Alternative Evaluation Report

CUY-14-6.93
PID 104132
June 15, 2020

Prepared for:
ODOT District 12
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June 15, 2020

Mr. Poonsak Sritalapat, PE
District 12 Project Manager
Ohio Department of Transportation
5500 Transportation Boulevard
Garfield Heights, OH 44125

Re: CUY-14-6.93
PID No. 104132
Alternative Evaluation Report

Dear Mr. Sritalapat:

AECOM is pleased to submit our Alternative Evaluation Report (AER) for the CUY-14-6.93 project for your review. This submittal has been updated following the Value Engineering (VE) session hosted at your office on July 9, 2019. A hard copy is being delivered directly to you at the address you provided. Per your direction, hard copies are also being delivered to Cuyahoga County Department of Public Works and Cleveland Metroparks. A full electronic copy is also being sent to all.

As you know, this site is highly complex. The AER narrative discusses the site complexities, and explains how these complexities eliminated most conceptual alternatives, how they factored into the evaluation of feasible alternatives, and how they ultimately led to our recommendation of a preferred alternative.

We look forward to the selection of a preferred alternative. Page 55 of the report outlines the Next Steps needed as we navigate the NEPA process and obtain concurrences before proceeding with Stage 1 design and plan preparation. Please let us know if any additional information is needed at this time to aid in decision making.

We are available to meet at your convenience and can do so virtually if requested. Please feel free to contact us with any questions you may have. We look forward to continuing with design and plan development on this important project.

Thank you.

Sincerely,

AECOM Technical Services, Inc.

Zack Deems, P.E.

Zack Deems, PE
Ohio Transportation Business Unit Leader

Copy With Attachments: Brendan Finn, PE, Chief Section Engineer – Bridge Design
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I. INTRODUCTION

The CUY-14-0693 Bridge in the City of Garfield Heights (a.k.a., Whitehouse Crossing Bridge) is near the end of its service life and is in a deteriorating condition. The existing bridge was built in 1929 (with a project which also rerouted Henry Street), was re-decked and widened in 1986, and received maintenance repairs in 2000 and 2010. During the 2017 annual Ohio Department of Transportation (ODOT) bridge inspection, the existing bridge General Appraisal dropped to 4 (Poor), and the subsequent Sufficiency Rating dropped to 45.4. These deteriorating bridge condition ratings have prompted this current project. While not in imminent failure mode, the existing structurally deficient bridge needs major rehabilitation or replacement within the next decade to continue to serve its purpose. ODOT District 12 has recognized that work is necessary to keep this important link of State Route 14 (SR14), a.k.a. Broadway Avenue, functioning. The AECOM team was hired by ODOT District 12 to study project alternatives to provide a 75 year life after construction; and then to design the preferred alternative.

The purpose of this report is to first present alternatives to rehabilitate or replace the existing facility, and to then identify a preferred alternative. Beginning at the west end, the existing bridge is a multiple short-span concrete frame design carrying SR14 through the Garfield Park Reservation (managed by Cleveland MetroParks). Near the middle of the bridge, Henry Street intersects SR14 from the south at a signalized intersection, and this spur of the bridge continues along Henry Street crossing over Mill Creek. Continuing east, the main SR14 Bridge then crosses over Chaincraft Road, two Norfolk Southern (NS) rail lines, and a rail line offset to the northeast which is owned by Wheeling and Lake Erie Railway (W&LE) but leased to Cleveland Commercial Railroad (CCR). The two NS rail lines carry in excess of 60 trains per day at speeds averaging 50-55 mph. The CCR rail line carries 2 trains per day averaging 10 mph. Separating the grades of SR14 and Henry Street from the rail lines was the original purpose of the project in 1929, and certainly remains necessary today and in the future.

Through the anticipated project limits, SR14 is an Urban Principal Arterial with a current ADT of 18,500 and with design and legal speed being 35 MPH. SR14 is a key residential, commuter, and freight route, and this existing bridge is the only grade separation in the City of Garfield Heights over the busy rail lines, except for Interstate 480 a mile to the east. South of the rail properties, Chaincraft Road is an industrial park road with several vibrant businesses with trucks that must pass under the existing bridge and often across the existing bridge. North of the rail lines lies another commercial and industrial area. Therefore, this bridge is a key link across the bisecting rail lines for residents, commuters, businesses, public transportation, pedestrians, bicyclists, park patrons, etc. Cleveland Clinic – Marymount Hospital is located at the end of Henry Street, less than a mile south of the intersection with SR14. In 2007, an emergency room was added to this hospital. Residential areas lie just beyond the described businesses in all directions. Henry Street has a current ADT of 7,000. Garfield Park Reservation is a heavily frequented destination and a vital resource to the residents of Garfield Heights.

See the Study Area Map in Appendix BB.

This report is organized and presented following ODOT’s Feasibility Studies and Alternative Evaluation Reports document dated October 2017.

II. PURPOSE AND NEED

Project History

The CUY-14-0693 Bridge (a.k.a., Whitehouse Crossing Bridge, SFN 1801805) carries State Route 14 (SR14 or Broadway Avenue) over Garfield Park Reservation, Chaincraft Road, Norfolk Southern (NS) rail lines, and Wheeling and Lake Erie (W&LE) rail lines [leased to Cleveland Commercial Railroad (CCR)] in the City of Garfield Heights. The bridge was built in 1929, re-decked and widened in 1986, and received maintenance repairs in 2000 & 2010.

The 2017 annual bridge inspection by the Ohio Department of Transportation (ODOT) found the condition had deteriorated to General Appraisal of 4 (Poor), and Sufficiency Rating of 45.4. AECOM was contracted to study the rehabilitation and replacement of the structure to provide a 75-year life span after construction.

Purpose Statement

The purpose of this project is to address the deficient structure in the City of Garfield Heights, Cuyahoga County, Ohio.

Need Elements

Facility Deficiencies: The ODOT Bridge Inspection Manual provides guidelines for assessing bridges from 0-9, where 9 is like new and 0 is out of service. Per the most recent bridge inspection dated October 4, 2019, the existing bridge has a General Appraisal Rating of 4 (Poor). A General Appraisal Rating of 4 or less is considered structurally deficient. The current Sufficiency Rating is 45.4. Sufficiency Ratings range from 100 as new to 0 as closed. The Federal Highway Administration (FHWA) has indicated that bridges deemed functionally obsolete or structurally deficient and with a Sufficiency Rating below 50 are eligible for replacement. Deficiencies found on the bridge during the 2018 inspection include:

- Deck (rated 5 Fair) – many transverse cracks and concrete patches on wearing surface with spalling, minor cracks in sidewalks, vertical & horizontal leaching cracks, spalling, and collision damage on railing;
- Approach (rated 6 Good) - minor collision damage to guardrails, cracks on approach slab, and minor embankment settling;
- Superstructure (rated 4 Poor) – steel beams have rusting section loss, bent & torn flanges, missing rivet heads, concrete beams have cracks, delamination, some exposed rebar, cross girders have pack rust at built up plates;
- Substructure (rated 5 Fair) – cracks, large delamination areas on piers with patched areas & large spalling and some rebar exposure, pier walls & pier caps have cracks, delamination areas, collision scrapes, large spalling, some rebar exposure, pier caps also have minor seat loss below concrete beams, and backwalls have severe rebar exposure and thru crack in rear.

If these deficiencies are not addressed the structure will eventually be closed to all traffic causing major impacts to the area and the general travelling public.

Secondary Needs: Provide pedestrian access to Garfield Park Reservation. SR14 is at the same elevation as Garfield Park Reservation and the businesses in the area at the intersection with Garfield Park Boulevard. SR14 then gradually rises onto the bridge and is approximately 30 feet above the Reservation. There are pedestrian access points to the Reservation near the Garfield Park Nature Center and the Garfield Park Maintenance Center. The proposed project should allow for maintaining, modifying, and/or enhancing these access points.

Summary

The purpose of this project is to address the deficient structure which has General Appraisal Rating of 4 and Sufficiency Rating of 45.4.

Logical Termini & Independent Utility

The logical termini for the project are 300' west of the beginning of the structure on SR14; 300' east of the end of the structure on SR14; and 250' south of the end of the structure on Henry Street. These termini are sufficient to consider viable alternatives to address the need.

The proposed project does not rely on any other project to meet the established purpose and need. Additionally, the project is independent of any other transportation improvement in the area and does not preclude any future project. Therefore, independent utility is established for the proposed project.

III. ALTERNATIVES

ODOT District 12 developed the Scope of Services for this Project Development Process (PDP) Path 2 project. ODOT and the AECOM team negotiated an agreement per the Scope of Services. As general guidance provided in the Scope of Services, the following alternatives are to be evaluated:

- Replace the wearing surface, and repair superstructure and substructure, spot painting, and fence replacement.
- Replace bridge with new bridge. Where possible, MSE walls and fill should be used to replace structure. Also the consultant may reduce the amount of spans, vary the span length, and/or vary the alignment. The new bridge can be either concrete or steel.
- Replace bridge with other innovative suggestion of the consultant.

With these guidelines in mind, the AECOM team initially considered many alternatives. As some alternatives did not satisfy the Purpose & Need (P&N), we were justified in giving those alternatives no further consideration. For many other alternatives, conceptual design was developed in enough detail to justify giving those alternatives no further consideration due either to significant impacts to the Key Issues discussed in Section IV later or simply that they were more impactful than other similar alternatives being considered. This report discusses those alternatives that were advanced for further consideration, and the next section introduces the Key Issues and impacts of these alternatives.

Many factors and potential impacts were used in evaluating those alternatives that were advanced for further consideration. In order for an alternative to be advanced, it had to satisfy the P&N and be constructible while traffic is maintained in many locations. Impacts to all Key Issues were considered for each alternative. Life-cycle costs for the next 75 years, considering initial construction and future maintenance costs, as well as right-of-way acquisition and utility relocation costs, were developed for each alternative to help in the evaluation process.

a. Alternatives Dismissed after Initial Consideration

i. Replace Bridge with Other Innovative Suggestion of the Consultant: A non-interstate rail grade separation of vehicular traffic from the rail lines was important enough to prompt the original construction in 1929, and remains equally important today. Since no other new grade separation crossing is planned within the Garfield Heights city limits, all alternatives considered for this project must provide this grade separation. Tunneling under the rail lines was initially considered as a replacement alternative, but this was given no further consideration due to concerns with maintenance of traffic, railroad permitting requirements, environmental impacts, construction costs, the grade of Henry Street, and the location of this site in a potential flood plain. Therefore, alternatives focused on bridging SR14 over the rail lines, which is consistent with the existing facility.

Changing the horizontal alignment dramatically looks inviting initially, as it appears to avoid obstacles near the existing alignment (utilities, businesses, other roadways, environmental impacts, etc.). However, brief conceptual engineering reveals significant impacts by major realignments to any number of the myriad of site restrictions; plus major increases to construction costs for any major realignment of SR14. Major realignments also are not conducive to maintaining traffic to many local businesses, and connecting with Henry Street in the finished product. Any such major realignment would have significant impacts (property, environmental, rail crossing, businesses, park, etc.). We simply do not foresee a scenario in which we would be able to state that no feasible alternative exists to support a major relocation. After much consideration and a careful review of site constraints, we focused on new alternatives which closely follow the existing horizontal alignment. Therefore, we gave alternatives that re-route SR14 outside the existing and adjacent footprint of the existing facility no further consideration.

ii. <u>Replace Bridge on Same Alignment Across Rail Lines</u>: Due to the need to maintain traffic on SR14 during construction, replacing the portion of the bridge over the rail lines would typically be done in phases in order to stay on the same horizontal roadway alignment. If that was constructible and feasible:

- In Phase 1, traffic on SR14 would be reduced to one lane in each direction and both lanes shifted to one side. Half of the width of the existing bridge would then be removed. Half of the proposed bridge width would then be built in the same location.
- In Phase 2, traffic on SR14 would stay at one lane in each direction but be placed on the portion of the new bridge constructed in Phase 1. Then the remainder of the bridge width would be removed and the new bridge construction finished.

However, the existing steel bridge section over the railroad tracks is made up of a unique floorbeam-and-stringer system. The floorbeams are framed normal (90^0) to the longitudinal stringers, and are supported on the pier pedestals at alternating locations (and beneath alternating stringer lines). These floorbeams are essentially fracture-critical steel pier caps supported on just 2 bearings each. In order to cut these members, new temporary columns would have to first be constructed in locations that would impede train traffic. This renders a true part-width construction phasing of this section of the existing bridge unfeasible. For example, Floorbeam H as labeled on 1986 plans (see Appendix DD) would require a new steel bearing stiffener and a new footing and column (constructed closer to the rail line) in order to remove just over 10 feet of existing superstructure width during phased removals. There are many other similar locations as well. This construction would be highly impactful to the operations of the rail lines, so we therefore do not recommend such work. Only the independent widening beams constructed in 1986 could be removed to minimize any roadway alignment shift, but there is still a significant shift needed. Due to existing structure type and the need to maintain traffic during construction, at least a portion of the new bridge across the tracks will have to be shifted (with little or no “overlap” in plan view) away from the existing bridge. Therefore, we gave this alternative (Replace Bridge on Same Alignment Across Rail Lines) no further consideration.

iii. Replace Bridge with Alignment Across Rail Lines Shifted Any Amount to the South: Due to the intersection of Henry Street from the south, shifting the new bridge by any amount to the south initially looks attractive. However, the buildings of Empire Paving Company, the former Collinwood Concrete, and other businesses east of the rail lines just south of the existing SR14 alignment would require acquisition, demolition, and environmental site clean-up for any southerly shift. This is simply too impactful compared to other alternatives. See the Study Area Map in Appendix BB. Therefore, we gave this alternative no further consideration.

b. Feasible Alternatives Advanced for Further Study

The previous section outlines why no further consideration was given to alternatives that:

- Provide a major change or reroute of the existing SR14 horizontal alignment;
- Replicate the existing SR14 horizontal alignment with no shift; or
- Move the SR14 horizontal alignment any amount to the south of existing.

That leaves the following alternatives to be analyzed in this report:

- Alternatives that move the SR14 horizontal alignment only approximately half of a facility width to the north/west of existing (Alternatives 1, 2, and 3);
- Alternatives that move the SR14 horizontal alignment a full facility width or more to the north/west of existing (Alternatives 2A, 3A, 3B, and 3C);
- An alternative which requires moderate rehabilitation initially followed by a full replacement in 10 years based on recent maintenance patterns (Alternative 4);
- An alternative that requires multiple major rehabilitations but no replacement for the 75-year life cycle (Alternative 5); and
- The No-Build Alternative.

A formal Value Engineering (VE) session coordinated by ODOT was held in 2019. The VE session consisted of an initial AER submittal on June 21, 2019, VE review by ODOT, a formal VE meeting on July 9, 2019, a follow-up formal VE Implementation Meeting on September 16, 2019, and additional design and research outlined in a memo dated October 22, 2019. See Appendix K. Alternatives 2A, 3A, 3B, and 3C were created to follow specific concurrence items from that formal VE process.

As one of the concurrence points from the VE session, all alternatives in this report call for closing all access to/from Henry Street during Phase 2 construction but maintaining full access in Phase 1 (and Phase 3 if there is one). To the contrary, for consistency, all alternatives use the same Henry Street facility as presented in the original Alternatives 1, 2, and 3, rather than reducing the facility in this short spur. Any reduction in Henry Street lane widths will result in very minimal savings, but can be added after selection of a preferred alternative if requested.

Alternatives that Move the SR14 Horizontal Alignment Only Approximately Half of a Facility Width to the North/West of Existing (Alternatives 1, 2, and 3)

i. **Alternative 1 – Provide Separate New Bridges over Rail Lines and Existing Chaincraft Road:** This alternative will shift the SR14 alignment approximately half of the SR14 width to the north/west. See the Alternative 1 Schematic Plan in Appendix GG. Construction will occur in 2 phases:
    - In Phase 1, one lane of traffic in each direction will remain on SR14, shifted into the current eastbound lanes; and Henry Street will remain fully open. A westbound SR14 left turn lane onto Henry Street will be provided in this phase. The steel framed bridge across the rail lines will remain fully intact. Most of the westbound lanes of the remainder of the existing SR14 portion of the bridge are removed. A new half width (future westbound lanes) of the full-length SR14 facility is constructed just to the north of the remaining existing facility.
    - In Phase 2, the one lane of traffic in each direction of SR14 will be shifted onto the portion of the new facility constructed in Phase 1. The WB SR14 left turn lane will not be provided because Henry Street will be closed. The entire remaining existing facility is removed in Phase 2, including the entire steel framed bridge across the rail lines. Then, the entire remaining proposed facility is constructed.

One significant negative with the minimal shifting of the new SR14 alignment with this alternative is the need to construct foundations, substructure units, and the superstructure in two separate phases across the rail lines and under the FirstEnergy transmission lines. While each of the two construction time periods with this alternative will be less than one time period if done all at once (as with fully shifted SR14 alignment alternatives), the need and reliance on two separate periods of access and shutdowns of services by a power grid supply and two rail line owners doubles the risk of construction schedule delays and high construction claims.

For this alternative, the only possible “overlap” of the new bridge in plan view across the rail lines versus the existing bridge would be through the removal of the steel bridge portion which was widened along the north bridge fascia in 1986. However, only minimal width would be gained, tapering at the east end to only the width of the sidewalk. If this previous widening is instead left in place, this extra existing bridge width becomes very beneficial to the contractor as a work/staging area during construction. Keeping the full bridge width intact in Phase 1 also eliminates additional removals and access on NS property during Phase 1. Therefore, we do not recommend removal of the 1986 widening in an earlier phase, but instead recommend waiting until Phase 2 to complete all bridge removals across the rail lines.

Bridges are expensive to build and to maintain, so within this Alternative 1 the total bridge deck area is minimized for alternatives which do not relocate Chaincraft Road and which minimize the impacts to rail line property. The finished product with Alternative 1 will consist mostly of embankment on fill retained by MSE wall sections, with 2 individual bridges: a two-span bridge across the rail lines; and a single span bridge across the existing Chaincraft Road alignment.

Viewing Alternative 1 from the main park property: From the west, the replacement project will replace the open view under the bridge toward Chaincraft Road with MSE walls supporting the roadway on fill. This would also isolate the park from Chaincraft Road, both visually and from any access. Turning the corner onto Henry Street, the MSE wall will continue around the corner, potentially shutting off all access from the main park under both SR14 and Henry Street. While this shutting off of access is generally counter to Section 4(f) logic, Cleveland MetroParks at a meeting on March 13, 2019, had no concerns with this or with access under SR14 or Henry Street (the City of Garfield Heights maintains the park ground north of SR14).

ii. **Alternative 2 – Provide One New Bridge to Span over Rail Lines and Existing Chaincraft Road:** This alternative uses the same proposed SR14 alignment, MOT phasing, etc., as Alternative 1. The difference with Alternative 2 versus Alternative 1 is that only one bridge is proposed to span over the rail lines and the existing Chaincraft Road alignment, versus having two separate bridges with a wedge of retained fill in between per Alternative 1.

This alternative adds more bridge deck area and one more pier than Alternative 1, and requires a SR14 profile 16” higher over the rail lines than that needed for Alternative 1 due to deeper bridge girders. However, compared to Alternative 1, Alternative 2 removes the difficult-to-phase-construct soil wedge and eliminates two approach slabs and two full height abutments.

Similar to Alternative 1, this Alternative 2 necessitates constructing foundations, substructure units, and the superstructure in two separate phases across the rail lines and under the electric transmission lines. As noted with Alternative 1, the need and reliance on two separate periods of access and shutdowns of services by a power grid supply and two rail line owners doubles the risk of construction schedule delays and high construction claims.

See more specific bridge discussions in the Key Issues section later. Also, see Appendix GG for AER Conceptual Detail Plans.

iii. **Alternative 3 – Provide One New Bridge to Span over Rail Lines and Relocated Chaincraft Road:** This alternative uses the same proposed SR14 alignment, MOT phasing, etc., as Alternative 1. The difference with Alternative 3 versus Alternative 1 is that a separate bridge over Chaincraft Road is not needed. Instead, Chaincraft Road is relocated to run adjacent to the southern NS right-of-way boundary to cross under the proposed SR14 alignment prior to bridge construction. There is no need for a second bridge, as the existing Chaincraft Road alignment will be abandoned. To carry the proposed SR14 over the relocated Chaincraft Road, the southern span of the new two-span bridge over the rail lines from Alternative 1 is extended (the south abutment is shifted further south). This alternative minimizes the total bridge deck area needed for the project and eliminates a separate bridge on full-height abutments over the existing Chaincraft Road alignment, the difficult-to-phase-construct soil wedge, and two approach slabs.

However, Alternative 3 requires an SR14 profile 24” higher over the rail lines than that needed for Alternative 1 due to deeper bridge girders. It also requires more relocation of Chaincraft Road. Another negative to Alternative 3 is that it requires the purchase of a full parcel (Parcel No. 544-18-006; 0.340 acres) of the limited available land that Chaincraft Road dead ends into.

Similar to Alternative 1, this Alternative 3 necessitates constructing foundations, substructure units, and the superstructure in two separate phases across the rail lines and under the electric transmission lines. As noted with Alternative 1, the need and reliance on two separate periods of access and shutdowns of services by a power grid supply and two rail line owners doubles the risk of construction schedule delays and high construction claims.

See the Study Area Map in Appendix BB, and see more specific bridge discussions in the Key Issues section later.

Alternatives that Move the SR14 Horizontal Alignment a Full Facility Width or More to the North/West of Existing (Alternatives 2A, 3A, 3B, and 3C)

iv. **Alternative 2A – Provide One New Bridge to Span over Rail Lines and Existing Chaincraft Road:** This alternative will shift the SR14 alignment a full facility width or more to the north/west. See the Alternative 2A Schematic Plan in Appendix GG. Construction will occur in just 2 phases:

- In Phase 1, one lane of traffic in each direction will remain on SR14, shifted into the current eastbound lanes; and Henry Street will remain fully open. A westbound SR14 left turn lane onto Henry Street will be provided in this phase. The steel framed bridge across the rail lines will remain fully intact, with the current westbound lanes remaining to be used for contractor parking and access/laydown. The westbound lanes of the remainder of the existing SR14 portion of the facility beyond the bridge over the rail lines in both directions will be removed in this phase to minimize the offset of the proposed SR14 alignment in those areas and to transition to the tie-in locations. A new full-width SR14 bridge across the rail lines is constructed just to the north of the existing facility. A new half-width facility beyond the bridge over the rail lines in each direction is constructed just north/west of the remaining existing facility.
- In Phase 2, the one lane of traffic in each direction of SR14 will be shifted onto the portion of the new facility constructed in Phase 1. The WB SR14 left turn lane will not be provided because Henry Street will be closed for the remainder of construction. In Phase 2 the entire remaining existing facility (SR14 and Henry Street) is removed, including the entire steel framed bridge across the

rail lines. Then, the entire remaining proposed facility (SR14 and Henry Street) is constructed.

The difference with Alternative 2A versus Alternative 2 is that the proposed SR14 alignment is pushed further north/west so the entire 3-span bridge can be constructed over the rail lines and under the electric transmission lines all in one phase. This Alternative 2A uses a similar 3-span bridge over the rail lines and existing Chaincraft Road alignment to the one identified earlier with Alternative 2. However, it is shorter and has a better overall skew and span arrangement since it has moved away from the turn of Chaincraft Road below. This results in a much more efficient structure, which results in cost savings, when compared to the bridge needed with Alternative 2.

The full shift of SR14 alignment across the rail lines provides a major advantage since access and shutdowns of services by a power grid supply and two rail line owners are needed only once with Alternative 2A versus twice with Alternative 2, which eliminates half the risk of construction schedule delays and high construction claims. However, this alignment does impact additional right-of-way to the north and west of the existing SR14 alignment than the alignment proposed with Alternative 2.

The main disadvantages of the SR14 horizontal alignment of Alternative 2A versus that of Alternative 2, which minimizes the horizontal alignment shift to the north to only approximately half of a bridge width, are as follows:

- The spur of Henry Street is longer with Alternative 2A versus Alternative 2, which increases its total length, and therefore costs, of the new facility needing constructed.
- The new pier location for Alternative 2 further restricts truck ingress/egress movements along Chaincraft Road during the phases in which trucks must negotiate beneath existing columns while new construction is taking place for the pier. which are already somewhat restrictive. However, truck turning analyses have been performed and access will be maintained, although it will require periods of one lane of two-way traffic.
- The new alignment associated with Alternative 2A increases the needed permanent right-of-way from the Park Area #1 portion of the Garfield Park Reservation (north of existing SR14 and south of the NS rail property).
- The public road parallel to and just north of SR14 at the east end of the project (Old Broadway Avenue) needs shifted by this alternative further into private property and up a hill, causing the acquisition of additional right-of-way and the disruption to businesses increased costs of that road.

To conclude, shifting the SR14 alignment across rail lines a full bridge width or more to the north (as proposed for this Alternative 2A, and also for Alternatives 3A, 3B, and 3C to follow) has advantages and disadvantages when compared to alignments across rail lines shifted minimally (only approximately half of an existing facility width) across the rail lines (as proposed for Alternatives 1, 2, and 3 earlier).

As shown, the rear abutment for this proposed bridge is quite long due to the skew and location along the curving SR14 alignment, and likely requires framing beams in the rear span near the rear abutment. If this alternative is selected, minor adjustments to the rear abutment skew and the geometrics (alignment, angle of intersection, radii, etc.) in the SR14/Henry Street intersection will be considered to improve the geometry in this area and to attempt to eliminate special framing considerations. See more specific bridge discussions in the Key Issues section later. Also, see Appendix FF for Alternative 2A Schematic Plan.

v. **<u>Alternative 3A – Provide One New Bridge to Span over Rail Lines and a Separate Culvert Structure to Span over Relocated Chaincraft Road:</u>** This alternative utilizes the following:

- Alternative 3A uses the same proposed SR14 horizontal alignment as identified earlier for Alternative 2A so the entire bridge across the rail lines and under the electric transmission lines can be constructed in one phase. Therefore, the SR14 horizontal alignment will shift a full facility width to the north/west across the tracks, transitioning to an approximate half facility width shift in each direction of SR14 to the ends of the project.
- Compared to Alternative 3 identified earlier, Alternative 3A uses a shorter 2-span bridge to carry SR14 only over the rail lines. The rear abutment of this bridge is placed close to and parallel with the southern NS right-of-way line. To carry the relocated Chaincraft Road alignment identified earlier for Alternative 3, this Alternative 3A uses a separate arch-topped 3-sided culvert. This culvert runs parallel with and adjacent to, and just behind, the rear abutment. In fact, one side of the 3-sided culvert is set on a "shelf" on the back of a modified full-height rear abutment, while the other side of the culvert is set atop pedestal walls. MSE wall panels above and west of the culvert complete the proposed facility in this location.

As detailed, Parcel No. 544-18-006 will be fully acquired to connect the relocated Chaincraft Road to the existing Chaincraft Road east of the existing SR14 alignment. Consideration was given to moving the tie-in further east, beyond Parcel No. 544-18-006, by running the relocated Chaincraft Road further east alongside the NS right-of-way line. A potential centerline alignment was generated and is shown in the Alternative 3A Schematic Plan located in Appendix FF. In a closer look of the potentially impacted parcels, it becomes quickly evident that such an extension would cause major operation disruptions and building takes. Therefore, compared to acquiring and using Parcel No. 544-18-006 for the connection, extending the relocated Chaincraft Road further east just increases impacts to parcels along the way, right-of-way acquisition costs, construction costs, and the length of signalized two-way one lane traffic during construction. Therefore, extending the relocation of Chaincraft Road further east was given no further consideration.

Construction will occur in 2 phases:

- All SR14 Phase 1 traffic, removals, and construction is exactly as described with Alternative 2A earlier. For Chaincraft Road, the full-height rear abutment of the bridge over the rail lines (with the “shelf” for later placement of culvert sections) must be constructed early on in Phase 1. Then, Chaincraft Road must be relocated to its final location up against this abutment and under the existing bridge (all parallel with the NS right-of-way line), with a new connection to a new intersection with existing Chaincraft Road made through the now acquired Parcel No. 544-18-006 east of SR14. A new pedestal wall to carry the other culvert legs can then be constructed, and the 3-sided arch-topped culvert sections placed. Chaincraft Road must remain signalized for two-way traffic on one lane until the existing bridge is removed in Phase 2.

- In Phase 2, the one lane of traffic in each direction of SR14 will be shifted onto the portion of the new facility constructed in Phase 1. The WB SR14 left turn lane will not be provided because Henry Street will be closed. Then, in the first item of construction in this phase, remove the existing bridge over the tracks and complete the two-lane facility of the relocated Chaincraft Road. Then, the entire remaining existing facility (SR14 and Henry Street) is removed, and the entire remaining proposed facility (SR14 and Henry Street) is constructed.

As currently detailed, the east end of the culvert appears in plan view to be in conflict with the existing bridge which is still intact when the culvert is placed. If this alternative is selected, this location will be graphed closely horizontally and vertically, and any conflicts will be addressed either by some additional removals of existing or by a slight adjustment to the alignment. See more specific bridge discussions in the Key Issues section later. Also, see Appendix FF for Alternative 3A Schematic Plan.

vi. Alternative 3B – Provide One New Bridge to Span over Rail Lines and a Separate Culvert Structure to Span over Existing Chaincraft Road (Alignment Option #1):

This alternative utilizes the following:

- Alternative 3B uses the same proposed SR14 horizontal alignment and bridge across the rail lines and under the electric transmission lines as identified earlier for Alternative 3A.
- The difference between Alternative 3B and Alternative 3A is that the existing Chaincraft Road alignment is left generally as is for Alternative 3B. Chaincraft Road maintains an “S” shape curve under SR14 with Alternative 3B, which leads to the shortest possible length of the separate arch-topped 3-sided culvert atop pedestal walls similar to that identified earlier for Alternative 3A. The culvert does not follow the back side of the full-height rear abutment for Alternative 3B, so two separate pedestal walls are needed, rather than just one like proposed in Alternative 3A. In addition to a second pedestal wall, another drawback with this shortest culvert length are the overall sight distance and maneuverability for trucks locked in place by the revised Chaincraft Road alignment. In addition, the backfill between the rear abutment of the bridge across the rail lines and the separate culvert structure will be difficult to place and compact, and may require lifts of low-strength-mortar backfill instead of compacted lifts of embankment. This alternative also requires a temporary bridge for maintaining SR14 traffic, and a third

construction phase to finish construction where the temporary bridge had impeded construction.

Construction will occur in 3 phases:

- For Phase 1, all traffic patterns, removals, and construction are exactly as described with Alternative 2A earlier. However, there are added complexities due to truck turning movement geometrics. Due to the location and angle of approach the trucks must take exiting Chaincraft Road under the remaining portion of the existing SR14 bridge during this phase, the trucks are routed close to the back of the newly constructed rear abutment of the bridge over the rail lines. This is also the location of the proposed construction of the culvert and pedestal walls which will carry Chaincraft Road in the completed project. Due to these site restrictions, the east pedestal wall supporting the culvert cannot be constructed in Phase 1. The west pedestal wall can be constructed, and the new MSE-wall contained embankment approach from the west up to that west pedestal wall (requires a temporary wire wall) can be constructed. Then, a new 100' long temporary bridge (Acrow or other) is needed to span from the new rear abutment to the wire-wall and MSE-wall supported approach west of the west pedestal wall over the one lane of signalized two-way Chaincraft Road being maintained below.
- In Phase 2, the first item of construction is to remove the remaining existing facility which impedes the truck flow along Chaincraft Road, then move the one lane of signalized two-way Chaincraft Road over against the west pedestal wall built during Phase 1. Then, the entire east pedestal wall and the culvert pieces over Chaincraft Road can be constructed. Placing each prefabricated culvert piece over the one lane of signalized two-way Chaincraft Road traffic will require short-duration closures. Then, the remainder of the entirety of the project can be constructed through completion, except for where the temporary bridge impedes completion.
- In Phase 3, flip SR14 traffic to the newly completed eastbound lanes, and reopen Henry Street and the intersection similar to the configuration in Phase 1. Then remove the temporary bridge and complete the remainder of the work.

If this alternative is selected, minor adjustments to the culvert width and the geometrics (alignment, angle of intersection, radii, etc.) in the SR14/Henry Street intersection will be considered. See more specific bridge discussions in the Key Issues section later. Also, see Appendix FF for Alternative 3B Schematic Plan.

vii. **<u>Alternative 3C – Provide One New Bridge to Span over Rail Lines and a Separate Culvert Structure to Span over Existing Chaincraft Road (Alignment Option #2):</u>** This alternative is very similar to Alternative 3B but flattens the Chaincraft Road horizontal alignment "S" shape curve under SR14 in the final product by moving the separate arch-topped 3-sided culvert atop pedestal walls further away from the rear abutment of the bridge across the rail lines. This Alternative 3C improves the overall sight distance and maneuverability for trucks locked in place by the revised Chaincraft Road alignment noted with Alternative 3B, and also avoids the backwall compaction issue noted for Alternative 3B. Alternative 3C also simplifies the maintenance of Chaincraft Road traffic during construction when compared to Alternative 3B. Similar to Alternative B, Alternative C also requires a temporary bridge for maintaining SR14 traffic, and a third construction phase to finish construction where the temporary bridge had impeded construction. The length of culvert needed for Alternative 3C is also considerably longer than the one needed for Alternative 3B (258' vs. 126').

Construction will occur in 3 phases:

- For Phase 1, all traffic patterns, removals, and construction are exactly as described with Alternative 2A earlier. However, similar to Alternative 3B described above, there are added complexities due to truck turning movement geometrics. Due to the location and angle of approach the trucks must take exiting Chaincraft Road under the remaining portion of the existing SR14 bridge during this phase, the trucks are routed close to the back of the newly constructed rear abutment of the bridge over the rail lines. However, there is room to construct Temporary Wire Wall J atop the rear abutment footing along the back of the rear abutment stem for support of a temporary bridge (Acrow or other) which will later hold Phase 2 SR 14 traffic. Construction in this Phase 1 includes a partial length of the culvert and both pedestal walls, which will later carry 2 lanes of Chaincraft Road, under the future westbound SR14 lanes. Temporary Wire Wall I runs along the phase line supporting this new construction from the west, continues across this new culvert and turns at Chaincraft Road to create the other abutment for the temporary bridge. The 80' long temporary bridge is placed to carry the future Phase 2 SR 14 traffic over the existing Chaincraft Road alignment until the culvert length is completed in Phase 2. During this Phase 1, Chaincraft Road will be maintained at a minimum with one lane of signalized two-way traffic.
- In Phase 2, the first item of construction is to remove the remaining existing facility which impedes the truck flow along Chaincraft Road and open up two lanes of Chaincraft Road on the existing alignment. Then, the next item is to complete the pedestal wall and culvert construction, which will require a short period of one lane of signalized Chaincraft Road traffic at the east end to complete. This is all Phase 2A MOT work. Then move Chaincraft Road to its final 2-lane configuration through the culvert, and the remainder of work in this phase is done under Phase 2B MOT. After the culvert is completed and Chaincraft Road routed through, the remainder of the entirety of the project can be constructed through completion, except for where the temporary bridge impedes completion.
- In Phase 3, flip SR14 traffic to the newly completed eastbound lanes, and reopen Henry Street and the intersection similar to the configuration in Phase 1. Then remove the temporary bridge and complete the remainder of the work.

If this alternative is selected, minor adjustments to the culvert width and the geometrics (alignment, angle of intersection, radii, etc.) in the SR14/Henry Street intersection will be considered. See more specific bridge discussions in the Key Issues section later. Also, see Appendix FF for AER Detail Plans and Appendix HH for Alternative 3C – Permanent Right-of-Way Impacts.

Rehabilitation Alternatives (Alternatives 4 and 5)

viii. **Alternative 4 – Moderate Rehabilitation Initially, Followed by Replacement in 10 Years:** This alternative consists of a moderate rehabilitation now (construction in 2025), followed by a full bridge replacement project just 10 years later, then maintenance projects as needed thru the 75-year life-cycle ending in 2100. This alternative requires less work with the initial project (and lesser impacts and lower initial construction costs), but will cause impacts and require costs associated with a full replacement in just 10 years (year 2035). The 10 year window is reasonable considering the recent maintenance pattern experienced with this bridge: major rehabilitation in 1986; moderate rehabilitations in 2000 and 2010; and a proposed moderate rehabilitation proposed for 2025. It is assumed for this report that the replacement alternative in 10 years will be similar to that identified with Alternative 2 above, although any of the proposed alternatives in this report can be substituted without much change. The replacement in 10 years will be needed unless an additional grade-separated crossing of the rail lines within the Garfield Heights city limits, which is easily accessible by SR14 traffic on both sides of the rail lines, is constructed in the next decade. Expensive work, albeit less costly than a full replacement, is needed initially to get the existing bridge to function as designed for the next 10 years. Initial work includes patching and epoxy injection for concrete repairs, fiber-reinforced polymer (FRP) wrapping of some existing concrete members for strengthening, strengthening and painting superstructure steel members over the rail lines, and performing partial overlays and/or partial deck replacements. For comparison purposes in this report, the anticipated replacement impacts and costs associated with the project in 10 years are being considered part of Alternative 4. However, a 10-year salvage value at year 75 is added for Alternative 4 since the replacement does not occur during the initial construction.

ix. **Alternative 5 – Major Rehabilitation Initially, Followed by Additional Major Rehabilitations in 25 and 50 Years:** This alternative consists of a major rehabilitation now (initial construction in 2025), followed by similar major rehabilitations in 25 years (year 2050) and 50 years (year 2075), with appropriate painting and patching included with each major rehabilitation.

A number of assumptions which must later be validated if this alternative is selected are made at this time in order to include this alternative in this report, such as: the existing steel can be retrofitted to last another 75 years, the existing columns can be wrapped (and not replaced) to last another 75 years, etc. The extent of “rusting section loss, bent & torn flanges, missing rivet heads”, etc., on ODOT’s latest bridge inspection report as noted in the Purpose and Need section earlier, will need investigated further. Such an in-depth inspection of the existing bridge elements is outside the scope of work at this time. For this AER, an assumption is being made that the existing steel can be retrofitted multiple times in order to extend the life of 95-year old (in 2025) fracture-critical steel, which is already showing disrepair, for the entire 75-year life cycle. It is also noteworthy that Alternative 5 leaves the deficient horizontal and vertical clearances over NS rail lines in place for another 75 years; whereas Alternatives 1, 2, and 3 all increase horizontal and vertical clearances to the required minimums with the initial construction, while Alternative 4 does so 10 years after initial construction. A general summary of the minimal work anticipated with Alternative 5 is as follows:

Initial Major Rehabilitation in year 2025:

- The Henry Street spur and intersection with SR14: This portion of the existing structure received a major rehabilitation in 2010, including patching and sealing of the deck, so the initial work in 2025 will consist of FRP wrapping all pier columns and performing moderate patching to all pier caps, the abutment, all concrete beams, and the deck.
- The steel bridge spanning the rail lines: It was noted earlier that the existing steel superstructure cannot be replaced on the same alignment while traffic is maintained on SR14. There is no viable detour for SR14 across the rail lines, so the initial rehabilitation with Alternative 5 in 2025 will be expected to begin a new 75-year life cycle for the existing 95 year old fracture-critical steel superstructure. Therefore, a full deck replacement is included with the initial construction because it is warranted and so the existing steel can be fully checked for fatigue cracking and corrosion. This will also allow for a major steel retrofit (bearings and associated jacking, strengthening, potential fatigue retrofits or arresting of cracks, etc.). All steel will be painted. Moderate patching to the pier walls will also be performed.
- The remainder of the concrete framed bridge: The remainder of the existing SR14 bridge (west of the Henry Street intersection, between the intersection and the steel bridge, and east of the steel bridge) consists of 95 year old concrete beams, pier caps and columns, and footings. The deck in these locations was replaced in 1986, along with some other isolated members. To begin a new 75-year life cycle in 2025, this portion of the existing bridge needs to have a full superstructure replacement, pier cap replacements, and FRP wrap added to all pier columns.

Major Rehabilitation in year 2050 (year 25 of the 75-year life cycle):

- The Henry Street spur and intersection with SR14: Full superstructure, pier cap, and abutment (above footing) replacement will be needed in this portion of the structure because it will then be 40 years since the 2010 rehabilitation. The FRP wrapping of columns just 25 years ago (in 2025) should need little or no maintenance. However, the 22'x7' box culvert carrying Mill Creek will need replaced during this rehabilitation, which will cause some pier replacements and temporary support design for phased construction to keep Henry Street open. Similar phasing will be needed for the work through the intersection area.
- The steel bridge spanning the rail lines: New steel painting and a concrete overlay should be the major work needed in year 2050 for the steel portion of the existing bridge. Additional moderate patching of the pier walls will also be performed.
- The remainder of the concrete framed bridge: Minor patching of the superstructure, pier caps and abutments will be needed in year 2050, and a new concrete overlay will be added.

Major Rehabilitation in year 2075 (year 50 of the 75-year life cycle):

- The Henry Street spur and intersection with SR14: This portion of the existing structure will have received a major rehabilitation in 2050, including replacement of the culvert, the superstructure, the abutment backwall, and all pier caps. Therefore, those portions should require only minor patching in year 2075. The FRP wrap on all columns will be 50 years old and will require replacement.
- The steel bridge spanning the rail lines: A new deck will be needed in year 2075, and new steel painting will also be provided. Additional moderate patching of the pier walls will also be performed.
- The remainder of the concrete framed bridge: Moderate patching of the superstructure, pier caps and abutments will be needed in year 2075 since those elements will then be 50 years old. Similar to that required at year 2050, a new concrete overlay will be added to the superstructure. The FRP wrap on all columns will be 50 years old and will require replacement.

Very expensive work, albeit less costly than a full replacement, is needed initially to get the existing bridge to function as designed for the next 25 years. As included in this AER, Alternative 5 will cause major impacts during the initial construction and will also require costs and cause impacts with additional major projects two more times during the 75 year life cycle. For comparison purposes in this AER, the anticipated rehabilitation costs in 25 and 50 years are being considered part of Alternative 5. However, it is worth noting again that many assumptions are made that the existing bridge members can be retrofitted to last another 75 years. If Alternative 5 is selected, and the steel superstructure is unable to last the 75 years, then there is a possibility that SR14 will be closed and detoured, or very extensive temporary supports disrupting NS and W&LE rail lines, will be needed to replace this steel at a later date.

No-Build Alternative

x. **No-Build Alternative:** The No-Build Alternative represents the conditions that are anticipated to occur if no substantive capital improvements are made within the study area beyond those already planned. Since there is currently no other major work planned for the existing facility, the No-Build Alternative for this project is the existing facility itself with simple routine maintenance only. The original construction took place in 1929, a redecking and slight widening was performed in 1986, and maintenance projects were performed in 2000 and 2010. Still, the 2018 bridge inspection found the existing structure rated in poor condition. While failure is not necessarily imminent, this recent record of disrepair and required major maintenance indicates that the existing facility with simple routine maintenance will not last anywhere close to 75 more years. Therefore, the No-Build Alternative does not satisfy the Purpose and Need, and was rejected as an implementation option. However, for baseline comparison purposes, the No-Build Alternative is carried forward to the Comparison of Alternatives Summary and included in the comparison matrix.

IV. KEY ISSUES

There are several factors to consider in establishing alternatives for any project, but this bridge project is more complex than most. The key issues in the evaluation of alternatives are discussed in this section. These are the main drivers of establishing alternatives and ultimately in selecting the preferred alternative. For Alternative 4, note that impacts on the key alternatives noted in this section are only for the initial construction. However, unless another convenient grade separation project is built in the City of Garfield Heights in the next decade, all of the impacts noted for Alternatives 1, 2, and 3 will also apply to Alternative 4 for a replacement project just 10 years after this initial construction. For Alternative 5, the major rehabilitations in years 25 and 50 will cause the same impacts as noted for the initial construction during those years unless another convenient grade separation project is built beforehand.

a. Environmental Impacts

The study area of this project contains a myriad of environmental site concerns: a Section 4(f)/Section 6(f) resource; public involvement; cultural resources; ecological resources; regulated materials sites; FEMA Flood Zones; pedestrian accessibility, etc. See the Study Area Map in Appendix BB and the Environmental Study Area Limits Map in Appendix JJ. The key environmental issues considered in the development of alternatives are outlined in this section. Initial work on the individual study elements shown below has begun. However, per ODOT guidance and policy, individual environmental studies will not be completed until Stage 1 design, after an alternative has been selected and approved for further plan development.

i. Section 4(f)/Section 6(f): This is a very key issue when considering feasibility of alternatives for this project. The entire area of Garfield Park Reservation was leased by the City of Cleveland to the Cleveland MetroParks in 1988 (for three consecutive 99 year terms). Basically, anything outside of existing road right-of-way, through the Garfield Park Reservation, is park land. This is true for SR14, Henry Street, and Chaincraft Road. With the original 1929 construction project, the existing Broadway Avenue right-of-way widths were acquired in fee, originally by Cuyahoga County Board of Commissioners per Plan I.C.H 12 of 1927, and later by improvements by the State of Ohio per 1986 plan CUY-14-6.99. Missing from Cuyahoga County records is the conversion of County ownership of the road right-of-way to State ownership, likely when this route was designated as SR14. Therefore, ODOT owns the right-of-way width upon which SR14 currently exists through the park, and the City of Garfield Heights owns the right-of-way width upon which Henry Street and Chaincraft Road currently exist through the park. All alternatives studied keep the proposed work limits within the Henry Street right-of-way. However, all replacement alternatives move SR14 and impact Chaincraft Road. For the purposes of this investigation, we have divided the Garfield Park Reservation into three distinct sections:

- Park Area #1: This is the sliver of land north of SR14, south of the NS rail property, and west of Henry Street; and outside of the right-of-way width that the City of Garfield Heights owns for Chaincraft Road. See the Study Area Map in Appendix BB. This piece of parkland of Garfield Park Reservation is considered a Section 4(f) resource per the USDOT Act of 1966 since there is federal transportation funding in this project. This law was changed with SAFETEA-LU in 2005, and it now:

(a) disallows approval of any project which requires the use of any <u>significant</u> Section 4(f) property unless:
  (1) There is no feasible and prudent alternative to the use of such land, and;
  (2) Such project includes all possible planning to minimize harm resulting from such use; or
(b) allows the use if impact is considered "<u>de minimis</u>", which considers avoidance, minimization, mitigation, or enhancements to a 4(f) property.

While beyond the scope of this phase of the design, it is possible that Park Area #1 described herein could be considered "de minimis", although a public involvement period, park ownership concurrence, and ultimately FHWA approval are needed before this determination can be made. Cleveland MetroParks, at a meeting on March 13, 2019, indicated that they understood this Park Area #1 is potentially needed for this project, and they would likely be in support of its use. However, as mitigation measures, the MetroParks would like the opportunity to discuss with ODOT the following:

- the potential vacation of current SR14 land back to the park on the south side of SR14 in a potential swap of land;
- a possible protected multi-use lane in lieu of sidewalk along the south side of SR14 and west side of Henry Street;
- the possible use of nearly vertical (1/4"/foot) vegetated walls in lieu of traditional MSE walls for those walls viewed from Park Area #2 as defined below.

- <u>Park Area #2</u>: This is the vast area of Garfield Park Reservation south of SR 14 and west of Henry Street. See the Study Area Map in Appendix BB. In addition to being a <u>significant</u> Section 4(f) resource, this piece of parkland is also subject to Section 6(f) anti-conversion protection per the Land and Water Conservation Fund (LWCF) Act of 1965 because a previously constructed all-purpose trail used LWCF Grant #39-01164. The "6(f)(3) project boundary map" which is required for LWCF inspections every 5 years (see Appendix CC) clearly shows only this Park Area #2 boundary. Conversion of property upon which LWCF funds have been spent needs approval and requires replacement property:

  <u>Per Section 6(f)(3) of LWCF Act of 1965</u>: No property acquired or developed with assistance under this section shall, without the approval of the Secretary, be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution

of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location.

In summary, if any Section 6(f) land is taken for permanent right-of-way, or even if any Section 6(f) land is needed for temporary right-of-way for a period longer than 6 months, then replacement property must be purchased and converted to park land. Being a significant Section 4(f) resource and also being considered Section 6(f) land makes avoiding Park Area #2 a critical decision driver of alternatives. Avoiding such impacts is paramount to any alternative being advanced for further study.

- Park Area #3: This is all of the Garfield Park Reservation property to the east of the existing Henry Street right-of-way. See the Study Area Map in Appendix BB. Similar to Park Area #1, this piece of parkland is considered a Section 4(f) resource per the USDOT Act of 1966, but is outside the LWCF Section 6(f) boundary. No permanent right-of-way is expected to be needed from Park Area #3.

  The only involvement with Park Area #3 will be if a replacement alternative is selected, and only temporary right-of-way would be needed for the following potential work:
    - A temporary access stair per ODOT SCD RM-2.1 down the slope from Henry Street to Chaincraft Road. Future stakeholder discussions can determine if this access is needed during construction (and also whether this access can and should remain in a permanent condition).
    - Replacement of the 22’x7’ culvert piece or pieces adjacent to Henry Street right-of-way which are impacted by the replacement of same through the Henry Street right-of-way width. This is especially true if the 6’x4’ culvert is rerouted down Chaincraft Road to connect to the main 22’x7’ culvert carrying Mill Creek at this location.

ii. Public Involvement: Public involvement will be a critical element in the further development of this project. The public involvement requirement to date for this project is simply to develop the plan to be implemented as the project progresses. A meeting to discuss the future Public Involvement Plan was held at ODOT District 12 on January 14, 2019, and resulting updates have been made. The Public Involvement Plan Outline as developed to date is in Appendix C.

Because of the Section 4(f)/Section 6(f) issues, the large number of stakeholders, and involvement from several public entities, AECOM has already communicated with Cleveland MetroParks, Cleveland Clinic – Marymount Hospital, the City of Garfield Heights, and Cuyahoga County. Minutes of these meetings and/or correspondence are contained in the Appendices D, E, F, and G. This coordination allowed the design team to understand the unique stakeholder needs, potential improvement requests, and requirements at this conceptual stage.

Ongoing public involvement is critical for a successful project, and the Next Steps section of this report gives a briefing of public meeting to be held and concurrences needed. Cleveland MetroParks offered to host future public involvement meetings at the Garfield Park Reservation visitors building.

iii. Cultural Resources: There are no previously identified cultural resources in the immediate vicinity of the proposed project. The project has fallen within the survey areas of two previous cultural surveys, one recording significant historic structures and one seeking archaeological sites. The nearest previously recorded item is a historic structure (CUY0187519) within Garfield Park, which is immediately south of the proposed project.

The Whitehouse Crossing Viaduct, the subject of the proposed project, is a historic-era bridge, built in the late 1920s. This viaduct includes three separate SFNs, none of which has been considered significant by ODOT in their historic bridge inventory. Though the bridges date to the 1920s, they have been substantially altered and are not considered eligible for NRHP inclusion.

iv. Ecological Resources: In October 2018, Lawhon & Associates, Inc. (L&A) completed an ecological resources assessment for the CUY-14-6.93 project. No streams, potentially jurisdictional ditches, ponds, or retention/detention basins were observed within the project area. Two (2) Category 1 wetlands were identified within the project area. Both wetlands are low quality resources and the total combined acreage only equals 0.076. Indiana bat and northern long-eared bat habitats were identified within the project area; approximately 1.410 acres of Suitable Wooded Habitat (SWH) was identified.

v. Regulated Materials: Using the ODOT Regulated Materials Review (RMR, formerly ESA) Guidance and the Ohio Regulated Properties Search (ORPS) Tool, a regulated materials review was performed to determine if any properties adjacent to the project area have any potential environmental concerns. Nine (9) properties are adjacent to the project area. The initial findings for the adjacent properties are as follows:

- RM-001 (*Parcel # 544-29-001*): ORPS indicates property on the OEPA Division of Environmental Response and Revitalization (DERR) and Spills database. The DERR listing has an activity status of Site Assessment and the Spills listing contains no pertinent information. Based on construction activities expected and distance from such, L&A recommends no further investigation for this site.
- RM-002 (*Parcel #s 544-18-001,544-18-006*): No environmental issues indicated from ORPS. L&A recommends no further investigation for this site.
- RM-003 (*Parcel # 544-17-026*): No environmental issues indicated from ORPS. However, current usage and historical aerials suggest this property was previously used as an auto repair facility. Based on construction activities expected and distance from such, L&A recommends no further investigation for this site.

- RM-004 (*Parcel #s 546-29-005,546-23-006*): No environmental issues indicated from ORPS. However, current usage and historical aerials show these properties were used as a railroad. L&A recommends no further investigation for this site.
- RM-005 (*Parcel #s 544-18-003,544-18-004,544-21-019*): ORPS indicates this property is a Leaking Underground Storage Tank (LUST) site. Underground storage tanks were removed in 1998 and four LUST incidents received a tracking status of No Further Action (NFA). An above-ground storage tank (AST) is located 150 feet south of the study area. Current and historical mapping show a processing plant on the central portion of the property and a historical rail spur within the study area. However, based on current construction limits and records reviewed, L&A recommends no further investigation.
- RM-006 (*Parcel # 546-05-005*): No environmental issues indicated from ORPS. L&A recommends no further investigation for this site.
- RM-007 (*Parcel # 546-05-004*): No environmental issues indicated from ORPS. However, current usage and historical aerials suggest this property was used in a manufacturing capacity. The anticipated construction limits propose partial right-of-way take this site. Following the RMR Flowchart, L&A recommends an RMR Investigation per step 8c.
- RM-008 (*Parcel # 546-05-010*): ORPS indicates this property is an OEPA-DERR (dumping site). The anticipated construction limits propose partial right-of-way take this site. Following the RMR Flowchart, L&A recommends an RMR Investigation per step 8c.
- RM-009 (*Parcel # 546-03-004*): ORPS indicates this property is a historical waste facility which was closed in 1973 and noted for the dumping of magnesium waste. An OEPA file review is still pending due to availability of records caused by COVID-19 lock-down restrictions. The anticipated construction limits propose partial right-of-way take this site. Following the RMR Flowchart, L&A recommends an RMR Investigation per step 8c. If deep excavation is proposed within a 300 feet buffer distance of the historical waste facility, which is likely the case, an OEPA 513 (formerly known as 27-13, or Rule 13) must be requested and completed.

Any proposed right-of-way takes will likely require additional RMR (ESA) studies.

vi. <u>FEMA Flood Zones:</u> There is a FEMA Flood Zone A within this project vicinity from Mill Creek Tributary 1, as indicated on flood map number 39035C0211E, effective on 12/03/2010. See Appendix EE. Base Flood Elevations have not been determined for Zone A areas via a calculated hydraulic analysis. Zone A instead is a graphical representation of the inundation limits expected with the 100-year storm. Ideally, impacts to FEMA Flood Zone A areas would be avoided by the proposed design. However, if encroachments into a flood zone are proposed, then ODOT Location and Design (L&D) Volume 2, Section 1005.1.2, Proposed Construction in FEMA Zones, provides the following direction:

> *"Construction within FEMA Zone A requires documentation through the ODOT self-permit process and coordination with the Local Floodplain Coordinator. A BFE has*

> *not been established. Limit the allowable water surface surcharge to the requirements from the Local Floodplain Coordinator or one (1) foot, whichever is less. Contact OHE if the allowable surcharge required by the Local Floodplain Coordinator is not feasible."*

Alternatives 1, 2, 3, 4, and 5 identified in this report do not encroach into FEMA Flood Zone A. However, per ODOT direction from the Value Engineering session, Alternatives 2A, 3A, 3B, and 3C do encroach into the FEMA Flood Zone A to minimize the needed bridge length across the rail lines and those associated construction costs. Therefore, a Hydrology and Hydraulics (H&H) Study was performed to determine the base flood elevations (BFE) and to determine what, if any, mitigation measures are needed if one of those alternatives is selected for further plan development.

Multiple data sources were investigated for the floodplain studies conducted on the Mill Creek floodplain. Detailed information on the Flood Insurance Study (FIS) was unavailable for the study area, and it appears the latest hydraulic modeling of the Mill Creek floodplain was performed in the 1980s. AECOM believes the floodplain extents shown in Appendix EE were estimated based on adjacent hydrologic and hydraulic analyses. Therefore, a HEC-RAS 2D model was developed to compare existing versus proposed facilities, using available survey information previously obtained for this project. OGRIP OSIP I LiDAR was used to supplement the existing survey.

The H&H model indicates a base flood elevation increase of approximately 5" at the proposed structure for Alternatives 2A, 3A, 3B, and 3C if no mitigation is added to the project. Therefore, no mitigation measures to reduce the expected increase have been added to these alternatives. However, per direction noted above in ODOT L&D Volume 2, Section 1005.1.2, coordination with the local floodplain coordinator will be performed if one of the impacting alternatives is selected for further plan development. Although not expected, if the local floodplain coordinator disallows any increase, a simple mitigation measure can be added to any of the impacting alternatives with only nominal increase to the overall project costs.

b. Right-of-Way Impacts

Temporary right-of-way impacts will be needed for any alternative, but this land use is temporary, and the land is returned after construction in at least as good or better condition than prior to construction. Therefore, the right-of-way impacts described in this section for the comparison of alternatives is based solely on permanent right-of-way impacts.

The minimization or avoidance of permanent right-of-way impacts is a critical driver to the identification and evaluation of alternatives. As noted earlier, major realignments and even a slight southerly alignment shift would create permanent right-of-way impacts significant enough to justify giving those alternatives no further consideration when compared with similar alternatives with far fewer permanent right-of-way impacts. For the alternatives being developed and considered, beginning at the west end of the project, the concerns with permanent right-of-way impacts are:

i. Section 4(f)/Section 6(f) Property: The implications of impacting the Garfield Park Reservation property are well documented in the previous section. This is a very key issue when considering the feasibility of alternatives for this project.

   If Alternative 1, 2, or 3 is selected for further plan development, the potential permanent right-of-way impact to "Park Area #1" described earlier is 0.201 acres; and the potential permanent vacation of right-of-way into "Park Area #2" described earlier is 0.041 acres.

   If Alternative 2A, 3A, 3B, or 3C is selected for further plan development, the potential permanent right-of-way impact to "Park Area #1" described earlier is 0.238 acres; and the potential permanent vacation of right-of-way into "Park Area #2" described earlier is 0.135 acres.

   No park property is needed for the initial construction if Alternative 4 or 5 is selected for further plan development; but Alternative 4 will have impacts similar to those noted for the replacement alternatives in just 10 years.

ii. Henry Street Bridge/Culvert: Henry Street is a city street maintained by the City of Garfield Heights. However, for the entire 59.5 feet of right-of-way width, the Cuyahoga County Engineer's Office owns and maintains both the culvert carrying Mill Creek under Henry Street and the portion of the main bridge carrying Henry Street south of SR14. The County inspects and maintains these structures as different "assets", but the culvert and the bridge above are integral. Columns for the bridge supporting Henry Street above are founded on the vertical walls of the 22'x7' box culvert carrying Mill Creek. The integral nature of these structures necessitates careful thought on removals, phasing, etc., if rehabilitation or replacement work is proposed for Henry Street.

   Per the most recent inspection report, the County's Henry Street Bridge 00.62 (SFN 1834282) that carries Henry Street and tees into the SR14 structure is in good condition with a GA of 7. The County assumes the steps are considered part of their structure and "generally try to keep the stairs free of foliage overgrowth". County crews recently replaced the expansion joints on their portion of this bridge.

   Per the most recent inspection report, the County's Henry Street Bridge 00.61 (SFN 1834037), the 22'x7' reinforced concrete box culvert built in 1929 that carries Mill Creek under Henry Street within the Henry Street right-of-way, is in poor condition with a GA of 4. The County owns/maintains only the portion of the culvert in the 59.5 feet of Henry Street right-of-way width. The portions of the culvert outside of this right-of-way width on both sides are in Garfield Park Reservation property owned by the City of Cleveland and leased to Cleveland MetroParks.

   Cuyahoga County has no vested interest in the stairs or in the existing driveway/short cut/access road between the park and Chaincraft Road on top of this culvert and under this bridge. In fact, this access road "…*has been a nuisance in the past as evident by* *our placement of barriers to protect the columns of our structure*…" See the correspondence in Appendix G. The Cuyahoga County Engineer's Office is always looking for opportunities to eliminate "assets" from their inventory, "…*so alternatives that rid us of either or both structures is, at face value, appealing*". There were comments from both the Cleveland MetroParks and the Cuyahoga County Engineer's Office that the driveway/short cut between Garfield Parkway and Chaincraft Road may be needed during flood events. However, the Garfield Heights fire chief indicated this is not the case and that this driveway/short cut is not needed for emergency vehicles at any time. The Cuyahoga County Engineer's Office would prefer to have the overhead bridge and the driveway/short cut eliminated if possible. As stated in an e-mail from the Cuyahoga County Engineer's Office: "*By replacing Bridge 00.62 with a retained earth structure as part of the larger project while also replacing the culvert carrying Mill Creek would serve the County's fiscal and operational objectives by providing a new culvert in "as-built" condition while also eliminating significant deck area, inspection effort and maintenance concerns for the overhead structure.*"

No additional permanent right-of-way is needed on either side of the existing 59.5' of Henry Street right-of-way width for any of the alternatives included in this report.

iii. Rail Lines: Alternatives that minimize disruption to the day-to-day rail operations of the two rail line owners during construction, and minimize conflicts with future rail line operations after construction, are given preference in the evaluation process. The existing minimum horizontal clearance to rail lines is 7.2' to NS and 9.4' to W&LE, whereas proposed minimums should be far greater (governed by location of footing edge) and up to 25.0' if crash walls are not provided. Existing minimum vertical clearance over rail lines is 21.1' over NS and 25.0' over W&LE, whereas proposed minimums should be 23.0'.

All replacement alternatives can completely span the rail property owned by W&LE and leased by CCR, and 23.0' of vertical clearance can easily be provided over all rail lines. The critical rail lines for both horizontal and vertical clearances are the NS lines. Since the overhead electric transmission lines are in the way of a taller structure, at least one pier needs located within the NS rail property. All replacement alternatives propose just one pier within this property, and we are awaiting response from NS on whether providing the above mentioned horizontal and vertical clearances are sufficient for these replacement alternatives. These clearances are typically adequate, although plans for future rail lines may necessitate revisions to the proposed pier location for each of these alternatives. We are also awaiting a reply on whether the vertical clearance can be relaxed from the 23.0' minimum for the replacement alternatives since the existing is so deficient in this urban built-up surrounding. Unless additional requirements are requested or relaxed requirements are granted by NS, replacement bridge alternatives will satisfy the previously mentioned minimum standards for both horizontal and vertical clearances to the existing rail line locations.

In addition, due to the necessary removals and proposed work, and considering the number of trains per day at such minimal clearances, the addition of a double cross-over and signals is likely needed for the two existing NS rail lines. We have included these costs for all alternatives, since major work above and adjacent to these rail lines will require times of switching rail traffic to adjacent lines.

Per Richard Behrendt, ODOT State Rail Coordinator, NS typically wants to see plans to determine if they can accept a design rather than respond to conceptual design requests; and those reviews can take several months. Upon concurrence from ODOT on selection of an alternative for further plan development, AECOM will coordinate the conceptual plans of the preferred alternative with the rail line owners.

For Alternative 1, permanent right-of-way necessary from NS is calculated at 0.174 acres for the proposed south abutment and 0.077 acres for the proposed pier; for a total of 0.251 acres. In addition, substantial temporary right-of-way and rail crossings are needed from both rail line owners for construction of the pier, removal of the existing superstructure and all the existing piers, and for steel erection.

Alternative 2 has the same rail line owner right-of-way impacts as Alternative 1, with only the south abutment in the discussion above being replaced by a second pier instead.

Alternative 3 increases the permanent NS right-of-way impacts over those needed for Alternatives 1 and 2. For Alternative 3, permanent right-of-way necessary from NS is calculated at 0.260 acres for the proposed Chaincraft Road realignment and 0.077 acres for the proposed pier; for a total of 0.337 acres. The temporary rail line owner right-of-way impacts are the same as noted in the discussion above for Alternative 1. In addition, Alternative 3 requires the purchase of a full parcel (Parcel No. 544-18-006; 0.340 acres) of the limited available land that Chaincraft Road dead ends into. See the Study Area Map in Appendix BB.

For Alternatives 3B and 3C, permanent right-of-way necessary from NS is calculated at 0.098 acres for the proposed south abutment, 0.079 acres for the proposed pier, and 0.141 acres for the proposed north abutment; for a total of 0.318 acres. In addition, substantial temporary right-of-way and rail crossings are needed from both rail line owners for construction of the pier, removal of the existing superstructure and all the existing piers, and for steel erection.

Alternative 2A has the same rail line owner right-of-way impacts as Alternatives 3B and 3C, with only the south abutment in the discussion above being replaced by a second pier instead.

Alternative 3A has the greatest permanent NS right-of-way impacts of all alternatives considered. For Alternative 3A, permanent right-of-way necessary from NS in addition to that mentioned for Alternatives 3B and 3C is calculated at 0.270 acres for the proposed Chaincraft Road realignment; for a total of 0.588 acres. The temporary rail line owner right-of-way impacts are the same as noted in the discussion above for

Alternatives 3B and 3C. In addition, Alternative 3A requires the purchase of a full parcel (Parcel No. 544-18-006; 0.340 acres) of the limited available land that Chaincraft Road dead ends into. See the Study Area Map in Appendix BB.

Also see the discussion in Alernative 3A earlier on further extending the relocation of Chaincraft Road to the east. Such an extension just adds costs and right-of-way impacts; and it quickly becomes evident that such an extension is not a betterment over the taking of Parcel No. 544-18-006.

In the initial construction, Alternative 4 keeps the existing structure and will not increase horizontal and vertical clearances to meet minimum standards. No permanent right-of-way is needed from the rail line owners, but temporary impacts will occur for painting of steel and other miscellaneous work. However, impacts similar to those shown for the replacement alternatives are needed just 10 years later when the existing facility needs replaced.

Alternative 5 keeps the existing structure throughout the 75-year life cycle and will not increase horizontal and vertical clearances to meet minimum standards. No permanent right-of-way is needed from the rail line owners, but temporary impacts will occur for painting of steel and other miscellaneous work.

iv. East of the Rail Lines: AECOM has investigated record deeds and plat references in regards to determining if the current ownership of two parcels in the name of Fanton Realty, LLC., located at the easterly end of the current bridge, has an easement or other guaranteed right for the County or State to maintain a contiguous access between the two parcels with unobstructed passage under the current bridge.

Fanton Realty, LLC is the current owner of record for two distinct parcels of land in Cuyahoga County and shown as PPN 554-18-003 and PPN 554-18-004 (also combined with PPN 544-21-019) per Instrument Number 20151008057 as recorded on October 8, 2015. The legal descriptions for these two parcels are described as being on either side of the roadway right-of-way and are not contiguous to each other. These parcels are described as being separated by “the land appropriated by the Board of County Commissioners of Cuyahoga County per Insolvency Case 15066”. Further research has determined the date of this insolvency case was “on or about the 18th day of June, 1927.”

AECOM has performed extensive research through the Cuyahoga County Recorder online site for this document, and has made an onsite visit to the Justice Building in an attempt to secure a copy of the court ruling. However, no record of the case was able to be found.

AECOM assumes that the right-of-way for the bridge in this area was acquired in fee simple with ownership being vested in the Board of County Commissioners of Cuyahoga County. This would be similar to the existing right-of-way acquisition for the current existing right-of-way located on the west end of the bridge and lying south of the rail properties. It is assumed that the right-of-way under the bridge could be utilized much like any other public right-of-way and would provide the owner access from either side of the bridge, to the parcel on the opposite side of the bridge. However, it should be noted that this right can only be utilized as long as the two parcels are owned by one common owner as no public right-of-way is noted on current tax map images or on the Cuyahoga County GIS site.

AECOM is in possession of a plat map provided by Cuyahoga County personnel and hand dated as “3/19/34” showing the proposed vacation of Henry Street from the north side of the W&LE railroad to the original location of Broadway Street. It is not signed by the owners or Commissioners, but is believed to be a copy of the original vacation plat prior to signing and recording. This plat also indicates the location of the present right-of-way of the bridge per Insolvency Case 15066. No indication of limitation of access under the bridge is noted on this plat.

If any of the proposed replacement alternatives is selected for further plan development (see Appendices GG & HH), then right-of-way acquisition east of the rail lines is the sum of the following :

- PPN 554-18-003 will be fully acquired (total permanent take of 0.254 acres) due to the SR14 alignment shift and the fact that the small potential remainder of this parcel would be an uneconomic remnant. This removes the issue of accessibility between parcels discussed above, but may introduce a hardship for the existing business on PPN 554-18-004 for accessibility of trucks. AECOM will therefore consider the “cost to cure” this hardship. This may involve a new driveway ramp access along the south side of the proposed SR14 MSE walls to provide available truck turning movements or a truck turn-around location on available land within PPN 554-18-004. This work can be in possible partnership with a vacation of existing right-of-way along the south side of the relocated SR14 alignment which is currently under the existing bridge. The possible total permanent vacation into PPN 554-18-004 is 0.275 acres for Alternatives 1, 2, and 3; and the possible total permanent vacation into PPN 554-18-004 is 0.520 acres for Alternatives 2A, 3A, 3B, and 3C. This right-of-way vacation could be part of a swap of value for the other impacted parcel and to provide ingress/egress.
- The existing public road termed “Old Broadway Ave.” on the 1986 Right-of-Way Plans must remain to access all remaining properties and must be widened to handle two-way traffic in the future as-built condition. This is the road that intersects SR14 on the north side in front of Pompili Precast Concrete.
  - With Alternatives 1, 2, and 3, this road will be shifted slightly to the north, requiring a triangular corner of PPN 546-05-010, Filling Development, LLC (total permanent take of 0.039 acres); a wide swath of frontage from PPN 546-05-004, Pompili Precast Concrete, (total permanent take of 0.300 acres); and a sliver of PPN 546-05-005, Quality Management Team, LLC (total permanent take of 0.003 acres); for a total permanent take from these three properties of 0.342 acres).

- With Alternatives 2A, 3A, 3B, and 3C, this road will be shifted more to the north, requiring a triangular corner of PPN 546-03-004, Garfield Alloys, Inc. (total permanent take of 0.049 acres); a “rectangular” portion of PPN 546-05-010, Filling Development, LLC (total permanent take of 0.151 acres); a wide swath of frontage from PPN 546-05-004, Pompili Precast Concrete, (total permanent take of 0.330 acres); and a sliver of PPN 546-05-005, Quality Management Team, LLC (total permanent take of 0.003 acres); for a total permanent take from these four properties of 0.533 acres).

If Alternative 4 is selected for further plan development, no additional permanent right-of-way is required east of the rail lines with the initial construction; but additional permanent right-of-way similar to that noted above for one of the replacement alternatives will be needed just 10 years after the initial construction.

If Alternative 5 is selected for further plan development, no additional permanent right-of-way is required east of the rail lines for the entire 75-year life cycle.

c. Maintenance of Traffic Design Issues (Vehicular)

SR14 is an Urban Principal Arterial with a current ADT of 18,500, and it represents the only non-interstate grade separation across three busy rail lines within the City of Garfield Heights. SR14 is a key residential, commuter, and freight route. South of the rail properties, Chaincraft Road is an industrial park road with several vibrant businesses with trucks that must pass under the existing bridge and often across the existing bridge. Another commercial and industrial area lies north of the rail lines. Therefore, this bridge is a key link across the bisecting rail lines for residents, commuters, businesses, public transportation, pedestrians, bicyclists, park patrons, etc. In addition, Cleveland Clinic – Marymount Hospital is located at the south end of Henry Street, less than a mile south of the intersection with SR14. In 2007, an emergency room was added to this hospital. Henry Street has a current ADT of 7,000. Residential areas lie just beyond the described businesses in all directions, and Garfield Park Reservation is a heavily frequented destination and a vital resource to the residents of Garfield Heights. Therefore, access during construction is certainly warranted and prudent, and will be vital to obtaining stakeholder acceptance as a key component of a successful Public Involvement Plan (PIP). Due to the lack of another convenient grade-separated crossing of the rail lines, a detour of SR14 is simply not a feasible solution.

Throughout the entire construction duration, except possibly for short night-time closures for specific construction activities, the following vehicular traffic will be maintained <u>at a minimum</u> in each construction phase:

- One lane in each direction of SR14 mainline traffic;
- One lane of signalized bi-directional traffic along Chaincraft Road beneath SR14;
- One lane of signalized bi-directional traffic along the existing public road termed “Old Broadway Ave.” north of SR14 at the east end of the project.

For all alternatives in this report, existing traffic patterns will be disrupted during the initial construction. The impacts for the replacement alternatives (Alternatives 1, 2, 3, and Alternatives 2A, 3A, 3B, and 3C) are similar, but will be for a much longer duration for the initial construction than for the rehabilitation alternatives (Alternatives 4 and 5) and the No-Build Alternative.

For the replacement alternatives, the general sequencing of SR14 construction phases is as follows:

Phase 1: Place one lane each way of SR14 traffic on the existing eastbound lanes. Remove the existing SR14 westbound lanes except for the steel bridge across the rail lines. Build the proposed westbound lanes of new facility. Access to and from Henry Street is maintained in Phase 1 for all alternatives.

Phase 2/3: Most alternatives require just 2 phases, while Alternatives 3B and 3C require a Phase 3 for some "finishing work". Place one lane each way of SR14 traffic on the new westbound lanes. Finish all existing removals and build the remaining proposed SR14 facility and the entire Henry Street Facility. Access to and from Henry Street is not maintained in these phases.

For Alternatives 4 and 5, with the initial construction, the specifics of each phase will vary based on the specifics of proposed work. However, one lane in each direction on SR14 and full access to Henry Street from SR14 will be maintained at all times during the initial construction. Access from Henry Street to SR14 may be closed for short periods (one week maximum) for some construction activities. For future work required with Alternatives 4 and 5, there will be impacts similar to those mentioned above for the replacement alternatives noted in this report.

Regardless of the alternative selected, we must keep Chaincraft Road open throughout construction for local business access since this road dead-ends further east and this is their only access. For all replacement alternatives, maintaining this Chaincraft Road access is difficult due to the tight available space limitations and the location under the SR14/Henry Street intersection area.

Except as noted in the following paragraphs, current levels of access along and to/from all roads and destinations will be maintained during construction, regardless of the alternative selected. For example, access to/from Garfield Park Reservation and Pompili Precast Concrete will not be affected during or after construction. However, the areas impacted by maintenance of traffic (MOT) operations during construction are summarized below:

i. Along Mainline SR14: Traffic counts were taken to verify that reducing SR14 to one lane in each direction is possible during construction without causing excessive queue lengths. If access from SR14 to Henry Street is kept open in any phase, then a westbound SR14 Left Turn Lane to Henry Street must be provided in that phase. If this turn lane is provided when this movement is allowed, then SR14 traffic can be reduced to one lane in each direction throughout construction. If access from SR14 to Henry Street is eliminated at any time, then the turn lane is obviously not needed in that phase. All alternatives in this report will maintain one lane in each direction on SR14 at all times.

ii. From SR14 to Henry Street: Emergency vehicle access to the Cleveland Clinic – Marymount Hospital is vital. Currently, the SR14 to Henry Street intersection provides the most direct grade-separated route from north of the rail lines. Maintaining this access when feasible is certainly justified. That hospital opened an emergency room in 2007, and Henry Street, via SR14, provides the only non-interstate grade separation over the rail lines from the north within the city limits of Garfield Heights.

All Replacement Alternatives (Alternatives 1, 2, 3, 2A, 3A, 3B, and 3C): During Phase 1 of construction, full access to (and from) Henry Street from SR14 will be provided at the existing intersection location, on the existing facility.

In all subsequent construction phases for all replacement alternatives, the vertical grade difference between the proposed work and the existing facility is too great to provide access from SR14 to Henry Street at the current intersection location. The proposed SR14 profile through the intersection with Henry Street will be several feet higher than existing since the profile must be raised over the tracks to meet minimum vertical clearance requirements and since superstructure depths will be greater to provide longer spans with non-fracture-critical bridge designs across the rail lines.

In Phase 2, it is possible to maintain ONLY emergency vehicle (ambulance) access from SR14 to Henry Street, although NOT at the existing intersection location. The existing eastbound SR14 lanes can remain open from the west abutment to the existing Henry Street intersection ONLY for emergency vehicle INGRESS to Cleveland Clinic – Marymount Hospital. Emergency vehicles (ambulances) travelling westbound on the newly constructed part-width SR14 facility from north of the rail lines can be directed past the existing Henry Street intersection location to a turn-around beyond the west abutment of the existing bridge (near the Garfield Park buildings). From there, they can be provided a travel lane on the existing SR14 facility to Henry Street and then to Cleveland Clinic – Marymount Hospital. Required construction elements to maintain this access are shown in the now voided Maintenance of Traffic plans in Appendix GG. Cost and construction duration increases are significant if access to Henry Street is provided in Phase 2 as described in this paragraph.

Alternatives 3B and 3C have a short-duration Phase 3 of construction to complete some finish work. Access to (and from) Henry Street from SR14 can be provided at the proposed intersection location during this phase.

As requested by ODOT District 12 at our April 17, 2019 Preliminary AER meeting, we researched cost savings that could be realized if access to (and from) Henry Street was closed throughout construction for replacement alternatives. For Phase 1, we recommend keeping access to and from Henry Street open throughout construction because no savings can be realized by closing this access. The savings can be realized in Phase 1 only. By closing access to and from Henry Street in Phase 2, a construction phase can be eliminated, which saves approximately 5 months off the construction schedule, for all replacement alternatives. From now voided Maintenance of Traffic plans in Appendix GG, temporary wire walls I, J, and K, the prefabricated bridge rental, a crane set-up to set the temporary bridge, mobilization costs, and field office rental for approximately 5 months result in quantifiable “hard” cost savings of $800K if the emergency vehicle (ambulance) access from SR14 to Henry Street is eliminated in Phase 2 for any of the replacement alternatives in this report. In addition to these “hard” costs, there are many “soft” costs that can be realized when trimming 5 months off of a total construction schedule, due to freeing up the site to provide greater work areas and site access, and enabling removals and replacements to happen in fewer construction phases. These “soft” costs are very subjective, but our experience (including working with contractors bidding design-build projects) leads us to believe they can add up to nearly 5% of an overall bid. 5% of the initial construction costs for any of the replacement alternatives can be over $2.2M. In total, we estimate a construction cost savings of $3M and an overall time savings of 5 months by closing Henry Street during Phase 2 of construction. We therefore propose providing a full detour of Henry Street during Phase 2. Full access can be maintained to/from Henry Street during Phase 1 and also for those alternatives which have a Phase 3. ODOT concurred with closing Henry Street access to/from SR14 during the July 9, 2019 VE review meeting. However, we recommend stakeholder meetings and public meetings be held to discuss this prior to proceeding.

For emergency vehicle (ambulance) trips to Cleveland Clinic – Marymount Hospital which originate north of the rail lines, and which use SR14 across the rail lines, the closing of the intersection with Henry Street during Phase 2 will be impactful. As stated earlier, it is only possible to provide Phase 2 access to Henry Street by routing to a turn-around beyond the existing rear abutment. From that point, if access is provided back through the existing SR14/Henry Street Intersection for emergency vehicles (ambulances) in Phase 2, the total distance to the entrance at Cleveland Clinic – Marymount Hospital is 0.75 miles. Our estimation is that this time can be traversed in approximately 1.5 minutes. If this access is not provided, and emergency vehicles (ambulances) are instead routed to Garfield Parkway-Turney Road-McCracken Road, the total distance to the entrance at Cleveland Clinic – Marymount Hospital is 2.10 miles, which we estimate can be traversed in approximately 3.0 minutes. Therefore, we estimate that the travel time to Cleveland Clinic – Marymount Hospital is increased by 1.5

minutes by closing access to Henry Street during Phase 2 for emergency vehicle (ambulance) trips which originate north of the rail lines and use SR14 access across the rail lines. After selection of a preferred alternative, additional meetings will be held with the city of Garfield Heights and with Cleveland Clinic – Marymount Hospital to discuss closing Henry Street, determine if additional routes need analyzed, or determine if other mitigation measures need implemented in the project moving forward.

Alternatives 4 and 5: For the initial construction of Alternatives 4 and 5, full access to Henry Street from SR14 will be maintained throughout construction.

iii. From Henry Street to SR14: The Henry Street to SR14 movement should be kept open when possible, but it is not vital to emergency vehicle access. While not as convenient as this direct link, there are alternative passable routes for all vehicles if/when this movement is not provided. For all replacement alternatives, access from Henry Street to SR14 is open during Phase 1 (and Phase for alternatives which have Phase 3), but not in Phase 2. For the initial construction of Alternatives 4 and 5, access from Henry Street to SR14 will be maintained throughout construction except for short (less than one week) closures for specific construction operations.

iv. Along Chaincraft Road Beneath SR14: Chaincraft Road beneath SR14 is the only ingress/egress route for the local businesses east of the project site, as Chaincraft Road dead-ends to the east. We looked at the original (pre-1929) location of Henry Street which still has an existing right-of-way, to possibly locate a temporary road to access Chaincraft Road from Henry Street east of the project site (See Appendix BB). However, this would require much site clearing, new pavement, substantial upgrades to existing Chaincraft Road, reconstructing a bridge or culvert over Mill Creek, placing industrial trucks on neighborhood streets, and require snow clearing for a temporary road at a 12+% grade. Therefore, we gave this no further consideration; so it is paramount to maintain ingress/egress access under SR14 at all times during construction. Traffic volumes are not high, but space is limited, so reducing travel along Chaincraft Road to one lane for both directions with a signal will suffice as long as adequate widths for truck turning movements are provided. All alternatives will provide at least one lane of signalized Chaincraft Road traffic with a temporary signal at all times during construction.

v. Access at Fanton Realty, LLC parcel 544-18-004: See this complete discussion in the Right-of-Way Impacts section.

Regardless of the alternative selected, as design and plan development proceed, temporary ITS signage will be considered due to the high traffic volumes on SR14 and because emergency vehicles will be in the area whether Henry Street is detoured or not. This signage could provide travel times, offer alternate routes during peak hour traffic, or simply warn of active emergency vehicles in the area. We will also consider pre-emption for the MOT signal at the Henry Street Intersection during Phase 1 (and Phase 3 if there is one), and even consider adding pre-emption signals at both ends of the zone where traffic is restricted to one lane in each direction.

At all tie-in locations at project ends, we will incorporate a quantity for temporary fill and pavement to be used as needed during construction to keep traffic flow uninterrupted. Often, these tie-in locations become worn and impact traffic speeds and overall operation of the MOT zones.

d. Geotechnical Design Issues

For this conceptual stage of project development, a full geotechnical investigation was not scoped and has not been performed. Instead, geotechnical conditions at the site have been assessed at a preliminary level through literature, public records, existing plans, historic structure foundation exploration sheets, and field reconnaissance.

Fill, or possible fill, was encountered in the historic soil exploration at each of the borings ranging in depth from 2.0 feet to 10.6 feet, comprised of Silty Sand, Sandy Clay and Silt, Sand and Gravel, Sand, Silt and Gravel, Sandy Clayey Silt, and Silty Clay. The natural subsoils encountered at the bridge foundation borings were found to comprise predominantly of sand and gravel sizes with variable amounts of silt and clay, ranging between A-1-a, A-1-b, A-2-4, and A-3a. The density of natural subsoils varied from loose to very dense but generally increased in density with depth. Water seepage was encountered at the bridge foundation borings at relatively shallow depths, ranging from 4.2 feet to 10.6 feet during drilling.

During the field reconnaissance for this project, signs of potential slope movement, such as sloughy soil and tilted shoring, were noted at the forward abutment of the main bridge. The presence of standing water was observed between existing Pier 38 and Bent 43. District 12 engineers also indicated that the area around existing Pier 38 was flooded multiple times in the past.

For all replacement alternatives:

- It is anticipated that bridge piers and abutments will be supported on Cast-In-Place (CIP) reinforced concrete piles. Based on the historic boring logs, it is estimated that the lengths of CIP piles to reach maximum ultimate bearing values will range between 20 feet and 30 feet.
- It is understood that embankment contained within MSE walls will be used to minimize/eliminate right-of-way impacts expected with embankment side slopes. MSE walls and fill will also be used to minimize the number of bridges and the total bridge deck area for the project. It is estimated that MSE walls will have soil reinforcement lengths not less than 70% of the wall heights (or 8 feet minimum), and it is expected that 1 foot of undercut and replacement with Item 203 Granular Material, Type C will be needed under the MSE wall face leveling pads.

- At a minimum, the proposed facility with embankment contained with MSE walls will be constructed part-width. Therefore, with Phase 1 construction, there will often be new embankment contained by an MSE wall on the proposed outside face and a “wire wall” along the phase line. The “wire wall” will be placed in close proximity to existing spread footings still holding traffic during Phase 1. NEAS anticipates 0.6” to 1.8” elastic (instantaneous during construction) settlement under the middle of the newly constructed contained embankment between these walls. This settlement value will reduce transversely out to the faces and under the existing bridge footings still supporting traffic. Less than 1” (maximum and conservative) of elastic settlement (and no long-term consolidation settlement) is anticipated at the existing bridge footings. Settlement monitoring survey points at the existing piers should be recorded on a daily basis at both sides of the existing piers during and after the MSE wall construction. Typically, no mitigation is needed for this magnitude of settlement.

- The details of preliminary geotechnical study can be found in the geotechnical red flag summary report. See Appendix H. It is recommended that a complete geotechnical investigation program be conducted for this project during the future plan development stages.

For Alternatives 4 and 5, no foundation work is proposed with the initial construction, so no geotechnical concerns exist for the initial construction. However, for Alternative 4, concerns noted above for the replacement alternatives will exist just 10 years after the initial construction.

e. Roadway Design Issues

i. Legal/Design Speed: The legal speed and design speed along SR14 through the project limits is 35 MPH. At this design speed, sharp horizontal curves require superelevation, but softer horizontal curves do not. Designs which do not require superelevation are preferred due to vertical clearance considerations and the simplification of drainage design (particularly during the phased construction). For Alternatives 4 and 5, the existing bridge does not contain superelevation, so drainage is collected and flows away in the gutterline on both sides of SR14 and Henry Street. For these same reasons, horizontal alignments which do not require superelevation were given preference in the development of replacement alternatives.

ii. Traffic/Safety Design Issues: 12-hour turning movement counts were collected in November 2018 at the intersection of SR14 and Henry Street. We expanded those counts and submitted a request for planning level traffic in January 2019; and Certified Traffic was received on March 27, 2019. Current Year ADT is 18,500 on SR14 and 7,000 on Henry Street. SR14 has 7% trucks and Henry Street has 1% trucks.

The turning movement counts indicate an AM peak hour of 7:15-8:15 and a PM peak hour of 4:30-5:30 at the intersection of SR14 and Henry Street. Traffic signal warrant analysis indicates that the Four-Hour (Warrant #2) and Peak Hour (Warrant #3) warrants are satisfied at this intersection. Turn lane storage length calculations were performed based on Figures 401-9 and 401-10 of the ODOT Location & Design (L&D) Manual. The analysis indicates that a westbound left-turn lane on Broadway should provide 175 feet of storage plus a 50-foot diverging taper to accommodate the turning volumes, but 550 feet is needed to prevent access to the turn lane from being blocked by queued Westbound SR14 through traffic. The preliminary layout showing the 550 feet length is shown in Appendix GG. However, in the subsequent VE meetings in 2019, ODOT requested that the turn lane be kept full width only until the end of the bridge (so as not to require a changing bridge width, but then to transition out with a 50-foot diverging taper prior to attaining 550 feet. The northbound left-turn lane on Henry Street requires 375 feet of storage plus a 50-foot diverging taper. However, that seems excessive and beyond the reasonable construction limits, so the preliminary layout for Henry Street only shows 200 feet of storage plus a taper.

A review of the recent crash history was conducted using data downloaded from the GCAT website for the years 2015-2017. Within the project limits there were a total of 40 crashes during the three-year period. There were 16 injury crashes, accounting for 40% of the crashes. The primary crash types were fixed object (14), rear-end (11) and sideswipe passing (6). The data indicates that 8 crashes occurred in 2015, followed by 15 in 2016 and 17 in 2017. It is unclear what may have contributed to the spike in crash frequency. Poor weather and roadway conditions were a factor in 16 (40%) of the crashes. As bridges typically freeze quicker than surface roadways and can have more slippery conditions, this is not entirely unexpected. None of the alternatives included in this report will improve or worsen safety of the facility following initial construction.

iii. Pedestrian and Bicycle Access: Currently, sidewalks exist along both sides of SR14 and Henry Street, and proper ADA ramps and cross walks exist at the intersection of these two streets. Cleveland MetroParks, at a meeting on March 13, 2019, indicated that a protected multi-use lane, in lieu of sidewalks, is preferred for the finished project (not during construction) along the entire south fascia of SR14 and the entire west fascia of Henry Street through the project limits. They also requested a "trough" for bicycle tires to assist bikers walking their bikes up or down alongside any stairs.

At the west end and east end of the project, there is no vertical divide for pedestrians/bicyclists, so existing access is compliant at these locations. Over the rail lines, there should not be access between the SR14 level and the rail line level, and there is none currently.

The only concerns for pedestrian/bicycle access with this project are:

1. During construction, throughout the project limits. For all alternatives in this report, pedestrian access through the project limits will be impacted similarly during the initial construction. Instead of sidewalks and ADA crosswalk accessibility being provided on both sides of SR14, this access during construction will be limited to only one side to allow for proposed work to be completed in phases. The same is true for Henry Street for the rehabilitation alternatives. However, for the replacement

alternatives, the current access along both sides of Henry Street will be provided in Phase 1, but no access will be provided in the subsequent construction phases if Henry Street is closed and detoured during those phases as discussed earlier.

If any of the replacement alternatives are selected for further plan development, prior to Henry Street being closed and prior to the existing steel stairway along the east side of Henry Street being removed, a temporary access stair per ODOT SCD RM-2.1 down the slope from Henry Street to Chaincraft Road through Park Area #3 of Garfield Park Reservation can be constructed. This new pedestrian access can be equipped with a trough for bike tires, and will provide pedestrian/bicycle access (albeit indirectly) to Garfield Park Reservation to/from Henry Street. Future discussions can determine if this access can remain in a permanent condition.

2. After construction, in the SR14/Henry Street Intersection area, between the upper SR14/Henry Street level and the lower Chaincraft Road/Garfield Park Reservation level. The only current pedestrian access in this location between these two levels is a flight of stairs along the east side of Henry Street, stepping down from the south along Henry Street and touching down on top of the culvert carrying Mill Creek. These stairs are not ADA compliant. Regardless of the alternative chosen for further plan development, ADA compliance must be considered.

   With any replacement alternative, a new non-compliant steel stair tower can be placed in the proposed southeast corner of the SR14 and Henry Street intersection, within existing ODOT-owned right-of-way, to replace the existing stairs. ODOT will own right-of-way in this area where SR14 is currently located, so there is room here; plus, this location adjacent to crosswalks is more conveniently located than the existing stairs. However, whether such a stair tower is provided or not, ADA compliance will still need considered. From this location on the lower level, there will be pedestrian access along the entire Chaincraft Road length, but not to Garfield Park Reservation except across SR14 from the west end of Chaincraft Road (where Chaincraft Road intersects SR14). Cleveland MetroParks, at a meeting on March 13, 2019, indicated that additional pedestrian access from Henry Street/SR14 or from Chaincraft Road is not needed unless public involvement discussions indicate otherwise.

   For the initial construction of Alternatives 4 and 5, the existing stairs remain, and there is unobstructed pedestrian access to all nearby points (Chaincraft Road and Garfield Park Reservation) along the lower level. For Alternative 4, the accessibility issues noted above for the replacement alternatives are delayed 10 years until that alternative requires a full replacement.

f. Bridge Design over Rail Lines

As described in the Alternatives section earlier, the existing steel bridge section over the rail lines is made up of a unique floorbeam-and-stringer system which renders part-width removals infeasible. Only the independent widening beams constructed in 1986 could be removed in a first phase, but constructability concerns make keeping the full width the best option during Phase 1 for all replacement alternatives (Alternatives 1, 2, and 3, and Alternatives 2A, 3A, 3B, and 3C). When developing options for a proposed bridge over the rail lines, bridge types that are constructible, constructible in phases (for Alternatives 1, 2, and 3 only), are as maintenance-free as possible, provide adequate vertical and horizontal clearance from the rail lines, reduce construction time on rail property, and avoid major impacts to the FEMA Flood Zone A along and to the north of the W&LE rail line were given preference.

The work over active rail lines makes cast-in-place bridge superstructures infeasible due to formwork and span requirements. The required span lengths and lifting weights of prefabricated members makes prestressed concrete beam superstructures infeasible. While reinforced concrete post-tensioned box superstructures are feasible, they are more expensive and reduce the number of bidders over standard redundant steel girder superstructures. For the proposed redundant steel girder superstructures for all replacement alternatives, span-to-depth ratios will be well within limits per AASHTO LRFD Table 2.5.2.6.3-1.

There appear to be multiple buried fiber-optic lines running south of and parallel with the NS rail lines, between the southernmost rail line and the southern NS right-of-way boundary. If any of the replacement alternatives is selected, we will perform SUE Level A Test Holes to determine exact fiber-optic line locations before finalizing substructure unit locations and foundation types to avoid impacts to these lines.

Alternative 1: If Alternative 1 is selected for further plan development, the proposed bridge over the rail lines will be a 2-span (164’ each span), 60° skewed, composite weathering steel welded plate girder superstructure on a cast-in-place reinforced concrete wall pier and cast-in-place reinforced concrete wall abutments using semi-integral design on driven friction piling. See the Alternative 1 Schematic Plan in Appendix GG. The east abutment of this bridge is located further east than necessary for the rail lines to avoid the FEMA flood zone along the north W&LE property line (see Appendix EE). The south abutment of this bridge is located at the minimum horizontal clearance to NS rail lines and will only require purchase of NS right-of-way that is in a step-out area unusable for future rail lines. The one pier was then positioned to equalize the two span lengths, which easily satisfies minimum horizontal clearances to rail lines. The long span lengths and large skews require heavy 68” deep steel girders; but fabrication, delivery, and erection of the steel members is certainly possible.

If this Alternative 1 is selected for further plan development, a minimization of the necessary span arrangement will be performed which does not adversely impact the FEMA flood zone, and an optimization of the 2-span arrangement will also be performed.

Alternative 2: If Alternative 2 is selected for further plan development, the proposed bridge over the rail lines will extend south to also span over the existing Chaincraft Road alignment. To both fit the site constraints and to optimize structural design, multiple 3-span and 4-span layouts for this bridge were considered, as were continuity over all piers versus providing deck joints at different locations, and keeping a constant skew versus changing substructure skews.

The limited locations and locked skews of the pier between rail lines and both abutments govern the bridge layout possibilities. The forward abutment type and location is identical to that for Alternative 1, and is positioned to span just beyond the FEMA flood zone. The pier between rail lines is placed at the same 60^o skew as the pier for Alternative 1. The rear abutment (west of Chaincraft Road) is tightly constrained from moving/ shifting/ turning due to maintaining traffic on Chaincraft Road during construction, the location of the Henry Street intersection above, and the required phasing of construction of SR14 which requires adjacent existing pier footings to hold traffic during Phase 1. Therefore, differing layouts only modify the location and skew of the one (or two) piers along SR14 between Chaincraft Road and the southern NS rail line. If only one additional pier is located near the NS property at 60^o skew, deck fascia lengths of the rear span will vary from 100'± along the north fascia to 200'± along the south fascia. Such a dramatic span difference across a deck width causes structural concerns whether for a continuous span or a separate single span. There is really no good location for another pier in this span due to the need to maintain traffic during construction. Therefore, we looked at a variety of differing locations and skews of just one added pier to make a 3-span bridge.

The optimal layout for Alternative 2 is a continuous 3-span bridge with changing skews (15^o at rear abutment, 40^o at rear pier, and 60^o at forward pier and forward abutment). Span lengths along the SR14 centerline are 134', 194', and 164'. The superstructure consists of composite weathering steel welded plate girders on cast-in-place reinforced concrete wall piers and cast-in-place reinforced concrete wall abutments on driven friction piling. Deck joints are required in lieu of using semi-integral design, and fixity will be provided at the pier located between the rail lines. See the Alternative 2 Schematic Plan in Appendix GG.

The long span lengths and large changing skews require heavy 84" deep steel girders; but fabrication, delivery, and erection of the steel members is certainly possible. Note that Alternative 2 requires a SR14 profile which is 16" higher than that required with Alternative 1.

Alternative 3: If Alternative 3 is selected for further plan development, the proposed bridge over the rail lines listed above for Alternative 1 will extend south to also span over a relocated Chaincraft Road alignment. In this alternative, Chaincraft Road is relocated to cross under SR14 adjacent to the southern NS right-of-way line. The proposed bridge with Alternative 3 will be a 2-span (215' and 180' spans), 60^0 skewed, composite weathering steel welded plate girder superstructure on a cast-in-place reinforced concrete wall pier and cast-in-place reinforced concrete wall abutments using semi-integral design on driven friction piling. See the Alternative 3 Schematic Plan in Appendix GG. The forward abutment type and location are the same as for Alternative 1; whereas the rear abutment type is the same but relocated to the south versus that for

Alternative 1. The pier between rail lines is the same as Alternative 1, but moved south as much as possible to best balance span ratios while still satisfying minimum horizontal clearances to NS rail lines.

The long span lengths require heavy 92” deep steel girders; but fabrication, delivery, and erection of the steel members is certainly possible. The Alternative 3 bridge design calls for 8”x8”x3/4” angles (maximum) for crossframes spaced at 12’ (minimum). Alternative 3 also requires a SR14 profile which is 24” higher than that required with Alternative 1.

ODOT District 12 has a very similar bridge to this Alternative 3 bridge currently in service. CUY-176-1168 is a 2-span (210’± and 194’± spans), 61^o± skew, bridge that was constructed in 1995±. Therefore, we compared our preliminary Alternative 3 bridge design to the plans for this similar project. The CUY-176 bridge used 90” deep girders and 6”x6”x7/8” angles (maximum) for crossframes spaced at 16’+ (minimum). Therefore, our preliminary bridge design for Alternative 3 seems reasonable.

Alternative 2A: If Alternative 2A is selected for further plan development, the proposed bridge will be a 3-span bridge to extend over the rail lines and the existing Chaincraft Road alignment similar to that described for Alternative 2. However, the proposed SR14 alignment of Alternative 2A is further north/west than that for Alternative 2. Both piers are cast-in-place reinforced concrete wall piers and both abutments are cast-in-place reinforced concrete wall abutments, all on driven friction piling, similar to other bridges analyzed previously in this report. To minimize the overall bridge length (cost savings), to fit the site constraints and to optimize structural design, the north (forward) abutment was moved inside the W&LE right-of-way into a “bumpout” area unsuitable for future rail lines. An H&H Study shows that the impacts to the FEMA flood zone cause only a minimal increase to base flood elevations, so mitigation measures are most likely not needed if this alternative is selected for further plan development.

Multiple 3-span layouts for this bridge were considered, although continuity over all piers will be provided. The limited locations and locked skews of the pier between rail lines and of the south (rear) abutment govern the bridge layout possibilities. The pier between rail lines is placed at the same 60^o skew as the pier for previous alternatives. The rear abutment (placed south of Chaincraft Road) is tightly constrained from moving/ shifting/ turning due to maintaining traffic on Chaincraft Road during construction, the location of the Henry Street intersection above, and the required phasing of construction of SR14 which requires adjacent existing pier footings to hold traffic during Phase 1. Therefore, differing layouts only modify the location and skew of the one pier along the relocated SR14 between Chaincraft Road and the southern NS rail line boundary. Moving the proposed SR14 alignment further north/west with this alternative actually aids in optimizing the span arrangement for the needed bridge, and also allows the entire bridge to be built during Phase 1 of construction so access across the rail properties and impacts to service of the overhead electric transmission lines is needed just during that construction phase.

The optimal span lengths for the continuous 3-span bridge for Alternative 2A along the proposed SR14 centerline are 129', 163', and 129', and all substructure units have a constant 60^0 skew. The superstructure consists of composite weathering steel welded plate girders. The long span lengths and large skews require heavy 60" deep steel girders; but fabrication, delivery, and erection of the steel members is certainly possible. Deck joints are required in lieu of using semi-integral design, and fixity will be provided at the pier located between the rail lines. See the Alternative 2A Schematic Plan in Appendix FF.

Note that Alternative 2A requires a SR14 profile which is lower than that required with Alternatives 1, 2, and 3. If this Alternative 2A is selected for further plan development, an optimization of the skews for the rear abutment and rear pier will be made to reduce the excessive length of rear abutment seat currently shown on the plans.

Alternative 3A: Alternative 3A resulted from direct discussions held at the VE session with ODOT in 2019. If Alternative 3A is selected for further plan development, the proposed bridge will be a 2-span bridge to extend over the rail lines only. A separate culvert structure noted later will carry SR14 over a relocated Chaincraft Road. The proposed SR14 alignment of Alternative 3A is identical to that noted above for Alternative 2A, moving a full facility width or more to the north/west over the rail lines. The one pier is a cast-in-place reinforced concrete wall pier and both abutments are cast-in-place reinforced concrete wall abutments, all on driven friction piling, similar to other bridges analyzed previously in this report. Compared to the bridge noted earlier for Alternative 3, the 2-span bridge length and deck area for the bridge in this Alternative 3A have been minimized. The south (rear) abutment is moved to the north of Chaincraft Road, located parallel to and adjacent to the south NS right-of-way boundary. The north abutment is moved into the same W&LE right-of-way "bumpout" area as noted earlier for Alternative 2A. Also as noted with Alternative 2A, an H&H Study shows that the impacts to the FEMA flood zone cause only a minimal increase to base flood elevations, so mitigation measures are most likely not needed if this alternative is selected for further plan development.

Attempts were made to optimize the proposed 2-span bridge over the rail lines. The locations (and skews) of both abutments are noted above, close to and parallel with the rail line boundaries, setting the skew at 60º. The skew of the pier between rail lines is also 60º. Therefore, differing layouts only modify the location of this one pier to attempt to balance the 2-span arrangement of the bridge. along the relocated SR14 between Chaincraft Road and the southern NS rail line. Moving the proposed SR14 alignment further north/west with this alternative actually aids in optimizing the span arrangement for the needed bridge, and also allows the entire bridge to be built during Phase 1 of construction so access across the rail properties and impacts to service of the overhead electric transmission lines is needed just during that construction phase.

The optimal span lengths for the continuous 2-span bridge for Alternative 3A along the proposed SR14 centerline are 140', 136'. As noted earlier, all substructure units have a constant 60^0 skew. The superstructure consists of composite weathering steel welded plate girders. The long span lengths and large skews require heavy 60" deep steel girders; but fabrication, delivery, and erection of the steel members is certainly possible. Similar to Alternative 3, semi-integral design to eliminate deck joints is possible with Alternative 3A, and all bearings will be expansion-type. See the Alternative 3A Schematic Plan in Appendix FF.

Note that Alternative 3A requires a SR14 profile which matches that noted for Alternative 2A, and is lower than that required with Alternatives 1, 2, and 3.

Alternative 3B and Alternative 3C: The bridge over the rail lines for these alternatives matches that identified for Alternative 3A. The differences between Alternative 3B and Alternative 3C are in the location of Chaincraft Road and the length of separate culvert structure necessary to convey Chaincraft Road through the MSE-wall contained embankment of relocated SR14.

Alternative 4: If Alternative 4 is selected for further plan development, bridge work for the entire structure in the initial construction will consist of isolated deck replacement areas, moderate rehabilitation and strengthening of many concrete members, and isolated concrete member replacement. The steel over the rail lines will be rehabilitated and painted. While some down track time and reduced temporary clearances are likely during construction, no change to the permanent horizontal and vertical clearances will take place after the initial construction. However, bridge work and impacts similar to those noted earlier for replacement alternatives will likely be needed just 10 years after initial construction.

Alternative 5: If Alternative 5 is selected for further plan development, the existing steel bridge over the rail lines will be re-decked, retrofitted, and painted. While some down track time and reduced temporary clearances will be needed during construction, no change to the permanent horizontal and vertical clearances will take place throughout the entire 75-year life cycle. Additional impacts similar to the initial construction will again be needed both 25 years and 50 years after initial construction.

g. Bridge Design over Chaincraft Road

Alternative 1: If Alternative 1 is selected for further plan development, a new bridge is needed to span over Chaincraft Road. Due to the partial-width SR14 alignment shift to the north, SR14 now crosses more in a tightly curved segment of Chaincraft Road. Note that moving the alignment further to the north would bring additional troubles trying to tie down SR14 to Henry Street. See the Alternative 1 Schematic Plan in Appendix GG. As is, in order to provide adequate site distance lines for the recommended design speed along Chaincraft Road of 20 MPH, and to maintain a lane of Chaincraft Road throughout construction, while constructing the shifting SR14 above in phases, a single span bridge on non-parallel abutments is needed. The resulting superstructure is a single span (span length changes throughout the width due to the varying skews). Abutments are cast-in-place reinforced concrete wall types using semi-integral design on driven friction piling, due to: 1.) the close proximity of the forward abutment to the rear abutment of the new railroad bridge, 2.) the wishes of ODOT to not place MSE wall panels where they can get salt spray, and 3.) constructability concerns with phasing SR14.

The maximum span length of this bridge easily exceeds standard cast-in-place concrete slab construction, and even makes custom designs infeasible. The variable length of every successive longitudinal stringer and the special framing required to provide the curving south bridge fascia make prefabricated prestressed concrete members uneconomical. Since new superstructure steel is already necessary for Alternative 1 on the adjacent bridge, and since steel easily accommodates the changing span length and special framing needed, the proposed superstructure type is composite weathering steel rolled beams. Special details will be needed due to the back-to-back semi-integral approach slabs from this bridge and the railroad bridge, but that can be easily accommodated by fixing the forward abutment of this bridge to force all temperature movement to the rear abutment.

Alternatives 2, 3, and 2A: No separate bridge over Chaincraft Road is needed for either Alternative 2, Alternative 3, or Alternative 2A.

Alternative 3A: If Alternative 3A is selected for further plan development, a new structure is needed to span over a relocated Chaincraft Road. With this alternative, the south (rear) abutment of the proposed bridge carrying the relocated SR14 over the rail lines is placed close to and parallel with the southern NS right-of-way boundary. Chaincraft Road is being relocated to cross under SR14 behind that abutment, similar to the alignment identified earlier with Alternative 3. To carry the relocated Chaincraft Road alignment through the MSE-wall contained embankment, Alternative 3A uses a separate arch-topped 3-sided culvert. This culvert runs parallel with and adjacent to, and just behind, the rear abutment. In fact, one side of the 3-sided culvert is set on a “shelf” on the back of the modified full-height rear abutment of the bridge over the rail lines, while the other side of the culvert is set atop pedestal walls. The proposed culvert with Alternative 3A consists of prefabricated reinforced concrete arch-topped culvert sections measuring 32’ span x 12’ rise. The total length of culvert is 210’ long to get fully through the relocated SR14 MSE wall contained embankment at the 60^0 skew. MSE wall panels above and continuing south of the culvert complete the proposed facility in this location. See the Alternative 3A Schematic Plan in Appendix FF.

Alternative 3B: If Alternative 3B is selected for further plan development, a new structure is needed to span over the Chaincraft Road where it currently crosses under SR14. Note that the proposed Chaincraft Road alignment west of SR14 is modified with Alternative 3B, but the proposed Chaincraft Road alignment matches existing east of SR14. Similar to Alternative 3A, with Alternative 3B the south (rear) abutment of the proposed bridge carrying the relocated SR14 over the rail lines is placed close to and parallel with the southern NS right-of-way boundary. Alternative 3B provides the shortest culvert to carry the existing Chaincraft Road alignment through the MSE-wall contained embankment. However, while the final alignment of Alternative 3B satisfies

ODOT L&D criteria for local roads, the final condition requires sharp turns for trucks and a very limited sight distance in all directions. Alternative 3B uses an arch-topped 3-sided culvert set atop two pedestal walls. The culvert consists of the same prefabricated reinforced concrete arch-topped culvert sections mentioned above for Alternative 3A, measuring 32' span x 12' rise. The total length of the Alternative 3B culvert is 126' long to get fully through the SR14 MSE wall contained embankment at a minimal skew. MSE wall panels above and beyond the culvert complete the proposed facility. See the Alternative 3B Schematic Plan in Appendix FF.

Alternative 3C: Alternative 3C is identical to Alternative 3B, except a much longer culvert is being proposed to dramatically improve the alignment of, and the sight distances for the trucks traveling along, Chaincraft Road under the relocated SR14. The total length of culvert is 258' long to get fully through the relocated SR14 MSE wall contained embankment under the SR14/Henry Street intersection above. See the AER Detail Plans in Appendix FF.

Alternatives 4 and 5: Bridge work over Chaincraft Road for Alternatives 4 and 5 was covered in the previous section.

h. Constructability Issues

This site is unique from a constructability standpoint, with multiple railroads, multiple utilities, multiple industrial access issues, heavy mainline traffic volumes, MOT restrictions, limited work spaces, etc. Therefore, we discussed the potential alternatives with a premier bridge building contractor in the State of Ohio. To briefly summarize the discussions, there are no major flaws in constructability of any of the alternatives. That being said, the complexities associated with replacement alternatives will likely reduce the number of bidders if any of those are selected for the initial construction. Some of the complexities discussed, and the resultant best decision for each are presented below:

i. Triangular Fill Area between Bridges (Alternative 1 only): For Alternative 1, the rear abutment of the new Bridge over Rail Lines will be parallel to the NS rail lines, whereas the forward abutment of the new Bridge over Chaincraft Road will be in line with the turning Chaincraft Road. These abutments will be more than 60 degrees different in skew, and fill must be placed between them. While this is not a bridge structural issue, it becomes an issue due to their close proximity and due to the need for phased construction. These abutments will be quite close on the northern face, but over 100' further apart on the finished southern face. The triangular fill area between bridges can be constructed within full-height cast-in-place reinforced concrete walls, with the addition of a waler system using tie-backs to the permanent structural walls for phased construction.

ii. Triangular Fill Area between Bridge over Rail Lines and Culvert Structure for Chaincraft Road (Alternative 3B only): The backfill and phase construction situation are very similar for Alternative 3B to the situation discussion above for

Alternative 1. Phasing a triangular (in plan view) wedge of soil complicates the constructability and increases costs, and complicates the maintenance of traffic of Chaincraft Road during construction.

iii. Mill Creek Culvert Replacement (All Replacement Alternatives only): The proposed reconstruction of the full length of the Mill Creek culvert through the Henry Street right-of-way width in one phase during a detour is highly recommended. If Henry Street is fully closed during any construction phase, then the entire culvert and new MSE wall contained embankment can be easily placed in that phase. If Henry Street cannot be entirely closed at any time, this would necessitate additional temporary wire walls and a temporary bridge, to effectively replace the culvert full width under the temporary bridge anyway. The height to Henry Street and the number of columns above the existing culvert walls simply makes phasing the actual replacement of the culvert through the Henry Street right-of-way width infeasible.

iv. Driving Piles for Pier between Rail Lines: For Alternatives 1, 2, and 3, access will be by two temporary crossings of the W&LE rail line from the “Old Broadway Ave.” right-of-way from the north of the project. One crossing will be needed to construct the new Phase 1 of the pier between the W&LE rail line and NS rail lines. The second crossing will be to the east, to aid in the removals and in the finishing of new pier construction (in lieu of crossing under the new work from the other crossing). Pile driving leads must be checked for clearance distance from the 5 overhead 69kV transmission lines paralleling the rail lines through the construction zone. It is likely that several de-energize periods will be needed just for driving piles for the pier (at least one 5-day period during each of two construction phases).

For Alternatives 2A, 3A, 3B, and 3C, the same access will be needed as described for Alternatives 1, 2, and 3, except that the entirety of the pier (and of the entire bridge over the rail lines) will be built in Phase 1. Access and de-energize times to build the pier will still be needed as described, but only once for proposed construction versus twice for Alternatives 1, 2, and 3.

v. Steel Girder Delivery for the Bridge over the Rail Lines (Alternatives 1, 2, and 3 only): During Phase 1 construction, the extra width remaining on the existing steel framing bridge over the rail lines will be used for steel delivery and splicing. Each girder line can be delivered and spliced on the existing deck (note that splices are not allowed to be located or performed over NS rail lines). Cranes set up on the lower grade can then reach out and pick each new steel girder (using flat booms and header beams) and swing each new girder onto the proposed abutments and pier. Depending on the alternative selected, it is possible also that the cranes could sit on new fill behind the newly constructed abutments. This delivery and erection technique should avoid (or at least reduce) the de-energize times needed for the 5 overhead 69kV transmission lines during steel erection.

For Alternatives 1, 2, and 3, during Phase 2 construction the same methodology can be used from on top of the newly constructed deck, although the lack of new bridge width upon which to work may necessitate that delivery and splicing take place off of the bridge to the north and driven on and picked during short night-time closures. During this phase, existing piers can be used to temporarily hold new steel girders near the final locations prior to final setting.

vi. Wire Wall along Phase Construction Line (All Replacement Alternatives): For the lengths of the project which will be atop MSE fill and constructed in phases, there are no concerns with constructability or construction access room near the existing bridge piers which are still supporting traffic.

i. Utility Issues

i. SUL Summary: Subsurface Utility Location (SUL) Quality Level B (QL-B) and Quality Level C (QL-C) were scoped of our team for this initial project phase. FHWA defines these as follows:

> QL-B involves the application of appropriate surface geophysical methods to determine the existence and horizontal position of virtually all utilities within the project limits. This activity is called "designating". The information obtained in this manner is surveyed to project control. It addresses problems caused by inaccurate utility records, abandoned or unrecorded facilities, and lost references. The proper selection and application of surface geophysical techniques for achieving QL-B data is critical. Information provided by QL-B can enable the accomplishment of preliminary engineering goals. Decisions regarding location of storm drainage systems, footers, foundations and other design features can be made to successfully avoid conflicts with existing utilities. Slight adjustments in design can produce substantial cost savings by eliminating utility relocations.
>
> QL-C is probably the most commonly used level of information. It involves surveying visible utility facilities (e.g., manholes, valve boxes, etc.) and correlating this information with existing utility records (QL-D information). When using this information, it is not unusual to find that many underground utilities have been either omitted or erroneously plotted. Its usefulness, therefore, is primarily on rural projects where utilities are not prevalent, or are not too expensive to repair or relocate.

NEAS, Inc. used the found monuments and located utilities in the field using VRS and Total Station. There are approximately 13 Utility Owners in the proposed work area. NEAS contacted all, but not all have conflicts in the vicinity of the proposed work area. NEAS has completed a Utility Coordination log for all the affected Utility Owners. See Appendix AA. This includes the contact information, communication log, whether conflicts exist or not, and whether plans have been received or not. Level B locating performed by NEAS consisted of toning any lines that had available tracer wires. NEAS also submitted OUPS tickets and contacted OGPUPS for markings and plans, and AECOM surveyors located those markings. Once Level B was completed and the basemap was updated, NEAS performed Level C to see if coverage was complete, which is based on record plans using found evidence in the field. Once all processing data was complete, NEAS then designated each line in the basemap with sizes, types, owner, and quality level, either B or C.

If any of the replacement alternatives (Alternatives 1, 2, 3, 2A, 3A, 3B, or 3C) is selected for further plan development, utility impacts are significant, as briefly outlined in the sections below.

ii. Overhead High Voltage Transmission: There are 5 overhead 69kV transmission lines paralleling the rail lines (located between NS and W&LE rail lines) and in the general location of where a new pier needs placed. These lines are of obvious concern. Per our discussions with Jim Gatto from FirstEnergy Corporation, it would be very difficult to take all 345kV completely out of service at any one time because this is a major backbone in the regional power grid. He said when FirstEnergy does maintenance work they only de-energize one side at a time. For planning any needed outages, 2 to 3 months advanced notice is typically required for a 5-day outage or 7 months advanced notice is typically required for a 10 day outage; and no outages will be granted from June through August. Multiple outages can be scheduled in advance, so it seems advantageous to schedule more outages than likely needed and hopefully cancel ones as they become unnecessary. There is also a risk relying on planned outages, as PJM Interconnection could cancel an outage at any time if something in the regional grid required it. PJM Interconnection is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 States, including Ohio.

FirstEnergy provided lowest clearance elevations to these transmission lines of 65' above grade beside the existing bridge, and 42' above the existing bridge. In the next phase of plan development, we will further survey and research wire elevations under maximum load and temperature, and minimum required clearance needed from these lines. Shorter pile driving leads, possibly revising to drilled shafts in lieu of piling, etc., all need considered to reduce or even eliminate the need for de-energize periods. However, at this stage of plan development, we assume multiple de-energize periods (at least 2) are needed for Alternatives 1, 2, and 3, and one less de-energize period is needed for Alternatives 2A, 3A, 3B, and 3C due to the entire proposed bridge across the tracks being completed in one phase (versus two phases for Alternatives 1, 2, and 3).

iii. Underground Fiber/Communication Lines along NS: Moving existing fiber-optic lines requires new vaults and extensive splicing. With the next phase of project development, the specific locations of existing fiber-optic lines will be found, and design mitigation measures such as moving substructure units or spanning the fiber-optic lines with piling will be considered to avoid fiber-optic line relocations.

iv. Mill Creek Culvert Replacement, and 6'x4' Tributary Culvert Replacement: The large existing 22'x7' box culvert carrying Mill Creek will be replaced with all replacement alternatives through the entire existing Henry Street right-of-way width. However, there is another tributary culvert, also constructed in 1929, which carries a tributary to Mill Creek in a 6’x4’ box culvert beginning north of the rail lines and crossing under Chaincraft Road and SR14 just west of the Henry Street intersection before connecting to the Mill Creek culvert in the main Garfield Park Reservation property (Park Area #2). The existing crossing location under SR14 will be in an area to receive MSE walls or abutment foundations for the replacement alternatives. The existing culvert is nearing 100 years old and was never designed to carry such loads. Therefore, this 6’x4’ culvert will be replaced. Consideration will be given to rerouting the replacement 6’x4’ culvert will be routed down the existing Chaincraft Road, and also to simply tying in to the existing structure just south of the SR14 MSE wall still within ODOT-owed right-of-way to avoid special culvert connection sections and work within the Park Area #2.

v. Waterline: The existing waterline seems random in direction and sizing throughout the proposed project limits, and hydrant locations and water pressure are deficient for fire protection, per the Garfield Heights fire chief. It is never good practice to locate any MSE wall and fill above pressure lines. In addition, the existing waterline is not designed to have high fills added over top of it in its current location. Therefore, all replacement alternatives will require relocation of waterlines impacted by proposed construction, and crossing of SR14 will happen under the pavement of Chaincraft Road. Proposed waterline sizing will be consistent and of the largest existing size found; and hydrants will be placed as needed and at each end of the proposed waterline relocation.

vi. Sanitary Sewer along Chaincraft Road: Similar to the waterline mentioned above, the existing sanitary sewer will be relocated under the pavement of Chaincraft Road for all replacement alternatives.

vii. Overhead Supply Lines: The supply lines (all except the major electric transmission lines noted earlier) on overhead poles will need permanently relocated prior to construction for all replacement alternatives.

If Alternative 4 or Alternative 5 is selected for further plan development, utility impacts during the initial construction will be minimal and temporary. However, utility impacts similar to those outlined above for the replacement alternatives will likely be necessary for future work.

j. Aesthetics

Aesthetics is an often overlooked design element. Done properly, nominal costs can go a long way toward harmonizing a facility into the surrounding environment. For this particular setting, the Garfield Park Reservation is a well-attended public park from which the view of the proposed facility is a prominent feature. This setting also is a well-traveled corridor in the City of Garfield Heights. As this project moves further into design and plan development, regardless of the alternative selected for further plan development, a few of the aesthetic considerations for this project are as follows:

- Possible use of vegetated MSE wall faces for those walls viewed from the main Garfield Park Reservation property.
- Possible street lighting with aesthetic pole and luminaire upgrades throughout the SR14 corridor.

k. Life-Cycle Cost Analysis

The National Highway System (NHS) Designation Act of 1995 specifically required that the Secretary of Transportation establish a program requiring States to conduct life-cycle costs analysis on NHS projects where the cost of a usable project segment equals or exceeds $25 million. Life-Cycle Cost Analysis is a process for evaluating the total economic worth of a usable project segment by analyzing initial costs and discounted future costs, such as maintenance, user, reconstruction, rehabilitation, restoring, and resurfacing costs, over the life of the project segment.

Preliminary construction costs and a life-cycle analysis were developed for each alternative, and are provided in Appendix A – Estimate of Probable Construction Costs and Appendix B - Life Cycle Cost Analysis. Unit prices were obtained using ODOT's Historical Bid Data Item Search (2014-2018). High cost/volume items were included in the estimates of construction cost, with lower cost/volume items omitted and accounted for through the use of a 20% contingency. An additional 20% premium was applied to the bridge items for Alternatives 1, 2, and 3 due to the added costs associated with phased bridge construction. Performing the work for each item twice in separate phases, requiring remobilizations and separate material deliveries for each task, etc., drives the cost up.

The life-cycle analysis for each alternative was used to capture all of the maintenance costs anticipated for the structures and road over an estimated 75-year useful life. The maintenance costs were inflated from present 2019 costs out to the year in which they will occur; then all costs were discounted back to a present worth at the time of construction (2025). The initial 2025 construction costs plus the discounted present worth of the future maintenance costs over the life of the structures provide a total discounted present worth which allows for an accurate comparison between the project alternatives. Alternatives 1, 2, 3, 2A, 3A, 3B, and 3C call for replacing the existing bridge in 2025, while Alternative 5 calls for only rehabilitations for the 75-year life cycle; neither of which results in a salvage value at year 75. Alternative 4 calls for rehabilitation of the bridge in 2025 followed by replacement of the bridge 10 years later; since Alternative 4 would extend the replacement useful life beyond the assumed 75 years, a salvage value has been applied to the Alternative 4 structures at year 75 to equate the lifespans of all alternatives. All project costs (structures and roadway) have been included for life cycle comparisons because the replacements occur at different times and thus have different present value.

An inflation rate of 2.5% was chosen based on ODOT's inflation calculator. The calculator will project out to 25 years, resulting in a total inflation of 82.0%. This equates to approximately 2.5% per year compounded yearly. Inflation will certainly vary over the 75-year useful life of the structures, but this rate appears to be a reasonable average. The discount rate is defined as the rate per year that future benefits and costs should be discounted to present value. According to the AASHTO User Benefit Analysis for Highways Manual (2003), the discount rate can be taken as equal to 3% plus the annual, future inflation rate, or 5.5% in this case.

The Discounted Present Worth Factor (DPWF) is summarized below:

Definitions: f = inflation rate = 2.5%; n = term (in years);
i = discount rate (projected cost of money) = 5.5%;

Present Worth Factor (PWF) = $\frac{1}{(1+i)}$ n Future Worth Factor (FWF) = $(1+f)$ n

DPWF = Present Worth Factor (PWF) x Future Worth Factor (FWF)

So, the formula $\frac{(1+f)^n}{(1+i)^n}$ is used to determine the present value of future costs at time of initial construction (2025).

Bridges: For replacement alternatives (Alternatives 1, 2, 3, 2A, 3A, 3B, and 3C), it is anticipated that the bridge decks will require an overlay in year 25, followed by a full deck replacement in year 50. The new decks will then last the remaining 25 years of the 75-year useful life. This is consistent with the estimated 20-30 year lifespan for overlays given in ODOT BDM 2019 Table 403-4. This overlay lifespan is longer than past estimations, but the incorporation of epoxy coated reinforcement and better concrete materials has improved deck performance in recent history. The overlays will be accompanied by sealing of concrete surfaces. The complete deck replacements will require removal and replacement of the approach slabs, sidewalk and barriers.

New steel beams/plate girders for replacement alternatives will employ weathering steel. ODOT BDM 2019 Section 302.4.1.5.a states that weathering steel reduces initial structure cost by $3.00 per square foot, and that it may eliminate future maintenance coatings. It should be monitored on a 5-year cycle to determine if section loss has progressed enough to justify painting. This project location provides good conditions for weathering steel performance; the crossings are not over water and are located high off the existing grade. It was decided to estimate painting the steel in years 25 and 50. This is also consistent with verbal recommendations for painting of weathering steel received from ODOT Office of Structures on recent AECOM projects requiring life cycle cost analyses.

For all replacement alternatives, it is anticipated that the MSE walls and cast-in-place abutments and piers will require patching and resealing at years 25 and 50; estimated at 5% of the total surface area. The barriers and sidewalks running along the MSE and cast-in-place walls (mounted on moment slabs) will require patching in year 25 and replacement in year 50.

Pavement: Flexible pavement was assumed for the replacements (during initial construction for replacement alternatives, and in year 10 for Alternative 4), and one pavement replacement was also assumed for Alternative 5. ODOT's Pavement Design Manual maintenance intervals listed in Section 703.2.1 were used for the life cycle costs:

- Year 14: 1.5" overlay with planing (driving lanes only).
- Year 24: 3.25" overlay with planing (driving lanes and shoulders) with 1% patching planed surface.
- Year 34: 1.5" overlay with planing (driving lanes only).

To simplify the life cycle cost analysis, the years in which the pavement is due for rehabilitation were shifted to coincide with the bridge maintenance schedule. No additional full-depth replacements are expected in the 75 year life cycles. For subsequent years when bridge maintenance is planned, resurfacing and an increasing amount of pavement repair each time is added for the pavement maintenance. ODOT does not use salvage values for pavement, so no salvage values were provided at year 75 for any option.

V. COMPARISON OF ALTERNATIVES

See the Comparison of Alternatives Matrix in Appendix LL. The matrix compares all alternatives advanced in this report.

The replacement alternatives (Alternatives 1, 2, 3, 2A, 3A, 3B, and 3C) provide for a complete replacement of the existing facility in 2025 to begin a 75-year life cycle. Future maintenance projects are considered for the life cycle costs of these alternatives.

As indicated throughout the document, Alternative 4 is a moderate rehabilitation project during the initial construction, but also requires a full replacement in just 10 years. Therefore, in order to provide an "apples-to-apples" comparison of impacts and costs of Alternative 4 versus the others, impacts and costs for both the initial construction and the anticipated replacement in 10 years were considered; although for the same reason the non-pavement portion of Alternative 4 is also assigned a salvage value of 10/75 at the end of the 75-year life cycle.

Similarly, in order to provide an "apples-to-apples" comparison of impacts and costs of Alternative 5 versus the others, impacts and costs for both the initial construction and the anticipated rehabilitations in 25 years and 50 years were considered for Alternative 5; although no salvage value was used for Alternative 5. Alternative 5 also assumes that a future in-depth inspection finds the existing structure capable of rehabilitating to begin a 75-year life cycle.

VI. CONCLUSION AND RECOMMENDATION

ODOT recognizes the need for major work at this site. Currently, in the Statewide Transportation Improvement Program (STIP), ODOT has planned for the expenditure of over $34 million toward this project (80% Federal, 20% State), with construction scheduled to begin in the Fall of 2024 (FY2025).

Alternative 4 has the lowest initial construction costs of the alternatives advanced in this AER. Alternative 4 calls for a large expenditure and traffic disruption with initial construction in 2025; then an even larger expenditure and impacts just 10 years later (a time period based on recent moderate/major maintenance projects in 1986, 2000, 2010, and planned for 2025). While initial construction costs are the lowest, the life-cycle costs of Alternative 4 are the highest. This alternative does not satisfy the Purpose and Need with initial construction, but simply delays the fix for 10 years. If another viable rail grade separation project within the City of Garfield Heights is constructed before 10 years passes, rendering the replacement in 10 years unnecessary, then Alternative 4 would be a viable alternative. However, with no such other project planned, we feel it is not prudent to recommend Alternative 4.

Alternative 5 has the second lowest initial construction costs of the alternatives advanced in this AER. Alternative 5 will cause major impacts during the initial construction and will also require costs and cause impacts with additional major projects two more times during the 75 year life cycle. However, to even consider Alternative 5 in this AER, a number of assumptions which must later be validated are made at this time. Mainly, it is assumed that the existing fracture-critical steel superstructure over the rail lines can be retrofitted to last another 75 years, and all existing columns can be wrapped (and not replaced) to last another 75 years. These existing structural elements will be 95 years old in the initial construction year of 2025. ODOT's 2018 bridge inspection report mentions the steel has areas of "rusting section loss, bent & torn flanges, missing rivet heads", etc. Before proceeding with this alternative, an in-depth inspection will be needed to determine if retrofits (every 25 years) can be done to the existing steel superstructure to carry the anticipated loads for the next 75 years. If Alternative 5 is selected, and the steel superstructure is unable to last the 75 years, then there is a possibility that SR14 will be closed and detoured, or very extensive temporary supports disrupting NS and W&LE rail lines, will be needed to replace this steel at a later date. It is also noteworthy that Alternative 5 leaves the deficient horizontal and vertical clearances over NS rail lines in place for another 75 years; whereas all replacement alternatives (Alternatives 1, 2, 3, 2A, 3A, 3B, and 3C) all increase horizontal and vertical clearances to the required minimums with the initial construction, while Alternative 4 does so 10 years after initial construction. While Alternative 5 has the lowest life-cycle costs of the alternatives advanced in this AER, the expenditure is still large and there is risk which does not exist with the other alternatives. Therefore, we feel it is not prudent to recommend Alternative 5.

Alternatives 1, 2, and 3 were developed to satisfy ODOT's scope of services for this project, and Alternatives 2A, 3A, 3B, and 3C were added following the formal Value Engineering (VE) process conducted by ODOT in 2019. The main updates to the original scope of services for which the preliminary AER was developed, and the take-aways from that VE process added into this AER report were:

- Henry Street may be detoured when needed, since maintaining traffic at all times proved costly. The original submittal had replacement alternatives (Alternatives 1, 2, and 3) which kept Henry Street open throughout construction. The plans for Alternative 2 in Appendix GG still show the phasing needed if this is done. However, the cost comparisons in this report are consistent in that all replacement alternatives shut down access to/from Henry Street during Phase 2.
- The SR14 alignment across the rail lines may be moved completely offline to be built in one phase, even with additional right-of-way impacts, which reduces the track time and overhead electric transmission de-energize times needed. The original submittal had replacement alternatives (Alternatives 1, 2, and 3) which minimized the SR14 alignment shift a half facility to the north/west. Alternatives 1, 2, and 3 still have this minimal alignment shift, whereas Alternatives 2A, 3A, 3B, and 3C use a full alignment shift in the same north/west direction.
- Additional alternatives which minimize bridge deck area were investigated, adding a separate culvert structure through the approaches to carry Chaincraft Road. Alternatives 3A, 3B, and 3C use a minimum bridge length across the rail lines, and a culvert through the MSE-wall contained embankment to carry Chaincraft Road.

All replacement alternatives (Alternatives 1, 2, 3, 2A, 3A, 3B, and 3C) satisfy the Purpose and Need. All replace the entire existing facility in 2025, have similar construction schedules and impacts to traffic during construction, and have very similar initial and 75-year life-cycle costs. Therefore, other impacts and concerns factor heavily into recommending a preferred alternative.

Alternative 3 (0.337 acres) requires more permanent Norfolk Southern right-of-way than Alternatives 1 and 2 (each at 0.251 acres). Alternative 3 also requires the full permanent acquisition of Parcel No. 544-18-006 (0.340 acres), whereas neither Alternative 1 nor 2 impact this parcel at all. With no measurable cost or impact savings compared to Alternative 1 or 2 to balance the addition of a parcel acquisition, we feel it is not prudent to recommend Alternative 3.

Alternative 1 has the lowest cost of the minimally SR14 horizontally shifted replacement alternatives (Alternatives 1, 2, and 3) requiring partial-width bridge construction across the rail lines. However, the need to maintain SR14 traffic during construction, and the location and placement of adjacent wall abutments at differing skews makes phased construction between the two bridges complex. Alternative 2 avoids this issue and requires fewer bridge substructure units versus Alternative 1. Therefore, while Alternative 1 is a viable alternative, we are not recommending selection of Alternative 1 as our preferred alternative.

Alternatives 3A and 3B both use a full facility shift of the proposed SR14 alignment to the north/west, the minimum length of 2-span bridge to carry SR14 across the rail lines, and a culvert to carry a relocated Chaincraft Road alignment through the MSE-wall contained southern approach. Alternative 3B requires a temporary SR14 bridge over a work zone and a final completion work phase whereas Alternative 3A does not. However, the length of culvert for Alternative 3A is 210’, and Alternative 3A also requires a relocation of Chaincraft Road and the full permanent acquisition of Parcel No. 544-18-006 (0.340 acres). The length of culvert for Alternative 3B is only 126’, and no relocation of Chaincraft Road or parcel purchase is needed. After comparing to Alternative 3B, we feel it is not prudent to recommend Alternative 3A.

Alternative 3B and 3C are very similar. The difference is only in the proposed alignment of Chaincraft Road, and in the resulting culvert length to carry that road thru the MSE-wall contained embankment of SR14. The curved alignment for Alternative 3B is traversable by the trucks using Chaincraft Road, and the total culvert length is 126’. Alternative 3C uses a much straighter alignment for Chaincraft Road, but requires a culvert length of 258’ which results in a more expensive project. We feel that both Alternative 3B and 3C are viable alternatives for selection as the preferred alternative. However, for the small percentage increase of overall costs of Alternative 3C versus Alternative 3B, we feel the benefit of a straighter alignment is certainly justified. Therefore, after comparing to Alternative 3C, we feel it is not prudent to recommend Alternative 3B.

When compared to Alternative 2A, Alternative 2 requires:

- Two construction phases for the bridge over the rail lines (versus one phase for Alternative 2A), which adds costs for mobilization, deliveries, etc.;
- more access across the rail lines and under the electric transmission lines for phasing the bridge construction;
- a less than optimal superstructure and span arrangement due to the geometric location of Chaincraft Road below, which also requires changing skews.

Alternative 2A does impact more right-of-way than Alternative 2. However, the benefits of Alternative 2A versus Alternative 2 outweigh the negative impact. Therefore, after comparing to Alternative 2A, we feel it is not prudent to recommend Alternative 2.

The recommendation of a preferred alternative is therefore between Alternative 2A and Alternative 3C. Both of these alternatives utilize a SR14 alignment shifted a full facility to the north/west of the existing to allow for only one construction phase of the bridge across the rail lines. Alternative 2A can be built in just two construction phases, whereas Alternative 3C requires a third finish construction phase. In following the ODOT recommendation for minimizing the bridge deck area, the recommendation is to proceed with design and plan development for Alternative 3C.

NEXT STEPS

The next steps are to complete the NEPA and FHWA requirements for the selection of the proposed alternative. ODOT requires a Value Engineering (VE) Study for all Federally-funded bridge projects on the Federal-Aid system with an estimated total cost (design, right-of-way and construction) over $40M. This AER incorporates comments from the formal 2019 VE session.

Stakeholder Concurrence

Upon selection of a preferred alternative, the next steps involve stakeholder concurrence:

1. ODOT Real Estate, Cleveland MetroParks, and AECOM meet to discuss:
    a. Anticipated use of Section 4(f) property, including total acreage needed and any potential vacation of existing SR14 right-of-way south of SR14.
    b. Possible revision of south sidewalk on SR14 and west sidewalk on Henry Street to a protected multi-use lane instead.
    c. Possible revision of vertical standard MSE walls along the south face of SR14 and west face of Henry Street to a ¼" per foot (H:V) sloped vegetated wall face instead.
2. AECOM team, Cleveland MetroParks, and ODOT OES determine next steps (possibly de minimis request to FHWA) for use of the Section 4(f) resource (Park Area #1).
3. AECOM and ODOT obtain concurrence from and work toward agreements with NS and W&LE rail lines on the proposed structure location, permanent and temporary clearances, foundation locations, contractor access points, limits of existing removals, and foundation construction techniques. SUL Level A Test Holes will be needed to locate buried utilities in the vicinity of all proposed footings.
4. AECOM obtain concurrence from local floodplain coordinator on any mitigation measures needed for proposed impacts to flood zones with the proposed project.
5. ODOT Real Estate provides direction on the proposed handling of right-of-way and access at the Fanton Realty, LLC property parcels PPN 554-18-003 & PPN 554-18-004. The full acquisition of parcel PPN 554-18-003 will eliminate access between the two parcels, but full ingress/egress must be provided for parcel PPN 554-18-004
6. If Alternative 3 or Alternative 3A is considered moving forward, AECOM and ODOT meet with the owner of Parcel No. 544-18-006 which will need fully acquired.
7. AECOM and ODOT meet again with City of Garfield Heights and Cleveland Clinic - Marymount Hospital to discuss anticipated arrival delays for emergency vehicles travelling from SR14 during construction, particularly the phases in which Henry Street is closed.
8. AECOM meet with Cuyahoga County Engineer's Office to go over the anticipated work to structures on Henry Street and the resulting finished structure that they will maintain.
9. The AECOM team performs full geotechnical investigations for the preferred alternative.
10. AECOM and ODOT begin implementation of the Public Involvement Plan.

Detail Design and Plan Production

After the above concurrence points, AECOM will negotiate a contract with ODOT to complete design and plan production for the preferred alternative. Construction is scheduled for 2025.

Appendix A

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs
Alternative 1

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
			ROADWAY		$ 308,900.00
1	LS	$8,000.00	CLEARING AND GRUBBING	$ 8,000.00	
10,000	SY	$20.00	PAVEMENT REMOVED	$ 200,000.00	
7,000	SF	$11.50	4" CONCRETE WALK	$ 80,500.00	
1,200	FT	$17.00	CURB, TYPE 6	$ 20,400.00	
			EROSION CONTROL		$ 43,000.00
1	LS	$13,000.00	STORM WATER POLLUTION PREVENTION PLAN	$ 13,000.00	
30,000	EACH	$1.00	EROSION CONTROL	$ 30,000.00	
			DRAINAGE		$ 518,500.00
190	FT	$650.00	6' X 4' CONDUIT, TYPE A, 706.05	$ 123,500.00	
4500	FT	$10.00	UNDERDRAIN	$ 45,000.00	
1	LS	$350,000.00	PROJECT DRAINAGE	$ 350,000.00	
			PAVEMENT		$ 752,500.00
2,500	CY	$55.00	AGGREGATE BASE	$ 137,500.00	
15,000	SY	$41.00	ASPHALT CONCRETE PAVEMENT	$ 615,000.00	
			LIGHTING		$ 200,000.00
1	LS	$200,000.00	PROJECT LIGHTING	$ 200,000.00	
			TRAFFIC CONTROL		$ 17,000.00
1	LS	$7,000.00	SIGNING	$ 7,000.00	
1	LS	$10,000.00	PAVEMENT MARKING	$ 10,000.00	
			TRAFFIC SIGNALS		$ 200,000.00
1	LS	$200,000.00	TRAFFIC SIGNAL INSTALLATION	$ 200,000.00	
			STRUCTURES: EXISTING STRUCTURE REMOVAL		$ 4,000,000.00
1	LS	$4,000,000.00	STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN	$ 4,000,000.00	
			STRUCTURES: BRIDGE OVER CHAINCRAFT (TOTAL INCREASED 20% FOR PHASED CONSTRUCTION)		$ 3,374,686.20
1	LS	$20,000.00	COFFERDAMS AND EXCAVATION BRACING	$ 20,000.00	
979	CY	$75.00	UNCLASSIFIED EXCAVATION	$ 73,425.00	
1	LS	$20,000.00	PILE DRIVING EQUIPMENT MOBILIZATION	$ 20,000.00	
3240	FT	$20.00	16" CIP REINFORCED CONCRETE PILES, DRIVEN	$ 64,800.00	
4050	FT	$54.00	16" CIP REINFORCED CONCRETE PILES, FURNISHED	$ 218,700.00	
304898	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 365,877.60	
387	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 270,900.00	
1690	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT INCLUDING FOOTING	$ 1,183,000.00	
1546	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 37,104.00	
149686	LB	$1.40	STRUCTURAL STEEL MEMBERS, LEVEL 3	$ 209,560.40	
19	EACH	$1,600.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	$ 30,400.00	
140	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 31,220.00	
536	CY	$84.00	POROUS BACKFILL WITH GEOTEXTILE FABRIC	$ 45,024.00	
177	FT	$8.50	6" PERFORATED CORRUGATED PLASTIC PIPE	$ 1,504.50	
40	FT	$15.10	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	$ 604.00	
294	SY	$226.00	REINFORCED CONCRETE APPROACH SLABS (T=12")	$ 66,444.00	
177	FT	$150.00	TYPE A INSTALLATION	$ 26,550.00	
140	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 14,000.00	
1	LS	$108,000.00	RETAINING WALL, MISC.: REAR ABUTMENT STRAPS	$ 108,000.00	
67	CF	$375.00	POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM	$ 25,125.00	
			STRUCTURES: BRIDGE OVER RAILROAD (TOTAL INCREASED 20% FOR PHASED CONSTRUCTION)		$ 10,084,668.72
1	LS	$20,000.00	COFFERDAMS AND EXCAVATION BRACING	$ 20,000.00	
1429	CY	$75.00	UNCLASSIFIED EXCAVATION	$ 107,175.00	
1	LS	$20,000.00	PILE DRIVING EQUIPMENT MOBILIZATION	$ 20,000.00	
7200	FT	$20.00	14" CIP REINFORCED CONCRETE PILES, DRIVEN	$ 144,000.00	
8640	FT	$40.00	14" CIP REINFORCED CONCRETE PILES, FURNISHED	$ 345,600.00	
726763	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 872,115.60	
1040	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 728,000.00	
784	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, PIER	$ 548,800.00	
2422	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT INCLUDING FOOTING	$ 1,695,400.00	
3720	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 89,280.00	
2072960	LB	$1.60	STRUCTURAL STEEL MEMBERS, LEVEL 4	$ 3,316,736.00	

Preliminary Engineer's Estimate of Probable Construction Costs

Alternative 1

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
295	FT	$45.00	ARMORLESS PREFORMED JOINT SEAL	$ 13,275.00	
24	EACH	$1,600.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	$ 38,400.00	
664	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 148,072.00	
692	CY	$84.00	POROUS BACKFILL WITH GEOTEXTILE FABRIC	$ 58,128.00	
292	FT	$8.50	6" PERFORATED CORRUGATED PLASTIC PIPE	$ 2,482.00	
40	FT	$15.10	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	$ 604.00	
123	SY	$226.00	REINFORCED CONCRETE APPROACH SLABS (T=12")	$ 27,798.00	
245	SY	$235.00	REINFORCED CONCRETE APPROACH SLABS (T=17")	$ 57,575.00	
295	FT	$150.00	TYPE C INSTALLATION	$ 44,250.00	
662	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 66,200.00	
1	LS	$60,000.00	RETAINING WALL, MISC.: FWD. ABUTMENT STRAPS	$ 60,000.00	
			STRUCTURES: WALLS		$ 11,222,453.00
353600	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 424,320.00	
1768	CY	$500.00	CLASS QC1 CONCRETE W/ QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	$ 884,000.00	
2860	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 68,640.00	
2031	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 452,913.00	
2031	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 203,100.00	
3485	SF	$50.00	RETAINING WALL, MISC.: WALER WALL FOR PHASED CONSTRUCTION	$ 174,250.00	
20582	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL A)	$ 2,881,480.00	
2185	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL B)	$ 305,900.00	
1820	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL C)	$ 254,800.00	
1020	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL D)	$ 142,800.00	
6875	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL E)	$ 962,500.00	
13050	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL F)	$ 1,827,000.00	
10175	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL G)	$ 1,424,500.00	
1975	SF	$200.00	SOLDIER PILE WALL (OLD BROADWAY)	$ 395,000.00	
17740	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL H)	$ 532,200.00	
9635	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL L)	$ 289,050.00	
			STRUCTURES: HENRY ST. CULVERT		$ 240,120.00
107	FT	$2,160.00	22' X 7' CONDUIT, TYPE A, 706.05 (INCLUDING DELIVERY AND INSTALLATION)	$ 231,120.00	
1	LS	$9,000.00	MOBILIZATION (INCLUDING CRANE)	$ 9,000.00	
			STRUCTURES: STAIR TOWER		$ 100,000.00
1	LS	$90,000.00	PREFAB STEEL STAIR TOWER	$ 90,000.00	
1	LS	$10,000.00	MOBILIZATION (INCLUDING CRANE)	$ 10,000.00	
			UTILITES		$ 410,000.00
2	EACH	$100,000.00	DE-ENERGIZE 345kV TRANSMISSION LINES	$ 200,000.00	
1	LS	$210,000.00	WATER WORK	$ 210,000.00	
			INCIDENTIALS		$ 795,000.00
1	LS	$35,000.00	RAILROAD INSURANCE BOND	$ 35,000.00	
24	MNTH	$2,500.00	FIELD OFFICE	$ 60,000.00	
1	LS	$100,000.00	MOBILIZATION	$ 100,000.00	
1	LS	$600,000.00	MAINTAINING TRAFFIC	$ 600,000.00	

SUB TOTAL:	$ 32,266,827.92
20% CONTINGENCY:	$ 6,453,365.58
RIGHT-OF-WAY ACQUISITION COST:	$ 320,000.00
RAILROAD TRACK WORK COST:	$ 1,000,000.00
RAILROAD SIGNAL WORK COST:	$ 1,000,000.00
RAILROAD FLAGGING COST:	$ 192,000.00
INFLATION FROM 2019 TO 2025 (23.1%):	$ 9,524,636.70
TOTAL:	$ 50,756,830.20

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs
Alternative 2

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
			ROADWAY		$ 299,150.00
1	LS	$8,000.00	CLEARING AND GRUBBING	$ 8,000.00	
10,000	SY	$20.00	PAVEMENT REMOVED	$ 200,000.00	
6,300	SF	$11.50	4" CONCRETE WALK	$ 72,450.00	
1,100	FT	$17.00	CURB, TYPE 6	$ 18,700.00	
			EROSION CONTROL		$ 43,000.00
1	LS	$13,000.00	STORM WATER POLLUTION PREVENTION PLAN	$ 13,000.00	
30,000	EACH	$1.00	EROSION CONTROL	$ 30,000.00	
			DRAINAGE		$ 511,500.00
190	FT	$650.00	6' X 4' CONDUIT, TYPE A, 706.05	$ 123,500.00	
3800	FT	$10.00	UNDERDRAIN	$ 38,000.00	
1	LS	$350,000.00	PROJECT DRAINAGE	$ 350,000.00	
			PAVEMENT		$ 737,450.00
2,450	CY	$55.00	AGGREGATE BASE	$ 134,750.00	
14,700	SY	$41.00	ASPHALT CONCRETE PAVEMENT	$ 602,700.00	
			LIGHTING		$ 200,000.00
1	LS	$200,000.00	PROJECT LIGHTING	$ 200,000.00	
			TRAFFIC CONTROL		$ 17,000.00
1	LS	$7,000.00	SIGNING	$ 7,000.00	
1	LS	$10,000.00	PAVEMENT MARKING	$ 10,000.00	
			TRAFFIC SIGNALS		$ 200,000.00
1	LS	$200,000.00	TRAFFIC SIGNAL INSTALLATION	$ 200,000.00	
			STRUCTURES: EXISTING STRUCTURE REMOVAL		$ 4,000,000.00
1	LS	$4,000,000.00	STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN	$ 4,000,000.00	
			STRUCTURES: BRIDGE OVER CHAINCRAFT AND RAILROAD (TOTAL INCREASED 20% FOR PHASED CONSTRUCTION)		$ 13,815,973.80
1	LS	$40,000.00	COFFERDAMS AND EXCAVATION BRACING	$ 40,000.00	
1775	CY	$75.00	UNCLASSIFIED EXCAVATION	$ 133,125.00	
1	LS	$40,000.00	PILE DRIVING EQUIPMENT MOBILIZATION	$ 40,000.00	
7050	FT	$20.00	14" CIP REINFORCED CONCRETE PILES, DRIVEN	$ 141,000.00	
8460	FT	$40.00	14" CIP REINFORCED CONCRETE PILES, FURNISHED	$ 338,400.00	
900125	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 1,080,150.00	
1273	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 891,100.00	
1318	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, PIER	$ 922,600.00	
2349	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT INCLUDING FOOTING	$ 1,644,300.00	
4640	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 111,360.00	
3251440	LB	$1.60	STRUCTURAL STEEL MEMBERS, LEVEL 4	$ 5,202,304.00	
250	FT	$495.00	STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL	$ 123,750.00	
32	EACH	$1,600.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	$ 51,200.00	
1083	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 241,509.00	
970	CY	$84.00	POROUS BACKFILL WITH GEOTEXTILE FABRIC	$ 81,480.00	
373	FT	$8.50	6" PERFORATED CORRUGATED PLASTIC PIPE	$ 3,170.50	
40	FT	$15.10	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	$ 604.00	
184	SY	$226.00	REINFORCED CONCRETE APPROACH SLABS (T=12")	$ 41,584.00	
245	SY	$235.00	REINFORCED CONCRETE APPROACH SLABS (T=17")	$ 57,575.00	
272	FT	$150.00	TYPE A INSTALLATION	$ 40,800.00	
1083	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 108,300.00	
1	LS	$168,000.00	RETAINING WALL, MISC.: ABUTMENT STRAPS	$ 168,000.00	
136	CF	$375.00	POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM	$ 51,000.00	
			STRUCTURES: WALLS		$ 10,972,303.00
344750	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 413,700.00	
1709	CY	$500.00	CLASS QC1 CONCRETE W/ QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	$ 854,500.00	
2715	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 65,160.00	
1931	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 430,613.00	
1931	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 193,100.00	
20582	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL A)	$ 2,881,480.00	
2185	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL B)	$ 305,900.00	
1820	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL C)	$ 254,800.00	
1020	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL D)	$ 142,800.00	

Preliminary Engineer's Estimate of Probable Construction Costs

Alternative 2

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
6875	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL E)	$ 962,500.00	
13050	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL F)	$ 1,827,000.00	
10175	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL G)	$ 1,424,500.00	
1975	SF	$200.00	SOLDIER PILE WALL (OLD BROADWAY)	$ 395,000.00	
17740	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL H)	$ 532,200.00	
9635	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL L)	$ 289,050.00	
			STRUCTURES: HENRY ST. CULVERT		$ 240,120.00
107	FT	$2,160.00	22' X 7' CONDUIT, TYPE A, 706.05 (INCLUDING DELIVERY AND INSTALLATION)	$ 231,120.00	
1	LS	$9,000.00	MOBILIZATION (INCLUDING CRANE)	$ 9,000.00	
			STRUCTURES: STAIR TOWER		$ 100,000.00
1	LS	$90,000.00	PREFAB STEEL STAIR TOWER	$ 90,000.00	
1	LS	$10,000.00	MOBILIZATION (INCLUDING CRANE)	$ 10,000.00	
			UTILITES		$ 410,000.00
2	EACH	$100,000.00	DE-ENERGIZE 345kV TRANSMISSION LINES	$ 200,000.00	
1	LS	$210,000.00	WATER WORK	$ 210,000.00	
			INCIDENTIALS		$ 795,000.00
1	LS	$35,000.00	RAILROAD INSURANCE BOND	$ 35,000.00	
24	MNTH	$2,500.00	FIELD OFFICE	$ 60,000.00	
1	LS	$100,000.00	MOBILIZATION	$ 100,000.00	
1	LS	$600,000.00	MAINTAINING TRAFFIC	$ 600,000.00	

SUB TOTAL:	$ 32,341,496.80
20% CONTINGENCY:	$ 6,468,299.36
RIGHT-OF-WAY ACQUISITION COST:	$ 320,000.00
RAILROAD TRACK WORK COST:	$ 1,000,000.00
RAILROAD SIGNAL WORK COST:	$ 1,000,000.00
RAILROAD FLAGGING COST:	$ 192,000.00
INFLATION FROM 2019 TO 2025 (23.1%):	$ 9,545,334.91
TOTAL:	$ 50,867,131.07

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs
Alternative 3

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
			ROADWAY		$ 422,175.00
1	LS	$10,000.00	CLEARING AND GRUBBING	$ 10,000.00	
13,800	SY	$20.00	PAVEMENT REMOVED	$ 276,000.00	
7,850	SF	$11.50	4" CONCRETE WALK	$ 90,275.00	
2,700	FT	$17.00	CURB, TYPE 6	$ 45,900.00	
			EROSION CONTROL		$ 43,000.00
1	LS	$13,000.00	STORM WATER POLLUTION PREVENTION PLAN	$ 13,000.00	
30,000	EACH	$1.00	EROSION CONTROL	$ 30,000.00	
			DRAINAGE		$ 557,000.00
190	FT	$650.00	6' X 4' CONDUIT, TYPE A, 706.05	$ 123,500.00	
5350	FT	$10.00	UNDERDRAIN	$ 53,500.00	
1	LS	$380,000.00	PROJECT DRAINAGE	$ 380,000.00	
			PAVEMENT		$ 922,150.00
3,050	CY	$55.00	AGGREGATE BASE	$ 167,750.00	
18,400	SY	$41.00	ASPHALT CONCRETE PAVEMENT	$ 754,400.00	
			LIGHTING		$ 200,000.00
1	LS	$200,000.00	PROJECT LIGHTING	$ 200,000.00	
			TRAFFIC CONTROL		$ 17,000.00
1	LS	$7,000.00	SIGNING	$ 7,000.00	
1	LS	$10,000.00	PAVEMENT MARKING	$ 10,000.00	
			TRAFFIC SIGNALS		$ 200,000.00
1	LS	$200,000.00	TRAFFIC SIGNAL INSTALLATION	$ 200,000.00	
			STRUCTURES: EXISTING STRUCTURE REMOVAL		$ 4,000,000.00
1	LS	$4,000,000.00	STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN	$ 4,000,000.00	
			STRUCTURES: BRIDGE OVER RE-ALIGNED CHAINCRAFT AND RAILROAD (TOTAL INCREASED 20% FOR PHASED CONSTRUCTION)		$ 12,514,947.00
1	LS	$20,000.00	COFFERDAMS AND EXCAVATION BRACING	$ 20,000.00	
1849	CY	$75.00	UNCLASSIFIED EXCAVATION	$ 138,675.00	
1	LS	$20,000.00	PILE DRIVING EQUIPMENT MOBILIZATION	$ 20,000.00	
6900	FT	$20.00	14" CIP REINFORCED CONCRETE PILES, DRIVEN	$ 138,000.00	
8280	FT	$40.00	14" CIP REINFORCED CONCRETE PILES, FURNISHED	$ 331,200.00	
917300	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 1,100,760.00	
1366	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 956,200.00	
806	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, PIER	$ 564,200.00	
2805	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT INCLUDING FOOTING	$ 1,963,500.00	
3898	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 93,552.00	
2704960	LB	$1.60	STRUCTURAL STEEL MEMBERS, LEVEL 4	$ 4,327,936.00	
293	FT	$45.00	ARMORLESS PREFORMED JOINT SEAL	$ 13,185.00	
24	EACH	$1,600.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	$ 38,400.00	
916	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 204,268.00	
1148	CY	$84.00	POROUS BACKFILL WITH GEOTEXTILE FABRIC	$ 96,432.00	
413	FT	$8.50	6" PERFORATED CORRUGATED PLASTIC PIPE	$ 3,510.50	
40	FT	$15.10	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	$ 604.00	
490	SY	$235.00	REINFORCED CONCRETE APPROACH SLABS (T=17")	$ 115,150.00	
293	FT	$150.00	TYPE C INSTALLATION	$ 43,950.00	
916	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 91,600.00	
1	LS	$168,000.00	RETAINING WALL, MISC.: FWD. ABUTMENT STRAPS	$ 168,000.00	
			STRUCTURES: WALLS		$ 12,448,681.00
379800	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 455,760.00	
1899	CY	$500.00	CLASS QC1 CONCRETE W/ QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	$ 949,500.00	
3072	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 73,728.00	
2181	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 486,363.00	
2181	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 218,100.00	
20582	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL A)	$ 2,881,480.00	
2185	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL B)	$ 305,900.00	
1820	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL C)	$ 254,800.00	
7180	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL D)	$ 1,005,200.00	
6875	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL E)	$ 962,500.00	
13490	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL F)	$ 1,888,600.00	

Preliminary Engineer's Estimate of Probable Construction Costs

Alternative 3

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
10175	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL G)	$ 1,424,500.00	
1000	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL N)	$ 140,000.00	
1975	SF	$200.00	SOLDIER PILE WALL (OLD BROADWAY)	$ 395,000.00	
22140	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL H)	$ 664,200.00	
9635	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL L)	$ 289,050.00	
1800	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL O)	$ 54,000.00	
			STRUCTURES: HENRY ST. CULVERT		$ 240,120.00
107	FT	$2,160.00	22' X 7' CONDUIT, TYPE A, 706.05 (INCLUDING DELIVERY AND INSTALLATION)	$ 231,120.00	
1	LS	$9,000.00	MOBILIZATION (INCLUDING CRANE)	$ 9,000.00	
			STRUCTURES: STAIR TOWER		$ 100,000.00
1	LS	$90,000.00	PREFAB STEEL STAIR TOWER	$ 90,000.00	
1	LS	$10,000.00	MOBILIZATION (INCLUDING CRANE)	$ 10,000.00	
			UTILITES		$ 410,000.00
2	EACH	$100,000.00	DE-ENERGIZE 345kV TRANSMISSION LINES	$ 200,000.00	
1	LS	$210,000.00	WATER WORK	$ 210,000.00	
			INCIDENTIALS		$ 805,000.00
1	LS	$35,000.00	RAILROAD INSURANCE BOND	$ 35,000.00	
24	MNTH	$2,500.00	FIELD OFFICE	$ 60,000.00	
1	LS	$100,000.00	MOBILIZATION	$ 100,000.00	
1	LS	$610,000.00	MAINTAINING TRAFFIC	$ 610,000.00	

SUB TOTAL:	$ 32,880,073.00
20% CONTINGENCY:	$ 6,576,014.60
RIGHT-OF-WAY ACQUISITION COST:	$ 620,000.00
RAILROAD TRACK WORK COST:	$ 1,000,000.00
RAILROAD SIGNAL WORK COST:	$ 1,000,000.00
RAILROAD FLAGGING COST:	$ 192,000.00
INFLATION FROM 2019 TO 2025 (23.1%):	$ 9,763,928.24
TOTAL:	$ 52,032,015.84

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs

Alternative 2A

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
			ROADWAY		$ 299,150.00
1	LS	$8,000.00	CLEARING AND GRUBBING	$ 8,000.00	
10,000	SY	$20.00	PAVEMENT REMOVED	$ 200,000.00	
6,300	SF	$11.50	4" CONCRETE WALK	$ 72,450.00	
1,100	FT	$17.00	CURB, TYPE 6	$ 18,700.00	
			EROSION CONTROL		$ 43,000.00
1	LS	$13,000.00	STORM WATER POLLUTION PREVENTION PLAN	$ 13,000.00	
30,000	EACH	$1.00	EROSION CONTROL	$ 30,000.00	
			DRAINAGE		$ 526,450.00
213	FT	$650.00	6' X 4' CONDUIT, TYPE A, 706.05	$ 138,450.00	
3,800	FT	$10.00	UNDERDRAIN	$ 38,000.00	
1	LS	$350,000.00	PROJECT DRAINAGE	$ 350,000.00	
			PAVEMENT		$ 737,450.00
2,450	CY	$55.00	AGGREGATE BASE	$ 134,750.00	
14,700	SY	$41.00	ASPHALT CONCRETE PAVEMENT	$ 602,700.00	
			LIGHTING		$ 200,000.00
1	LS	$200,000.00	PROJECT LIGHTING	$ 200,000.00	
			TRAFFIC CONTROL		$ 17,000.00
1	LS	$7,000.00	SIGNING	$ 7,000.00	
1	LS	$10,000.00	PAVEMENT MARKING	$ 10,000.00	
			TRAFFIC SIGNALS		$ 200,000.00
1	LS	$200,000.00	TRAFFIC SIGNAL INSTALLATION	$ 200,000.00	
			STRUCTURES: EXISTING STRUCTURE REMOVAL		$ 4,000,000.00
1	LS	$4,000,000.00	STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN	$ 4,000,000.00	
			STRUCTURES: BRIDGE OVER CHAINCRAFT AND RAILROAD		$ 11,706,289.00
1	LS	$40,000.00	COFFERDAMS AND EXCAVATION BRACING	$ 40,000.00	
2,119	CY	$75.00	UNCLASSIFIED EXCAVATION	$ 158,925.00	
1	LS	$20,000.00	PILE DRIVING EQUIPMENT MOBILIZATION	$ 20,000.00	
9,200	FT	$20.00	14" CIP REINFORCED CONCRETE PILES, DRIVEN	$ 184,000.00	
11,040	FT	$40.00	14" CIP REINFORCED CONCRETE PILES, FURNISHED	$ 441,600.00	
1,055,075	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 1,266,090.00	
1,120	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 784,000.00	
1,634	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, PIER	$ 1,143,800.00	
3,115	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT INCLUDING FOOTING	$ 2,180,500.00	
6,028	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 144,672.00	
2,701,035	LB	$1.60	STRUCTURAL STEEL MEMBERS, LEVEL 4	$ 4,321,656.00	
331	FT	$495.00	STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL	$ 163,845.00	
32	EACH	$1,600.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	$ 51,200.00	
1,002	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 223,446.00	
1,013	CY	$84.00	POROUS BACKFILL WITH GEOTEXTILE FABRIC	$ 85,092.00	
484	FT	$8.50	6" PERFORATED CORRUGATED PLASTIC PIPE	$ 4,114.00	
40	FT	$15.10	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	$ 604.00	
487	SY	$235.00	REINFORCED CONCRETE APPROACH SLABS (T=17")	$ 114,445.00	
359	FT	$150.00	TYPE A INSTALLATION	$ 53,850.00	
1,002	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 100,200.00	
1	LS	$168,000.00	RETAINING WALL, MISC.: ABUTMENT STRAPS	$ 168,000.00	
150	CF	$375.00	POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM	$ 56,250.00	
			STRUCTURES: WALLS		$ 12,441,888.48
367,200	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 440,640.00	
1,836	CY	$500.00	CLASS QC1 CONCRETE W/ QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	$ 918,000.00	
2,793	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 67,032.00	
2,154	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 480,431.20	
2,154	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 215,440.00	
21,291	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL A)	$ 2,980,698.82	
2,185	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL B)	$ 305,900.00	
1,820	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL C)	$ 254,800.00	
6,531	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL D)	$ 914,340.00	
10,547	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL E)	$ 1,476,540.19	
8,518	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL F)	$ 1,192,512.96	

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs

Alternative 2A

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
13,770	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL G)	$ 1,927,795.75	
1,975	SF	$200.00	SOLDIER PILE WALL (OLD BROADWAY)	$ 395,000.00	
13,034	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL H)	$ 391,017.56	
16,058	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL I)	$ 481,740.00	
			STRUCTURES: HENRY ST. CULVERT		$ 240,120.00
107	FT	$2,160.00	22' X 7' CONDUIT, TYPE A, 706.05 (INCLUDING DELIVERY AND INSTALLATION)	$ 231,120.00	
1	LS	$9,000.00	MOBILIZATION (INCLUDING CRANE)	$ 9,000.00	
			STRUCTURES: STAIR TOWER		$ 100,000.00
1	LS	$90,000.00	PREFAB STEEL STAIR TOWER	$ 90,000.00	
1	LS	$10,000.00	MOBILIZATION (INCLUDING CRANE)	$ 10,000.00	
			UTILITES		$ 310,000.00
1	EACH	$100,000.00	DE-ENERGIZE 345kV TRANSMISSION LINES	$ 100,000.00	
1	LS	$210,000.00	WATER WORK	$ 210,000.00	
			INCIDENTIALS		$ 765,000.00
1	LS	$35,000.00	RAILROAD INSURANCE BOND	$ 35,000.00	
24	MNTH	$2,500.00	FIELD OFFICE	$ 60,000.00	
1	LS	$70,000.00	MOBILIZATION	$ 70,000.00	
1	LS	$600,000.00	MAINTAINING TRAFFIC	$ 600,000.00	

SUB TOTAL:	$ 31,586,347.48
20% CONTINGENCY:	$ 6,317,269.50
RIGHT-OF-WAY ACQUISITION COST:	$ 400,000.00
RAILROAD TRACK WORK COST:	$ 1,000,000.00
RAILROAD SIGNAL WORK COST:	$ 1,000,000.00
RAILROAD FLAGGING COST:	$ 192,000.00
INFLATION FROM 2019 TO 2025 (23.1%):	$ 9,354,487.52
TOTAL:	$ 49,850,104.50

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs

Alternative 3A

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
			ROADWAY		$ 422,175.00
1	LS	$10,000.00	CLEARING AND GRUBBING	$ 10,000.00	
13,800	SY	$20.00	PAVEMENT REMOVED	$ 276,000.00	
7,850	SF	$11.50	4" CONCRETE WALK	$ 90,275.00	
2,700	FT	$17.00	CURB, TYPE 6	$ 45,900.00	
			EROSION CONTROL		$ 43,000.00
1	LS	$13,000.00	STORM WATER POLLUTION PREVENTION PLAN	$ 13,000.00	
30,000	EACH	$1.00	EROSION CONTROL	$ 30,000.00	
			DRAINAGE		$ 571,950.00
213	FT	$650.00	6' X 4' CONDUIT, TYPE A, 706.05	$ 138,450.00	
5,350	FT	$10.00	UNDERDRAIN	$ 53,500.00	
1	LS	$380,000.00	PROJECT DRAINAGE	$ 380,000.00	
			PAVEMENT		$ 922,150.00
3,050	CY	$55.00	AGGREGATE BASE	$ 167,750.00	
18,400	SY	$41.00	ASPHALT CONCRETE PAVEMENT	$ 754,400.00	
			LIGHTING		$ 200,000.00
1	LS	$200,000.00	PROJECT LIGHTING	$ 200,000.00	
			TRAFFIC CONTROL		$ 17,000.00
1	LS	$7,000.00	SIGNING	$ 7,000.00	
1	LS	$10,000.00	PAVEMENT MARKING	$ 10,000.00	
			TRAFFIC SIGNALS		$ 200,000.00
1	LS	$200,000.00	TRAFFIC SIGNAL INSTALLATION	$ 200,000.00	
			STRUCTURES: EXISTING STRUCTURE REMOVAL		$ 4,000,000.00
1	LS	$4,000,000.00	STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN	$ 4,000,000.00	
			STRUCTURES: BRIDGE OVER RAILROAD		$ 8,913,736.50
1	LS	$20,000.00	COFFERDAMS AND EXCAVATION BRACING	$ 20,000.00	
3,071	CY	$75.00	UNCLASSIFIED EXCAVATION	$ 230,325.00	
1	LS	$10,000.00	PILE DRIVING EQUIPMENT MOBILIZATION	$ 10,000.00	
6,450	FT	$20.00	14" CIP REINFORCED CONCRETE PILES, DRIVEN	$ 129,000.00	
7,740	FT	$40.00	14" CIP REINFORCED CONCRETE PILES, FURNISHED	$ 309,600.00	
915,775	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 1,098,930.00	
966	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 676,200.00	
739	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, PIER	$ 517,300.00	
3,390	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT INCLUDING FOOTING	$ 2,373,000.00	
4,180	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 100,320.00	
1,734,895	LB	$1.60	STRUCTURAL STEEL MEMBERS, LEVEL 4	$ 2,775,832.00	
284	FT	$45.00	ARMORLESS PREFORMED JOINT SEAL	$ 12,780.00	
24	EACH	$1,600.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	$ 38,400.00	
684	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 152,532.00	
853	CY	$84.00	POROUS BACKFILL WITH GEOTEXTILE FABRIC	$ 71,652.00	
449	FT	$8.50	6" PERFORATED CORRUGATED PLASTIC PIPE	$ 3,816.50	
40	FT	$15.10	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	$ 604.00	
487	SY	$235.00	REINFORCED CONCRETE APPROACH SLABS (T=17")	$ 114,445.00	
284	FT	$150.00	TYPE C INSTALLATION	$ 42,600.00	
684	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 68,400.00	
1	LS	$168,000.00	RETAINING WALL, MISC.: FWD. ABUTMENT STRAPS	$ 168,000.00	
			STRUCTURES: WALLS		$ 13,535,184.65
395,000	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 474,000.00	
1,975	CY	$500.00	CLASS QC1 CONCRETE W/ QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	$ 987,500.00	
3,005	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 72,120.00	
2,318	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 516,914.00	
2,318	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 231,800.00	
21,320	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL A)	$ 2,984,832.94	
2,188	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL B)	$ 306,325.45	
1,820	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL C)	$ 254,800.00	
6,965	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL D)	$ 975,104.19	
10,551	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL E)	$ 1,477,142.86	
11,602	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL F)	$ 1,624,290.27	
13,757	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL G)	$ 1,925,914.97	

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs

Alternative 3A

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
1,000	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL H)	$ 140,000.00	
1,975	SF	$200.00	SOLDIER PILE WALL (OLD BROADWAY)	$ 395,000.00	
21,123	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL I)	$ 633,699.97	
16,058	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL J)	$ 481,740.00	
1,800	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL K)	$ 54,000.00	
			STRUCTURES: CHAINCRAFT RD. CULVERT		$ 1,448,186.00
210	FT	$3,300.00	CONDUIT, TYPE A, PRECAST CONCRETE ARCH SECTIONS, 32'X12' (INCLUDING DELIVERY AND INSTALLATION)	$ 693,000.00	
109,025	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 130,830.00	
623	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT INCLUDING FOOTING	$ 436,100.00	
669	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 16,056.00	
2,400	LF	$20.00	14" CIP REINFORCED CONCRETE PILES, DRIVEN	$ 48,000.00	
2,880	LF	$40.00	14" CIP REINFORCED CONCRETE PILES, FURNISHED	$ 115,200.00	
1	LS	$9,000.00	MOBILIZATION (INCLUDING CRANE)	$ 9,000.00	
			STRUCTURES: HENRY ST. CULVERT		$ 240,120.00
107	FT	$2,160.00	22' X 7' CONDUIT, TYPE A, 706.05 (INCLUDING DELIVERY AND INSTALLATION)	$ 231,120.00	
1	LS	$9,000.00	MOBILIZATION (INCLUDING CRANE)	$ 9,000.00	
			STRUCTURES: STAIR TOWER		$ 100,000.00
1	LS	$90,000.00	PREFAB STEEL STAIR TOWER	$ 90,000.00	
1	LS	$10,000.00	MOBILIZATION (INCLUDING CRANE)	$ 10,000.00	
			UTILITES		$ 310,000.00
1	EACH	$100,000.00	DE-ENERGIZE 345kV TRANSMISSION LINES	$ 100,000.00	
1	LS	$210,000.00	WATER WORK	$ 210,000.00	
			INCIDENTIALS		$ 775,000.00
1	LS	$35,000.00	RAILROAD INSURANCE BOND	$ 35,000.00	
24	MNTH	$2,500.00	FIELD OFFICE	$ 60,000.00	
1	LS	$70,000.00	MOBILIZATION	$ 70,000.00	
1	LS	$610,000.00	MAINTAINING TRAFFIC	$ 610,000.00	

SUB TOTAL:	$ 31,698,502.15
20% CONTINGENCY:	$ 6,339,700.43
RIGHT-OF-WAY ACQUISITION COST:	$ 700,000.00
RAILROAD TRACK WORK COST:	$ 1,000,000.00
RAILROAD SIGNAL WORK COST:	$ 1,000,000.00
RAILROAD FLAGGING COST:	$ 192,000.00
INFLATION FROM 2019 TO 2025 (23.1%):	$ 9,454,876.80
TOTAL:	$ 50,385,079.38

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs
Alternative 3B

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
			ROADWAY		$ 422,175.00
1	LS	$10,000.00	CLEARING AND GRUBBING	$ 10,000.00	
13,800	SY	$20.00	PAVEMENT REMOVED	$ 276,000.00	
7,850	SF	$11.50	4" CONCRETE WALK	$ 90,275.00	
2,700	FT	$17.00	CURB, TYPE 6	$ 45,900.00	
			EROSION CONTROL		$ 43,000.00
1	LS	$13,000.00	STORM WATER POLLUTION PREVENTION PLAN	$ 13,000.00	
30,000	EACH	$1.00	EROSION CONTROL	$ 30,000.00	
			DRAINAGE		$ 571,950.00
213	FT	$650.00	6' X 4' CONDUIT, TYPE A, 706.05	$ 138,450.00	
5,350	FT	$10.00	UNDERDRAIN	$ 53,500.00	
1	LS	$380,000.00	PROJECT DRAINAGE	$ 380,000.00	
			PAVEMENT		$ 922,150.00
3,050	CY	$55.00	AGGREGATE BASE	$ 167,750.00	
18,400	SY	$41.00	ASPHALT CONCRETE PAVEMENT	$ 754,400.00	
			LIGHTING		$ 200,000.00
1	LS	$200,000.00	PROJECT LIGHTING	$ 200,000.00	
			TRAFFIC CONTROL		$ 17,000.00
1	LS	$7,000.00	SIGNING	$ 7,000.00	
1	LS	$10,000.00	PAVEMENT MARKING	$ 10,000.00	
			TRAFFIC SIGNALS		$ 200,000.00
1	LS	$200,000.00	TRAFFIC SIGNAL INSTALLATION	$ 200,000.00	
			STRUCTURES: EXISTING STRUCTURE REMOVAL		$ 4,000,000.00
1	LS	$4,000,000.00	STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN	$ 4,000,000.00	
			STRUCTURES: BRIDGE OVER RAILROAD		$ 8,842,854.50
1	LS	$20,000.00	COFFERDAMS AND EXCAVATION BRACING	$ 20,000.00	
4,007	CY	$75.00	UNCLASSIFIED EXCAVATION	$ 300,525.00	
1	LS	$10,000.00	PILE DRIVING EQUIPMENT MOBILIZATION	$ 10,000.00	
8,200	FT	$20.00	14" CIP REINFORCED CONCRETE PILES, DRIVEN	$ 164,000.00	
9,840	FT	$40.00	14" CIP REINFORCED CONCRETE PILES, FURNISHED	$ 393,600.00	
858,550	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 1,030,260.00	
966	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 676,200.00	
739	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, PIER	$ 517,300.00	
3,063	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT INCLUDING FOOTING	$ 2,144,100.00	
3,278	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 78,672.00	
1,734,895	LB	$1.60	STRUCTURAL STEEL MEMBERS, LEVEL 4	$ 2,775,832.00	
284	FT	$45.00	ARMORLESS PREFORMED JOINT SEAL	$ 12,780.00	
24	EACH	$1,600.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	$ 38,400.00	
684	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 152,532.00	
1,557	CY	$84.00	POROUS BACKFILL WITH GEOTEXTILE FABRIC	$ 130,788.00	
449	FT	$8.50	6" PERFORATED CORRUGATED PLASTIC PIPE	$ 3,816.50	
40	FT	$15.10	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	$ 604.00	
487	SY	$235.00	REINFORCED CONCRETE APPROACH SLABS (T=17")	$ 114,445.00	
284	FT	$150.00	TYPE C INSTALLATION	$ 42,600.00	
684	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 68,400.00	
1	LS	$168,000.00	RETAINING WALL, MISC.: FWD. ABUTMENT STRAPS	$ 168,000.00	
			STRUCTURES: WALLS		$ 13,070,016.79
394,600	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 473,520.00	
1,973	CY	$500.00	CLASS QC1 CONCRETE W/ QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	$ 986,500.00	
3,003	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 72,072.00	
2,316	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 516,468.00	
2,316	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 231,600.00	
21,320	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL A)	$ 2,984,832.94	
2,188	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL B)	$ 306,325.45	
1,820	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL C)	$ 254,800.00	
4,299	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL D)	$ 601,916.17	
10,551	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL E)	$ 1,477,142.86	
13,156	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL F)	$ 1,841,829.14	
13,757	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL G)	$ 1,925,914.97	

Preliminary Engineer's Estimate of Probable Construction Costs
Alternative 3B

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
1,975	SF	$200.00	SOLDIER PILE WALL (OLD BROADWAY)	$ 395,000.00	
17,345	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL H)	$ 520,355.26	
16,058	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL I)	$ 481,740.00	
			STRUCTURES: CHAINCRAFT RD. CULVERT		$ 1,486,032.00
132	FT	$3,300.00	CONDUIT, TYPE A, PRECAST CONCRETE ARCH SECTIONS, 32'X12' (INCLUDING DELIVERY AND INSTALLATION)	$ 435,600.00	
184,800	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 221,760.00	
924	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT INCLUDING FOOTING	$ 646,800.00	
403	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 9,672.00	
2,400	LF	$20.00	14" CIP REINFORCED CONCRETE PILES, DRIVEN	$ 48,000.00	
2,880	LF	$40.00	14" CIP REINFORCED CONCRETE PILES, FURNISHED	$ 115,200.00	
1	LS	$9,000.00	MOBILIZATION (INCLUDING CRANE)	$ 9,000.00	
			STRUCTURES: TEMPORARY PREFABRICATED STEEL BRIDGE		$ 95,000.00
1	LS	$85,000.00	PREFAB STEEL BRIDGE (12 MO. RENTAL, INCL. DELIVERY AND INSTALLATION)	$ 85,000.00	
1	LS	$10,000.00	MOBILIZATION (INCLUDING CRANE)	$ 10,000.00	
			STRUCTURES: HENRY ST. CULVERT		$ 240,120.00
107	FT	$2,160.00	22' X 7' CONDUIT, TYPE A, 706.05 (INCLUDING DELIVERY AND INSTALLATION)	$ 231,120.00	
1	LS	$9,000.00	MOBILIZATION (INCLUDING CRANE)	$ 9,000.00	
			STRUCTURES: STAIR TOWER		$ 100,000.00
1	LS	$90,000.00	PREFAB STEEL STAIR TOWER	$ 90,000.00	
1	LS	$10,000.00	MOBILIZATION (INCLUDING CRANE)	$ 10,000.00	
			UTILITES		$ 310,000.00
1	EACH	$100,000.00	DE-ENERGIZE 345kV TRANSMISSION LINES	$ 100,000.00	
1	LS	$210,000.00	WATER WORK	$ 210,000.00	
			INCIDENTIALS		$ 775,000.00
1	LS	$35,000.00	RAILROAD INSURANCE BOND	$ 35,000.00	
24	MNTH	$2,500.00	FIELD OFFICE	$ 60,000.00	
1	LS	$70,000.00	MOBILIZATION	$ 70,000.00	
1	LS	$610,000.00	MAINTAINING TRAFFIC	$ 610,000.00	

SUB TOTAL:	$ 31,295,298.29
20% CONTINGENCY:	$ 6,259,059.66
RIGHT-OF-WAY ACQUISITION COST:	$ 400,000.00
RAILROAD TRACK WORK COST:	$ 1,000,000.00
RAILROAD SIGNAL WORK COST:	$ 1,000,000.00
RAILROAD FLAGGING COST:	$ 192,000.00
INFLATION FROM 2019 TO 2025 (23.1%):	$ 9,273,808.69
TOTAL:	$ 49,420,166.64

