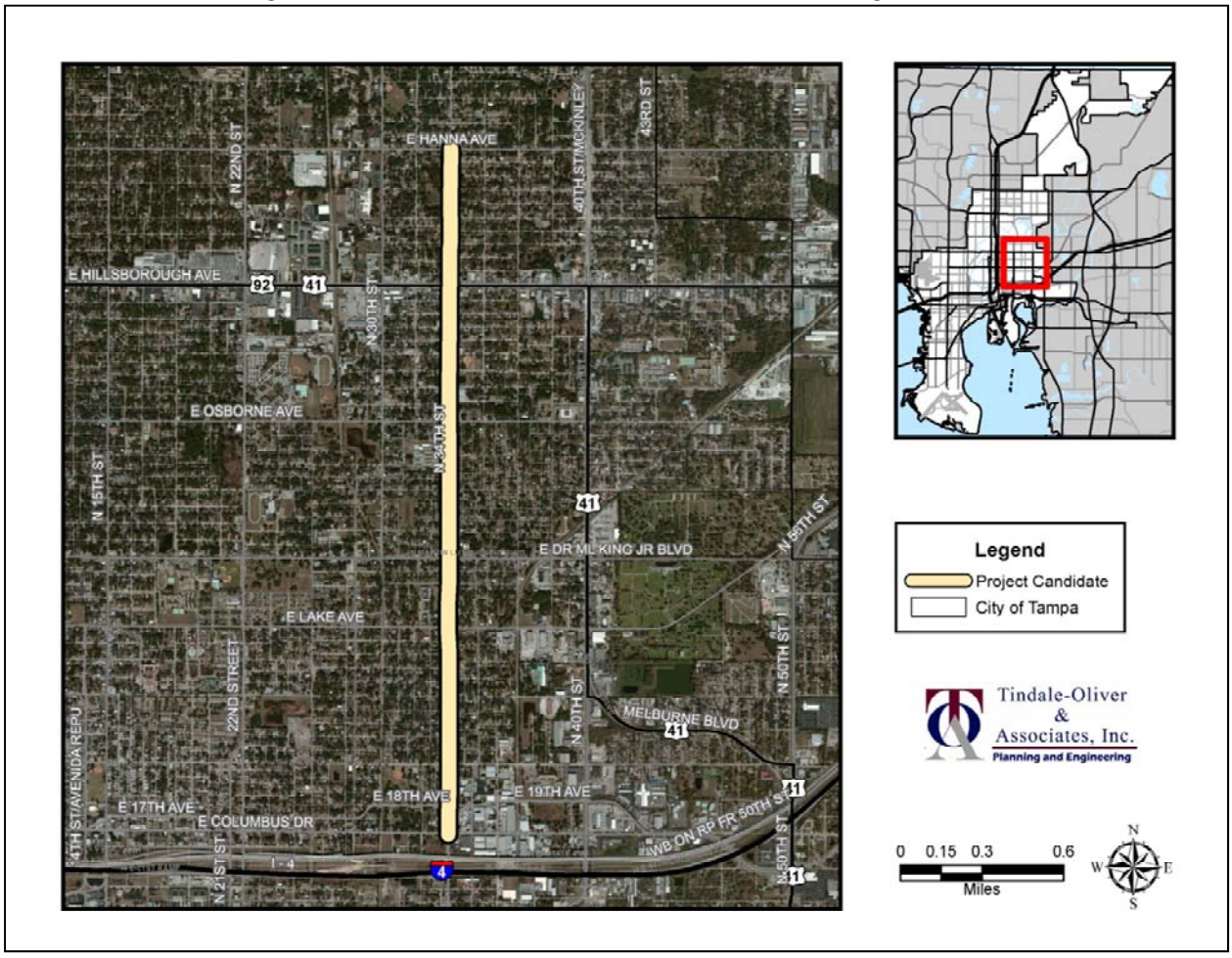
## SI.1 – 34th Street from Columbus Avenue to Hillsborough Avenue

**Figure 1: 34th Street Corridor from Columbus Drive to Hillsborough Avenue**




**Summary**

34th Street from Columbus Drive to Hillsborough Avenue is primarily a 2-lane undivided collector roadway with a posted speed of 30 mph, as shown in Figure 2. 34th Street provides a secondary north/south access between the port area and northeast Tampa with 40th Street being the primary north/south arterial. 34th Street has an average daily traffic volume of 6,000 to 8000.

In a review of city-wide fatal and incapacitating injury crashes from 2009 to 2011, this section of 34th Street was identified as having a clustering (14) of fatal and severe injury crashes. As such, this section of roadway was analyzed for countermeasures to improve safety and apply as a candidate for Highway Safety Improvement Program (HSIP) Off-System Funds. Appendix A: Photo Log contains all the field review photographs taken.

**Figure 2: 34th Street at Chelsea Street**


***Crash Analysis***

A safety analysis for the corridor was conducted. Crash data from January 2009 through December 2011 was reviewed. The data was collected from the City of Tampa Crash Data Management Systems (CDMS), and the FDOT Crash Analysis Reporting System (CARS). The FDOT (CARS) consists only of the Long Form of the Florida Traffic Crash Report, while the City of Tampa Database consists of both the Long and Short Forms reports.

