

## **SECTION III: ALTERNATIVES**

### **Introduction**

The project study team developed 30 alternatives and sub-alternatives for the Circle Interchange aiming to address the project Purpose and Need. The high traffic volumes and the constrained, urbanized project area calls for a unique solution that departs from traditional interchange designs. The alternative development process began with a brainstorming effort that considered both the interchange as a whole as well as key movements and sections along the project routes. Concept alternatives were designated either as A-, B-, C- and D-Series. A-Series encompassed the entire interchange; B-Series included those that focused on Ramp NW (northbound to westbound); C-Series focused on the eastbound triple divergence of eastbound I-290, Ramp EN and Ramp ES; and D-Series focused on the north leg of the interchange along the Kennedy Expressway. During the alternative development process, leading aspects of B-, C-, and D-Series alternatives were used to create additional A-Series alternatives. The genesis of the various alternatives and sub-alternatives is diagramed in the Alternative Histogram in Exhibit 2. Schematics and concept plans of the alternatives and sub-alternatives are included as Exhibit 3.

### **No-Build Alternative**

**NB**

The No-Build Alternative represents a base condition in which no improvements are made to the Circle Interchange other than routine maintenance. This alternative would not meet the Purpose and Need of the project because it does not address the safety, mobility and facility deficiencies. It will not provide the additional capacity improvements to meet future 2040 traffic volume needs. Northbound and southbound I-90/94, Ramp NW and Ramp EN continue to have insufficient capacity. The safety issues associated with the northbound C-D road serving Ramp NW and Ramp NE, the merge of westbound Congress Parkway, Ramp NW and Ramp SW, and the triple divergence of eastbound Congress Parkway, Ramp EN and Ramp ES remain. Lastly, the No-Build Alternative does not provide any improvements to address the aging roadway facility and update the roadway condition to current design standards and requirements.

Consequences resulting from the No-Build Alternative include:

- Increased crash potential as traffic volumes increase without safety, capacity and operational improvements.
- Increased congestion and delays resulting in increased energy consumption and increased vehicle emissions from idling and accelerating vehicles.
- Increased maintenance costs as pavement and bridge structures further deteriorate.

The Circle Interchange and the routes feeding into it are classified as a full access control interstate to interstate facility. It is an important link in the local and regional transportation network. The No-Build Alternative will not provide the necessary improvements to provide the safety and mobility needs, nor address the facility deficiencies of the interchange.

The No-Build Alternative does not address the safety, mobility, and facility condition needs of the Circle Interchange. It is not consistent with the Fiscal Year (FY) 2010-2015 Transportation Improvement Program and the *GO TO 2040* Comprehensive Regional Plan (CRP) which are both endorsed by CMAP. It does not satisfy the purpose and need for the improvement.

### **Transportation System Management (Congestion Management Process) Alternative**

**TSM**

The provisions of 23 CFR 450.320 place restrictions on the use of federal funds for projects in Transportation Management Areas (TMAs) designated as non-attainment for carbon monoxide and/or ozone. In these areas, federal funds may not be programmed for any project that will significantly increase capacity for single-occupancy vehicles (SOVs) unless the project is addressed through a Congestion Management Process (CMP).

The CMP is required to provide an appropriate analysis of alternatives to the proposal for adding SOV capacity, including all reasonable congestion management strategies. If the analysis demonstrates that other alternatives

and/or congestion management strategies cannot fully satisfy the need for additional capacity and that, therefore, the additional SOV capacity is warranted, the CMP must identify all reasonable strategies that will maintain the functional integrity of the additional lanes. All identified reasonable strategies must be incorporated into the project. The CMP for each affected TMA is addressed in materials available from the Metropolitan Planning Organization (MPO) responsible for the area.

Individual projects involving additional SOV capacity were evaluated, selected, and prioritized in the course of developing the Fiscal Year 2010-2015 Transportation Improvement Program and the long-range *GO TO 2040* Comprehensive Regional Plan for Northeastern Illinois. The Northeastern Illinois CMP is documented via various materials that are available through the Chicago Metropolitan Agency for Planning (CMAP). The following are examples:

- Congestion Mitigation Handbook, September 1998
- Congestion Management System for Northeastern Illinois, July, 2006 Annual Status Report
- Congestion Reduction Demonstration for Northeastern Illinois: A Proposal for Direct Highway Pricing, Transit, Technology, and Supporting Strategies, December 31, 2007
- Arterials and Streets Infrastructure and Operations for Mobility, Access, and Community in Metropolitan Chicago, January 2009
- Travel Demand Management, Strategy Paper, March 2009
- *GO TO 2040* Comprehensive Regional Plan for Northeastern Illinois, October 2010

The development process for the TIP and *GO TO 2040* Plan constitutes the CMP for Northeastern Illinois. This process documents the warranted projects for adding SOV capacity and, as applicable, also documents that regional and/or project-specific alternatives (e.g., Transportation Demand Management measures, High-Occupancy vehicle measures, Transit Capital Improvements, Congestion Pricing, Growth Management, and Incident Management) would not obviate the need for adding SOV capacity. Planned projects resulting from the CMP are documented in the annual CMP status report referenced above.

The Circle Interchange project is included in the 2010-2015 TIP under No. 01-12-0019 and was adopted into the *Go To 2040* Plan at the March 13, 2013 CMAP Board meeting.

