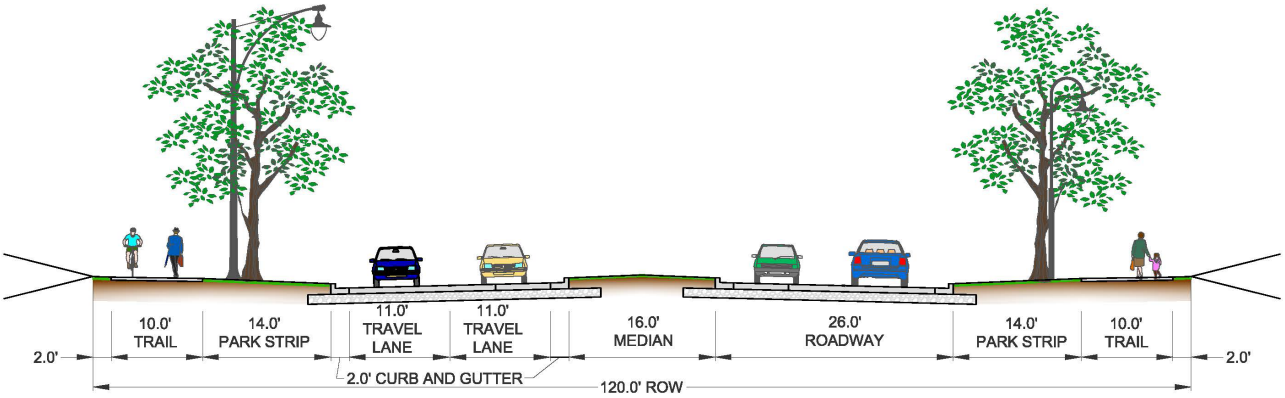
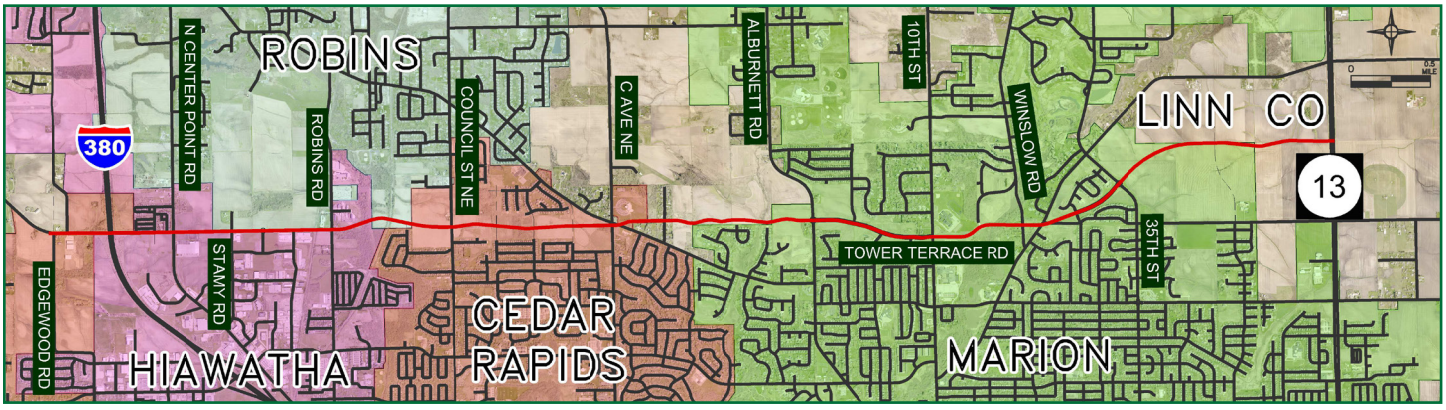
Hiawatha • Robins • Cedar Rapids • Linn County • Marion • Iowa DOT