The crashes were reviewed and the following patterns were identified:

- Speed related crashes
- Crashes at "major" east west intersections

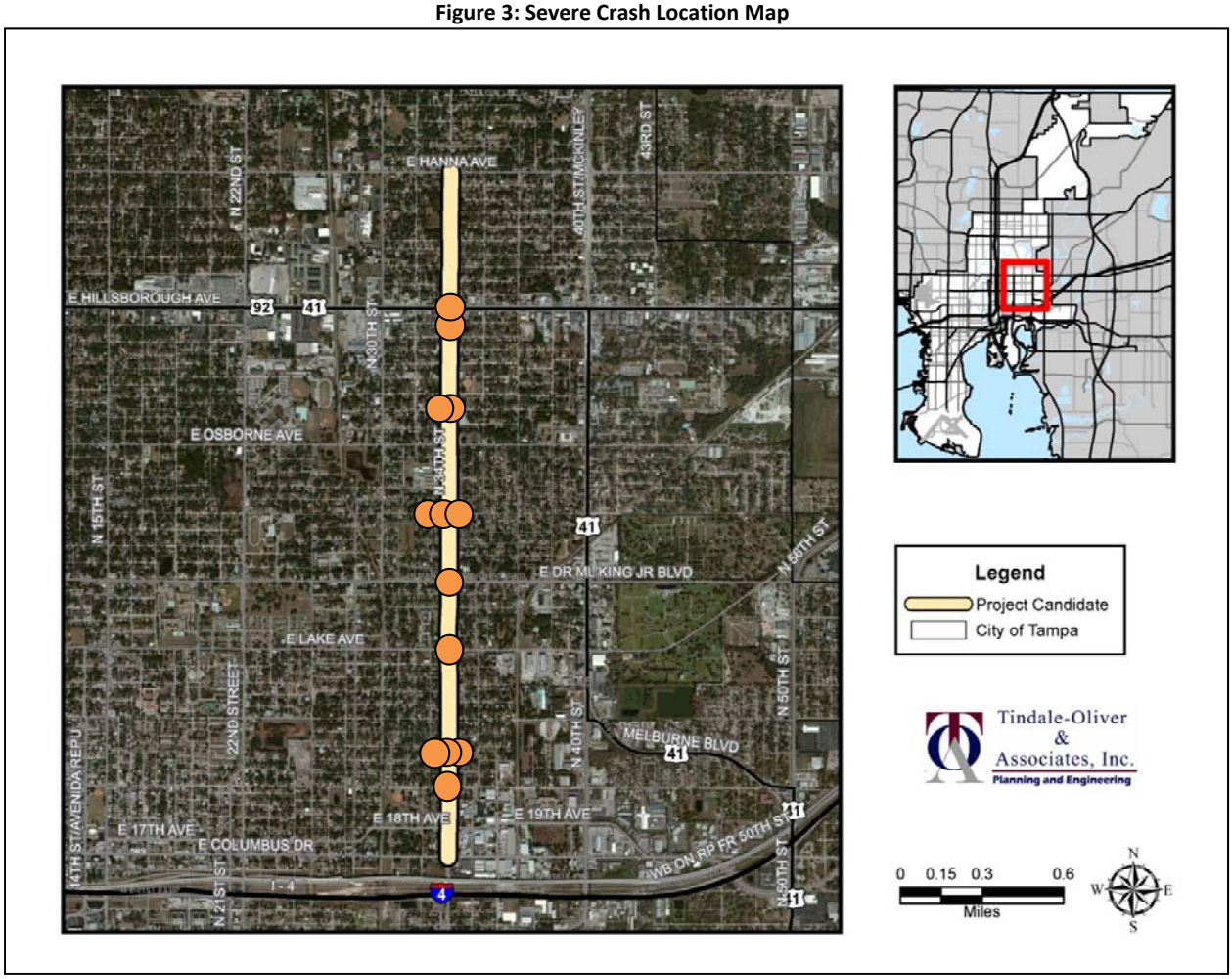
From 2009 to 2011, 34th Street from Columbus to Hillsborough Avenue exhibited the following key crash characteristics listed in Table 1.

**Table 1: Crash Attributes 34th Street**

| | Corridor Crashes | Percent of Total |
|---|---|---|
| All Crashes | 98 | |
| Fatal | 5 | 5% |
| Incapacitating | 9 | 9% |
| Angle | 30 | 31% |
| Left turn | 8 | 8% |
| Sideswipe | 6 | 6% |
| Rear-End | 11 | 11% |
| Ped | 7 | 7% |
| Bike | 2 | 2% |
| Night | 3 | 3% |
| Wet | 7 | 7% |
| At intersection | 50 | 51% |

Figure 3 illustrates the location of fatal and incapacitating injury crashes (severe injury) along the corridor over the three year period between 2009 and 2011. Appendix B: Crash Table contains crash data attributes for all the reviewed crashes along the corridor.

**Figure 3: Severe Crash Location Map**




Speed was identified as the primary contributing factor to the corridor crashes. As such, an analysis was undertaken to determine countermeasures that could reduce travel speeds along the corridor. The corridor has few mainline stop or signal controlled locations.