## Build Alternatives

### Alternative A-1.1

A-1.1

Alternative A-1.1 generally maintains the existing Circle interchange layout while increasing capacity on I-90/94 and key ramps. The alternative provides four lanes in each direction along I-90/94 through the interchange to address lane balance issues. It also provides two lanes on Ramp NW, but on a similar horizontal alignment and vertical profile as the existing ramp maintaining the current deficiencies. Ramp NE is completely separated from Ramp NW with its own divergence downstream on I-90/94. This alternative also provides two lanes on Ramp EN, but it is also on a similar horizontal alignment and vertical profile as the existing ramp maintaining the current deficiencies. While the eastbound I-290 triple divergence and westbound I-290 triple convergence are addressed with improved geometrics, the northbound I-90/94 triple convergence is not addressed at all under this alternative. In addition, the westbound Morgan Street exit ramp is completely removed. This alternative is identical to the *Circle Interchange Scoping Report* Long Term Improvement "A". The report is a separate document, available at the IDOT, District 1 Office in Schaumburg, Illinois.

#### Alternative A-1.2

A-1.2

Alternative A-1.2 is the same as Alternative A-1.1, except that Ramp SE is also removed. The removal of Ramp SE creates space within the interchange to develop improved geometry on the remaining System Ramps, however, this alternative results in an interchange that does not provide for all system movements.

#### Alternative A-2

A-2

This alternative mirrors Alternative A-1.1, except that Ramp NW is provided on a flyover. The flyover provides an improved horizontal alignment and vertical profile as it passes above Harrison Street and Halsted Street. This alternative is identical to the *Circle Interchange Scoping Report* Long Term Improvement "B".

#### Alternative A-3

A-3

Alternative A-3 provides a four-level, fully directional and symmetric interchange with high speed ramps. Although the performance of the interchange would be improved compared to the existing interchange, it would impact adjacent buildings and properties. This early alternative was developed to demonstrate these impacts. The interface with adjacent roadways was not considered in detail as part of this alternative due to its impacts.

#### Alternative A-4

A-4

Alternative A-4 is similar to Alternative A-3, except that the footprint of the interchange is reduced. This results in slightly lower design speeds for the ramps, but the compact directional interchange does not eliminate the impacts to adjacent buildings and properties.

#### Alternative A-5

A-5

Alternative A-5 introduces the concept of realigning both directions of I-290/Congress Parkway outward, allowing for ramps to be centrally located within the interchange further reducing the footprint of the directional interchange. Ramp NW is on a flyover similar to previous alternatives, but enters on the left side of westbound I-290. Both the Ramp NW flyover and westbound I-290 pass above Halsted Street. Ramp EN diverges from eastbound I-290 on the left side, passes above I-90/94 and beneath westbound I-290 and Van Buren Street. It is force-merged with northbound I-90/94. Ramp SW passes below Halsted Street, westbound I-290 and Ramp NW to emerge on the left side of the westbound I-290 corridor, encroaching on the CTA property.

#### Alternative A-6

A-6

Alternative A-6 proposes a T-system interchange, with directional ramps accommodating movements between I-290 and I-90/94. Non-directional ramps serve Congress Parkway. The prominent feature of Alternative A-6 is a Ramp EN flyover that passes above Van Buren Street, Jackson Boulevard and Adams Street before passing below Monroe Street. This is geometrically infeasible because it would require a 40-foot elevation downgrade in approximately 450 feet, which is severely substandard. Eastbound I-290 and Ramp EN pass above Halsted Street. It also provides a Ramp NW flyover similar to previous alternatives.

#### Alternative A-7.1a

A-7.1a

Alternative A-7.1a maintains generally maintains a circular interchange with key improvements from the existing interchange. Ramp NW is provided on a flyover that exits on the right side of northbound I-90/94. It provides an improved horizontal alignment and vertical profile as it passes above Harrison Street and Halsted Street. Ramp NW also has exclusive access to Morgan Street. Ramp EN is also widened to two lanes on an improved horizontal alignment and vertical profile. Taylor Street access from southbound I-90/94 is provided north of the interchange, while access from Ramp ES is removed. This alternative addresses the eastbound I-290 triple divergence and the westbound I-290 triple convergence. However, the northbound I-90/94 triple convergence is not addressed.

#### Alternative A-7.1b

### A-7.1b

Alternative A-7.1b is similar to Alternative A-7.1a, except for key northbound improvements. The Ramp NW flyover diverges on the right side of northbound I-90/94 and a northbound C-D road is provided to serve downtown exits. In this alternative, the northbound C-D road diverges at the same location as the Ramp NE divergence, and merges at the same location as the Ramp EN merge on northbound I-90/94. This geometry removes a weaving movement from the northbound I-90/94 triple convergence point.

#### Alternative A-7.1c

### A-7.1c

Alternative A-7.1c, ultimately selected as the Recommended Alternative and refined into the Preferred Alternative, is a variation of Alternative A-7.1b. Key improvements over its predecessor include providing the northbound C-D road with its own divergence from northbound I-90/94 by having Ramp NW and Ramp NE share a separate C-D road (similar to existing conditions, except that Ramp NW has two lanes to alleviate existing safety concerns). The northbound C-D road also serves all downtown exits before merging into northbound I-90/94 near Lake Street.

#### Alternative A-7.2a

### A-7.2a

Alternative A-7.2a is similar to Alternative A-7.1a with the left divergence of Ramp NW from northbound I-90/94. It is also similar to Alternative A-7.1b with the northbound C-D road shared divergence and merge points. This alternative differentiates itself by placing Ramp EN in a trench below I-90/94. This trench adds another vertical level to the interchange to improve vertical profiles. However, after consultation with IDOT-Hydraulics, the trench poses drainage concerns that renders it fatally flawed. The trench would be below the water table, be difficult to drain and could present life-safety issues in the event of a heavy storm event.

#### Alternative A-7.2b

### A-7.2b

Alternative A-7.2b is similar to Alternative A-7.2a, except that the Ramp NW divergence is on the right side of northbound I-90/94. Ramp EN is also placed in a trench below I-90/94 with the same drainage concerns as noted in Alternative A-7.2a.

#### Alternative A-7.2c

### A-7.2c

Alternative A-7.2c is the same as Alternative A-7.2b except that the southbound I-90/94 to Taylor Street ramp is provided south of the interchange, similar to existing conditions. The drainage concerns with a Ramp EN trench below I-90/94 also apply to this alternative.