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs

Alternative 3C

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
			ROADWAY		$ 422,175.00
1	LS	$10,000.00	CLEARING AND GRUBBING	$ 10,000.00	
13,800	SY	$20.00	PAVEMENT REMOVED	$ 276,000.00	
7,850	SF	$11.50	4" CONCRETE WALK	$ 90,275.00	
2,700	FT	$17.00	CURB, TYPE 6	$ 45,900.00	
			EROSION CONTROL		$ 43,000.00
1	LS	$13,000.00	STORM WATER POLLUTION PREVENTION PLAN	$ 13,000.00	
30,000	EACH	$1.00	EROSION CONTROL	$ 30,000.00	
			DRAINAGE		$ 571,950.00
213	FT	$650.00	6' X 4' CONDUIT, TYPE A, 706.05	$ 138,450.00	
5,350	FT	$10.00	UNDERDRAIN	$ 53,500.00	
1	LS	$380,000.00	PROJECT DRAINAGE	$ 380,000.00	
			PAVEMENT		$ 922,150.00
3,050	CY	$55.00	AGGREGATE BASE	$ 167,750.00	
18,400	SY	$41.00	ASPHALT CONCRETE PAVEMENT	$ 754,400.00	
			LIGHTING		$ 200,000.00
1	LS	$200,000.00	PROJECT LIGHTING	$ 200,000.00	
			TRAFFIC CONTROL		$ 17,000.00
1	LS	$7,000.00	SIGNING	$ 7,000.00	
1	LS	$10,000.00	PAVEMENT MARKING	$ 10,000.00	
			TRAFFIC SIGNALS		$ 200,000.00
1	LS	$200,000.00	TRAFFIC SIGNAL INSTALLATION	$ 200,000.00	
			STRUCTURES: EXISTING STRUCTURE REMOVAL		$ 4,000,000.00
1	LS	$4,000,000.00	STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN	$ 4,000,000.00	
			STRUCTURES: BRIDGE OVER RAILROAD		$ 8,789,744.50
1	LS	$20,000.00	COFFERDAMS AND EXCAVATION BRACING	$ 20,000.00	
3,273	CY	$75.00	UNCLASSIFIED EXCAVATION	$ 245,475.00	
1	LS	$10,000.00	PILE DRIVING EQUIPMENT MOBILIZATION	$ 10,000.00	
9,200	FT	$20.00	14" CIP REINFORCED CONCRETE PILES, DRIVEN	$ 184,000.00	
11,040	FT	$40.00	14" CIP REINFORCED CONCRETE PILES, FURNISHED	$ 441,600.00	
845,950	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 1,015,140.00	
966	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 676,200.00	
739	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, PIER	$ 517,300.00	
2,991	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT INCLUDING FOOTING	$ 2,093,700.00	
3,259	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 78,216.00	
1,734,895	LB	$1.60	STRUCTURAL STEEL MEMBERS, LEVEL 4	$ 2,775,832.00	
284	FT	$45.00	ARMORLESS PREFORMED JOINT SEAL	$ 12,780.00	
24	EACH	$1,600.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	$ 38,400.00	
684	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 152,532.00	
1,556	CY	$84.00	POROUS BACKFILL WITH GEOTEXTILE FABRIC	$ 130,704.00	
449	FT	$8.50	6" PERFORATED CORRUGATED PLASTIC PIPE	$ 3,816.50	
40	FT	$15.10	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	$ 604.00	
487	SY	$235.00	REINFORCED CONCRETE APPROACH SLABS (T=17")	$ 114,445.00	
284	FT	$150.00	TYPE C INSTALLATION	$ 42,600.00	
684	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 68,400.00	
1	LS	$168,000.00	RETAINING WALL, MISC.: FWD. ABUTMENT STRAPS	$ 168,000.00	
			STRUCTURES: WALLS		$ 14,007,471.45
413,000	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 495,600.00	
2,065	CY	$500.00	CLASS QC1 CONCRETE W/ QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	$ 1,032,500.00	
3,143	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 75,432.00	
2,424	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 540,552.00	
2,424	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 242,400.00	
21,320	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL A)	$ 2,984,832.94	
2,188	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL B)	$ 306,325.45	
1,820	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL C)	$ 254,800.00	
4,643	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL D)	$ 650,069.46	
5,592	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL E)	$ 782,909.60	
10,551	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL F)	$ 1,477,140.00	
13,156	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL G)	$ 1,841,840.00	

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs
Alternative 3C

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
13,757	SF	$140.00	MECHANICALLY STABILIZED EARTH WALL (WALL H)	$ 1,925,980.00	
1,975	SF	$200.00	SOLDIER PILE WALL (OLD BROADWAY)	$ 395,000.00	
17,345	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL I)	$ 520,350.00	
16,058	SF	$30.00	TEMPORARY WIRE FACED MECHANICALLY STABILIZED EARTH WALL (WALL L)	$ 481,740.00	
			STRUCTURES: CHAINCRAFT RD. CULVERT		$ 2,506,652.00
258	FT	$3,300.00	CONDUIT, TYPE A, PRECAST CONCRETE ARCH SECTIONS, 32'X12' (INCLUDING DELIVERY AND INSTALLATION)	$ 851,400.00	
217,700	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 261,240.00	
1,244	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT INCLUDING FOOTING	$ 870,800.00	
813	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 19,512.00	
7,275	LF	$20.00	14" CIP REINFORCED CONCRETE PILES, DRIVEN	$ 145,500.00	
8,730	LF	$40.00	14" CIP REINFORCED CONCRETE PILES, FURNISHED	$ 349,200.00	
1	LS	$9,000.00	MOBILIZATION (INCLUDING CRANE)	$ 9,000.00	
			STRUCTURES: HENRY ST. CULVERT		$ 240,120.00
107	FT	$2,160.00	22' X 7' CONDUIT, TYPE A, 706.05 (INCLUDING DELIVERY AND INSTALLATION)	$ 231,120.00	
1	LS	$9,000.00	MOBILIZATION (INCLUDING CRANE)	$ 9,000.00	
			STRUCTURES: STAIR TOWER		$ 100,000.00
1	LS	$90,000.00	PREFAB STEEL STAIR TOWER	$ 90,000.00	
1	LS	$10,000.00	MOBILIZATION (INCLUDING CRANE)	$ 10,000.00	
			STRUCTURES: TEMPORARY PREFABRICATED STEEL BRIDGE		$ 95,000.00
1	LS	$85,000.00	PREFAB STEEL BRIDGE (12 MO. RENTAL, INCL. DELIVERY AND INSTALLATION)	$ 85,000.00	
1	LS	$10,000.00	MOBILIZATION (INCLUDING CRANE)	$ 10,000.00	
			UTILITES		$ 310,000.00
1	EACH	$100,000.00	DE-ENERGIZE 345kV TRANSMISSION LINES	$ 100,000.00	
1	LS	$210,000.00	WATER WORK	$ 210,000.00	
			INCIDENTIALS		$ 775,000.00
1	LS	$35,000.00	RAILROAD INSURANCE BOND	$ 35,000.00	
24	MNTH	$2,500.00	FIELD OFFICE	$ 60,000.00	
1	LS	$70,000.00	MOBILIZATION	$ 70,000.00	
1	LS	$610,000.00	MAINTAINING TRAFFIC	$ 610,000.00	

SUB TOTAL:	$ 33,200,262.95
20% CONTINGENCY:	$ 6,640,052.59
RIGHT-OF-WAY ACQUISITION COST:	$ 400,000.00
RAILROAD TRACK WORK COST:	$ 1,000,000.00
RAILROAD SIGNAL WORK COST:	$ 1,000,000.00
RAILROAD FLAGGING COST:	$ 192,000.00
INFLATION FROM 2019 TO 2025 (23.1%):	$ 9,801,864.89
TOTAL:	$ 52,234,180.43

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs

Alternative 4

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
			PAVEMENT		$ 10,000.00
400	SY	$3.00	PAVEMENT PLANING	$ 1,200.00	
400	SY	$14.00	3-1/4" ASPHALT CONCRETE OVERLAY	$ 5,600.00	
80	SY	$40.00	PAVEMENT REPAIR (20%)	$ 3,200.00	
			STRUCTURE: CUY-14-0693		$ 10,976,840.00
3500	LB	$1.60	REINFORCING STEEL, REPLACEMENT OF EXISTING REINFORCING STEEL, APP	$ 5,600.00	
53000	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 1,272,000.00	
16400	SY	$18.00	SEALING CONCRETE BRIDGE DECKS WITH HMWM RESIN	$ 295,200.00	
4700	FT	$88.00	CONCRETE REPAIR BY EPOXY INJECTION	$ 413,600.00	
87200	SF	$8.10	SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	$ 706,320.00	
87200	SF	$1.90	FIELD PAINTING OF EXISTING STRUCTURAL STEEL, PRIME COAT	$ 165,680.00	
87200	SF	$2.20	FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	$ 191,840.00	
87200	SF	$2.00	FIELD PAINTING STRUCTURAL STEEL, FINISH COAT	$ 174,400.00	
3900	SF	$36.00	SPECIAL-COMPOSITE FIBER WRAP SYSTEM	$ 140,400.00	
1100	SY	$325.00	SPECIAL-PATCHING CONCRETE BRIDGE DECK OVERLAY WITH MICRO-SILICA MODIFIED CONCRETE	$ 357,500.00	
72900	SF	$87.00	PATCHING CONCRETE STRUCTURE	$ 6,342,300.00	
12000	SF	$76.00	PATCHING CONCRETE STRUCTURE WITH TROWELABLE MORTAR	$ 912,000.00	
			INCIDENTIALS		$ 377,800.00
1	LS	$35,000.00	RAILROAD INSURANCE BOND	$ 35,000.00	
8	MNTH	$1,600.00	FIELD OFFICE	$ 12,800.00	
1	LS	$30,000.00	MOBILIZATION	$ 30,000.00	
1	LS	$300,000.00	MAINTAINING TRAFFIC	$ 300,000.00	

SUB TOTAL:	$ 11,364,640.00
20% CONTINGENCY:	$ 2,272,928.00
RAILROAD TRACK WORK COST:	$ 1,000,000.00
RAILROAD SIGNAL WORK COST:	$ 1,000,000.00
RAILROAD FLAGGING COST:	$ 192,000.00
INFLATION FROM 2019 TO 2025 (23.1%):	$ 3,656,630.21
TOTAL:	$ 19,486,198.21

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs
Alternative 5 - Year 0

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
			PAVEMENT		$ 7,500.00
300	SY	$3.00	PAVEMENT PLANING	$ 900.00	
300	SY	$14.00	3-1/4" ASPHALT CONCRETE OVERLAY	$ 4,200.00	
60	SY	$40.00	PAVEMENT REPAIR (20%)	$ 2,400.00	
			STRUCTURE: CUY-14-0693 (FIBER WRAP ALL COLUMNS)		$ 2,299,950.00
57000	SF	$36.00	SPECIAL-COMPOSITE FIBER WRAP SYSTEM	$ 2,052,000.00	
2850	SF	$87.00	PATCHING CONCRETE STRUCTURE	$ 247,950.00	
			STRUCTURE: CUY-14-0693 (EXTENSIVE REHAB WEST OF INTERSECTION, TOTAL INCREASED 20% FOR PHASED CONSTRUCTION)		$ 4,892,214.60
1	LS	$700,000.00	PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	$ 700,000.00	
143	SY	$34.00	APPROACH SLAB REMOVED	$ 4,862.00	
592775	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 711,330.00	
1890	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 1,323,000.00	
852	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, PIER	$ 596,400.00	
7	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT NOT INCLUDING FOOTING	$ 4,900.00	
9626	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 231,024.00	
258	FT	$495.00	STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL	$ 127,710.00	
10	EA	$300.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES ONLY (NEOPRENE)	$ 3,000.00	
978	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 218,094.00	
34	CY	$84.00	POROUS BACKFILL WITH GEOTEXTILE FABRIC	$ 2,856.00	
65	FT	$8.50	6" PERFORATED CORRUGATED PLASTIC PIPE	$ 552.50	
20	FT	$15.10	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	$ 302.00	
143	SY	$230.00	REINFORCED CONCRETE APPROACH SLABS (T=13")	$ 32,890.00	
65	FT	$150.00	TYPE A INSTALLATION	$ 9,750.00	
978	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 97,800.00	
33	CF	$375.00	POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM	$ 12,375.00	
			STRUCTURE: CUY-14-0693 (EXTENSIVE REHAB EAST OF INTERSECTION, TOTAL INCREASED 20% FOR PHASED CONSTRUCTION)		$ 11,512,233.00
1	LS	$1,300,000.00	PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	$ 1,300,000.00	
143	SY	$34.00	APPROACH SLAB REMOVED	$ 4,862.00	
687275	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 824,730.00	
2245	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 1,571,500.00	
459	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, PIER	$ 321,300.00	
7	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT NOT INCLUDING FOOTING	$ 4,900.00	
14816	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 355,584.00	
500000	LB	$5.00	STRUCTURAL STEEL MEMBERS, LEVEL 4	$ 2,500,000.00	
87200	SF	$8.10	SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	$ 706,320.00	
87200	SF	$1.90	FIELD PAINTING OF EXISTING STRUCTURAL STEEL, PRIME COAT	$ 165,680.00	
87200	SF	$2.20	FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	$ 191,840.00	
87200	SF	$2.00	FIELD PAINTING STRUCTURAL STEEL, FINISH COAT	$ 174,400.00	
322	FT	$495.00	STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL	$ 159,390.00	
10	EA	$300.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES ONLY (NEOPRENE)	$ 3,000.00	
41	EA	$3,000.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	$ 123,000.00	
1528	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 340,744.00	
34	CY	$84.00	POROUS BACKFILL WITH GEOTEXTILE FABRIC	$ 2,856.00	
65	FT	$8.50	6" PERFORATED CORRUGATED PLASTIC PIPE	$ 552.50	
20	FT	$15.10	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	$ 302.00	
7296	SF	$87.00	PATCHING CONCRETE STRUCTURE	$ 634,752.00	
143	SY	$230.00	REINFORCED CONCRETE APPROACH SLABS (T=13")	$ 32,890.00	
65	FT	$150.00	TYPE A INSTALLATION	$ 9,750.00	
1528	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 152,800.00	
33	CF	$375.00	POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM	$ 12,375.00	
			STRUCTURE: CUY-14-0693 (MODERATE REHAB TO INTERSECTION AND HENRY ST.)		$ 1,727,795.00
500	LB	$1.60	REINFORCING STEEL, REPLACEMENT OF EXISTING REINFORCING STEEL, APP	$ 800.00	
7632	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 183,168.00	
780	FT	$88.00	CONCRETE REPAIR BY EPOXY INJECTION	$ 68,640.00	
68	SF	$36.00	SPECIAL-COMPOSITE FIBER WRAP SYSTEM	$ 2,448.00	
11453	SF	$87.00	PATCHING CONCRETE STRUCTURE	$ 996,411.00	
1757	SF	$76.00	PATCHING CONCRETE STRUCTURE WITH TROWELABLE MORTAR	$ 133,532.00	
2008	SY	$81.00	MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	$ 162,648.00	
2008	SY	$76.00	SURFACE PREPARATION USING HYDRODEMOLITION	$ 152,608.00	
84	CY	$310.00	MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	$ 26,040.00	
1	LS	$1,500.00	TEST SLAB	$ 1,500.00	
			INCIDENTIALS		$ 648,400.00
1	LS	$35,000.00	RAILROAD INSURANCE BOND	$ 35,000.00	

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Preliminary Engineer's Estimate of Probable Construction Costs
Alternative 5 - Year 0

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
24	MNTH	$1,600.00	FIELD OFFICE	$ 38,400.00	
1	LS	$75,000.00	MOBILIZATION	$ 75,000.00	
1	LS	$500,000.00	MAINTAINING TRAFFIC	$ 500,000.00	

SUB TOTAL:	$ 21,088,092.60
20% CONTINGENCY:	$ 4,217,618.52
RAILROAD TRACK WORK COST:	$ 1,000,000.00
RAILROAD SIGNAL WORK COST:	$ 1,000,000.00
RAILROAD FLAGGING COST:	$ 192,000.00
TOTAL:	$ 27,497,711.12

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs
Alternative 5 - Year 25

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
			PAVEMENT		$ 2,500.00
100	SY	$3.00	PAVEMENT PLANING	$ 300.00	
100	SY	$14.00	3-1/4" ASPHALT CONCRETE OVERLAY	$ 1,400.00	
20	SY	$40.00	PAVEMENT REPAIR (20%)	$ 800.00	
			STRUCTURE: CUY-14-0693 (MINOR MAINTENANCE WEST OF INTERSECTION)		$ 1,097,669.00
9626	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 231,024.00	
4332	SF	$87.00	PATCHING CONCRETE STRUCTURE	$ 376,884.00	
2873	SY	$81.00	MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	$ 232,713.00	
2873	SY	$76.00	SURFACE PREPARATION USING HYDRODEMOLITION	$ 218,348.00	
120	CY	$310.00	MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	$ 37,200.00	
1	LS	$1,500.00	TEST SLAB	$ 1,500.00	
			STRUCTURE: CUY-14-0693 (MINOR MAINTENANCE EAST OF INTERSECTION)		$ 3,639,278.00
14816	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 355,584.00	
87200	SF	$8.10	SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	$ 706,320.00	
87200	SF	$1.90	FIELD PAINTING OF EXISTING STRUCTURAL STEEL, PRIME COAT	$ 165,680.00	
87200	SF	$2.20	FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	$ 191,840.00	
87200	SF	$2.00	FIELD PAINTING STRUCTURAL STEEL, FINISH COAT	$ 174,400.00	
13964	SF	$87.00	PATCHING CONCRETE STRUCTURE	$ 1,214,868.00	
4878	SY	$81.00	MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	$ 395,118.00	
4878	SY	$76.00	SURFACE PREPARATION USING HYDRODEMOLITION	$ 370,728.00	
204	CY	$310.00	MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	$ 63,240.00	
1	LS	$1,500.00	TEST SLAB	$ 1,500.00	
			STRUCTURE: CUY-14-0693 (EXTENSIVE REHAB TO INTERSECTION AND HENRY ST., TOTAL INCREASED 20% FOR PHASED CONSTRUCTION)		$ 3,849,606.00
1	LS	$500,000.00	PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	$ 500,000.00	
125	SY	$34.00	APPROACH SLAB REMOVED	$ 4,250.00	
454975	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 545,970.00	
1301	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 910,700.00	
682	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, PIER	$ 477,400.00	
6	CY	$700.00	CLASS QC1 CONCRETE W/ QC/QA, ABUTMENT NOT INCLUDING FOOTING	$ 4,200.00	
6563	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 157,512.00	
272	FT	$495.00	STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL	$ 134,640.00	
10	EA	$300.00	ELASTOMERIC BEARING WITH INTERNAL LAMINATES ONLY (NEOPRENE)	$ 3,000.00	
555	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 123,765.00	
30	CY	$84.00	POROUS BACKFILL WITH GEOTEXTILE FABRIC	$ 2,520.00	
56	FT	$8.50	6" PERFORATED CORRUGATED PLASTIC PIPE	$ 476.00	
20	FT	$15.10	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	$ 302.00	
125	SY	$230.00	REINFORCED CONCRETE APPROACH SLABS (T=13")	$ 28,750.00	
56	FT	$150.00	TYPE A INSTALLATION	$ 8,400.00	
555	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 55,500.00	
28	CF	$375.00	POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM	$ 10,500.00	
107	FT	$2,160.00	22' X 7' CONDUIT, TYPE A, 706.05 (INCLUDING DELIVERY AND INSTALLATION)	$ 231,120.00	
1	LS	$9,000.00	MOBILIZATION (INCLUDING CRANE)	$ 9,000.00	
			INCIDENTIALS		$ 393,800.00
1	LS	$35,000.00	RAILROAD INSURANCE BOND	$ 35,000.00	
18	MNTH	$1,600.00	FIELD OFFICE	$ 28,800.00	
1	LS	$30,000.00	MOBILIZATION	$ 30,000.00	
1	LS	$300,000.00	MAINTAINING TRAFFIC	$ 300,000.00	

SUB TOTAL:	$ 8,982,853.00
20% CONTINGENCY:	$ 1,796,570.60
RAILROAD FLAGGING COST:	$ 192,000.00
TOTAL:	$ 10,971,423.60

AECOM

Preliminary Engineer's Estimate of Probable Construction Costs
Alternative 5 - Year 50

QUANTITY	UNIT	UNIT PRICE	DESCRIPTION	ENGINEER'S ESTIMATE	
			STRUCTURE: CUY-14-0693 (FIBER WRAP ALL COLUMNS)		$ 2,299,950.00
57000	SF	$36.00	SPECIAL-COMPOSITE FIBER WRAP SYSTEM	$ 2,052,000.00	
2850	SF	$87.00	PATCHING CONCRETE STRUCTURE	$ 247,950.00	
			STRUCTURE: CUY-14-0693 (MINOR MAINTENANCE WEST OF INTERSECTION)		$ 1,097,669.00
9626	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 231,024.00	
4332	SF	$87.00	PATCHING CONCRETE STRUCTURE	$ 376,884.00	
2873	SY	$81.00	MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	$ 232,713.00	
2873	SY	$76.00	SURFACE PREPARATION USING HYDRODEMOLITION	$ 218,348.00	
120	CY	$310.00	MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	$ 37,200.00	
1	LS	$1,500.00	TEST SLAB	$ 1,500.00	
			STRUCTURE: CUY-14-0693 (MINOR MAINTENANCE EAST OF INTERSECTION)		$ 5,584,998.00
14816	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 355,584.00	
87200	SF	$8.10	SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	$ 706,320.00	
87200	SF	$1.90	FIELD PAINTING OF EXISTING STRUCTURAL STEEL, PRIME COAT	$ 165,680.00	
87200	SF	$2.20	FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT	$ 191,840.00	
87200	SF	$2.00	FIELD PAINTING STRUCTURAL STEEL, FINISH COAT	$ 174,400.00	
13964	SF	$87.00	PATCHING CONCRETE STRUCTURE	$ 1,214,868.00	
1777	SY	$81.00	MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	$ 143,937.00	
1777	SY	$76.00	SURFACE PREPARATION USING HYDRODEMOLITION	$ 135,052.00	
74	CY	$310.00	MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	$ 22,940.00	
1	LS	$1,500.00	TEST SLAB	$ 1,500.00	
1	LS	$900,000.00	PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	$ 900,000.00	
318175	LB	$1.20	EPOXY COATED REINFORCING STEEL	$ 381,810.00	
1157	CY	$700.00	CLASS QC2 CONCRETE W/ QC/QA, SUPERSTRUCTURE	$ 809,900.00	
141	FT	$495.00	STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL	$ 69,795.00	
964	FT	$223.00	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	$ 214,972.00	
964	FT	$100.00	VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	$ 96,400.00	
			STRUCTURE: CUY-14-0693 (MINOR MAINTENANCE TO INTERSECTION AND HENRY ST.)		$ 757,306.00
6563	SY	$24.00	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	$ 157,512.00	
2954	SF	$87.00	PATCHING CONCRETE STRUCTURE	$ 256,998.00	
2008	SY	$81.00	MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	$ 162,648.00	
2008	SY	$76.00	SURFACE PREPARATION USING HYDRODEMOLITION	$ 152,608.00	
84	CY	$310.00	MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	$ 26,040.00	
1	LS	$1,500.00	TEST SLAB	$ 1,500.00	
			INCIDENTIALS		$ 393,800.00
1	LS	$35,000.00	RAILROAD INSURANCE BOND	$ 35,000.00	
18	MNTH	$1,600.00	FIELD OFFICE	$ 28,800.00	
1	LS	$30,000.00	MOBILIZATION	$ 30,000.00	
1	LS	$300,000.00	MAINTAINING TRAFFIC	$ 300,000.00	

SUB TOTAL: $ 10,133,723.00

20% CONTINGENCY: $ 2,026,744.60

RAILROAD FLAGGING COST: $ 192,000.00

TOTAL: $ 12,352,467.60

Appendix B

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 1

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
BRIDGE REPLACEMENT COST				$ 41,232,193.50	$50,756,830.20						$50,756,830.20
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	13,555	SY	$24.00	$325,320.00	$272,587.92		$699,440.20		$1,296,723.03		$1,996,163.24
PATCHING CONCRETE STRUCTURE, AS PER PLAN	6,100	SF	$87.00	$530,700.00	$444,677.27		$1,141,008.59		$2,115,366.15		$3,256,374.74
MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	2,980	SY	$81.00	$241,380.00	$136,091.07		$518,968.63				$518,968.63
SURFACE PREPARATION USING HYDRODEMOLITION	2,980	SY	$76.00	$226,480.00	$127,690.38		$486,933.53				$486,933.53
MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	126	CY	$310.00	$38,905.00	$21,934.80		$83,646.01				$83,646.01
TEST SLAB	2	LS	$1,500.00	$3,000.00	$1,691.41		$6,450.02				$6,450.02
SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	62,410	SF	$8.10	$505,521.00	$423,579.61		$1,086,873.57		$2,015,002.84		$3,101,876.42
FIELD PAINTING OF EXISTING STRUCTURAL STEEL PRIME COAT	62,410	SF	$1.90	$118,579.00	$99,358.18		$254,945.65		$472,654.99		$727,600.64
FIELD PAINTING OF EXISTING STRUCTURAL STEEL INTERMEDIATE COAT	62,410	SF	$2.20	$137,302.00	$115,046.31		$295,200.23		$547,284.72		$842,484.95
FIELD PAINTING OF EXISTING STRUCTURAL STEEL FINISH COAT	62,410	SF	$2.00	$124,820.00	$104,587.56		$268,363.84		$497,531.57		$765,895.41
PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	1	LS	$1,000,000.00	$1,000,000.00	$274,102.81				$3,985,992.36		$3,985,992.36
APPROACH SLAB REMOVED	781	SY	$34.00	$26,554.00	$7,278.53				$105,844.04		$105,844.04
EPOXY COATED REINFORCING STEEL	244,773	LB	$1.20	$293,727.60	$80,511.56				$1,170,795.97		$1,170,795.97
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE	1,427	CY	$700.00	$998,900.00	$273,801.29				$3,981,607.77		$3,981,607.77
CLASS QC1 CONCRETE WITH QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	1,768	CY	$500.00	$884,000.00	$242,306.88				$3,523,617.25		$3,523,617.25
ARMORLESS PREFORMED JOINT SEAL	295	FT	$45.00	$13,275.00	$3,638.71				$52,914.05		$52,914.05
RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	2,835	FT	$223.00	$632,205.00	$173,289.16				$2,519,964.30		$2,519,964.30
REINFORCED CONCRETE APPROACH SLABS	781	SY	$235.00	$183,535.00	$50,307.46				$731,569.11		$731,569.11
TYPE A INSTALLATION	177	FT	$150.00	$26,550.00	$7,277.43				$105,828.10		$105,828.10
TYPE C INSTALLATION	295	FT	$150.00	$44,250.00	$12,129.05				$176,380.16		$176,380.16

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 1

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	2,835	FT	$100.00	$283,500.00	$77,708.15				$1,130,028.83		$1,130,028.83
POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM	67	CF	$375.00	$25,125.00	$6,886.83				$100,148.06		$100,148.06
RAILROAD FLAGGING (NS & CCRR)	1,920	HOUR	$100.00	$192,000.00	$160,878.15		$412,801.30		$765,310.53		$1,178,111.83
PAVEMENT PLANING	15,000	SY	$3.00	$45,000.00	$98,244.21	$73,737.74	$96,750.30	$131,734.84	$179,369.66	$259,780.74	$741,373.29
1-1/2" ASPHALT CONCRETE OVERLAY	15,000	SY	$8.00	$120,000.00	$92,923.19	$196,633.97					$196,633.97
3-1/4" ASPHALT CONCRETE OVERLAY	15,000	SY	$14.00	$210,000.00	$295,857.42		$451,501.42	$614,762.60	$837,058.40	$1,212,310.14	$3,115,632.56
PAVEMENT REPAIR (1%)	150	SY	$40.00	$6,000.00	$3,382.83		$12,900.04				$12,900.04
PAVEMENT REPAIR (5%)	750	SY	$40.00	$30,000.00	$11,793.49			$87,823.23			$87,823.23
PAVEMENT REPAIR (10%)	1,500	SY	$40.00	$60,000.00	$16,446.17				$239,159.54		$239,159.54
PAVEMENT REPAIR (20%)	3,000	SY	$40.00	$120,000.00	$21,338.59					$692,748.65	$692,748.65
	TOTAL DISCOUNTED PRESENT WORTH				**$54,414,176.62**				**TOTAL LIFE CYCLE COST**		**$86,392,296.90**

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 2

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
BRIDGE REPLACEMENT COST				$ 41,321,796.16	$50,867,131.07						$50,867,131.07
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	13,690	SY	$24.00	$328,560.00	$275,302.74		$706,406.22		$1,309,637.65		$2,016,043.87
PATCHING CONCRETE STRUCTURE, AS PER PLAN	6,161	SF	$87.00	$536,007.00	$449,124.04		$1,152,418.68		$2,136,519.81		$3,288,938.48
MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	3,270	SY	$81.00	$264,870.00	$149,334.83		$569,472.29				$569,472.29
SURFACE PREPARATION USING HYDRODEMOLITION	3,270	SY	$76.00	$248,520.00	$140,116.63		$534,319.68				$534,319.68
MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	137	CY	$310.00	$42,470.00	$23,944.77		$91,310.79				$91,310.79
TEST SLAB	1	LS	$1,500.00	$1,500.00	$845.71		$3,225.01				$3,225.01
SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	110,580	SF	$8.10	$895,698.00	$750,511.66		$1,925,756.76		$3,570,245.38		$5,496,002.15
FIELD PAINTING OF EXISTING STRUCTURAL STEEL PRIME COAT	110,580	SF	$1.90	$210,102.00	$176,045.95		$451,720.72		$837,464.97		$1,289,185.69
FIELD PAINTING OF EXISTING STRUCTURAL STEEL INTERMEDIATE COAT	110,580	SF	$2.20	$243,276.00	$203,842.67		$523,045.05		$969,696.28		$1,492,741.32
FIELD PAINTING OF EXISTING STRUCTURAL STEEL FINISH COAT	110,580	SF	$2.00	$221,160.00	$185,311.52		$475,495.50		$881,542.07		$1,357,037.57
PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	1	LS	$1,000,000.00	$1,000,000.00	$274,102.81				$3,985,992.36		$3,985,992.36
APPROACH SLAB REMOVED	429	SY	$34.00	$14,586.00	$3,998.06				$58,139.68		$58,139.68
EPOXY COATED REINFORCING STEEL	350,075	LB	$1.20	$420,090.00	$115,147.85				$1,674,475.53		$1,674,475.53
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE	1,273	CY	$700.00	$891,100.00	$244,253.01				$3,551,917.79		$3,551,917.79
CLASS QC1 CONCRETE WITH QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	1,709	CY	$500.00	$854,500.00	$234,220.85				$3,406,030.47		$3,406,030.47
STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL	250	FT	$495.00	$123,750.00	$33,920.22				$493,266.55		$493,266.55
RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	3,014	FT	$223.00	$672,122.00	$184,230.53				$2,679,073.16		$2,679,073.16
REINFORCED CONCRETE APPROACH SLABS	429	SY	$235.00	$100,815.00	$27,633.67				$401,847.82		$401,847.82
TYPE A INSTALLATION	272	FT	$150.00	$40,800.00	$11,183.39				$162,628.49		$162,628.49
VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	3,014	FT	$100.00	$301,400.00	$82,614.59				$1,201,378.10		$1,201,378.10

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 2

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM	136	CF	$375.00	$51,000.00	$13,979.24				$203,285.61		$203,285.61
RAILROAD FLAGGING (NS & CCRR)	1,920	HOUR	$100.00	$192,000.00	$52,627.74				$765,310.53		$765,310.53
PAVEMENT PLANING	14,700	SY	$3.00	$44,100.00	$96,279.33	$72,262.99	$94,815.30	$129,100.15	$175,782.26	$254,585.13	$726,545.82
1-1/2" ASPHALT CONCRETE OVERLAY	14,700	SY	$8.00	$117,600.00	$91,064.73	$192,701.29					$192,701.29
3-1/4" ASPHALT CONCRETE OVERLAY	14,700	SY	$14.00	$205,800.00	$289,940.27		$442,471.39	$602,467.35	$820,317.23	$1,188,063.94	$3,053,319.91
PAVEMENT REPAIR (1%)	150	SY	$40.00	$6,000.00	$3,382.83		$12,900.04				$12,900.04
PAVEMENT REPAIR (5%)	750	SY	$40.00	$30,000.00	$11,793.49			$87,823.23			$87,823.23
PAVEMENT REPAIR (10%)	1,500	SY	$40.00	$60,000.00	$16,446.17				$239,159.54		$239,159.54
PAVEMENT REPAIR (20%)	3,000	SY	$40.00	$120,000.00	$21,338.59					$692,748.65	$692,748.65
	TOTAL DISCOUNTED PRESENT WORTH				**$55,029,668.94**				**TOTAL LIFE CYCLE COST**		**$90,593,952.51**

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 3

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
BRIDGE REPLACEMENT COST				$ 42,268,087.60	$52,032,015.84						$52,032,015.84
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	13,893	SY	$24.00	$333,432.00	$279,385.02		$716,881.06		$1,329,057.40		$2,045,938.46
PATCHING CONCRETE STRUCTURE, AS PER PLAN	6,252	SF	$87.00	$543,924.00	$455,757.75		$1,169,440.28		$2,168,076.91		$3,337,517.19
MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	2,632	SY	$81.00	$213,192.00	$120,198.55		$458,364.24				$458,364.24
SURFACE PREPARATION USING HYDRODEMOLITION	2,632	SY	$76.00	$200,032.00	$112,778.89		$430,070.15				$430,070.15
MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	110	CY	$310.00	$34,100.00	$19,225.72		$73,315.23				$73,315.23
TEST SLAB	1	LS	$1,500.00	$1,500.00	$845.71		$3,225.01				$3,225.01
SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	100,962	SF	$8.10	$817,792.20	$685,233.84		$1,758,258.77		$3,259,713.46		$5,017,972.23
FIELD PAINTING OF EXISTING STRUCTURAL STEEL PRIME COAT	100,962	SF	$1.90	$191,827.80	$160,733.86		$412,431.07		$764,624.15		$1,177,055.21
FIELD PAINTING OF EXISTING STRUCTURAL STEEL INTERMEDIATE COAT	100,962	SF	$2.20	$222,116.40	$186,112.90		$477,551.76		$885,354.27		$1,362,906.04
FIELD PAINTING OF EXISTING STRUCTURAL STEEL FINISH COAT	100,962	SF	$2.00	$201,924.00	$169,193.54		$434,137.97		$804,867.52		$1,239,005.49
PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	1	LS	$1,000,000.00	$1,000,000.00	$274,102.81				$3,985,992.36		$3,985,992.36
APPROACH SLAB REMOVED	490	SY	$34.00	$16,660.00	$4,566.55				$66,406.63		$66,406.63
EPOXY COATED REINFORCING STEEL	375,650	LB	$1.20	$450,780.00	$123,560.06				$1,796,805.64		$1,796,805.64
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE	1,366	CY	$700.00	$956,200.00	$262,097.10				$3,811,405.89		$3,811,405.89
CLASS QC1 CONCRETE WITH QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	1,899	CY	$500.00	$949,500.00	$260,260.61				$3,784,699.75		$3,784,699.75
ARMORLESS PREFORMED JOINT SEAL	293	FT	$45.00	$13,185.00	$3,614.05				$52,555.31		$52,555.31
RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	3,097	FT	$223.00	$690,631.00	$189,303.89				$2,752,849.89		$2,752,849.89
REINFORCED CONCRETE APPROACH SLABS	490	SY	$235.00	$115,150.00	$31,562.94				$458,987.02		$458,987.02
TYPE C INSTALLATION	293	FT	$150.00	$43,950.00	$12,046.82				$175,184.36		$175,184.36
VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	3,097	FT	$100.00	$309,700.00	$84,889.64				$1,234,461.83		$1,234,461.83

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 3

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
RAILROAD FLAGGING (NS & CCRR)	1,920	HOUR	$100.00	$192,000.00	$52,627.74				$765,310.53		$765,310.53
PAVEMENT PLANING	18,400	SY	$3.00	$55,200.00	$120,512.90	$90,451.63	$118,680.37	$161,594.74	$220,026.78	$318,664.38	$909,417.90
1-1/2" ASPHALT CONCRETE OVERLAY	18,400	SY	$8.00	$147,200.00	$113,985.78	$241,204.34					$241,204.34
3-1/4" ASPHALT CONCRETE OVERLAY	18,400	SY	$14.00	$257,600.00	$362,918.43		$553,841.74	$754,108.79	$1,026,791.63	$1,487,100.44	$3,821,842.60
PAVEMENT REPAIR (1%)	185	SY	$40.00	$7,400.00	$4,172.15		$15,910.05				$15,910.05
PAVEMENT REPAIR (5%)	920	SY	$40.00	$36,800.00	$14,466.68			$107,729.83			$107,729.83
PAVEMENT REPAIR (10%)	1,850	SY	$40.00	$74,000.00	$20,283.61				$294,963.43		$294,963.43
PAVEMENT REPAIR (20%)	3,700	SY	$40.00	$148,000.00	$26,317.60					$854,390.00	$854,390.00
	TOTAL DISCOUNTED PRESENT WORTH				**$56,182,770.99**				**TOTAL LIFE CYCLE COST**		**$92,307,502.47**

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 2A

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
BRIDGE REPLACEMENT COST				$ 40,495,616.98	$49,850,104.50						$49,850,104.50
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	15,353	SY	$24.00	$368,472.00	$308,745.28		$792,217.29		$1,468,726.58		$2,260,943.87
PATCHING CONCRETE STRUCTURE, AS PER PLAN	6,909	SF	$87.00	$601,069.95	$503,640.74		$1,292,304.46		$2,395,860.23		$3,688,164.69
MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	3,529	SY	$81.00	$285,821.28	$161,147.25		$614,517.69				$614,517.69
SURFACE PREPARATION USING HYDRODEMOLITION	3,529	SY	$76.00	$268,177.99	$151,199.89		$576,584.50				$576,584.50
MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	148	CY	$310.00	$45,880.00	$25,867.34		$98,642.31				$98,642.31
TEST SLAB	1	LS	$1,500.00	$1,500.00	$845.71		$3,225.01				$3,225.01
SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	93,753	SF	$8.10	$759,399.30	$636,306.02		$1,632,713.64		$3,026,959.81		$4,659,673.44
FIELD PAINTING OF EXISTING STRUCTURAL STEEL PRIME COAT	93,753	SF	$1.90	$178,130.70	$149,256.97		$382,982.21		$710,027.61		$1,093,009.82
FIELD PAINTING OF EXISTING STRUCTURAL STEEL INTERMEDIATE COAT	93,753	SF	$2.20	$206,256.60	$172,823.86		$443,453.09		$822,137.23		$1,265,590.32
FIELD PAINTING OF EXISTING STRUCTURAL STEEL FINISH COAT	93,753	SF	$2.00	$187,506.00	$157,112.60		$403,139.17		$747,397.48		$1,150,536.65
PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	1	LS	$1,000,000.00	$1,000,000.00	$274,102.81				$3,985,992.36		$3,985,992.36
APPROACH SLAB REMOVED	487	SY	$34.00	$16,558.00	$4,538.59				$66,000.06		$66,000.06
EPOXY COATED REINFORCING STEEL	308,000	LB	$1.20	$369,600.00	$101,308.40				$1,473,222.78		$1,473,222.78
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE	1,120	CY	$700.00	$784,000.00	$214,896.60				$3,125,018.01		$3,125,018.01
CLASS QC1 CONCRETE WITH QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	1,836	CY	$500.00	$918,000.00	$251,626.38				$3,659,140.99		$3,659,140.99
STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL	331	FT	$495.00	$163,845.00	$44,910.37				$653,084.92		$653,084.92
RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	3,156	FT	$223.00	$703,877.20	$192,934.72				$2,805,649.14		$2,805,649.14
REINFORCED CONCRETE APPROACH SLABS	487	SY	$235.00	$114,445.00	$31,369.70				$456,176.90		$456,176.90
TYPE A INSTALLATION	359	FT	$150.00	$53,850.00	$14,760.44				$214,645.69		$214,645.69
VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	3,156	FT	$100.00	$315,640.00	$86,517.81				$1,258,138.63		$1,258,138.63

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 2A

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM	150	CF	$375.00	$56,250.00	$15,418.28				$224,212.07		$224,212.07
RAILROAD FLAGGING (NS & CCRR)	1,920	HOUR	$100.00	$192,000.00	$52,627.74				$765,310.53		$765,310.53
PAVEMENT PLANING	14,700	SY	$3.00	$44,100.00	$96,279.33	$72,262.99	$94,815.30	$129,100.15	$175,782.26	$254,585.13	$726,545.82
1-1/2" ASPHALT CONCRETE OVERLAY	14,700	SY	$8.00	$117,600.00	$91,064.73	$192,701.29					$192,701.29
3-1/4" ASPHALT CONCRETE OVERLAY	14,700	SY	$14.00	$205,800.00	$289,940.27		$442,471.39	$602,467.35	$820,317.23	$1,188,063.94	$3,053,319.91
PAVEMENT REPAIR (1%)	147	SY	$40.00	$5,880.00	$3,315.17		$12,642.04				$12,642.04
PAVEMENT REPAIR (5%)	735	SY	$40.00	$29,400.00	$11,557.62			$86,066.76			$86,066.76
PAVEMENT REPAIR (10%)	1,470	SY	$40.00	$58,800.00	$16,117.24				$234,376.35		$234,376.35
PAVEMENT REPAIR (20%)	2,940	SY	$40.00	$117,600.00	$20,911.82					$678,893.68	$678,893.68
	TOTAL DISCOUNTED PRESENT WORTH				**$53,931,248.16**				**TOTAL LIFE CYCLE COST**		**$88,932,130.72**

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 3A

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
BRIDGE REPLACEMENT COST				$ 40,930,202.58	$50,385,079.38						$50,385,079.38
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	15,544	SY	$24.00	$373,056.00	$312,586.25		$802,072.93		$1,486,998.37		$2,289,071.29
PATCHING CONCRETE STRUCTURE, AS PER PLAN	6,995	SF	$87.00	$608,547.60	$509,906.32		$1,308,381.46		$2,425,666.08		$3,734,047.54
MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	2,287	SY	$81.00	$185,274.00	$104,458.27		$398,340.35				$398,340.35
SURFACE PREPARATION USING HYDRODEMOLITION	2,287	SY	$76.00	$173,837.33	$98,010.23		$373,751.44				$373,751.44
MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	96	CY	$310.00	$29,760.00	$16,778.81		$63,984.20				$63,984.20
TEST SLAB	1	LS	$1,500.00	$1,500.00	$845.71		$3,225.01				$3,225.01
SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	56,200	SF	$8.10	$455,220.00	$381,432.04		$978,726.08		$1,814,503.44		$2,793,229.52
FIELD PAINTING OF EXISTING STRUCTURAL STEEL PRIME COAT	56,200	SF	$1.90	$106,780.00	$89,471.71		$229,577.72		$425,624.26		$655,201.99
FIELD PAINTING OF EXISTING STRUCTURAL STEEL INTERMEDIATE COAT	56,200	SF	$2.20	$123,640.00	$103,598.83		$265,826.84		$492,828.10		$758,654.93
FIELD PAINTING OF EXISTING STRUCTURAL STEEL FINISH COAT	56,200	SF	$2.00	$112,400.00	$94,180.75		$241,660.76		$448,025.54		$689,686.30
PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	1	LS	$1,000,000.00	$1,000,000.00	$274,102.81				$3,985,992.36		$3,985,992.36
APPROACH SLAB REMOVED	487	SY	$34.00	$16,558.00	$4,538.59				$66,000.06		$66,000.06
EPOXY COATED REINFORCING STEEL	265,650	LB	$1.20	$318,780.00	$87,378.49				$1,270,654.64		$1,270,654.64
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE	966	CY	$700.00	$676,200.00	$185,348.32				$2,695,328.03		$2,695,328.03
CLASS QC1 CONCRETE WITH QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	1,975	CY	$500.00	$987,500.00	$270,676.52				$3,936,167.46		$3,936,167.46
ARMORLESS PREFORMED JOINT SEAL	284	FT	$45.00	$12,780.00	$3,503.03				$50,940.98		$50,940.98
RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	3,002	FT	$223.00	$669,446.00	$183,497.03				$2,668,406.64		$2,668,406.64
REINFORCED CONCRETE APPROACH SLABS	487	SY	$235.00	$114,445.00	$31,369.70				$456,176.90		$456,176.90
TYPE C INSTALLATION	284	FT	$150.00	$42,600.00	$11,676.78				$169,803.27		$169,803.27
VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	3,002	FT	$100.00	$300,200.00	$82,285.66				$1,196,594.91		$1,196,594.91

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 3A

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
RAILROAD FLAGGING (NS & CCRR)	1,920	HOUR	$100.00	$192,000.00	$52,627.74				$765,310.53		$765,310.53
PAVEMENT PLANING	18,400	SY	$3.00	$55,200.00	$120,512.90	$90,451.63	$118,680.37	$161,594.74	$220,026.78	$318,664.38	$909,417.90
1-1/2" ASPHALT CONCRETE OVERLAY	18,400	SY	$8.00	$147,200.00	$113,985.78	$241,204.34					$241,204.34
3-1/4" ASPHALT CONCRETE OVERLAY	18,400	SY	$14.00	$257,600.00	$362,918.43		$553,841.74	$754,108.79	$1,026,791.63	$1,487,100.44	$3,821,842.60
PAVEMENT REPAIR (1%)	184	SY	$40.00	$7,360.00	$4,149.60		$15,824.05				$15,824.05
PAVEMENT REPAIR (5%)	920	SY	$40.00	$36,800.00	$14,466.68			$107,729.83			$107,729.83
PAVEMENT REPAIR (10%)	1,840	SY	$40.00	$73,600.00	$20,173.97				$293,369.04		$293,369.04
PAVEMENT REPAIR (20%)	3,680	SY	$40.00	$147,200.00	$26,175.34					$849,771.68	$849,771.68
	TOTAL DISCOUNTED PRESENT WORTH				**$53,945,735.66**				**TOTAL LIFE CYCLE COST**		**$85,644,807.19**

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 3B

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
BRIDGE REPLACEMENT COST				$ 40,146,357.95	$49,420,166.64						$49,420,166.64
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	14,139	SY	$24.00	$339,336.00	$284,332.02		$729,574.70		$1,352,590.70		$2,082,165.40
PATCHING CONCRETE STRUCTURE, AS PER PLAN	6,363	SF	$87.00	$553,541.85	$463,816.62		$1,190,118.72		$2,206,413.58		$3,396,532.31
MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	2,287	SY	$81.00	$185,274.00	$104,458.27		$398,340.35				$398,340.35
SURFACE PREPARATION USING HYDRODEMOLITION	2,287	SY	$76.00	$173,837.33	$98,010.23		$373,751.44				$373,751.44
MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	96	CY	$310.00	$29,760.00	$16,778.81		$63,984.20				$63,984.20
TEST SLAB	1	LS	$1,500.00	$1,500.00	$845.71		$3,225.01				$3,225.01
SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	56,200	SF	$8.10	$455,220.00	$381,432.04		$978,726.08		$1,814,503.44		$2,793,229.52
FIELD PAINTING OF EXISTING STRUCTURAL STEEL PRIME COAT	56,200	SF	$1.90	$106,780.00	$89,471.71		$229,577.72		$425,624.26		$655,201.99
FIELD PAINTING OF EXISTING STRUCTURAL STEEL INTERMEDIATE COAT	56,200	SF	$2.20	$123,640.00	$103,598.83		$265,826.84		$492,828.10		$758,654.93
FIELD PAINTING OF EXISTING STRUCTURAL STEEL FINISH COAT	56,200	SF	$2.00	$112,400.00	$94,180.75		$241,660.76		$448,025.54		$689,686.30
PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	1	LS	$1,000,000.00	$1,000,000.00	$274,102.81				$3,985,992.36		$3,985,992.36
APPROACH SLAB REMOVED	487	SY	$34.00	$16,558.00	$4,538.59				$66,000.06		$66,000.06
EPOXY COATED REINFORCING STEEL	265,650	LB	$1.20	$318,780.00	$87,378.49				$1,270,654.64		$1,270,654.64
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE	966	CY	$700.00	$676,200.00	$185,348.32				$2,695,328.03		$2,695,328.03
CLASS QC1 CONCRETE WITH QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	1,973	CY	$500.00	$986,500.00	$270,402.42				$3,932,181.46		$3,932,181.46
ARMORLESS PREFORMED JOINT SEAL	284	FT	$45.00	$12,780.00	$3,503.03				$50,940.98		$50,940.98
RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	3,000	FT	$223.00	$669,000.00	$183,374.78				$2,666,628.89		$2,666,628.89
REINFORCED CONCRETE APPROACH SLABS	487	SY	$235.00	$114,445.00	$31,369.70				$456,176.90		$456,176.90
TYPE C INSTALLATION	284	FT	$150.00	$42,600.00	$11,676.78				$169,803.27		$169,803.27
VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	3,000	FT	$100.00	$300,000.00	$82,230.84				$1,195,797.71		$1,195,797.71

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 3B

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
RAILROAD FLAGGING (NS & CCRR)	1,920	HOUR	$100.00	$192,000.00	$52,627.74				$765,310.53		$765,310.53
PAVEMENT PLANING	18,400	SY	$3.00	$55,200.00	$120,512.90	$90,451.63	$118,680.37	$161,594.74	$220,026.78	$318,664.38	$909,417.90
1-1/2" ASPHALT CONCRETE OVERLAY	18,400	SY	$8.00	$147,200.00	$113,985.78	$241,204.34					$241,204.34
3-1/4" ASPHALT CONCRETE OVERLAY	18,400	SY	$14.00	$257,600.00	$362,918.43		$553,841.74	$754,108.79	$1,026,791.63	$1,487,100.44	$3,821,842.60
PAVEMENT REPAIR (1%)	184	SY	$40.00	$7,360.00	$4,149.60		$15,824.05				$15,824.05
PAVEMENT REPAIR (5%)	920	SY	$40.00	$36,800.00	$14,466.68			$107,729.83			$107,729.83
PAVEMENT REPAIR (10%)	1,840	SY	$40.00	$73,600.00	$20,173.97				$293,369.04		$293,369.04
PAVEMENT REPAIR (20%)	3,680	SY	$40.00	$147,200.00	$26,175.34					$849,771.68	$849,771.68
	TOTAL DISCOUNTED PRESENT WORTH				**$52,906,027.82**				**TOTAL LIFE CYCLE COST**		**$84,128,912.38**

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 3C

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
BRIDGE REPLACEMENT COST				$ 42,432,315.54	$52,234,180.43						$52,234,180.43
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	16,680	SY	$24.00	$400,320.00	$335,430.95		$860,690.71		$1,595,672.46		$2,456,363.17
PATCHING CONCRETE STRUCTURE, AS PER PLAN	7,506	SF	$87.00	$653,022.00	$547,171.73		$1,404,001.72		$2,602,940.70		$4,006,942.42
MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	2,287	SY	$81.00	$185,274.00	$104,458.27		$398,340.35				$398,340.35
SURFACE PREPARATION USING HYDRODEMOLITION	2,287	SY	$76.00	$173,837.33	$98,010.23		$373,751.44				$373,751.44
MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	96	CY	$310.00	$29,760.00	$16,778.81		$63,984.20				$63,984.20
TEST SLAB	1	LS	$1,500.00	$1,500.00	$845.71		$3,225.01				$3,225.01
SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	56,200	SF	$8.10	$455,220.00	$381,432.04		$978,726.08		$1,814,503.44		$2,793,229.52
FIELD PAINTING OF EXISTING STRUCTURAL STEEL PRIME COAT	56,200	SF	$1.90	$106,780.00	$89,471.71		$229,577.72		$425,624.26		$655,201.99
FIELD PAINTING OF EXISTING STRUCTURAL STEEL INTERMEDIATE COAT	56,200	SF	$2.20	$123,640.00	$103,598.83		$265,826.84		$492,828.10		$758,654.93
FIELD PAINTING OF EXISTING STRUCTURAL STEEL FINISH COAT	56,200	SF	$2.00	$112,400.00	$94,180.75		$241,660.76		$448,025.54		$689,686.30
PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	1	LS	$1,000,000.00	$1,000,000.00	$274,102.81				$3,985,992.36		$3,985,992.36
APPROACH SLAB REMOVED	487	SY	$34.00	$16,558.00	$4,538.59				$66,000.06		$66,000.06
EPOXY COATED REINFORCING STEEL	265,650	LB	$1.20	$318,780.00	$87,378.49				$1,270,654.64		$1,270,654.64
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE	966	CY	$700.00	$676,200.00	$185,348.32				$2,695,328.03		$2,695,328.03
CLASS QC1 CONCRETE WITH QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	2,065	CY	$500.00	$1,032,500.00	$283,011.15				$4,115,537.11		$4,115,537.11
ARMORLESS PREFORMED JOINT SEAL	284	FT	$45.00	$12,780.00	$3,503.03				$50,940.98		$50,940.98
RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	3,108	FT	$223.00	$693,084.00	$189,976.27				$2,762,627.53		$2,762,627.53
REINFORCED CONCRETE APPROACH SLABS	487	SY	$235.00	$114,445.00	$31,369.70				$456,176.90		$456,176.90
TYPE C INSTALLATION	284	FT	$150.00	$42,600.00	$11,676.78				$169,803.27		$169,803.27
VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	3,108	FT	$100.00	$310,800.00	$85,191.15				$1,238,846.43		$1,238,846.43

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 3C

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
RAILROAD FLAGGING (NS & CCRR)	1,920	HOUR	$100.00	$192,000.00	$52,627.74				$765,310.53		$765,310.53
PAVEMENT PLANING	18,400	SY	$3.00	$55,200.00	$120,512.90	$90,451.63	$118,680.37	$161,594.74	$220,026.78	$318,664.38	$909,417.90
1-1/2" ASPHALT CONCRETE OVERLAY	18,400	SY	$8.00	$147,200.00	$113,985.78	$241,204.34					$241,204.34
3-1/4" ASPHALT CONCRETE OVERLAY	18,400	SY	$14.00	$257,600.00	$362,918.43		$553,841.74	$754,108.79	$1,026,791.63	$1,487,100.44	$3,821,842.60
PAVEMENT REPAIR (1%)	184	SY	$40.00	$7,360.00	$4,149.60		$15,824.05				$15,824.05
PAVEMENT REPAIR (5%)	920	SY	$40.00	$36,800.00	$14,466.68			$107,729.83			$107,729.83
PAVEMENT REPAIR (10%)	1,840	SY	$40.00	$73,600.00	$20,173.97				$293,369.04		$293,369.04
PAVEMENT REPAIR (20%)	3,680	SY	$40.00	$147,200.00	$26,175.34					$849,771.68	$849,771.68
	TOTAL DISCOUNTED PRESENT WORTH				**$55,876,666.18**				**TOTAL LIFE CYCLE COST**		**$88,249,937.07**

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 4

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 10 (2035)	YEAR 24 (2049)	YEAR 35 (2060)	YEAR 47.5 (2072)	YEAR 60 (2085)	YEAR 75 (2100)	LIFE CYCLE COST
BRIDGE REHABILITATION COST				$ 15,829,568.00	$19,486,198.21							$19,486,198.21
BRIDGE REPLACEMENT COST				$ 41,321,796.16	$35,911,739.41	$61,342,438.66						$61,342,438.66
BRIDGE SALVAGE VALUE				$ (3,996,583.49)	-$532,583.26						-$29,533,980.68	
SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	13,690	SY	$24.00	$328,560.00	$206,312.05			$904,259.69		$1,676,446.91		$2,580,706.60
PATCHING CONCRETE STRUCTURE, AS PER PLAN	6,161	SF	$87.00	$536,007.00	$336,573.84			$1,475,193.34		$2,734,925.98		$4,210,119.32
MICRO SILICA MODIFIED CONCRETE OVERLAY USING HYDRODEMOLITION	3,270	SY	$81.00	$264,870.00	$111,911.62			$728,972.68				$728,972.68
SURFACE PREPARATION USING HYDRODEMOLITION	3,270	SY	$76.00	$248,520.00	$105,003.49			$683,974.37				$683,974.37
MICRO SILICA MODIFIED CONCRETE OVERLAY (VARIABLE THICKNESS) MATERIAL ONLY	137	CY	$310.00	$42,470.00	$17,944.22			$116,885.53				$116,885.53
TEST SLAB	1	LS	$1,500.00	$1,500.00	$633.77			$4,128.29				$4,128.29
SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL	110,580	SF	$8.10	$895,698.00	$562,433.92			$2,465,131.47		$4,570,215.94		$7,035,347.40
FIELD PAINTING OF EXISTING STRUCTURAL STEEL PRIME COAT	110,580	SF	$1.90	$210,102.00	$131,928.94			$578,240.71		$1,072,025.96		$1,650,266.67
FIELD PAINTING OF EXISTING STRUCTURAL STEEL INTERMEDIATE COAT	110,580	SF	$2.20	$243,276.00	$152,759.83			$669,541.88		$1,241,293.22		$1,910,835.10
FIELD PAINTING OF EXISTING STRUCTURAL STEEL FINISH COAT	110,580	SF	$2.00	$221,160.00	$138,872.57			$608,674.44		$1,128,448.38		$1,737,122.82
PORTIONS OF STRUCTURE REMOVED, OVER 20' SPAN, AS PER PLAN	1	LS	$1,000,000.00	$1,000,000.00	$205,412.82					$5,102,407.21		$5,102,407.21
APPROACH SLAB REMOVED	429	SY	$34.00	$14,586.00	$2,996.15					$74,423.71		$74,423.71
EPOXY COATED REINFORCING STEEL	350,075	LB	$1.20	$420,090.00	$86,291.87					$2,143,470.25		$2,143,470.25
CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE	1,273	CY	$700.00	$891,100.00	$183,043.36					$4,546,755.07		$4,546,755.07
CLASS QC1 CONCRETE WITH QC/QA, FOOTING (MOMENT SLAB AND SIDEWALK)	1,709	CY	$500.00	$854,500.00	$175,525.25					$4,360,006.96		$4,360,006.96
STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL	250	FT	$495.00	$123,750.00	$25,419.84					$631,422.89		$631,422.89
RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	3,014	FT	$223.00	$672,122.00	$138,062.47					$3,429,440.14		$3,429,440.14
REINFORCED CONCRETE APPROACH SLABS	429	SY	$235.00	$100,815.00	$20,708.69					$514,399.18		$514,399.18
TYPE A INSTALLATION	272	FT	$150.00	$40,800.00	$8,380.84					$208,178.21		$208,178.21
VANDAL PROTECTION FENCE, 6' STRAIGHT, COATED FABRIC	3,014	FT	$100.00	$301,400.00	$61,911.42					$1,537,865.53		$1,537,865.53
POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM	136	CF	$375.00	$51,000.00	$10,476.05					$260,222.77		$260,222.77
RAILROAD FLAGGING	1,920	HOUR	$100.00	$192,000.00	$120,562.19			$528,420.56		$979,662.18		$1,508,082.75

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 4

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 10 (2035)	YEAR 24 (2049)	YEAR 35 (2060)	YEAR 47.5 (2072)	YEAR 60 (2085)	YEAR 75 (2100)	LIFE CYCLE COST
PAVEMENT PLANING	14,700	SY	$3.00	$44,100.00	$66,275.04		$92,502.73	$121,371.60	$165,259.10	$225,016.16		$604,149.59
1-1/2" ASPHALT CONCRETE OVERLAY	14,700	SY	$8.00	$117,600.00	$68,243.97		$246,673.95					$246,673.95
3-1/4" ASPHALT CONCRETE OVERLAY	14,700	SY	$14.00	$205,800.00	$189,856.59			$566,400.79	$771,209.14	$1,050,075.40		$2,387,685.34
PAVEMENT REPAIR (1%)	150	SY	$40.00	$6,000.00	$2,535.09			$16,513.14				$16,513.14
PAVEMENT REPAIR (5%)	750	SY	$40.00	$30,000.00	$8,838.05				$112,421.16			$112,421.16
PAVEMENT REPAIR (10%)	1,500	SY	$40.00	$60,000.00	$12,324.77					$306,144.43		$306,144.43
	TOTAL DISCOUNTED PRESENT WORTH				**$58,016,593.07**						**TOTAL LIFE CYCLE COST**	**$129,477,257.93**

FACTORS USED IN ANALYSIS	
INFLATION RATE =	2.50%
DISCOUNT RATE =	5.50%

Bridge No. CUY-14-0693

Life Cycle Cost Analysis for Alternative 5

ITEM	QUANTITY	UNIT	UNIT COST (2019)	TOTAL COST (2019)	DISCOUNTED PRESENT WORTH (2025)	YEAR 14 (2039)	YEAR 25 (2050)	YEAR 37.5 (2062)	YEAR 50 (2075)	YEAR 65 (2090)	LIFE CYCLE COST
YEAR 0 REHAB				$ 27,497,711.12	$33,849,682.39						$33,849,682.39
YEAR 25 REHAB				$ 10,971,423.60	$6,185,735.13		$23,588,635.00				$23,588,635.00
YEAR 50 REHAB				$ 12,352,467.60	$3,385,846.02				$49,236,841.48		$49,236,841.48
	TOTAL DISCOUNTED PRESENT WORTH				**$43,421,263.54**				**TOTAL LIFE CYCLE COST**		**$106,675,158.87**

Appendix C

Public Involvement Plan Outline

CUY-14-6.93 PID 104132

Prepared for:

ODOT District 12
5500 Transportation Blvd.
Garfield Heights, OH 44125

January 2019

Prepared by:

Lawhon & Associates, Inc.
1441 King Avenue
Columbus, OH 43212

1.0 PROJECT OVERVIEW

1.1 Project Description

This will be a 2 part scope to rehabilitate or replace the Whitehouse crossing bridge (SR14-6.93). The first part of the scope the consultant shall conduct an AER study. As part of the study the Consultant shall perform a life cycle analysis to determine the cost for the alternatives for the next 75 years. The study should look at the following alternatives:

- Replace the wearing surface, and repair superstructure and substructure, spot painting, and fence replacement.
- Replace bridge with new bridge. Where possible, MSE walls and fill should be used to replace structure. Also the consultant may reduce the amount of spans, vary the span length, and/or vary the alignment. The new bridge can be either concrete or steel.
- Replace bridge with other innovative suggestion of the consultant

Even though there may be additional right of way needed for this project, the study should depend on existing right of way plans and/or district's annual bridge inspections.

For part two of the scope, if authorized by ODOT D-12, the consultant will develop a preliminary design/set of detailed plans/prepare scope for design build which would be based on the results of the AER study. The consultant shall submit a Structure Load Rating of the proposed bridge as per section 900 of the Bridge Design Manual.

1.2 Purpose and Need

- Bridge Inventory and Appraisal (9/20/18) – Structurally Deficient Rating

1.3 PI Management Responsibilities

- Lawhon & Associates Project Manager – Jessica Stratigakos
- Lawhon & Associates PI Lead – Erin Grushon

1.4 Goals and Objectives of PI Plan

- Objectives
    - Describe PI approach
    - Establish goals for PI effort
    - Identify stakeholders
    - Define strategies for achieving PI goals

- Goals
    - Provide information about the project to property and business owners, elected officials, community groups, emergency service providers, and other project stakeholders.
    - Ensure that traditionally underserved populations have sufficient opportunity to engage in the project development process.
    - Maintain communication between ODOT and other government agencies.

1.5 Applicable Legal Requirements

- National Environmental Policy Act (NEPA) of 1969 Section 102
- US USC 4332

- Council of Environmental Quality 40 CFR 1500.1 & 1506.6
- Statewide Transportation Planning & Programming 23 CFR 450.210, 450.212
- Metropolitan Transportation Planning & Programming 23 CFR 450.316
- FHWA Regulations 23 CFR 771.111
- Title VI of the Civil Rights Act of 1964
- Executive Order 12898
- Age Discrimination Act of 1975
- Section 504 of the Rehabilitation Act of 1973
- Americans with Disabilities Act of 1990
- Executive Order 13166
- Ohio Revised Code 5511.01

2.0 PROJECT TEAM

2.1 Project Sponsor

- ODOT District 12

2.2 ODOT and Consultant Project Managers

- ODOT Project Manager – Poonsak Sritalapat
- ODOT Environmental Project Manager – Mark Carpenter
- AECOM Project Manager – Scott Buchanan
- Lawhon & Associates Project Manager – Jessica Stratigakos

2.3 Supporting Staff

- Lawhon & Associates PI Lead – Erin Grushon

3.0 STAKEHOLDERS

3.1 Stakeholder List

- Cleveland Metroparks - Garfield Park Reservation
  11350 Broadway Ave
  Garfield Heights, OH 44125
- Cleveland Metroparks Ranger Department
  4600 Valley Parkway
  Fairview Park, OH 44126
- Cuyahoga County Sheriff
  1215 W 3rd St
  Cleveland, OH 44113
- David E. Marquard P.E., P.S.
  Cuyahoga County Engineer
  Cuyahoga County Dept of Public Works
  2079 E. 9th St.
  Cleveland, OH 44115
- Trinity High School

12425 Granger Rd
Garfield Heights, OH 44125

- Vic Collova
  Mayor - City of Garfield Heights
  5407 Turney Rd
  Garfield Heights, OH 44125
- Michael Dudley, Sr.
  Council – Ward One
  13620 Saybrook Ave,
  Garfield Heights, OH 44125
- Joe LaMalfa
  Council – Ward Two
  13205 Silver Rd
  Garfield Heights, OH 44125
- Garfield Heights Police Department
  5555 Turney Road
  Garfield Heights, OH 44125
- Garfield Heights Fire Department
  5115 Turney Rd
  Garfield Heights, OH 44125
- Garfield Heights City Schools
  5640 Briarcliff Dr
  Garfield Heights, OH 44125
- RTA
  1240 6th St
  Cleveland, OH 44113
- Calvary Cemetery
  10000 Miles Ave
  Cleveland, OH 44105
- Baumann's Recycling Center
  4801 Chaincraft Rd
  Cleveland, OH 44125
- Pompili Precast Concrete
  12307 Broadway Ave
  Cleveland, OH 44125
- Savage Engineering & Sales
  4855 Chaincraft Rd
  Cleveland, OH 44125
- Ohio State Highway Patrol – Police Department
  5225 W 140th St
  Brook Park, OH 44142
- Mill Creek HOA
  4401 Brooks Rd
  Cleveland, OH 44105
- Marymount Hospital
  12300 McCracken Rd
  Garfield Heights, OH 44125
- Physicians Ambulance Service, Inc.
  4495 Cranwood Parkway
  Warrensville Heights, OH 44128

- Rural/Metro Inc
  5171 Canal Rd
  Cleveland, OH 44125
- Donald Martens & Sons
  5520 Cloverleaf Pkwy
  Cleveland, OH 44125
- Medical Transportation
  16004 Broadway Ave
  Maple Heights, OH 44137
- Fresenius Kidney Care Garfield Heights
  9729 Granger Rd
  Cleveland, OH 44125
- Veerendra Nandigam MD Inc
  4901 Turney Rd
  Cleveland, OH 44125
- Wheeling and Lake Erie Railway Company
  100 E 1st St
  Brewster, OH 44613
- Norfolk Southern RR
  5300 Greenhurst Dr
  Maple Heights, OH 44137
- Cleveland Electric Illuminating Company (FirstEnergy)
  FirstEnergy Corp.
  76 South Main St
  Akron, OH 44308
- Dominion East Ohio
  1201 E 55th St
  Cleveland, OH 44103
- Columbia Gas of Ohio
  P.O. Box 2318
  Columbus, OH 43216-2318
- Cleveland Water Department
  1201 Lakeside Ave E
  Cleveland, OH 44114

a. Stakeholder Strategy

- Preliminary Stakeholder Meetings with Cleveland Metroparks - Garfield Park Reservation and Baumann's Recycling Center during Phase 1
- Outreach to emergency service providers, the local school district, and elected officials during Phase 2
- Stakeholder coordination letters during Phase 2
- Informational Stakeholder Meeting during Phase 2
- Individual or Small Group Stakeholder Meetings (3-5)
  - Frequency of the individual stakeholder meeting to be determined with design schedule.
  - Stakeholder groups identified for potential individual meetings include:
    - Marymount Hospital
    - Cleveland Metroparks

    - Baumann’s Recycling Center
    - Pompili Precast Concrete
    - Savage Engineering & Sales

b. Potential Opposition to Project

4.0 UNDERSERVED POPULATIONS

4.1 Identification of Underserved Populations

- Low income – ranges from 33% to 56%
- Minority – ranges from 38% to 98%
- Linguistic isolation – 0%
- Over age 64 – ranges from 8% to 34%

4.2 Underserved Populations Outreach Strategy

The following places of worship and social services offices will be contacted to help spread the word to Environmental Justice populations about the proposed project:

- Word of Righteousness Family Life Center
  13455 Dressler Ave
  Garfield Heights, OH 44125
- Garfield Heights Branch of the Cuyahoga County Public Library
  5409 Turney Rd
  Cleveland, OH 44125
- Dan Kostel Recreation Center
  5411 Turney Rd
  Cleveland, OH 44125
- Christian Kingdom Assembly
  12700 Broadway Ave
  Cleveland, OH 44125
- Pentecostal Determine Church – God
  9105 Miles Park Ave
  Cleveland, OH 44105
- Higher Hope Apostolic Church
  9114 Miles Park Ave
  Cleveland, OH 44105
- Cornerstone Missionary Baptist
  8915 Miles Park Ave
  Cleveland, OH 44105
- Allen Chapel Missionary Baptist
  9333 Miles Ave
  Cleveland, OH 44105
- Sacred Trinity Missionary Baptist Church
  9503 Miles Ave
  Cleveland, OH 44105
- Our Savior Baptist Church
  9610 Miles Ave
  Cleveland, OH 44105

Additional outreach activities to underserved populations could include:

- Placing notices in local newspapers geared toward minority or non-English speaking populations
- Placing fliers at local businesses and public/social service agencies
    - Peters Market
      4617 Turney Rd
      Cleveland, OH 44125
    - Turney Deli
      4925 Turney Rd
      Cleveland, OH 44105
    - Family Dollar
      9302 Miles Ave
      Cleveland, OH 44105
    - Dollar General
      9111 Miles Ave
      Cleveland, OH 44105
    - United States Postal Service – Newburg Station
      8745 Broadway Ave
      Cleveland, OH 44105
    - Bureau of Motor Vehicles
      14000 Broadway Ave
      Garfield Heights, OH 44125
    - South End Hardware
      8815 Broadway Ave
      Cleveland, OH 44105
    - Salvation Army
      4139 E 93rd St
      Cleveland, OH 44105

5.0 PUBLIC INVOLVEMENT ACTIVITIES

- Property Owner Notification Letters
- Stakeholder Meetings
    - Preliminary stakeholder meetings with Cleveland Metroparks - Garfield Park Reservation and Baumann's Recycling Center during Phase 1
    - One informational meeting with stakeholder group during Phase 2
    - Three to five individual or small group stakeholder meetings with major stakeholders will be held periodically during Phase 2 of the project. Issues of concern that will be addressed at stakeholder meetings include potential park impacts including changes in access to park, visual impacts, and maintenance of traffic issues.
- Public Meetings
    - 1st public meeting – held early in Phase 2 of project to inform public of project, preliminary alternatives, alternatives evaluation process, and the preferred alternative and provide an opportunity to comment on the project.
        - Open-house style meeting
        - Set up in stations: sign-in, project back ground information including purpose and need, alternatives evaluation, preferred

        alternative, community and environmental resources/potential impacts, and comments.
        - Lawhon &Associates will be responsible for securing the public meeting location and advertising the meeting. Advertising for the meeting will include preparation and distribution of an invitation letter to surrounding property owners, tenants, and businesses as well as placement of an advertisement in the local paper with the highest circulation 30 days and 15 days prior to the meeting.
    - 2nd public meeting – held before completing NEPA process to inform public of potential impacts to environmental and community resources and provide an opportunity to comment on the project.
        - Open-house style meeting
        - Set up in stations: sign-in, project back ground information including purpose and need, project design community and environmental resources/potential impacts, and comments.
        - Lawhon &Associates will be responsible for securing the public meeting location and advertising the meeting. Advertising for the meeting will include preparation and distribution of an invitation letter to surrounding property owners, tenants, and businesses as well as placement of an advertisement in the local paper with the highest circulation 30 days and 15 days prior to the meeting.

6.0 TIMELINE / PROJECT SCHEDULE

- NEPA Start Date - January 2018
- Begin Public Involvement – Fall 2019
- Environmental Clear – July 2023
- Tracings Complete – July 2024
- District Right-of-Way Certification – July 2024
- Estimated End Construction – October 2026

7.0 DECISION-MAKING PROCESS

- Stakeholder and public involvement will occur early in project development process, throughout Preliminary Engineering and Environmental Engineering phases
- Discuss role and opportunities for stakeholders and the public as project develops

8.0 MEETING LOCATIONS

Potential public meeting locations include:

- Elmwood Elementary School
  5275 Turney Rd
  Garfield Heights, OH 44125
- Garfield Heights High School
  4900 Turney Rd
  Cleveland, OH 44125
- Miles Park School
  4090 E 93rd St
  Cleveland, OH 44105

9.0 IMPLEMENTATION

- This section will be updated as public involvement activities are carried out.

Appendix D

Minutes of Meeting

ODOT Project	CUY-14-06.93 (PID 104132)	Meeting Date/Time	02/04/2019 - 4:00 PM
Purpose of meeting	Hospital access during construction	Venue	Marymount Hospital Boardroom
Recorder	Jim Sima, AECOM	Issue Date	02/07/2019

Distribution

Name	Company	Telephone no.	E-mail address	Attended
Scott Buchanan	AECOM	330-800-2730	scott.buchanan@aecom.com	Yes
Zack Deems	AECOM	330-800-2705	zack.deems@aecom.com	No
Jim Sima	AECOM	216-622-2415	jim.sima@aecom.com	Yes
Dan Darke	CCF-MM		darked@ccf.org	Yes
Renee Kolonick	CCF-MM		kolonir@ccf.org	Yes
Nadal Montoya	CCF-MM		montoyn@ccf.org	Yes
Dan Napierkowski	CCF-MM		napierd@ccf.org	Yes
Blake Ody	CCF-MM		odyb@ccf.org	Yes
Judy Santora	CCF-MM		jsantora@ccf.org	Yes
Tom Stanish	CCF-MM		stanist@ccf.org	Yes
Brian Summers	CCF-MM	216-587-8236	bsummers@ccf.org	Yes
Chief Kenneth Strope	Garfield Hts Fire	216-475-4053	kstrope@garfieldhts.org	Yes

Minutes

Note: These minutes reflect the recorders understanding of the discussions and the intended actions arising from the meeting. Our agreement that the minutes form a record of the discussions will be assumed unless adverse comments are received within three business days from issuing minutes.

1. AECOM is studying the rehabilitation and/or replacement of the Broadway Avenue bridge at Henry Street over Chaincraft Road and Norfolk Southern and Wheeling and Lake Erie Railways for the Ohio Department of Transportation (ODOT).
2. Construction is scheduled for the end of 2024/beginning of 2025.
3. Assuming the bridge will be replaced, the grade of the Broadway/Henry intersection will be raised approximately 5 feet due to:
    a. The deficient clearance over the railroad
    b. Increased depth of proposed beams due to lengthened spans
4. The northern half of the new bridge would be built offline to the north during the first construction phase.
5. There are two options for maintaining traffic for the second phase of construction to demolish the existing bridge and build the southern half of the new bridge:
    a. Close Henry Street with no access to Broadway Avenue during the second phase of construction
    b. Allow only southbound emergency vehicles to access Henry Street from Broadway Avenue. This requires an additional construction season to build the Henry Street connection in two phases, and Henry Street would still need to be closed for a short duration to make the connection to the new structure built in the first phase.

6. AECOM is interested in how vehicles, especially emergency vehicles, currently access the hospital and to see if alternate routes to the hospital are feasible if Henry Street at Broadway Avenue were to be closed as it was during a previous construction project at this intersection.
    a. Currently emergency vehicles from the east use Henry Street to access the Marymount Hospital.
    b. Marymount Hospital takes emergency runs not only from Garfield Heights, but also from Cleveland, Maple Heights, Bedford, Twinsburg, Sagamore Hills, Macedonia, and other surrounding areas.
7. Chief Strope said that he was ok with closing Henry Street at Broadway Avenue. GHFD has an engine and a rescue squad at Station #2 on E. 131st St., so there is coverage from both side of this intersection.
8. Chief Strobe also said that emergency vehicles would not use McCracken Road from the east as a detour route due to the at-grade railroad crossing just west of Broadway Avenue.
9. If emergency vehicles from the east were on I-480 WB and exited at Lee Road and used Libby Road/Granger Road to Turney Road to McCracken Road, the distance to get to Marymount Hospital is slightly less, and the time would be slightly more.
10. Signals on Granger Road, Turney Road, Libby Road, Lee Road, and Broadway Avenue have preemption for emergency vehicles.
11. There are concerns about using Libby Road/Granger Road for a detour route since Granger Road is only two lanes and is congested.
    a. If Libby Road/Granger Road is used for a detour route, temporary adjustment of the signal timing could be included in the construction contract.
    b. The width that will be available on Broadway Avenue during construction will be 26 feet with concrete barrier on one side and a high, non-traversable integral curb/sidewalk on the other side. Broadway will not have width for an emergency vehicle to pass in the middle if traffic in both directions were to stop.
    c. Granger Road is striped as two lanes with a third left turn lane at some intersections, it is a minimum of 30 ft wide throughout the corridor with curbs and driveways. While this route may have more congestion, there is room for vehicles to move off to the sides to allow an emergency vehicle to pass.
12. Judy Santora asked about buses. GCRTA's route 48 bus has a stop at the Henry/Broadway intersection. This route begins/ends at Marymount Hospital and has service to Cleveland Clinic's main campus. Buses will be detoured after the first phase of construction for both maintenance of traffic options.
13. Scott Buchanan discussed innovative contracting methods that could potentially be implemented:
    a. Incentives for on time/early completion; Disincentives for not meeting scheduled completion
    b. A + B bidding where there is a monetary bid (A) and also a duration of time (B) that are make up a composite score in lieu of awarding contract based solely on the lowest bid.
14. A new I-480 westbound exit ramp at Granger Road was brought up. Marymount Hospital provided funds to study this potential ramp. Building this ramp would greatly improve hospital access and the closing of the Henry/Broadway intersection would not be a concern.
    a. Update since this meeting: AECOM contacted ODOT regarding the ramp study. ODOT said a meeting was held in 2018. ODOT indicated that they were not conducting a study, and that it was up to Marymount Hospital or another entity to justify any further action by ODOT.

Action Items

Item no.	Description	Raised in meeting	Action by	Original due date	Forecast close-out date
NA	AECOM is available to meet again or organize a conference call to discuss any issue or question. Marymount Hospital to determine the need for a follow-up meeting.	02/04/19	CCF-MM	No due date	NA

Attachments

PDF of map that was displayed at meeting, sign-in sheet

2/4/19

CUY-14 Meeting Attendees

1.	Jim Sima	AECOM	jim.sima@aecom.com
2.	Scott Buchanan	AECOM (HR)	scott.buchanan@aecom.com
3	Judy Santora	CC-MM	jsantora@ccf.org
4	Blake ODY	CCF-MM	ODYB@CCF.ORG
5.	Dan Darke	CCF-MM	Darked@ccf.org
6.	TOM STANISH	CCF-MM	stanist@ccf.org
7.	NADAL MONTOYA	CCF-MM	MONTOYN@CCF.ORG
8	Chief Strope	Garfield Fire	KStrope@GarfieldHts.org
9	BRIAN SUMMERS	CCF-MM	bsummers@ccf.org
10	Renee Kolonick	CC	kolonir@ccf-org
11	Dan Napierkowski	CC	napierd@ccf.org

Appendix E

Minutes of Meeting

ODOT Project	CUY-14-06.93 (PID 104132)	Meeting Date/Time	02/11/2019 - 3:00 PM
Purpose of meeting	Detour routes for emergency services	Venue	Garfield Heights Mayor's Office
Recorder	Jim Sima, AECOM	Issue Date	02/15/2019

Distribution

Name	Company	Telephone no.	E-mail address	Attended
Scott Buchanan	AECOM	330-800-2730	scott.buchanan@aecom.com	Yes
Zack Deems	AECOM	330-800-2705	zack.deems@aecom.com	No
Jim Sima	AECOM	216-622-2415	jim.sima@aecom.com	Yes
Chief Robert Byrne	Garfield Heights Police	216-475-5563	rbyrne@garfieldhts.org	Yes
Mayor Vic Collova	Garfield Heights	216-475-4388	vcollova@garfieldhts.org	Yes
Chief Kenneth Strope	Garfield Heights Fire	216-475-4053	kstrope@garfieldhts.org	Yes
Dave Krock	OHM	330-913-1045	david.krock@ohm-advisors.com	Yes
Jim Sickels	OHM	330-913-1050	james.sickels@ohm-advisors.com	Yes

Minutes

Note: These minutes reflect the recorders understanding of the discussions and the intended actions arising from the meeting. Our agreement that the minutes form a record of the discussions will be assumed unless adverse comments are received within three business days from issuing minutes.

1. AECOM is studying the rehabilitation and/or replacement of the Broadway Avenue bridge at Henry Street over Chaincraft Road and Norfolk Southern and Wheeling and Lake Erie Railways for the Ohio Department of Transportation (ODOT). The project name is CUY-14-06.93 (PID 104132).
2. Construction is scheduled for the end of 2024/beginning of 2025.
3. Assuming the bridge will be replaced, the grade of the Broadway/Henry intersection will be raised approximately 5 feet due to:
    a. The deficient clearance over the railroad
    b. Increased depth of proposed beams due to lengthened spans
4. The northern half of the new bridge would be built offline to the north during the first construction phase.
5. There are two options for maintaining traffic for the second phase of construction to demolish the existing bridge and build the southern half of the new bridge:
    a. Close Henry Street with no access to Broadway Avenue during the second phase of construction
    b. Allow only southbound emergency vehicles to access Henry Street from Broadway Avenue. This requires an additional construction season to build the Henry Street connection in two phases, and Henry Street would still need to be closed for a short duration to make the connection to the new structure built in the first phase.
6. AECOM is interested in how emergency vehicles, currently access the hospital and to see if alternate routes to the hospital are feasible if Henry Street at Broadway Avenue were to be closed as it was during a previous construction project at this intersection.
    a. Currently emergency vehicles from the east use Henry Street to access the Marymount Hospital.
    b. Marymount Hospital takes emergency runs not only from Garfield Heights, but also from Cleveland, Maple Heights, Bedford, Twinsburg, Sagamore Hills, Macedonia, and other surrounding areas.
7. There are concerns about using Libby Road/Granger Road for a detour route since Granger Road is only two

lanes and is congested.

    a. If Libby Road/Granger Road is used for a detour route, temporary adjustment of the signal timing could be included in the construction contract.
    b. The width that will be available on Broadway Avenue during construction will be 26 feet with concrete barrier on one side and a high, non-traversable integral curb/sidewalk on the other side. Broadway will not have width for an emergency vehicle to pass in the middle if traffic in both directions were to stop.
    c. Granger Road is striped as two lanes with a third left turn lane at some intersections, it is a minimum of 30 ft wide throughout the corridor with curbs and driveways. While this route may have more congestion, there is room for vehicles to move off to the sides to allow an emergency vehicle to pass.

8. Dave Krock mentioned that the old Henry Street right of way still exists. Chief Strope mentioned that there are still steel beams where old Henry Street previously crossed Mill Creek to what is now Chaincraft Road. There is a steep grade along this alignment. After this meeting, AECOM visited the site and noted that the pavement on Chaincraft Road would have to be rehabilitated to use as an emergency vehicle detour route if the Henry Street/Broadway Avenue intersection were to be closed.
9. After this meeting Jim Sima contacted Jim Sickels in regards to the study for a new I-480 westbound exit ramp at Granger Road. Building this ramp would greatly improve hospital access and the closing of the Henry/Broadway intersection would not be a concern.
10. AECOM asked if the city had a preference regarding replacing the existing steps on the east side of Henry Street just south of Broadway Avenue. Chief Strobe mentioned that the hydrants on Chaincraft Street do not have sufficient pressure and that in the event of a fire on Chaincraft Street, GHFD would use the nearest hydrant to the top of the stairs and lay the hose(s) on the steps. AECOM mentioned that there will be water work on this project and that improving the configuration to hopefully achieve sufficient pressure on Chaincraft Street could be included as part of the project. Additionally a hydrant on the west side of Henry Street might be needed since the Henry Street bridge will be replaced with fill retained by MSE walls.

Action Items

Item no.	Description	Raised in meeting	Action by	Original due date	Forecast close-out date
8	AECOM to investigate the approximate grade of a connection using the old Henry Street right of way.	02/11/19	AECOM	02/2019	02/2019
9	AECOM to contact Marymount Hospital to request a copy of the I-480 WB exit ramp at Granger Road study.	Post-meeting call on 02/14/19	AECOM	NA	NA
NA	AECOM is available to meet again or organize a conference call to discuss any issue or question.	02/04/19	Garfield Hts	No due date	NA

Attachments

NA

Appendix F

Minutes of Meeting

ODOT Project	CUY-14-06.93 (PID 104132)	Meeting Date/Time	03/12/2019 - 2:00 PM
Purpose of meeting	Potential Impacts of project to Garfield Park Reservation Property	Venue	Cleveland MetroParks Boardroom
Recorder	Zack Deems, AECOM	Issue Date	03/21/2019

Distribution

Name	Company	Telephone no.	E-mail address	Attended
Scott Buchanan	AECOM	330-800-2730	scott.buchanan@aecom.com	No
Zack Deems	AECOM	330-800-2705	zack.deems@aecom.com	Yes
Jim Sima	AECOM	216-622-2415	jim.sima@aecom.com	No
Jessica Stratigakos	Lawhon		jstratigakos@lawhon-assoc.com	Yes
Libby Rushley	Lawhon		lrushley@lawhon-assoc.com	Yes
Mark Carpenter	ODOT District 12		Mark.carpenter@dot.ohio.gov	Yes
Isaac Smith	Cleveland MetroParks		ids@clevelandmetroparks.com	Yes

Minutes

Note: These minutes reflect the recorders understanding of the discussions and the intended actions arising from the meeting. Our agreement that the minutes form a record of the discussions will be assumed unless adverse comments are received within three business days from issuing minutes.

1. AECOM is studying the rehabilitation and/or replacement of the Broadway Avenue bridge at Henry Street over Chaincraft Road and Norfolk Southern and Wheeling and Lake Erie Railways for the Ohio Department of Transportation (ODOT).
2. Construction is scheduled for the end of 2024/beginning of 2025.
3. West of Henry Street, the City of Garfield Heights owns the right-of-way where Chaincraft Road is located, and ODOT owns the right-of-way where SR14 is currenctly located. The City of Cleveland owns, and has leased to Cleveland MetroParks for 3 consecutive 99 year terms, the rest of the property south of the Norfolk Southern Corporation (NSC) property.
4. If the project proceeds as a replacement, the alignment must move somewhat, including the area west of Henry Street, in order to maintain traffic during construction.
5. For replacement alternatives, the design team is proceeding as follows with respect to land lease to Cleveland MetroParks:
    a. The main area of Garfield Park Reservation south of SR14 and west of Henry Street (main Garfield Park Reservation property) is considered a significant Section 4(f) resource and also LWCF Section 6(f) land. No permanent right-of-way and only temporary right-of-way will be needed from this area.
    b. The area of Garfield Park Reservation north of SR14 and south of NSC property (all this area except for the right-of-way owned by the City of Garfield Heights for Chaincraft Road) is Section 4(f) but not Section 6(f) per the LWCF 6(f)(3) project boundary map. The City of Garfield Heights maintains this land for the park. This area may or may not qualify for "de minimis" status. However, Cleveland MetroParks understands the need for permanent and temprorary right-of-way for the project from this area and would be receptive to allowing the purchase for such use.
6. Cleveland MetroParks would like the opportunity to negotiate with ODOT the following items when negotiating the purchase of the land mentioned above:
    a. the potential vacation of current SR14 land back to the park on the south side of SR14 in a potential swap of

land;

   b. a possible protected multi-use lane in lieu of sidewalk along the south side of SR14 and west side of Henry Street;
   c. the possible use of nearly vertical (1/4”/foot) vegetated walls in lieu of traditional MSE walls for those walls viewed from the main Garfield Park Reservation property south of SR14 and west of Henry Street.

7. Cleveland MetroParks does not desire pedestrian access to the main Garfield Park Reservation property south of SR14 and west of Henry Street from the upper level of SR14/Henry Street. Instead, Cleveland MetroParks would prefer that pedestrian traffic be routed west along SR14 to enter the park near their visitor building at the west end of the project.
8. Cleveland MetroParks mentioned the drive from Garfield Parkway to Chaincraft road over the Mill Creek culvert under Henry Street is used by emergency vehicles during flooding events. However, Chief Kenneth Strope of the Garfield Heights Fire Department said that this is not the case and that no emergency service vehicles need this access.
9. Cleveland MetroParks asked that if stairs are used anywhere on the project that they be equipped with a “trough” for bicycle wheels to ease the transport of bicycles between levels.
10. Cleveland MetroParks provided a copy of their Garfield Heights Reservation Master Plan dated December 2017.
11. Cleveland MetroParks offered to host Public Involvement Meetings needed for this project at the Garfield Heights Visitor Center. ODOT will determine if location access and size is acceptable for the anticipated attendees.

Action Items

Item no.	Description	Raised in meeting	Action by	Original due date	Forecast close-out date
NA	AECOM will be coordinating future plan submittals with Cleveland MetroParks	03/12/19	All parties	No due date	NA

Attachments

PDF of agenda that was distributed prior to the meeting, and Meeting sign-in sheet

Deems, Zack

From: Jessica Stratigakos <jstratigakos@lawhon-assoc.com>
Sent: Tuesday, March 12, 2019 7:55 AM
To: ids@clevelandmetroparks.com
Cc: Libby Rushley; Deems, Zack
Subject: Garfield Park - Broadway Ave Railroad Overpass Bridge Project Meeting

Isaac,

Below are some of the concerns from the designers to be discussed in today's meeting:

SECTION 4(f)/SECTION 6(f):

The land west of Henry Street currently is, to the best of our knowledge:

Area #1: South of SR14 is Section 4(f)/Section 6(f) per the map we have.
Area #2: Within the SR14 R/W is state-owned land for SR14.
Area #3: North of SR14 and south of the local Chaincraft Road is LIKELY Section 4(f), but NOT Section 6(f).

The proposed project would like to:

Area #1: Stay out of the Section 6(f) boundary [Area #1] with any permanent work, and less than 6 months with temporary work. To minimize Section 6(f) impacts.
Area #2: Utilize this area as much as possible.
Area #3: Widening and shifting of alignment is needed into this area, which is a LIKELY Section 4(f) impact.

Questions:

1. With the above knowledge, and since Cleveland MetroParks (CMP) is the Official With Jurisdiction (OWJ) for Garfield Park Reservation, would CMP as the OWJ support presentation of Area #3 being "de minimus" whereas, if approved by FHWA after a Public Involvement period, render Area #3 usable for this project without further Section 4(f) mitigation?

ACCESSIBILITY:

It is possible that the entire proposed SR14 and Henry Street facility will be on embankment contained within MSE walls. If done completely, this would completely isolate Area #1 from Chaincraft Road, effectively creating a wall boundary along the southern face of SR14 and the western face of Henry Street.

Questions:

1. Is this isolation of a park resource allowed? And, if so, is it supported by CMP?
2. If this isolation is not allowed or preferred, the likely fix is adding a small pedestrian underpass (arch culvert type structure) beneath SR14 to connect Area #3 to Area #1 and allow a mower to access all grounds.
3. The existing stairs down from Henry Street to the ground level on the east side of Henry Street will be removed with this project. What type of pedestrian access would CMP prefer down to Area #1 from SR14/Henry Street above? Would CMP be interested in a rural walkway with switchbacks within the Area #1 boundary?

Please let me know if you have any questions. Looking forward to meeting today.

Thank you,

Jessica Stratigakos
Sr. Project Manager
Lawhon & Associates, Inc.
7650 Chippewa Road, Suite 311
Brecksville, OH 44141

Name	email
Zack Deems	zack.deems@aecom.com
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Isaac Smith	ids@clevelandmetroparks.com
Libby Rushley, Lawhon	lrushley@lawhon-assoc.com
Kelly Coffman	kbc@clevelandmetroparks.com

Appendix G

From: Brendan Finn <bfinn@cuyahogacounty.us>
Sent: Friday, January 25, 2019 9:15 AM
To: Deems, Zack
Cc: Wimer, Mark; Buchanan, Scott; Sima, Jim; Jim Hazimihalis; Thomas Sotak
Subject: RE: Henry Street over Mill Creek in Garfield Heights

Zack:

I spoke with Jim this morning and he confirms the bulk of my message from yesterday. Here are some additional points:

- The access drive is used by motorists as a cut-through when the Garfield Parkway floods. It is generally a nuisance to the County.
- It is difficult to load rate the culvert structure (Bridge 00.61) because the pier columns for Bridge 00.62 are founded on the sidewalls of the culvert.
- Our crews have recently replaced the expansion joints on Bridge 00.62 and generally try to keep the stairs free of foliage overgrowth.
- The property information identifies Cleveland as the owner, but I'm thinking there may be an agreement between the City and the Metroparks concerning the park.

Our basic interests would include replacement or elimination of either or both structures. Since Henry Street is carried above, the culvert serves no essential purpose as a highway structure. The access drive is not a county route and is only a "convenience" for others. By replacing Bridge 00.62 with a retained earth structure as part of the larger project while also replacing the culvert carrying Mill Creek would serve the County's fiscal and operational objectives by providing a new culvert in "as-built" condition while also eliminating significant deck area, inspection effort and maintenance concerns for the overhead structure.

We can discuss this in greater detail in person or on the phone. I'm going to be at District 12 the rest of this morning, but I'll be back in the office this afternoon and on Monday.

-Brendan

Brendan G. Finn, P.E.
Chief Section Engineer – Bridge Design
Cuyahoga County Department of Public Works
2079 East Ninth Street, Fifth Floor
Cleveland, Ohio 44115
Phone: (216) 348-3883
Email: bfinn@cuyahogacounty.us
Web: http://publicworks.cuyahogacounty.us/

From: Brendan Finn
Sent: Thursday, January 24, 2019 3:22 PM
To: 'Deems, Zack' <zack.deems@aecom.com>
Cc: 'Wimer, Mark' <mark.wimer@aecom.com>; 'Buchanan, Scott' <scott.buchanan@aecom.com>; 'Sima, Jim' <jim.sima@aecom.com>; Jim Hazimihalis <jhazimihalis@cuyahogacounty.us>
Subject: RE: Henry Street over Mill Creek in Garfield Heights

Zack:

I’m going to be able to speak with Jim Hazimihalis in some detail about this tomorrow. I will verify these things that I believe to be facts regarding our structures on Henry Street:

The County owns/maintains the Henry Street Bridge 00.62 (SFN1834282) that tees into the Broadway structure. I believe the steps are considered part of our structure. The bridge is in good condition with a GA of 7.

The County owns/maintains only the portion of the culvert carrying Mill Creek under Henry Street that lies within the Henry Street right-of-way. That structure is Henry Street Bridge 00.61 (SFN 1834037). It is in poor condition with a GA of 4. I believe the portions of the culvert outside of the right-of-way are the responsibility of the adjacent property owner, which looks to be the City of Cleveland (see attached PDF).

In general terms, I don’t believe the County has a vested interest in either the stairs or the access road. They exist for the use/convenience of the public and adjacent entities. The access road has been a nuisance in the past as evident by our placement of barriers to protect the columns of our structure as shown in the attached photos. We are always looking for opportunities to eliminate “assets” from our inventory, so alternatives that rid us of either or both structures is, at face value, appealing.

Once Jim and I talk, we can confirm and expand on the above.

-Brendan

From: Brendan Finn
Sent: Friday, January 18, 2019 7:29 AM
To: 'Deems, Zack' <zack.deems@aecom.com>
Cc: Wimer, Mark <mark.wimer@aecom.com>; Buchanan, Scott <scott.buchanan@aecom.com>; Sima, Jim <jim.sima@aecom.com>
Subject: RE: Henry Street over Mill Creek in Garfield Heights

Zack:

I’m going to discuss this with Jim Hazimihalis in our Bridge Inspection/Maintenance section. Thank you for including us in the conversation. Both structures are of concern to us and this might be an opportunity to clean up a rather messy conglomeration of overlapping responsibilities, etc.

I will get back to you soon.

-Brendan

Brendan G. Finn, P.E.
Chief Section Engineer – Bridge Design
Cuyahoga County Department of Public Works
2079 East Ninth Street, Fifth Floor
Cleveland, Ohio 44115
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Email: bfinn@cuyahogacounty.us
Web: http://publicworks.cuyahogacounty.us/

From: Deems, Zack <zack.deems@aecom.com>
Sent: Friday, January 18, 2019 6:48 AM
To: Brendan Finn <bfinn@cuyahogacounty.us>
Cc: Wimer, Mark <mark.wimer@aecom.com>; Buchanan, Scott <scott.buchanan@aecom.com>; Sima, Jim

<jim.sima@aecom.com>
Subject: Henry Street over Mill Creek in Garfield Heights

Good Morning, Brendan.

We are working with ODOT District 12 in the conceptual stage of design (developing alternatives for AER) for the rehabilitation or replacement of the SR 14 bridge through Garfield Park Reservation and over NS (southern 2 lines) and CCRR (northern line) in Garfield Heights. Toward the middle of the existing bridge is an intersection with Henry Street, and a small section of Henry Street is also on the bridge. See attached zoomed map for reference.

It appears that Cuyahoga County has responsibility for the 22’x7’ box culvert structure that carries Mill Creek under this spur of Henry Street. There is also an access drive on top of that culvert and under the bridge (a cut-through drive between Chaincraft Road and the Park Road). There are also steps going down to that access drive from the east side of Henry Street.

A full replacement of the existing bridge is certainly a viable option at this point. With that option, we may simply put MSE walls on both sides of Henry Street and just replace the piece of culvert impacted. Or, Mill Creek could be opened up and bridged. Again, we are at AER stage and deciding what our options are.

Can you please look into what Cuyahoga County owns and maintains (how much of the culvert? the stairs? the access drive?, etc.), and also provide the County’s wishes for these items if the replacement alternative wins? We can then discuss with ODOT and try to accommodate.

I can come to your office to discuss further if you want. Just let me know.

Thank you.

Zack Deems, PE
Ohio Transportation Business Unit Leader
D (330) 800-2705
C (330) 815-2535
zack.deems@aecom.com

AECOM
Columbus / Cleveland / Cincinnati / Akron

Barriers Placed by Cuyahoga County Engineer's Office to protect piers

View of Stairs and Henry Street Bridge over Mill Creek Culvert

Appendix H

DRAFT REPORT
GEOTECHNICAL RED FLAG SUMMARY
CUY-14-6.93 BRIDGE
CUYAHOGA COUNTY, OHIO

Prepared For:

AECOM Technical Services, Inc.
564 White Pond Drive
Akron, OH 44320

Prepared by:

NATIONAL ENGINEERING AND ARCHITECTURAL SERVICES INC.
2800 Corporate Exchange Drive, Suite 240
Columbus, Ohio 43231

NEAS PROJECT 18-0023

November 19, 2018

EXECUTIVE SUMMARY

This report supports National Engineering & Architectural Services' geotechnical contribution to the Red Flag Summary being prepared for the CUY-14-6.93 project in the City of Garfield Heights, Ohio. The purpose of the report is to identify geotechnical concerns that could cause revisions to the anticipated design and construction scope of work, proposed project development schedules, the estimated project budget, or the potential impacts of the project on surrounding areas.

The report summarizes the results of a paper study and a site visit to gather information necessary for the geotechnical engineering related sections of the Red Flag Summary for the subject report. The paper study consisted of a review of available geotechnical information and literature (from various sources including information from ODNR, ODOT, and USGS), including a review of geologic hazards, and determination of the general geologic setting of the project area. The site visit consisted of walking the project site with the intent of observing any clearly visible and significant geotechnical issues along the project alignment.

Geotechnical conditions at the site have been assessed at a preliminary level through information in the literature, public records and construction drawings, as described above. In summary, fill or possible fill encountered in the previous soil exploration was encountered at each of the borings ranging in depth from 2.0 to 10.6 ft at the bridge site, comprised of Silty Sand, Sandy Clay and Silt, Sand and Gravel, Sand, Silt and Gravel, Sandy Clayey Silt, and Silty Clay. The natural subsoils at the bridge foundation borings were found to comprise predominantly of sand and gravel sizes with variable amounts of silt and clay, with ranging between A-1-a, A-1-b, A-2-4, and A-3a. The density varied from loose to very dense but generally increased in density with depth. Water seepage was encountered at the bridge foundation borings at relatively shallow depths. No uniform water level was indicated by the water measurements made at the completion of drilling of each boring, but was encountered at depths ranging from 4.2 to 10.6 feet during drilling at the bridge foundation borings, which is an elevation range of approximately 10 ft. As indicated by the bedrock geology literature and verified by the previous geotechnical investigations, at the project site, the bedrock of Devonian System primarily consists of Berea Sandstone and Bedford Shale. Bedrock elevations range from 800 to 850 ft amsl in the project area, and depth to bedrock is variable, ranging between 15 and 100 ft bgs.

In terms of general foundation type, since bedrock was not encountered in all the historical borings drilled within the project limit, CIP pipe piles and friction shafts in overburden soils will be two alternatives in the foundation design for the proposed new bridge. However, other constraints should also be considered in selecting foundation type, e.g. shifted bridge alignment and the active rail yard.

Based on the information compiled during this study, the following potential geotechnical issues should be considered during the project development. Signs of potential slope movement, such as sloughy soil and titled shoring, were noted at the forward abutment. Therefore, slope stability at the forward abutment should be evaluated. The presence of standing water was observed between Pier 38 and Bent 43 during the field visit. Drainage problems should be investigated during the further project development. In addition, the presence of fill could require special subgrade preparation, such as removal and replacement with proper engineered fill. Large thicknesses of overburden soils or new fills could cause settlement in the project area, depending on the specific soil type encountered. It is recommended that a geotechnical investigation and a quantitative assessment of engineering properties of the soils should be performed for this project area.

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1. INTRODUCTION

This report presents the results of a study to support the Geotechnical Red Flag Summary for the CUY-14-6.93 project in Garfield Heights, Ohio. The purpose of the proposed project is to rehabilitate or replace the White Crossing Bridge SR-14-6.93 on SR-14 (Broadway Avenue). To serve the purpose, this study is to present an overview of the geotechnical conditions at the project site and identify potential areas of geotechnical related issues to be considered within the project limits that could negatively impact anticipated design and construction, project budget, project schedule or negatively impact the surrounding area. The study findings are also summarized in tabular form for inclusion in the overall project Red Flag Summary (Appendix A).

Data that can be used to evaluate subsurface conditions in this area are sources such as the Ohio Department of Transportation (ODOT) Geotechnical Branch, Ohio Department of Natural Resources (ODNR), and the State of Ohio Geographic Information Systems metadata explorer system; all contributed to the accumulated data set. Existing geotechnical literature and mapping, historical boring logs within the project limits were reviewed and provide an invaluable resource for evaluation conditions at the project site. The data used in the study have been described in the references to this report.

2. GEOLOGY

The project site is located within the Galion Glaciated Low Plateau, Physiographic Region of Ohio (ODGS, 1998). This is a rolling upland transitional between the gently rolling Till Plain and the hilly Glaciated Allegheny Plateau, mantled with thin to thick drift. The elevation of the plateau is between 800 ft to 1400 ft. The geology in this region can be described characteristically medium- to low-lime Wisconsinan-age till over Mississippian-age shales and sandstones.

The site is located on the glaciated Mississippi Valley Plain, near the foot of the portage escarpment. General geologic references indicate the soil deposits. To be glacial ground moraine, and/or possibly lake deposits. Groundwater resources information indicates the possibility of a buried valley in the vicinity of the site. Glacial ground moraine is generally composed of an unsorted, unstratified mixture of clay, silt, sand and coarse fragments inclusive of cobbles and boulders. A buried valley could be filled with substantial depths of sand and gravel and coarser sizes.

Characteristics of Soils

Soils at the project site within the Galion Glaciated Low Plateau is sand and gravel, generally Wisconsinan-age. Interbedded sand and gravel commonly containing thin, discontinuous layer of silt and clay; grains well to moderately sorted, moderately to well rounded; finely stratified to massive, may be cross-bedded; locally may contain organics. In deep buried valleys, may be older than Wisconsinan. Found in terraces and buried valleys and as beach-ridge deposits of high, proglacial predecessors of Lake Erie (ODGS, 1998). The surficial units map for the project site was shown in Exhibit 1.

Based on the Web Soil Survey by the Natural Resources Conservation Service (USDA, 2015), which state that the more developed portion at the project site is Urban Land, and the less developed portion generally consists of rolling Loudonville-Urban and complex, with 50% of Loudonville. The rolling Loudonville-Urban and complex is well drained with none flood frequency.

Characteristics of Bedrock

The bedrock underlying the project area is comprised of Devonian Systems (Exhibit 2), dating from 359 to 385 million years before present, defined in Bedrock Geologic Map of Ohio, ODNR Division of Geological Survey (2006). Devonian strata are sedimentary rocks: mainly shale and siltstone with some sandstone.

According to Bedrock geologic map of Ohio: Ohio Division of Geological Survey Map (ODGS, 2003), the project site is mapped as Undivided Berea Sandstone and Bedford Shale - Sandstone and shale. The upper portion of sedimentary is brown sandstone; weathers light brown to reddish brown; thin to thick bedded, planar to lenticular bedding; minor shale interbeds; 5 to 75 feet thick, locally 100 to 125 feet thickness in Lorain, Cuyahoga, and Medina Counties. The lower portion is gray to brown shale; locally reddish brown; thin to medium bedded, planar to lenticular bedding; interbedded siltstone and sandstone, ripple marks in siltstone beds; 80 to 180 feet thick, locally thin to absent where Berea Sandstone is thick (ODGS, 2003).

According to Surficial Units Map of Ohio (ODGS, 1998), the project site is characterized as Berea Sandstone and Bedford Shale, Mississipian-age Cuyahoga Formation. Cuyahoga Formation (uppermost unit) gray to brown shale interbedded with minor sandstone and siltstone; rapid vertical and horizontal changes. Berca Sandstone, resistant unit forming hills and cliffs at or near the northward into gray shale; thick siltstone lentils present; thickness ranging from 50 to 150 feet (ODGS, 1998).

According to the Shaded Bedrock-Topography Map of Ohio (ODNR, 2015), bedrock elevations range from 800 to 850 ft amsl in the project area. The bedrock surface elevation of the project site is present in Exhibit 3. In this region bedrock is nearly flat-lying. Depth to bedrock in this region is variable, ranging between 15 and 100 ft bgs.

3. HYDROLOGY/HYDROGEOLOGY

Groundwater can be expected at an elevation consistent with that of the immediately adjacent Mill Creek, as it is the most dominant hydraulic influence in the immediate vicinity with the topography in the immediate area. The elevation of the adjacent Mill Creek is approximately 814 ft amsl, and this elevation may be generally representative of the local groundwater table under normal circumstances (ODNR, 2007).

The project site is partially located within a special flood hazard area (Exhibit 4) subject to inundation by the 1% annual change flood (100-year flood) based on available mapping by the Federal Emergency Management Agency's (FEMA) National Flood Hazard mapping program (FEMA, 2016).

4. ODNR WATER WELL LOGS, MINING AND OIL/GAS PRODUCTION

A search of the ODNR on-line water well log database produced more than 50 well logs within 1 mile of the project site (ODNR, 2011). The monitoring wells, which encountered bedrock are of interest, are listed in Table 1. The map of water well locations at the project site can be found at Exhibit 5.

Four mines (Table 2) are noted on ODNR's Ohio Mine Locator within the vicinity of the project's boundaries (ODNR [1], 2016). The map of mine locations at the project site can be found at Exhibit 6.

Three oil or gas wells are (Table 3) noted on ODNR's Ohio Oil & Gas Locator within the immediate vicinity of the project's boundaries (ODNR [2], 2016). The map of oil & gas locations at the project site can be found at Exhibit 7.

Table 1: Water well logs encountered bedrock in proximity to the project site

Well Name	Owner	Aquifer Type	Elevation (ft)	Latitude/Longitude	Bedrock Depth (ft)	Distance (mile)
2022251	SUNOCO	SANDSTONE	884	41.427083, -81.612056	6	~0.7 Southwest
2022313	SUNOCO	SANDSTONE	887	41.426694, -81.61225	6	~0.7 Southwest
2022312	SUNOCO	SANDSTONE	884	41.427083, -81.612056	6	~0.7 Southwest
899343	GARFIELD HTS SCH DIS	SANDSTONE	885	41.42679, -81.61332	2	~0.7 Southwest
2021955	SUNOCO	SANDSTONE	889	41.426387, -81.612639	7	~0.7 Southwest
2027844	SHELL OIL	SILTSTONE	921	41.4227, -81.609917	12	~0.8 Southwest
2000205	SHELL STATION	SHALE	921	41.42277, -81.60998	10	~0.8 Southwest
2001863	TURNEY TOWN SHELL	SHALE	924	41.42258, -81.6097	6	~0.8 Southwest
966927	DEWATERING CO, NORTH AMERICAN	FILL MATERIAL	867	41.42307, -81.59895	60	~0.6 Southeast
966904	FORMER PEGASUS REALTY	SHALE	864	41.42342, -81.59958	66	~0.6 Southeast
966918	N.AMERICAN DEWATERIN	SHALE	868	41.42318, -81.59868	65	~0.6 Southeast
966907	N AMERICAN DEWATER	SHALE	869	41.42312, -81.59862	65	~0.6 Southeast
962149	N. AMERICAN DEWATERI	FILL MATERIAL	868	41.4231, -81.59868	66	~0.6 Southeast
966908	N. AMERICAN DEWATERI	FILL MATERIAL	867	41.42305, -81.59893	65	~0.6 Southeast
2022842	FORMER FLANNERY GULF	SAND	844	41.424267, -81.583017	2	~0.9 Southeast
991875	TREATING, ERIEVIEW METALS	Null	898	41.43664, -81.57888	51	~1.3 Northeast
2059679	ERIEVIEW METAL TREATING	BEREA	Null	41.438616, -81.577855	59	~1.3 Northeast

Table 2: Mines in Proximity to the project site

Mine Name	Permittee	MineType	Status	Distance (mile)
Historic Industrial Minerals	-	Quarry	Historic	~1.8 Northwest
Historic Industrial Minerals	-	Quarry	Historic	~1.5 Southwest
IM-0413	Boyas Excavating, Inc.	Sandstone	Inactive	~1.8 Southwest
IM-0686	Boyas Excavating, Inc.	Sandstone	Active	~2.0 Southwest

Table 3: Gas & Oil wells in Proximity to the project site

Well Name	Owner	Well Status	Distance (mile)
Calvary Cemetery # 1 (21476)	CATHOLIC CEMETERIES ASSOC	Not Drilled	~0.3 Northeast
Chaincraft 1 (21988)	4850 CHAINCRAFT ROAD, LTD	Producing	~0.4 Southeast
Mccracken Property North LLC 1 (21959)	FLESHER HOLDING COMPANY LLC	Producing	~0.6 Southeast

5. EXISTING GEOTECHNICAL DATA

Sources of existing geotechnical data that were used to support this study include ODOT's on-line geotechnical exploration data. Records of geotechnical exploration for the proposed project site were located and reviewed (State of Ohio, TIMS, 2016). The relative boring logs for the project area were obtained from the Office of Structures, Ohio Department of Transportation. The historical information is summarized as follows:

The only available previous subsurface exploration within the CUY-14-6.93 project limits was conducted by Richland Engineering Limited between July 18, 1983 and July 21, 1983 (ODOT 1983, SFN1801805 SFE Sheets). The exploration was completed for the widening and rehabilitation of the existing Broadway Avenue Bridge No. CUY-14-0699 over Consolidated Rail Corporation and N & W Railroad, in the city of Garfield Heights, Ohio.

The exploration consisted of Ten (10) drive sample borings; seven (7) of them were drilled for the bridge foundation to depths between 43.5 ft and 44.5 ft below ground surface (bgs); and the other three borings were drilled for the roadways to a depth of 10 ft bgs each. Bedrock was not encountered in all of the borings.

The borings were drilled by means of a truck mounded rotary-type drill rig. The ground surface elevation, the recorded latitude and longitude location and the depth of the historical borings are shown on Table 4 below.

Table 4: Historical borings within the project limits

Boring Number	Latitude	Longitude	Ground Elevation (ft)	EOB (ft)	Depth (ft)	Structure
B-001-0-83	41.431308	-81.600887	814.7	771.2	43.5	Bridge
B-003-0-83	41.431194	-81.600590	814.7	770.5	44.2	Bridge
B-005-0-83	41.431125	-81.600185	816.1	772.2	43.9	Bridge
B-006-0-83	41.431121	-81.600022	817.1	773.1	44.0	Bridge
B-007-0-83	41.431059	-81.599501	823.9	779.7	44.2	Bridge
B-008-0-83	41.431033	-81.599279	822.8	778.5	44.3	Bridge
B-009-0-83	41.431008	-81.598921	822.7	778.2	44.5	Bridge
B-010-0-83	41.432045	-81.602537	832.3	822.3	10.0	Roadway
B-011-0-83	41.430616	-81.600901	850.1	840.1	10.0	Roadway
B-012-0-83	41.430787	-81.597439	847.4	837.4	10.0	Roadway

The borings disclosed variable depths of man-made fill at each of the borings ranging in depth from 2.0 to 10.6 ft at the bridge foundation borings and extending the full 10 ft depth of the borings at each of the roadway borings. The compositions of the fill were variable and comprised of Silty Sand, Sandy Clay and Silt, Sand and Gravel, Sand, Silt and Gravel, Sandy Clayey Silt, and Silty Clay.

The natural subsoils at the bridge foundation borings were found to comprise predominantly of sand and gravel sizes with variable amounts of silt and clay, with ODOT classifications ranging between A-2-4, A-3a, A-1-b, and A-1-a. The density varied from loose to very dense but generally increased in density with depth at each of the bridge foundation borings.

The man-made fill at the three roadway borings was relatively free of foreign materials at depths below a few feet of existing grade. This fill, which varied between borings, comprised A-2-4, A-3a, A-4a, A-6a and A-6b materials in a soft to medium consistency or density.

Water seepage was encountered at the bridge foundation borings at relatively shallow depths. No uniform water level was indicated by the water measurements made at the completion of drilling of each boring, but was encountered at depths ranging from 4.2 to 10.6 feet during drilling at the bridge foundation borings, which is an elevation range of approximately 10 ft. No seepage was detected in any of the three roadway borings. The summary of water level and water seepage is presented in Table 5 below.

Table 5: Water level and water seepage recorded in historical borings

Boring Number	Free Water Depth (ft)	Free Water Elevation (ft)	Static Water Depth (ft)	Static Water Elevation (ft)	Water Seepage Depth (ft)	Water Seepage Elevation (ft)
B-001-0-83	5.2	809.5	NE	-	7.5 (7.2 Slight)	807.2 (807.5 Slight)
B-003-0-83	9.8	804.9	NE	-	8.0	806.7
B-005-0-83	5.7	810.4	NE	-	3.5	812.6
B-006-0-83	6.2	810.9	NE	-	5.0	812.1
B-007-0-83	16.6	807.3	NE	-	11.0 (6.5 Trace)	812.9 (817.4 Trace)
B-008-0-83	9.7	813.1	NE	-	10.0 - 10.5	812.3 - 812.8
B-009-0-83	8.0	814.7	NE	-	10.1	812.6
B-010-0-83	NE	-	NE	-	NE	-
B-011-0-83	NE	-	NE	-	NE	-
B-012-0-83	NE	-	NE	-	NE	-

6. RECONNAISSANCE

A field reconnaissance visit for the CUY-14-6.93 project site was conducted on September 19, 2018, during which site conditions were noted and photographed. The existing Broadway Avenue Bridge carrying four lanes of traffic is over Consolidated Rail Corporation and Norfolk & Western Railroad, in the city of Garfield Heights, Ohio. During our field reconnaissance, no geohazards were observed within the immediate vicinity of the bridge site. Land use of the area surrounding the proposed project site can be described as primarily commercial and recreational (Photograph 1).

The rear abutment embankment along SR 14 was observed to be at a maximum slope grade of approximately 3 Horizontal to 1 Vertical (3H:1V) (Photograph 2). No visible signs of instability nor local failures were observed along the embankments. Vegetation along the roadway embankment slopes was noted as thick with virtually no exposed soils. No local failures were observed along the embankment. However, the concrete spalling with signs of reinforcement was observed under the bridge deck and wingwall (Photograph 3).

The rear abutment embankment along Henry Street was observed to be at a maximum slope grade of approximately 2 Horizontal to 1 Vertical (2H:1V) (Photograph 4). The height of the south embankment slope is about 30 ft. A portion of retaining wall was tilted (Photograph 5); however, all the surrounding trees were observed to be vertical with no signs of instability nor local failures.

The forward abutment embankment along SR 14 was observed to be at a maximum slope grade of approximately 3 Horizontal to 1 Vertical (3H:1V) (Photograph 7). Signs of potential slope movement such as sloughy soil and tilted shoring were observed close to the abutment location (Photographs 6 through 10).

The bridge deck and piers were observed to be in poor condition at the time of our reconnaissance visit. Frequent signs of concrete spalling showing reinforcement under the deck and on the piers were observed (Photograph 11 & 12).

The pavement condition along SR 14 and Henry Street at the bridge site was observed to be in poor to good condition with signs of medium to high severity weathering (Photographs 13). Pavement wear included occasional medium to high severity transverse cracking, patching, and longitudinal cracking. The pavement appeared to be well drained, with no signs of ponding observed during our reconnaissance visit. However, standing water was noted between Pier 38 and Bent 43 (Photograph 14). District Engineer indicated that this area was flooded in the past.

P1: View of existing Broadway Avenue Bridge at Garfield Park

P2: Rear embankment of the bridge along SR 14

P3: Concrete spalling under bridge deck

P4: Rear Abutment along Henry Street

P5: Tilted retaining wall at the rear abutment along Henry Street

P6: Tilted shoring and concrete spalling at the forward abutment along SR 14

P7: Sloughy soil at the forward abutment embankment

P8: Creep trees at the forward abutment embankment

P9: Titled retaining wall at Bent 47

P10: Tilted shoring at Bent 48

P11: Concrete spalling under the bridge deck

P12: Concrete spalling on the bridge pier

P13: Pavement condition on the bridge

P14: Standing water observed under the bridge by the railroad

7. GENERAL FOUNDATION TYPE CONSIDERATION

Geotechnical conditions for foundation design at the site have been assessed at a preliminary level through information in the literature, public records, field reconnaissance and construction drawings, as described above. In summary, existing Piers 1 through 8 and Bents 42 through 49 of the main bridge along SR 14 were supported on 16-inch diameter cast-in-place piles ranging 8.4 ft to 24.5 ft in length. The design load for the piers are 30 tons per pile. Existing Bents 1 through 41 of the main bridge along SR 14 and Bents 50 through Bent 56 of the bridge along Henry Street were supported on spread footing. Existing foundation information of Whitehouse Crossing Bridge was summarized in Appendix B.

If the existing bridge is decided to be rehabilitated, the exiting foundation systems shall be repaired. Or the existing bridge will be replaced with new bridge, where possible, MSE walls and fill can be used to replace structure. The portion of the new bridge crossing Chaincraft Road, railroad tracks and the access to the abandoned factory next to the forward abutment are recommended using two basic categories of deep foundation types – driven piles and drilled shafts. Driven piles will require construction of a pile cap to distribute the superstructure load to the foundation elements whereas drilled shafts may be used with or without a pile cap depending on the superstructure design. Within each category, the alternatives of end-bearing foundation elements constructed on bedrock or friction-supported elements that terminate in the overburden soils are considered.

For driven piles these two alternatives translate into H-piles (end-bearing piles) and cast-in-place (CIP) pipe piles (friction piles). H-piles used to support superstructure are driven to refusal on bedrock. CIP pipe piles not driven to refusal on bedrock develop their geotechnical resistance by a combination of soil friction or adhesion along the sides of the pile and end bearing on the pile tip. Since bedrock was not encountered in all the ten historical borings drilled within the project limit, CIP pipe pile is an alternative in the deep foundation design. It should be noted that there were high voltage poles along the alignment of Pier 36. Drilled shafts are recommended at this location since driven piles can be a risk to the poles from vibration during driving.

Drilled shafts can be designed to develop a high level of resistance when they are socketed into bedrock. Drilled shafts may also be designed to gain resistance from friction of the soil around them, or from a combination of side friction and end bearing. The subsoils at the project site appears to be relatively strong. The friction shafts in overburden soil will be another alternative in the foundation design

However, if the proposed new bridge alignment will vary from the existing alignment, it is recommended that a thorough geotechnical investigation be performed in the project area for the foundation design. Additionally, there are a number of important construction constraints that may influence the choice of foundation type in the active rail yard. First among these is the issue of clearance from the active lines during construction. Other related issues include the need for railroad personnel for safety monitoring and control, vehicular access for movement of large volumes of material and vibration or heave related impacts to the tracks caused by pile driving in close proximity.

8. GEOTECHNICAL CONSIDERATIONS

Based on the information compiled during this study, the following potential geotechnical issues should be considered during the project development. The potential slope movement at the forward abutment location should be evaluated. Also, the presence of standing water was observed between Pier 38 and Bent 43 during the field visit. Drainage problems should be considered during the further project development. In addition, the presence of fill could require special subgrade preparation, such as removal and replacement with proper engineered fill. Large thicknesses of overburden soils or new fill could cause settlement in the project area, depending on the specific soil type encountered. It is recommended that a geotechnical investigation and a quantitative assessment of engineering properties of the soils should be performed for this project area.

A tabular Red Flag Summary of these findings is presented in Appendix A.

It has been a pleasure to be of service to AECOM in performing this Red Flag Study for the CUY-14-6.93 project.

Respectfully Submitted,

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Geotechnical Engineer

Chunmei (Melinda) He, Ph.D. P.E.
Project Manager

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APPENDIX A

RED FLAG SUMMARY

RED FLAG SUMMARY

Red Flag Summary Completed: September 19, 2018

Purpose

The purpose of this Red Flag Summary is to identify concerns that could cause revisions to the following:
Anticipated design and construction scope of work
Proposed project development schedule
Estimated project budget
Potential impacts of the project on the surrounding area

Instructions

A written Red Flag Summary is required for both major and minor projects. A written Red Flag Summary is optional for minimal projects; though red flag issues must still be identified.
A field review is required for all projects. Each specialty area of the Red Flag Summary should be completed by individuals who possess sufficient experience to enable them to correctly identify and evaluate issues arising from the field review.
In the Location/Comments field provide information concerning potential impacts that is brief, but gives enough detail to allow an understanding of the issue(s).
The scope of services document should account for any issues identified in the Red Flag Summary that have the potential to affect scope, schedule, and budget.
A list of resources that may need to be consulted in order to complete this form can be found in the introduction to Appendix H of the Project Development Process Manual.

Red Flag Summary Deliverables

Provide an expanded Study Area Map identifying project design constraints identified through the Red Flag Summary. Tables, photographs or other support material may also be submitted with the Red Flag Summary to illustrate specific problem areas. (**This information is mandatory for Major Projects.**)

General

Project Name (County, Route, Section):	CUY-14-6.93	**PID:**	104132
Date Red Flag Summary Completed:	09/19/18	**Prepared By:**	ZM
City, Township or Village Name(s):	Garfield Heights	**Project Manager:**	CH

GEOTECHNICAL ISSUES:

Based on the information compiled during this study indicate whether or not the following geotechnical issues are present or should be further considered during project development. Provide additional comments as needed.

	Design Issue	Comments
☒ Yes ☐ No ☐ Possible ☐ N/A	Is there evidence of soil drainage problems (e.g., wet or pumping subgrade, standing water, the presence of seeps, wetlands, swamps, bogs)?	The presence of standing water was observed between Pier 38 and Bent 43 during the field visit. Drainage problems should be considered during the further project development.
☐ Yes ☐ No ☒ Possible ☐ N/A	Is the groundwater table anticipated to be affected by construction?	
☒ Yes ☐ No ☐ Possible ☐ N/A	Is there evidence of any embankment or foundation problems (e.g., differential settlement, sag, foundation failures, slope failures, scours, evidence of channel migrations)?	Sloughy soil and creep trees was noted at the forward abutment embankment location. Tilted shoring was observed at Bent 48. Tilted retaining wall was noted on Bent 47. A portion of retaining wall in front of Bent 54 was tilted.
☒ Yes ☐ No ☐ Possible ☐ N/A	Is there evidence of any slope instability (soil or rock)?	Sloughy soil and creep trees was noted at the forward abutment embankment location. Tilted shoring was observed at Bent 48. Tilted retaining wall was noted on Bent 47. A portion of retaining wall in front of Bent 54 was tilted.
☐ Yes ☐ No ☒ Possible ☐ N/A	Is there evidence of unsuitable materials (e.g., presence of debris or man-made fills or waste pits containing these materials, indications from old soil borings)?	The soil survey and previous boring logs indicate the presence of man-made fills.
☐ Yes ☐ No ☒ Possible ☐ N/A	Is there evidence of rock strata (e.g., presence of exposed bedrock, rock on the old borings)?	According to the Shaded Bedrock-Topography Map of Ohio (ODNR, 2015), bedrock elevations range from 800 to 850 ft amsl in the project area. Depth to bedrock in this region is variable, ranging between 15 and 100 ft bgs.
☐ Yes ☐ No ☒ Possible ☐ N/A	Is there evidence of active, reclaimed or abandoned surface mines?	
☐ Yes ☒ No ☐ Possible ☐ N/A	Is there information pertaining to the existence of underground mines?	
☐ Yes ☒ No ☐ Possible ☐ N/A	Is there Acid Mine Drainage present within the study area?	
☐ Yes ☐ No ☒ Possible ☐ N/A	Does an undercut or subgrade stabilization appear to be needed?	
☐ Yes ☐ No ☒ Possible ☐ N/A	Should the Office of Geotechnical Engineering be contacted to evaluate the project site?	
☐ Yes ☒ No ☐ Possible ☐ N/A	Were there any significant items found during plan and specification review? Specify.	
☐ Yes ☐ No ☒ Possible ☐ N/A	Are There any other geotechnical issues? Specify.	Based on readily available information, all issues have been addressed. More site specific geotechnical information should be gathered and additional concerns may then be identified.

APPENDIX B

EXISTING BRIDGE FOUNDATION SUMMARY

No.	Size of Pile	No. of Piles	Design Load
Pier 1	16" Precast Concrete Pile	2 x 10	30 tons / 60 kips
Pier 2	16" Precast Concrete Pile	2 x 11 (Left); 2 x 11 (Right)	30 tons / 60 kips
Pier 3	16" Precast Concrete Pile	2 x 11 (Left); 2 x 11 (Right)	30 tons / 60 kips
Pier 4	16" Precast Concrete Pile	2 x 11 (Left); 2 x 11 (Right)	30 tons / 60 kips
Pier 5	16" Precast Concrete Pile	2 x 11 (Left); 2 x 11 (Right)	30 tons / 60 kips
Pier 6	16" Precast Concrete Pile	2 x 11 (Left); 2 x 11 (Right)	30 tons / 60 kips
Pier 7	16" Precast Concrete Pile	2 x 11 (Left); 2 x 11 (Right)	30 tons / 60 kips
Pier 8	16" Precast Concrete Pile	2 x10	30 tons / 60 kips
Bent 42	16" CIP Pile	4 piles/footer x 4 footer = 16	No load information
Bent 42 As Built			
Bent 43	16" CIP Pile	4 piles/footer x 4 footer = 16	
Bent 44	16" CIP Pile	4 piles/footer x 4 footer = 16	
Bent 45	16" CIP Pile	4 piles/footer x 4 footer = 16	
Bent 46	16" CIP Pile	4 piles/footer x 4 footer = 16	
Bent 47	16" CIP Pile	4 piles/footer x 4 footer = 16	
Bent 48	16" CIP Pile	4 piles/footer x 4 footer = 16	
Bent 48 As Built			
Bent 49	16" CIP Pile	8 piles/footer x 4 footer = 32	
		Total: 144	

No.	Size of Footing			
	N	X	Y	S
Bent 1	5'-3" x 14' x 3'	5' x 14' x 3'	5' x 14' x 3'	5'-3" x 14' x 3'
Bent 2	6'-8" x 5' x 3'-3"	6' x 5' x 3'	6' x 5' x 3'	6'-8" x 5' x 3'-3"
Bent 3	6'-8" x 5' x 3'-3"	6' x 5' x 3'	6' x 5' x 3'	6'-8" x 5' x 3'-3"
Bent 4	6'-8" x 5' x 3'-3"	6' x 5' x 3'	6' x 5' x 3'	6'-8" x 5' x 3'-3"
Bent 5	6'-8" x 5' x 3'-3"	6' x 5' x 3'	6' x 5' x 3'	6'-8" x 5' x 3'-3"
Bent 6	6'-8" x 5' x 3'-3"	6' x 5' x 3'	6' x 5' x 3'	6'-8" x 5' x 3'-3"
Bent 7	5'-10" x 5' x 3'	5'-2" x 5' x 3'	5'-2" x 5' x 3'	5'-10" x 5' x 3'
Bent 8	5'-10" x 5' x 3'	5'-2" x 5' x 3'	5'-2" x 5' x 3'	5'-10" x 5' x 3'
Bent 9	7' x 5' x 3'-6"	6'-4" x 5' x 3'	6'-4" x 5' x 3'	7' x 5' x 3'-6"
Bent 10	7' x 5' x 3'-6"	6'-4" x 5' x 3'	6'-4" x 5' x 3'	7' x 5' x 3'-6"
Bent 11	7' x 5' x 3'-6"	6'-4" x 5' x 3'	6'-4" x 5' x 3'	7' x 5' x 3'-6"
Bent 12	7' x 5' x 3'-6"	6'-4" x 5' x 3'	6'-4" x 5' x 3'	7' x 5' x 3'-6"
Bent 12 As Built		6'-4" x 5' x 3.74'		
Bent 13	7' x 5' x 3'-6"	6'-4" x 5' x 3'	6'-4" x 5' x 3'	7' x 5' x 3'-6"
Bent 14	6' x 5' x 3'	5'-4" x 5' x 3'	5'-4" x 5' x 3'	6' x 5' x 3'
Bent 15	6' x 5' x 3'	5'-4" x 5' x 3'	5'-4" x 5' x 3'	6' x 5' x 3'
Bent 16	7' x 5' x 3'-6"	6'-4" x 5' x 3'-6"	6'-4" x 5' x 3'-6"	7' x 5' x 3'-6"
Bent 17	7' x 5' x 3'-6"	6'-4" x 5' x 3'-6"	6'-4" x 5' x 3'-6"	7' x 5' x 3'-6"
Bent 18	7' x 5' x 3'-6"	6'-4" x 5' x 3'-6"	6'-4" x 5' x 3'-6"	7' x 5' x 3'-6"
Bent 19	7' x 5' x 3'-6"	6'-4" x 5' x 3'-6"	6'-4" x 5' x 3'-6"	7' x 5' x 3'-6"
Bent 20	7' x 5' x 3'-6"	6'-4" x 5' x 3'-6"	6'-4" x 5' x 3'-6"	7' x 5' x 3'-6"
Bent 21	6'-2" x 5' x 3'	5'-10" x 5' x 3'	5'-10" x 5' x 3'	6'-2" x 5' x 3'
Bent 22	6'-10" x 5' x 3'	6'-4" x 5' x 3'	6'-4" x 5' x 3'	6'-4" x 5' x 3'-3"
Bent 23	7' x 6' x 3'-6"	7' x 6' x 3'-6"	7' x 5'-6" x 4'	6'-4" x 5'-6" x 4'
Bent 24	6'-8" x 5'-6" x 3'-6"	6'-4" x 5'-6" x 3'-6"	6'-4" x 5'-6" x 3'-6"	6'-4" x 5'-6" x 3'-6"
Bent 25	6'-10" x 5'-6" x 3'-6"	6'-4" x 5'-6" x 3'-6"	6'-4" x 5'-6" x 3'-6"	6'-6" x 5'-6" x 3'-6"
Bent 26	6'-8" x 5'-6" x 3'-6"	6'-4" x 5'-6" x 3'-6"	6'-4" x 5'-6" x 3'-6"	6'-4" x 5'-6" x 3'-6"
Bent 27	7' x 6' x 3'-6"	7' x 6' x 3'-6"	7' x 5'-6" x 4'	6'-4" x 5'-6" x 4'
Bent 28	6'-10" x 5' x 3'	6'-4" x 5' x 3'	6'-4" x 5' x 3'	6'-4" x 5' x 3'-3"
Bent 29	6' x 5' x 3'	5'-6" x 5' x 3'	5'-6" x 5' x 3'	6' x 5' x 3'

Bent 30	7' x 5' x 3'-6"	6'-4" x 5' x 3'	6'-4" x 5' x 3'	7' x 5' x 3'-6"
Bent 31	4 Footers are the same with two layers		6' x 5'-3" x 2'-6" (Top)	8'-6" x 7'-6" x 2'-6" (Bottom)
No Bent 32 - 39				
Bent 40	4 Footers are the same with two layers		6' x 5'-3" x 2'-6" (Top)	8'-6" x 7'-6" x 2'-6" (Bottom)
Bent 41	6'-10" x 5' x 3'-6"	6' x 5' x 3'	6' x 5' x 3'	6'-10" x 5' x 3'-6"
Bent 41 As Built	6'-3" x 5' x 8.36'	5'-6" x 5' x 7.16'	5'-6" x 5' x 4.36'	6'-3" x 5' x 4.36'
Bent 50	5'-6" x 5'-6" x 3'-6"	5'-6" x 6'-4" x 3'-6"	5'-6" x 5'-6" x 3'-6"	
Bent 50 & 24, Bent 50 &26	Irregular Shape Footing at the Intersection		5'-6" x 5' x 7' x 5'-6" x 3'-6"	5'-6" x 5' x 7' x 5'-6" x 3'-6"
Bent 51	6'-2" x 5'-6" x 3'-6"	6'-6" x 5'-6" x 3'-6"	6'-2" x 5'-6" x 3'-6"	
Bent 52	Sitting on Box Footing (Culvert) 59'-6" x 26' x 10'-6"			
Bent 53				
Bent 54	7' x 6'-6" x 4'-7 3/4" (N)	7'-6" x 6'-6" x 4'-7 3/4" (M)	7' x 6'-6" x 4'-7 3/4" (S)	
Bent 55	6'-10" x 6'-6" x 4'-9 5/8" (N)	7'-4" x 6'-6" x 4'-9 5/8" (M)	6'-10" x 6'-6" x 4'-9 5/8" (S)	
Bent 56	6'-6" x 5'-4" x 3'-9" (N)	6'-6" x 5'-8" x 4'-3" (M)	6'-6" x 5'-4" x 3'-9" (S)	

EXHIBITS

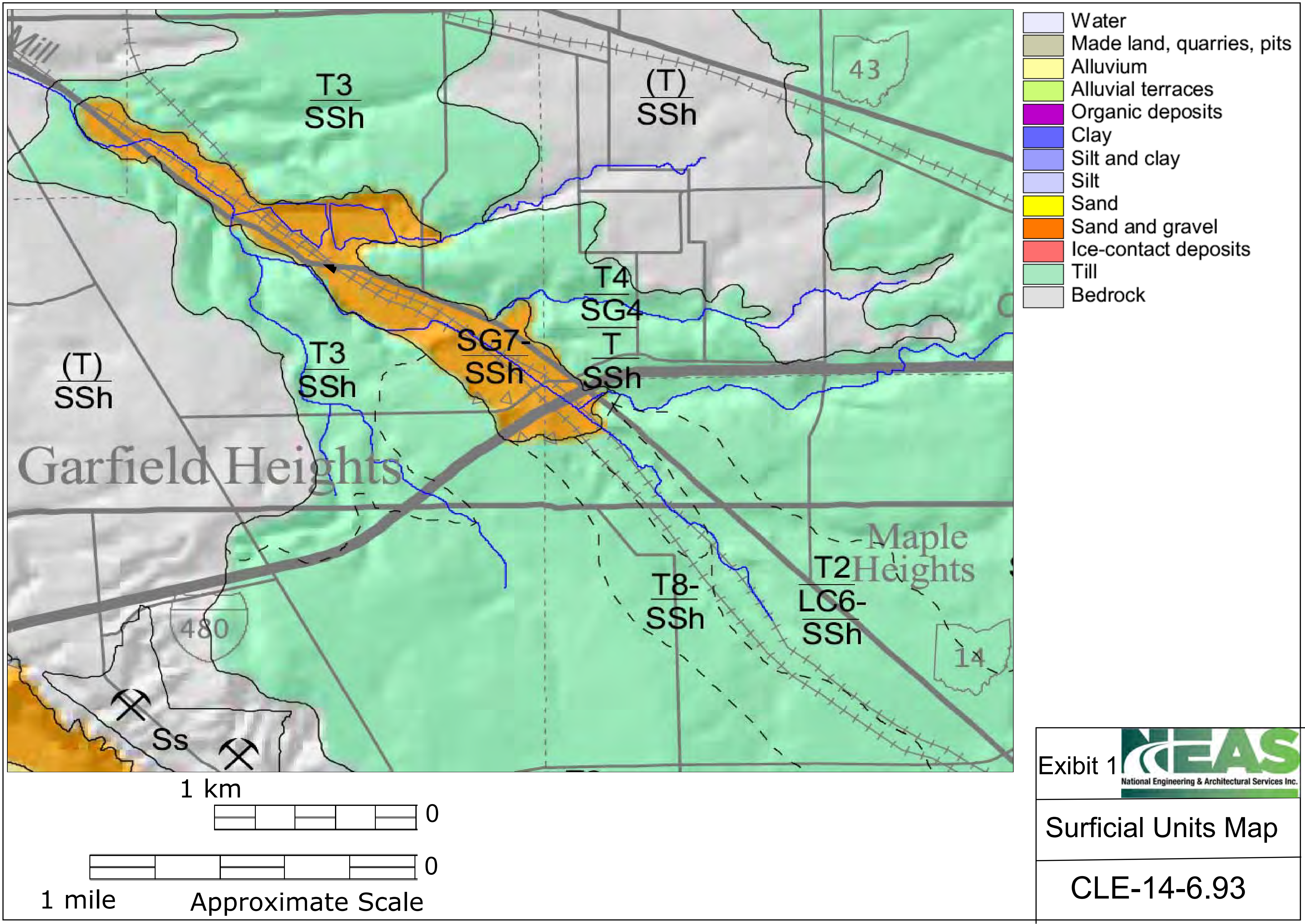
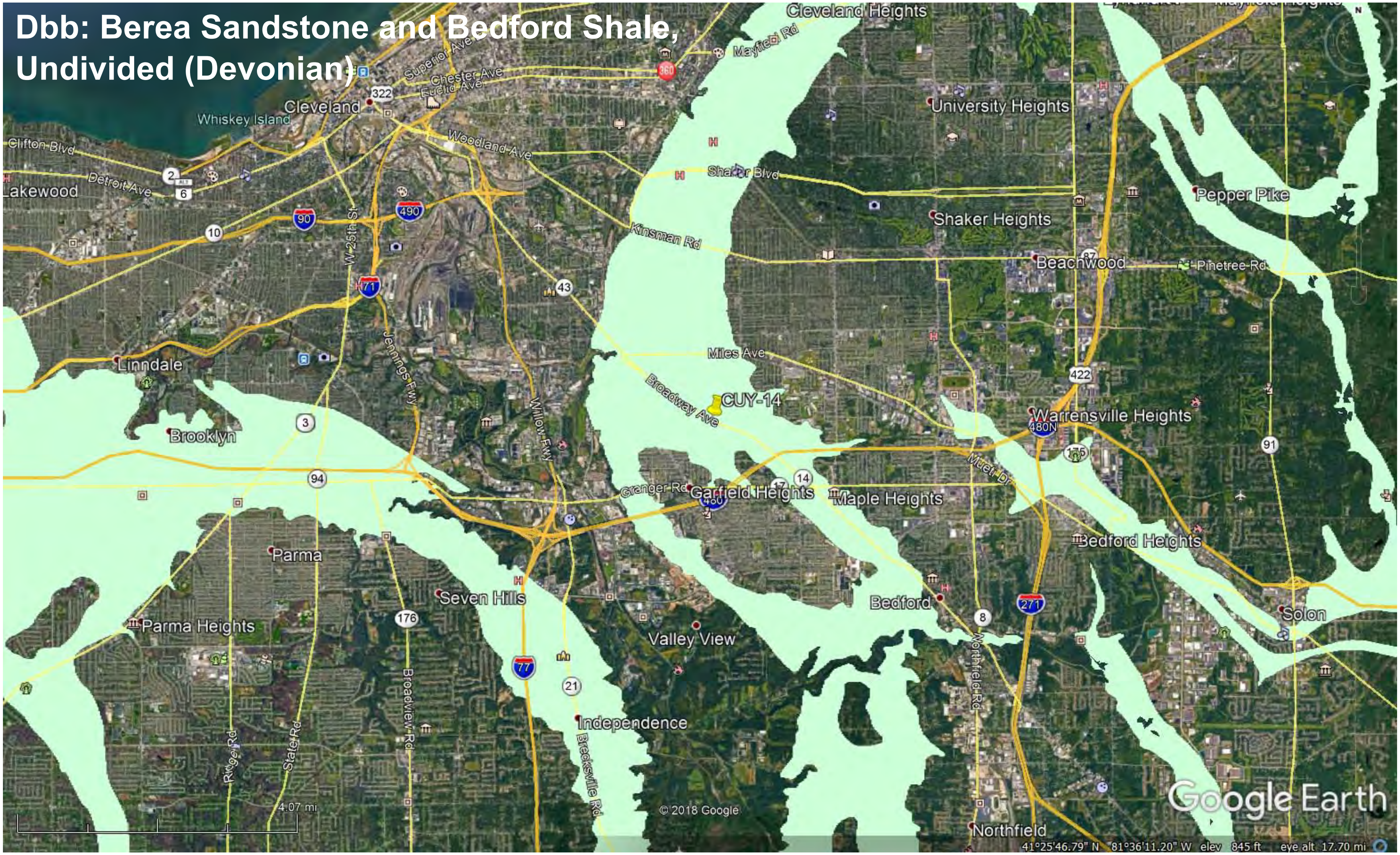


Exhibit 1

National Engineering & Architectural Services Inc.

Surficial Units Map

CLE-14-6.93



Dbb: Berea Sandstone and Bedford Shale, Undivided (Devonian)

Exhibit 2

NEAS
National Engineering & Architectural Services Inc.

Bedrock Geology Map

CUY-14-6.93

Exhibit 3

National Engineering & Architectural Services Inc.

Bedrock Surface Elevation

CUY-14-6.93

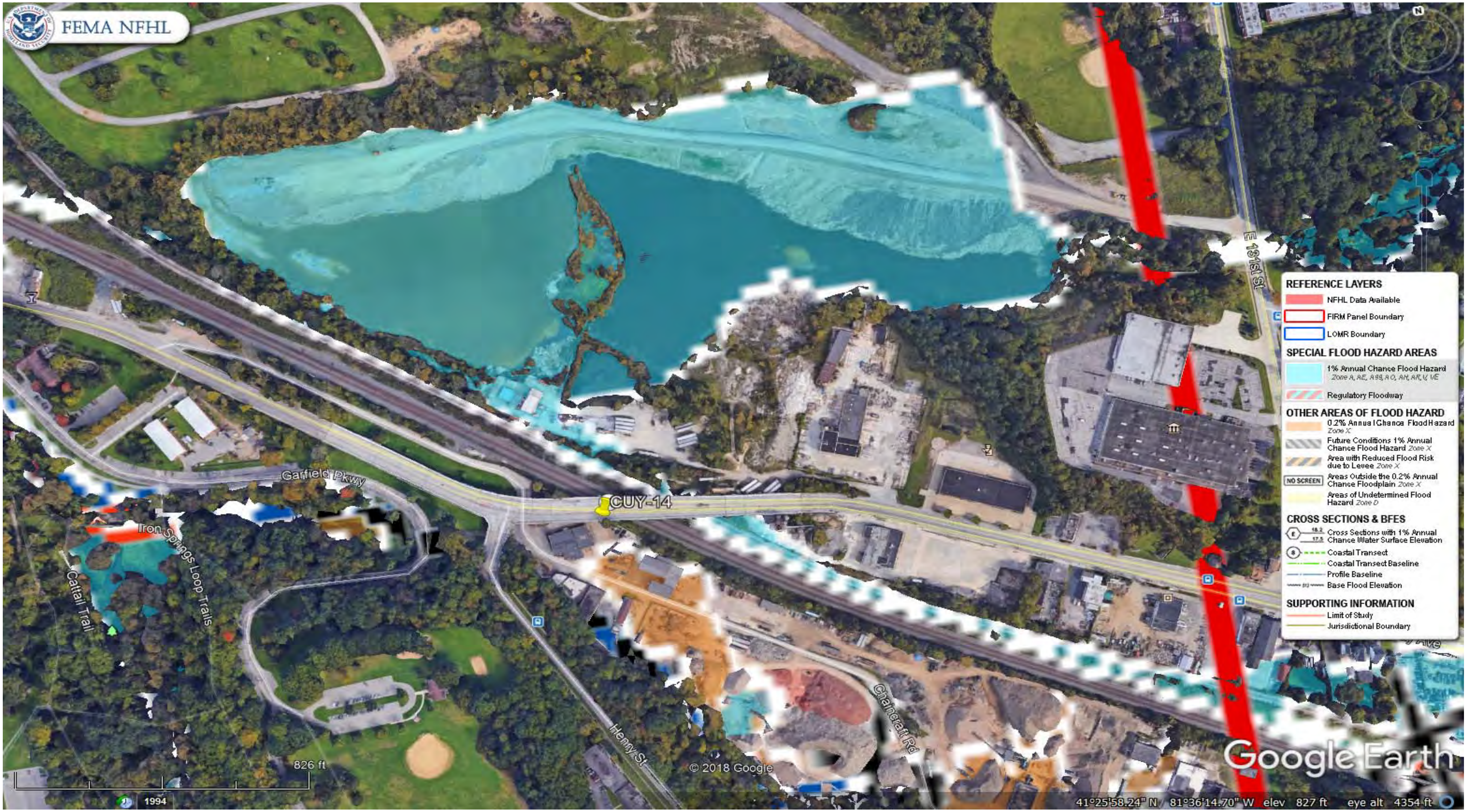


Exhibit 4

NEAS
National Engineering & Architectural Services Inc.

Flood Zone Map

CUY-14-6.93

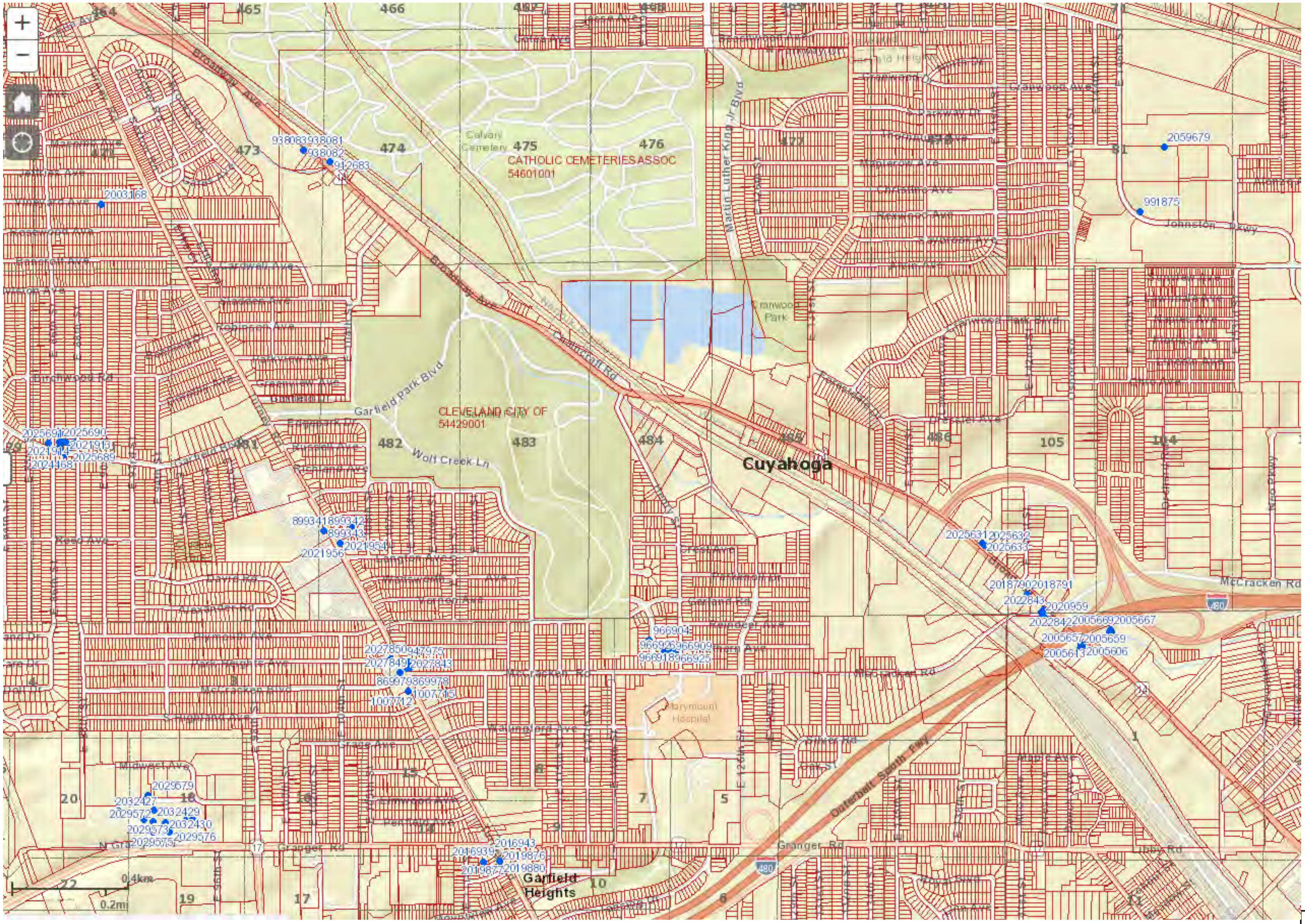


Exhibit 5

National Engineering & Architectural Services Inc.

Water Well Logs Map

CUY-14-6.93

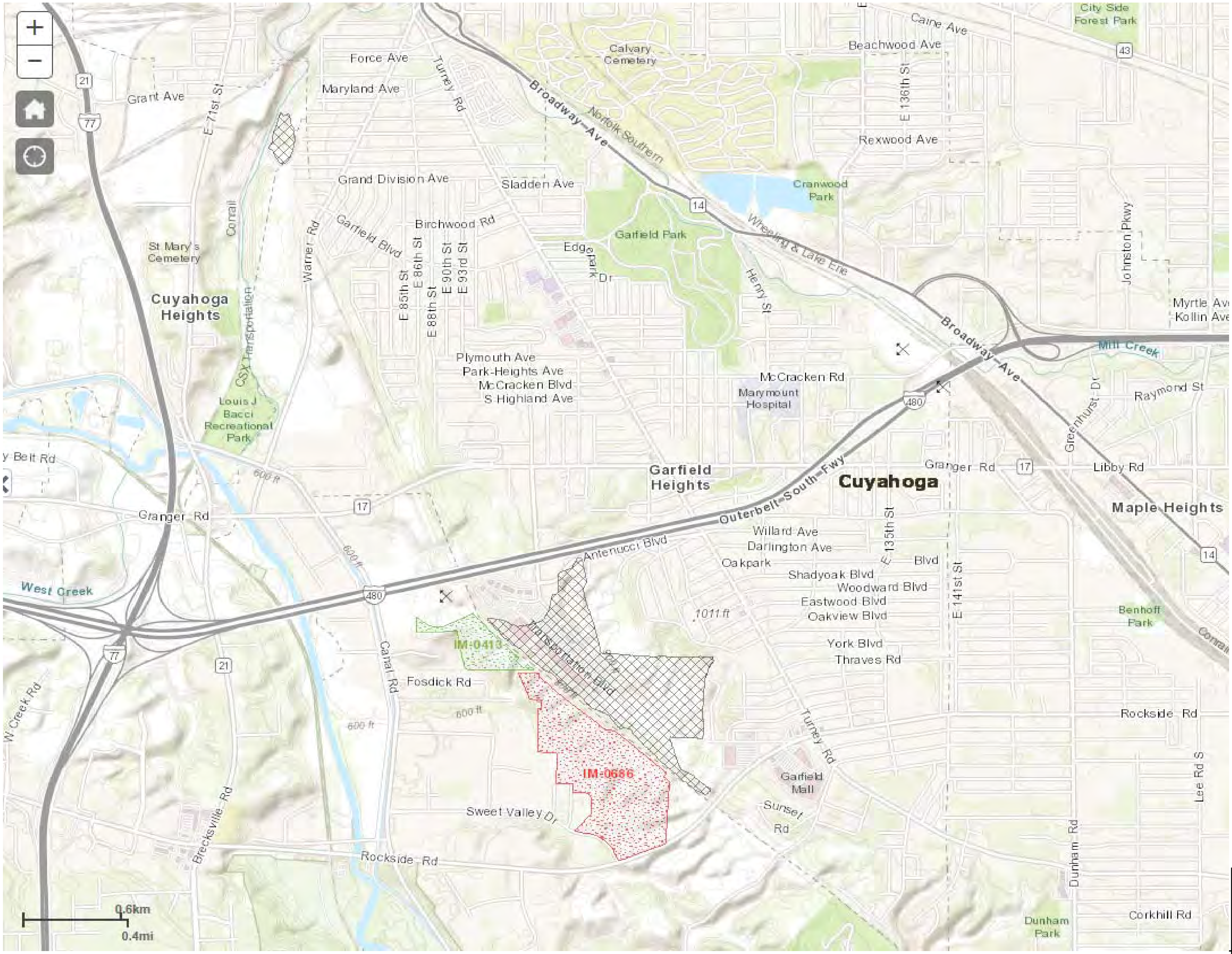


Exhibit 6

National Engineering & Architectural Services Inc.

Mines Map

CUY-14-6.93

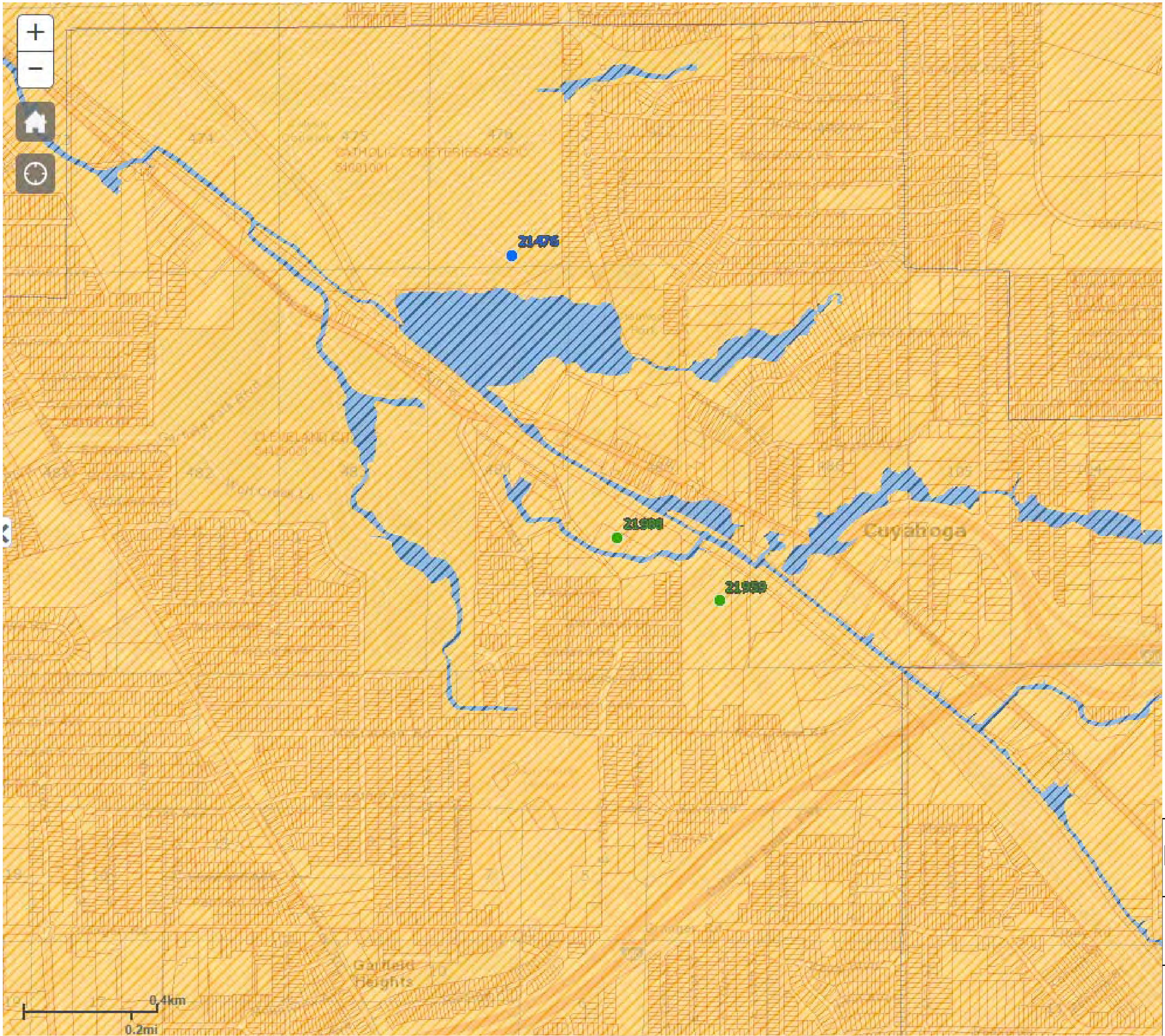


Exhibit 7

National Engineering & Architectural Services Inc.

Oil & Gas Wells Map

CUY-14-6.93

Appendix I

Deems, Zack

From: Richard.Behrendt@dot.ohio.gov
Sent: Thursday, January 17, 2019 11:23 AM
To: Deems, Zack
Cc: Buchanan, Scott; Wimer, Mark; Sima, Jim
Subject: RE: CUY-14 RR questions (2)

Zack,
See my responses below in red…

Richard Behrendt
ODOT State Rail Coordinator
ORDC Technical Project Manager
1980 W. Broad Street, Columbus, Ohio 43223
(p) 614.387.3097 (600am-230pm)
(c) 614-429.8432
richard.behrendt@dot.state.gov

OHIO DEPARTMENT OF
TRANSPORTATION

From: Deems, Zack <zack.deems@aecom.com>
Sent: Thursday, January 17, 2019 7:24 AM
To: Behrendt, Richard <Richard.Behrendt@dot.ohio.gov>
Cc: Buchanan, Scott <scott.buchanan@aecom.com>; Wimer, Mark <mark.wimer@aecom.com>; Sima, Jim <jim.sima@aecom.com>
Subject: CUY-14 RR questions

Hi, Rich.

We are working with ODOT District 12 in the conceptual stage of design (developing alternatives for AER) for the rehabilitation or replacement of the SR 14 bridge over NS (southern 2 lines) and CCRR (northern line) in Garfield Heights near the Garfield Park Reservation. See attached zoomed map for reference. Currently, the vertical clearance is deficient over NS. See other attachment. The fracture critical nature of the existing bridge superstructure keeps the existing superstructure quite shallow. If the bridge is replaced with a non-fracture critical superstructure (which is definitely preferred), we would have to raise the existing profile by 3'+ just to maintain the existing vertical clearance over NS. If we are to satisfy 23.0' vertical clearance over the tracks, this will cause us to raise the SR 14 profile 5'+ over NS. Either of these will cause issues with the nearby intersection of SR 14 and Henry Street since we are currently slated to maintain traffic during construction. ODOT District 12 asked that we contact you to make sure we follow your guidance on either matching existing vertical clearances or raising them.
This is NS's Cleveland Line, which is a highly-important, strategic rail line for NS that sees 90+/- trains a day (plus 2 Amtrak trains), and so they will be looking very closely at any attempt to lower the 23' standard vertical clearance.

The 23' dimension is the 'ideal' vertical dimension for them, in that it not only provides clearance for double-stack container trains (which they are able to run through there today w/the existing vertical dimension), but gives their maintenance crews some ability to raise/adjust track beds as needed for drainage (which isn't available too much today due to the restrictive vertical clearance which shows from your drawing as being from 21.1' to 22.1'…

We have been somewhat successful at having the 23' dimension waived on some past OH bridges down to 22', particularly on NS's ex-NKP east-west line that runs adj. to the Innerbelt Br. downtown Cleveland into the east suburbs due the urbanized and built-up area that line runs through, and with cross roads intersecting just off some of those OH bridges – We might consider asking for a waiver of the 23' dimension as you suggest down to 22', which I believe is a reasonable request to ask given the existing road layout and geometry, and understanding that this might change the road profile/intersection at Henry St.

Let me know if this might be considered, and if so, I can make a formal request to NS…

Therefore, while we are still identifying alternatives, please answer the following for us:

1. If we keep the existing bridge and simply rehabilitate it, our understanding is that we do not have to increase the vertical clearances. Please verify.
   Correct…if we're simply doing minor rehab. on sub- and superstructure…

2. If we replace the bridge, are we required to meet 23.0' or can we simply match existing vertical clearances (make it no worse than it currently is)?
   Yes…if we remove/replace the superstructure, we will be required to provide a clear vertical clearance of 23'

Also, for new bridge alternatives across the tracks, we are intending on 2-span bridges. Our intent is to provide 25' horizontal clearances, and even provide crash worthy elements there (cast-in-place concrete wall abutments south of NS and north of CCRR, and just 1 wall-type pier parallel to and 25' north of the northern NS line). That pier would be located in line with the overhead power poles in the photo. Can you also provide us with a contact name for NS? We want to run this by them as well to make sure there is no fatal flaw with this logic and to make sure we incorporate any special construction provisions they may have.
EW Chambers is my primary contact in NS's Public Projects, but I am not recommending contacting him at this point 'till a PE Agreement has been executed between ODOT and NS, which won't get executed for a few months as the PE Agreement will be going out by 1/31 (I didn't think any interface would be needed this early on since the Project doesn't file 'till 2024…(?))

His response to any of this will likely be that they will only react after seeing a set of proposed drawings, and without first getting approval from various internal depts (i.e. Transportation, MOW, Operations, Engineering and Dearborn Division to name a few…) which as you know, can take anywhere from 60-120 days due to the unique nature of what is proposed on this skewed structure…

We work with NS a lot, but I thought it best to get this started with the contact person you provide to us.

Thank you.

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zack.deems@aecom.com

AECOM
Columbus / Cleveland / Cincinnati / Akron

From:	Deems, Zack
Sent:	Tuesday, March 19, 2019 2:52 PM
To:	'Eldridge.Chambers@nscorp.com'
Subject:	CUY-14 Bridge Replacement
Attachments:	SR14 (Broadway Ave over NS).pdf; SR14 over NS - CrossingInventory.pdf; Capture.jpg

Mr. Chambers,

We are working with the Ohio Department of Transportation, District 12, on the rehabilitation or replacement of their bridge carrying State Route 14 over NSC rail lines in the city of Garfield Heights, Cuyahoga County, Ohio. We are currently in the process of analyzing alternatives.

Minimum existing vertical clearance is 21.1’, and minimum existing horizontal clearance is 7.2’.

The NSC manual’s permanent clearance requirements section states the following:

> *Overhead bridge structures shall provide the specified horizontal and vertical clearances for anticipated future tracks, changes in track centers, and raising of track for maintenance purposes. This information shall be determined by inquiry to the NS Public Project Engineer.*

For our replacement alternatives, are we correct in assuming proposed clearances per your manual from existing rail lines of 23’ vertical and 25’ horizontal (to not require crash walls) are acceptable to NSC?

Are there any chances for relaxation of these requirements?

We will certainly be coordinating with NSC as we progress with the design phase, but we initially want to understand some overall governances.

Thank you.

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Ohio Transportation Business Unit Leader
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AECOM
Columbus / Cleveland / Cincinnati / Akron

Deems, Zack

From:	Wimer, Mark
Sent:	Thursday, April 25, 2019 8:54 AM
To:	Roxberry, Todd; Deems, Zack
Subject:	FW: CUY-14-6.93

Mark Wimer, P.E., M.S.
Senior Structural Engineer
Project Manager
D 1-330-800-2743
mark.wimer@aecom.com

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From: Richard.Behrendt@dot.ohio.gov [mailto:Richard.Behrendt@dot.ohio.gov]
Sent: Thursday, April 25, 2019 6:42 AM
To: Wimer, Mark
Subject: RE: CUY-14-6.93 (2)

Mark,
Your understanding and assessment of the NS requirements as outlined below are correct…22' min. from face of new piers/abutments to centerline of closest track, and 13' min. from face of foundation to centerline of closest track.

This restriction applies to any pier top stems/cantilevers (if applicable) as well…

Richard Behrendt
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ORDC Technical Project Manager
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(c) 614-429.8432
richard.behrendt@dot.state.gov

OHIO DEPARTMENT OF
TRANSPORTATION

From: Wimer, Mark <mark.wimer@aecom.com>
Sent: Wednesday, April 24, 2019 3:50 PM
To: Behrendt, Richard <Richard.Behrendt@dot.ohio.gov>
Subject: CUY-14-6.93

Rich,

We are investigating some of the action items from the meeting last week for the CUY-14-6.93 AER. If you recall, one item that came up was to consider using a larger 2-span over the tracks, and realign Chaincraft under the bridge just west of the NS tracks. This makes the western span pretty large, so I want to make sure I'm bringing my central pier as close as I can to the NS tracks. I've attached some select sections from the NS Public Projects Manual. Section H.1.2.A.4 states that the edges of footings shall not be closer than 13'. It also states that pier faces closer than 25' shall have crash walls. The figure in Appendix I "Overhead Bridge Details Permanent Clearances" shows a minimum of 22' from CL track to pier face. Does this mean that even if crash walls are provided, the pier face shall not be closer than 22’ **and** the edge of footing shall not be closer than 13’? I just want to make sure we aren’t making the span longer than necessary given that it is going to exceed 200’. Please let me know if you concur with our interpretation of NS clearances. Otherwise, maybe you can put us in touch with the right person at NS to provide clarification. We would like to finalize these clearances early as it will drive which alternative we recommend. Thanks Rich.

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From:	Wimer, Mark
Sent:	Wednesday, May 29, 2019 11:56 AM
To:	Deems, Zack; Roxberry, Todd; Sima, Jim; Buchanan, Scott
Subject:	FW: CUY-14-6.93 (2)

See response from Rich Behrendt below. No major objections. This is probably the most concurrence we could hope for at this early stage.

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From: Richard.Behrendt@dot.ohio.gov [mailto:Richard.Behrendt@dot.ohio.gov]
Sent: Wednesday, May 29, 2019 10:29 AM
To: Wimer, Mark
Subject: FW: CUY-14-6.93 (2)

Mark,
Preliminarily, I don't think NS will take issue w/what is proposed, as long as drainage off their track bed is adequately accommodated for (which I'm assuming is shown in blue on your attachment) – The only potential problem may be that this may require relocation of their UG fiber optic line(s) that they likely have buried on the west side of the tracks in line with the new drainage ditch… ODOT will likely be responsible for maintenance of the new catch basin north of the new bridge, even though it's on NS's ROW…

I could forward this to NS for their review and comment/approval, but that process could take 6-8 mos. (or more) to complete, as it needs to go before a number of different internal Depts., as well as Dearborn Division before any comments might be received back; but frankly, I don't think we need their review/approval on the concept to keep things moving forward, since the new road is off their primary operating ROW, is more that 25' from centerline of the nearest track, and is outside of the clearance envelope needed for safe and unobstructed rail operations, so the new roadway alignment won't generate any issues that I can see as being problematic…

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OHIO DEPARTMENT OF TRANSPORTATION

From: Wimer, Mark <mark.wimer@aecom.com>
Sent: Tuesday, May 28, 2019 5:22 PM
To: Behrendt, Richard <Richard.Behrendt@dot.ohio.gov>
Subject: RE: CUY-14-6.93 (2)

Rich,

As you recall, at the District 12 meeting on 4/17/19 regarding this project, we committed to investigating an option that provides a single large 2-span bridge and realigns Chaincraft Rd next to the NS tracks under the large first span. This would require purchasing NS R/W as well as purchasing a Baumann Property. Attached is a plan view of the realigned Chaincraft Rd as well as cross sections. The potential NS R/W purchase is shaded in yellow. Chaincraft will need to be raised somewhat to provide a ditch between Chaincraft and the NS tracks as shown in the attached cross sections. I am sending this now to allow you and/or NS the opportunity for a preliminary review in order to raise any initial concerns that might preclude the progession of this as a viable alternative. If NS will have significant objection to this alternative, it is best to know early and prevent expending effort with calculations, costing, etc. Thanks for the help Rich.

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mark.wimer@aecom.com

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From: Richard.Behrendt@dot.ohio.gov [mailto:Richard.Behrendt@dot.ohio.gov]
Sent: Thursday, April 25, 2019 6:42 AM
To: Wimer, Mark
Subject: RE: CUY-14-6.93 (2)

Mark,
Your understanding and assessment of the NS requirements as outlined below are correct…22' min. from face of new piers/abutments to centerline of closest track, and 13' min. from face of foundation to centerline of closest track.

This restriction applies to any pier top stems/cantilevers (if applicable) as well…

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richard.behrendt@dot.state.gov

OHIO DEPARTMENT OF TRANSPORTATION

From: Wimer, Mark <mark.wimer@aecom.com>
Sent: Wednesday, April 24, 2019 3:50 PM
To: Behrendt, Richard <Richard.Behrendt@dot.ohio.gov>
Subject: CUY-14-6.93

Rich,

We are investigating some of the action items from the meeting last week for the CUY-14-6.93 AER. If you recall, one item that came up was to consider using a larger 2-span over the tracks, and realign Chaincraft under the bridge just west of the NS tracks. This makes the western span pretty large, so I want to make sure I'm bringing my central pier as close as I can to the NS tracks. I've attached some select sections from the NS Public Projects Manual. Section H.1.2.A.4

states that the edges of footings shall not be closer than 13'. It also states that pier faces closer than 25' shall have crash walls. The figure in Appendix I "Overhead Bridge Details Permanent Clearances" shows a minimum of 22' from CL track to pier face. Does this mean that even if crash walls are provided, the pier face shall not be closer than 22' **and** the edge of footing shall not be closer than 13'? I just want to make sure we aren't making the span longer than necessary given that it is going to exceed 200'. Please let me know if you concur with our interpretation of NS clearances. Otherwise, maybe you can put us in touch with the right person at NS to provide clarification. We would like to finalize these clearances early as it will drive which alternative we recommend. Thanks Rich.

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Appendix J

Inter-office communication

To: District 12- Poonsak Sritalapat, Ph.D., P.E., Project Manager **Date:** April 11, 2019

From: Tim Keller, P.E., Administrator, Office of Structural Engineering

By: Teddy Antonios P.E., TE4

Subject: CUY-14-6.93; PID 104132; AER Review

The Office of Structural Engineering has performed a cursory review of the information furnished for the AER Submittal prepared by AECOM for the above referenced project and offer the following comments.

Additional Comments may be issued by the Office of Geotechnical Engineering and/or the Office of Hydraulic Engineering.

General Comments:

1. On sheet 29 of 49 of the Plans the option that was chosen for the subject project is a continuous two span bridge with reinforced concrete deck supported on steel girders using wall type semi-integral abutment and wall type pier supported on deep foundation. This bridge as stated is over the railroad. Behind the rear abutment to the west a triangular fill is used followed by another single span bridge using wall type semi-integral abutment supports on deep foundation.
   Alternative 1 starting on Page 7 of 35 of the AER report discusses in details the advantages and disadvantages of this alternative. OSE doesn't recommend this alternative for the following reasons:
    a) The single span bridge over Chaincraft Road that utilizes different abutment skew along with steel beams of different span length and curved deck is not recommended for semi-integral design. Also, the proximity of the approach slabs on the north side of both bridges is not feasible for construction and for design due to the movement of both bridges using semi-integral design.
    b) The triangle fill area between both bridges using stage construction is problematic and difficult to construct.
2. Provide an additional alternative a three span continuous structure with expansion joints at the abutments. This option was discussed on page 6 of 35 of the AER report and dismissed for various reasons. It is also stated this alternative increases the cost of the project. OSE sees a viable solution using this alternative. We recommend the design agency prepare cost estimate along with preliminary details of this alternative.
3. On Sheet 31 of 49 of the plans Section B the footing is not wide enough for the wall that is approximately 30 foot in height. Also, more than one row of piling is needed. Please check the design and adjust the cost of this alternative.
4. On sheet 32, 33, 39, 40 of 49 the channel strut that is used to support the cantilever cap is not a viable design due to concrete delamination of the cap and column as shown in the photographs. Consider using shoring towers to support the cantilever cap.
5. On sheet 32, 33, 39, 40 of 49 the bracket that is used to support the cantilever deck is not a viable design due to concrete delamination of the superstructure at various locations which weakens the stringers when anchors are used to support the loads. Because of using the bracket to support the loads the transverse moment must be considered when analyzing the longitudinal stringer to determine if the outside stringer can carry the loads. Consider using shoring to support the cantilever deck from the top of the cap.

6. On Sheet 38 of 49 a wall abutment of approximately 42 foot in height supported on two rows of piles is not adequate to support the loads. Please check the design and adjust the cost estimate.
7. On Sheet 43 of 49 see comment No. 6.
8. On Sheet 9 of 49 and other sheets provide an explanation how the one-way traffic can be accomplished when Henry Street is closed to traffic and continuous barrier are installed along Broadway Avenue during Stage Construction.

After addressing the above review comments, please submit a copy of the report for further review.

Nothing in the above comments is to be construed as authorizing extra work for which additional compensation may be claimed. If you believe that these comments require work outside the limits of the Scope of Services for this project, please contact this office before proceeding.

TK: TAA
c. File

Deems, Zack

From: Deems, Zack
Sent: Monday, April 22, 2019 6:09 PM
To: Calanni, James
Cc: jim.sima@aecom.com; Wimer, Mark; Buchanan, Scott
Subject: CUY-14-6.93; PID 104132; AER Schedule

Jim,

Please let me know if June 21, 2019 works for the revised AER submittal. This date fits our schedules with other project commitments and with vacations stacked around the Memorial Day weekend. If so, please have the Value Engineering (VE) review scheduled accordingly.

Also, the following bullet points serve as our minutes of the meeting from last Wednesday, April 17, 2019, as well as our action items to revise/update the AER for use in the VE review:

- Add an alternative that only rehabs the existing facility for the full 75 year life cycle (requires multiple major rehabs).
- Add an alternative similar to Alternative 1 but which replaces the triangular wedge of soil between individual bridges over the tracks and Chaincraft Road with more bridge. The two separate bridges will be combined; and the finished product will be a 3-span bridge (either continuous or with a joint located over the southern pier). We will consider different skews of the substructure units.
- If it works geometrically and if MOT along Chaincraft Road is workable, add an alternative similar to Alternative 1 but which reroutes Chaincraft Road over against the NSC R/W to cross under SR 14 to eliminate the separate bridge over Chaincraft Road. The south abutment of the bridge over the tracks will be moved south so the southern span of the bridge over the tracks will also span over the relocated Chaincraft Road. This alternative adds to the R/W needed from NSC and requires the full purchase of parcel 544-18-006.
- For the odd R/W issue that exists east of the tracks, we today emailed the research we have to you. The narrative in the draft AER still applies. Please coordinate this with your ODOT R/W legal folks. As mentioned in our meetings, we are available to meet if needed.
- We will discuss with contractors and come up with a cost savings which could be realized if Henry Street is closed to traffic during construction. It is likely that we can keep Henry Street open during phase 1 as planned with no savings to gain. We will therefore provide the cost savings from eliminating the use of Henry Street for the emergency-vehicle-only access after phase 1.

If you agree with this email, please feel free to forward to others. Or, please respond if you have questions or concerns.

Thanks again for hosting the meeting last Wednesday. It was needed to make sure we have concurrence moving forward.

Zack Deems, PE
Ohio Transportation Business Unit Leader
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C (330) 815-2535
zack.deems@aecom.com

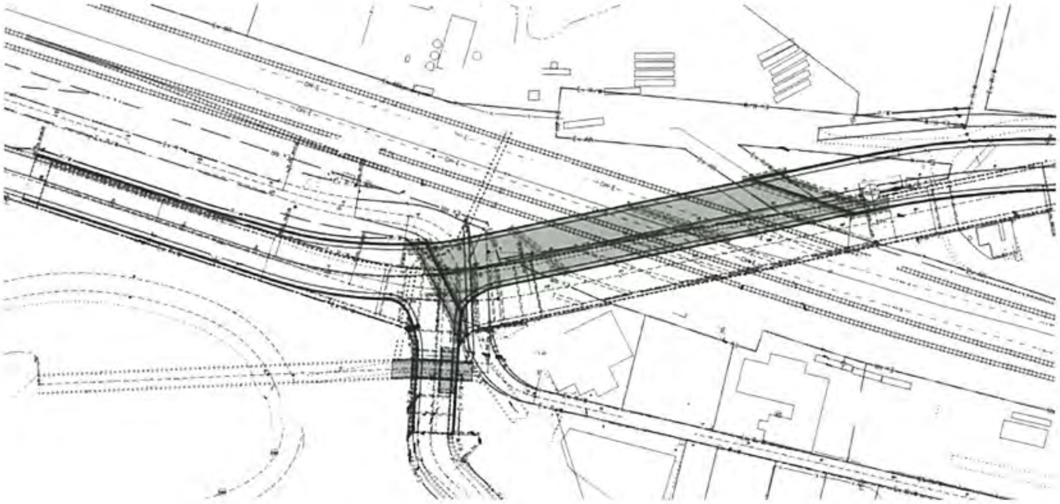
AECOM
Columbus / Cleveland / Cincinnati / Akron

Appendix K

Ohio Department of Transportation
Office of Roadway Engineering

CUY-14-6.93
Whitehouse Crossing Bridge

VALUE ENGINEERING REPORT



July 9-10, 2019

PID:	104132
Design Team:	AECOM
VE Coordinator:	Don Fisher
District 12 VE Coordinator:	George Soos

SECTION I – EXECUTIVE SUMMARY

VE SESSION DATE:
July 9-10, 2019

LOCATION: District 12

PROJECT SUMMARY:

PID: 104132

Cost:

PE: $2,090,724
ROW: $1,500,000
CO: $30,500,000
Total: $34,090,724

Primary Funding Source:
Major Bridge

No. Construction Seasons:
3 Years

Description: Replace the Whitehouse Crossing structure (SR-14) over NS RR in Garfield Hts. Provide pedestrian access to Garfield Park.

The ADT on SR.14 is 20,222

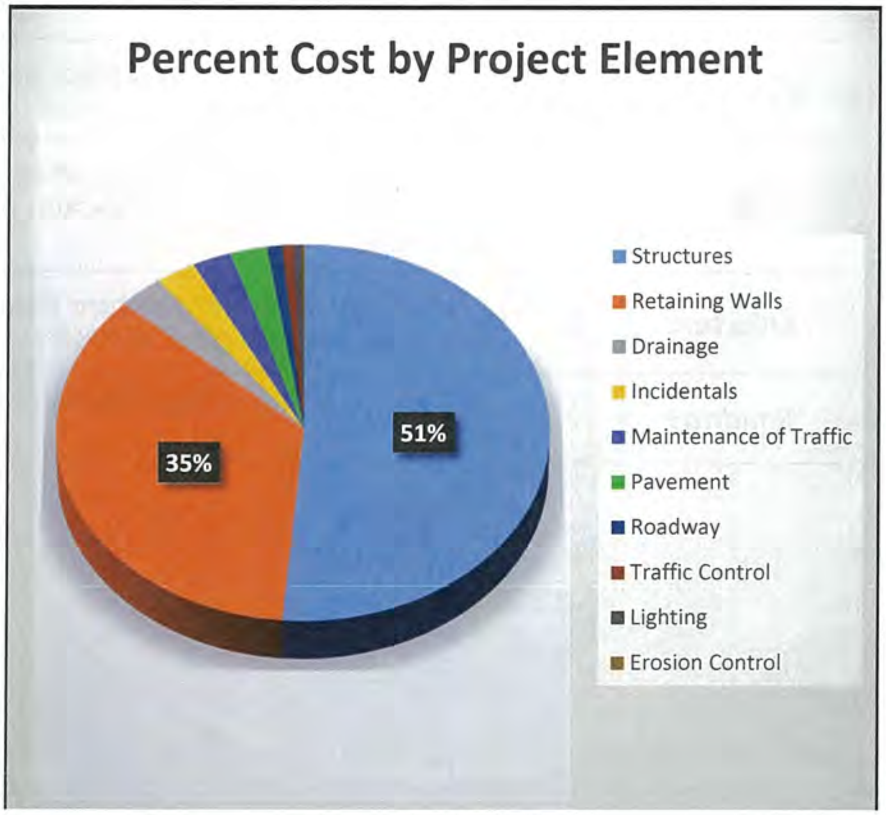
VE TEAM*:*

Don Fisher	C.O
Mike Cronebach	C.O.
Jeff Crace	C.O.
Eric Zippay	District 12
Jeff Hebebrand	District 12
Kyle Dohlen	District 12
George Soos	District 12
Jim Calanni	District 12
Tom Sorge	District 12
Mike Herceg	District 12
Scott Buchanan	AECOM
Jim Sima	AECOM
Zack Deems	AECOM
Mark Wimer	AECOM

CONCLUSIONS & RECOMMENDATIONS

At the time of this Value Engineering Workshop, the CUY-14 bridge replacement project was early in preliminary design. Major project challenges include construction near two railroad lines and a FirstEnergy utility line running parallel to the tracks. Further complicating the replacement of the structure is the presence of 4(f) and 6(f) environmental areas adjacent to the structure. The construction cost of this project without contingencies is around $30 million. Eighty percent of the project cost can be found in two cost categories. These categories are: structures (51.29%) and retaining walls (35.46%). Listed below are the value adding ideas discussed in the workshop:

- Recommend moving forward with Alternative #3 and building offline to reduce impacts to traffic.
- Investigate the use of larger diameter cast-in-place pile
- Move abutments to reduce span length and beam depth
- Review optimized span lengths and pier configurations
- Explore additional MOT schemes
- Reduce the length of the turn lane to Henry Street.