***Proposed Improvement***

The 34th Street project concept proposes a number of improvements with the goal of improving safety through implementation of countermeasures and by changing the overall character of the roadway. Looking at the corridor as a whole, it was determined that the predominant countermeasures to be implemented involve converting intersections into traffic circles and roundabouts throughout the corridor. These improvements have been identified in FHWA-*SA-12-005 – Proven Safety Countermeasures* as an effective measure that creates a low-speed environment creating substantial safety advantages, particularly effective against injury crashes. Additionally, roundabouts are cited in FHWA's Safety page as a form of traffic calming which curb speeding and some forms of aggressive driving.

Based on the geometrics of this roadway, several strategies were considered to help reduce traveling speed and improve safety along the roadway:

- Option 1: Reduce lane widths and add curb and gutter and medians
- Option 2: Reduce lane widths and add bike lanes
- Option 3: Improve speed control by constructing roundabouts throughout the corridor.
- Option 4: Convert the 4-lane sections to 2-lanes

Options 1 and Option 2 combined with Option 3 were considered to have the most impact. However, Options 1 and 2 carry significant costs that would marginalize the benefit. Therefore, it was determined that the best treatment for the roadway is to install roundabouts at major intersections where right-of-way is available (Option 3), and reduce the 4-lane sections to 2-lane sections (Option 4).

The improvements are summarized as follows and presented conceptually on the following figures:

- Roundabouts
    - Figure 4: 21st Avenue
    - Figure 5: Lake Avenue
    - Figure 6: Osborne Ave
- Lane Diet
    - Figure 7: from Columbus Drive to 21st Street (with turn lanes)
    - Figure 8: from Lake Avenue to Martin Luther King Jr. Boulevard (with two-way left turn lane)
- Bicycle Facilities
    - At design, consider bike lanes and shared lane arrows throughout the corridor.

A detail of each intersection is provided in the Appendix C: Concept Drawings.