#### Alternative A-7.3

### A-7.3

Alternative A-7.3 is similar to Alternative A-7.1a, except for the position of the Ramp EN and Ramp ES from eastbound I-290. In this alternative, the Ramp EN divergence is to the right of Ramp ES that provides a minimal improvement to its horizontal alignment. Ramp EN passes above Ramp ES in a tight vertical profile envelope between Halsted Street and Harrison Street.

#### Alternative A-7.4a

### A-7.4a

Alternative A-7.4a provides a Ramp NW flyover on an improved curvilinear horizontal alignment that shadows the existing ramp. It passes above Harrison Street and below Halsted Street. This alignment requires Van Buren Street to be bubbled outward towards the north and includes a lengthy curved horizontal alignment coupled with a steep vertical profile. A northbound C-D road is provided, but it merges onto northbound I-90/94 just downstream from the Ramp EN merge. Taylor Street access from southbound I-90/94 is maintained near its existing location, but access is removed for Ramp ES and Ramp WS. Ramp WS is routed above I-290, below Ramp EN and below Harrison Street with a steep profile.

#### Alternative A-7.4b

### A-7.4b

Alternative A-7.4b addresses the steep profile on Ramp WS by placing Ramp EN in a trench. Ramp WS is then routed above I-290 and Ramp EN and below Harrison Street with a steep

profile. Otherwise, it is the same as Alternative A-7.4a. Placing Ramp EN in a trench presents the same drainage concerns noted with previous alternatives.

#### Alternative A-8

**A-8**

The distinctive features of Alternative A-8 are a flatter Ramp NW flyover of Harrison Street and Hasted Street that has a left-side divergence from NB I-90/94, as well as a left-side to left-side Ramp WS. Ramp EN passes below I-90/94 in a trench with the same drainage concerns noted in previous alternatives. In general, a number of ramps are clustered in the southern half of the interchange area. This alternative also merges Ramp ES into southbound I-90/94 upstream of a Taylor Street exit ramp, resulting in a new weaving area. The alternative does not provide a northbound C-D road.

#### Alternative A-9

**A-9**

Alternative A-9 takes an opposite approach compared to Alternative A-8. The Ramp NW flyover exits northbound I-90/94 on the right side and merges on the left side of westbound I-290. Both of these roadways pass above Halsted Street, similar to Alternative A-5. Ramp SE merges with eastbound Congress Parkway on the left side. In general, a number of ramps are clustered in the northern half of the interchange area. Ramp EN passes below I-90/94 in a trench with the same drainage concerns noted in previous alternatives. The alternative does not provide a northbound C-D road.

#### Alternative A-10

**A-10**

Alternative A-10 is similar to Alternative A-7.1b, with some exceptions. It does not provide a northbound C-D road. It does place Ramp EN below I-90/94 in a trench with the same drainage concerns noted in previous alternatives. Since Taylor Street access is not provided for Ramp ES, the alternative provides a new ramp from southbound I-90/94 to Roosevelt Road. However, this adds a new weaving area to southbound I-90/94.

#### Alternative A-11

**A-11**

Alternative A-11 provides a flatter Ramp NW flyover somewhat similar to Alternative A-8. Ramp WS exits on the left side of westbound I-290, but joins with a Taylor Street ramp from southbound I-90/94 before merging with southbound I-90/94 at virtually the same point as the Ramp ES merge. Ramp SE is provided on a wider curvilinear alignment that is atop a Ramp EN trench below I-90/94. This causes the same trench concerns noted in previous alternatives, as well as clustered geometrics in the southwest corner of the interchange area. No northbound C-D road is provided.

#### Alternative A-12

**A-12**

Alternative A-12 provides a directional interchange with focus on a C-D system north of the interchange. It includes a Ramp NW flyover from the right side of the northbound I-90/94 to the center of westbound I-290. This alternative provides improved geometry of Ramp EN, which passes above I-90/94. Ramp EN becomes a northbound C-D road, with Ramp WN merging on the left side and a northbound local bypass merging on the right side. A southbound I-90/94 C-D road along I-90/94 is also provided. This alternative requires substantial reconstruction of the Kennedy Expressway from the Circle Interchange to Hubbard's Cave.

#### Alternative A-13

**A-13**

Alternative A-13 features a flatter Ramp NW flyover from the right side of northbound I-90/94 to the center of westbound I-290. It also replaces the Morgan Street ramp with a ramp at Aberdeen Street. Ramp EN passes below I-90/94 in a trench with the same concerns noted in previous alternatives. Ramp WN merges into northbound I-90/94 just upstream of the Ramp EN merge. No northbound C-D road is provided.

#### Alternative A-13.1

### A-13.1

Alternative A-13.1 is the same as Alternative A-13, except that Ramp WS and Ramp SE are replaced with 20 mph loop ramps, resulting in a short weaving area on southbound I-90/94. The Ramp SE loop overlaps the Ramp EN trench.

#### Alternative A-14

### A-14

Alternate A-14 distinctively locates Ramp NW in a trench, eliminating the need for flyovers, but introducing the same drainage concerns as noted in previous trenched alternatives. It also may be infeasible to construct due to its proximity to existing Ramp NW and Pump Station No. 5 utilities. This alternative also shows a frontage road concept connecting the cross roadways. The frontage road would be located between and above northbound and southbound I-90/94.

#### Alternative A-14.1

### A-14.1

Alternative A-14.1 is the same as Alternative A-14, except that the Ramp NW trench is located partially below the Van Buren Street structure. This alternative has the same drainage and construction concerns as Alternative A-14.