Workshop Idea Summary

Category	*Idea No.*	*Idea List*	*Potential Cost Savings*
General	*16* *	Recommend Alt. #3 and build offline	-$900,000
Structures	*1* *	Move Structure further west and build offline	Design Suggestion
Drainage	*2* **	Move Henry Street to the east and build culvert offline	Design Suggestion
Drainage	*3* **	Relocate culvert under Henry Street to the south	Design Suggestion
Structures	*7* *	Locate east abutment closer to the flood plain	Combined with idea 11
Structures	8 **	Utilize larger diameter 36" cast in place pile	$140,000
Retaining Walls	*9* **	Use 1:1 reinforced slope at park vs. MSE wall	Design Suggestion
Roadway	*10* *	Relocate Chaincraft Rd. parallel with RR	Design Suggestion
Structures	11 *	Move west abutment and place culvert over Chaincraft Rd.	$1,966,000
MOT	13 *	Close Henry St. during MOT phases - use Garfield to Turney to McCracken or other alternate.	$3,000,000
Structure	24 *	Reduce the length of the turn lane on structure over RR (500' to 200')	$235,000
Roadway	25 *	Reduce lane and sidewalk width on Henry Street	Design Suggestion
		Total	**$5,431,000**

Concurrences from July 9, 2019 meeting are noted below:

- *** New alternatives will consider**
- **** Rejected from further consideration**

OHIO DEPARTMENT OF TRANSPORTATION

LOCATION: ODOT District 12 **TIME:** 8:30 **DATE:** 7/9/2019

PROJECT: CUY-14-6.93; PID: 104132

SUBJECT: Value Engineering Study

ATTENDEES (Please Print)

NAME	*ORGANIZATION/TITLE*	*PHONE/EMAIL*
Erik Zippay	ODOT Construction	216-630-9724 Erik.Zippay@DoT.ohio
JEFF HEBERBRAND	" "	216.584.2155 jeffery.heberbrand@
Kyle Dohlen	ODOT - Geotechnical Engineer	216-584-2125 Kyle.dohlen@dot.ohio.gov
Jeff Crace	ODOT - C.O. Structures	614-466-2741 jeff.crace@dot.ohio.gov
Jim Sima	AECOM	216-622-2415 jim.sima@aecom.com
Zack Deems	AECOM	330-815-2535 zack.deems@aecom
Mark Wimer	AECOM	3308002743 mark.wimer@aecom.com
SCOTT BUCHANAN	AECOM	3308002730 scott.buchanan@AECOM.com
Mike Cronebach	ODOT - C.O. Roadway	614-752-9849 mike.cronebach@dot.ohio.g
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OHIO DEPARTMENT OF TRANSPORTATION

LOCATION: ODOT District 12 **TIME:** 8:30 **DATE:** 7/9/2019

PROJECT: CUY-14-6.93; PID: 104132

SUBJECT: Value Engineering Study

ATTENDEES (Please Print)

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AECOM

Project: CUY-14-6.93
PID: 104132
Date: 10-22-2019
Purpose: Proposed Scope of Services items for a modification to take the plan development from the Value Engineering (VE) Review Meeting held September 16, 2019 to a completed Alternatives Evaluation Report (AER).

1. Full Public and Stakeholder Involvement for NEPA Approval: As currently scoped, the AECOM team has just prepared a public involvement plan. This plan still needs approved by ODOT/FHWA, and then implemented. All stakeholders (park, hospital, city, adjacent owners, etc.) must be educated about the project and given ample opportunity to review and comment. This input must then be given legitimate consideration by the design team. Formal documentation is needed to show compliance with applicable State and Federal laws.

2. Shift the proposed bridge alignment over the RR lines to the west to build off line in one phase: As currently scoped, the AECOM team was tasked with minimizing R/W impacts for the proposed alternatives. Per Ideas 1 and 16 of the VE Review, the proposed alignment across the RR lines will move west and increase R/W impacts in the NW quadrant and in the portion of Garfield Park Reservation currently north of the existing SR 14 alignment. The advantage of this revision is that the proposed bridge across the RR lines can be built all in one phase off line (adjacent to the existing SR 14 alignment) rather than requiring multiple phases (and mobilizations, track down time coordination, overhead power shutdown windows, etc.). In addition to requiring further study of the NW quadrant area to determine feasibility and amount of additional R/W impacts in this area, additional environmental study work will be needed in this area.

3. Make the turn lane (WB SR 14 to SB Henry Street) length match the bridge length: This is related to the previous section. The turn lane storage length needed based on traffic counts is much shorter than that currently shown on the plans. However, the volume of through-traffic blocks access to this turn lane. The length in the current plans was chosen not only to move any taper of overall width off of the proposed bridge, but also to allow access to the turn lane even during heavy traffic flows. Idea 24 of the VE Review resulted in reducing the turn lane length to just match the proposed bridge length (longer than needed for queueing, but shorter than currently shown in the plans).

4. Detour Henry Street when needed to avoid phasing construction: As currently scoped, the AECOM team was tasked with keeping Henry Street open as much as possible throughout construction. Idea 13 of the VE Review suggests closing Henry Street when needed to simplify construction and be more economical. Henry Street can remain fully operational during a revised construction phase 1 as SR 14 is mostly built offline to the west. However, in construction phase 2, Henry Street will be closed to remove the existing facility, build the proposed facility, connect to the newly constructed phase 1, and completely replace the section of 22'x7' culvert through the existing 59.5' of Henry Street R/W width. Therefore, there is no reason to realign or relocate any section of this culvert as suggested in Idea 3 of the VE Review.

5. Run Various Travel Time Scenarios to determine impacts to emergency vehicle access: This is related to the previous section. The AECOM team, as part of the now proposed detouring of Henry Street, will determine travel time impacts to emergency vehicles which typically use Henry Street. This information will be needed for stakeholder engagement and public involvement.

6. Perform a Hydrology and Hydraulic (H&H) Study for the impacts of reducing bridge span: No H&H Study work is currently scoped for this project. During the preparation of the AER alternatives to date, it was determined that a flood zone does cross under the existing SR 14 bridge north of the RR lines. The currently proposed bridge similarly was placed (extended) to also span over this area. Ideas 7 and 11 of the VE Review suggest minimizing the overall bridge length across the RR lines by moving the abutments up against the R/W lines of the RR properties. Doing so would impact the flood zone. An H&H Study is therefore needed to determine the best method to mitigate this impact.

7. Add a tall culvert to the proposed Alternative #3 design to route Chaincraft Road through: This is related to the previous section. By moving the south wall abutment of the two-span bridge over the RR lines up against the RR property, a separate structure is needed to span over the relocated Chaincraft Road. Because the SR 14 and Henry Street intersection will be above the relocated Chaincraft Road, an additional bridge span is not ideal due to the intersection radii. Therefore, Idea 11 of the VE Review suggests placing a culvert (possibly atop retaining walls to provide vertical and horizontal clearance around the relocated 2-lane Chaincraft Road. Above this culvert, normal roadway treatment (embankment and pavement) can be placed to the required intersection geometry. A full revised alignment and intersection layout is needed to properly analyze this approach to make sure it is constructible and feasible for Chaincraft Road MOT due to locations of existing pier columns still needed during the phased construction before the existing facility is removed.

8. Extend the relocated Chaincraft Road further east: As currently scoped, the AECOM team was tasked with minimizing R/W impacts for the proposed alternatives. Alternative #3 relocates Chaincraft Road to the north adjacent to the southern RR property line from just west of the proposed SR 14 alignment to east of the SR 14 alignment and past the first parcel to the east. A full parcel purchase is currently proposed of the second parcel east of the project to tie back to existing. Idea 10 of the VE Review suggests extending the relocation of Chaincraft Road further east to avoid the need to fully purchase that useful second parcel. The AECOM team will need to investigate design feasibility (proposed roadway widths, truck turning movements, etc.), and additional roadway and R/W costs of the most viable such design meeting this suggestion. Then, environmental study work on the potentially newly impacted parcels, additional stakeholder engagement, and additional public involvement will also be required.

9. Reduce lane and sidewalk widths along Henry Street: Idea 25 of the VE Review suggests reducing the sidewalk and lane widths on Henry Street from those currently proposed, and also look into possibly reducing Henry Street to just 2 lanes instead of 3 near the intersection with SR 14. The AECOM team will analyze traffic counts and the needed turning radii both at the intersection with SR 14 and at the sharp turn just south of the intersection. We will also coordinate with the City of Garfield Heights and PARTA to determine any minimum requirements needed in this area.

Appendix L

AECOM

Hydrology & Hydraulics Report

The CUY-14 crossing of the Mill Creek floodplain in Cuyahoga County, Ohio
Bridge No. CUY-00014-06930 (SFN 1801805)
PID No. 104132

Prepared For:
Ohio Department of Transportation: District 12

Ohio Department of
Transportation

Prepared By:
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June 15, 2020

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Figures

Tables

1. Introduction

1.1 Project Location

The project is located on Broadway Avenue (CUY-14) at the crossing of Mill Creek, approximately 1.1 miles west of Interstate Highway 480 in the city of Garfield Heights, Cuyahoga County, Ohio. The project location is shown below in **Figure 1**.

Figure 1. Project Location Map

1.2 Project Overview

This report was prepared for Ohio Department of Transportation (ODOT) District 12 for the replacement of the existing structure on Broadway Avenue over Mill Creek in Cuyahoga County, Ohio.

Broadway Avenue has a functional classification of urban principal arterial. Average daily traffic (ADT) information was obtained from an Ohio Department of Transportation (ODOT) Certified Traffic Report. The opening year ADT in 2026 is 18,500 for two-way traffic, and the future ADT in the design year of 2046 is 19,000. The existing Bridge Inventory Report is included in **Attachment A1**.

The existing bridge was built in 1929 (with a project which also rerouted Henry Street), was re-decked and widened in 1986, and received maintenance repairs in 2000 and 2010. The existing bridge within the study area consists of a unique steel floorbeam-and-stringer system with a non-composite reinforced concrete deck. The substructure units in the study area consist of columns supporting the floor beams, with integral crash walls between the columns. The structure has multiple spans with a total span of 1371’-6”, and the bridge deck is 63’-0” wide. The existing deck drainage consists of scuppers and downspouts. Existing bridge plans can be found in **Attachment A2** of this report.

This Hydrologic and Hydraulics (H&H) Report and Structure Type Study was prepared in accordance with the ODOT Bridge Design Manual and the Location and Design Manual, Vol. 2, Sections 1003, 1004, 1005, 1006, 1107, and 1118.

2. Hydrologic Analysis

2.1 Design Storm

ODOT Location and Design Manual (L&D), Vol. 2, Section 1004.2 states that freeways or other multi-lane facilities with limited access require the 50-year discharge for hydraulic design. Per L&D Vol. 2, Section 1118.2.1, analysis of the 100-year and 500-year discharge is also required.

The design storm for this analysis is the 100-year, 24-hour event. The structure carrying Broadway Avenue is not located across the main channel of the floodplain but crosses a small overflow of the main floodway. Results for the 50- and 500-year storm events are not included in this report.

2.2 FEMA Floodplain Information

The CUY-14 crossing at Mill Creek is located within a Federal Emergency Management Agency (FEMA) floodplain Zone A. The project site is located on FEMA map panel 39035C0211E. **Attachment B1** provides the FEMA National Flood Hazard Layer (NFHL) map in the vicinity of the study area along with excerpts from the Cuyahoga County Flood Insurance Study (FIS).

Due to the complex nature of the floodplain at the project location, several sources were contacted to obtain the necessary data for this analysis. The Ohio Department of Natural Resources (ODNR) floodplain coordinator list was consulted with regards to the Garfield Heights floodplain coordinator. The Garfield Heights floodplain coordinator was contacted via email and voice message with no response. Additional attempts to reach the floodplain coordinator were attempted by contacting the building commissioner’s office with no response. Since the study area was adjacent to the Mill Creek FEMA Zone AE floodplain, an FIS data request was placed with FEMA. The data request was returned with HEC-2 modeling for FEMA cross sections A-N, which were downstream of the study area for this analysis. The data required for this analysis was for FEMA cross sections P-U. The Cuyahoga County FIS report indicates the floodplain analysis for the study area was completed in 1986. An additional analysis was conducted on the reservoir adjacent to the study area. The FIS indicates a hydrologic study was prepared for the reservoir that developed flood hydrographs, and the discharge-frequency curves for Mill Creek were adjusted based on the results.

Since no information was able to be obtained from the FIS study, AECOM prepared this analysis based on the best available information. The model serves as a comparison of existing versus proposed conditions and does not accurately reflect the analysis prepared in the FIS. Due to the complexity of the floodplain within the study area, a traditional HEC-RAS 1D analysis would not be able to accurately depict the hydraulics. An approach utilizing HEC-RAS 2D was discussed with ODOT: District 12 and deemed acceptable.

Peak flow values in the HEC-RAS model were taken directly from the FIS. Several flows were taken at multiple points along Mill Creek. Additionally, multiple StreamStats reports were ran along Mill Creek and the tributaries that drain to Mill Creek within the study area. The StreamStats reports are provided in **Attachment B2**. The peak flows used in the HEC-RAS model are summarized in **Table 1**.

Table 1. HEC-RAS Peak Flow Summary

Location	Drainage Area (sq mi)	Source	FEMA Section	Peak Flow (cfs) 50-yr	100-yr	500-yr
UNT Pompili	0.91	StreamStats	-	338	401	564
UNT I-480	1.69	StreamStats	-	790	956	1,400
Wolf Creek	2.18	StreamStats	-	810	973	1,400
At Garfield Hts US	6.67	**FEMA**	**U**	1,670	**2,150**	2,650
Mill Creek - Upper	7.42	StreamStats	-	1,870	2,220	3,130
Just DS of UNT I-480	8.26	**FEMA**	**-**	2,560	**3,000**	4,100
Mill Creek - Middle	9.32	StreamStats	-	2,230	2,650	3,730
Just DS of Wolf Creek	10.66	**FEMA**	**R**	2,720	**3,370**	4,500
At Garfield Hts DS	12.7	FEMA	Past DS Bound	3,150	3,820	5,200

Since HEC-RAS 2D requires the use of an unsteady-state analysis, the peak flows provided in **Table 1** were used to develop flow hydrographs as boundary conditions in the model. HydroCAD v10.00 was used to develop approximate flood hydrographs using an SCS Type II, 24-hour storm distribution. Rainfall data were obtained from the National Oceanic and Atmospheric Administration (NOAA) Precipitation Frequency Data Server (PFDS) with the location set to Garfield Heights, Ohio.

The flood hydrographs were adjusted to develop identical peak flows to the values used in the FIS. Each subcatchment was calibrated so the peak flows line up at the same time step for each flood hydrograph at the model boundary conditions. The flood hydrograph development is summarized in **Attachment B3**.

2.3 Downstream Boundary Condition

The downstream boundary condition selected for this analysis was normal depth. A downstream slope of 0.00463 ft/ft was used for the analysis based on the stream inverts provided in the Cuyahoga County FIS.

3. Hydraulic Analysis

3.1 Existing Structure

3.1.1 Cross Section Geometry

The hydraulic analysis of the stream and structure was performed using HEC-RAS. A preliminary 1D model was created to begin the modeling process. Cuyahoga County National Flood Hazard Layer (NFHL) data were downloaded and used as a basis for the model. Cross sections were placed along the Mill Creek Zone AE floodplain as shown in the FIS. Additional cross sections were placed as necessary to accurate define the channel geometry.

LiDAR data from the Ohio Geographically Referenced Information Program (OGRIP) were downloaded from the 2011 Ohio Statewide Imagery Program I (OSIP I). The LiDAR data were used to create a terrain for the study area and to cut geographically referenced information for the cross sections. Additionally, an approximate trapezoidal channel was cut in each cross section based on the inverts shown in the Cuyahoga County FIS. Once the 1D model was complete, a detailed terrain based on the cross section geometry in the channel was cut and incorporated into an overall terrain.

Once the terrain was finalized for the model, a 2D flow area was created for the study area. Boundary conditions were included at the Mill Creek upstream and downstream boundaries within the study area, the Unnamed tributary near I-480, the Unnamed tributary near Pompili Precast Concrete, and Wolf Creek. Breaklines were added along high points in the model including roads and railroads. Weir connections were created for the CUY-14 structure and for the existing 22’ x 7’ box culvert that carries Mill Creek beneath Chaincroft Road, Henry Street, and Garfield Parkway. A base cell spacing of 50’ x 50’ was assumed for the study area, with more detailed cell spacing along breaklines and weir connections.

The model horizontal projection is NAD83, Ohio North Zone, US Survey feet, and the vertical datum is NAVD88.

3.1.2 Hydraulic Model Variables

Manning’s ‘n’ values for the 2D flow area were assigned by utilizing a land cover layer. Land cover data for the study area were obtained from the 2016 National Land Cover Database (NLCD). A Manning’s ‘n’ land cover map layer was created by assigning ‘n’ values to each unique land cover type. Additional detail was provided to the roughness layer by adjusting the values in the Mill Creek main channel. **Table 2** below summarizes the Manning’s coefficients used in the model.

Table 2. Manning’s ‘n’ Values

Name	Manning’s value
Barren Land Rock / Sand / Clay	0.04
Deciduous Forest	0.10
Developed, High Intensity	0.10
Developed, Medium Intensity	0.06
Developed, Low Intensity	0.045
Developed, Open Space	0.04
Grassland / Herbaceous	0.045

Name	Manning's value
Open Water	0.035
Pasture / Hay	0.05
No Data	0.035
Refinement Region	0.035

The existing channel at the project location can best be described as a natural stream that is straight with some weeds and stones. A Manning's roughness coefficient ('n' value) of 0.035 was used for the main channel sections. Roughness coefficients for the overbanks were estimated based on the HEC-RAS Hydraulic Reference Manual. Pictures of the study area are included in **Attachment A3**.

The ordinary highwater mark (OHWM) is typically determined in the field by observing changes in the channel banks and comparing the selected location to the natural water surface. An OHWM was not determined at the structure since the structure crosses the 100-year floodplain and does not convey water under ordinary conditions.

3.1.3 Existing Bridge Geometry

The existing bridge was built in 1929 (with a project which also rerouted Henry Street), was re-decked and widened in 1986, and received maintenance repairs in 2000 and 2010. The existing bridge within the study area consists of a unique steel floorbeam-and-stringer system with a non-composite reinforced concrete deck. The substructure units in the study area consist of columns supporting the floor beams, with integral crash walls between the columns.

Since the primary purpose of the structure is to span several roadways crossing underneath, the low chord is significantly above the Mill Creek floodplain. Due to the overall complexity of the HEC-RAS model and potential model instabilities caused by the inclusion of detailed bridge data in a 2D analysis, the bridge piers were not modeled. The structure itself was omitted from the model as the abutments and piers were represented in the terrain surface and the bridge deck is well above the floodplain. A weir connection was included at the existing bridge to ensure model accuracy underneath the structure. The HEC-RAS 2D plan view for the existing conditions geometry is provided in **Attachment C1**.

3.2 Proposed Structure

The proposed structure within the study area consists of continuous steel plate girders with a composite reinforced concrete deck, supported on reinforced concrete wall-type piers and abutments. The forward abutment of the proposed structure was brought in by approximately 500 feet at the direction of the Department. The proposed forward abutment encroaches on the FEMA Zone A floodplain within the study area by approximately 5,200 square feet. The purpose of this analysis is to model the difference between existing and proposed conditions and to determine the change in floodplain extents due to the proposed abutment location. Preliminary proposed bridge plans are included in **Attachment A4**.

Similarly to the existing bridge, the proposed structure was not modeled in detail in the proposed conditions HEC-RAS analysis. Rather, the new abutment grading was brought into the HEC-RAS terrain, and the revised abutment location was represented in the weir connection for CUY-14. The existing roadway elevation will be maintained for both options. The HEC-RAS 2D plan view for the proposed conditions geometry is provided in **Attachment C2**.

4. Results and Conclusions

4.1 Hydraulics

This hydraulic and hydrologic analysis is in accordance with the **ODOT L&D, Volume 2** and the scope as defined in the contract. A summary and comparison of the HEC-RAS Results is provided in **Attachment C4**.

4.1.1 Backwater

The project site is located within a FEMA Zone A floodplain; therefore, a no-rise condition is preferred, but not required, for the 100-year water surface at the proposed bridge. The following **Table 3** compares the proposed structure to existing conditions. The headwater (HW) water surface elevations (WSE)s and maximum velocities are taken at the proposed weir connection in the HEC-RAS 2D model. A profile was taken along the proposed structure alignment, and the existing and proposed conditions were compared.

Table 3. Comparison of Existing vs. Proposed Water Surface Elevation

Structure	HW_{100} (ft.)	V_{100} (ft/s)
Existing	820.77	3.08
Proposed	821.19	1.76

As can be seen in **Table 3**, the 100-year headwater is increased by approximately 0.42 feet for the proposed bridge. As the structure is located within a FEMA Zone A, a no-rise condition is preferred but not required. The proposed water surface does not come into contact with the new bridge abutment, so the difference is most likely due to the relocation of the Broadway Avenue weir connection in the 2D model. The maximum velocity was also taken near the proposed structure abutment and was determined to decrease in the proposed condition.

4.1.2 Freeboard

Per **ODOT L&D, Vol. 2, Section 1006.3, Part A**, the existing headwater in a bridge replacement project for the design storm and check flood is to be matched to the maximum extent possible. Any increase in the headwaters requires verification of the upstream impacts of an increase of headwater. Additionally, **ODOT L&D, Vol. 2, Section 1005.1** states that inundation of the highway is not permitted for the design-year storm event.

The proposed structure is located significantly above the 100-year flood extents. The low chord of the proposed structure is approximately 851 ft. where it crosses the 100-year floodplain and the proposed water surface elevation is 821.19 ft. Highway Freeboard and Structure Freeboard are of no concern in this analysis.

ODOT L&D, Vol. 2, Section 1118.2.2, Part D requires an approximation of the flood peak discharge frequency of roadway overtopping. Due to a difference of approximately 30 feet between the bridge low chord and maximum water surface elevation for the 100-year storm event, overtopping of the highway is highly unlikely.

4.1.3 Scour

The existing bridge inspection reports indicated no scour issues underneath the structure where the FEMA Zone A floodplain is shown. Scour calculations were not performed for the proposed structure, and no scour countermeasures are required.

4.2 Flood Risk

A discussion of capital costs and risks is required per **ODOT L&D, Vol. 2, Section 1118.2.2, Part A**. Since this project is located within a FEMA Zone A and a HEC-RAS 2D model was prepared for the area, a map showing inundation area for the 100-year storm event was created. See **Attachment C3** for a comparison of the existing and proposed floodplain extents.

The floodplain extents were compared for existing and proposed conditions. As can be seen in **Attachment C3**, the floodplain extends are nearly the same, although the proposed extents are slightly larger. Since the proposed structure abutment does not come in contact with the floodplain, the increase is most likely due to model calculation differences from the relocation of the Broadway Avenue weir connection in the HEC-RAS 2D model.

Multiple data sources were investigated for the floodplain studies conducted on the Mill Creek floodplain. Since the latest hydraulic modeling of the Mill Creek floodplain was performed in the 1980s, AECOM believes the FEMA Zone A floodplain extents were estimated based on adjacent hydrologic and hydraulic analyses of the study area. Detailed information on the FIS study was unavailable for the study area; therefore, an approximate model was created using HEC-RAS 2D. The model indicated an increase of approximately 5 inches at the proposed structure encroachment. A more detailed floodplain analysis with an expanded scope would be required to create an accurate hydraulic model of the Mill Creek floodplain.

Based on the reasons listed above, AECOM recommends that no mitigation is provided for the proposed encroachment on the floodplain.

Attachment A – General Information

Attachment A1 – Bridge Inventory Report

(203) Bridge (Dedicated) Name:
BRIDGE INVENTORY AND APPRAISAL
Report Date: 1/8/2019
Structure File Number: 1801805
Inventory Bridge Number: CUY 00014 06930
Sufficiency Rating: 045.4 Deficiency Rating: SD
NSC,W&LE RR @ HENRY ST.
Bridge Status: Active

(2) District: 12
(4) FIPS Code: CUY-M-29428-GARFIELD HEIGHTS
(102) Direction of Traffic: 2 - 2-Way Traffic
(3) County: 18-CUYAHOGA
Owner: OHIO DEPT OF TRANSPORTATION
(103) Temporary Structure:
(9) Location: Approx 2Mi W Cnty144
(208) Route On Bridge: State (Odot) (Toll Free)
(110) Designated National Network: Not National Network
(42A) Type Serv (On): Highway-Pedestrian
(7) Facility Carried: Sr14
(207) Route Under Bridge: Non Highway Traffic On Bridge (I.E.
(101) Parallel: N
(42B) Type Serv (Under): Railroad

INVENTORY ROUTE DATA
(5A) Route On/Under: 1 - Route Carried "On" The Structure
(5B) Hwy Sys: 3 - State Highway
(5D) Route No: 00014 (5E) Dir: Not Applic (5C) Des: Mainline
(6) Feature Int: Nsc,W&Le Rr @ Henry St.
(200) CL: 06930 (201)Spec Des: (209) Interstate Mile:
(29) Avg. Daily Traffic(ADT): 12,155 (30) ADT Year: 2015
(235) Truck Traf: 1,339 (210) Corridor: N (104) NHS: route is on the nhs
(26) Functional Class: urban - other principal (100) Strahnt: Route Is Not A Strahnet

INTERSECTED ROUTE DATA
(370A) Record Type: (370B) Hwy Sys:
(370D) Route No: (370E) Dir: (370C) Des:
(373) Feature Int:
(382) CL: 0000 (371) Interstate Mile: (387) Special Desig:
(379) Avg. Daily Traffic(ADT): 0 (380) ADT Year: 0
(381) Truck Traf: 0 (384) Corridor: (378) NHS: -
(375) Functional Class: (386) Strahnt:

CLEARANCE ON THE BRIDGE
Min. Hriz on Bridge: (335) NC: 0.0 Ft (47) Card: 52.0 Ft
(53) Prac Max Vert On Brg: 9999.9 Ft
Min Vrt Clr On Brg: (336) NC: 0.0 Ft (10) Card: 9999.9 Ft
Min Latl Clr: (338) Right NC: 0.0 Ft (337) Right Card: 2.0 Ft
(340) Left NC: 0.0 Ft (339) Left Card: 2.0 Ft

(45) Main Spans Number: 9 (43) Type: Steel /Beam /Continuous
(46) Approach Spans Nbr: 47 (44) Type: Concrete /Beam /Simple
(307) Total Spans: 56 (48) Max Span: 65.0 Ft (49) Overall Leng: 1359.0 Ft

SUBSTRUCTURE
Abut-Rear (532) Matl: Concrete (531) Type: Pedestal (533) Fnd: Cast-In-Place Reinforced Concrete Piles
Abut-Fwd (527) Matl: Concrete (526) Type: Pedestal (528) Fnd: Cast-In-Place Reinforced Concrete Piles
Pier-Pred (535) Matl: Concrete (534) Type: Capped Column (536) Fnd: Cast-In-Place Reinforced Concrete Piles
(663) Stream Velocity: 00000 fps (113) Scour: Bridge Not Over Waterway.
(92B) Underwater Inspection: N Freq: 0 (655) Chan Prot: Not Applicable
(93B) Date of last Underwater Insp: (657) Drainage Area: 000 Sq Mi

CLEARANCE UNDER THE BRIDGE
Min. Horiz Under Clear: (326) NC: 0.0 Ft (325) Card: 0.0 Ft
(328) Prac Max Vrt Under Clear: 29.5 Ft
Min Vert Under Clear: (327) NC: 29.2 Ft (54) Card: 29.5 Ft
Min Lat Under Clear: (329) Right NC: 0.0 Ft (55) Right Card: 9.0 Ft
(330) Left NC: 0.0 Ft (56) Left Card: 9.0 Ft

STRUCTURE INFORMATION
(19) Bypass Length: 4.0 Miles
(16) Latitude: 41 Deg 25 Min 55.13 Sec (17) Longitude: 81 Deg 36 Min 08.43 Sec
(20) Toll: On Free Road, The Structure Is Toll Free
(263) Date Built: 7/1/1929 (264) Major Reconstruction Date:
(28A) No. Lanes On: 4 (28B)No. Lanes Under: 0
(301) Horiz Curve: 00D00M (34) Skew: 0 Deg
(32) App. Rdw Width: 50 Ft (51) Brg. Rdw Width: 52.0 Ft
(52) Deck Width: 62.3 Ft (424) Deck Area: 84711 Sq. Ft
(406) Median Type: /Non Barrier /No Joint
(33) Bridge Median: No Median
Sidewalks: (50A) Left 5.0 Ft (50B) Right 5.0 Ft
Type Curb or Sidewalk:
(427) Left Matl: Concrete (428) Type: Sidewalk (Greater Than 2' In Width)
(429) Right Matl: Concrete (430) Type: Sidewalk (Greater Than 2' In Width)
(35) Flared: 1 (408) Composite: U - Not Applicable

LOAD RATING INFORMATION
(31) Design Load: H15
(64) Opr Rat Fact/Ton: 1.935
(66) Inv Rat Fact/Ton: 1.160
(734) Ohio Percent of Legal Load: 130
(704) Year of Rating: 2007 (708) Rate Soft: Combination
(63) Opr Rat Method: Load Factor Rating (Lfr) Reported By Rf
(65) Inv Rat Method: Load Factor Rating (Lfr) Reported By Rf
Load Rater: (705) Youssef (706) Seif (707) PE#: 59487

APPRAISAL
(71) Waterway Adequacy: N Not Applicable
(72) Approach Alignment: 8 Equal to present desirable criteria
(67) Calc Str Appraisal: 4 - Meets minimum tolerable limits
(68) Calc Deck Geometry: 4 - Meets minimum tolerable limits
(69) Calc Underclearance: 4 - Meets minimum tolerable limits

APPROACH INFORMATION
(401) Approach Guardrail: Steel Beam
(403) Approach Pavement: Bituminous (402) Grade: Good

CULVERT INFORMATION
(575) Culvert Type: Not A Culvert Or Rigid Frame (578) Length: 0.0 Ft
(580) Depth of Fill: 0.0 Ft (582) Headwalls: None Or Not Applicable (Not A Culvert)

GENERAL INFORMATION
(475) Main Member: Welded Built-Up Steel (477) Moment Plate: No Moment Plates
(414) Expansion Joint: Compression Seal
(453) Bearing Devices: Rockers & Bolsters

(203) Bridge (Dedicated) Name:

BRIDGE INVENTORY AND APPRAISAL

Report Date: 1/8/2019

Structure File Number: 1801805

Inventory Bridge Number: CUY 00014 06930

Sufficiency Rating: 045.4 Deficiency Rating: SD

NSC,W&LE RR @ HENRY ST.

Bridge Status: Active

(407) Railing: Other

(409) Deck Drainage: Scuppers And Downspouts

(107) Deck Type: Concrete Cast-In-Place

Deck Protection: (108B) External: Epoxy

(108C) Internal: Not Applicable (Applies Only To Bridges

(108A) Wearing Surface: Latex Modified Concrete (Lmc) - Overlay

(423) Thickness: 1.2 in (422) Date of Wearing Surface: 7/1/1986

(547) Slope Protection: None

(38) Navigation: N | (39) Nav Vert Clr: 0.0 Ft | (40) Nav Horiz Clear: 0.0 Ft

(92C) Spec Insp: N | Freq: 0 | (93C) Special Inspection Date:

(92A) Fracture Critical Insp: Y | Freq: 24 | (93A) Fracture Critical Feature Inspection Date: 7/10/2018

(474) Main Structure System: Other

(468) Hinges: Not Applicable (Structures With No Hinge

(487) Structural Steel Memb: Unknown

(465) Framing:

(482) Paint: Paint System B

(426) Bridge Railing Steel: U

(483) PCS Date: 1/1/1988

GENERAL INFORMATION (CONTINUED)

(37) Hist Significance: Not Eligible For National Register Of Hi

(112) NBIS: Y

(842) Hist/Designer: Ohio State Highway Department

(827) Hist Build Year: 1929

(828) Hist Type: Deck

(98A) Border Bridge State:

(98B) Border Bridge Resp:

(99) Border Bridge SFN:

PROPOSED IMPROVEMENTS

(114) Future ADT (On Bridge): 16871

(115) Year of Future ADT: 2038

ORIGINAL PLANS INFORMATION

(250) Fabricator:

(249) Contractor:

(248) Ohio Original Construction Project No: 099427

(252) Microfilm Reel:

(251) Standard Drawing:

Aperture Cards:

(246) Orig: Y

(247) Repair: N

(245) Fabr: N

(709) Rating Source: 1 Plan Information Available For Load Rati

INSPECTION SUMMARY

(58) Deck: 5

(59) Superstructure: 4

(60) Substructure: 5

(62) Culvert: N

(61) Channel: N

(C6) Approaches: 6

General Appraisal: 4

(41) Operational Status: A

(90) Inspection date: 10/30/2018

(91) Desig Insp Freq: 12 Mos

SURVEY ITEMS

(36A) Railings: Meets Acceptable Standards

(36B) Transitions: Meets Acceptable Standards

(36C) Guardrail: Meets Acceptable Standards

(36D) Guardrail Ends: Meets Acceptable Standards

(219) Temporary Barrier: N

(223) Temporary Shoring: N

(224) Temporary Sub Decking: N

(253) SFNs Replacing this retired bridge:

(255) SFNs That were replaced by this bridge:

UTILITIES

(265) Electric Line:	U
(266) Gas Line:	U
(269) Sanitary Sewer:	U
(267) Telephone Line:	U
(268) TV Cable:	U
(270) Water Line:	U
(271) Other Utilities:	U

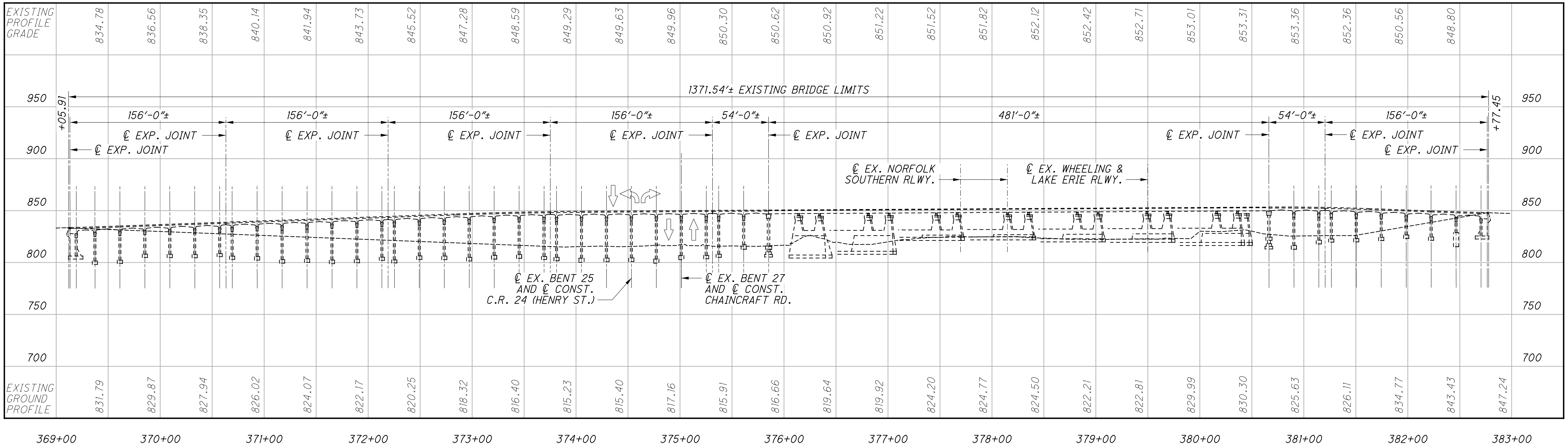
SPECIAL FEATURES

(283) Lighting:	Y
(431) Fence:	Y
(433) Glare-Screen:	N
(436) Splash-Guard:	N
(459) Catwalks:	N
(271) Other-Feat:	U
(279) Signs-On:	Y
(281) Signs-Under	N
(432) Fence-Ht on Bridge	0.0 FT
(434) Noise Barrier Walls	N

Insp 1st:	1 - Ohio State Transportation Department
2nd:	
3rd:	
(21) Major Maint 1st:	1 - Ohio State Transportation Department
2nd:	
3rd:	
(225) Routine Maint 1st:	4 - City Or Other Local Agency
2nd:	
3rd:	

Attachment A2 – Existing Bridge Plans

pw:\\aecom-na-pw.bentley.com:AECOM_DS20_NA_2019\Documents\60581903-CUY-14-6.93\104132_CUY-14-0693\Design\Structures\CUY-14-0693C\Sheets\014_0693C_SG001.dgn Sheet 6/12/2020 11:55:27 AM todd.roxbe



EXISTING PROFILE ALONG ℄ SURVEY S.R. 14 (BROADWAY AVE.)

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED CMA	DRAWN CMA	REVIEWED ZRD	DATE 6/20
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER 1081085	

EXISTING PROFILE - BROADWAY AVENUE

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

Attachment A3 – River & Bridge Pictures

Figure 2. Birds Eye View of Study Area – Looking North

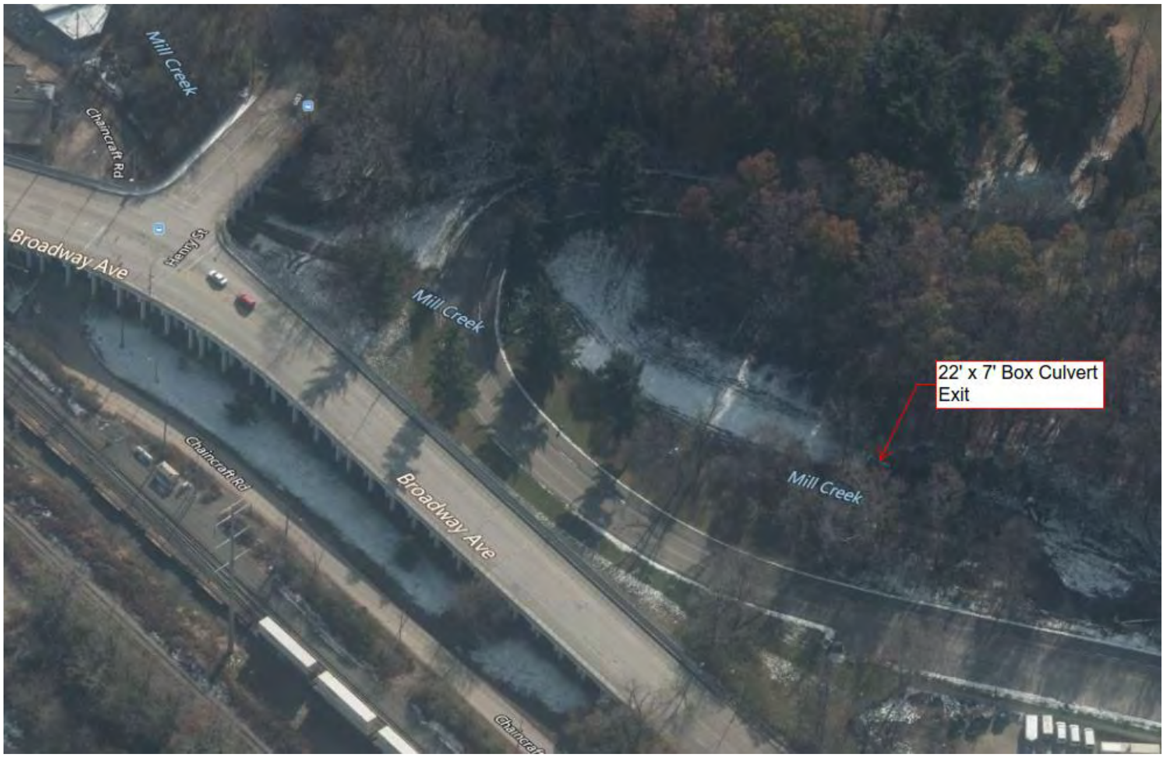
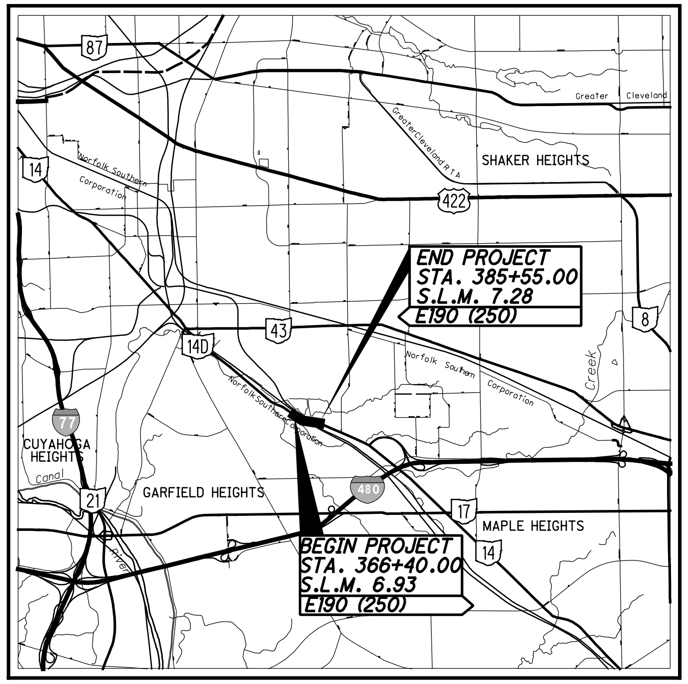


Figure 3. Bird's Eye View of Study Area – Looking South

Figure 4. CUY-14 Structure – Looking North

Figure 5. Flooding near Zone A Floodplain – Looking North

Attachment A4 – Preliminary Proposed Bridge Plans



LOCATION MAP

LATITUDE: N41°25'55" LONGITUDE: W81°36'08"

SCALE IN MILES
0 1 2 3 4

N

PORTION TO BE IMPROVED
INTERSTATE HIGHWAY
FEDERAL ROUTES
STATE ROUTES
COUNTY & TOWNSHIP ROADS
OTHER ROADS

STATE OF OHIO

DEPARTMENT OF TRANSPORTATION

CUY-14-06.93

RECONSTRUCTION OF EXISTING SEPARATED CROSSING WITH THE NORFOLK SOUTHERN AND THE WHEELING & LAKE ERIE RAILWAYS

CITY OF GARFIELD HEIGHTS CUYAHOGA COUNTY

INDEX OF SHEETS:

PROJECT DESCRIPTION

EARTH DISTURBED AREAS

PROJECT EARTH DISTURBED AREA:	ACRES
ESTIMATED CONTRACTOR EARTH DISTURBED AREA:	ACRES
NOTICE OF INTENT EARTH DISTURBED AREA:	ACRES

LIMITED ACCESS

THIS IMPROVEMENT IS ESPECIALLY DESIGNED FOR THROUGH TRAFFIC AND HAS BEEN DECLARED A LIMITED ACCESS HIGHWAY OR FREEWAY BY ACTION OF THE DIRECTOR IN ACCORDANCE WITH THE PROVISIONS OF SECTION 5511.02 OF THE OHIO REVISED CODE.

2019 SPECIFICATIONS

THE STANDARD SPECIFICATIONS OF THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, INCLUDING SUPPLEMENTAL SPECIFICATIONS LISTED IN THE PLANS AND CHANGES LISTED IN THE PROPOSAL SHALL GOVERN THIS IMPROVEMENT.

ALTERNATIVE EVALUATION REPORT 6/15/20

DESIGN DESIGNATION (*CERTIFIED TRAFFIC HAS NOT BEEN PROVIDED)

ROUTE	ADT (2018)	ADTT (2018)	ADT (2048)	ADTT (2048)	D	DESIGN SPEED	LEGAL SPEED	DESIGN FUNC. CLASS.	NHS ROUTE?
S.R. 14 (BROADWAY AVE)	20222*	687*	20222*	687*	0.60*	35	35	URBAN PRINCIPAL ARTERIAL	Y
C.R. 24 (HENRY STREET)	6641*	66*	6641*	66*	0.53*	25	25	LOCAL ROAD	N
CHAINCRAFT						25		LOCAL ROAD	N

DESIGN EXCEPTIONS

UNDERGROUND UTILITIES
Contact Two Working Days Before You Dig

OHIO811.org
Before You Dig

OHIO811, 8-1-1, or 1-800-362-2764
(Non-members must be called directly)

PLAN PREPARED BY:
AECOM
1300 E. 9th STREET, SUITE 500 CLEVELAND, OHIO 44114
(216) 622-2300

ENGINEERS SEAL:

SIGNED:
DATE:

ENGINEERS SEAL:

SIGNED:
DATE:

STANDARD CONSTRUCTION DRAWINGS					SUPPLEMENTAL SPECIFICATIONS	SPECIAL PROVISIONS

I HEREBY APPROVE THESE PLANS AND DECLARE THAT THE MAKING OF THIS IMPROVEMENT WILL NOT REQUIRE THE CLOSING TO TRAFFIC OF THE HIGHWAY EXCEPT FOR THE SIDE ROADS AS DESCRIBED ON SHEETS AND THAT PROVISIONS FOR THE MAINTENANCE AND SAFETY OF TRAFFIC WILL BE AS SET FORTH ON THE PLANS AND ESTIMATES.

APPROVED
DATE DISTRICT DEPUTY DIRECTOR

APPROVED
DATE DIRECTOR, DEPARTMENT OF TRANSPORTATION

FEDERAL PROJECT NO.
E190250

PID NO.
104132

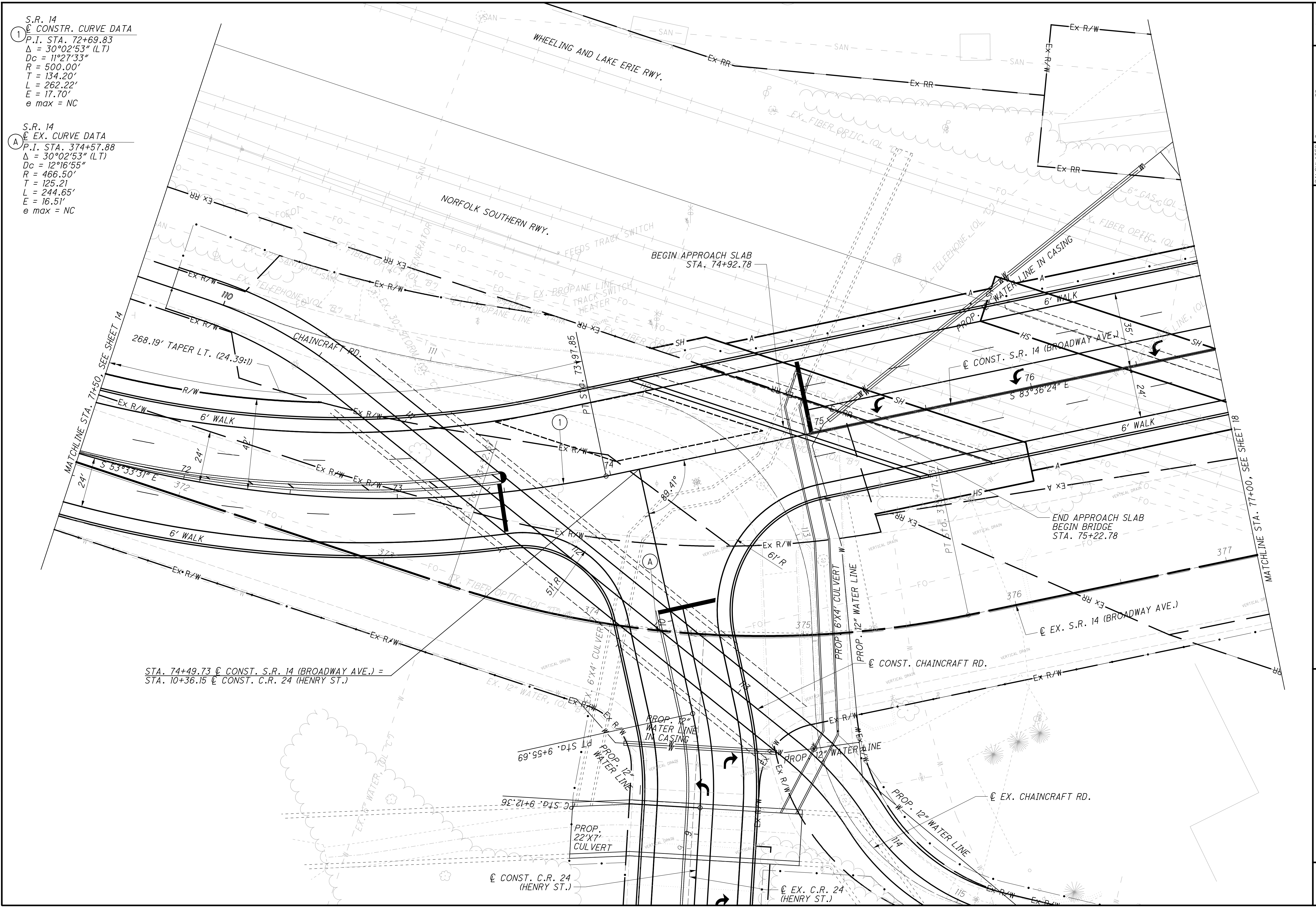
CONSTRUCTION PROJECT NO.

RAILROAD INVOLVEMENT
NORFOLK SOUTHERN
WHEELING & LAKE ERIE

pw:\\aecom-na-pw.bentley.com:AECOM_DS20_NA_2019\Documents\60581903-CUY-14-6.93\104132_CUY-14-0693\Design\Roadway\Sheets\104132_GP3002.dgn Sheet 6/12/2020 11:52:08 AM todd.roxberry

S.R. 14
① ℄ CONSTR. CURVE DATA
P.I. STA. 72+69.83
Δ = 30°02′53″ (LT)
Dc = 11°27′33″
R = 500.00′
T = 134.20′
L = 262.22′
E = 17.70′
e max = NC

S.R. 14
Ⓐ ℄ EX. CURVE DATA
P.I. STA. 374+57.88
Δ = 30°02′53″ (LT)
Dc = 12°16′55″
R = 466.50′
T = 125.21
L = 244.65′
E = 16.51′
e max = NC



0 10 20 40
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PLAN - S.R. 14 (BROADWAY AVE.)
STA. 71+50 TO STA. 77+00

CUY-14-6.93

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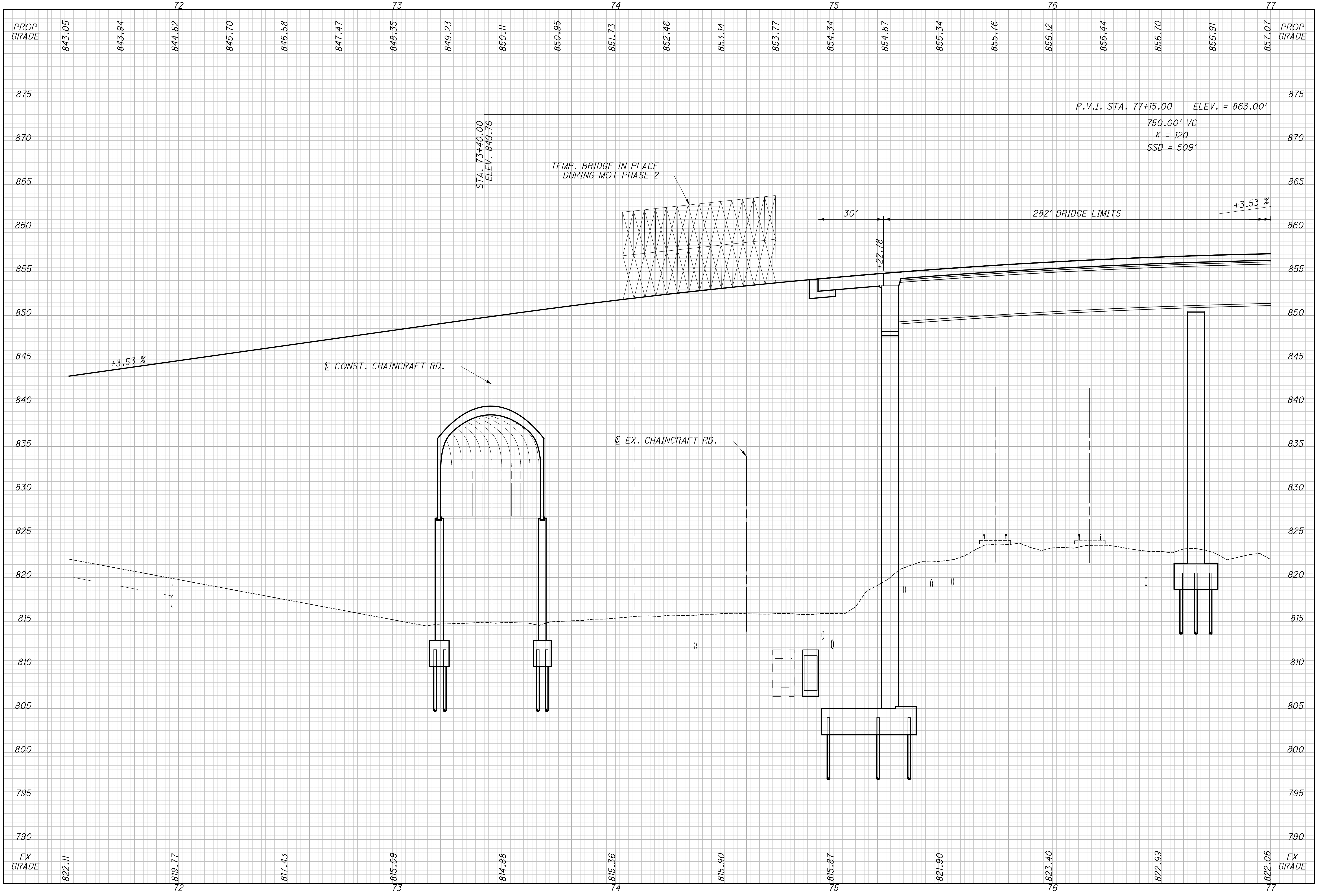
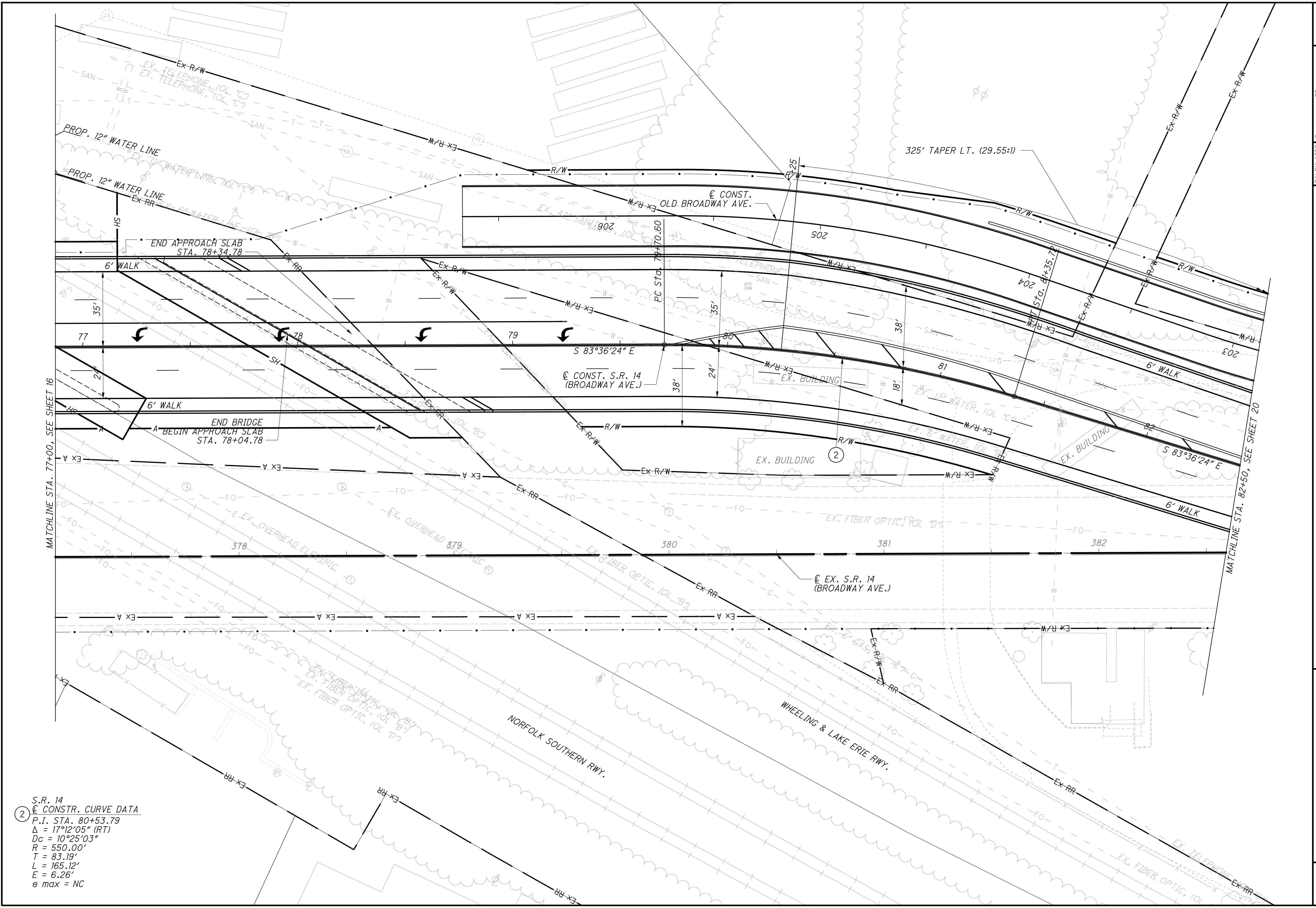


CALCULATED RJJ
CHECKED JMS

PROFILE - S.R. 14 (BROADWAY AVE.)
STA. 71+50 TO STA. 77+00

CUY-14-6.93

pw:\\aecom-na-pw.bentley.com:AECOM_DS20_NA_2019\Documents\60581903-CUY-14-6.93\104132_CUY-14-0693\Design\Roadway\Sheets\104132_GP3003.dgn Sheet 6/12/2020 11:52:33 AM todd.roxberry

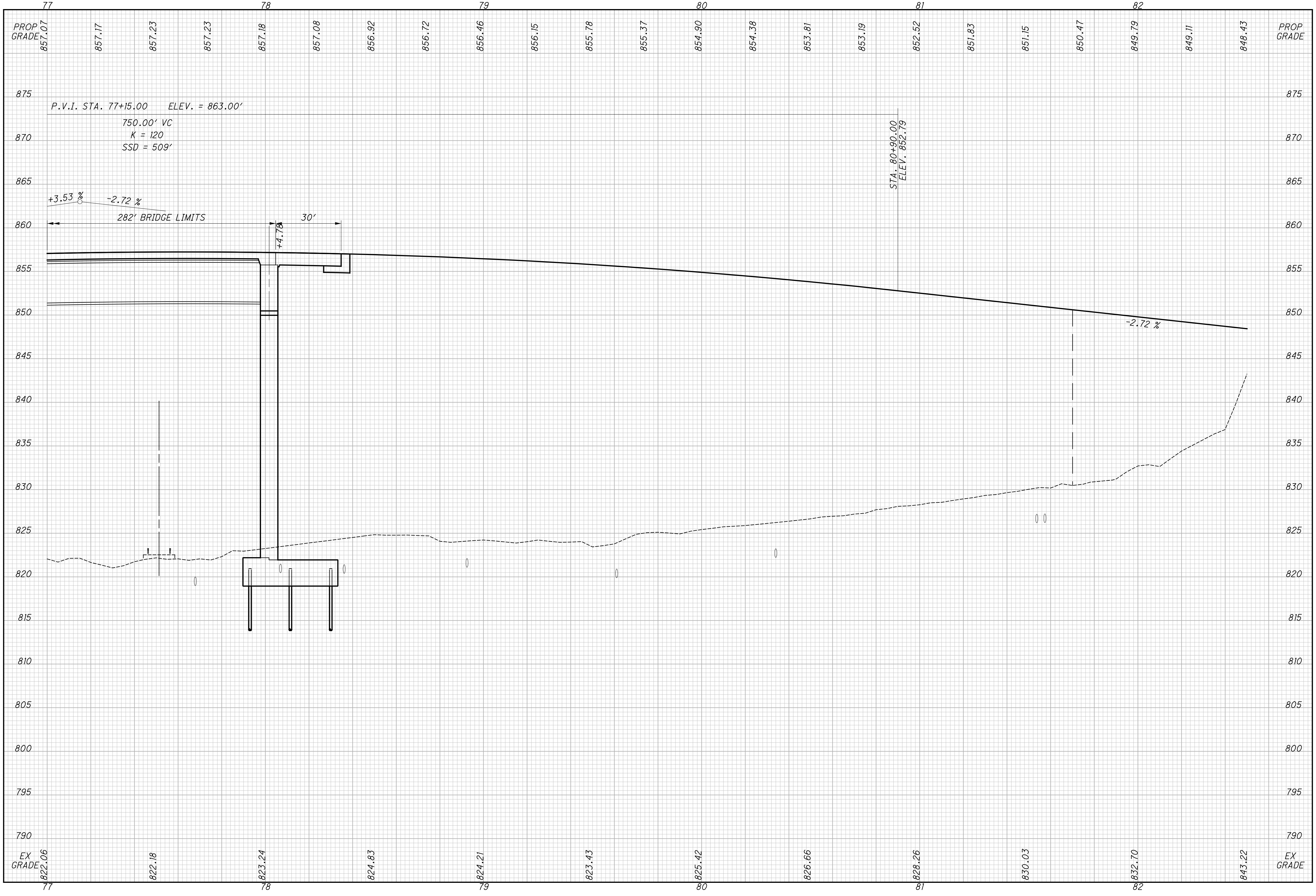


S.R. 14
② ℄ CONSTR. CURVE DATA
P.I. STA. 80+53.79
Δ = 17°12'05" (RT)
Dc = 10°25'03"
R = 550.00'
T = 83.19'
L = 165.12'
E = 6.26'
e max = NC

CALCULATED RJJ
CHECKED JMS

PLAN - S.R. 14 (BROADWAY AVE.)
STA. 77+00 TO STA. 82+50

CUY-14-6.93

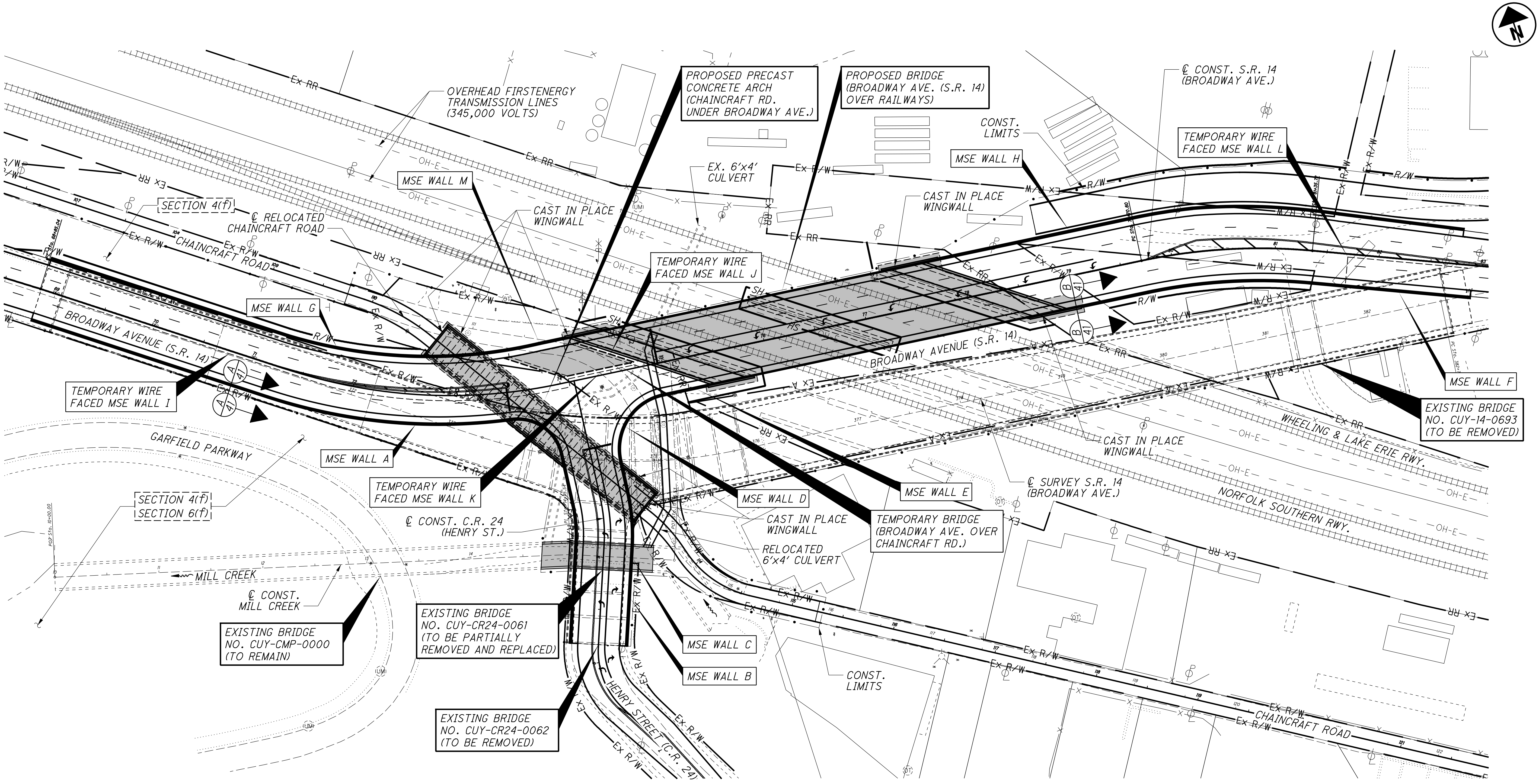


CALCULATED
RJJ
CHECKED
JMS

PROFILE - S.R. 14 (BROADWAY AVE.)
STA. 77+00 TO STA. 82+50

CUY-14-6.93

pw:\\aecom-na-pw.bentley.com:AECOM_DS20_NA_2019\Documents\60581903-CUY-14-6.93\104132_CUY-14-0693\Design\Roadway\Sheets\104132_GF3003.dgn Sheet 6/12/2020 11:52:35 AM todd.roxberry



STRUCTURES WORK:

REMOVALS
- 2 BRIDGES
- 1 PARTIAL CULVERT

CONSTRUCTION
- 1 PROPOSED BRIDGE
- 1 PROPOSED PRECAST CONCRETE ARCH
- 1 PARTIAL CULVERT
- 8 PERMANENT MSE WALLS
- 4 TEMPORARY WIRE FACED MSE WALLS
- 1 TEMPORARY BRIDGE

EXISTING STRUCTURE (C.R. 24)

TYPE: CONTINUOUS REINFORCED CONCRETE BEAMS WITH REINFORCED CONCRETE DECK AND SUBSTRUCTURE.
SPANS: 4 SPANS AT 24'-0"±
ROADWAY: 46'-0"± F/F SAFETY CURB (5'± SIDEWALK)
LOADING: HS20-44 AND ALTERNATE MILITARY
SKEW: 0°0'0"
APPROACH SLABS: 20'-0"
ALIGNMENT: TANGENT
CROWN: VARIES
STRUCTURAL FILE NUMBER: 1834282
DATE BUILT: 1929 (1988 MAJOR RECONSTRUCTION)
DISPOSITION: TO BE REMOVED

EXISTING STRUCTURE (S.R. 14)

TYPE: CONTINUOUS REINFORCED CONCRETE BEAMS AND STEEL STRINGERS AND FLOOR BEAMS WITH CONCRETE REINFORCED DECK AND SUBSTRUCTURE.
SPANS: CONCRETE BEAMS - MULTIPLE 24'± WITH 6'± CANTILEVERS. STEEL STRINGERS - ALTERNATE 20'± AND 47'±.
ROADWAY: VARIES (52'± TO 64±) F/F SAFETY CURB (5'± SIDEWALK)
LOADING: H15
SKEW: 0°0'0" (CONCRETE BEAMS) AND 60°0'0" RF (STEEL BEAMS)
APPROACH SLABS: 20'-0"
ALIGNMENT: TANGENT
CROWN: VARIES
STRUCTURAL FILE NUMBER: 1801805
DATE BUILT: 1929 (1988 MAJOR RECONSTRUCTION)
DISPOSITION: TO BE REMOVED

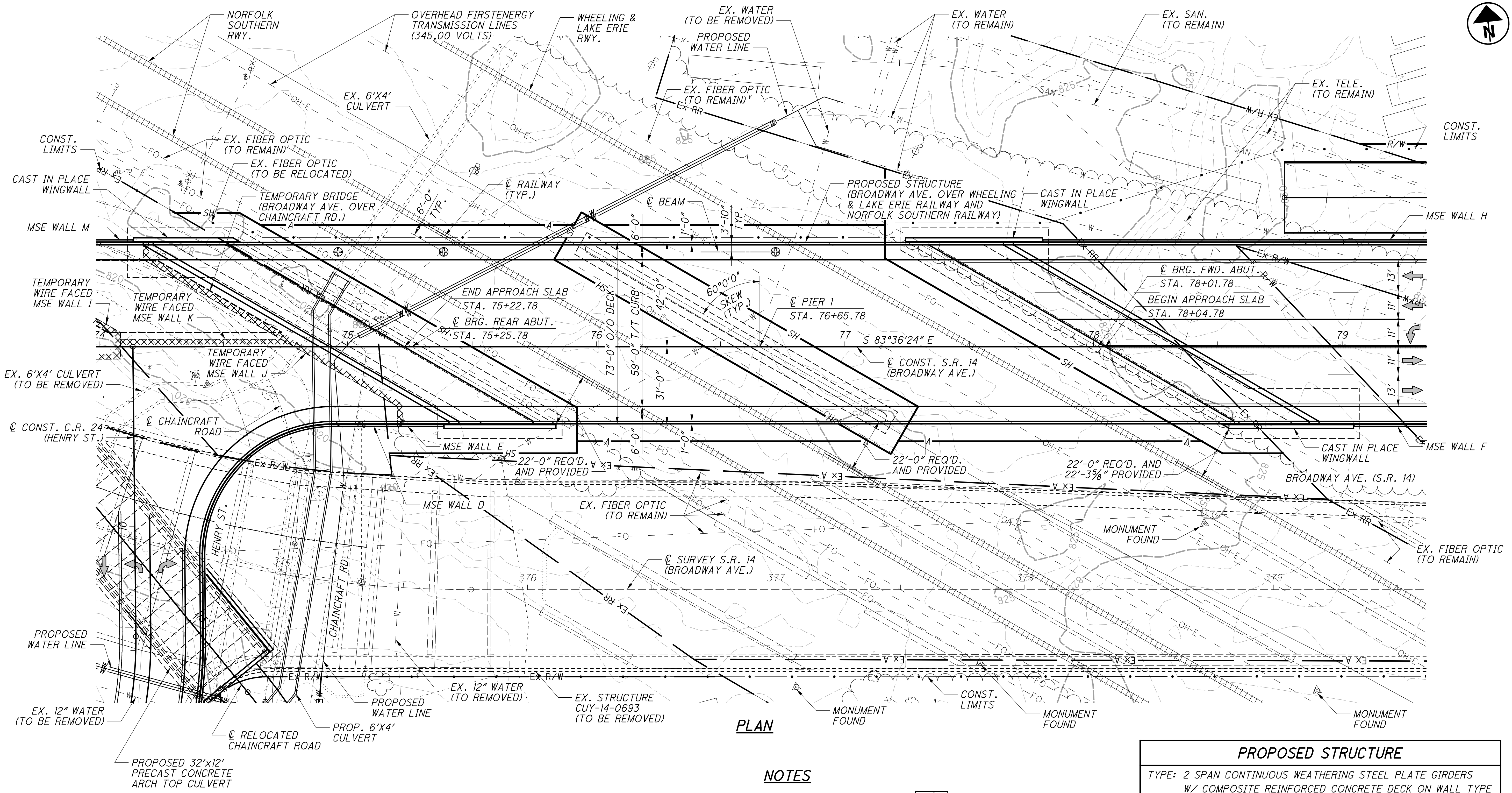
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		1081085/1834282	

ALTERNATIVE 3C - SCHEMATIC PLAN

BRIDGE NO. CUY-14-0693 AND CUY-CR24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132



PLAN

NOTES

- FOR PROFILE, SEE SHEET 4/32.
- FOR EXISTING STRUCTURE BOXES, SEE SHEET 1/32.
- EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.

DESIGN TRAFFIC:

2026 ADT = 18,500	2026 ADTT = 1,295
2046 ADT = 19,000	2046 ADTT = 1,330

DIRECTIONAL DISTRIBUTION = 0.51

NORFOLK SOUTHERN RAILWAY TRAFFIC IS 60 TRAINS PER DAY.
WHEELING & LAKE ERIE RAILWAY TRAFFIC IS 2 TRAINS PER DAY.

FOUNDATION DATA:

PROPOSED ABUTMENT AND PIER PILES SHALL BE 14" C.I.P. FRICTION PIPE PILES WITH AN ESTIMATED LENGTH OF 25 FEET.

LEGEND

⊕ - POINT OF MINIMUM VERTICAL CLEARANCE

PROPOSED STRUCTURE

TYPE: 2 SPAN CONTINUOUS WEATHERING STEEL PLATE GIRDERS W/ COMPOSITE REINFORCED CONCRETE DECK ON WALL TYPE SEMI-INTEGRAL ABUTMENTS AND WALL TYPE PIERS ON CAST-IN-PLACE FRICTION PIPE PILES.

SPANS: 140'-0", 136'-0" (C/C BEARINGS)

ROADWAY: 59'-0" (T/T CURB) WITH 6'-0" SIDEWALK EACH SIDE

DECK AREA: 20,586 SF

LOADING: HL-93 W/ FUTURE WEARING SURFACE (FWS) 60 PSF

SKEW: 60°0'0" RIGHT FORWARD

APPROACH SLABS: 30'-0" LONG, 17" THICK (AS-1-15),
INSTALLATION TYPE C (AS-2-15)

ALIGNMENT: TANGENT

CROWN: 0.02 FT/FT

WEARING SURFACE: 1" MONOLITHIC CONCRETE

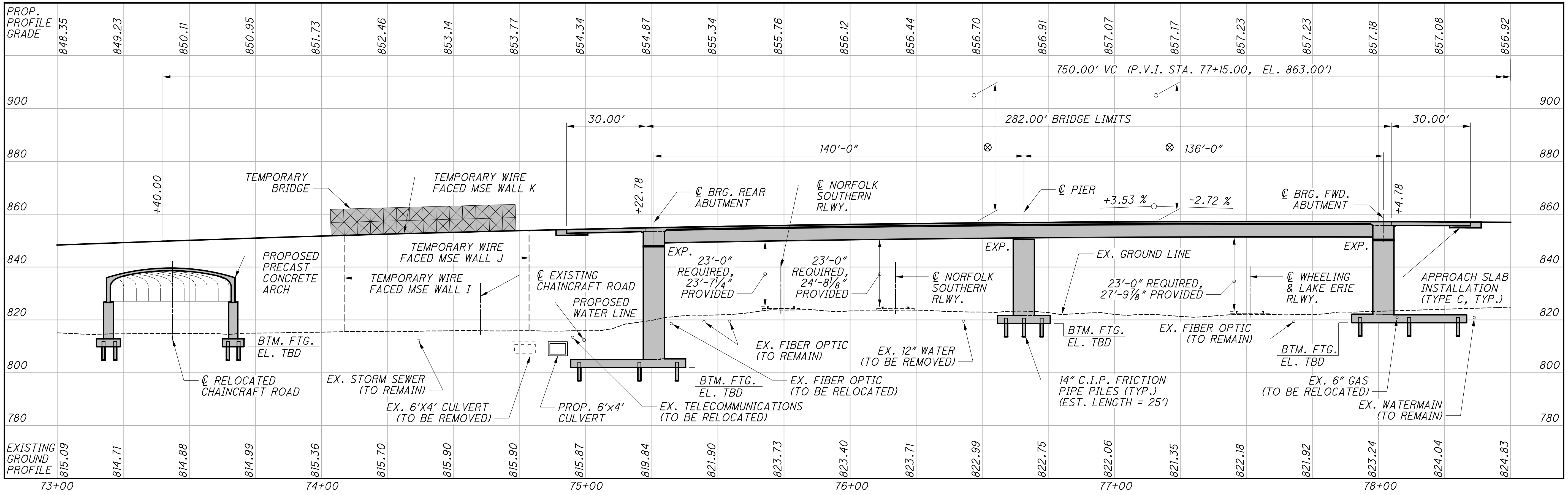
COORDINATES: LATITUDE N 41°25'52.62"
LONGITUDE W 81°36'01.00"

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

ALTERNATIVE 3C - BROADWAY SITE PLAN
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



PROFILE ALONG ℄ CONST. S.R. 14 (BROADWAY AVE.)

LEGEND

⊗ - OVERHEAD FIRSTENERGY TRANSMISSION LINES (345,000 VOLTS)
EX. VERTICAL CLR. = TBD
PROP. VERTICAL CLR. = TBD

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	DRAWN TMR	REVIEWED ZRD	DATE 6/20
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

ALTERNATIVE 3C - PROFILE

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

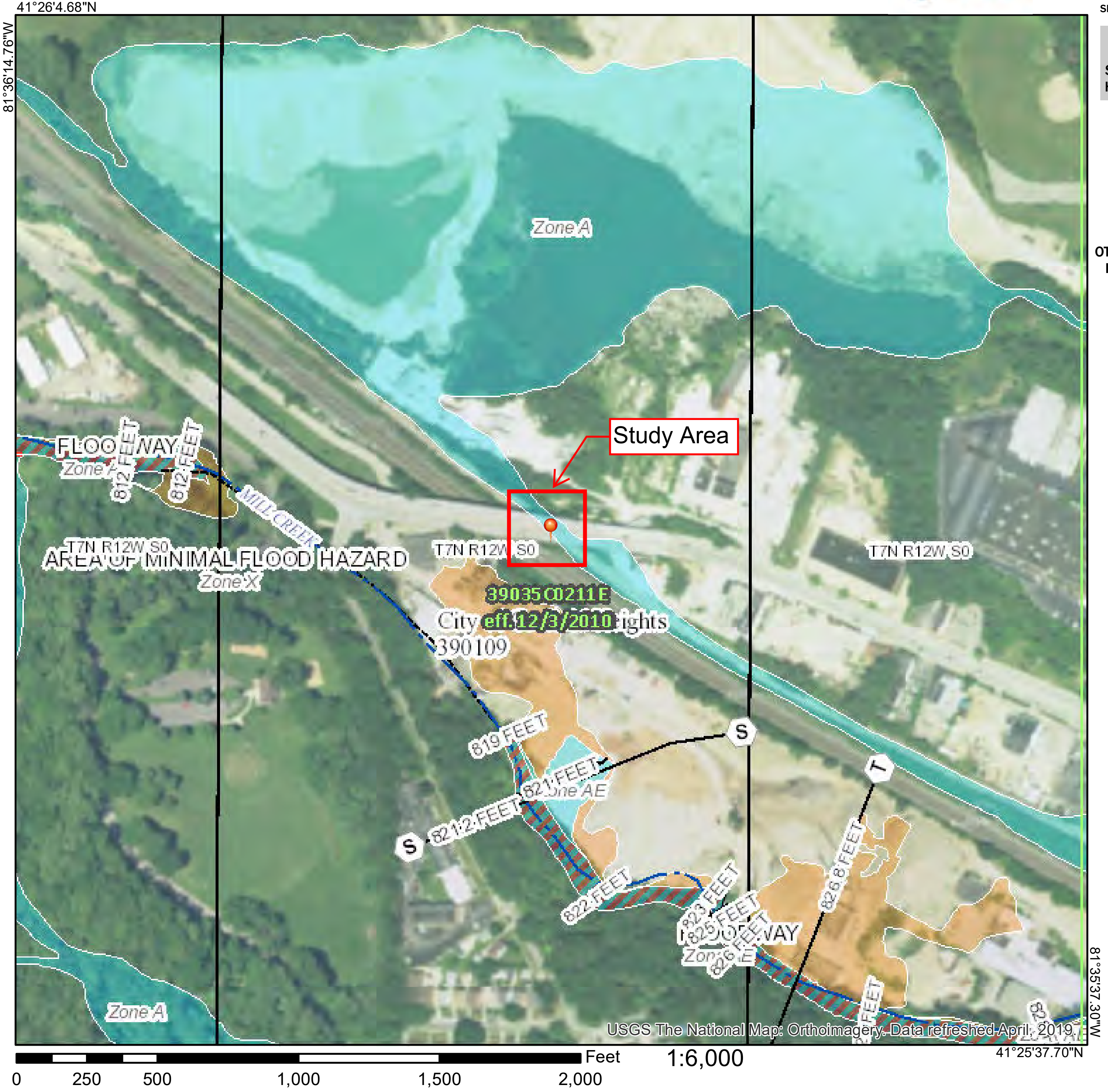
4/32

Attachment B – Hydrologic Data & Calculations

Attachment B1 – FEMA FIS and NFHL

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

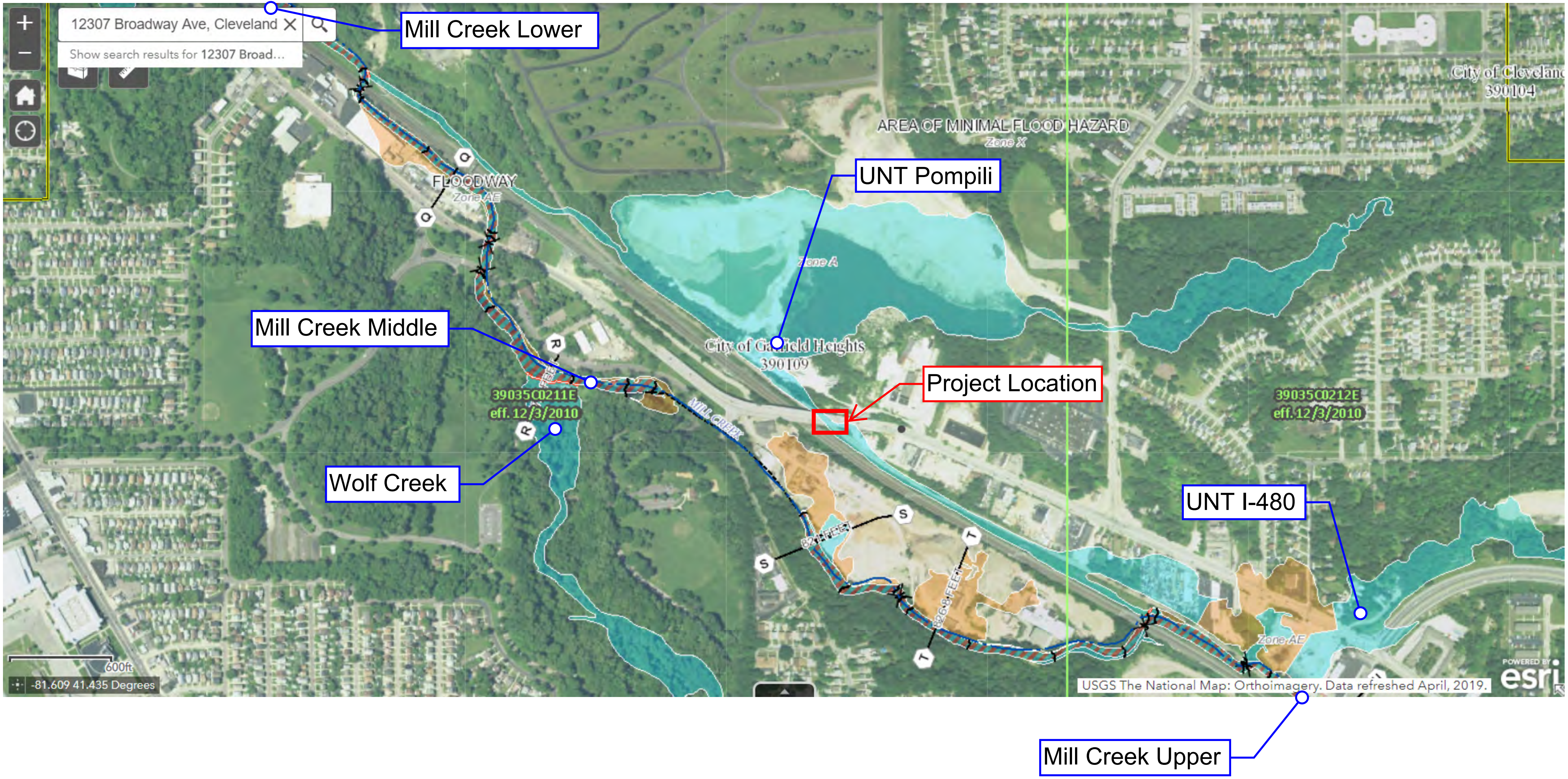
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/26/2020 at 9:13:44 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.


12307 Broadway Ave, Cleveland
Show search results for 12307 Broad...
Mill Creek Lower
AREA OF MINIMAL FLOOD HAZARD
Zone X
City of Cleveland
390104
UNT Pompili
FLOODWAY
Zone AE
Zone A
Mill Creek Middle
City of Garfield Heights
390109
Project Location
39035C0211E
eff. 12/3/2010
39035C0212E
eff. 12/3/2010
MILL CREEK
Wolf Creek
UNT I-480
Zone AE
Q
R
S
T
600ft
-81.609 41.435 Degrees
USGS The National Map: Orthoimagery. Data refreshed April, 2019.
esri
Mill Creek Upper

FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 4

CUYAHOGA COUNTY, OHIO

AND INCORPORATED AREAS

COMMUNITY NAME	NUMBER	COMMUNITY NAME	NUMBER
BAY VILLAGE, CITY OF	390093	LYNDHURST, CITY OF	390113
BEACHWOOD, CITY OF	390094	MAPLE HEIGHTS, CITY OF	390114
BEDFORD HEIGHTS, CITY OF	390096	MAYFIELD, VILLAGE OF	390116
BEDFORD, CITY OF	390095	MAYFIELD HEIGHTS, CITY OF	390115
BENTLEYVILLE, VILLAGE OF	390682	MIDDLEBURG HEIGHTS, CITY OF	390117
BEREA, CITY OF	390097	MORELAND HILLS, VILLAGE OF	390118
BRATENAHL, VILLAGE OF	390734	NEWBURGH HEIGHTS, VILLAGE OF	390119
BRECKSVILLE, CITY OF	390098	NORTH OLMSTED, CITY OF	390120
BROADVIEW HEIGHTS, CITY OF	390099	NORTH RANDALL, VILLAGE OF	390736
BROOK PARK, CITY OF	390102	NORTH ROYALTON, CITY OF	390121
BROOKLYN HEIGHTS, VILLAGE OF	390101	OAKWOOD, VILLAGE OF	390122
BROOKLYN, CITY OF	390100	OLMSTED FALLS, CITY OF	390672
CHAGRIN FALLS, VILLAGE OF	390103	ORANGE, VILLAGE OF	390737
CLEVELAND, CITY OF	390104	PARMA, CITY OF OF	390123
CLEVELAND HEIGHTS, CITY OF	390105	PARMA HEIGHTS, CITY	390124
CUYAHOGA COUNTY (UNINCORPORATED AREAS)	390766	PEPPER PIKE, CITY OF	390125
CUYAHOGA HEIGHTS, VILLAGE OF	390654	RICHMOND HEIGHTS, CITY OF	390126
EAST CLEVELAND, CITY OF *	390106	ROCKY RIVER, CITY OF	395372
EUCLID, CITY OF	390107	SEVEN HILLS, CITY OF	390128
FAIRVIEW PARK, CITY OF	390108	SHAKER HEIGHTS, CITY OF	390129
GARFIELD HEIGHTS, CITY OF	390109	SOLON, CITY OF	390130
GATES MILLS, VILLAGE OF	390593	SOUTH EUCLID, CITY OF	390131
GLENWILLOW, VILLAGE OF	390735	STRONGSVILLE, CITY OF	390132
HIGHLAND HEIGHTS, CITY OF	390110	UNIVERSITY HEIGHTS, CITY OF *	390133
HIGHLAND HILLS, VILLAGE OF	390127	VALLEY VIEW, VILLAGE OF	390134
HUNTING VALLEY, VILLAGE OF	390594	WALTON HILLS, VILLAGE OF	390636
INDEPENDENCE, CITY OF	390111	WARRENSVILLE HEIGHTS, CITY OF	390135
LAKEWOOD, CITY OF	390112	WESTLAKE, CITY OF	390136
LINNDALE, VILLAGE OF	390069	WOODMERE, VILLAGE OF *	390157

*No Special Flood Hazard Areas Identified

REVISED:

AUGUST 15, 2019

FLOOD INSURANCE STUDY NUMBER
39035CV001B
Version Number 2.3.2.4

FEMA

Table 2: Flooding Sources Included in this FIS Report *(Continued)*

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Hawthorne Creek	Solon, City of	About 130 feet downstream of Aurora Road	About 385 feet downstream of Miles Road	04110002	1.85	Y	AE	Unknown
Hawthorne Creek	Warrensville Heights, City of	About 965 feet downstream of Country Lane	About 3500 feet upstream of Emery Road	04110002	1.03	Y	AE	1980
Kirk Lateral	Westlake, City of	Confluence with Cahoon Creek	About 80 feet upstream of Woodpath Trail	04110001	1.28	Y	AE	1978
Lake Erie	Bay Village, City of; Bratenahl, Village of; Cleveland, City of; Euclid, City of; Lakewood, City of; Rocky River, City of	Eastern Cuyahoga County Boundary	Western Cuyahoga County Boundary	04110001, 04110002, 04110003, 04120200	36.5	N	AE/AO/VE/X	2016
Mill Creek	Cleveland, City of	About 1 mile downstream of Warner Road	About 660 feet downstream of Broadway Avenue	04110002	1.67	Y	AE	1977
Mill Creek	Garfield Heights, City of	About 660 feet downstream of Broadway Avenue	McCracken Road	04110002	2.11	Y	AE	1986
Mill Creek	Maple Heights, City of	McCracken Road	About 730 feet upstream of Lee Road	04110002	1.36	Y	AE	1979
Mill Creek	Warrensville Heights, City of	About 720 feet downstream of Miles Road	About 430 feet upstream of Emery Road	04110002	0.62	Y	AE	1980

Table 7: Historic Flooding Elevations *(Continued)*

Flooding Source	Location	Historic Peak (Feet NAVD88)	Event Date	Approximate Recurrence Interval (years)	Source of Data
Big Creek	City of Cleveland	Unknown	1964	Unknown	NOAA
Big Creek	City of Cleveland	Unknown	1972	80	NOAA
Big Creek	City of Cleveland	Unknown	1975	100	NOAA
Chagrin River	Unknown	610.93	1948	Unknown	USACE 2/1971
Chagrin River	Unknown	Unknown	1913	Unknown	Unknown
Chagrin River	Unknown	Unknown	1929	Unknown	Unknown
Chagrin River	Unknown	Unknown	1931	Unknown	Unknown
Chagrin River	Unknown	Unknown	1959	Unknown	Unknown
Chagrin River	Unknown	Unknown	1969	Unknown	Unknown
Cuyahoga River	USGS Gage No. 04208000	Unknown	1954	10	FEMA 8/1980, FEMA 2/1981
Cuyahoga River	USGS Gage No. 04208000	Unknown	1959	100	FEMA 8/1980, USGS 7/2004
Cuyahoga River	USGS Gage No. 04208000	Unknown	1969	9	FEMA 8/1980, USACE 6/2000
Cuyahoga River	USGS Gage No. 04208000	Unknown	1976	10	FEMA 8/1980, B71 1992
Mill Creek	Unknown	Unknown	1969	Unknown	Unknown
Mill Creek	Unknown	Unknown	1972	Unknown	Unknown
Mill Creek	Unknown	Unknown	1975	Unknown	Unknown
Rocky River	USGS Gage No. 04201500	670.1	1913	500	USACE 7/1968
Rocky River	USGS Gage No. 04201500	Unknown	1924	Unknown	USACE 2/1971
Rocky River	USGS Gage No. 04201500	Unknown	1927	10	USACE 7/1968
Rocky River	USGS Gage No. 04201500	Unknown	1928	Unknown	City of Lakewood
Rocky River	USGS Gage No. 04201500	Unknown	1929	10	USGS Gage No. 04201500
Rocky River	USGS Gage No. 04201500	Unknown	1933	8	USACE 7/1968

Table 8: Non-Levee Flood Protection Measures *(Continued)*

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Cuyahoga River	N/A	Flooding Warning	Cuyahoga River Drainage Basin in the City of Cleveland	Emergency flood warning system operated by NOAA.
Cuyahoga River	N/A	Dredge	Mouth of river	USACE maintains a dredge program for navigation approximately 5.5 miles upstream from the mouth.
Euclid Creek Tributary 1.5	N/A	Detention Basin	Confluence of Eculid Creek Tributaries 1.5 and 1.5.1	Planned to be constructed as part of the Highland Greens subdivision, which may provide flood protection when construction is completed.
Hawthorne Creek	N/A	Cleaning and Maintenance	Along channel and embankments in City of Solon.	Periodic cleaning and channel maintenance.
Lake Erie	N/A	Sea Walls	Coast along City of Bay Village	Sea walls to protect against erosion and retard the advance of wave action.
Lake Erie	N/A	Berm	Coast along City of Bay Village	Rubble mound banks constructed to protect against erosion and retard the advance of wave action.
Lake Erie	N/A	Breakwall	Offshore in Lake Erie from the mouth of the Cuyahoga River at Cleveland.	Serves as a flood protection measure by inhibiting the advance of waves from storms on the open lake. The breakwall is sufficiently high to provide complete protection from the 100-year storm, and, if properly maintained, should provide the harbor with adequate protection from the 500-year storm.
Mill Creek	N/A	Retention Basin-Reservoir	Upstream of Lee Road in the City of Warrensville	The retention basin-reservoir has an uncontrolled outlet and ungated spillway that reduces downstream flooding by temporarily storing flood waters.

Table 8: Non-Levee Flood Protection Measures *(Continued)*

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Mill Creek	N/A	Cleaning and Maintenance	Along channel and embankments in the City of Maple Heights	Periodic cleaning and channel maintenance.
Multiple Streams	N/A	Regulations	Village of Bratenahl, Village of Brooklyn Heights, Village of Cuyahoga Heights, City of Euclid, City of Highland Heights, City of Middleburg Heights, City of Parma, City of Parma Heights, City of Pepper Pike, City of Shaker Heights, City of South Euclid, and City of Warrensville Heights	Land use regulations adopted from the Code of Federal Regulations (CFR) which control building within areas that have a high risk of flooding.
Tinkers Creek	N/A	Cleaning and Maintenance	Along channel and embankments in the Village of Glenwillow.	Periodic cleaning and maintenance of the channel. Additional maintenance is conducted on culverts and roadside ditches when needed.
Tinkers Creek Tributary 2	N/A	Cleaning and Maintenance	Along channel and embankments in the Village of Glenwillow and the City of Solon.	Periodic cleaning and maintenance of the channel. Additional maintenance is conducted on culverts and roadside ditches when needed.
Wischmeyer Creek	N/A	Cleaning and Maintenance	Along the channel in the City of Bay Village	Channel maintenance perfomred by the County Engineer and the community.
Wischmeyer Creek	N/A	Culvert	West Glen Park Drive, Wolf Road, Normandy Road, Midland Road and Osborn Road	New culvert replaced a smaller bridge or culvert to increase carrying capacity. The upstream and downstream locations of each culvert were widened.
Wischmeyer Creek	N/A	Channelization	Between Lake Road and West Glen Park Drive, and between Osborn Road and East Oviatt Road.	Channel widening and reconstruction, and lining with gabions.

Table 10: Summary of Discharges *(Continued)*

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10-Percent Annual Chance	4-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance Existing	0.2-Percent Annual Chance
Euclid Creek Tributary 2	Upstream study limit	1.85	855	*	1,175	1,385	1,755
Fitch Lateral	At confluence with Roots Ditch	2	*	*	*	1,140	*
Fitch Lateral	Just upstream of confluence of Westerly Lateral	1.43	*	*	*	910	*
Hawthorne Creek	At confluence with Tinker Creek	7.01	1,047	*	1,636	1,919	2,610
Hawthorne Creek	500' upstream of Cannon Road	4.64	764	*	1,195	1,404	1,911
Kirk Lateral	At mouth	1.96	332	*	511	594	1,047
Kirk Lateral	Downstream of Strawberry Lane	1.31	252	*	392	457	817
Mill Creek	At City of Cleveland corporate Limit	16	2,411	*	3,551	4,043	5,183
Mill Creek	Broadway Avenue	15	2,358	*	3,477	3,959	5,078
Mill Creek	At City of Garfield Heights downstream corporate boundary (near state hospital)	12.7	2,270	*	3,150	3,820	5,200
Mill Creek	Just downstream of confluence of Wolf Creek	10.66	1,960	*	2,720	3,370	4,500
Mill Creek	Just downstream of confluence of tributary near Interstate 480	8.26	1,780	*	2,560	3,000	4,100

* Not calculated for this Flood Risk Project.

Cross Section N / O

Table 10: Summary of Discharges *(Continued)*

At I-480

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10-Percent Annual Chance	4-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance Existing	0.2-Percent Annual Chance
Mill Creek	At City of Garfield Heights upstream corporate boundary	6.67	1,250	*	1,670	2,150	2,650
Mill Creek	Downstream of McCracken Road Bridge	5.65	982	*	1,424	1,622	2,082
Mill Creek	At Marvin Road (extended)	3.48	995	*	1,395	1,650	2,130
Mill Creek	Just upstream of Emery Road	3.13	930	*	1,305	1,540	1,985
Mill Creek	About 500' downstream of Longbrook Road	2.93	845	*	1,185	1,400	1,810
Mill Creek	At Warrensville Center Road	2.38	645	*	925	1,085	1,425
Nine Mile Creek	At mouth	7.8	*	*	*	3,500	*
Pepper Creek	Just downstream of confluence of Tributary 2	6.43	1,230	*	1,760	2,070	2,750
Pepper Creek	Just upstream of confluence of Tributary 2	6.17	1,200	*	1,700	2,000	2,700
Pepper Creek	Just downstream of confluence of Tributary 3	5.89	1,150	*	1,675	1,970	2,460
Pepper Creek	Just upstream of confluence of Tributary 3	5.2	1,060	*	1,545	1,810	2,410
Pepper Creek	Just downstream of confluence of Tributary 4	5.17	1,055	*	1,540	1,800	2,400
Pepper Creek	Just upstream of confluence of Tributary 4	4.76	1,010	*	1,450	1,715	2,290

* Not calculated for this Flood Risk Project.

Table 13: Summary of Hydrologic and Hydraulic Analyses *(Continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Hawthorne Creek	About 130 feet downstream of Aurora Road	About 385 feet downstream of Miles Road	Regression Analysis	HEC-2	Unknown	AE w/ Floodway	
Hawthorne Creek	About 965 feet downstream of Country Lane	About 3500 feet upstream of Emery Road	Regression Analysis	HEC-2	03/1980	AE w/ Floodway	
Kirk Lateral	Confluence with Cahoon Creek	About 80 feet upstream of Woodpath Trail	Regression Analysis	HEC-2	02/1978	AE w/ Floodway	
Nine Mile Creek	The mouth at Lake Erie to	Approximately 30 feet downstream of Lake Shore Boulevard	Unknown	Unknown	2016	AE	LOMR 15-05-6419P
Mill Creek	About 1 mile downstream of Warner Road	About 660 feet downstream of Broadway Avenue	Regression Equations	HEC-2	04/1977	AE w/ Floodway	
Mill Creek	About 660 feet downstream of Broadway Avenue	McCracken Road	Regression Equations	HEC-2	04/1986	AE w/ Floodway	The retention basin-reservoir on Mill Creek, upstream of Lee Road, will attenuate flood hydrographs, thus reducing the peaks downstream. The discharge-frequency curves for locations along Mill Creek were adjusted to reflect the storage effects of the reservoir. The discharge-frequency curves were modified by analyzing the results of routing flood hydrographs through the reservoir.
Mill Creek	McCracken Road	About 730 feet upstream of Lee Road	Regression Equations	HEC-2	04/1979	AE w/ Floodway	
Mill Creek	About 720 feet downstream of Miles Road	About 430 feet upstream of Emery Road	Regression Equations	HEC-2	03/1980	AE w/ Floodway	

Table 13: Summary of Hydrologic and Hydraulic Analyses *(Continued)*

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Mill Creek	About 525 feet downstream of Longbrook Road	Warrensville Center Road	Regression Equations	HEC-2	03/1980	AE w/ Floodway	
Pepper Creek	About 2400 feet below the Shaker Boulevard bridge	1900 feet above the Lander Road bridge	Regression Analysis	HEC-2	04/1980	AE w/ Floodway	
Pepper Creek Tributary 4.1.1	About 1200 feet downstream of Cedar Road	About 775 feet upstream of Landerbrook Drive	Unknown	HEC-RAS	12/2010	A	
Plum Creek	About 890 feet downstream of Usher Road	The Lorain County Boundary	Regression Analysis	HEC-2	04/1977	AE w/ Floodway	
Plum Creek	Confluence at the West Branch Rocky River	About 890 feet downstream of Usher Road	HEC-HMS	HEC-RAS (Jan. 2001)	02/2001	AE w/ Floodway	
Pond Brook	Pettibone Road	About 2,415 feet upstream of Rollingbrook Trail	Unknown	HEC-RAS	12/2010	A	
Porter Creek (Huntington Creek) / Gifford-Avon Ditch	Confluence with Lake Erie	County Boundary	Regression Analysis, Bulletin 43	HEC-2	11/1976	AE w/ Floodway	
Reservoir Creek	4300 feet downstream of Eureka Parkway	Pearl Road	Regression Analysis	HEC-2	04/1980	AE w/ Floodway	
RIDE Studied Streams	Multiple	Multiple	SWMM 4.4	SWMM 4.4	12/2010	A	
Rocky River	Confluence with Lake Erie	About 3600 feet upstream of Park Drive	Log-Pearson Type III	HEC-2	11/1976	AE w/ Floodway	Hydraulic analyses for this study, however, are based only on the effects of unobstructed flow

Table 14: Roughness Coefficients *(Continued)*

Flooding Source	Channel “n”	Overbank “n”
Kirk Lateral	0.015-0.021	0.021-0.045
Mill Creek	0.030-0.06	0.04-0.12
Pepper Creek	0.035-0.04	0.05-0.14
Plum Creek	0.030 -0.035	0.025 – 0.040
Porter (Huntington) Creek	0.03-0.06	0.05-0.07
Reservoir Creek	0.035-0.045	0.04-0.12
Rocky River	0.03-0.04	0.03-0.12
Roots Ditch	0.014-0.04	0.017-1.0
Rose Lateral	0.015-0.021	0.021-0.045
Sagamore Creek	*	*
Spencer Creek	0.015-0.055	0.05-0.1
Sperry Creek	0.015-0.021	0.021-0.045
Stone Water Creek	0.040-0.080	0.040-0.080
Stone Water Creek Tributary 1	0.015-0.045	0.045-0.100
Tinkers Creek	0.03	0.05-0.08
Tinkers Creek Tributary 1	0.03	0.04 – 0.05
Tinkers Creek Tributary 2	0.03	0.05
West Branch Rocky River	0.025 – 0.030	0.040 – 0.080
West Creek	0.035-0.05	0.04-0.11
Wilhelmy Creek	0.015-0.021	0.021-0.045
Wischmeyer Creek	0.02-0.04	0.5
Wood Creek	0.03	0.05

* No data available

5.3 Coastal Analyses

For the areas of Cuyahoga County that are impacted by coastal flooding processes, coastal flood hazard analyses were performed to provide estimates of coastal BFEs. Coastal BFEs reflect the increase in water levels during a flood event due to storm surge as well as overland wave effects.

The following subsections provide summaries of how each coastal process was considered for this FIS Report. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation. Table 15 summarizes the methods and/or models used for the coastal analyses. Refer to Section 2.5.1 for descriptions of the terms used in this section.

FLOODING SOURCE		FLOODWAY				1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	WIDTH REDUCED FROM PRIOR STUDY (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE (FEET)
Kirk Lateral									
G	1,595	18		58	10.2	721.4	721.4	721.4	0.0
H	1,645	16		57	10.4	721.6	721.6	721.6	0.0
I	2,200	21		100	5.9	724.3	724.3	724.8	0.5
J	3,272	20		86	6.9	725.9	725.9	726.2	0.3
K	3,322	22		83	7.2	725.9	725.9	726.2	0.3
L	3,408	22		99	6.0	726.7	726.7	727.0	0.3
M	4,187	25		87	5.2	728.0	728.0	728.0	0.0
N	4,237	24		98	4.7	728.1	728.1	728.1	0.0
O	4,334	23		81	5.7	728.1	728.1	728.1	0.0
P	4,384	28		91	5.0	728.3	728.3	728.3	0.0
Q	4,434	28		94	4.9	728.4	728.4	728.4	0.0
R	4,860	24		71	6.4	729.0	729.0	729.0	0.0
S	4,899	22		68	6.7	729.1	729.1	729.1	0.0
T	4,950	24		75	6.1	729.4	729.4	729.4	0.0
U	4,958	25		80	5.7	729.7	729.7	729.7	0.0
V	5,161	19		61	7.5	729.8	729.8	729.8	0.0
W	5,211	22		74	6.2	730.4	730.4	730.4	0.0
X	5,251	61		111	4.1	731.1	731.1	731.1	0.0
Y	5,841	20		57	8.0	732.0	732.0	732.4	0.4
Z	6,760	22		71	6.5	734.2	734.2	734.2	0.0
Mill Creek									
A	10,250	40		384	10.3	659.3	659.3	659.3	0.0
B	10,415	67		339	11.7	659.3	659.3	659.4	0.1
C	10,727	48	28	252	15.7	661.2	661.2	661.2	0.0
D	11,782	51		224	17.7	671.2	671.2	671.2	0.0
E	12,779	55		297	13.3	688.3	688.3	688.4	0.1
F	13,089	70		349	11.3	690.7	690.7	690.7	0.0

[1] Feet above mouth

Table 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CUYAHOGA COUNTY, OHIO
AND INCORPORATED AREAS

FLOODWAY DATA

Kirk Lateral, Mill Creek

FLOODING SOURCE		FLOODWAY				1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	WIDTH REDUCED FROM PRIOR STUDY (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE (FEET)
Mill Creek									
G	13,417	83		722	5.5	697.2	697.2	697.7	0.5
H	14,000	108		291	13.6	702.7	702.7	702.8	0.1
I	14,798	43		72	54.9	712.4	712.4	712.4	0.0
J	14,849	46		205	19.3	761.0	761.0	761.0	0.0
K	15,259	76		710	5.6	777.0	777.0	777.5	0.5
L	16,717	43		358	11.1	780.9	780.9	781.1	0.2
M	17,397	66		445	8.9	784.2	784.2	784.2	0.0
N	18,590	60		560	7.1	789.5	789.5	790.0	0.5
O	19,000	80		406	6.8	790.9	790.9	790.9	0.0
P	20,090	53	27	578	4.8	795.3	795.3	795.3	0.0
Q	21,860	75		466	5.9	802.3	802.3	802.3	0.0
R	23,260	86		431	5.7	807.4	807.4	807.4	0.0
S	25,270	80		444	5.4	821.2	821.2	821.2	0.0
T	26,230	47	33	544	4.4	826.8	826.8	826.8	0.0
U	28,810	41		229	9.4	836.3	836.3	836.4	0.1
V	30,097	-		-	-	841.5	841.5	-	-
W	30,687	32		239	6.8	844.7	844.7	845.3	0.6
X	31,628	26		206	7.9	847.3	847.3	848.0	0.7
Y	33,598	31		166	9.8	855.6	855.6	856.2	0.6
Z	35,128	34		156	10.4	868.2	868.2	868.3	0.1
AA	36,538	28		154	10.5	878.2	878.2	878.2	0.0
AB	37,217	44		174	9.3	882.8	882.8	882.8	0.0
AC	43,385	30		144	12.5	941.2	941.2	941.3	0.1
AD	43,805	50		341	4.8	954.3	954.3	954.3	0.0
AE	44,305	50		261	6.3	954.9	954.9	955.3	0.4
AF	45,145	50		378	4.4	971.2	971.2	971.3	0.1
AG	45,335	50		259	6.4	971.2	971.2	971.3	0.1
AH	45,887	60		463	3.3	976.8	976.8	977.2	0.4

[1] Feet above mouth

Table 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

CUYAHOGA COUNTY, OHIO
AND INCORPORATED AREAS

FLOODWAY DATA

Mill Creek

FLOODING SOURCE		FLOODWAY				1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	WIDTH REDUCED FROM PRIOR STUDY (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE (FEET)
Mill Creek (Cont.)									
AI	49,885[1]	40		219	6.4	1005.4	1005.4	1005.8	0.4
AJ	50,205 [1]	60		354	3.7	1009.3	1009.3	1009.8	0.5
AK	50,960 [1]	35		166	7.8	1010.6	1010.6	1010.8	0.2
AL	51,650 [1]	30		132	8.5	1016.8	1016.8	1016.9	0.1
Pepper Creek									
A	4,660 [2]	60		385	5.2	960.7	960.7	961.0	0.3
B	5,750 [2]	50		240	8.3	963.2	963.2	963.2	0.0
C	6,600 [2]	50		309	6.5	966.9	966.9	967.2	0.3
D	7,200 [2]	180		1421	1.4	972.1	972.1	972.8	0.7
E	8,145 [2]	40		197	9.2	972.6	972.6	972.8	0.2
F	8,340 [2]	50		381	4.7	975.9	975.9	975.9	0.0
G	9,115 [2]	50		231	7.4	976.7	976.7	976.8	0.1
H	9,800 [2]	370		3000	0.6	985.7	985.7	985.7	0.0
I	10,280 [2]	100		647	2.7	985.7	985.7	985.7	0.0
J	11,055 [2]	47		137	6.8	988.2	988.2	988.2	0.0
K	11,800 [2]	30		110	8.4	993.2	993.2	993.5	0.3
L	12,430[2]	60		156	6.0	998.6	998.6	998.6	0.0
M	12,840 [2]	30		177	4.9	1004.9	1004.9	1004.9	0.0
N	13,735 [2]	20		89	9.7	1014.3	1014.3	1014.4	0.1
O	14,595[2]	20		86	9.5	1027.8	1027.8	1027.8	0.0
Plum Creek									
A	181[1]	59		307	13.0	710.1	710.1	710.1	0.0
B	1,087[1]	85		439	9.1	728.8	728.8	728.8	0.0
C	1,400[1]	66		317	12.6	745.8	745.8	745.8	0.0
D	1,855[1]	77		671	5.9	750.9	750.9	750.9	0.0
E	2,602[1]	225		2,673	1.5	763.5	763.5	763.5	0.0

[1] Feet above mouth [2] Feet above Som Center Road

Table 24

FEDERAL EMERGENCY MANAGEMENT AGENCY

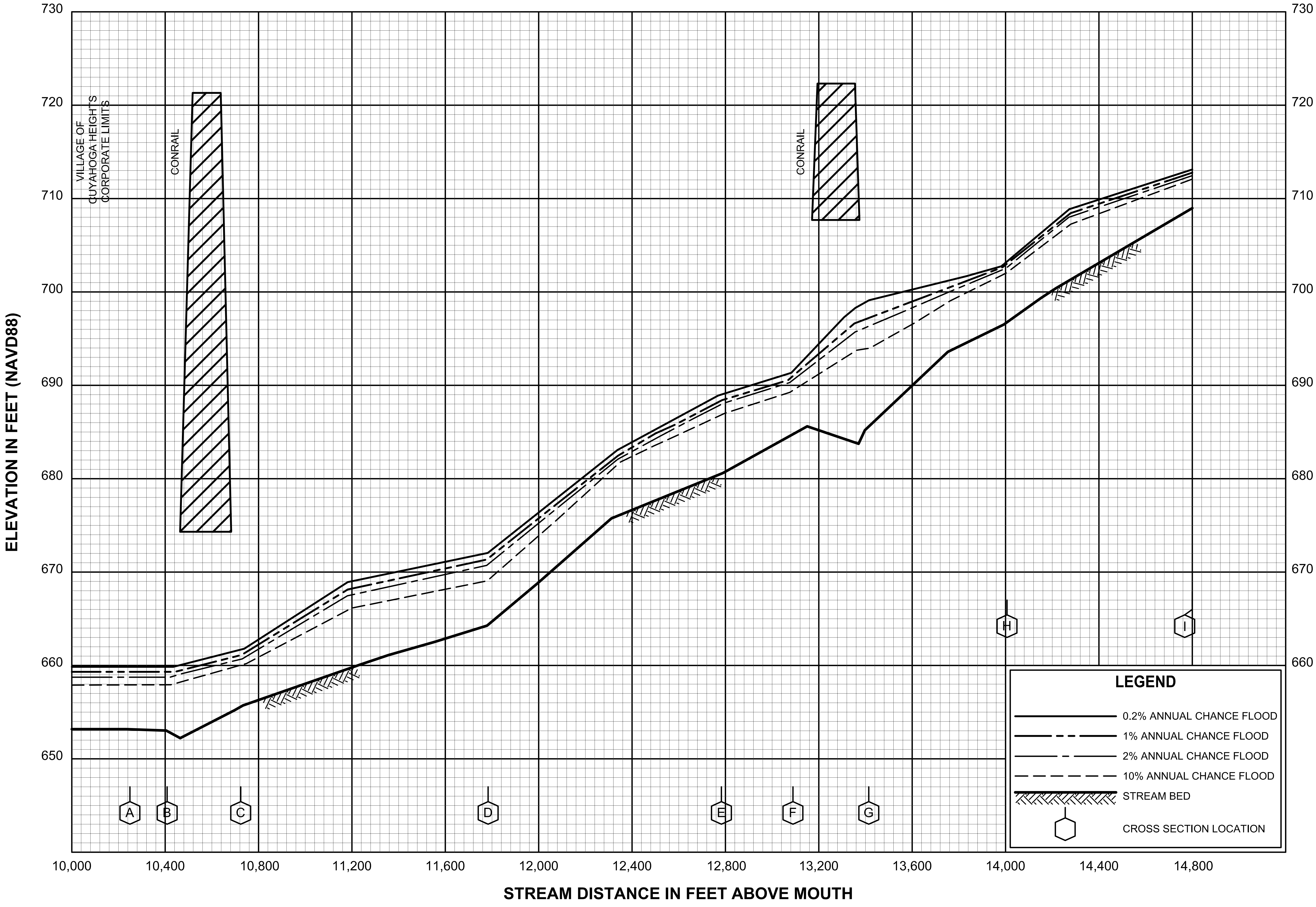
CUYAHOGA COUNTY, OHIO
AND INCORPORATED AREAS

FLOODWAY DATA

Mill Creek, Pepper Creek, Plum Creek

Table 29: Summary of Contracted Studies Included in this FIS Report *(Continued)*

Flooding Source	FIS Report Dated	Contractor	Number	Work Completed Date	Affected Communities
Euclid Creek Tributary 1.6	09/1995	Euthenics, Inc.	Unknown	November 1992	Highland Heights, City of
Euclid Creek Tributary 2	02/1981	Burgess & Niple	H-4717	April 1980	South Euclid, City of
Fitch Lateral	07/1992	USACE, Buffalo District	EMW-89-E-2992	Unknown	North Olmsted, City of
Hawthorne Creek	03/1980	Dalton, Dalton, Newport/Polytech, Inc.	H-4732	February 1979	Bedford Heights, City of
Hawthorne Creek	07/1999	Unknown	Unknown	Unknown	Solon, City of
Hawthorne Creek	02/1981	Burgess & Niple	H-4717	March 1980	Warrensville Heights, City of
Kirk Lateral	07/1979	Dalton, Dalton, Little, and Newport	H-4528	February 1978	Westlake, City of
Mill Creek	02/1978	Dalton, Dalton, Little, and Newport for	H-3802	April 1977	Cleveland, City of
Mill Creek	01/1988	USACE, Buffalo District	EMW-85-E-1822	April 1986	Garfield Heights, City of
Mill Creek	03/1980	Dalton, Dalton, Newport/Polytech, Inc.	H-4732	April 1979	Maple Heights, City of
Mill Creek	02/1981	Burgess & Niple	H-4717	March 1980	Warrensville Heights, City of
Ninemile Creek	N/A	Unknown	LOMR 15-05-6419P	2016	Bratenahl, Village of
Pepper Creek	02/1981	Burgess & Niple	H-4717	April 1980	Pepper Pike, City of
Pepper Creek Tributary 4.1.1	12/2010	Stantec Consulting Services	HSFE-05-D-0026	December 2010	Mayfield Heights, City of; Pepper Pike, City of
Pond Brook	12/2010	Stantec Consulting Services	HSFE-05-D-0026	December 2010	Solon, City of
Plum Creek	02/1978	Dalton, Dalton, Little, and Newport for	H-3802	April 1977	Cuyahoga County, Unincorporated Areas; Olmsted Township



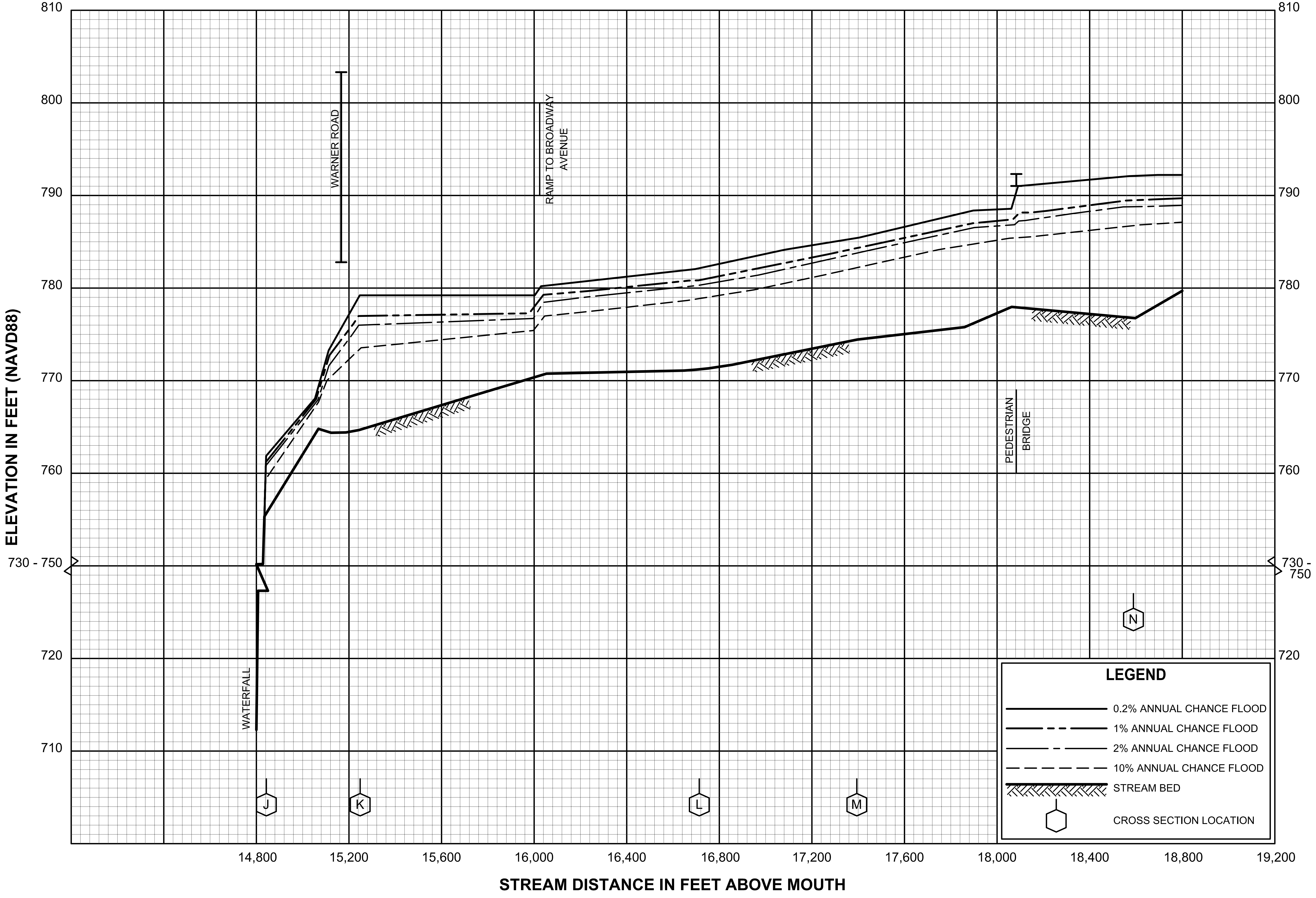
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CUYAHOGA COUNTY, OH

AND INCORPORATED AREAS



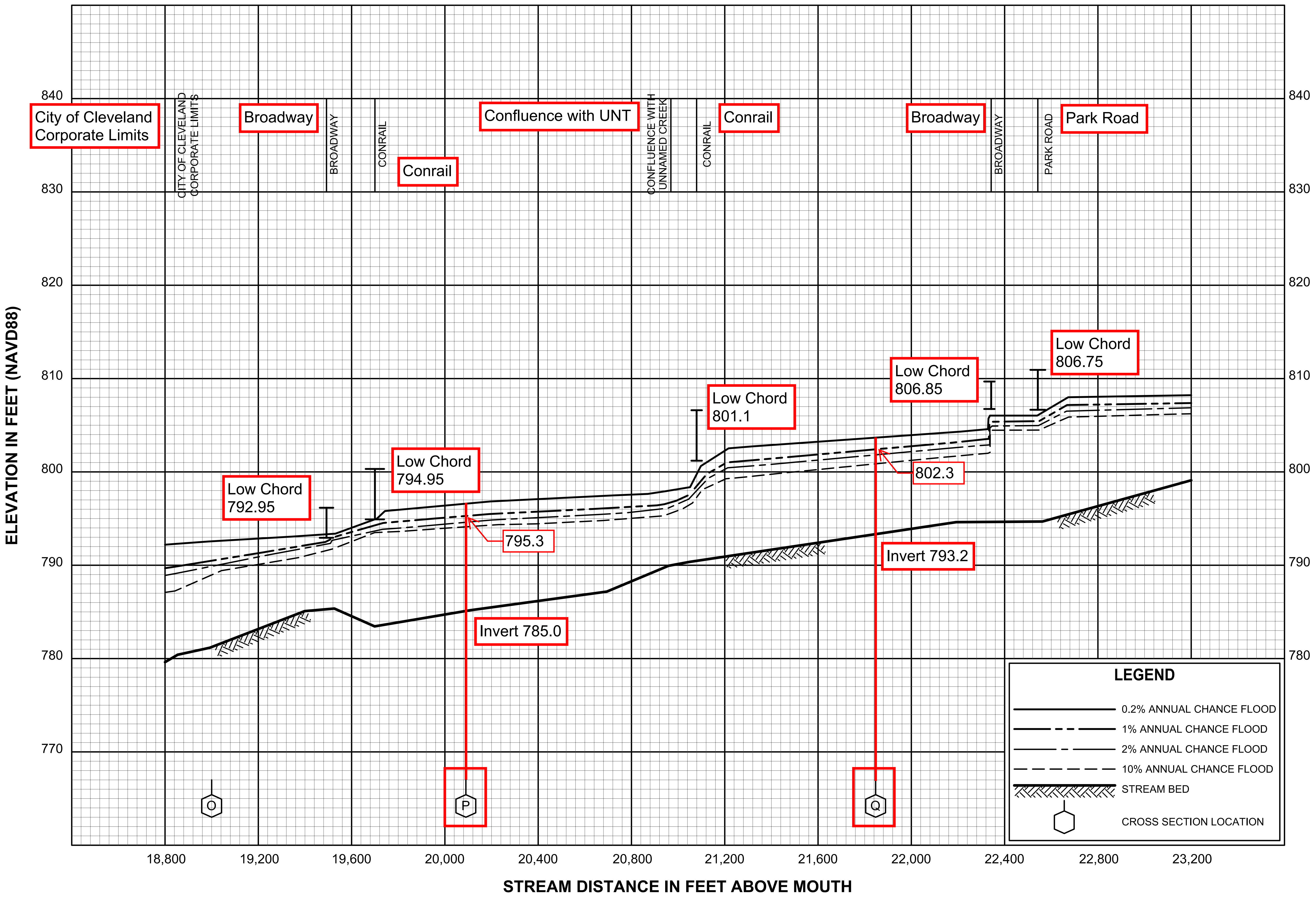
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CUYAHOGA COUNTY, OH

AND INCORPORATED AREAS



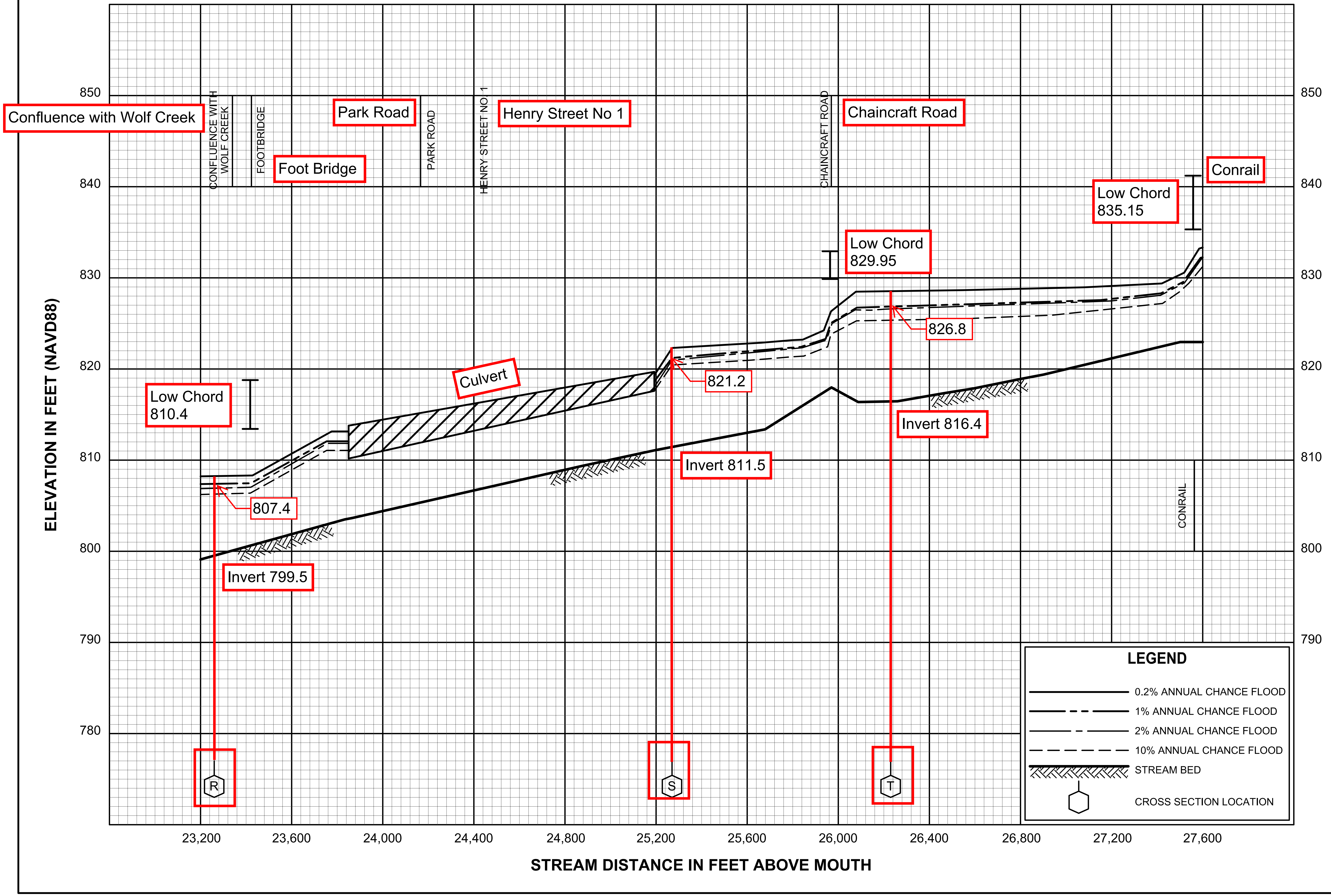
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CUYAHOGA COUNTY, OH

AND INCORPORATED AREAS



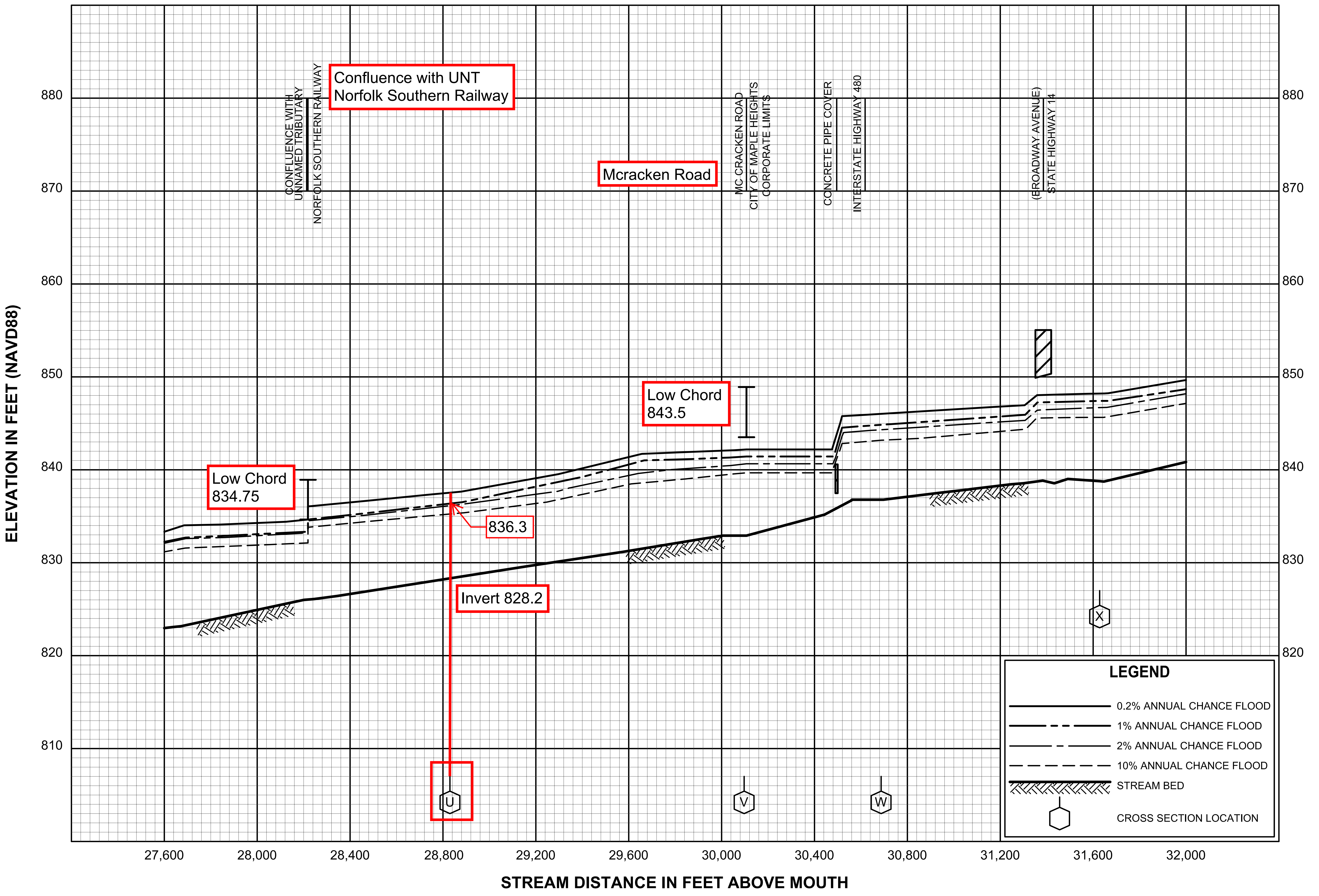
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CUYAHOGA COUNTY, OH

AND INCORPORATED AREAS



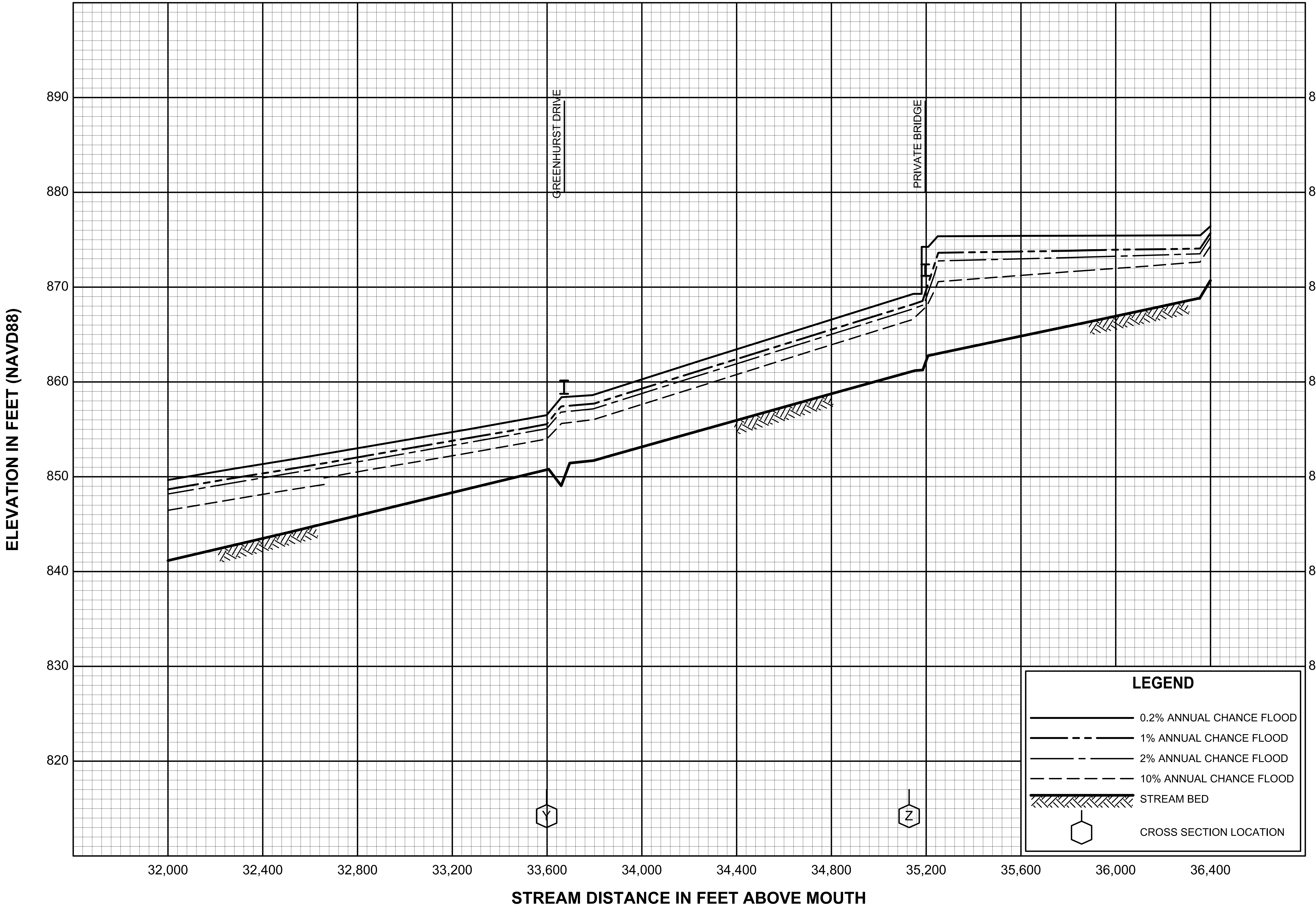
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CUYAHOGA COUNTY, OH

AND INCORPORATED AREAS



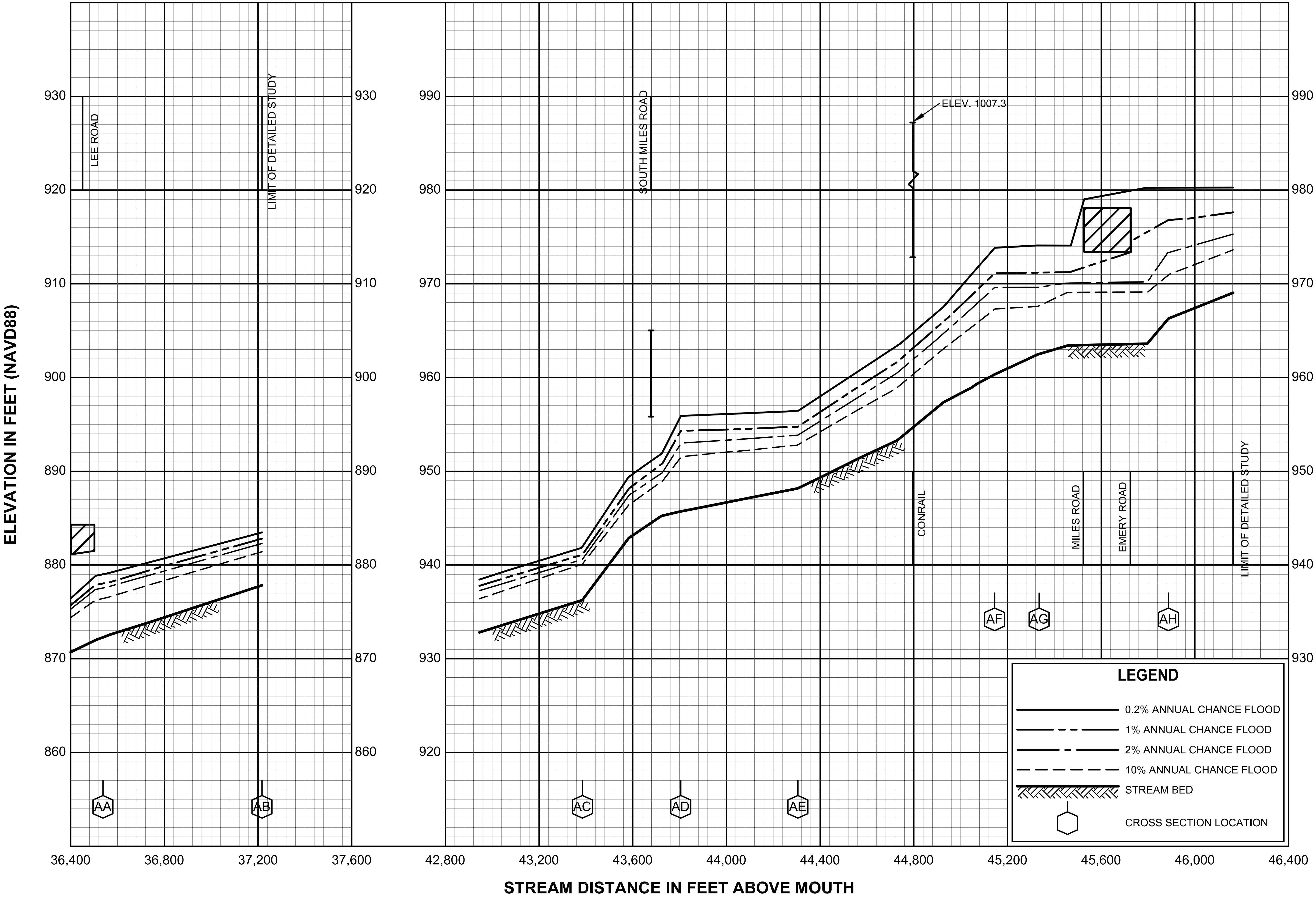
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CUYAHOGA COUNTY, OH

AND INCORPORATED AREAS



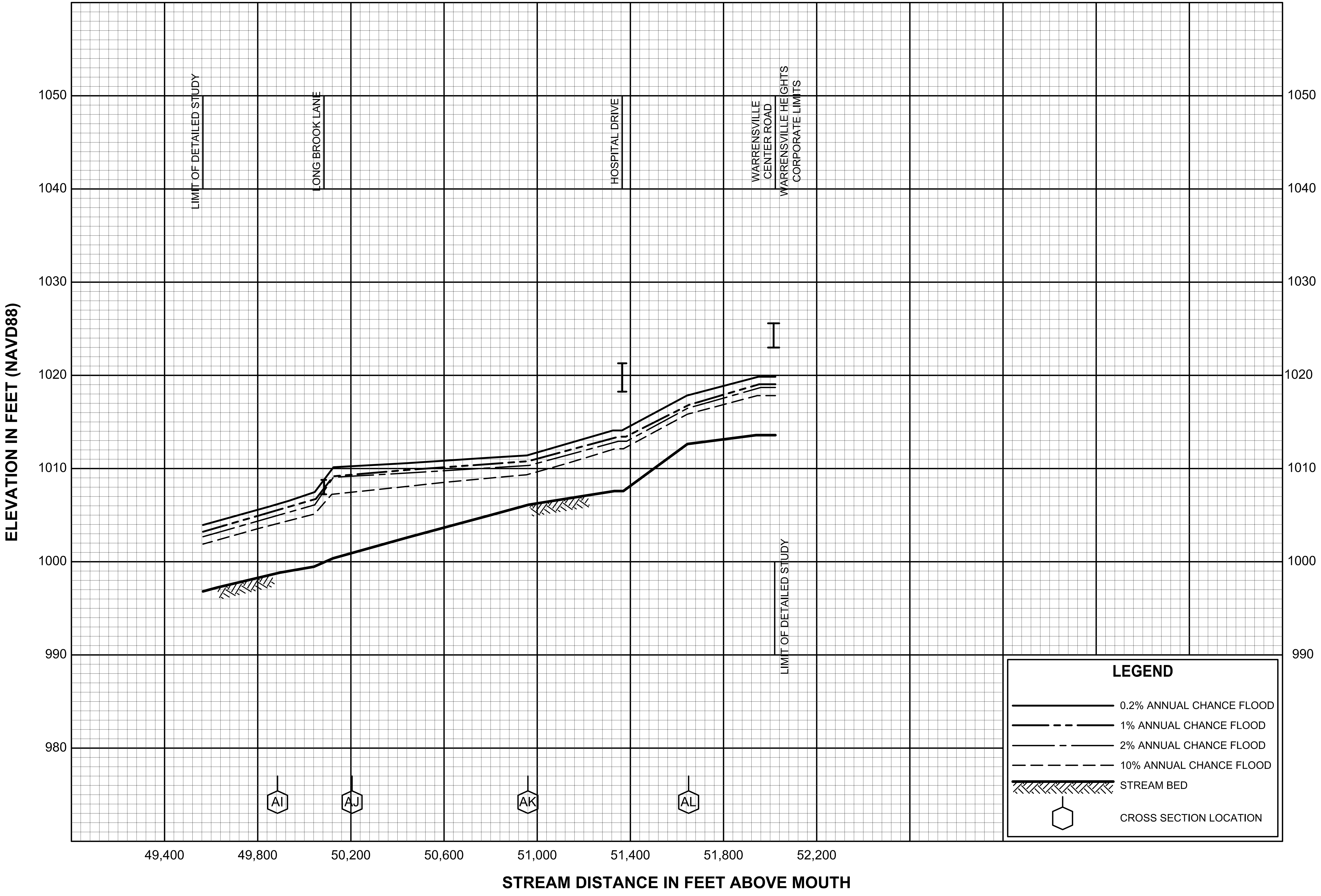
FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CUYAHOGA COUNTY, OH

AND INCORPORATED AREAS



FLOOD PROFILES

MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

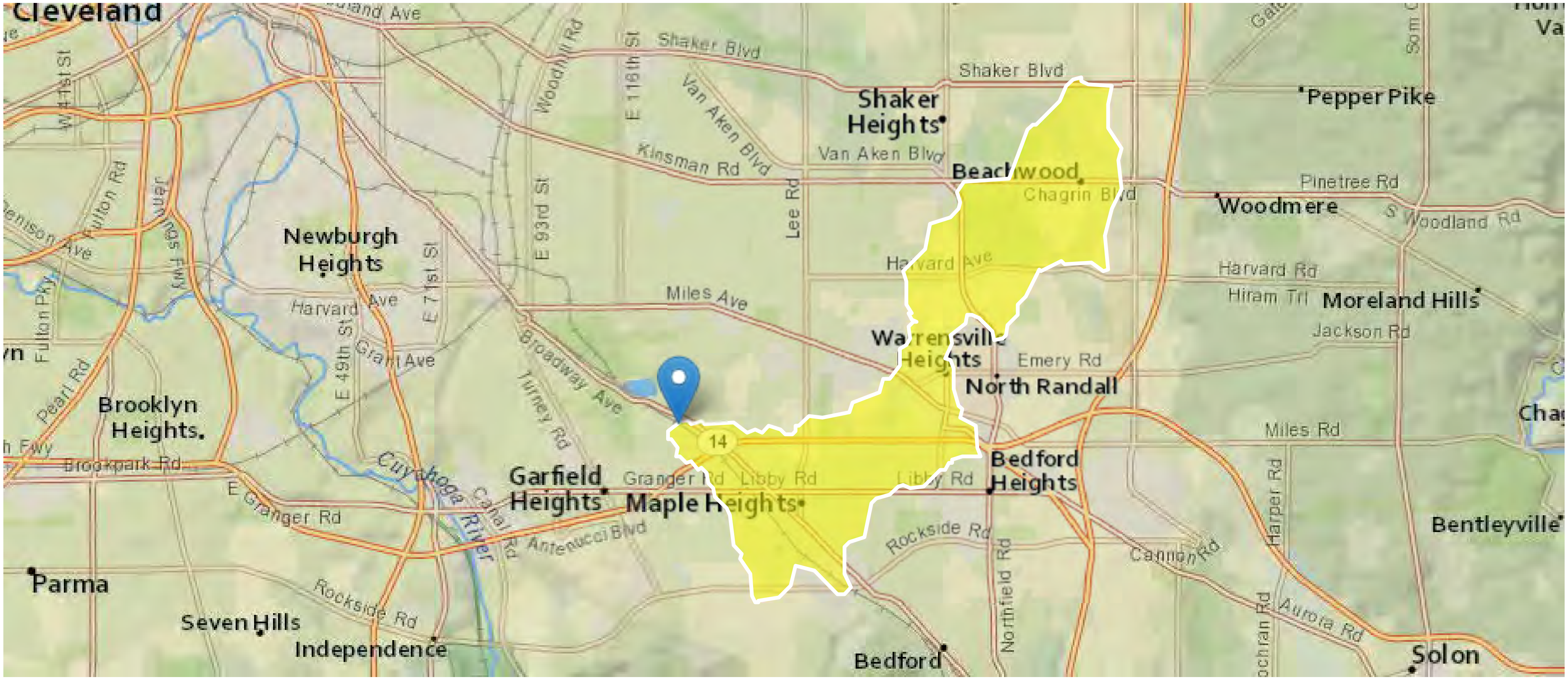
CUYAHOGA COUNTY, OH

AND INCORPORATED AREAS

Attachment B2 – StreamStats

StreamStats Report - Mill Creek Upper

Region ID: OH
Workspace ID: OH20200601193532819000
Clicked Point (Latitude, Longitude): 41.42735, -81.59104
Time: 2020-06-01 15:35:48 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	7.42	square miles
PRECIP	Mean Annual Precipitation	39.3	inches
LAT_CENT	Latitude of Basin Centroid	41.4376	decimal degrees
OHREGC	Ohio Region C Indicator	0	dimensionless
OHREGA	Ohio Region A Indicator	1	dimensionless
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	45.5	feet per mi
LC92STOR	Percentage of water bodies and wetlands determined from the NLCD	1.26	percent
FOREST	Percentage of area covered by forest	13.2	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	94.3	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	36.1	percent
LFPLENGTH	Length of longest flow path	8.03	miles
LONG_CENT	Longitude Basin Centroid	81.5422	decimal degrees
STREAM_VARG	Streamflow variability index as defined in WRIR 02-4068, computed from regional grid	0.46	dimensionless

Annual Flow Statistics Parameters[Low Flow LatGT 41.2 wri02 4068]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	7.42	square miles	0.12	7422

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
PRECIP	Mean Annual Precipitation	39.3	inches	34	43.2
LAT_CENT	Latitude of Basin Centroid	41.4376	decimal degrees	41.2	41.59

Annual Flow Statistics Flow Report[Low Flow LatGT 41.2 wri02 4068]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp
Mean Annual Flow	8.99	ft^3/s	11.4	11.4

Annual Flow Statistics Citations

Koltun, G. F., and Whitehead, M. T.,2002, Techniques for Estimating Selected Streamflow Characteristics of Rural, Unregulated Streams in Ohio: U. S. Geological Survey Water-Resources Investigations Report 02-4068, 50 p (https://pubs.er.usgs.gov/publication/wri024068)

Peak-Flow Statistics Parameters[Peak Flow Full Model Reg A SIR2019 5018]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	7.42	square miles	0.04	5989
OHREGC	Ohio Region C Indicator 1 if in C else 0	0	dimensionless	0	1
OHREGA	Ohio Region A Indicator 1 if in A else 0	1	dimensionless	0	1
CSL1085LFP	Stream Slope 10 and 85 Longest Flow Path	45.5	feet per mi	1.53	516
LC92STOR	Percent Storage from NLCD1992	1.26	percent	0	25.35

Peak-Flow Statistics Flow Report[Peak Flow Full Model Reg A SIR2019 5018]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp

Statistic	Value	Unit	PIl	PIu	SEp
2 Year Peak Flood	499	ft^3/s	264	943	40.1
5 Year Peak Flood	854	ft^3/s	472	1540	37.2
10 Year Peak Flood	1130	ft^3/s	623	2070	37.6
25 Year Peak Flood	1540	ft^3/s	838	2820	38.1
50 Year Peak Flood	1870	ft^3/s	1010	3460	37.8
100 Year Peak Flood	2220	ft^3/s	1180	4160	39.6
500 Year Peak Flood	3130	ft^3/s	1660	5930	40.3

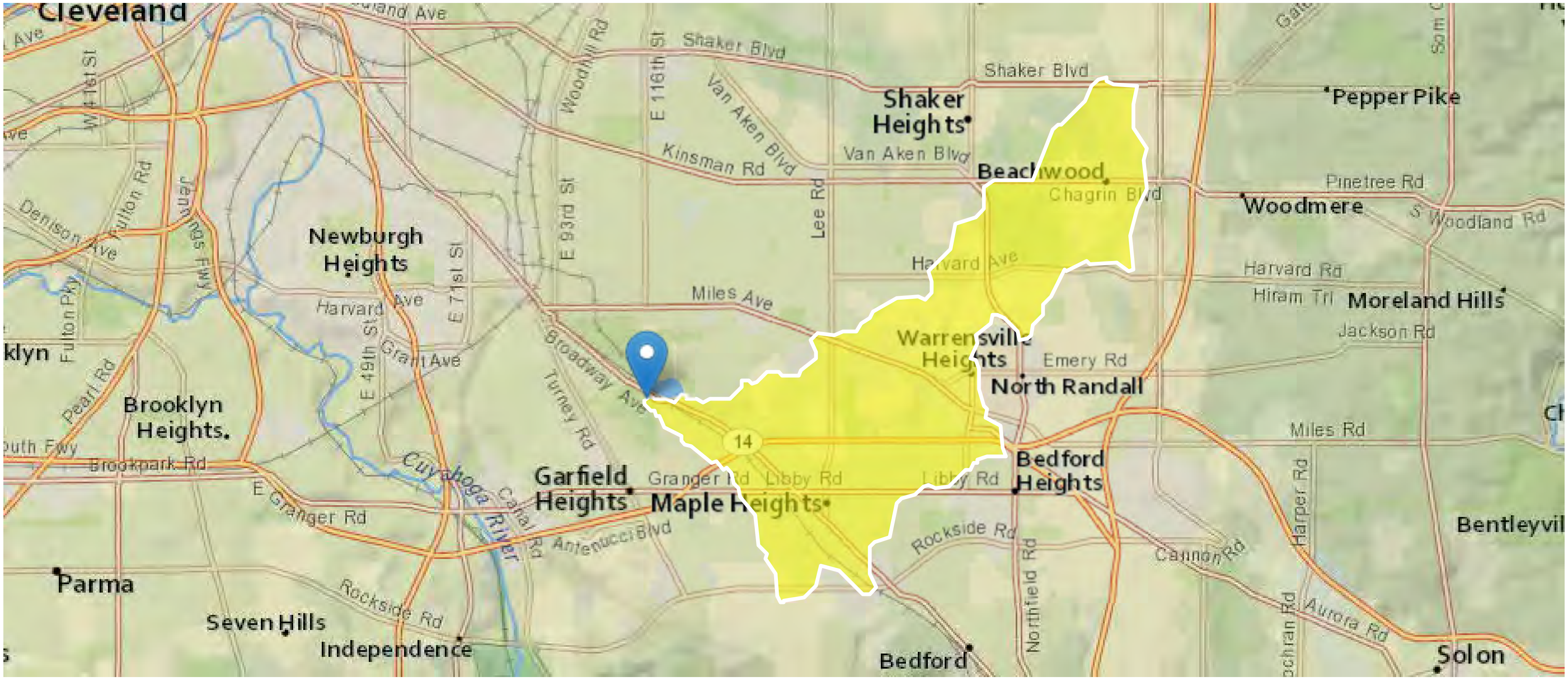
Peak-Flow Statistics Citations

Koltun, G.F.,2019, Flood-frequency estimates for Ohio streamgages based on data through water year 2015 and techniques for estimating flood-frequency characteristics of rural, unregulated Ohio streams: U.S. Geological Survey Scientific Investigations Report 2019–5018, xx p. (https://dx.doi.org/10.3133/sir20195018)

Application Version: 4.3.11

StreamStats Report - Mill Creek Middle

Region ID: OH
Workspace ID: OH20200601194024625000
Clicked Point (Latitude, Longitude): 41.43108, -81.60273
Time: 2020-06-01 15:40:41 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	9.32	square miles
PRECIP	Mean Annual Precipitation	39.3	inches
LAT_CENT	Latitude of Basin Centroid	41.4369	decimal degrees
OHREGC	Ohio Region C Indicator	0	dimensionless
OHREGA	Ohio Region A Indicator	1	dimensionless
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	42.6	feet per mi
LC92STOR	Percentage of water bodies and wetlands determined from the NLCD	1.06	percent

Annual Flow Statistics Parameters[Low Flow LatGT 41.2 wri02 4068]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	9.32	square miles	0.12	7422
PRECIP	Mean Annual Precipitation	39.3	inches	34	43.2
LAT_CENT	Latitude of Basin Centroid	41.4369	decimal degrees	41.2	41.59

Annual Flow Statistics Flow Report[Low Flow LatGT 41.2 wri02 4068]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp
Mean Annual Flow	11.3	ft^3/s	11.4	11.4

Annual Flow Statistics Citations

Koltun, G. F., and Whitehead, M. T.,2002, Techniques for Estimating Selected Streamflow Characteristics of Rural, Unregulated Streams in Ohio: U. S. Geological Survey Water-Resources Investigations Report 02-4068, 50 p (https://pubs.er.usgs.gov/publication/wri024068)

Peak-Flow Statistics Parameters[Peak Flow Full Model Reg A SIR2019 5018]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	9.32	square miles	0.04	5989
OHREGC	Ohio Region C Indicator 1 if in C else 0	0	dimensionless	0	1
OHREGA	Ohio Region A Indicator 1 if in A else 0	1	dimensionless	0	1
CSL1085LFP	Stream Slope 10 and 85 Longest Flow Path	42.6	feet per mi	1.53	516
LC92STOR	Percent Storage from NLCD1992	1.06	percent	0	25.35

Peak-Flow Statistics Flow Report[Peak Flow Full Model Reg A SIR2019 5018]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SEp
2 Year Peak Flood	597	ft^3/s	315	1130	40.1
5 Year Peak Flood	1020	ft^3/s	563	1840	37.2
10 Year Peak Flood	1350	ft^3/s	744	2470	37.6
25 Year Peak Flood	1830	ft^3/s	1000	3360	38.1
50 Year Peak Flood	2230	ft^3/s	1200	4130	37.8
100 Year Peak Flood	2650	ft^3/s	1410	4960	39.6
500 Year Peak Flood	3730	ft^3/s	1970	7060	40.3

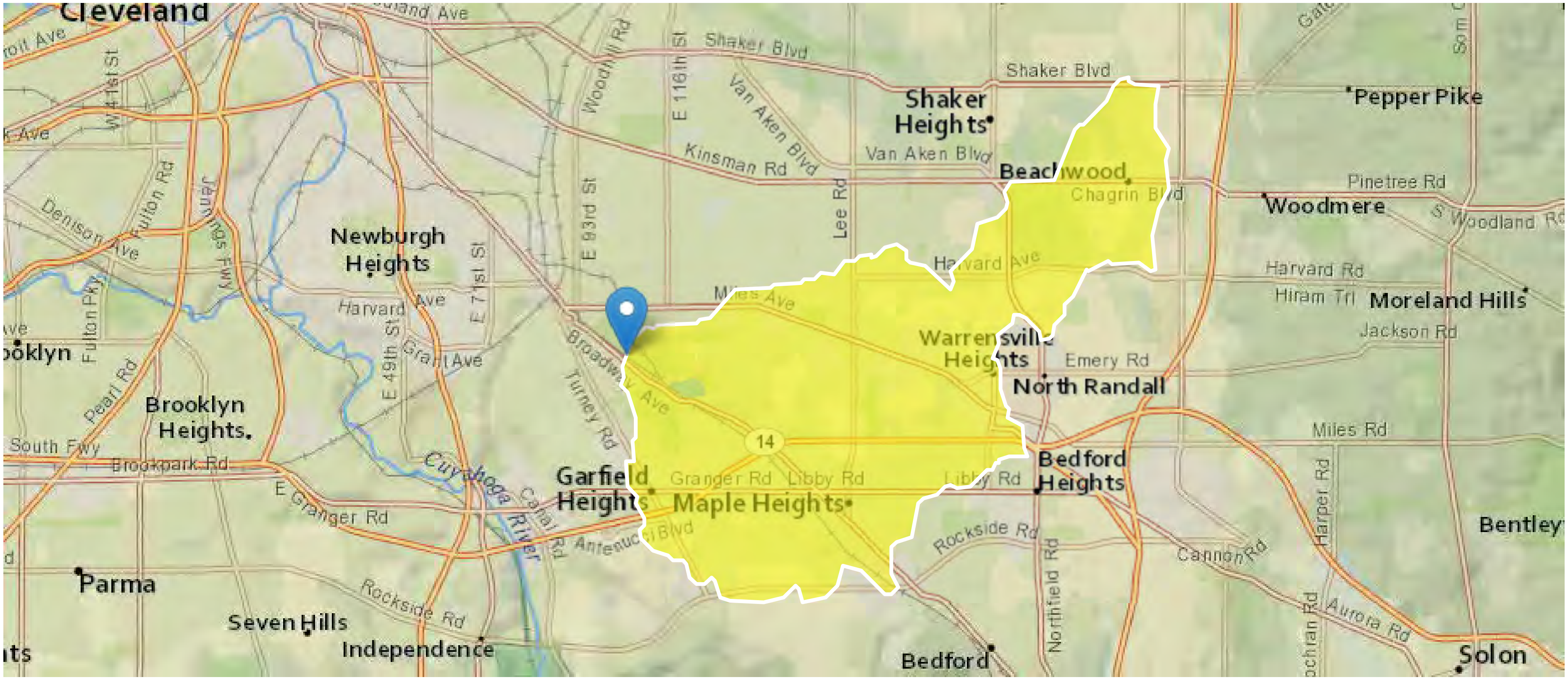
Peak-Flow Statistics Citations

Koltun, G.F.,2019, Flood-frequency estimates for Ohio streamgages based on data through water year 2015 and techniques for estimating flood-frequency characteristics of rural, unregulated Ohio streams: U.S. Geological Survey Scientific Investigations Report 2019–5018, xx p. (https://dx.doi.org/10.3133/sir20195018)

Application Version: 4.3.11

StreamStats Report - Mill Creek Lower

Region ID: OH
Workspace ID: OH20200601194446219000
Clicked Point (Latitude, Longitude): 41.43792, -81.61117
Time: 2020-06-01 15:45:01 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	14.3	square miles
PRECIP	Mean Annual Precipitation	39.3	inches
LAT_CENT	Latitude of Basin Centroid	41.4342	decimal degrees
OHREGC	Ohio Region C Indicator	0	dimensionless
OHREGA	Ohio Region A Indicator	1	dimensionless
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	42.2	feet per mi
LC92STOR	Percentage of water bodies and wetlands determined from the NLCD	1.29	percent
FOREST	Percentage of area covered by forest	10.5	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	96.1	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	38.2	percent
LFPLENGTH	Length of longest flow path	9.52	miles
LONG_CENT	Longitude Basin Centroid	81.5613	decimal degrees
STREAM_VARG	Streamflow variability index as defined in WRIR 02-4068, computed from regional grid	0.48	dimensionless

Annual Flow Statistics Parameters[Low Flow LatGT 41.2 wri02 4068]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	14.3	square miles	0.12	7422

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
PRECIP	Mean Annual Precipitation	39.3	inches	34	43.2
LAT_CENT	Latitude of Basin Centroid	41.4342	decimal degrees	41.2	41.59

Annual Flow Statistics Flow Report[Low Flow LatGT 41.2 wri02 4068]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp
Mean Annual Flow	17.4	ft^3/s	11.4	11.4

Annual Flow Statistics Citations

Koltun, G. F., and Whitehead, M. T.,2002, Techniques for Estimating Selected Streamflow Characteristics of Rural, Unregulated Streams in Ohio: U. S. Geological Survey Water-Resources Investigations Report 02-4068, 50 p (https://pubs.er.usgs.gov/publication/wri024068)

Peak-Flow Statistics Parameters[Peak Flow Full Model Reg A SIR2019 5018]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	14.3	square miles	0.04	5989
OHREGC	Ohio Region C Indicator 1 if in C else 0	0	dimensionless	0	1
OHREGA	Ohio Region A Indicator 1 if in A else 0	1	dimensionless	0	1
CSL1085LFP	Stream Slope 10 and 85 Longest Flow Path	42.2	feet per mi	1.53	516
LC92STOR	Percent Storage from NLCD1992	1.29	percent	0	25.35

Peak-Flow Statistics Flow Report[Peak Flow Full Model Reg A SIR2019 5018]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp

Statistic	Value	Unit	PIl	PIu	SEp
2 Year Peak Flood	821	ft^3/s	433	1550	40.1
5 Year Peak Flood	1390	ft^3/s	766	2510	37.2
10 Year Peak Flood	1830	ft^3/s	1000	3340	37.6
25 Year Peak Flood	2470	ft^3/s	1340	4520	38.1
50 Year Peak Flood	2980	ft^3/s	1610	5530	37.8
100 Year Peak Flood	3530	ft^3/s	1880	6620	39.6
500 Year Peak Flood	4950	ft^3/s	2610	9370	40.3

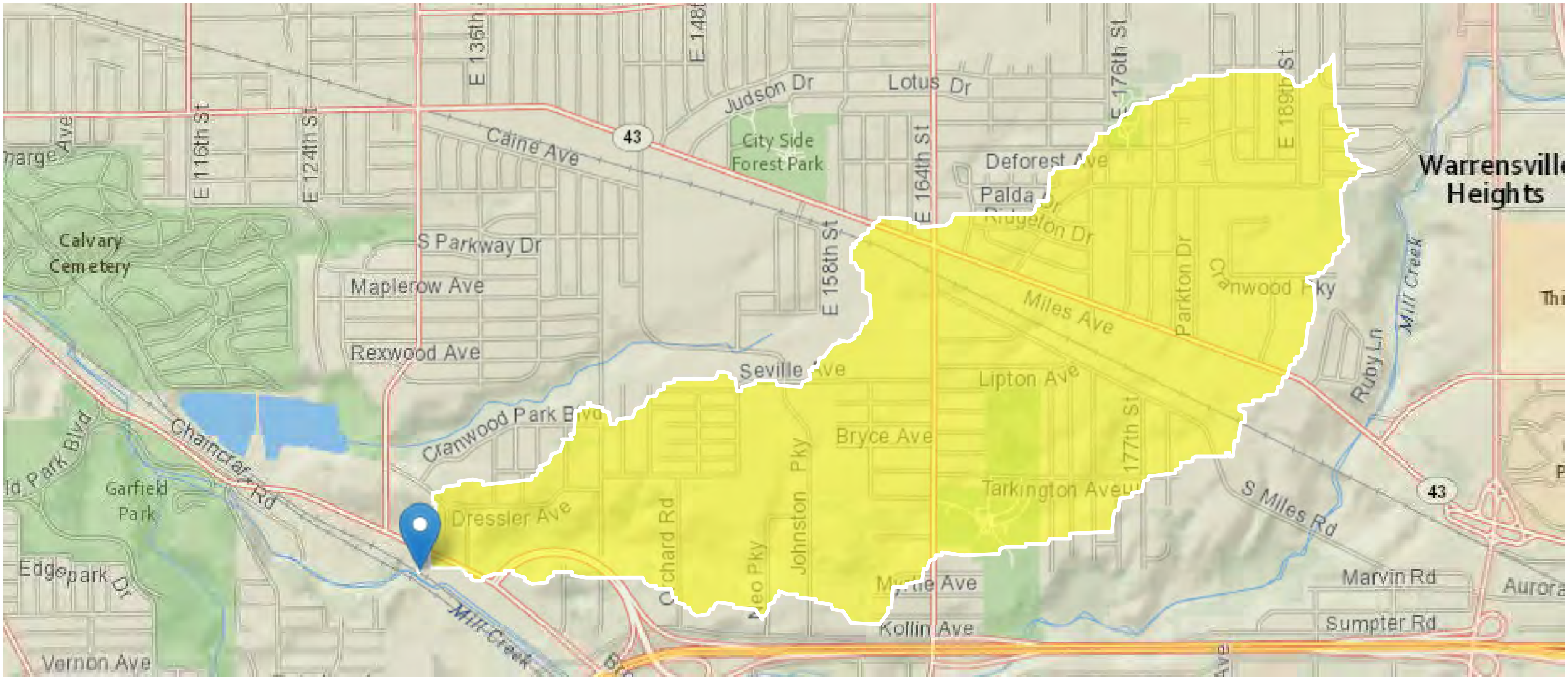
Peak-Flow Statistics Citations

Koltun, G.F.,2019, Flood-frequency estimates for Ohio streamgages based on data through water year 2015 and techniques for estimating flood-frequency characteristics of rural, unregulated Ohio streams: U.S. Geological Survey Scientific Investigations Report 2019–5018, xx p. (https://dx.doi.org/10.3133/sir20195018)

Application Version: 4.3.11

StreamStats Report - UNT I-480

Region ID: OH
Workspace ID: OH20200601192822603000
Clicked Point (Latitude, Longitude): 41.42770, -81.59115
Time: 2020-06-01 15:28:38 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.69	square miles
PRECIP	Mean Annual Precipitation	39.3	inches
LAT_CENT	Latitude of Basin Centroid	41.4351	decimal degrees
OHREGC	Ohio Region C Indicator	0	dimensionless
OHREGA	Ohio Region A Indicator	1	dimensionless
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	69.8	feet per mi
LC92STOR	Percentage of water bodies and wetlands determined from the NLCD	0.26	percent
FOREST	Percentage of area covered by forest	11.3	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	97.8	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	42.6	percent
LFPLENGTH	Length of longest flow path	3.57	miles
LONG_CENT	Longitude Basin Centroid	81.5631	decimal degrees
STREAM_VARG	Streamflow variability index as defined in WRIR 02-4068, computed from regional grid	0.46	dimensionless

Annual Flow Statistics Parameters[Low Flow LatGT 41.2 wri02 4068]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.69	square miles	0.12	7422

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
PRECIP	Mean Annual Precipitation	39.3	inches	34	43.2
LAT_CENT	Latitude of Basin Centroid	41.4351	decimal degrees	41.2	41.59

Annual Flow Statistics Flow Report[Low Flow LatGT 41.2 wri02 4068]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp
Mean Annual Flow	2.02	ft^3/s	11.4	11.4

Annual Flow Statistics Citations

Koltun, G. F., and Whitehead, M. T.,2002, Techniques for Estimating Selected Streamflow Characteristics of Rural, Unregulated Streams in Ohio: U. S. Geological Survey Water-Resources Investigations Report 02-4068, 50 p (https://pubs.er.usgs.gov/publication/wri024068)

Peak-Flow Statistics Parameters[Peak Flow Full Model Reg A SIR2019 5018]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.69	square miles	0.04	5989
OHREGC	Ohio Region C Indicator 1 if in C else 0	0	dimensionless	0	1
OHREGA	Ohio Region A Indicator 1 if in A else 0	1	dimensionless	0	1
CSL1085LFP	Stream Slope 10 and 85 Longest Flow Path	69.8	feet per mi	1.53	516
LC92STOR	Percent Storage from NLCD1992	0.26	percent	0	25.35

Peak-Flow Statistics Flow Report[Peak Flow Full Model Reg A SIR2019 5018]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp

Statistic	Value	Unit	PII	PIu	SEp
2 Year Peak Flood	182	ft^3/s	95.8	344	40.1
5 Year Peak Flood	331	ft^3/s	183	600	37.2
10 Year Peak Flood	455	ft^3/s	249	830	37.6
25 Year Peak Flood	637	ft^3/s	347	1170	38.1
50 Year Peak Flood	790	ft^3/s	425	1470	37.8
100 Year Peak Flood	956	ft^3/s	509	1800	39.6
500 Year Peak Flood	1400	ft^3/s	736	2650	40.3

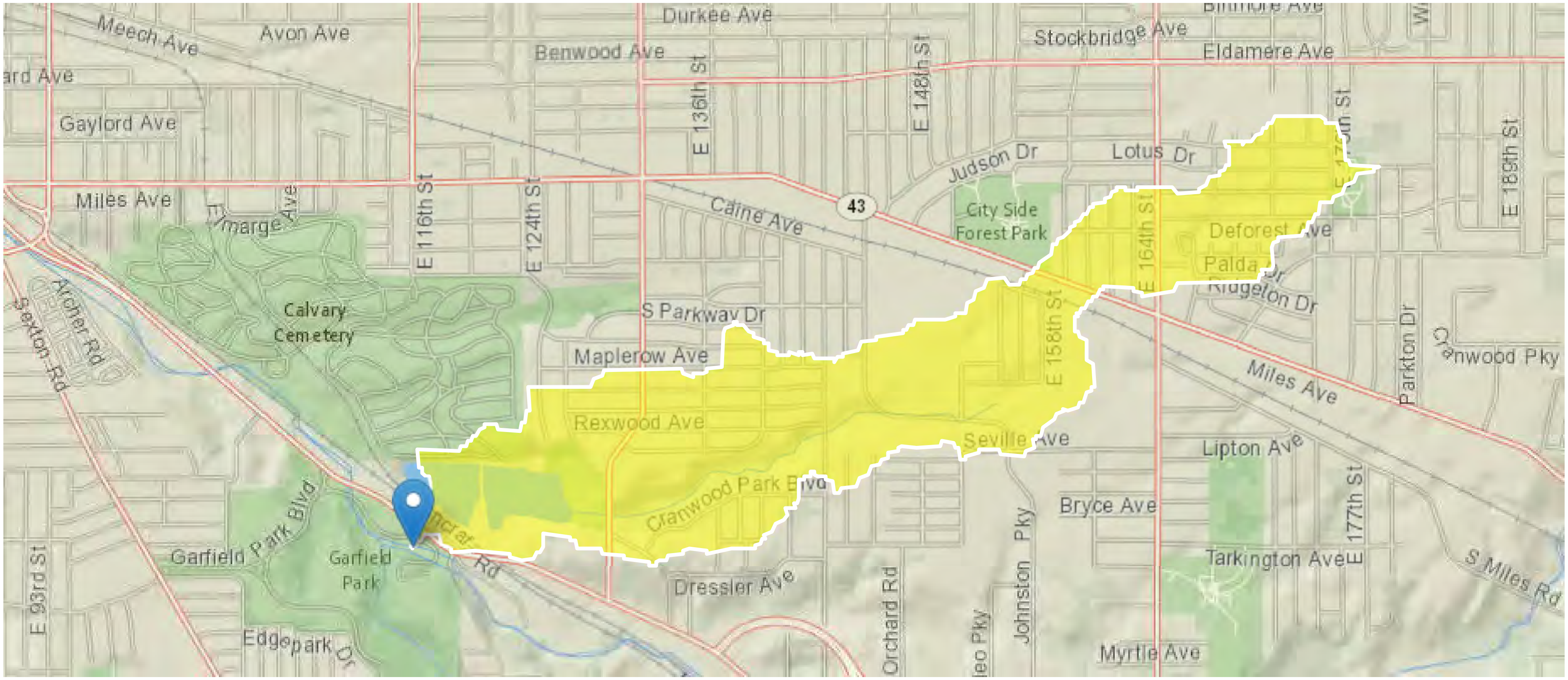
Peak-Flow Statistics Citations

Koltun, G.F.,2019, Flood-frequency estimates for Ohio streamgages based on data through water year 2015 and techniques for estimating flood-frequency characteristics of rural, unregulated Ohio streams: U.S. Geological Survey Scientific Investigations Report 2019–5018, xx p. (https://dx.doi.org/10.3133/sir20195018)

Application Version: 4.3.11

StreamStats Report - UNT Pompili

Region ID: OH
Workspace ID: OH20200601192328019000
Clicked Point (Latitude, Longitude): 41.43129, -81.60286
Time: 2020-06-01 15:23:43 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.91	square miles
OHREGC	Ohio Region C Indicator	0	dimensionless
OHREGA	Ohio Region A Indicator	1	dimensionless
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	75.3	feet per mi
LC92STOR	Percentage of water bodies and wetlands determined from the NLCD	5.97	percent
PRECIP	Mean Annual Precipitation	39.3	inches
LAT_CENT	Latitude of Basin Centroid	41.4376	decimal degrees
FOREST	Percentage of area covered by forest	8.16	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	94.3	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	38.7	percent
LFPLENGTH	Length of longest flow path	3.15	miles
LONG_CENT	Longitude Basin Centroid	81.5799	decimal degrees
STREAM_VARG	Streamflow variability index as defined in WRIR 02-4068, computed from regional grid	0.47	dimensionless

Peak-Flow Statistics Parameters[Peak Flow Full Model Reg A SIR2019 5018]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.91	square miles	0.04	5989

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
OHREGC	Ohio Region C Indicator 1 if in C else 0	0	dimensionless	0	1
OHREGA	Ohio Region A Indicator 1 if in A else 0	1	dimensionless	0	1
CSL1085LFP	Stream Slope 10 and 85 Longest Flow Path	75.3	feet per mi	1.53	516
LC92STOR	Percent Storage from NLCD1992	5.97	percent	0	25.35

Peak-Flow Statistics Flow Report[Peak Flow Full Model Reg A SIR2019 5018]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SEp
2 Year Peak Flood	90.8	ft^3/s	47.6	173	40.1
5 Year Peak Flood	155	ft^3/s	85.2	284	37.2
10 Year Peak Flood	206	ft^3/s	112	379	37.6
25 Year Peak Flood	278	ft^3/s	150	515	38.1
50 Year Peak Flood	338	ft^3/s	180	632	37.8
100 Year Peak Flood	401	ft^3/s	211	759	39.6
500 Year Peak Flood	564	ft^3/s	294	1080	40.3

Peak-Flow Statistics Citations

Koltun, G.F.,2019, Flood-frequency estimates for Ohio streamgages based on data through water year 2015 and techniques for estimating flood-frequency characteristics of rural, unregulated Ohio streams: U.S. Geological Survey Scientific Investigations Report 2019–5018, xx p. (https://dx.doi.org/10.3133/sir20195018)

Annual Flow Statistics Parameters[Low Flow LatGT 41.2 wri02 4068]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.91	square miles	0.12	7422
PRECIP	Mean Annual Precipitation	39.3	inches	34	43.2
LAT_CENT	Latitude of Basin Centroid	41.4376	decimal degrees	41.2	41.59

Annual Flow Statistics Flow Report[Low Flow LatGT 41.2 wri02 4068]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp
Mean Annual Flow	1.08	ft^3/s	11.4	11.4

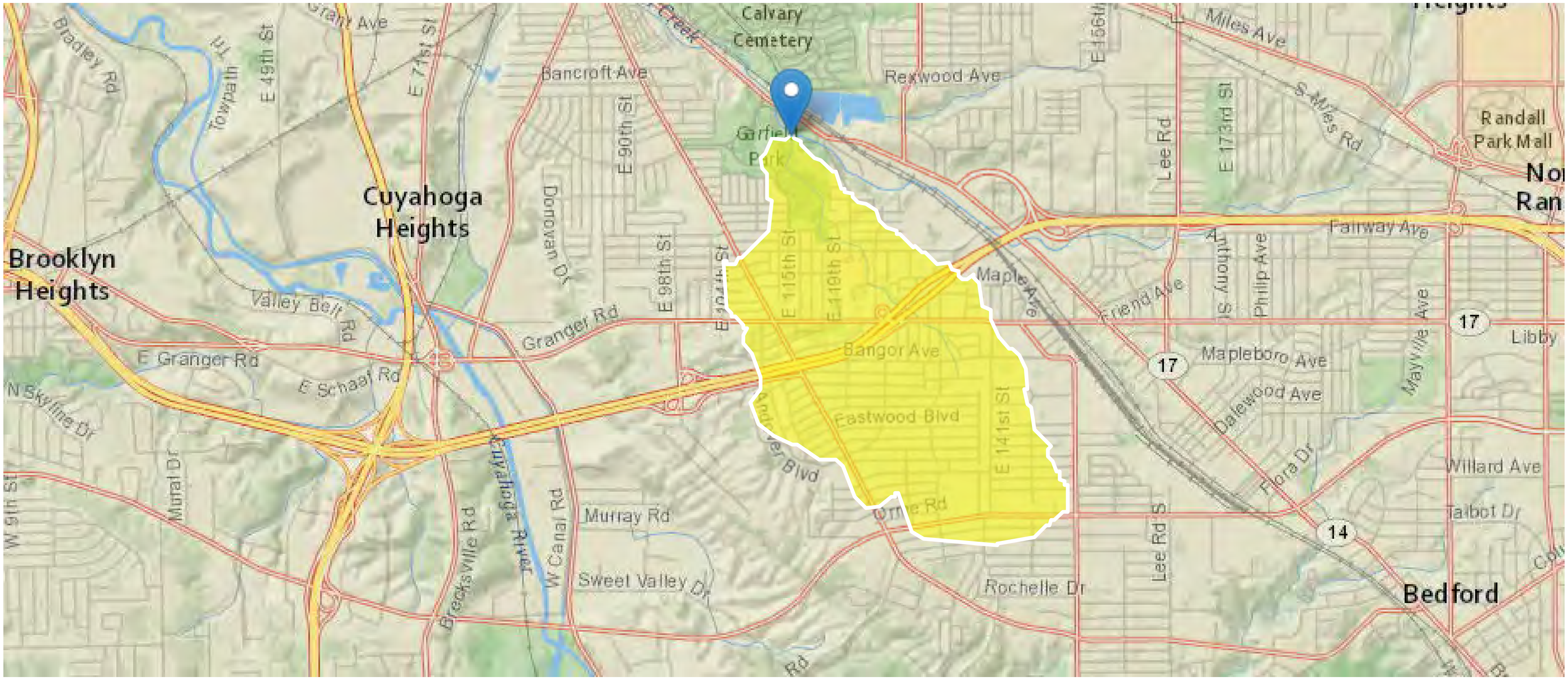
Annual Flow Statistics Citations

Koltun, G. F., and Whitehead, M. T.,2002, Techniques for Estimating Selected Streamflow Characteristics of Rural, Unregulated Streams in Ohio: U. S. Geological Survey Water-Resources Investigations Report 02-4068, 50 p (https://pubs.er.usgs.gov/publication/wri024068)