Tower Terrace Road

Corridor Management Plan Update

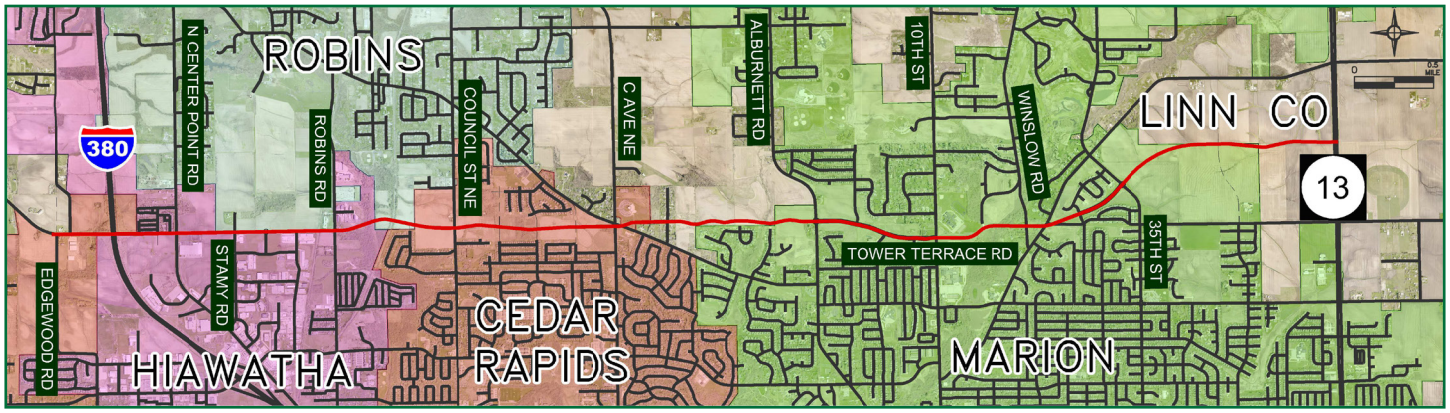
Updated September 2018





Prepared for Corridor MPO by Anderson Bogert

PAGE INTENTIONALLY LEFT BLANK



ACKNOWLEDGEMENTS

Corridor MPO Policy Board

Nick AbouAssaly, Mayor, Marion
John Bender, Citizen Representative, Marion
Bill Bennett, Mayor, Hiawatha
Ken DeKeyser, Development Services Manager, Cedar Rapids
Bernie Frieden, Mayor, Fairfax
Sandi Fowler, Assistant City Manager, Cedar Rapids
Brad Hart, Mayor, Cedar Rapids
Roy Heseman, Water Pollution Control Plant Manager, Cedar Rapids
Chuck Hinz, Mayor, Robins
Denise Hoy, City Clerk/Administrator, Ely
René Gadelha, City Council Member, Marion
Brent Oelsen, Supervisor, Linn County
Scott Olson, City Council Member, Cedar Rapids
Scott Overland, City Council Member, Cedar Rapids
Jeff Pomeranz, City Manager, Cedar Rapids
Ryan Scheckel, Mayor, Palo
Susie Weinacht, City Council Member, Cedar Rapids
Jen Winter, Public Works Director, Cedar Rapids

Corridor MPO Staff

Elizabeth Darnall, Regional Transportation Planner
Hilary Hershner, Regional Transportation Planner
William Micheel, MPO Manager
Fernando Oliveira, Intern
Haley Sevening, Intern
Brandon Whyte, Multimodal Transportation Planner

Project Advisory Group

Michael Barkalow, City Engineer, Marion
John Bender, City Engineer, Hiawatha
Kesha Billings, Associate Planner, Marion
Kim Downs, City Administrator, Hiawatha
Kent Ellis, Local Systems Engineer, Iowa Department of Transportation
Brenna Fall, CIP Engineering Program Manager, Cedar Rapids
Chuck Hinz, Mayor, Robins
Brad Ketels, County Engineer, Linn County
Brent Oleson, Supervisor, Linn County
John Witt, Traffic Engineering Program Manager, Cedar Rapids

Consultant Team

ANDERSON BOGERT

HDR

TABLE OF CONTENTS

APPENDIX

ADVISORY GROUP MEETING MINUTES

Meeting One, Pages _

Meeting Two, Pages _

Meeting Three, Pages _

CANADIAN NATIONAL RAILWAY CORRESPONDENCE, PAGES _ - _

COST OPINIONS

Edgewood Road to West Edge of I-380 Interchange, Pages _

East Edge of I-380 Interchange to Center Point Road, Pages _

Center Point Road to Stamy Road, Pages _

Robins Road to Council Street (Bridges of Dry Creek and Canadian National Railway), Pages _

Council Street to Turtle Run Extended, Pages _

Turtle Run Extended to Summerset Extended, Pages _

Summerset Extended to C Avenue, Pages _

C Avenue to East Edge of Area C, Pages _

East Edge of Area C to East Edge of Kloubec Property, Pages _

East Edge of Kloubec Property to Alburnett Road, Pages _

Relocated Winslow to Existing Winslow (Bridge over Indian Creek), Pages _

The Ridge at Indian Creek to Beckner-Robinson-Vaughn Farms, Pages _

Beckner-Robinson-Vaughn Farms to IA Highway 13, Pages_

I-380 Pedestrian Underpass, Page _

DURABLE PAVEMENT LIFESPAN, PAGE _

EARTHWORK COST ESTIMATE BY PROJECT PHASE, PAGE _

ENVIRONMENTAL MEMORANDUM, PAGES _ - _

FUTURE LAND USE MAP, PAGE _

PLAN AND PROFILE SHEETS

Overview Page, Page _

East Edge of I-380 Interchange to Center Point Road, Page _

Center Point Road to Stamy Road, Page _

Robins Road to Council Street (Bridges of Dry Creek and Canadian National Railway), Page _