**Figure 4: Roundabout at 21st Avenue**

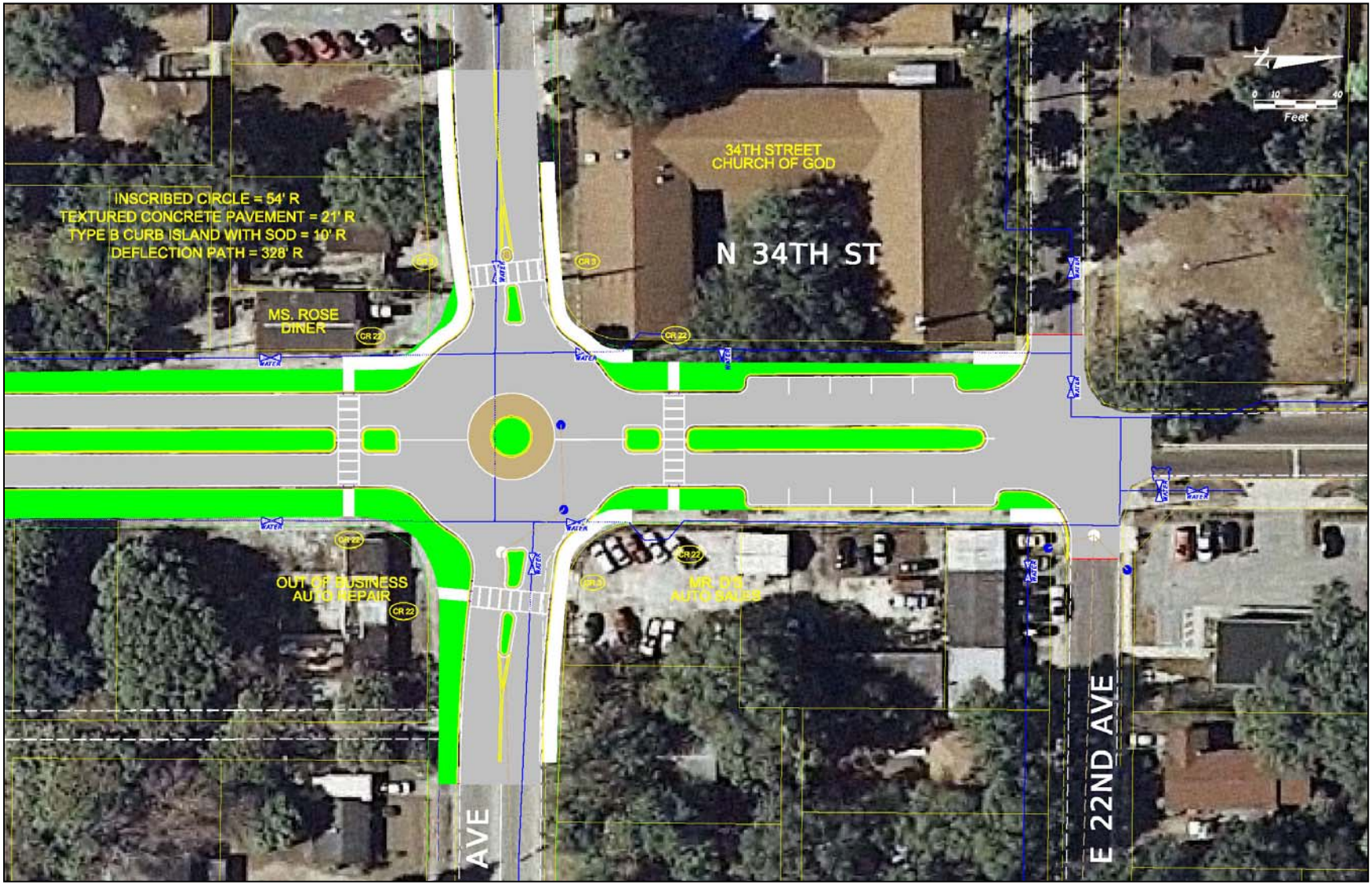


**Figure 5: Roundabout at Lake Avenue**

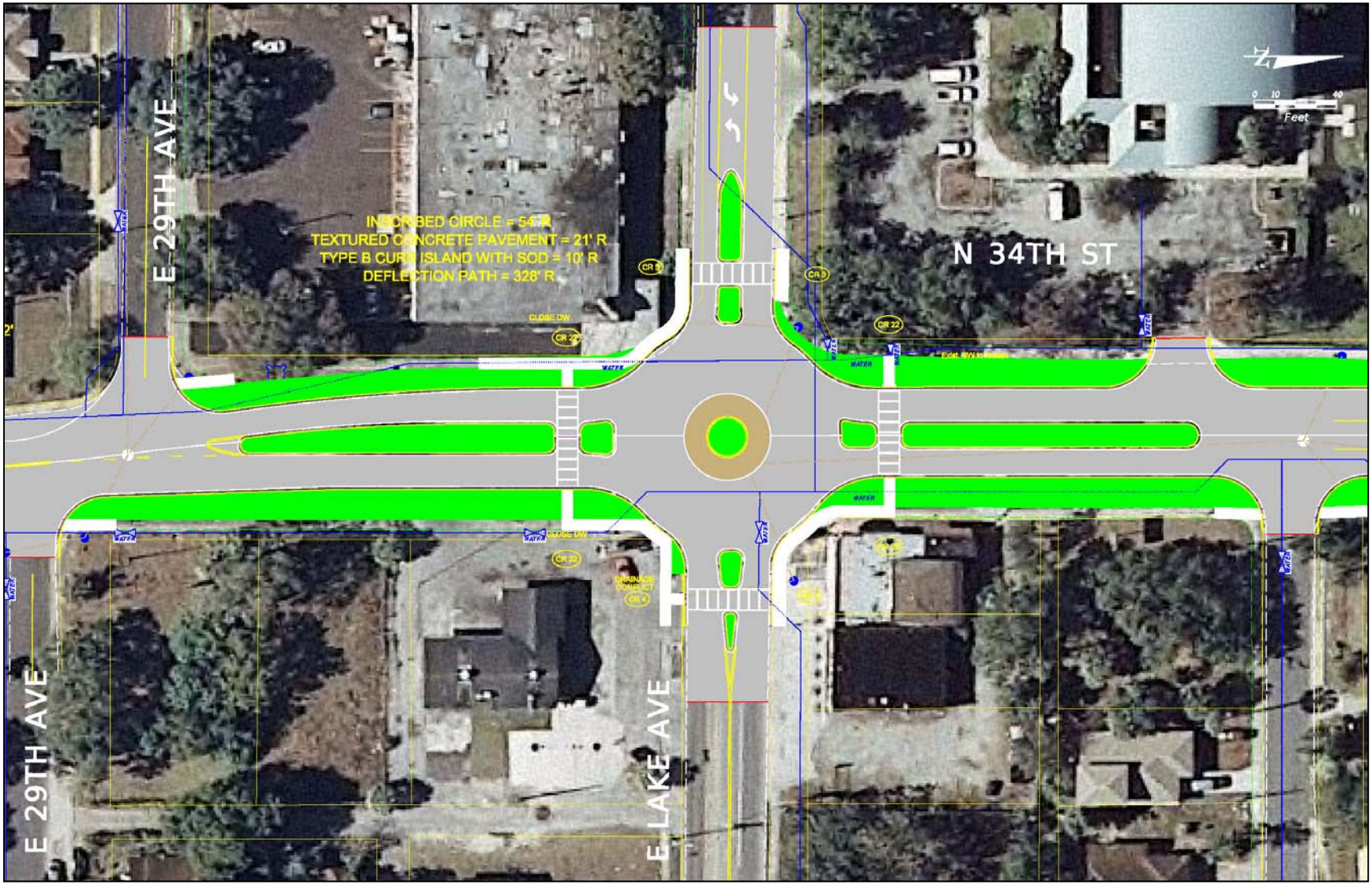