Application Version: 4.3.11

StreamStats Report - Wolf Creek

Region ID: OH
Workspace ID: OH20200601193252486000
Clicked Point (Latitude, Longitude): 41.43114, -81.60430
Time: 2020-06-01 15:33:07 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	2.18	square miles
PRECIP	Mean Annual Precipitation	39.3	inches
LAT_CENT	Latitude of Basin Centroid	41.4137	decimal degrees
OHREGC	Ohio Region C Indicator	0	dimensionless
OHREGA	Ohio Region A Indicator	1	dimensionless
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	48	feet per mi
LC92STOR	Percentage of water bodies and wetlands determined from the NLCD	0.7	percent

Annual Flow Statistics Parameters[Low Flow LatGT 41.2 wri02 4068]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.18	square miles	0.12	7422
PRECIP	Mean Annual Precipitation	39.3	inches	34	43.2
LAT_CENT	Latitude of Basin Centroid	41.4137	decimal degrees	41.2	41.59

Annual Flow Statistics Flow Report[Low Flow LatGT 41.2 wri02 4068]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp
Mean Annual Flow	2.6	ft^3/s	11.4	11.4

Annual Flow Statistics Citations

Koltun, G. F., and Whitehead, M. T.,2002, Techniques for Estimating Selected Streamflow Characteristics of Rural, Unregulated Streams in Ohio: U. S. Geological Survey Water-Resources Investigations Report 02-4068, 50 p (https://pubs.er.usgs.gov/publication/wri024068)

Peak-Flow Statistics Parameters[Peak Flow Full Model Reg A SIR2019 5018]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.18	square miles	0.04	5989
OHREGC	Ohio Region C Indicator 1 if in C else 0	0	dimensionless	0	1
OHREGA	Ohio Region A Indicator 1 if in A else 0	1	dimensionless	0	1
CSL1085LFP	Stream Slope 10 and 85 Longest Flow Path	48	feet per mi	1.53	516
LC92STOR	Percent Storage from NLCD1992	0.7	percent	0	25.35

Peak-Flow Statistics Flow Report[Peak Flow Full Model Reg A SIR2019 5018]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp
2 Year Peak Flood	200	ft^3/s	106	379	40.1
5 Year Peak Flood	354	ft^3/s	196	641	37.2
10 Year Peak Flood	479	ft^3/s	263	871	37.6
25 Year Peak Flood	660	ft^3/s	360	1210	38.1
50 Year Peak Flood	810	ft^3/s	437	1500	37.8
100 Year Peak Flood	973	ft^3/s	519	1820	39.6
500 Year Peak Flood	1400	ft^3/s	740	2650	40.3

Peak-Flow Statistics Citations

Koltun, G.F.,2019, Flood-frequency estimates for Ohio streamgages based on data through water year 2015 and techniques for estimating flood-frequency characteristics of rural, unregulated Ohio streams: U.S. Geological Survey Scientific Investigations Report 2019–5018, xx p. (https://dx.doi.org/10.3133/sir20195018)

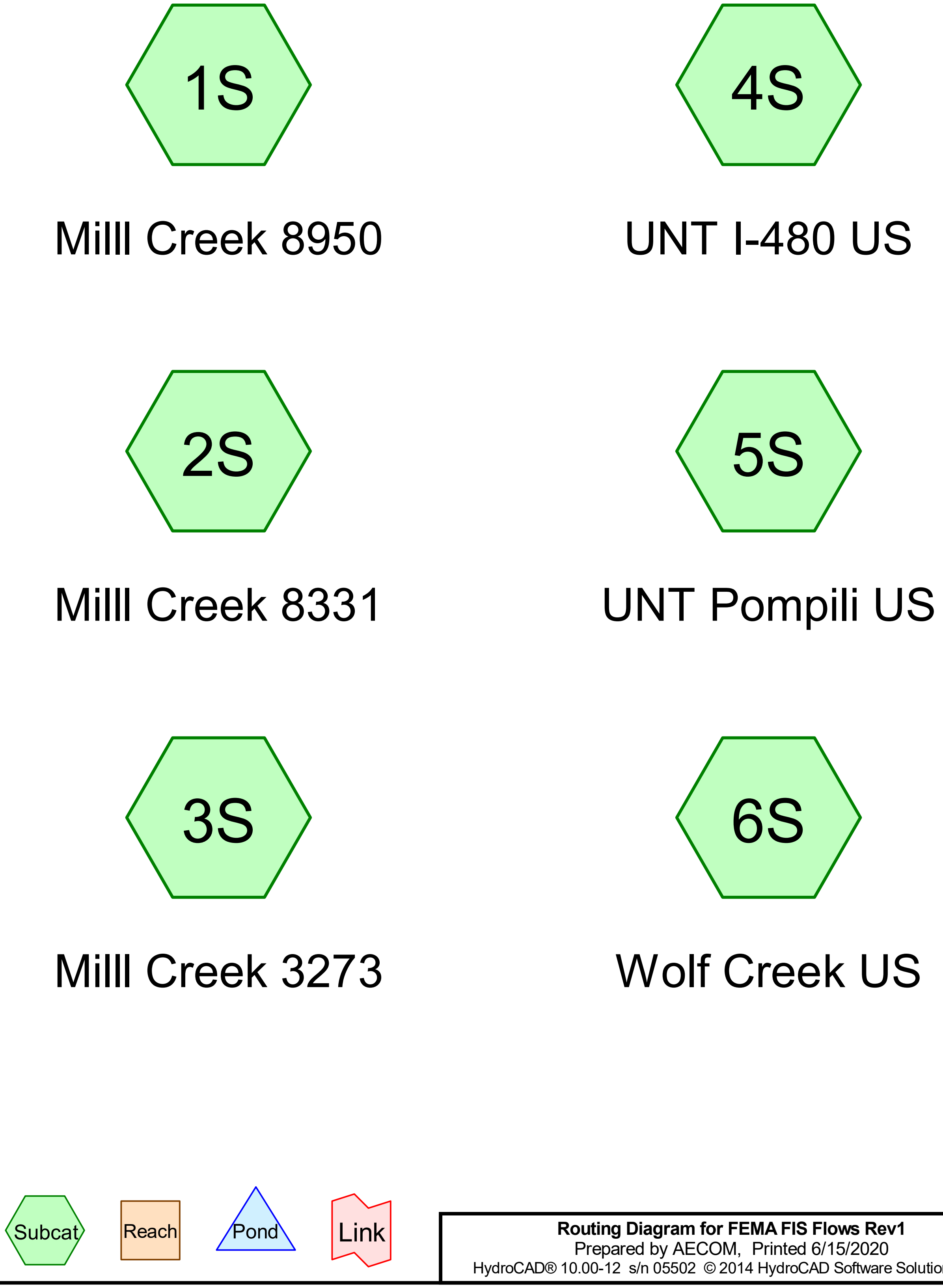
Application Version: 4.3.11

Attachment B3 – Flood Hydrographs

StreamStats and FEMA Flows

Date: 06/01/2020

Location	Drainage Area (sq mi)	Source	HEC-RAS Station	Peak Flow (cfs)						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
UNT Pompili	0.91	StreamStats		91	155	206	278	338	401	564
UNT I-480	1.69	StreamStats		182	331	455	637	790	956	1,400
Wolf Creek	2.18	StreamStats		200	354	479	660	810	973	1,400
At Garfield Hts US	6.67	FEMA	8950	-	-	1,250	-	1,670	2,150	2,650
Mill Creek - Upper	7.42	StreamStats	-	499	854	1,130	1,540	1,870	2,220	3,130
Just DS of UNT I-480	8.26	FEMA	8331	-	-	1,780	-	2,560	3,000	4,100
Mill Creek - Middle	9.32	StreamStats	-	597	1,020	1,350	1,830	2,230	2,650	3,730
Just DS of Wolf Creek	10.66	FEMA	3273	-	-	1,960	-	2,720	3,370	4,500
At Garfield Hts DS	12.7	FEMA	Past DS Bound	-	-	2,270	-	3,150	3,820	5,200
Mill Creek - Lower	14.3	StreamStats	-	821	1,390	1,830	2,470	2,980	3,530	4,950
Broadway Ave	15	FEMA	-	-	-	2,358	-	3,477	3,959	5,078
Cleveland DS	16	FEMA	-	-	-	2,411	-	3,551	4,043	5,183
Mill Creek - USGS	17.3	StreamStats	-	960	1,620	2,140	2,880	3,480	4,110	5,760



Routing Diagram for FEMA FIS Flows Rev1
Prepared by AECOM, Printed 6/15/2020
HydroCAD® 10.00-12 s/n 05502 © 2014 HydroCAD Software Solutions LLC

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Milll Creek 8950 Runoff Area=4,268.800 ac 0.00% Impervious Runoff Depth=1.75"
Tc=120.0 min CN=63 Runoff=2,171.36 cfs 624.233 af

Subcatchment 2S: Milll Creek 8331 Runoff Area=5,286.400 ac 0.00% Impervious Runoff Depth=1.91"
Tc=120.0 min CN=65 Runoff=2,990.09 cfs 842.009 af

Subcatchment 3S: Milll Creek 3273 Runoff Area=6,822.400 ac 0.00% Impervious Runoff Depth=1.75"
Tc=120.0 min CN=63 Runoff=3,470.28 cfs 997.649 af

Subcatchment 4S: UNT I-480 US Runoff Area=1,081.600 ac 0.00% Impervious Runoff Depth=2.58"
Tc=120.0 min CN=73 Runoff=871.33 cfs 232.736 af

Subcatchment 5S: UNT Pompili US Runoff Area=582.400 ac 0.00% Impervious Runoff Depth=2.49"
Tc=120.0 min CN=72 Runoff=451.21 cfs 121.063 af

Subcatchment 6S: Wolf Creek US Runoff Area=1,395.200 ac 0.00% Impervious Runoff Depth=1.11"
Tc=120.0 min CN=54 Runoff=387.04 cfs 128.855 af

Summary for Subcatchment 1S: Milll Creek 8950

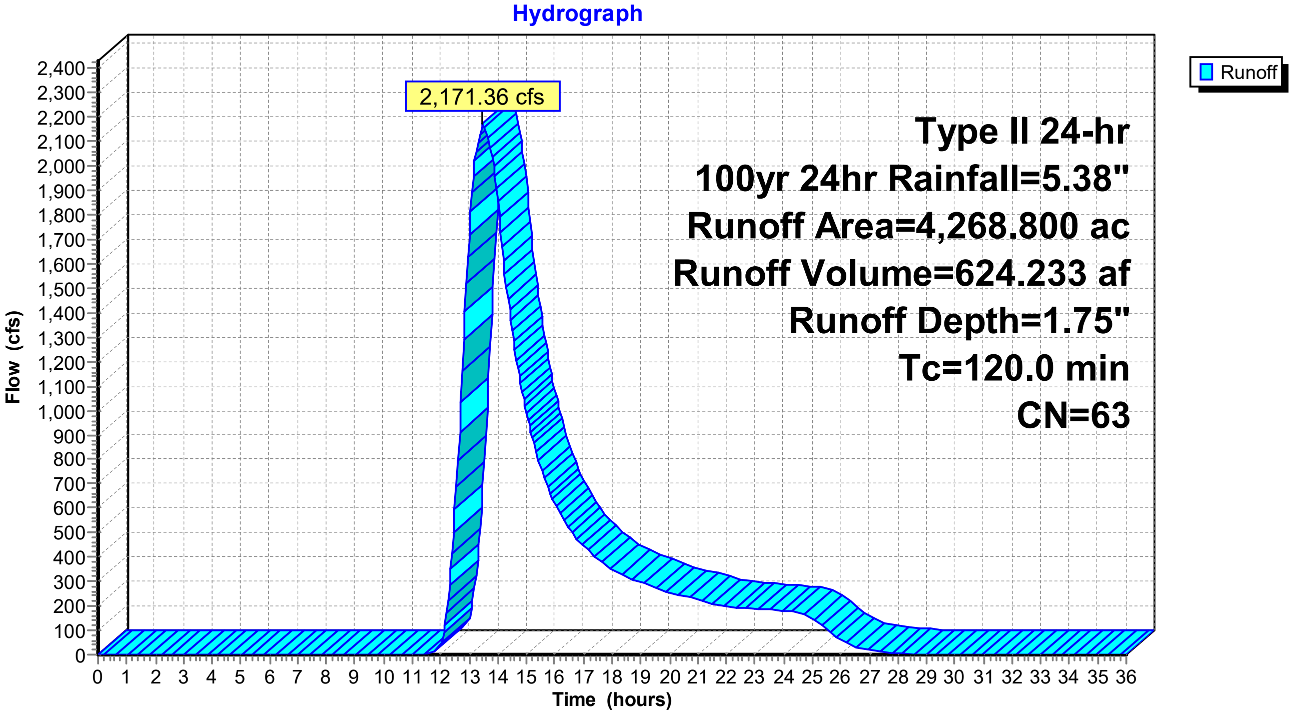
Runoff = 2,171.36 cfs @ 13.47 hrs, Volume= 624.233 af, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr 24hr Rainfall=5.38"

	Area (ac)	CN	Description
*	4,268.800	63	Woods/grass comb., Poor, HSG B
	4,268.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
120.0					**Direct Entry, Estimated**

Subcatchment 1S: Milll Creek 8950



Summary for Subcatchment 2S: Milll Creek 8331

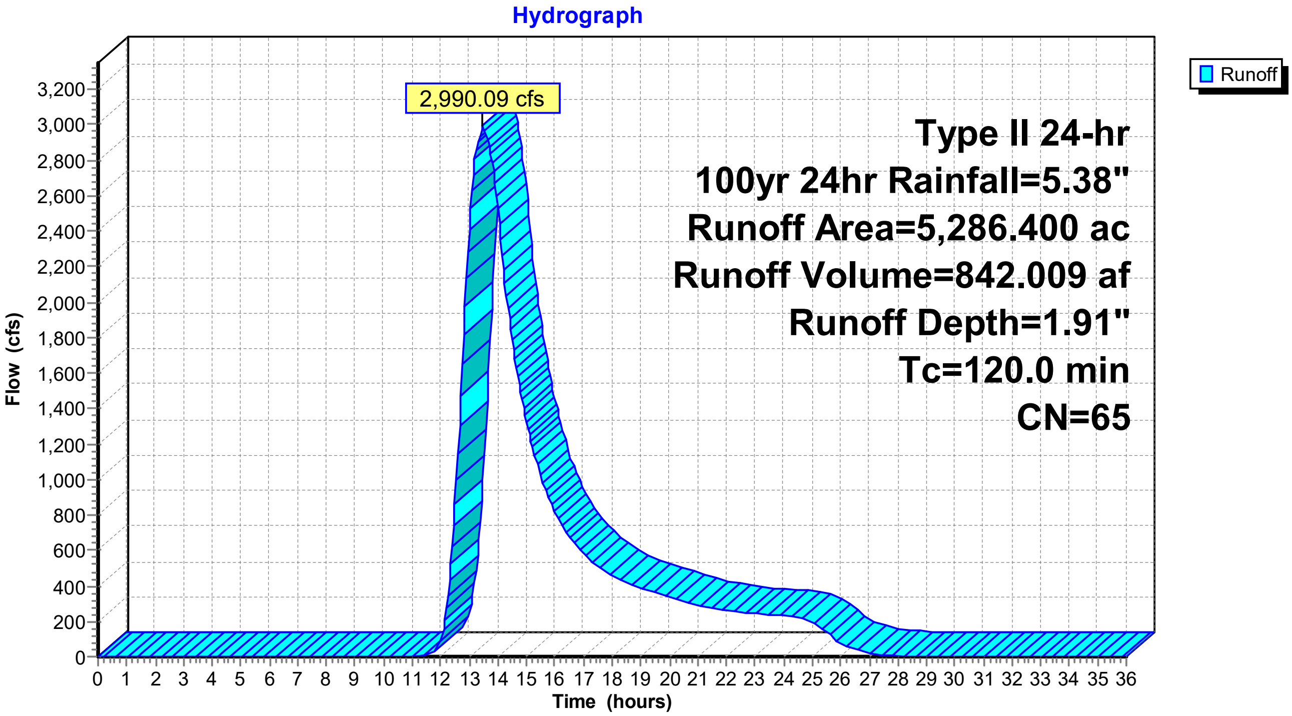
Runoff = 2,990.09 cfs @ 13.47 hrs, Volume= 842.009 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr 24hr Rainfall=5.38"

	Area (ac)	CN	Description
*	5,286.400	65	Woods/grass comb., Poor, HSG B
	5,286.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
120.0					**Direct Entry, Estimated**

Subcatchment 2S: Milll Creek 8331



Summary for Subcatchment 3S: Milll Creek 3273

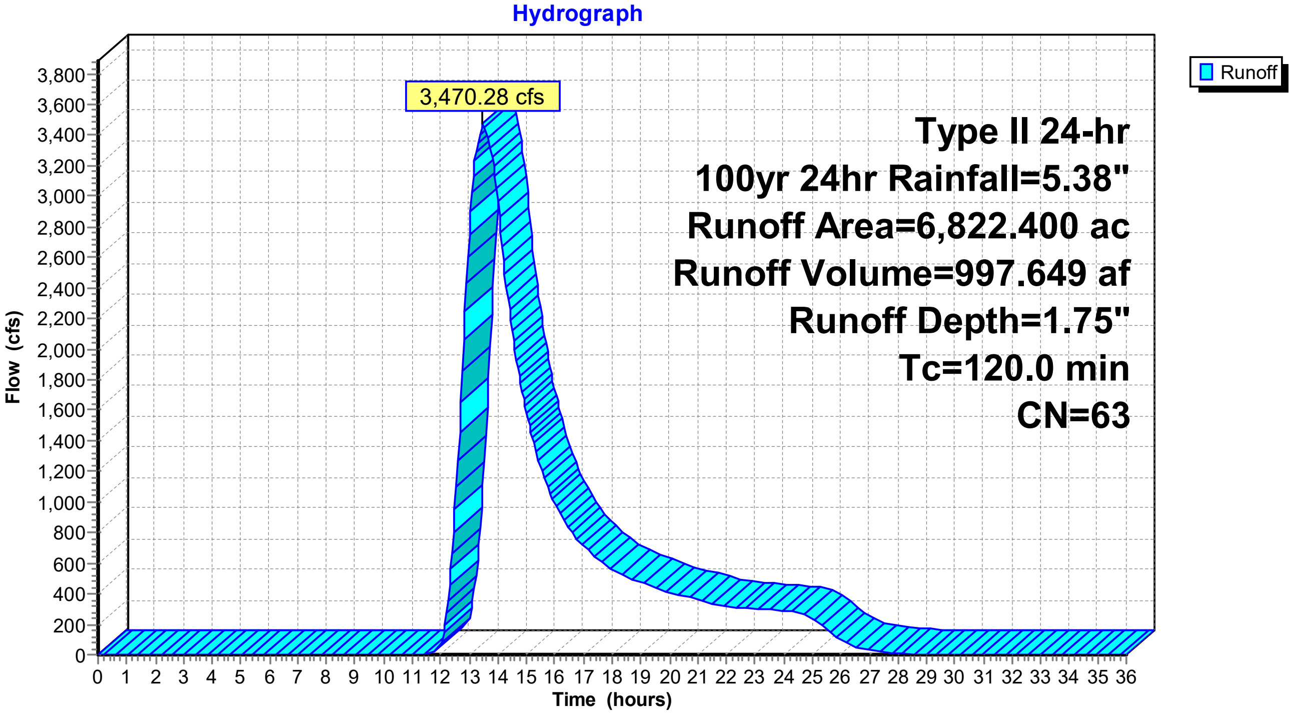
Runoff = 3,470.28 cfs @ 13.47 hrs, Volume= 997.649 af, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr 24hr Rainfall=5.38"

	Area (ac)	CN	Description
*	6,822.400	63	Woods/grass comb., Poor, HSG B
	6,822.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
120.0					**Direct Entry, Estimated**

Subcatchment 3S: Milll Creek 3273



Summary for Subcatchment 4S: UNT I-480 US

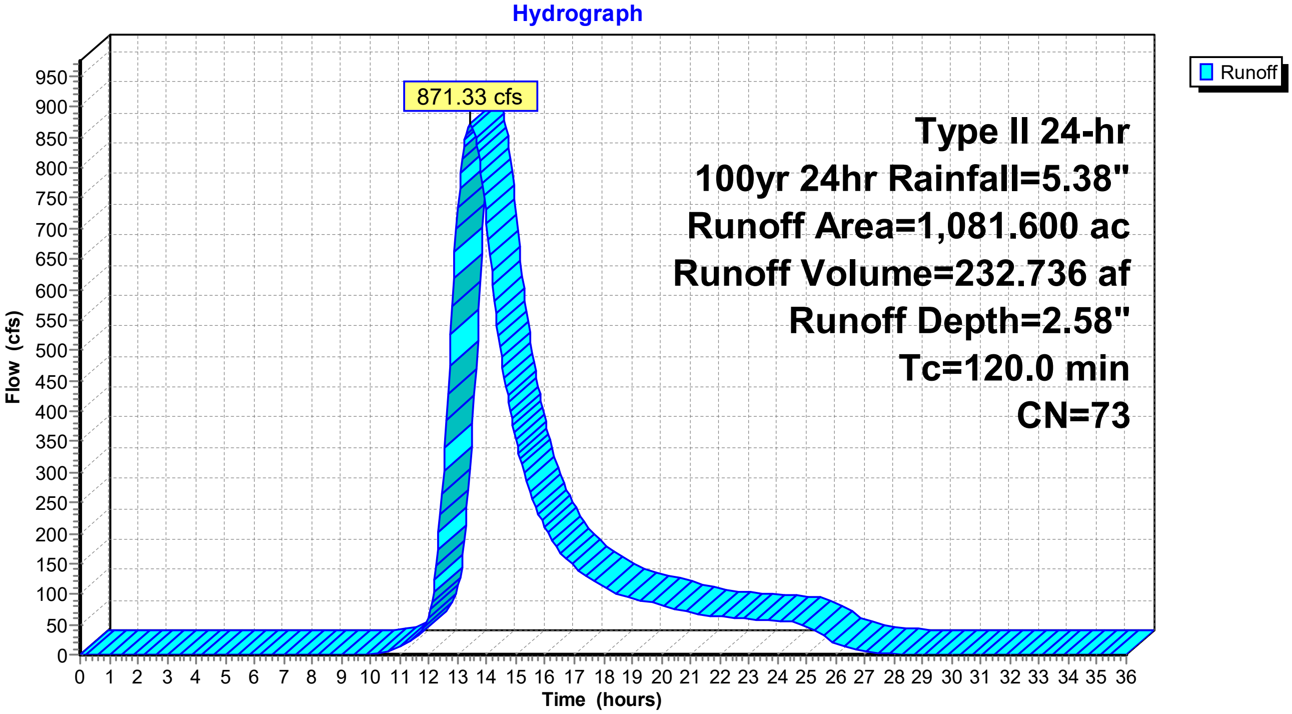
Runoff = 871.33 cfs @ 13.45 hrs, Volume= 232.736 af, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr 24hr Rainfall=5.38"

	Area (ac)	CN	Description
*	1,081.600	73	Woods/grass comb., Poor, HSG B
	1,081.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
120.0					**Direct Entry, Estimated**

Subcatchment 4S: UNT I-480 US



Summary for Subcatchment 5S: UNT Pompili US

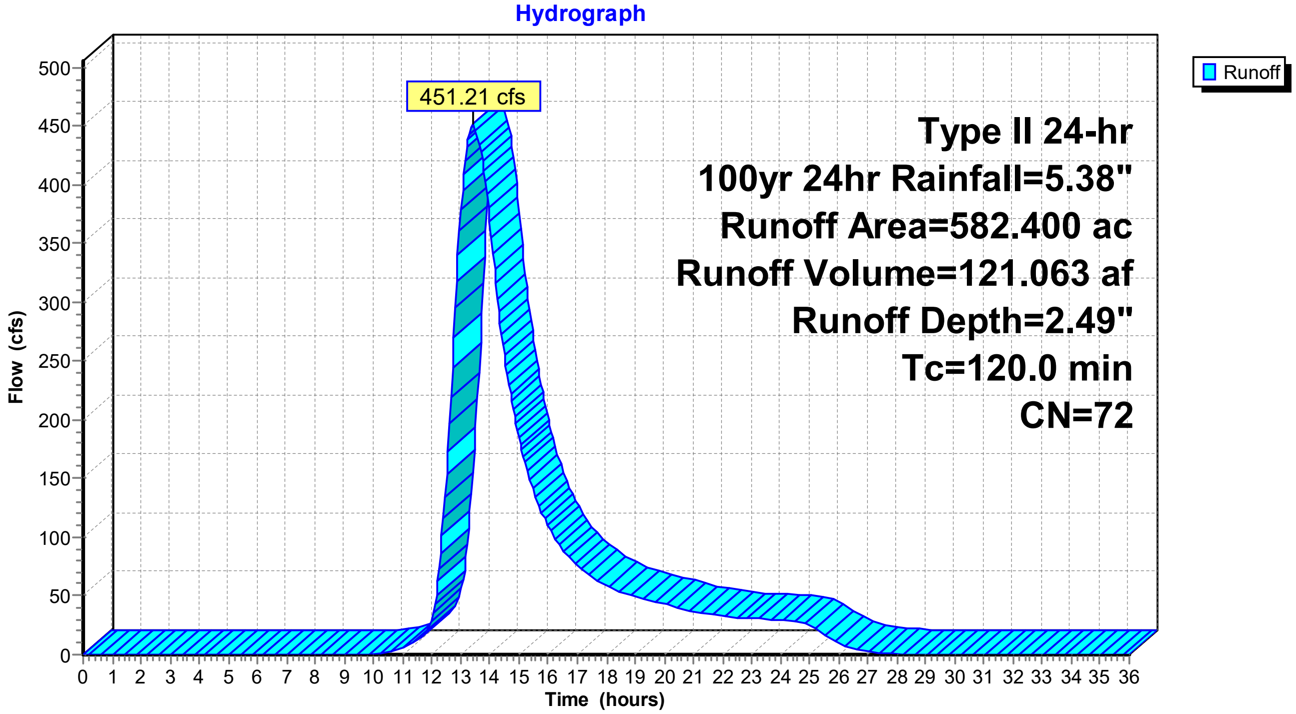
Runoff = 451.21 cfs @ 13.45 hrs, Volume= 121.063 af, Depth= 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr 24hr Rainfall=5.38"

	Area (ac)	CN	Description
*	582.400	72	Woods/grass comb., Poor, HSG B
	582.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
120.0					**Direct Entry, Estimated**

Subcatchment 5S: UNT Pompili US



Summary for Subcatchment 6S: Wolf Creek US

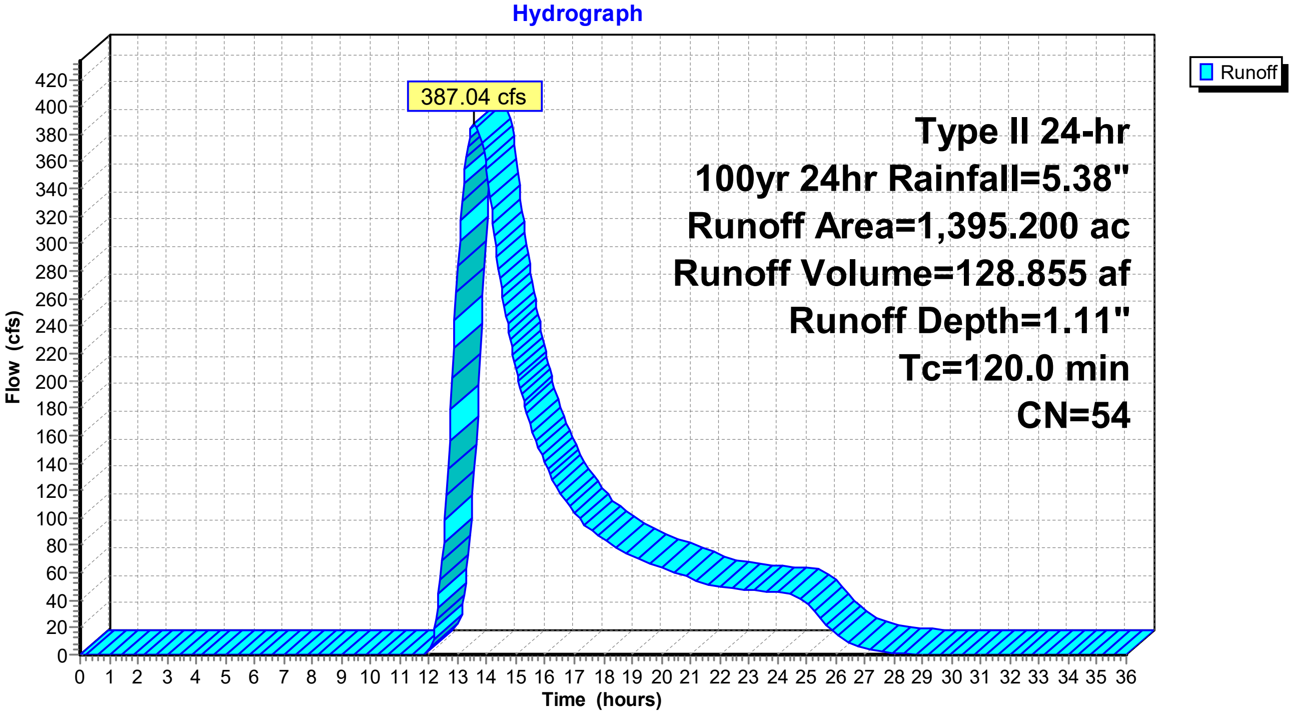
Runoff = 387.04 cfs @ 13.58 hrs, Volume= 128.855 af, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr 24hr Rainfall=5.38"

	Area (ac)	CN	Description
*	1,395.200	54	Woods/grass comb., Poor, HSG B
	1,395.200		100.00% Pervious Area

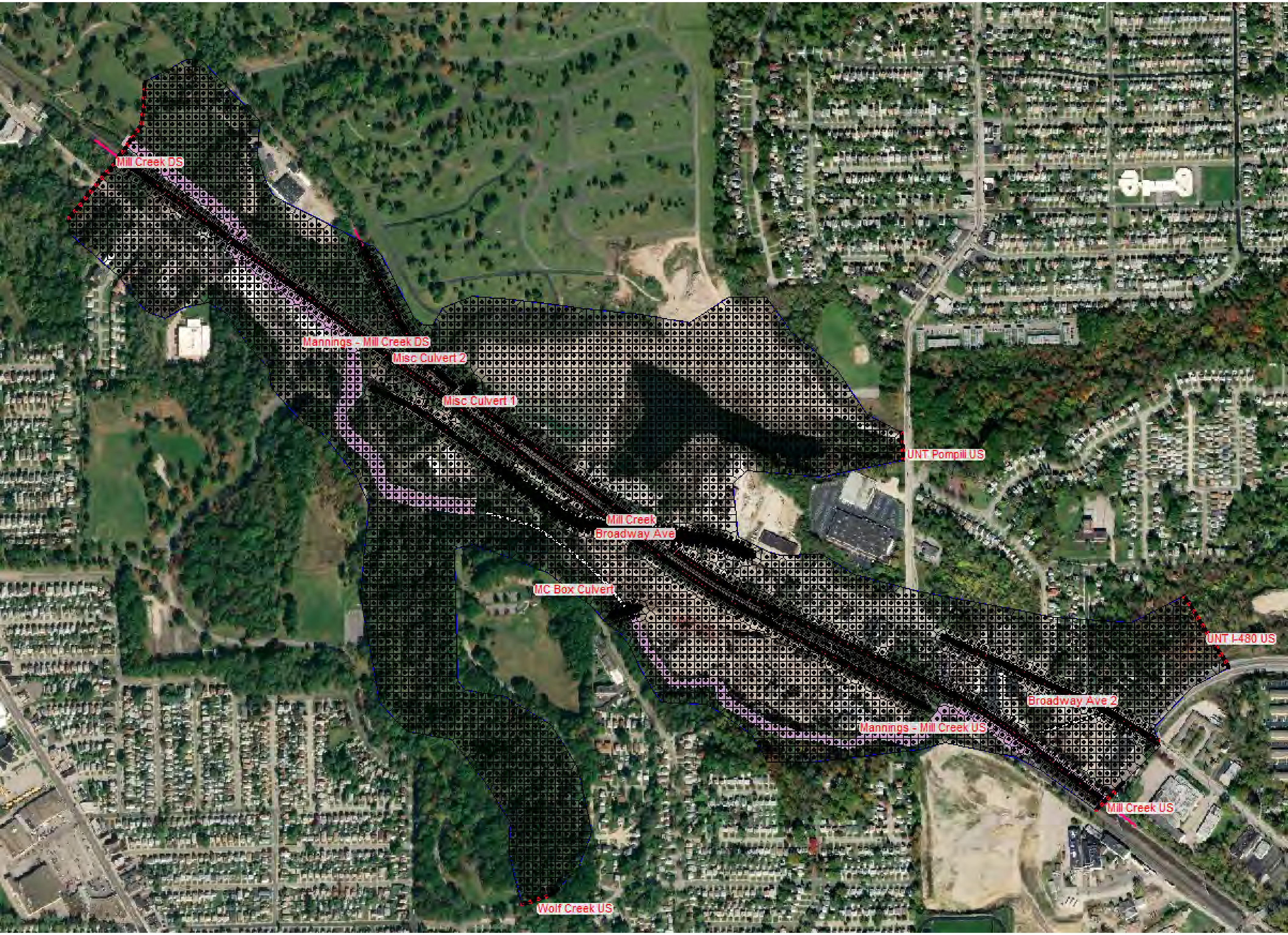
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
120.0					**Direct Entry, Estimated**

Subcatchment 6S: Wolf Creek US



Attachment C – Hydraulic Data & Calculations

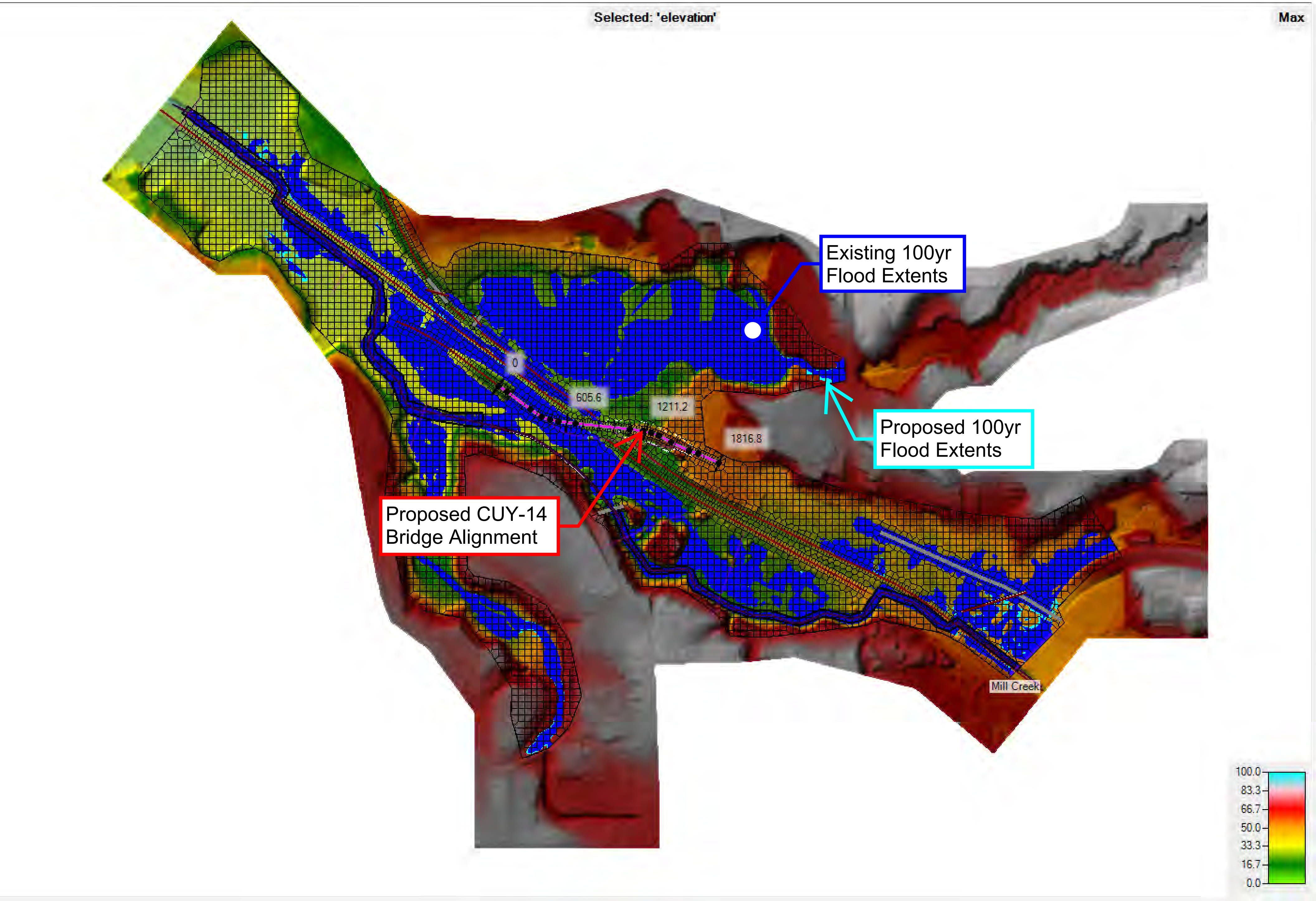
Attachment C1 – Existing HEC-RAS 2D Layout

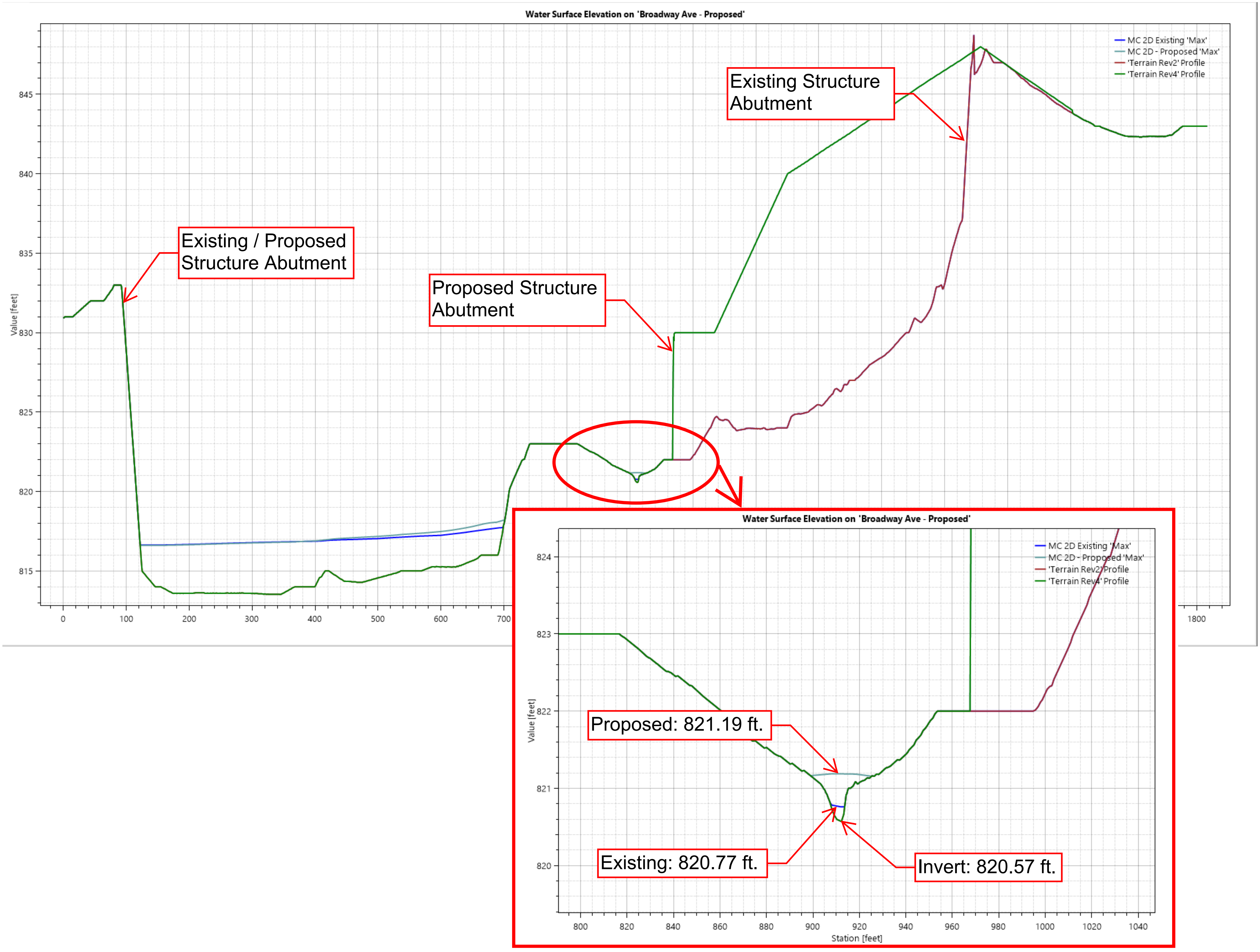

Mill Creek DS
Mannings - Mill Creek DS
Misc Culvert 2
Misc Culvert 1
UNT Pompili US
Mill Creek
Broadway Ave
MC Box Culvert
UNT I-480 US
Broadway Ave 2
Mannings - Mill Creek US
Mill Creek US
Wolf Creek US

Attachment C2 – Proposed HEC-RAS 2D Layout


Mill Creek DS
Mannings - Mill Creek DS
Misc Culvert 2
Misc Culvert 1
UNT Pompili US
Broadway Prop
MC Box Culvert
UNT I-480 US
Broadway Ave 2
Mannings - Mill Creek US
Mill Creek US
Wolf Creek US

Attachment C3 – HEC-RAS Results Summary


Selected: 'elevation'
Max
Existing 100yr Flood Extents
Proposed 100yr Flood Extents
Proposed CUY-14 Bridge Alignment
0
605.6
1211.2
1816.8
Mill Creek
100.0
83.3
66.7
50.0
33.3
16.7
0.0



Existing / Proposed Structure Abutment

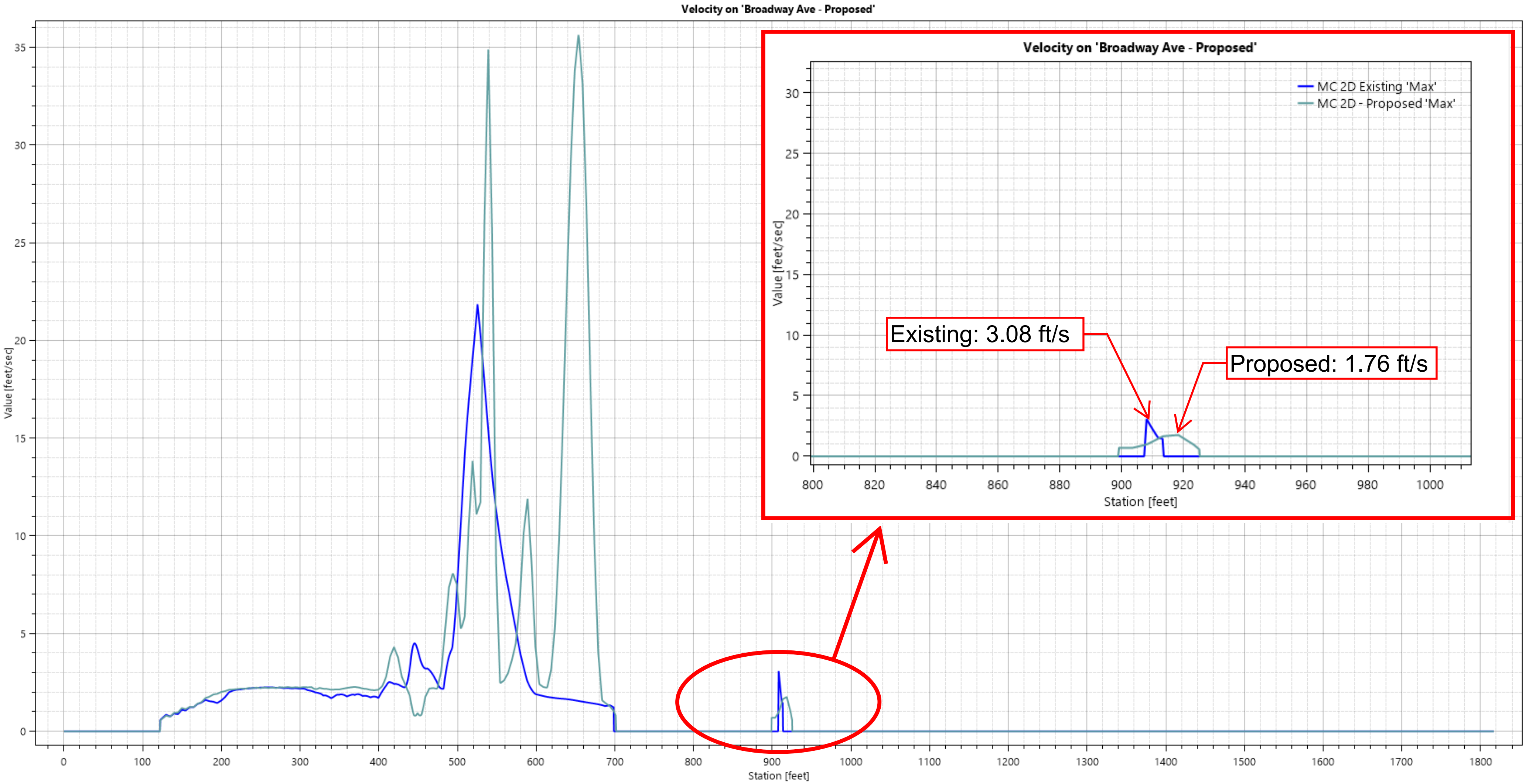
Proposed Structure Abutment

Existing Structure Abutment

Proposed: 821.19 ft.

Existing: 820.77 ft.

Invert: 820.57 ft.



Existing: 3.08 ft/s

Proposed: 1.76 ft/s

Appendix AA

O.U.P.S 1-800-362-2764	COMPANY ID:		PROJECT: CUY-14-6.93	PID: 104132		Last Updated By: RAW			
PM: Scott Buchanan, 330-800-2730, scott.buchanan.aecom.com	OUPS TICKET 10/11/18 Design: A828403246, A828403293, A828403304	OUPS TICKET 12/07/18 Markings: B834100266, B834100472, A834702438, A834702514	Location- Cleveland, OH Cuyahoga County					Project Location: Located approximately .75 miles east of the Cleveland/Garfield Heights Corp. Line Latitude 41.431981 Longitude -81.602342	

Utility Company Name and Address	Telephone No.	Contact Name	Project Notification Notice (Emailed by ODOT or Consultant)	OUPS Request Utility Plans	Received Utility Plans or Positive Response	Sent Stage 1/ 2 Plans	Received Comments	Sent Stage 3 Plans	Received Comments	FINAL TRACINGS SENT	Received Comments	Remarks	UG or OH
AT&T - Ohio 13630 Lorain Ave, 2nd Floor Cleveland, OH 44111	(216) 476-6142	Mr. James Janis pj8191@att.com		10/11/2018	1/23/2019								
CEI First Energy (Illuminating CO.) 6896 Miller Rd. Brecksville, OH 44141	(440) 546-8738 1-800-589-3101	Mr. Ted Rader radert@firstenergycorp.com		10/11/2018	Minimal Conflict 11/27/2018							Ted Rader response letter-There are no Illuminating Company underground facilities within the ROW that you outlined. There are UG services at 12307 Broadway Ave. and 10853 Broadway Ave. (off Henry St.)	
Centurylink 100 S. Cincinatti Ave. Tulsa, OK 74103	(918) 547-0547	Mrs. Kendall Zetina (Relocation Dept.) Kendall.Zetina@centurylink.com NationalRelo@centurylink.com		10/11/2018	11/19/2018							please contact the Kendall.Zetina@centurylink.com to discuss and reference the file number 121137 OH with any future communications	
Charter Comm. (Spectrum/Time Warner) 7 Severance Circle Cleveland Heights, OH 44118	(216) 575-8016 Ext. 2165554202	Mr. Pat Santoiemmo Pat.Santoiemmo@charter.com		10/11/2018	No Conflict 12/18/2018								
City of Cleveland (Division of Cleveland Public Power-Melp) 1300 Lakeside Ave. Cleveland, OH 44114	(216) 664-3922, Ext. 76183	Mr. Bryan Shepherd bshepherd@cpp.org		10/11/2018	No Conflict 11/13/2018								
City of Cleveland (Division of Water) 1201 Lakeside Ave. Cleveland, OH 44114	(216) 664-2444, Ext. 5590	Mr. Fred Roberts fred_roberts@ClevelandWater.com		10/11/2018	10/12/2018								
City of Cleveland (Division of Water Pollution Control) 12302 Kirby Rd. Cleveland, OH 44108	(216) 664-2756	Mr. Elie Ramy eramy@ClevelandWPC.com		10/11/2018	No Conflict 11/12/2018								
City of Cleveland (Division of Traffic Engineering) 4150 E. 49th St., Building #4 Cleveland, OH 44108	(216) 420-8270	Mr. Dominic Martino across@city.cleveland.oh.us		10/11/2018	No Conflict 11/12/2018								
Dominion Energy Ohio 601 Lakeside Ave., Room 25 Cleveland, OH 44114	(330) 664-2781	Mr. Bill Snyder William.d.snyder@dominionenergy.com		10/11/2018	10/12/2018								
Energy Transfer (Sunoco Pipeline, L.P.) 525 Fritztown Road Sinking Spring,PA 19608	(610) 670-3258 (216) 712-2945 (610) 670-3258	Mrs. Debra Schneck encroachments@energytransfer.com Mr. Mathew Debrock sxldesignreviews@sunocologistics.com		10/11/2018	12/18/2018							If you have any questions please contact Sunoco Pipeline, L.P 1 713-989-7080 Email Response stated SEND DESIGN PLANS - Energy Transfer/Sun is in conflict with your plans please send design information to encroachments@energytransfer.com or call 610-670-3258	
City of Garfield Heights 5407 Turney Rd. Garfield Heights, OH 44125	(216) 475-3835			10/11/2018	No Conflict 11/13/2018								

Utility Company Name and Address	Telephone No.	Contact Name	Project Notification Notice (Emailed by ODOT or Consultant)	OUPS Request Utility Plans	Received Utility Plans or Positive Response	Sent Stage 1/ 2 Plans	Received Comments	Sent Stage 3 Plans	Received Comments	FINAL TRACINGS SENT	Received Comments	Remarks	UG or OH
Level 3 Communications (AKA Century Link)	(918) 547-0547	Mr. Kendall Ztina (Relocation Dept.)		10/11/2018	11/19/2018							please contact the Kendall.Zetina@centurylink.com to discuss and reference the file number 121137 OH with any future communications	
		Kendall.Zetina@centurylink.com											
100 S. Cincinatti Ave.													
Tulsa, OK 74103		NationalRelo@centurylink.com											
Northeast Ohio Regional Sewer District	(216) 881-6600 Ext. 6023	Mr. Spence Nash		10/11/2018	11/15/2018								
3900 Euclid Ave.		nashs@neorsd.org											
Cleveland, OH 44115													
	(216) 881-6600, Ext. 6466	Mrs. Mary Maciejowski											
		maciejowskim@neorsd.org											
Windstream	(440) 329-4245 (office)	Mr. Geoffrey Hamm		10/11/2018	10/12/2018								
560 Ternes Ave.	(330) 256-6133 (cell)	geoffrey.p.hamm@windstream.com											
Elria, OH 44035													
Verizon (MCI)	(440) 457-4730 (office)	Mr. Michael Yanek		10/11/2018	10/12/2018								
12300 Ridge Rd	(216) 213-3357 (cell)	michael.yanik@verizon.com											
North Royalton, OH 44133													
												I've attached a map image from our GIS system to this email. The orange lines shows routes of fibers that we lease, one from Windstream and one from Level(3) (Verizon). Those relocations would not involve us besides causing us to take an outage as the cable owners move their cables. The red line shows our cable that is installed in Bell (ATT) duct. We would be required to move our cable into new AT&T duct once AT&T constructs a new path. ATT is the duct owner, we just lease a duct from them to run our cable. If possible, once you get the relocation plans from AT&T, could you send us a copy so we can prepare to coordinate with AT&T to move our cable as well?	
Zayo Fiber Solutions	(234) 281-0025	Mr. Dave Galuska		10/11/2018	2/1/2019								
4199 Kinross Lakes Parkway, Suite 10		dave.galuska@zayo.com											
Richfield, OH 44286													
	(330) 237-3292 (Office)	Mr. Eric Licis											
	(216) 533-0023 (Cell)	erik.licis@zayo.com											

COMMUNICATIONS LOG

Project Name : CUY-14-6.93 PID # 104132

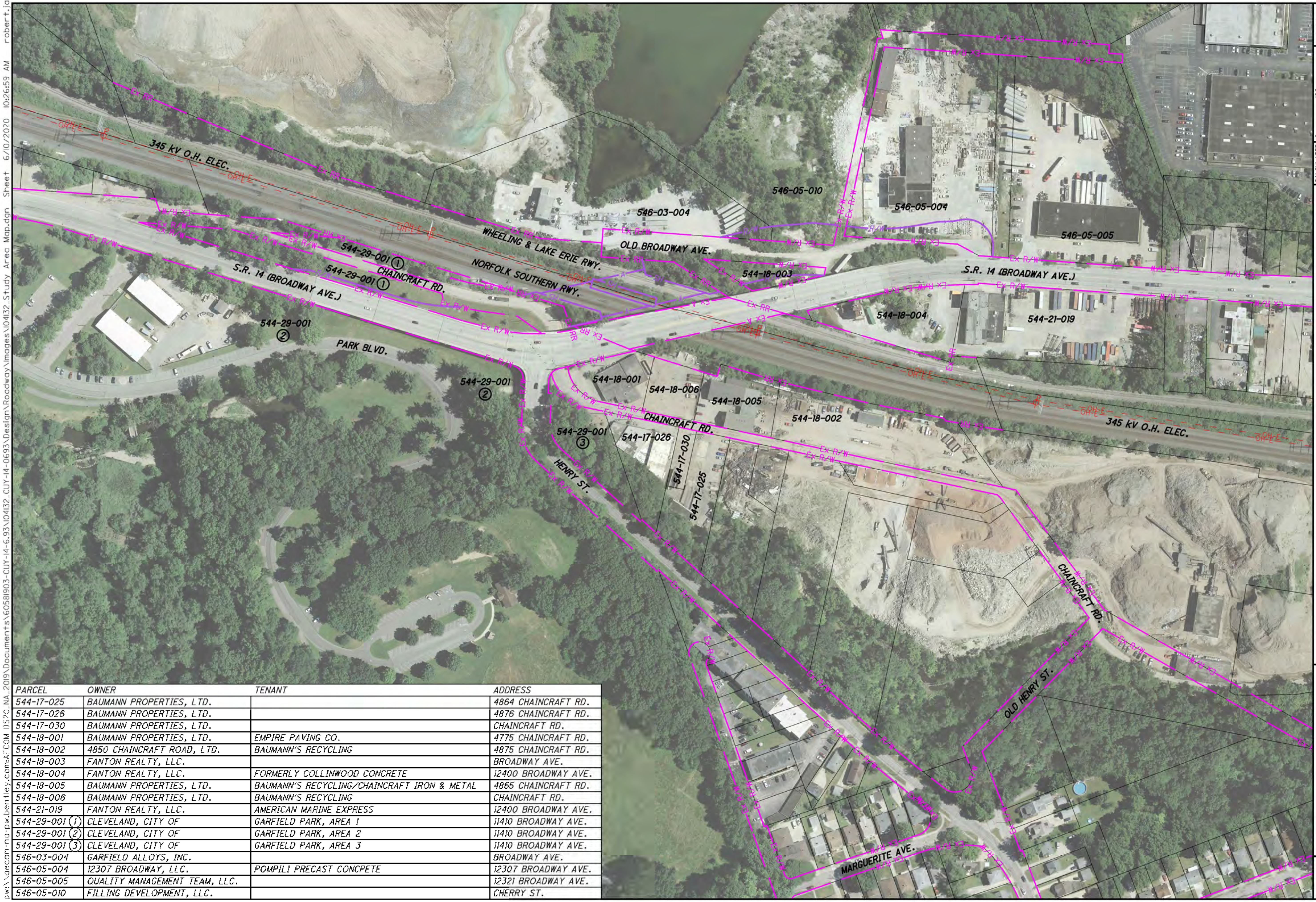
Date	Time	Contact Info (Name, Phone, Address,Email)	Description of effort or request	Description of results or response
10/15/2018	9:40 AM	(Sunnoco Pipeline), Matt Debrock, 216-712-2945	I received a call from a Matt asking if I needed Markings	I told him not just yet, that I just sent in a request for plans. He said he would pass it on to their design department.
10/17/2018	9:26 AM	(Level 3 Communications), Level3networkrelocations@level3.com	I sent an email inquirying if they had any utilities within the project limits	I sent an email, waiting on response. I received Plans 11-19
10/17/2018	9:32 AM	(Century Link), NationalRelo@centurylink.com	I sent an email inquirying if they had any utilities within the project limits	I sent an email, waiting on response. I received plans 11-19
11/12/2018	7:50 AM	(AT&T – Ohio), Mr. James Janis, pj8191@att.com	I sent an email inquirying if they had any utilities within the project limits and to inquiry point of contact information	I sent an email, waiting on response
11/12/2018	8:06 AM	(Northeast Ohio Regional Sewer District), Mrs. Mary Maciejowski, maciejowskim@neorsd.org	I sent an email inquirying if they had any utilities within the project limits and to inquiry point of contact information	I sent an email, waiting on response. I received plans from Spencer Nash 11/15
11/12/2018	8:11 AM	(CEI First Energy (Illuminating CO.), Mr. Ted Rader, radert@firstenergycorp.com	I sent an email inquirying if they had any utilities within the project limits and to inquiry point of contact information	I sent an email, I received a auto response to contact Jack Meno at menoj@firstenergycorp.com
11/12/2018	8:29 AM	(CEI First Energy (Illuminating CO.), Mr. Jack Meno, menoj@firstenergycorp.com	I sent an email inquirying if they had any utilities within the project limits and to inquiry point of contact information	I sent an email, waiting on response. I received a response from Ted Rader 11-27
11/12/2018	8:29 AM	(City of Garfield Heights), Mr. Tony Toff, 216-581-2100	I called to inquire if they had any utilities within the project limits and to inquiry point of contact information	They were closed for Veterans Day
11/12/2018	8:51 AM	(Zayo Fiber Solutions), Mr. Scott Heinlen, scott.heinlen@zayo.com	I sent an email inquirying if they had any utilities within the project limits and to inquiry point of contact information	I sent an email, waiting on response
11/12/2018	8:57 AM	(Charter Communications), Mr. Pat Santoiemmo, Pat.Santoiemmo@charter.com	I sent an email inquirying if they had any utilities within the project limits and to inquiry point of contact information	I sent an email, waiting on response
11/12/2018	9:12 AM	(Verizon-MCI), Mr. Al Guest, allan.guest@verizon.com	I sent an email inquirying if they had any additional plans of utilities within the project limits and to inquiry point of contact information	I sent an email, waiting on response, I received a response email that the inquiry forwarded to Mike Yanik. I received plans from Mike 11-19
11/12/2018	9:12 AM	(Windstream), Mr. Geoffrey Hamm, geoffrey.p.hamm@windstream.com, jennifer.l.biewen@windstream.com, Jesse.Cooksley@windstream.com	I sent an email inquirying if they had any additional plans of utilities within the project limits and to inquiry point of contact information	I sent an email, waiting on response
11/12/2018	9:31 AM	(Dominion Energy), Mr. Bill Snyder, William.d.snyder@dominionenergy.com	I sent an email inquirying point of contact information	I sent an email, waiting on response
11/12/2018	9:44 AM	(Cleveland Utilities), Mr. Fred Roberts, fred_roberts@ClevelandWater.com, chirzel@cpp.org, rzoghaib@ClevelandWPC.com, eramy@ClevelandWPC.com, across@city.cleveland.oh.us	I sent an email inquirying if they had any additional plans of utilities within the project limits and to inquiry point of contact information	I sent an email, waiting on response, I received a call from Cleveland Water Pollution Control that there was no Conflict.I received an email that Cleveland Traffic was not in conflict.I received an Email that CPP was not in conflict
11/12/2018	10:31 AM	(Century Link), Christopher R. Strayer Christopher.strayer@centurylink.com	I sent an email inquirying if they had any utilities within the project limits and to inquiry point of contact information	I sent an email, waiting on response.I received plans 11-19
11/12/2018	11:02 AM	(Level 3 Communications), Doug Holloway doug.holloway@level3.com	I sent an email inquirying if they had any utilities within the project limits and to inquiry point of contact information	I sent an email, waiting on response. I received Plans 11-19
11/13/2018	1:07 PM	(City of Garfield Heights), 216-475-3835	I called to inquire if they had any utilities within the project limits and to inquiry point of contact information	They said they owned no utilities within the project Limits
12/5/2018	8:05 AM	(AT&T – Ohio), Mr. James Janis, (216) 476-6142	I called to inquire if they had any utilities within the project limits and to inquiry point of contact information	I left a voicemail
12/5/2018	8:15 AM	(Charter Communications), Mr. Pat Santoiemmo, (216) 575-8016 Ext. 5033	I called to inquire if they had any utilities within the project limits and to inquiry point of contact information	Phone kept ringing, unable to leave voicemail
12/5/2018	8:20 AM	(Sunnoco Pipeline), Mr. John Freiberger, (567) 371-2274	I called to inquire if they had any utilities within the project limits and to inquiry point of contact information	He said that was not his area and that he would look up the contact for that area and call me back
12/5/2018	9:00 AM	(Zayo Fiber Solutions), Mr. Scott Heinlen, (740) 501-6921	I called to inquire if they had any utilities within the project limits and to inquiry point of contact information	I left a voicemail
12/18/2018	10:30 AM	(Sunnoco Pipeline), Matt Debrock, (216)-712-2945	I called to inquire about utilities within the project limits and to inquiry point of contact information	He told me to reach out to Debra Schneck, (610) 670-3258, debra.schneck@energytransfer.com
12/18/2018	10:40 AM	(Sunnoco Pipeline), Debra Schneck, (610) 670-3258	I called to inquire about utilities within the project limits and to inquiry point of contact information	She gave me the contact info and said she would email me a plan sheet depicting a 6" gas line
12/18/2018	11:00 AM	(Zayo Fiber Solutions), Mr.John Bruce, (769) 216-8095, john.bruce@zayo.com	I called to inquire about utilities within the project limits and to inquiry point of contact information	He said to reach out to Dave Galuska, (234) 281-0025, dave.galuska@zayo.com. I sent an email with site limits and question to both.
12/18/2018	11:30 AM	(AT&T – Ohio), Mr. James Janis, (216) 476-6142	I called to inquire if they had any utilities within the project limits and to inquiry point of contact information	He said he would review the limits and let me know if they had any facilities within the project limits
12/18/2018	11:49 AM	(Windstream), Mr. Geoffrey Hamm, (440) 329-4245	I spoke with him about markings tickets coming back as no conflict	He said he would look into it, He emailed me a cadd drawing
12/18/2018	11:49 AM	(Charter Communications), Mr. Pat Santoiemmo, (216) 575-8016 Ext. 2165554202	I called to inquire if they had any utilities within the project limits and to inquiry point of contact information	He verified contact info and said he would check and see if they had facilities within the project limits and get back in touch with me, He sent an email back and said that they do not have facilities within the project limits
12/19/2018	9:11 AM	(CEI First Energy (Illuminating CO.), Mr. Ted Rader, radert@firstenergycorp.com	I called to inquire about questions the Primary consultant had on the Transmission Lines	He said he would pass the questions on to the proper people to answer them
12/19/2018	9:40 AM	(Sunnoco Pipeline), Matt Debrock, (216)-712-2945	I called to inquire about difference in previous plan sheet I received verse his markings	He sent me a plan sheet snipet and said he believed the line was moved and was depicted properly in the snipet he sent
1/23/2019	9:12 AM	(Century Link), Mrs. Kendall Zetina, (918) 547-0547	I called to inquire about more information on the telecom line shown running down the center of Broadway Avenue in the "Utility Map" plan received from Century Link	She said she didn't have any information, just that is was leased and installed by American Fiber Solutions.It looks like Zayo Fiber Solutions Acquired American Fiber Solutions in 2010

COMMUNICATIONS LOG

Project Name : CUY-14-6.93 PID # 104132

Date	Time	Contact Info (Name, Phone, Address,Email)	Description of effort or request	Description of results or response
1/23/2019	9:32 AM	(Zayo Fiber Solutions), Mr. Dave Galuska, (234) 281-0025,	I called to inquire if they had any utilities within the project limits and to inquiry point of contact information	I left a voicemail
1/23/2019	9:42 AM	(AT&T – Ohio), Mr. James Janis, (216) 476-6142	I called to inquire if they had any utilities within the project limits and to inquiry point of contact information	He said he would review the limits and let me know if they had any facilities within the project limits. I was emailed plans
1/24/2019	11:18 AM	(Zayo Fiber Solutions), Mr. Eric Licis, (330) 237-3292,	I called to inquire if they had any utilities within the project limits and to inquiry point of contact information	I talked with him and followed it up with an email. He said he would look into it and let me know what he finds. I received Plans on 02-01-19

Appendix BB



PARCEL	OWNER	TENANT	ADDRESS
544-17-025	BAUMANN PROPERTIES, LTD.		4864 CHAINCRAFT RD.
544-17-026	BAUMANN PROPERTIES, LTD.		4876 CHAINCRAFT RD.
544-17-030	BAUMANN PROPERTIES, LTD.		CHAINCRAFT RD.
544-18-001	BAUMANN PROPERTIES, LTD.	EMPIRE PAVING CO.	4775 CHAINCRAFT RD.
544-18-002	4850 CHAINCRAFT ROAD, LTD.	BAUMANN'S RECYCLING	4875 CHAINCRAFT RD.
544-18-003	FANTON REALTY, LLC.		BROADWAY AVE.
544-18-004	FANTON REALTY, LLC.	FORMERLY COLLINWOOD CONCRETE	12400 BROADWAY AVE.
544-18-005	BAUMANN PROPERTIES, LTD.	BAUMANN'S RECYCLING/CHAINCRAFT IRON & METAL	4865 CHAINCRAFT RD.
544-18-006	BAUMANN PROPERTIES, LTD.	BAUMANN'S RECYCLING	CHAINCRAFT RD.
544-21-019	FANTON REALTY, LLC.	AMERICAN MARINE EXPRESS	12400 BROADWAY AVE.
544-29-001 ①	CLEVELAND, CITY OF	GARFIELD PARK, AREA 1	11410 BROADWAY AVE.
544-29-001 ②	CLEVELAND, CITY OF	GARFIELD PARK, AREA 2	11410 BROADWAY AVE.
544-29-001 ③	CLEVELAND, CITY OF	GARFIELD PARK, AREA 3	11410 BROADWAY AVE.
546-03-004	GARFIELD ALLOYS, INC.		BROADWAY AVE.
546-05-004	12307 BROADWAY, LLC.	POMPILI PRECAST CONCPETE	12307 BROADWAY AVE.
546-05-005	QUALITY MANAGEMENT TEAM, LLC.		12321 BROADWAY AVE.
546-05-010	FILLING DEVELOPMENT, LLC.		CHERRY ST.

0 50 100 200
HORIZONTAL SCALE IN FEET

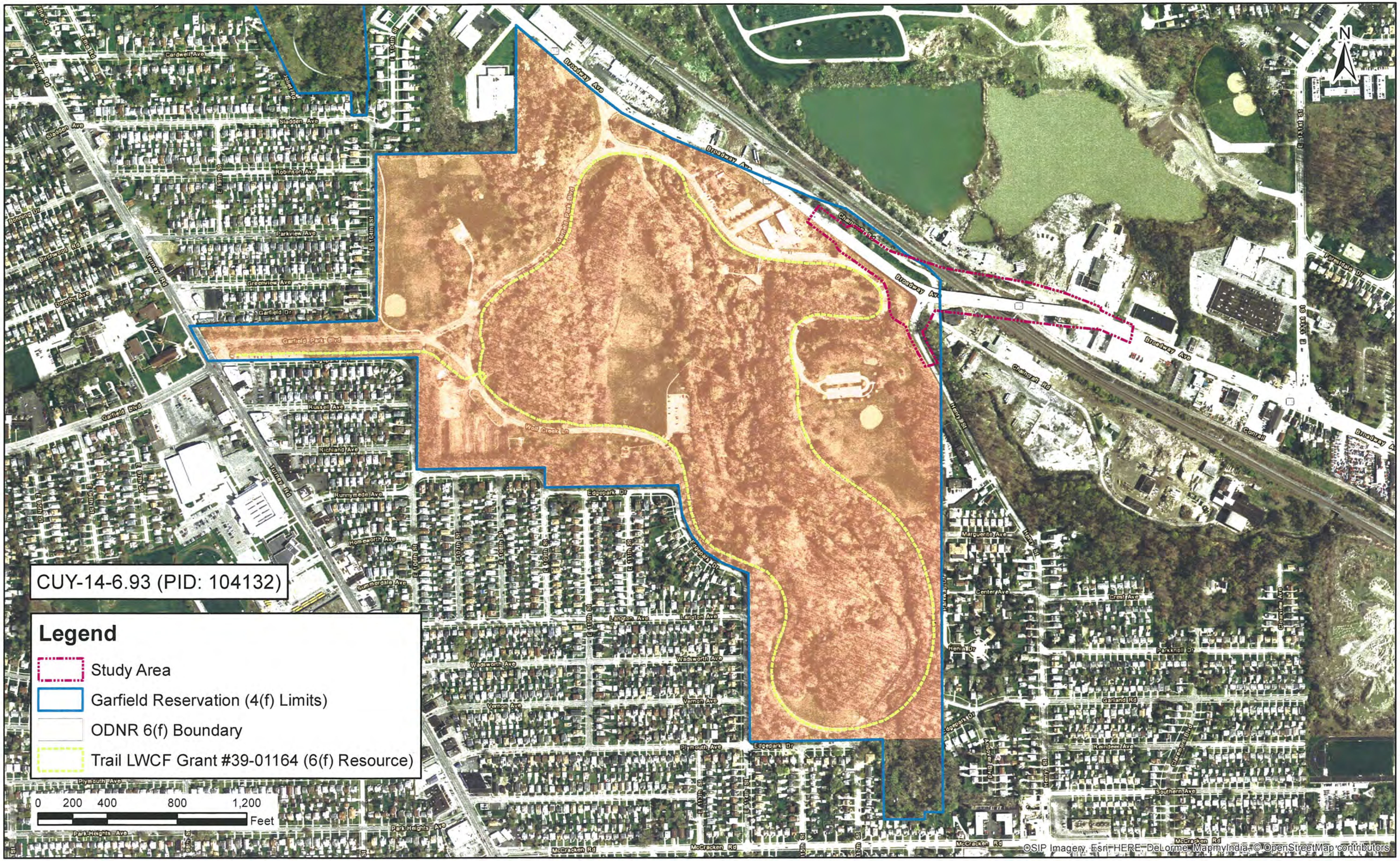
CALCULATED RJJ
CHECKED ZRD

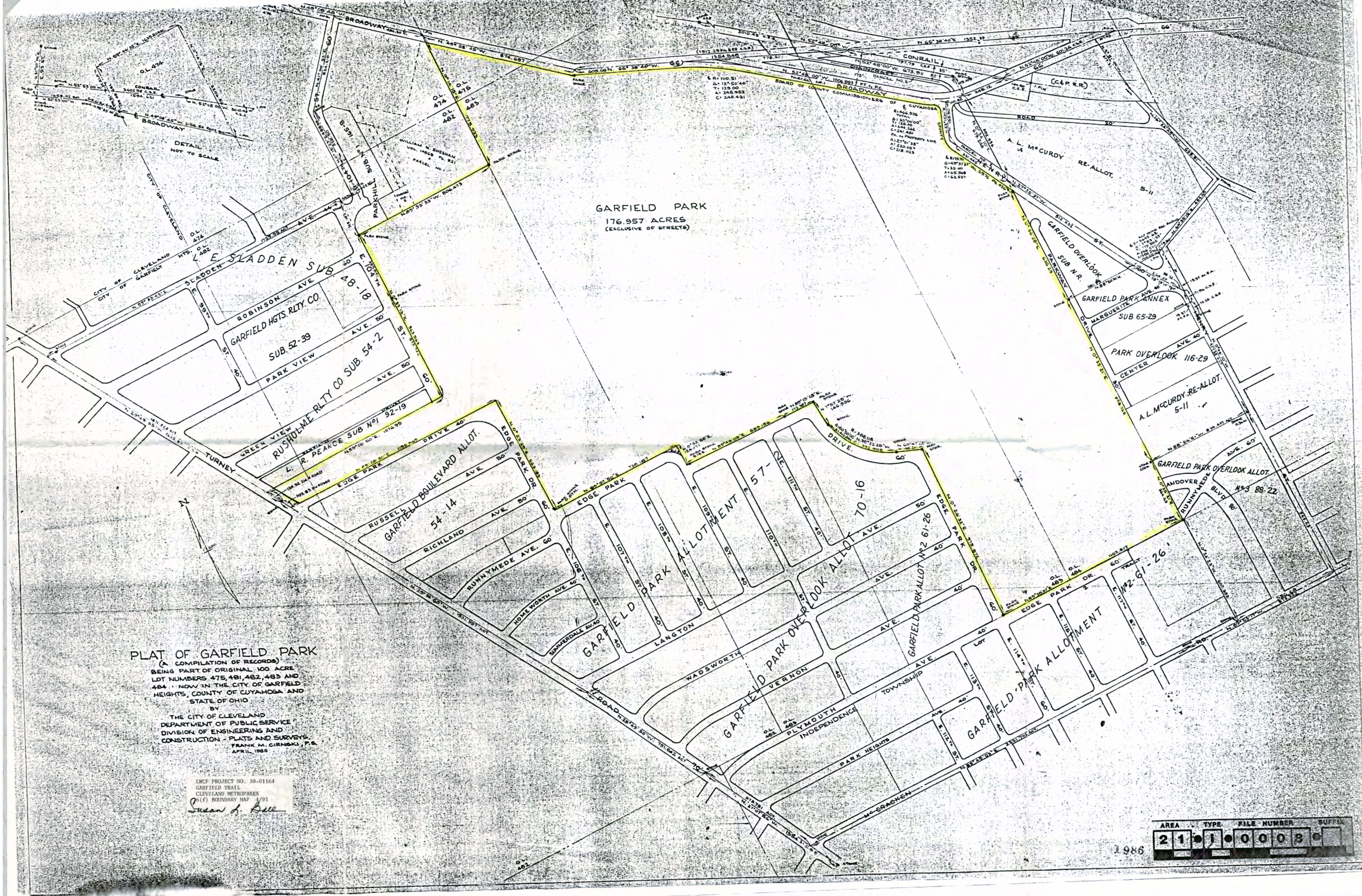
STUDY AREA MAP

CUY-14-6.93

1/1

Appendix CC


CUY-14-6.93 (PID: 104132)
Legend
Study Area
Garfield Reservation (4(f) Limits)
ODNR 6(f) Boundary
Trail LWCF Grant #39-01164 (6(f) Resource)
0 200 400 800 1,200
Feet
N
Broadway Ave
Garfield Park Blvd
Wolf Creek Ln
Turney Rd
Garfield Blvd
Edgepark Dr
Sladden Ave
Robinson Ave
Parkview Ave
Greenview Ave
Garfield Dr
Russell Ave
Richland Ave
Runnymede Ave
Homeworth Ave
Summerdale Ave
Langton Ave
Wadsworth Ave
Vernon Ave
Plymouth Ave
Park Heights Ave
McCracken Rd
Cardwell Ave
Chaincraft Rd
Conrail
Henry St
Marguerite Ave
Center Ave
Crest Ave
Henia Dr
Parknoll Dr
Garland Rd
Reindeer Ave
Southern Ave
E 131st St
E 104th St
©SIP Imagery, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors



PLAT OF GARFIELD PARK

(A COMPILATION OF RECORDS)
BEING PART OF ORIGINAL 100 ACRE
LOT NUMBERS 475, 481, 482, 483 AND
484 · NOW IN THE CITY OF GARFIELD
HEIGHTS, COUNTY OF CUYAHOGA AND
STATE OF OHIO
BY
THE CITY OF CLEVELAND
DEPARTMENT OF PUBLIC SERVICE
DIVISION OF ENGINEERING AND
CONSTRUCTION - PLATS AND SURVEYS.
FRANK M. CIRNSKI, P.S.
APRIL, 1986

LWCF PROJECT NO. 39-01164
GARFIELD TRAIL
CLEVELAND METROPARKS
6(f) BOUNDARY MAP 4/91
Susan L. Bell

1986

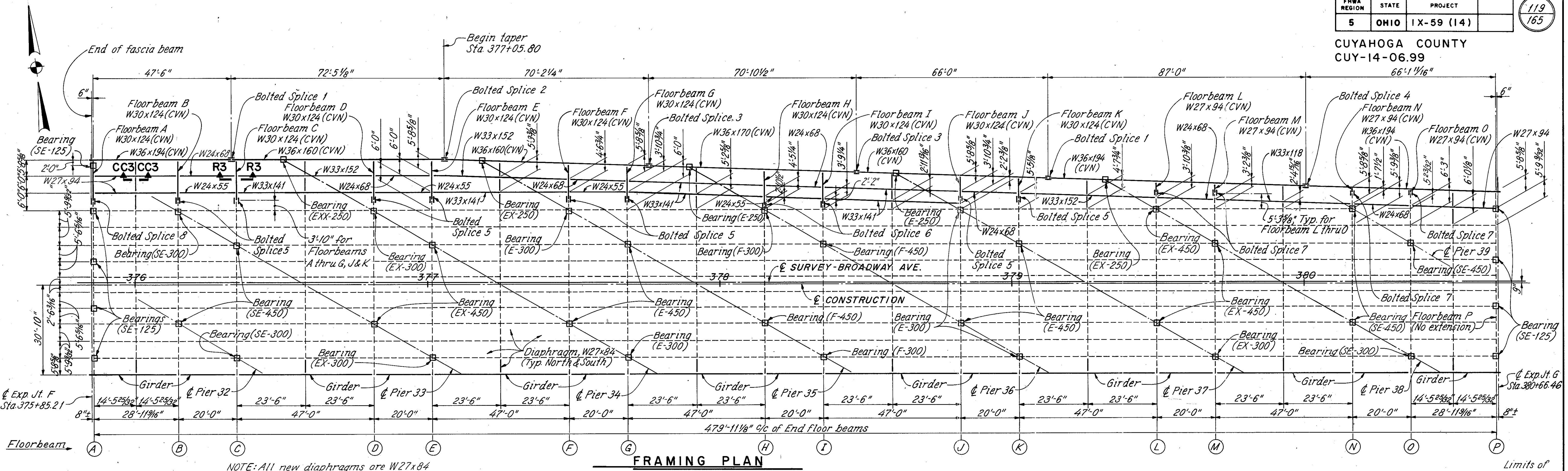
AREA	TYPE	FILE NUMBER	SUFFIX
21	1	0008	

Appendix DD

FHWA REGION	STATE	PROJECT	
5	OHIO	IX-59 (14)	

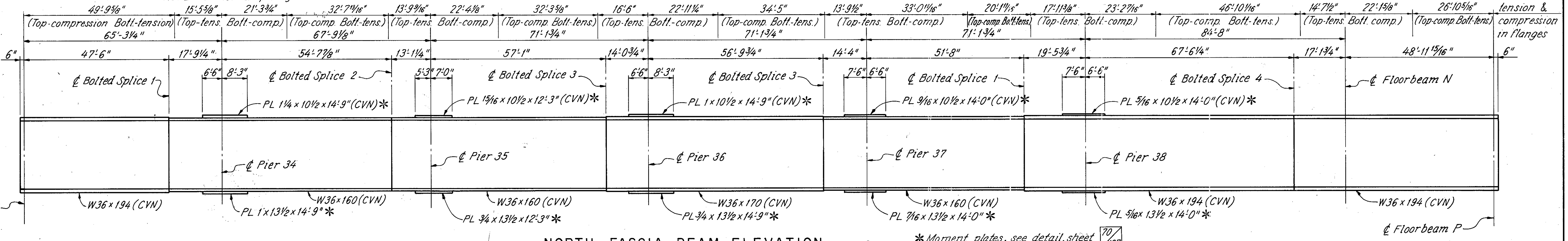
119/165

CUYAHOGA COUNTY
CUY-14-06.99



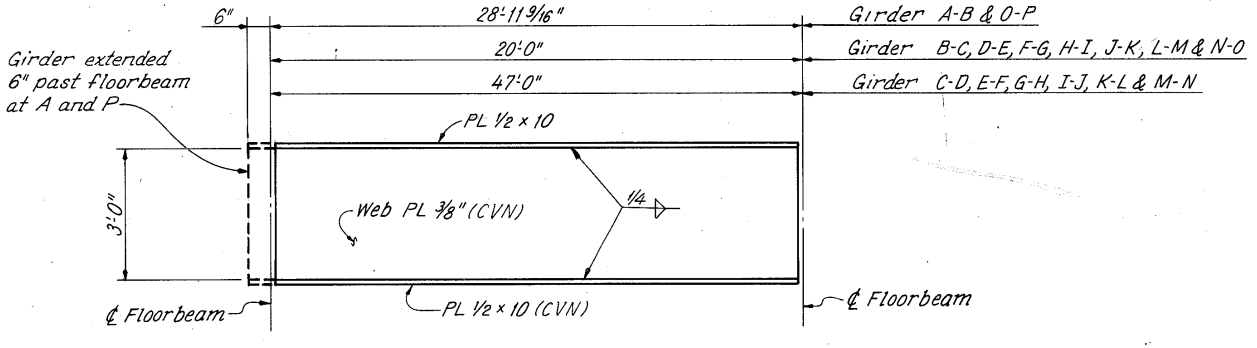
FRAMING PLAN

NOTE: All new diaphragms are W27x84



NORTH FASCIA BEAM ELEVATION

* Moment plates, see detail, sheet 70/107



PARTIAL SOUTH FASCIA GIRDER ELEVATION

NOTES

BOLTED SPLICES 1 THRU 8: See sheet 71/107.

BEARINGS: See sheets 74/107, 75/107, 76/107 & 77/107.

FASCIA & DIAPHRAGM CONNECTION DETAILS: See sheet 72/107

STRINGER CONNECTION DETAILS: See sheet 73/107

CAMBER DIAGRAM: See sheet 70/107

EXISTING STRINGER SIZES:
I28"x92# for 28'-11 9/16" spans
I24"x70# for 20'-0" spans
~~I30"x181# for 47'-0" spans~~

HIGH STRENGTH BOLTS: shall be 1" ϕ A325 unless otherwise noted.

CVN: Where a shape or plate is designated (CVN) the material shall meet the specified minimum notch toughness requirements as specified in 711.02 of CMS.

EXPANSION JOINTS stations shown are approximate. Actual ℄ of joints varies with temperature and are to be determined by measurement from existing floorbeams.

WELDED ATTACHMENT: See note sheet 70/107

SECTION R3-R3 & CC3-CC3: See sheet 78/107

RICHLAND ENGINEERING LIMITED
MANSFIELD, OHIO

CUYAHOGA COUNTY ENGINEER
CLEVELAND OHIO

BROADWAY AVENUE
BRIDGE OVER CONSOLIDATED RAIL CORP.
AND NORFOLK AND WESTERN RAILROAD
CITY OF GARFIELD HEIGHTS

SECTION 3
STEEL FRAMING PLAN

BRIDGE NO. 123 REPORT NO. 7122 DATE 8-15-85

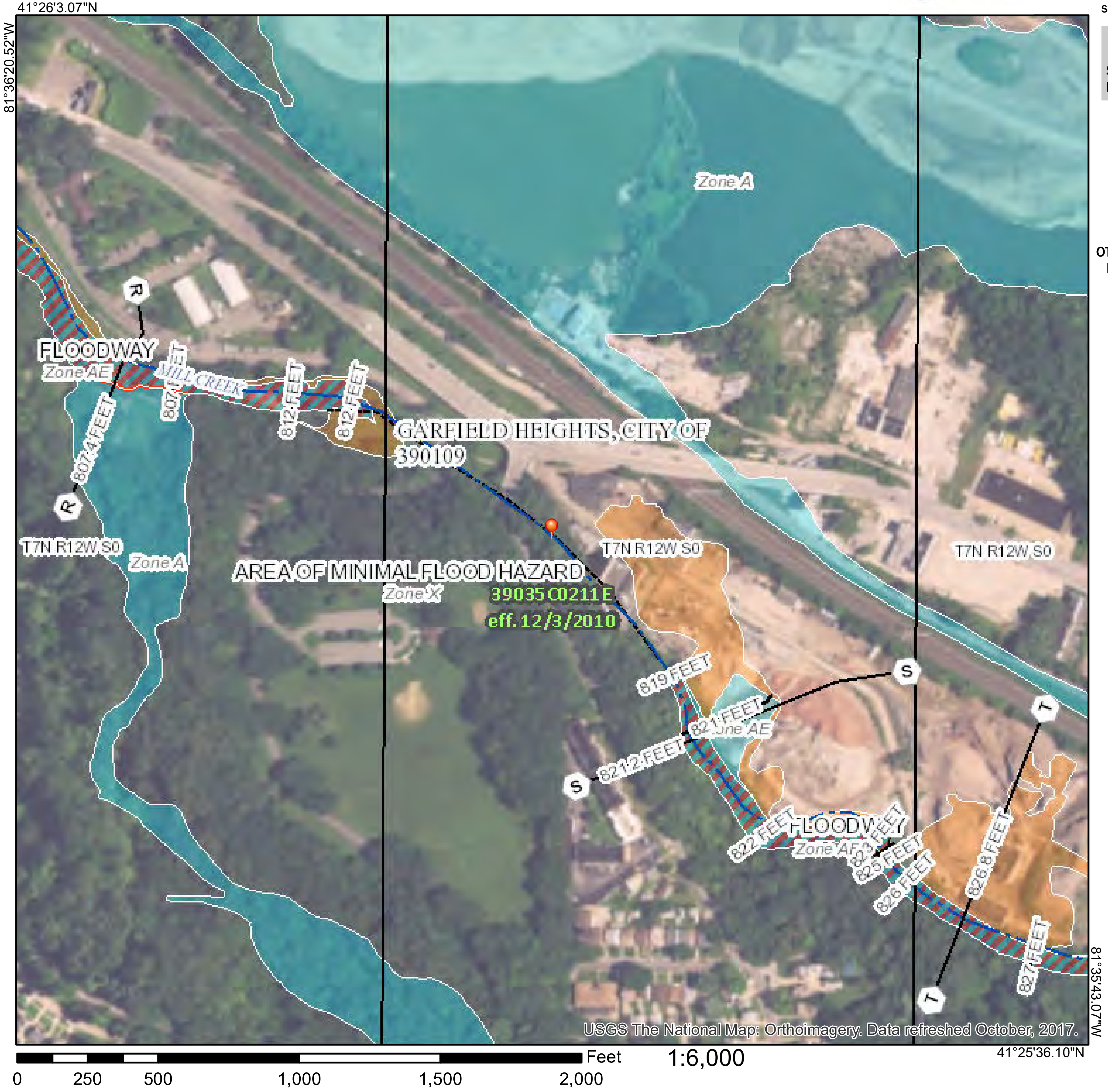
NO. B-61 69/107
STRUCTURE FILE NO. 1801805

DESIGN	DRAWN	CHECKED	REVISED: TO AS BUILT
RDN	JPS	DAP	

Appendix EE

National Flood Hazard Layer FIRMette

FEMA



USGS The National Map: Orthoimagery. Data refreshed October, 2017.

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- ☐ Digital Data Available
- ☐ No Digital Data Available
- ☒ Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/20/2019 at 2:01:26 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix FF

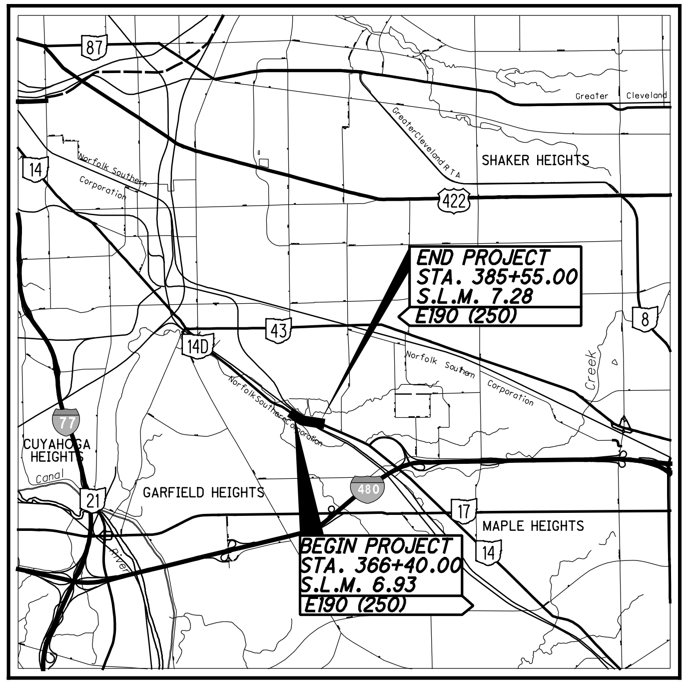
STATE OF OHIO

DEPARTMENT OF TRANSPORTATION

CUY-14-06.93

RECONSTRUCTION OF EXISTING SEPARATED CROSSING WITH THE NORFOLK SOUTHERN AND THE WHEELING & LAKE ERIE RAILWAYS

CITY OF GARFIELD HEIGHTS
CUYAHOGA COUNTY



LOCATION MAP

LATITUDE: N41°25′55″ LONGITUDE: W81°36′08″

SCALE IN MILES

0 1 2 3 4

PORTION TO BE IMPROVED
INTERSTATE HIGHWAY
FEDERAL ROUTES
STATE ROUTES
COUNTY & TOWNSHIP ROADS
OTHER ROADS

DESIGN DESIGNATION

ROUTE	ADT (2026)	ADTT (2026)	ADT (2046)	ADTT (2046)	D	DESIGN SPEED	LEGAL SPEED	DESIGN FUNC. CLASS.	NHS ROUTE?
S.R. 14 (BROADWAY AVE)	18500	1295	19000	1330	0.51	35	35	URBAN PRINCIPAL ARTERIAL	Y
C.R. 24 (HENRY STREET)	7000	630	7500	675	0.54	25	25	LOCAL ROAD	N
CHAINCRAFT						25		LOCAL ROAD	N

DESIGN EXCEPTIONS

UNDERGROUND UTILITIES
Contact Two Working Days Before You Dig

OHIO811.org
Before You Dig

OHIO811, 8-1-1, or 1-800-362-2764
(Non-members must be called directly)

PLAN PREPARED BY:
AECOM
1300 E. 9th STREET, SUITE 500 CLEVELAND, OHIO 44114
(216) 622-2300

INDEX OF SHEETS:

ENGINEERS SEAL:

SIGNED:
DATE:

ENGINEERS SEAL:

SIGNED:
DATE:

STANDARD CONSTRUCTION DRAWINGS					SUPPLEMENTAL SPECIFICATIONS	SPECIAL PROVISIONS

PROJECT DESCRIPTION

EARTH DISTURBED AREAS

PROJECT EARTH DISTURBED AREA:	ACRES
ESTIMATED CONTRACTOR EARTH DISTURBED AREA:	ACRES
NOTICE OF INTENT EARTH DISTURBED AREA:	ACRES

LIMITED ACCESS

THIS IMPROVEMENT IS ESPECIALLY DESIGNED FOR THROUGH TRAFFIC AND HAS BEEN DECLARED A LIMITED ACCESS HIGHWAY OR FREEWAY BY ACTION OF THE DIRECTOR IN ACCORDANCE WITH THE PROVISIONS OF SECTION 5511.02 OF THE OHIO REVISED CODE.

2019 SPECIFICATIONS

THE STANDARD SPECIFICATIONS OF THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, INCLUDING SUPPLEMENTAL SPECIFICATIONS LISTED IN THE PLANS AND CHANGES LISTED IN THE PROPOSAL SHALL GOVERN THIS IMPROVEMENT.

ALTERNATIVE EVALUATION REPORT
6 / 15 / 20

I HEREBY APPROVE THESE PLANS AND DECLARE THAT THE MAKING OF THIS IMPROVEMENT WILL NOT REQUIRE THE CLOSING TO TRAFFIC OF THE HIGHWAY EXCEPT FOR THE SIDE ROADS AS DESCRIBED ON SHEETS AND THAT PROVISIONS FOR THE MAINTENANCE AND SAFETY OF TRAFFIC WILL BE AS SET FORTH ON THE PLANS AND ESTIMATES.

APPROVED
DATE DISTRICT DEPUTY DIRECTOR

APPROVED
DATE DIRECTOR, DEPARTMENT OF TRANSPORTATION

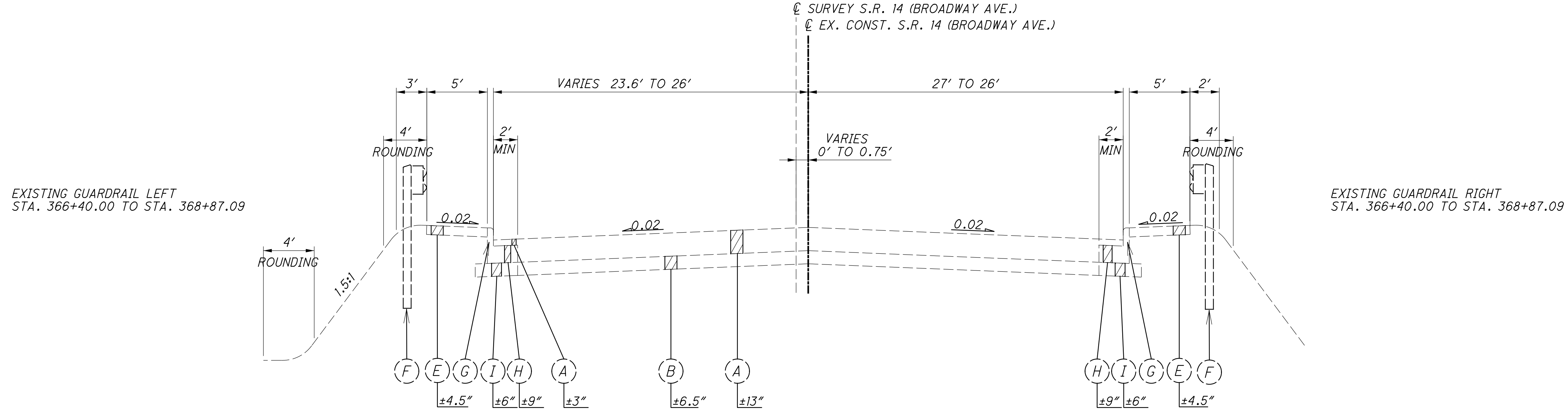
FEDERAL PROJECT NO.
E190250

PID NO.
104132

CONSTRUCTION PROJECT NO.

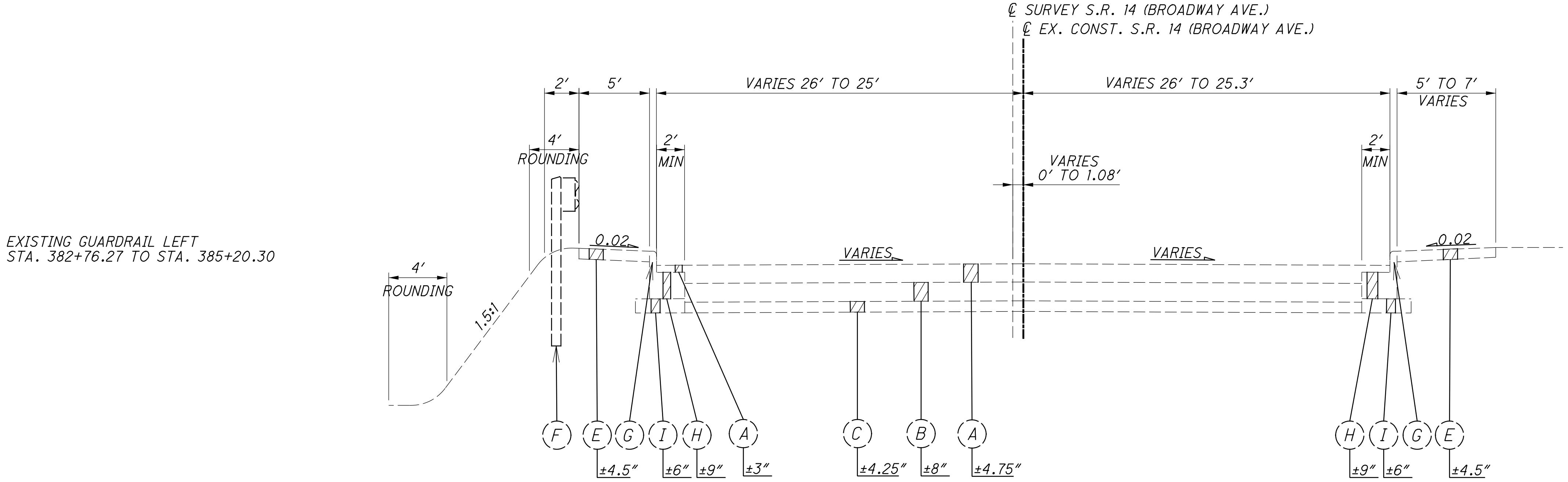
RAILROAD INVOLVEMENT
NORFOLK SOUTHERN
WHEELING & LAKE ERIE

CUY-14-06.93



EXISTING NORMAL SECTION - S.R. 14 (BROADWAY AVE.)

STA. 366+40.00 TO STA. 368+87.09 = 247.09'
(EX. BRIDGE BEGINS STA. 368+87.09)
TOTAL LENGTH = 247.09'



EXISTING SUPERELEVATED SECTION - S.R. 14 (BROADWAY AVE.)

STA. 382+76.27 TO STA. 385+20.30 = 244.03'
(EX. BRIDGE ENDS STA. 382+76.27)
TOTAL LENGTH = 244.03'

EXISTING LEGEND

(A) ASPHALT
(B) CONCRETE
(C) SLAG
(D) SAND & SLAG
(E) CONCRETE WALK
(F) GUARDRAIL, TYPE 5
(G) CURB, TYPE 2-B
(H) REINFORCED CONCRETE
(I) SUBBASE
(J) STABILIZED CRUSHED AGGREGATE

pw:\\aecom-na-pw.bentley.com:AECOM_DS20_NA_2019\Documents\60581903-CUY-14-6.93\104132_CUY-14-0693\Design\Roadway\Sheets\104132_GY3001.dgn Sheet 6/15/2020 1:20:51 PM todd.roxberry

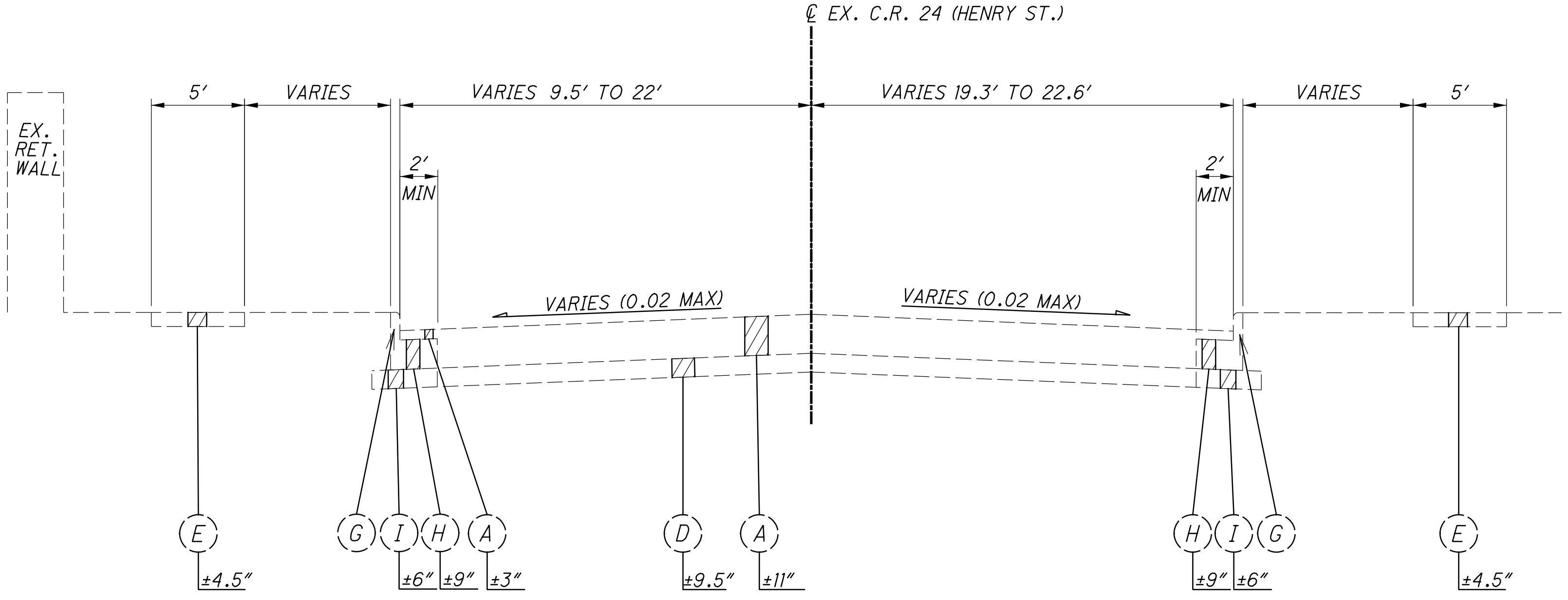
TYPICAL SECTIONS

CUY-14-06.93

pw:\\aecom-na-pw.bentley.com:AECOM_DS20_NA_2019\Documents\60581903-CUY-14-6.93\104132_CUY-14-0693\Design\Roadway\Sheets\104132_GY3001.dgn Sheet 6/15/2020 1:20:51 PM todd.roxberry

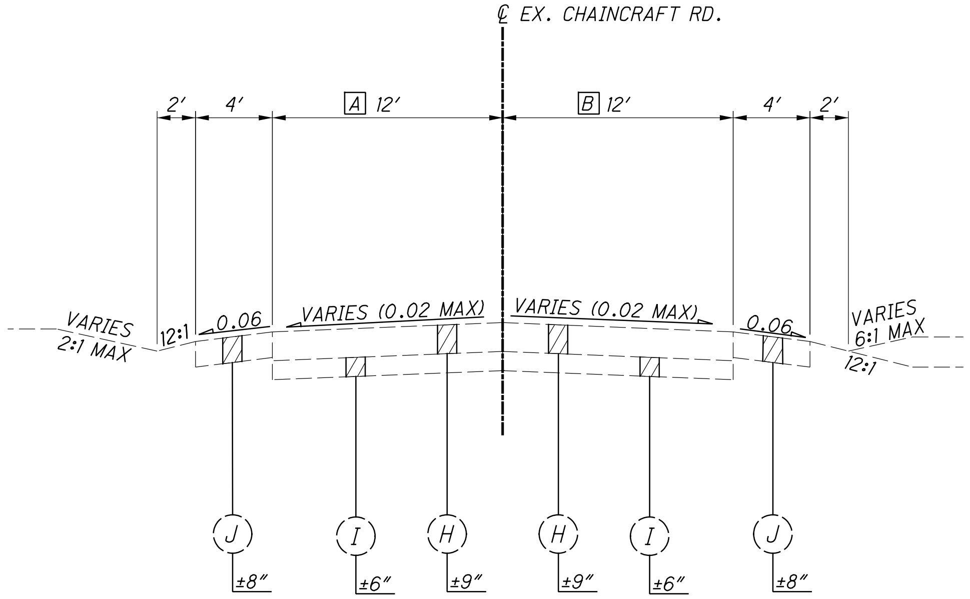
NOTES:

1. FOR EXISTING LEGEND, SEE SHEET 2



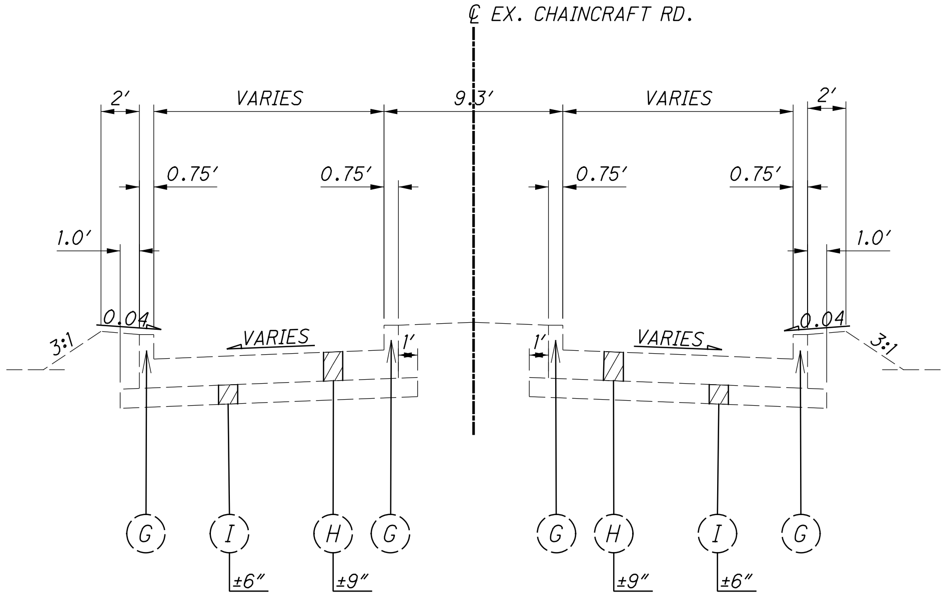
C.R. 24 (HENRY ST.)

STA. 5+83.00 TO STA. 8+03.44 = 220.44'
TOTAL LENGTH = 220.44'



CHAINCRAFT RD.

STATION RANGE	A	B	LENGTH
100+00.00 TO 102+22.51	18.8'-15.5'		222.51'
102+22.51 TO 104+86.18	15.5'-9.2'	24.8'-11.4'	263.67'
104+86.18 TO 107+30.92	9.2'-8.8'	11.4'-13.3'	244.74'
107+30.92 TO 111+17.46	8.8'-11.8'	13.3'-12.8'	386.54'
TOTAL LENGTH =1117.46'			

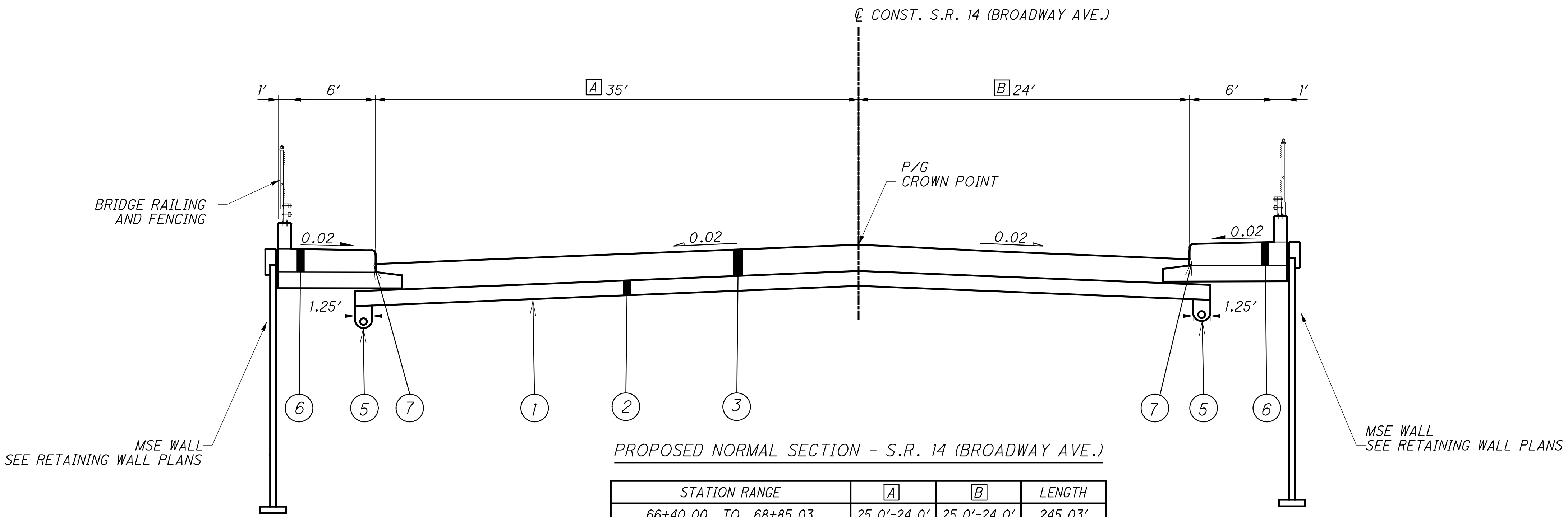


CHAINCRAFT RD.

STA. 111+17.46 TO STA. 115+11.08 = 393.62'
TOTAL LENGTH = 393.62'

TYPICAL SECTIONS

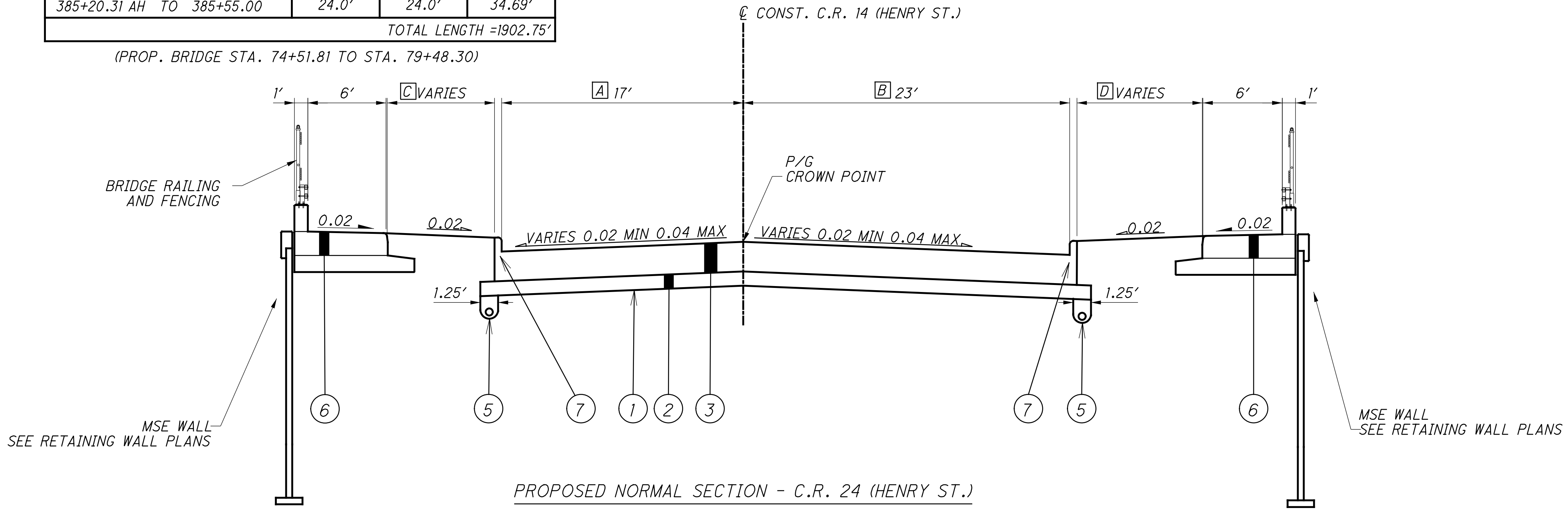
CUY-14-06.93



PROPOSED NORMAL SECTION - S.R. 14 (BROADWAY AVE.)

STATION RANGE	A	B	LENGTH
66+40.00 TO 68+85.03	25.0'-24.0'	25.0'-24.0'	245.03'
68+85.03 TO 71+24.66	24.0'	24.0'	239.63'
71+24.66 TO 73+92.85	24.0'-35.0'	24.0'	268.19'
73+92.85 TO 80+25.00	35.0'	24.0'	632.15'
80+25.00 TO 83+50.00	35.0'-24.0'	24.0'	325.00'
83+50.00 TO 85+08.06 BK	24.0'	24.0'	158.06'
385+20.31 AH TO 385+55.00	24.0'	24.0'	34.69'
			TOTAL LENGTH =1902.75'

(PROP. BRIDGE STA. 74+51.81 TO STA. 79+48.30)



PROPOSED NORMAL SECTION - C.R. 24 (HENRY ST.)

STATION RANGE	A	B	C	D	LENGTH
5+83.00 TO 7+08.00	9.5'-15.0'	10.7'-23.0'	0.0'	0.0'	125.00'
7+08.00 TO 7+58.15	15.0'-17.0'	23.0'	0.0'	0.0'	50.15'
7+58.15 TO 8+13.91	17.0'-20.0'	23.0'-20.0'	0.0'	0.0'	55.76'
8+13.91 TO 10+72.12	20.0'	20.0'	0.0'	0.0'	258.21'
					TOTAL LENGTH =489.12'

PROPOSED LEGEND

① ITEM 204 - SUBGRADE COMPACTION
② ITEM 304 - AGGREGATE BASE (T=6")
③ PROPOSED PAVEMENT (PVMT TYPE TBD)
④ ITEM 526 - REINFORCED CONCRETE APPROACH SLABS (T=12" REAR, T=17" FWD)
⑤ ITEM 605 - 6" BASE PIPE UNDERDRAIN
⑥ ITEM 608 - CONCRETE WALK
⑦ ITEM 609 - CURB (PENDING PVMT TYPE)

TYPICAL SECTIONS

CUY-14-06.93

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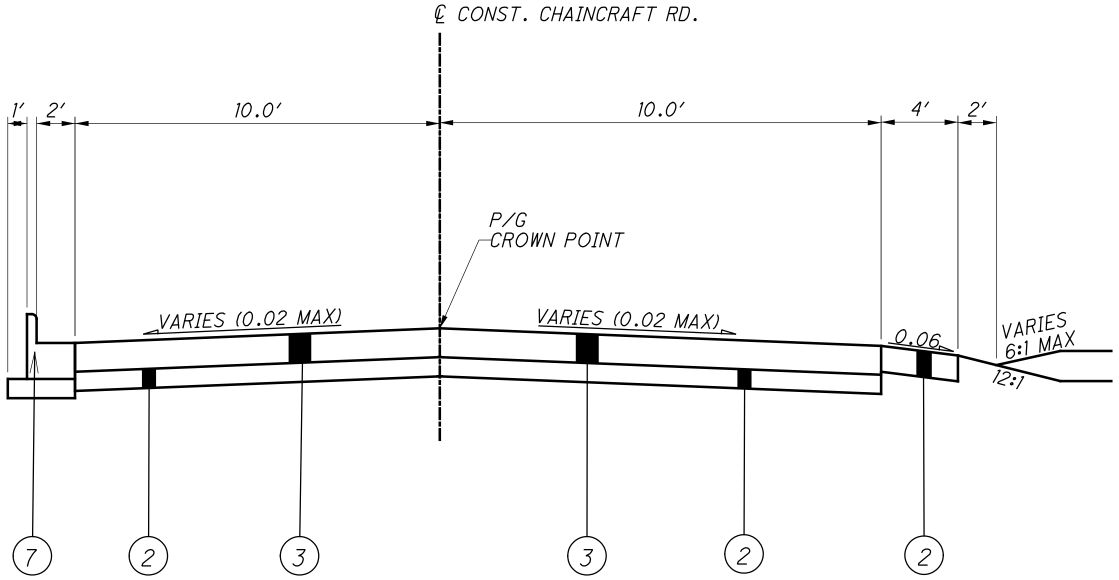
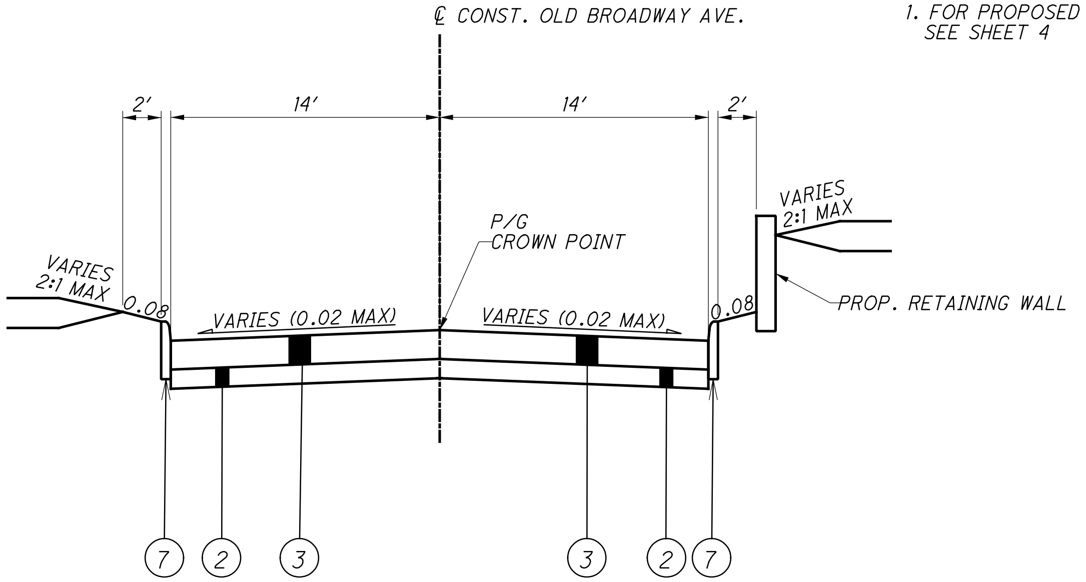
NOTES:

1. FOR PROPOSED LEGEND, SEE SHEET 4



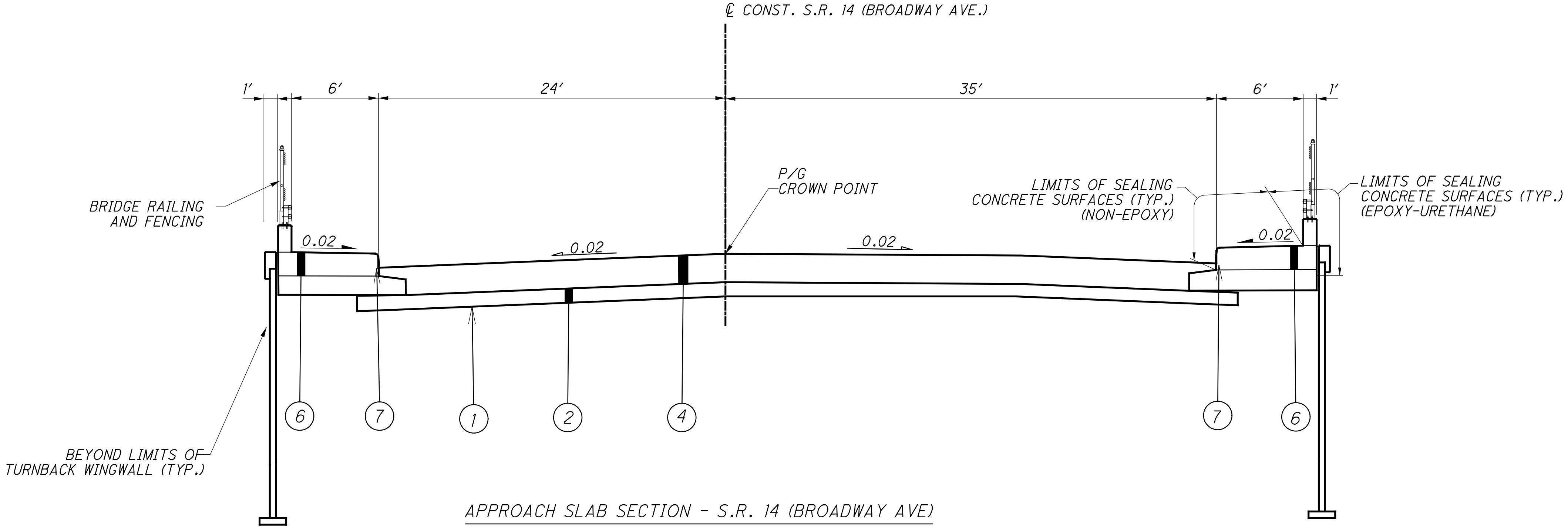
PROPOSED NORMAL SECTION - CHAINCRAFT RD.

STA. 109+75.00 TO STA. 115+25.00 = 550.00'
TOTAL LENGTH = 550.00'



PROPOSED NORMAL SECTION - OLD BROADWAY AVE.

STA. 200+00.00 TO STA. 206+66.77 = 666.77'
TOTAL LENGTH = 666.77'

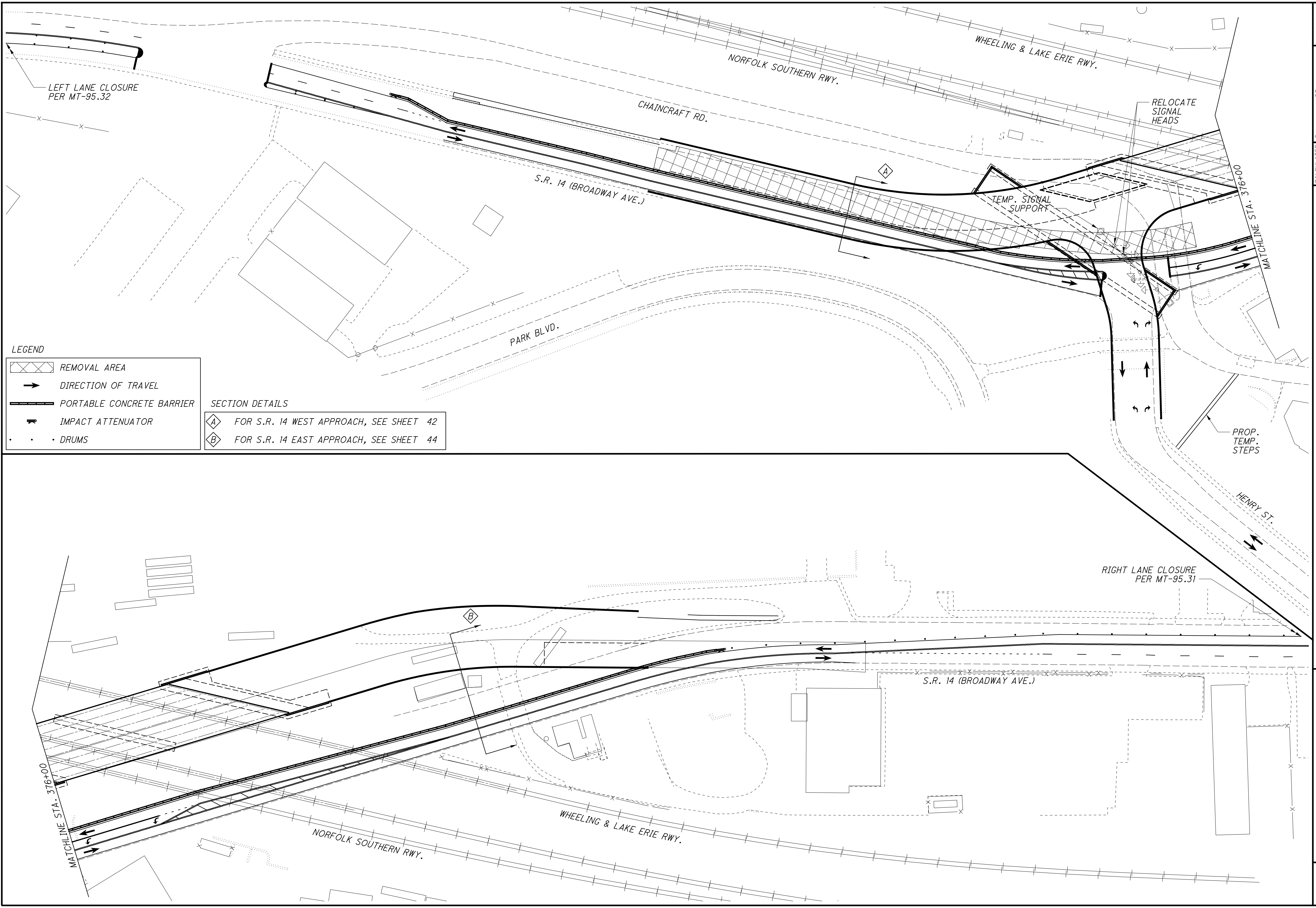


APPROACH SLAB SECTION - S.R. 14 (BROADWAY AVE)

STA. 74+92.78 TO STA. 75+22.78 = 30.00'
STA. 78+04.78 TO STA. 78+34.78 = 30.00'
TOTAL LENGTH = 60.00'

TYPICAL SECTIONS

CUY-14-06.93



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N

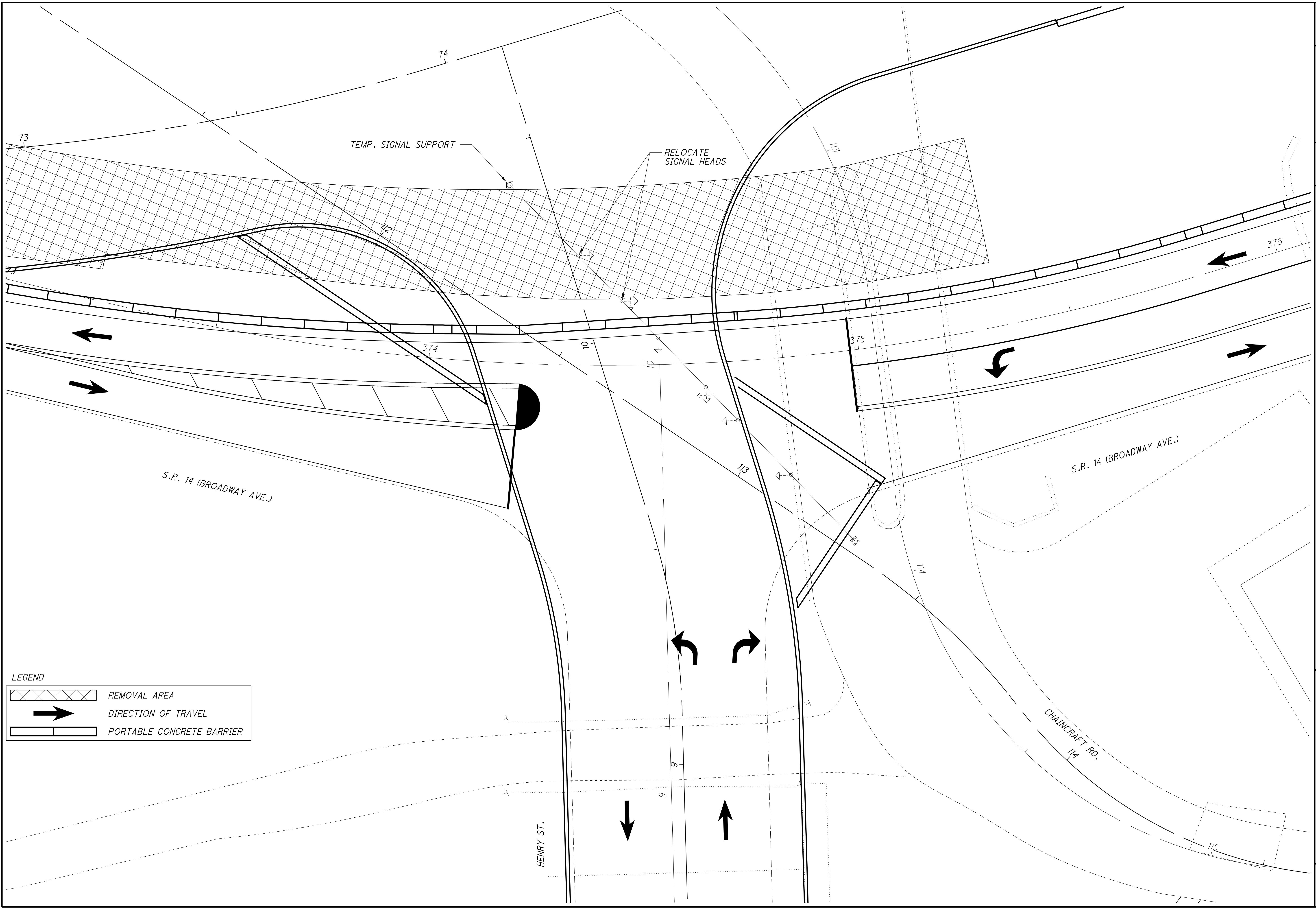
0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PHASE 1 REMOVAL PLAN

CUY-14-6.93

6
69



LEGEND

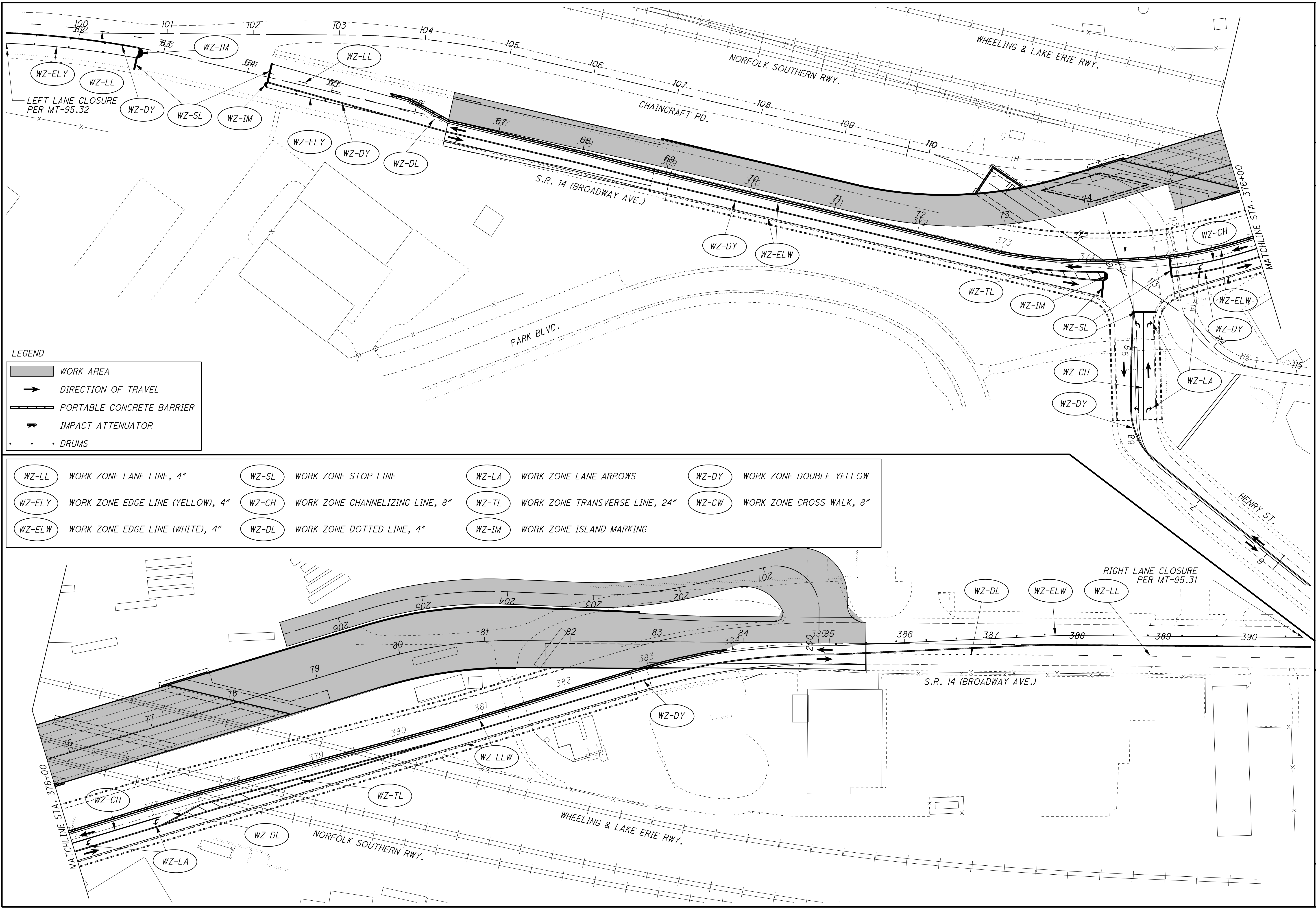
▨	REMOVAL AREA
→	DIRECTION OF TRAVEL
▭	PORTABLE CONCRETE BARRIER

0 5 10 20
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PHASE 1 REMOVAL DETAIL

CUY-14-6.93



LEGEND

▨	WORK AREA
→	DIRECTION OF TRAVEL
═	PORTABLE CONCRETE BARRIER
⊤	IMPACT ATTENUATOR
• • •	DRUMS

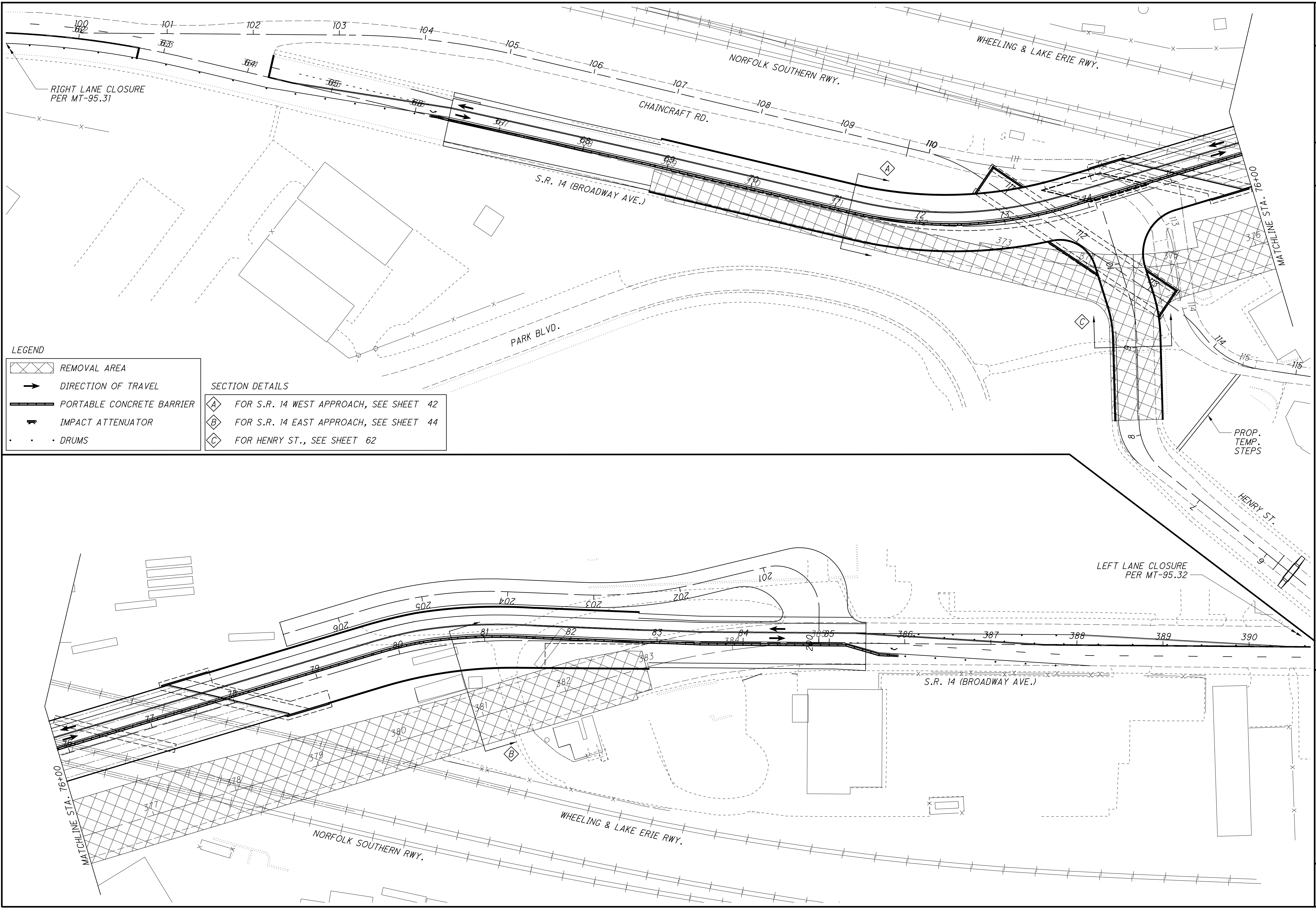
WZ-LL	WORK ZONE LANE LINE, 4"	WZ-SL	WORK ZONE STOP LINE	WZ-LA	WORK ZONE LANE ARROWS	WZ-DY	WORK ZONE DOUBLE YELLOW
WZ-ELY	WORK ZONE EDGE LINE (YELLOW), 4"	WZ-CH	WORK ZONE CHANNELIZING LINE, 8"	WZ-TL	WORK ZONE TRANSVERSE LINE, 24"	WZ-CW	WORK ZONE CROSS WALK, 8"
WZ-ELW	WORK ZONE EDGE LINE (WHITE), 4"	WZ-DL	WORK ZONE DOTTED LINE, 4"	WZ-IM	WORK ZONE ISLAND MARKING		

0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PHASE 1 SCHEMATIC PLAN

CUY-14-6.93



RIGHT LANE CLOSURE PER MT-95.31

LEFT LANE CLOSURE PER MT-95.32

PROP. TEMP. STEPS

LEGEND

▨	REMOVAL AREA
→	DIRECTION OF TRAVEL
═	PORTABLE CONCRETE BARRIER
▬	IMPACT ATTENUATOR
• • •	DRUMS

SECTION DETAILS

◇A	FOR S.R. 14 WEST APPROACH, SEE SHEET 42
◇B	FOR S.R. 14 EAST APPROACH, SEE SHEET 44
◇C	FOR HENRY ST., SEE SHEET 62

0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JEL

PHASE 2 REMOVAL PLAN

CUY-14-6.93

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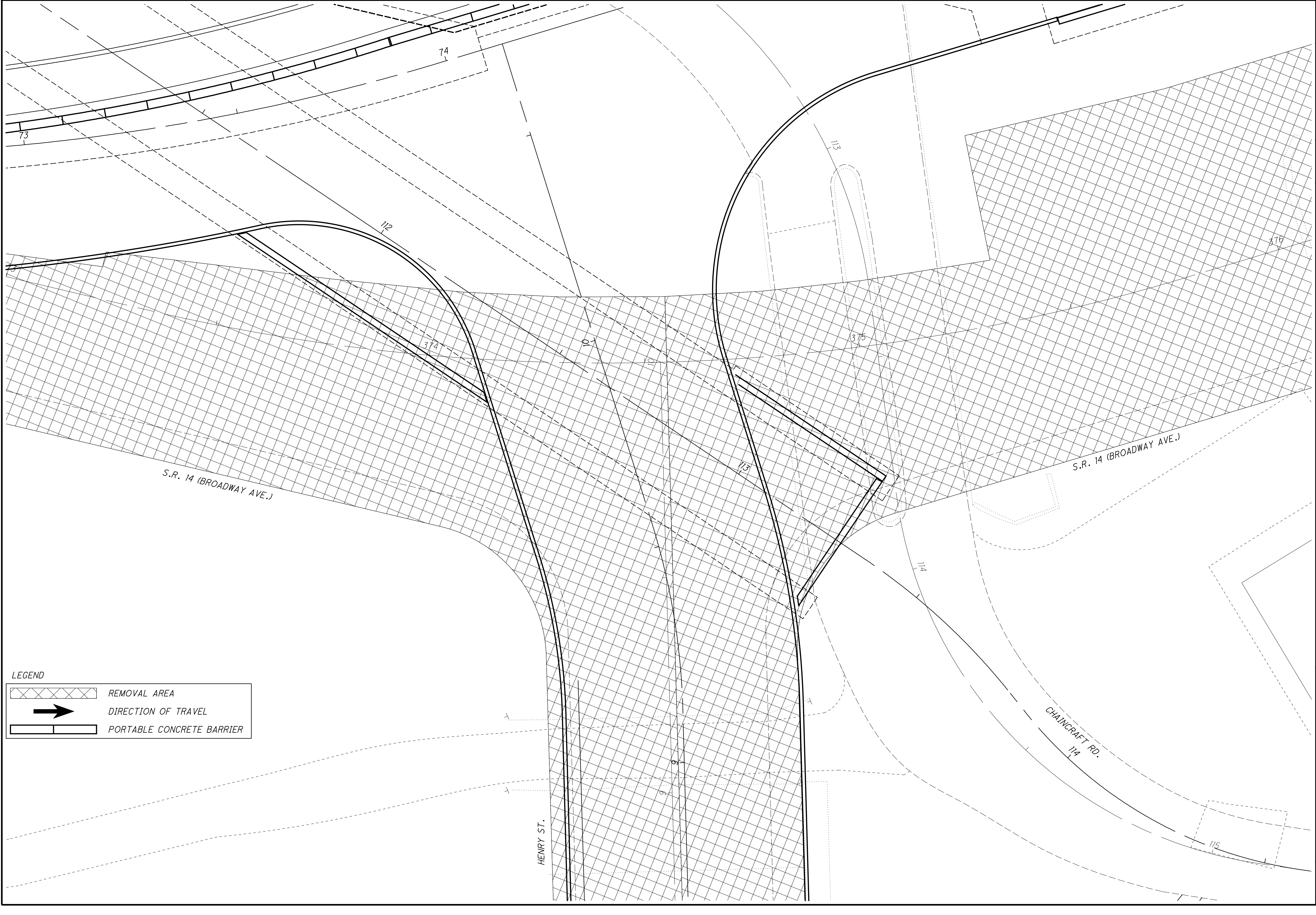


LEGEND

▨	REMOVAL AREA
→	DIRECTION OF TRAVEL
▭	PORTABLE CONCRETE BARRIER

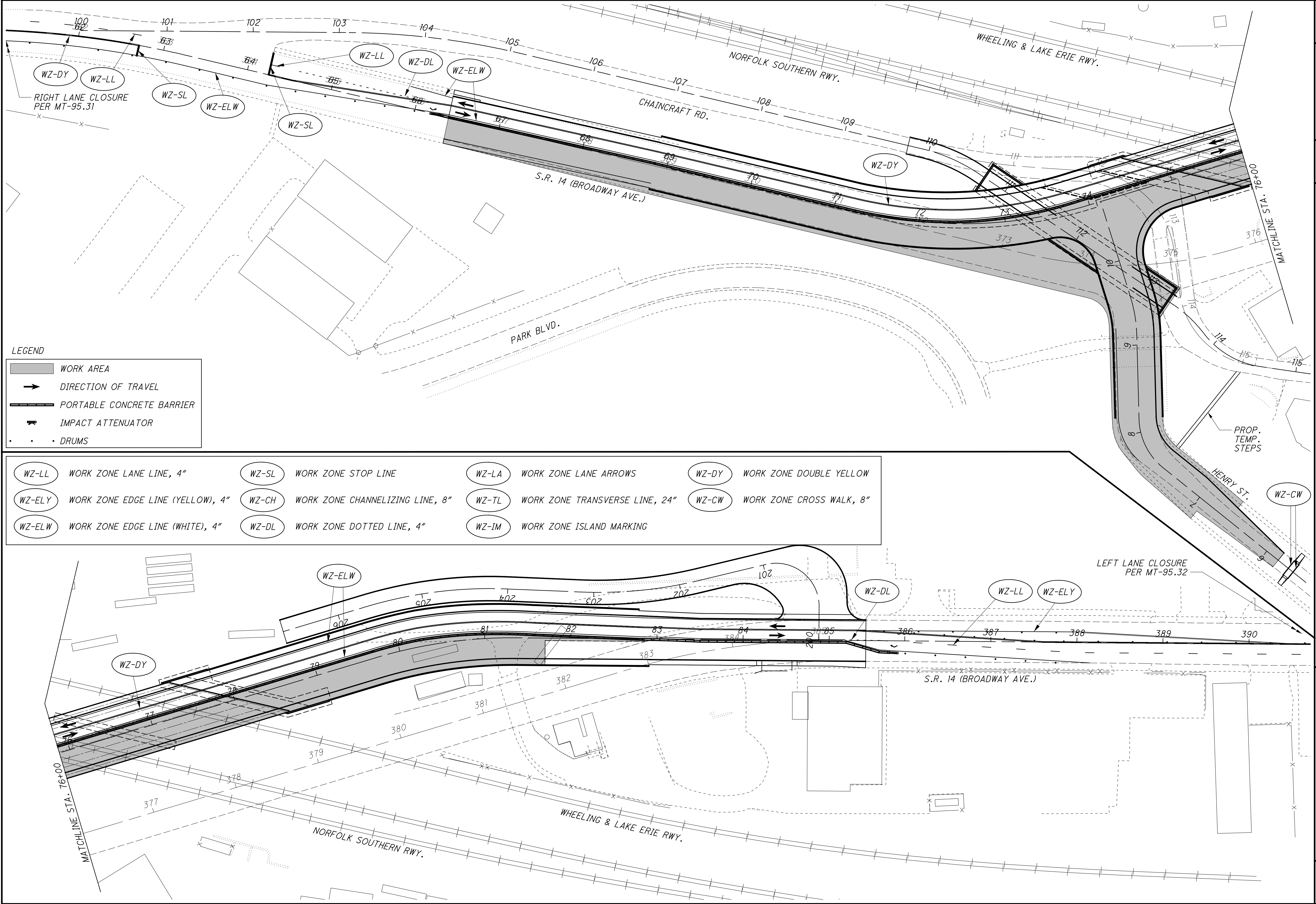
N

0 5 10 20
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PHASE 2 REMOVAL DETAIL

CUY-14-6.93



LEGEND

▨	WORK AREA
→	DIRECTION OF TRAVEL
═	PORTABLE CONCRETE BARRIER
⊼	IMPACT ATTENUATOR
• • •	DRUMS

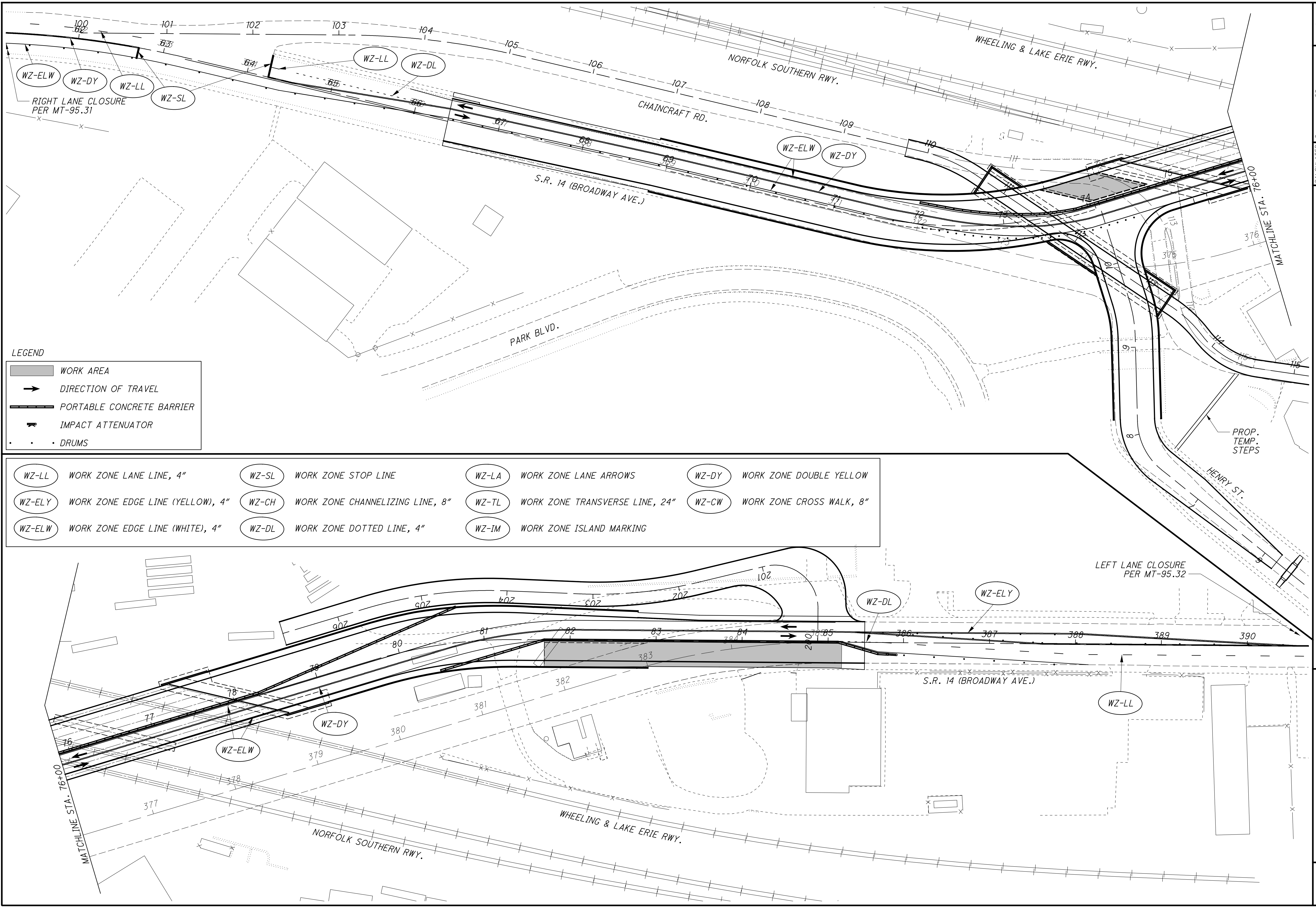
WZ-LL	WORK ZONE LANE LINE, 4"	WZ-SL	WORK ZONE STOP LINE	WZ-LA	WORK ZONE LANE ARROWS	WZ-DY	WORK ZONE DOUBLE YELLOW
WZ-ELY	WORK ZONE EDGE LINE (YELLOW), 4"	WZ-CH	WORK ZONE CHANNELIZING LINE, 8"	WZ-TL	WORK ZONE TRANSVERSE LINE, 24"	WZ-CW	WORK ZONE CROSS WALK, 8"
WZ-ELW	WORK ZONE EDGE LINE (WHITE), 4"	WZ-DL	WORK ZONE DOTTED LINE, 4"	WZ-IM	WORK ZONE ISLAND MARKING		

HORIZONTAL SCALE IN FEET
0 25 50 100

CALCULATED RJJ
CHECKED JMS

PHASE 2 SCHEMATIC PLAN

CUY-14-6.93



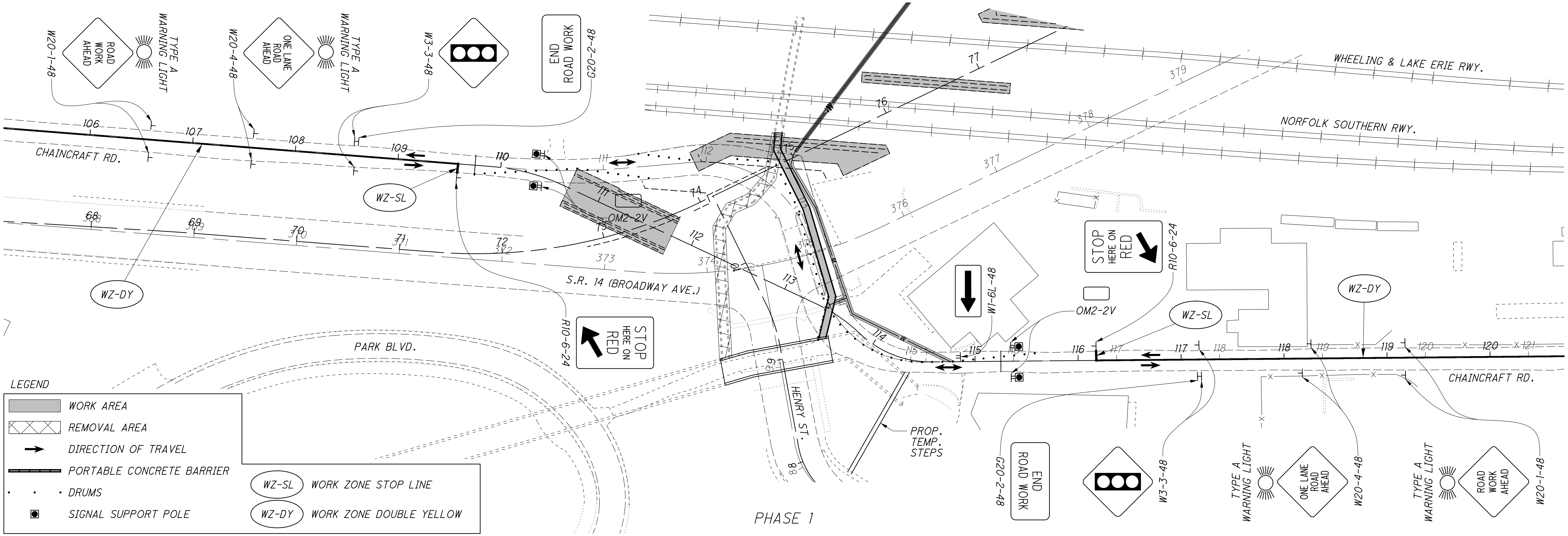
WZ-LL WORK ZONE LANE LINE, 4"	WZ-SL WORK ZONE STOP LINE	WZ-LA WORK ZONE LANE ARROWS	WZ-DY WORK ZONE DOUBLE YELLOW
WZ-ELY WORK ZONE EDGE LINE (YELLOW), 4"	WZ-CH WORK ZONE CHANNELIZING LINE, 8"	WZ-TL WORK ZONE TRANSVERSE LINE, 24"	WZ-CW WORK ZONE CROSS WALK, 8"
WZ-ELW WORK ZONE EDGE LINE (WHITE), 4"	WZ-DL WORK ZONE DOTTED LINE, 4"	WZ-IM WORK ZONE ISLAND MARKING	

HORIZONTAL SCALE IN FEET
0 25 50 100

CALCULATED RJJ
CHECKED JMS

PHASE 3 SCHEMATIC PLAN

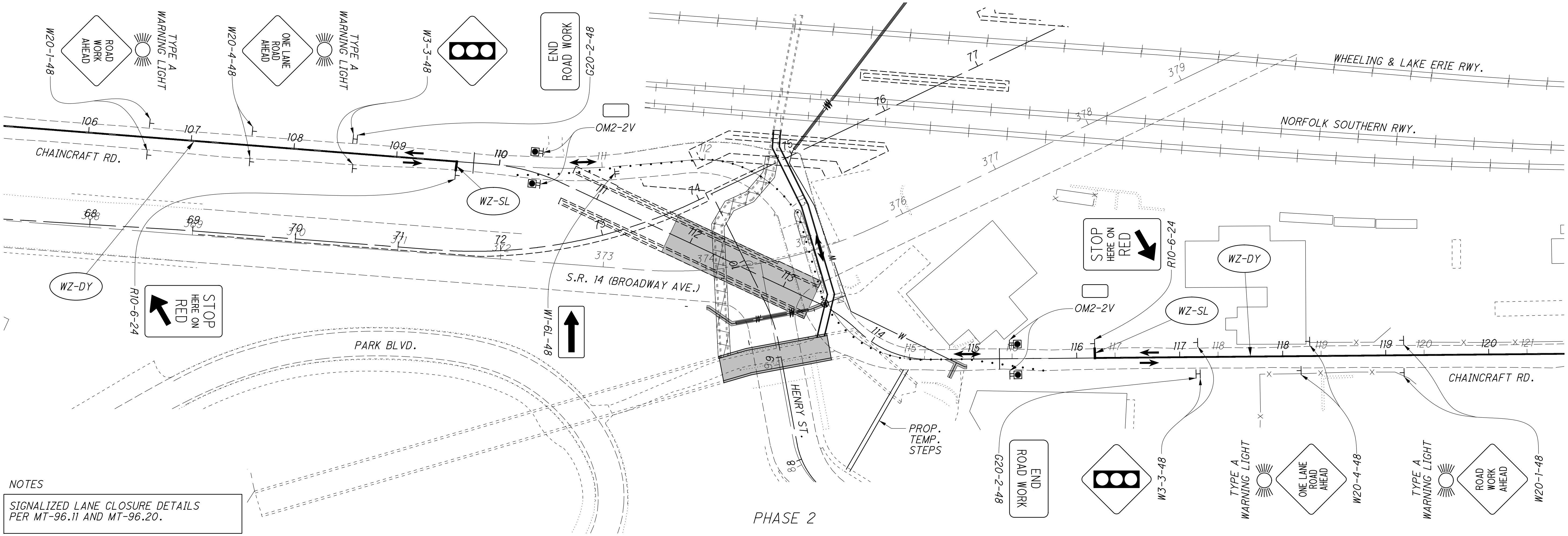
CUY-14-6.93



PHASE 1

LEGEND

▨	WORK AREA
⊠	REMOVAL AREA
→	DIRECTION OF TRAVEL
═	PORTABLE CONCRETE BARRIER
· · ·	DRUMS
◙	SIGNAL SUPPORT POLE
WZ-SL	WORK ZONE STOP LINE
WZ-DY	WORK ZONE DOUBLE YELLOW



PHASE 2

NOTES

SIGNALIZED LANE CLOSURE DETAILS PER MT-96.11 AND MT-96.20.