Council Street to Turtle Run Extended, Page _

Turtle Run Extended to Summerset Extended, Page _

Summerset Extended to C Avenue, Page _

C Avenue to East Edge of Area C, Page _

East Edge of Area C to East Edge of Kloubec Property, Page _

East Edge of Kloubec Property to Alburnett Road, Page _

Relocated Winslow to Existing Winslow (Bridge over Indian Creek), Page _

The Ridge at Indian Creek to Beckner-Robinson-Vaughn Farms, Page _

Beckner -Robinson-Vaughn Farms to IA Highway 13, Page _

I-380 Pedestrian Underpass, Page _

PUBLIC INVOLVEMENT MEMORANDUM, PAGES _ - _

STRUCTURAL MEMORANDUM, PAGES _ - _

TYPICAL TOWER TERRACE ROAD CROSS SECTIONS

Between Dry Creek and Canadian National Railway Bridges, Page _

Typical Bridge Section (Applies to all bridges: Dry Creek, Canadian National Railway, Indian Creek), Page _

North Center Point Road to Robins Road, Page _

On Council Street at Tower Terrace Road, Page _

Over Bridge, Page _

Roadway Widening (From east of N. Center Point Road to west of Robins Road), Page _

Widening, Page _

EXHIBITS

DEFINITIONS

Access Spacing: The distance between adjacent entry points to properties along roadways. May be longer or shorter depending on road curvature and design speed.

At-grade: On the same level or elevation.

Better Utilizing Investments to Leverage Development (BUILD) Grant: Federal program that grants funds' investments in transportation infrastructure, including transit, with an increased emphasis on projects that are located in rural areas.

Back of Curb: The farthest edge of a raised curb from the centerline of a road that is adjacent to a street.

Clear Zone: The total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles.

Crest K: The length of the crest (hill) vertical curve divided by the total change in gradient in the vertical curve. Used to describe how sharp a hill is. The smaller the k value, the sharper the hill.

Complete Streets: Transportation facilities that include safe, attractive, and comfortable access and travel for all anticipated modes of travel

Construction Administration: Ensures that construction projects are completed in an environmentally safe, efficient, and safe manner. May also help with scheduling, material certification, and sourcing.

Curve Length: The length of a horizontal or vertical curve when it is placed into an alignment.

Design Speed: The selected speed used to determine the various geometric features of the roadway.

Diverging Diamond Interchange: An alternative to the conventional diamond interchange in which two directions of traffic on the non-freeway road cross to the opposite side of the roadway on both sides of the bridge at the freeway eliminating the need for left-turning vehicles to cross the paths of approaching through vehicles.

Doweled Median: Strip of PCC concrete that is between the lanes of opposing traffic on a divided highway. Built on top of the lane pavement and held in place with straight or deformed rebar, or dowels.

Earthwork: The disturbance of soil or earth by any means, including excavation (including subsurface), tunneling, drilling, infilling, or land rehabilitation.

Environmental Analysis: Analysis determining if federal action has the potential to cause significant environmental effects.

Environmental Clearance: Gained from the Federal Highway Administration, it is a mandatory requirement to begin construciton for any expansion, modernization, or new construction.

Environmental Review: The process of reviewing a project and its potential environmental impacts to determine whether it meets federal, state, and local environmental standards.

Federal-Aid: Monetary assistance granted by a federal government to a person or group in support of an enterprise regarded as being in the public interest.

DEFINITIONS

General Obligation Bonds (GOB): A public entity borrows money against the future revenues expected to be generated by the city through taxes and/or fees over time.

Grade: Also called slope; the degree or angle at which something rises, expecially roadways or paths.

Grade Separated: A junction of two or more surface transport alignments at different heights so they will not disrupt traffic on the other transit routes, such as a bridge or tunnel.

Green Street: A street that includes tree plantings and other plant materials to create a greener roadway in terms of appearance; intending sustainable design practices be included in the design of roadways to lessen environmental impact.

Gutter Pan: Part of a curb and gutter section of the roadway; the extension of the roadway pavement that water and vehicles must traverse before coming in contact with the curb.

Horizontal Alignment: The positioning of a roadway, as shown in the plan view, using a series of straight lines called tangents connected by circular curves.