#### Alternative A-15.1

### A-15.1

Alternative A-15.1 realigns both directions of I-290/Congress Parkway outward so that Ramp NW can be centrally located. The Ramp NW flyover begins on the right side of northbound I-90/94, over Harrison Street before passing below Halsted Street and merging on the left side of westbound I-290. Ramp EN exits on the left side of eastbound I-290 with an improved horizontal alignment and vertical profile.

#### Alternative A-15.2

### A-15.2

Alternative A-15.2 is essentially the same as Alternative A-15.1, except that Ramp SE is removed. While this may reduce the complication of the interchange geometrics, it would no longer provide a full access interchange, for all system movements.

#### Alternative A-15.3

### A-15.3

Alternative A-15.3 is a refinement of Alternative A-15.1. The outward realignment of I-290/Congress Parkway is less pronounced. Ramp EN exits on the right side of eastbound I-290 and passes below I-90/94 in a trench, with the same drainage concerns as previous trenched alternatives. This alternative also includes a northbound C-D road, which shares a divergence point with Ramp NE. It does not require a flyover of Halsted Street or the west side of Harrison Street.

#### Alternative A-15.4

### A-15.4

Alternative A-15.4 is a variation of Alternative A-15.3, except that Ramp EN crosses above I-90/94. This requires Ramp WS to pass above the west side of Harrison Street. This alternative also includes a direct exit to Ramp NE from Ramp NW.

#### Alternative A-15.5

### A-15.5

Alternative A-15.5 is a refinement of Alternative A-15.4 in tightening the Ramp EN alignment. This allows Ramp WS to slip below the west side of Harrison Street.

#### Alternatives Evaluation Process

The alternative evaluation process involved technical evaluation by the project study team and collaboration with the FHWA and the Department in a series of geometric workshops. The process to evaluate alternatives began at a broad level to identify fatal flaws and then added more detail with each successive round. Throughout this process, alternatives were compared relative to other alternatives and to specific criteria. Each round removed alternatives that performed poorly and, in some cases, introduced new or refined alternatives. This process concluded with a

Recommended Alternative, which was then refined into the Preferred Alternative. Details of the Alternatives Evaluation Process are available in the *Circle Interchange Alternatives Evaluation Memorandum*, which is a separate document available at the Illinois Department of Transportation, District 1 Office in Schaumburg, Illinois. For purposes of this Environmental Assessment, the Alternative Histogram in Exhibit 2 diagrams how each alternative moved through this process. The evaluation process included five rounds:

1. Fatal Flaw Evaluation
2. Purpose and Need Evaluation
3. Performance Evaluation
4. Specific Issues Evaluation
5. Final Evaluation

**Fatal Flaw Evaluation**

This evaluation round identified whether or not an alternative would be infeasible or impractical to implement. Each of the original six alternatives was subjectively evaluated at a broad level based on conceptual drawings and aerial photography based on discussions at the first geometric workshop. These were the four fatal flaws in this evaluation:

- Requiring all but very minimal right-of-way (ROW) acquisition without major impacts to buildings and structures requiring relocations
- Requiring the use of CTA property located in the median of I-290. The CTA ROW is dedicated solely to CTA use. Per the CTA, any alternative which requires use or conversion of their transportation corridor ROW will be detrimental to their operations and future expansion plans, i.e. Blue Line expansion and modernization
- Non-compatibility with future projects along I-90/94. This includes alternatives which are inconsistent with the Department’s future transportation goals of the project corridors or alternatives which may cause the implementing or retrofitting of future transportation solutions to become cost prohibitive, (i.e. managed lanes)
- Not being geometrically feasible

Alternatives A-1, A-2 and A-5 do not contain any fatal flaws, as defined above, and were carried forward. Alternatives A-3 and A-4 were found to have multiple flaws. As fully directional, four-level interchanges, these latter alternatives require substantial right-of-way, impact buildings, impact the CTA property and may be geometrically infeasible given the surrounding roadway network. Alternative A-6 also has multiple flaws. In particular, this alternative includes a Ramp EN flyover located above Adams Street and below Monroe Street, which would require a geometrically infeasible vertical profile. Table 7 summarizes these findings.

**Table 7 Fatal Flaw Evaluation**

Alternative	Result	Remark
A-1	Carried Forward	Does not contain a fatal flaw per this evaluation
A-2	Carried Forward	Does not contain a fatal flaw per this evaluation
A-3	Dropped	Contains multiple fatal flaws (ROW impacts, CTA property impacts, geometrically infeasible)
A-4	Dropped	Contains multiple fatal flaws (ROW impacts, CTA property impacts, geometrically infeasible)
A-5	Carried Forward	Does not contain a fatal flaw per this evaluation
A-6	Dropped	Contains multiple fatal flaws (CTA property impacts, geometrically infeasible)

**Purpose and Need Evaluation**

For the next evaluation round, alternatives were evaluated based on how well each met the Purpose and Need of the project based on discussion at the second geometric workshop. This evaluation included 13 alternatives, three carried forward from the previous evaluation (A-1, A-2 and A-5), plus 10 additional alternatives. The ten additional alternatives were a result of coordination and input from the Project Working Group (PWG) and from the Project

Study Team design workshops. Part XIII of this report provides additional detail on the PWG meetings. An alternative was deemed to have passed the Purpose and Need Evaluation if it substantially met the following conditions:

- Improve Safety
  - Addressed Ramp NW/Ramp NE C-D lane usage issue
  - Improved the triple convergence of westbound I-290, Ramp NW and Ramp SW
  - Improved the triple divergence along eastbound I-290 (with Ramp EN and Ramp ES)
  - Improved the triple convergence of northbound I-90/94, Ramp EN and Ramp WN
- Improve Mobility
  - Improved the lane balance throughout the interchange area along I-90/94
  - Improved mobility and ramp geometry of Ramp NW
  - Improved the mobility and ramp geometry of Ramp EN
- Improve Operational Deficiencies
  - Maintained or reduced overall decision points
  - Improved the design speed of the system ramps
  - Improved the overall weaving situation throughout the interchange area
- Improve Facility Condition
  - Replaced aging infrastructure

Alternatives A-1, A-2, A-7, A-9 and A-11 were carried forward for further evaluation. Alternatives A-7, A-9 and A-11 substantially meet the project Purpose and Need. Alternatives A-1 and A-2, which essentially maintain most of the existing geometry, were carried forward only as minimal improvement alternatives (considered as No-Build Plus alternatives). This allowed further evaluation of these minimal improvement alternatives even though neither substantially met the Purpose and Need.