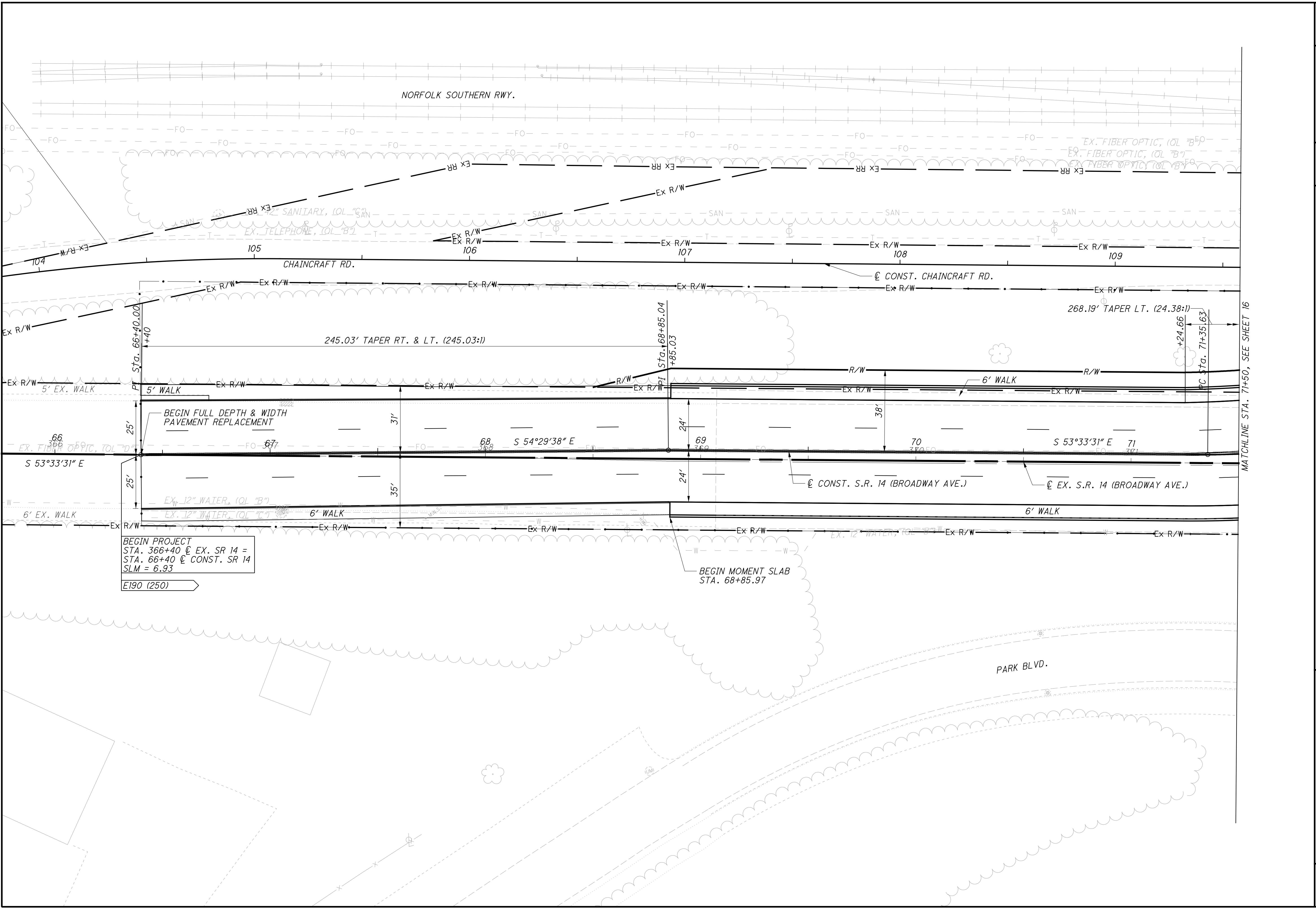
0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED RJJ

CHECKED JMS

CHAINCRAFT RD. SCHEMATIC PLAN

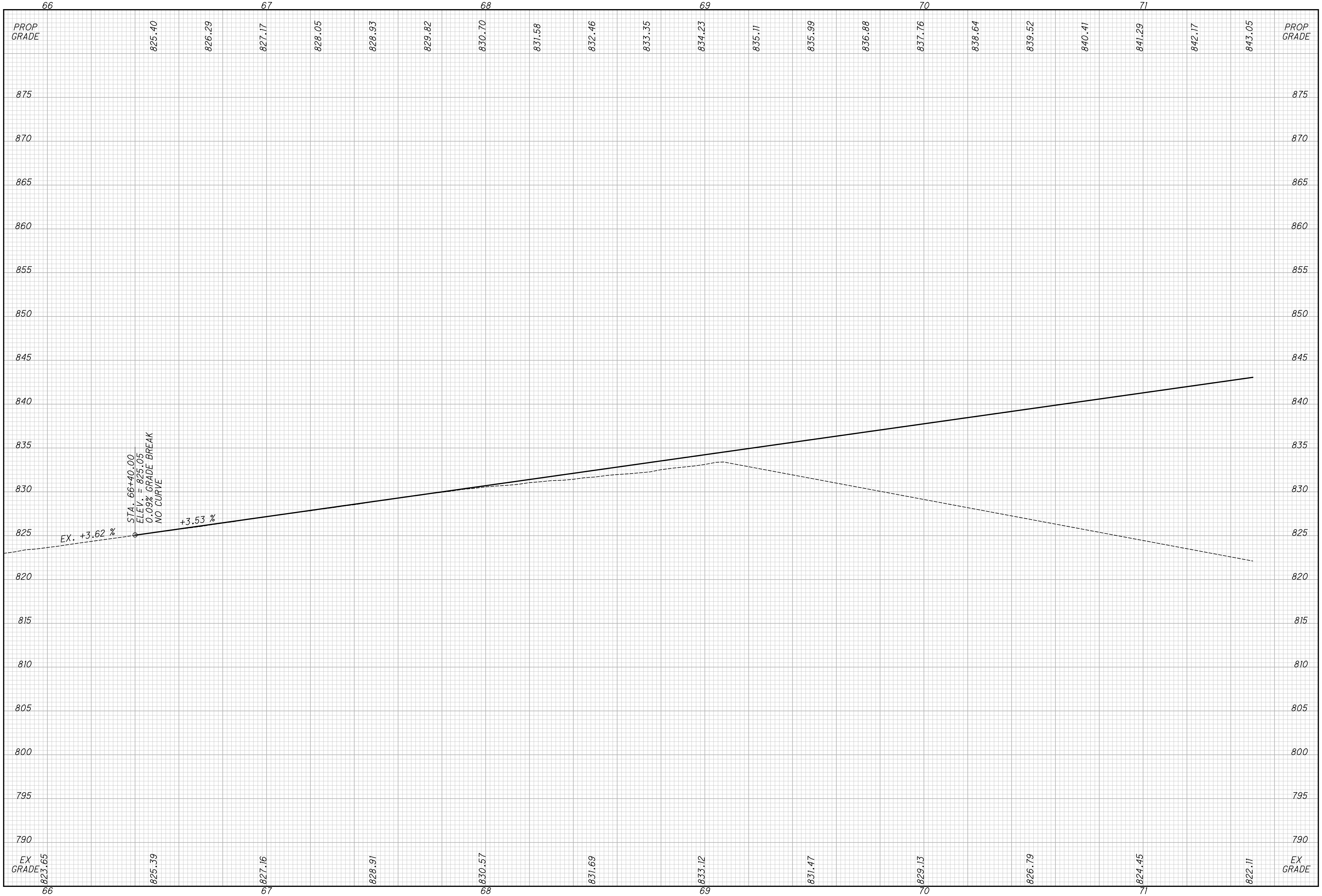
CUY-14-6.93



CALCULATED RJJ
CHECKED JMS

PLAN - S.R. 14 (BROADWAY AVE.)
STA. 66+40 TO STA. 71+50

CUY-14-6.93



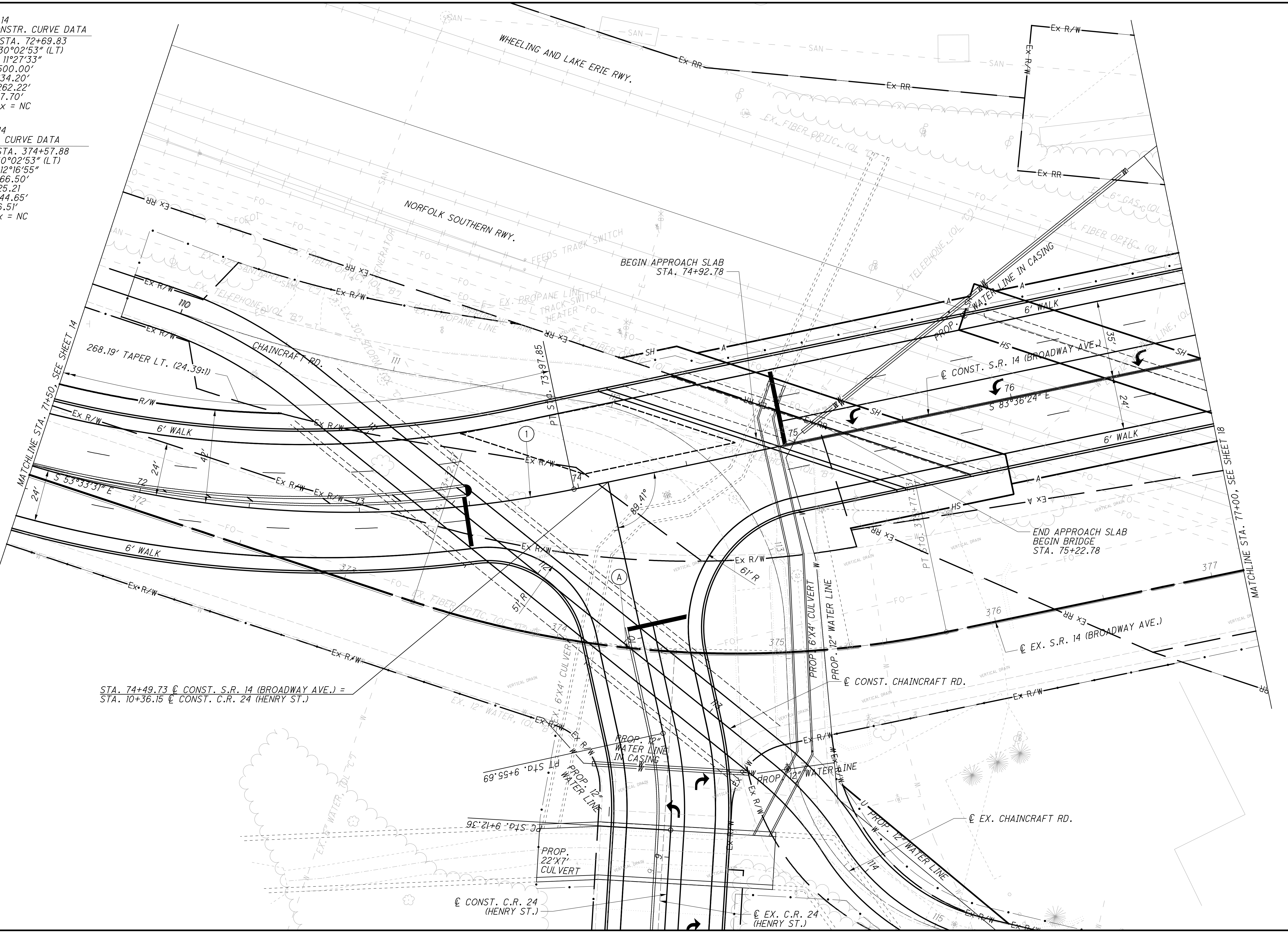
CALCULATED
RJJ
CHECKED
JMS

PROFILE - S.R. 14 (BROADWAY AVE.)
STA. 66+40 TO STA. 71+50

CUY-14-6.93

S.R. 14
① ℄ CONSTR. CURVE DATA
P.I. STA. 72+69.83
Δ = 30°02′53″ (LT)
Dc = 11°27′33″
R = 500.00′
T = 134.20′
L = 262.22′
E = 17.70′
e max = NC

S.R. 14
Ⓐ ℄ EX. CURVE DATA
P.I. STA. 374+57.88
Δ = 30°02′53″ (LT)
Dc = 12°16′55″
R = 466.50′
T = 125.21
L = 244.65′
E = 16.51′
e max = NC



0 10 20 40
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PLAN - S.R. 14 (BROADWAY AVE.)
STA. 71+50 TO STA. 77+00

CUY-14-6.93

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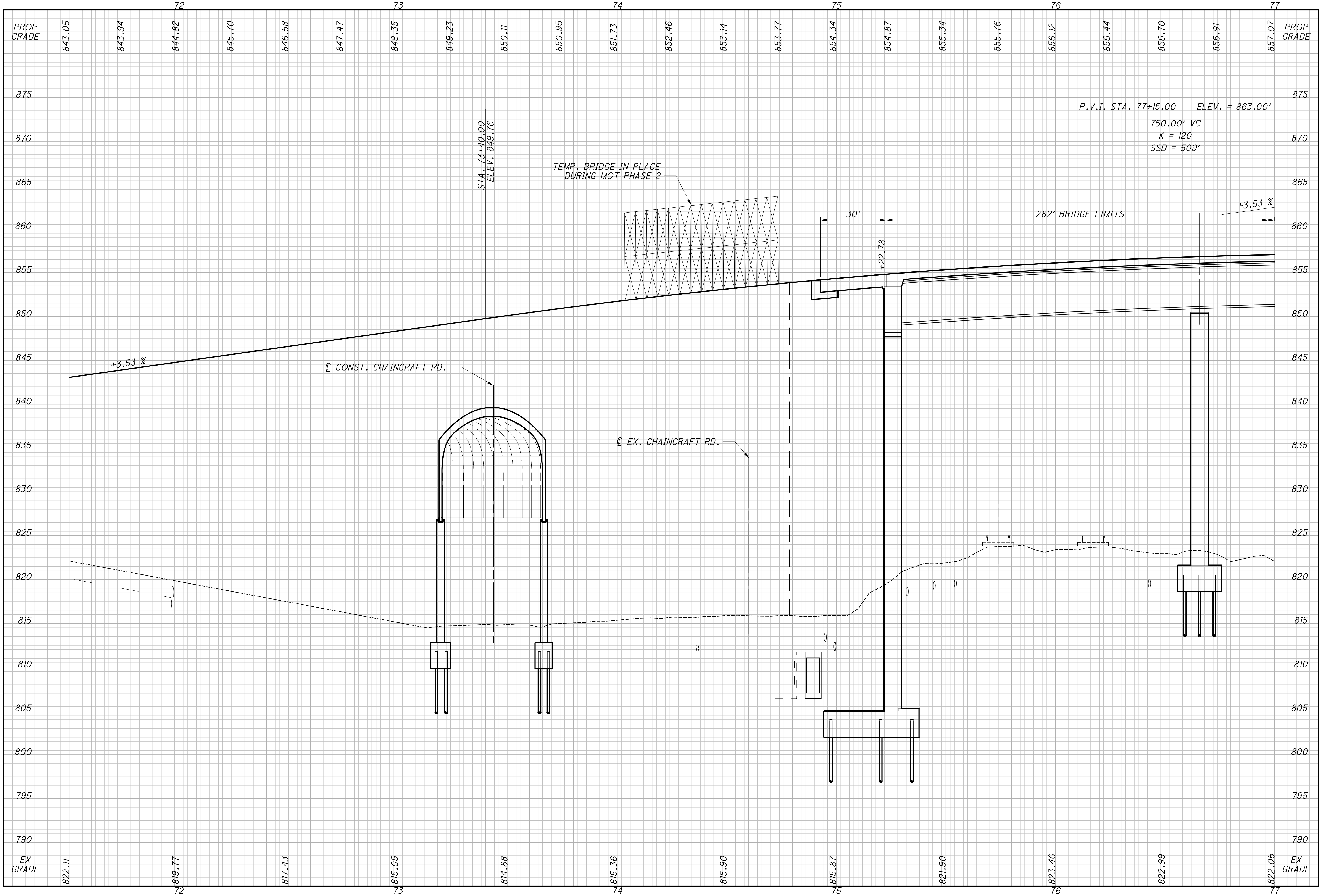
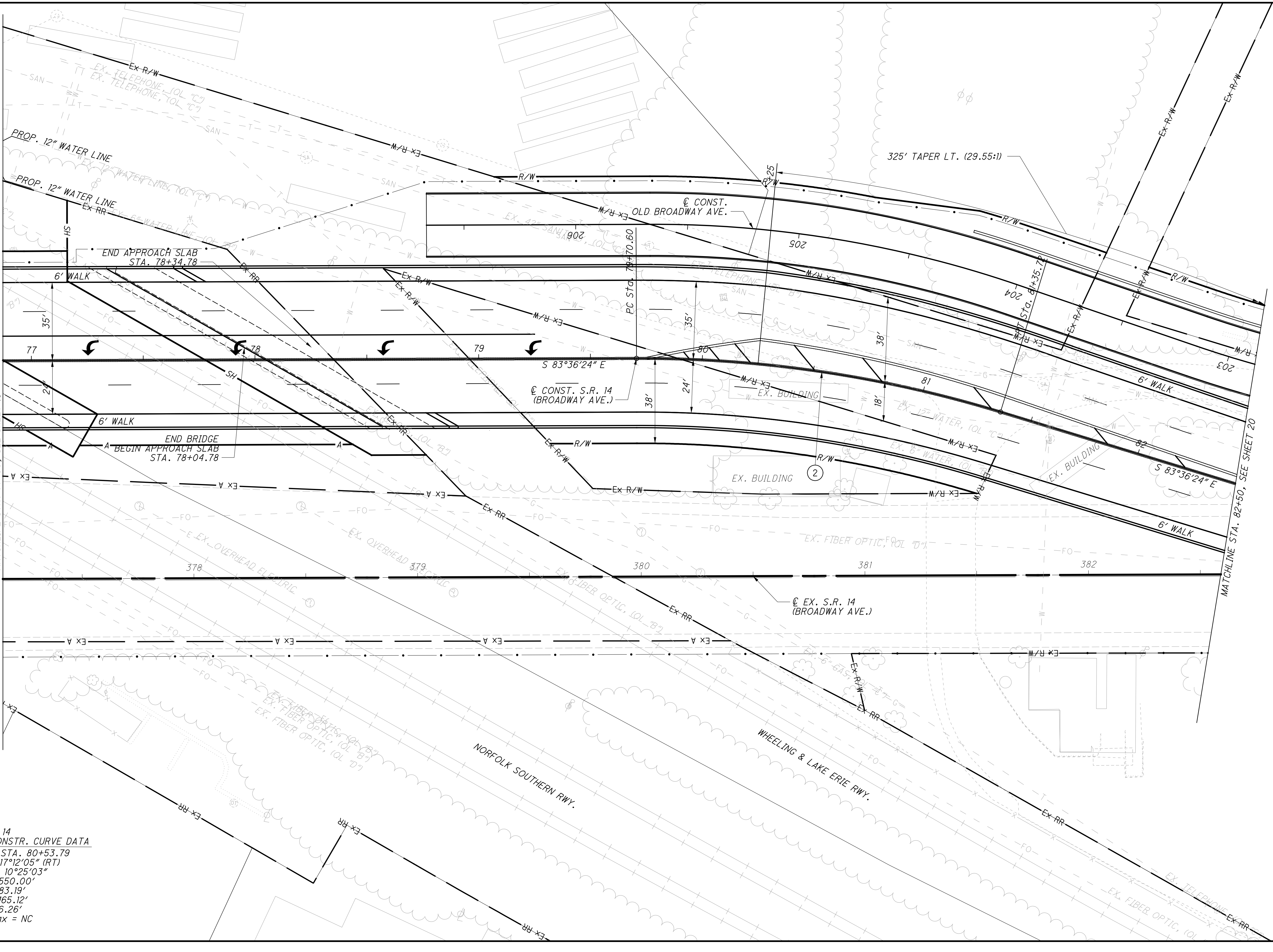


CALCULATED
RJJ
CHECKED
JMS

PROFILE - S.R. 14 (BROADWAY AVE.)
STA. 71+50 TO STA. 77+00

CUY-14-6.93



S.R. 14
② ℄ CONSTR. CURVE DATA
P.I. STA. 80+53.79
Δ = 17°12'05" (RT)
Dc = 10°25'03"
R = 550.00'
T = 83.19'
L = 165.12'
E = 6.26'
e max = NC

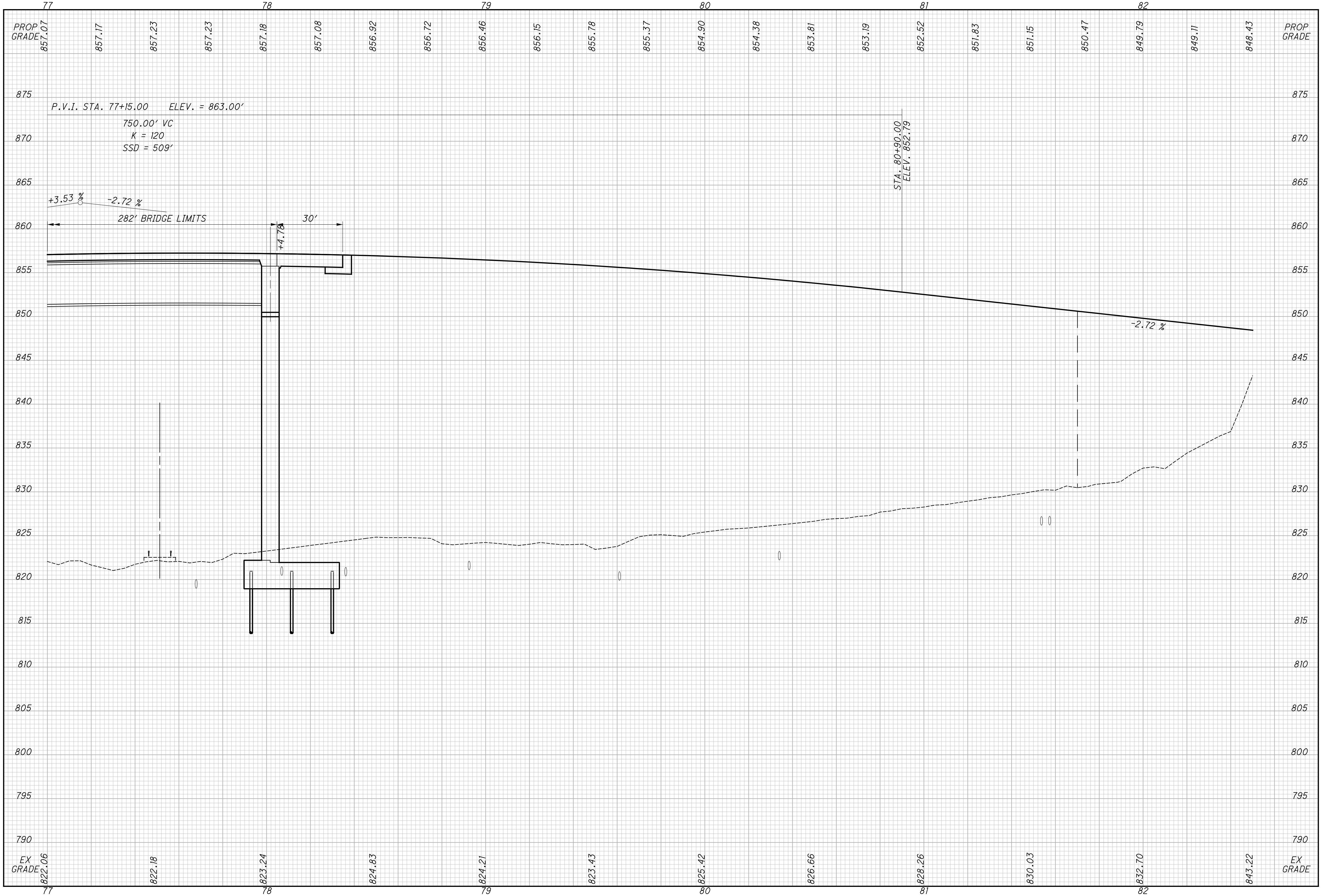
0 10 20 40
HORIZONTAL
SCALE IN FEET

CALCULATED
RJJ

CHECKED
JMS

PLAN - S.R. 14 (BROADWAY AVE.)
STA. 77+00 TO STA. 82+50

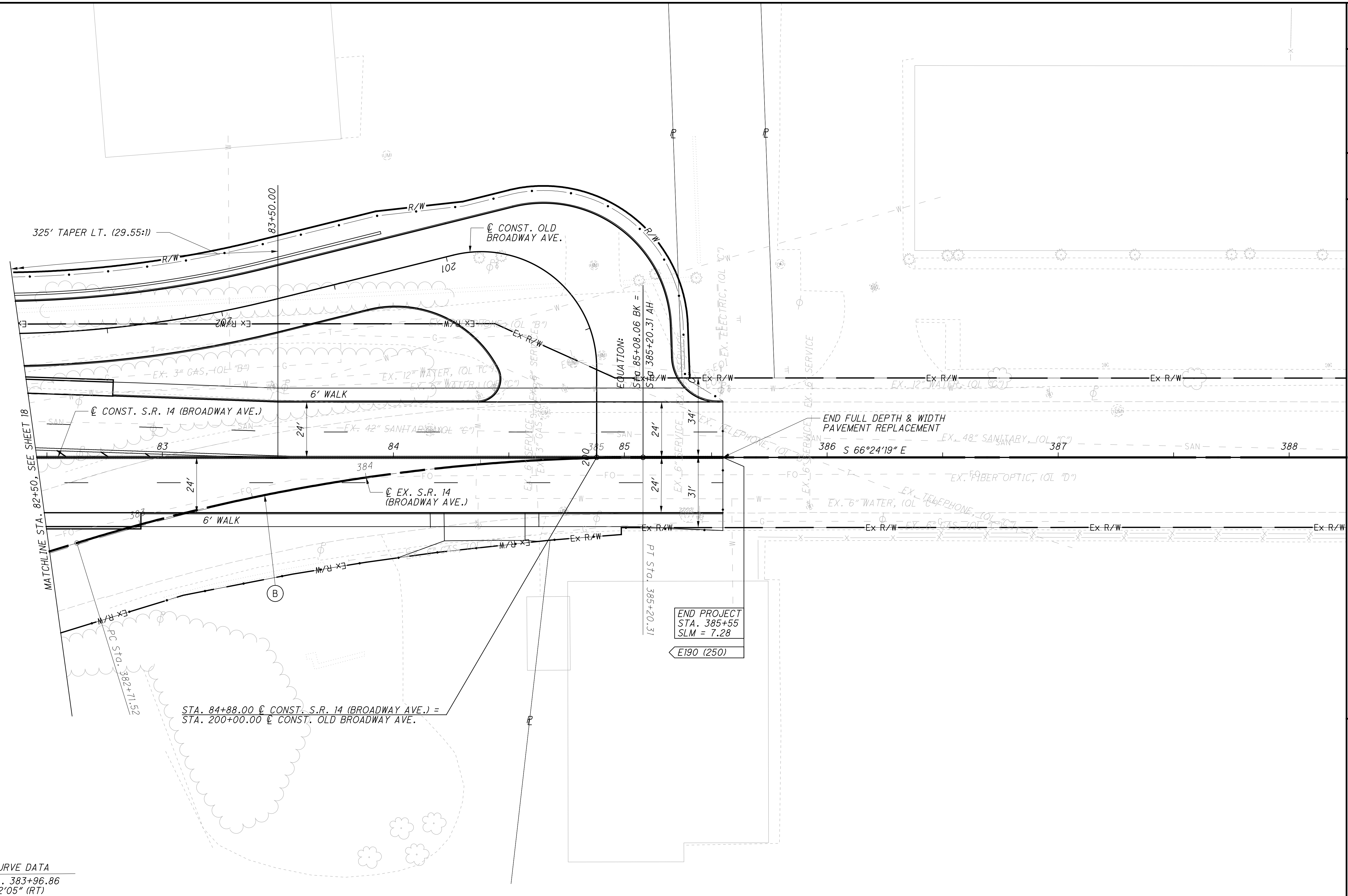
CUY-14-6.93



CALCULATED
RJJ
CHECKED
JMS

PROFILE - S.R. 14 (BROADWAY AVE.)
STA. 77+00 TO STA. 82+50

CUY-14-6.93



(B) S.R. 14
℄ EX. CURVE DATA

P.I. STA. 383+96.86
Δ = 17°12'05" (RT)
Dc = 6°54'50"
R = 828.71'
T = 125.34'
L = 248.80'
E = 9.43'
e max = NC

CALCULATED RJJ
CHECKED JMS

PLAN - S.R. 14 (BROADWAY AVE.)
STA. 82+50 TO ENDING

CUY-14-6.93

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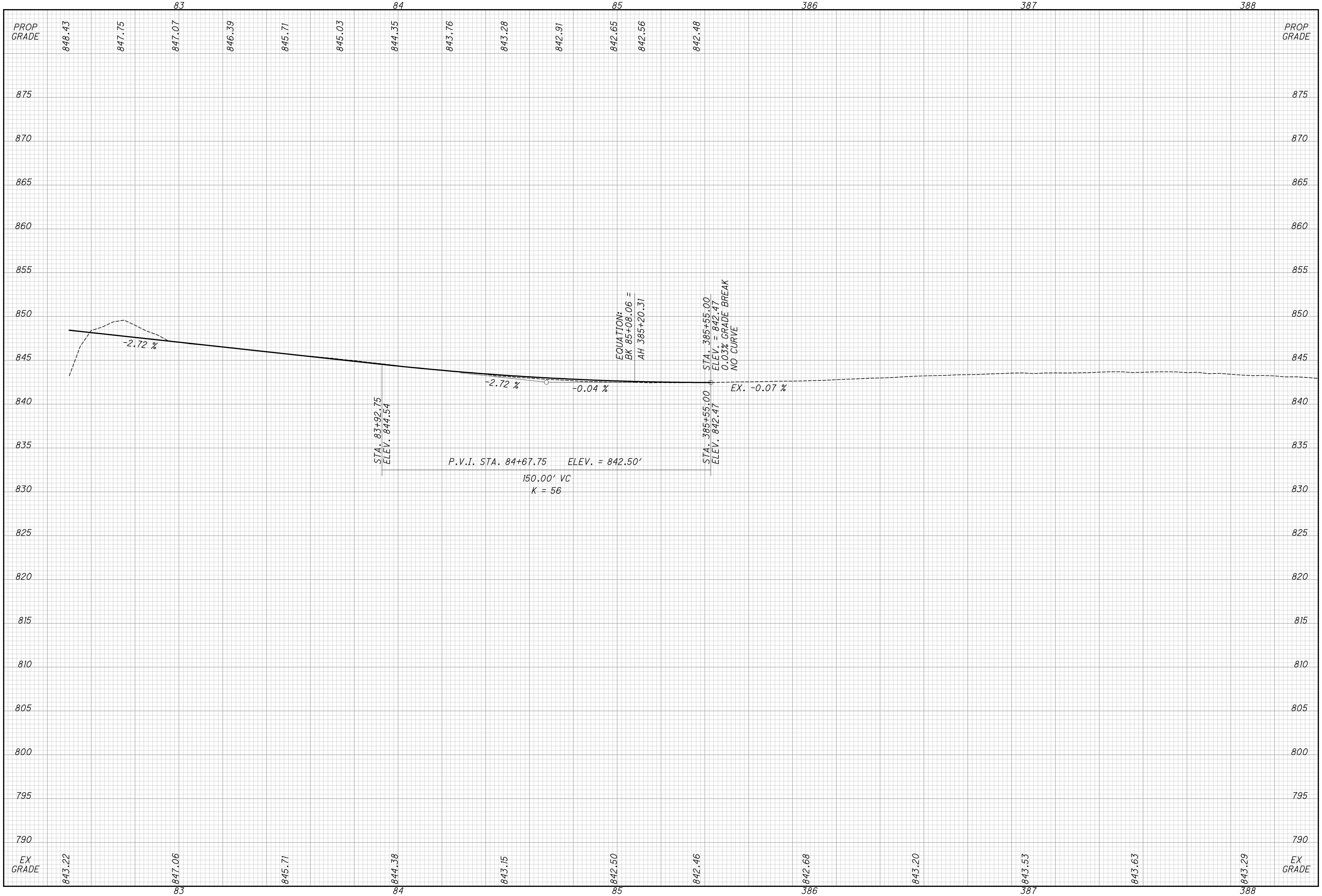


CALCULATED RJJ
CHECKED JMS

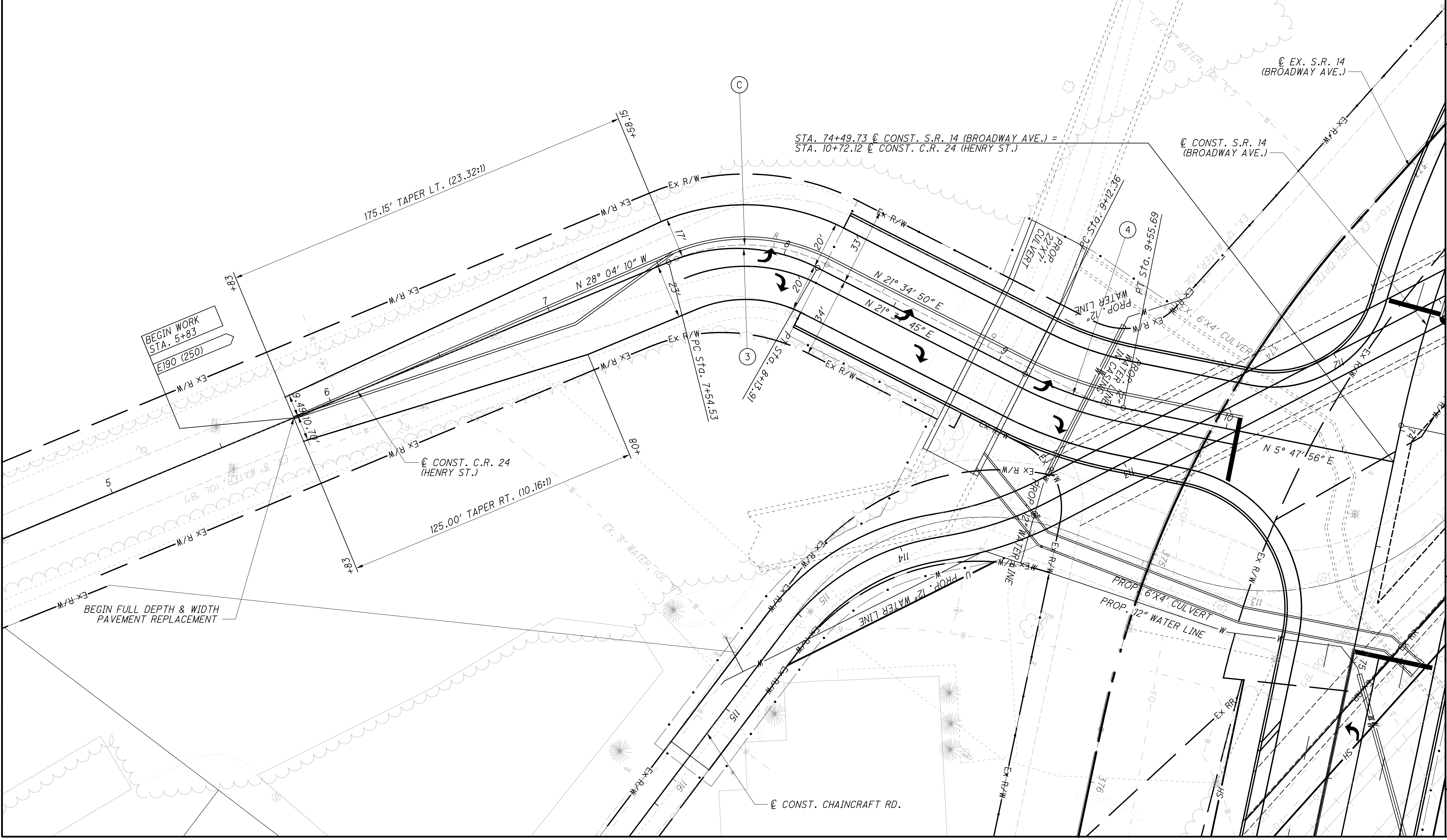
PROFILE - S.R. 14 (BROADWAY AVE.)
STA. 82+50 TO STA. 385+55

CUY-14-6.93

Ⓒ C.R. 24
℄ EX. CONSTR. CURVE DATA
P.I. STA. 7+93.17
Δ = 49°39'00" (RT)
Dc = 75°41'04"
R = 75.70'
T = 35.02'
L = 65.60'
E = 7.70'
e max = NC

③ C.R. 24
℄ CONSTR. CURVE DATA
P.I. Sta. 7+89.23
Δ = 49° 38' 54" (RT)
Dc = 83° 37' 14"
R = 75.00'
T = 34.69'
L = 59.37'
E = 7.64'
C = -62.98'
C.B. = N 3° 14' 42" W

④ C.R. 24
℄ CONSTR. CURVE DATA
P.I. Sta. 9+34.53
Δ = 15° 46' 49" (LT)
Dc = 36° 25' 12"
R = 160.00'
T = 22.17'
L = 43.33'
E = 1.53'
C = -43.93'
C.B. = N 13° 41' 21" E



CALCULATED RJJ
CHECKED JMS

HORIZONTAL SCALE IN FEET
0 10 20 40

N

PLAN - C.R. 24 (HENRY ST.)
STA. 5+83 TO 10+72.12

CUY-14-6.93

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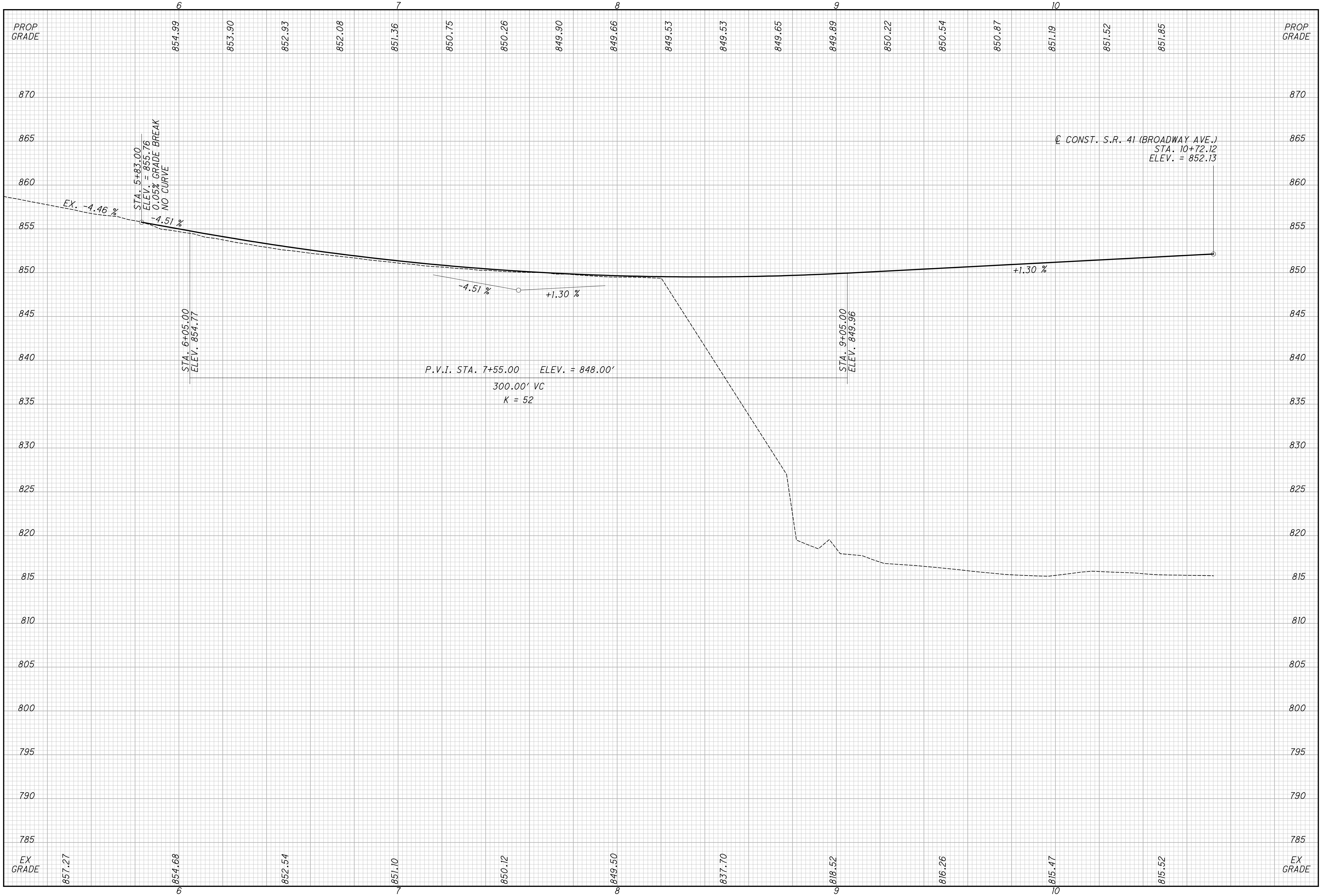

CALCULATED
RJJ
CHECKED
JMS

PROFILE - C.R. 24 (HENRY ST.)
BEGINNING TO END

CUY-14-6.93

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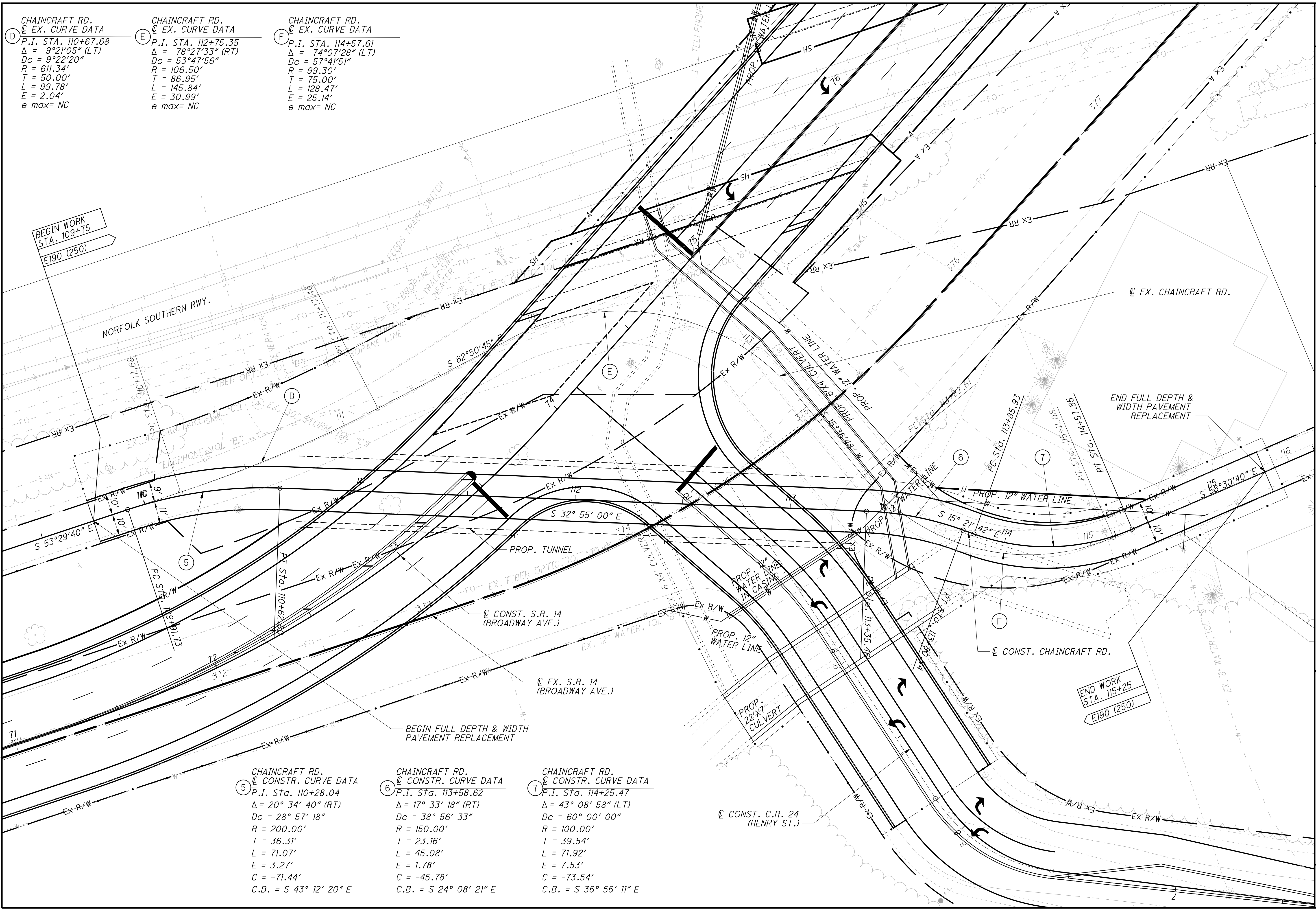
CHAINCRAFT RD.
℄ EX. CURVE DATA
Ⓓ
P.I. STA. 110+67.68
Δ = 9°21′05″ (LT)
Dc = 9°22′20″
R = 611.34′
T = 50.00′
L = 99.78′
E = 2.04′
e max= NC

CHAINCRAFT RD.
℄ EX. CURVE DATA
Ⓔ
P.I. STA. 112+75.35
Δ = 78°27′33″ (RT)
Dc = 53°47′56″
R = 106.50′
T = 86.95′
L = 145.84′
E = 30.99′
e max= NC

CHAINCRAFT RD.
℄ EX. CURVE DATA
Ⓕ
P.I. STA. 114+57.61
Δ = 74°07′28″ (LT)
Dc = 57°41′51″
R = 99.30′
T = 75.00′
L = 128.47′
E = 25.14′
e max= NC



CHAINCRAFT RD.
℄ CONSTR. CURVE DATA
⑤
P.I. Sta. 110+28.04
Δ = 20° 34′ 40″ (RT)
Dc = 28° 57′ 18″
R = 200.00′
T = 36.31′
L = 71.07′
E = 3.27′
C = -71.44′
C.B. = S 43° 12′ 20″ E

CHAINCRAFT RD.
℄ CONSTR. CURVE DATA
⑥
P.I. Sta. 113+58.62
Δ = 17° 33′ 18″ (RT)
Dc = 38° 56′ 33″
R = 150.00′
T = 23.16′
L = 45.08′
E = 1.78′
C = -45.78′
C.B. = S 24° 08′ 21″ E

CHAINCRAFT RD.
℄ CONSTR. CURVE DATA
⑦
P.I. Sta. 114+25.47
Δ = 43° 08′ 58″ (LT)
Dc = 60° 00′ 00″
R = 100.00′
T = 39.54′
L = 71.92′
E = 7.53′
C = -73.54′
C.B. = S 36° 56′ 11″ E

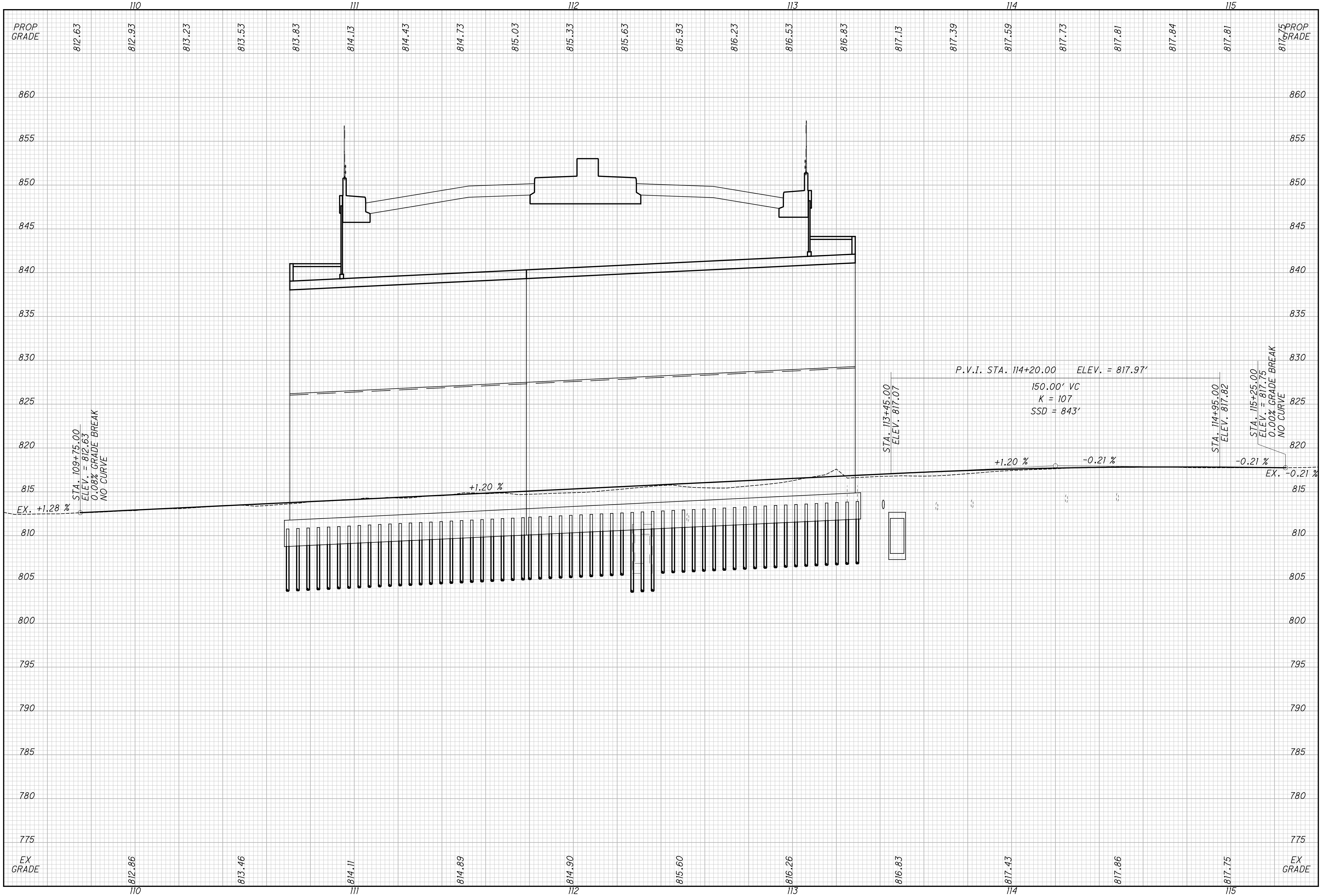
N

0 10 20 40
HORIZONTAL
SCALE IN FEET

CALCULATED
RJJ
CHECKED
JMS

PLAN - CHAINCRAFT RD.
STA. 109+75 TO STA. 115+25

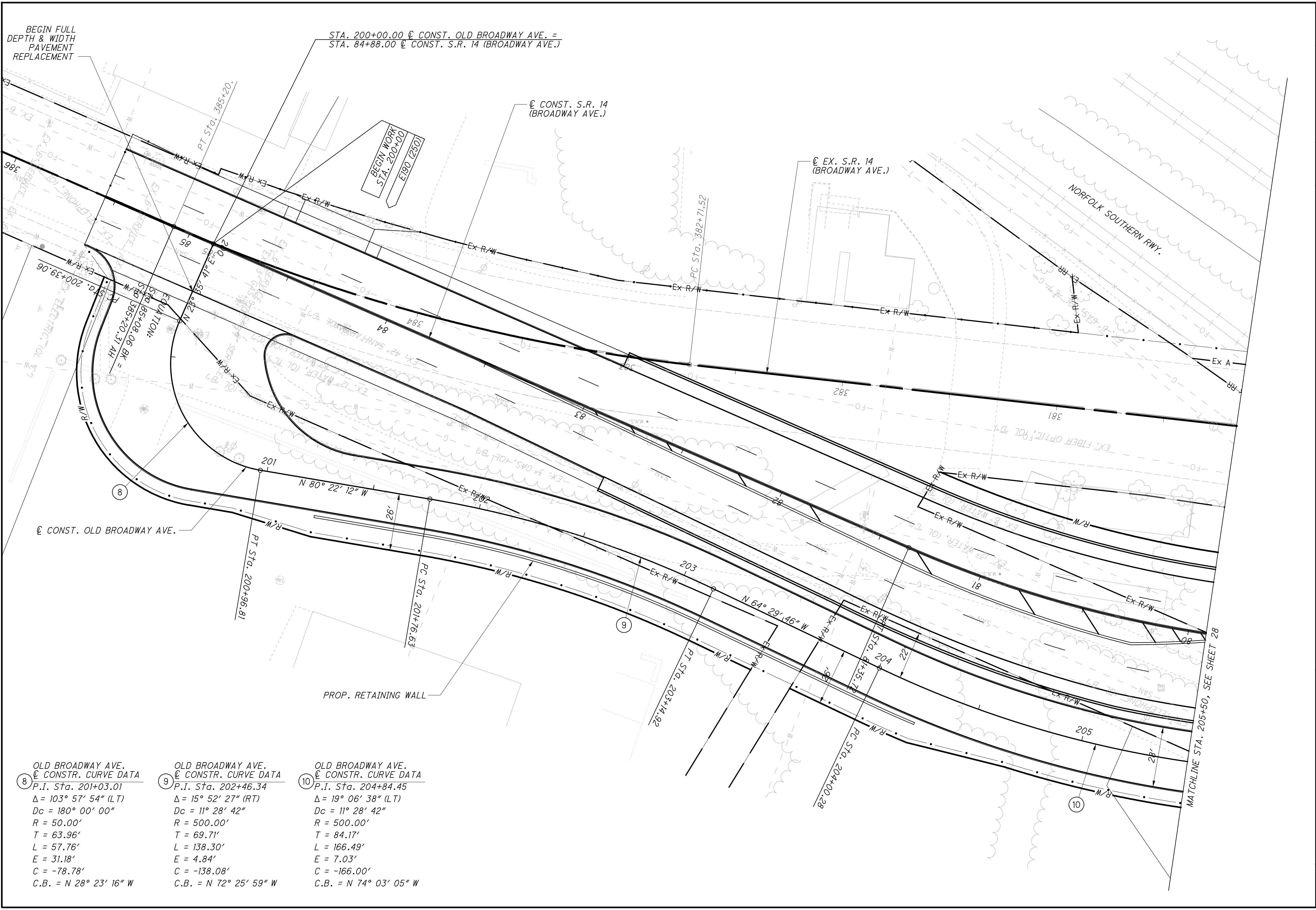
CUY-14-6.93



CALCULATED
RJJ
CHECKED
JMS

PROFILE - CHAINCRAFT RD.
STA. 109+75 TO STA. 115+25

CUY-14-6.93



⑧ OLD BROADWAY AVE.
℄ CONSTR. CURVE DATA
P.I. Sta. 201+03.01
Δ = 103° 57′ 54″ (LT)
Dc = 180° 00′ 00″
R = 50.00′
T = 63.96′
L = 57.76′
E = 31.18′
C = -78.78′
C.B. = N 28° 23′ 16″ W

⑨ OLD BROADWAY AVE.
℄ CONSTR. CURVE DATA
P.I. Sta. 202+46.34
Δ = 15° 52′ 27″ (RT)
Dc = 11° 28′ 42″
R = 500.00′
T = 69.71′
L = 138.30′
E = 4.84′
C = -138.08′
C.B. = N 72° 25′ 59″ W

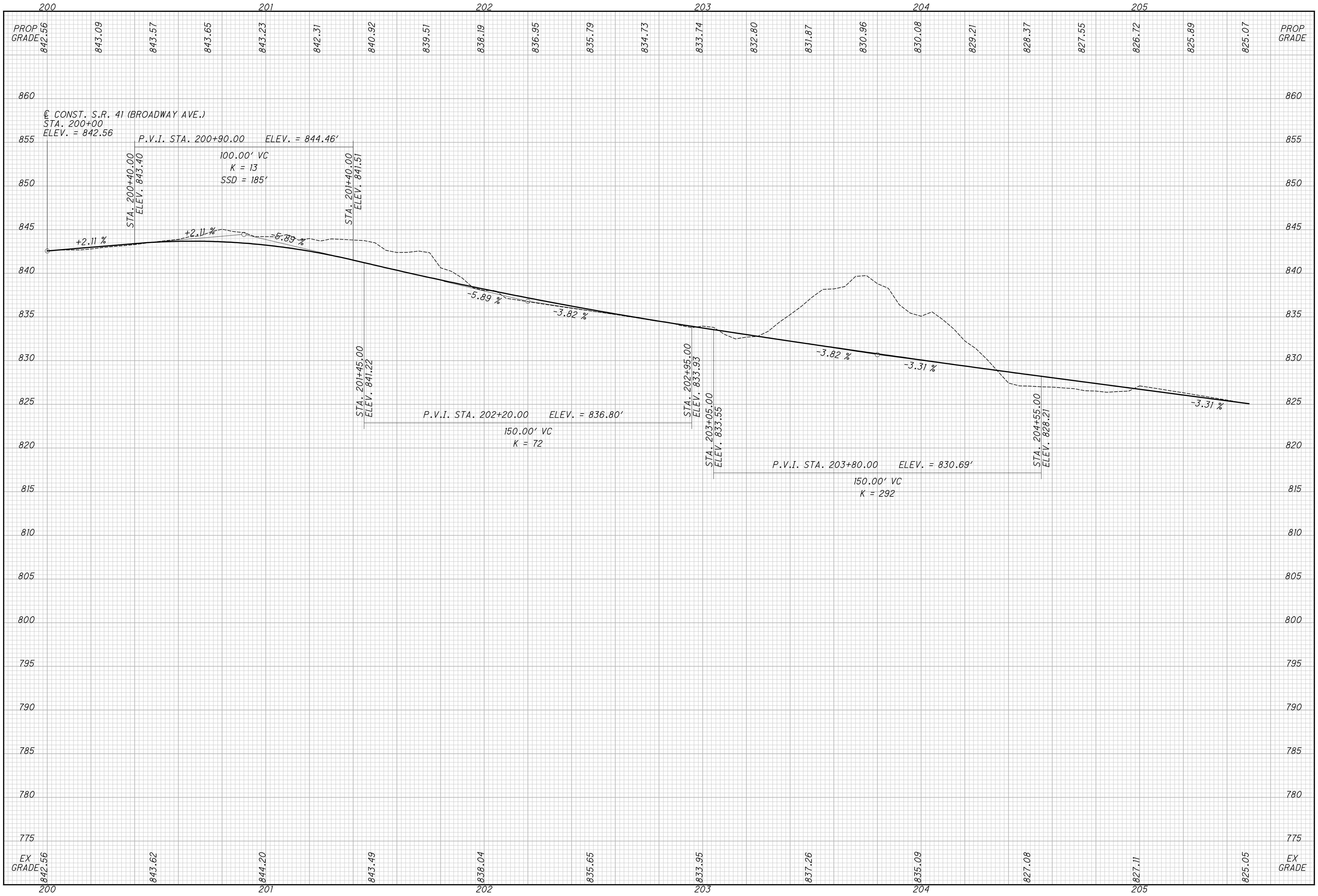
⑩ OLD BROADWAY AVE.
℄ CONSTR. CURVE DATA
P.I. Sta. 204+84.45
Δ = 19° 06′ 38″ (LT)
Dc = 11° 28′ 42″
R = 500.00′
T = 84.17′
L = 166.49′
E = 7.03′
C = -166.00′
C.B. = N 74° 03′ 05″ W

0 10 20 40
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PLAN - OLD BROADWAY AVE.
STA. 200+00 TO STA. 205+50

CUY-14-6.93



CALCULATED RJJ
CHECKED JMS

PROFILE - OLD BROADWAY AVE.
STA. 200+00 TO STA. 205+50

CUY-14-6.93

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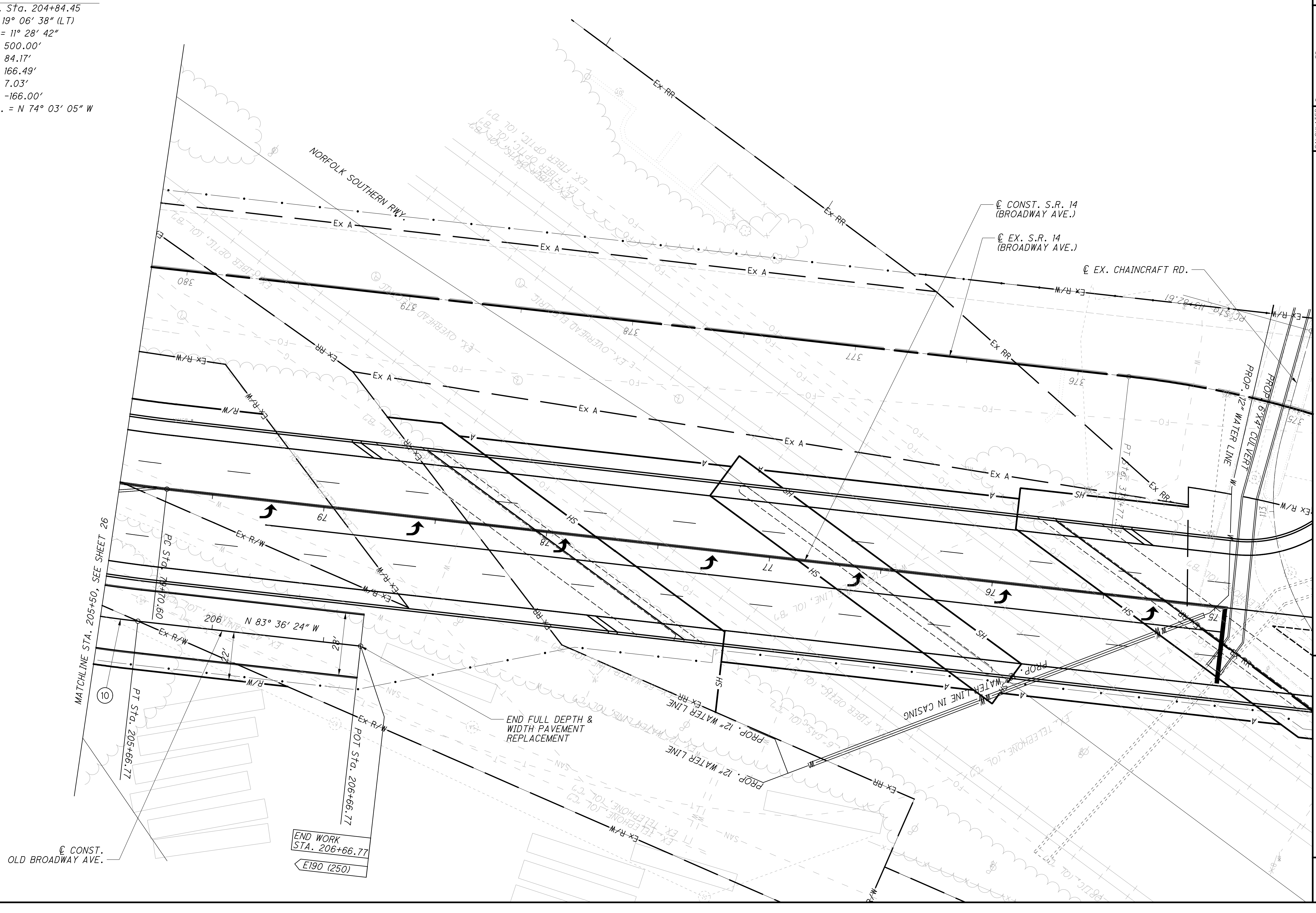
OLD BROADWAY AVE.
⑩ ℄ CONSTR. CURVE DATA
P.I. Sta. 204+84.45
Δ = 19° 06′ 38″ (LT)
Dc = 11° 28′ 42″
R = 500.00′
T = 84.17′
L = 166.49′
E = 7.03′
C = -166.00′
C.B. = N 74° 03′ 05″ W



CALCULATED RJJ
CHECKED JMS

PLAN - OLD BROADWAY AVE.
STA. 205+50 TO STA. 206+66.77

CUY-14-6.93

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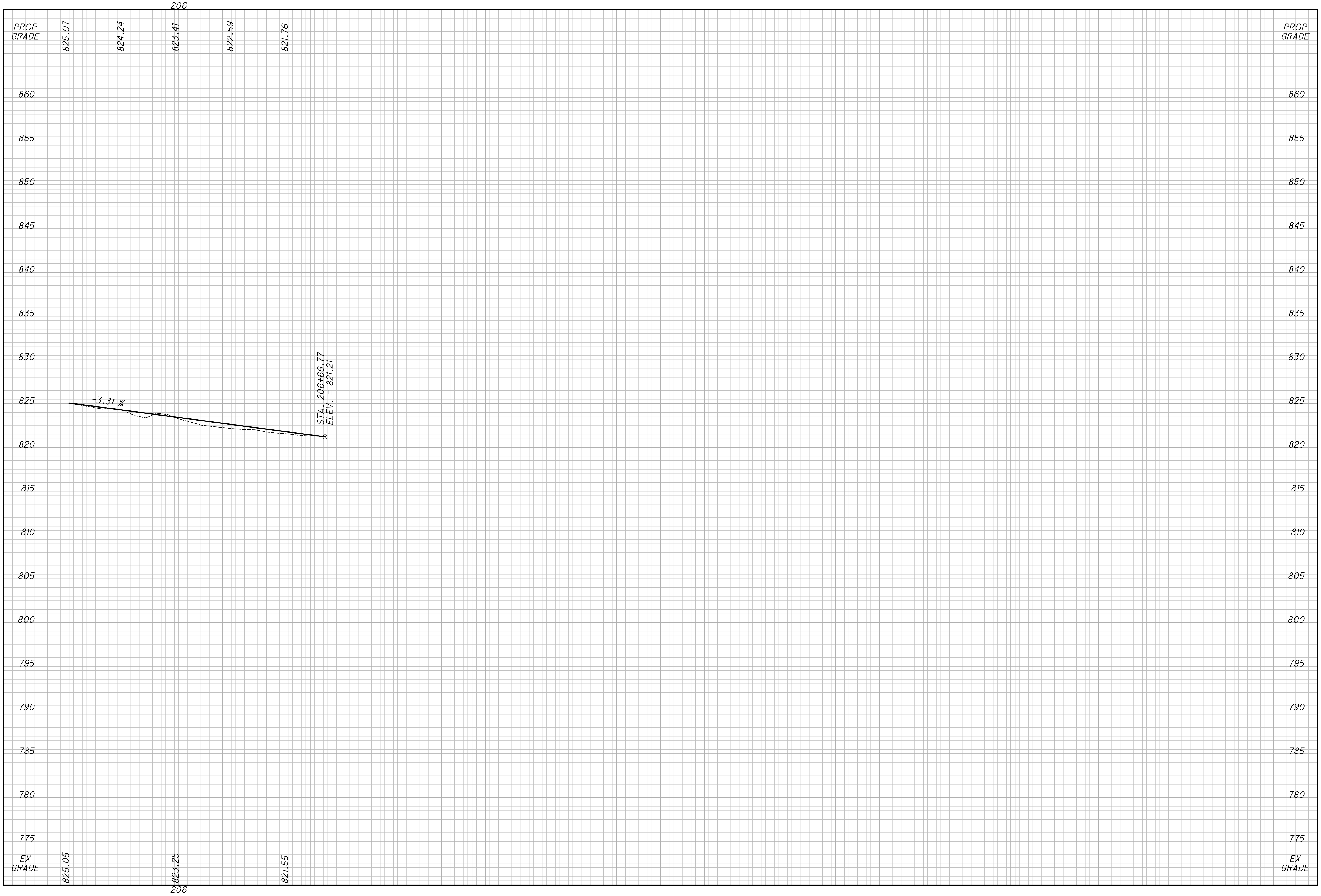


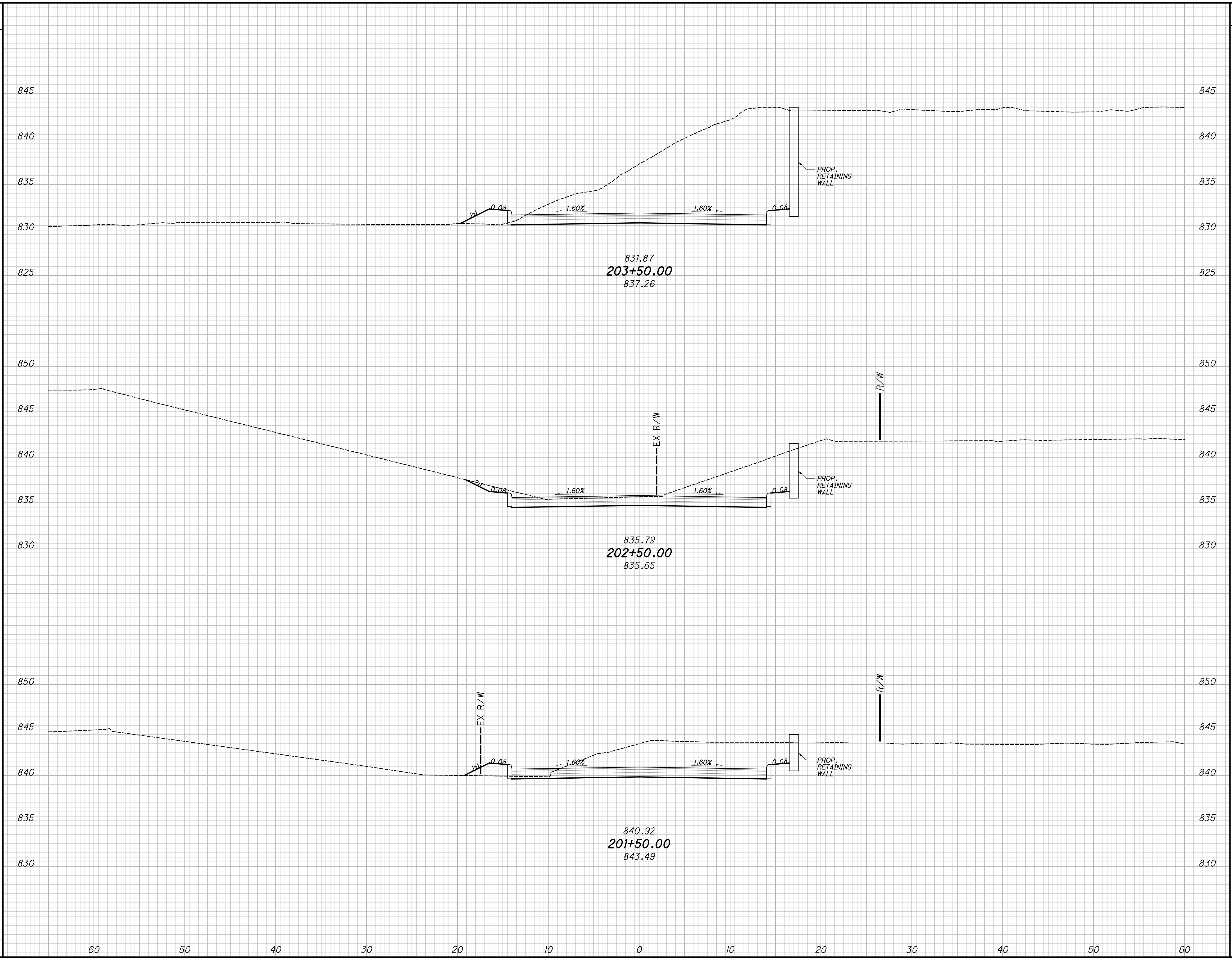
CALCULATED RJJ
CHECKED JMS

PROFILE - OLD BROADWAY AVE.
STA. 205+50 TO STA. 206+66.77

CUY-14-6.93

pw:\\aecom-na-pw.bentley.com:AECOM_DS20_NA_2019\Documents\60581903-CUY-14-6.93\104132_CUY-14-0693\Design\Roadway\Sheets\104132_GF3302.dgn Sheet 6/15/2020 1:26:22 PM todd.roxberry

SEEDING	
END WIDTH	SQ. YDS.



END AREA		VOLUME	
CUT	FILL	CUT	FILL

CALCULATED RJJ

CHECKED JEL

CROSS SECTIONS
OLD BROADWAY AVE.

CUY-14-6.93

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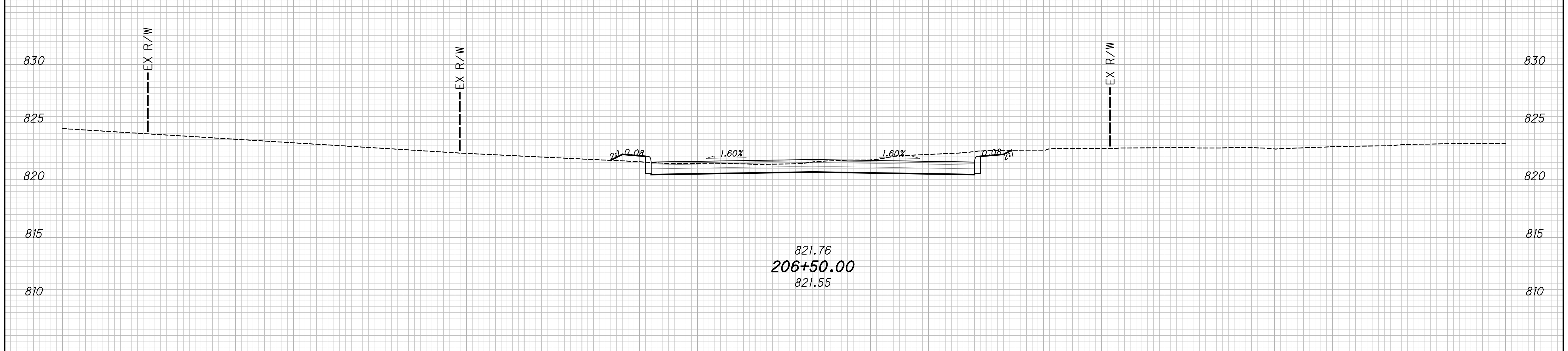
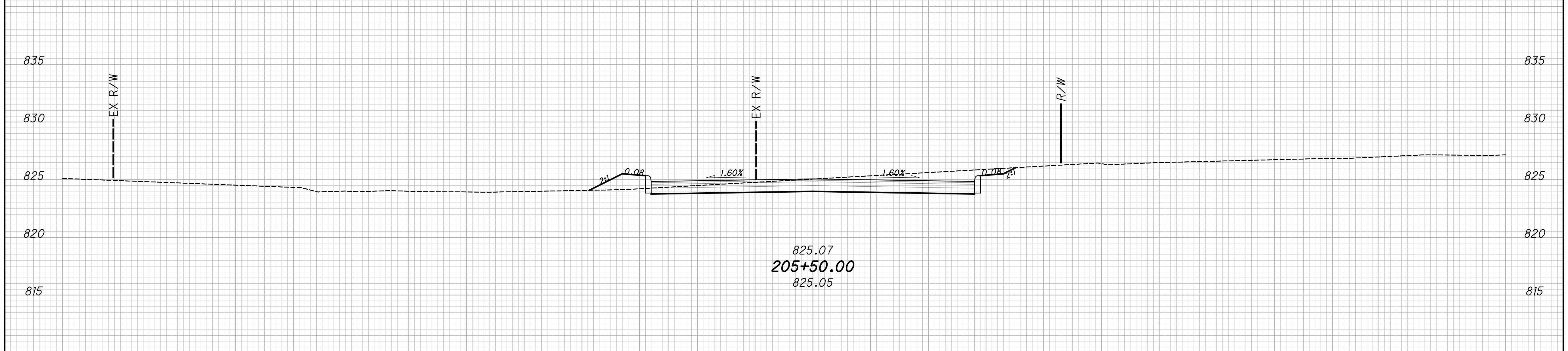
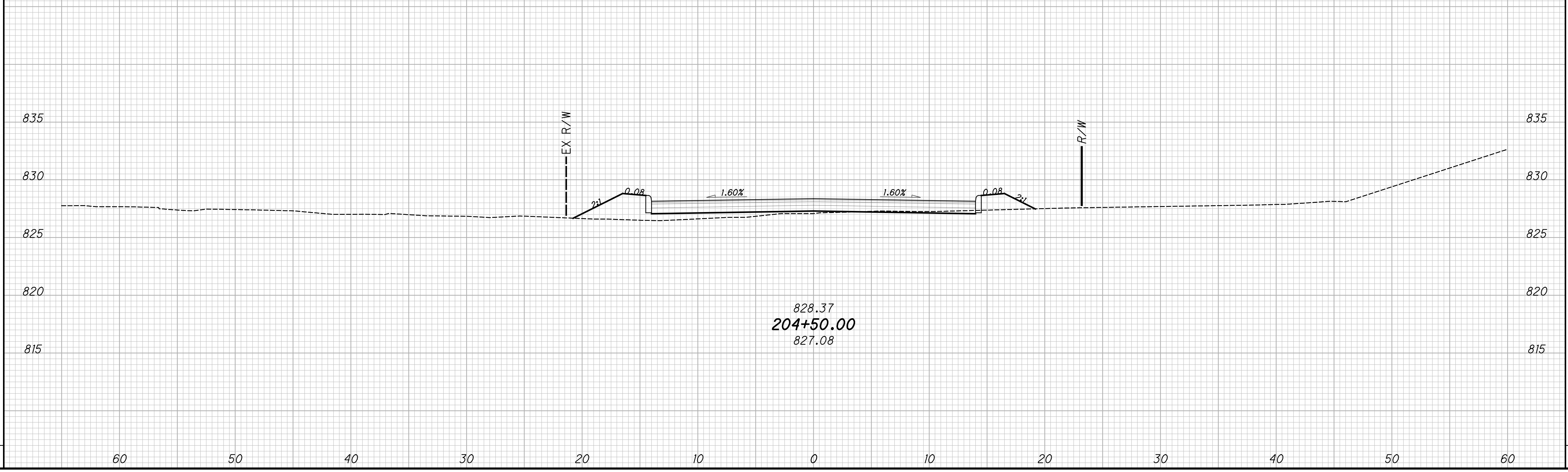
SEEDING		END AREA		VOLUME		CALCULATED	CHECKED
END WIDTH	SQ. YDS.	CUT	FILL	CUT	FILL	RJJ	JEL



821.76
206+50.00
821.55



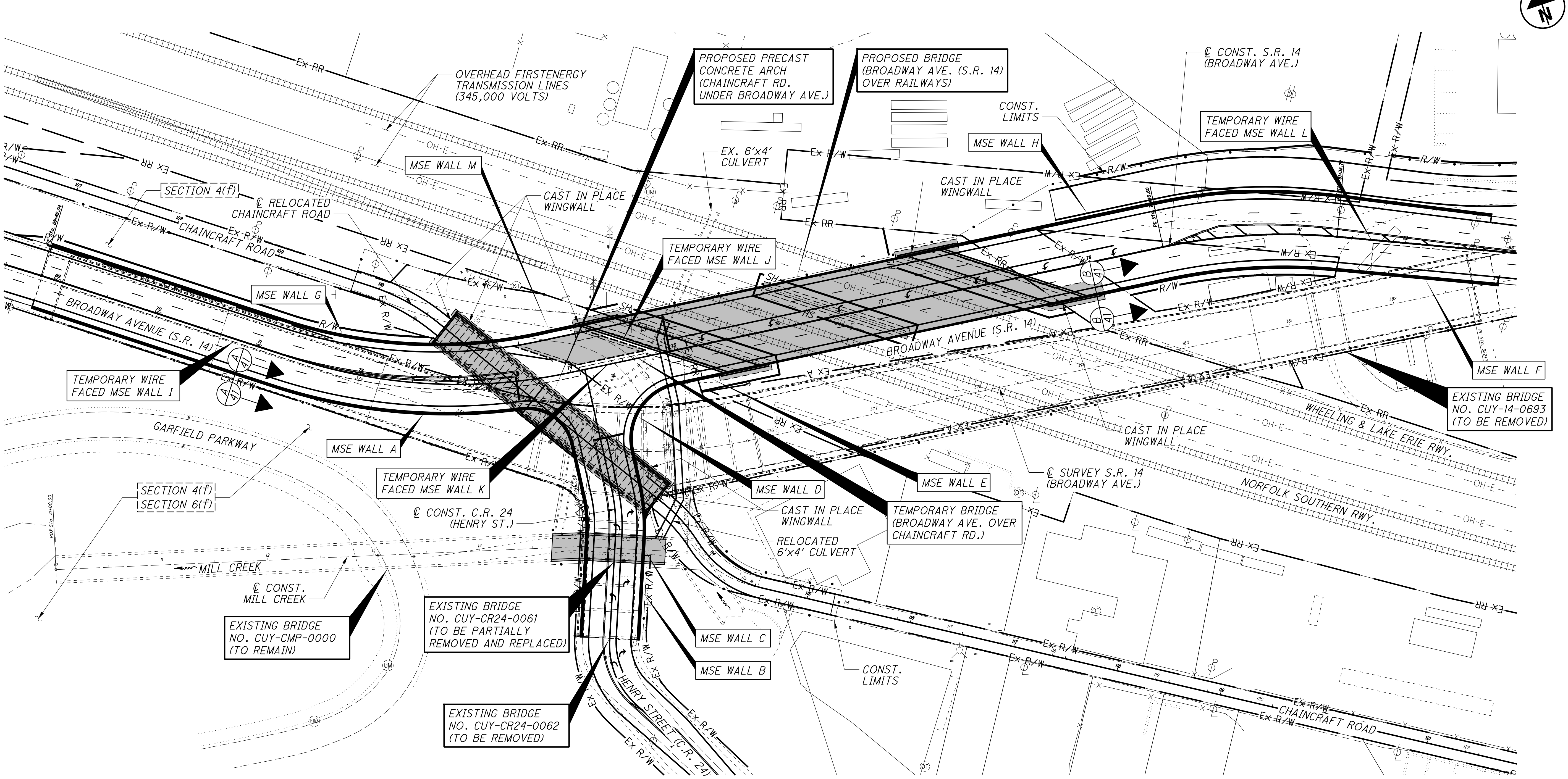
825.07
205+50.00
825.05



828.37
204+50.00
827.08

CROSS SECTIONS
OLD BROADWAY AVE.

CTY-RTE-SECTION



STRUCTURES WORK:

REMOVALS
- 2 BRIDGES
- 1 PARTIAL CULVERT

CONSTRUCTION
- 1 PROPOSED BRIDGE
- 1 PROPOSED PRECAST CONCRETE ARCH
- 1 PARTIAL CULVERT
- 8 PERMANENT MSE WALLS
- 4 TEMPORARY WIRE FACED MSE WALLS
- 1 TEMPORARY BRIDGE

EXISTING STRUCTURE (C.R. 24)

TYPE: CONTINUOUS REINFORCED CONCRETE BEAMS WITH REINFORCED CONCRETE DECK AND SUBSTRUCTURE.
SPANS: 4 SPANS AT 24'-0"±
ROADWAY: 46'-0"± F/F SAFETY CURB (5'± SIDEWALK)
LOADING: HS20-44 AND ALTERNATE MILITARY
SKEW: 0°0'0"
APPROACH SLABS: 20'-0"
ALIGNMENT: TANGENT
CROWN: VARIES
STRUCTURAL FILE NUMBER: 1834282
DATE BUILT: 1929 (1988 MAJOR RECONSTRUCTION)
DISPOSITION: TO BE REMOVED

EXISTING STRUCTURE (S.R. 14)

TYPE: CONTINUOUS REINFORCED CONCRETE BEAMS AND STEEL STRINGERS AND FLOOR BEAMS WITH CONCRETE REINFORCED DECK AND SUBSTRUCTURE.
SPANS: CONCRETE BEAMS - MULTIPLE 24'± WITH 6'± CANTILEVERS. STEEL STRINGERS - ALTERNATE 20'± AND 47'±.
ROADWAY: VARIES (52'± TO 64±) F/F SAFETY CURB (5'± SIDEWALK)
LOADING: H15
SKEW: 0°0'0" (CONCRETE BEAMS) AND 60°0'0" RF (STEEL BEAMS)
APPROACH SLABS: 20'-0"
ALIGNMENT: TANGENT
CROWN: VARIES
STRUCTURAL FILE NUMBER: 1801805
DATE BUILT: 1929 (1988 MAJOR RECONSTRUCTION)
DISPOSITION: TO BE REMOVED

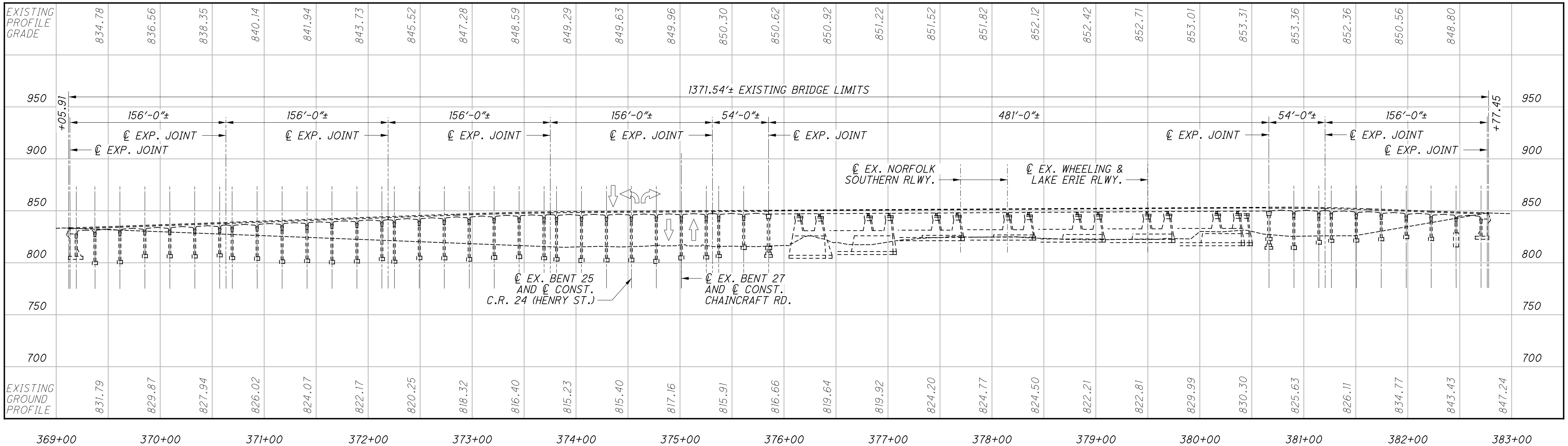
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		1081085/1834282	

ALTERNATIVE 3C - SCHEMATIC PLAN

BRIDGE NO. CUY-14-0693 AND CUY-CR24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132



EXISTING PROFILE GRADE	834.78	836.56	838.35	840.14	841.94	843.73	845.52	847.28	848.59	849.29	849.63	849.96	850.30	850.62	850.92	851.22	851.52	851.82	852.12	852.42	852.71	853.01	853.31	853.36	852.36	850.56	848.80	
EXISTING GROUND PROFILE	831.79	829.87	827.94	826.02	824.07	822.17	820.25	818.32	816.40	815.23	815.40	817.16	815.91	816.66	819.64	819.92	824.20	824.77	824.50	822.21	822.81	829.99	830.30	825.63	826.11	834.77	843.43	847.24

EXISTING PROFILE ALONG ℄ SURVEY S.R. 14 (BROADWAY AVE.)

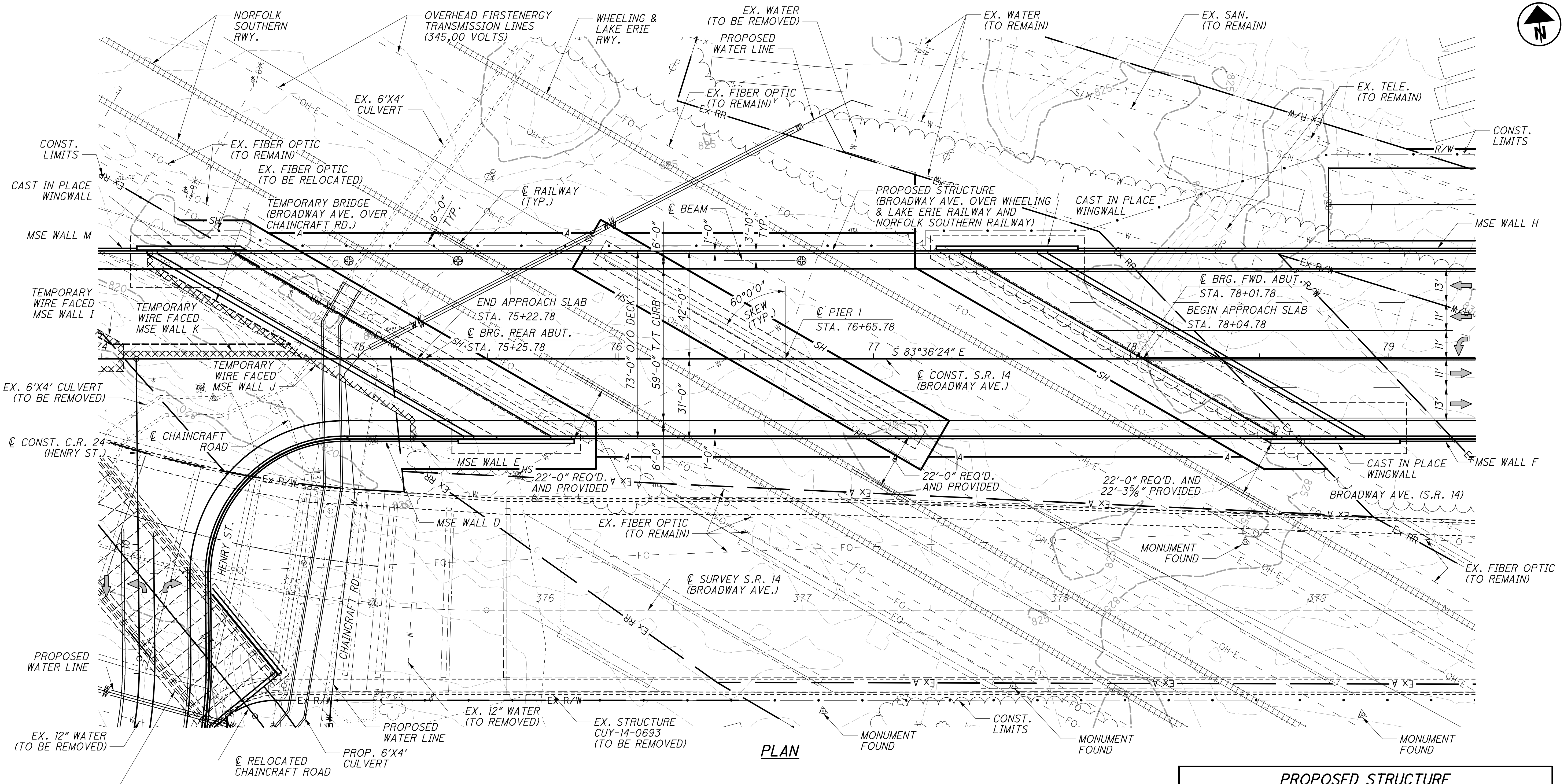
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED CMA	DRAWN CMA	REVIEWED ZRD	DATE 6/20
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER 1081085	

EXISTING PROFILE - BROADWAY AVENUE

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



PLAN

NOTES

- FOR PROFILE, SEE SHEET 4/32.
- FOR EXISTING STRUCTURE BOXES, SEE SHEET 1/32.
- EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.

DESIGN TRAFFIC:

2026 ADT = 18,500	2026 ADTT = 1,295
2046 ADT = 19,000	2046 ADTT = 1,330

DIRECTIONAL DISTRIBUTION = 0.51

NORFOLK SOUTHERN RAILWAY TRAFFIC IS 60 TRAINS PER DAY.
WHEELING & LAKE ERIE RAILWAY TRAFFIC IS 2 TRAINS PER DAY.

FOUNDATION DATA:

PROPOSED ABUTMENT AND PIER PILES SHALL BE 14" C.I.P. FRICTION PIPE PILES WITH AN ESTIMATED LENGTH OF 25 FEET.

LEGEND

⊕ - POINT OF MINIMUM VERTICAL CLEARANCE

PROPOSED STRUCTURE

TYPE: 2 SPAN CONTINUOUS WEATHERING STEEL PLATE GIRDERS W/ COMPOSITE REINFORCED CONCRETE DECK ON WALL TYPE SEMI-INTEGRAL ABUTMENTS AND WALL TYPE PIERS ON CAST-IN-PLACE FRICTION PIPE PILES.

SPANS: 140'-0", 136'-0" (C/C BEARINGS)

ROADWAY: 59'-0" (T/T CURB) WITH 6'-0" SIDEWALK EACH SIDE

DECK AREA: 20,586 SF

LOADING: HL-93 W/ FUTURE WEARING SURFACE (FWS) 60 PSF

SKEW: 60°0'0" RIGHT FORWARD

APPROACH SLABS: 30'-0" LONG, 17" THICK (AS-1-15),
INSTALLATION TYPE C (AS-2-15)

ALIGNMENT: TANGENT

CROWN: 0.02 FT/FT

WEARING SURFACE: 1" MONOLITHIC CONCRETE

COORDINATES: LATITUDE N 41°25'52.62"
LONGITUDE W 81°36'01.00"

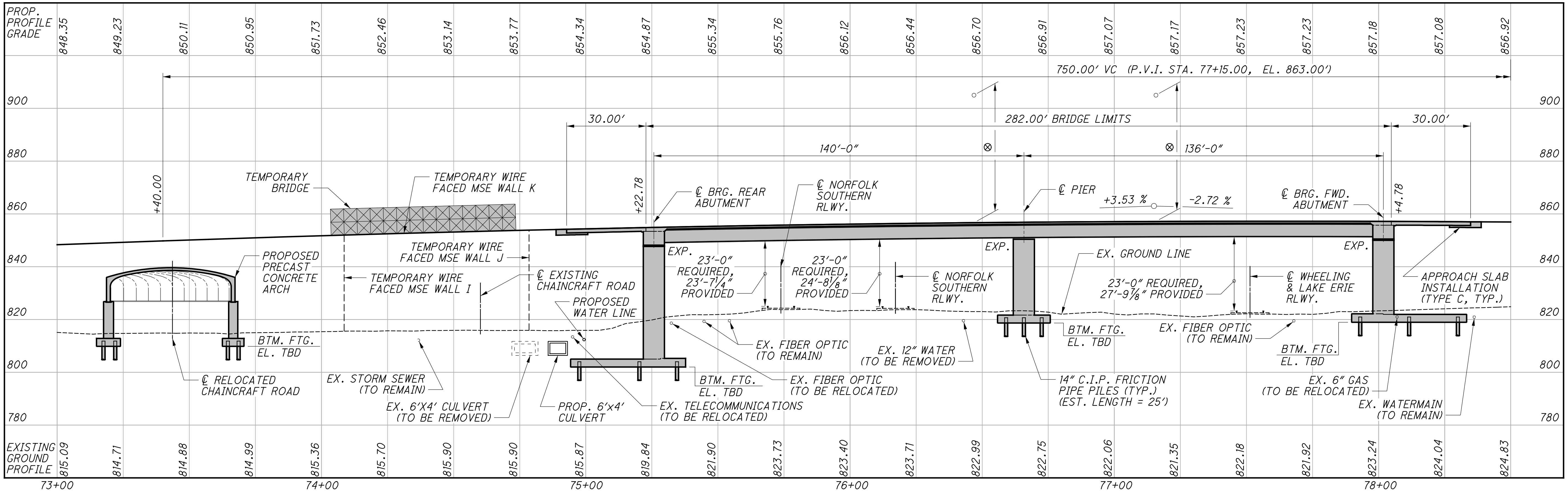
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

ALTERNATIVE 3C - BROADWAY SITE PLAN

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



PROFILE ALONG ℄ CONST. S.R. 14 (BROADWAY AVE.)

LEGEND

⊗ - OVERHEAD FIRSTENERGY TRANSMISSION LINES (345,000 VOLTS)
EX. VERTICAL CLR. = TBD
PROP. VERTICAL CLR. = TBD

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

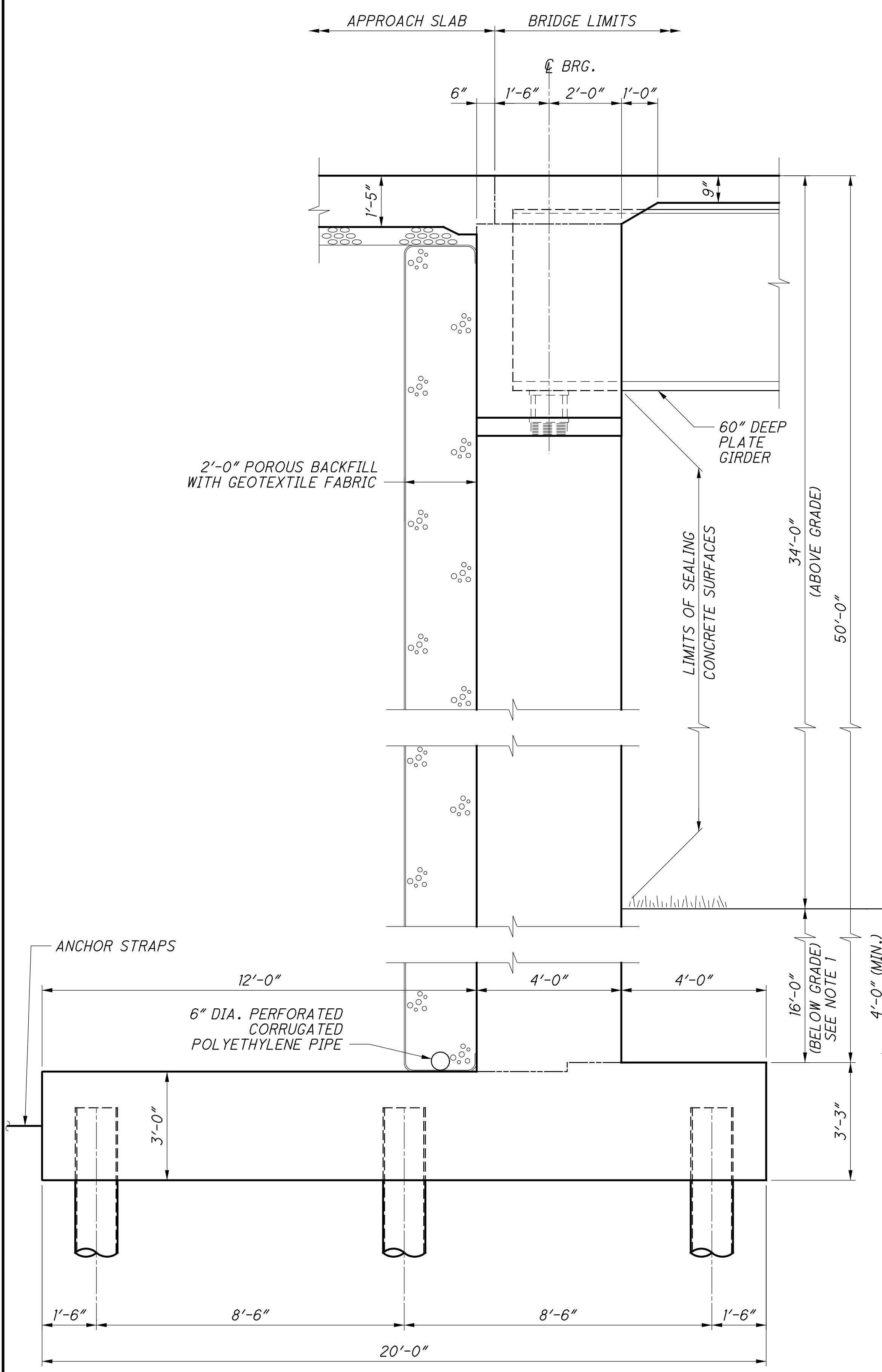
REVIEWED	DATE
ZRD	6/20

STRUCTURE FILE NUMBER
TBD

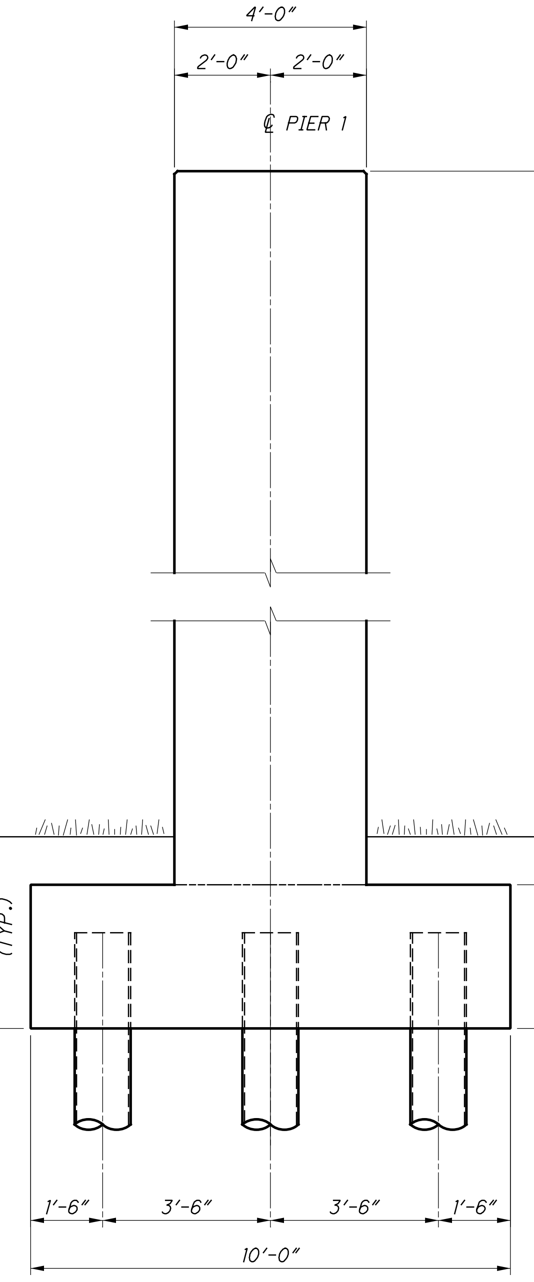
DESIGNED	DRAWN	REVISED
TMR	TMR	
CHECKED		
MRW		

ALTERNATIVE 3C - PROFILE
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

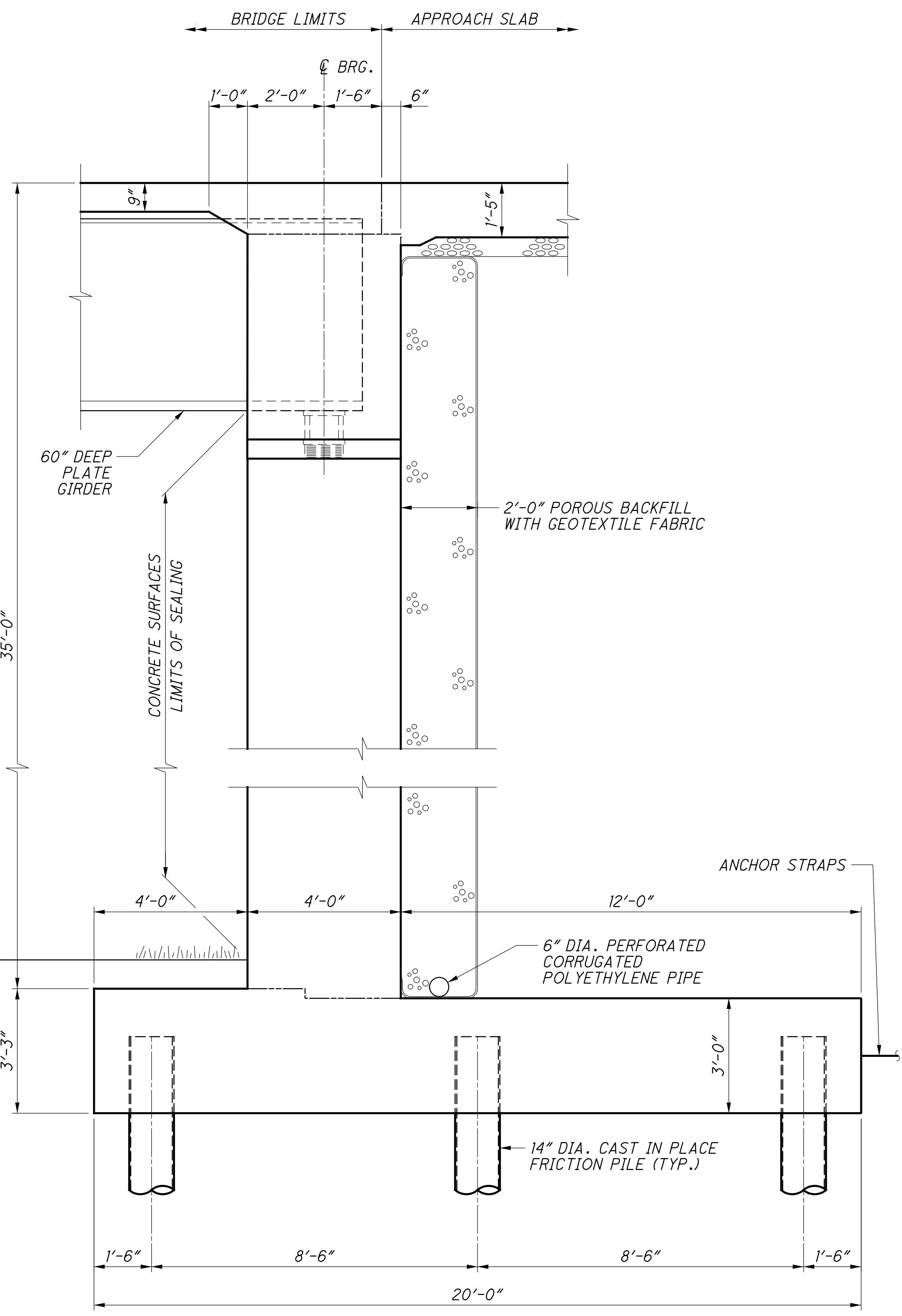
CUY-14-6.93
PID No. 104132



TYPICAL REAR ABUTMENT SECTION



TYPICAL PIER SECTION



TYPICAL FORWARD ABUTMENT SECTION

NOTE:

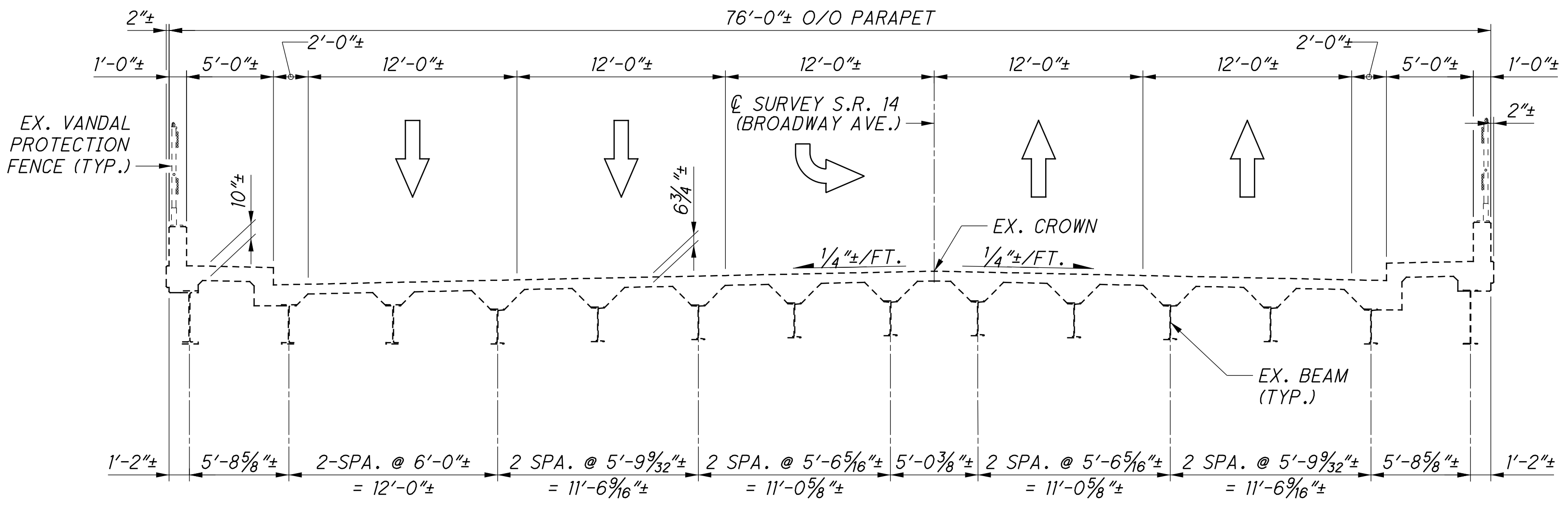
1. A DEEP FOOTING IS REQUIRED TO ELIVIATE THE CONFLICT WITH THE 6′x4′ CULVERT.

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

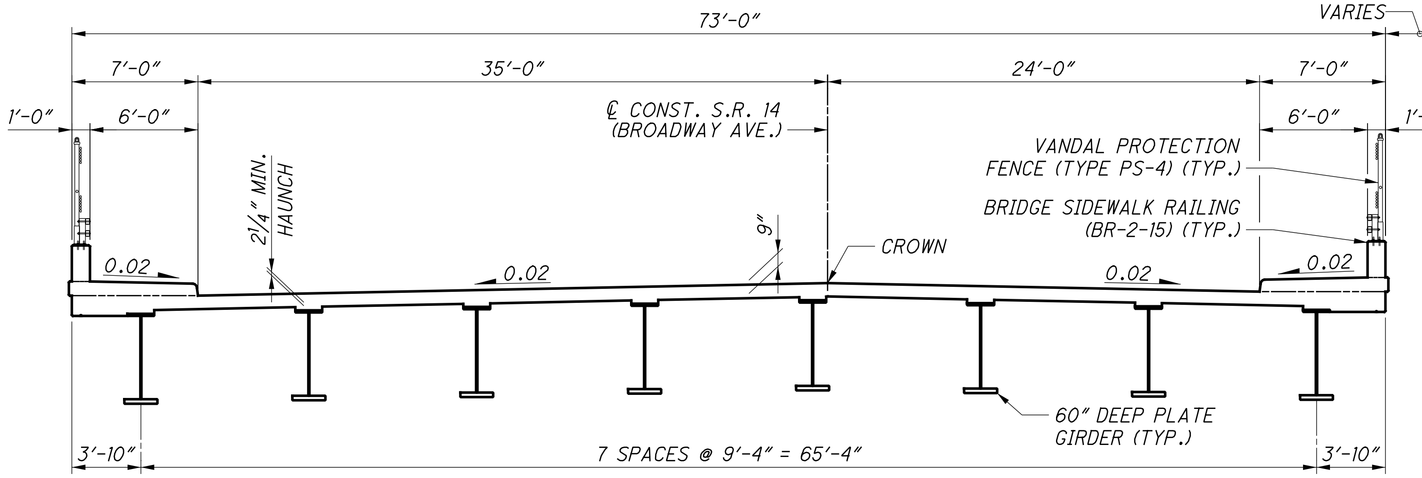
DESIGNED	DRAWN	REVIEWED	DATE
JDM	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

ALTERNATIVE 3C - SUBSTRUCTURE DETAILS
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

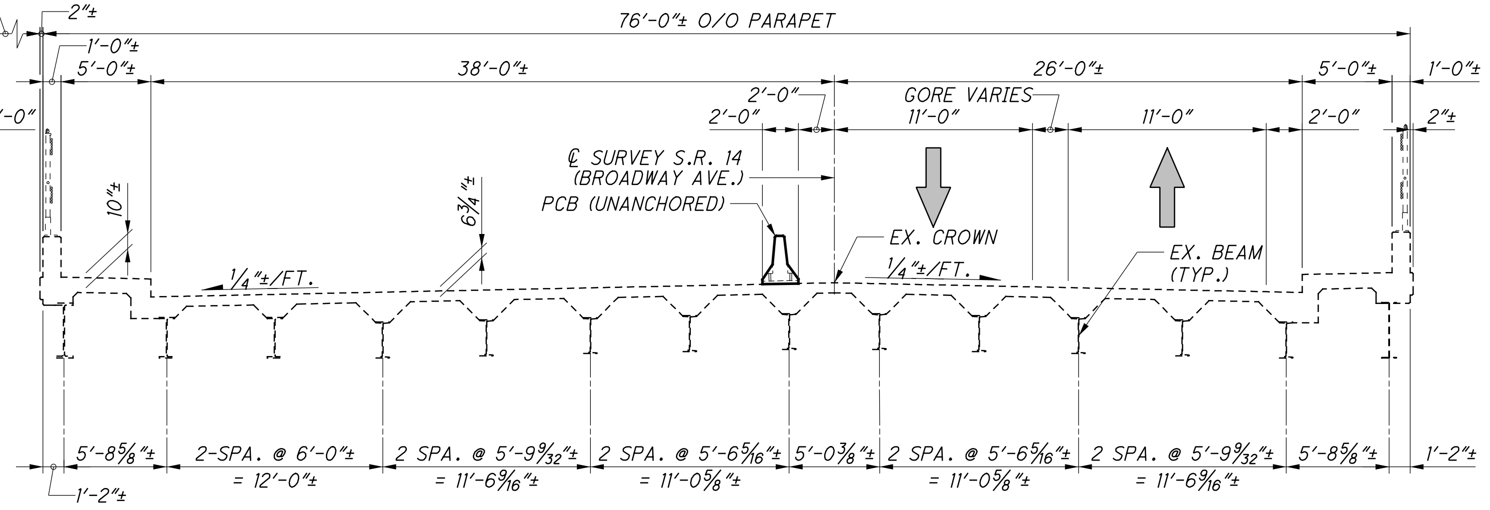
CUY-14-6.93
PID No. 104132



EXISTING CONDITION

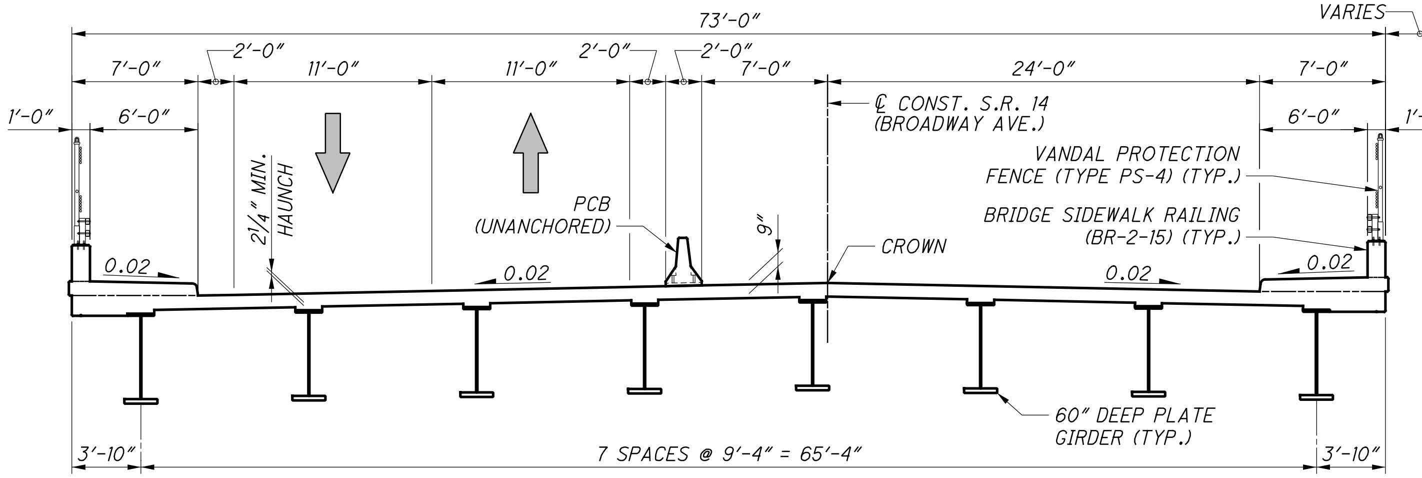


CONSTRUCTION

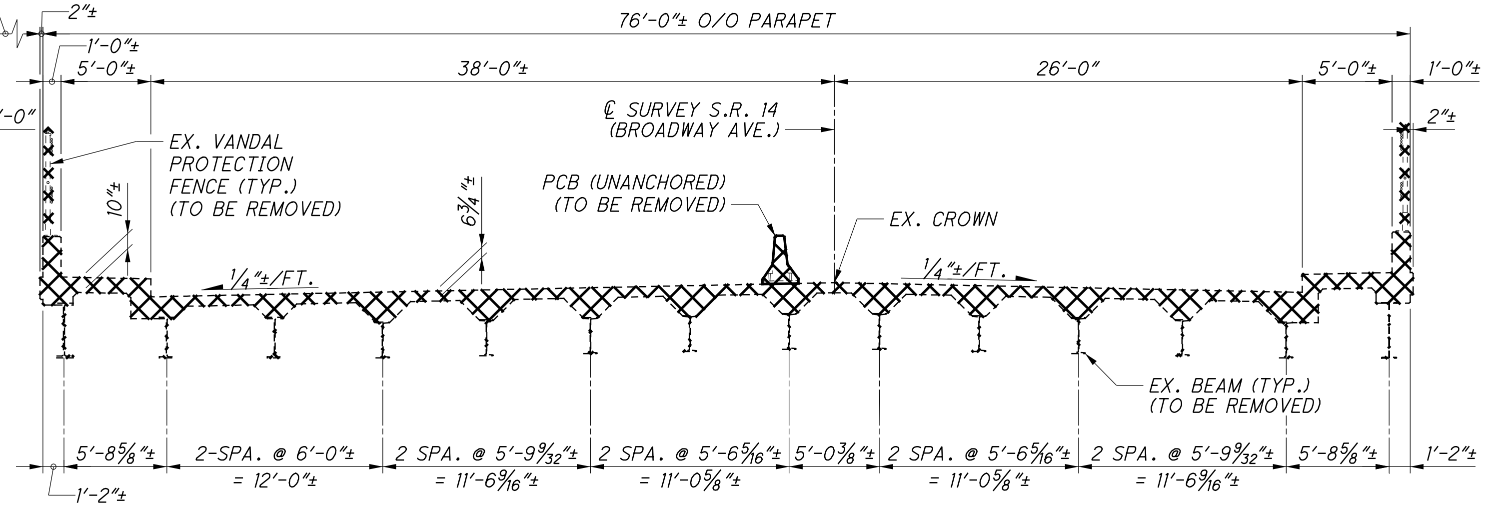


M.O.T.

PHASE 1



M.O.T.



REMOVAL

PHASE 2

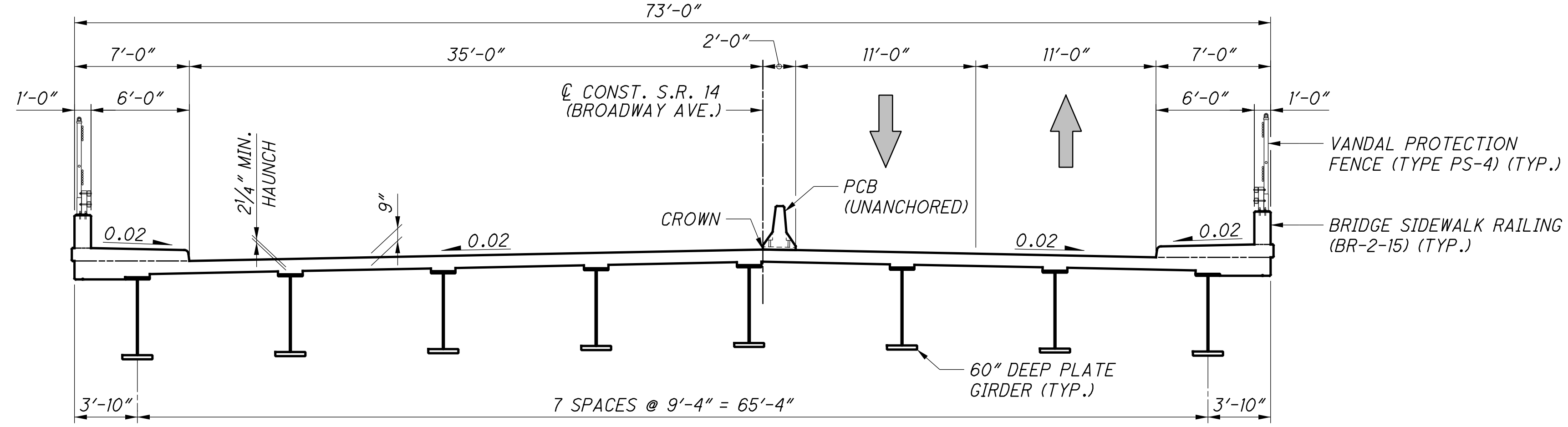
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	DRAWN TMR	REVIEWED ZRD	DATE 6/20
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

ALTERNATIVE 3C - PHASE CONSTRUCTION DETAILS OVER RAILWAYS

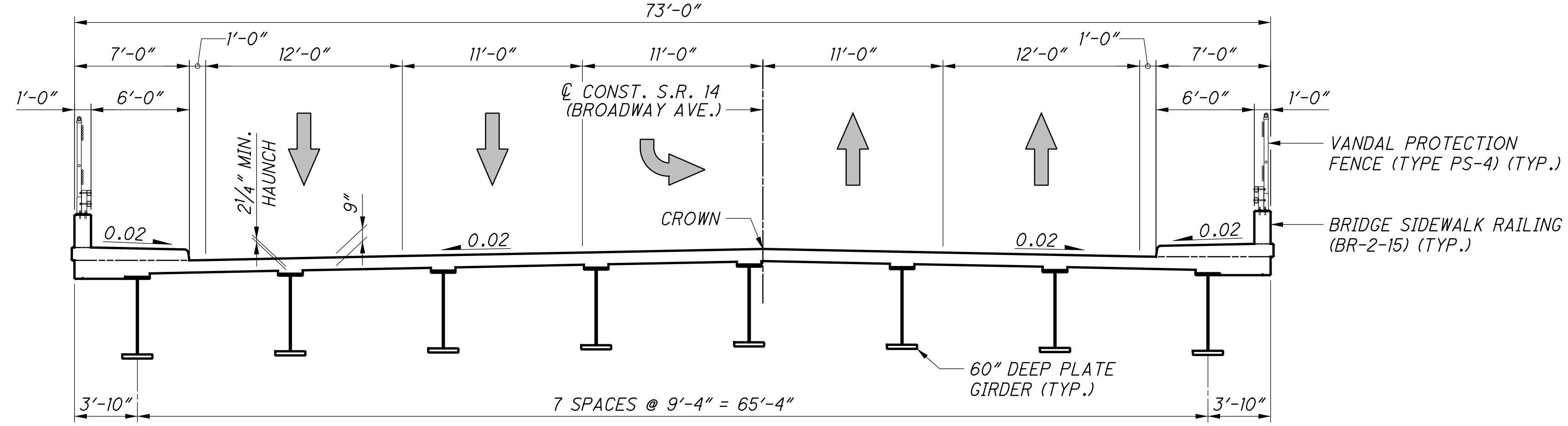
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



PHASE 3

M.O.T.



FINAL CONDITION

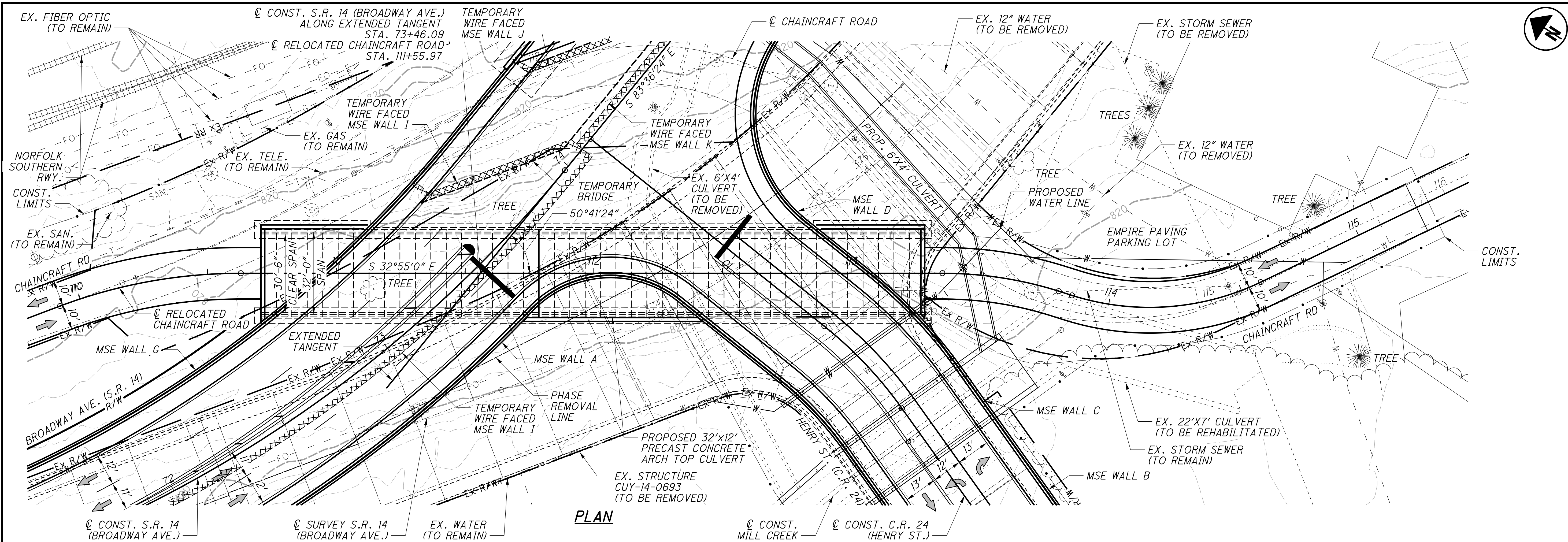
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

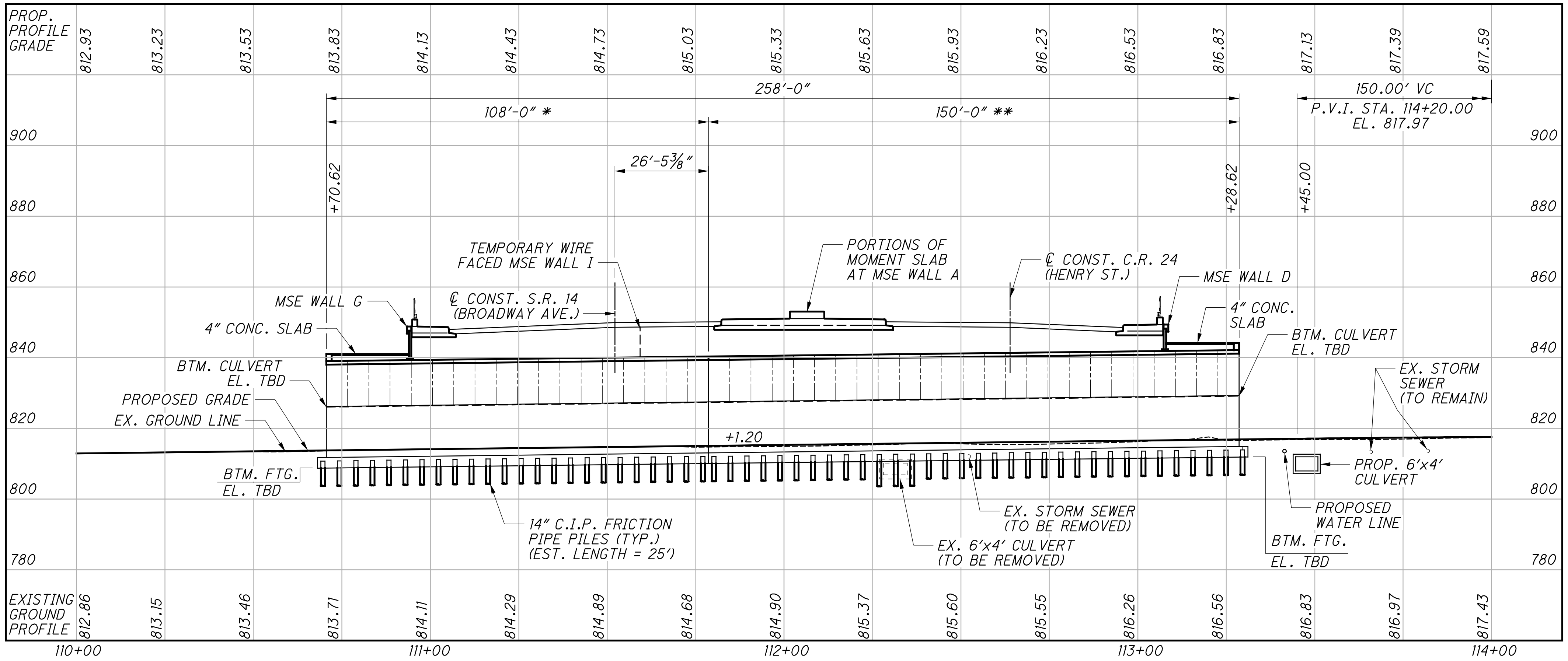
ALTERNATIVE 3C - PHASE CONSTRUCTION DETAILS OVER RAILWAYS

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



PLAN



PROFILE ALONG ℄ RELOCATED CHAINCRAFT ROAD

NOTES

- FOR EXISTING STRUCTURE BOXES, SEE SHEET 1/32.
- EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.

DESIGN TRAFFIC:

BROADWAY AVE. (S.R. 14)

2026 ADT = 18,500	2026 ADTT = 1,295
2046 ADT = 19,000	2046 ADTT = 1,330

DIRECTIONAL DISTRIBUTION = 0.51

HENRY ST. (C.R. 24)

2026 ADT = 7,000	2026 ADTT = 630
2046 ADT = 7,500	2046 ADTT = 675

DIRECTIONAL DISTRIBUTION = 0.54

LEGEND

* - PHASE 1 CONSTRUCTION
** - PHASE 2A CONSTRUCTION

PROPOSED STRUCTURE

TYPE: 32'x12' PRECAST CONCRETE 3 SIDED ARCH TOP CULVERT WITH CAST-IN-PLACE PEDESTAL WALL ON 14" CAST-IN-PLACE FRICTION PIPE PILES.

SPAN: 32'-0" F/F CULVERT

ROADWAY: 30'-6" F/F PEDESTAL WALL

LOADING: HL-93 W/ FUTURE WEARING SURFACE (FWS) 60 PSF

SKEW: NONE

APPROACH SLABS: NONE

ALIGNMENT: TANGENT

CROWN: 0.02 FT/FT

WEARING SURFACE: 1" MONOLITHIC CONCRETE

COORDINATES: LATITUDE N 41°25'52.60"
LONGITUDE W 81°36'03.50"

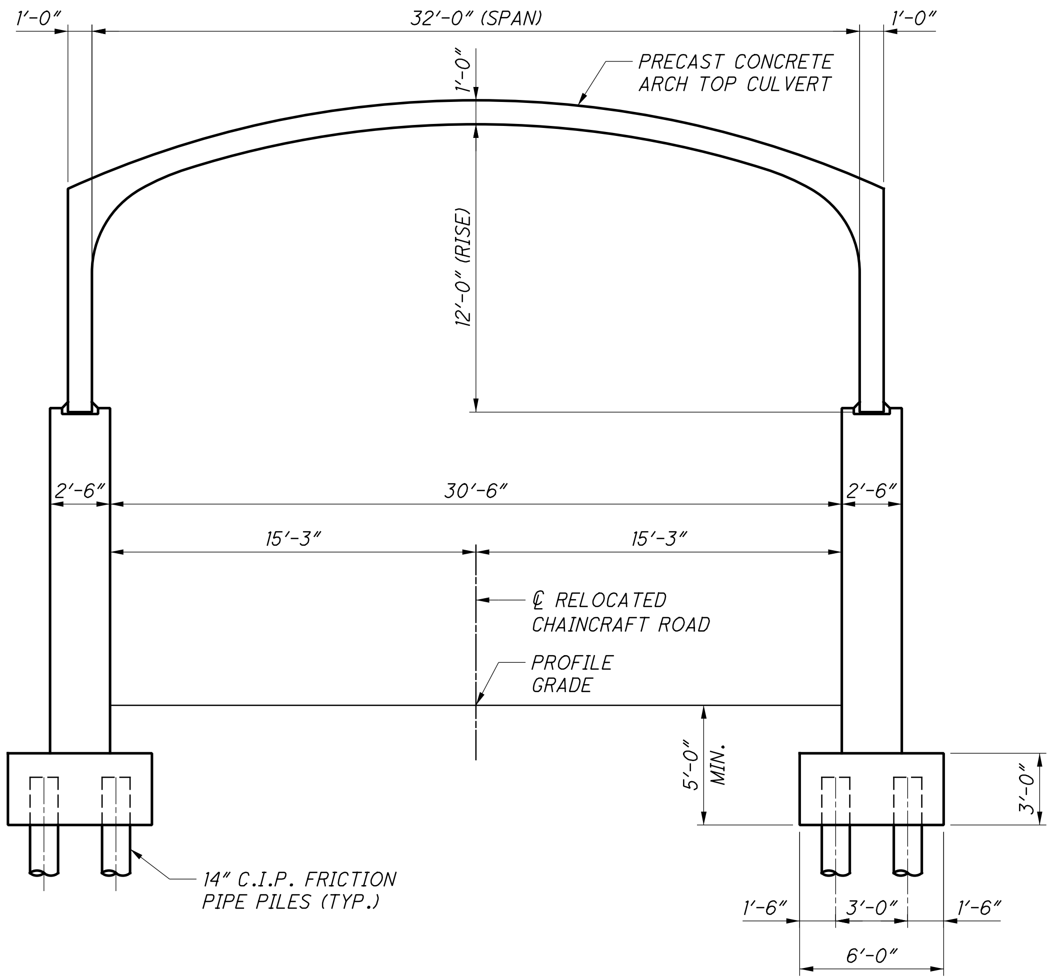
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

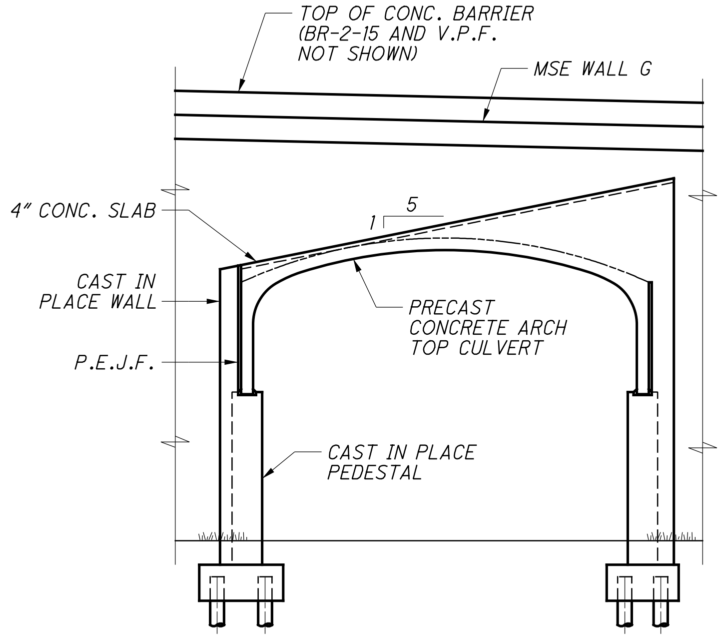
ALTERNATIVE 3C - CHAINCRAFT SITE PLAN

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

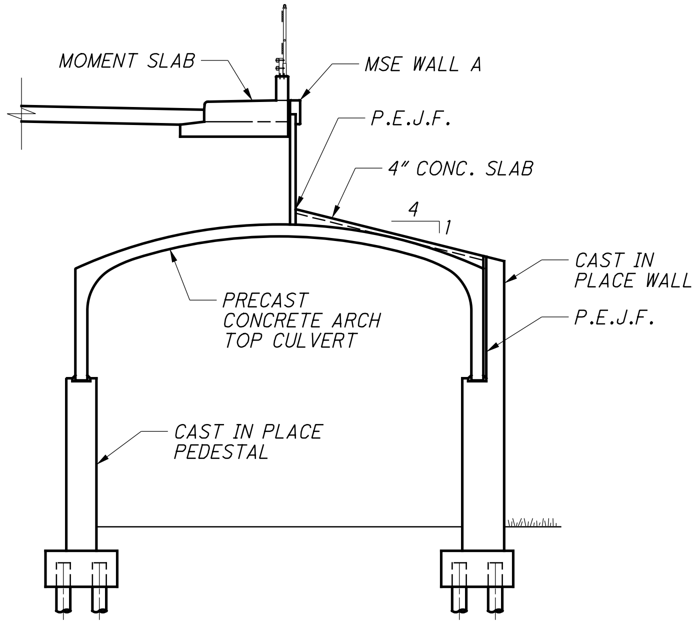


TYPICAL SECTION



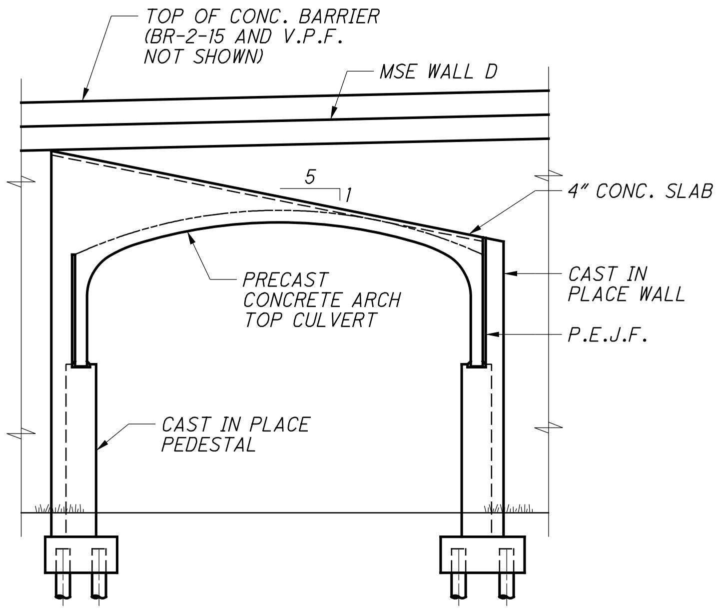
CULVERT SECTION - STA. 110+65

UPSTATION



CULVERT SECTION - STA. 112+06

UPSTATION



CULVERT SECTION - STA. 113+30

BACKSTATION

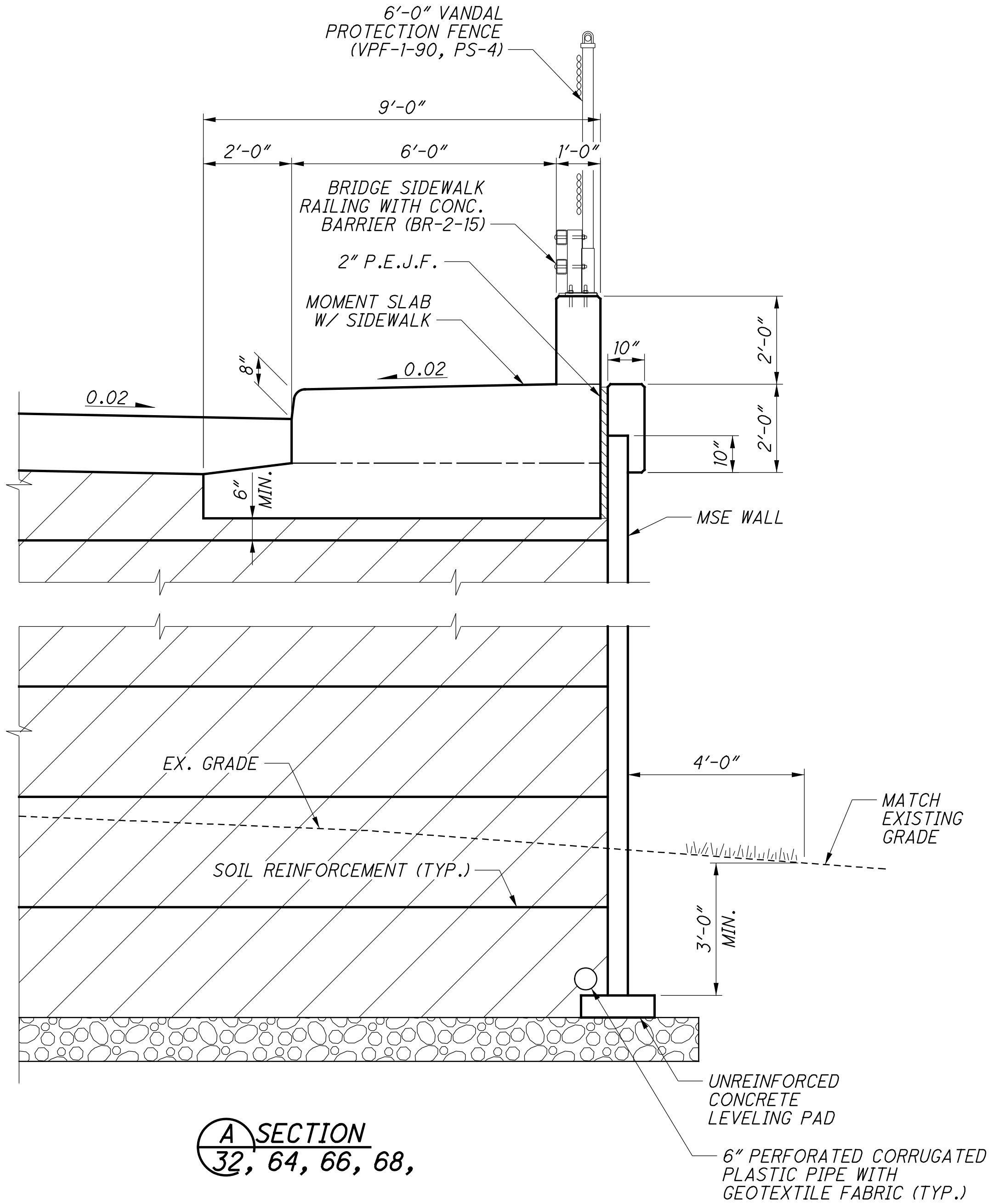
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

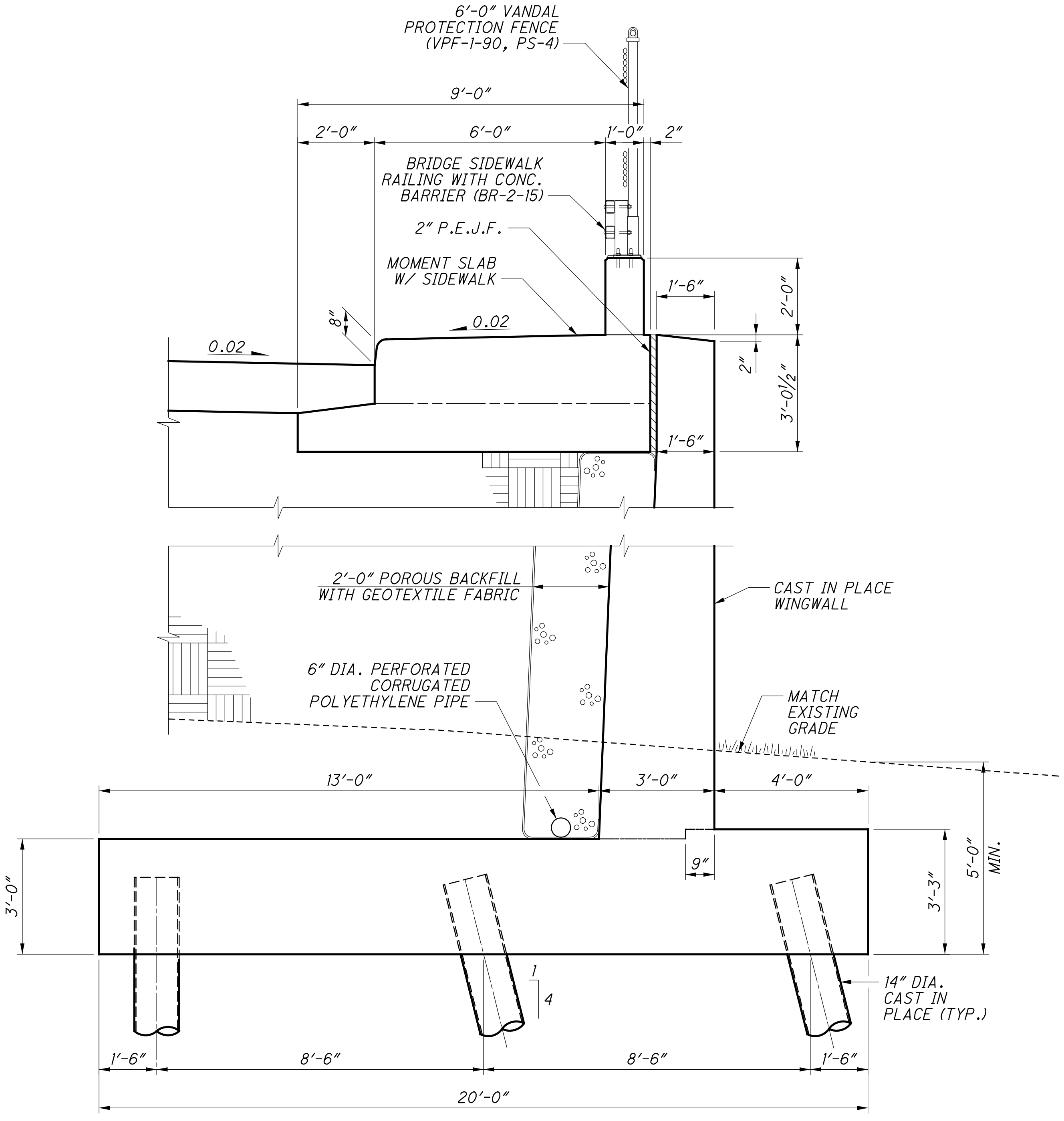
ALTERNATIVE 3C - CULVERT DETAILS

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



A SECTION
32, 64, 66, 68,



B SECTION
32, 64, 66, 68,

LEGEND:

▥ ITEM 203 - EMBANKMENT

▨ SELECT GRANULAR BACKFILL PER SUPPLEMENTAL SPECIFICATION 840

░ ITEM 203 - GRANULAR MATERIAL, TYPE C (1'-0" MIN.)

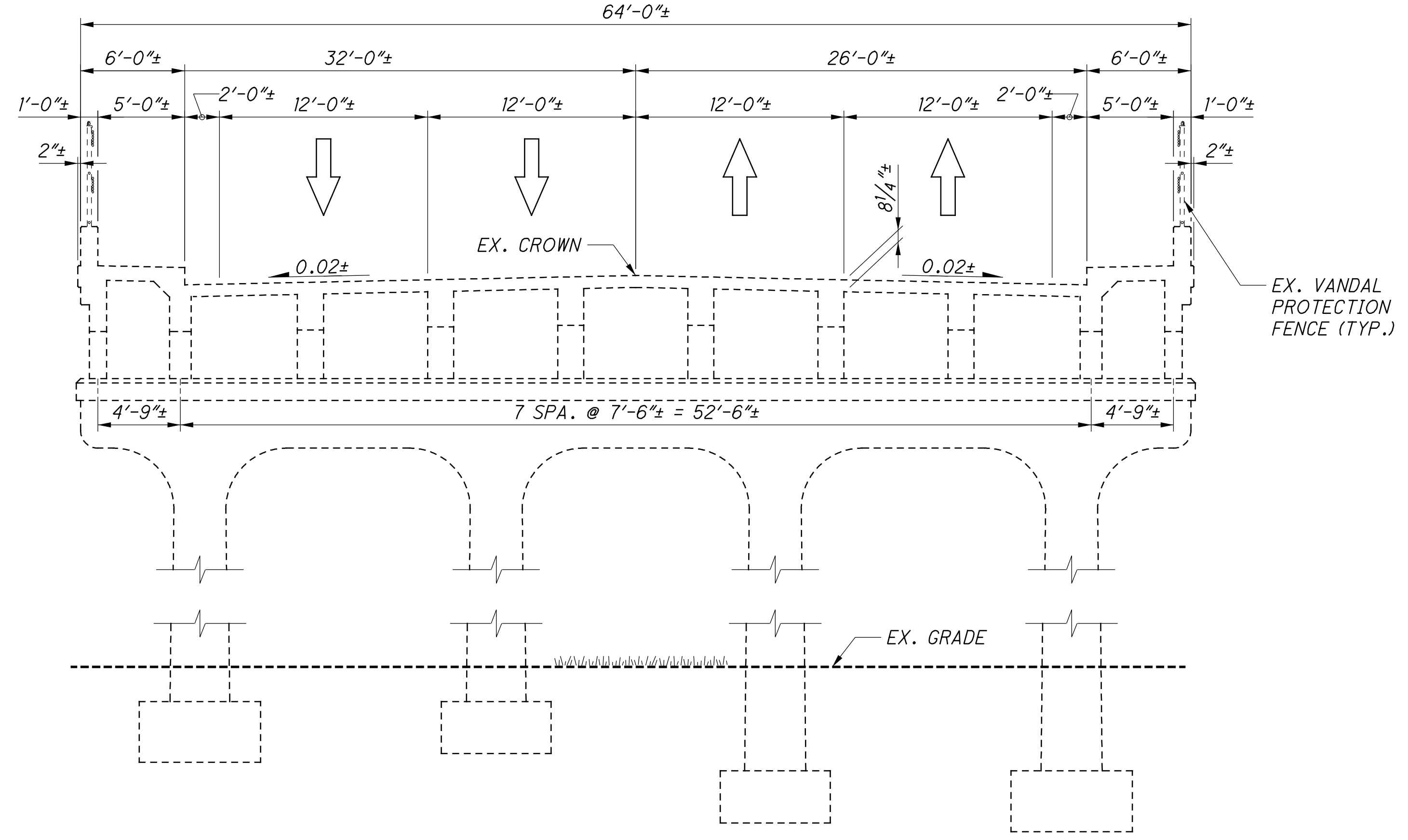
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

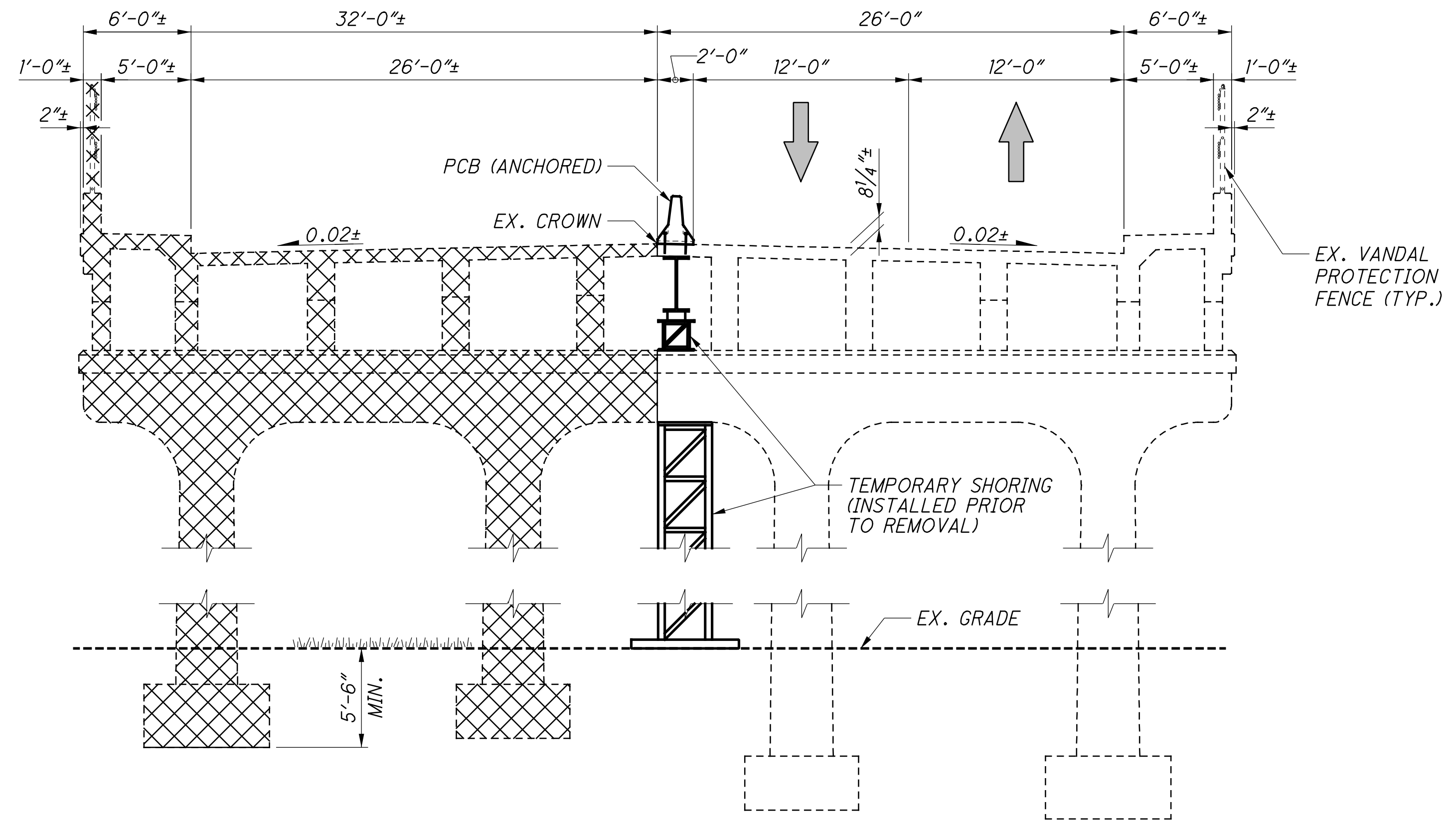
MOMENT SLAB AND WALL DETAILS

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



EXISTING CONDITION



REMOVAL

M.O.T.

PHASE 1

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

DESIGN AGENCY

AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	DRAWN TMR	REVIEWED ZRD	DATE 6/20
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

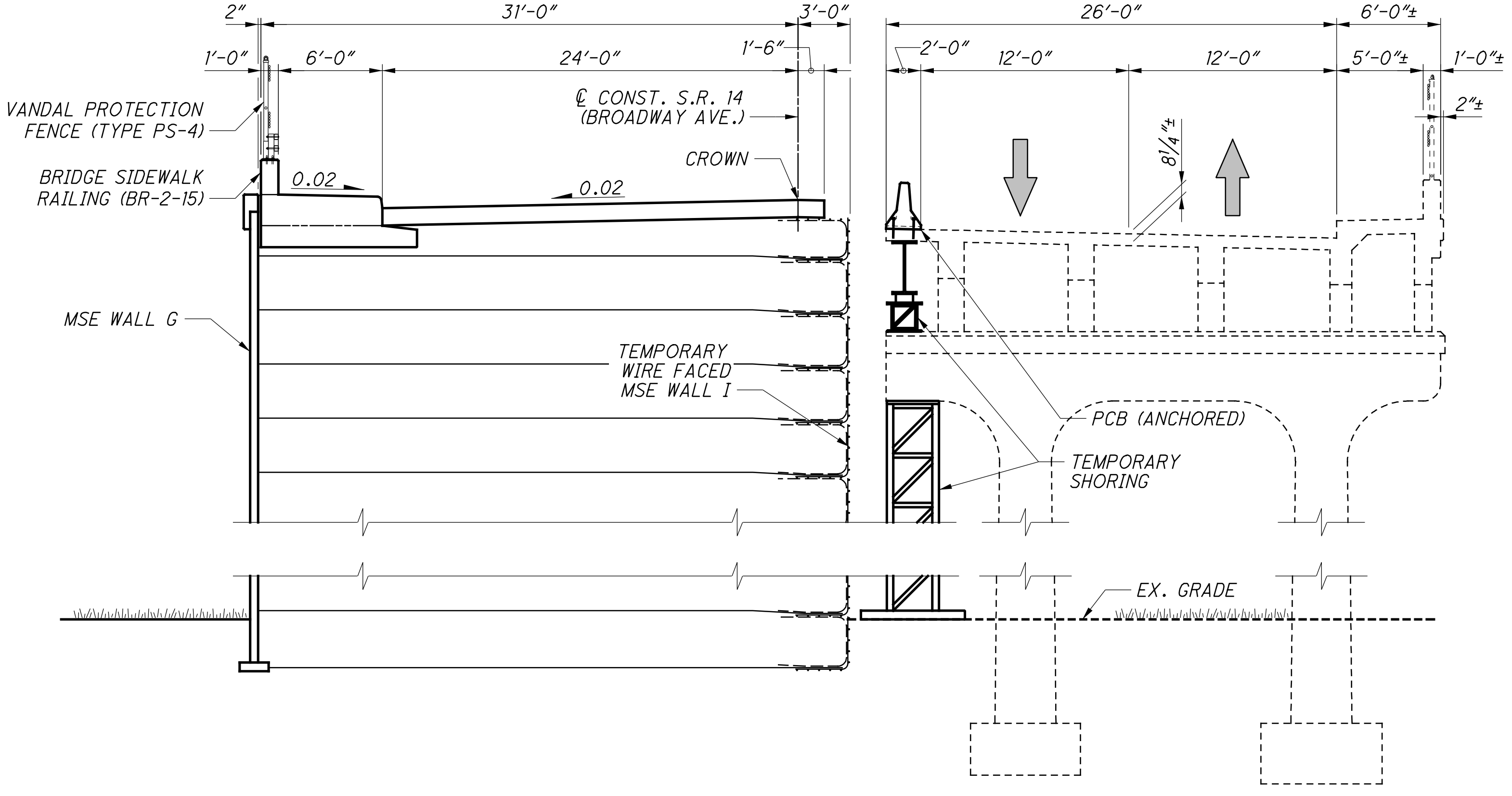
PHASE CONSTRUCTION DETAILS - WEST APPROACH

BRIDGE NO. CUY-14-0693

BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93

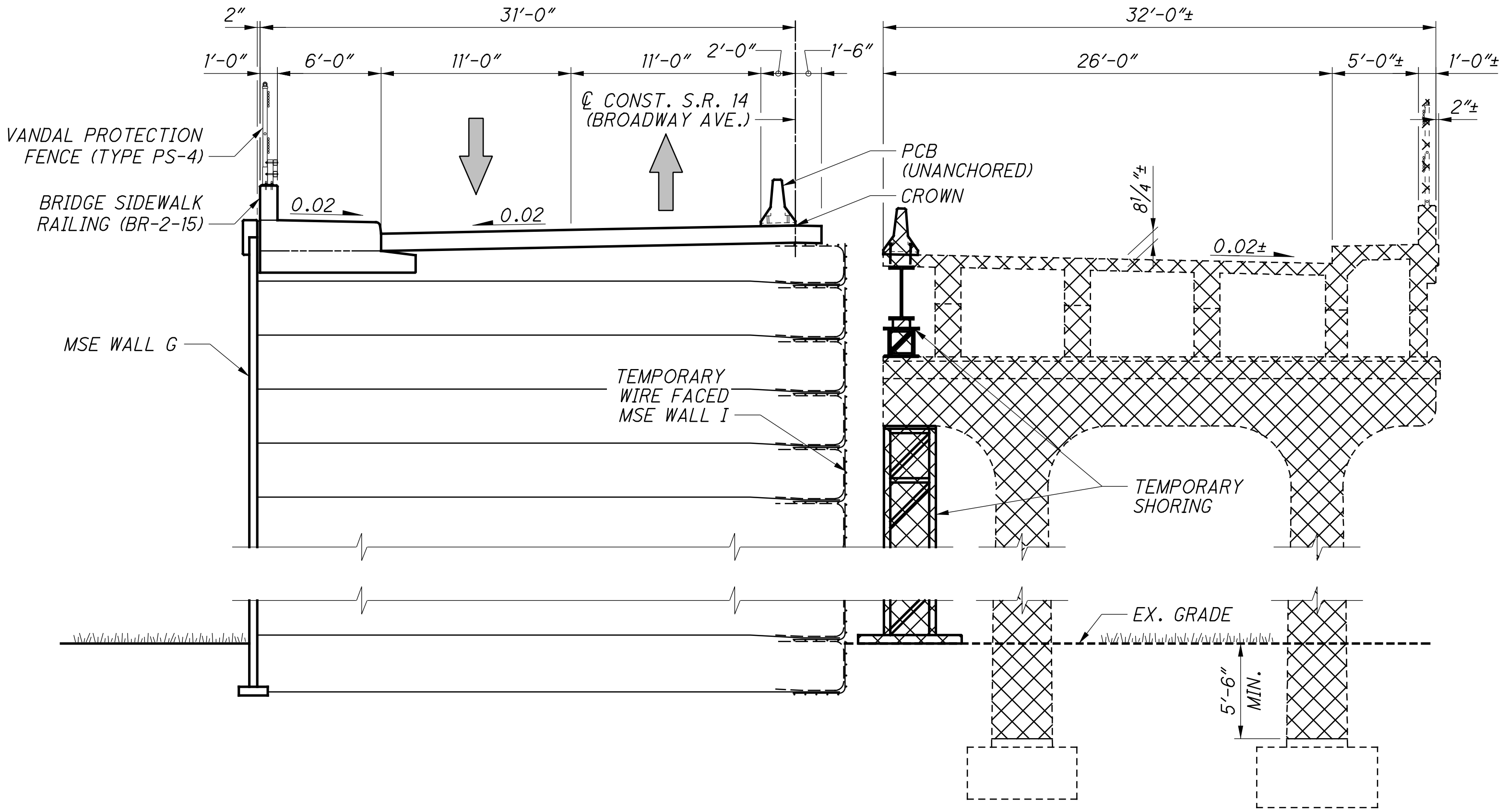
PID No. 104132



CONSTRUCTION

M.O.T.

PHASE 1



M.O.T.

REMOVAL

PHASE 2

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

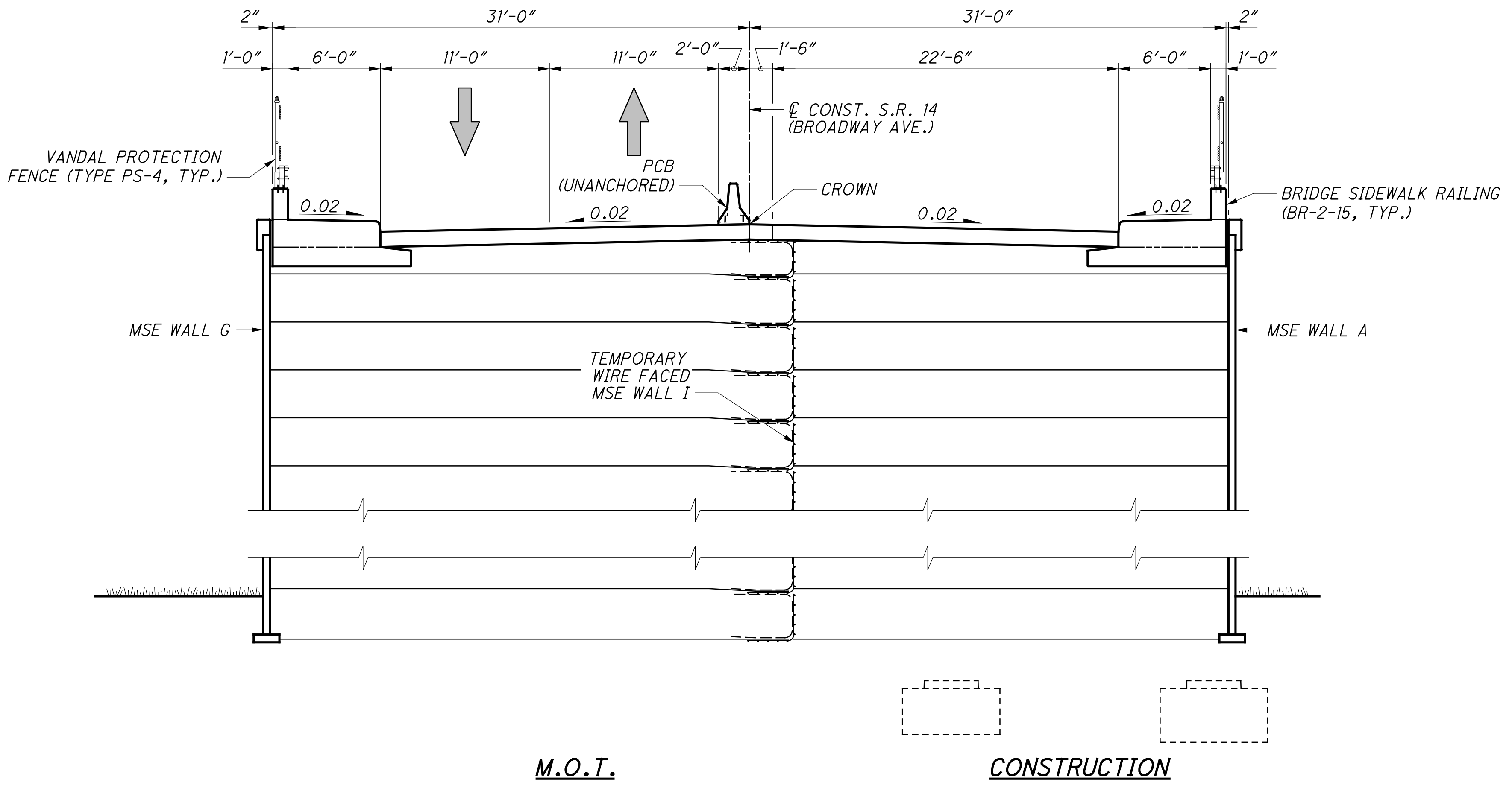
PHASE CONSTRUCTION DETAILS - WEST APPROACH

BRIDGE NO. CUY-14-0693

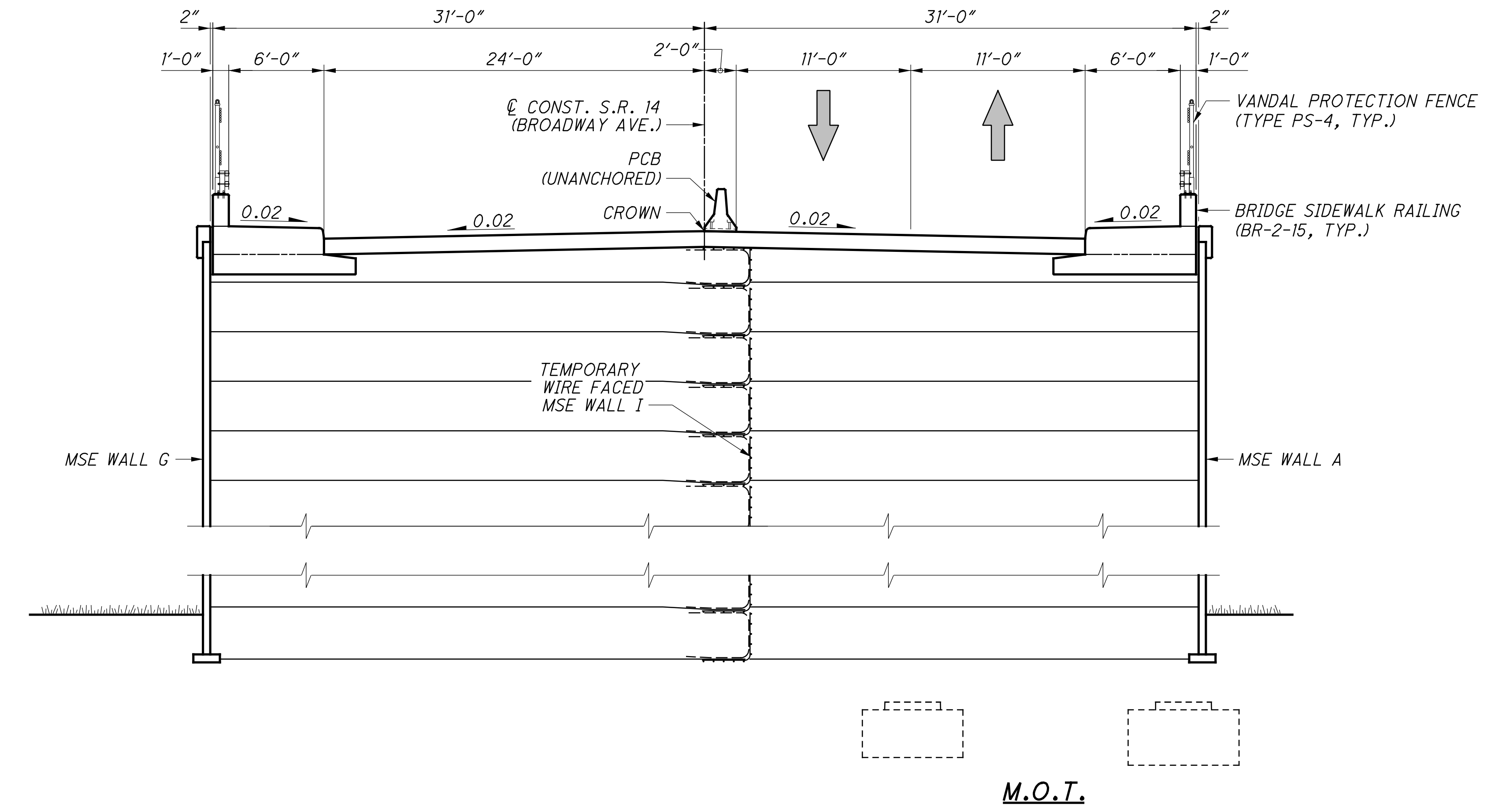
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93

PID No. 104132



PHASE 2



PHASE 3

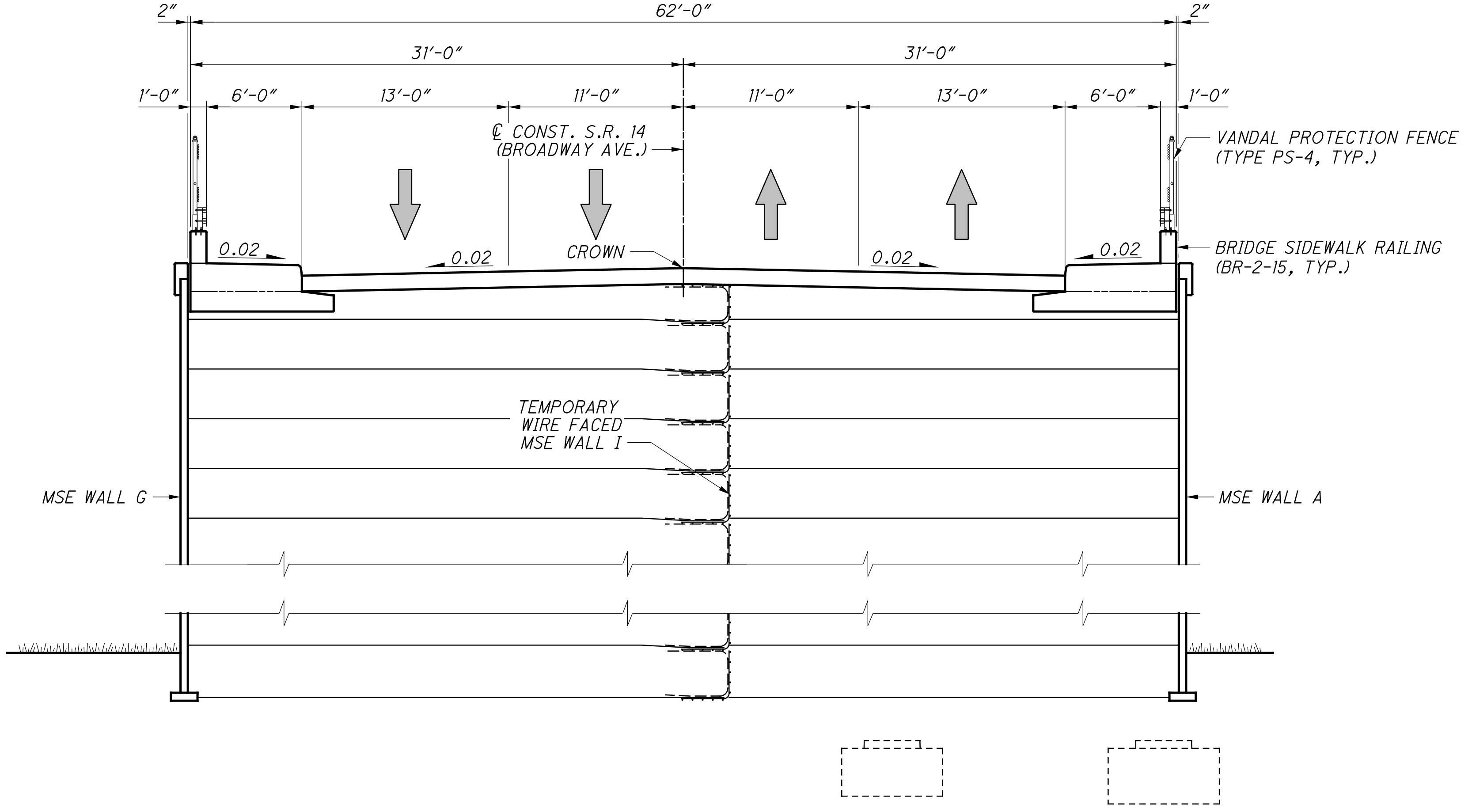
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

PHASE CONSTRUCTION DETAILS - WEST APPROACH
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

13/32



FINAL CONDITION

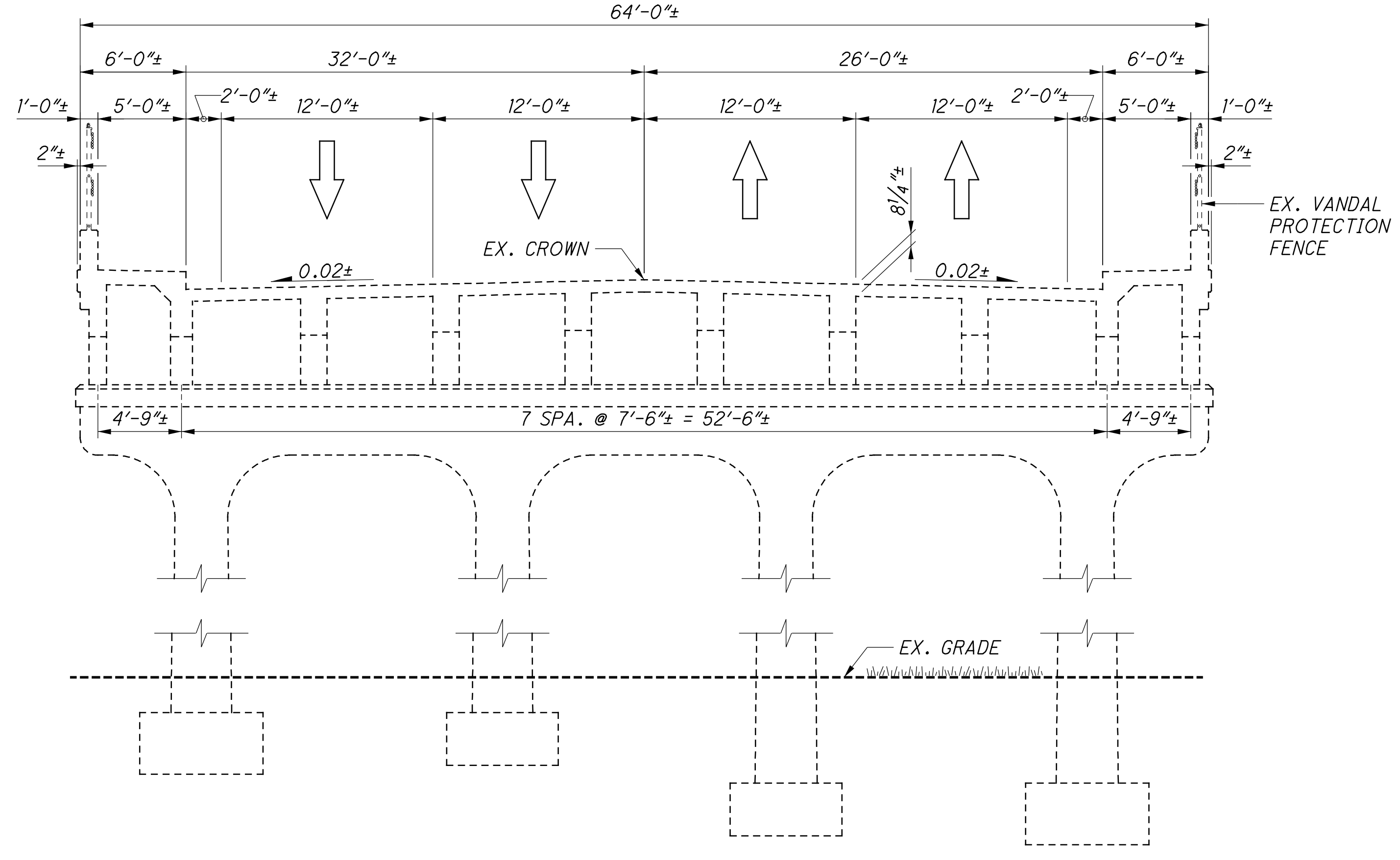
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

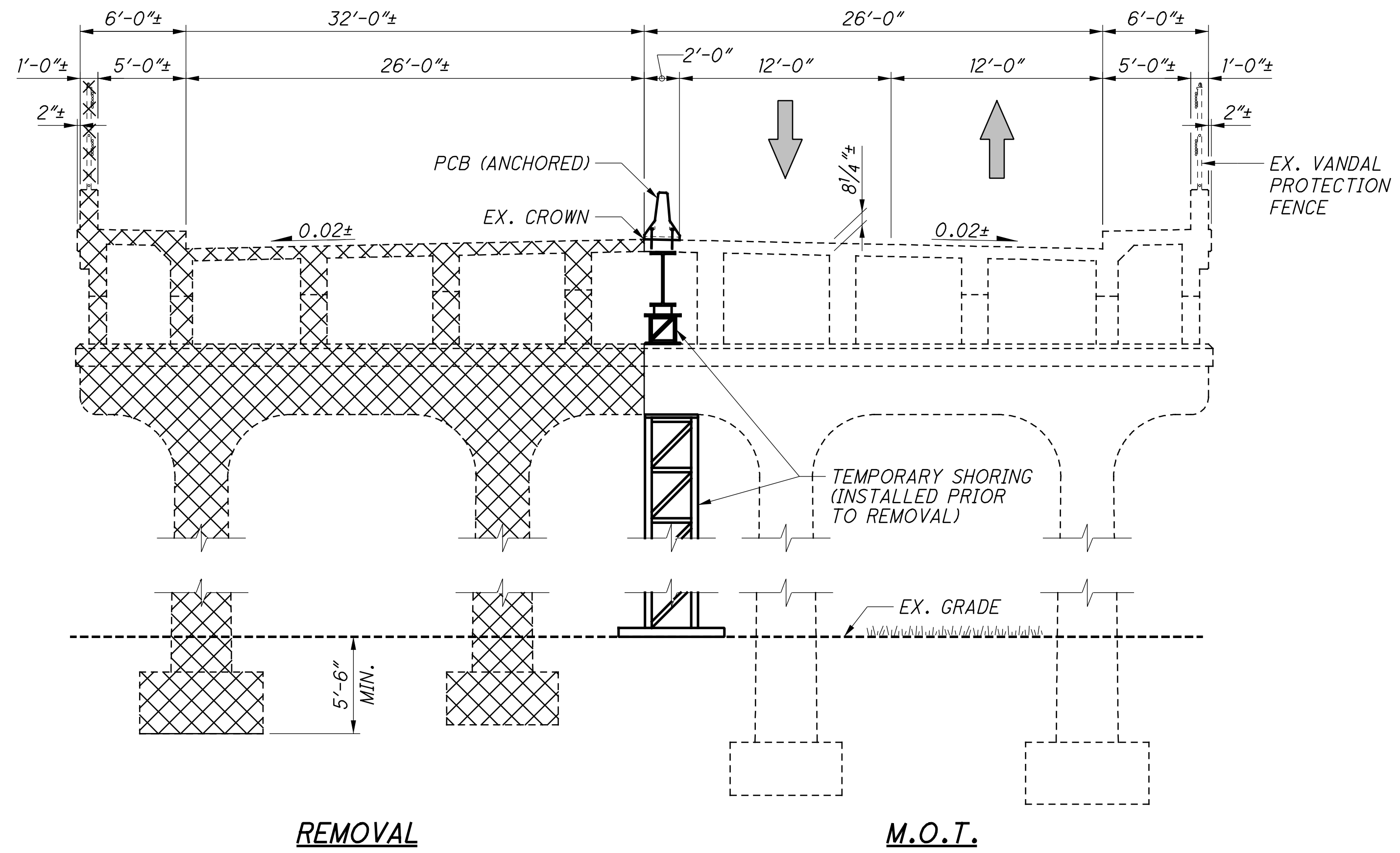
PHASE CONSTRUCTION DETAILS - WEST APPROACH

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



EXISTING CONDITION



REMOVAL

M.O.T.

PHASE 1

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	DRAWN TMR	REVIEWED ZRD	DATE 6/20
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

PHASE CONSTRUCTION DETAILS - WEST APPROACH OVER CULVERT

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

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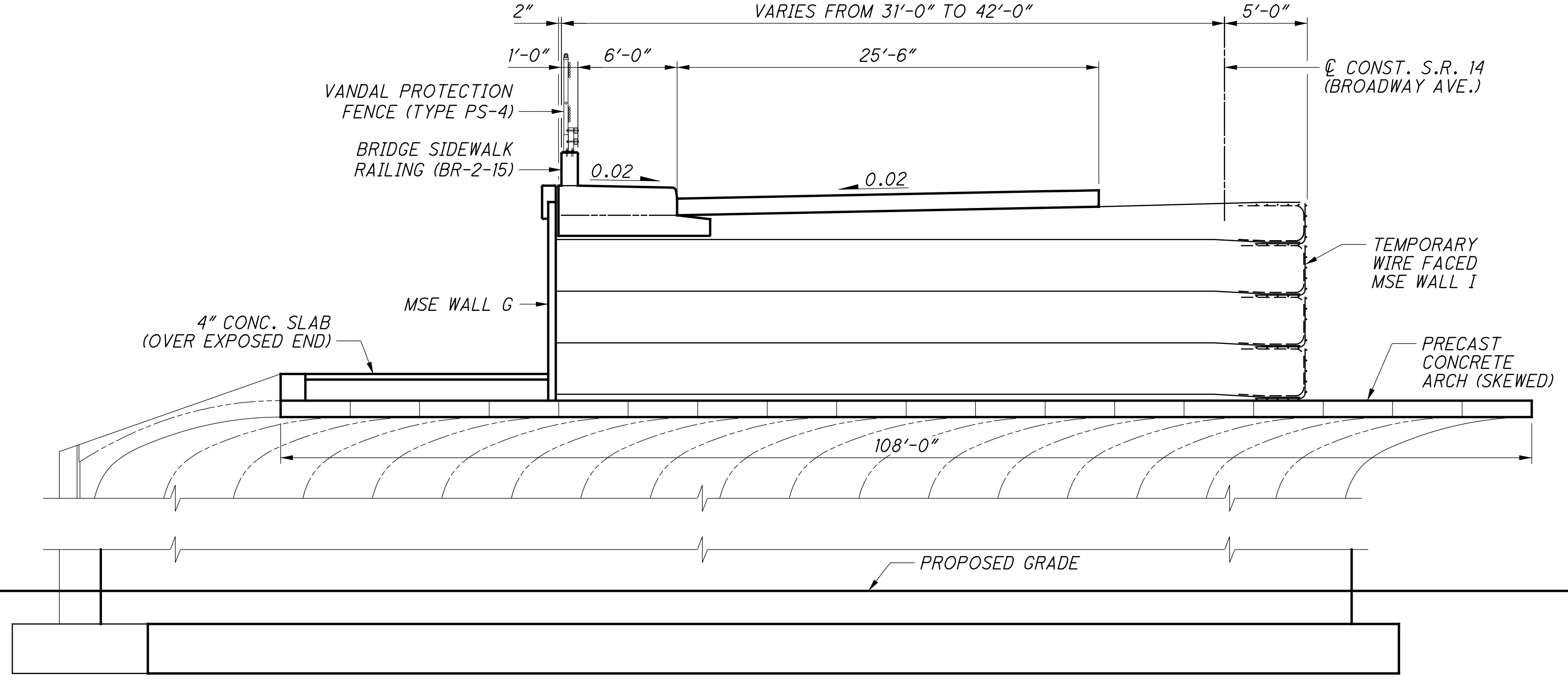
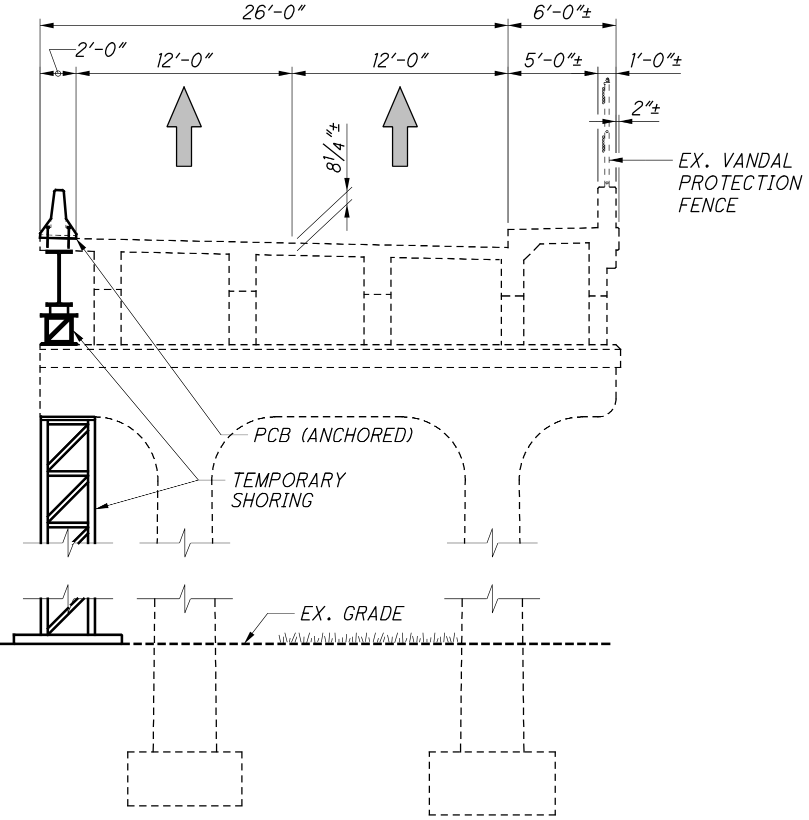
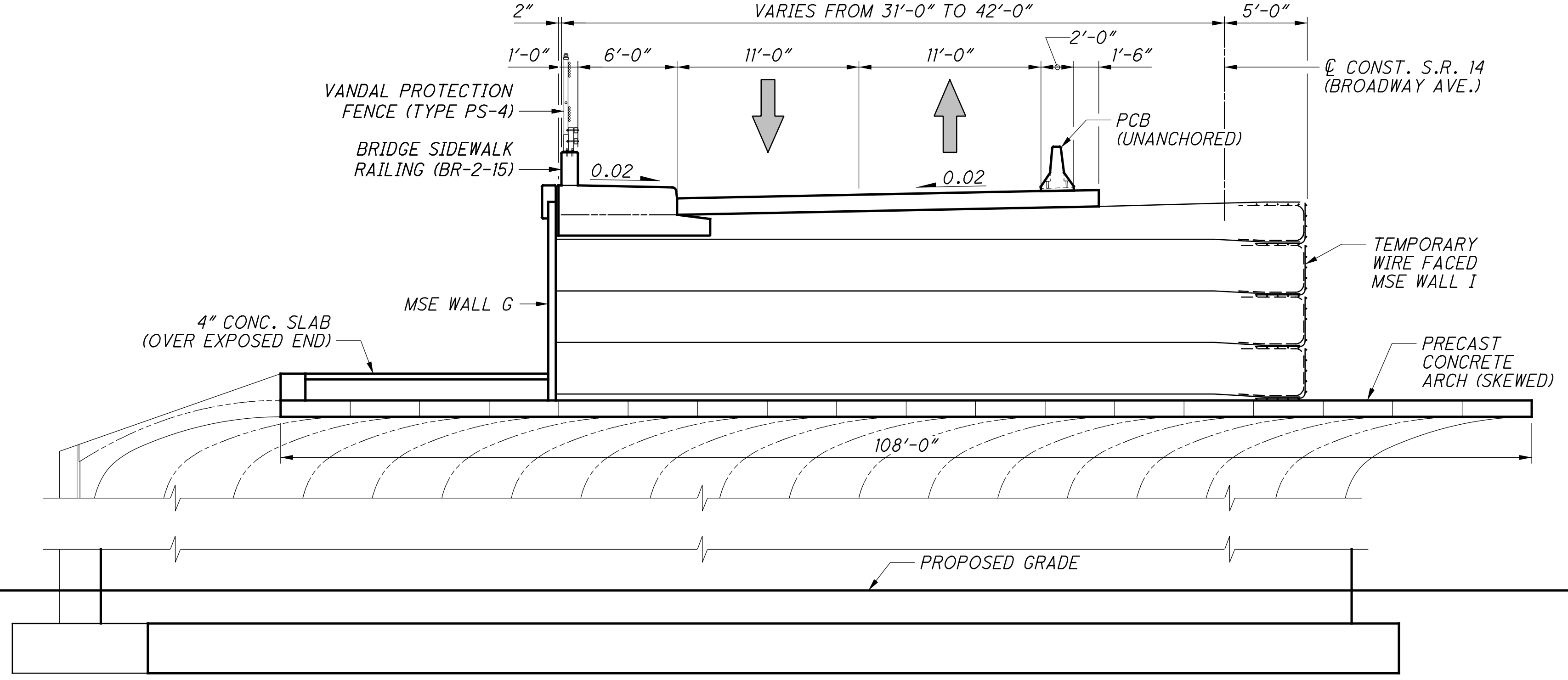


CONSTRUCTION

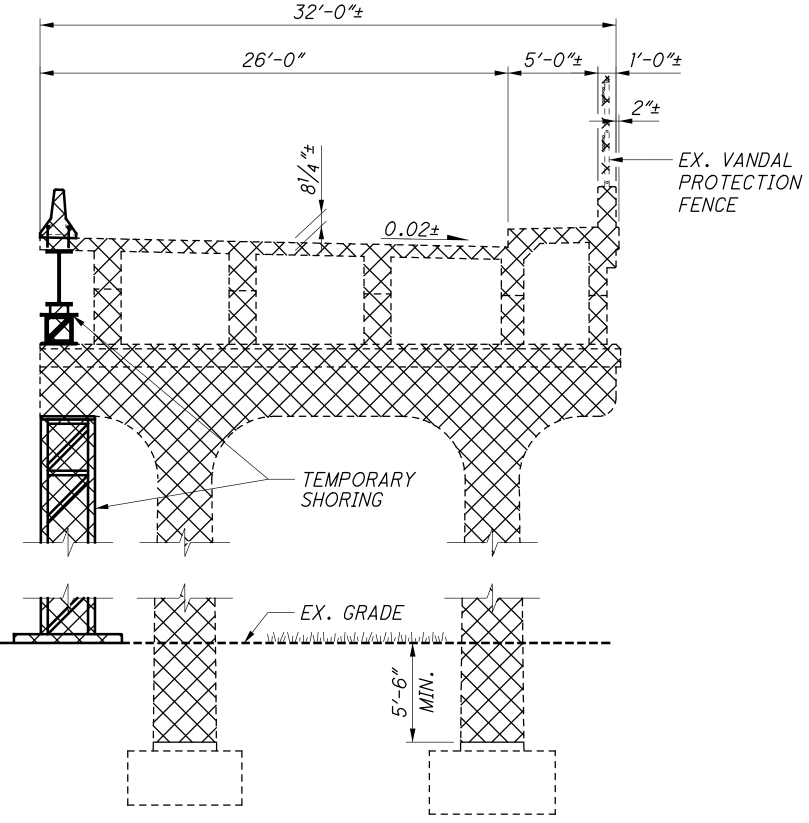


M.O.T.

PHASE 1



M.O.T.



REMOVAL

PHASE 2

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

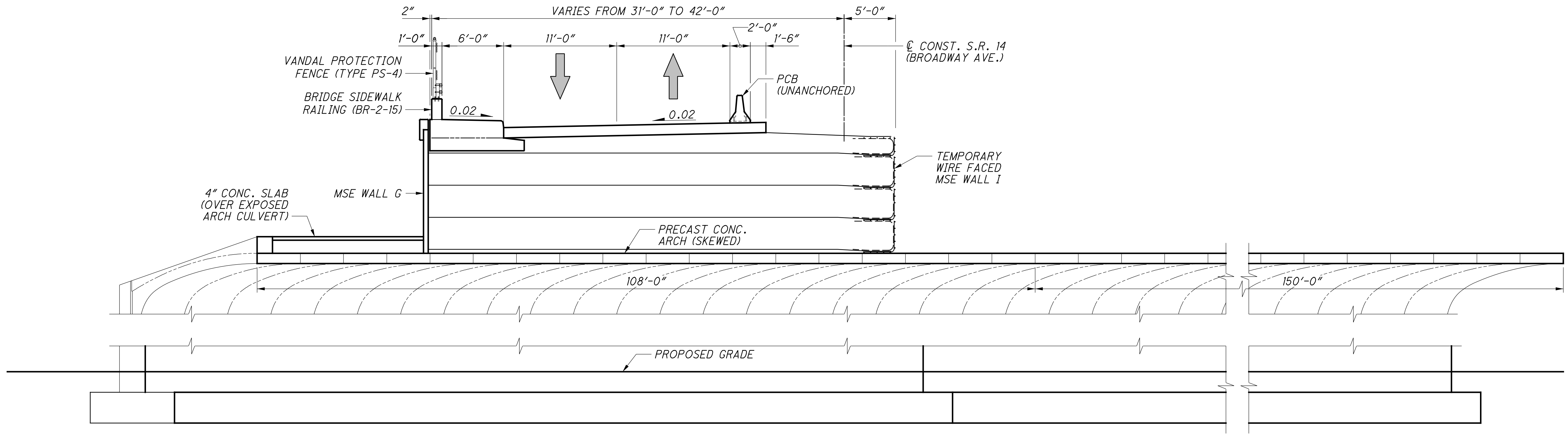
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	DRAWN TMR	REVIEWED ZRD	DATE 6/20
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

PHASE CONSTRUCTION DETAILS - WEST APPROACH OVER CULVERT
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

16/32

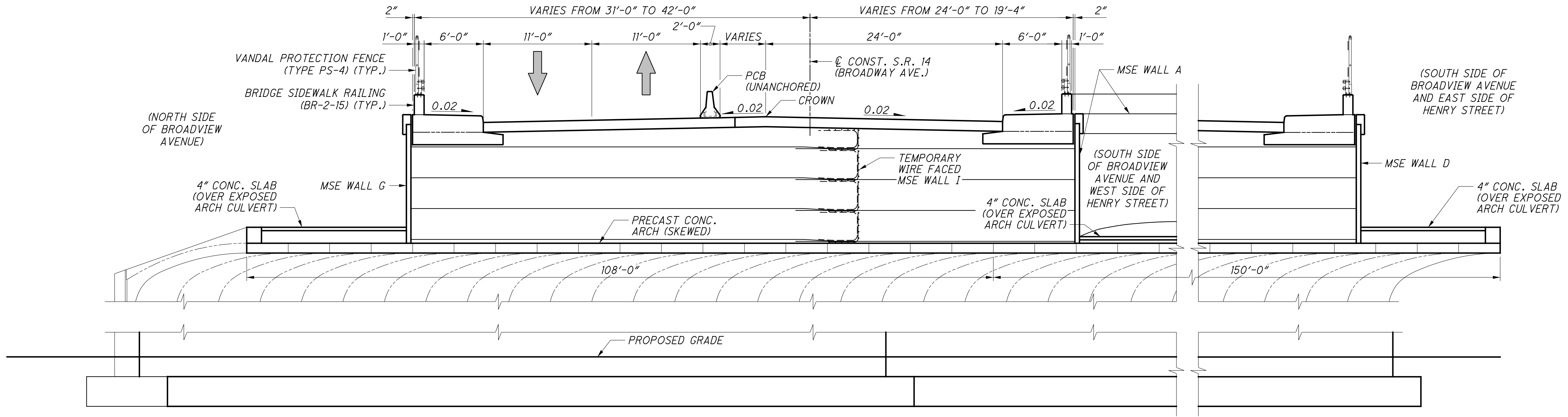


CHAINCRAFT ROAD MOT DURING PHASE 2A CONSTRUCTION IS MAINTAINED ALONG THE EXISTING CHAINCRAFT ROAD.

M.O.T.

CONSTRUCTION
(PHASE 2A)

PHASE 2



CHAINCRAFT ROAD MOT DURING PHASE 2B CONSTRUCTION IS MAINTAINED ALONG THE RELOCATED CHAINCRAFT ROAD.

M.O.T.

CONSTRUCTION
(PHASE 2B)

PHASE 2

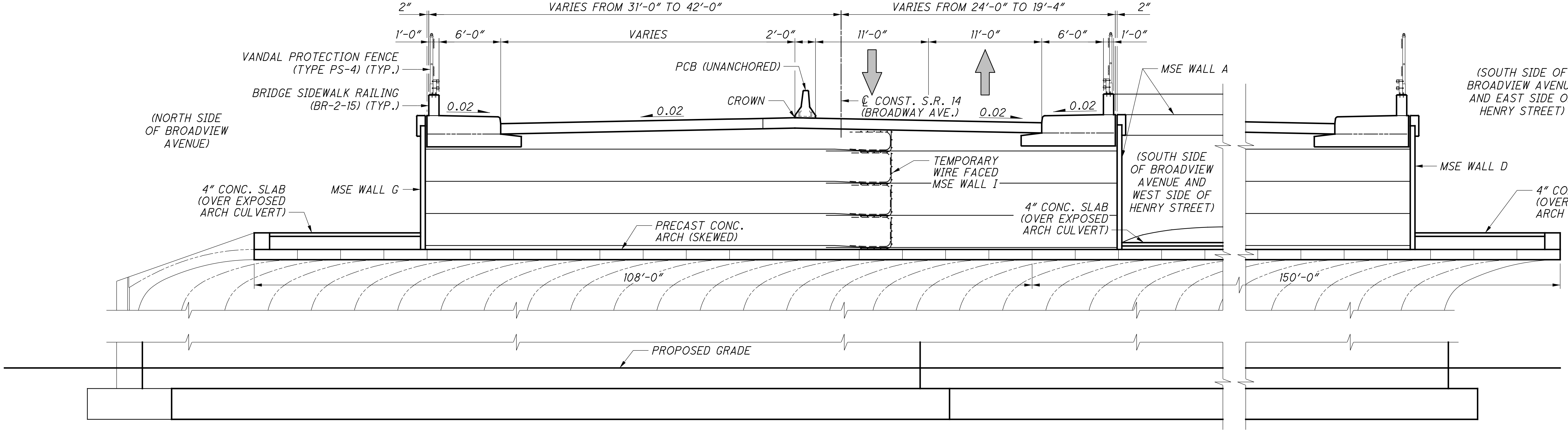
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	DRAWN TMR	REVIEWED ZRD	DATE 6/20
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

PHASE CONSTRUCTION DETAILS - WEST APPROACH OVER CULVERT

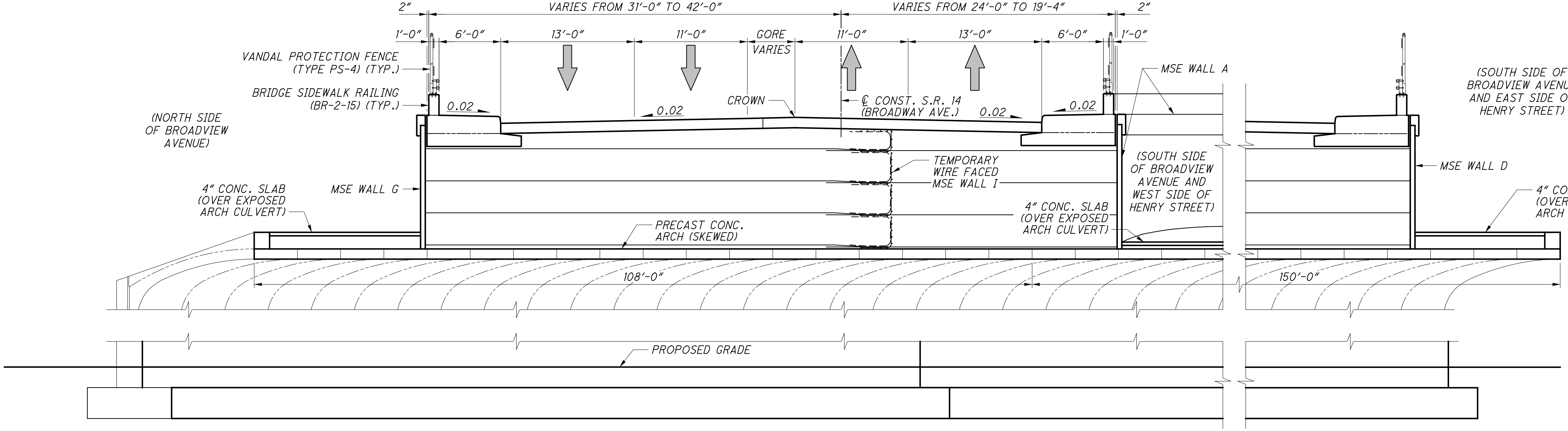
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



M.O.T.