Horizontal Curve: Provides a transition between two straight strips of roadway, allowing a vehicle to negotiate a turn at a gradual rate rather than a sharp cut.

K Value: The horizontal distance required to achieve a 1% change in the slope of a vertical curve. Used to describe how sharp a valley (or sag) or hill (or crest) is. The smaller the k value, the sharper the valley or hill.

Logical Termini: Rational end points for a transportation improvement or a review of the environmental impacts of a certain project.

Median: Reserved area that divides opposing lanes of a roadway.

Median Nose: The rounded or square end of a median between a divided roadway. Usually located at an intersection or other crossing.

Object Setback: An area provided adjacent to the roadway that is clear of obstructions measure from the face of curb. The purpose of the object setback is to provide an operational clearance to increase driver comfort and avoid a negative impact on traffic flow.

Park Strip: The area of land between the back of curb and the sidewalk.

Point of Vertical Intersection (PVI): The point where two adjacent grade lines meet in a vertical curve.

Public Frontage: The land between the street and the private property line adjacent to the roadway.

Prestressed Beam Bridge: A steel reinforced concrete bridge that consists of a concrete slab deck with supporting beams underneath that carry the load of the bridge. The beams are either precast or cast and in place with stress being introduced into the reinforcing fibers before a weighted load is applied.

Revitalize Iowa's Sound Economy (RISE): Program that promotes economic development in Iowa through the establishment, construction, and improvement of roads and streets. Targeted toward value-adding activities that boost the local economy and provide the maximum economic impact to the state.

Right-of-Way (ROW): The land (usually a strip) acquired for or devoted to transportation purposes.

DEFINITIONS

Right-of-Way Acquisition: The act of acquiring privately owned land for use on public projects or programs. This may include property along roadways or parcels of land for a building.

Platting: To plan or make a map of an area before design or construction work takes place.

Primary Road Funds: Money used for the establishment, construction, and maintenance of the primary road system. The Primary Road System consists of roads and streets, both inside and outside the boundaries of municipalities, which are under the jurisdiction of the DOT.

Road Use Tax Allocations: Major state funding source for the construction, maintenance, and supervision of roads.

Sag K: The length of the sag (depression) vertical curve divided by the total change in gradient in the vertical curve. Used to describe how sharp a valley, or sag, is. The smaller the k value, the sharper the valley.

Slab Bridge: A short-span bridge consisting of a reinforced concrete slab resting on abutments.

Station: Used as a measurement of distance along an alignment. Each station is 100 feet.

Stopping Sight Distance: The distance needed for drivers to see an object on the roadway ahead and bring their vehicle to a stop safely before a collision occurs.

SWAP Funds: Switching federal-aid dollars for primary road funds.

Tax Increment Finance (TIF): Depending on the community, and whether TIF districts are available, TIF funds can be used to bond projects and pay off the bond using an incremental tax from development. Available funds are tied to the value of the TIF district.

Traffic Analysis: A detailed examination and study of a transportation system or network. Involves data collection, analyzing the data, and then a report summarizing the findings.

Typical Sections: A section made by a plane cutting through the roadway at a right angle. Used as a guideline for planning of a project and the quantities of materials required.

Uneconomic Remnants: A parcel of real property in which the owner is left with an interest after the partial acquisition of the owner's property, and which the Agency has determined has little or no value or utility to the owner.

Vertical Alignment: The vertical aspect of the road, including crest (hills) and sag (valleys) curves, and the straight grade lines connecting them.

Vertical Clearance: The maximum vertical drop distance from the lowest point of a bridge span, or other similar structure, down to the ground or water surface beneath the bridge span.

Vertical Curve: Provides a transition between two sloped roadways, allowing a vehicle to negotiate the elevation rate change at a gradual rate rather than a sharp cut.

ACRONYMNS

AASHTO: American Association of State Highway and Transportation Officials

BUILD Grant: Better Utilizing Investments to Leverage Development

BVCS: Beginning Vertical Curve Station

BVCE: Beginning Vertical Curve Elevation

Corridor MPO: Corridor Metropolitan Planning Organization

CN RR: Canadian National Railway

DOT: Department of Transportation

DDI: Diverging Diamond Interchange

FA: Federal Aid

FFY: Federal Fiscal Year

GOB: General Obligation Bonds

ICAAP: Iowa Clean Air Attainment Program

NEPA: National Environmental Policy Act

PCC: Portland Cement Concrete

PVI: Point of Vertical Intersection

RISE: Revitalize Iowa's Sound Economy

ROW: Right-of-way

SUDAS: Statewide Urban Design and Specifications

TIF: Tax Increment Financing

TIGER Grant: Transportation Investment Generating Economic Recovery

VTTS: Value of Travel Time Savings

INTRODUCTION

OVERVIEW

This plan is an update of the original Tower Terrace Road Corridor Management Plan completed in March of 2010.