Other alternatives did not adequately meet the Purpose and Need. Alternative A-5 modifies, but does not improve, the eastbound triple divergence. It simply relocates the Ramp EN divergence from the right side of eastbound I-290 to the left side, in addition to containing complex vertical geometry including a westbound I-290 flyover of Halsted Street. Alternative A-8 does not improve the northbound I-90/94 weave between Ramps EN/WN and the Madison Street exit. It also introduces a new weave on southbound I-90/94 between Ramp ES and a new Taylor Street exit ramp. A new Roosevelt Road exit ramp would be located immediately downstream of the weave. Alternative A-10 contains a weave on westbound I-290 between Ramp ES and the Morgan Street exit ramp. It also introduces a new weave on southbound I-90/94 between Ramp ES and a new Roosevelt Road exit ramp.

Other alternatives, which were created following the Fatal Flaw Evaluation, contained fatal flaws upon additional analyses. Alternatives A-12 and A-13 call for four levels of roadways between Halsted Street and Peoria Street, which is geometrically infeasible. Alternative A-13.1 includes two loop ramps along southbound I-90/94 (Ramp WS and Ramp SE). These ramps are geometrically infeasible, especially since Ramp SE overlaps Ramp EN. Alternatives A-14 and A-14.1 each contain a Ramp NW tunnel below I-90/94, which is geometrically infeasible due to impacts on the Van Buren structure above and hydraulic impacts (high water table) below. Table 8 summarizes these findings.

**Table 8 Purpose and Need Evaluation**

Alternative	Result	Remark
A-1	Carried forward	Carried forward for further evaluation as a minimal improvement alternative
A-2	Carried forward	Carried forward for further evaluation as a minimal improvement alternative
A-5	Dropped	Does not adequately meet the Purpose and Need (does not improve the eastbound triple divergence)
A-7	Carried forward	Meets the Purpose and Need
A-8	Dropped	Does not adequately meet the Purpose and Need (does not improve the deficient northbound weave between Ramps EN/WN and Madison St.)
A-9	Carried forward	Meets the Purpose and Need

Alternative	Result	Remark
A-10	Dropped	Does not adequately meet the Purpose and Need (does not improve the deficient westbound weave between Ramps NW/SW and Morgan Street, adds southbound weave Ramp ES and new Roosevelt Road exit ramp.)
A-11	Carried forward	Meets the Purpose and Need
A-12	Dropped	Developed after Fatal Flaw Evaluation, but is fatally flawed (four levels of roadway at Halsted Street, including a trench of Ramp SW that is hydraulically infeasible)
A-13	Dropped	Developed after Fatal Flaw Evaluation, but is fatally flawed (four levels of roadway at Halsted Street, including a trench of Ramp SW that is hydraulically infeasible)
A-13.1	Dropped	Developed after Fatal Flaw Evaluation, but is fatally flawed (four levels of roadway at Halsted Street, including a trench of Ramp SW that is hydraulically infeasible; loop ramps along southbound I-90/94 have operational and safety flaws)
A-14	Dropped	Developed after Fatal Flaw Evaluation, but is fatally flawed (due to Ramp NW tunnel below I-90/94 impacts the Van Buren structure above and has hydraulic impacts (high water table) below)
A-14.1	Dropped	Developed after Fatal Flaw Evaluation, but is fatally flawed (due to Ramp NW tunnel below I-90/94 impacts the Van Buren structure above and has hydraulic impacts (high water table) below)

### Performance Evaluation

The Performance Evaluation focused on evaluating alternatives based on their subjective performance beyond the Purpose and Need, as discussed at the third geometric workshop. It included 10 alternatives, three carried forward from the previous evaluation (A-2, A-9 and A-11), two alternatives developed from A-1 (A-1.1 and A-1.2) three alternatives developed from A-7 (A-7.1, A-7.2 and A-7.3), plus two additional alternatives (A-15.1 and A-15.2). The development of sub-alternatives and new alternatives reflected new ideas brought forward during project coordination and tested during the alternative evaluation process. In this evaluation, an alternative was deemed to have good performance if it met a majority of the following conditions:

- Improves Safety
  - Likely to require a limited amount of Level One design exceptions
    - Level One design exceptions include the controlling design criteria established by FHWA and the disabled accessibility criteria. These criteria are judged to be those design elements that are the most critical indicators of a highway's safety and its overall serviceability,<sup>10</sup> and will require documented justification for approval.
  - Contains well-spaced geometrics (no clustering of ramps in a particular area)
- Improves Mobility
  - Allows Ramp NW access to Morgan Street or equivalent ramp along westbound I-290 (Note: Traffic studies indicate that most Morgan Street ramp users originate on Ramp NW)
- Constructability
  - Reasonable to construct
  - Requires no (or minimal) ramp closures to construct
- Compatibility
  - Compatible with drainage and utility facilities
  - Compatible with cross street network by maintaining or improving access

Alternatives A-7.1, A-7.2, A-15.1 and A-15.2 met the above Performance Criteria and were carried forward for further evaluation. Other alternatives were dropped from consideration for not meeting the performance criteria.

