

# BURGESS & NIPLE

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Ms. Dayna Mallas, PE  
Ohio Department of Transportation  
District 12  
5500 East 98<sup>th</sup> Street  
Garfield Heights, OH 44125

Re: Cleveland Innerbelt Study (PID 77510)  
I-90 East Alignment Study  
Technical Memorandum

December 20, 2023

Dear Ms. Mallas:

Burgess & Niple, Inc. (B&N) has completed a preliminary feasibility study comparing several proposed I-90 horizontal alignments between Payne Avenue and Lakeside Avenue as part of the Cleveland Innerbelt Study. The purpose of this study is to identify the benefits and impacts of each alternative to determine whether the benefits outweigh the impacts and to determine if there is a potentially viable alternative for proposed I-90 that maintains proposed I-90 eastbound (EB) completely east of the existing I-90 pavement while allowing the Ohio Boxboard Company building (1400 East 30<sup>th</sup> Street) to remain.

## PROJECT BACKGROUND

The Cleveland Innerbelt Study was launched in 2000 and has served as the planning study for the reconstruction of the Cleveland Innerbelt, including portions of I-71 and I-90 through downtown Cleveland, to improve capacity and safety in response to the anticipated growth in the area. An Environmental Impact Statement (EIS) was completed for the project and submitted on in late 2008. The approval of the EIS by FHWA on March 3, 2009, led to a Record of Decision (ROD) being granted for the project on September 18, 2009.

As part of this study, an implementation plan was developed that identified seven construction contract groups (CCGs) needed to phase the improvements throughout the entire corridor. See **Figure 1** for the 2009 version of the Implementation plan for the corridor.

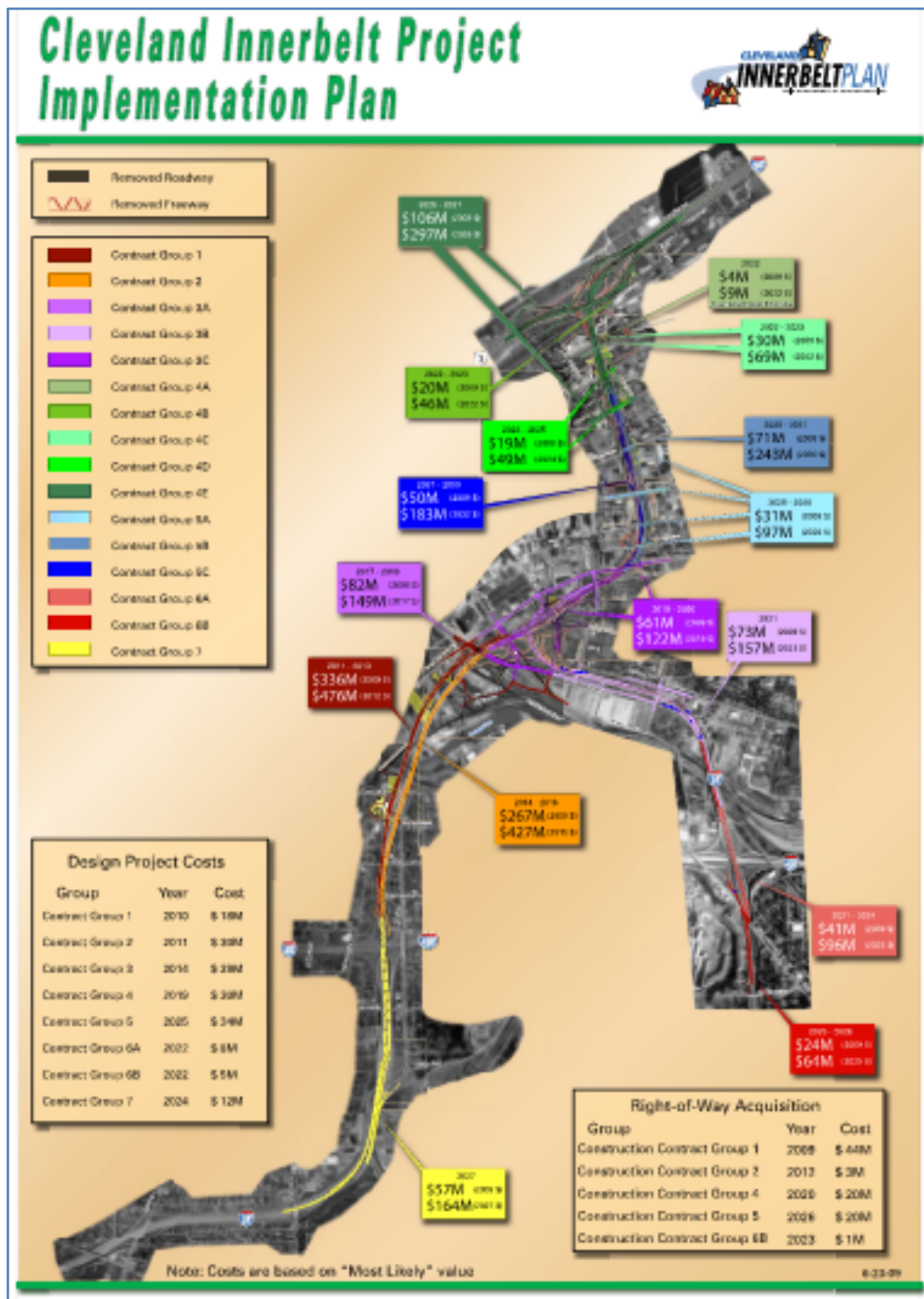


Figure 1 – Cleveland Innerbelt Implementation Plan (version 2009)

To date, CCG1 (I-90 EB bridge over the Cuyahoga River), CCG2 (I-90 WB bridge over the Cuyahoga River), and CCG6 (I-77 over I-490 and Broadway Avenue bridge replacement) have been constructed. CCG3 (Central Interchange of I-90 & I-77) is currently advancing forward in design and is awaiting funding for construction. CCG4 (Innerbelt Curve at the I-90 & SR 2 interchange) and CCG5 (Innerbelt Trench from the Carnegie Curve, where Carnegie Avenue goes over I-90, to the Innerbelt Curve) have a preliminary concept but have yet to advance into detailed design.

Through the CCG4 and CCG5 segments of the corridor, two alignments for proposed I-90 were developed as part of the planning study. These two alignments were identified as mitigation strategies for various expected impacts through the corridor, primarily through CCG5. These two alignments are discussed in the next section.

## ALTERNATIVES CONSIDERED AS PART OF CLEVELAND INNERBELT STUDY

*Alternative 1: East Alignment* - In 2008, an I-90 alignment was developed that established a proposed I-90 centerline located east of the existing I-90 centerline from the Carnegie Curve to the Innerbelt Curve. The intention of this alignment was to allow for half of the proposed I-90 pavement, which included the proposed I-90 EB lanes, to be constructed without impacting the existing I-90 EB or WB lanes. This alignment of I-90 and resulting proposed ramp connections created the anticipation of R/W acquisition, impacts to several existing buildings, and modifications to existing access along the east side of the Innerbelt Trench as the overall width of the trench (including both the existing and proposed pavement) increased. See **Appendix A** for a schematic alignment of *Alternative 1*, a visual of the impacted buildings, and changes to the existing access because of the alternative.