PHASE 3



FINAL CONDITION

pw:\\aecom-na-pw.bentley.com:AECOM_DS20_NA_2019\Documents\60581903-CUY-14-6.93\104132_CUY-14-0693\Design\Structures\CUY-14-0693C\Sheets\014_0693C_SC118.dgn Sheet 6/15/2020 1:30:09 PM todd.roxber

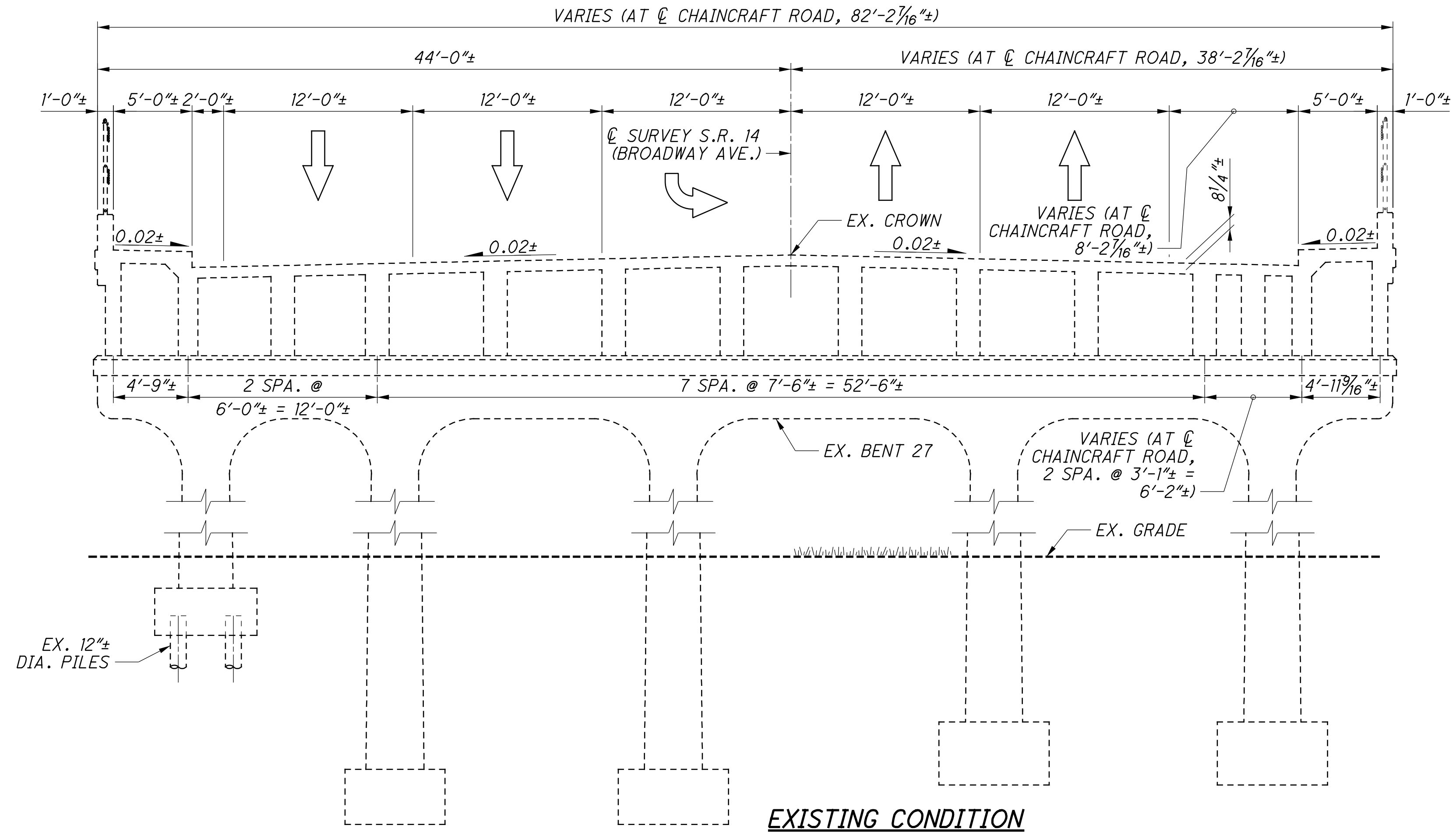
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR
CHECKED MRW
DRAWN TMR
REVISED
REVIEWED ZRD
DATE 6/20
STRUCTURE FILE NUMBER TBD

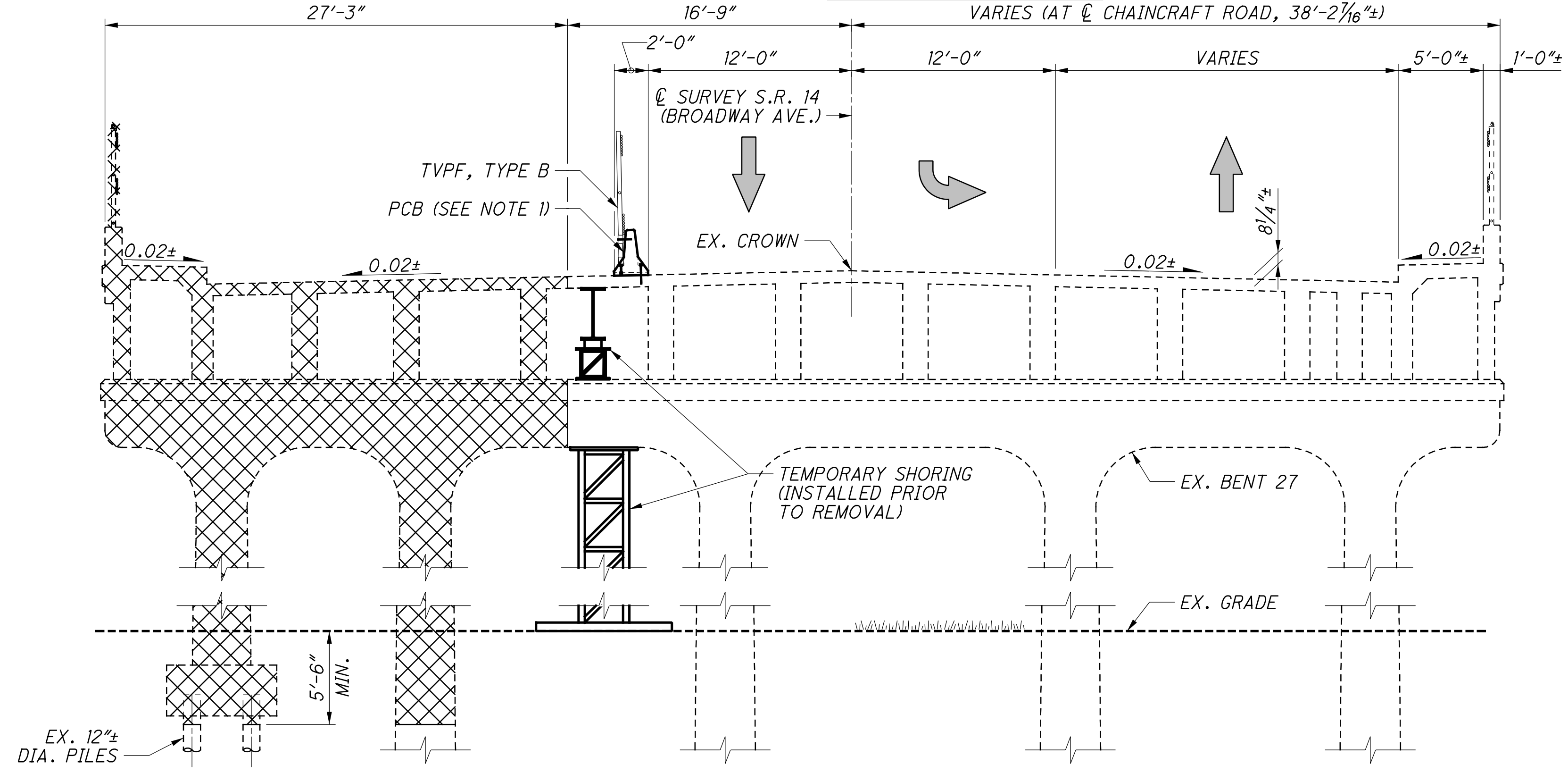
PHASE CONSTRUCTION DETAILS - WEST APPROACH OVER CULVERT

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



EXISTING CONDITION



REMOVAL

M.O.T.

PHASE 1

LEGEND:

▨	ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

NOTE:

1. PORTABLE CONCRETE BARRIER SHALL BE ANCHORED FOR THE TEMPORARY VANDAL PROTECTION FENCE, TYPE B, OVER CHAINCRAFT ROAD. PORTABLE CONCRETE BARRIER SHALL BE UNANCHORED BEYOND CHAINCRAFT ROAD.

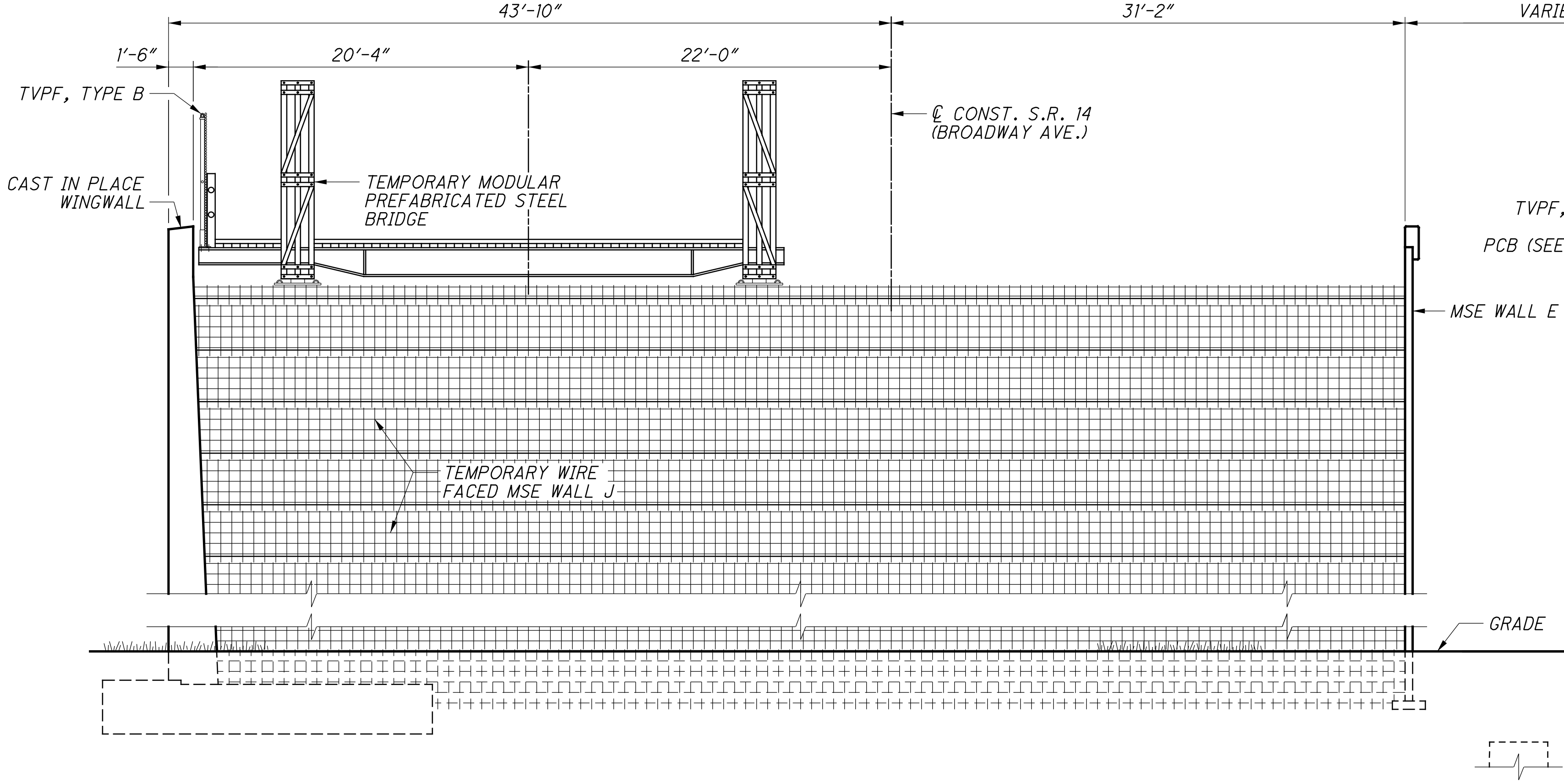
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

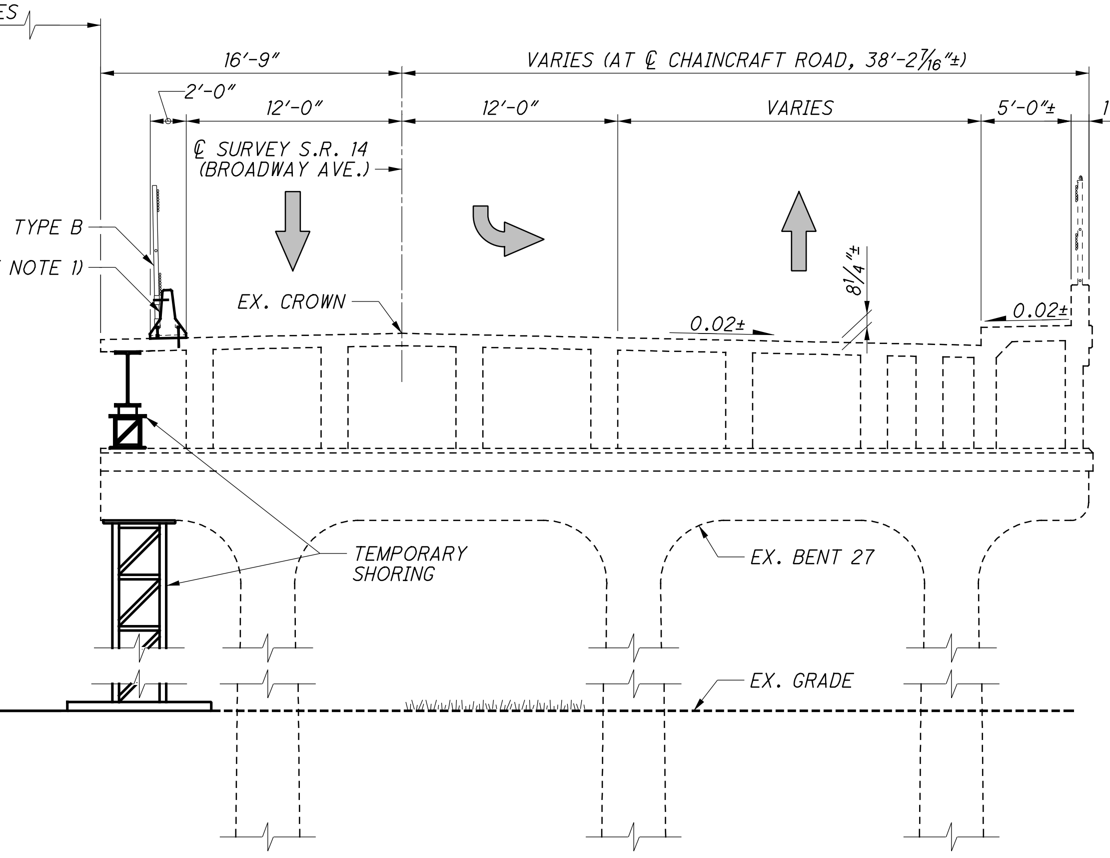
ALTERNATIVE 3C-PHASE CONSTRUCTION DETAILS OVER CHAINCRAFT

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

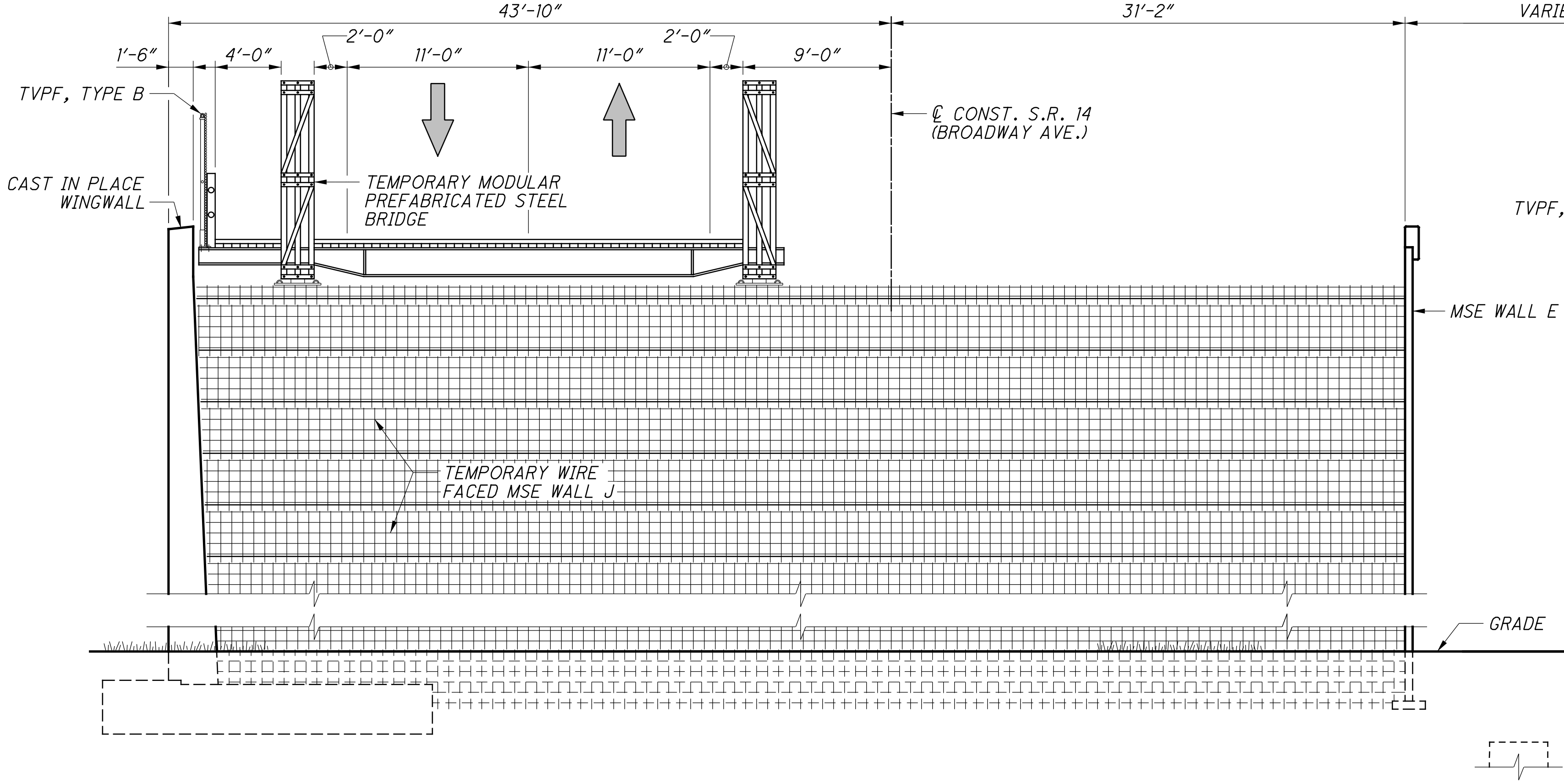


CONSTRUCTION

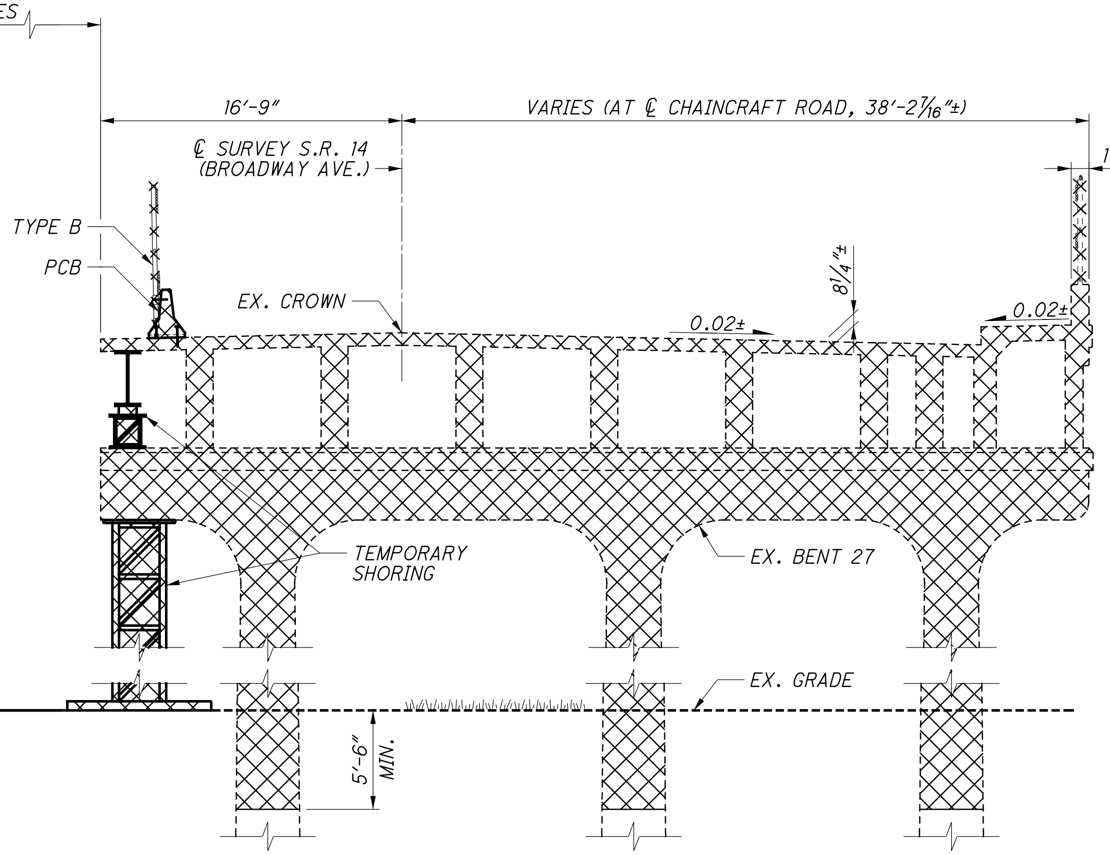


M.O.T.

PHASE 1



M.O.T.



REMOVAL

PHASE 2

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

NOTE:

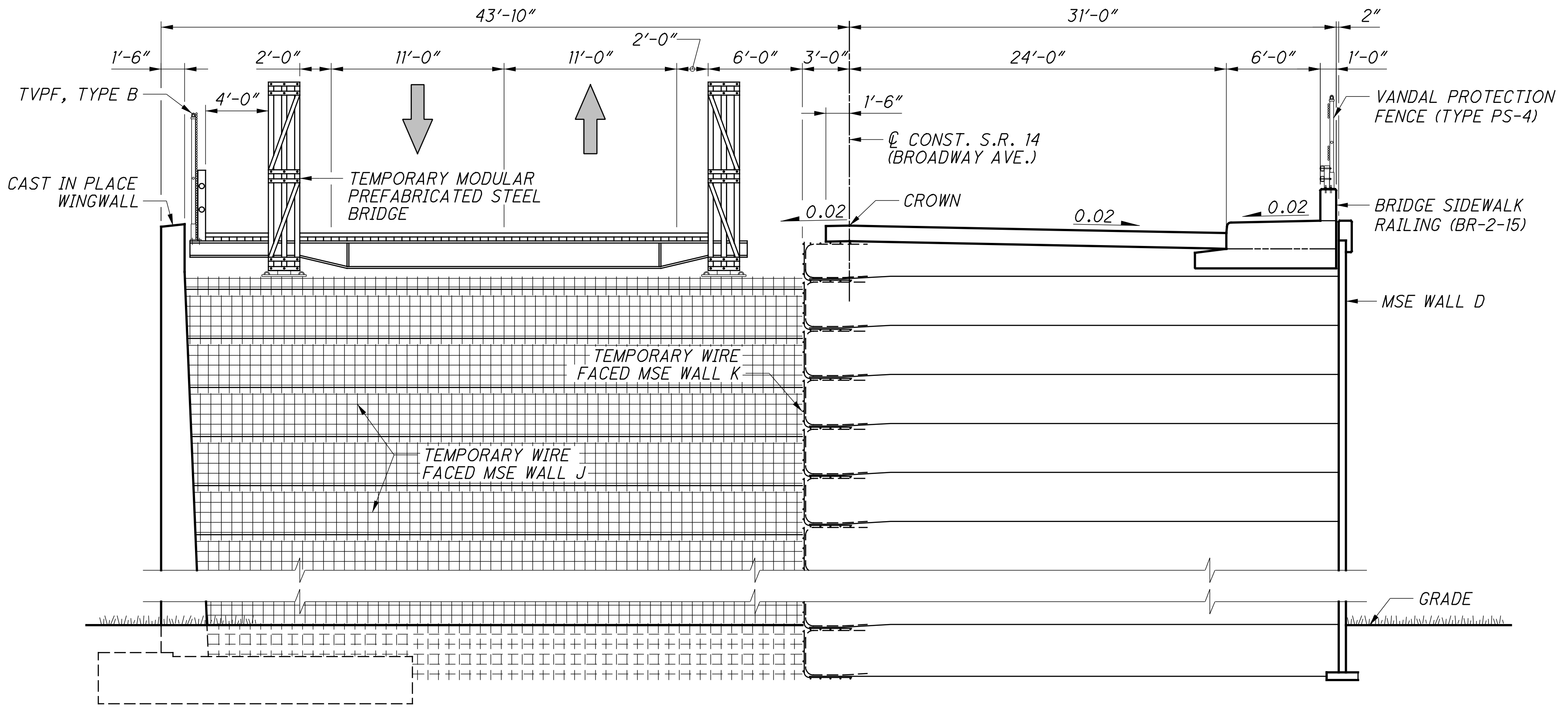
1. PORTABLE CONCRETE BARRIER SHALL BE ANCHORED FOR THE TEMPORARY VANDAL PROTECTION FENCE, TYPE B, OVER CHAINCRAFT ROAD. PORTABLE CONCRETE BARRIER SHALL BE UNANCHORED BEYOND CHAINCRAFT ROAD.

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

REVIEWED ZRD
DATE 6/20
STRUCTURE FILE NUMBER TBD
DRAWN TMR
REVISED
DESIGNED TMR
CHECKED MRW

ALTERNATIVE 3C-PHASE CONSTRUCTION DETAILS OVER CHAINCRAFT
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

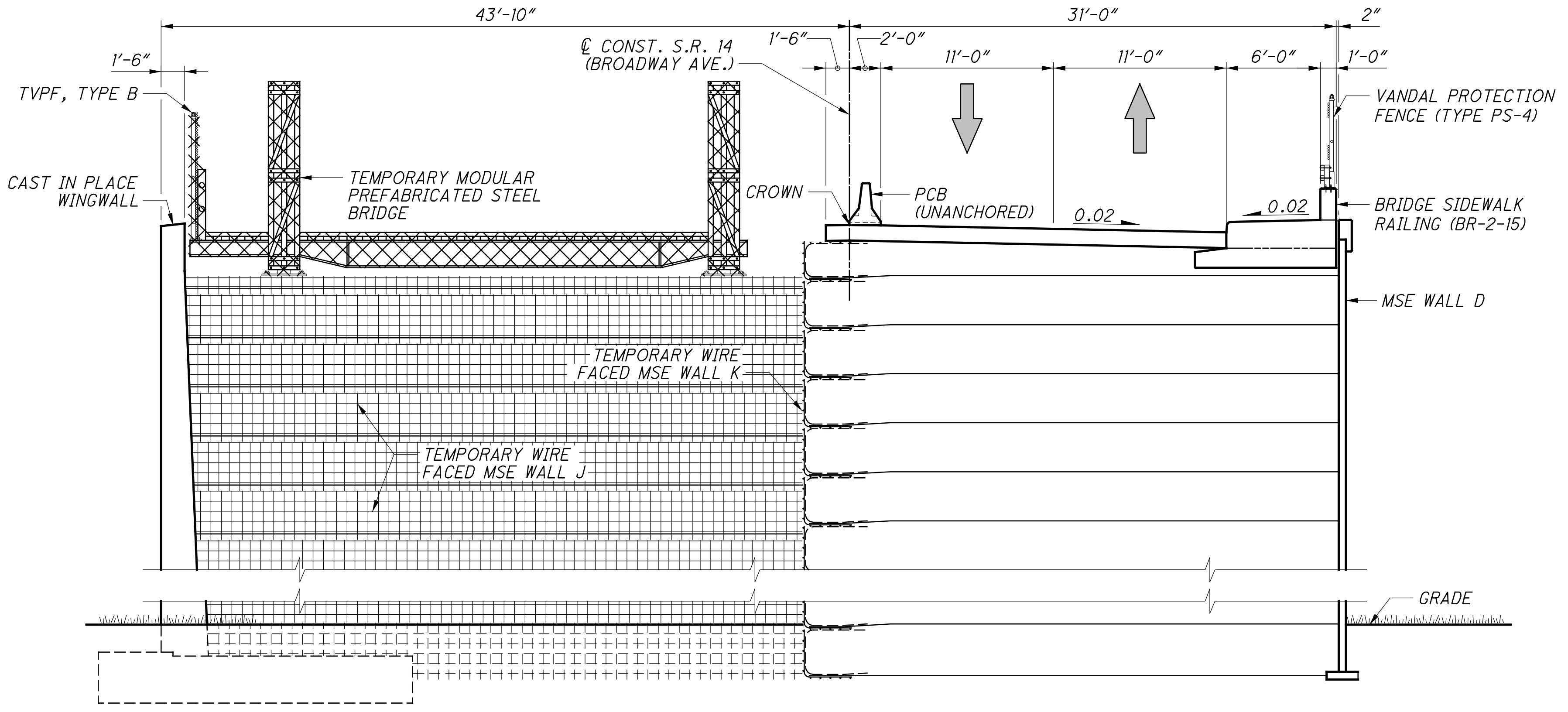


M.O.T.

CONSTRUCTION

(PHASE 2B)

PHASE 2



REMOVAL

M.O.T.

PHASE 3

LEGEND:

▩ REMOVAL OF TEMPORARY MODULAR PREFABRICATED STEEL BRIDGE

DESIGN AGENCY

AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	CHECKED MRW
DRAWN TMR	REVISED
REVIEWED ZRD	STRUCTURE FILE NUMBER TBD
DATE 6/20	

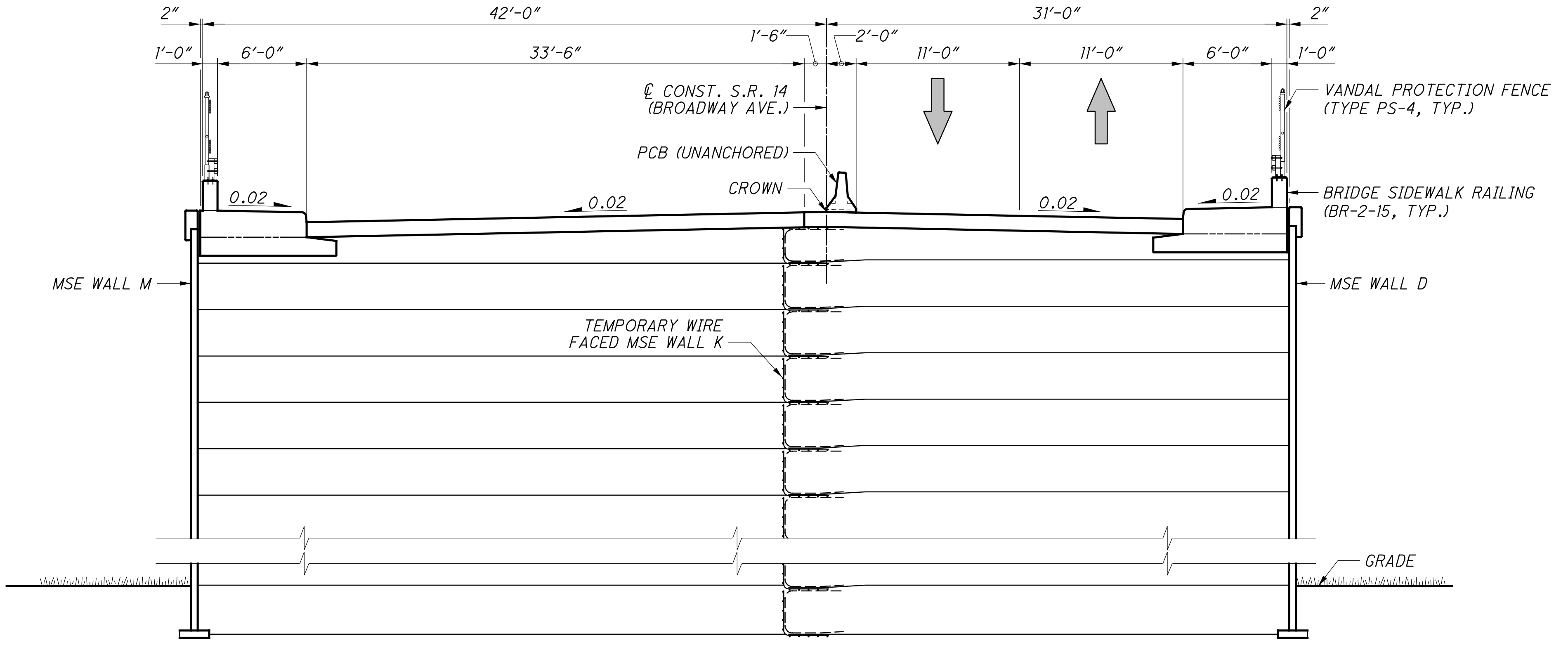
ALTERNATIVE 3C-PHASE CONSTRUCTION DETAILS OVER CHAINCRAFT

BRIDGE NO. CUY-14-0693

BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

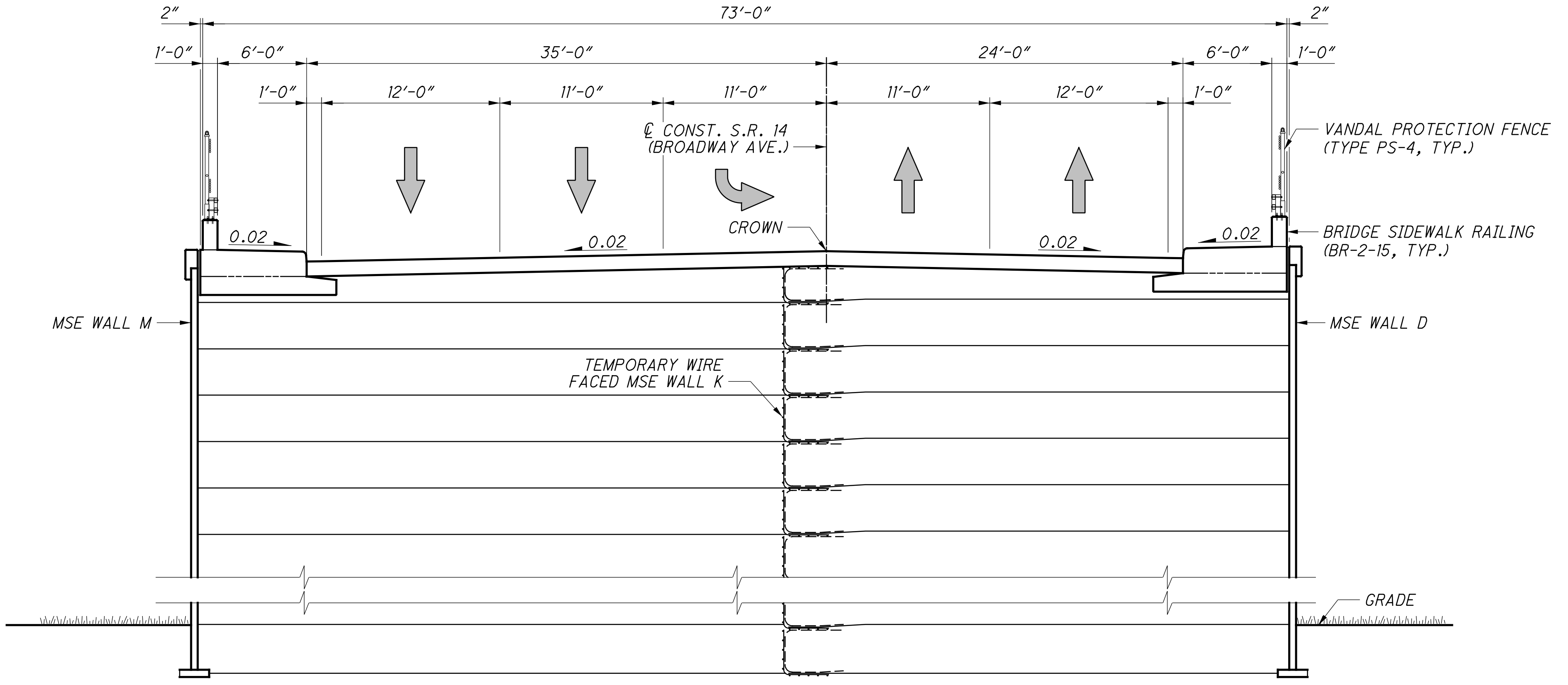
CUY-14-6.93

PID No. 104132



CONSTRUCTION M.O.T.

PHASE 3



FINAL CONDITION

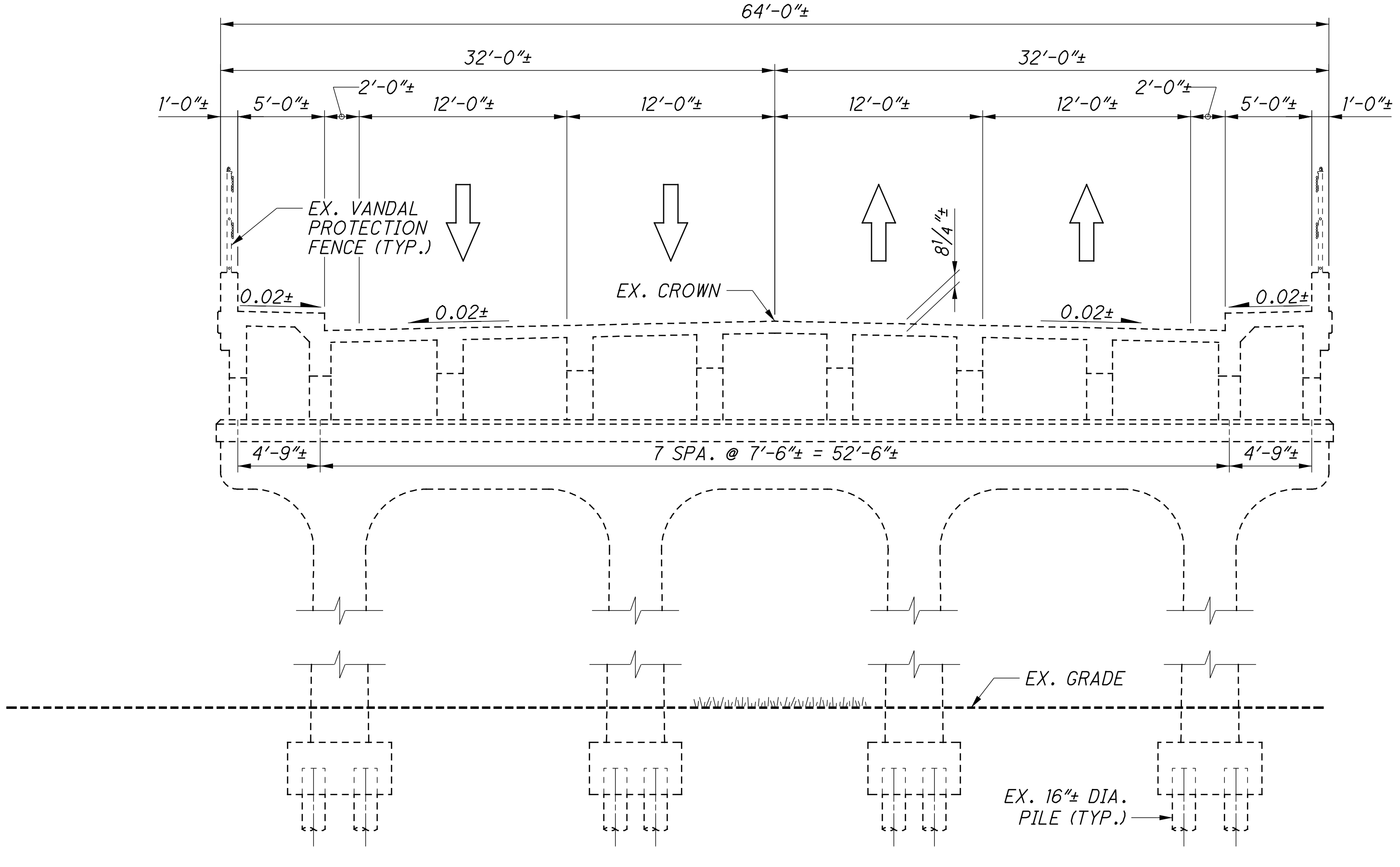
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

REVIEWED ZRD
DATE 6/20
STRUCTURE FILE NUMBER TBD
DRAWN TMR
REVISED
DESIGNED TMR
CHECKED MRW

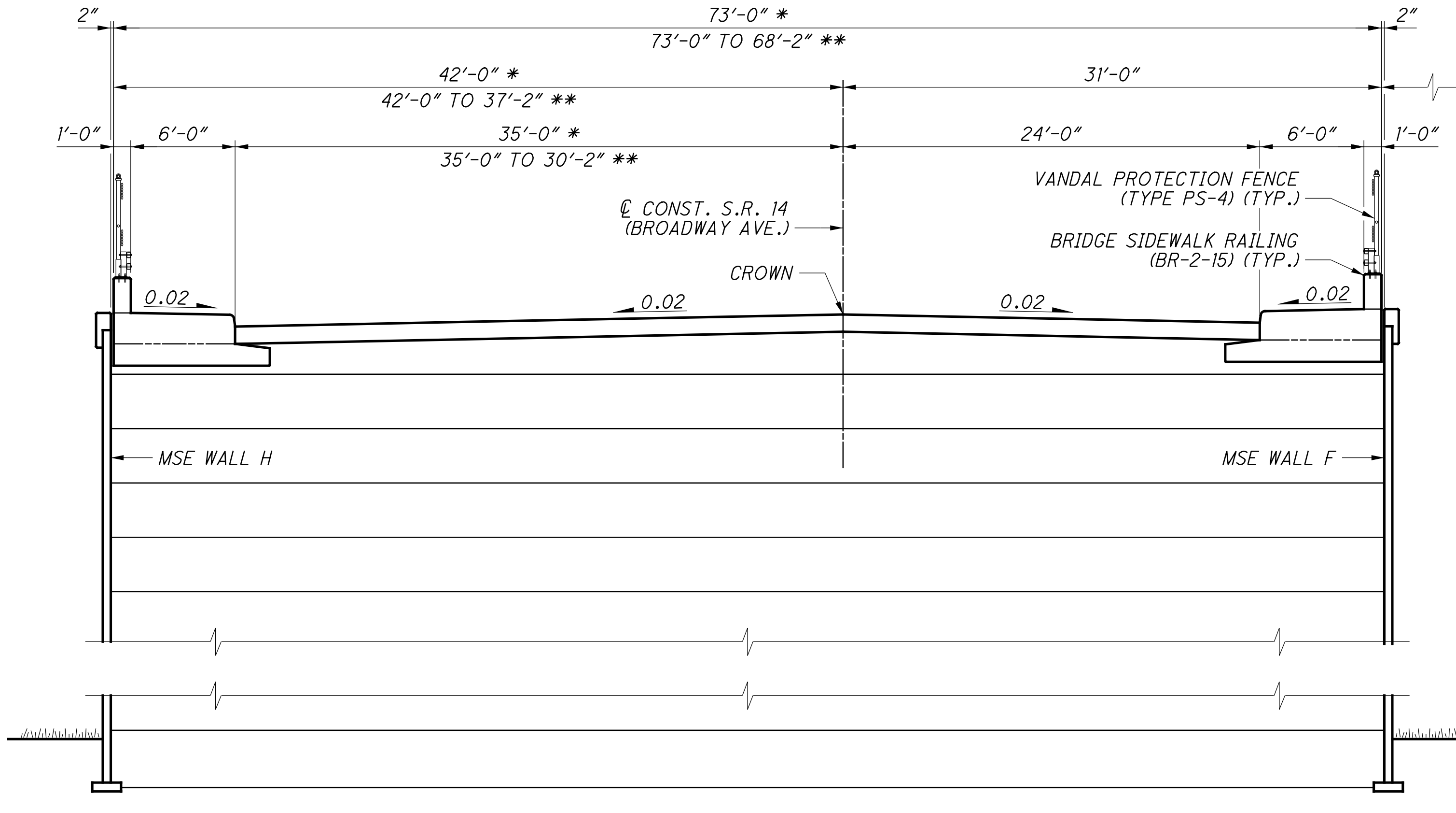
ALTERNATIVE 3C-PHASE CONSTRUCTION DETAILS OVER CHAINCRAFT

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

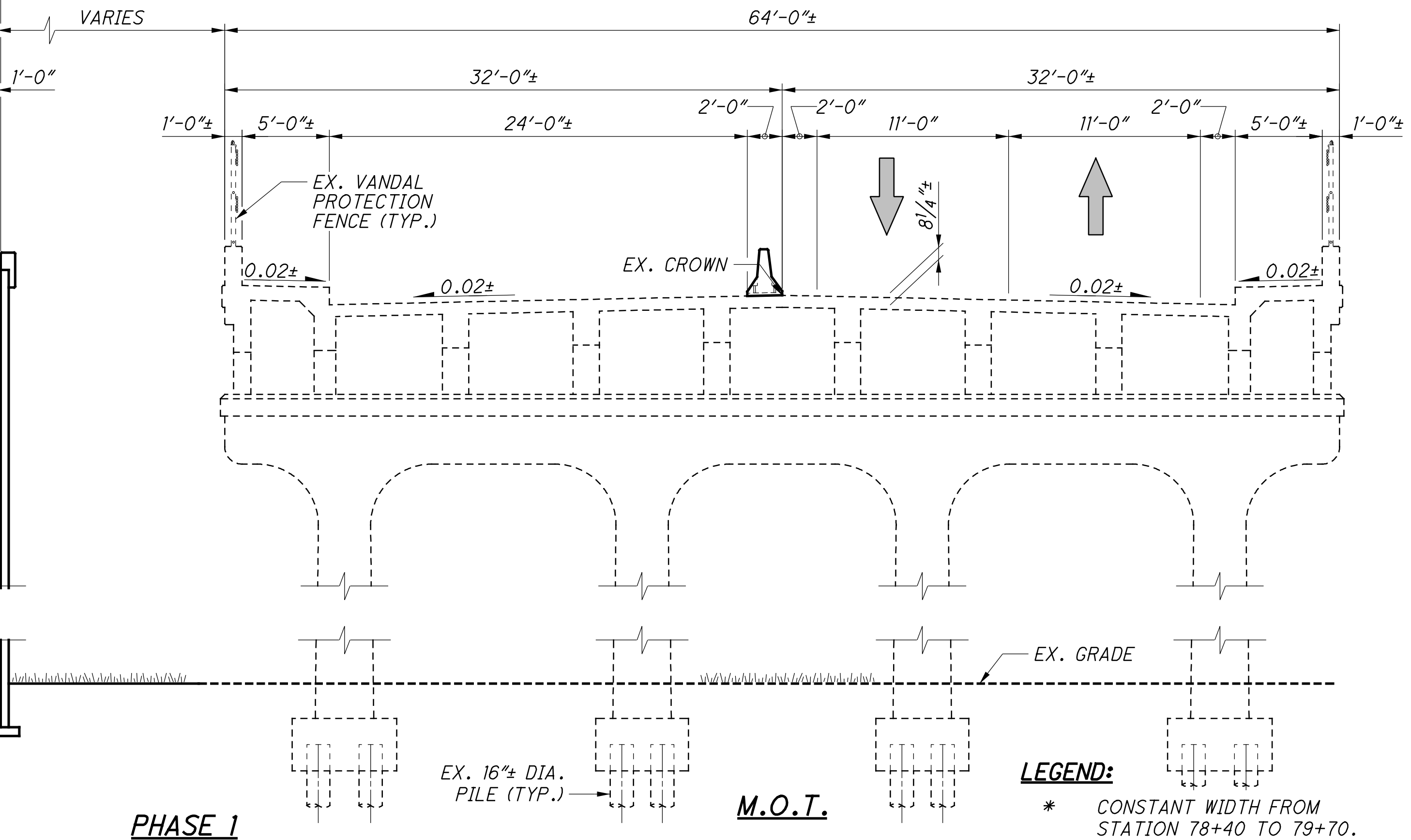
CUY-14-6.93
PID No. 104132



EXISTING CONDITION



CONSTRUCTION



M.O.T.

PHASE 1

(STA. 78+40 TO STA. 81+70)

LEGEND:

*	CONSTANT WIDTH FROM STATION 78+40 TO 79+70.
**	VARIABLE WIDTH FROM STATION 79+70 TO 81+70.

DESIGN AGENCY

AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	DRAWN TMR	REVIEWED ZRD
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD

DATE 6/20

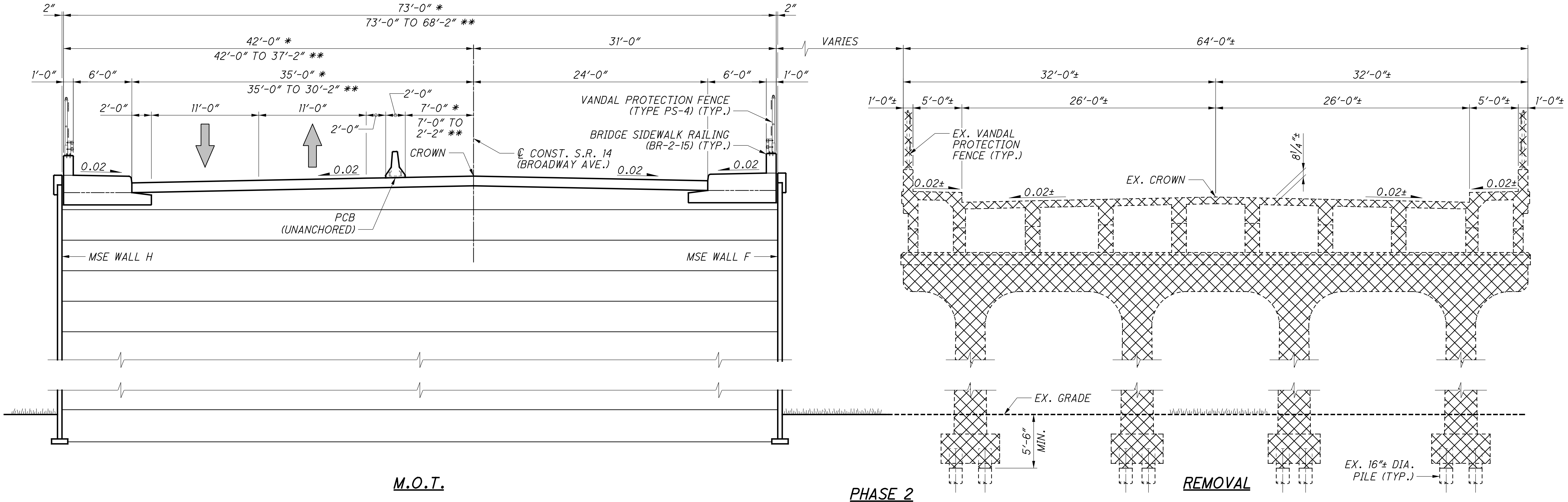
PHASE CONSTRUCTION DETAILS - EAST APPROACH

BRIDGE NO. CUY-14-0693

BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93

PID No. 104132

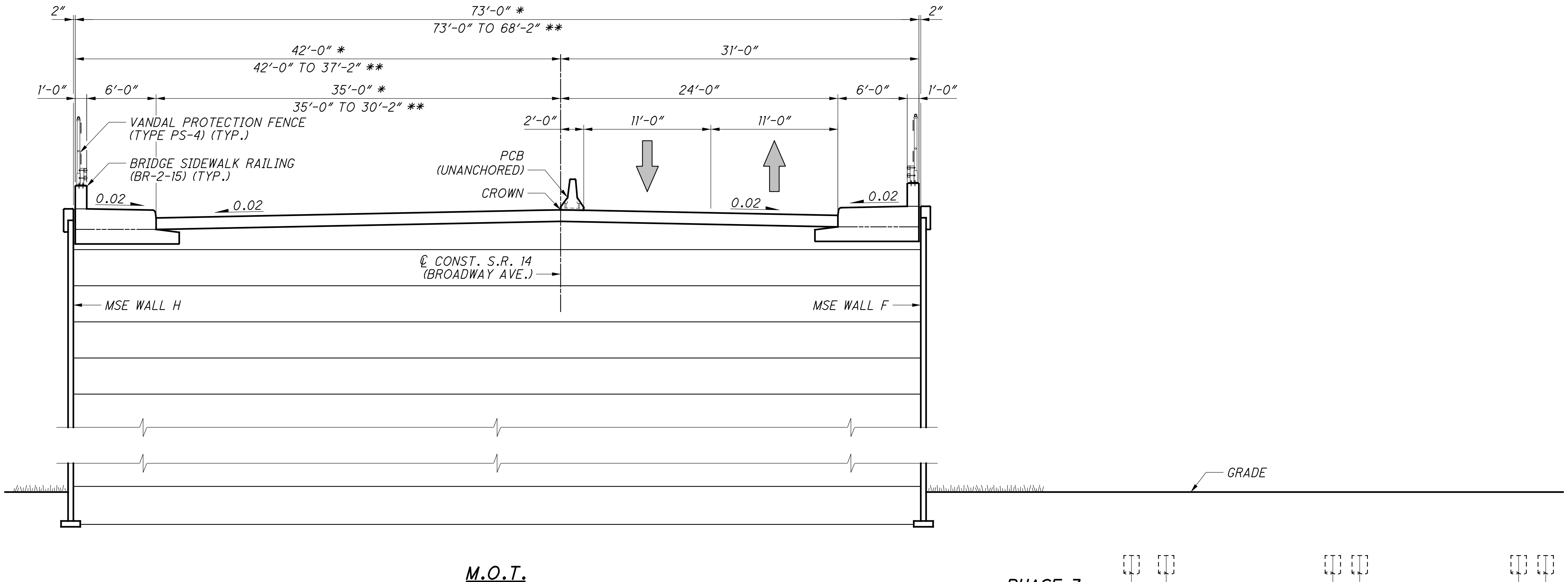


M.O.T.

REMOVAL

PHASE 2

(STA. 78+40 TO STA. 79+70)



M.O.T.

PHASE 3

(STA. 78+40 TO STA. 81+70)

LEGEND:

▨	ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN
*	CONSTANT WIDTH FROM STATION 78+40 TO 79+70.
**	VARIABLE WIDTH FROM STATION 79+70 TO 81+70.

DESIGN AGENCY

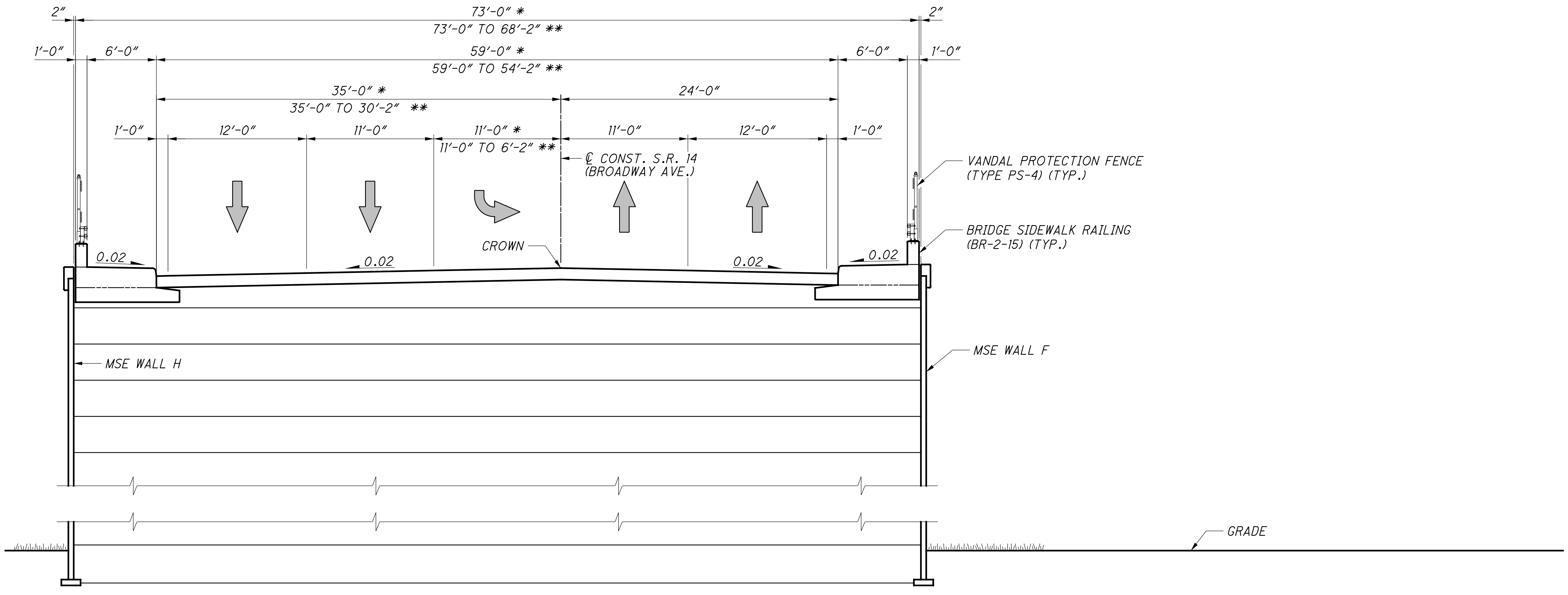
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

PHASE CONSTRUCTION DETAILS - EAST APPROACH
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

pw:\\aecom-na-pw.bentley.com:AECOM_DS20_NA_2019\Documents\60581903-CUY-14-6.93\104132_CUY-14-0693\Design\Structures\CUY-14-0693C\Sheets\014_0693C_SC111.dgn Sheet 6/15/2020 1:31:11 PM todd.roxberry



FINAL CONDITION

(STA. 78+40 TO STA. 81+70)

LEGEND:

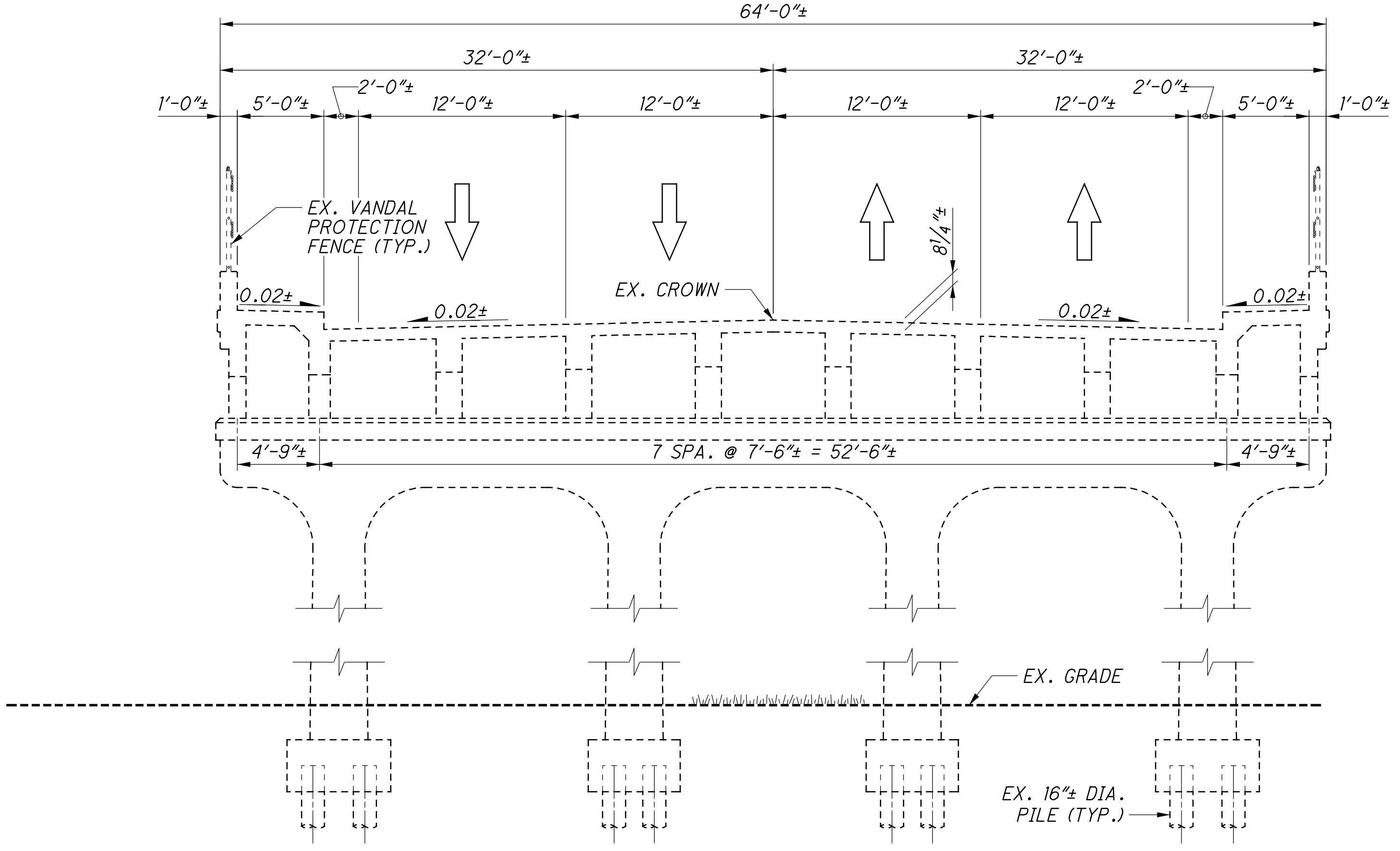
*	CONSTANT WIDTH FROM STATION 78+40 TO 79+70.
**	VARIABLE WIDTH FROM STATION 79+70 TO 81+70.

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

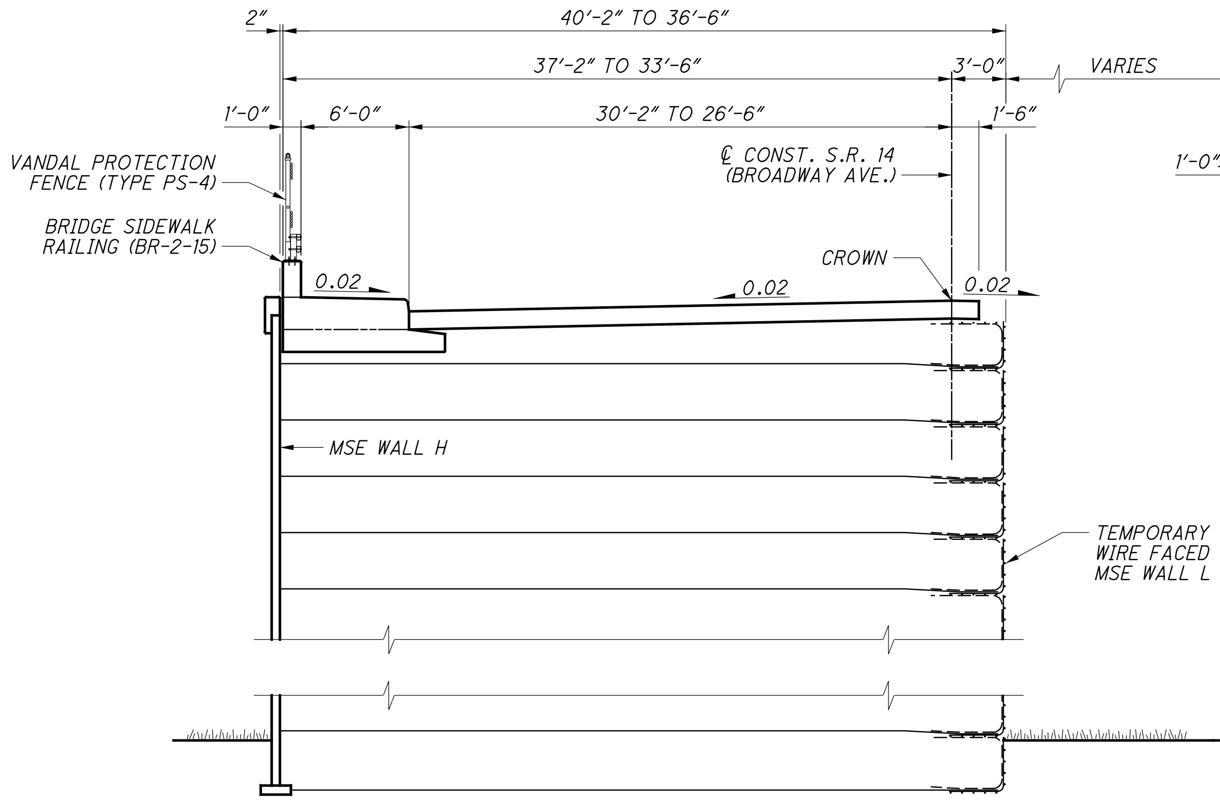
DESIGNED TMR	DRAWN TMR	REVIEWED ZRD	DATE 6/20
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

PHASE CONSTRUCTION DETAILS - EAST APPROACH
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

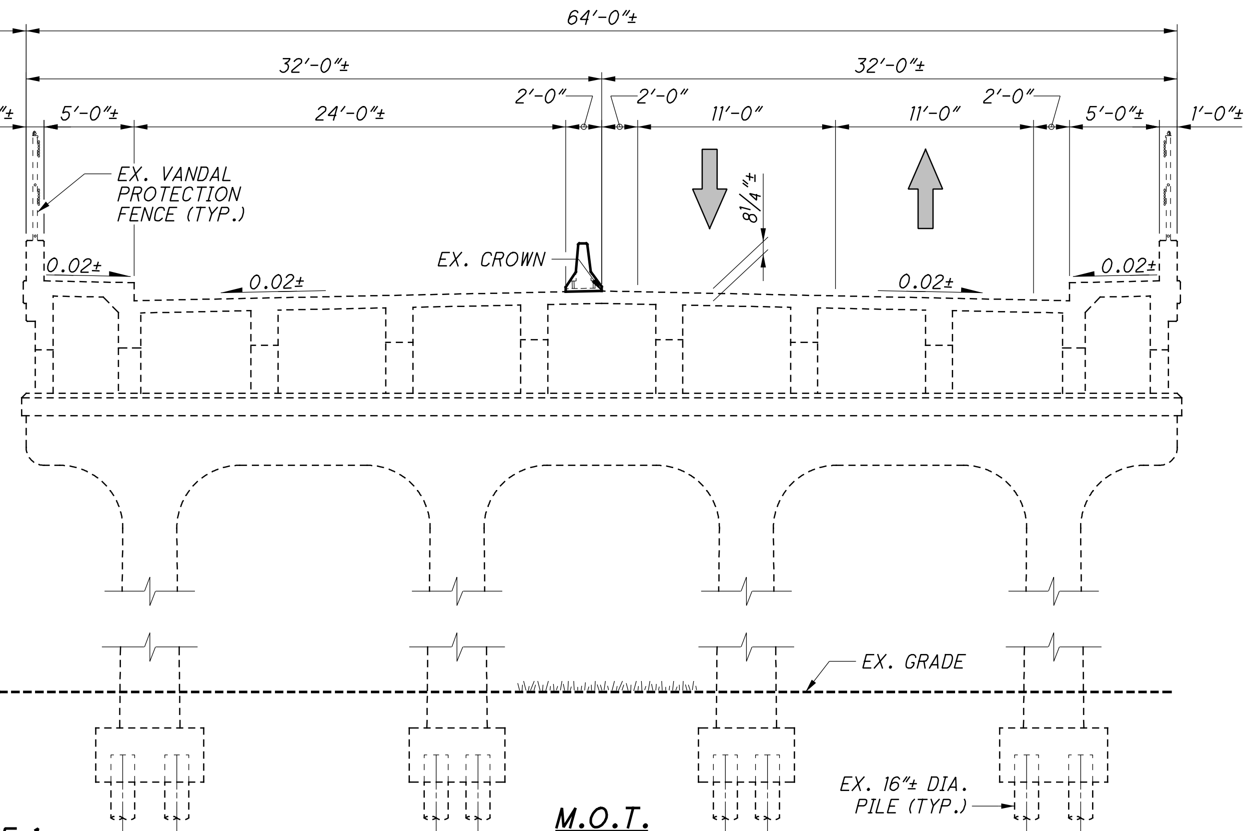
CUY-14-6.93
PID No. 104132



EXISTING CONDITION



CONSTRUCTION



M.O.T.

PHASE 1

(STA. 81+70 TO STA. 82+82)

DESIGN AGENCY

AECOM

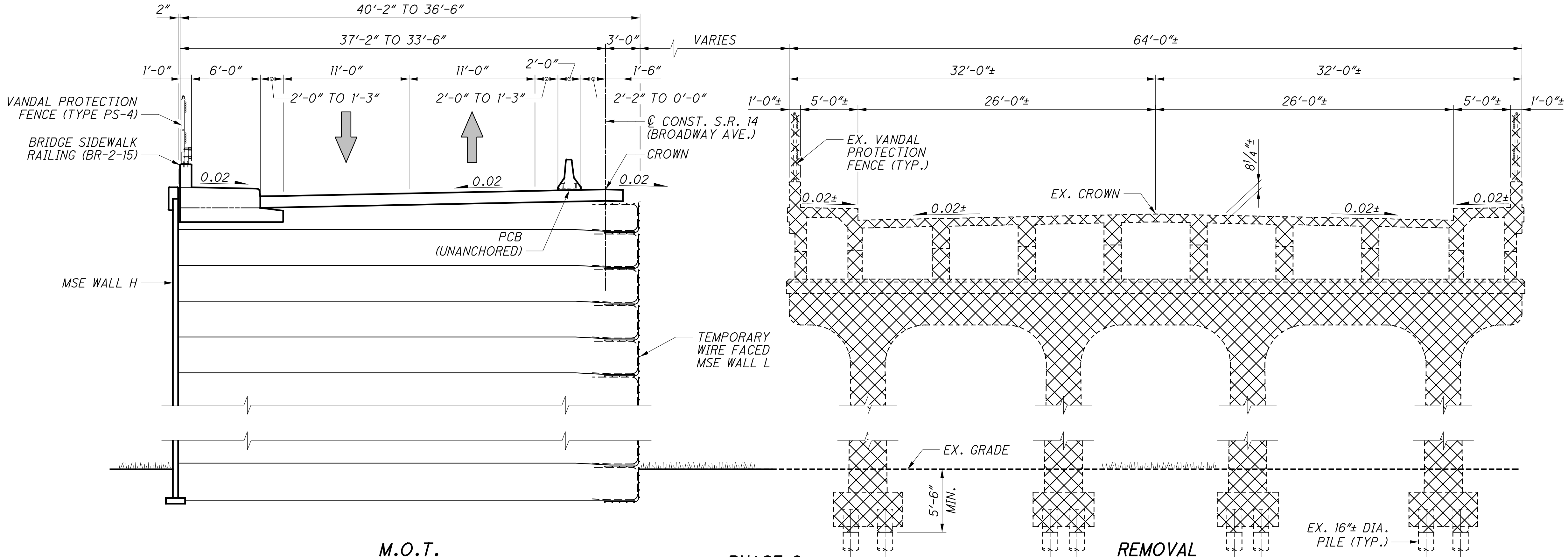
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

PHASE CONSTRUCTION DETAILS - EAST APPROACH

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

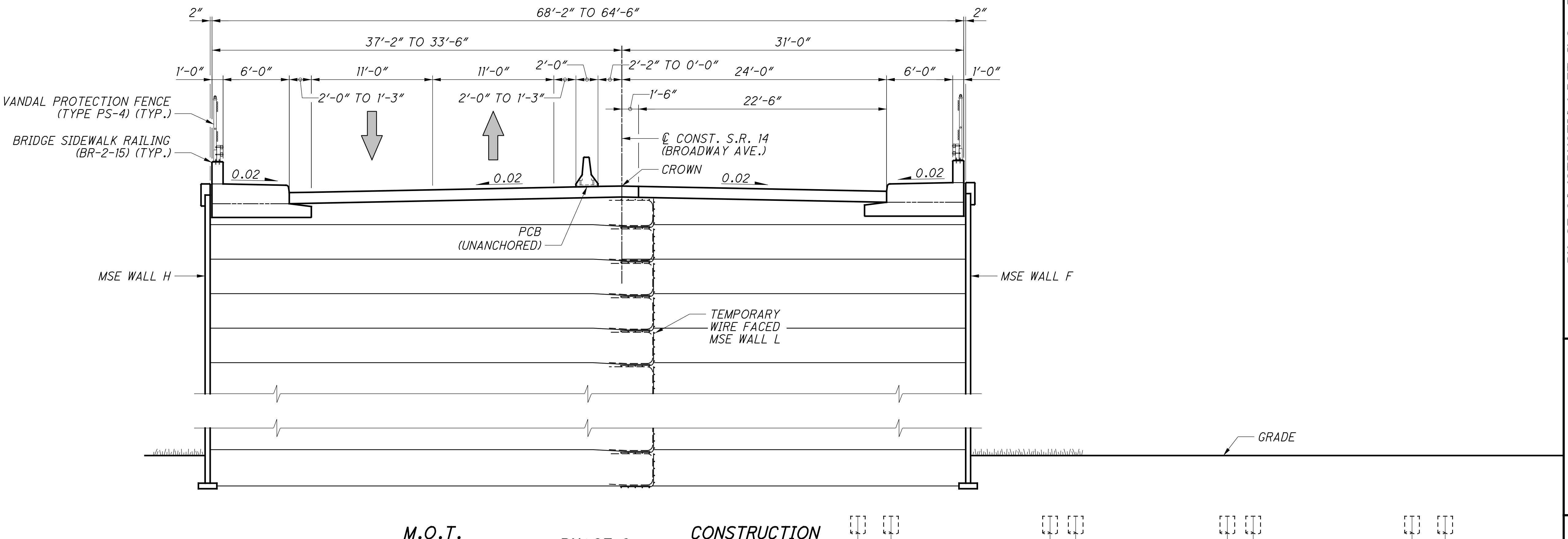
CUY-14-6.93
PID No. 104132



M.O.T.

PHASE 2
(STA. 81+70 TO STA. 82+82)

REMOVAL



M.O.T.

PHASE 2
(STA. 81+70 TO STA. 82+82)

CONSTRUCTION

LEGEND:

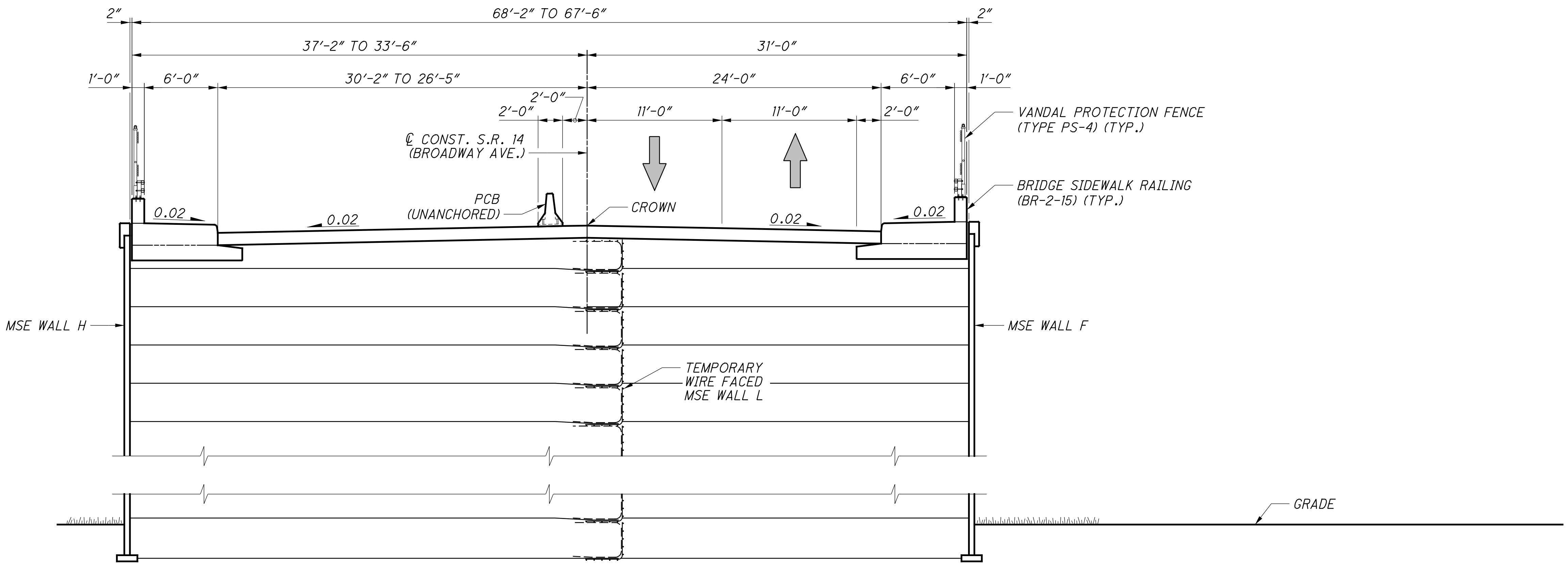
▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	DRAWN TMR	REVIEWED ZRD	DATE 6/20
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

PHASE CONSTRUCTION DETAILS - EAST APPROACH
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

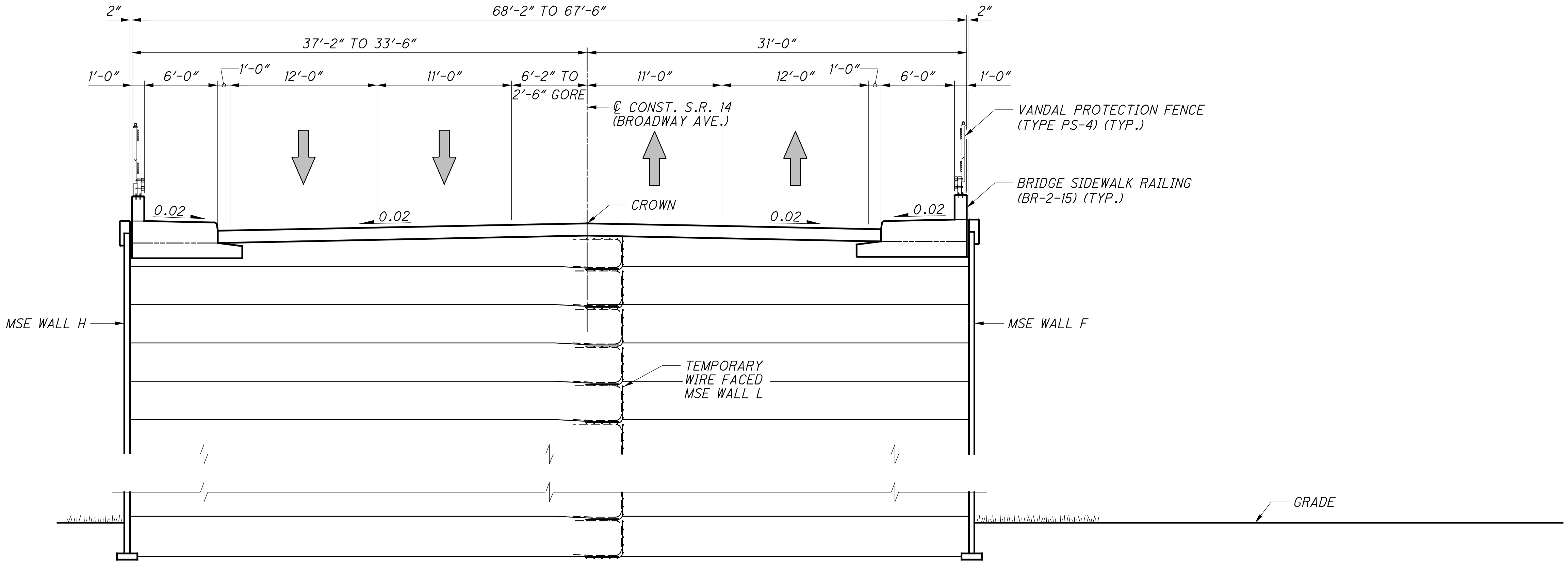
CUY-14-6.93
PID No. 104132



M.O.T.

PHASE 3

(STA. 81+70 TO STA. 82+82)



FINAL CONDITION

(STA. 81+70 TO STA. 82+82)

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

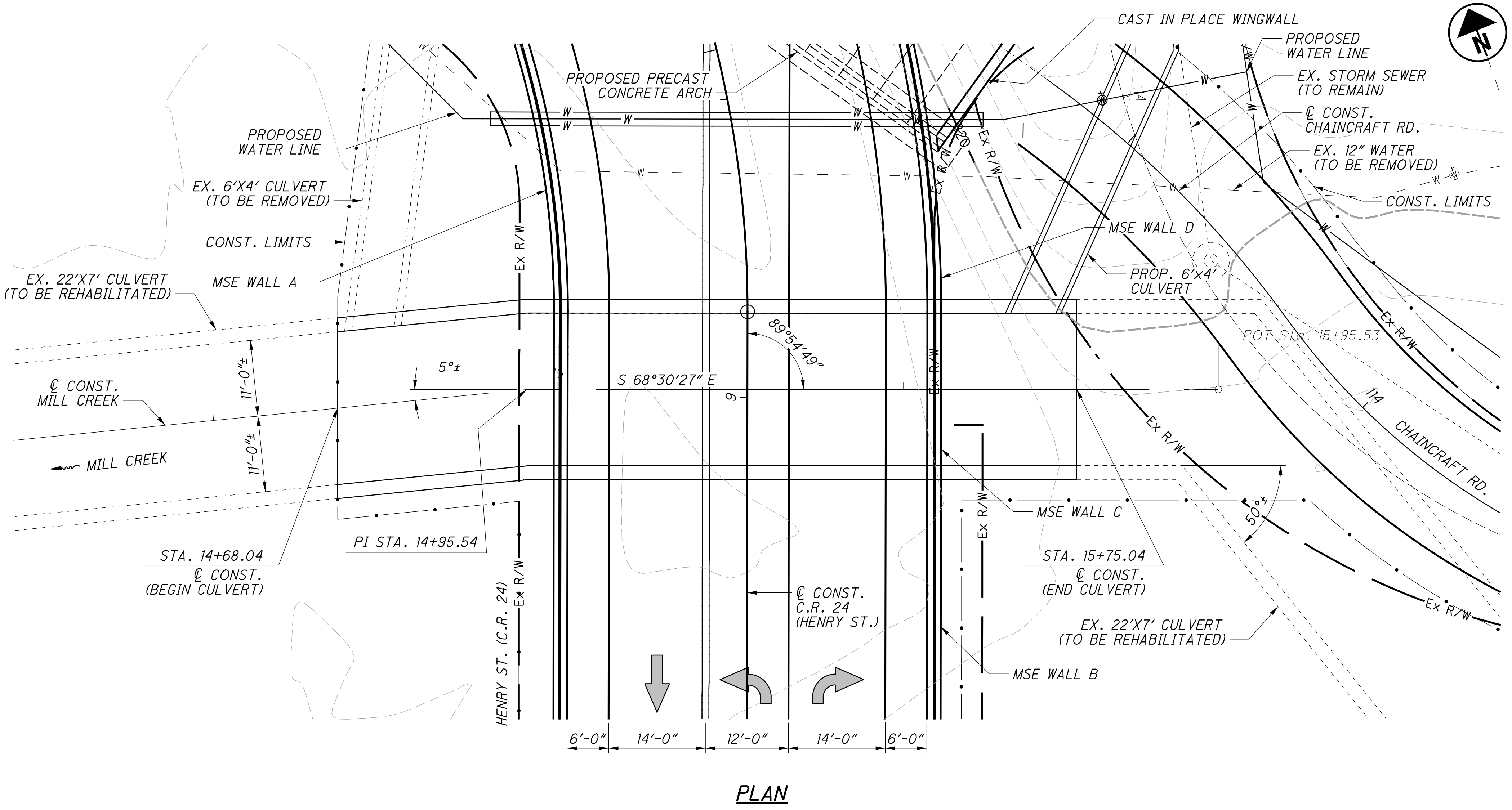
PHASE CONSTRUCTION DETAILS - EAST APPROACH

BRIDGE NO. CUY-14-0693

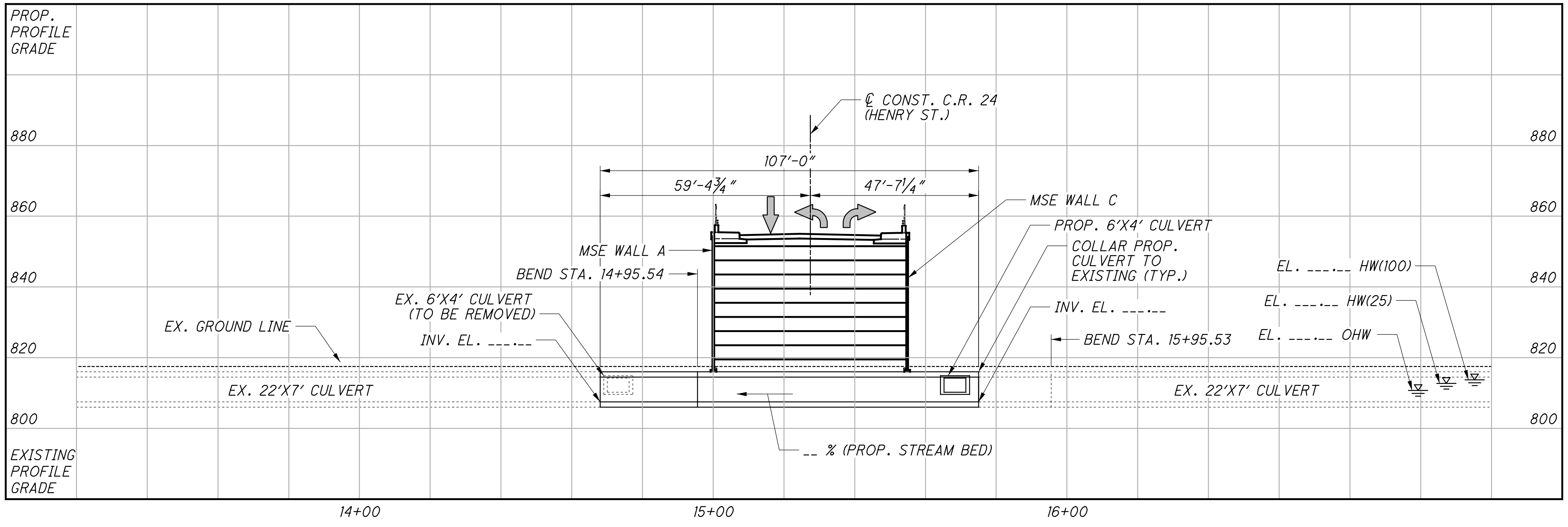
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93

PID No. 104132



PLAN



PROFILE ALONG ℄ CONST. C.R. 24 (HENRY ST.)

NOTES

EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.

DESIGN TRAFFIC:

2026 ADT = 7,000	2026 ADTT = 630
2046 ADT = 7,500	2046 ADTT = 675

DIRECTIONAL DISTRIBUTION = 0.54

LEGEND

⌖ BORING LOCATION

HYDRAULIC DATA

DRAINAGE AREA = __ SQ. MILES

Q (25) = ___ CFS	V (25) = ___ FPS
Q (100) = ___ CFS	V (100) = ___ FPS

THE 25 YEAR FLOOD WATER ELEVATION CLEARS THE LOW EDGE OF CULVERT BY __.__ FEET

NOTE TO REVIEWER:

CULVERT PROPOSED ELEVATIONS ARE TO BE DETERMINED, MORE DETAILED SURVEY REQ'D FOR REMOVAL LIMITS AND SLOPE RUN.

ORDINARY, 25 YEAR AND 100 YEAR HIGH WATER ELEVATIONS TO BE DETERMINED IN FINAL DESIGN.

EXISTING STRUCTURE

TYPE: 22'x7' CAST-IN-PLACE, 4 SIDED, REINFORCED, CONCRETE CULVERT.
SPANS: 22'-0"± CLEAR SPAN
ROADWAY: 46'-0"± F/F SAFETY CURB (5'± SIDEWALK)
LOADING: HS20-44 AND ALTERNATE MILITARY
SKEW: 0°0'0"
APPROACH SLABS: NONE
ALIGNMENT: TANGENT
CROWN: NONE
STRUCTURAL FILE NUMBER: 1834037
DATE BUILT: 1928
DISPOSITION: TO BE PARTIALLY REMOVED AND REPLACED

PROPOSED STRUCTURE

TYPE: 22'X7' PRECAST 4 SIDED BOX CULVERT
SPANS: 22'-0" CLEAR SPAN
ROADWAY: 40'-0" TOE/TOE CURB
LOADING: HL-93 W/ FUTURE WEARING SURFACE (FWS) 60 PSF
SKEW: 0°0'0"
APPROACH SLABS: NONE
ALIGNMENT: TANGENT
CROWN: 0.02 FT/FT
COORDINATES: LATITUDE N 41°81'51.06"
LONGITUDE W 81°36'02.99"

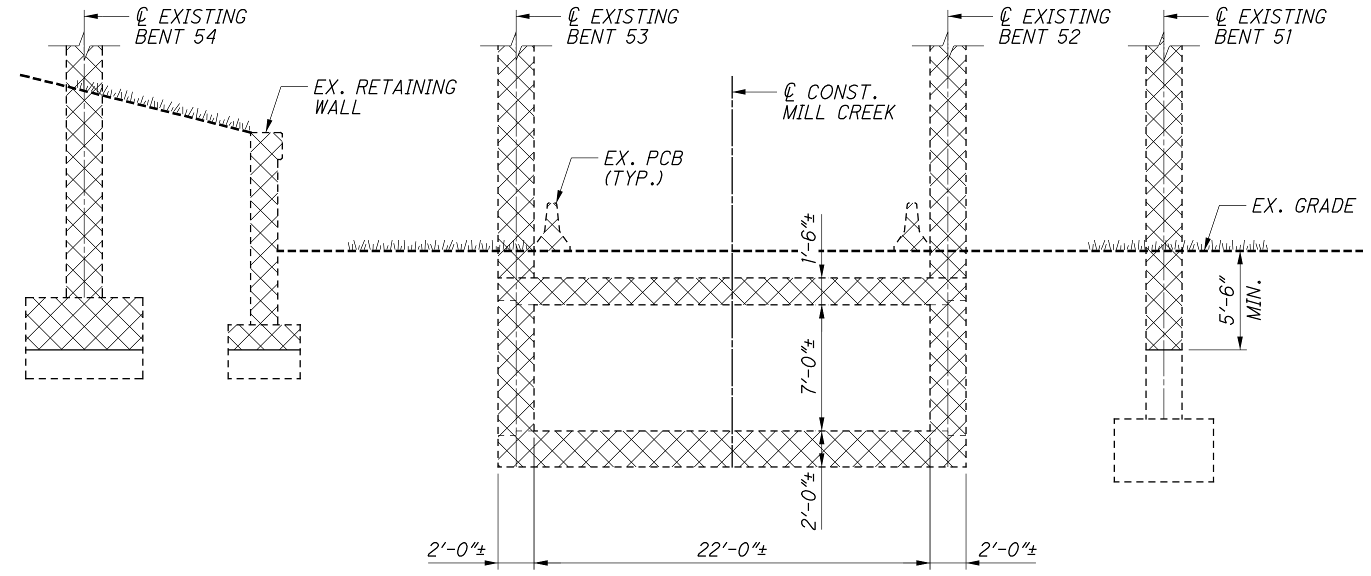
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
JDM	JDM	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		1834037	

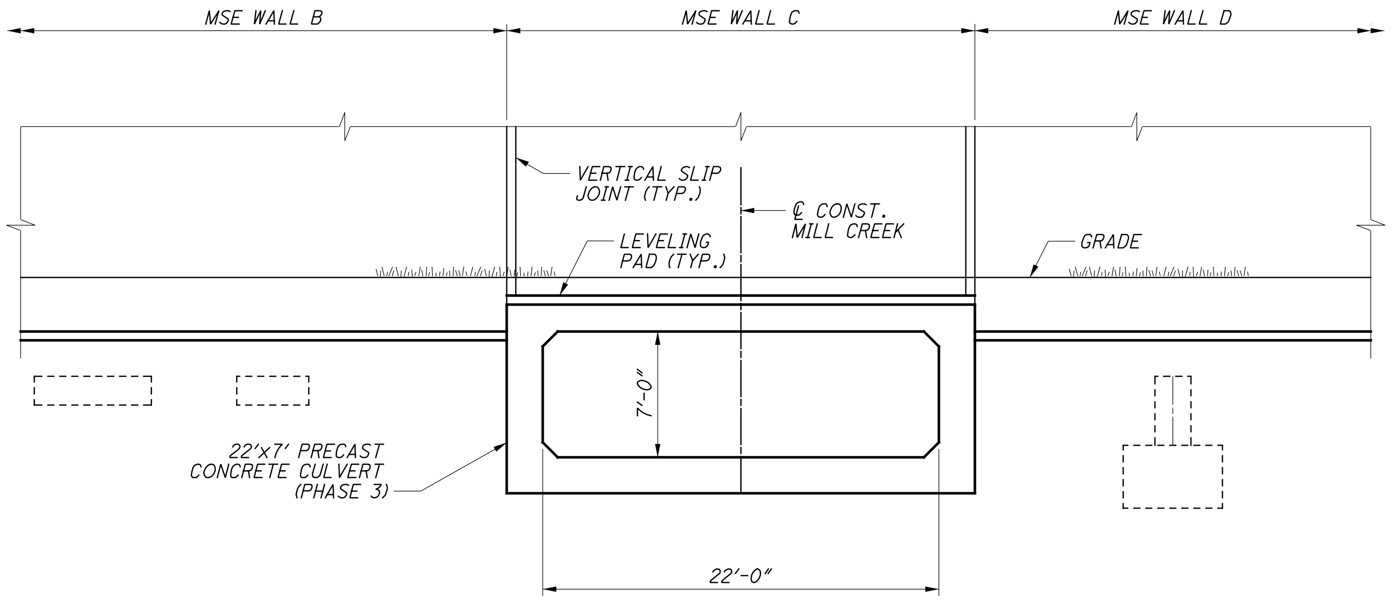
SITE PLAN

BRIDGE NO. CUY-CR24-0061
HENRY STREET (C.R. 24) OVER MILL CREEK

CUY-14-6.93
PID No. 104132



(A) EXISTING SECTION
62, 63



(A) PROPOSED SECTION
62, 63

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

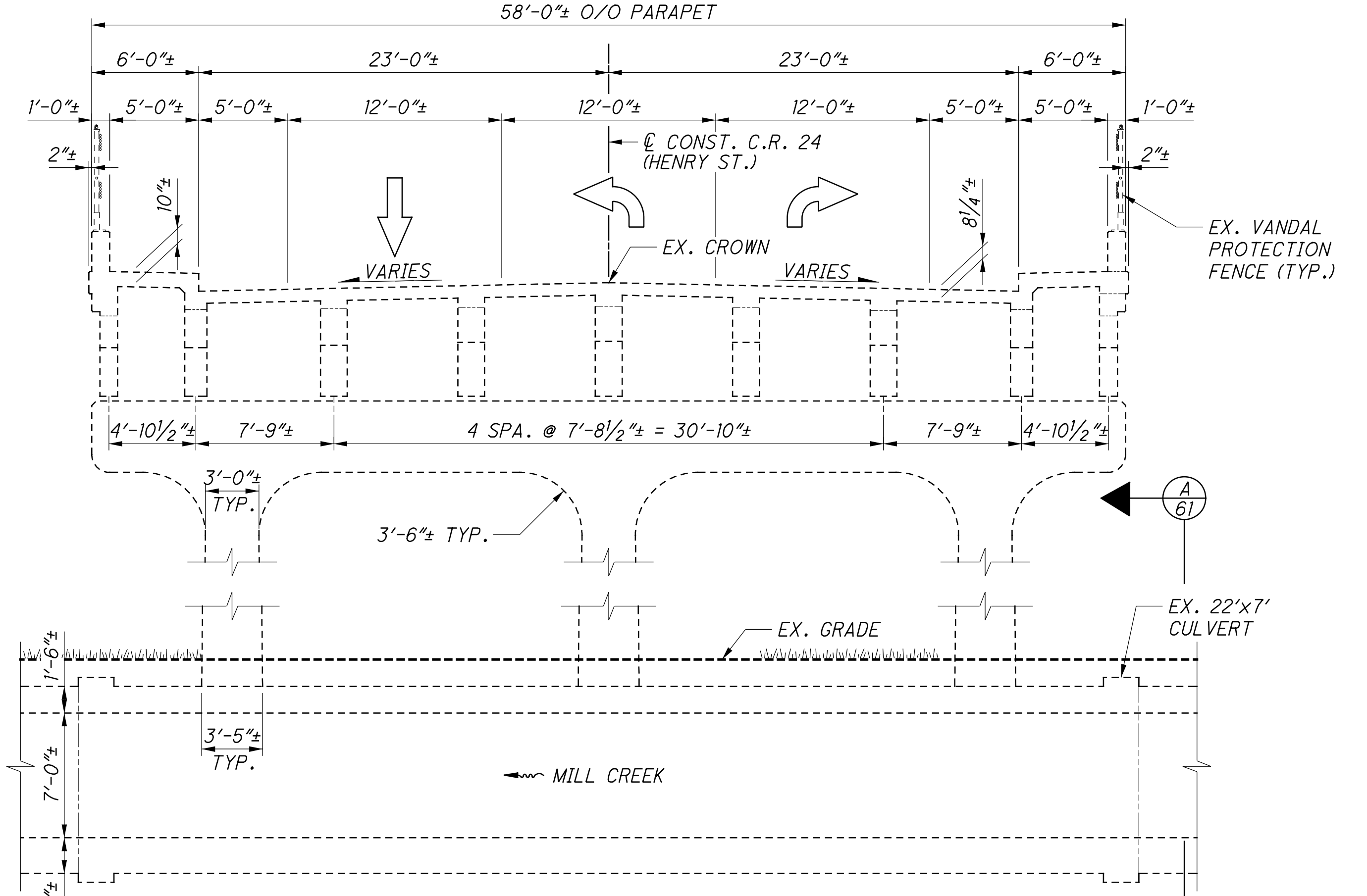
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED JDM	DRAWN TMR	REVIEWED ZRD	DATE 6/20
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER 1834037	

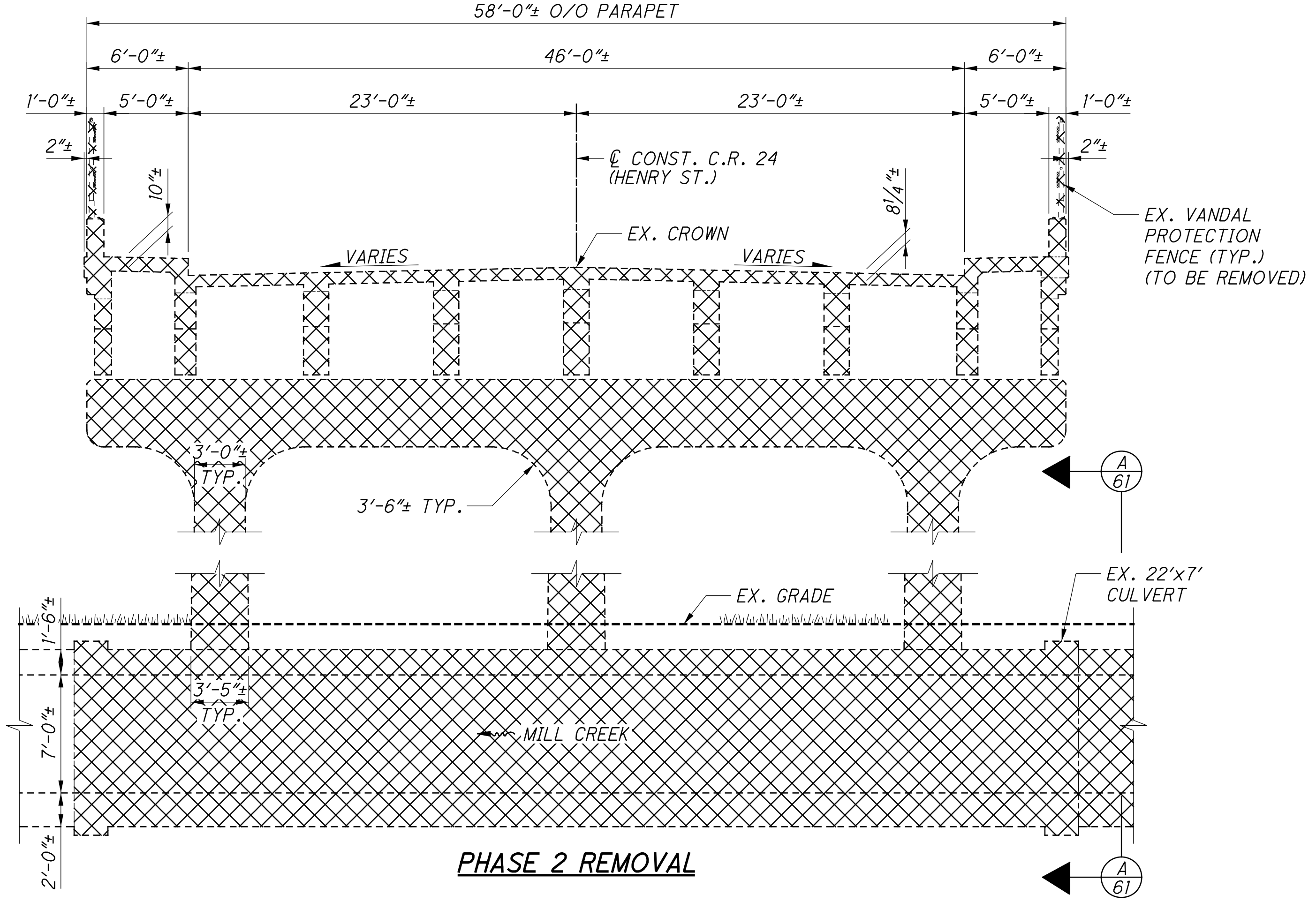
CULVERT DETAILS

BRIDGE NO. CUY-CR24-0061
HENRY STREET (C.R. 24) OVER MILL CREEK

CUY-14-6.93
PID No. 104132



EXISTING CONDITION AND PHASE 1 M.O.T.



PHASE 2 REMOVAL

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

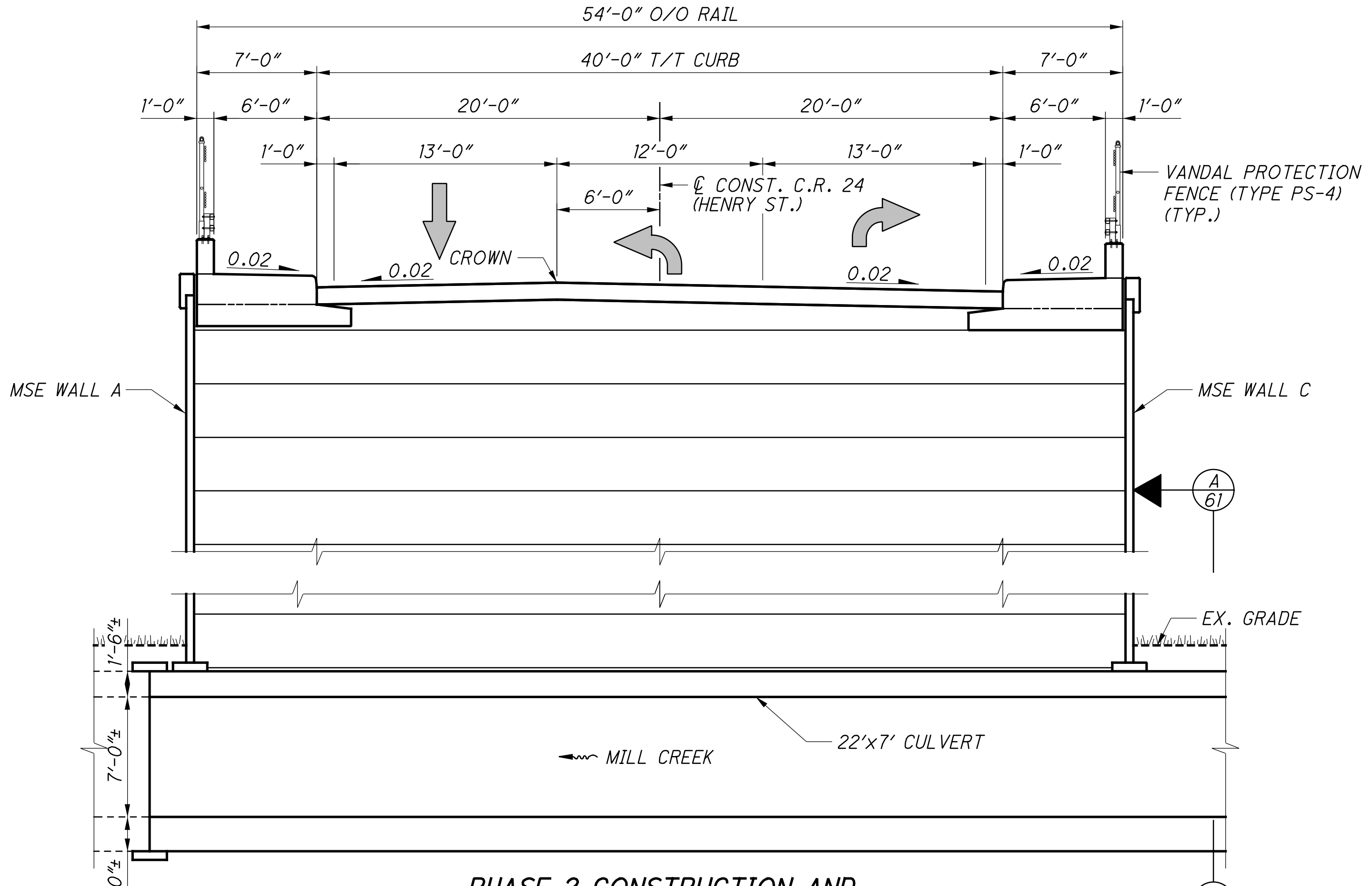
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		1834037	

PHASE CONSTRUCTION DETAILS
BRIDGE NO. CUY-CR24-0061
HENRY STREET (C.R. 24) OVER MILL CREEK

CUY-14-6.93
PID No. 104132

31/32



PHASE 2 CONSTRUCTION AND FINAL CONDITION

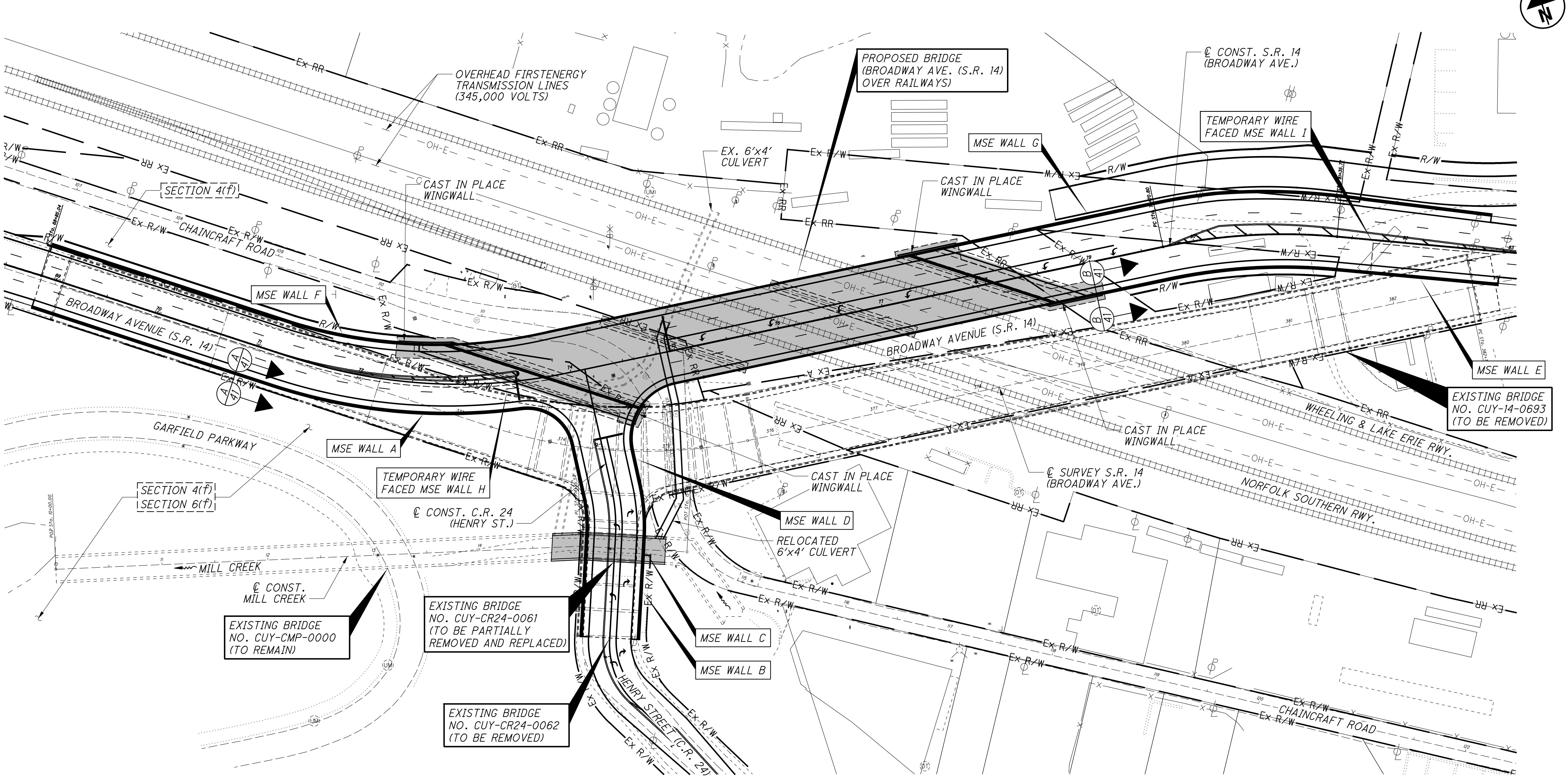
PHASE CONSTRUCTION DETAILS

BRIDGE NO. CUY-CR24-0061
HENRY STREET (C.R. 24) OVER MILL CREEK

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		1834037	

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

CUY-14-6.93
PID No. 104132



STRUCTURES WORK:

REMOVALS
  2 BRIDGES
  1 PARTIAL CULVERT

CONSTRUCTION
  1 PROPOSED BRIDGE
  0 PRECAST CONCRETE ARCH
  1 PARTIAL CULVERT
  7 PERMANENT MSE WALLS
  2 TEMPORARY WIRE FACED MSE WALLS
  0 TEMPORARY BRIDGE

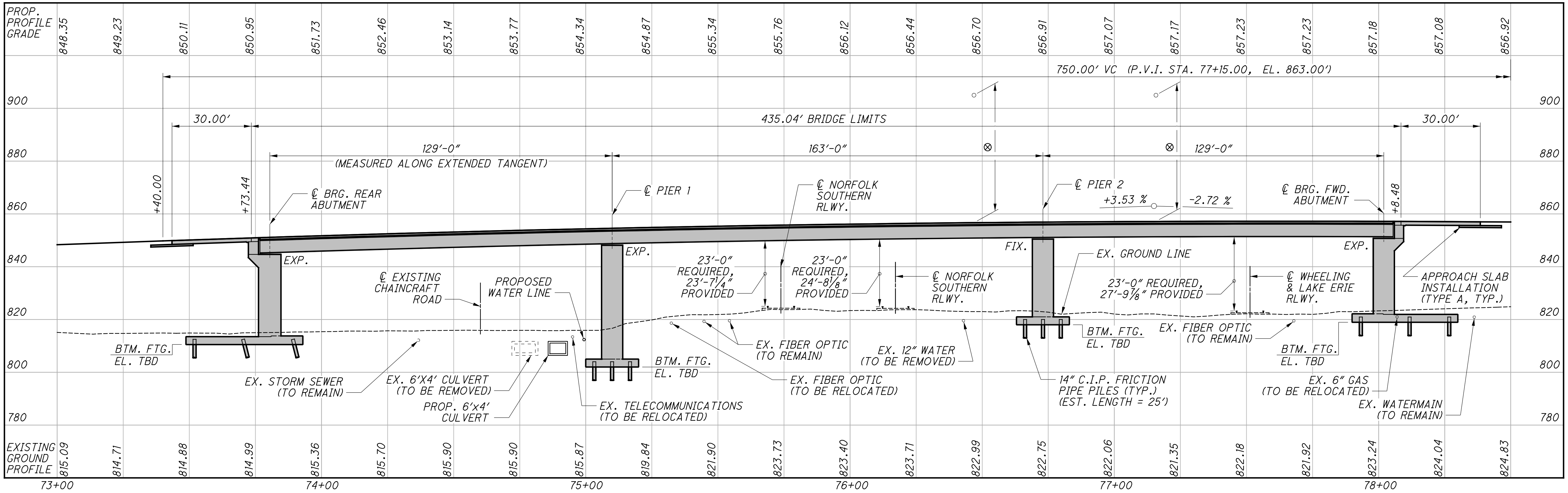
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		1081085/1834282	

ALTERNATIVE 2A - SCHEMATIC PLAN

BRIDGE NO. CUY-14-0693 AND CUY-CR24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132



PROFILE ALONG ℄ CONST. S.R. 14 (BROADWAY AVE.)

LEGEND

⊗ - OVERHEAD FIRSTENERGY TRANSMISSION LINES (345,000 VOLTS)
EX. VERTICAL CLR. = TBD
PROP. VERTICAL CLR. = TBD

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

REVIEWED	DATE
ZRD	6/20

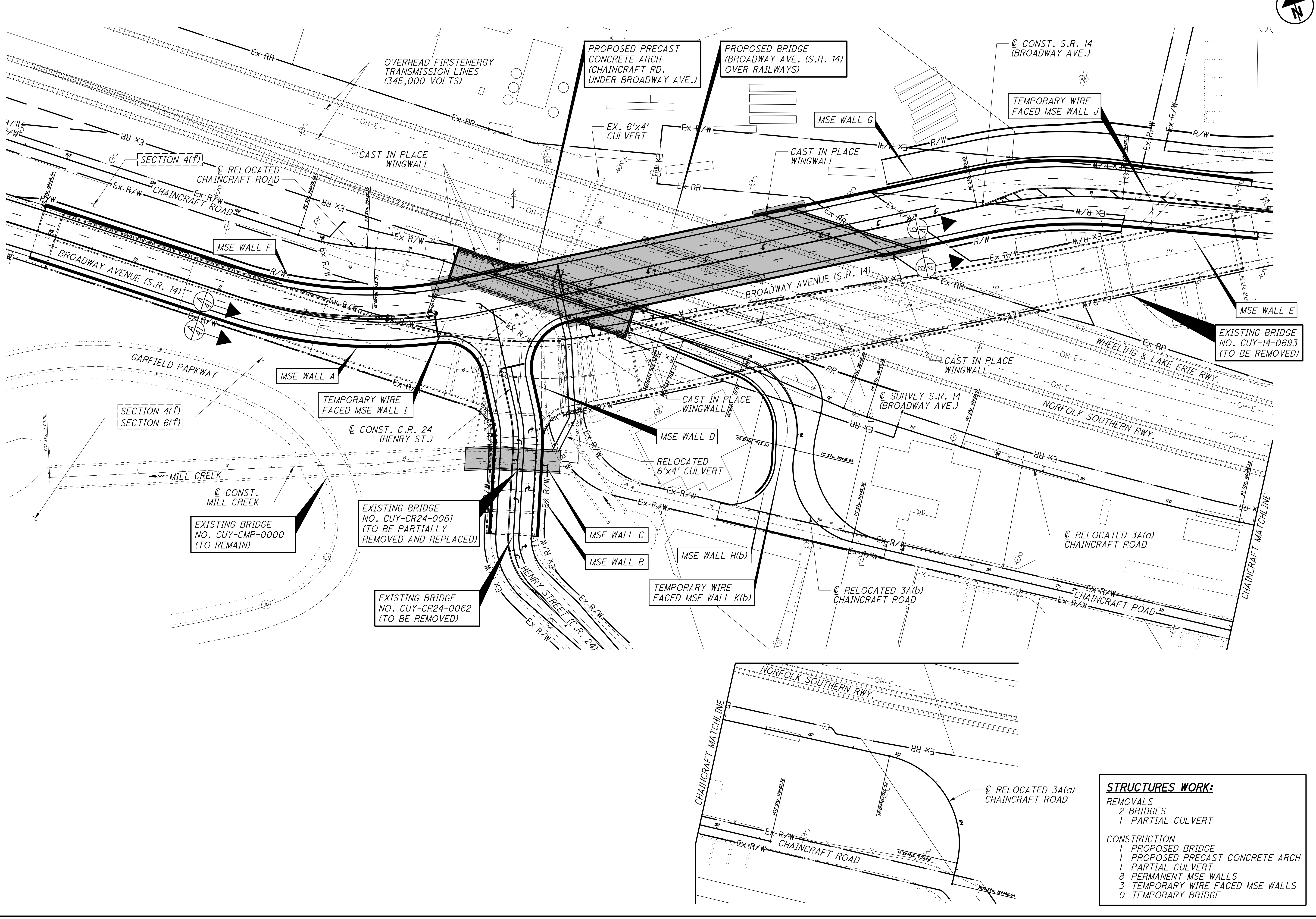
STRUCTURE FILE NUMBER TBD

DESIGNED	DRAWN	REVIEWED
TMR	TMR	

CHECKED	REVISED
MRW	

ALTERNATIVE 2A - PROFILE
BRIDGE NO. CUY-14-0693 AND CUY-CR24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132



STRUCTURES WORK:

REMOVALS
  2 BRIDGES
  1 PARTIAL CULVERT

CONSTRUCTION
  1 PROPOSED BRIDGE
  1 PROPOSED PRECAST CONCRETE ARCH
  1 PARTIAL CULVERT
  8 PERMANENT MSE WALLS
  3 TEMPORARY WIRE FACED MSE WALLS
  0 TEMPORARY BRIDGE

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		1081085/1834282	

ALTERNATIVE 3A - SCHEMATIC PLAN

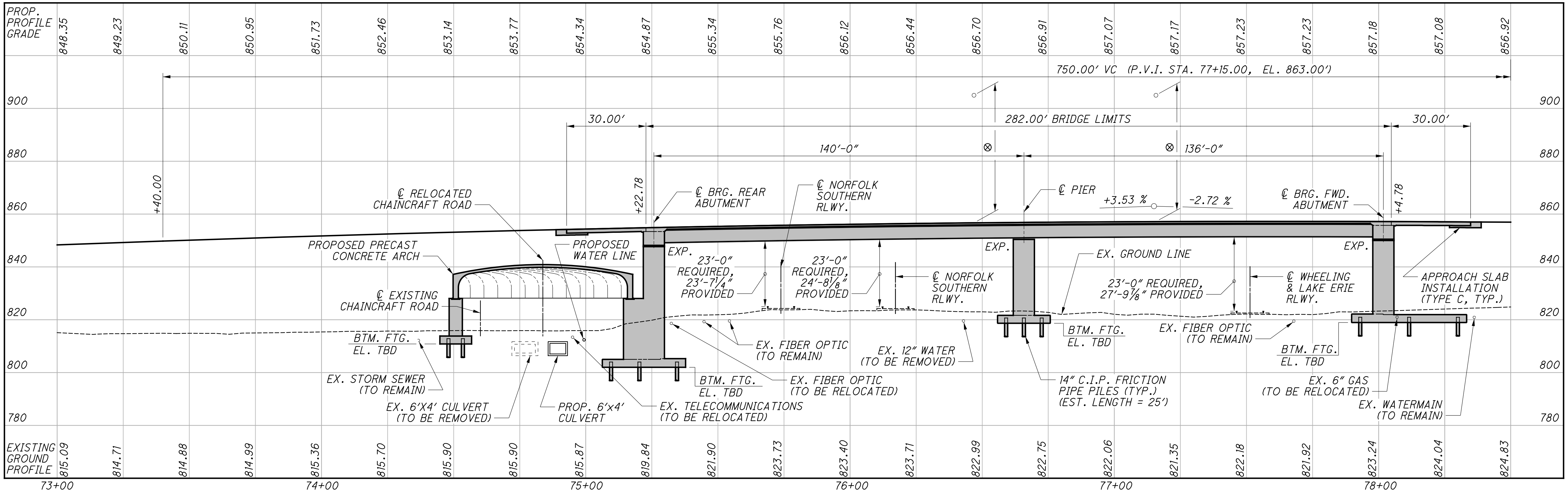
BRIDGE NO. CUY-14-0693 AND CUY-CR24-0062

BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93

PID No. 104132

1/2



PROFILE ALONG ℄ CONST. S.R. 14 (BROADWAY AVE.)

LEGEND

⊗ - OVERHEAD FIRSTENERGY TRANSMISSION LINES (345,000 VOLTS)
EX. VERTICAL CLR. = TBD
PROP. VERTICAL CLR. = TBD

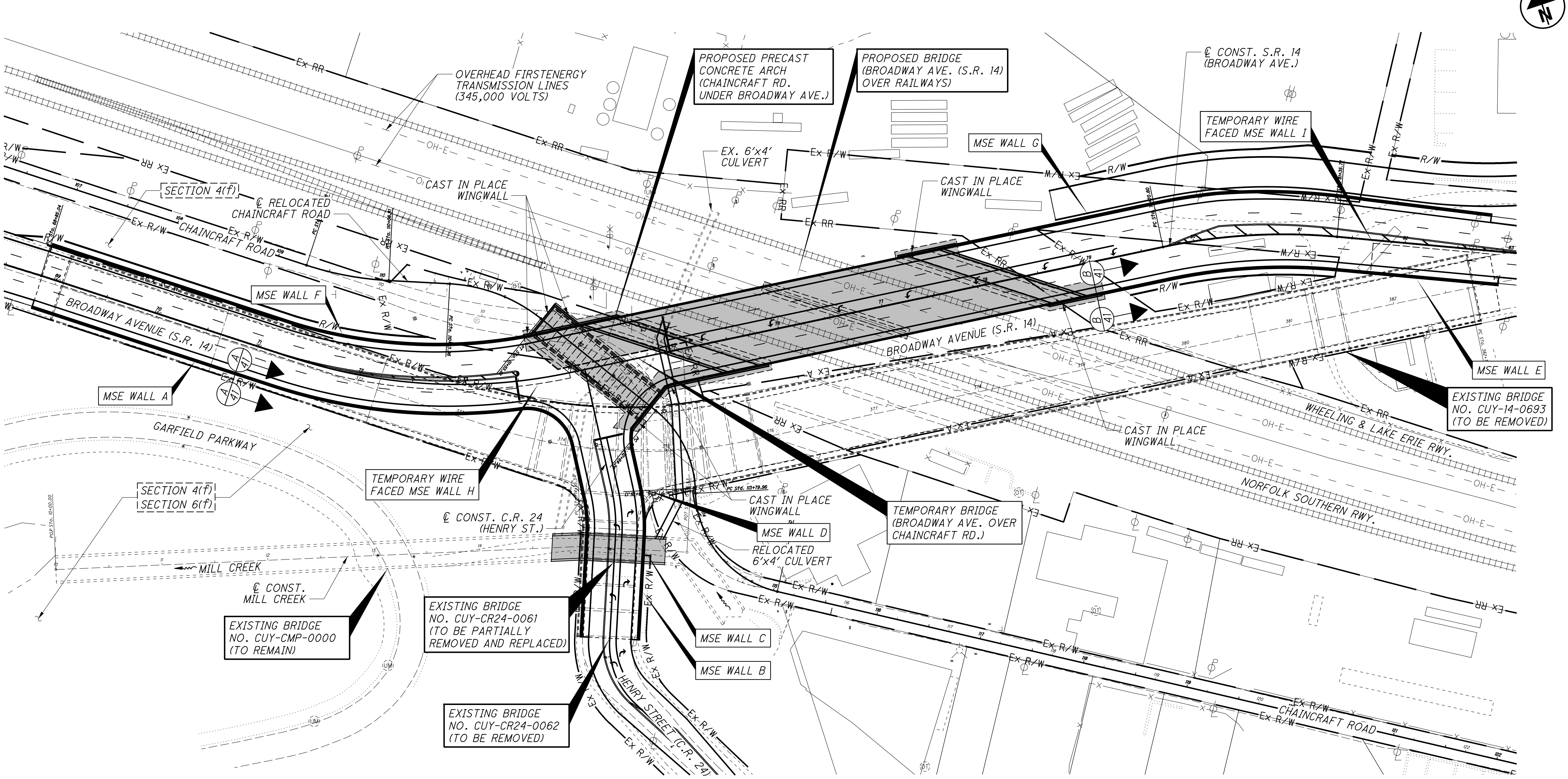
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

ALTERNATIVE 3A - PROFILE
BRIDGE NO. CUY-14-0693 AND CUY-CR24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132

2/2



STRUCTURES WORK:

REMOVALS
2 BRIDGES
1 PARTIAL CULVERT

CONSTRUCTION
1 PROPOSED BRIDGE
1 PROPOSED PRECAST CONCRETE ARCH
1 PARTIAL CULVERT
7 PERMANENT MSE WALLS
2 TEMPORARY WIRE FACED MSE WALLS
1 TEMPORARY BRIDGE

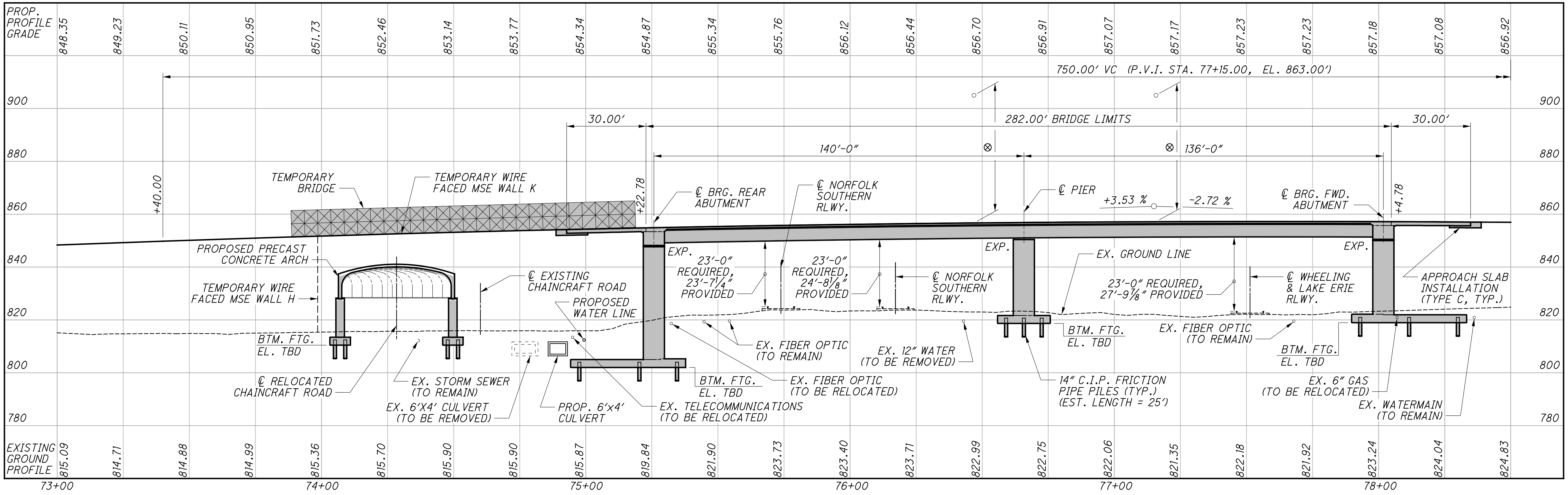
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		1081085/1834282	

ALTERNATIVE 3B - SCHEMATIC PLAN

BRIDGE NO. CUY-14-0693 AND CUY-CR24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132



PROFILE ALONG ℄ CONST. S.R. 14 (BROADWAY AVE.)

LEGEND

⊗ - OVERHEAD FIRSTENERGY TRANSMISSION LINES (345,000 VOLTS)
EX. VERTICAL CLR. = TBD
PROP. VERTICAL CLR. = TBD

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	ZRD	6/20
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

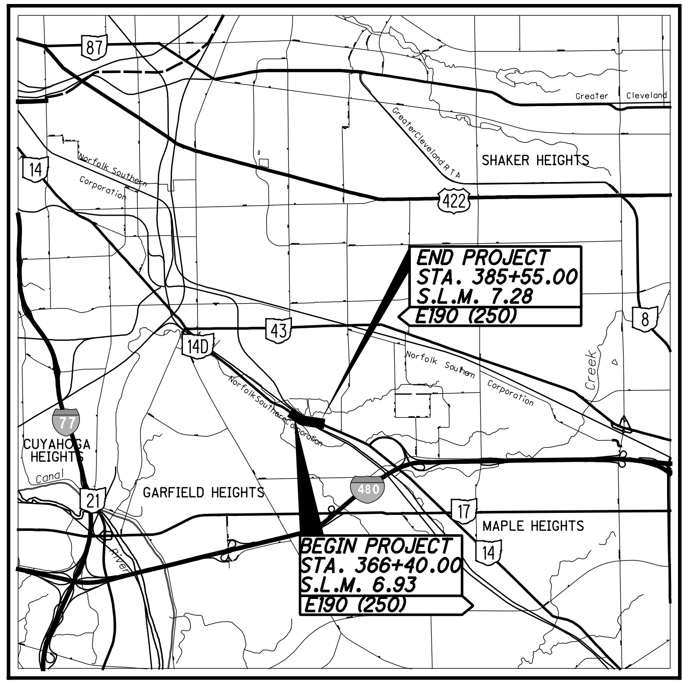
ALTERNATIVE 3B - PROFILE

BRIDGE NO. CUY-14-0693 AND CUY-CR24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132

2/2

Appendix GG



LOCATION MAP

LATITUDE: N41°25'55" LONGITUDE: W81°36'08"

SCALE IN MILES

0 1 2 3 4

N

PORTION TO BE IMPROVED

INTERSTATE HIGHWAY

FEDERAL ROUTES

STATE ROUTES

COUNTY & TOWNSHIP ROADS

OTHER ROADS

STATE OF OHIO

DEPARTMENT OF TRANSPORTATION

CUY-14-06.93

RECONSTRUCTION OF EXISTING SEPARATED CROSSING WITH THE NORFOLK SOUTHERN AND THE WHEELING & LAKE ERIE RAILWAYS

CITY OF GARFIELD HEIGHTS
CUYAHOGA COUNTY

INDEX OF SHEETS:

PROJECT DESCRIPTION

EARTH DISTURBED AREAS

PROJECT EARTH DISTURBED AREA: ACRES

ESTIMATED CONTRACTOR EARTH DISTURBED AREA: ACRES

NOTICE OF INTENT EARTH DISTURBED AREA: ACRES

LIMITED ACCESS

THIS IMPROVEMENT IS ESPECIALLY DESIGNED FOR THROUGH TRAFFIC AND HAS BEEN DECLARED A LIMITED ACCESS HIGHWAY OR FREEWAY BY ACTION OF THE DIRECTOR IN ACCORDANCE WITH THE PROVISIONS OF SECTION 5511.02 OF THE OHIO REVISED CODE.

2019 SPECIFICATIONS

THE STANDARD SPECIFICATIONS OF THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, INCLUDING SUPPLEMENTAL SPECIFICATIONS LISTED IN THE PLANS AND CHANGES LISTED IN THE PROPOSAL SHALL GOVERN THIS IMPROVEMENT.

ALTERNATIVE EVALUATION REPORT
6/21/19

DESIGN DESIGNATION (*CERTIFIED TRAFFIC HAS NOT BEEN PROVIDED)

ROUTE	ADT (2018)	ADTT (2018)	ADT (2048)	ADTT (2048)	D	DESIGN SPEED	LEGAL SPEED	DESIGN FUNC. CLASS.	NHS ROUTE?
S.R. 14 (BROADWAY AVE)	20222*	687*	20222*	687*	0.60*	35	35	URBAN PRINCIPAL ARTERIAL	Y
C.R. 24 (HENRY STREET)	6641*	66*	6641*	66*	0.53*	25	25	LOCAL ROAD	N
CHAINCRAFT						25		LOCAL ROAD	N

DESIGN EXCEPTIONS

UNDERGROUND UTILITIES

Contact Two Working Days Before You Dig

OHIO811.org
Before You Dig

OHIO811, 8-1-1, or 1-800-362-2764
(Non-members must be called directly)

PLAN PREPARED BY:
AECOM
1300 E. 9th STREET, SUITE 500 CLEVELAND, OHIO 44114
(216) 622-2300

ENGINEERS SEAL:

SIGNED:
DATE:

ENGINEERS SEAL:

SIGNED:
DATE:

STANDARD CONSTRUCTION DRAWINGS					SUPPLEMENTAL SPECIFICATIONS	SPECIAL PROVISIONS

I HEREBY APPROVE THESE PLANS AND DECLARE THAT THE MAKING OF THIS IMPROVEMENT WILL NOT REQUIRE THE CLOSING TO TRAFFIC OF THE HIGHWAY EXCEPT FOR THE SIDE ROADS AS DESCRIBED ON SHEETS AND THAT PROVISIONS FOR THE MAINTENANCE AND SAFETY OF TRAFFIC WILL BE AS SET FORTH ON THE PLANS AND ESTIMATES.

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

APPROVED
DATE DISTRICT DEPUTY DIRECTOR

APPROVED
DATE DIRECTOR, DEPARTMENT OF TRANSPORTATION

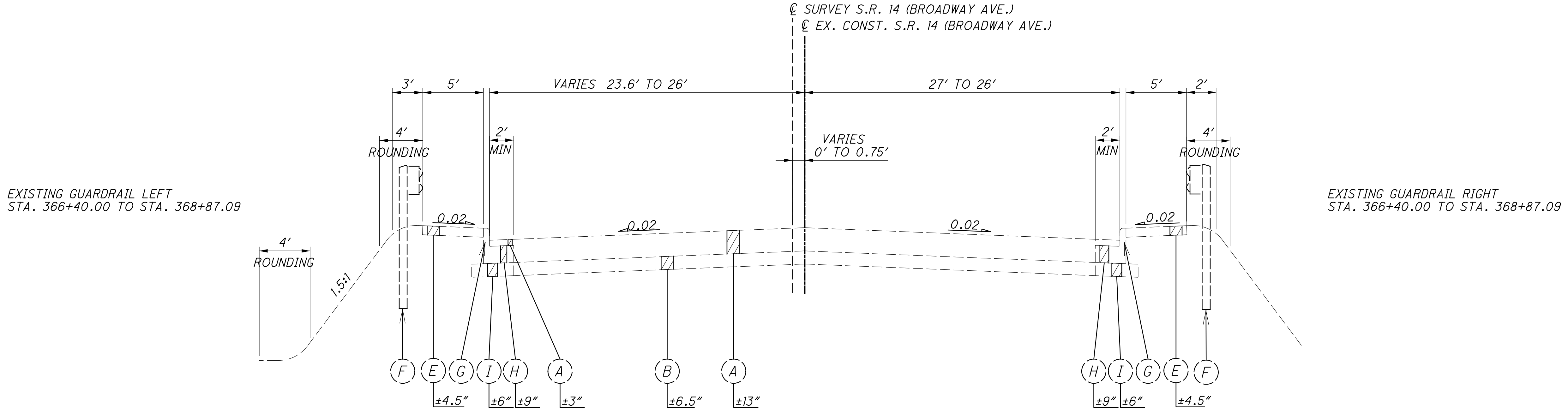
FEDERAL PROJECT NO.
E190250

PID NO.
104132

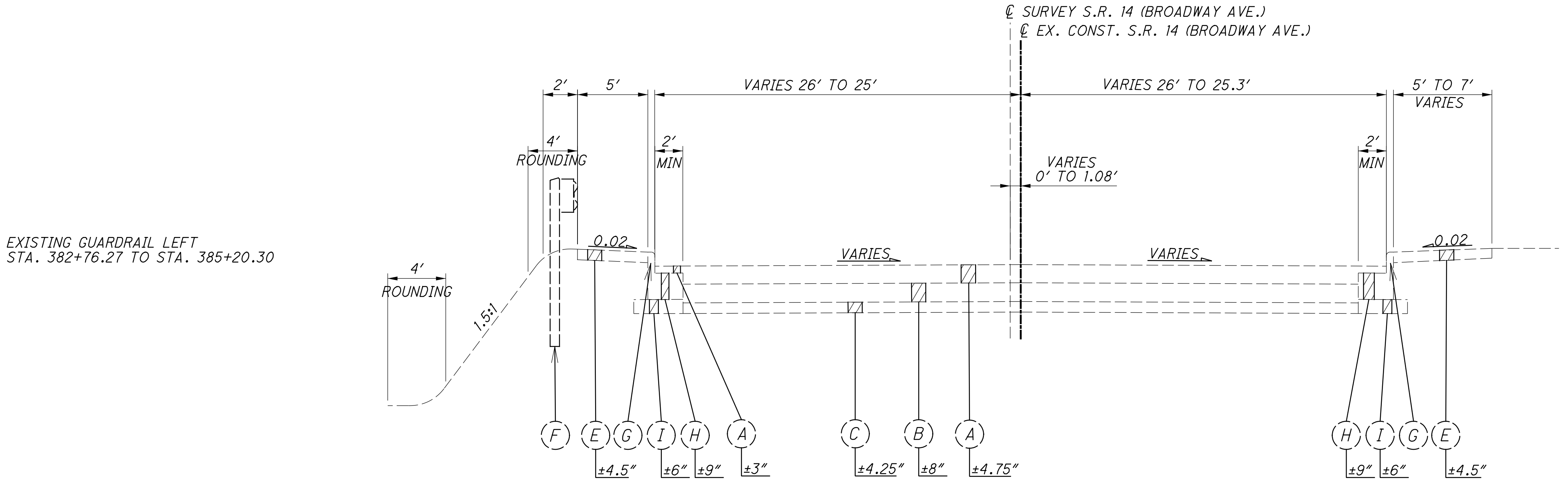
CONSTRUCTION PROJECT NO.

RAILROAD INVOLVEMENT
NORFOLK SOUTHERN
WHEELING & LAKE ERIE

CUY-14-06.93



EXISTING NORMAL SECTION - S.R. 14 (BROADWAY AVE.)
STA. 366+40.00 TO STA. 368+87.09 = 247.09′
(EX. BRIDGE BEGINS STA. 368+87.09)
TOTAL LENGTH = 247.09′



EXISTING SUPERELEVATED SECTION - S.R. 14 (BROADWAY AVE.)
STA. 382+76.27 TO STA. 385+20.30 = 244.03′
(EX. BRIDGE ENDS STA. 382+76.27)
TOTAL LENGTH = 244.03′

EXISTING LEGEND

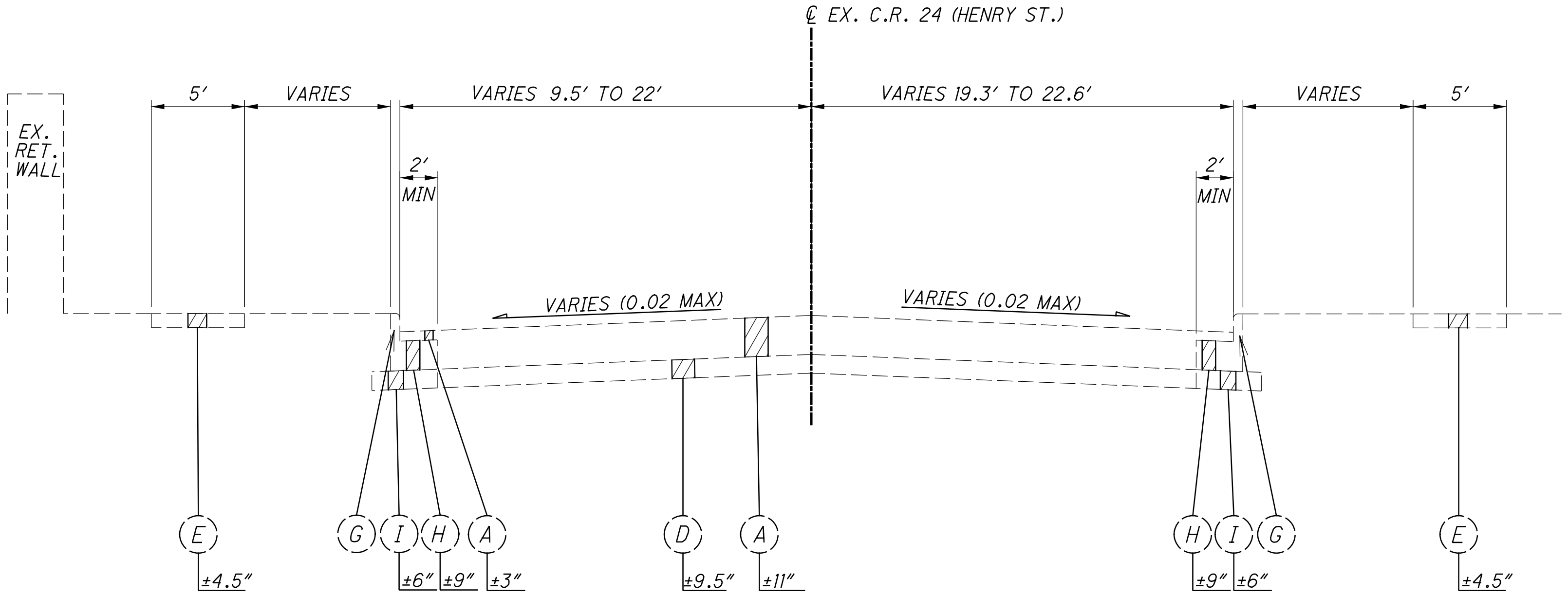
Ⓐ ASPHALT
Ⓑ CONCRETE
Ⓒ SLAG
Ⓓ SAND & SLAG
Ⓔ CONCRETE WALK
Ⓕ GUARDRAIL, TYPE 5
Ⓖ CURB, TYPE 2-B
Ⓗ REINFORCED CONCRETE
Ⓘ SUBBASE
Ⓙ STABILIZED CRUSHED AGGREGATE

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

TYPICAL SECTIONS

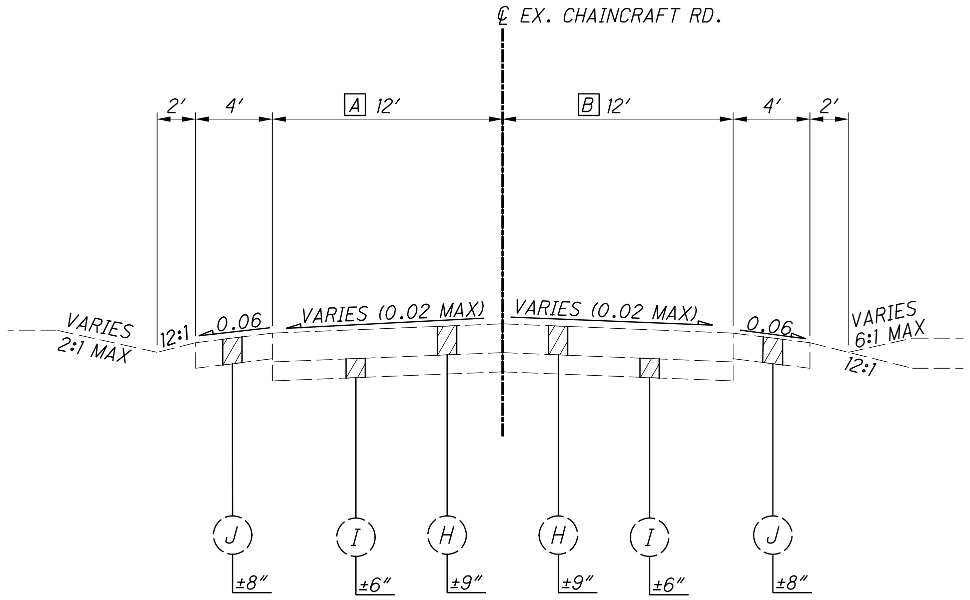
CUY-14-06.93

NOTES:
1. FOR EXISTING LEGEND, SEE SHEET 2



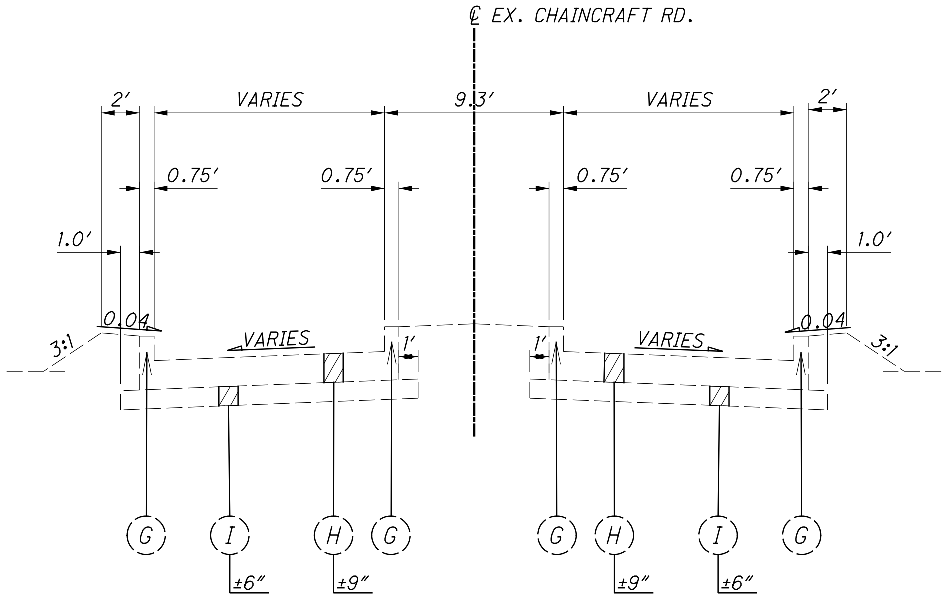
C.R. 24 (HENRY ST.)

STA. 5+83.00 TO STA. 8+03.44 = 220.44′
TOTAL LENGTH = 220.44′



CHAINCRAFT RD.

STATION RANGE	A	B	LENGTH
100+00.00 TO 102+22.51	18.8′-15.5′		222.51′
102+22.51 TO 104+86.18	15.5′-9.2′	24.8′-11.4′	263.67′
104+86.18 TO 107+30.92	9.2′-8.8′	11.4′-13.3′	244.74′
107+30.92 TO 111+17.46	8.8′-11.8′	13.3′-12.8′	386.54′
TOTAL LENGTH =1117.46′			



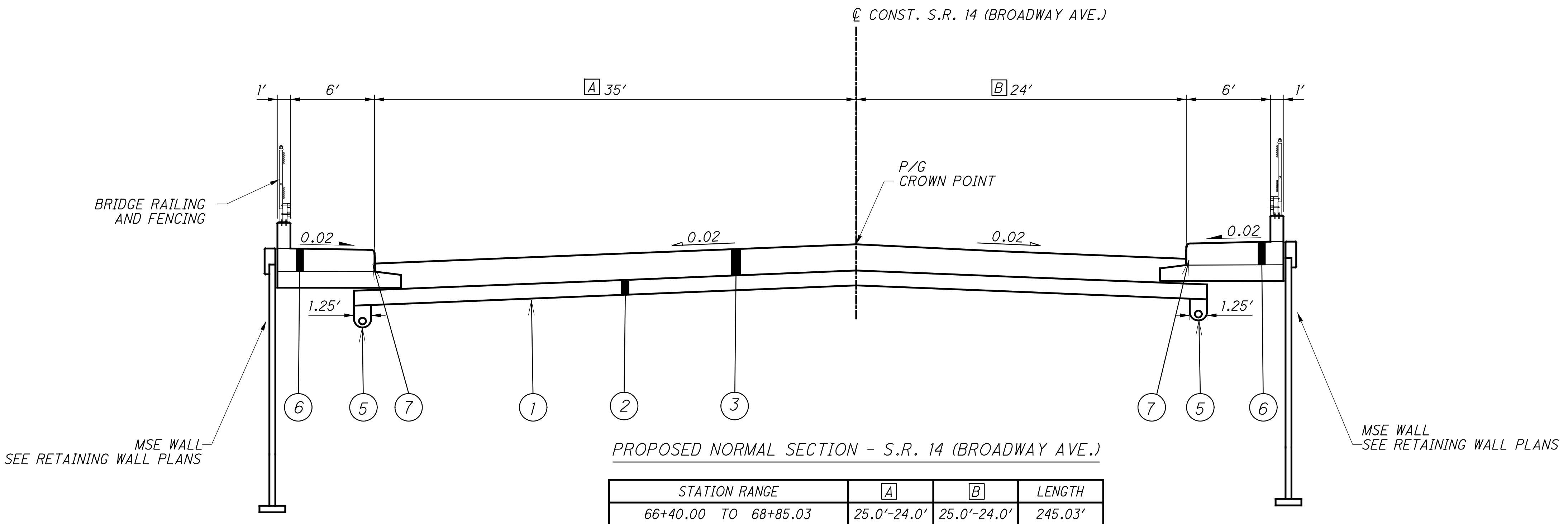
CHAINCRAFT RD.

STA. 111+17.46 TO STA. 115+11.08 = 393.62′
TOTAL LENGTH = 393.62′

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

TYPICAL SECTIONS

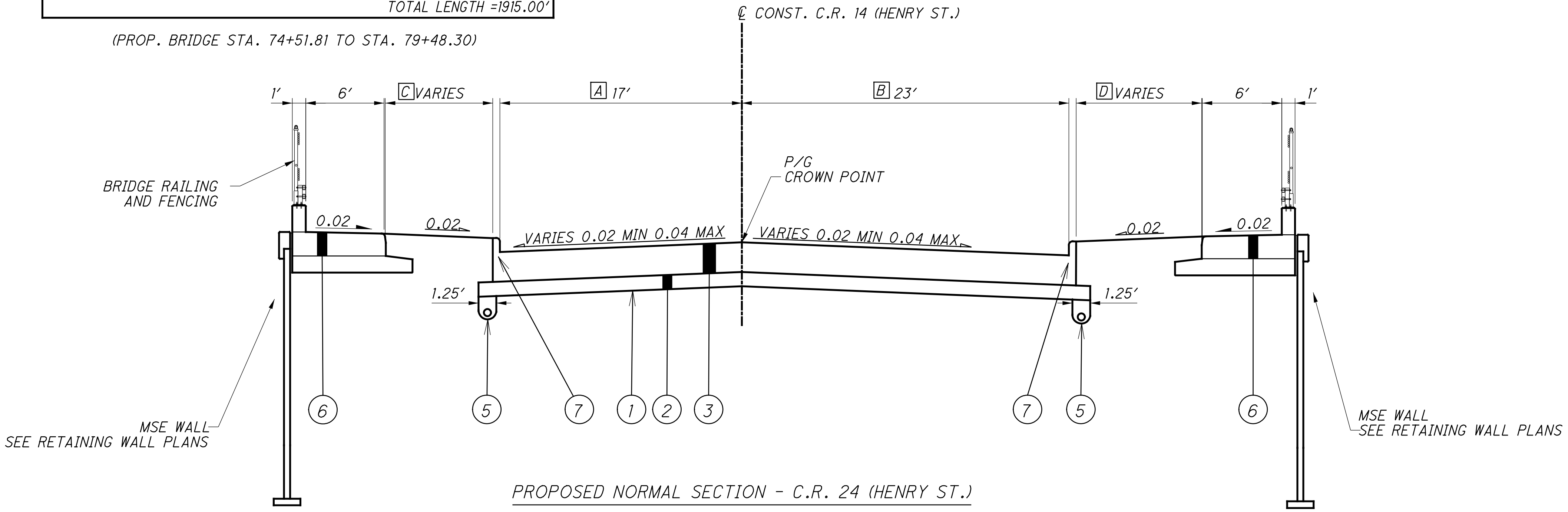
CUY-14-06.93



PROPOSED NORMAL SECTION - S.R. 14 (BROADWAY AVE.)

STATION RANGE	A	B	LENGTH
66+40.00 TO 68+85.03	25.0′-24.0′	25.0′-24.0′	245.03′
68+85.03 TO 71+25.00	24.0′	24.0′	239.97′
71+25.00 TO 73+50.00	24.0′-35.0′	24.0′	225.00′
73+50.00 TO 81+20.00	35.0′	24.0′	770.00′
81+20.00 TO 84+44.58 BK	35.0′-24.0′	24.0′	333.80′
384+53.80 AH TO 385+55.00	24.0′	24.0′	101.20′
TOTAL LENGTH =1915.00′			

(PROP. BRIDGE STA. 74+51.81 TO STA. 79+48.30)



PROPOSED NORMAL SECTION - C.R. 24 (HENRY ST.)

STATION RANGE	A	B	C	D	LENGTH
5+83.00 TO 6+57.42	9.5′-12.7′	10.7′-18.0′	0.0′	0.0′	74.42′
6+57.42 TO 6+83.01	12.7′-13.8′	18.0′-20.5′	0.0′	4.4′-0.0′	25.59′
6+83.01 TO 6+92.63	13.8′-14.2′	20.5′-21.5′	0.0′	0.0′	9.62′
6+92.63 TO 7+08.00	14.2′-14.9′	21.5′-23.0′	6.4′-4.8′	0.0′	15.37′
7+08.00 TO 7+34.52	14.9′-16.0′	23.0′	4.8′-0.0′	0.0′	26.52′
7+34.52 TO 7+58.15	16.0′-17.0′	23.0′	0.0′	0.0′	23.63′
7+58.15 TO 10+11.83	17.0′	23.0′	0.0′	0.0′	253.68′
TOTAL LENGTH =428.83′					

PROPOSED LEGEND

① ITEM 204 - SUBGRADE COMPACTION
② ITEM 304 - AGGREGATE BASE (T=6″)
③ PROPOSED PAVEMENT (PVMT TYPE TBD)
④ ITEM 526 - REINFORCED CONCRETE APPROACH SLABS (T=12″ REAR, T=17″ FWD)
⑤ ITEM 605 - 6″ BASE PIPE UNDERDRAIN
⑥ ITEM 608 - CONCRETE WALK
⑦ ITEM 609 - CURB (PENDING PVMT TYPE)

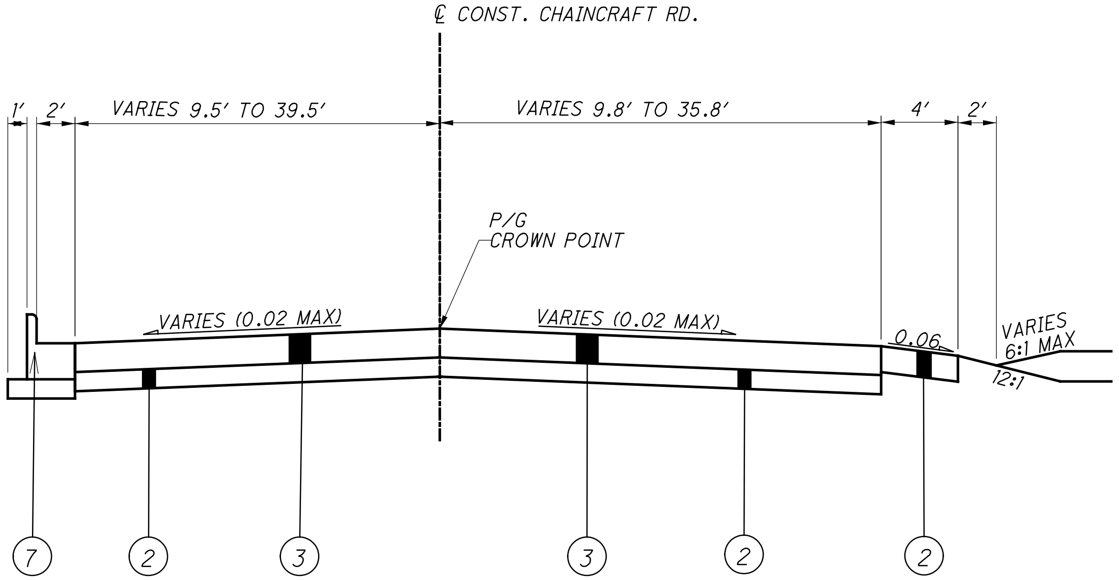
PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

TYPICAL SECTIONS

CUY-14-06.93

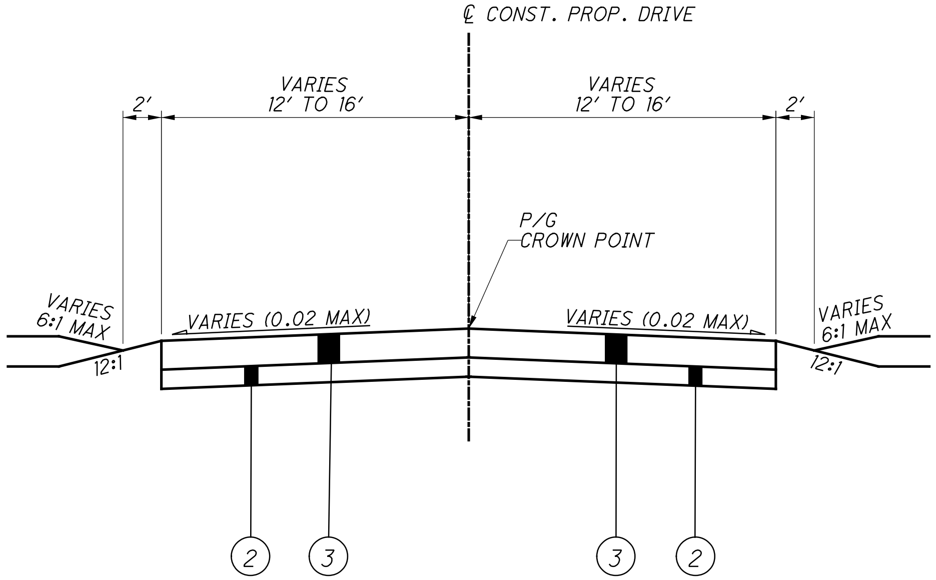
NOTES:

1. FOR PROPOSED LEGEND, SEE SHEET 4



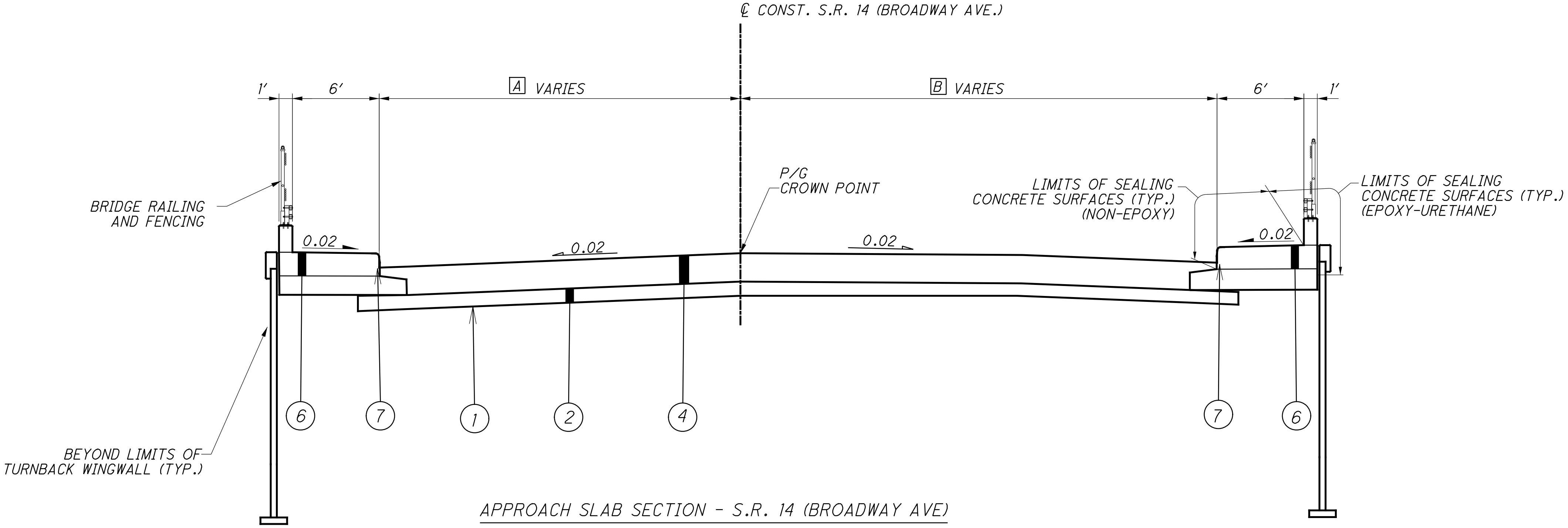
PROPOSED NORMAL SECTION - CHAINCRAFT RD.