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<sup>10</sup> Source: Section 31-8.03(a) IDOT BDE Manual, September 2010  
<http://www.dot.il.gov/desenv/BDE%20Manual/BDE/pdf/Chapter%2031%20Basic%20Design%20Controls.pdf>

Alternatives A-1.1, A-1.2 (same as A-1.1 except that Ramp SE is removed) and A-2 maintain much of the existing deficient geometry, requiring design exceptions along several ramps in terms of maintaining tight horizontal geometry and steep vertical profile grades. These alternatives also raise constructability issues because proposed ramps would be constructed in the same location as existing ramps, which would require full closure of the existing ramps. Due to the amount of traffic in this interchange, it is important to maintain the interstate-to-interstate movements during construction. Alternative A-7.3 introduces the concept of crisscrossing Ramp EN and Ramp ES to increase the radius of Ramp EN, which would introduce constructability issues in maintaining those existing movements during construction. Alternative A-9 clusters several ramps in a tight location at the northwest quadrant of the interchange, including a westbound I-290 flyover of Halsted Street. Alternative A-11 clusters several ramps in a tight location at the southwest quadrant of the interchange. Table 9 summarizes these findings.

**Table 9 Performance Evaluation**

Alternative	Result	Remark
A-1.1	Dropped	Does not meet the performance criteria (likely requires many design exceptions due to maintaining existing deficient ramp alignments, which also results in constructability issues)
A-1.2	Dropped	Does not meet the performance criteria (likely requires many design exceptions due to maintaining existing deficient ramp alignments, which also results in constructability issues)
A-2	Dropped	Does not meet the performance criteria (likely requires many design exceptions due to maintaining existing deficient ramp alignments, which also results in constructability issues)
A-7.1	Carried forward	Meets the majority of performance criteria
A-7.2	Carried forward	Meets the majority of performance criteria
A-7.3	Dropped	Does not meet the performance criteria (constructability issues due to Ramp ES and Ramp EN crisscross design, which may not be geometrically feasible)
A-9	Dropped	Does not meet the performance criteria (clusters several ramps in a tight location at the northwest quadrant of the interchange)
A-11	Dropped	Does not meet the performance criteria (clusters ramps in a tight location at the southwest quadrant of the interchange)
A-15.1	Carried forward	Meets the majority of performance criteria
A-15.2	Carried forward	Meets the majority of performance criteria

Specific Issue Evaluation

The Specific Issue Evaluation included 13 alternatives: two carried forward from the previous evaluation (A-15.1, A-15.2), three alternatives developed from A-7.1 (A-7.1a, A-7.1b and A-7.1c), three alternatives developed from A-7.2 (A-7.2a, A-7.2b and A-7.2c), and five new alternatives. As in the previous evaluation, development of sub-alternatives and new alternatives reflected new ideas brought forward during project coordination among the FHWA, Department and the Project Study Team at the fourth geometric workshop. An alternative was deemed to pass this evaluation if the following criteria were met:

- Includes Ramp NW from the right side of northbound I-90/94 to the right side of westbound I-290.

Traffic analysis shows that a right-handed Ramp NW operates more favorably than a left-handed Ramp NW. A right-handed exit ramp also meets driver expectations.

- Provides a northbound C-D road to serve downtown exits.

The northbound C-D road reduces weaving between northbound I-90/94 traffic that exits to Madison Street and Washington Street by positioning it to the right of Ramp EN traffic that merges with northbound I-90/94. This is accomplished with a one-lane bypass ramp that exits below Harrison Street.

- Contains no or a subtle outward realignment of I-290/Congress Parkway above I-90/94.

Among the concepts, there are two general treatments of Congress Parkway above I-90/94, generally maintaining the existing alignment or an outward realignment to centrally locate system ramps. Outward realignment was deemed not to be feasible since several existing system ramps would have to be closed for an extended period of time to construct the new I-290/Congress Parkway alignments and system ramps. Maintaining interstate-to-interstate movements during construction, such as along Ramp NW (32,500 vehicles per day) and Ramp EN (26,600 vehicles per day), is an important construction consideration.

- Ramp NE exits directly from a two-lane Ramp NW, simplifying the geometrics with the proposed northbound C-D road.

With the addition of the northbound C-D road, it became apparent that Ramp NE should share a C-D road with Ramp NW, similar to the existing conditions. This simplifies the geometry along northbound I-90/94 because the northbound C-D road and Ramp NE would not divert at the same location. Furthermore, unlike the existing conditions, a two-lane Ramp NW would eliminate the need for abrupt lane changes at the Ramp NW/Ramp NE divergence.

Alternatives A-7.1b, A-7.1c, A-7.2b, A-7.2c, A-7.4a, A-7.4b, A-15.3, A-15.4 and A-15.5 met the majority of Specific Issue Evaluation and were carried forward for further evaluation. Other alternatives were dropped from consideration during this evaluation. Alternatives A-7.1a and A-7.2a locate Ramp NW on the left side of northbound I-90/94. Alternatives A-15.1 and A-15.2 realign eastbound and westbound I-290 outward from their existing alignments such that the ability to use existing ramps during construction staging becomes an issue. Table 10 summarizes this evaluation.