*Alternative 2: West Alignment* – In 2010, in response to concerns over the anticipated impacts to the Ohio Boxboard Company building (1400 East 30<sup>th</sup> Street) that was present in *Alternative 1*, shown in **Figure 2**, an alternate I-90 alignment was developed. As stated in the 2006 Phase II History/Architecture Survey completed by Gray and Pape, “*The Ohio Boxboard Company plant at East 30<sup>th</sup> Street provides one of the better-preserved examples of vernacular Chicago Style architecture in the area..... taken as a whole, the Ohio Boxboard Company building represents an intact example of an industrial plant that utilized both traditional and modern design elements. As such, the building represents an outstanding example of the transition from traditional to modern structural designs. A well-preserved example of vernacular Chicago Style architecture and a fine model for demonstrating the evolution of architecture and engineering practice, the Ohio Boxboard Company plant at East 30<sup>th</sup> Street is recommended eligible for the NRHP under Criterion C.*”

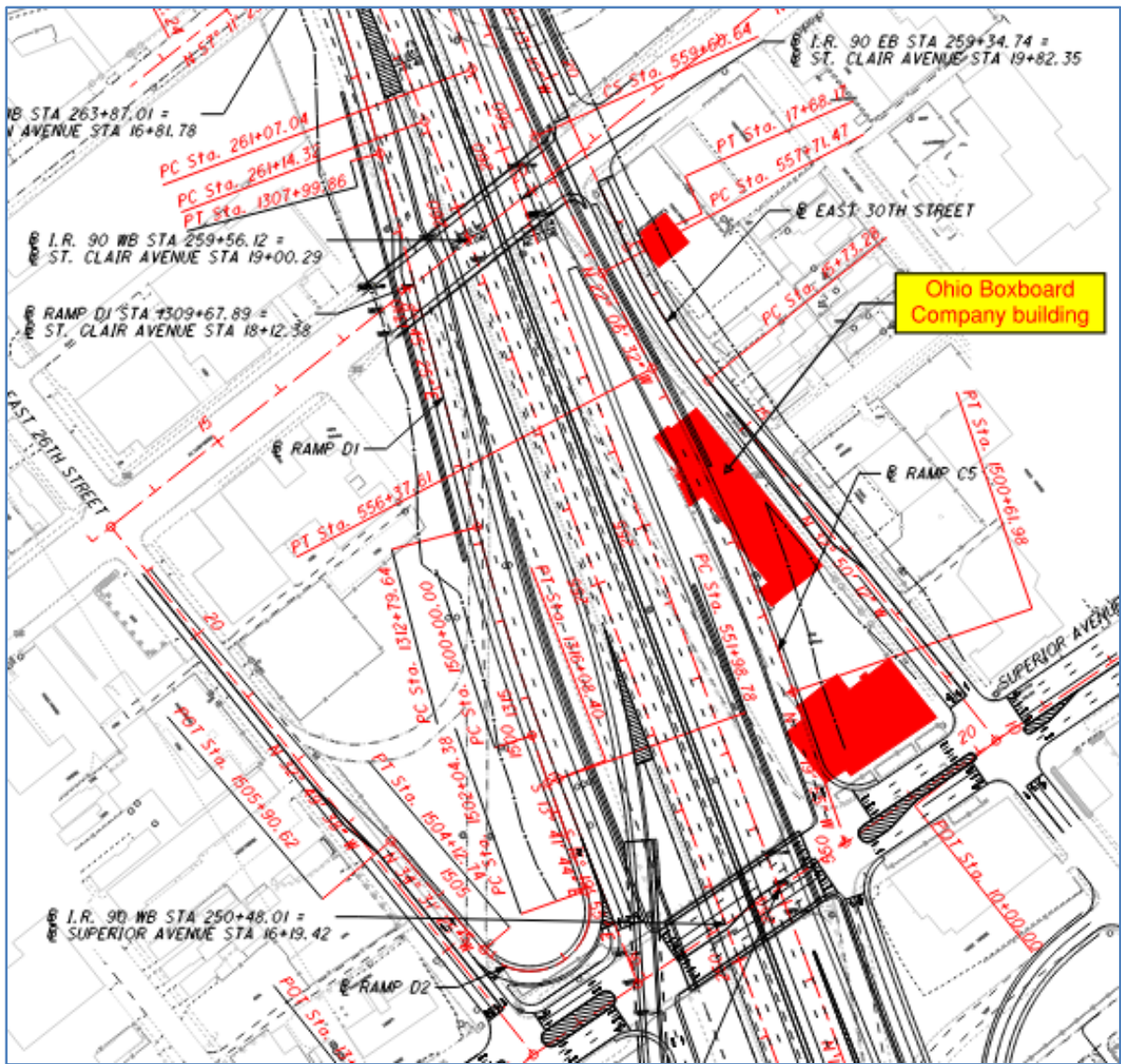


Figure 2 – Alternative 1’s anticipated impacts to the Ohio Boxboard Company building (1400 East 30<sup>th</sup> Street)

Alternative 2 establishes a proposed I-90 centerline located east of the existing I-90 centerline traveling north out of the Carnegie Curve, then shifts west of the existing I-90 centerline just south of Superior Avenue. Once near Lakeside Avenue, the proposed I-90 centerline shifts back to the east and matches the same alignment north of Lakeside Avenue as Alternative 1. The difference between the proposed I-90 horizontal alignment between Alternative 1 and Alternative 2 occurs between Payne Avenue and Lakeside Avenue. Outside of this range, the two alternatives utilize the same alignment for proposed I-90. The alignment of Alternative 2 introduced the anticipation of R/W acquisition and impacts to three existing

Clarify that if any alternative from this study is selected, a formal NEPA reevaluation will be required. Also explain what is involved or expected in a formal NEPA reevaluation.

buildings, on the west side of the Innerbelt Trench. See **Appendix A** for a schematic alignment of *Alternative 2*, a visual of the impacted buildings, and changes to the existing access because of the alternative.

The Final EIS/ROD is based upon *Alternative 2: West Alignment*. If a different alternative is chosen for this area, the EIS will require a formal NEPA reevaluation.

## KEY ISSUES

Additional assessment was completed on the conceptual alternatives proposed during the Cleveland Innerbelt study. The objective of this additional analysis was to provide a comparison of the alternatives as well as identify those elements critical to the implementation of each alternative that need to be addressed with further analysis. A summary of the key analyses and assessments is provided below.

**Constructability** – Each alternative was evaluated and compared based on the anticipated ability to construct the proposed solution, maintain traffic during construction, and the expected number of traffic shifts necessary to construct the project. *Alternative 1* scores better in this category because with proposed I-90 EB placed east of and outside of the existing I-90 pavement limits, it can be constructed first without significant impact to the existing traffic on I-90. Once proposed I-90 EB lanes are constructed, existing I-90 EB traffic can be shifted onto them. This frees up significant width along the existing I-90 lanes to keep the existing I-90 WB traffic in their existing lanes and then construct proposed I-90 WB in the existing I-90 EB lanes. Through this corridor, proposed I-90 is about 3-4 feet below the existing I-90 pavement, so being able to shift the entire direction (EB) to the new pavement and likely utilizing a contraflow situation where possibly one WB lane of the existing is also shifted to the new pavement creates enough room to construct the new pavement adjacent to the existing pavement even with the elevation difference.

The I-90 pavement in *Alternative 1* can be constructed in two major construction phases with large work zones, essentially running the entire length of the corridor, constructed at a time. This will create less traffic shifts and more construction efficiencies due to the larger work zones which should result in significant construction mobilization and traffic control savings. Finally, by keeping proposed I-90 EB outside (east) of the existing I-90 pavement, the proposed overhead bridges can be constructed by placing a center pier between the existing I-90 WB and proposed I-90 EB pavement without conflicting with the existing or proposed I-90 traffic. This allows for the overhead bridges to be constructed before the I-90 pavement and their presence doesn't preclude the construction of the new I-90 pavement. Early review of

the vertical clearance between the proposed bridges and the existing I-90 pavement shows that at least the existing vertical clearance can be achieved by raising the profile of the cross streets by about a foot because of additional beams and efficiencies with the new structure not present in the existing. Raising the cross street by approximately one foot is not expected to have any impacts to access to properties adjacent to the bridge Does this apply to all the overhead bridges in both CCG4 and CCG5?