**Figure 6: Roundabout at Osborne (Option 1)**

**Figure 7: Lane Diet from Columbus Drive to 21st Street**

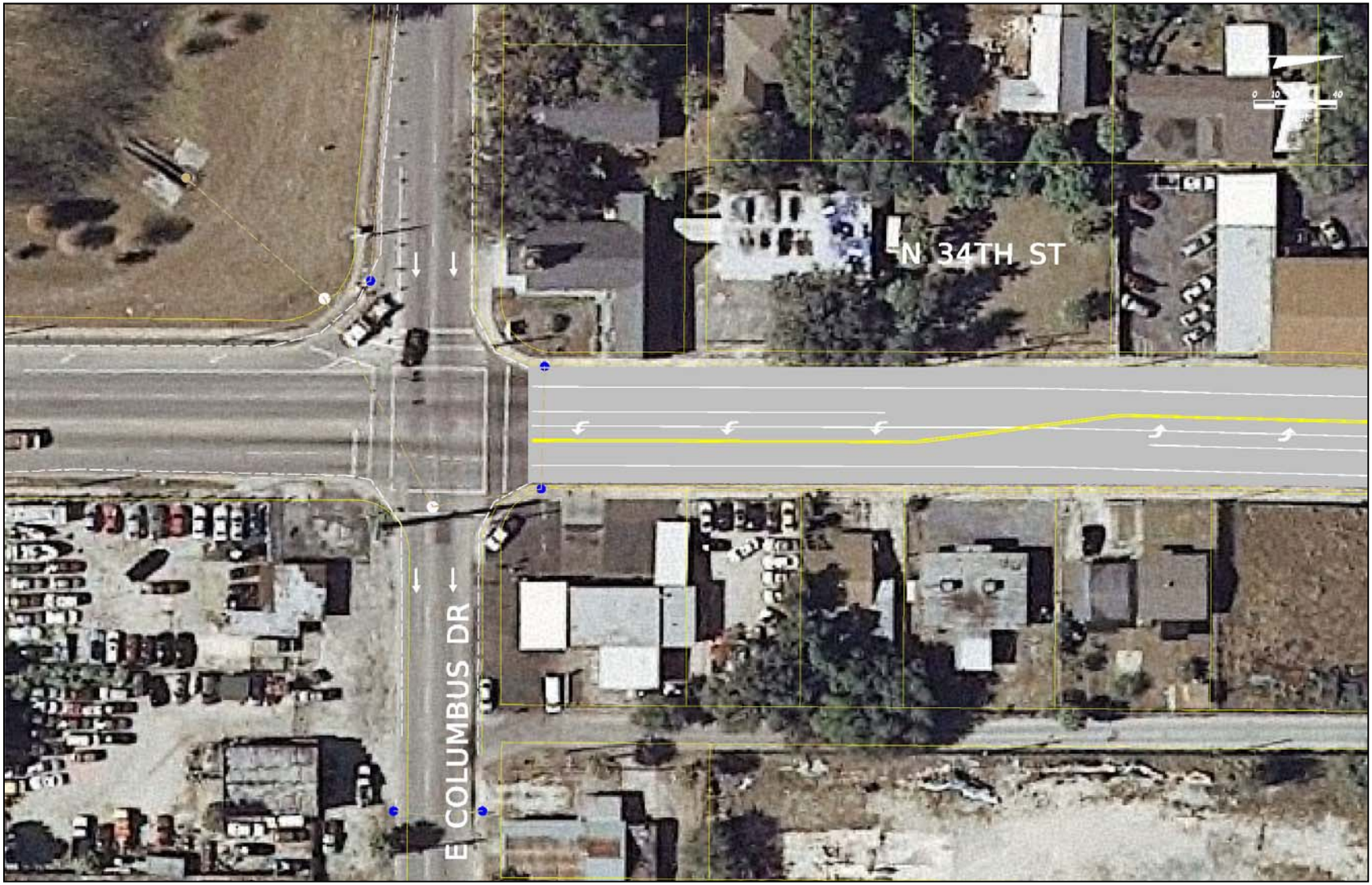
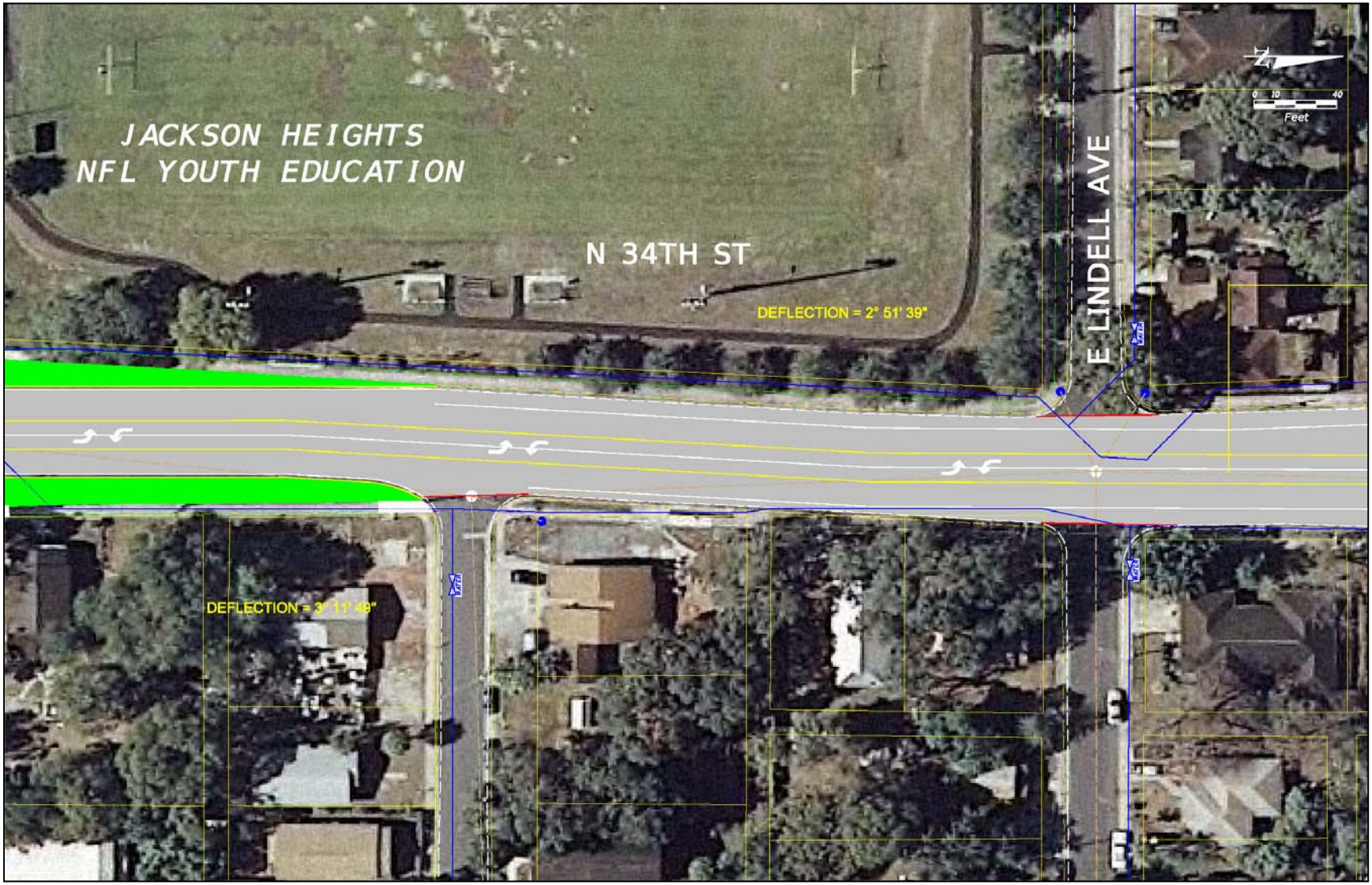