**Table 10 Specific Issue Evaluation**

Alternative	Result	Remark
A-7.1a	Dropped	Does not meet criteria (Ramp NW on left side of NB I-90/94)
A-7.1b	Carried forward	Meets majority of the specific issue criteria (Ramp NW on the right side; provides NB C-D; no outward realignment of I-290/Congress)
A-7.1c	Carried forward	Meets all of the specific issue criteria
A-7.2a	Dropped	Does not meet criteria (Ramp NW on left side of NB I-90/94)
A-7.2b	Carried forward	Meets majority of the specific issue criteria (Ramp NW on the right side; provides NB C-D; no outward realignment of I-290/Congress)
A-7.2c	Carried forward	Meets all of the specific issue criteria
A-7.4a	Carried forward	Meets all of the specific issue criteria
A-7.4b	Carried forward	Meets all of the specific issue criteria
A-15.1	Dropped	Does not meet criteria (outward realignment of EB and WB I-290)
A-15.2	Dropped	Does not meet criteria (outward realignment of EB and WB I-290)
A-15.3	Carried forward	Meets majority of the specific issue criteria (Ramp NW on the right side; provides NB C-D; Ramp NE exits from Ramp NW)
A-15.4	Carried forward	Meets majority of specific issue criteria
A-15.5	Carried forward	Meets majority of specific issue criteria

### Final Evaluation

The Final Evaluation examined the nine remaining alternatives from the Specific Issue Evaluation. The evaluation details and results are included in the *Circle Interchange Alternatives Evaluation Memorandum*, which is set forth in a separate document that is available at the Illinois Department of Transportation, District 1 Office in Schaumburg, Illinois. The paragraphs below summarize the four-step evaluation process and results described in the Memorandum:

### Step 1: Ramp EN must go over I-90/94

Originally in the alternative development process, placing Ramp EN beneath I-90/94 in a trench was desirable to provide flatter vertical ascending and descending grades. It would also accommodate Ramp WS beneath Harrison Street with more favorable vertical grades, thus eliminating a third-level flyover. However, this configuration would require drainage of the trench via a pump station. In considering of the drainage options, the Department determined that a trench of Ramp EN would have too many flooding risks, including life-safety risks (the possibility that people could become trapped in the flooded tunnel). As the study progressed, the design of a Ramp EN overpass of I-90/94 was improved to provide vertical upgrades and downgrades closer to the design criteria of four percent and six percent, respectively. Thus, the geometric advantage of a Ramp EN trench was reduced. Based on the flooding and life-safety risk concerns, and the reduced geometric advantage, alternatives with a Ramp EN trench were dropped from consideration. These included Alternatives A-7.2b, A-7.2c, A-7.4b and A-15.3.

### Step 2: Ramp WS must not be compromised

Variations of two alternatives provide a Ramp EN overpass of I-90/94 with a Ramp WS underpass of Harrison Street. Alternatives A-7.4a and A-15.5 accommodate the Ramp WS underpass with downgrades of 10 percent and eight percent, respectively. Each exceeds the design criteria maximum downgrade of six percent. In addition, these steeper downgrades are located on a reverse horizontal curvature with a left-sided merge onto Ramp ES. Given the substandard geometry of Ramp WS, Alternatives A-7.4a and A-15.5 were dropped from consideration.

### Step 3: Compare Alternative A-7.1b with A-7.1c

Alternatives A-7.1b and A-7.1c are very similar, except that A-7.1c was developed to enhance the geometrics of Ramp EN and Ramp NE. It increased the design speed of Ramp EN to 35 mph from 30 mph and reduced the maximum grade on Ramp NE from 9.0 percent to 2.8 percent. Thus, Alternative A-7.1b was dropped from consideration.

### Step 4: Compare Alternative A-7.1c with A-15.4

Alternative A-7.1c includes a flyover of Halsted Street, which was a concern raised at the PWG meetings. Specifically, PWG members were concerned that the flyover would have a tunneling effect similar to the Congress Parkway over Des Plaines Street. The Project Team explained that the flyover would only be two lanes instead of eight lanes, thus not having a tunneling effect. Alternative A-15.4 does not include a flyover of Halsted Street, but has more complex geometry that includes an outward realignment of Congress Parkway over I-90/94. An outward realignment reduces the design speed and horizontal sight distance, which is a safety concern. Based on this comparison, the project study team identified Alternative A-7.1c as the Recommended Alternative.

Table 11 provides a summary of the Alternatives Evaluation Memo results.

**Table 11 Alternatives Evaluation Memo Results**

Alternative	Result	Remark
A-7.1b	Dropped	Dropped in Step 3; outperformed by A-7.1c
A-7.1c	Preferred	<b>Recommended Alternative (now the Preferred Alternative)</b>
A-7.2b	Dropped	Dropped in Step 1; contains trench under I-90/94
A-7.2c	Dropped	Dropped in Step 1; contains trench under I-90/94
A-7.4a	Dropped	Dropped in Step 2; contains steep grades on Ramp WS
A-7.4b	Dropped	Dropped in Step 1; contains trench under I-90/94
A-15.3	Dropped	Dropped in Step 1; contains trench under I-90/94
A-15.4	Dropped	Dropped in Step 4; outperformed by A-7.1c
A-15.5	Dropped	Dropped in Step 2; contains steep grades on Ramp WS

### Further Evaluation

Subsequent to the selection of the Preferred Alternative in December 2012, additional requirements were added to the project. These included 1) providing a wider inside shoulder to accommodate a future managed lane along all

three expressways and 2) physically separating the allowed movement from Ramp NW to exit at Morgan Street from the Ramp SW and westbound I-290 movements, which will not be allowed to exit at Morgan Street.

The Preferred Alternative was presented at the April 3, 2013 Public Hearing. Based on public input received at the hearing, the Department reviewed all the alternatives previously considered and re-evaluated the Preferred Alternative and Alternative 15.4 in more detail. Input was received from the residents of Green Street Lofts, located at 400 S. Green Street, adjacent to the north side of I-290. Concerns were expressed about the proximity of the proposed Ramp NW to the southeast corner of the building. They requested that Alternative 15.4 be reconsidered as it proposed Ramp NW to connect to I-290 along the inside lane rather than the outside lane as shown in the Preferred Alternative.