Alternative 2 offers greater challenges because of the two sections where the proposed I-90 lanes cross the existing I-90 lanes. In the section south of Superior Avenue and the section north of Lakeside Avenue, the proposed I-90 elevation is about 3-4 feet below the existing I-90 elevation and they cross horizontally. See **Figure 3** for the visual representation of the elevation difference between the proposed and existing I-90 pavement elevations south of Superior Avenue. See **Figure 4** for the visual representation of the elevation difference between the proposed and existing I-90 pavement elevations north of Lakeside Avenue.

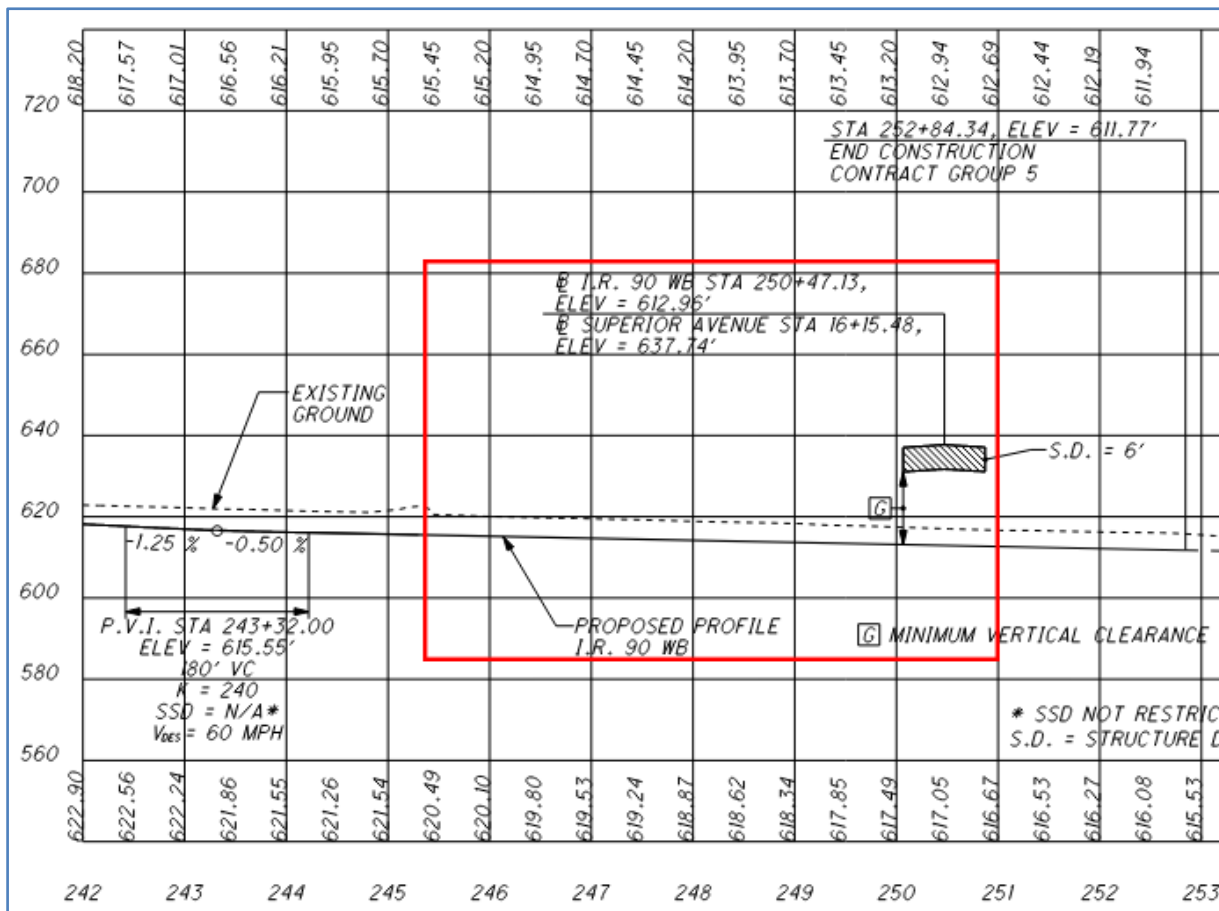


Figure 3 – Elevation difference between proposed and existing I-90 in Alternative 2 south of Superior Avenue

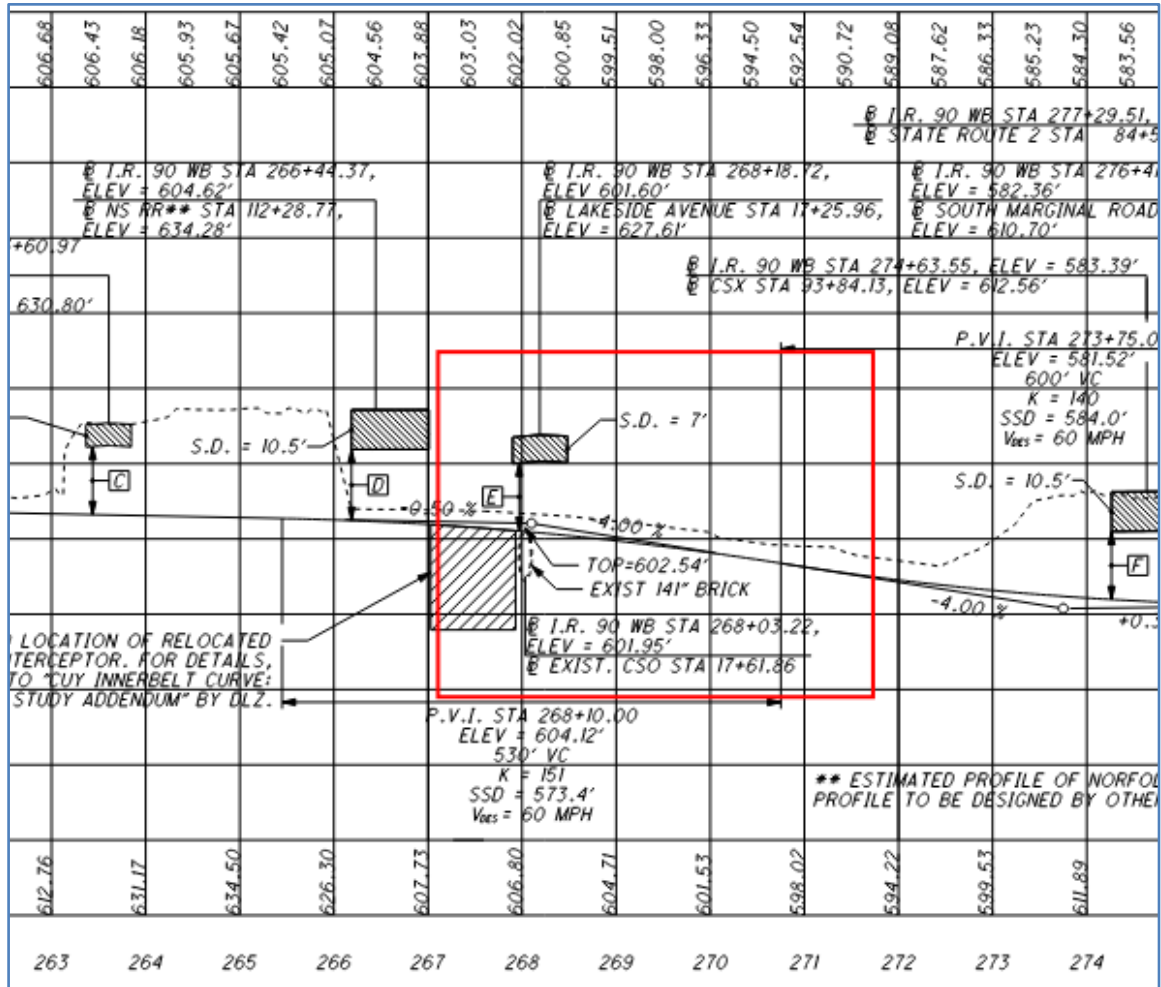


Figure 4 – Elevation difference between proposed and existing I-90 in Alternative 2 north of Lakeside Avenue