**Figure 8: Lane Diet from Lake Avenue to Martin Luther King Jr. Boulevard**



***Construction and Design Considerations***

Given the nature of these improvements, a thorough constructability review was conducted by the City in order to identify the major items to be considered. Through this review no issues were identified which would be considered to result in "fatal flaws" for the intent of moving forward. However, it is important that the observations be well documented early and considered during ultimate design. Based on this thorough review, it is not anticipated that this project will trigger design exceptions for any of the 13 controlling design elements.

The conceptual design relied on a number of assumptions which were considered to the maximum extent possible for this phase of project review:

- Right of way lines and horizontal and vertical control have not been established. Dated right of way information was provided by the City and Property Appraiser information was also considered. No survey was conducted.
- The design was based on internet (Google Earth) aerial photography and City GIS data.
- Many field reviews were undertaken to review existing conditions.
- Utilities shown are from the City's GIS.
- Every effort was made to keep the design within the limits of existing pavement and sidewalk, as a confident indication that adequate right of way is available.
- Earthwork and grading will need to be performed when a surveyed DTM is available.

Key design considerations are as follows:

- For roundabout review a 40' bus was used as the design vehicle.
- The interior island is considered to be rimmed with textured concrete pavement at 0.06 cross slope and set flush at the asphalt edge, interior to that is a Type B Concrete Curb island with a turf.
- Consideration can be given to providing additional on street parking within the existing paved surface.

The following characteristics of the roadway and project area were observed and noted:

- There is a Fire Station less than 500' north of the end of milling for the proposed 21st Street roundabout.
- There is a midblock crossing at E. 25$^{th}$ Avenue (between 21$^{st}$ Street and Lake Avenue).
- There is a signalized midblock crossing at Potter Elementary School (between Chelsea and Osborne).
- 34$^{th}$ Street is a transit route
- Providing a roundabout at Chelsea is considered infeasible due to the lack of right of way. Advanced warning signage with a flashing beacon has been included for placement on the Chelsea approaches to the intersection. This location was also subject of an RSA recently.
- This corridor is on the City's truck route. However, with parallel corridors, such as 40$^{th}$ Street, providing for truck movement, consideration should be given to removing this area from the City's truck route.

During the design phase of the project, the following should also be considered.

- Right of way corner clips may be required. This will be confirmed during detailed survey.
- Inlet location, grading and drainage will be modified at the roundabouts
- There are likely to be modifications to access to several parcels which may include
    - Driveway closures
    - Driveway width reduction
    - Curbing may be required at the right of way lines in limited locations
    - Provisions for on-street parking
- The intersection at 26th Street is a 4-way Stop and the stop condition on 34th Street will become an inconsistency in the corridor. It is anticipated that modifications to the nature of the corridor will allow consideration of conversion to a 2-way stop.
- There is existing street lighting at the intersections. Lighting levels should be analyzed to assure adequate coverage for the roundabouts. At design, review upgrading and modifying the existing lighting.
- Utility locations and necessary relocates including adjustments to TECO poles.

Available ROW information is provided in Appendix D: Right of Way.