STA. 111+17.46 TO STA. 115+11.08 = 393.62'
TOTAL LENGTH = 393.62'



PROPOSED NORMAL SECTION - PROP. DRIVE

STA. 79+75.37 TO STA. 83+10.70 = 335.33'
TOTAL LENGTH = 335.33'



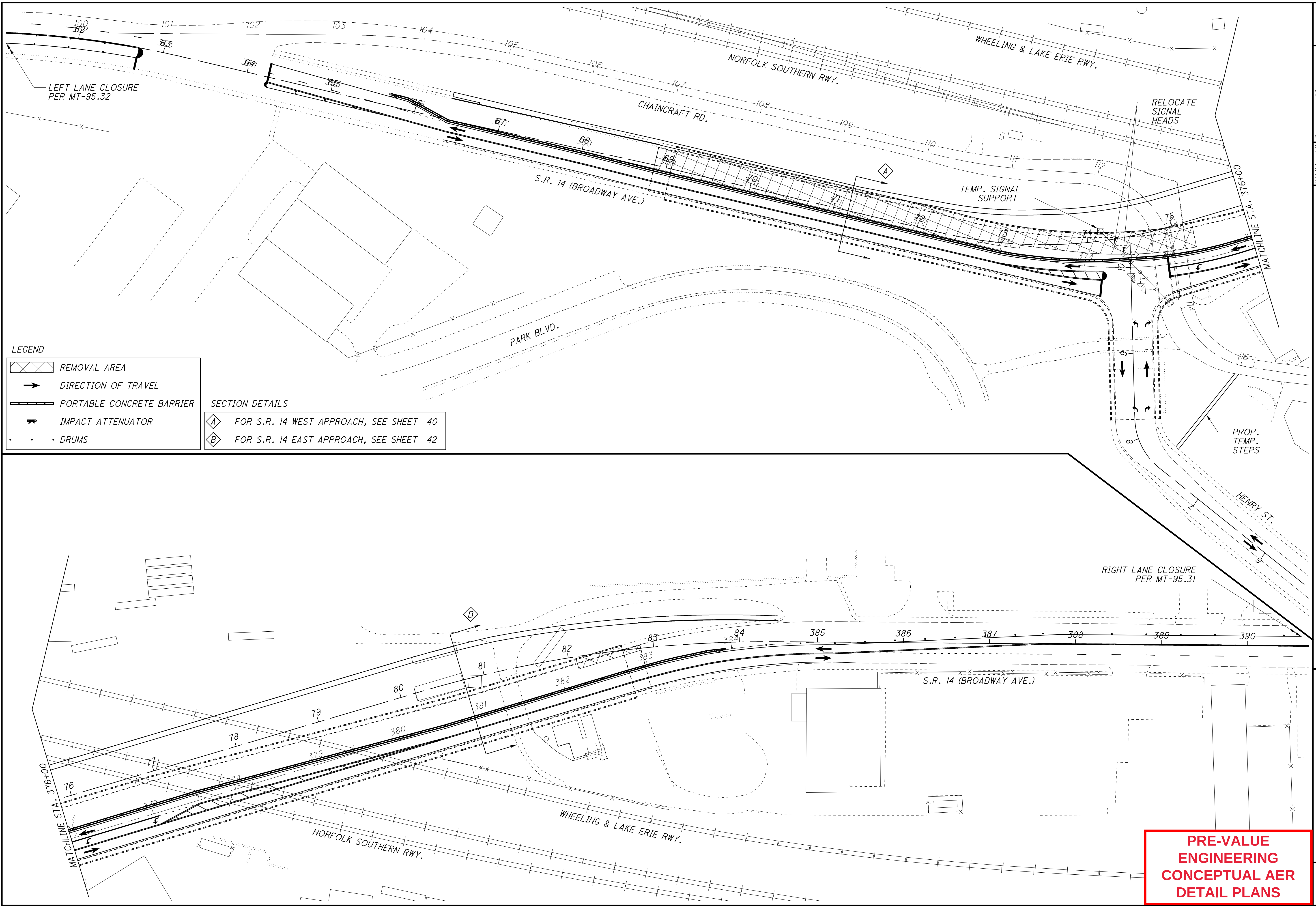
APPROACH SLAB SECTION - S.R. 14 (BROADWAY AVE)

STATION RANGE	A	B	LENGTH
74+36.81 TO 74+51.81	41.0'	78.7'-54.2'	15.00'
79+48.30 TO 79+63.30	41.0'	30.0'	15.00'

TYPICAL SECTIONS

CUY-14-06.93

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS



LEGEND

▨	REMOVAL AREA
→	DIRECTION OF TRAVEL
═	PORTABLE CONCRETE BARRIER
▬	IMPACT ATTENUATOR
· · ·	DRUMS

SECTION DETAILS

◇A FOR S.R. 14 WEST APPROACH, SEE SHEET 40

◇B FOR S.R. 14 EAST APPROACH, SEE SHEET 42

0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PHASE 1 REMOVAL PLAN

CUY-14-6.93

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

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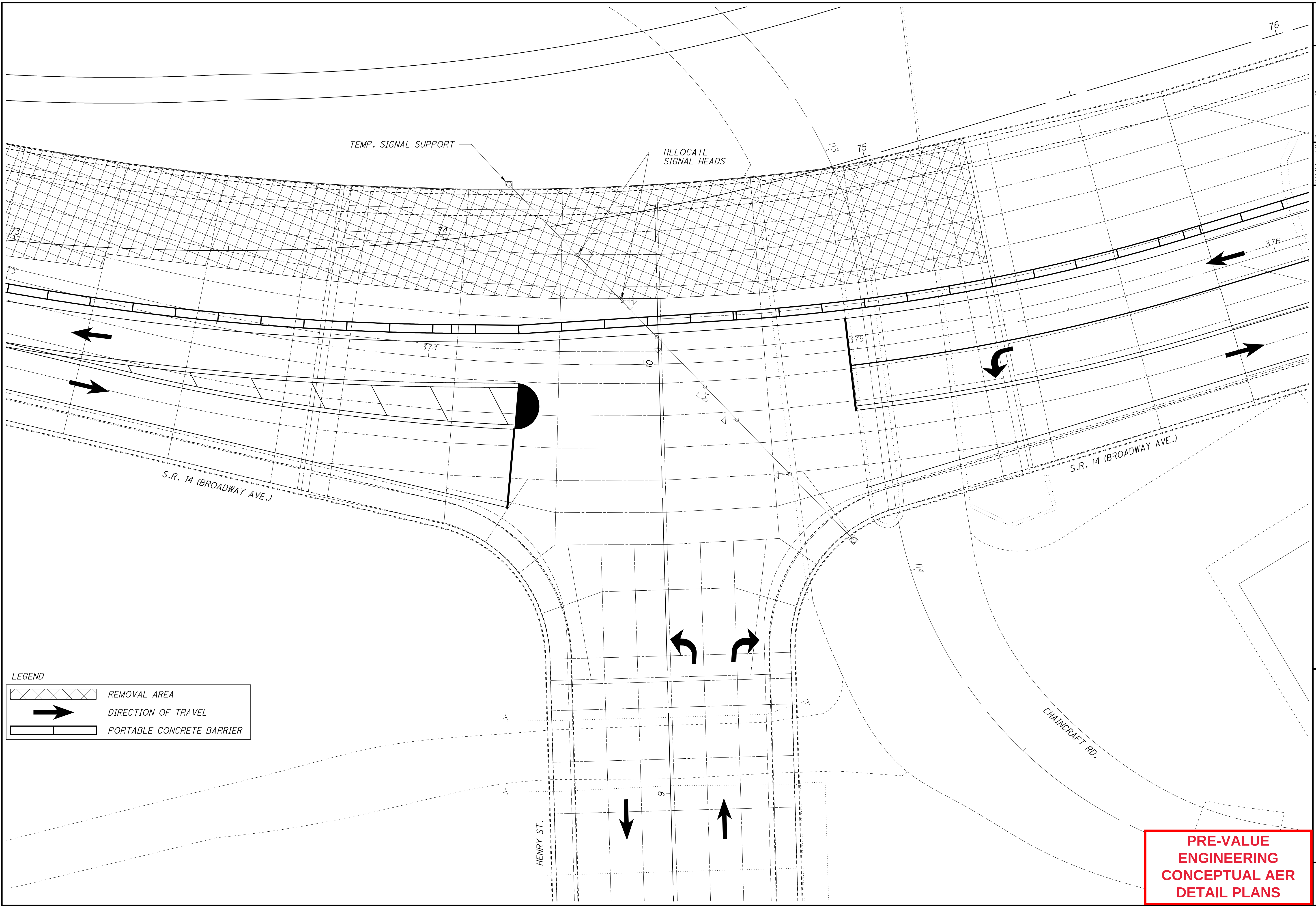

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

CALCULATED RJJ
CHECKED JMS

PHASE 1 REMOVAL DETAIL

CUY-14-6.93

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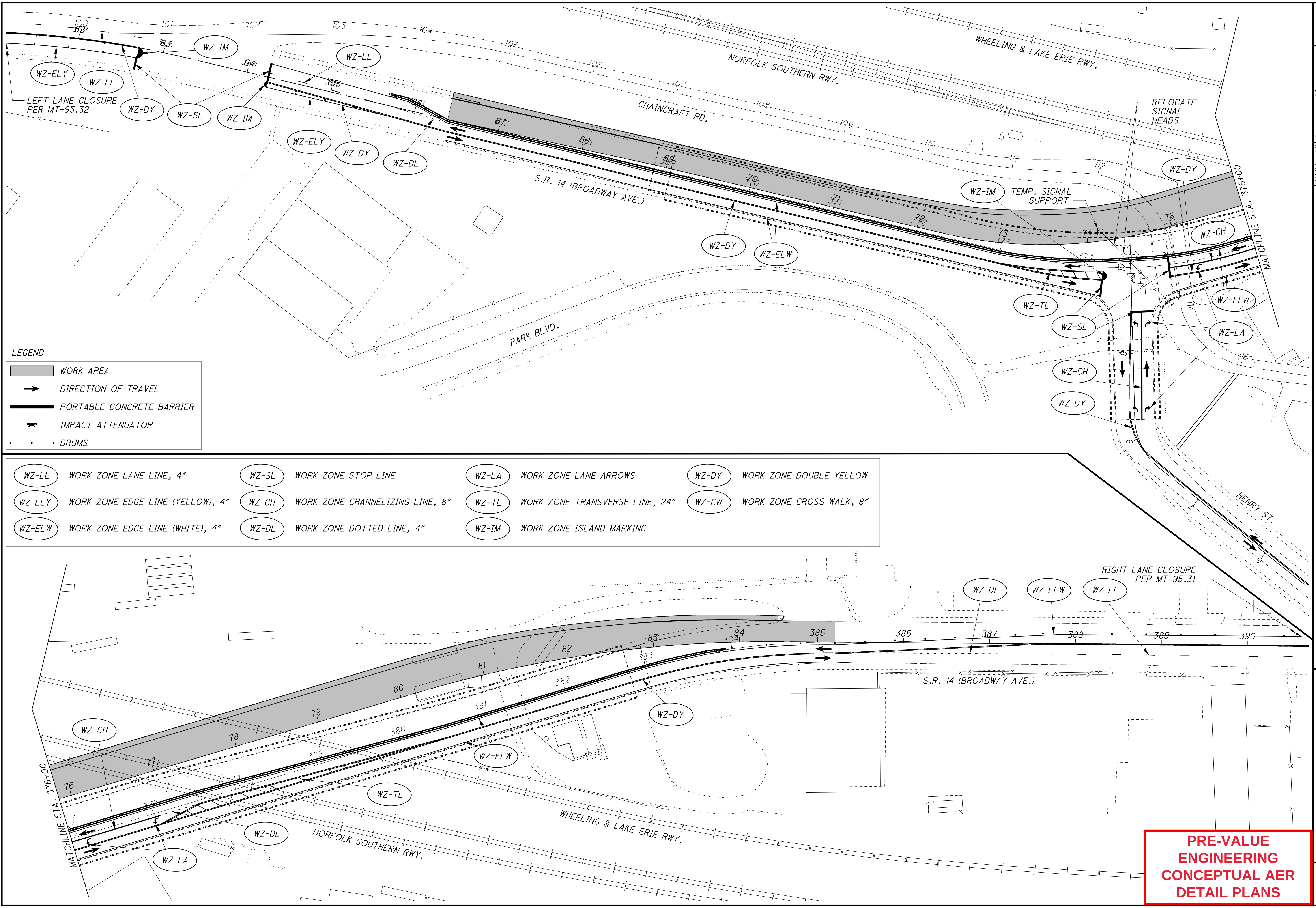

LEGEND

▨	WORK AREA
→	DIRECTION OF TRAVEL
═	PORTABLE CONCRETE BARRIER
⊤	IMPACT ATTENUATOR
· · ·	DRUMS

WZ-LL	WORK ZONE LANE LINE, 4"	WZ-SL	WORK ZONE STOP LINE	WZ-LA	WORK ZONE LANE ARROWS	WZ-DY	WORK ZONE DOUBLE YELLOW
WZ-ELY	WORK ZONE EDGE LINE (YELLOW), 4"	WZ-CH	WORK ZONE CHANNELIZING LINE, 8"	WZ-TL	WORK ZONE TRANSVERSE LINE, 24"	WZ-CW	WORK ZONE CROSS WALK, 8"
WZ-ELW	WORK ZONE EDGE LINE (WHITE), 4"	WZ-DL	WORK ZONE DOTTED LINE, 4"	WZ-IM	WORK ZONE ISLAND MARKING		

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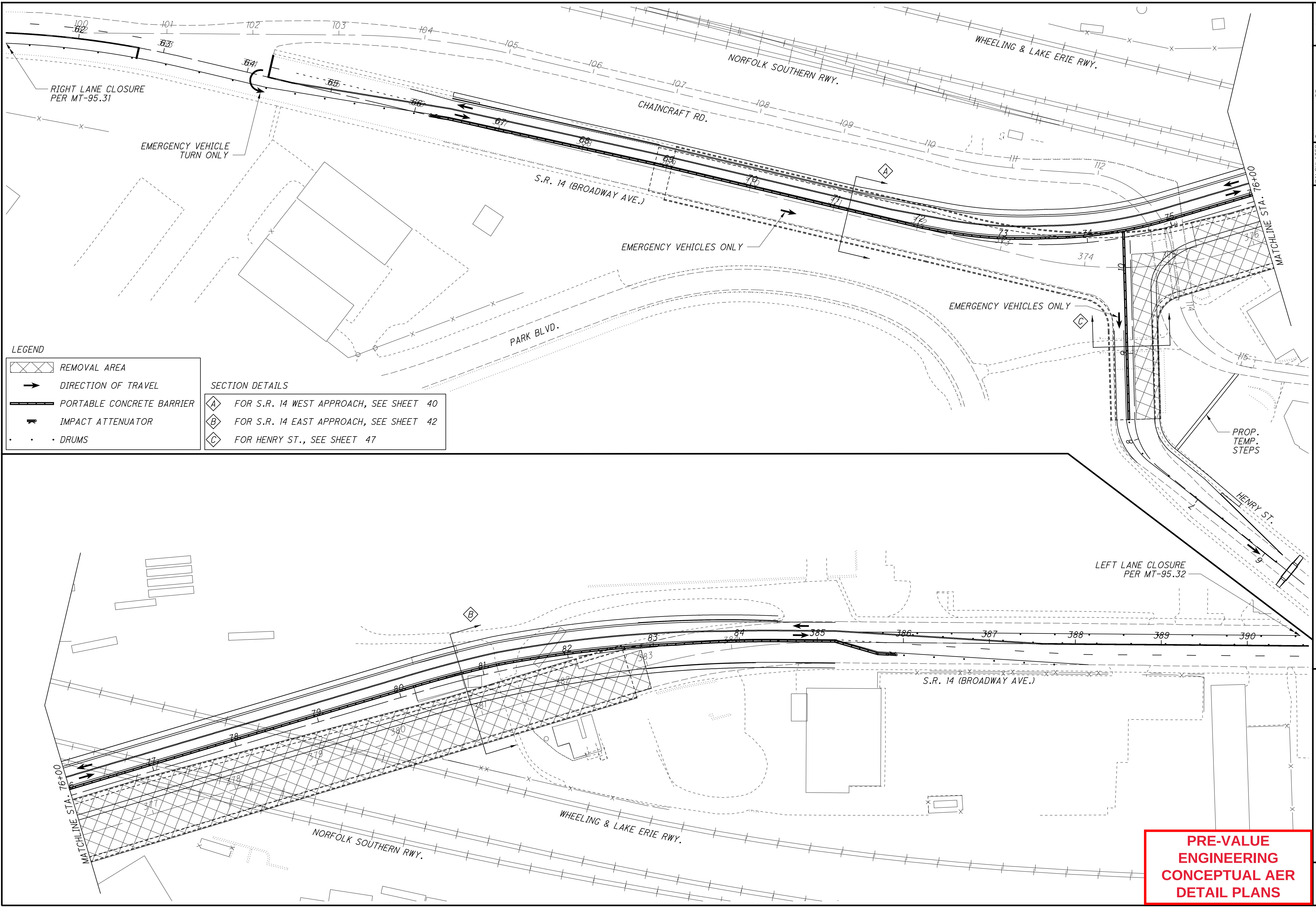
0 25 50 100
HORIZONTAL
SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PHASE 1 SCHEMATIC PLAN

CUY-14-6.93

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS



LEGEND

▨	REMOVAL AREA
→	DIRECTION OF TRAVEL
═	PORTABLE CONCRETE BARRIER
⊤	IMPACT ATTENUATOR
· · ·	DRUMS

SECTION DETAILS

- Ⓐ FOR S.R. 14 WEST APPROACH, SEE SHEET 40
- Ⓑ FOR S.R. 14 EAST APPROACH, SEE SHEET 42
- Ⓒ FOR HENRY ST., SEE SHEET 47

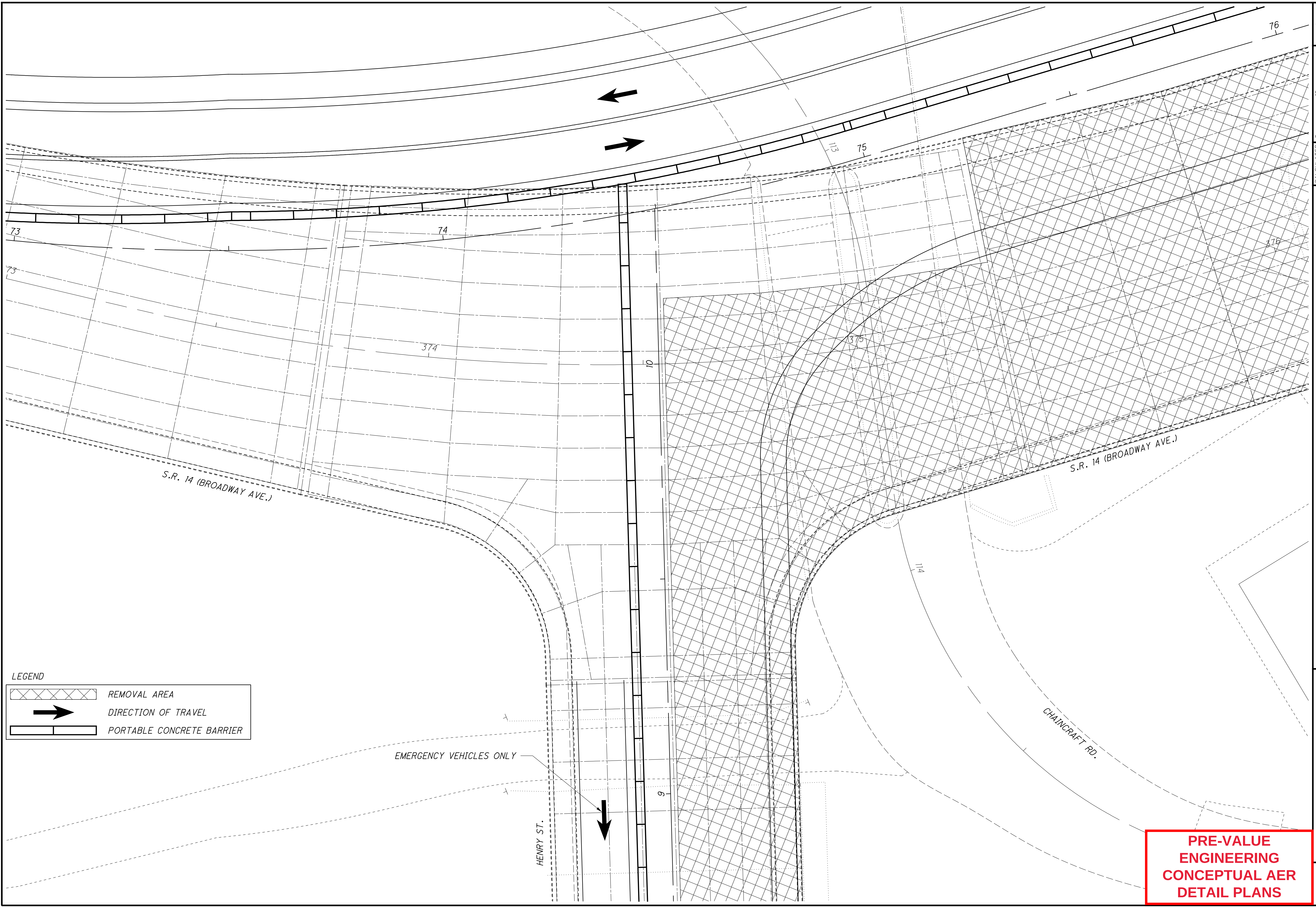
0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PHASE 2 REMOVAL PLAN

CUY-14-6.93

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS



LEGEND

▨ REMOVAL AREA

→ DIRECTION OF TRAVEL

▭ PORTABLE CONCRETE BARRIER

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

HORIZONTAL SCALE IN FEET 0 5 10 20

CALCULATED RJJ

CHECKED JMS

PHASE 2 REMOVAL DETAIL

CUY-14-6.93

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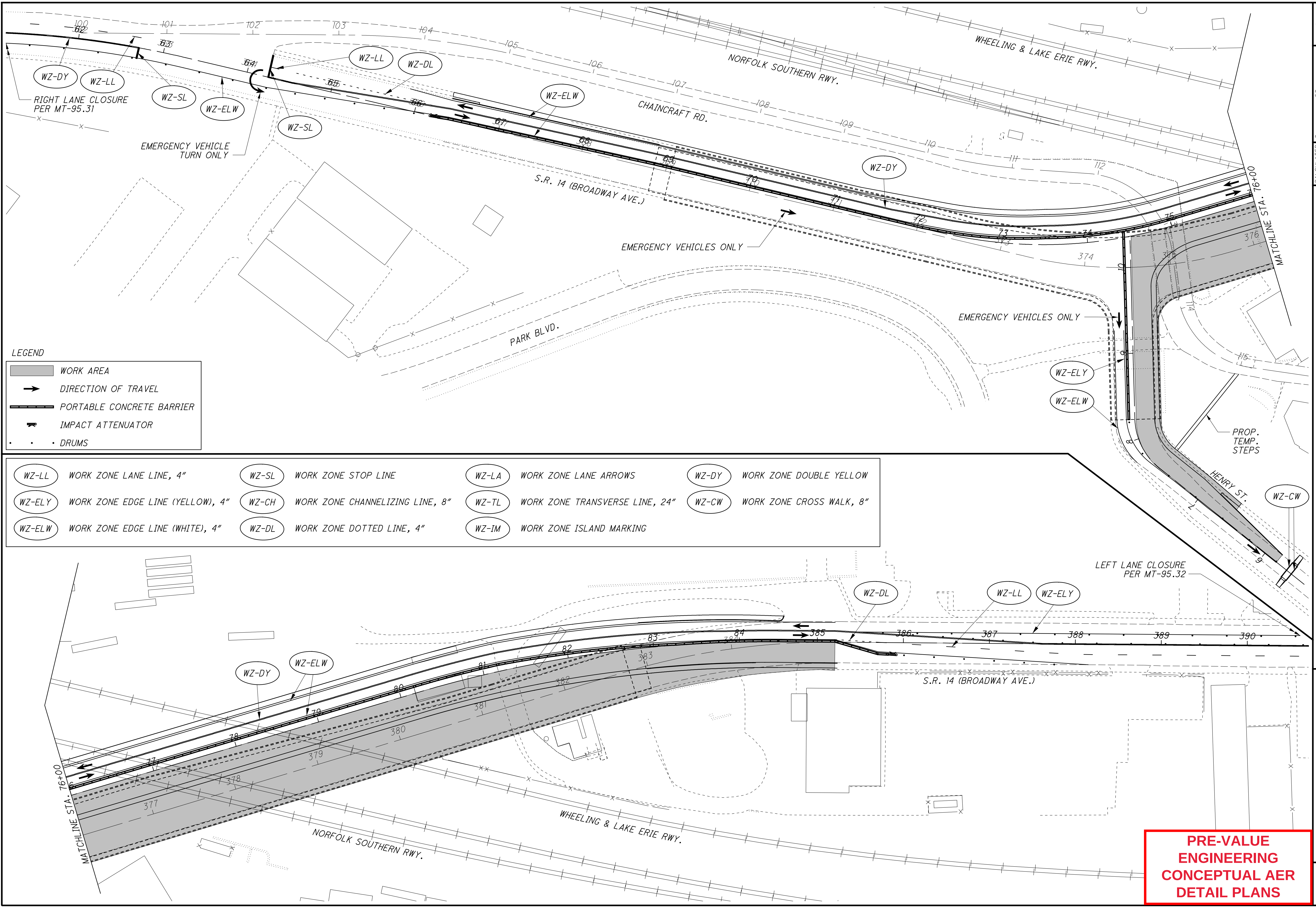

LEGEND

▨	WORK AREA
→	DIRECTION OF TRAVEL
═	PORTABLE CONCRETE BARRIER
⊤	IMPACT ATTENUATOR
• • •	DRUMS

WZ-LL	WORK ZONE LANE LINE, 4"	WZ-SL	WORK ZONE STOP LINE	WZ-LA	WORK ZONE LANE ARROWS	WZ-DY	WORK ZONE DOUBLE YELLOW
WZ-ELY	WORK ZONE EDGE LINE (YELLOW), 4"	WZ-CH	WORK ZONE CHANNELIZING LINE, 8"	WZ-TL	WORK ZONE TRANSVERSE LINE, 24"	WZ-CW	WORK ZONE CROSS WALK, 8"
WZ-ELW	WORK ZONE EDGE LINE (WHITE), 4"	WZ-DL	WORK ZONE DOTTED LINE, 4"	WZ-IM	WORK ZONE ISLAND MARKING		

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N

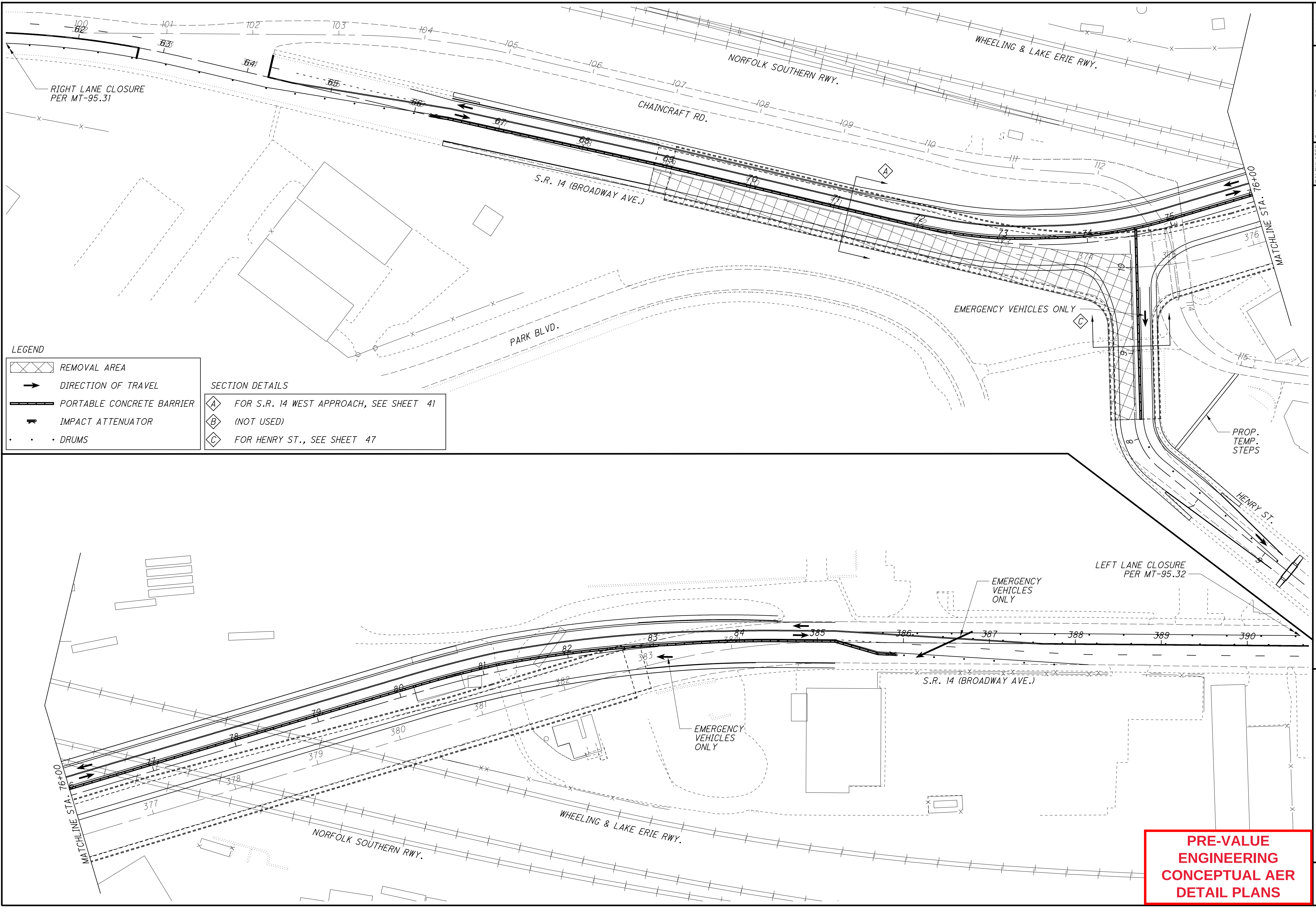
0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PHASE 2 SCHEMATIC PLAN

CUY-14-6.93

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS



LEGEND

▨	REMOVAL AREA
→	DIRECTION OF TRAVEL
═	PORTABLE CONCRETE BARRIER
▬	IMPACT ATTENUATOR
· · ·	DRUMS

SECTION DETAILS

◇A	FOR S.R. 14 WEST APPROACH, SEE SHEET 41
◇B	(NOT USED)
◇C	FOR HENRY ST., SEE SHEET 47

0 25 50 100
HORIZONTAL
SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PHASE 3 REMOVAL PLAN

CUY-14-6.93

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

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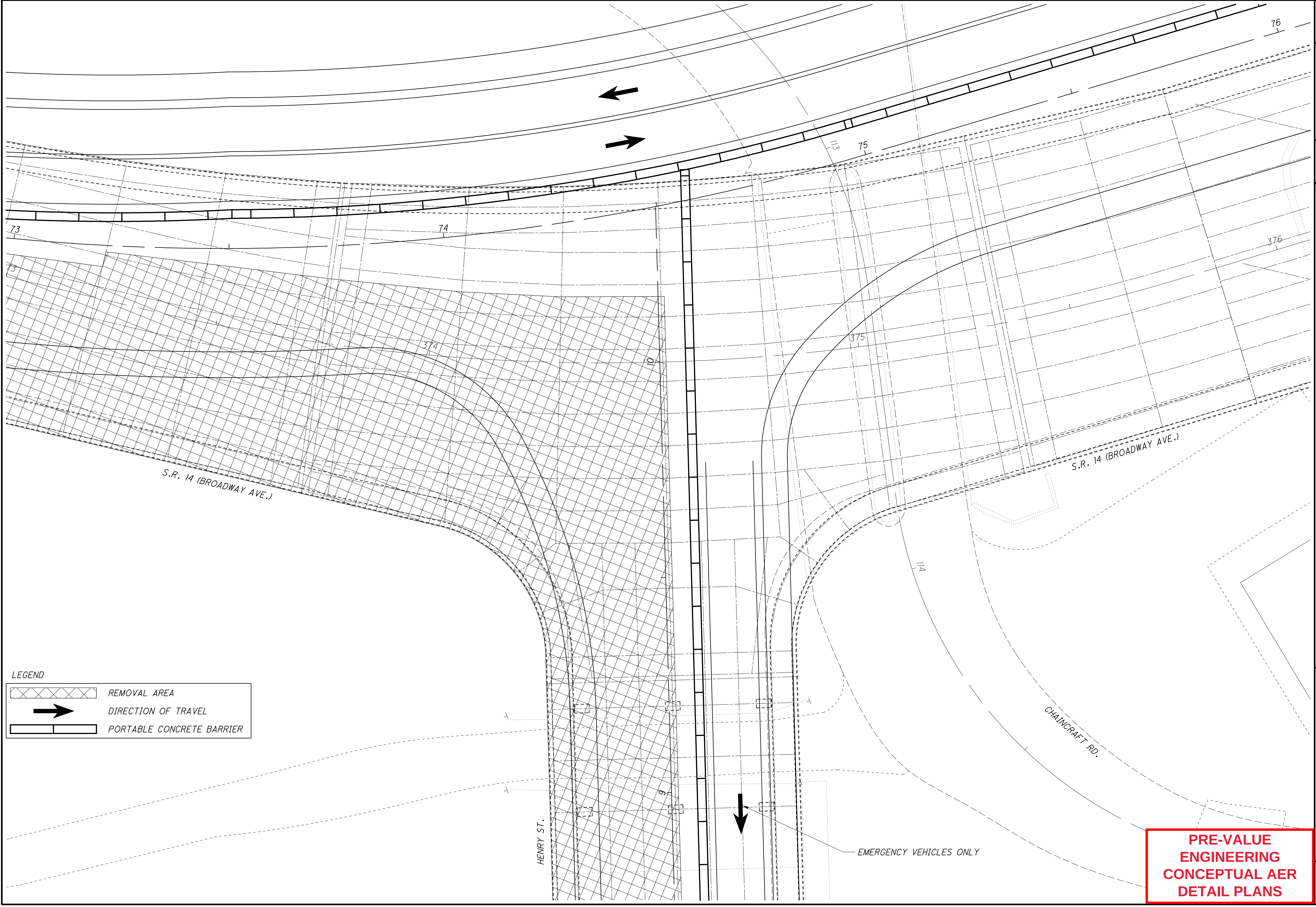


LEGEND

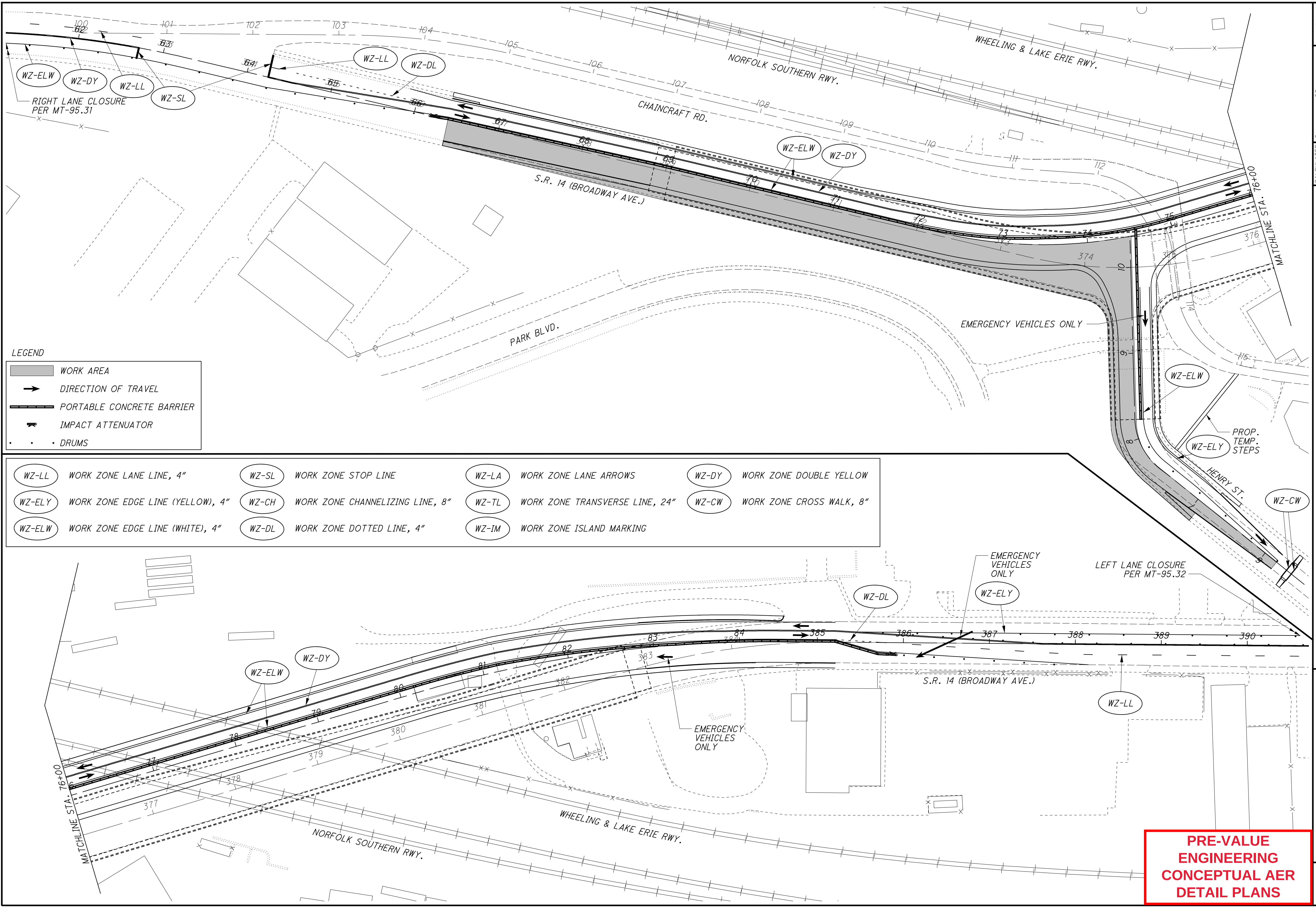
▨	REMOVAL AREA
➡	DIRECTION OF TRAVEL
▭▭	PORTABLE CONCRETE BARRIER

CALCULATED RJJ
CHECKED JMS

PHASE 3 REMOVAL DETAIL

CUY-14-6.93

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS



LEGEND

▨	WORK AREA
→	DIRECTION OF TRAVEL
═	PORTABLE CONCRETE BARRIER
⊤	IMPACT ATTENUATOR
• • •	DRUMS

WZ-LL	WORK ZONE LANE LINE, 4″	WZ-SL	WORK ZONE STOP LINE	WZ-LA	WORK ZONE LANE ARROWS	WZ-DY	WORK ZONE DOUBLE YELLOW
WZ-ELY	WORK ZONE EDGE LINE (YELLOW), 4″	WZ-CH	WORK ZONE CHANNELIZING LINE, 8″	WZ-TL	WORK ZONE TRANSVERSE LINE, 24″	WZ-CW	WORK ZONE CROSS WALK, 8″
WZ-ELW	WORK ZONE EDGE LINE (WHITE), 4″	WZ-DL	WORK ZONE DOTTED LINE, 4″	WZ-IM	WORK ZONE ISLAND MARKING		

N

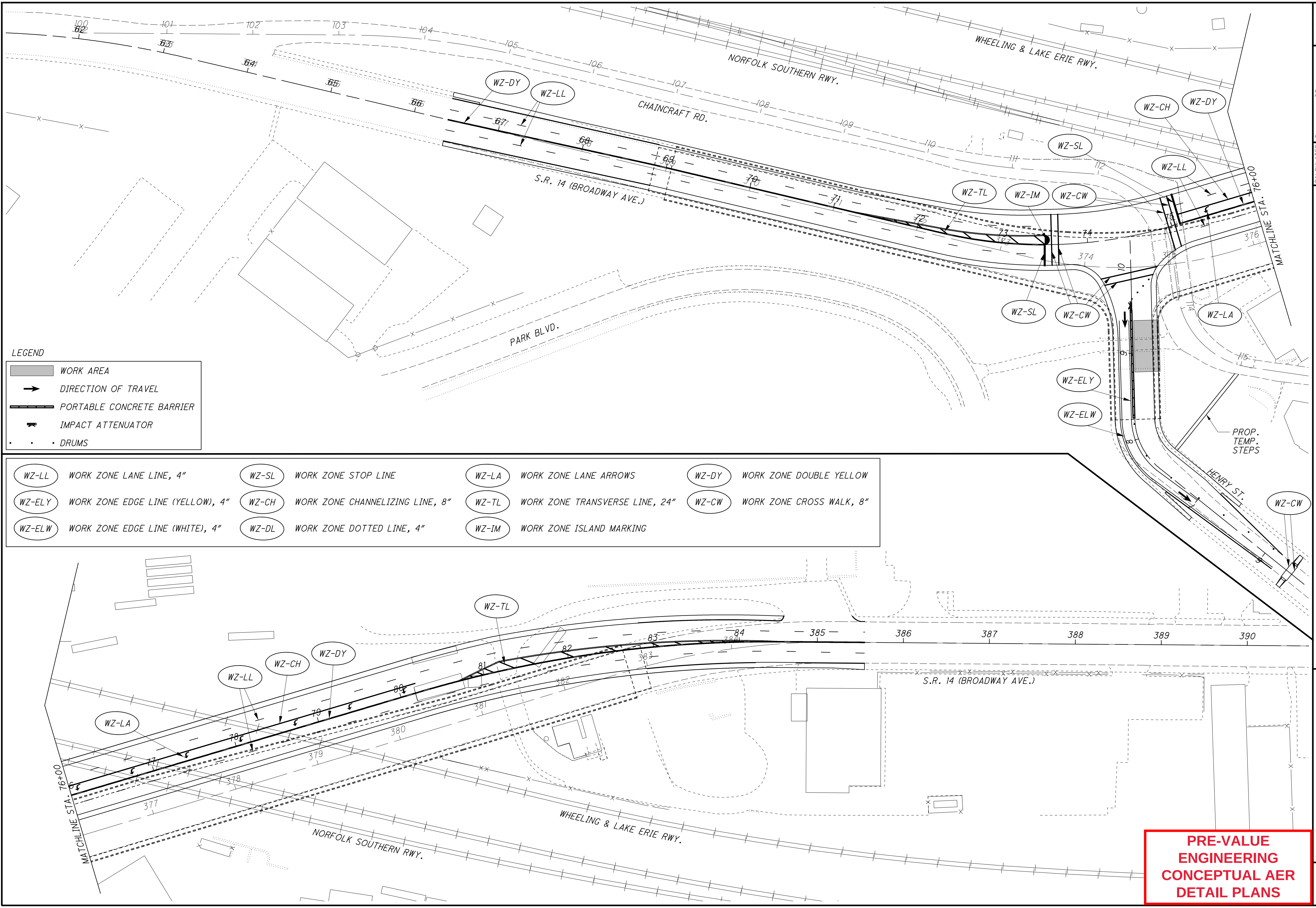
0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PHASE 3 SCHEMATIC PLAN

CUY-14-6.93

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS



LEGEND

▨	WORK AREA
→	DIRECTION OF TRAVEL
═	PORTABLE CONCRETE BARRIER
	IMPACT ATTENUATOR
· · ·	DRUMS

WZ-LL	WORK ZONE LANE LINE, 4"	WZ-SL	WORK ZONE STOP LINE	WZ-LA	WORK ZONE LANE ARROWS	WZ-DY	WORK ZONE DOUBLE YELLOW
WZ-ELY	WORK ZONE EDGE LINE (YELLOW), 4"	WZ-CH	WORK ZONE CHANNELIZING LINE, 8"	WZ-TL	WORK ZONE TRANSVERSE LINE, 24"	WZ-CW	WORK ZONE CROSS WALK, 8"
WZ-ELW	WORK ZONE EDGE LINE (WHITE), 4"	WZ-DL	WORK ZONE DOTTED LINE, 4"	WZ-IM	WORK ZONE ISLAND MARKING		

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N

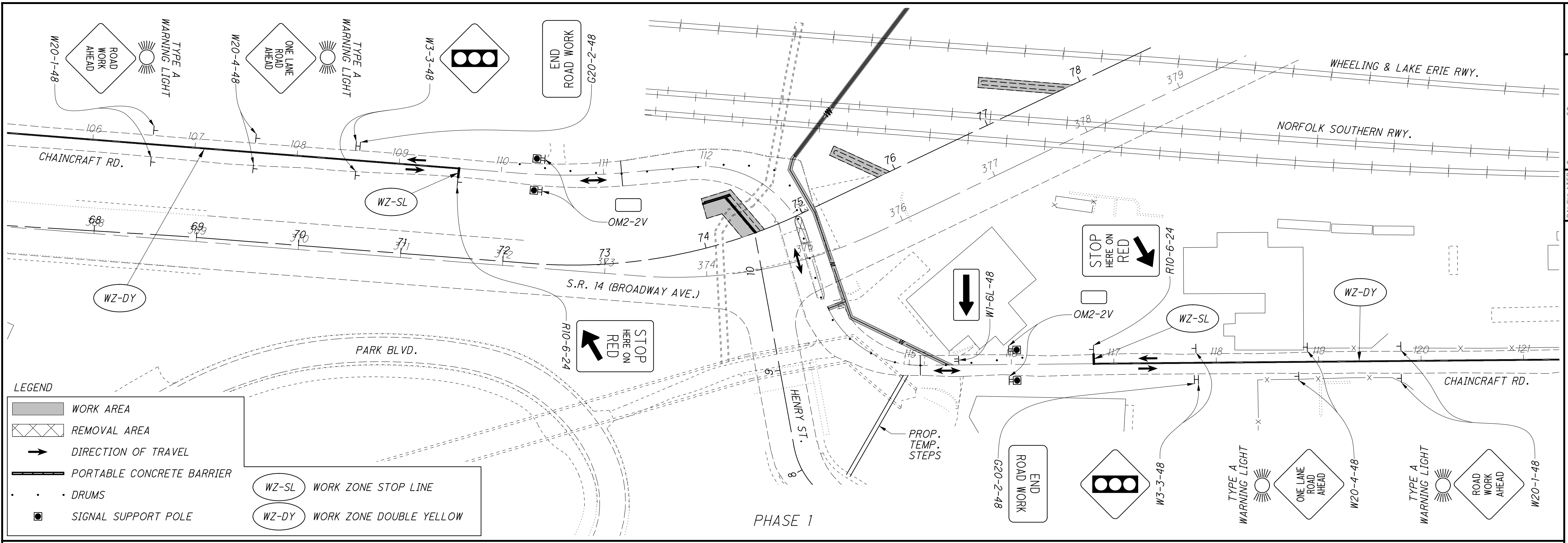
0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PHASE 4 SCHEMATIC PLAN

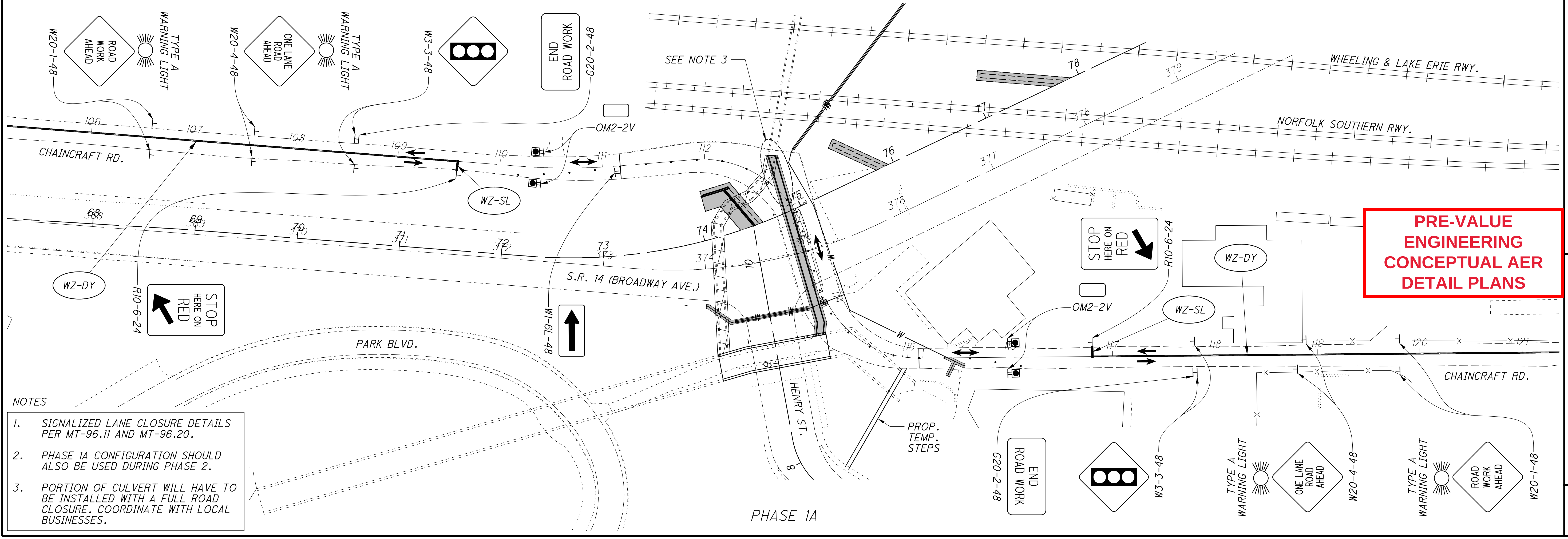
CUY-14-6.93

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS



LEGEND

▨	WORK AREA
☒	REMOVAL AREA
→	DIRECTION OF TRAVEL
▬	PORTABLE CONCRETE BARRIER
· · ·	DRUMS
■	SIGNAL SUPPORT POLE
WZ-SL	WORK ZONE STOP LINE
WZ-DY	WORK ZONE DOUBLE YELLOW



NOTES

1. SIGNALIZED LANE CLOSURE DETAILS PER MT-96.11 AND MT-96.20.
2. PHASE 1A CONFIGURATION SHOULD ALSO BE USED DURING PHASE 2.
3. PORTION OF CULVERT WILL HAVE TO BE INSTALLED WITH A FULL ROAD CLOSURE. COORDINATE WITH LOCAL BUSINESSES.

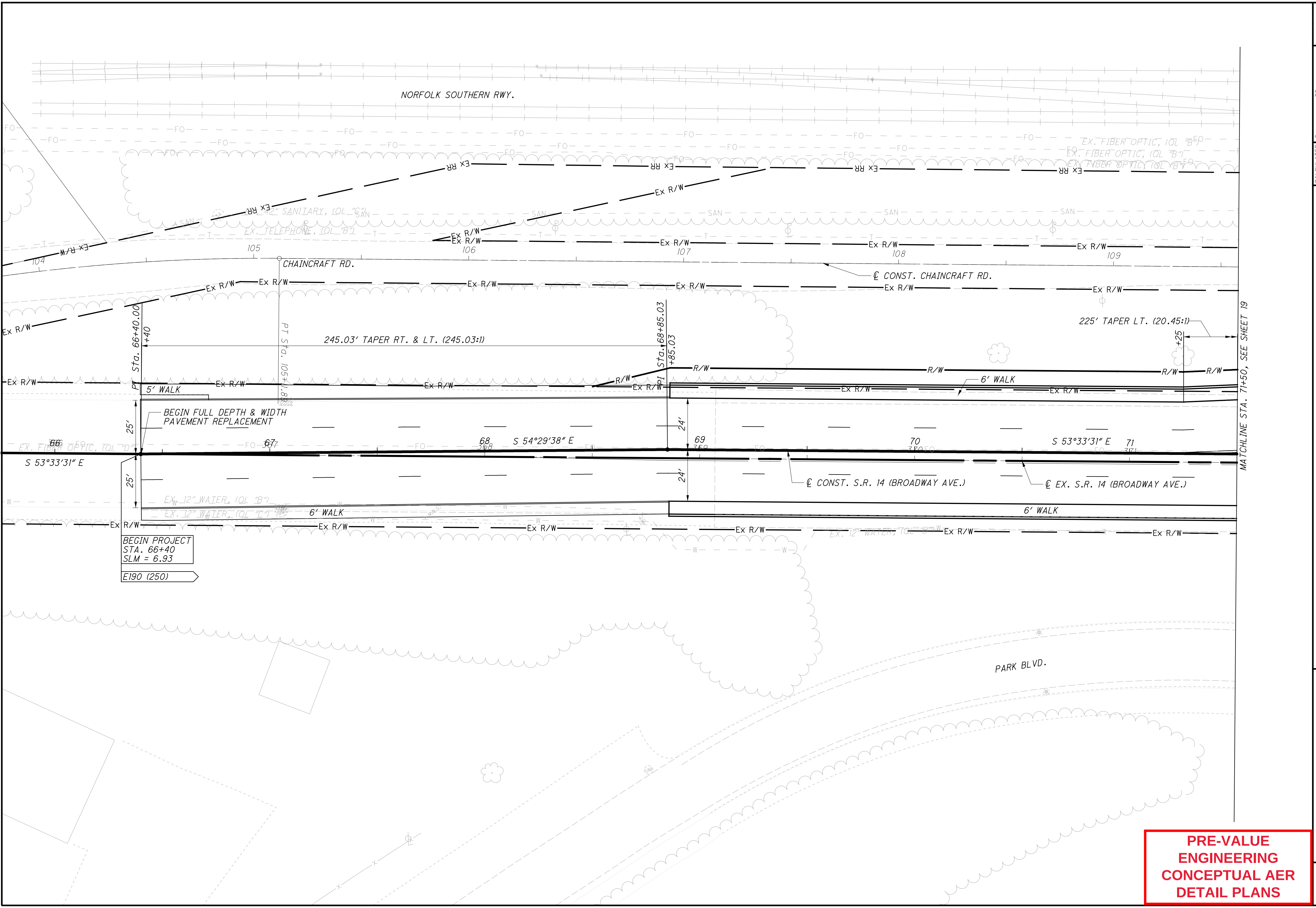
PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

CHAINCRAFT RD. SCHEMATIC PLAN

CUY-14-6.93



0 10 20 40
HORIZONTAL
SCALE IN FEET

CALCULATED
RJJ
CHECKED
JMS

PLAN - S.R. 14 (BROADWAY AVE.)
BEGINNING TO STA. 71+50

CUY-14-6.93

17
57

PRE-VALUE
ENGINEERING
CONCEPTUAL AER
DETAIL PLANS

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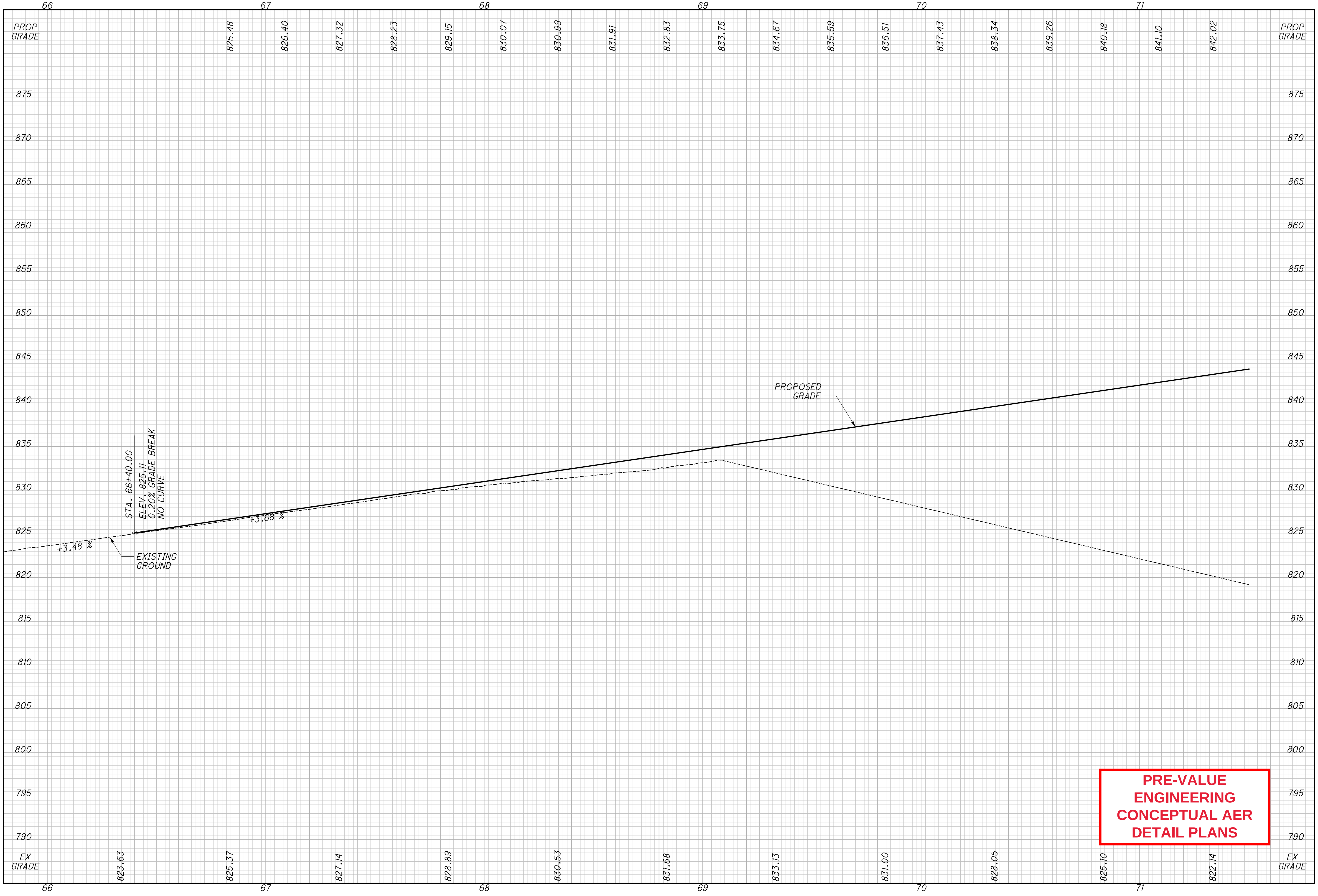


PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

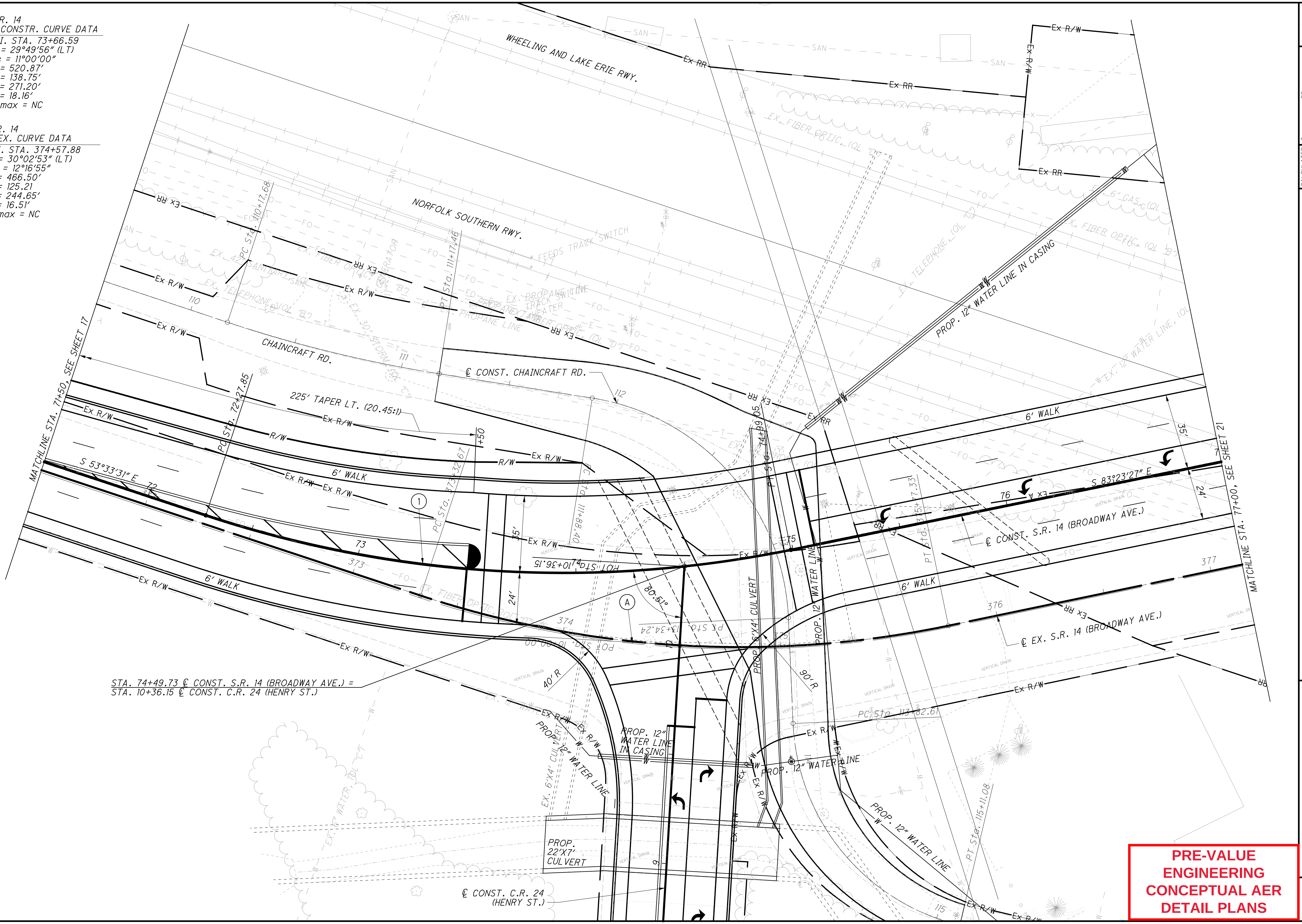
CALCULATED RJJ
CHECKED JMS

PROFILE - S.R. 14 (BROADWAY AVE.)
BEGINNING TO STA. 71+50

CUY-14-6.93

S.R. 14
① ℄ CONSTR. CURVE DATA
P.I. STA. 73+66.59
Δ = 29°49′56″ (LT)
Dc = 11°00′00″
R = 520.87′
T = 138.75′
L = 271.20′
E = 18.16′
e max = NC

S.R. 14
Ⓐ ℄ EX. CURVE DATA
P.I. STA. 374+57.88
Δ = 30°02′53″ (LT)
Dc = 12°16′55″
R = 466.50′
T = 125.21
L = 244.65′
E = 16.51′
e max = NC



HORIZONTAL SCALE IN FEET
0 10 20 40

CALCULATED RJJ
CHECKED JMS

PLAN - S.R. 14 (BROADWAY AVE.)
STA. 71+50 TO STA. 77+00

CUY-14-6.93

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

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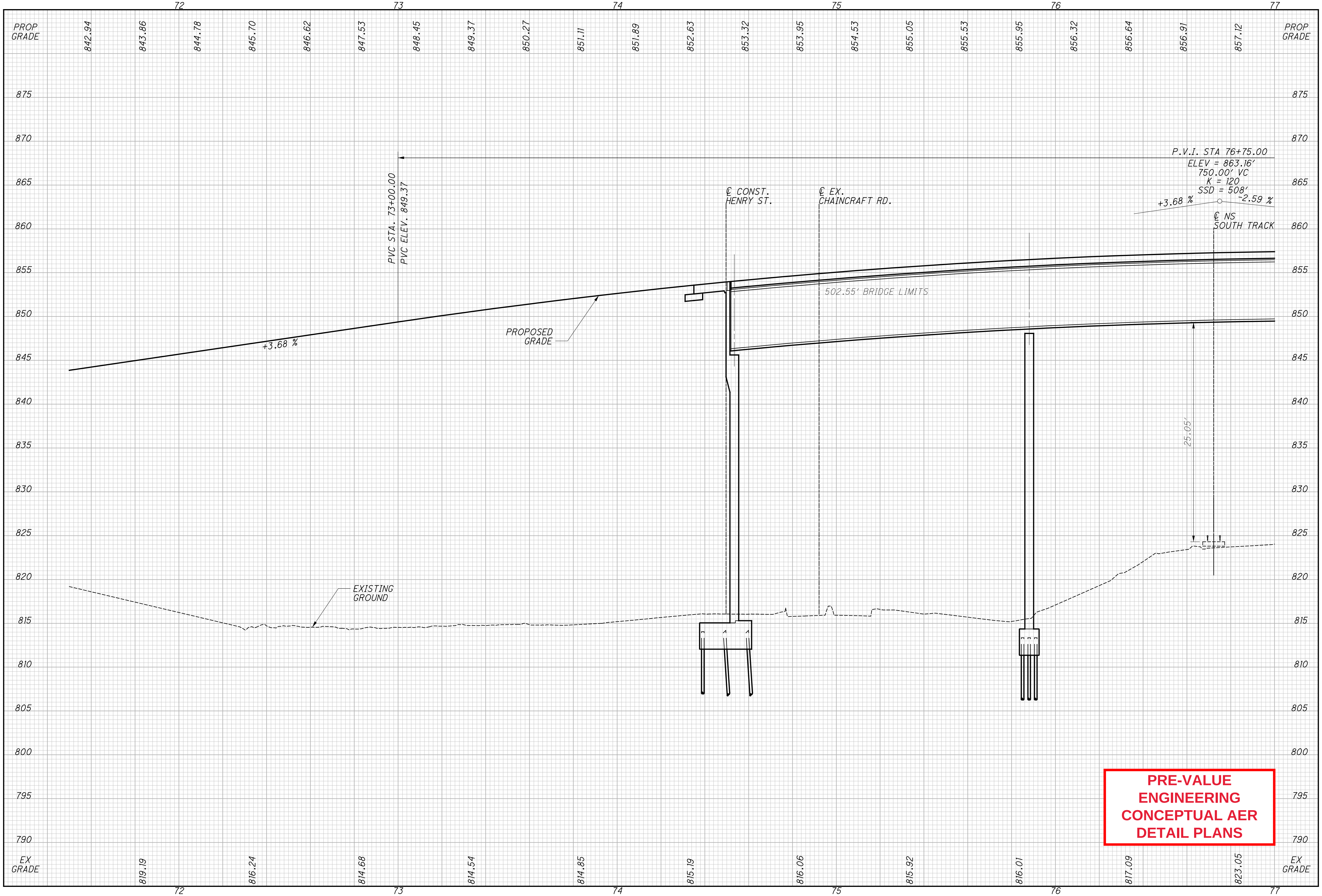
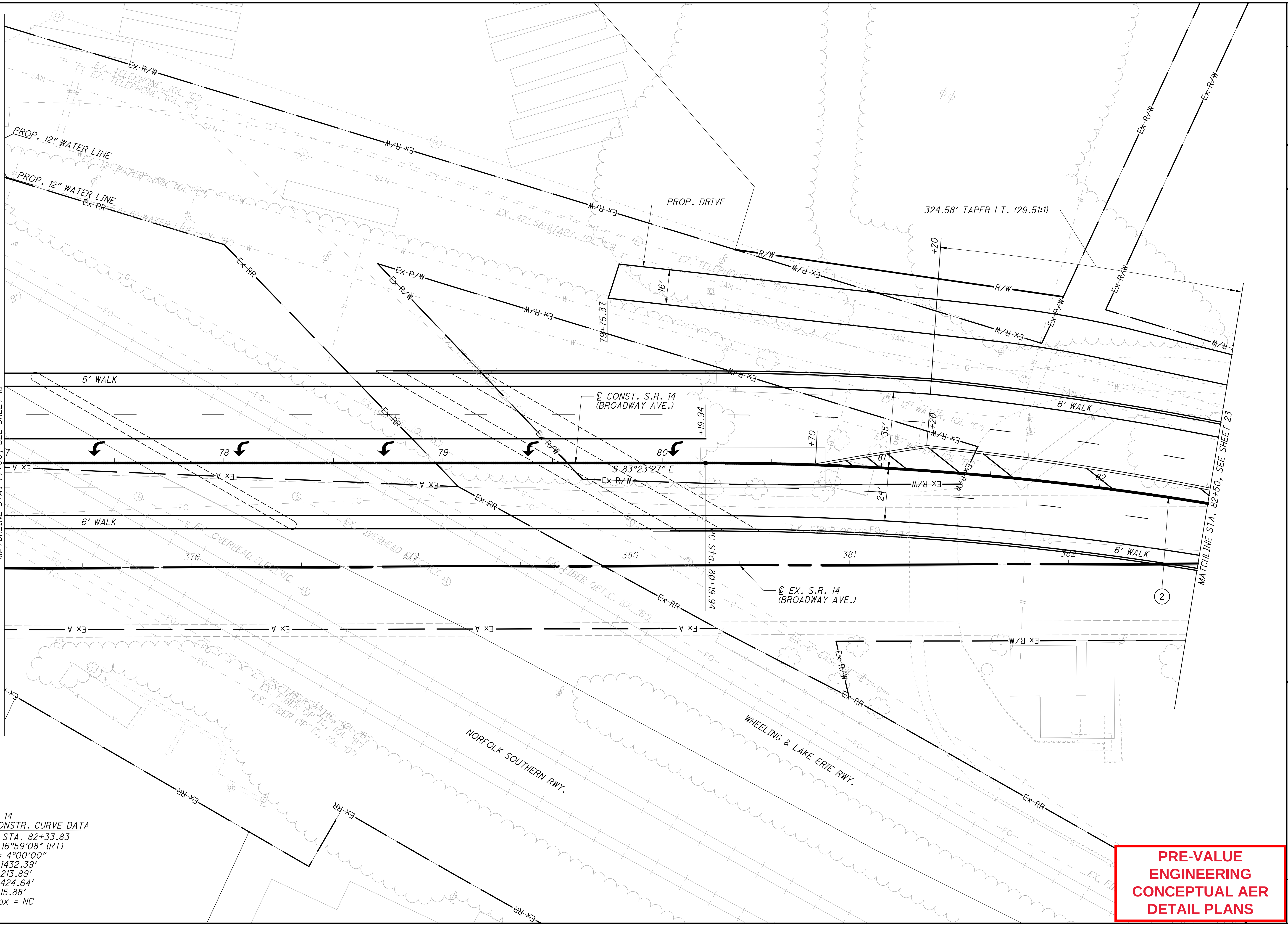


PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

CALCULATED
RJJ
CHECKED
JMS

PROFILE - S.R. 14 (BROADWAY AVE.)
STA. 71+50 TO STA. 77+00

CUY-14-6.93



S.R. 14
② ℄ CONSTR. CURVE DATA
P.I. STA. 82+33.83
Δ = 16°59'08" (RT)
Dc = 4°00'00"
R = 1432.39'
T = 213.89'
L = 424.64'
E = 15.88'
e max = NC

0 10 20 40
HORIZONTAL
SCALE IN FEET

CALCULATED
RJJ
CHECKED
JMS

PLAN - S.R. 14 (BROADWAY AVE.)
STA. 77+00 TO STA. 82+50

CUY-14-6.93

21
57

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

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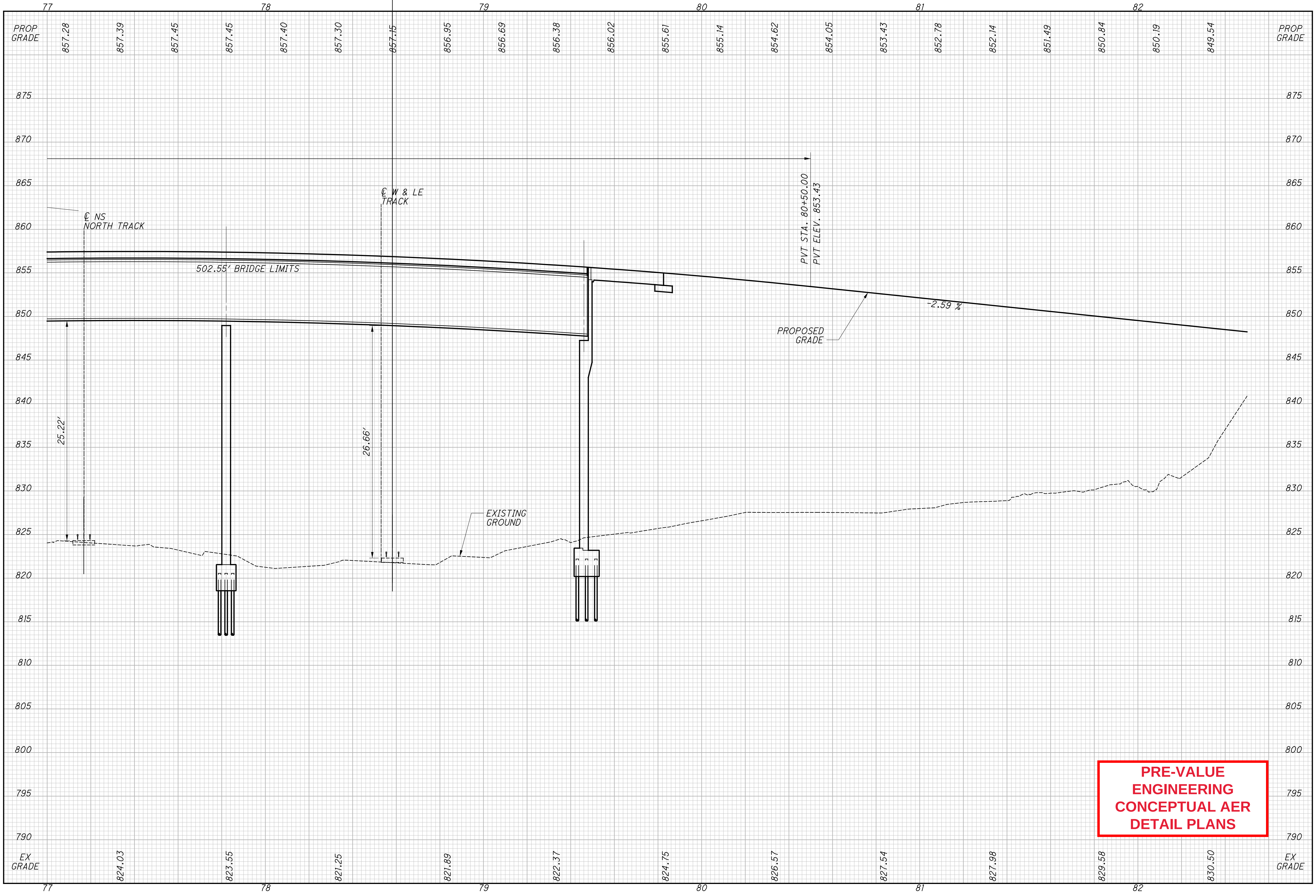
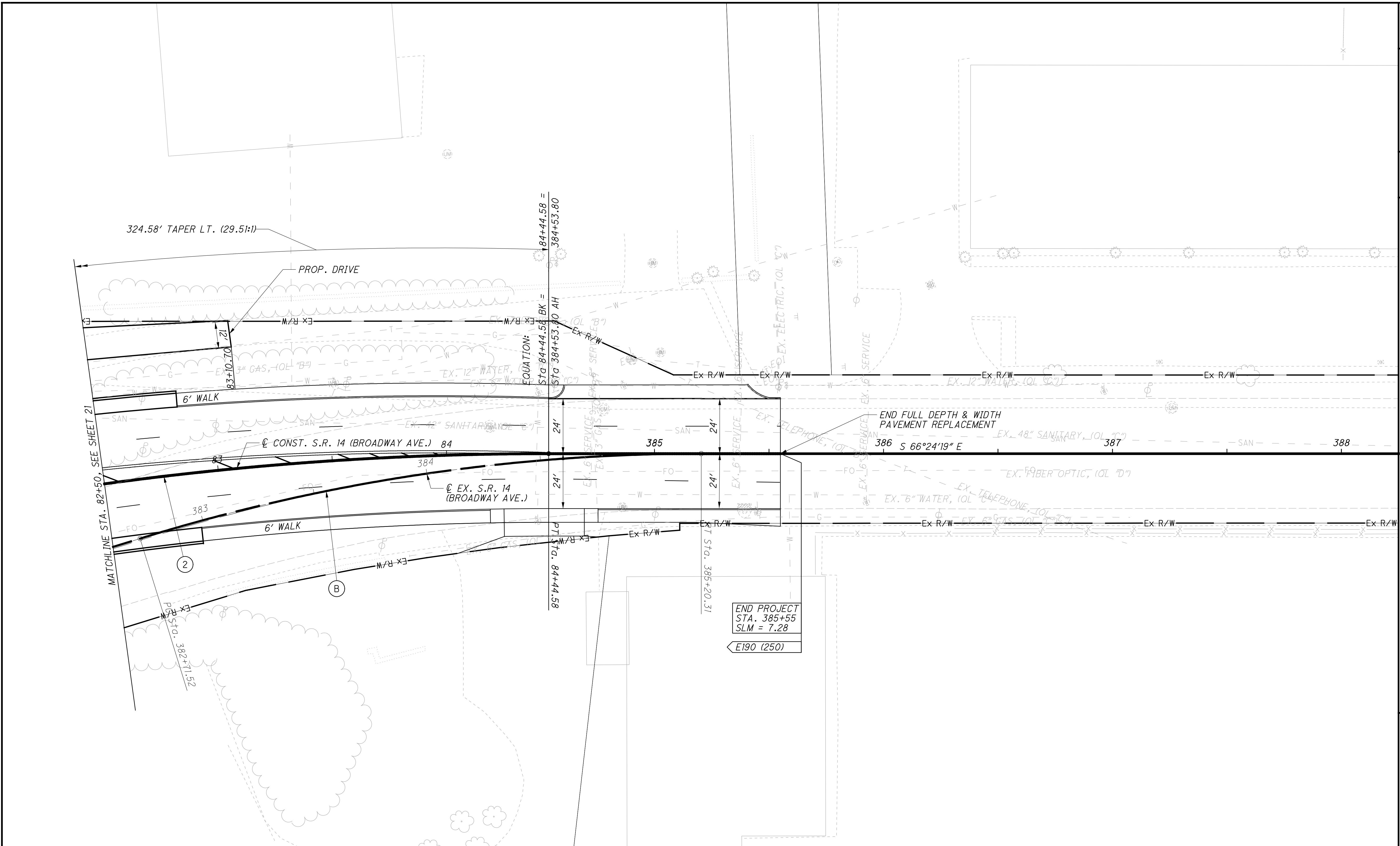


PRE-VALUE
ENGINEERING
CONCEPTUAL AER
DETAIL PLANS

CALCULATED
RJJ
CHECKED
JMS

PROFILE - S.R. 14 (BROADWAY AVE.)
STA. 77+00 TO STA. 82+50

CUY-14-6.93



S.R. 14
℄ CONSTR. CURVE DATA
② P.I. STA. 82+33.83
Δ = 16°59'08" (RT)
Dc = 4°00'00"
R = 1432.39'
T = 213.89'
L = 424.64'
E = 15.88'
e max = NC

S.R. 14
℄ EX. CURVE DATA
Ⓑ P.I. STA. 383+96.86
Δ = 17°12'05" (RT)
Dc = 6°54'50"
R = 828.71'
T = 125.34'
L = 248.80'
E = 9.43'
e max = NC

HORIZONTAL
SCALE IN FEET
0 10 20 40

CALCULATED
RJJ
CHECKED
JMS

PLAN - S.R. 14 (BROADWAY AVE.)
STA. 82+50 TO ENDING

CUY-14-6.93

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

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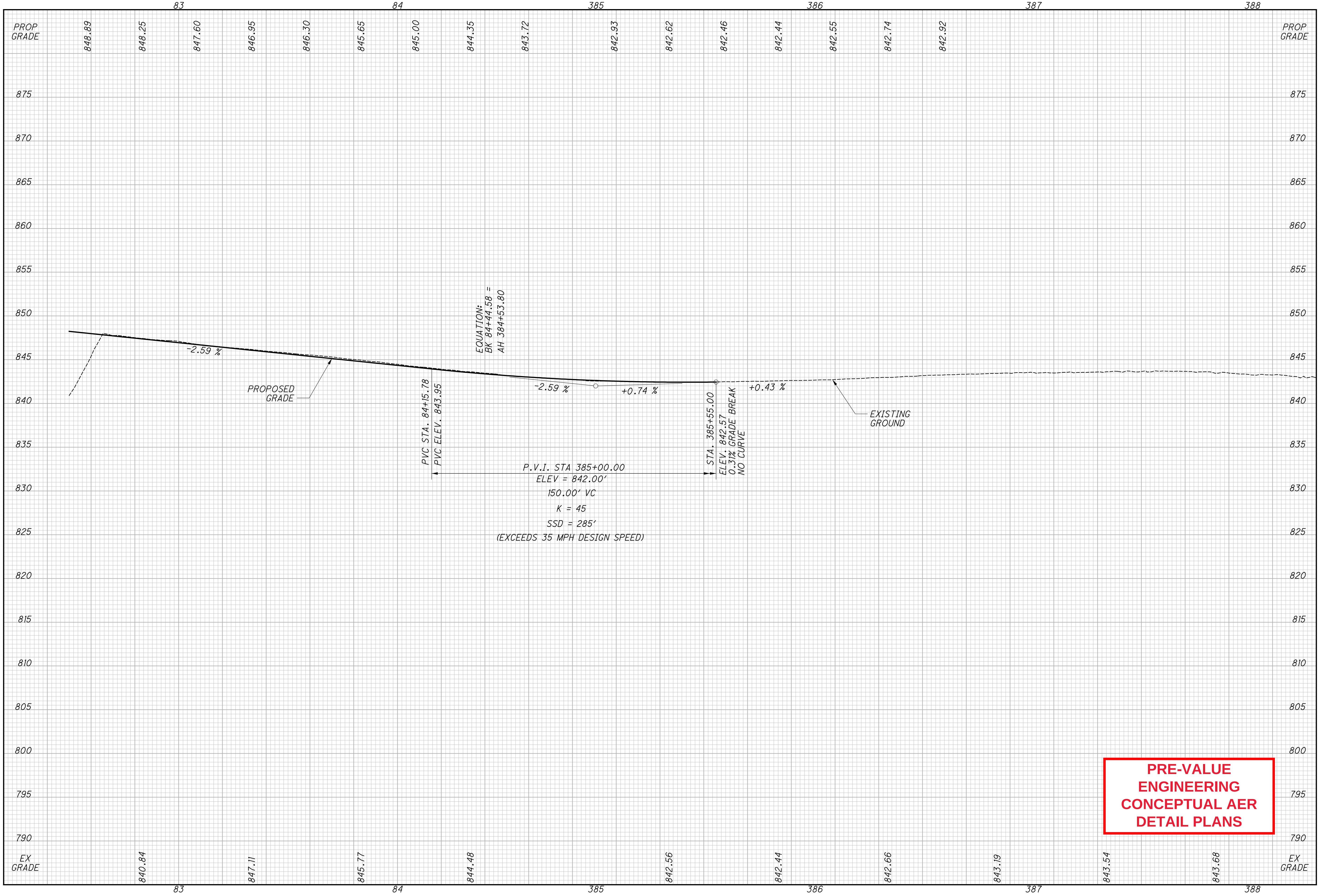


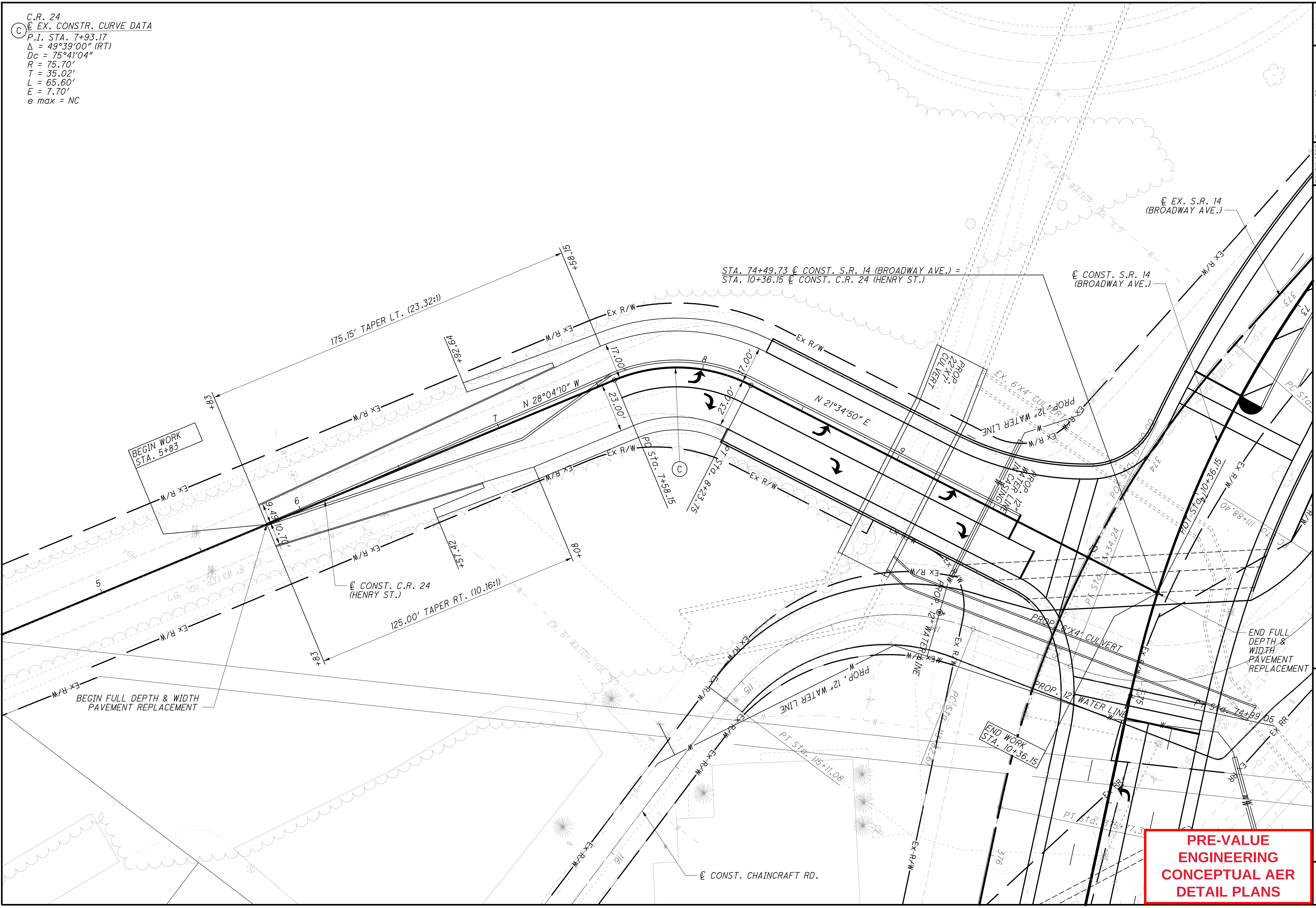
PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

CALCULATED RJJ
CHECKED JMS

PROFILE - S.R. 14 (BROADWAY AVE.)
STA. 82+50 TO END

CUY-14-6.93

C.R. 24
Ⓒ ℄ EX. CONSTR. CURVE DATA
P.I. STA. 7+93.17
Δ = 49°39'00" (RT)
Dc = 75°41'04"
R = 75.70'
T = 35.02'
L = 65.60'
E = 7.70'
e max = NC



PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

N

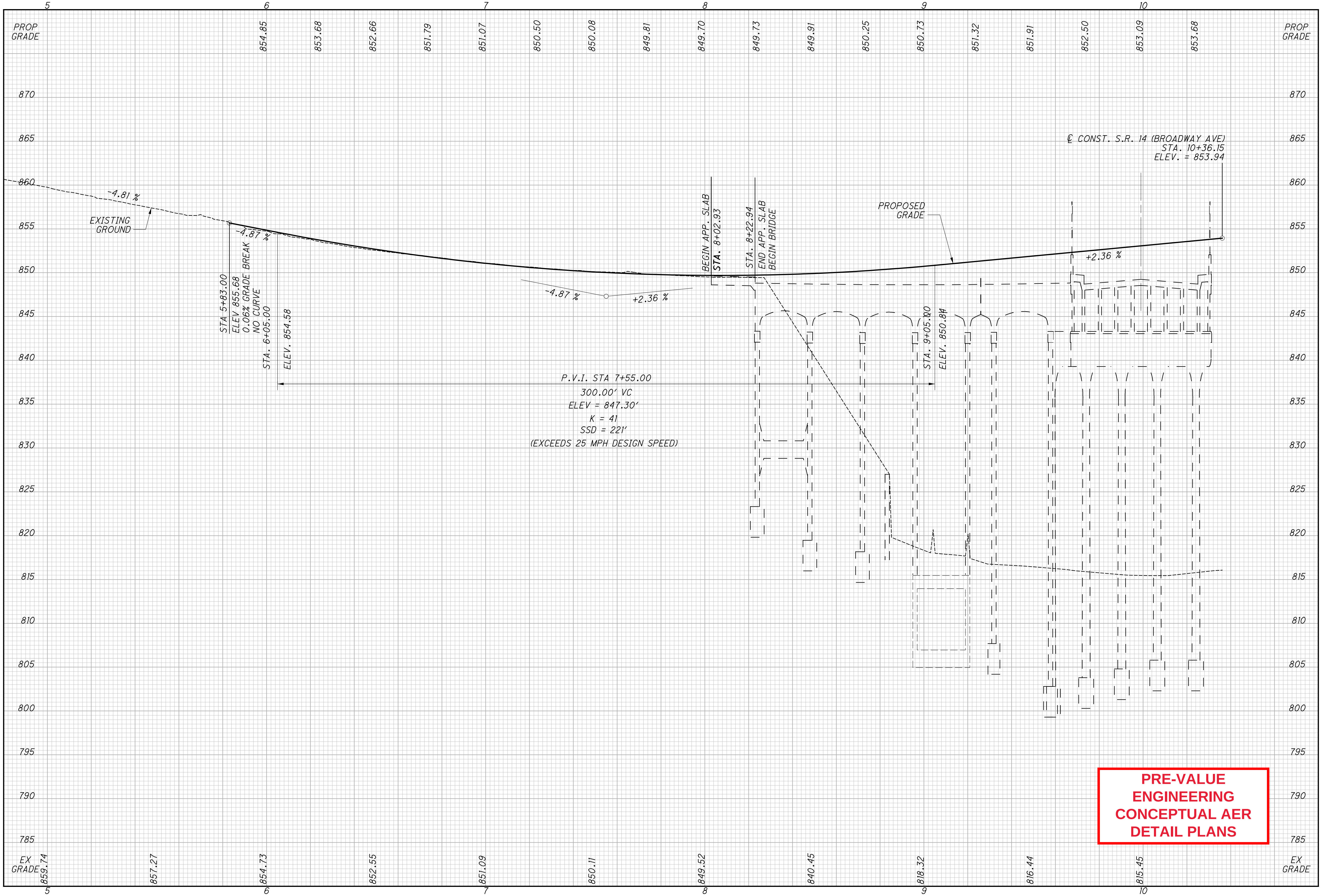
0 10 20 40
HORIZONTAL SCALE IN FEET

CALCULATED RJJ
CHECKED JMS

PLAN - C.R. 24 (HENRY ST.)
BEGINNING TO ENDING

CUY-14-6.93

G:\Cleveland\DCS\Projects\TRN\60581903_CUY14693\900_CAD_GIS\104132_CUY-14-0693\Design\Roadway\Sheets\104132_GP101a2.dgn Sheet 6/21/2019 7:33:46 AM todd.roxberry



PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

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CALCULATED RJJ
CHECKED JMS

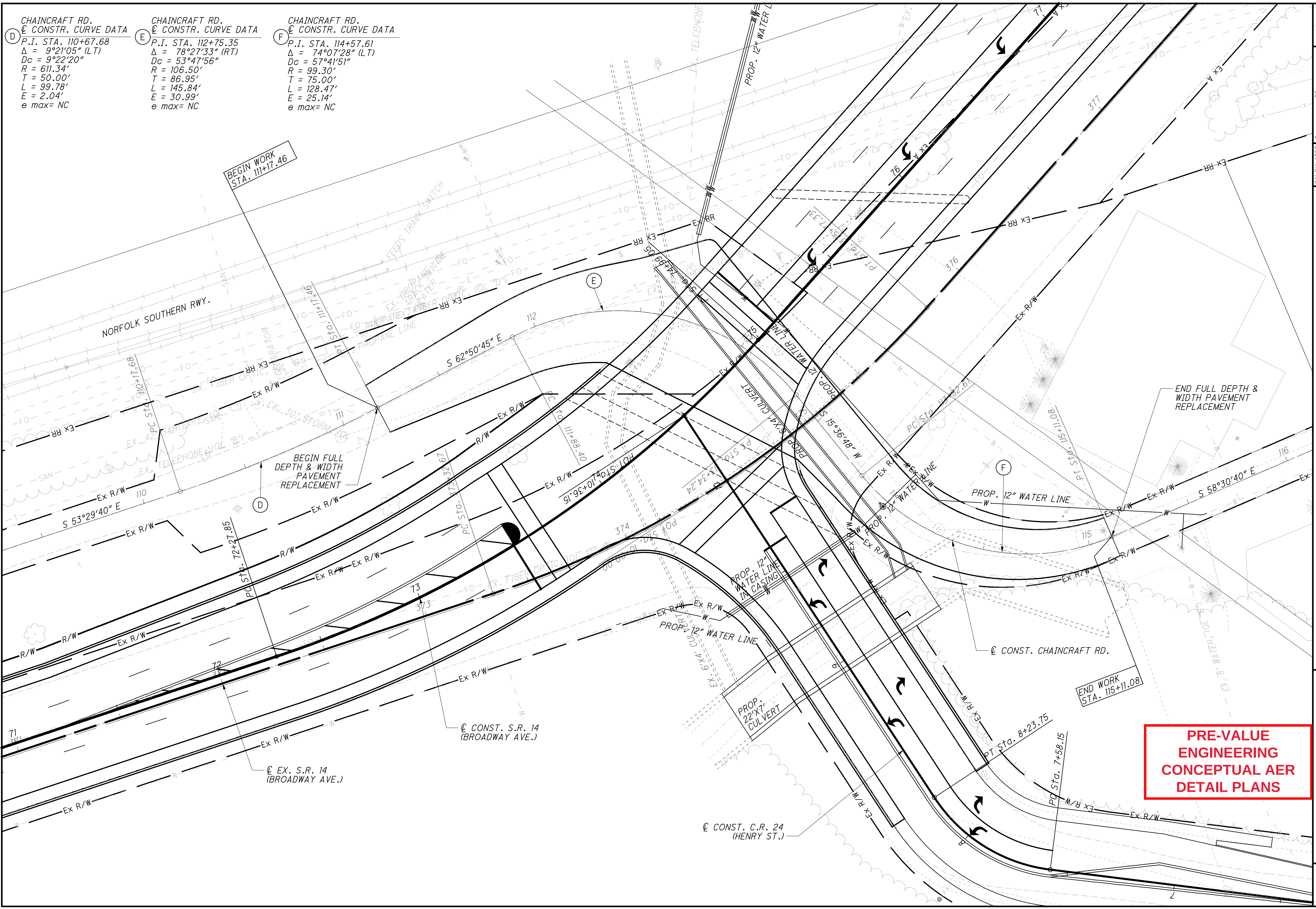
PROFILE - C.R. 24 (HENRY ST.)
BEGINNING TO END

CUY-14-6.93

Ⓓ CHAINCRAFT RD.
℄ CONSTR. CURVE DATA
P.I. STA. 110+67.68
Δ = 9°21′05″ (LT)
Dc = 9°22′20″
R = 611.34′
T = 50.00′
L = 99.78′
E = 2.04′
e max= NC

Ⓔ CHAINCRAFT RD.
℄ CONSTR. CURVE DATA
P.I. STA. 112+75.35
Δ = 78°27′33″ (RT)
Dc = 53°47′56″
R = 106.50′
T = 86.95′
L = 145.84′
E = 30.99′
e max= NC

Ⓕ CHAINCRAFT RD.
℄ CONSTR. CURVE DATA
P.I. STA. 114+57.61
Δ = 74°07′28″ (LT)
Dc = 57°41′51″
R = 99.30′
T = 75.00′
L = 128.47′
E = 25.14′
e max= NC



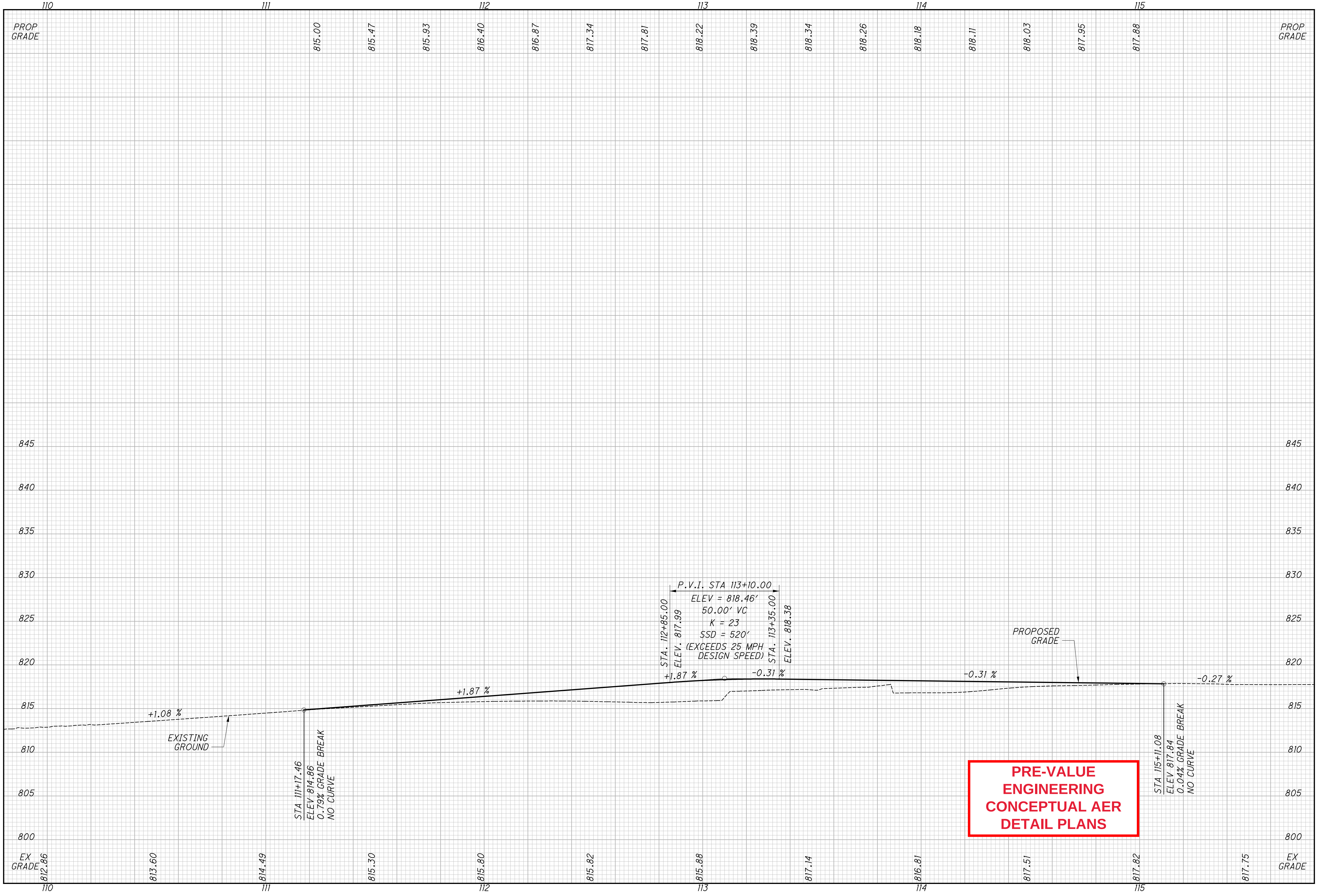
PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

0 10 20 40
HORIZONTAL SCALE IN FEET

CALCULATED	CHECKED
RJJ	JMS

PLAN - CHAINCRAFT RD.
BEGINNING TO ENDING

CUY-14-6.93



PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

PROFILE - CHAINCRAFT RD.
BEGINNING TO END

CALCULATED RJJ
CHECKED JMS

CUY-14-6.93

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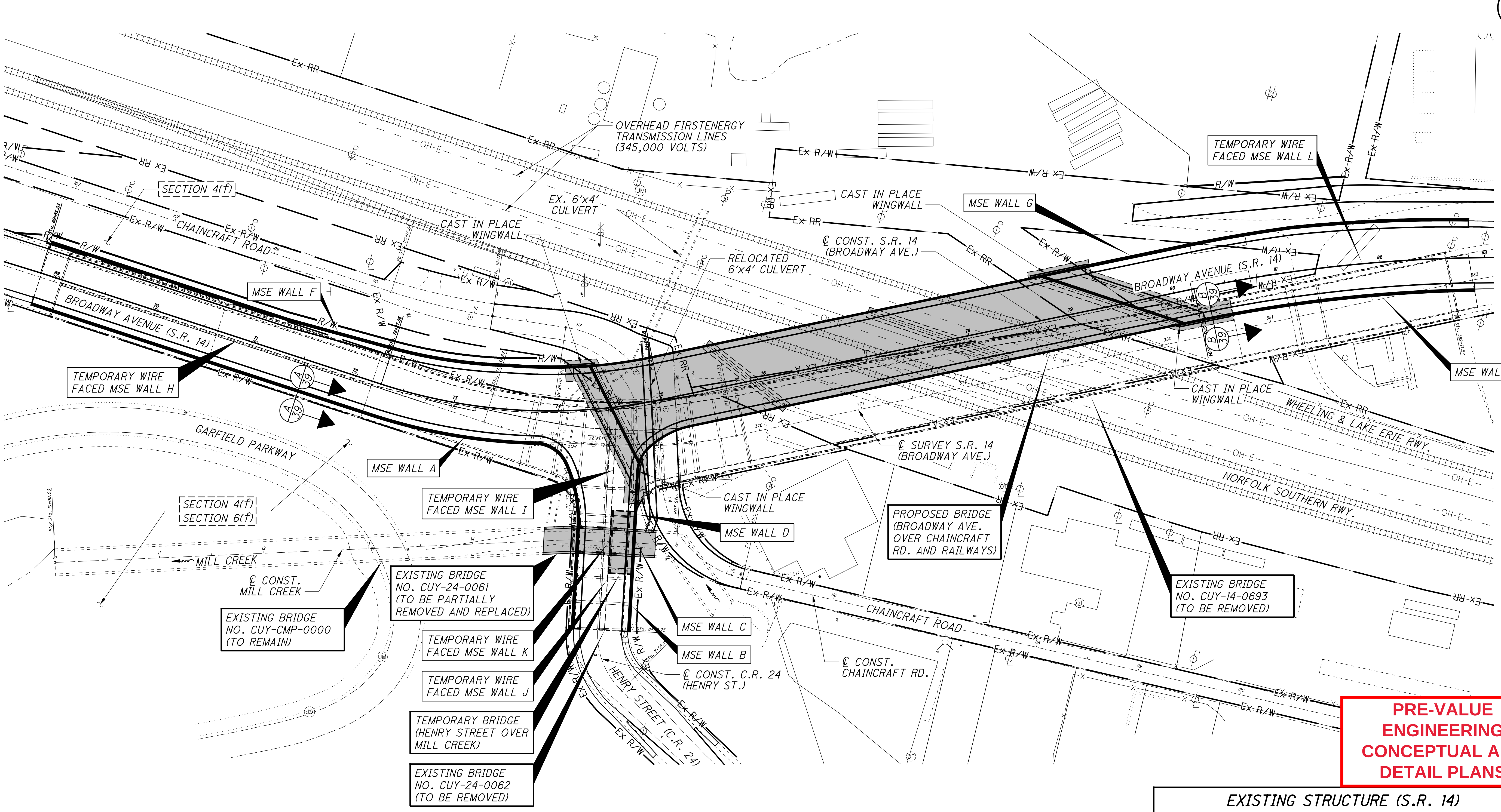


PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

EXISTING STRUCTURE (S.R. 14)

TYPE: CONTINUOUS REINFORCED CONCRETE BEAMS AND STEEL STRINGERS AND FLOOR BEAMS WITH CONCRETE REINFORCED DECK AND SUBSTRUCTURE.
SPANS: CONCRETE BEAMS - MULTIPLE 24'± WITH 6'± CANTILEVERS.
STEEL STRINGERS - ALTERNATE 20'± AND 47'±.
ROADWAY: VARIES (52'± TO 64±) F/F SAFETY CURB (5'± SIDEWALK)
LOADING: H15
SKEW: 0°0'0" (CONCRETE BEAMS) AND 60°0'0" RF (STEEL BEAMS)
APPROACH SLABS: 20'-0"
ALIGNMENT: TANGENT
CROWN: VARIES
STRUCTURAL FILE NUMBER: 1801805
DATE BUILT: 1929 (1988 MAJOR RECONSTRUCTION)
DISPOSITION: TO BE REMOVED

EXISTING STRUCTURE (C.R. 24)

TYPE: CONTINUOUS REINFORCED CONCRETE BEAMS WITH REINFORCED CONCRETE DECK AND SUBSTRUCTURE.
SPANS: 4 SPANS AT 24'-0"±
ROADWAY: 46'-0"± F/F SAFETY CURB (5'± SIDEWALK)
LOADING: HS20-44 AND ALTERNATE MILITARY
SKEW: 0°0'0"
APPROACH SLABS: 20'-0"
ALIGNMENT: TANGENT
CROWN: VARIES
STRUCTURAL FILE NUMBER: 1834282
DATE BUILT: 1929 (1988 MAJOR RECONSTRUCTION)
DISPOSITION: TO BE REMOVED

STRUCTURES WORK:

REMOVALS
- 2 BRIDGES
- 1 PARTIAL CULVERT

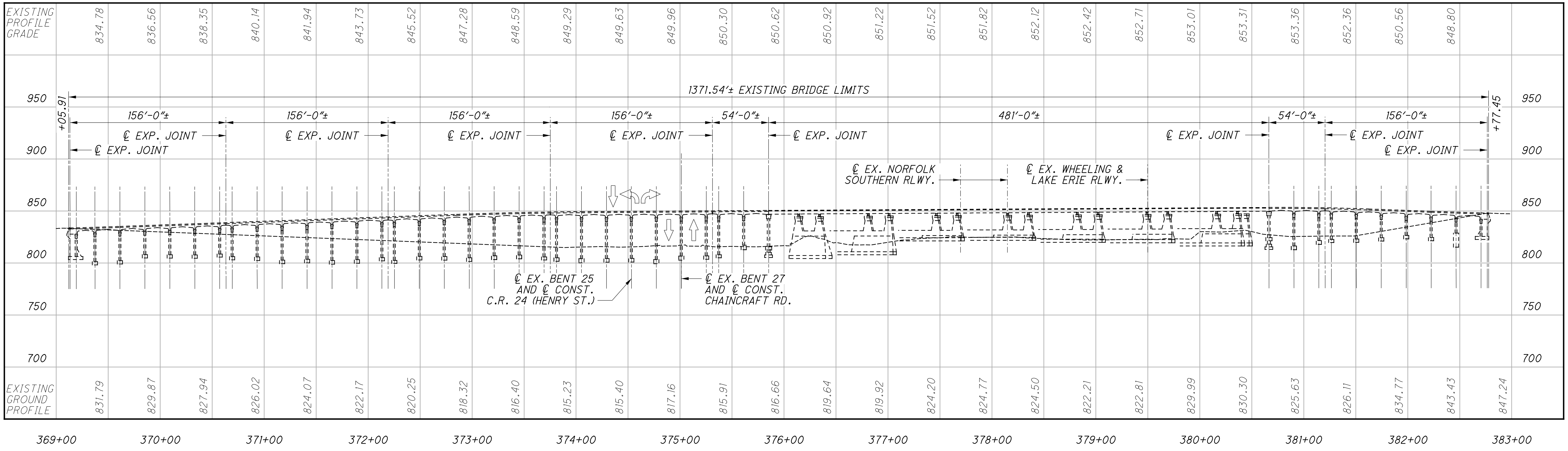
CONSTRUCTION
- 1 PROPOSED BRIDGE
- 1 PARTIAL CULVERT
- 7 PERMANENT MSE WALLS
- 5 TEMPORARY WIRE FACED MSE WALLS
- 1 TEMPORARY BRIDGE

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE	STRUCTURE FILE NUMBER
TMR	TMR	JTH	6/19	1081085/1834282
CHECKED	REVISED			
MRW				

ALTERNATIVE 2 - SCHEMATIC PLAN
BRIDGE NO. CUY-14-0693 AND CUY-24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132



EXISTING PROFILE ALONG ℄ SURVEY S.R. 14 (BROADWAY AVE.)

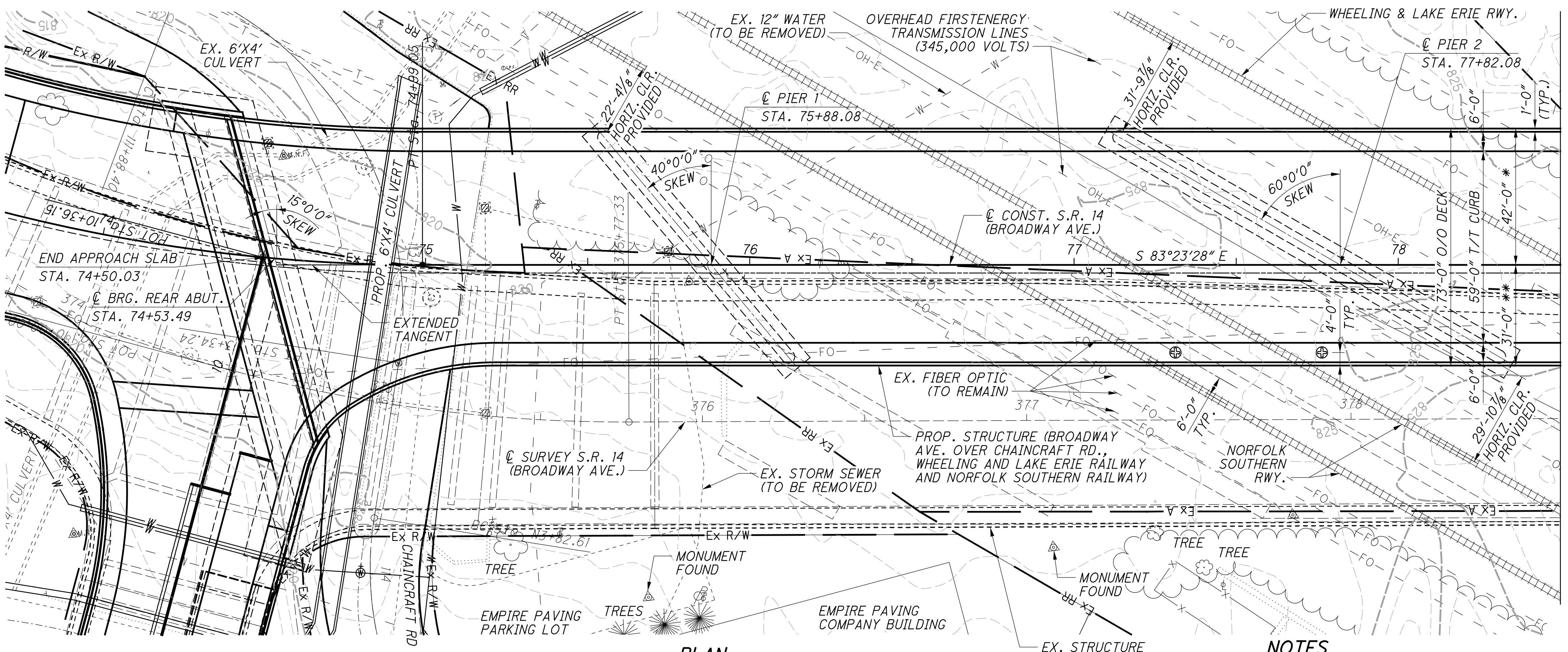
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

REVIEWED JTH	DATE 6/19
STRUCTURE FILE NUMBER 1081085	
DRAWN CMA	REVISED
DESIGNED CMA	CHECKED MRW

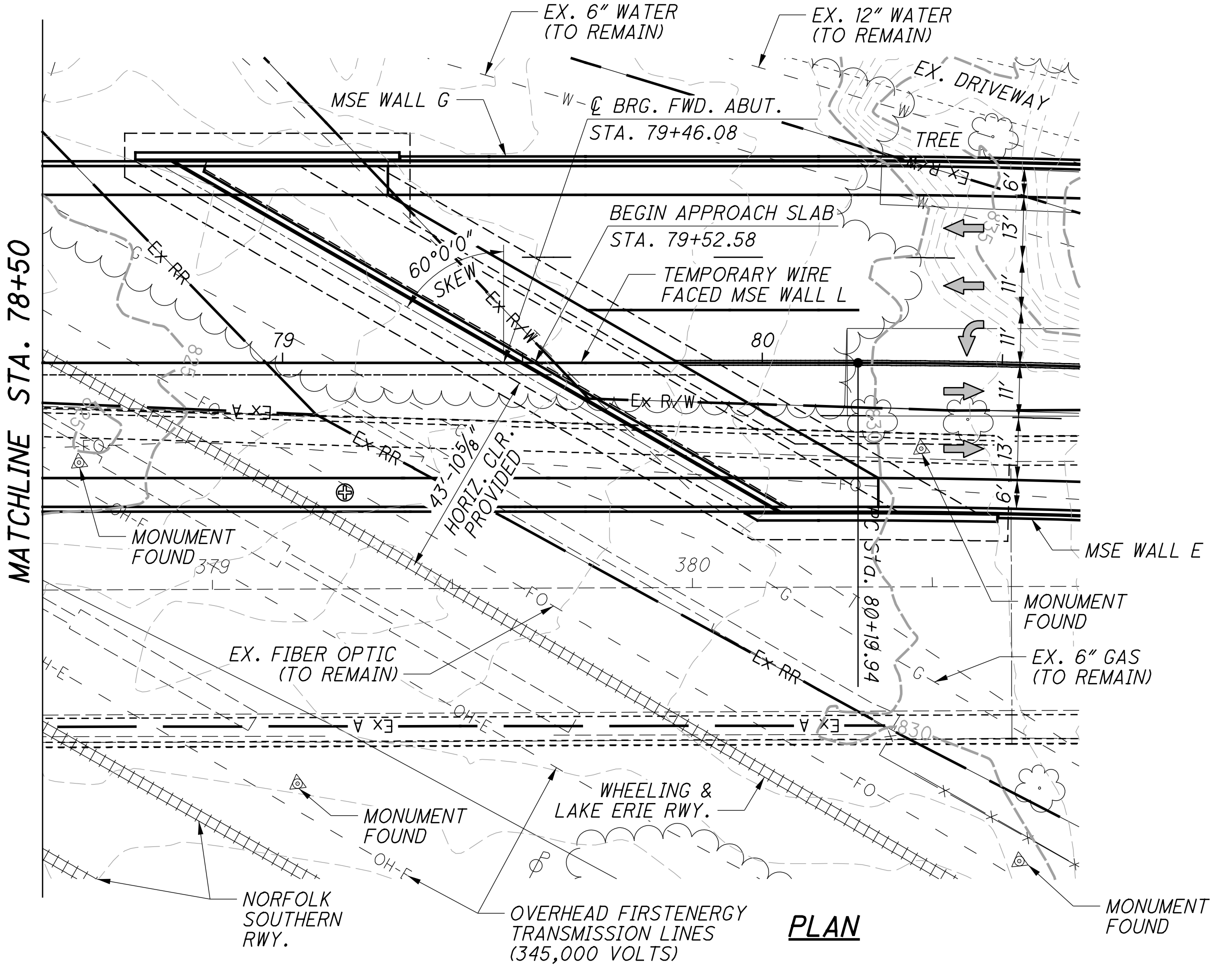
EXISTING PROFILE - BROADWAY AVENUE
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS



PLAN



PLAN

NOTES

FOR PROFILE, SEE SHEET 4/20.
FOR EXISTING STRUCTURE BOXES, SEE SHEET 1/20.
EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.

DESIGN TRAFFIC:

2026 ADT = 23,500	2026 ADTT = 1,645
2046 ADT = 23,600	2046 ADTT = 1,652

DIRECTIONAL DISTRIBUTION = 0.60
(ADT AND ADTT ARE BASED ON AN AECOM TRAFFIC COUNT DATED 11-13-18. COUNTS WILL BE UPDATED UPON RECEIPT OF CERTIFIED TRAFFIC)
NORFOLK SOUTHERN RAILWAY TRAFFIC IS 60 TRAINS PER DAY.
WHEELING & LAKE ERIE RAILWAY TRAFFIC IS 2 TRAINS PER DAY.

FOUNDATION DATA:

PROPOSED ABUTMENT AND PIER PILES SHALL BE 14" C.I.P. FRICTION PIPE PILES WITH AN ESTIMATED LENGTH OF 35 FEET.

LEGEND

* - PHASE 1 CONSTRUCTION
** - PHASE 2 CONSTRUCTION
⊕ - POINT OF MINIMUM VERTICAL CLEARANCE

PROPOSED STRUCTURE

TYPE: 3 SPAN CONTINUOUS WEATHERING STEEL PLATE GIRDERS W/ COMPOSITE REINFORCED CONCRETE DECK ON WALL TYPE ABUTMENTS AND WALL TYPE PIERS

SPANS: 134'-0", 194'-0", 164'-0" (C/C BRG.) MEASURED ALONG EXTENDED TANGENT

ROADWAY: 59'-0" T/T CURB WITH 6'-0" SIDEWALK EACH SIDE

LOADING: HL-93 W/ FUTURE WEARING SURFACE (FWS) 60 PSF

SKEW: VARIES RF (15°0'0", 40°0'0", 60°0'0", 60°0'0")

APPROACH SLABS: 15'-0" AND 30'-0" LONG (AS-1-15 AND AS-2-15)

ALIGNMENT: TANGENT

CROWN: 0.02 FT/FT

WEARING SURFACE: 1" MONOLITHIC CONCRETE

COORDINATES: LATITUDE N 41°25'51.96"
LONGITUDE W 81°35'59.01"

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED JDM	DRAWN TMR	REVIEWED JTH	DATE 3/19
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

ALTERNATIVE 2 - SITE PLAN
BRIDGE NO. CUY-14-____
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

3/20

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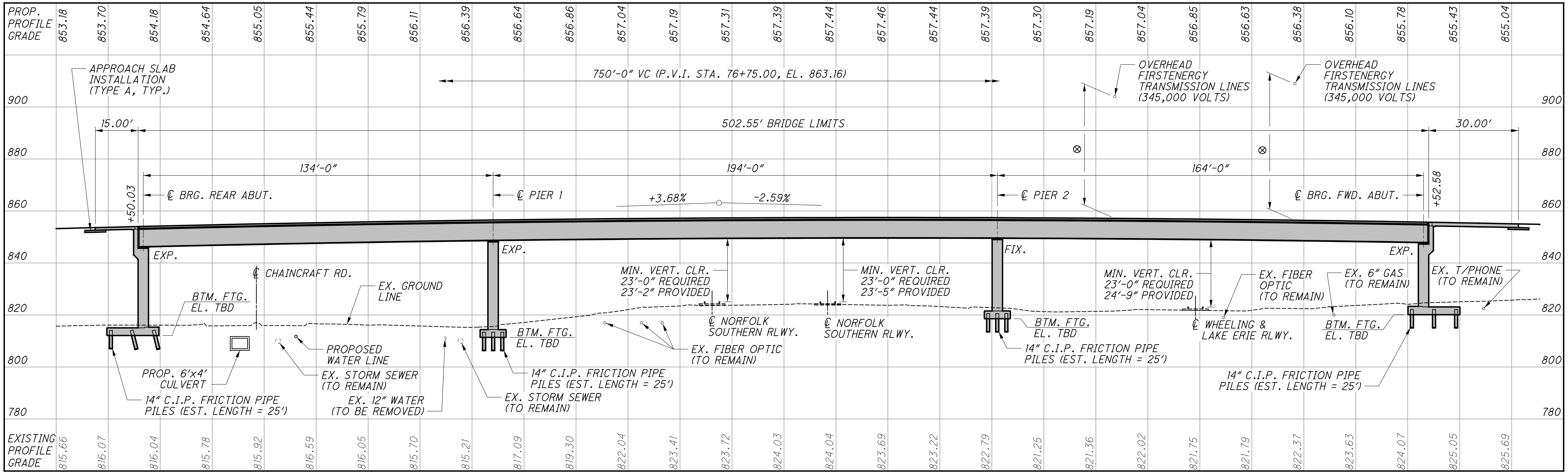


PROFILE ALONG ℄ CONST. S.R. 14 (BROADWAY AVE.)

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

LEGEND

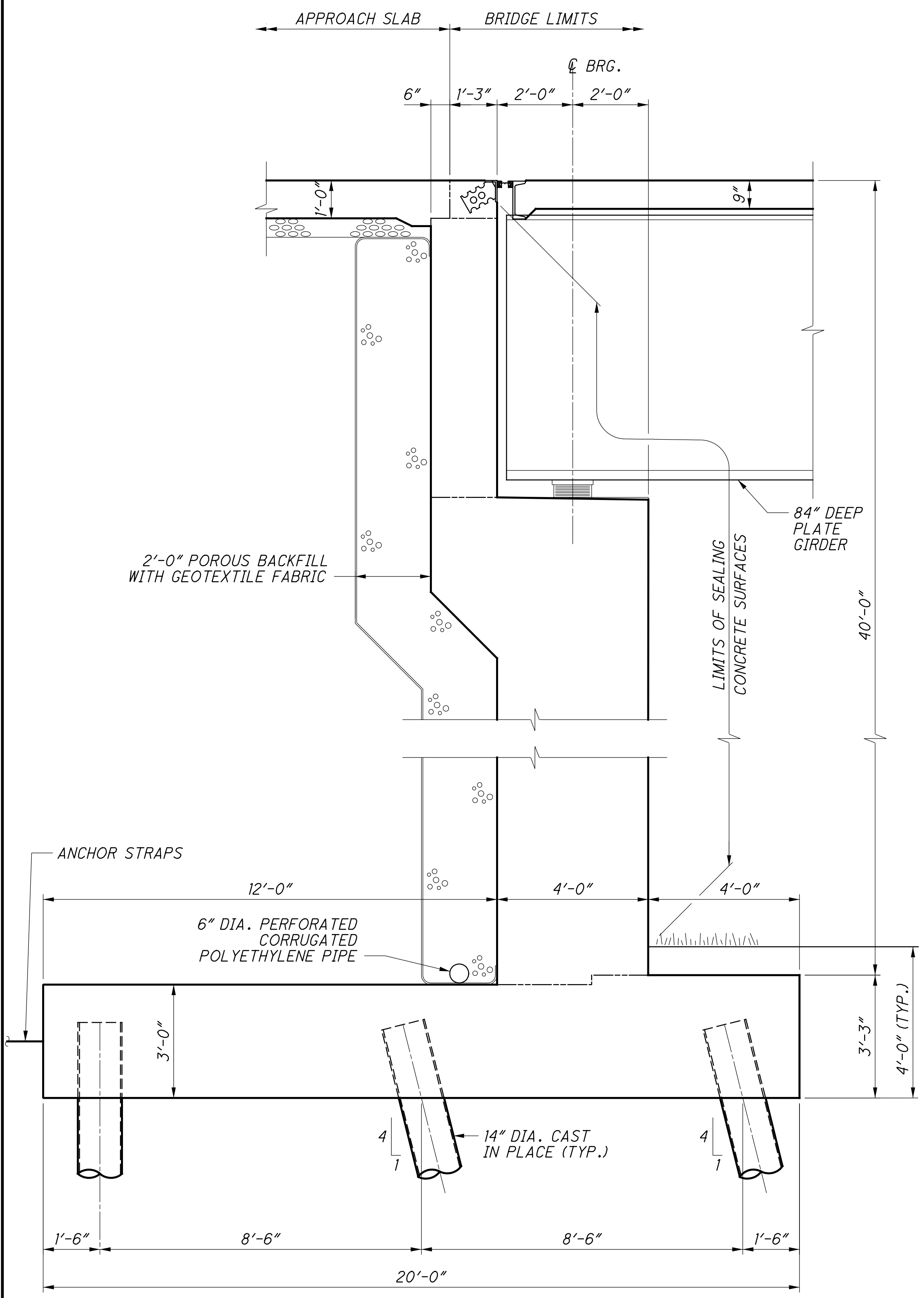
⊗ - OVERHEAD FIRSTENERGY TRANSMISSION LINES
EX. VERTICAL CLR. = TBD
PROP. VERTICAL CLR. = TBD

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

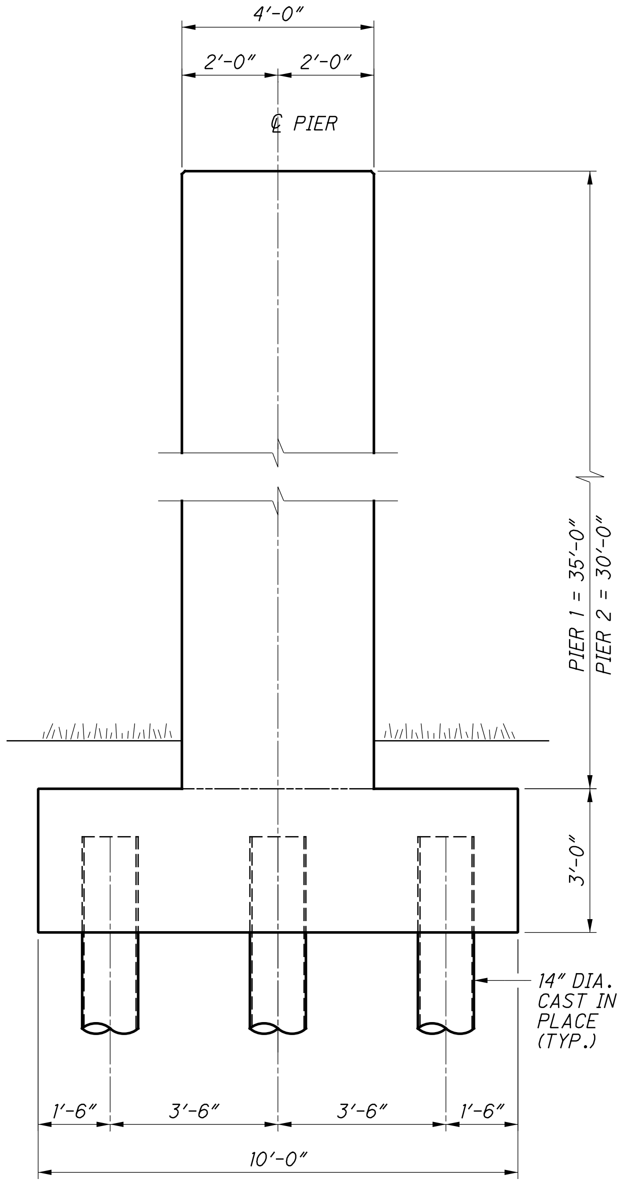
DESIGNED JDM
CHECKED MRW
DRAWN TMR
REVISED
REVIEWED JTH
DATE 3/19
STRUCTURE FILE NUMBER TBD

ALTERNATIVE 2 - PROFILE
BRIDGE NO. CUY-14-____
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

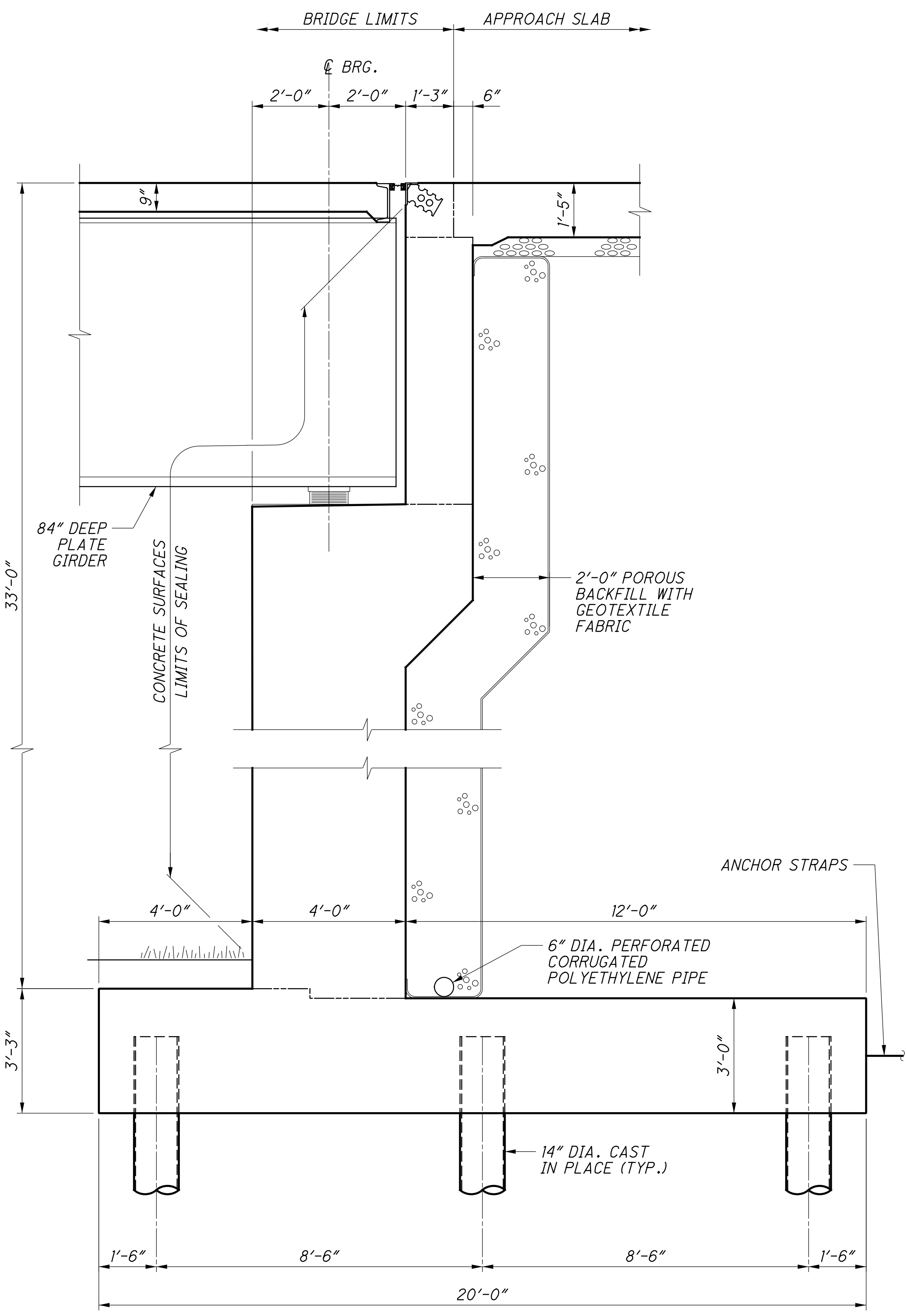
CUY-14-6.93
PID No. 104132



TYPICAL REAR ABUTMENT SECTION



TYPICAL PIER SECTION



TYPICAL FORWARD ABUTMENT SECTION

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
JDM	TMR	JTH	3/19
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

ALTERNATIVE 2 - SUBSTRUCTURE DETAILS

BRIDGE NO. CUY-14-____
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

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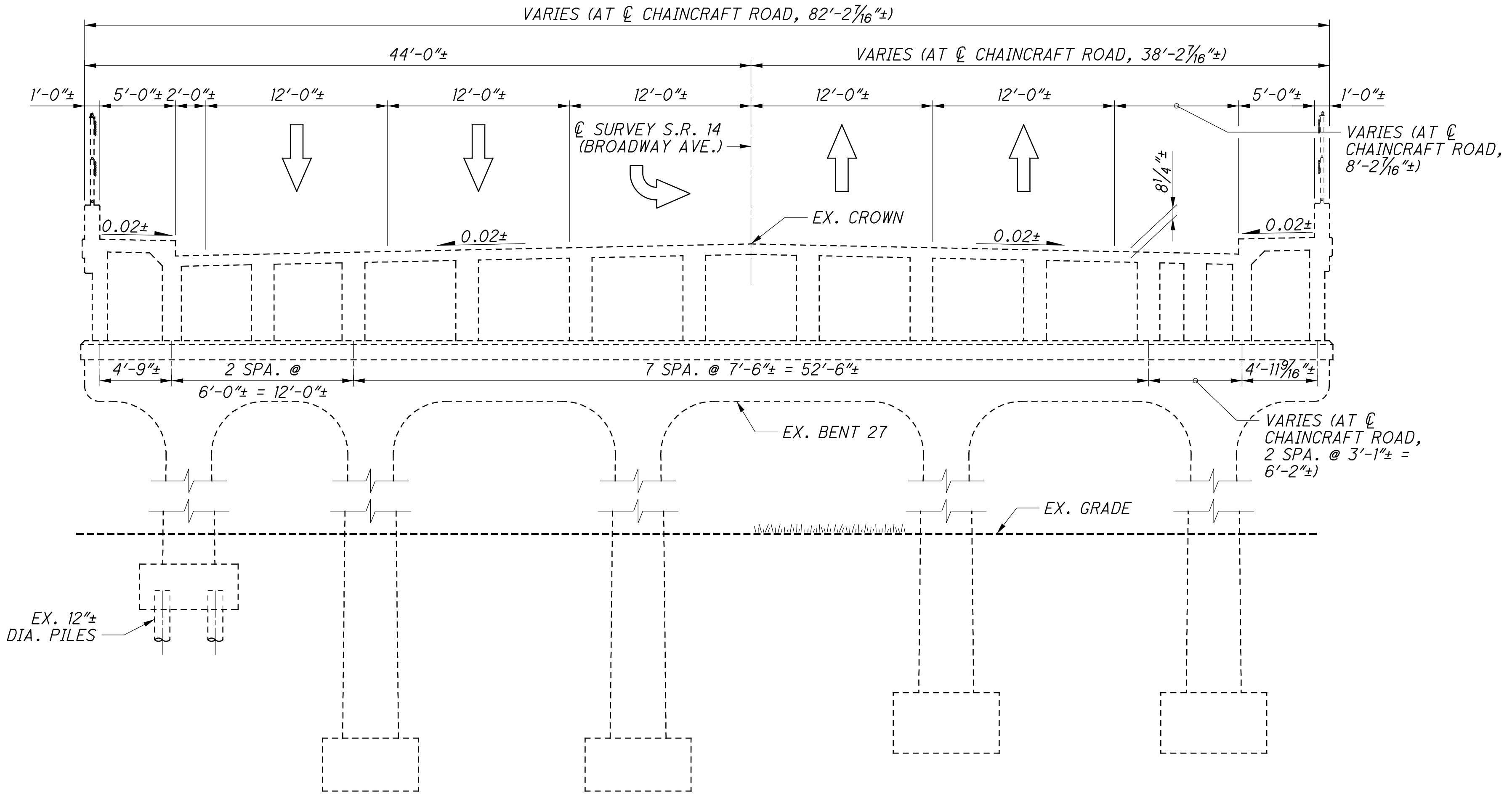
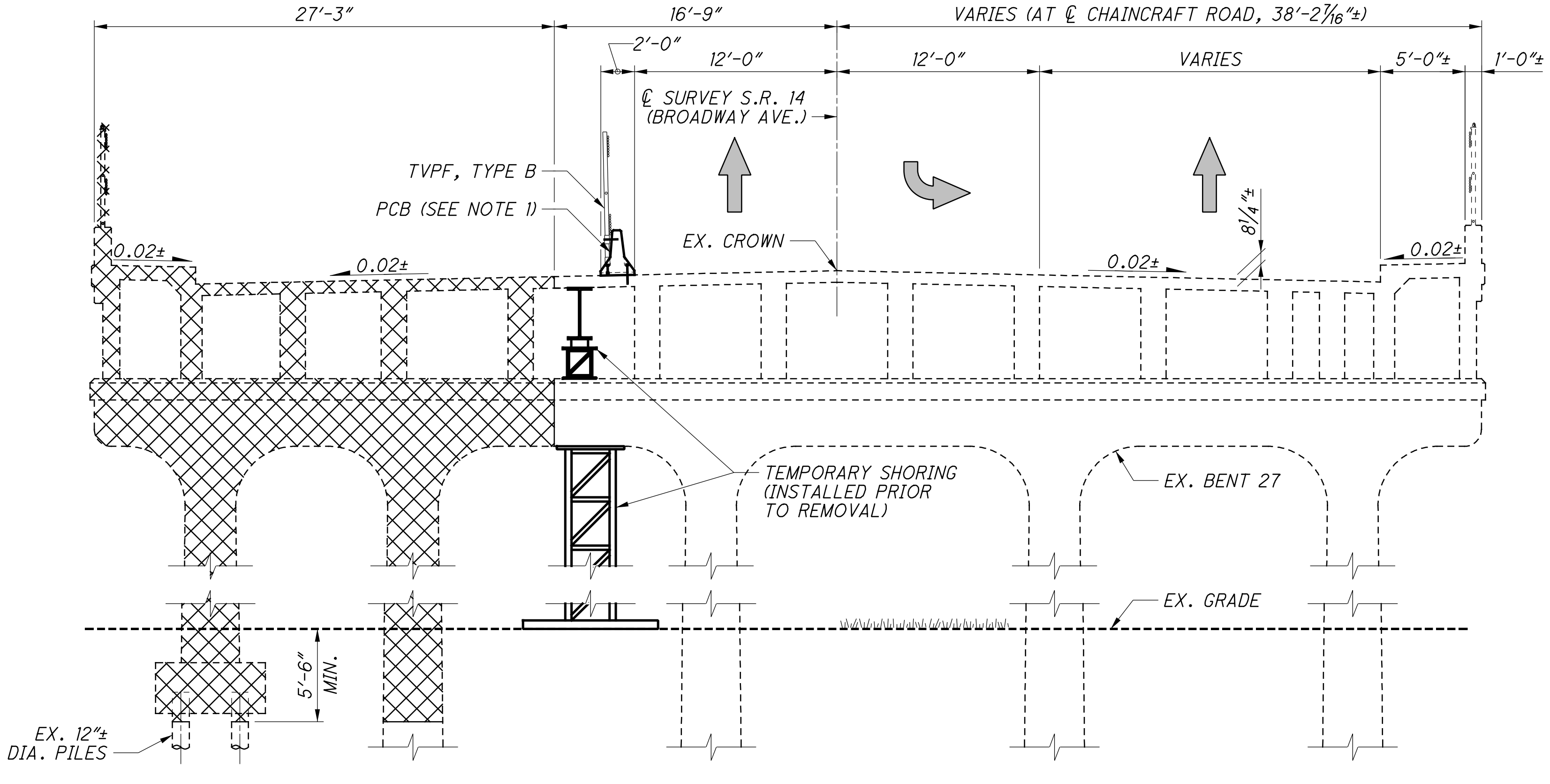


EXISTING CONDITION



PHASE 1 REMOVAL

PHASE 1 M.O.T.

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

NOTE:

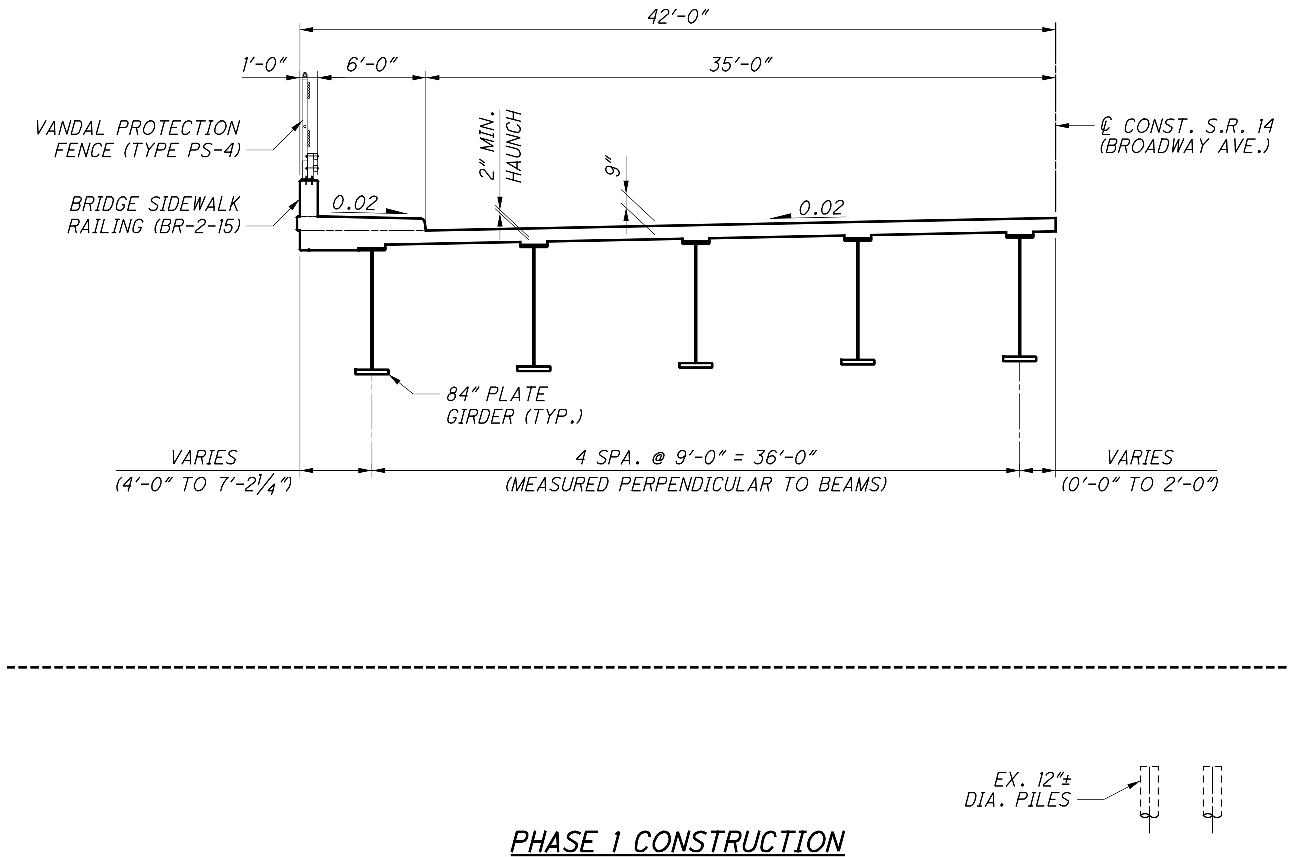
1. PORTABLE CONCRETE BARRIER SHALL BE ANCHORED FOR THE TEMPORARY VANDAL PROTECTION FENCE, TYPE B, OVER CHAINCRAFT ROAD. PORTABLE CONCRETE BARRIER SHALL BE UNANCHORED BEYOND CHAINCRAFT ROAD.

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

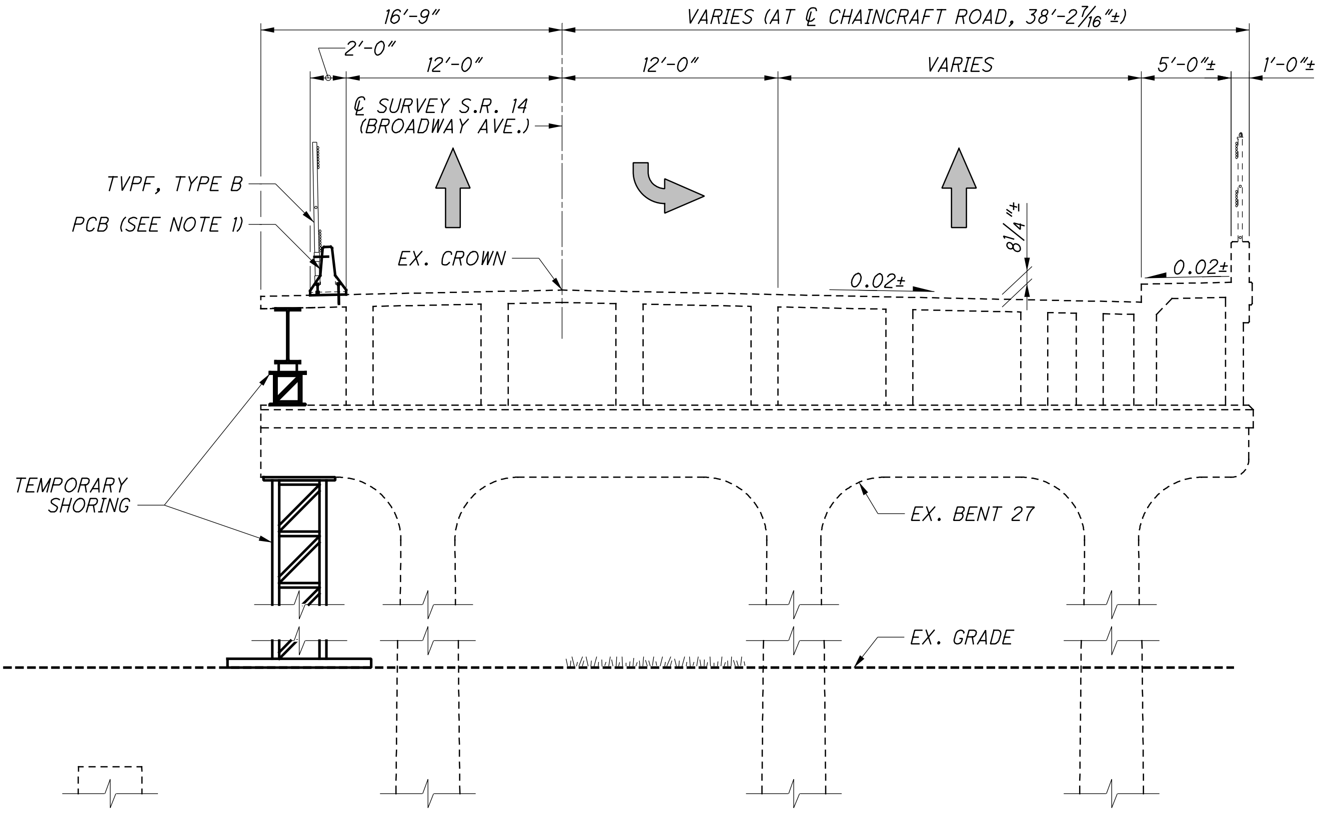
DESIGNED TMR	DRAWN TMR	REVIEWED JTH	DATE 6/19
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

ALTERNATIVE 2 - PHASE CONSTRUCTION DETAILS OVER CHAINCRAFT
BRIDGE NO. CUY-14-____
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

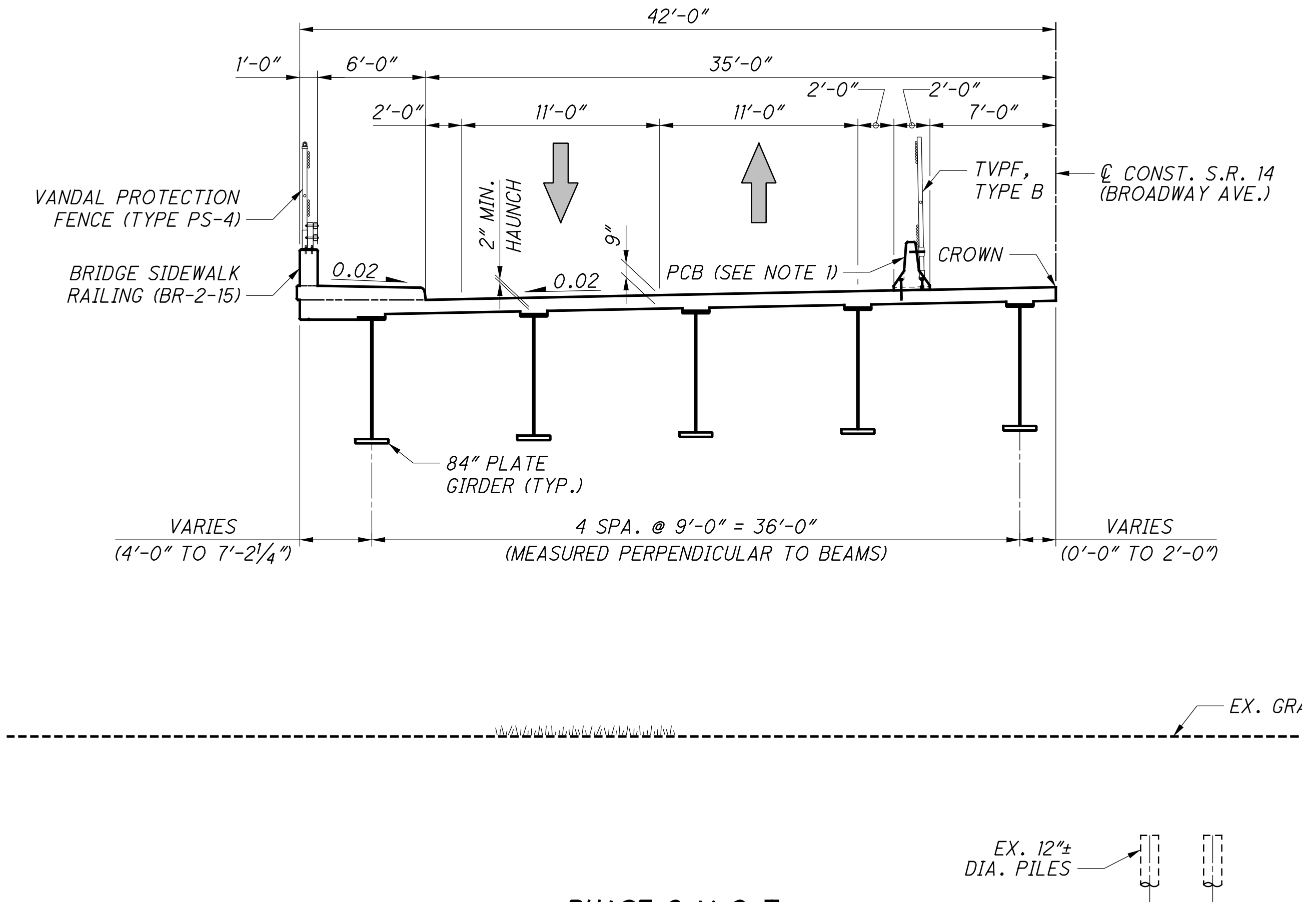
CUY-14-6.93
PID No. 104132



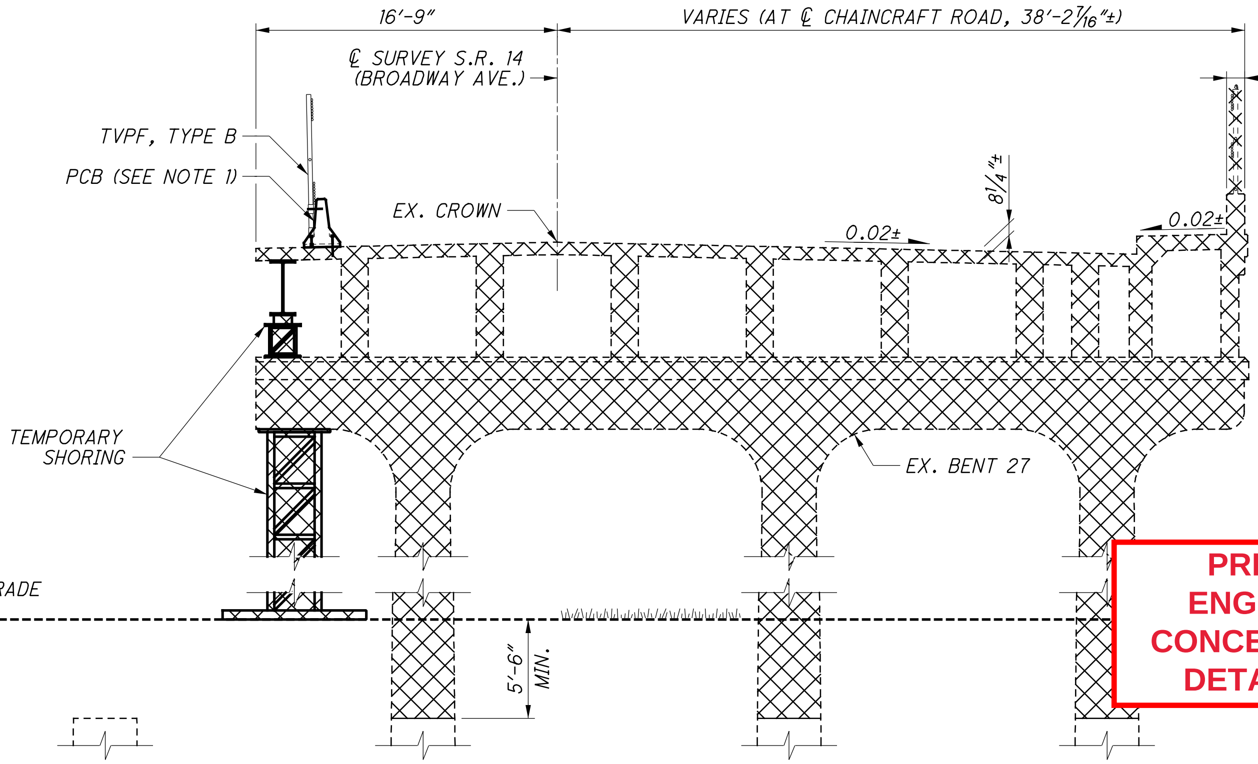
PHASE 1 CONSTRUCTION



PHASE 1 M.O.T.



PHASE 2 M.O.T.



PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

PHASE 2 REMOVAL

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

NOTE:

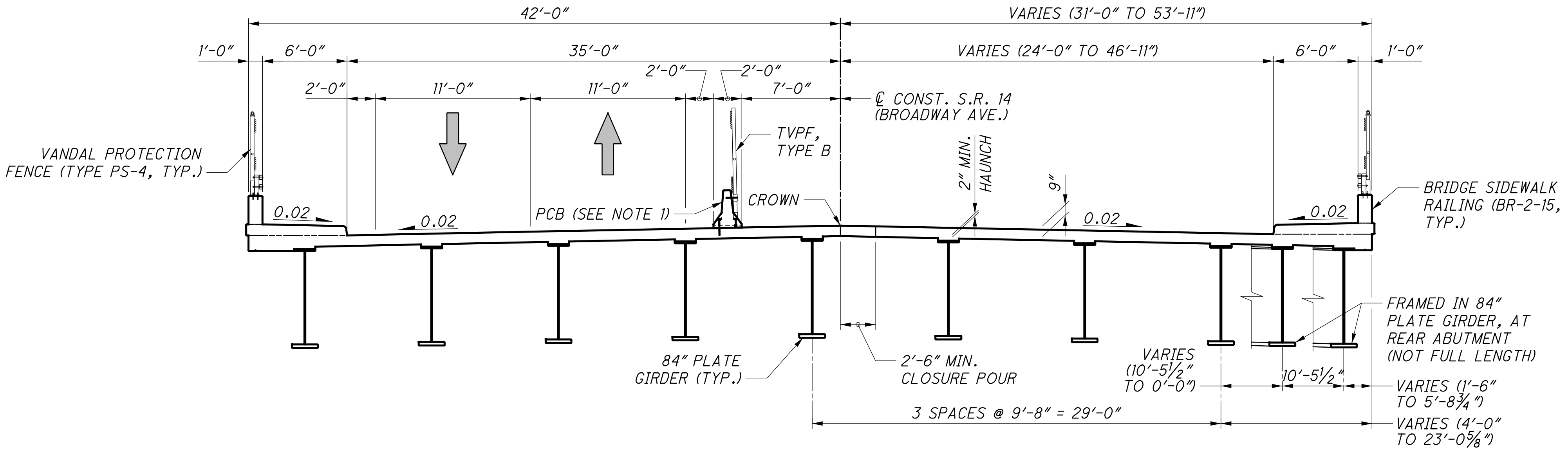
1. PORTABLE CONCRETE BARRIER SHALL BE ANCHORED FOR THE TEMPORARY VANDAL PROTECTION FENCE, TYPE B, OVER CHAINCRAFT ROAD. PORTABLE CONCRETE BARRIER SHALL BE UNANCHORED BEYOND CHAINCRAFT ROAD.

AECOM
DESIGN AGENCY
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	CHECKED	DRAWN	REVISED	REVIEWED	DATE	STRUCTURE FILE NUMBER
TMR	MRW	TMR		JTH	6/19	TBD

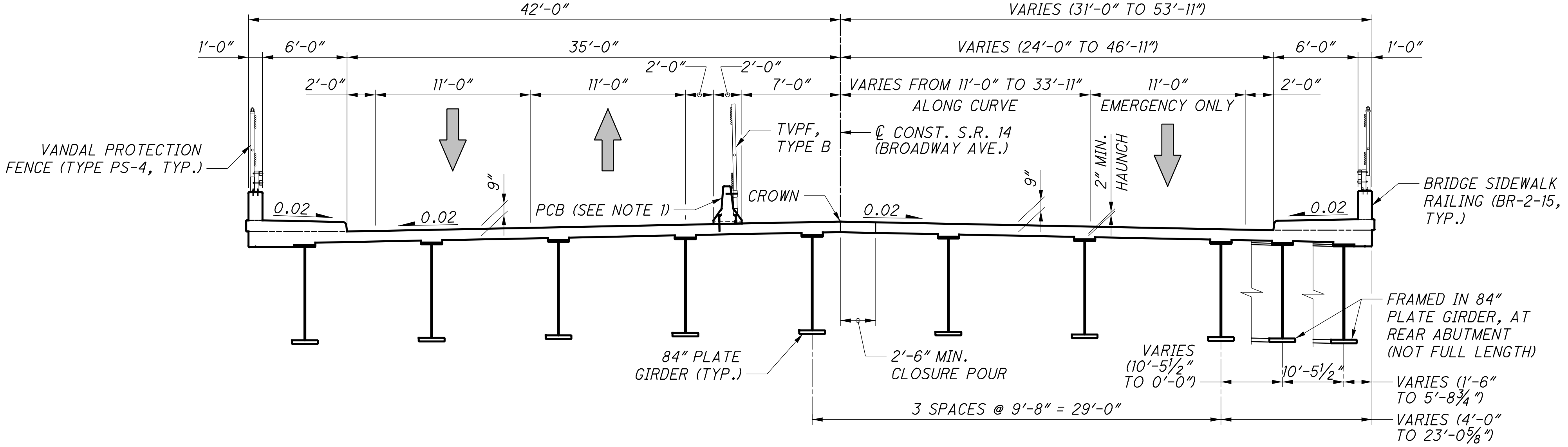
ALTERNATIVE 2 - PHASE CONSTRUCTION DETAILS OVER CHAINCRAFT
BRIDGE NO. CUY-14-____
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



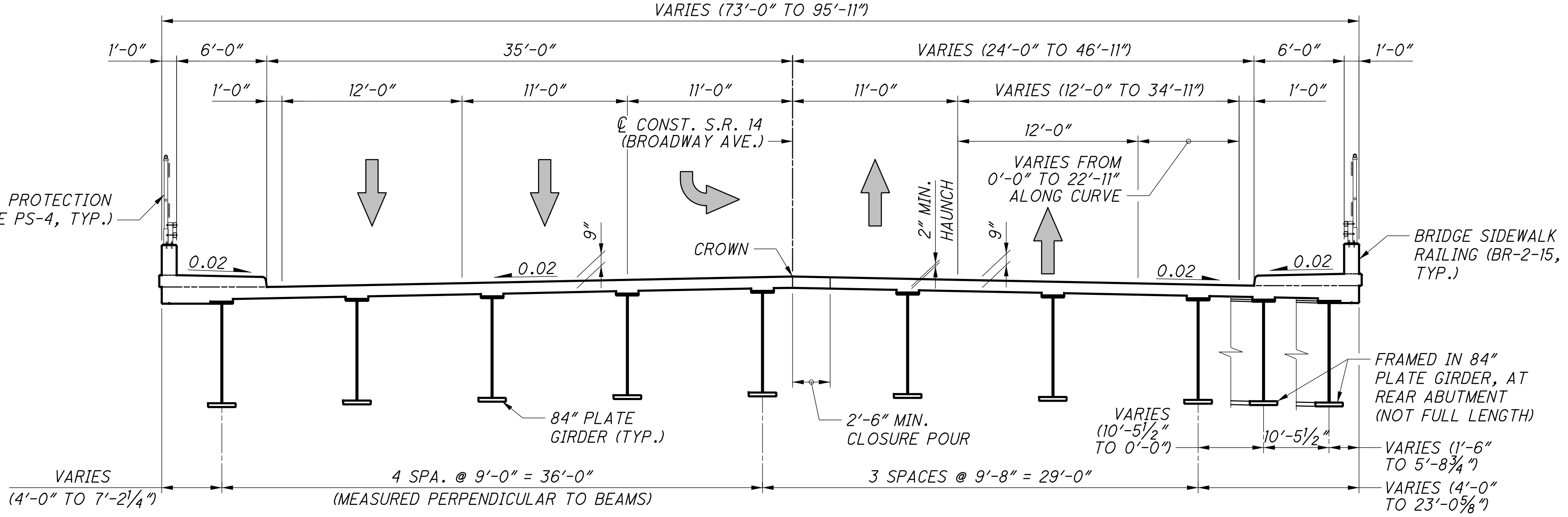
PHASE 2 M.O.T.

PHASE 2 CONSTRUCTION



PHASE 3 M.O.T.

PHASE 3 M.O.T.
(EMERGENCY VEHICLES ONLY)



FINAL CONDITION

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

NOTE:

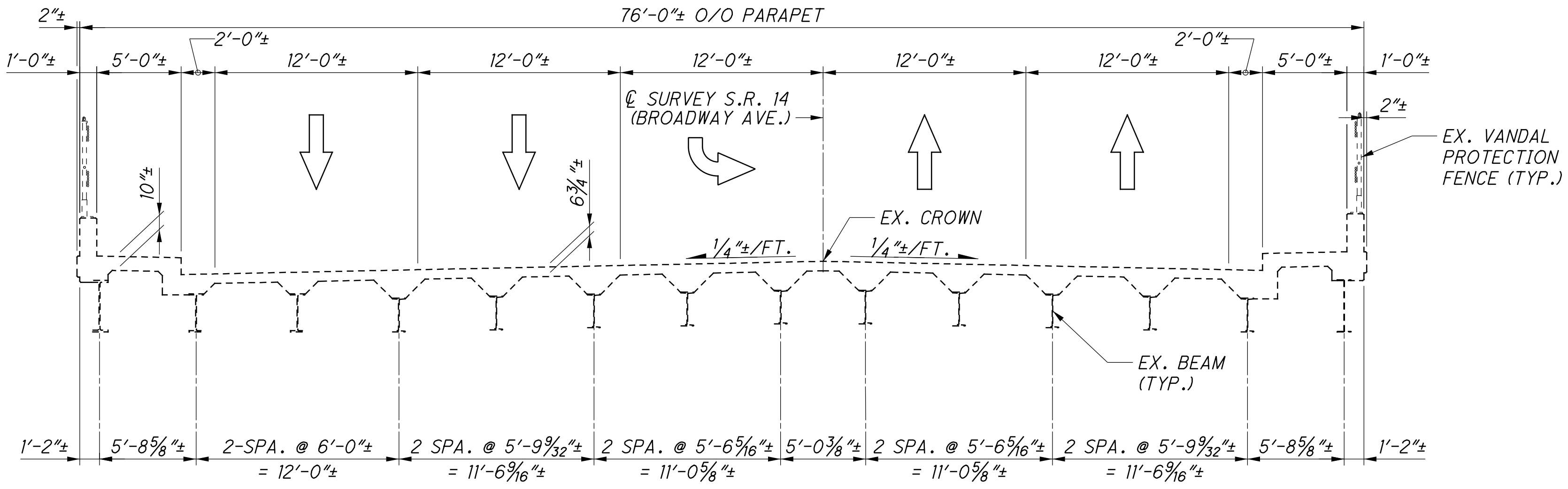
1. PORTABLE CONCRETE BARRIER SHALL BE ANCHORED FOR THE TEMPORARY VANDAL PROTECTION FENCE, TYPE B, OVER CHAINCRAFT ROAD. PORTABLE CONCRETE BARRIER SHALL BE UNANCHORED BEYOND CHAINCRAFT ROAD.

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

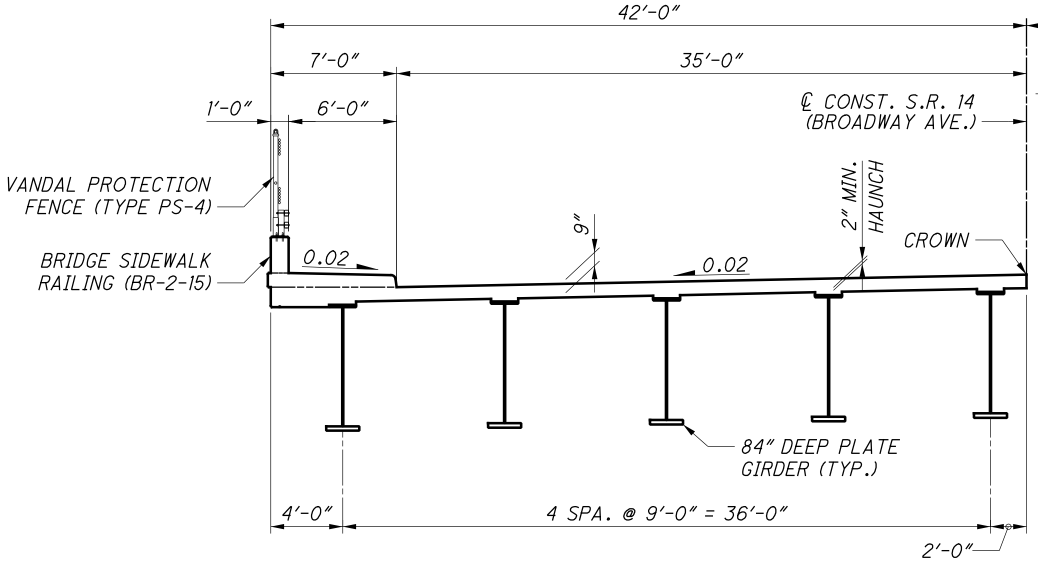
DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	JTH	6/19
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

ALTERNATIVE 2 - PHASE CONSTRUCTION DETAILS OVER CHAINCRAFT
BRIDGE NO. CUY-14-____
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

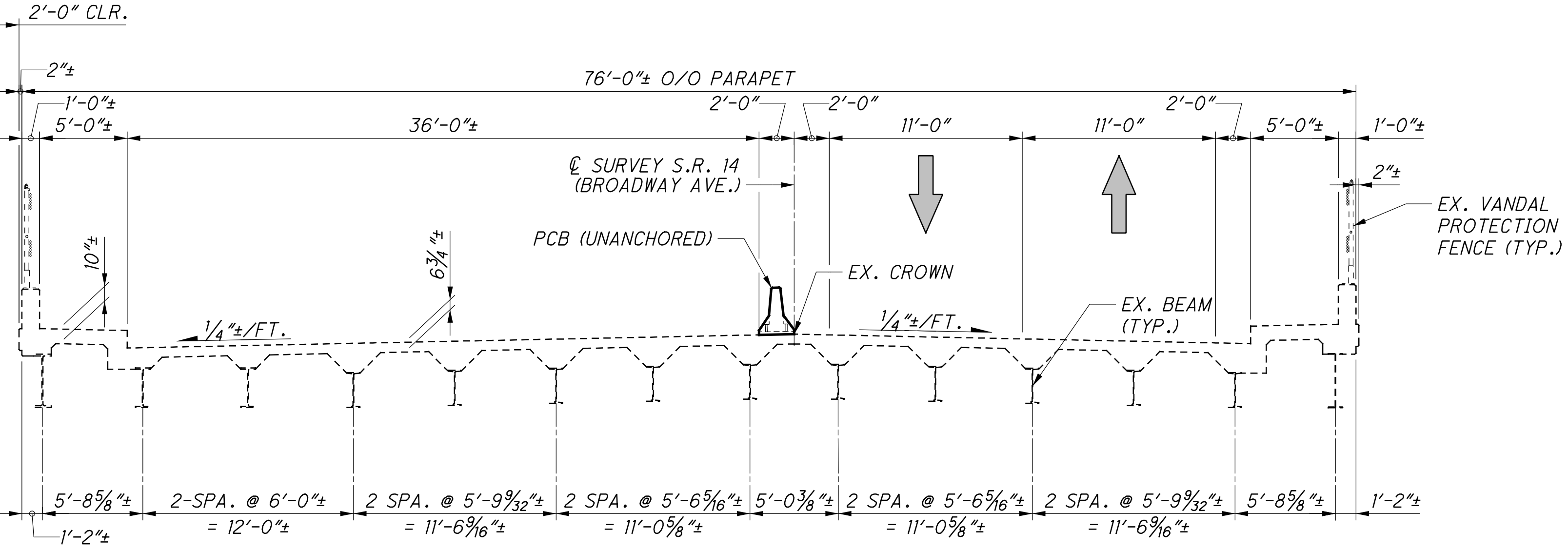
CUY-14-6.93
PID No. 104132



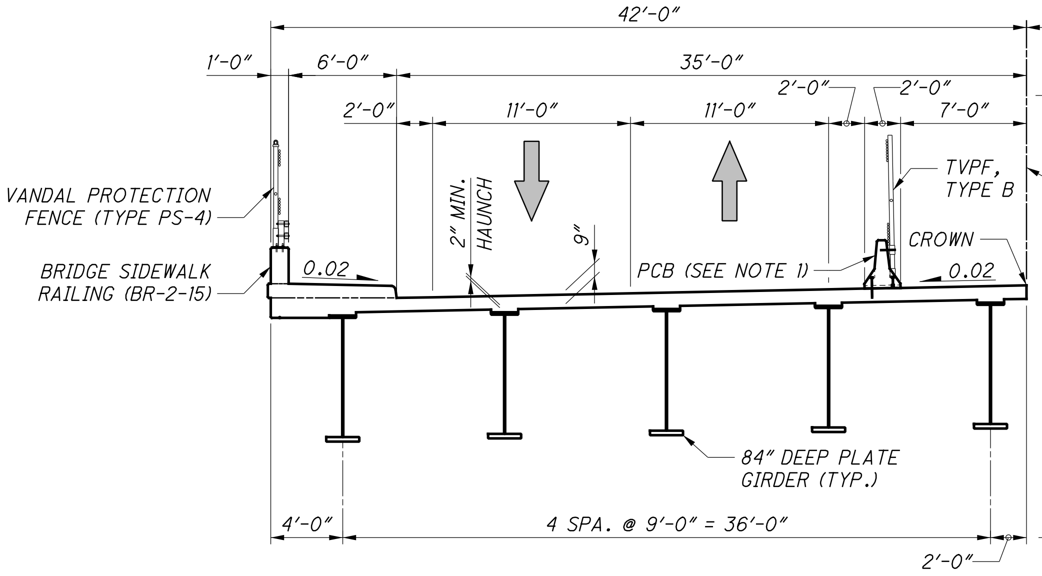
EXISTING CONDITION



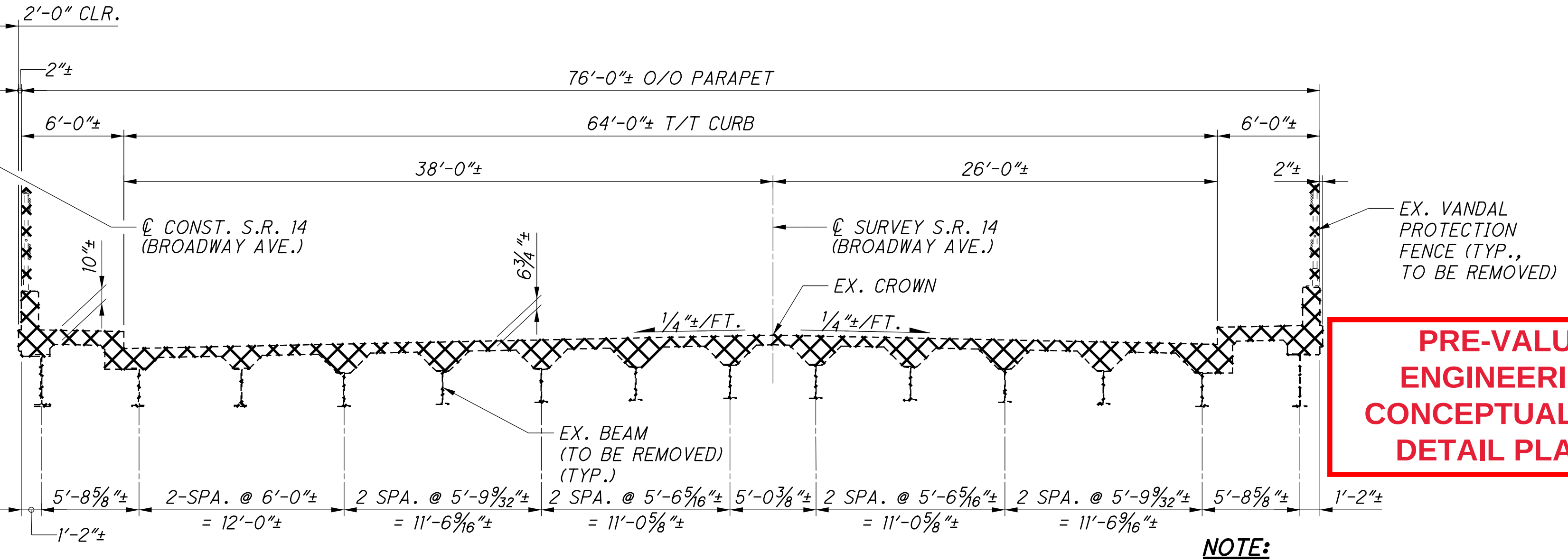
PHASE 1 CONSTRUCTION



PHASE 1 M.O.T.



PHASE 2 M.O.T.



PHASE 2 REMOVAL

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

NOTE:

1. PORTABLE CONCRETE BARRIER SHALL BE ANCHORED FOR THE TEMPORARY VANDAL PROTECTION FENCE, TYPE B, OVER THE RAILROAD LIMITS. PORTABLE CONCRETE BARRIER SHALL BE UNANCHORED BEYOND THE RAILROAD LIMITS.

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	DRAWN TMR	REVIEWED JTH	DATE 6/19
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

ALTERNATIVE 2 - PHASE CONSTRUCTION DETAILS OVER RAILWAYS

BRIDGE NO. CUY-14-____
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

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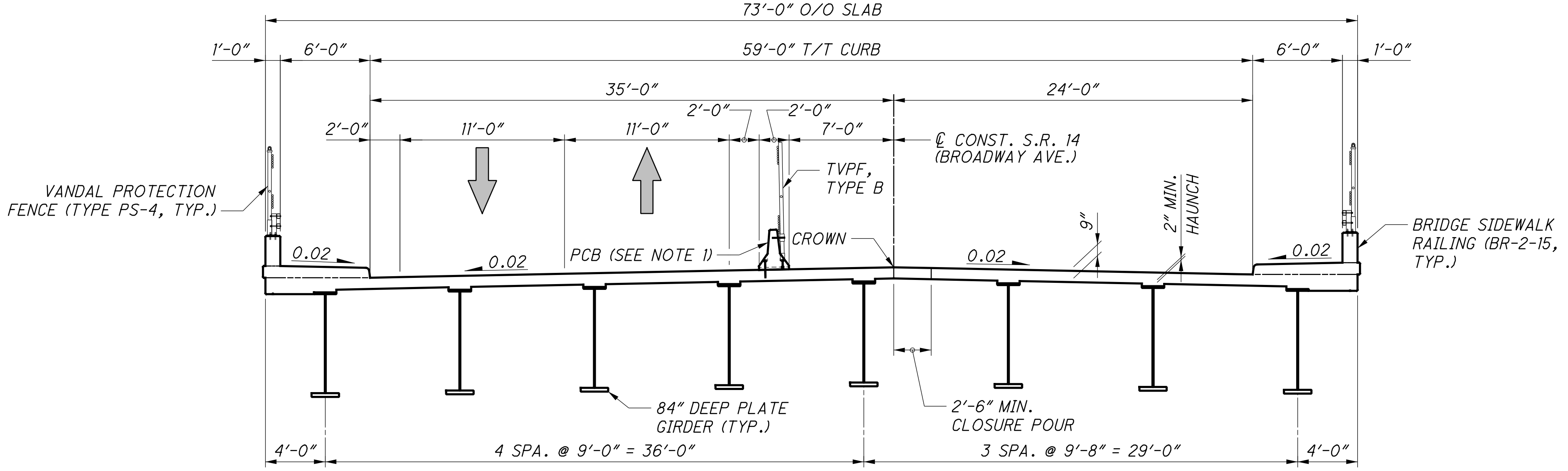
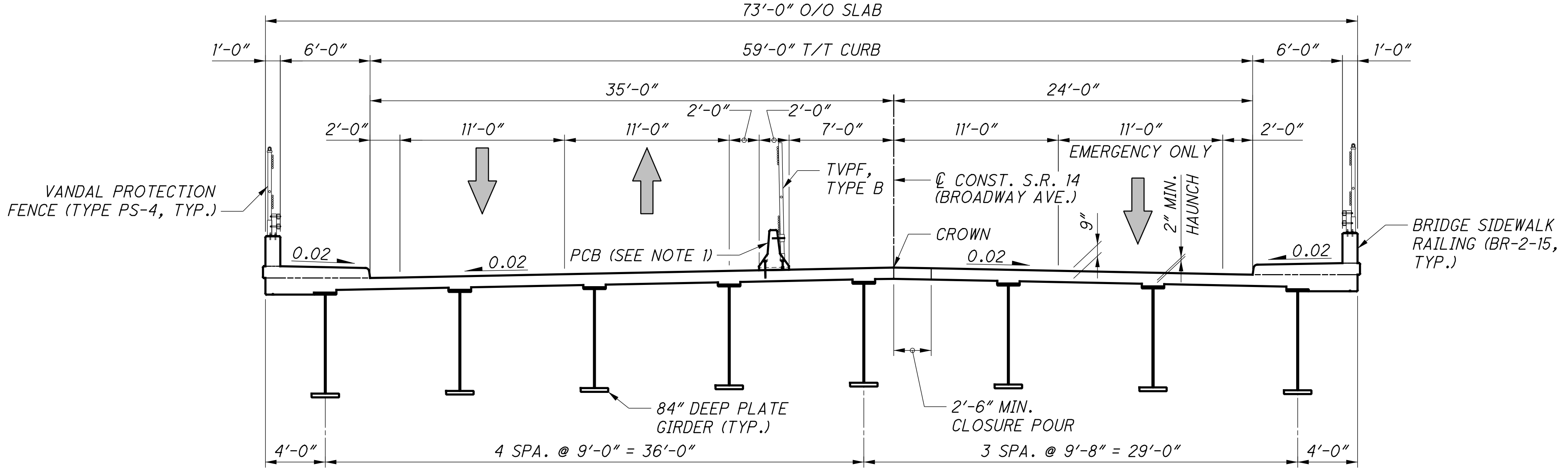


PHASE 2 M.O.T.

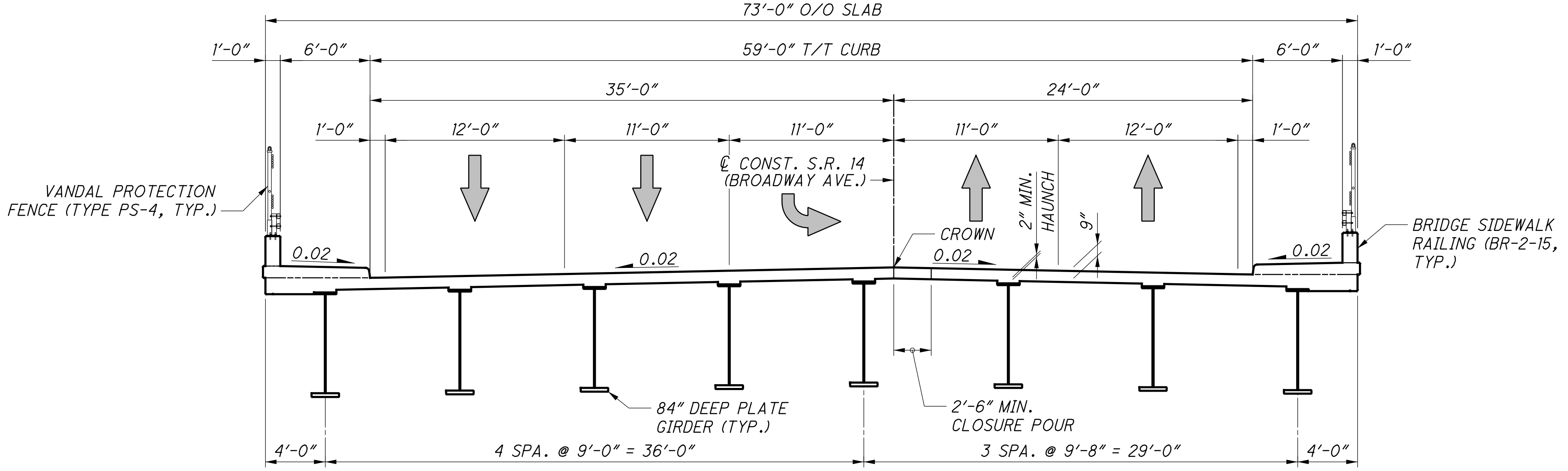
PHASE 2 CONSTRUCTION



PHASE 3 M.O.T.

PHASE 3 M.O.T.

(EMERGENCY VEHICLES ONLY)



FINAL CONDITION

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

NOTE:

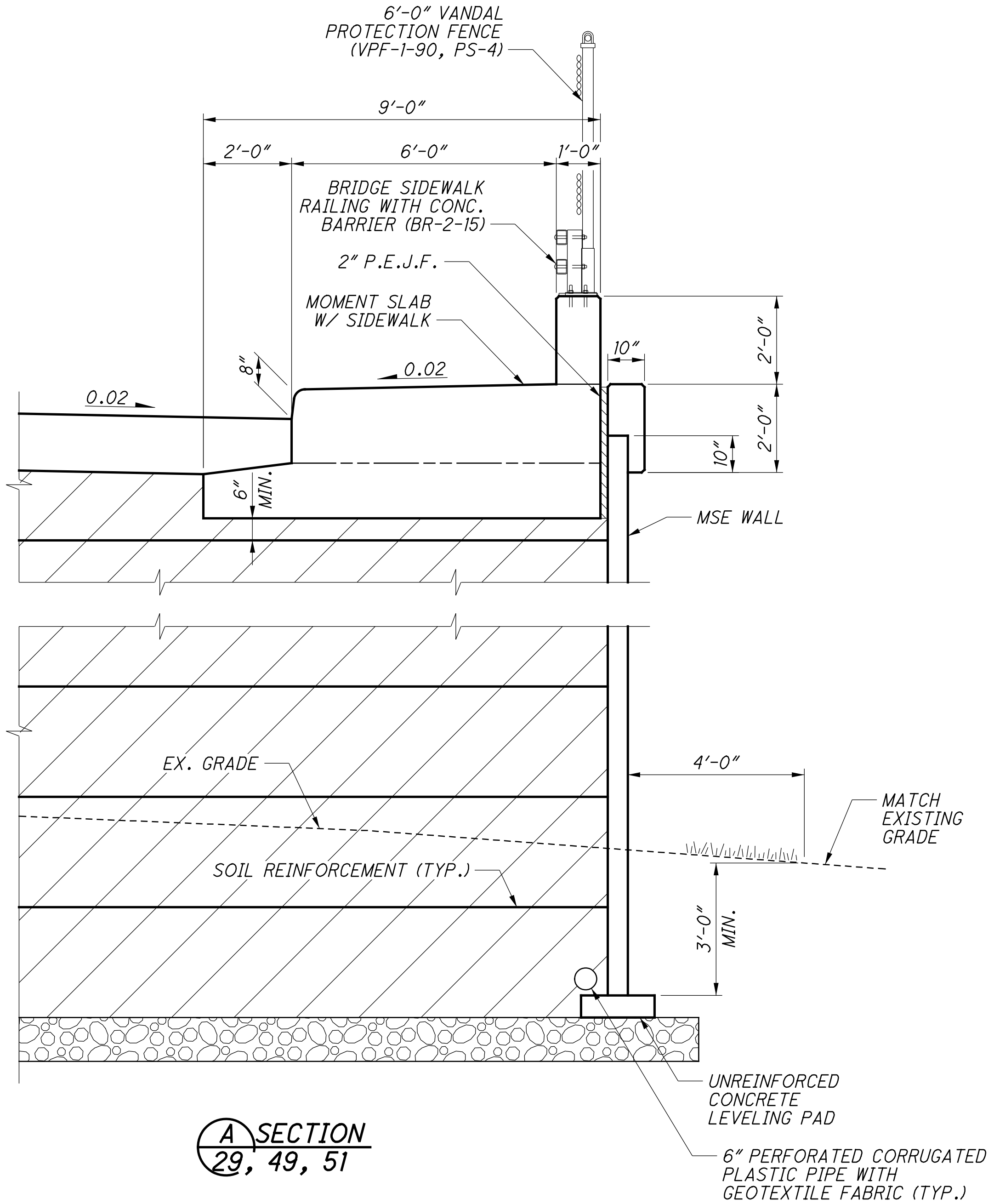
1. PORTABLE CONCRETE BARRIER SHALL BE ANCHORED FOR THE TEMPORARY VANDAL PROTECTION FENCE, TYPE B, OVER THE RAILROAD LIMITS. PORTABLE CONCRETE BARRIER SHALL BE UNANCHORED BEYOND THE RAILROAD LIMITS.

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

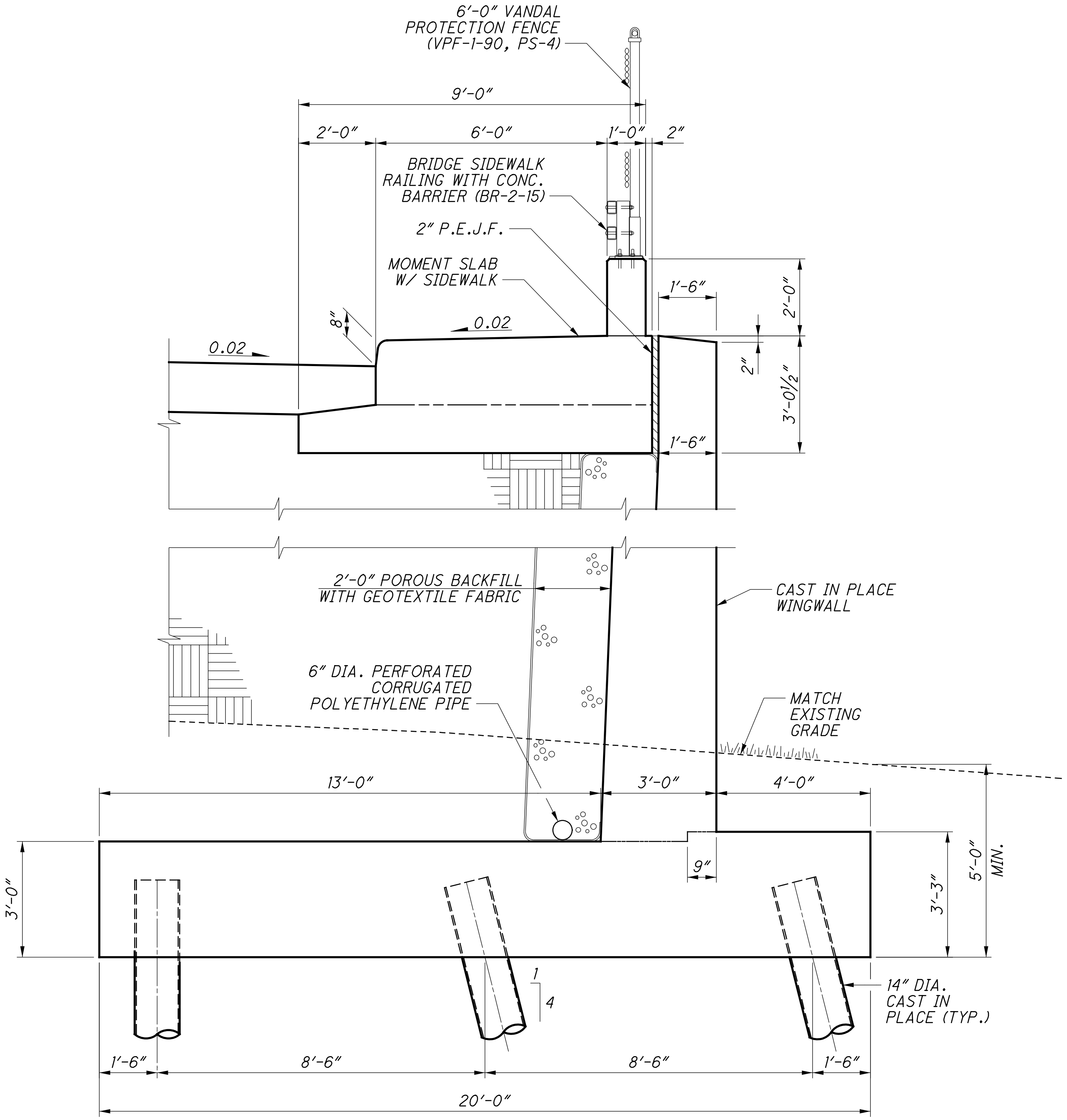
DESIGNED TMR	DRAWN TMR	REVIEWED JTH	DATE 6/19
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER TBD	

ALTERNATIVE 2 - PHASE CONSTRUCTION DETAILS OVER RAILWAYS
BRIDGE NO. CUY-14-____
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



A SECTION
29, 49, 51



B SECTION
29, 49, 51

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

LEGEND:

▤ ITEM 203 - EMBANKMENT

▨ SELECT GRANULAR BACKFILL PER SUPPLEMENTAL SPECIFICATION 840

▒ ITEM 203 - GRANULAR MATERIAL, TYPE C (1'-0" MIN.)

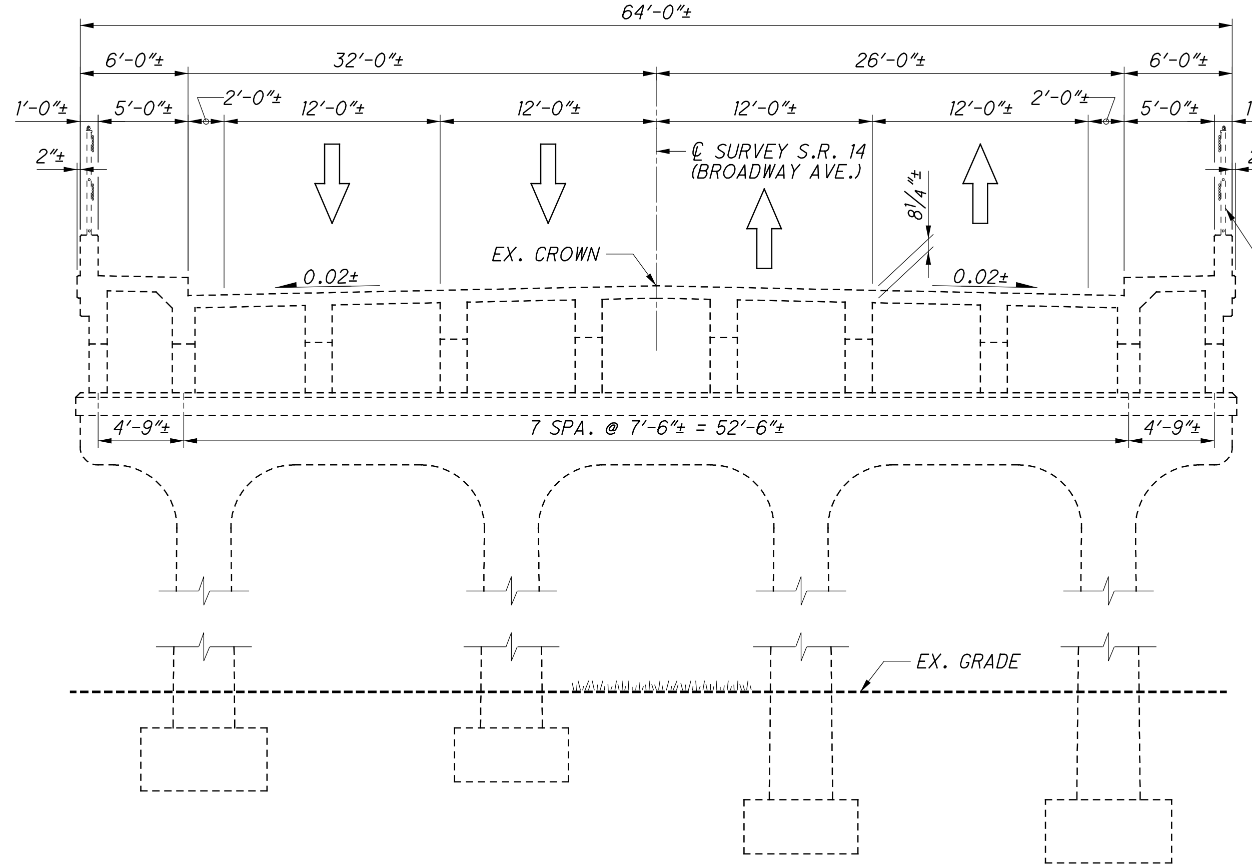
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	CHECKED	DRAWN	REVISED	REVIEWED	DATE	STRUCTURE FILE NUMBER
TMR	MRW	TMR		JTH	6/19	1081085

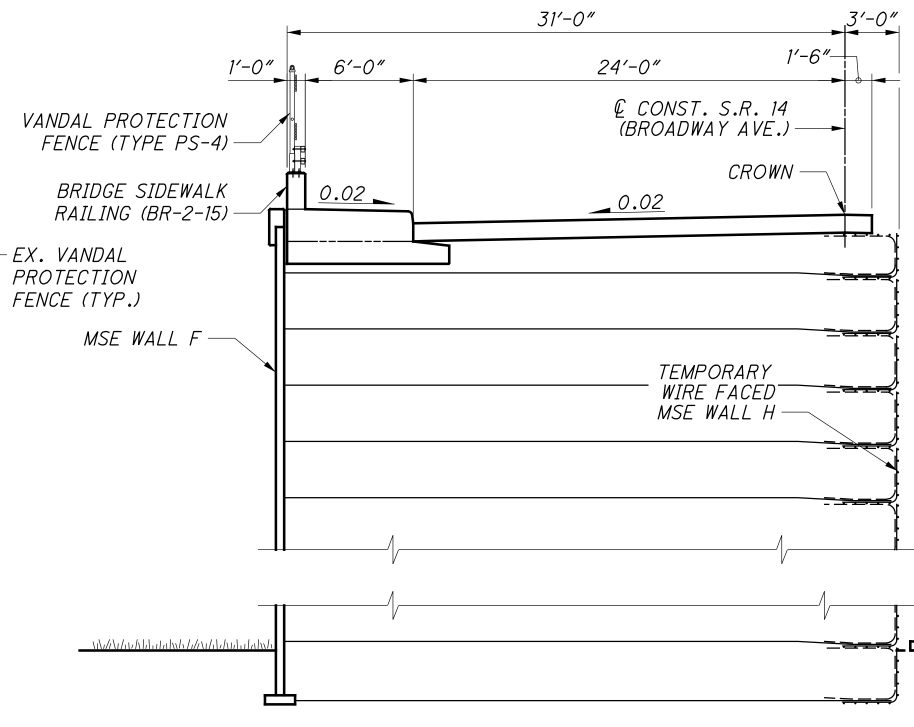
MOMENT SLAB AND WALL DETAILS

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

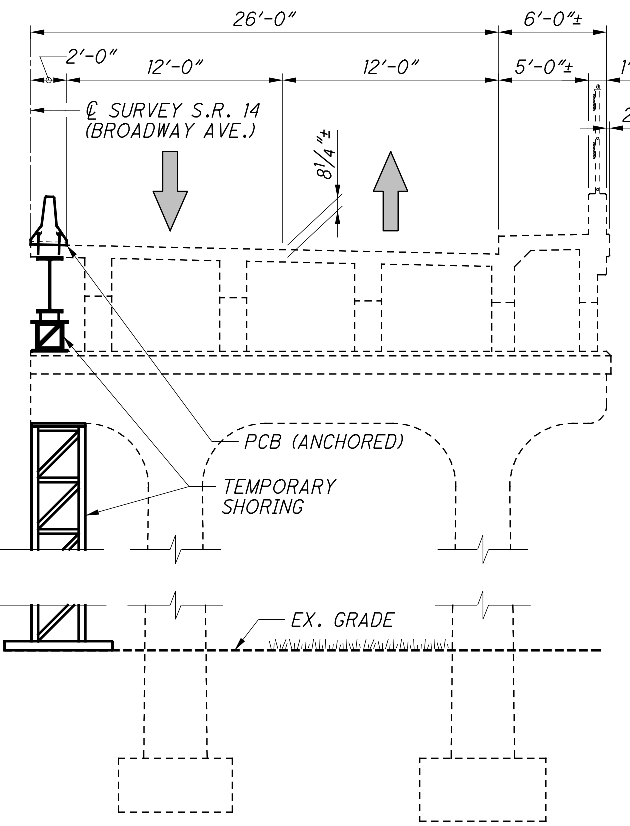
CUY-14-6.93
PID No. 104132



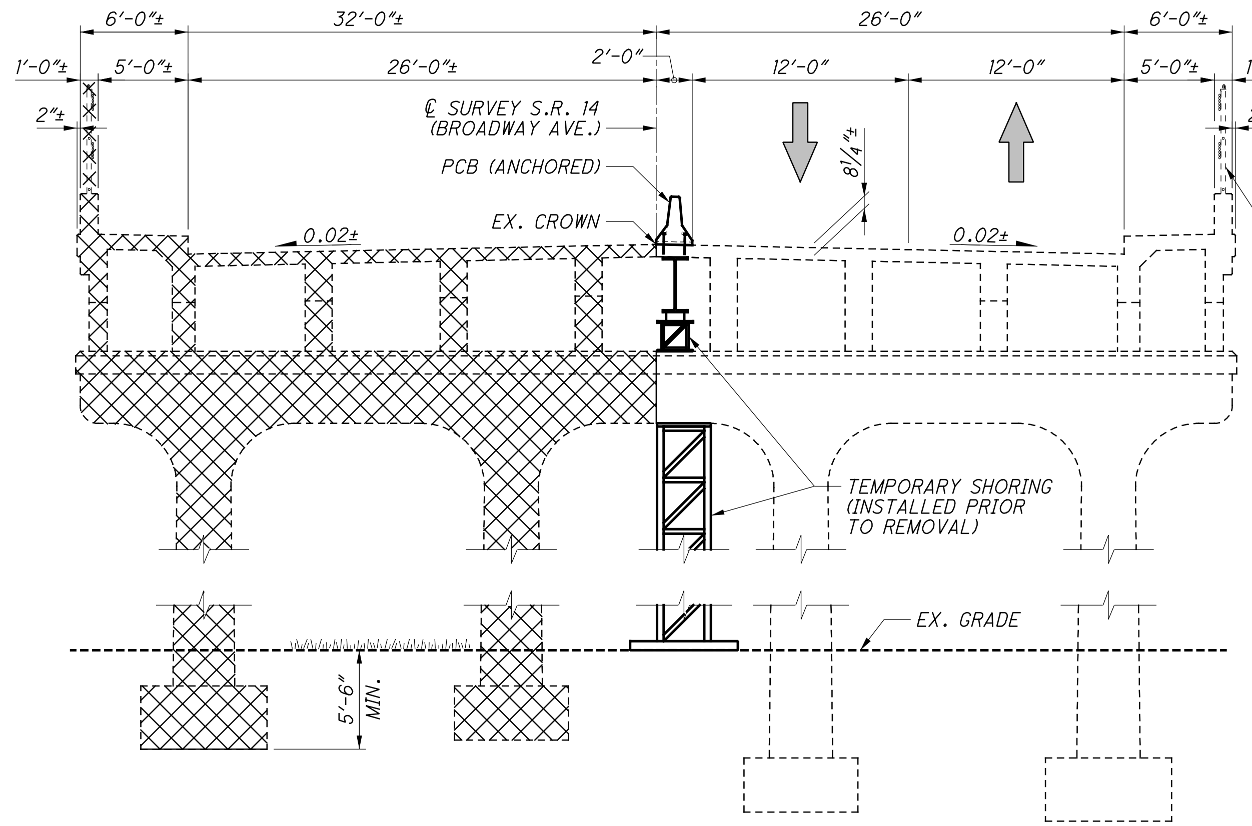
EXISTING CONDITION



PHASE 1 CONSTRUCTION

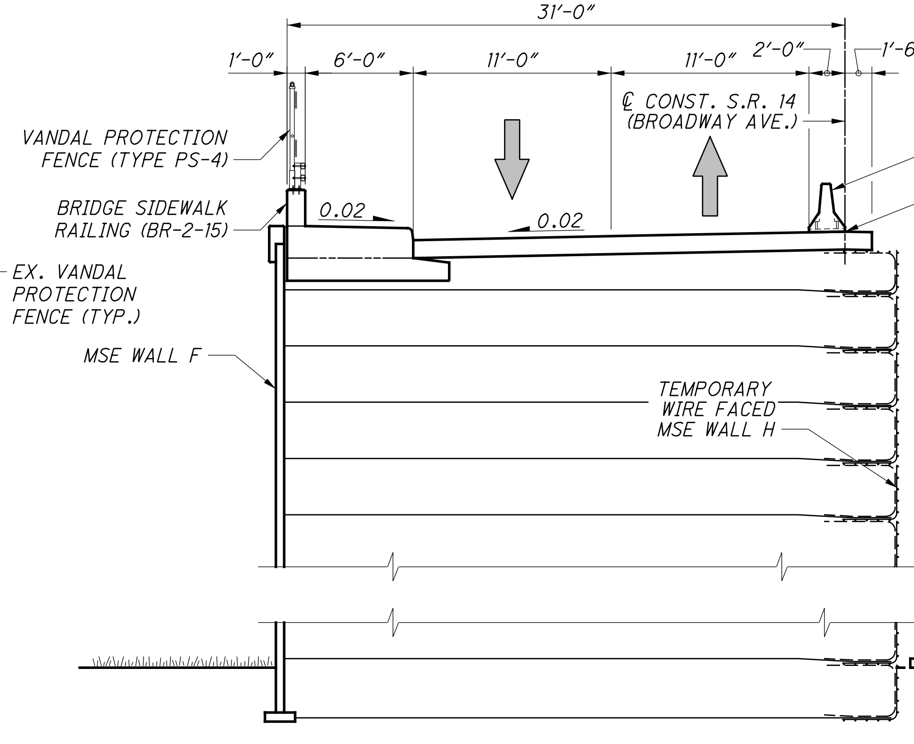


PHASE 1 M.O.T.