This becomes much more difficult to construct because the work areas are smaller and temporary pavement transitions need to be constructed between these smaller work areas to make up the elevation difference between the two. Then the proposed solution needs to be constructed where the temporary pavement transitions are located, creating additional work areas. Instead of being able to construct the entire segment in two major construction phases like in *Alternative 1*, *Alternative 2* is going to need to be broken into at least five linear segments:

| Segment | Description   |
|---------|---|
| 1       | Carnegie Curve to south of Superior Avenue (proposed I-90 is east of existing I-90)                     |
| 2       | South of Superior Avenue to north of Superior Avenue (transition area where proposed crosses existing)  |
| 3       | North of Superior Avenue to south of St. Clair Avenue (proposed I-90 is west of existing I-90)          |
| 4       | South of St. Clair Avenue to north of Lakeside Avenue (transition area where proposed crosses existing) |
| 5       | North of Lakeside Avenue to Innerbelt Curve (proposed I-90 is east of existing I-90)                    |

With each linear segment, there are probably two phases, one for each direction of pavement being constructed. This could require at least ten major construction phases, creating numerous traffic shifts throughout the extent of this construction project. While there are opportunities to combine some of these linear segments when a corridor construction phasing strategy is developed, with the addition of several additional traffic shifts, *Alternative 2* will be less efficient to construct and will cost more in mobilization and traffic control than *Alternative 1*.

Another challenge with *Alternative 2* is the construction of the overhead bridges within Segment 4. In this segment, proposed I-90 is crossing existing I-90, which does not leave a place to locate a center pier for the St. Clair Avenue, Hamilton Avenue, and Norfolk-Southern (N-S) Railroad proposed overhead bridges without conflicting with either the existing or the proposed I-90 traffic. Here is a summary of the challenges with constructed these bridges.

*St. Clair Avenue bridge* - See **Figure 5** for a schematic representation of this situation under the St. Clair Avenue bridge. In this figure, the green shaded pavement represents proposed I-90, and the existing pavement width is identified with dashed blue lines. The red arrows represent the existing I-90 lanes. As noted in this figure, the proposed center pier for the proposed bridge over I-90 cannot be placed where it is shown, within the red circle, without significant conflict with the existing I-90 WB lanes. Options to overcome this conflict include:

- Creating a single span bridge that clears the entire existing and proposed I-90 pavement, which creates a deeper structure and forces the vertical profile of St. Clair to be raised substantially, by as much as three feet. This would impact six driveways along St. Clair, Radio Lane on the west side, and East 30<sup>th</sup> on the east side.



Possible additional alternative: Consider using a temporary prefabricated single-span bridge to maintain one lane (with a directional detour for opposite direction) or two lanes (one lane each direction) on St. Clair while proposed I-90 is constructed so the existing bridge can be removed as discussed below. This was done on the Maumee River Crossing project in ODOT D2 to maintain a city street connection over IR-280 during major reconstruction and realignment of the pavement.

- Utilizing an extended full closure along St. Clair by removing the existing bridge before proposed I-90 is constructed and constructing the proposed bridge after the proposed I-90 pavement is completed. This would keep St. Clair Avenue closed for up to four years which is the expected construction duration for this project. An extended full closure of St. Clair Avenue would likely require the Superior Avenue bridge to be carrying full capacity to be a viable detour, either before or after its construction and would need to be coordinated with the City of Cleveland.
- Placing about 1,500 feet of temporary pavement along I-90 WB and the exit ramp to East 26<sup>th</sup> Street to shift the alignment to the west to avoid the proposed pier location. This would still require the removal of the existing St. Clair Avenue bridge prior to temporarily shifting I-90 WB pavement but would allow the new overhead bridge to be placed prior to construction of the proposed I-90 pavement.
- Revising the horizontal and vertical geometry of proposed I-90 to better accommodate the construction of this overhead bridge in an early construction phase.

How is this option impacted if a SMART lane is constructed I90 WB in first phase of CCG4?