In addition to this review, the intersection of 34th Street and Chelsea Avenue had previously been identified by the City of Tampa as a location of critical concern. In February 2013 a Roadway Safety Audit was undertaken at this location as a joint effort between the City and Department of Transportation and several recommendations were made including:

- Converting 34th and Chelsea Street from a two-way stop-control to an all-way stop due to observed sight distance limitations on side street approaches.
- Extending the sidewalks to remove discontinuity leading to the nearby bus stops.
- Providing additional overhead lighting at bus stops where lighting is inadequate.
- Coordinating improvements to be in line with future use for upcoming community center proposed for southeast quadrant
- Long term removal of vacant structures in the southwest and northwest corners which limit visibility from the side street approaches

***Benefit and Cost Estimation***

Based on a review of the crash data and information from the Crash Modification Factor (CMF) Clearinghouse, the project benefit:cost was calculated. Detailed calculations and forms are summarized below. Figures 9 through 13 list crash reduction factors from the CMF for the proposed improvements. Note that the CMF used for countermeasure from the Clearinghouse correspond with the expected crashes reduction factors cited in *FHWA-SA-12-005 – Proven Safety Countermeasures* for roundabouts.

**Figure 9: CMF Clearinghouse Countermeasure: Road diet (Convert 4-lane undivided road to 2-lanes plus turning lane)**

| CMF | CRF(%) | Quality | Crash Type | Crash Severity | Roadway Type | Area Type | Reference |
|---|---|---|---|---|---|---|---|
| 0.71 [B] | 29 | ★★★★★ | All | All | Minor Arterial | Urban | Harkey et al., 2008 |
| 0.95 | 5 | ★★★☆☆ | All | All | Not specified | | Lyles et al., 2012 |

**Figure 10: CMF Countermeasure: Converting four-lane roadways to three-lane roadways with center turn lane (road diet)**

| CMF | CRF(%) | Quality | Crash Type | Crash Severity | Roadway Type | Area Type | Reference |
|---|---|---|---|---|---|---|---|
| 0.47 | 53 | ★★★★☆ | All | All | Not Specified | Suburban | Persaud et. al, 2010 |

**Figure 11: Figure 12: CMF Clearinghouse Countermeasure: Convert signalized intersection to modern roundabout**

| CMF | CRF(%) | Quality | Crash Type | Crash Severity | Roadway Type | Area Type | Reference |
|---|---|---|---|---|---|---|---|
| 0.68 | 32 | ★★★★☆ | All | Serious injury,Minor injury | Not specified | Not specified | De Brabander and Vereeck, 2007 |
| 0.4 [B] | 60 | ★★★★☆ | All | Serious Injury,Minor Injury | Not Specified | Urban | Rodegerdts et al., 2007 |
| 0.33 [B] | 67 | ★★★★☆ | All | All | Not Specified | Suburban | Rodegerdts et al., 2007 |
| 0.52 [B] | 48 | ★★★★☆ | All | All | Not Specified | All | Rodegerdts et al., 2007 |
| 0.22 [B] | 78 | ★★★★☆ | All | Serious Injury,Minor Injury | Not Specified | All | Rodegerdts et al., 2007 |
| 0.79 | 21 | ★★★★☆ | All | All | Not Specified | Urban and suburban | Gross et al., 2012 |
| 0.34 | 66 | ★★★★☆ | All | Serious injury,Minor injury | Not Specified | Urban and suburban | Gross et al., 2012 |
| 0.58 | 42 | ★★★★☆ | All | All | Not Specified | Suburban | Gross et al., 2012 |
| 0.26 | 74 | ★★★★☆ | All | Serious injury,Minor injury | Not Specified | Suburban | Gross et al., 2012 |

**Figure 13: CMF Clearinghouse Countermeasure: Conversion of stop-controlled intersection into single-lane roundabout**

| CMF | CRF(%) | Quality | Crash Type | Crash Severity | Roadway Type | Area Type | Reference |
|---|---|---|---|---|---|---|---|
| 0.28 | 72 | ★★★★☆ | All | All | Not specified | Urban | Persaud et al., 2001 |
| 0.42 | 58 | ★★★★☆ | All | All | Not specified | Rural | Persaud et al., 2001 |
| 0.12 | 88 | ★★★★☆ | All | Serious injury,Minor injury | Not specified | Urban | Persaud et al., 2001 |
| 0.18 | 82 | ★★★★☆ | All | Serious injury,Minor injury | Not specified | Rural | Persaud et al., 2001 |

Table 2 illustrates the number of crashes and their associated crash reduction factor used for the CMF countermeasure. Utilizing a crash cost of $95,536 (1/2 of $191,071 for undivided 4-5 lane sub-urban roadways), an estimated annual **benefit of $728,299 per year** was calculated. Note that the corridor has both 2-3 lane and 4-5 lane segments, the lower of the two values was assumed for the crash cost of all crashes along the segment.