After the Public Hearing, the two changes to the Preferred Alternative listed above were also applied to Alternative 15.4 because it had not been modified since December 2012, when Alternative 7.1.c became the recommended alternative. This allowed for an equal comparison to the Preferred Alternative (7.1.c). The results of these revisions to Alternative 15.4 are as follows:

- For Alternative 15.4, the “footprint” adjacent to the Green Street Lofts building became wider to accommodate the wider inside shoulder for the future managed lane and the separation of the Ramp NW exit movement to Morgan Street. Consequently, the horizontal distance from the back of the retaining wall on the north edge of the roadway to the southeast building corner of the Green Street Lofts would be approximately 20 feet, similar to the Preferred Alternative.
- Initial findings of the updated geometry for Alternative 15.4 indicate that based upon span lengths and superstructure depths of the ramp structures, numerous ramp movements will incur extremely steep grades in excess of eight percent which are a major safety concern and potential geometric fatal flaws in the proposed design.
- The pavement edge closest to the building in Alternative 15.4 would be approximately 17.9 feet below ground level.
- Alternative 15.4 required lowering the Kennedy Expressway over three feet in a flood prone section. This would require the construction of a new pump station and a new storm sewer outlet to the Chicago River.
- Overall, the horizontal location of mainline and ramps between the two alternatives is relatively the same, but there is a vertical difference.

Based on these finding, the selection of Alternative 7.1.c as the Preferred Alternative was still valid. Further refinements were made to the Preferred Alternative to maximize the separation between the building at 400 S. Green Street and Ramp NW based on input from the Green Street Lofts Homeowners Association board representatives.

### **Preferred Alternative**

The Preferred Alternative, shown as Exhibit 4, meets the Purpose and Need of the project by improving safety, mobility, operational deficiencies and facility condition. It accomplishes other goals of the project by requiring a very minimal amount of land acquisition, requiring no permanent acquisition of CTA property in the median of I-290, being compatible with future expansion on I-90/94, and being constructible.

The most notable aspect of the Preferred Alternative is the Ramp NW flyover. This two-lane flyover solves multiple issues on the project. From a safety standpoint, it eliminates the need for a last moment lane change to access Ramp NW from the left lane of the Ramp NE/Ramp NW C-D road. It also increases capacity with a two-lane cross section; it replaces an existing ramp with tight horizontal and vertical geometry with simpler, more gradual geometry; and it eliminates a weaving area with Morgan Street.

An improved two-lane Ramp EN solves similar issues. It reduces the likelihood for queue backup onto eastbound I-290; it provides improved horizontal alignment and vertical profiles; and it eliminates a forced merge with Ramp WN.

The lane balance along I-90/94 will be improved. Currently, only three lanes in each direction pass through the interchange. The Preferred Alternative provides four lanes, increasing capacity and also reducing the need for lane changes. Five through lanes are provided in each direction up and downstream of the interchange. All eight system movements are maintained as part of the Preferred Alternative. However, the Preferred Alternative geometrics necessitate the removal of five secondary accesses.

The northbound C-D road improves northbound I-90/94 access to the downtown ramps, which include Madison Street, Washington Street, Randolph Street and Lake Street. This northbound C-D road reduces weaving by keeping this traffic flow independent of the Ramp EN merge with northbound I-90/94. Ramp EN has a slip ramp to the northbound C-D road to allow its traffic to access the downtown ramps. The northern end of the northbound C-D road has a slip ramp that allows traffic to return to northbound I-90/94.

The Preferred Alternative maintains much of the existing Circle Interchange appearance from a plan view. However, it adds an additional level of ramps above the cross streets to achieve improved horizontal and vertical geometry: Ramp NW/Ramp NE over Harrison Street; Ramp NW over Halsted Street and Ramp WS/Taylor exit ramp over Harrison Street.

The additional interchange level, along with new mainline, ramp and cross street structures, and new retaining walls, provide an aesthetic enhancement opportunity.

### **Preferred Alternative Determination**

The proposed improvements of the Preferred Alternative address the project need to improve safety. Four areas of the existing interchange were targeted as safety issues. These include improving the following deficiencies: 1) Ramp NW/Ramp NE C-D lane usage; 2) triple convergence of westbound I-290, Ramp NW and Ramp SW; 3) triple divergence along eastbound I-290, with Ramp EN and Ramp ES; and 4) triple convergence of northbound I-90/94, Ramp EN and Ramp WN.

The proposed improvements of the Preferred Alternative address the project need to improve mobility. Improving mobility through the Circle Interchange involves three key steps: 1) improve the lane balance along I-90/94; 2) improve the mobility on Ramp NW; and 3) improve the mobility on Ramp EN.

The proposed improvements of the Preferred Alternative address the project need to improve operational deficiencies by 1) maintaining or reducing overall decision points; 2) improving the design speed of system ramps; and 3) improving the overall weaving situation throughout the interchange area.

Lastly, the proposed improvements of the Preferred Alternative address the project need to improve facility conditions. The Preferred Alternative reconstructs the entirety of the Circle Interchange, thereby improving its condition compared to the existing conditions. It also reconstructs six cross street structures over I-90/94: Taylor Street, Harrison Street (each over northbound I-90/94 and southbound I-90/94), Van Buren Street, Jackson Street, Adams Street and Monroe Street; and two cross street structures over I-290: Peoria Street and Halsted Street. The Preferred Alternative also enhances the aesthetics of the interchange area. The interchange in-fields will be grassed; landscaping will be provided which is consistent with the Master Plan and the discussions at the Project Working Group meetings with the project stakeholders. The aesthetic elements could include gateway features, decorative elements on bridge fascias, lighting and banners highlighting the adjacent neighborhoods such as Greektown and the UIC campus. Selection and application of the specific aesthetic elements will be finalized during Design Engineering as coordination with the City of Chicago and community groups is concluded and interagency agreements regarding funding and maintenance responsibilities are finalized.

The Preferred Alternative is consistent with the *GO TO 2040* Comprehensive Regional Plan endorsed by the Chicago Metropolitan Agency for Planning (CMAP), the Metropolitan Planning Organization for the region, and is included in the Fiscal Year 2010-2015 Transportation Improvement Program endorsed by CMAP.