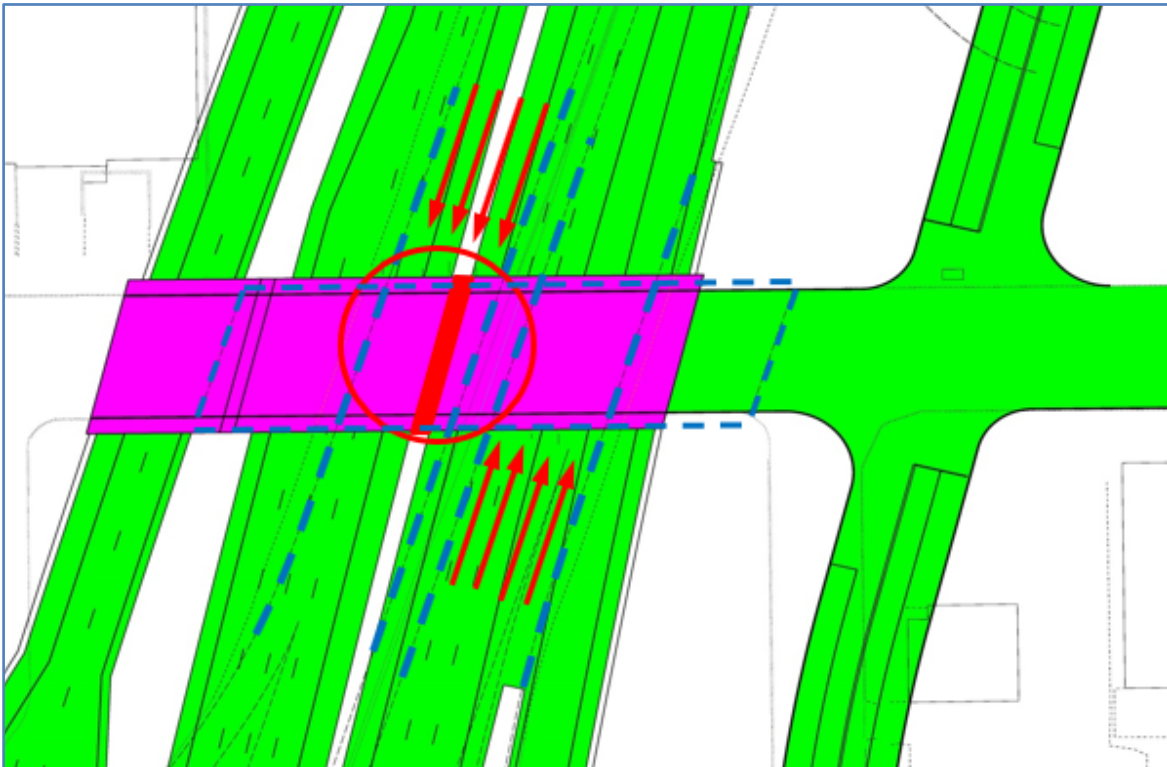


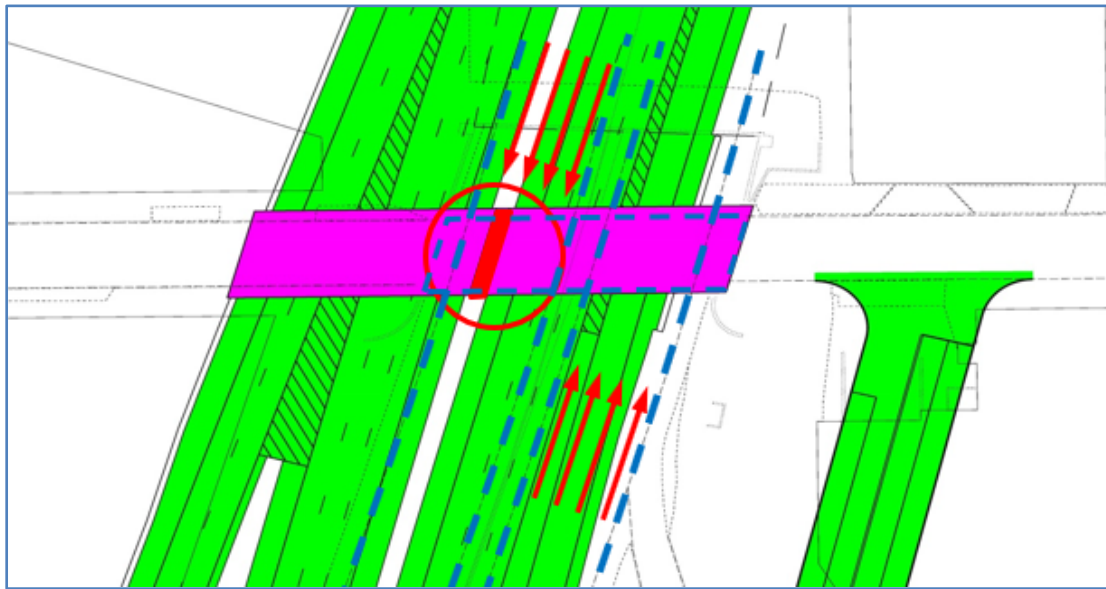
Figure 5 – Pier placement concern for the St. Clair Avenue bridge over existing and proposed I-90

*Hamilton Avenue bridge* - See **Figure 6** for a schematic representation of this situation under the Hamilton Avenue bridge. In this figure, the green shaded pavement represents proposed I-90, and the existing pavement width is identified as dashed blue lines. The red arrows represent the existing I-90 lanes. As noted in this figure, the proposed center pier for the proposed bridge over I-90 cannot be placed where it is shown, within the red circle, without conflicting with the existing I-90 WB lanes. Options to overcome this conflict include:

- Creating a single span bridge that clears the entire existing and proposed I-90 pavement, which creates a deeper structure and forces the vertical profile of Hamilton Avenue to be raised substantially, by as much as four feet. This would impact four driveways along Hamilton Avenue.
- Utilizing an extended full closure along Hamilton by removing the existing bridge before proposed I-90 is constructed and constructing the proposed bridge after the proposed I-90 pavement is completed. This would keep Hamilton Avenue closed for up to four years which is the expected construction duration for this project. An extended full closure of Hamilton Avenue would likely require the St. Clair Avenue or the Lakeside Avenue bridges to be carrying full capacity to be a viable detour, either before or after their construction and would need to be coordinated with the City of Cleveland.
- Placing about 1,800 feet of temporary pavement along I-90 WB to shift the alignment to the west to avoid the proposed pier location. This would still require the removal of the existing Hamilton Avenue bridge prior to temporarily shifting I-90 WB pavement but would allow the new overhead bridge to be placed prior to construction of the proposed I-90 pavement. However, for this option to be viable, the proposed N-S bridge over I-90 immediately north of the Hamilton Avenue bridge needs to be already in place because this temporary shift of I-90 WB to the west cannot be accommodated under the existing N-S bridge.
- Revising the horizontal and vertical geometry of proposed I-90 to better accommodate the construction of this overhead bridge in an early construction phase.

Possible additional alternative: Consider using a temporary prefabricated single-span bridge to maintain one lane (with a directional detour for opposite direction) or two lanes (one lane each direction) for Hamilton Avenue. See comments for St. Clair.

How is this option impacted if a SMART lane is constructed I90 WB in first phase of CCG4?



**Figure 6 – Pier placement concern for the Hamilton Avenue bridge over existing and proposed I-90**

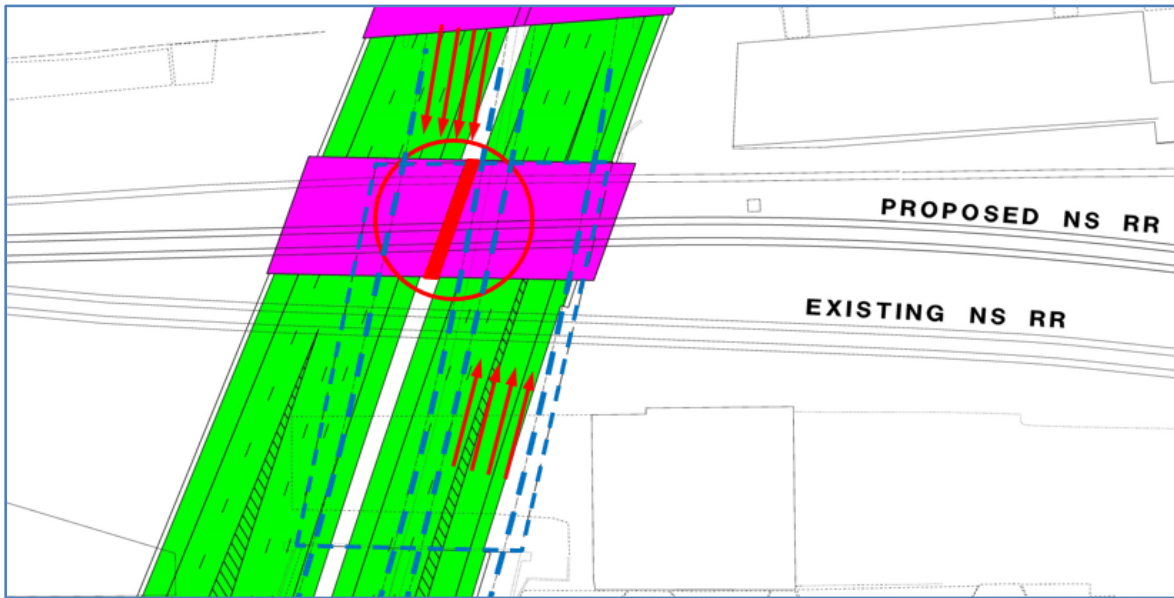
*N-S railroad bridge* - See **Figure 7** for a schematic representation of this situation under the N-S railroad bridge. In this figure, the green shaded pavement represents proposed I-90, and the existing pavement width is identified with dashed blue lines. The red arrows represent the existing I-90 lanes. Because a long-term closure of this railroad is not acceptable, as determined during coordination with Norfolk-Southern, the anticipated construction sequence for this bridge requires the unused northern portion of the existing bridge to be removed and a new bridge constructed immediately north of the existing N-S railroad lines, then shift the N-S railroad lines to this new bridge. This requires an alignment of I-90 to be compatible with both the existing N-S railroad bridge and the new bridge.