PHASE 1 REMOVAL

PHASE 1 M.O.T.



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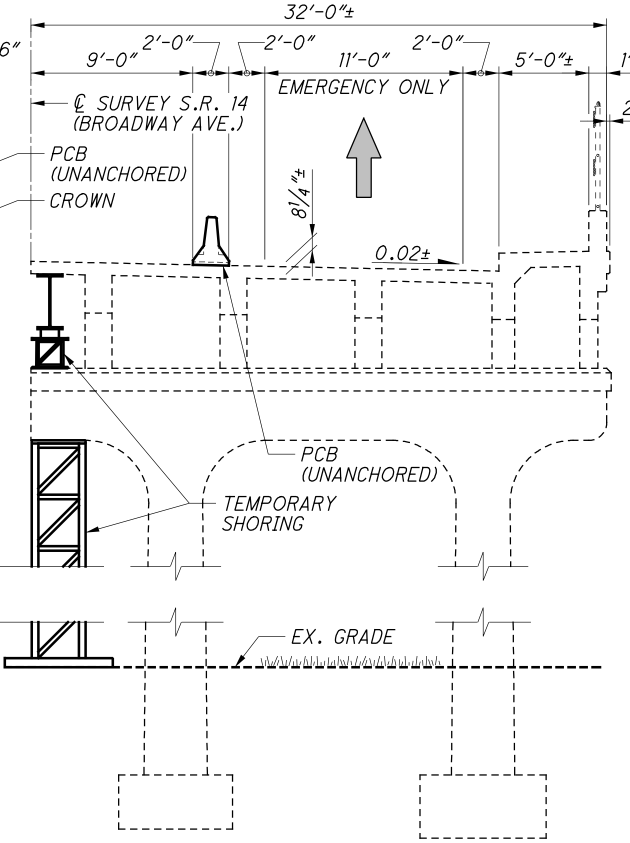


PHASE 2 M.O.T.

(EMERGENCY VEHICLES ONLY)

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

LEGEND:

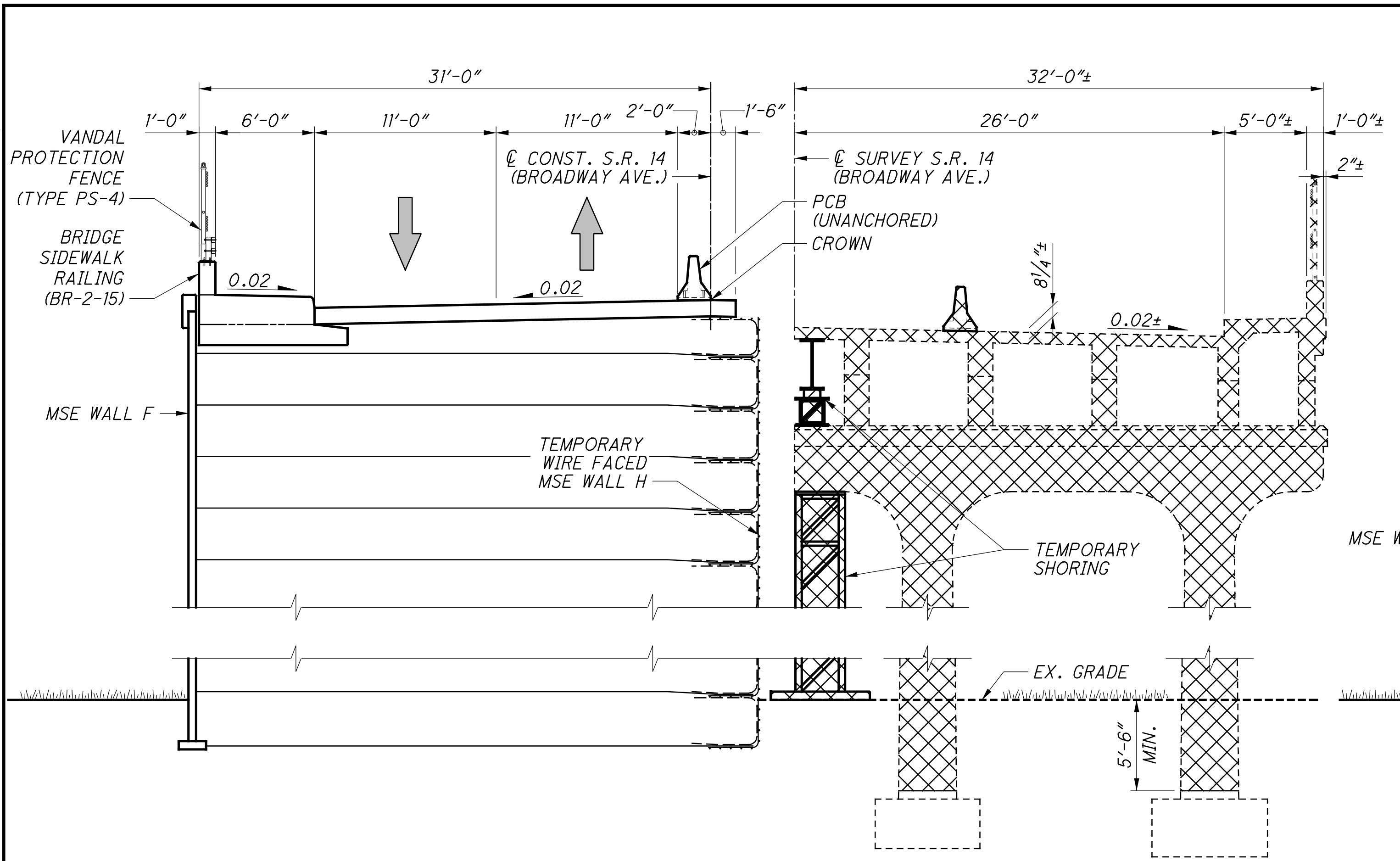
▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	CHECKED MRW
DRAWN TMR	REVISED
REVIEWED JTH	DATE 6/19
STRUCTURE FILE NUMBER 1081085	

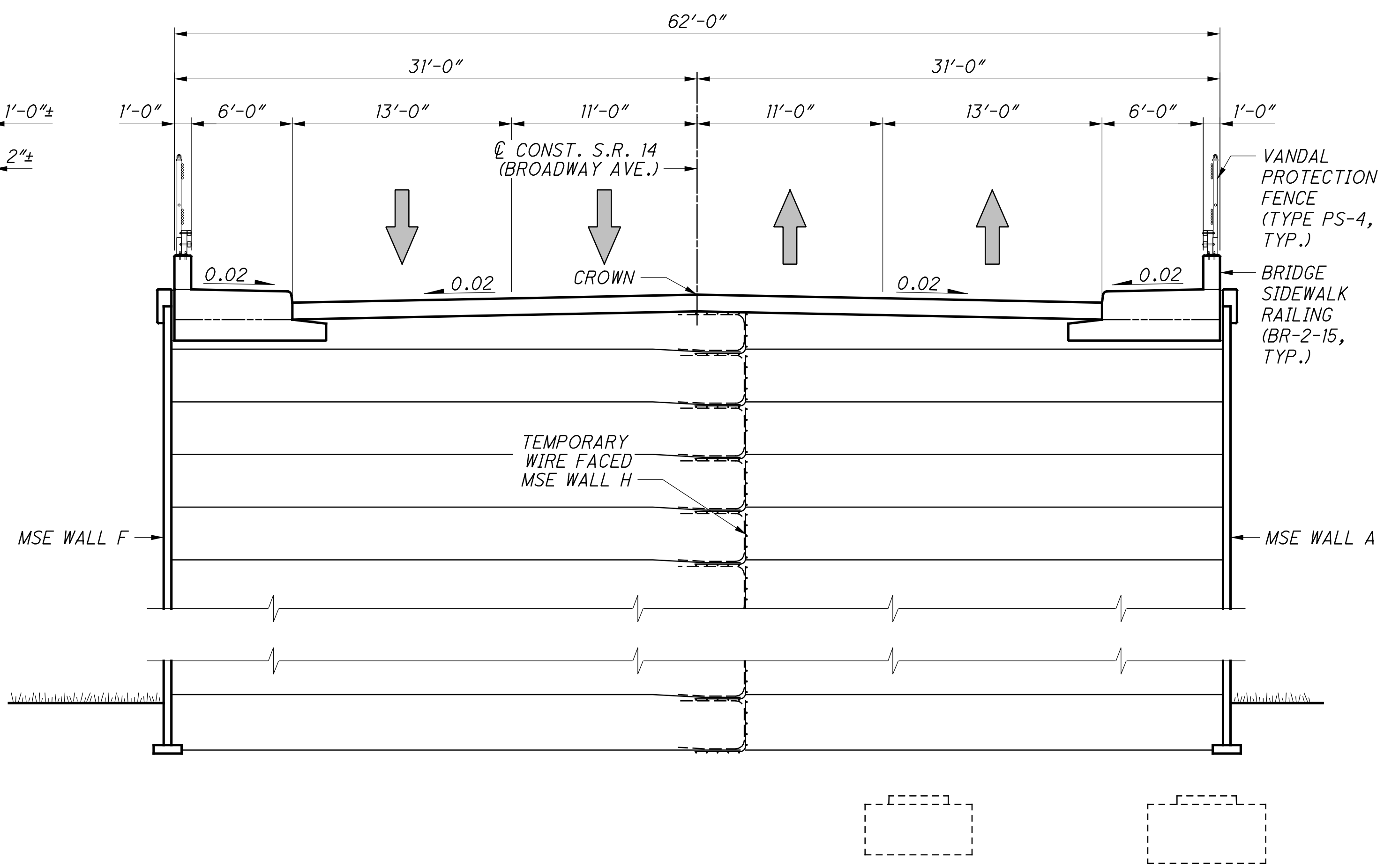
PHASE CONSTRUCTION DETAILS - WEST APPROACH
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

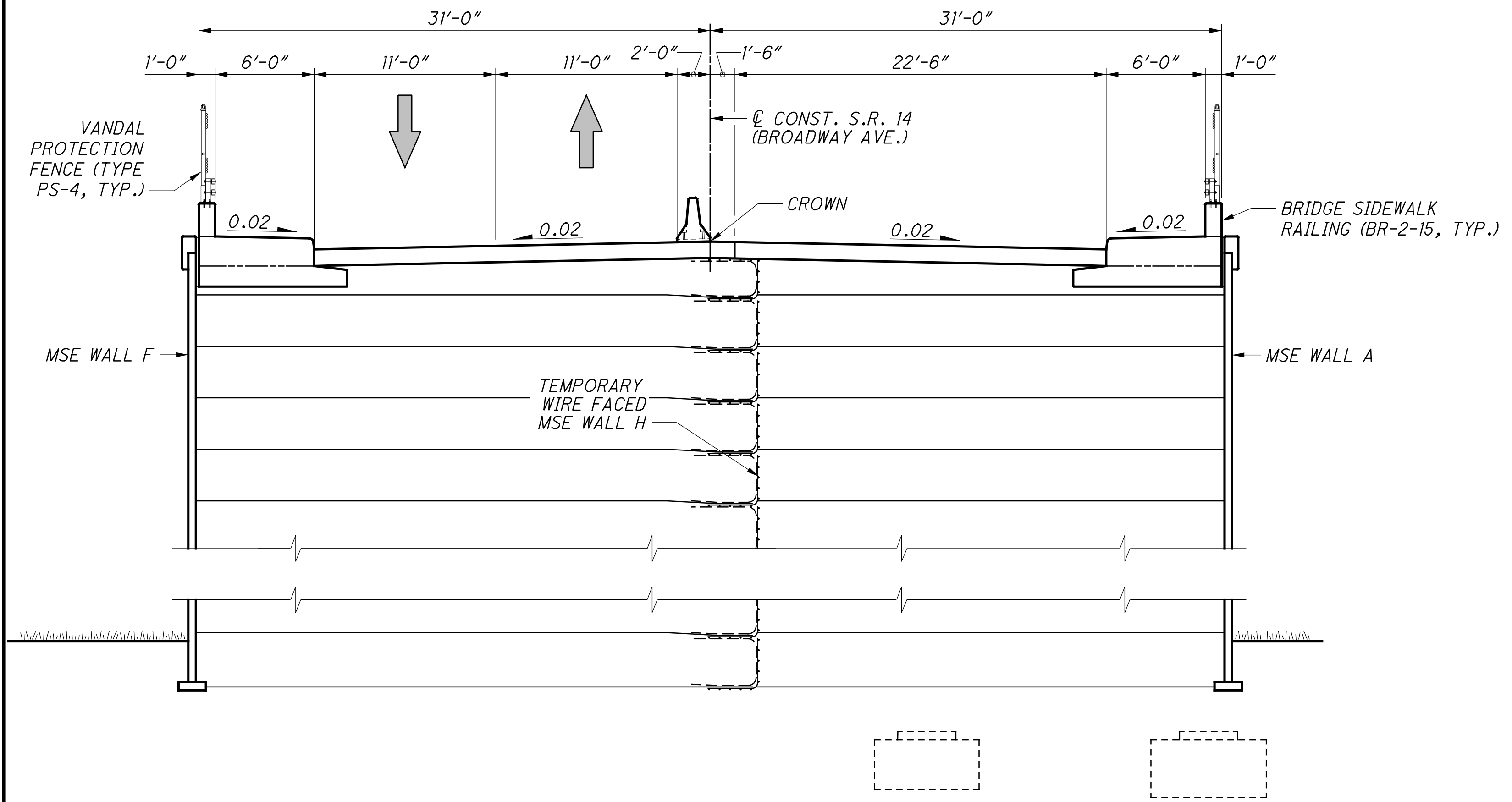


PHASE 3 M.O.T.

PHASE 3 REMOVAL



FINAL CONDITION



PHASE 3 M.O.T.

PHASE 3 CONSTRUCTION

LEGEND:

▨	ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

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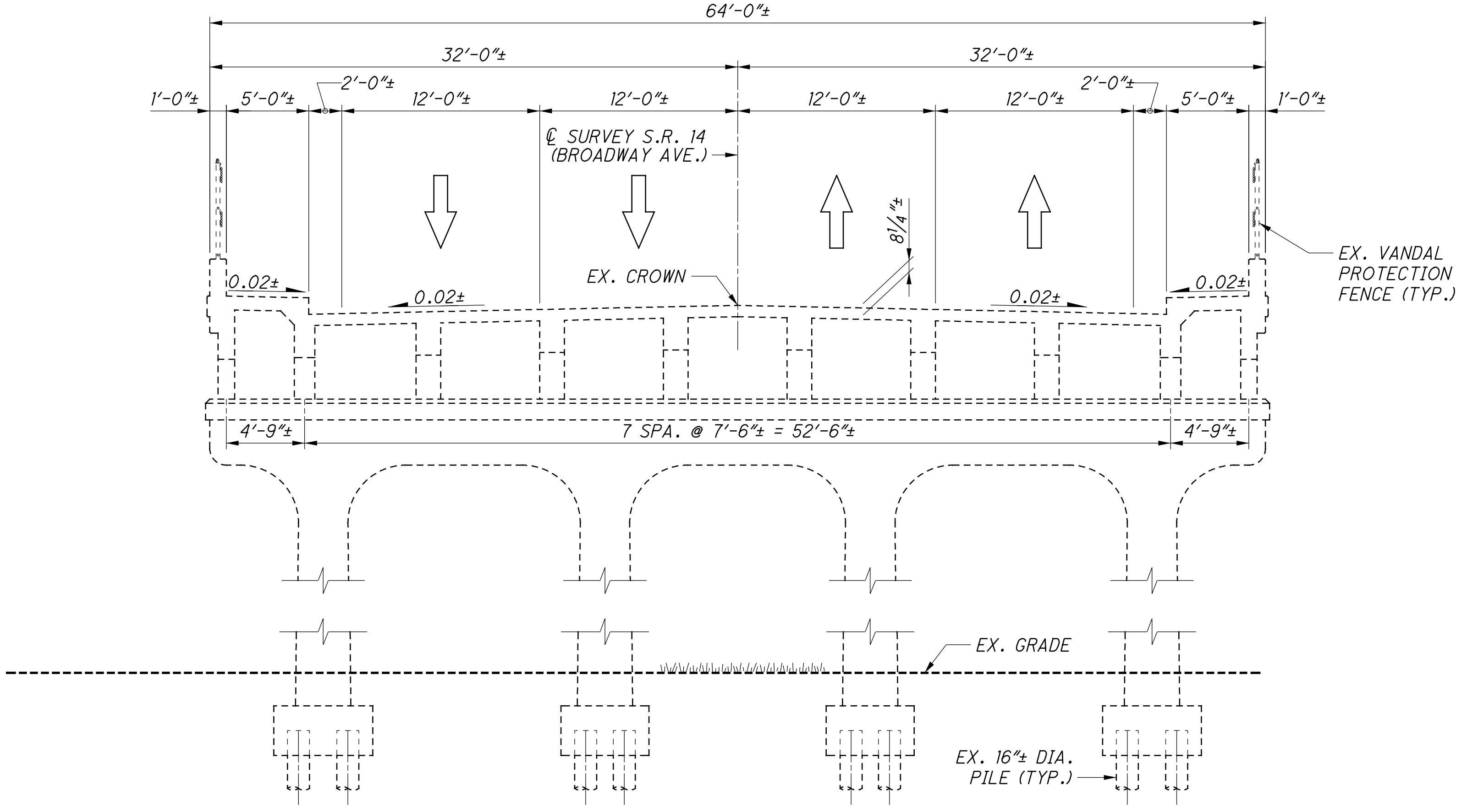
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DATE 6/19
STRUCTURE FILE NUMBER 1081085
REVIEWED JTH
DRAWN TMR
REVISED
DESIGNED TMR
CHECKED MRW

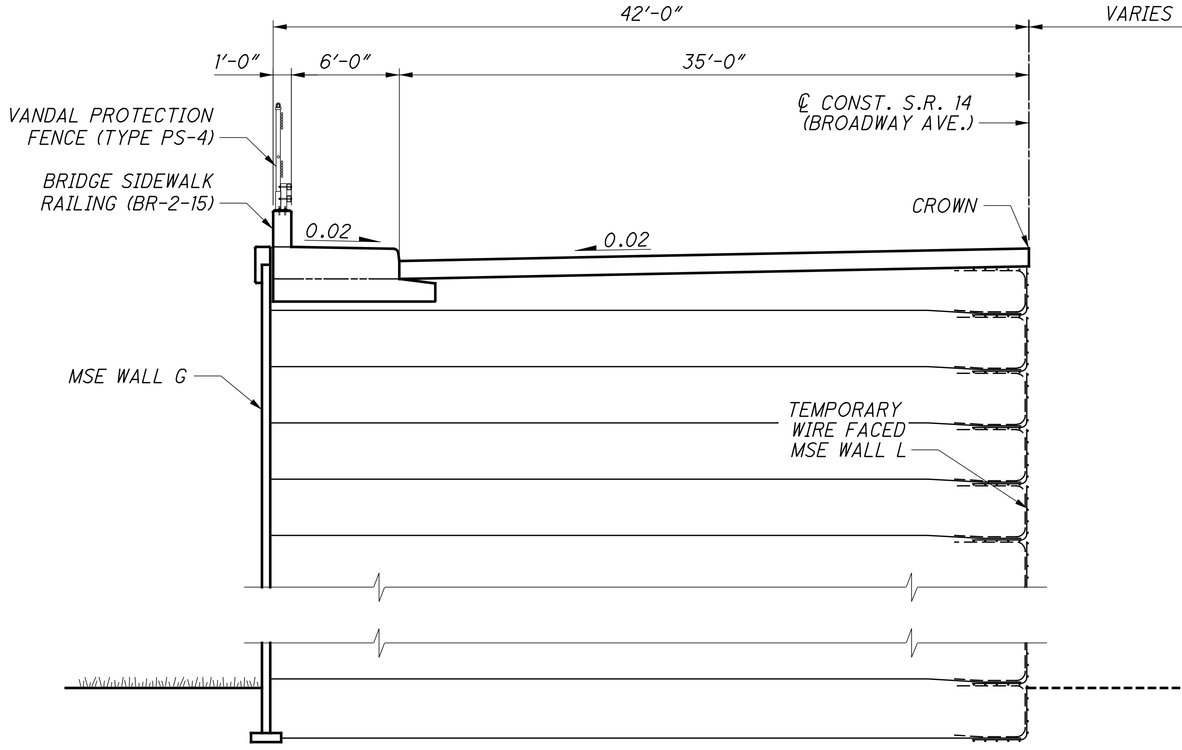
PHASE CONSTRUCTION DETAILS - WEST APPROACH

BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

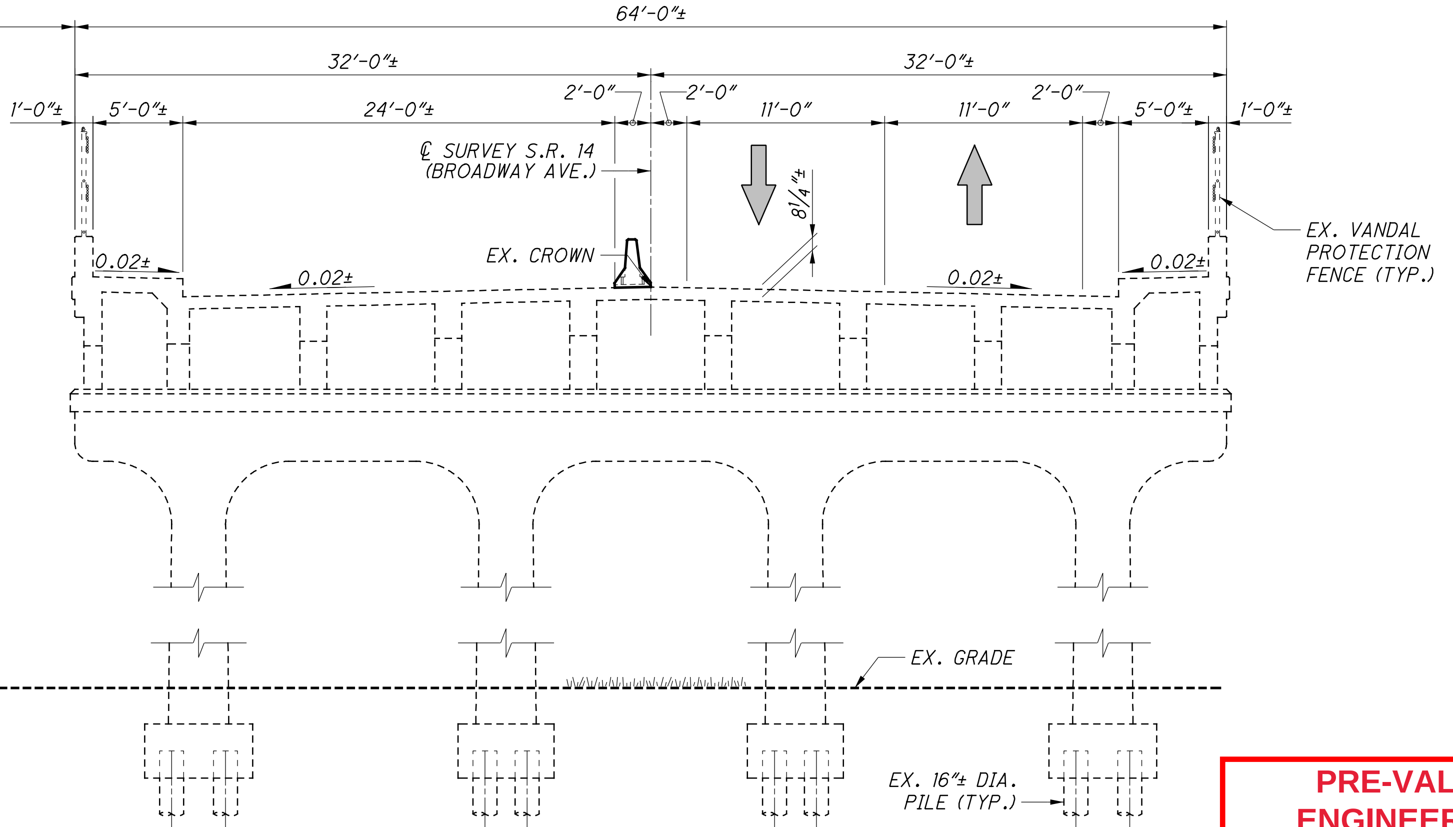
CUY-14-6.93
PID No. 104132



EXISTING CONDITION



PHASE 1 CONSTRUCTION



PHASE 1 M.O.T.

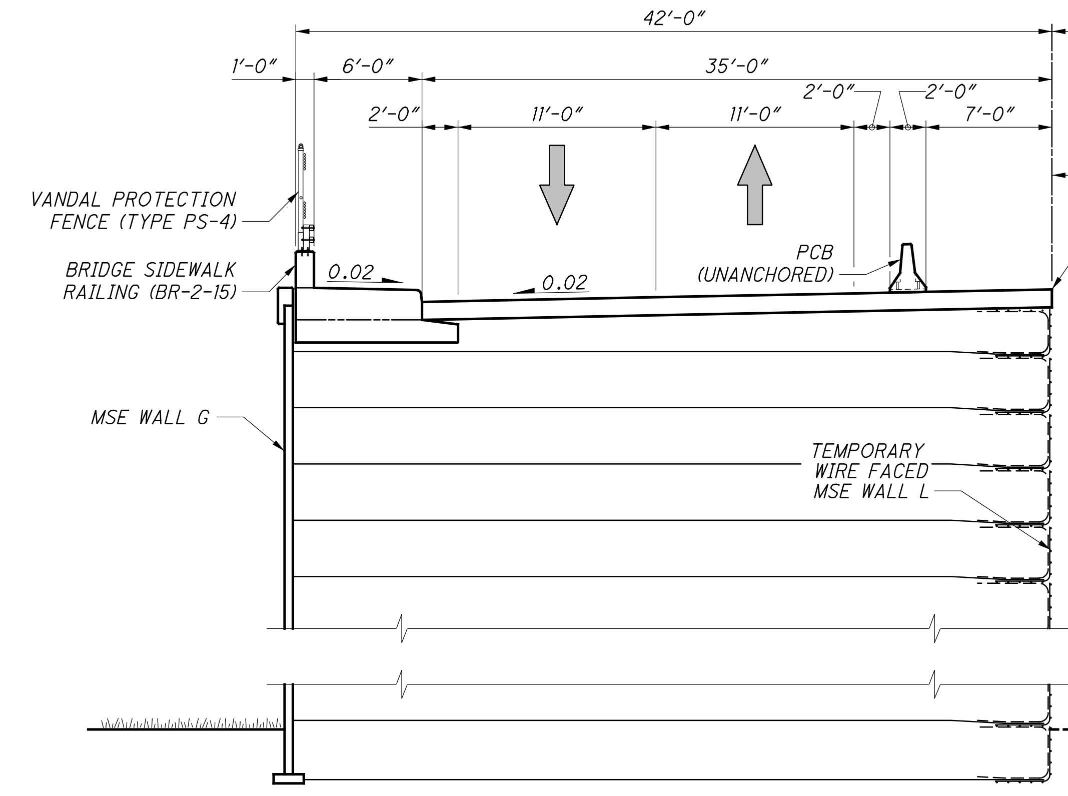
PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

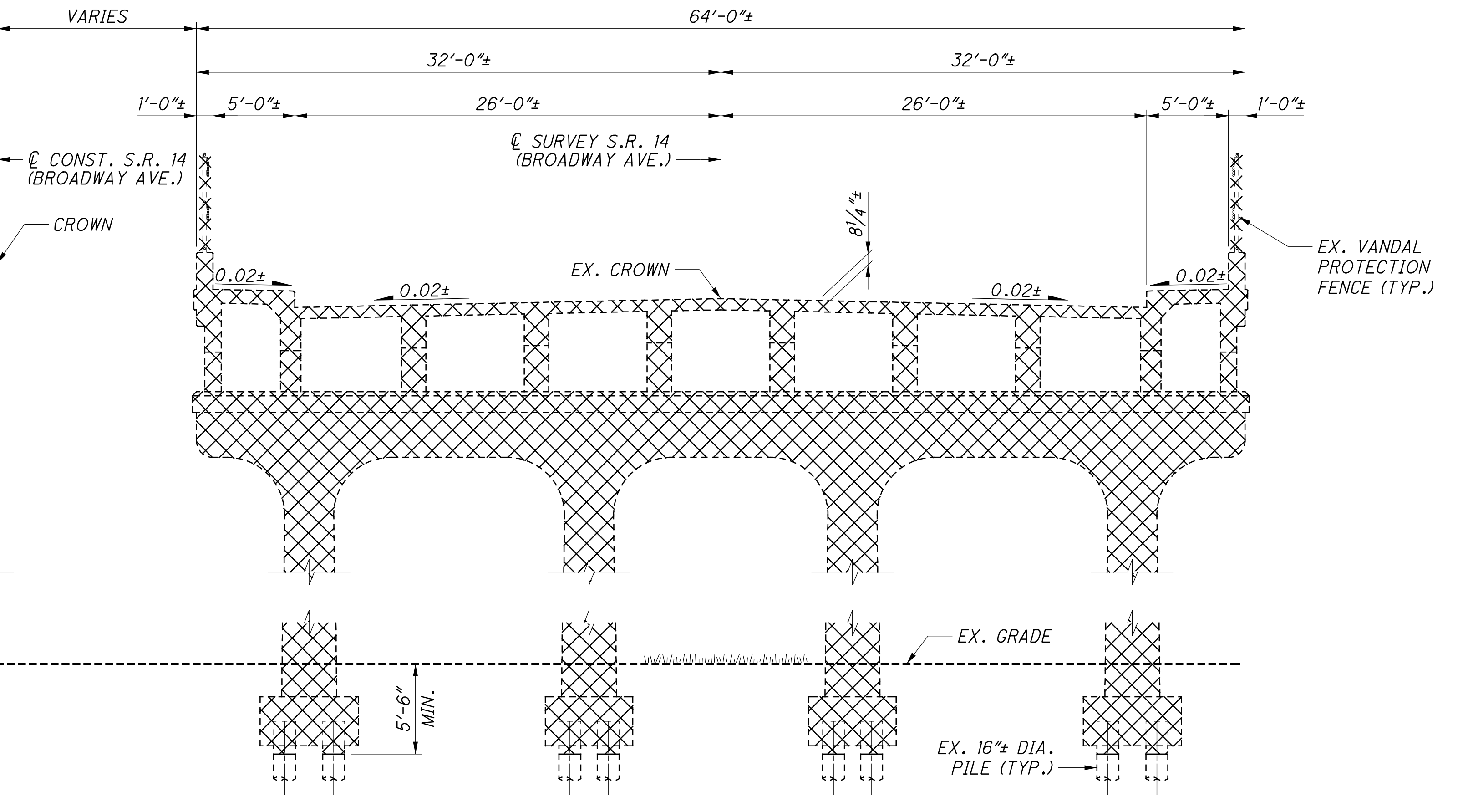
REVIEWED JTH	DATE 6/19
STRUCTURE FILE NUMBER 1081085	
DRAWN TMR	REVISED
DESIGNED TMR	CHECKED MRW

PHASE CONSTRUCTION DETAILS - EAST APPROACH
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



PHASE 2 M.O.T.



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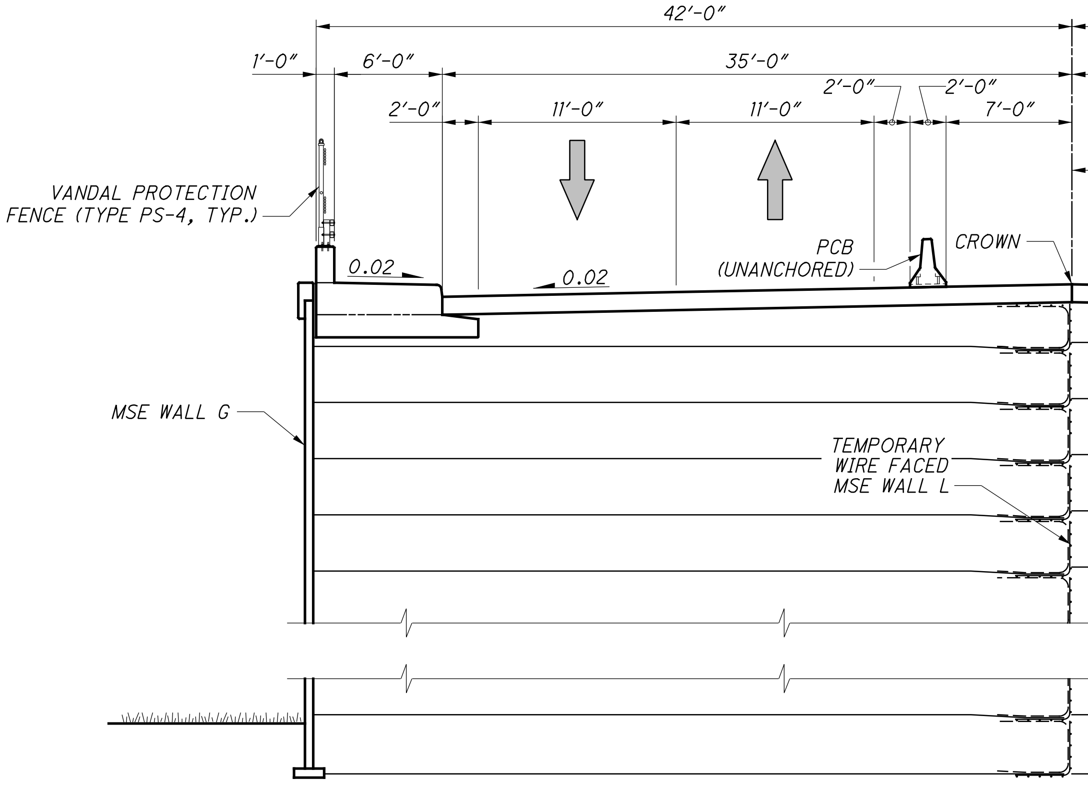
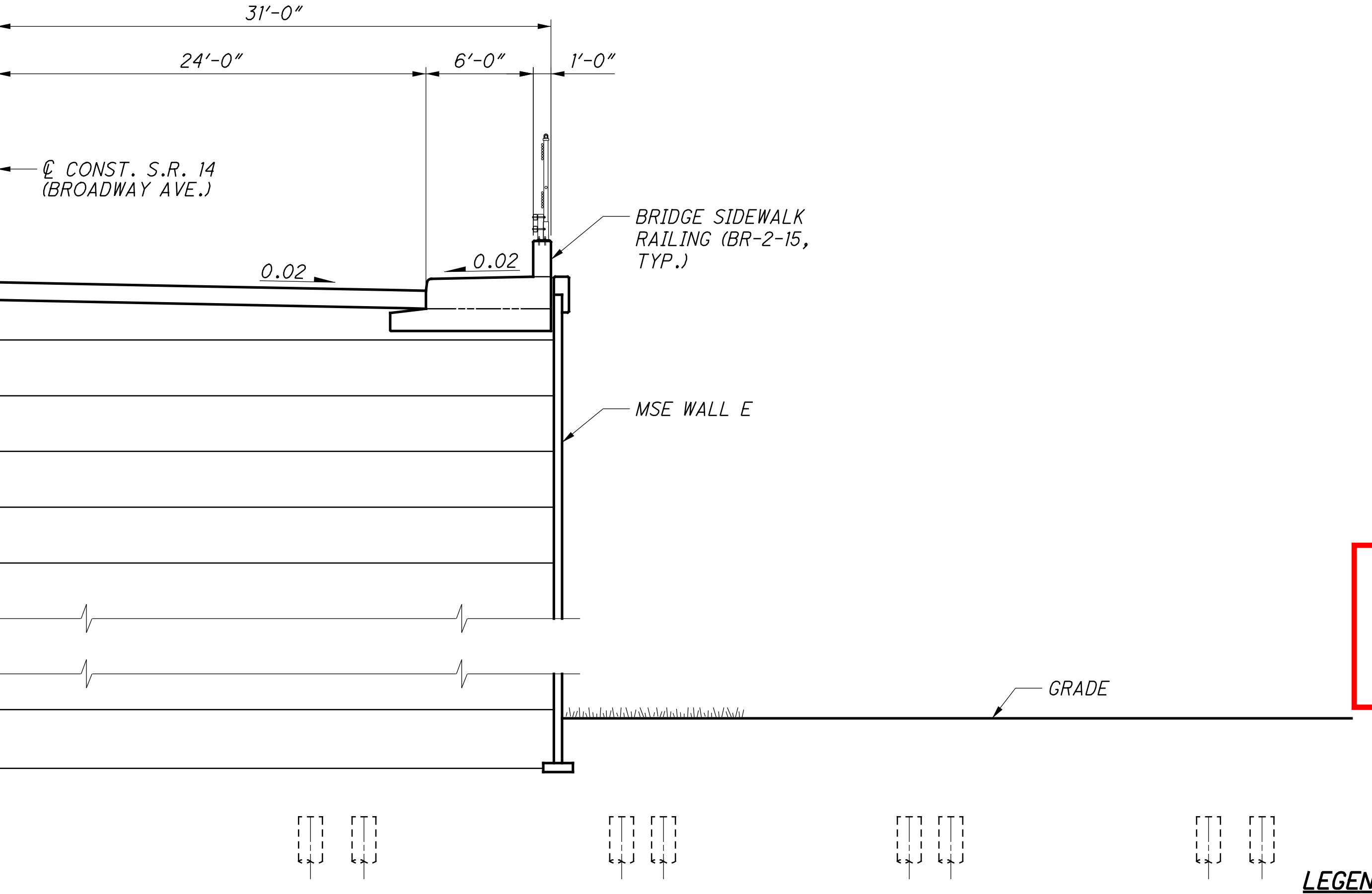


PHASE 2 M.O.T.



PHASE 2 CONSTRUCTION

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED TMR	DRAWN TMR	REVIEWED JTH	DATE 6/19
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER 1081085	

PHASE CONSTRUCTION DETAILS - EAST APPROACH
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132

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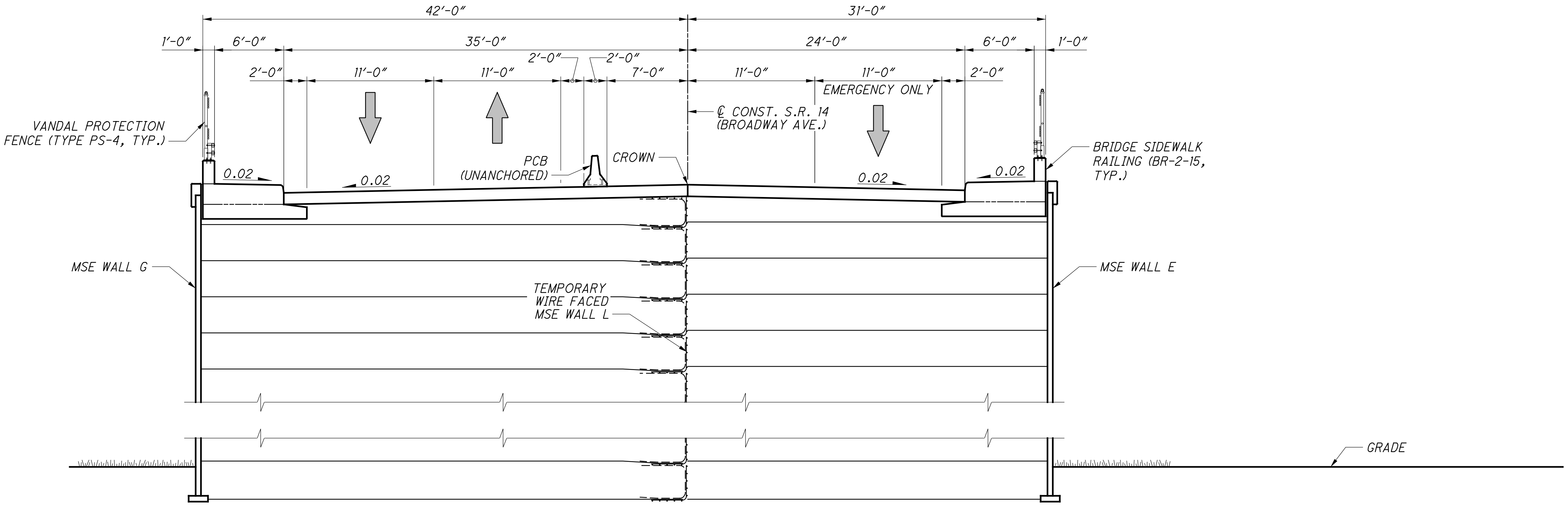
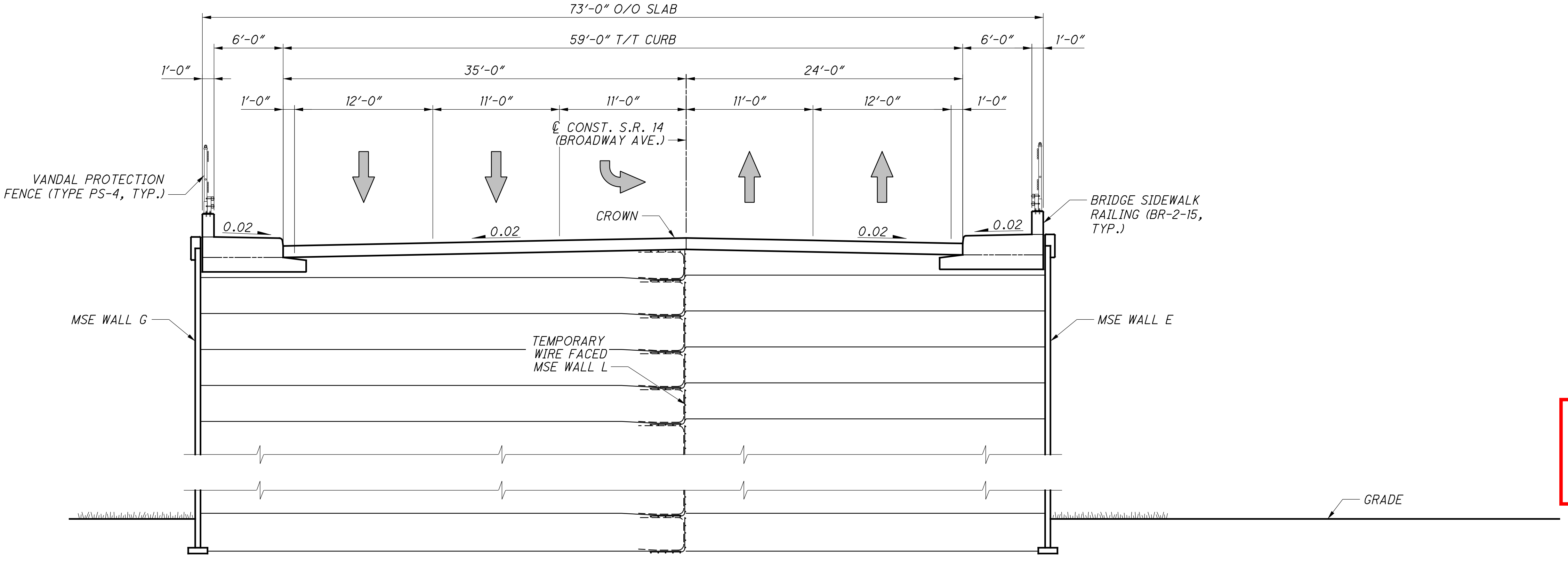


PHASE 3 M.O.T.



FINAL CONDITION

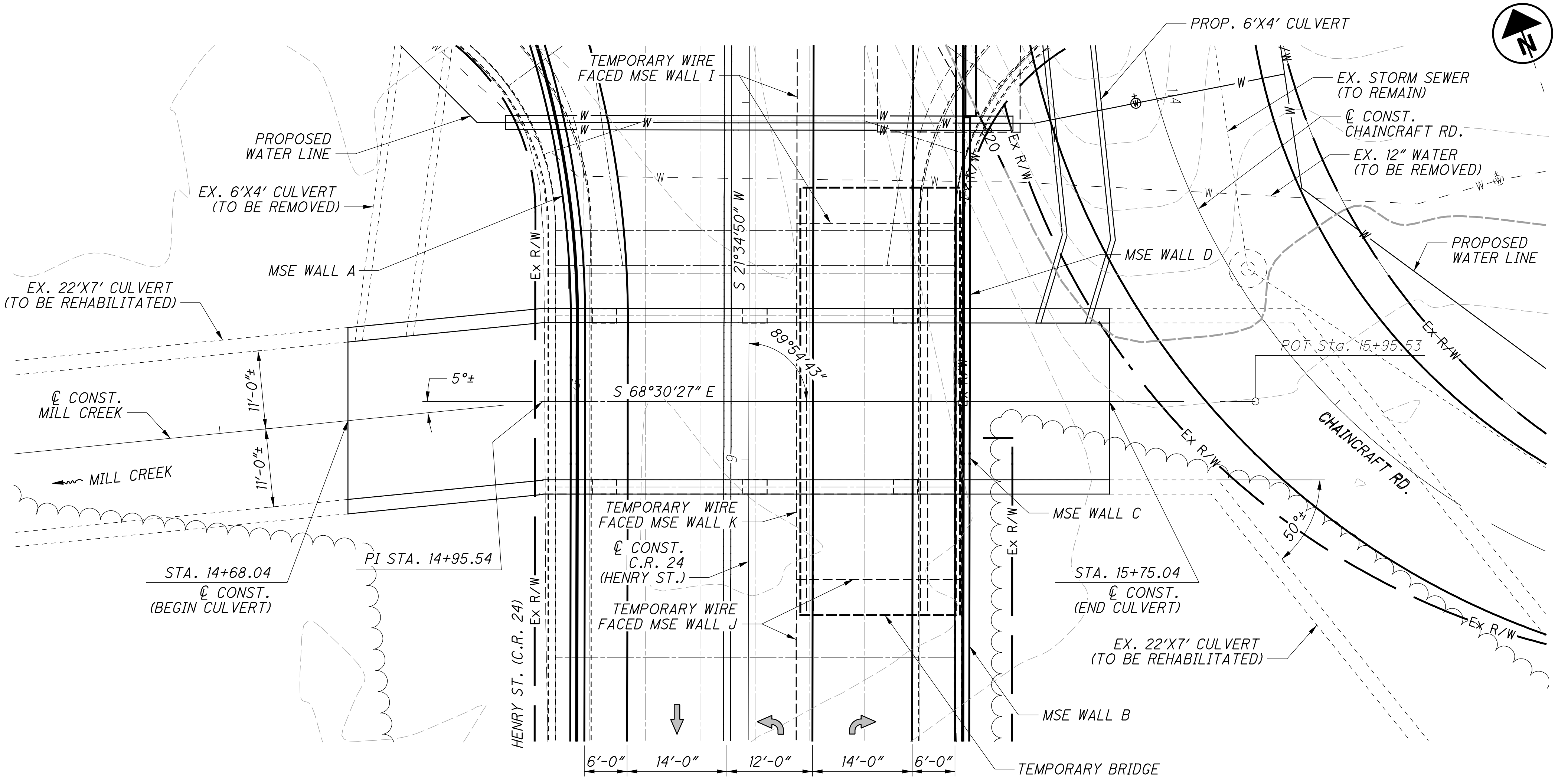
PRE-VALUE
ENGINEERING
CONCEPTUAL AER
DETAIL PLANS

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

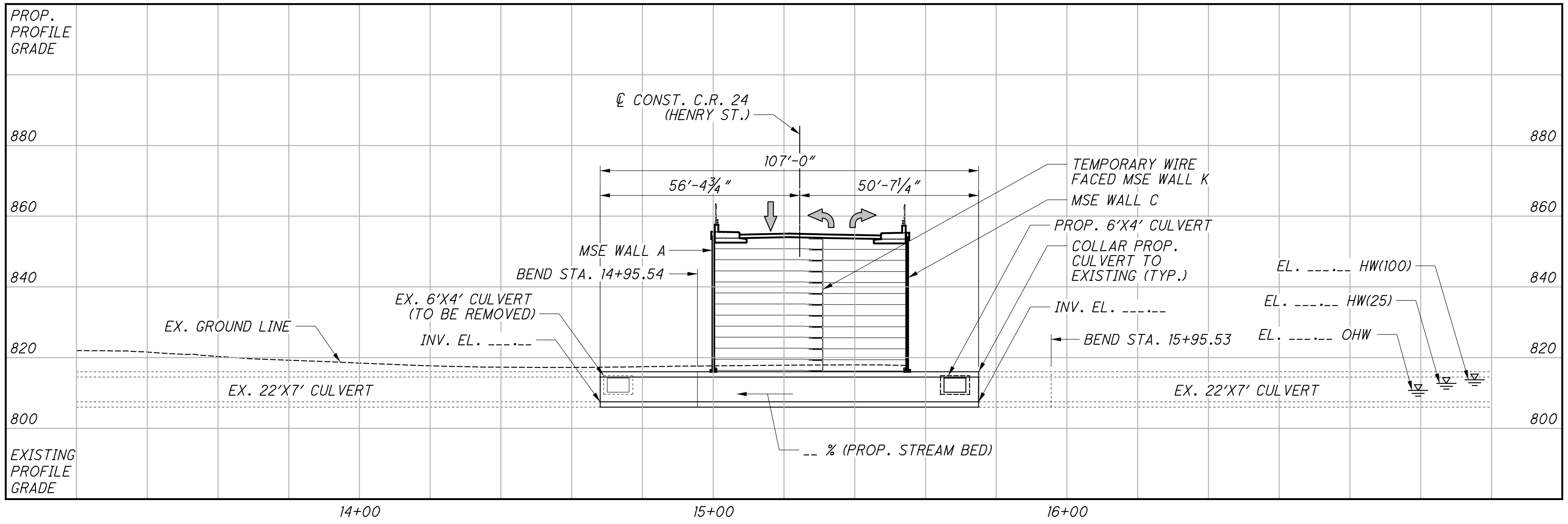
DESIGNED	TMR
CHECKED	MRW
DRAWN	TMR
REVISED	
REVIEWED	JTH
DATE	6/19
STRUCTURE FILE NUMBER	1081085

PHASE CONSTRUCTION DETAILS - EAST APPROACH
BRIDGE NO. CUY-14-0693
BROADWAY AVE. (SR 14) OVER CHAINCRAFT, W&LE & NORFOLK SOUTHERN RAILWAYS

CUY-14-6.93
PID No. 104132



PLAN



PROFILE ALONG ℄ CONST. C.R. 24 (HENRY ST.)

NOTES

EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.

DESIGN TRAFFIC:

2026 ADT = 7,000	2026 ADTT = 70
2046 ADT = 7,500	2046 ADTT = 75

DIRECTIONAL DISTRIBUTION = 0.53

(ADT AND ADTT ARE BASED FROM A TRAFFIC COUNT ON 11-13-2018. THESE COUNTS WILL BE UPDATED WHEN THE REQUESTED CERTIFIED TRAFFIC IS RECEIVED.)

LEGEND

⊕ BORING LOCATION

HYDRAULIC DATA

DRAINAGE AREA = __ SQ. MILES

O (25) = ___ CFS	V (25) = ___ FPS
O (100) = ___ CFS	V (100) = ___ FPS

THE 25 YEAR FLOOD WATER ELEVATION CLEARS THE LOW EDGE OF CULVERT BY __.__ FEET

NOTE TO REVIEWER:

CULVERT PROPOSED ELEVATIONS ARE TO BE DETERMINED, MORE DETAILED SURVEY REQ'D FOR REMOVAL LIMITS AND SLOPE RUN.

ORDINARY, 25 YEAR AND 100 YEAR HIGH WATER ELEVATIONS TO BE DETERMINED IN FINAL DESIGN.

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

EXISTING STRUCTURE

TYPE: 22'x7' CAST-IN-PLACE, 4 SIDED, REINFORCED, CONCRETE CULVERT.
SPANS: 22'-0"± CLEAR SPAN
ROADWAY: 46'-0"± F/F SAFETY CURB (5'± SIDEWALK)
LOADING: HS20-44 AND ALTERNATE MILITARY
SKEW: 0°0'0"
APPROACH SLABS: NONE
ALIGNMENT: TANGENT
CROWN: NONE
STRUCTURAL FILE NUMBER: 1834037
DATE BUILT: 1928
DISPOSITION: TO BE PARTIALLY REMOVED AND REPLACED

PROPOSED STRUCTURE

TYPE: 22'X7' PRECAST 4 SIDED BOX CULVERT
SPANS: 22'-0" CLEAR SPAN
ROADWAY: 40'-0" TOE/TOE CURB
LOADING: HL-93 W/ FUTURE WEARING SURFACE (FWS) 60 PSF
SKEW: 0°0'0"
APPROACH SLABS: NONE
ALIGNMENT: TANGENT
CROWN: 0.02 FT/FT

COORDINATES: LATITUDE N 41°81'51.06"
LONGITUDE W 81°36'02.99"

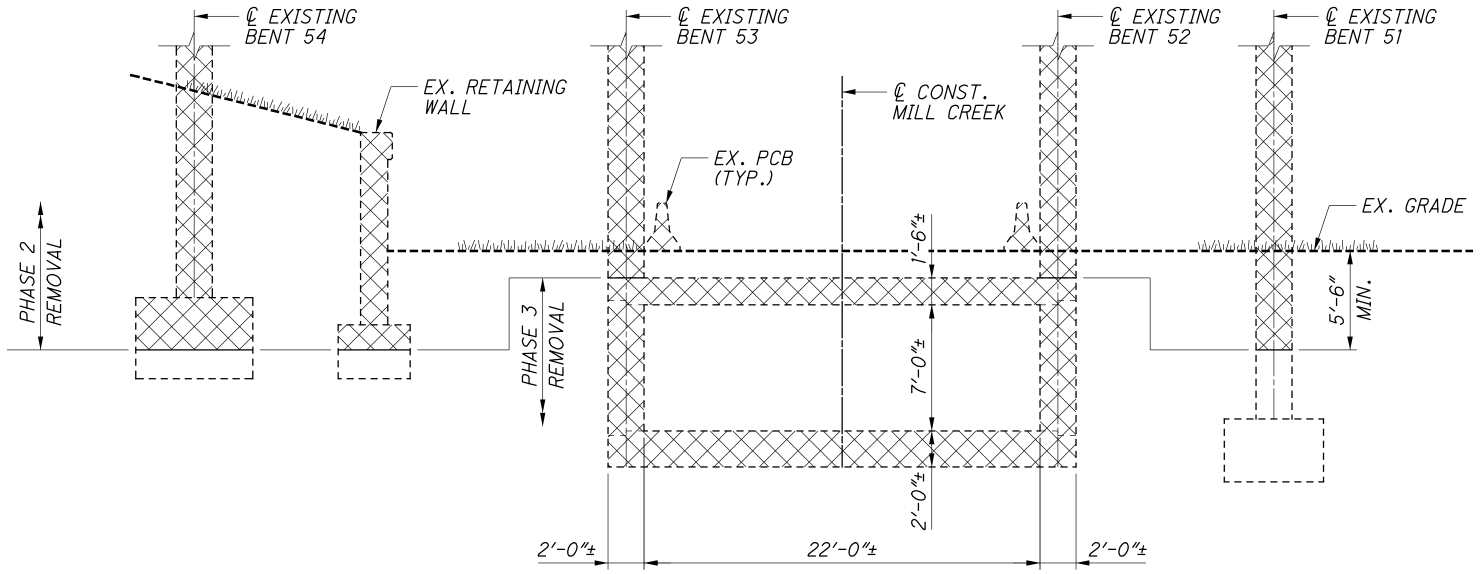
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED JDM	DRAWN JDM	REVIEWED JTH	DATE 3/19
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER 1834037	

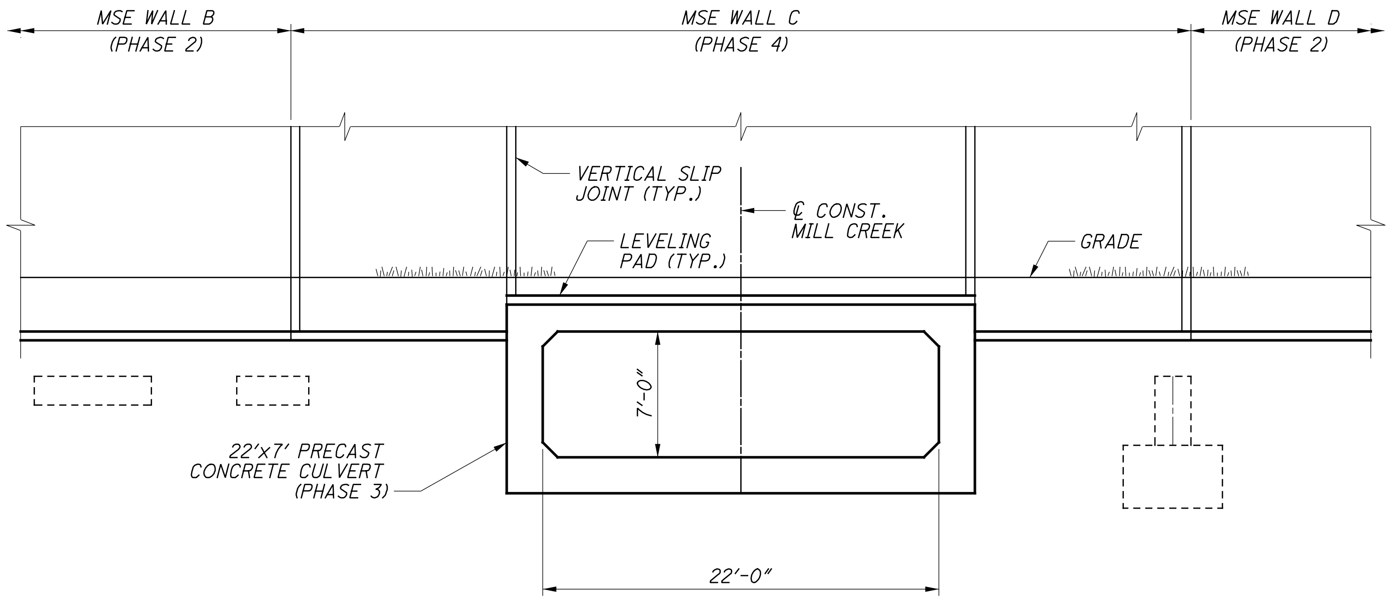
SITE PLAN

BRIDGE NO. CUY-24-0061
HENRY STREET (C.R. 24) OVER MILL CREEK

CUY-14-6.93
PID No. 104132



(A 47, 48) EXISTING SECTION



(A 47, 48) PROPOSED SECTION

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

LEGEND:

▨ *ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN*

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED JDM	DRAWN TMR	REVIEWED JTH	DATE 3/19
CHECKED MRW	REVISED	STRUCTURE FILE NUMBER 1834037	

CULVERT DETAILS
BRIDGE NO. CUY-24-0061
HENRY STREET (C.R. 24) OVER MILL CREEK

CUY-14-6.93
PID No. 104132

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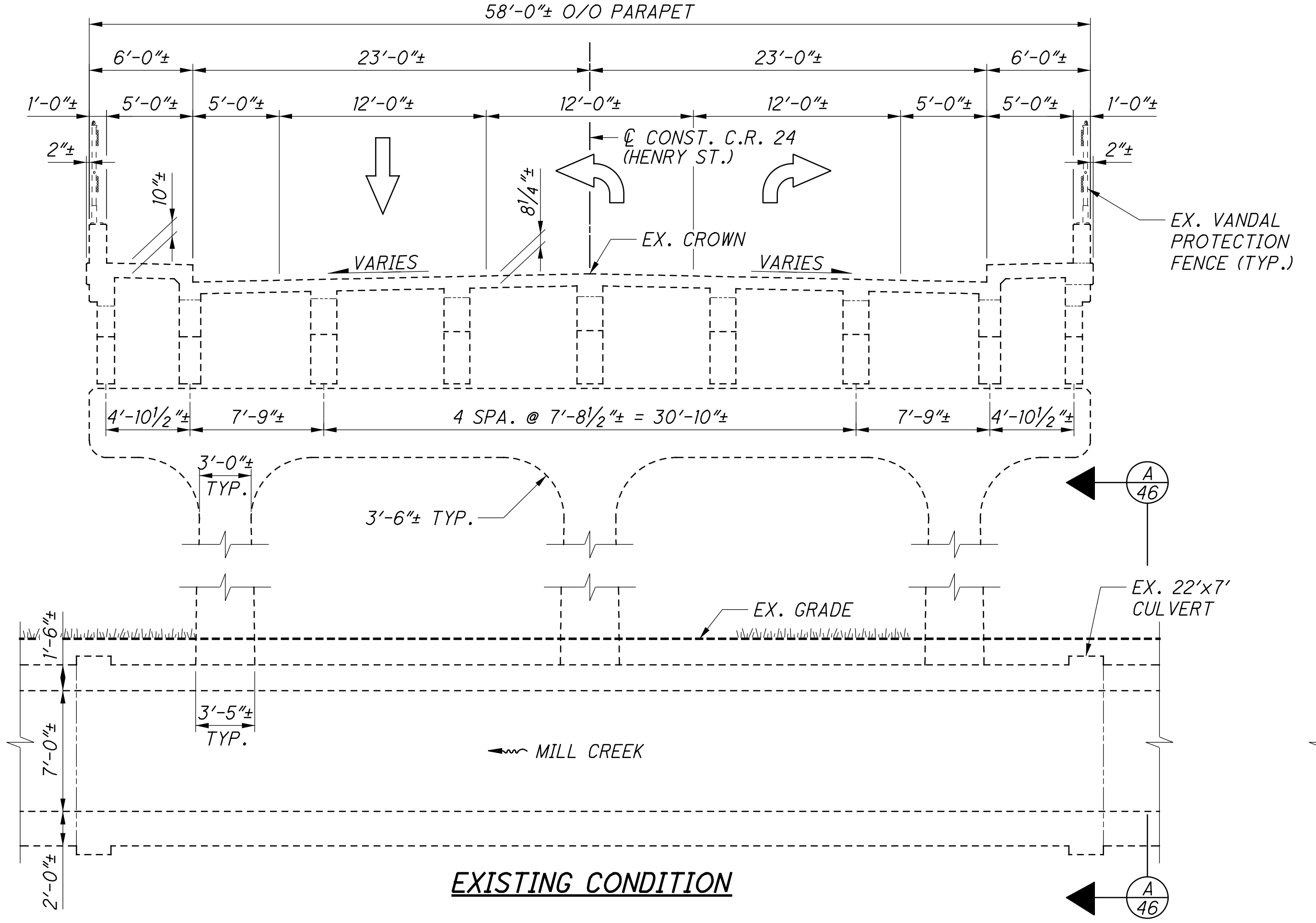
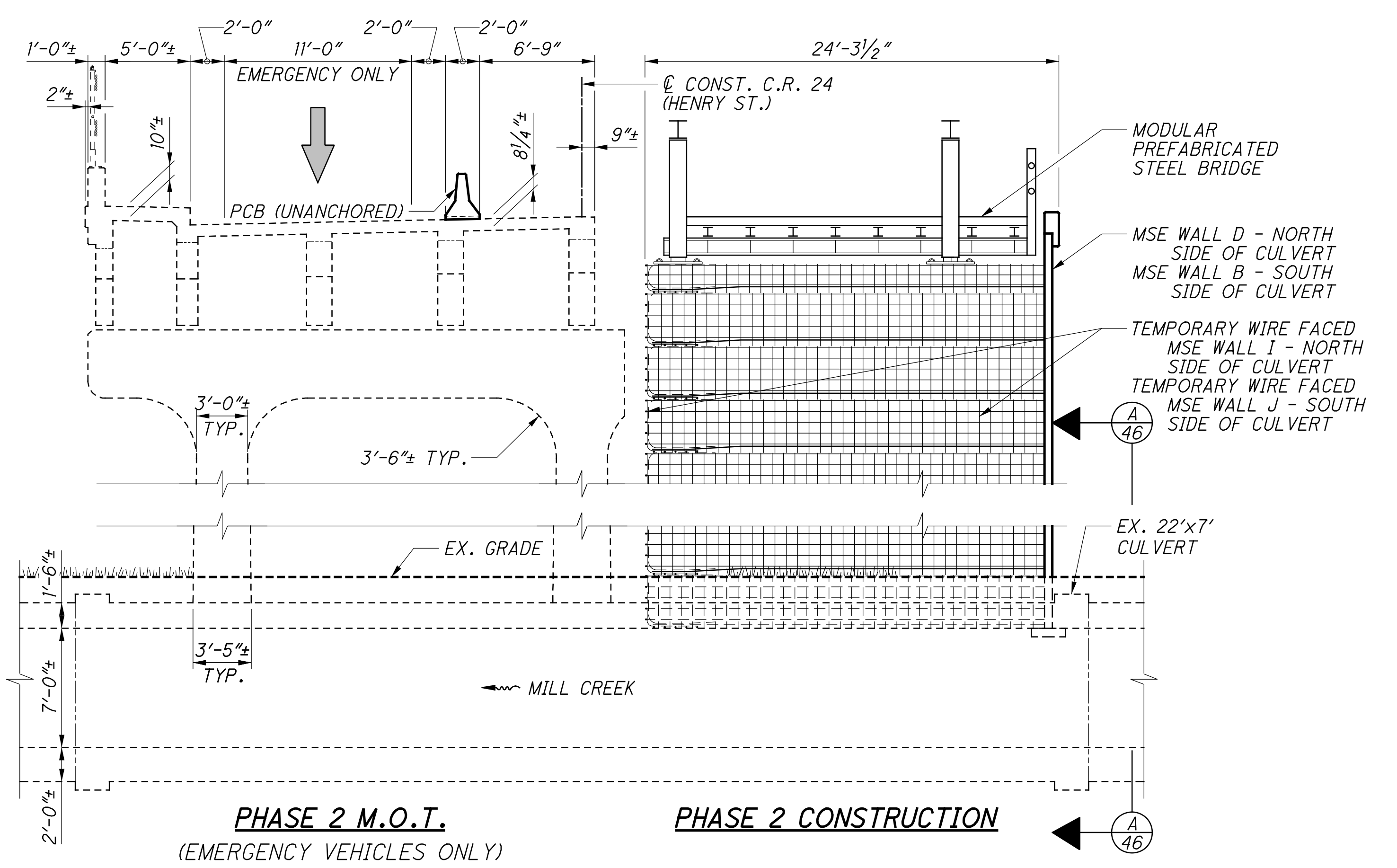


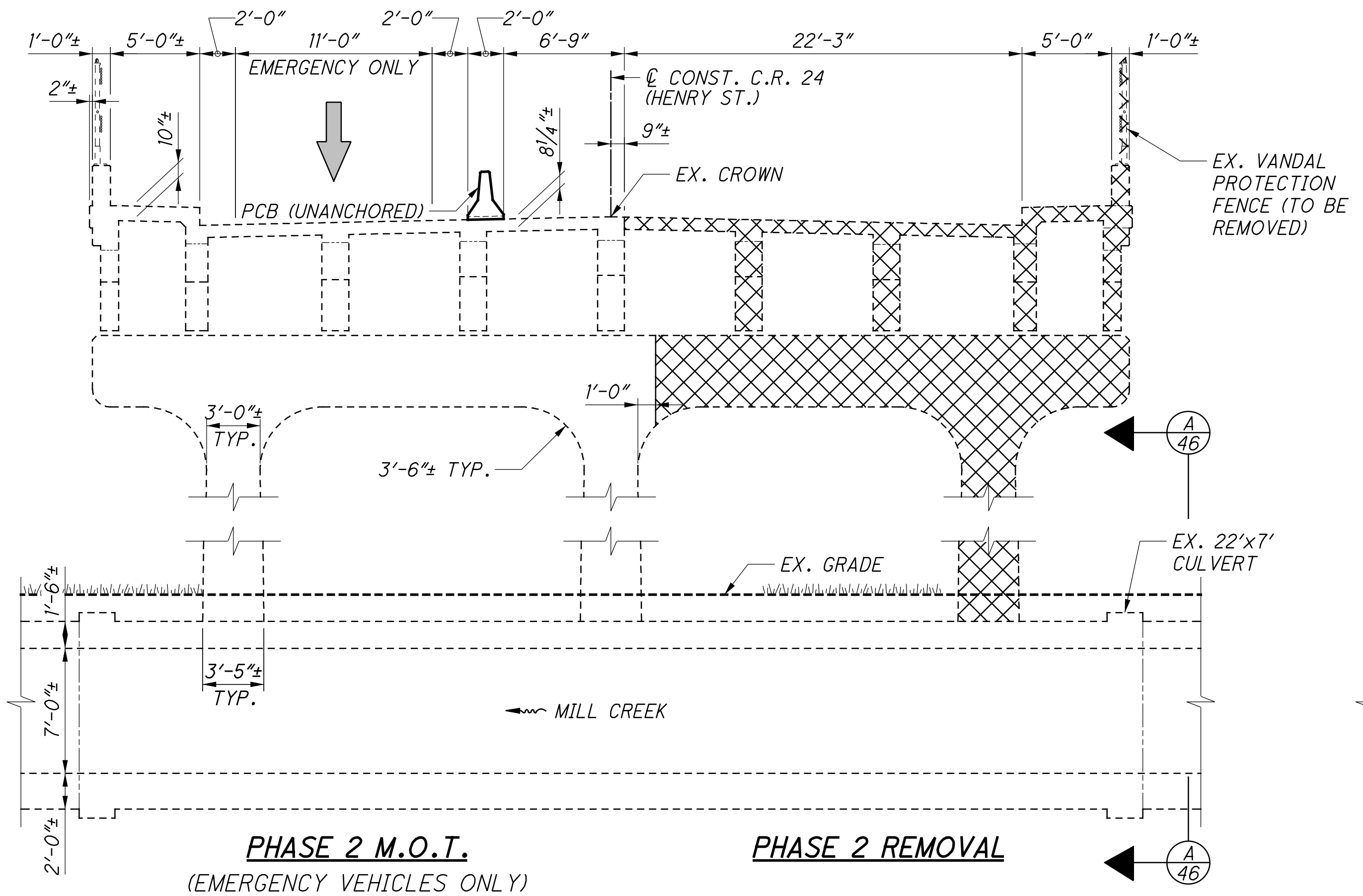
EXISTING CONDITION



PHASE 2 M.O.T.

(EMERGENCY VEHICLES ONLY)

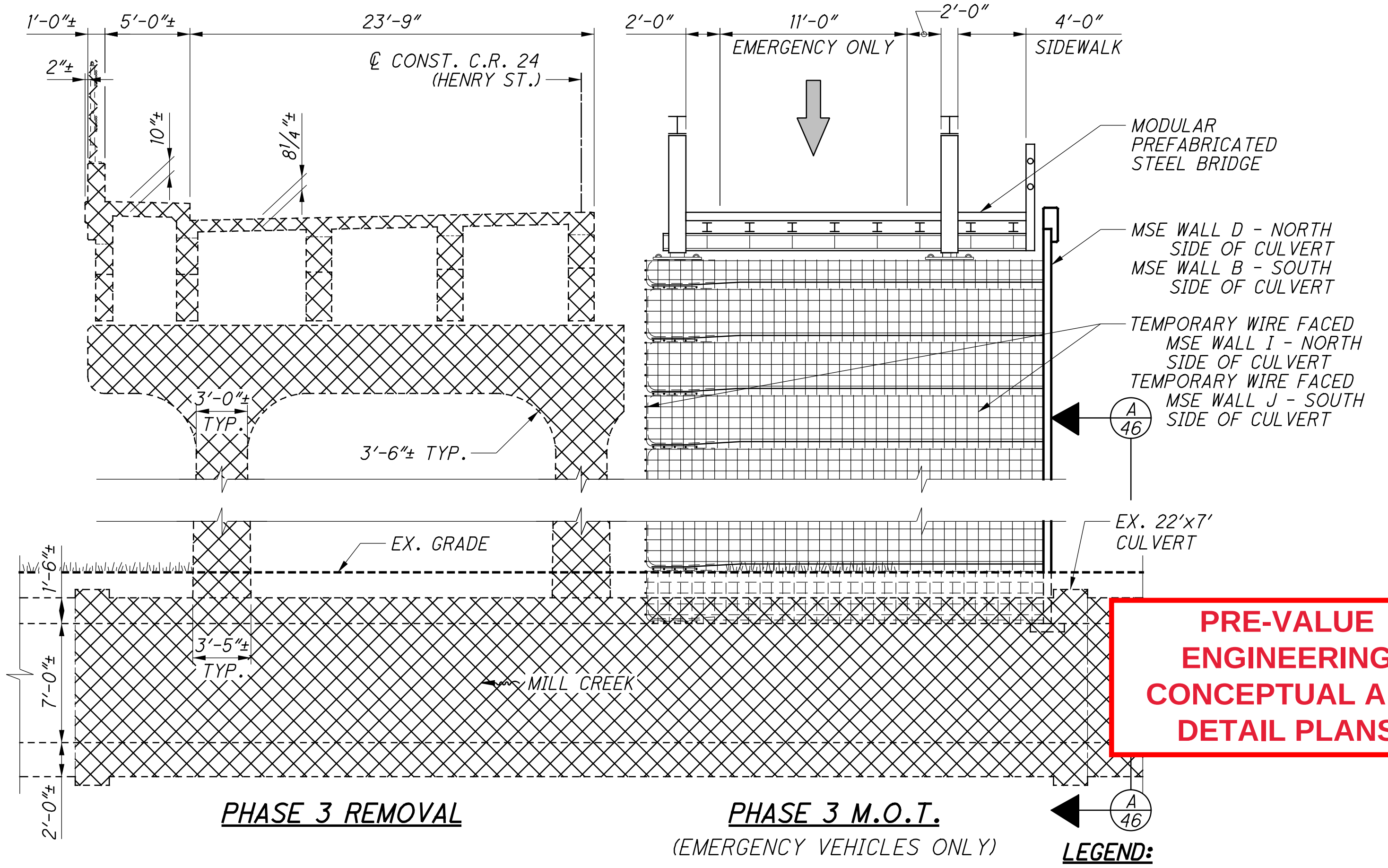
PHASE 2 CONSTRUCTION



PHASE 2 M.O.T.

(EMERGENCY VEHICLES ONLY)

PHASE 2 REMOVAL



PHASE 3 REMOVAL

PHASE 3 M.O.T.

(EMERGENCY VEHICLES ONLY)

LEGEND:

▨ ITEM 202 - STRUCTURE REMOVED, OVER 20 FOOT SPAN

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

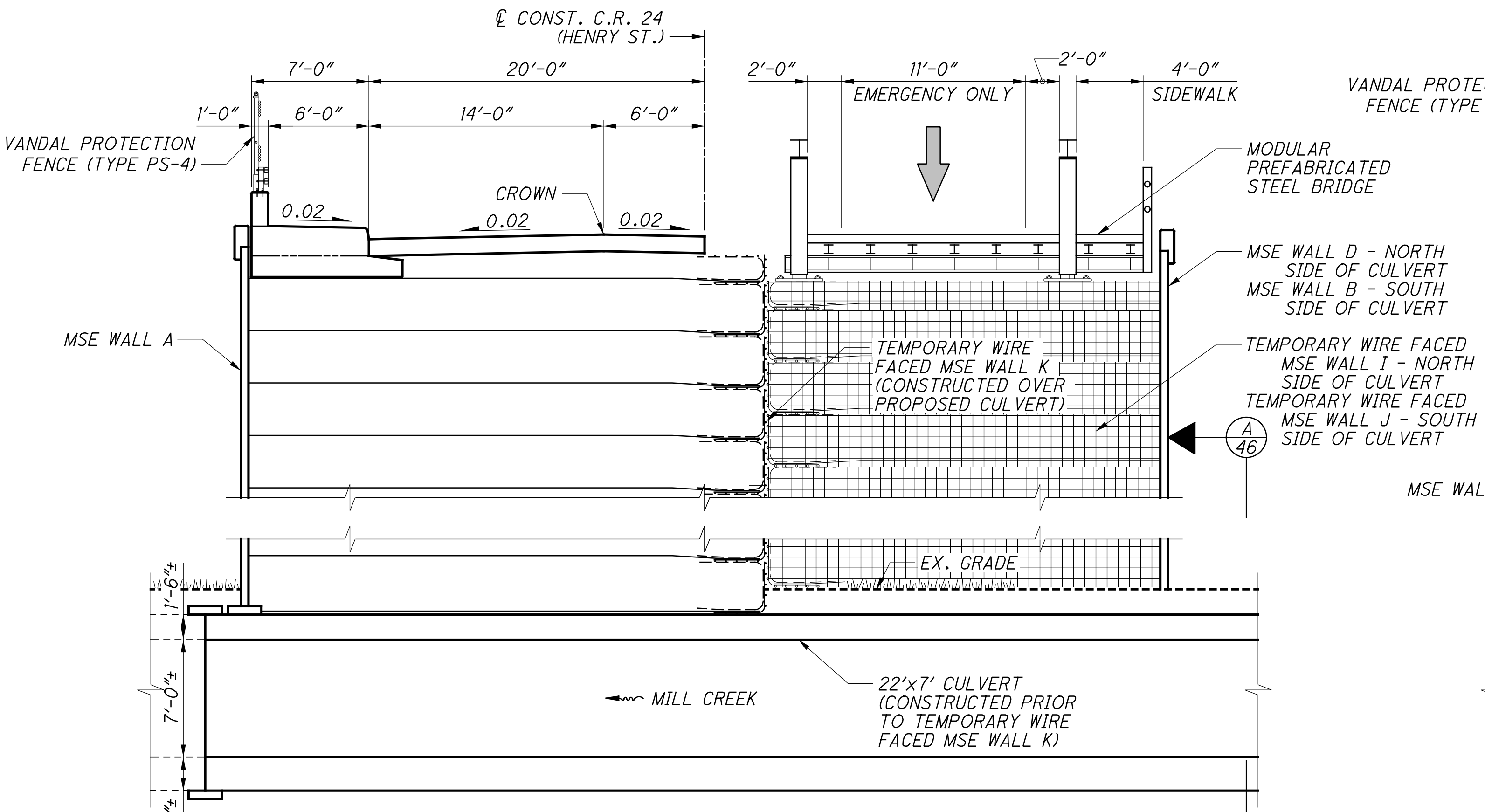
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

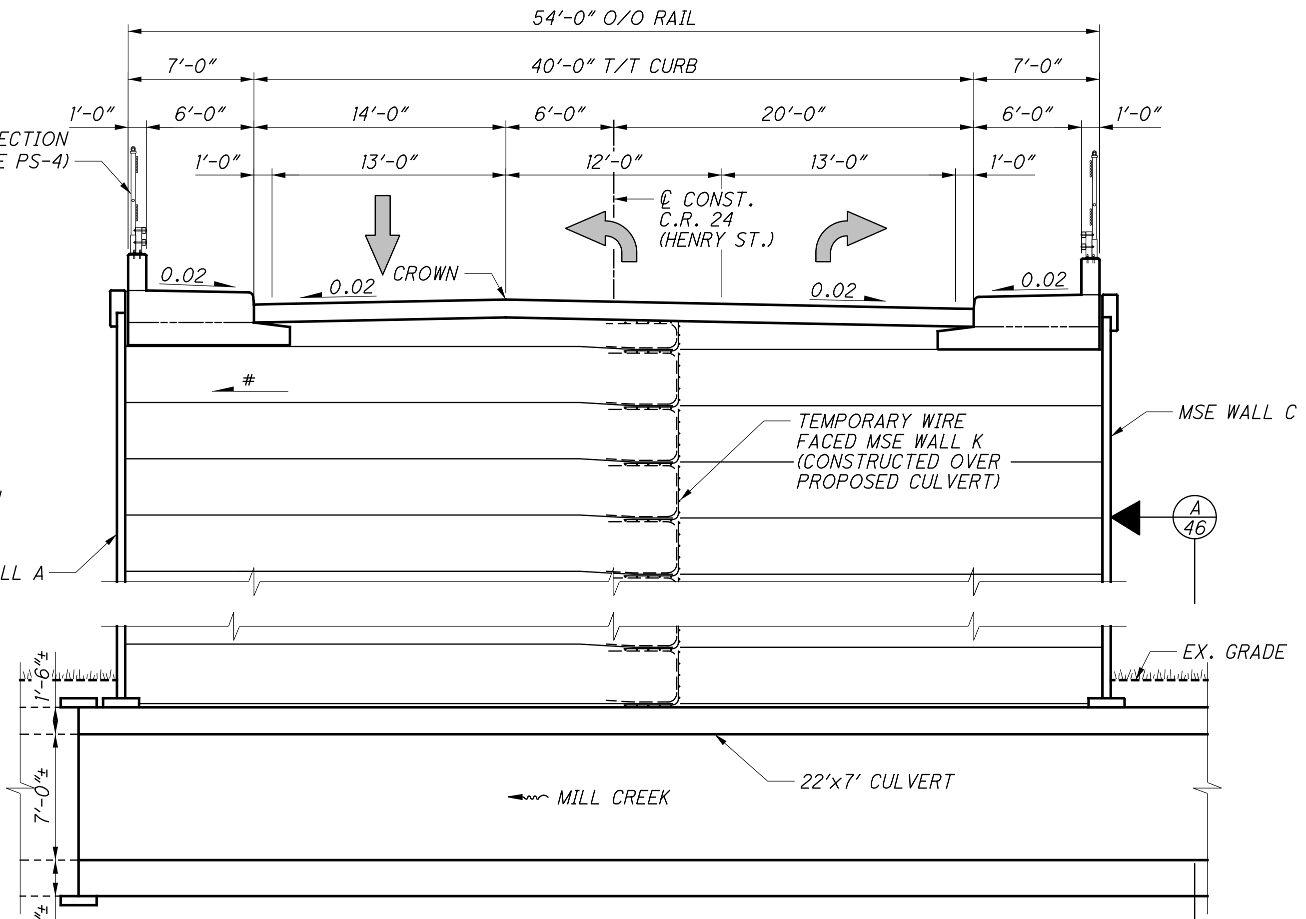
DATE	3/19
REVIEWED	JTH
STRUCTURE FILE NUMBER	1834037
DRAWN	TMR
REVISED	
DESIGNED	TMR
CHECKED	MRW

PHASE CONSTRUCTION DETAILS

BRIDGE NO. CUY-24-0061
HENRY STREET (C.R. 24) OVER MILL CREEK

CUY-14-6.93
PID No. 104132



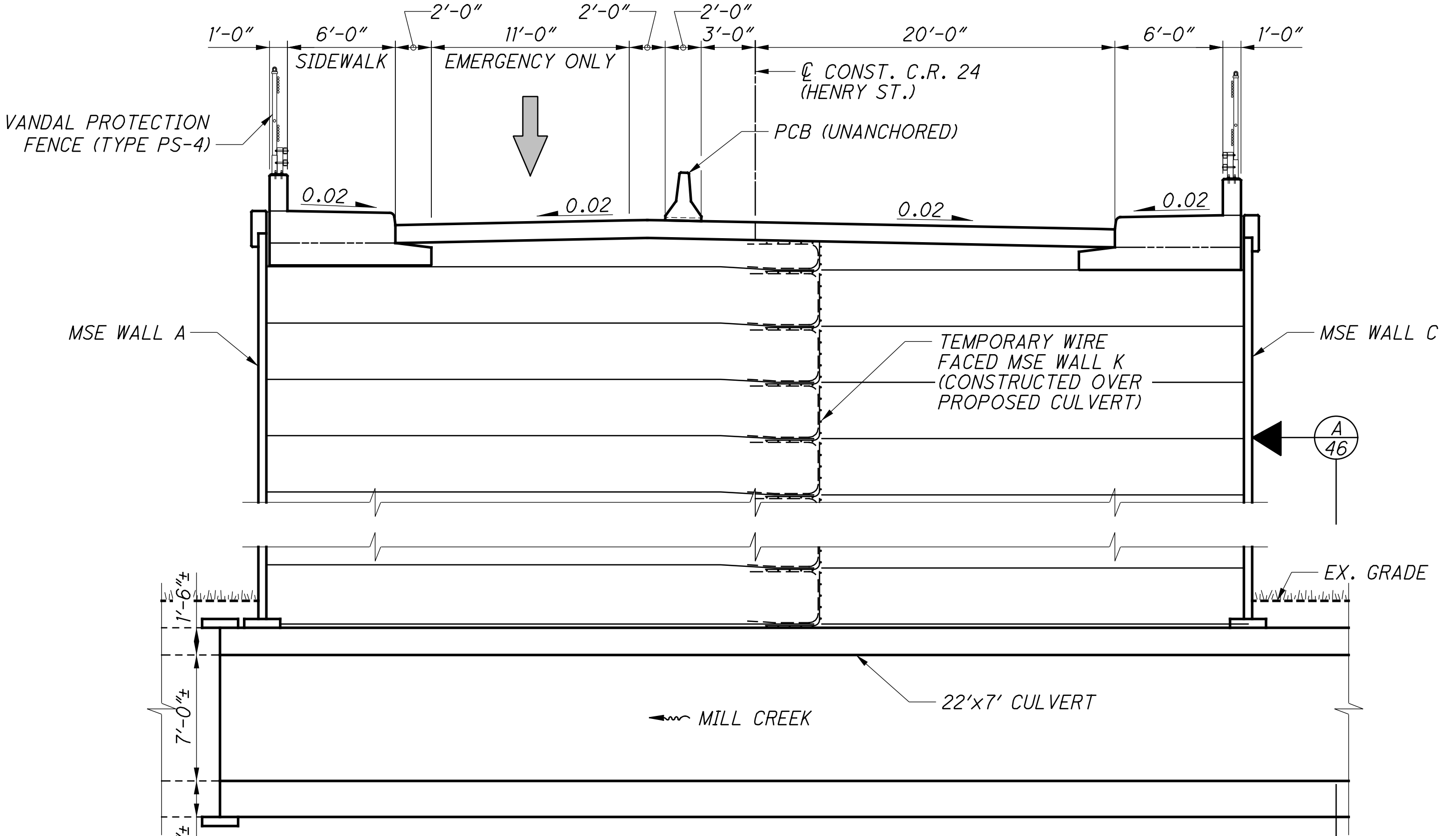


PHASE 3 CONSTRUCTION

PHASE 3 M.O.T.

(EMERGENCY VEHICLES ONLY)

FINAL CONDITION



PHASE 4 M.O.T.

(EMERGENCY VEHICLES ONLY)

PHASE 4 CONSTRUCTION

PRE-VALUE
ENGINEERING
CONCEPTUAL AER
DETAIL PLANS

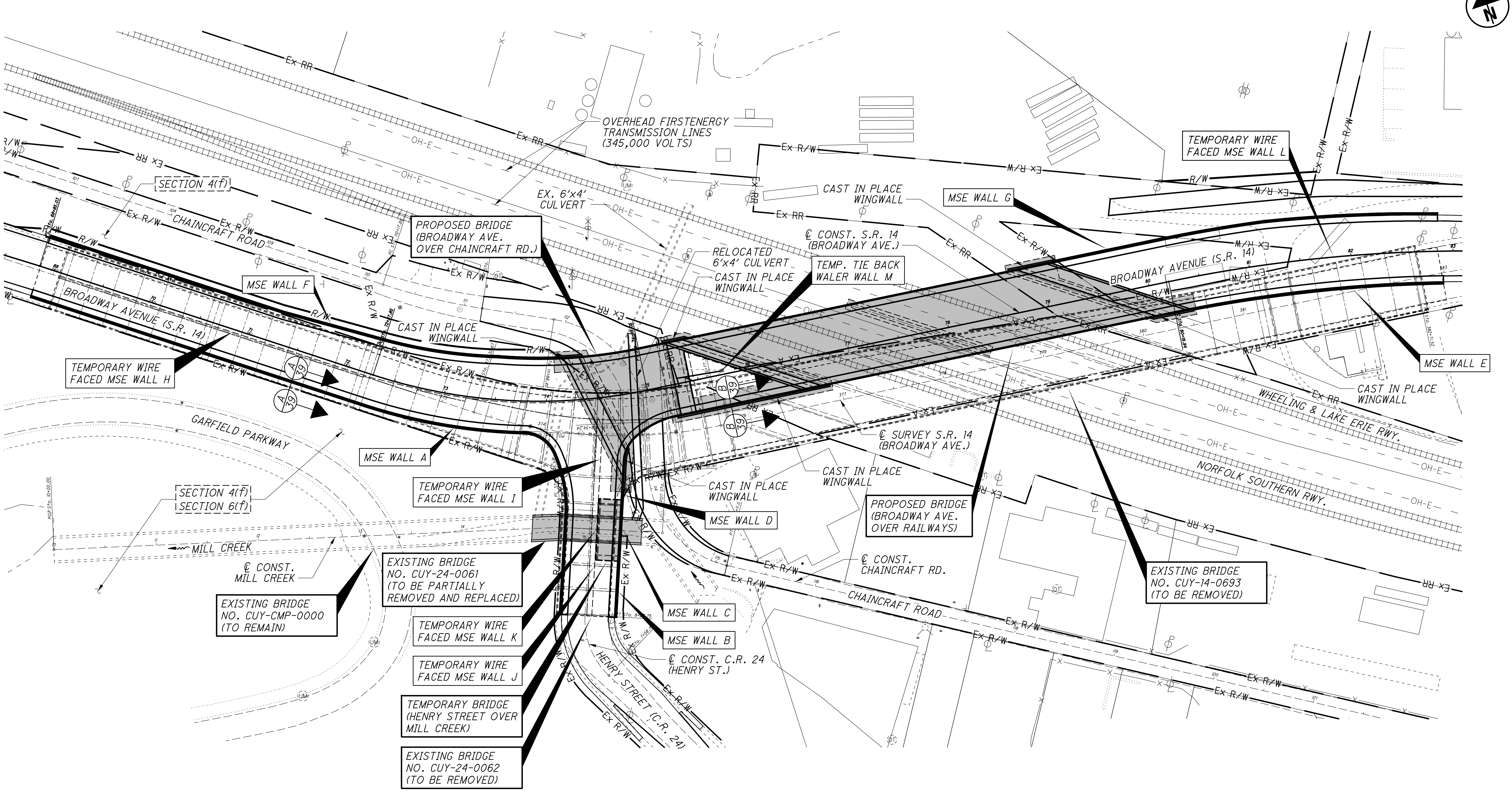
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DATE	3/19
STRUCTURE FILE NUMBER	1834037
REVIEWED	JTH
DRAWN	TMR
REVISED	
DESIGNED	TMR
CHECKED	MRW

PHASE CONSTRUCTION DETAILS
BRIDGE NO. CUY-24-0061
HENRY STREET (C.R. 24) OVER MILL CREEK

CUY-14-6.93
PID No. 104132

20/20



PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

STRUCTURES WORK:

REMOVALS
- 2 BRIDGES
- 1 PARTIAL CULVERT

CONSTRUCTION
- 2 PROPOSED BRIDGES
- 1 PARTIAL CULVERT
- 7 PERMANENT MSE WALLS
- 5 TEMPORARY WIRE FACED MSE WALLS
- 1 TEMPORARY WALER WALL
- 1 TEMPORARY BRIDGE

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	JTH	6/19
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		1081085/1834282	

ALTERNATIVE 1 - SCHEMATIC PLAN

BRIDGE NO. CUY-14-0693 AND CUY-24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132

1/2

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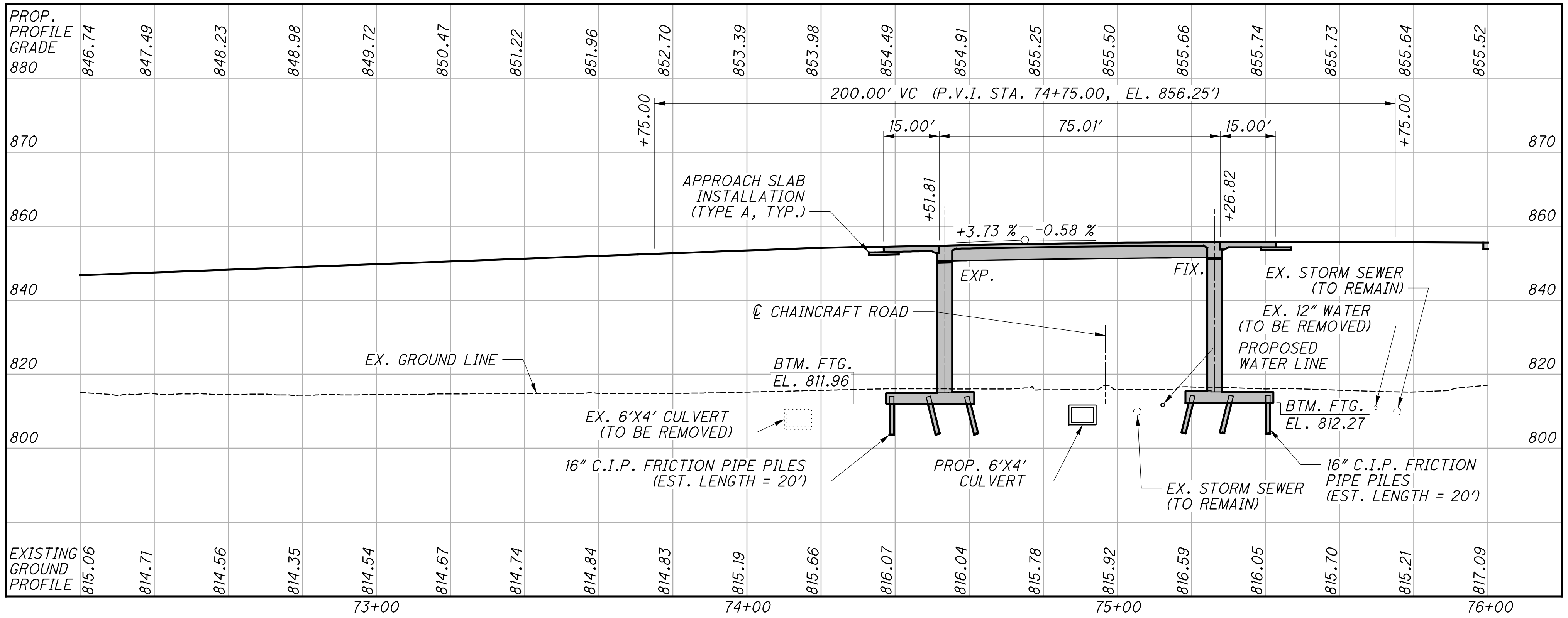
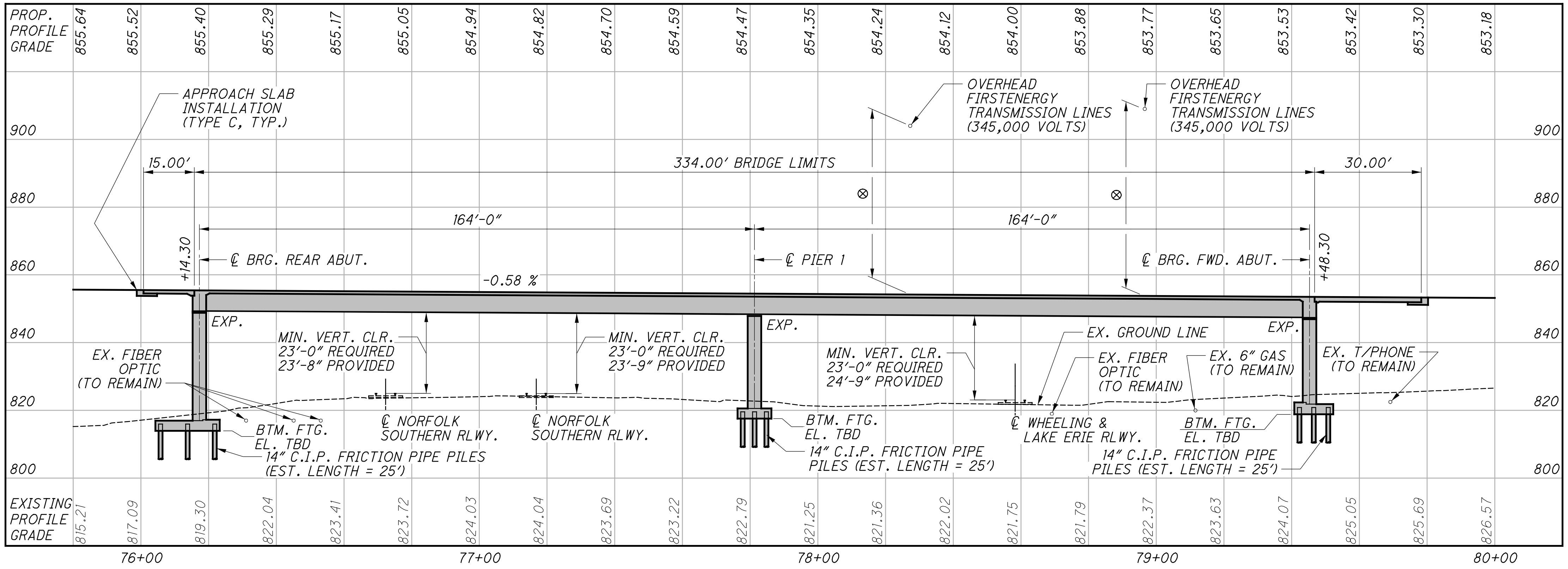


PROFILE ALONG ℄ CONST. S.R. 14 (BROADWAY AVE. OVER CHAINCRAFT RD.)

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS



PROFILE ALONG ℄ CONST. S.R. 14 (BROADWAY AVE. OVER RAILWAYS)

LEGEND

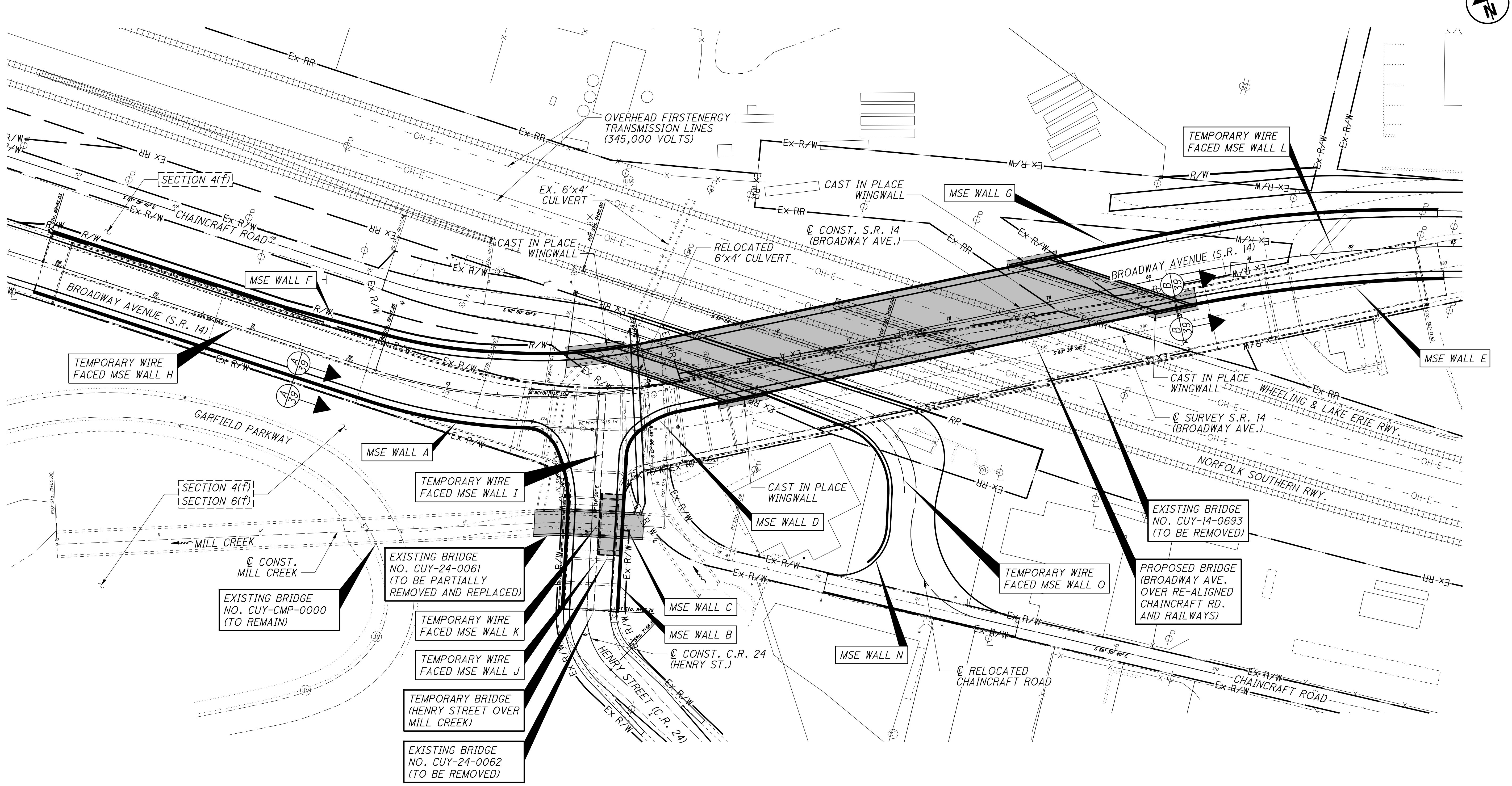
⊗ - OVERHEAD FIRSTENERGY TRANSMISSION LINES
EX. VERTICAL CLR. = TBD
PROP. VERTICAL CLR. = TBD

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
JDM/AMA	JDM/AMA	JTH	3/19
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		TBD	

ALTERNATIVE 1 - PROFILES
BRIDGE NO. CUY-14-0693 AND CUY-24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132



PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

STRUCTURES WORK:

REMOVALS
- 2 BRIDGES
- 1 PARTIAL CULVERT

CONSTRUCTION
- 1 PROPOSED BRIDGE
- 1 PARTIAL CULVERT
- 8 PERMANENT MSE WALLS
- 6 TEMPORARY WIRE FACED MSE WALLS
- 1 TEMPORARY BRIDGE

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	JTH	6/19
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		1081085/1834282	

ALTERNATIVE 3 - SCHEMATIC PLAN

BRIDGE NO. CUY-14-0693 AND CUY-24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132

1/5

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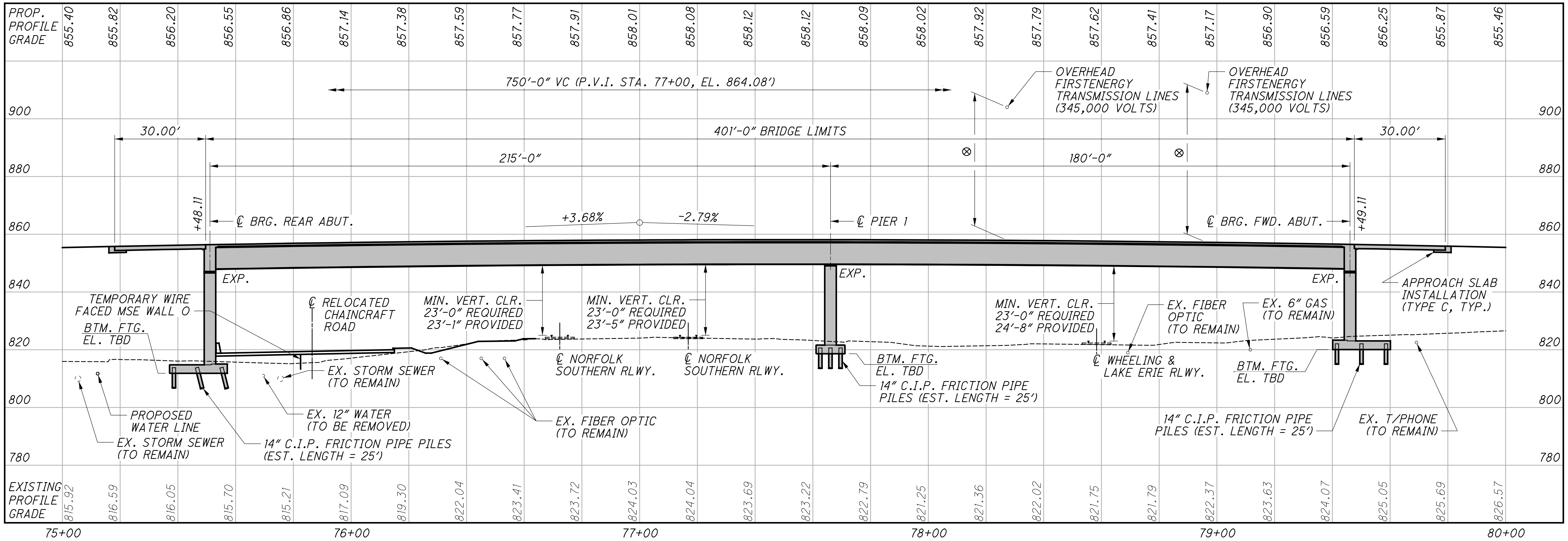


PROFILE ALONG ℄ CONST. S.R. 14 (BROADWAY AVE. OVER RAILWAYS)

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

LEGEND

⊗ - OVERHEAD FIRSTENERGY TRANSMISSION LINES
EX. VERTICAL CLR. = TBD
PROP. VERTICAL CLR. = TBD

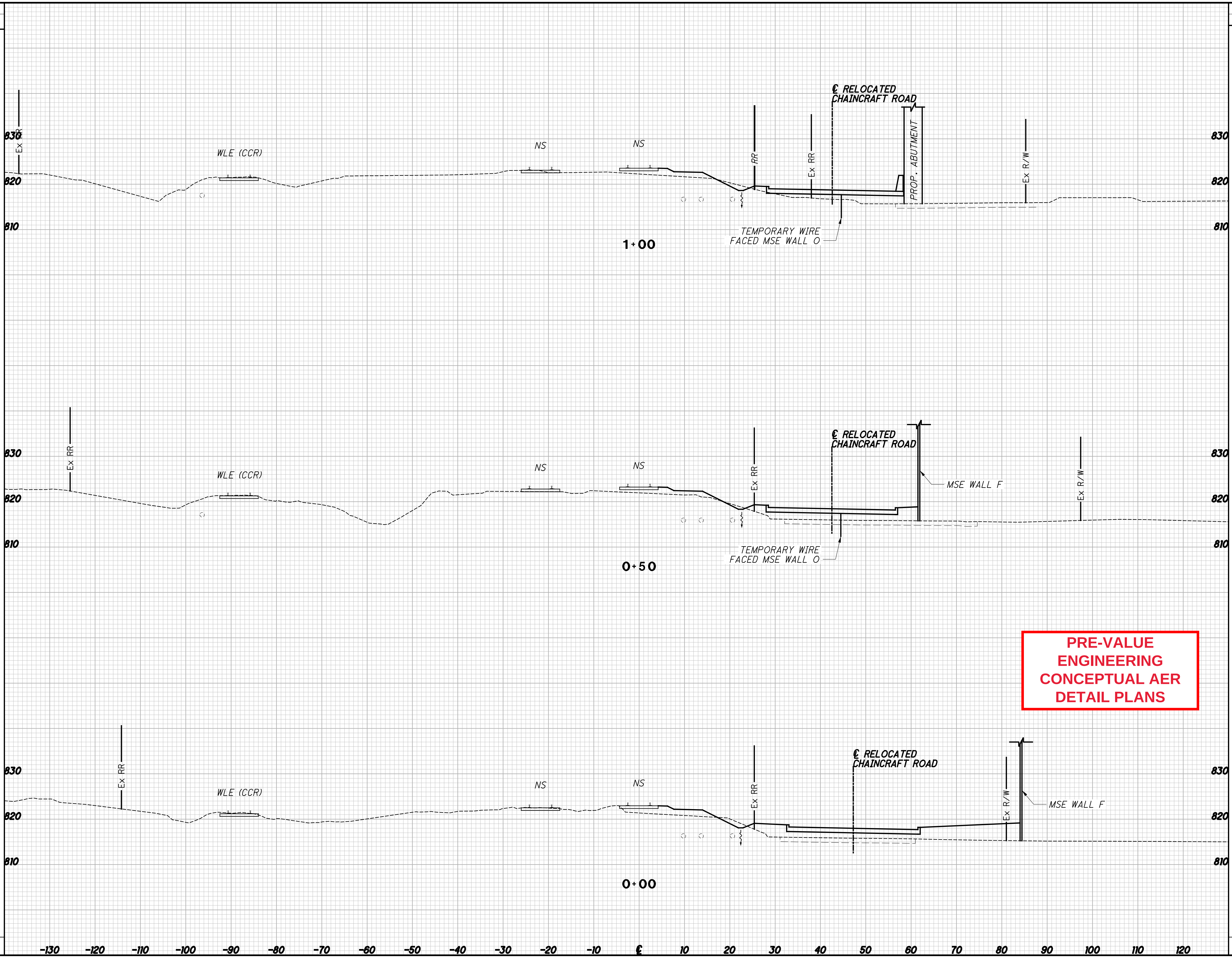
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

REVIEWED JTH	DATE 3/19
STRUCTURE FILE NUMBER TBD	
DRAWN TMR	REVISED
DESIGNED JDM	CHECKED MRW

ALTERNATIVE 3 - PROFILE
BRIDGE NO. CUY-14-0693 AND CUY-24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132

SEEDING	
END WIDTH	SQ. YDS.



END AREA		VOLUME	
CUT	FILL	CUT	FILL

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

REVIEWED JTH
DATE 6/19
STRUCTURE FILE NUMBER 1081085/1834282
DRAWN JMS
REVISED
DESIGNED JMS
CHECKED DSB

ALTERNATIVE 3 - CROSS SECTIONS STA. 0+00 TO 1+00

BRIDGE NO. CUY-14-0693 AND CUY-24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132

3/5

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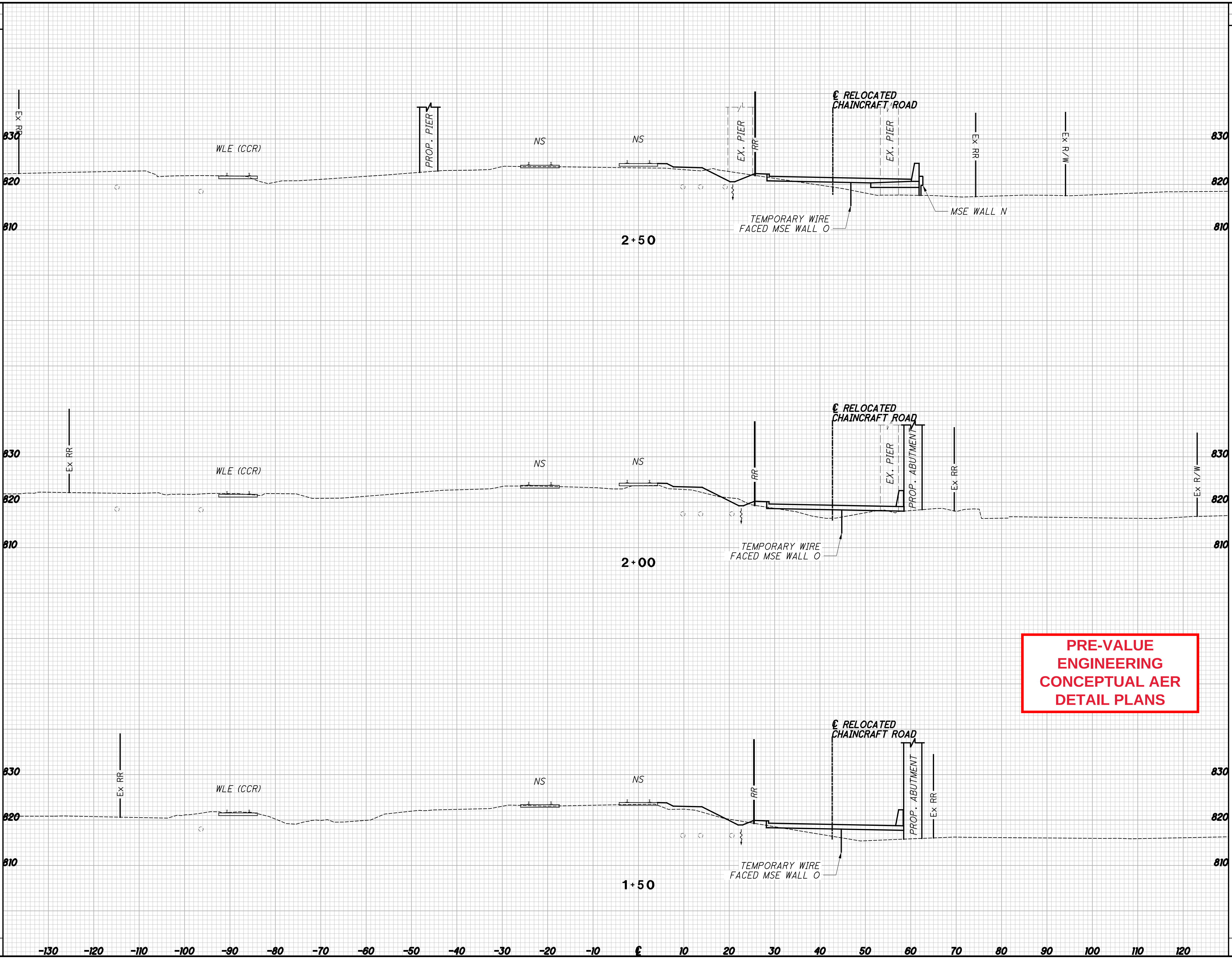
SEEDING	
END WIDTH	SQ. YDS.



PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

END AREA		VOLUME	
CUT	FILL	CUT	FILL

DESIGN AGENCY

AECOM

564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED JMS	DRAWN JMS	REVIEWED JTH	DATE 6/19
CHECKED DSB	REVISED	STRUCTURE FILE NUMBER 1081085/1834282	

ALTERNATIVE 3 - CROSS SECTIONS STA. 1+50 TO 2+50

BRIDGE NO. CUY-14-0693 AND CUY-24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

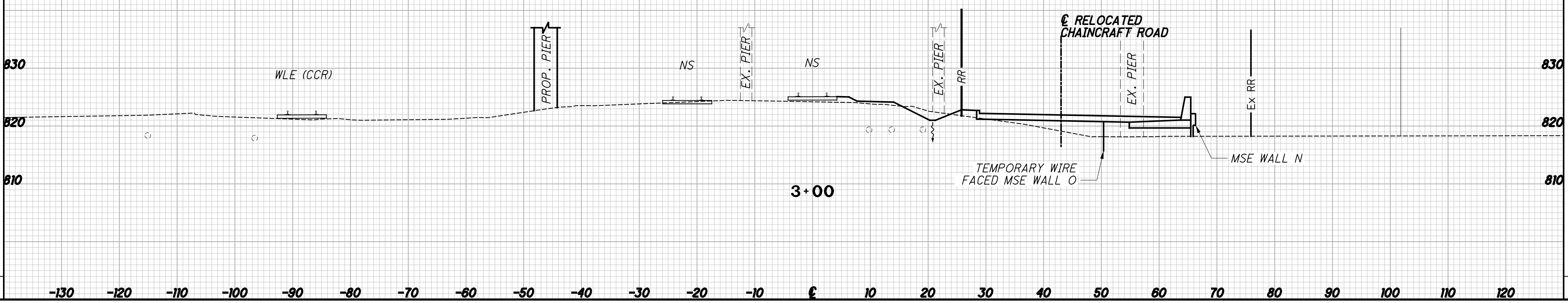
CUY-14-6.93
PID No. 104132

4 / 5

SEEDING	
END WIDTH	SQ. YDS.

END AREA		VOLUME	
CUT	FILL	CUT	FILL

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS



DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED JMS
CHECKED DSB
DRAWN JMS
REVISED
REVIEWED JTH
DATE 6/19
STRUCTURE FILE NUMBER 1081085/1834282

ALTERNATIVE 3 - CROSS SECTIONS STA. 3+00
BRIDGE NO. CUY-14-0693 AND CUY-24-0062
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132

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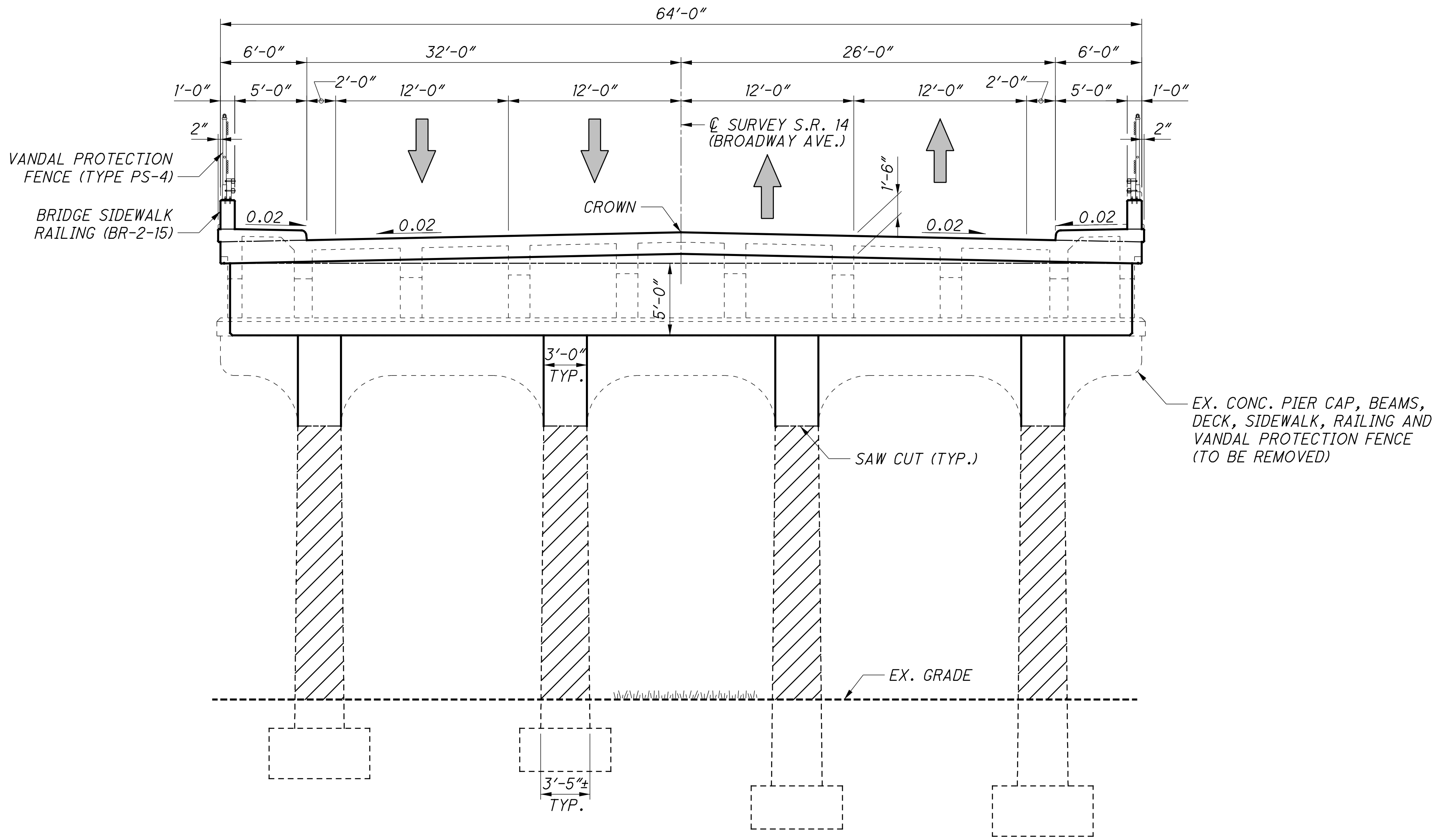
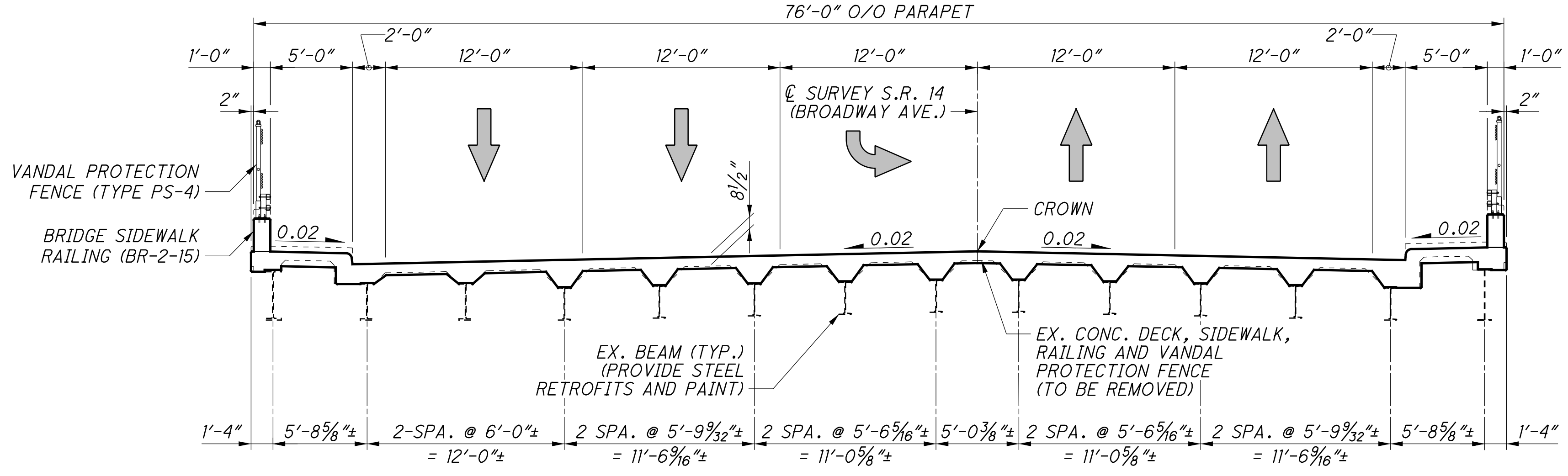


EAST AND WEST APPROACH BRIDGE

(WEST APPROACH SHOWN, EAST SIMILAR)



RAILWAY BRIDGE

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

LEGEND:

▨ ITEM 519
- PATCHING CONCRETE STRUCTURE
- SPECIAL - COMPOSITE FIBER WRAP SYSTEM

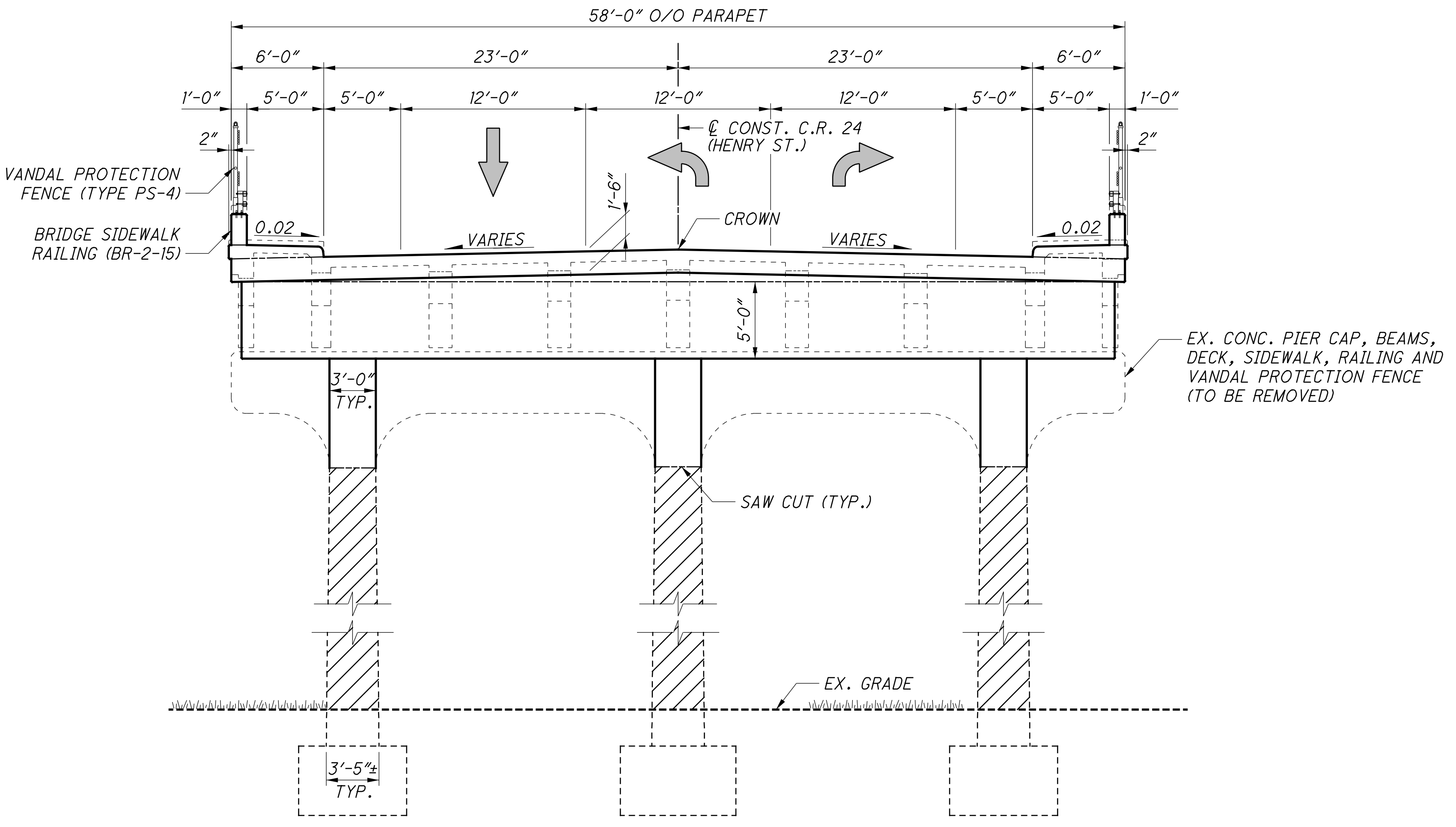
DESIGN AGENCY
AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

DESIGNED	DRAWN	REVIEWED	DATE
TMR	TMR	JTH	6/19
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MRW		1081085	

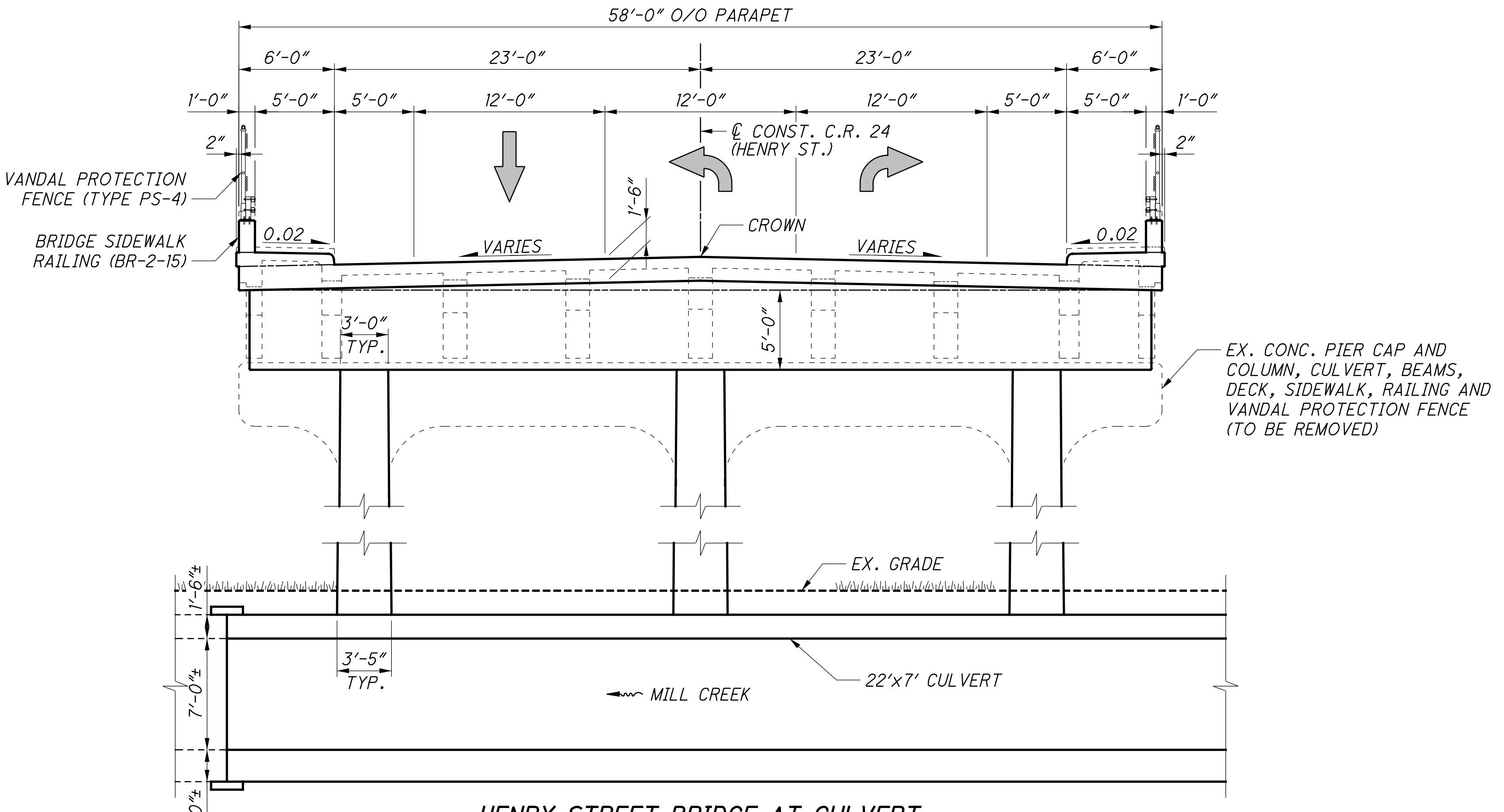
ALTERNATIVE 5 - PATCHING DETAILS

BRIDGE NO. CUY-14-0693
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132



HENRY STREET BRIDGE



HENRY STREET BRIDGE AT CULVERT

PRE-VALUE ENGINEERING CONCEPTUAL AER DETAIL PLANS

LEGEND:

▨ ITEM 519
- PATCHING CONCRETE STRUCTURE
- SPECIAL - COMPOSITE FIBER WRAP SYSTEM

DESIGN AGENCY

AECOM
564 WHITE POND DRIVE
AKRON, OHIO 44320-1100
(330) 836-9111

REVIEWED JTH	DATE 6/19	STRUCTURE FILE NUMBER 1081085	
DRAWN TMR	REVISED		
DESIGNED TMR	CHECKED MRW		

ALTERNATIVE 5 - PATCHING DETAILS
BRIDGE NO. CUY-14-0693
BROADWAY (SR 14) OVER CHAINCRAFT, W&LE & NS AND HENRY (CR 24) OVER MILL CRK

CUY-14-6.93
PID No. 104132

2/2

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57

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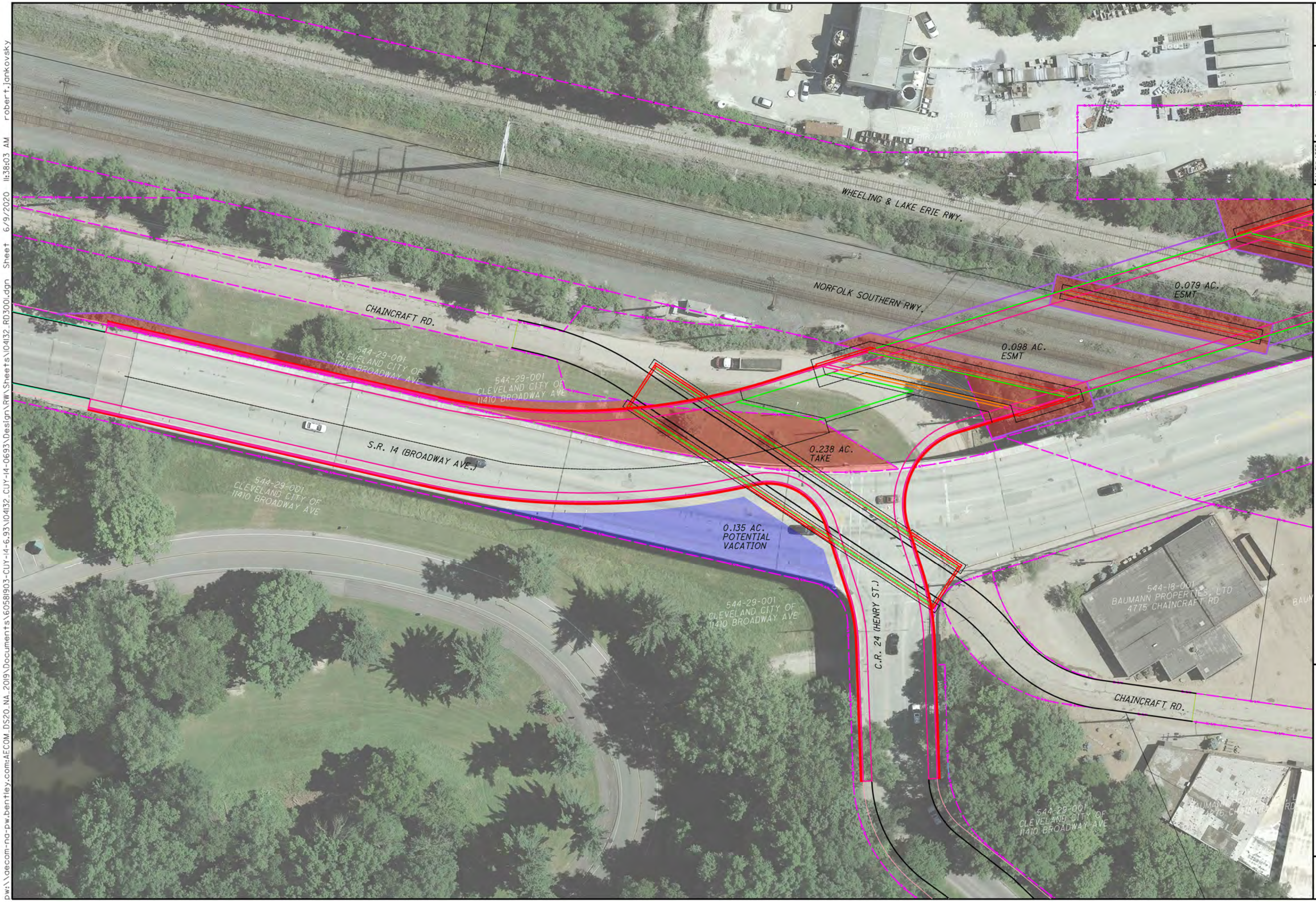
Appendix HH



0 5 10 20
HORIZONTAL
SCALE IN FEET

CALCULATED
JMS
CHECKED
ZRD

WEST END RIGHT OF WAY IMPACTS

CUY-14-6.93

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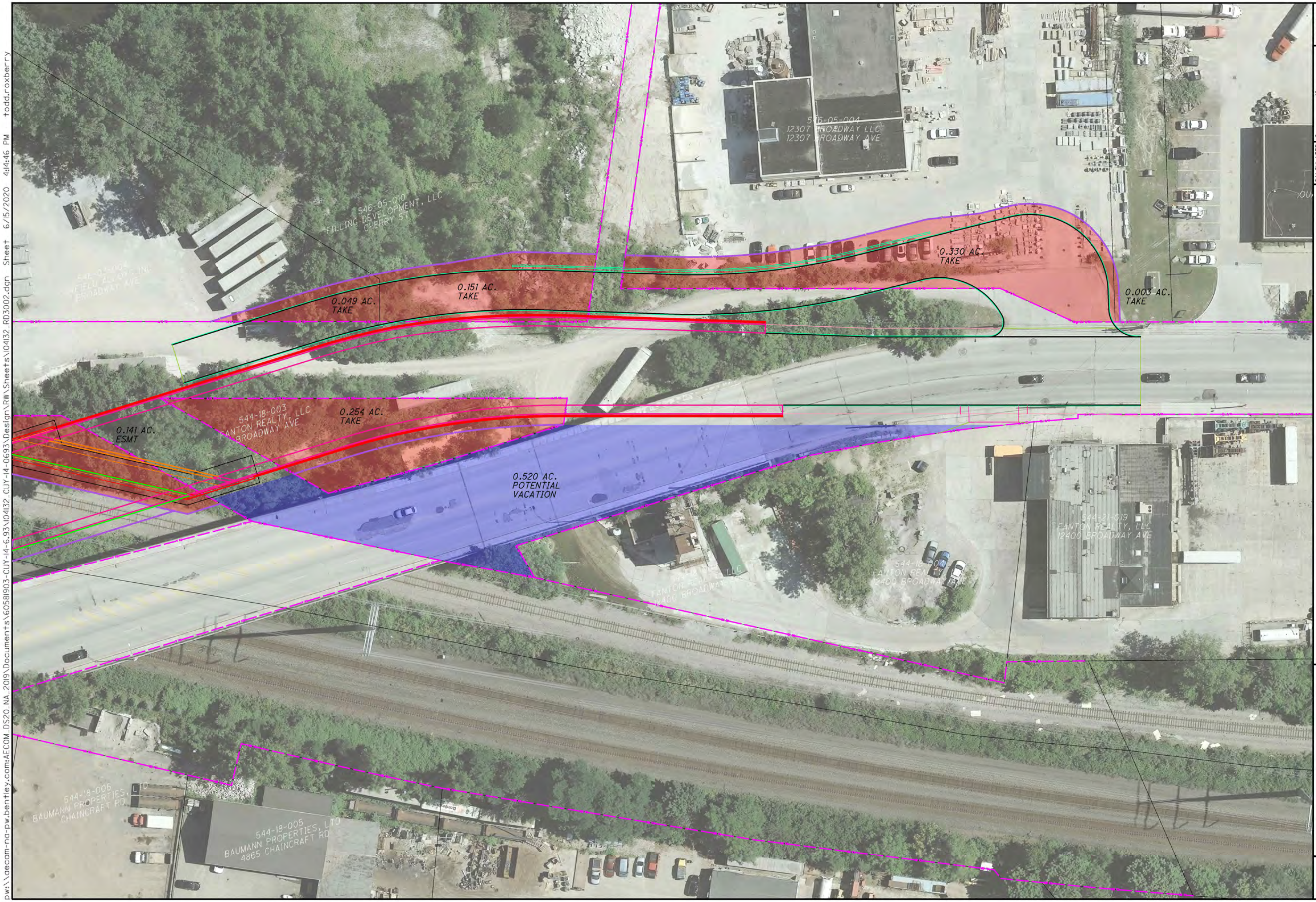

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0 5 10 20
HORIZONTAL SCALE IN FEET

CALCULATED	CHECKED
JMS	ZRD

EAST END RIGHT OF WAY IMPACTS

CUY-14-6.93

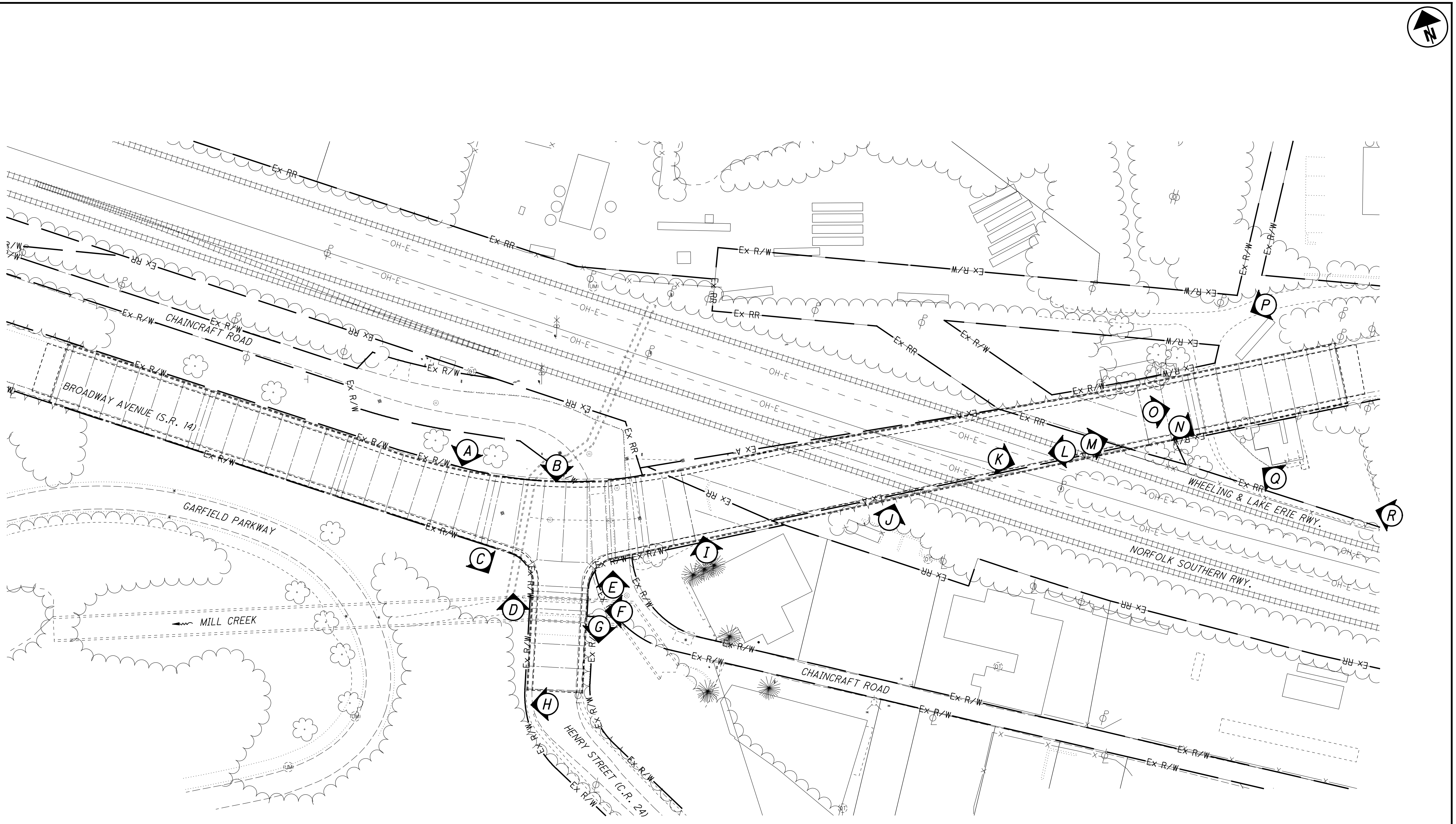

PHOTO LOCATION MAP

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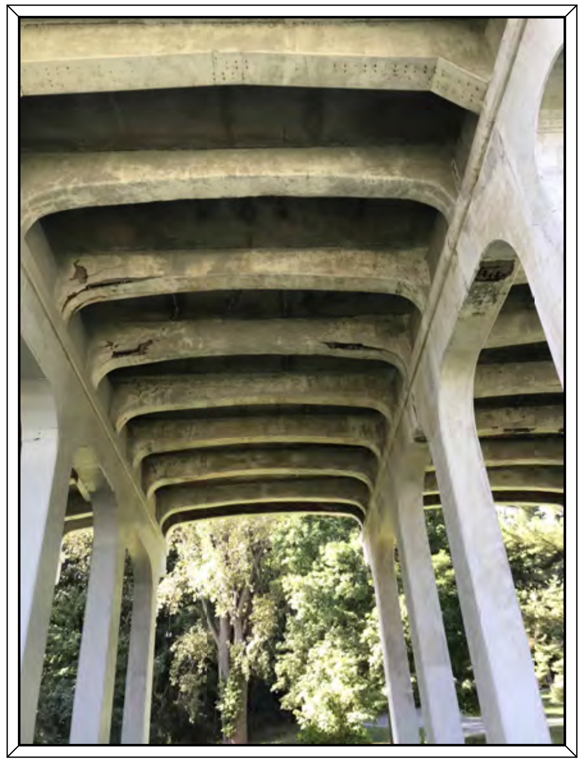

VIEW A

VIEW B

VIEW C

VIEW D

VIEW E

VIEW F

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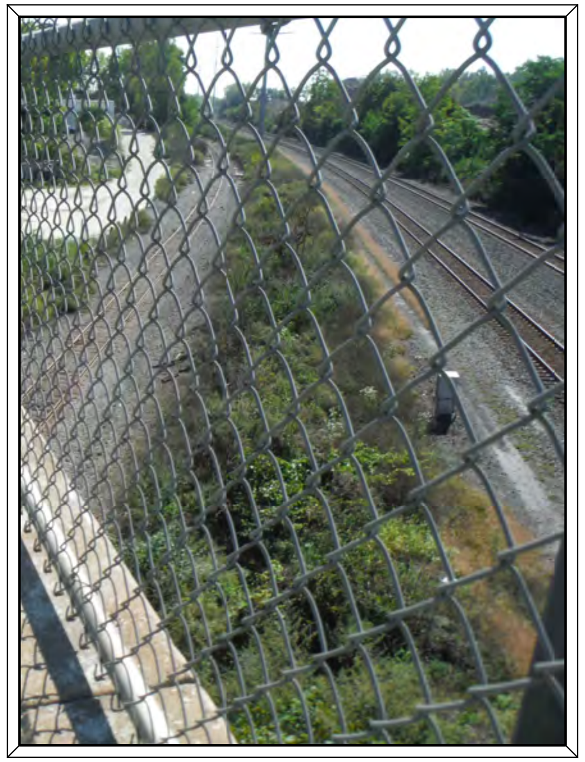
VIEW G

VIEW H

VIEW I

VIEW J



VIEW K

VIEW L

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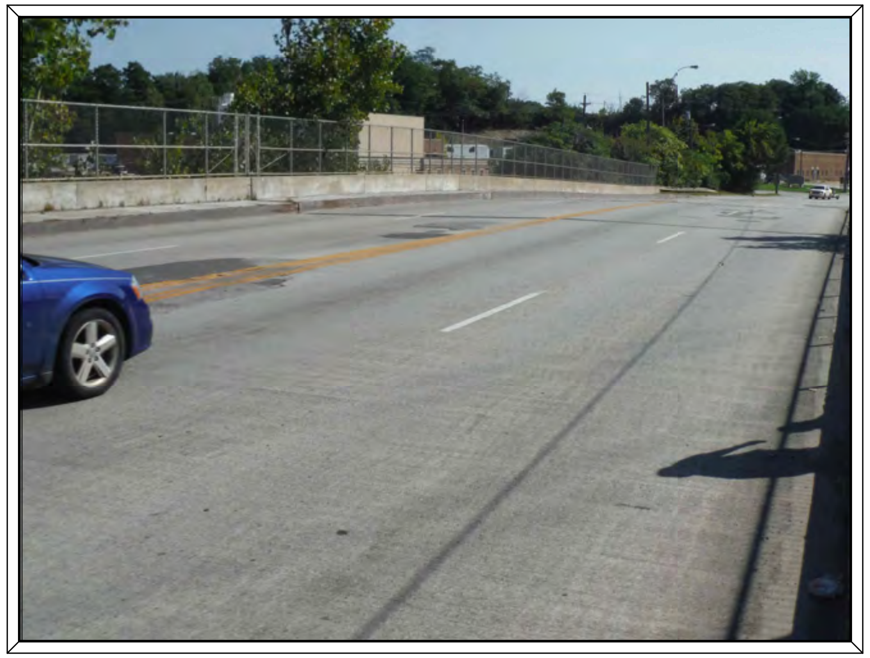

VIEW M

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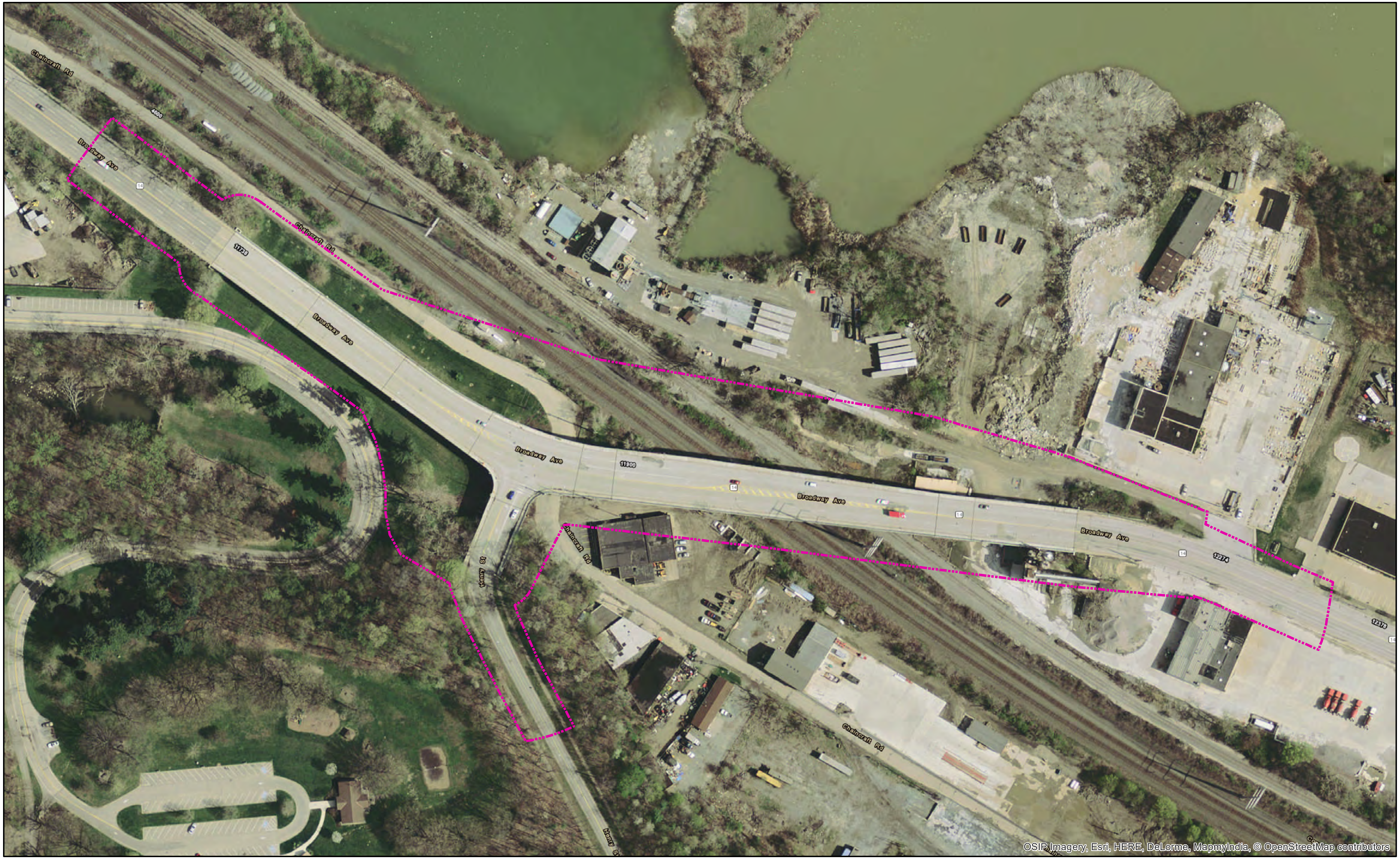
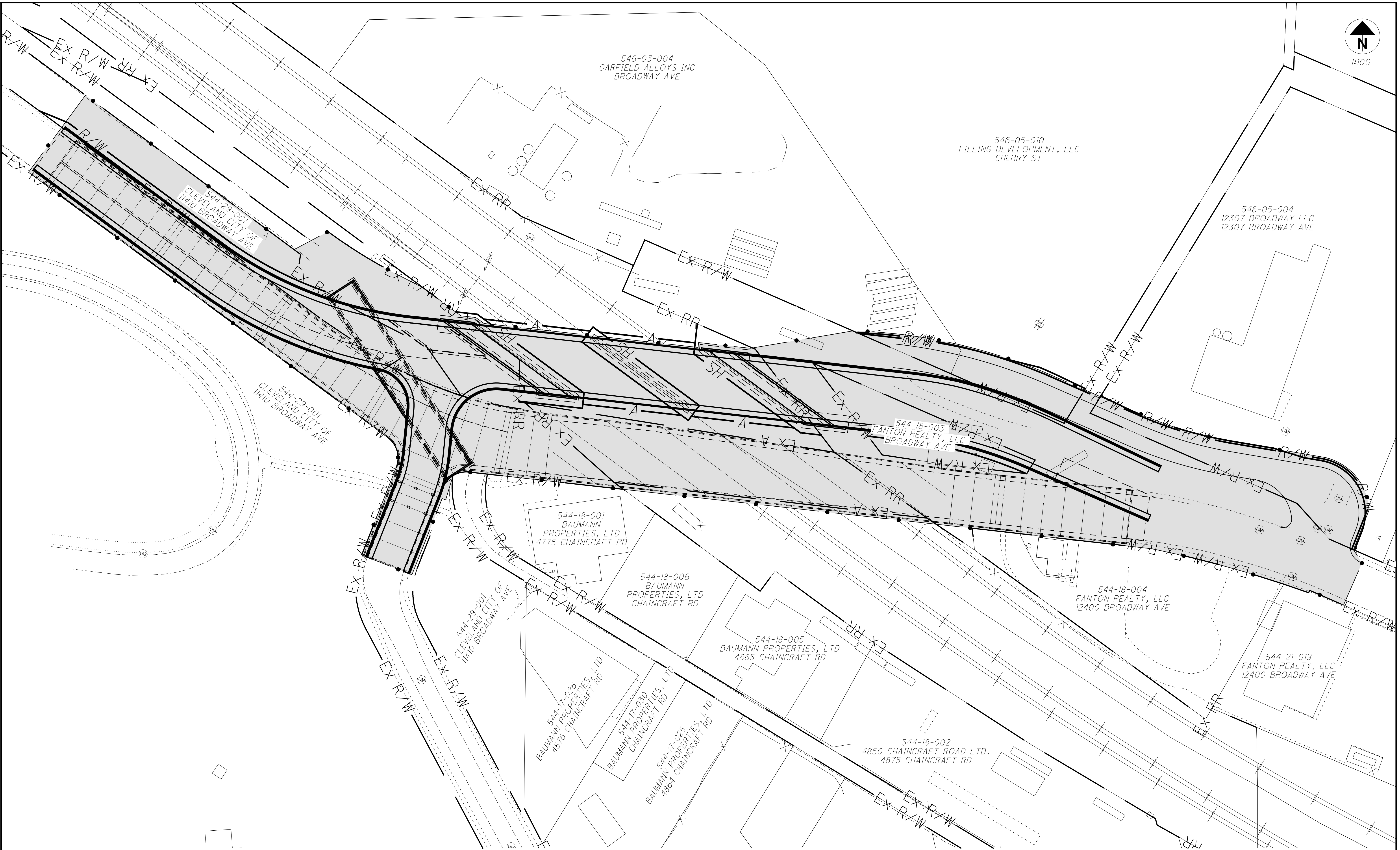
Appendix JJ

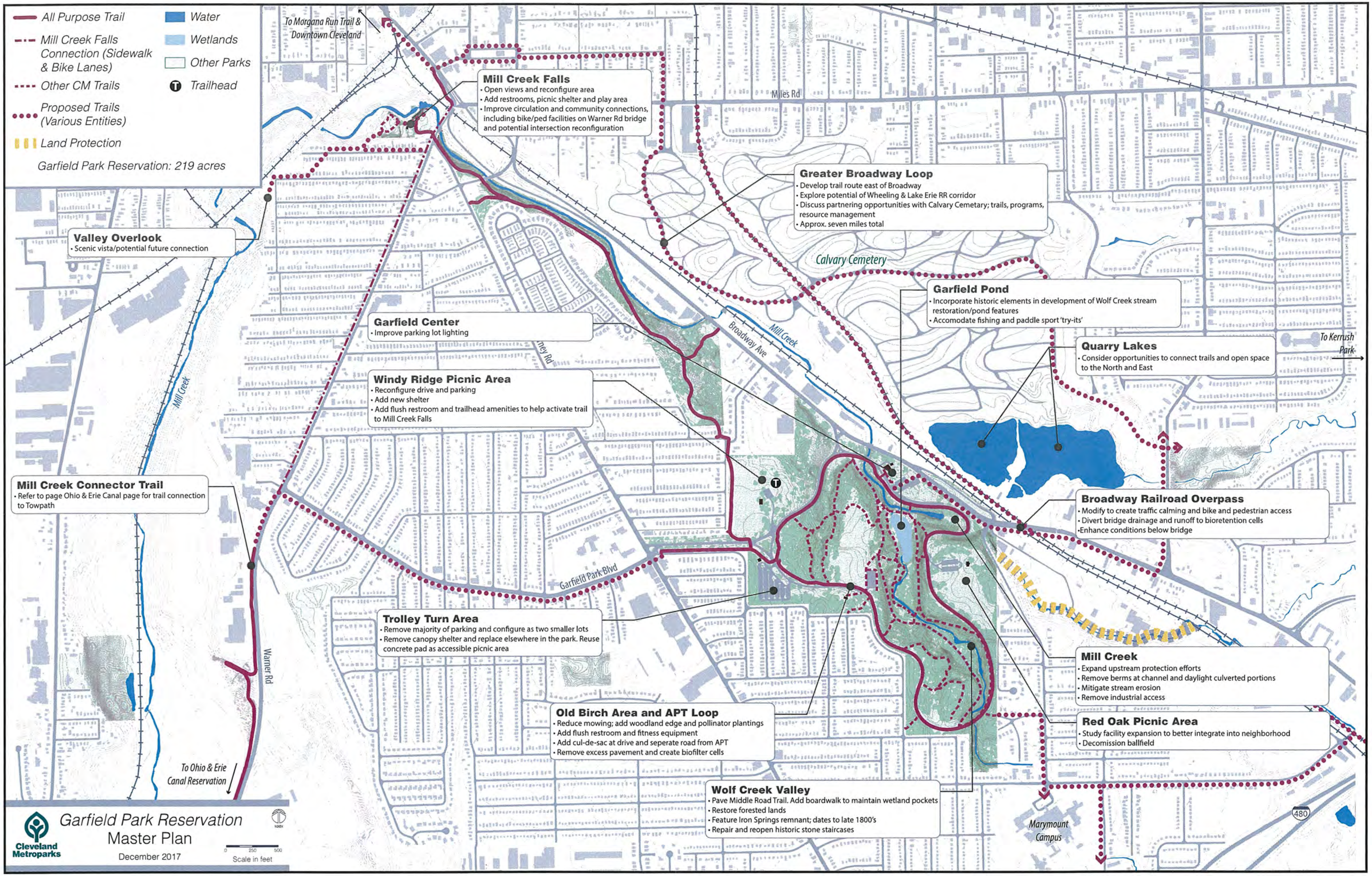


OSIP Imagery, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors pw:\\aecom-na-pw.bentley.com:AECOM_DS20_NA_2019\Documents\60581903-CUY-14-6.93\104132_CUY-14-0693\Design\Structures\CUY-14-0693C\Basemaps\Const_Limits Sheet 6/12/2020 1:58:11 PM todd.roxberry



ALTERNATIVE 3C - ANTICIPATED CONSTRUCTION LIMITS

Appendix KK



Mill Creek Falls
- Open views and reconfigure area
- Add restrooms, picnic shelter and play area
- Improve circulation and community connections, including bike/ped facilities on Warner Rd bridge and potential intersection reconfiguration

Greater Broadway Loop
- Develop trail route east of Broadway
- Explore potential of Wheeling & Lake Erie RR corridor
- Discuss partnering opportunities with Calvary Cemetary; trails, programs, resource management
- Approx. seven miles total

Valley Overlook
- Scenic vista/potential future connection

Garfield Pond
- Incorporate historic elements in development of Wolf Creek stream restoration/pond features
- Accomodate fishing and paddle sport 'try-its'

Garfield Center
- Improve parking lot lighting

Quarry Lakes
- Consider opportunities to connect trails and open space to the North and East

Windy Ridge Picnic Area
- Reconfigure drive and parking
- Add new shelter
- Add flush restroom and trailhead amenities to help activate trail to Mill Creek Falls

Mill Creek Connector Trail
- Refer to page Ohio & Erie Canal page for trail connection to Towpath

Broadway Railroad Overpass
- Modify to create traffic calming and bike and pedestrian access
- Divert bridge drainage and runoff to bioretention cells
- Enhance conditions below bridge

Trolley Turn Area
- Remove majority of parking and configure as two smaller lots
- Remove canopy shelter and replace elsewhere in the park. Reuse concrete pad as accessible picnic area

Mill Creek
- Expand upstream protection efforts
- Remove berms at channel and daylight culverted portions
- Mitigate stream erosion
- Remove industrial access

Old Birch Area and APT Loop
- Reduce mowing; add woodland edge and pollinator plantings
- Add flush restroom and fitness equipment
- Add cul-de-sac at drive and seperate road from APT
- Remove excess pavement and create biofilter cells

Red Oak Picnic Area
- Study facility expansion to better integrate into neighborhood
- Decomission ballfield

Wolf Creek Valley
- Pave Middle Road Trail. Add boardwalk to maintain wetland pockets
- Restore forested lands
- Feature Iron Springs remnant; dates to late 1800's
- Repair and reopen historic stone staircases

Cleveland Metroparks

Garfield Park Reservation Master Plan

December 2017

Appendix LL

KEY ISSUES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4		ALTERNATIVE 5 (only initial constr. shown)	NO-BUILD ALTERNATIVE
				Initial Rehabilitation	Replacement in 10 Years		
Satisfy Purpose and Need	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes ***	**No**
Environmental Impacts	**Moderate Significance**	**Moderate Significance**	**High Significance**	**Minor Significance**	**Moderate to High Significance**	**Minor Significance**	**None**
Section 4(f) Impacts	New Permanent & Temporary takes in possible "de minimis" areas only	New Permanent & Temporary takes in possible "de minimis" areas only	New Permanent & Temporary takes in possible "de minimis" areas only	Temporary Only	New Permanent & Temporary takes in possible "de minimis" areas only	Temporary Only	N/A
Section 6(f) Impacts	Temporary (< 6 months) Only	Temporary (< 6 months) Only	Temporary (< 6 months) Only	Temporary (< 6 months) Only	Temporary (< 6 months) Only	Temporary (< 6 months) Only	N/A
Public Involvement	Significant PI required	Significant PI required	Significant PI required	Minimal PI required	Significant PI required	Minimal PI required	N/A
Cultural Resources	None	None	None	None	None	None	N/A
Ecological Resources	Minimal, Not Significant	Minimal, Not Significant	Minimal, Not Significant	None	Minimal, Not Significant	None	N/A
Regulated Materials	Moderate, Likely Not Significant	Moderate, Likely Not Significant	Highest, Potentially Significant	None	Potentially Significant	None	N/A
FEMA Flood Zones	None	None	None	None	None	None	N/A
Right-of-Way Impacts	**Moderate Significance**	**Moderate Significance**	**High Significance**	**Minor Significance**	**Moderate to High Significance**	**Minor Significance**	**None**
Section 4(f) Impacts	0.201 acres Permanent, plus Temporary, in "de minimis" areas only	0.201 acres Permanent, plus Temporary, in "de minimis" areas only	0.201 acres Permanent, plus Temporary, in "de minimis" areas only	Temporary Only	0.201 acres Permanent, plus Temporary, in "de minimis" areas only	Temporary Only	N/A
Section 6(f) Impacts	Temporary Only	Temporary Only	Temporary Only	Temporary Only	Temporary Only	Temporary Only	
Henry Street Bridge/Culvert	Temporary Only	Temporary Only	Temporary Only	None	Temporary Only	None	N/A
Rail lines	0.251 acres Permanent, plus substantial Temporary	0.251 acres Permanent, plus substantial Temporary	0.337 acres Permanent, plus substantial Temporary; plus full 0.340 acres of Parcel 544-18-006	Substantial Temporary, but no Permanent	0.251 or 0.337 acres Permanent, plus substantial Temporary, plus possible full 0.340 acres of Parcel 544-18-006	Substantial Temporary, but no Permanent	N/A
East of the Rail Lines	0.596 acres Permanent from 4 parcels, plus minor Temporary	0.596 acres Permanent from 4 parcels, plus minor Temporary	0.596 acres Permanent from 4 parcels, plus minor Temporary	None	0.596 acres Permanent from 4 parcels, plus minor Temporary	None	N/A
MOT Design Issues	**High Significance**	**High Significance**	**High Significance**	**Minor Significance**	**High Significance**	**Minor Significance**	**None**
Along Mainline SR14 (Vehicular)	1 lane each way maintained at all times, plus WB left turn lane at Henry in Phase 1	1 lane each way maintained at all times, plus WB left turn lane at Henry in Phase 1	1 lane each way maintained at all times, plus WB left turn lane at Henry in Phase 1	Minimum of 1 lane each way maintained at all times, plus WB left turn lane at Henry	1 lane each way maintained at all times, plus WB left turn lane at Henry in Phase 1	Minimum of 1 lane each way maintained at all times, plus WB left turn lane at Henry	N/A
From SR14 to Henry Street (Vehicular)	Open in Phase 1, Closed in Phase 2	Open in Phase 1, Closed in Phase 2	Open in Phase 1, Closed in Phase 2	Open throughout construction	Open in Phase 1, Closed in Phase 2	Open throughout construction	N/A
From Henry Street to SR14 (Vehicular)	Open in Phase 1, Closed in Phase 2	Open in Phase 1, Closed in Phase 2	Open in Phase 1, Closed in Phase 2	Short (< week) lane closures	Open in Phase 1, Closed in Phase 2	Short (< week) lane closures	N/A
Along Chaincraft Road Under SR14 (Vehicular)	A minimum of One lane, Two way signalized throughout construction	A minimum of One lane, Two way signalized throughout construction	A minimum of One lane, Two way signalized throughout construction	None except short periods of one lane, two way for repairs	A minimum of One lane, Two way signalized throughout construction	None except short periods of one lane, two way for repairs	N/A
Access at Fanton PPN 544-18-004 (Veh.)	Access being changed, but never impeded	Access being changed, but never impeded	Access being changed, but never impeded	No change	Access being changed, but never impeded	No change	N/A
Throughout Project (Pedestrian)	SR14 open throughout construction, Access to/from Henry Street closed in Phase 2 only	SR14 open throughout construction, Access to/from Henry Street closed in Phase 2 only	SR14 open throughout construction, Access to/from Henry Street closed in Phase 2 only	No change	SR14 open throughout construction, Access to/from Henry Street closed in Phase 2 only	No change	N/A
Geotechnical Design issues	**High Significance**	**High Significance**	**High Significance**	**None**	**High Significance**	**None**	**None**
Geotechnical Design issues	Substantial, with new MSE fill placed in phases, plus new bridge foundations	Substantial, with new MSE fill placed in phases, plus new bridge foundations	Substantial, with new MSE fill placed in phases, plus new bridge foundations and Chaincraft Road culvert foundations	None	Substantial, with new MSE fill placed in phases, plus new bridge foundations	None	N/A
Roadway Design Issues	**None**	**None**	**None**	**None**	**None**	**None**	**None**
Legal/Design Speed	35 MPH unaffected	35 MPH unaffected	35 MPH unaffected	35 MPH unaffected	35 MPH unaffected	35 MPH unaffected	N/A
Traffic/Safety Design Issues	No safety upgrades/downgrades	No safety upgrades/downgrades	No safety upgrades/downgrades	No safety upgrades/downgrades	No safety upgrades/downgrades	No safety upgrades/downgrades	N/A
Pedestrian and Bicycle Access	Access after construction to match existing	Access after construction to match existing	Access after construction to match existing	Access after construction to match existing	Access after construction to match existing	Access after construction to match existing	N/A
Bridge Design over Rail Lines	**Complete Replacement**	**Complete Replacement**	**Complete Replacement**	**Moderate Rehabilitation**	**Complete Replacement**	**Major Rehabilitation**	**None**
Bridge Design over Rail Lines	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	Existing deteriorating 90+ year old fracture-critical bridge with clearance deficiencies remains for 10 years only	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	Existing deteriorating 90+ year old fracture-critical bridge with clearance deficiencies remains for the full 75 year life cycle	N/A
Bridge Design over Chaincraft Road	**Complete Replacement**	**Complete Replacement**	**Complete Replacement**	**Major Rehabilitation**	**Complete Replacement**	**Major Rehabilitation**	**None**
Bridge Design over Chaincraft Road	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	Existing deteriorating 90+ year old bridge remains for 10 years only	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	Existing deteriorating 90+ year old bridge remains for the full 75 year life cycle	N/A
Constructability Issues	**Significant, but Constructible**	**Significant, but Constructible**	**Significant, but Constructible**	**Minor, and Constructible**	**Significant, but Constructible**	**Minor, and Constructible**	**None**
Triangular Fill Area between Bridges	Phase construction uses walers and tie-backs to new abutments	N/A	N/A	N/A	Possible, depending on Alternative selected in 10 years	N/A	N/A
Mill Creek Culvert Replacement	Culvert replaced in Phase 2 during closure of Henry Street	Culvert replaced in Phase 2 during closure of Henry Street	Culvert replaced in Phase 2 during closure of Henry Street	Existing 90+ year old culvert remains for 10 years	Culvert replaced in Phase 2 during closure of Henry Street	Existing 90+ year old culvert remains for 25 years	N/A
Driving Piles for Pier between Rail Lines	Requires work in 2 phases, each with rail access permit and 5-day de-energize period on five 69kV transmission lines	Requires work in 2 phases, each with rail access permit and 5-day de-energize period on five 69kV transmission lines	Requires work in 2 phases, each with rail access permit and 5-day de-energize period on five 69kV transmission lines	N/A	Requires work in 1 or 2 phases, each with rail access permit and 5-day de-energize period on five 69kV transmission lines	N/A	N/A
Steel Girder Delivery; Bridge over Rail Lines	Delivery and splicing on SR14, set with cranes below; no de-energizing needed	Delivery and splicing on SR14, set with cranes below; no de-energizing needed	Delivery and splicing on SR14, set with cranes below; no de-energizing needed	N/A, but existing steel repairs and painting will require substantial track time	Delivery and splicing on SR14, set with cranes below; no de-energizing needed	N/A, but existing steel repairs/retrofits and painting will require substantial track time	N/A
Wire Wall along Phase Construction Line	Placed near existing footings holding Phase 1 traffi, but no settlement issues expected	Placed near existing footings holding Phase 1 traffi, but no settlement issues expected	Placed near existing footings holding Phase 1 traffi, but no settlement issues expected	N/A	Placed near existing footings holding Phase 1 traffi, but no settlement issues expected	N/A	N/A
Utility Issues	**Significant**	**Significant**	**Significant**	**Minor**	**Significant**	**Minor**	**None**
Overhead Five 69kV Transmission Lines	Two 5-day de-energize periods	Two 5-day de-energize periods	Two 5-day de-energize periods	N/A	One or two 5-day de-energize periods	N/A	N/A
Underground Fiber Lines along NSC	Potential conflict with new rear abutment, but can be avoided	Potential conflict with new pier, but can be avoided	N/A	N/A	Potential conflict depending on Alternative selected in 10 years	N/A	N/A
6'x4' Tributary Culvert Replacement	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	Exist. 90+ year old culvert remains 10 years	Replaced/rerouted through constr. limits	Exist. 90+ year old culvert remains 25 years	N/A
Waterline	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	N/A	Replaced/rerouted through constr. limits	N/A	N/A
Sanitary Sewer along Chaincraft Road	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	N/A	Replaced/rerouted through constr. limits	N/A	N/A
Overhead Supply Lines	Relocated prior to construction	Relocated prior to construction	Relocated prior to construction	Temporary Relocations Only	Relocated prior to construction	Temporary Relocations Only	N/A
Life Cycle Cost Analysis	**Moderately Expensive**	**Moderately Expensive**	**Moderately Expensive**	**Most Expensive**		**Least Expensive**	**None**
Discounted Present Worth	$54.4M	$55.0M	$56.2M	$58.0M		$43.4M *	N/A
CONCLUSION	**DISMISSED**	**DISMISSED**	**DISMISSED**	**DISMISSED**		**DISMISSED**	**DISMISSED**

* Only if many assumptions are verified and risks realized

KEY ISSUES	ALTERNATIVE 2A	ALTERNATIVE 3A	ALTERNATIVE 3B	ALTERNATIVE 3C
Satisfy Purpose and Need	**Yes**	**Yes**	**Yes**	**Yes**
Environmental Impacts	**Moderate Significance**	**High Significance**	**Moderate Significance**	**Moderate Significance**
Section 4(f) Impacts	New Permanent & Temporary takes in possible "de minimis" areas only	New Permanent & Temporary takes in possible "de minimis" areas only	New Permanent & Temporary takes in possible "de minimis" areas only	New Permanent & Temporary takes in possible "de minimis" areas only
Section 6(f) Impacts	Temporary (< 6 months) Only	Temporary (< 6 months) Only	Temporary (< 6 months) Only	Temporary (< 6 months) Only
Public Involvement	Significant PI required	Significant PI required	Significant PI required	Significant PI required
Cultural Resources	None	None	None	None
Ecological Resources	Minimal, Not Significant	Minimal, Not Significant	Minimal, Not Significant	Minimal, Not Significant
Regulated Materials	Moderate, Likely Not Significant	Highest, Potentially Significant	Moderate, Likely Not Significant	Moderate, Likely Not Significant
FEMA Flood Zones	Minor Impacts	Minor Impacts	Minor Impacts	Minor Impacts
Right-of-Way Impacts	**Moderate Significance**	**High Significance**	**Moderate Significance**	**Moderate Significance**
Section 4(f) Impacts	0.238 acres Permanent, plus Temporary, in "de minimis" areas only	0.238 acres Permanent, plus Temporary, in "de minimis" areas only	0.238 acres Permanent, plus Temporary, in "de minimis" areas only	0.238 acres Permanent, plus Temporary, in "de minimis" areas only
Section 6(f) Impacts	Temporary Only	Temporary Only	Temporary Only	Temporary Only
Henry Street Bridge/Culvert	Temporary Only	Temporary Only	Temporary Only	Temporary Only
Rail lines	0.318 acres Permanent, plus substantial Temporary	0.588 acres Permanent, plus substantial Temporary; plus full 0.340 acres of Parcel 544-18-006	0.318 acres Permanent, plus substantial Temporary	0.318 acres Permanent, plus substantial Temporary
East of the Rail Lines	0.787 acres Permanent from 5 parcels, plus minor Temporary	0.787 acres Permanent from 5 parcels, plus minor Temporary	0.787 acres Permanent from 5 parcels, plus minor Temporary	0.787 acres Permanent from 5 parcels, plus minor Temporary
MOT Design Issues	**High Significance**	**High Significance**	**High Significance**	**High Significance**
Along Mainline SR14 (Vehicular)	1 lane each way maintained at all times, plus WB left turn lane at Henry in Phase 1	1 lane each way maintained at all times, plus WB left turn lane at Henry in Phase 1	1 lane each way maintained at all times, plus WB left turn lane at Henry in Phase 1	1 lane each way maintained at all times, plus WB left turn lane at Henry in Phase 1
From SR14 to Henry Street (Vehicular)	Open in Phase 1, Closed in Phase 2	Open in Phase 1, Closed in Phase 2	Open in Phases 1 and 3, Closed in Phase 2	Open in Phases 1 and 3, Closed in Phase 2
From Henry Street to SR14 (Vehicular)	Open in Phase 1, Closed in Phase 2	Open in Phase 1, Closed in Phase 2	Open in Phases 1 and 3, Closed in Phase 2	Open in Phases 1 and 3, Closed in Phase 2
Along Chaincraft Road Under SR14 (Vehicular)	A minimum of One lane, Two way signalized throughout construction	A minimum of One lane, Two way signalized throughout construction	A minimum of One lane, Two way signalized throughout construction	A minimum of One lane, Two way signalized throughout construction
Access at Fanton PPN 544-18-004 (Veh.)	Access being changed, but never impeded	Access being changed, but never impeded	Access being changed, but never impeded	Access being changed, but never impeded
Throughout Project (Pedestrian)	SR14 open throughout construction, Access to/from Henry Street closed in Phase 2 only	SR14 open throughout construction, Access to/from Henry Street closed in Phase 2 only	SR14 open throughout construction, Access to/from Henry Street closed in Phase 2 only	SR14 open throughout construction, Access to/from Henry Street closed in Phase 2 only
Geotechnical Design issues	**High Significance**	**High Significance**	**High Significance**	**High Significance**
Geotechnical Design issues	Substantial, with new MSE fill placed in phases, plus new bridge foundations	Substantial, with new MSE fill placed in phases, plus new bridge foundations and Chaincraft Road culvert foundations	Substantial, with new MSE fill placed in phases, plus new bridge foundations and Chaincraft Road culvert foundations	Substantial, with new MSE fill placed in phases, plus new bridge foundations and Chaincraft Road culvert foundations
Roadway Design Issues	**None**	**None**	**None**	**None**
Legal/Design Speed	35 MPH unaffected	35 MPH unaffected	35 MPH unaffected	35 MPH unaffected
Traffic/Safety Design Issues	No safety upgrades/downgrades	No safety upgrades/downgrades	No safety upgrades/downgrades	No safety upgrades/downgrades
Pedestrian and Bicycle Access	Access after construction to match existing	Access after construction to match existing	Access after construction to match existing	Access after construction to match existing
Bridge Design over Rail Lines	**Complete Replacement**	**Complete Replacement**	**Complete Replacement**	**Complete Replacement**
Bridge Design over Rail Lines	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance
Bridge Design over Chaincraft Road	**Complete Replacement**	**Complete Replacement**	**Complete Replacement**	**Complete Replacement**
Bridge Design over Chaincraft Road	New 75 year redundant bridge which satisfies all clearance requirements and needs minimal maintenance	New 75 year 3-sided culvert which satisfies all clearance requirements and needs minimal maintenance	New 75 year 3-sided culvert which satisfies all clearance requirements and needs minimal maintenance	New 75 year 3-sided culvert which satisfies all clearance requirements and needs minimal maintenance
Constructability Issues	**Significant, but Constructible**	**Significant, but Constructible**	**Significant, but Constructible**	**Significant, but Constructible**
Triangular Fill Area between Bridges	N/A	N/A	Phase construction uses walers and tie-backs to new abutments	N/A
Mill Creek Culvert Replacement	Culvert replaced in Phase 2 during closure of Henry Street	Culvert replaced in Phase 2 during closure of Henry Street	Culvert replaced in Phase 2 during closure of Henry Street	Culvert replaced in Phase 2 during closure of Henry Street
Driving Piles for Pier between Rail Lines	Requires work in just 1 phases, with rail access permit and 5-day de-energize period on five 69kV transmission lines	Requires work in just 1 phases, with rail access permit and 5-day de-energize period on five 69kV transmission lines	Requires work in just 1 phases, with rail access permit and 5-day de-energize period on five 69kV transmission lines	Requires work in just 1 phases, with rail access permit and 5-day de-energize period on five 69kV transmission lines
Steel Girder Delivery; Bridge over Rail Lines	Delivery and splicing on SR14, set with cranes below; no de-energizing needed	Delivery and splicing on SR14, set with cranes below; no de-energizing needed	Delivery and splicing on SR14, set with cranes below; no de-energizing needed	Delivery and splicing on SR14, set with cranes below; no de-energizing needed
Wire Wall along Phase Construction Line	Placed near existing footings holding Phase 1 traffi, but no settlement issues expected	Placed near existing footings holding Phase 1 traffi, but no settlement issues expected	Placed near existing footings holding Phase 1 traffi, but no settlement issues expected	Placed near existing footings holding Phase 1 traffi, but no settlement issues expected
Utility Issues	**Significant**	**Significant**	**Significant**	**Significant**
Overhead Five 69kV Transmission Lines	One 5-day de-energize period	One 5-day de-energize period	One 5-day de-energize period	One 5-day de-energize period
Underground Fiber Lines along NSC	Potential conflict with new pier, but can be avoided	Potential conflict with new rear abutment, but can be avoided	Potential conflict with new rear abutment, but can be avoided	Potential conflict with new rear abutment, but can be avoided
6'x4' Tributary Culvert Replacement	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits
Waterline	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits
Sanitary Sewer along Chaincraft Road	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits	Replaced/rerouted through constr. limits
Overhead Supply Lines	Relocated prior to construction	Relocated prior to construction	Relocated prior to construction	Relocated prior to construction
Life Cycle Cost Analysis	**Moderately Expensive**	**Moderately Expensive**	**Moderately Expensive**	**Moderately Expensive**
Discounted Present Worth	$53.9M	$53.9M	$52.9M	$55.9M
CONCLUSION	**POTENTIAL SELECTION**	**DISMISSED**	**DISMISSED**	**PREFERRED SELECTION**