**Table 2: Benefit Calculations**

| 13. TYPE OF CRASH | TOTAL # OF CRASHES 2009 | 2010 | 2011 | CMF % | TOTAL # TO BE PREVENTED |
|---|---|---|---|---|---|
| Road Diet - All crashes | | | 59 | 29% | 17.11 |
| Signal to Roundabout - All Crashes | | | 5 | 48% | 2.40 |
| Signal to Roundabout - Severe Crashes | | | 1 | 78% | 0.78 |
| Stop to Roundabout - All Crashes | | | 4 | 44% | 1.76 |
| Stop to Roundabout - Severe Crashes | | | 1 | 82% | 0.82 |
| | | | | | 0.00 |
| | | | | | 0.00 |
| | | | | | 0.00 |
| | | | | | 0.00 |
| | | | | | 0.00 |
| | | | | | 0.00 |
| TOTAL | 0 | 0 | 70 | | 22.87 |
| 16. BENEFITS | | | | | |
| A. CRASH REDUCTION | | | | | $728,299 |
| B. OTHER | | | | | |
| C. OTHER | | | | | |
| TOTAL ANNUAL BENEFIT | | | | | $728,299 |

Table 3 illustrates the average annual cost for the improvement. Based on a review of the proposed improvements, this project had an estimated cost of $1,385,278 and a life cycle of 20 years. This calculates to a **project cost of $101,169 per year**. Appendix E: Cost Estimate details the assumptions for the improvement costs.

**Table 3: Cost Calculations**

| 15. ANNUAL COST OF IMPROVEMENTS | | | | |
|---|---|---|---|---|
| **TYPE** | **COST** | **LIFE** | **CRF** | **AN'L COST** |
| A. R.O.W.: | | | | |
| B. P.E.C.E.I.: | $277,056 | 20 | 0.07358 | $20,386 |
| C. STRUCTURE: | | | | |
| D. ROADWAY: | $1,108,223 | 20 | 0.07358 | $81,544.97 |
| E. PAVEMENT: | | | | |
| F. SIGNAL: | | | | |
| G. LIGHTS: | | | | |
| H. SUBTOTAL: | $1,385,278 | | | $101,931 |
| I. CHANGE IN MAINTENANCE: | | | | $0 |
| J. CRASH CLEANUP: | | | | ($762) |
| **K. TOTAL:** | | | | **$101,169** |

***Benefit:Cost and Net Present Value (NPV)***

Based on the Benefit and Cost information discussed above, the B:C ratio for this project is estimated at **7.20**. At the end of the projects life (20 years) the project is estimated to have a **NPV of $7,458,503.** The calculation steps for the NPV calculations are shown in Table 4.

**Table 4: Net Present Value Calculations**

| Project Name | |
|---|---|
| Current Year | 2014 |
| Project Completion | 2016 |
| Project Life | 20 |
| Project Category | |
| Discount Rate | 0.04 |
| **Project Ends** | 2035 |
| **NPV** | **$7,458,503** |

Estimated Reduction in Crashes = 7.22 crashes/year; Total Annual benefit = $429,846; Cost Per Crash $59,536

| Year # | Calendar Year | Estimated Cost | Estimated Benefits | Discount Factor | Discounted Cost | Discounted Benefits |
|---|---|---|---|---|---|---|
| 0 | 2014 | $1,385,278 | | 1.000 | -$1,385,278 | $0 |
| 1 | 2015 | | | 0.962 | $0 | $0 |
| 2 | 2016 | | | 0.925 | $0 | $0 |
| 3 | 2017 | | $728,299 | 0.889 | $0 | $647,455 |
| 4 | 2018 | | $728,299 | 0.855 | $0 | $622,553 |
| 5 | 2019 | | $728,299 | 0.822 | $0 | $598,609 |
| 6 | 2020 | | $728,299 | 0.790 | $0 | $575,585 |
| 7 | 2021 | | $728,299 | 0.760 | $0 | $553,447 |
| 8 | 2022 | | $728,299 | 0.731 | $0 | $532,161 |
| 9 | 2023 | | $728,299 | 0.703 | $0 | $511,693 |
| 10 | 2024 | | $728,299 | 0.676 | $0 | $492,013 |
| 11 | 2025 | | $728,299 | 0.650 | $0 | $473,089 |
| 12 | 2026 | | $728,299 | 0.625 | $0 | $454,893 |
| 13 | 2027 | | $728,299 | 0.601 | $0 | $437,397 |
| 14 | 2028 | | $728,299 | 0.577 | $0 | $420,575 |
| 15 | 2029 | | $728,299 | 0.555 | $0 | $404,399 |
| 16 | 2030 | | $728,299 | 0.534 | $0 | $388,845 |
| 17 | 2031 | | $728,299 | 0.513 | $0 | $373,889 |
| 18 | 2032 | | $728,299 | 0.494 | $0 | $359,509 |
| 19 | 2033 | | $728,299 | 0.475 | $0 | $345,682 |
| 20 | 2034 | | $728,299 | 0.456 | $0 | $332,386 |
| 21 | 2035 | | $728,299 | 0.439 | $0 | $319,602 |

***Conclusion***

Based on the detailed constructability review and the analysis, this project though complex does not appear to pose any "fatal flaws". The complexity of this project is considered to be in line with the potential safety benefits to this corridor which exhibits significant crash history and a high level of severe crashes.

This project has an estimated B:C ratio of 7.20. Additionally it is estimated that this project will mitigate 7.62 total crashes per year, of which approximately 1.2 per year are fatal or incapacitating injury crashes. **Based on this report, this project meets the qualifying criteria to be eligible for HSIP project funds.**