As noted in **Figure 7**, the proposed center pier for the proposed bridge over I-90 cannot be placed where it is shown, within the red circle, without significant conflict with the existing I-90 WB lanes. Options to overcome this conflict are limited because of the requirement to maintain the N-S railroad during construction. Unlike the previous two bridges discussed, creating a single span bridge that clears the entire existing and proposed I-90 pavement is not a viable option because of the large loads associated with the railroad and the massive structure that would be needed. Placing temporary pavement to shift I-90 WB to the west can only be accommodated by reducing the number of I-90 WB to two (existing is four) because of the narrow width of the

What would be the required span, and how does it compare to the spans of the single-span railroad bridges that have been built over IR-77 in D12? Is this alternative being dismissed because design is impossible, or is it because this alternative's design would be overly expensive in comparison to other solutions?

existing N-S bridge. Reducing the number of I-90 WB lanes isn't a viable solution due to capacity constraints. This likely leaves a single option for overcoming the conflicting pier issue at the N-S railroad bridge:

- Revising the horizontal and vertical geometry of proposed I-90 to better accommodate the construction of this overhead bridge in an early construction phase.



**Figure 7 - Pier placement concern for the N-S railroad bridge over existing and proposed I-90**

*Alternative 1* does not have these pier conflicts at these three bridges, allowing the proposed bridges to be constructed ahead of the proposed I-90 pavement being constructed. In the case of the N-S railroad bridge, the proposed bridge can be constructed while the existing railroad bridge is in use, allowing for the railroad to be operational during construction. Additional study may be warranted to determine the exact placement of the proposed N-S railroad bridge center pier and whether one lane needs to be reduced along I-90 EB (from four to three lanes) during the time prior to removal of the existing N-S railroad bridge.

**R/W Impacts** – Each alternative was evaluated and compared based on the impacts to the existing R/W associated with each alternative. *Alternative 1* scores better in this category than *Alternative 2* because *Alternative 2* impacts properties on both the east and west side of the existing trench and totals one additional building impact. **Table 1** shows a summary of the expected building impacts between Payne Avenue and Lakeside Avenue for each alternative.

| Number of Building Impacts      | Alternative 1 | Alternative 2 |
|---------------------------------|---------------|---------------|
| East side of Innerbelt Trench   | 11            | 9             |
| West side of Innerbelt Trench   | 0             | 3             |
| <b>Total Impacted Buildings</b> | <b>11</b>     | <b>12</b>     |

**Table 1 – Summary of expected building impacts for each alternative**

Expand on what research is expected. Foundation investigation?

One building that is shown as an impact in *Alternative 1* is owned by the Asia Plaza Group, LLC (1550 East 30<sup>th</sup> Street). This group was vocal during the study expressing concern regarding this impact. If this alternative is advanced into the next phase of project development, it is recommended that research be completed to determine how close the proposed construction can be to the existing building before it is negatively impacted and the horizontal alignment of proposed I-90 and the proposed exit ramp to Superior Avenue/East 30<sup>th</sup> be optimized by shifting west away from the building. If the right turn exit ramp from I-90 EB to East 30<sup>th</sup> Street cannot be constructed without impacting this building, it likely would need to be eliminated, forcing proposed traffic to travel through the ramp intersection at Superior Avenue to access East 30<sup>th</sup> Street. Capacity analysis would need to be completed to confirm that the intersection at the I-90 EB exit ramp and Superior Avenue operates acceptably without causing excessive queues to extend down the ramp toward I-90. If the direct ramp to East 30<sup>th</sup> Street is removed, an addendum to the Interchange Modification Study (IMS) would need to be completed. Additional public outreach may also be desired due to the change in access presented with the new alternative. *Alternative 2* is not anticipated to impact this building.

What impact would this have on the EIS/ROD?

**Existing Local Access Modifications** – Each alternative was evaluated and compared based on the anticipated impacts and modifications to the local access associated with each alternative. For this discussion, local access is identified as local street intersections and driveways near the I-90 roadway alignments. Both alternatives show the same changes and impacts to the existing local street intersections adjacent to the Innerbelt Trench. However, with *Alternative 2* shifting the I-90 alignment west, there is greater separation between I-90 and the local roadways on the east side, creating more opportunity to minimize re-alignment and reduce impacts in order to maintain these roadways. *Alternative 1* will require more re-alignment to these two roadways, which creates greater impact length along them. *Alternative 2* could introduce significantly greater impacts to the driveways adjacent to the freeways along St. Clair Avenue and Hamilton Avenue, depending on which alternative is chosen for how to construct those proposed bridges over I-90. If a clear span option for those bridges is chosen, those roadways will need to raise vertically by as much as four feet. This will create a situation where the cross street is much higher than the driveway. Many of these driveways are short, so there may not be enough physical space to re-connect these driveways to a raised St. Clair Avenue or Hamilton Avenue without introducing an excessively steep vertical grade on the driveway or possibly a situation where the driveway can no longer be connected to their property, which could require full acquisition of the property. While this is an option for building these bridges, it is not a likely one. Assuming that the local streets do not need to be raised 3-4 feet, *Alternative 2* scores slightly better than *Alternative 1* in this category due to the reduced impact to East 30<sup>th</sup> Street and East 27<sup>th</sup> Street.

**Historical/Archeology Impacts** – The Final EIS/ROD is based upon *Alternative 2: West Alignment*. If a different alternative is chosen for this area, the EIS will require a formal NEPA reevaluation. In 2023, Lawhon & Associates conducted a review of the buildings impacted by each alignment to provide information for ODOT-OES to determine whether any additional historic properties would be impacted by the two alignments under consideration. The overall results are presented in a technical memo dated June 30, 2023, included as **Appendix D** of this report. Numbers in the following summary refer to the listing in the technical memo shown in **Appendix D**. Here are the conclusions of that review:

- Three buildings previously inventoried in the corridor no longer exist (#2, #3, #11).
- Both alternatives impact several buildings that have not been previously assessed (#7, #9a, #12, #12a, #13, #14) or were previously not recommended as NR-eligible (#1, #15).
- The East Alignment impacts the NR-eligible Ohio Boxboard Company building (#8) and Asia Plaza (#10) which was not previously inventoried.
- The West Alignment impacts three buildings (#4, #5, #6) that were previously inventoried and not recommended as NR-eligible.

The I-90 East Alignment (*Alternative 1*) impacts these buildings that are avoided by West Alignment:

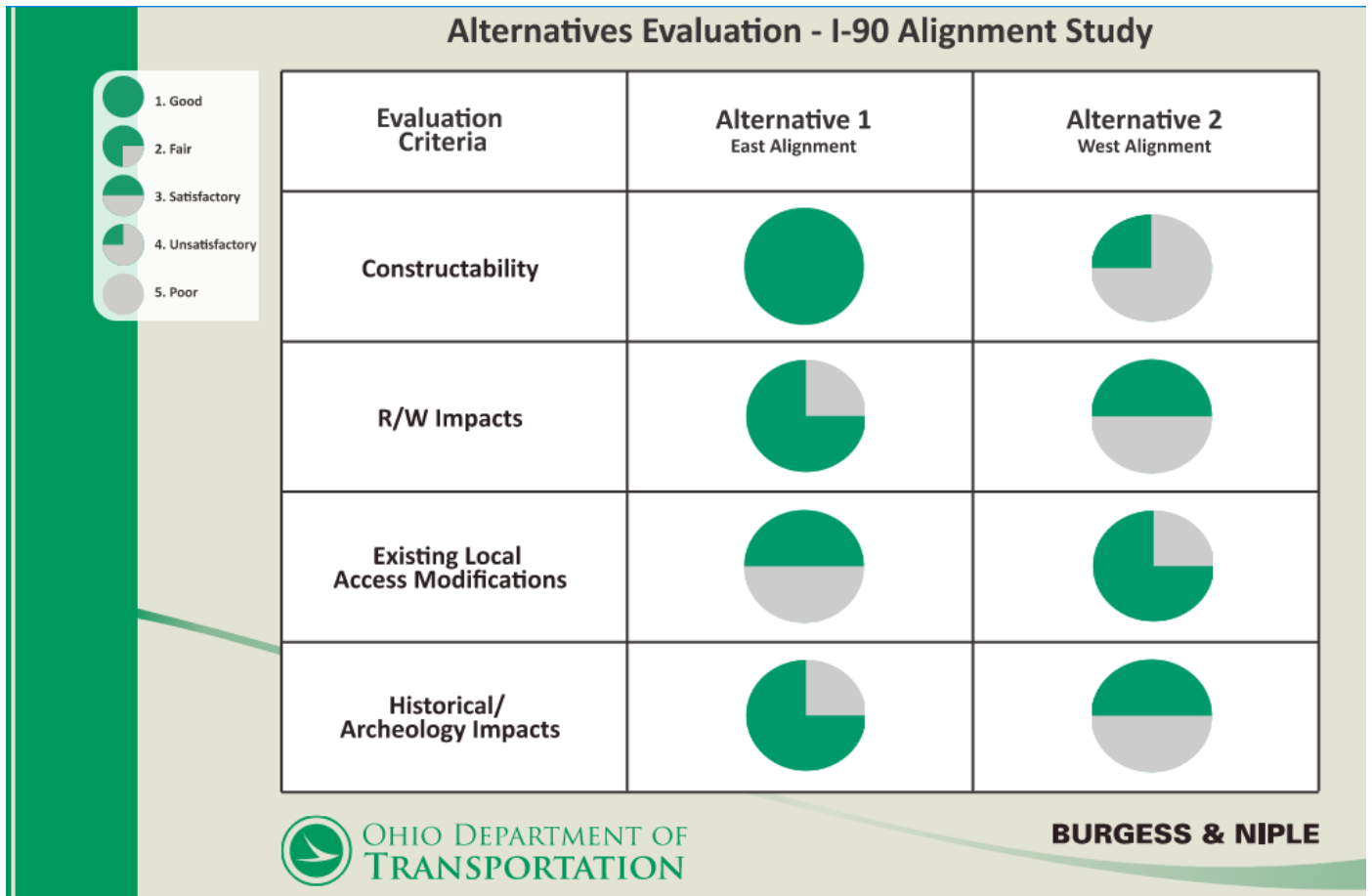
- #8 Ohio Boxboard Company building (OHI CUY0800205) – 1400 East 30<sup>th</sup> Street – Determined Eligible for NRHP by SHPO
- #10 Asia Plaza (not previously inventoried) – 1558 East 30<sup>th</sup> Street and 2999 Payne Avenue c. 1920, 1929, 1978, 1979 and renovations 2006-2018.

The I-90 West Alignment (*Alternative 2*) impacts these buildings that are avoided by East Alignment:

- #4 WMB Properties -Hamilton LLC – 2797 Hamilton Avenue (AKA Schuemann Surgical Supply building OHI CUY0837801) c. 1965-1969
- #5 Kevlar Investments LLC – 2610 Hamilton Avenue (AKA Greyhound Bus facility OHI CUY0363101) c. 1939-1943
- #6 Downtown Warehousing LLC – 2701 St. Clair Avenue (AKA Commercial Electric OHI CUY0845701) c. 1937-1949

ODOT-OES will review the technical memo to confirm whether any new information warrants reconsideration of any of the impacted buildings. Based upon preliminary information, it does not appear that additional historic properties would be impacted by the alternatives, other than the Ohio Boxboard Building which is impacted by the East Alignment

Refer to **Appendix B** for the evaluation matrix, also shown in **Figure 8**, that was developed for this study to compare these two alternatives.



**Figure 8 – Evaluation Matrix**



## I-90 EAST ALIGNMENT EVALUATION

As this evaluation was being completed between the I-90 East and I-90 West alignments, a question was asked: ***Could an alignment be developed that provides the constructability benefits of the I-90 East alternative and doesn't impact the Ohio Boxboard Building?*** This question prompted a geometric evaluation of the I-90 East alignment to determine if this alignment existed. Here is a summary of that evaluation.

**Methodology for Alternative Evaluation** – A 3-step process was identified as a strategy for determining a solution that leverages the constructability benefits of the I-90 East alignment while staying far enough away from the Ohio Boxboard building to avoid impacts.

- **Step 1** – Focus on I-90 East alignment to see if an alignment can be developed that keeps I-90's proposed alignment at least half off the existing alignment to the east to allow for the new bridges to be constructed without significant impact to the existing I-90 lanes AND doesn't impact the Ohio Boxboard Building and Asia Plaza.  
**Step 2** - If Step 1 isn't successful in determining an East alignment that doesn't impact the Boxboard building, focus on the I-90 West Alignment to determine a) how far to push the alignment west (from the East Alignment) to get a solution that doesn't impact the Ohio Boxboard Building, b) determine which bridges need to be further studied with the re-alignment of I-90 to the west for constructability, and c) **quantify the constructability impacts of the West Alignment to weight against taking the Ohio Boxboard Building.**  
**Step 3** - If Step 1 isn't successful in determining an East alignment that doesn't impact the Asia Plaza building, focus on the impacts of removing the East 30th Slip Ramp from I-90 EB and pushing the ramp traffic to the Superior Avenue intersection. This would include traffic analysis to determine the impacts of this ramp traffic to the Superior Avenue ramp terminal intersection and corridor. This would be a feeder into the Interchange Modification Study (IMS) Addendum process.

Considering the risk of uncertainty and need for further investigation on the impacts to the Ohio Boxboard Building and Asia Plaza. It would be beneficial to quantify this now.

Step 1 was completed for this report. This included developing several I-90 horizontal alignments and typical sections between the Carnegie Curve through the Innerbelt Curve. Included in this was the development of various alignments and typical sections for the Chester Avenue to I-90 EB ramp, the I-90 EB to Superior Avenue ramp, and the Superior Avenue to I-90 EB ramp because these ramps are the closest roadways to Asia Plaza and the Ohio Boxboard Building, respectively. To develop the varying typical sections, **the lane widths proposed along I-90 ranged from 11 feet (minimum) to 12 feet (maximum)** and the outside shoulders along the ramps varied from 6 feet (minimum) to 10 feet (maximum). Finally, the gores widths between I-90 and the ramps ranged from 19 feet (minimum) to 23 feet (maximum). A table

Must provide at least one 12 foot lane in each direction (EB & WB) on I90.

summarizing these critical elements is included in the proposed schematic exhibits of the alternatives developed for this evaluation, shown in **Appendix C**. It should be noted that the inside (left) shoulder width along I-90 was not reduced from the 10 feet shown during the previous study because it was determined to not be favorable to shift traffic in toward the median barrier than back away once past the Ohio Boxboard Building.

**I-90 and Superior Avenue Entrance Ramp Alternative Evaluation** – Seven alternatives were developed for I-90 EB and the ramp alignments to maximize the offset to the Asia Plaza and the Ohio Boxboard Building, shown in **Appendix C**. These are summarized below.

- *Alternative 1* – Using 12-foot-wide lanes along I-90, standard shoulder widths (3-foot left and 8-foot right through the gore area) along the Superior Avenue to I-90 EB ramp, 23-foot-wide back of gore between the ramp and I-90 EB, and a 50:1 high-speed ramp taper merge, an alignment for the ramp was developed that placed the right edge of the ramp 13 feet away from the Ohio Boxboard Building at the closest location. This ramp alignment was not believed to be long enough to make the vertical alignment feasible as the ramp was only 415 feet between the intersection with Superior Avenue and the gore with I-90 EB, which is too short to make the vertical level difference needed to connect the two roadways. For this reason, *Alternative 1* was dismissed from further consideration as drawn.
- *Alternative 2* – Using 11-foot-wide lanes along I-90, standard shoulder widths (3-foot left and 8-foot right through the gore area) along the Superior Avenue to I-90 EB ramp, 23-foot-wide back of gore between the ramp and I-90 EB, and a 50:1 high-speed ramp taper merge, an alignment for the ramp was developed that placed the right edge of the ramp 13 feet away from the Ohio Boxboard Building at the closest location. This alternative improved from *Alternative 1* by increasing the length of vertical independence between Superior Avenue and I-90 from 415 feet to 470 feet; however, this ramp alignment was also not long enough to make the vertical alignment feasible. For this reason, *Alternative 2* was dismissed from further consideration as drawn.
- *Alternative 3* – Using 11-foot-wide lanes along I-90, reduced shoulder widths (3-foot left and 6-foot right through the gore area) along the Superior Avenue to I-90 EB ramp, 23-foot-wide back of gore between the ramp and I-90 EB, and a 50:1 high-speed ramp taper merge, an alignment for the ramp was developed that placed the right edge of the ramp 9.5 feet away from the Ohio Boxboard Building at the closest location. This alternative improved from *Alternative 2* by increasing the length of vertical independence between Superior Avenue and I-90 from 470 feet to 750 feet; however, this ramp alignment was not favorable because of the reverse curvature introduced through the gore that was determined to be difficult to introduce the superelevation required to

meet the design speed, and the minimum offset to the Ohio Boxboard Building was reduced below 10 feet. For these reasons, *Alternative 3* was dismissed from further consideration as drawn.

- *Alternative 4* – This alternative used the same typical section characteristics of *Alternative 3* but revised the horizontal alignment of the ramp to eliminate the need for superelevation along the ramp through the gore. Unfortunately, this reduced the minimum offset to the Ohio Boxboard Building to 9 feet, which is believed to be too close to not negatively impact the building. For this reason, *Alternative 4* was dismissed from further consideration as drawn.
- *Alternative 5* – This alternative was the first of three alternatives that adjusted the gore width and taper rate through the interchange gore to provide greater separation from the Ohio Boxboard Building and increases the horizontal length of the ramp to allow the vertical design to be feasible. This alternative reduced the back of gore width from 23 feet to 19 feet. Using 11-foot-wide lanes along I-90, reduced shoulder widths (3-foot left and 6-foot right through the gore area) along the Superior Avenue to I-90 EB ramp, 19-foot-wide back of gore between the ramp and I-90 EB, and a 50:1 high-speed ramp taper merge, an alignment for the ramp was developed that placed the right edge of the ramp 13 feet away from the Ohio Boxboard Building at the closest location. This ramp alignment was not believed to be long enough to make the vertical alignment feasible as the ramp was only 550 feet between the intersection with Superior Avenue and the gore with I-90 EB, which is too short to make the vertical level difference needed to connect the two roadways. For this reason, *Alternative 5* was dismissed from further consideration as drawn.
- *Alternative 6* – This alternative reduced the back of gore width from 23 feet to 19 feet and changed the taper rate through the gore from 50:1 to 35:1. Using 11-foot-wide lanes along I-90, reduced shoulder widths (3-foot left and 6-foot right through the gore area) along the Superior Avenue to I-90 EB ramp, 19-foot-wide back of gore between the ramp and I-90 EB, and a 35:1 low-speed ramp taper merge, an alignment for the ramp was developed that placed the right edge of the ramp 12 feet away from the Ohio Boxboard Building at the closest location. However, this ramp alignment was not believed to be long enough to make the vertical alignment feasible as the ramp was only 575 feet between the intersection with Superior Avenue and the gore with I-90 EB, which is too short to make the vertical level difference needed to connect the two roadways. For this reason, *Alternative 6* was dismissed from further consideration as drawn.
- *Alternative 7* – This alternative adjusted the ramp horizontal alignment while utilizing the same typical section dimensions as *Alternative 6*. By reducing the minimum offset to the Ohio Boxboard Building from 12 feet in *Alternative 6* to 11.5 feet for *Alternative 7* and revising the horizontal alignment, 705 feet is provided between the intersection with Superior Avenue and the gore with I-90 EB, making this ramp alignment vertically viable.

This distance may be reduced further due to the need for at least one 12 foot lane in each direction (EB & WB) of I90. Will a retaining wall be required between the roadway and the Ohio Boxboard Building? Is this enough constructible distance?

Is a wall going to be required between the roadway and the Asia Plaza building? Will this provide enough constructible distance?

**I-90 EB to Superior Avenue / East 30<sup>th</sup> Street Exit Ramp Alternative Evaluation** – A single ramp alignment was carried forward for the ramp connection from I-90 EB to East 30<sup>th</sup> Street. Using 12-foot-wide lanes along I-90, standard shoulder widths (4-foot left and 8-foot right) along the I-90 EB to East 30<sup>th</sup> Street ramp, 19-foot-wide back of gore between the Superior Avenue ramp and the East 30<sup>th</sup> Street ramp, and a 35:1 low-speed ramp taper merge, an alignment for the ramp was developed that placed the right edge of the ramp 19 feet away from the Asia Plaza Building at the closest location. Other ramp alignments were developed that didn't produce substantially different results. The ramp alignment shown in **Appendix C** is believed to be a viable option to pair with the alignments adjacent to the Ohio Boxboard Building.

**Conclusion of I-90 East Alignment Study** – As a result of this evaluation, it is anticipated that a viable alternative has been developed that maintains the benefits of the I-90 East alignment while eliminating the impacts to the Ohio Boxboard Building and Asia Plaza. *Alternative 7* provides nearly the greatest minimum offset to the buildings while providing enough length along the Superior Avenue to I-90 EB ramp to make the vertical design feasible. For this reason, it is anticipated that *Alternative 7* should be carried forward and that at this time, Step 2 and Step 3 of the alignment evaluation process can be deferred.

## NEXT STEPS

As this study was being prepared, several activities were identified that likely needs to be completed, summarized below:

- Research the existing Ohio Boxboard Building (1400 East 30<sup>th</sup> Street) to determine how close the proposed construction can be to the existing building before it is negatively impacted,
- Research the existing building owned by the Asia Plaza Group, LLC (1550 East 30<sup>th</sup> Street) to determine how close the proposed construction can be to the existing building before it is negatively impacted,
- If it is later determined that the right turn exit ramp to East 30<sup>th</sup> Street needs to be removed if too close to the Asia Plaza building, capacity analysis would need to be completed at the I-90 and Superior Avenue interchange and an addendum to the Interchange Modification Study (IMS) would need to be completed,
- Additional geometric analysis should be done for I-90 between St. Clair Avenue and Lakeside Avenue to determine if the radius of the proposed horizontal curve to the west can be increased to allow for the center piers of the proposed Lakeside, Hamilton, N-S railroad, and St. Clair bridges can be placed fully outside of the existing I-90 pavement, and
- Coordinate with ODOT Office of Environmental Services (OES) to determine which alternative should be advanced into the next phase of project development.

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December 20, 2023  
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If you have any questions or need additional information related to our analysis, please don't hesitate to contact us.

Sincerely,

A handwritten signature in black ink, appearing to read "B D Toombs". The signature is written in a cursive style with a large, looped "B" and a stylized "D".

Brian D Toombs, PE  
Project Manager