The purpose of this plan is to revisit the goals and objectives identified in the 2010 plan to confirm their application to the current vision of the jurisdictions along the corridor. Additionally, this plan builds upon and supplements the work originally done for the Corridor Management Plan, taking it to the next step to provide a more robust implementation plan.

The implementation plan includes:

- Providing limits for environmental analyses,
- Phasing the corridor into financially manageable sized construction projects,
- Developing conceptual plans and cost estimates for each project,
- Assigning priority for each project,
- Recommending cost sharing,
- Identifying funding sources, and
- Developing an implementation schedule.

Jurisdictions and agencies involved include:

- City of Hiawatha
- City of Robins
- City of Cedar Rapids
- Linn County
- City of Marion
- Iowa Department of Transportation (DOT)

GENERAL BACKGROUND

Tower Terrace Road has been planned since the 1960s, and evidence of subdivision plats with right-of-way reservations occurred as early as 1977. Fifty years later, this plan is starting to become reality.

There are a few sections of Tower Terrace Road that exist as two-lane, paved, rural roadways (*see Figure 1*). The City of Marion has constructed segments of Tower Terrace Road to date, through public/private partnerships, which generally follow the 2010 Corridor Management Plan concept (*see Figure 2*). At this time, the City of Marion has the longest amount of Tower Terrace Road segments that follow the 2010 Corridor Management Plan concept.

FIGURE 1: Existing Segment of Tower Terrace Road in Hiawatha/Robins, 2018. Aerial: Linn County, 2018

FIGURE 2: Existing Segment of Tower Terrace Road in Marion, near 10th Street, 2018.
Aerial: Linn County, 2018; Photo: City of Marion, 2018

INTRODUCTION

More recently, a proposed interchange at I-380 and Tower Terrace Road is in the initial stages of design through the Iowa DOT and is expected to be constructed starting in 2021.

Corridor MPO Staff involved an Advisory Group in the development of the original Corridor Management Plan. This advisory group included representatives from Hiawatha, Robins, Cedar Rapids, Marion, Linn County, and the Iowa DOT. For this plan update, the Advisory Group was also instrumental in devising and making recommendations, along with Corridor MPO Staff. This plan has now been written twice.

USE OF THIS DOCUMENT

The purpose of this document is to advance the concepts developed in the 2010 Tower Terrace Road Corridor Management Plan into an implementable set of individual, phased projects that can be completed on schedule. To create a reasonable plan that can be accomplished, this document includes project limits, more detailed budgetary costs, priorities, and timelines.

This plan is a standalone document that incorporates the applicable elements of the 2010 Tower Terrace Road Corridor Management Plan and the current community vision for this corridor with updated design standards and practices. The intent is to identify the major steps to advance each project to construction, including:

- Environmental Review
- Preliminary Plans
- Right-of-way Acquisition
- Preparation of Bid Documents
- Funding
- Construction

This plan defines environmental review limits for major sections of Tower Terrace Road with logical termini (e.g., connecting from major intersection to major intersection and not bias the environmental analysis of the adjacent major sections). Within these environmental review limits will be a subset of individual construction projects.

This plan contains cost estimates for each project as a standalone construction effort. In addition to the project cost estimates, this plan also contains funding strategies and cost-saving options that jurisdictions could employ to assemble a funding package for construction of each project.

FIGURE 3: Existing Tower Terrace Road, near 35th Street in Marion, 2018

FIGURE 4: Existing Tower Terrace Road, near Winslow Road in Marion, 2018

FIGURE 5: Existing Tower Terrace Road, near Alburnett Road in Marion, 2018

INTRODUCTION

An approximate timeline for construction is included in the Projects section of this plan. It details the priorities used to develop the project timeline (such as current readiness to build, funding that is already in place, etc.).

Finally, the Appendix includes plan and profile sheets, and key cross sections for each of the 14 remaining projects. These conceptual plans are intended to demonstrate the corridor design principals developed by the Advisory Group. The plan sheets are revised from the original alignment of Tower Terrace Road to provide more curvature to the roadway to help control speeds and make the corridor more visually appealing.

This plan is intended to build upon and update the previous plan. The Tower Terrace Road corridor boundaries for this plan are from Edgewood Road to Highway 13, spanning six jurisdictions, including the Iowa DOT which has jurisdiction over the I-380 interchange at Tower Terrace Road and IA Highway 13 at the east end of the Tower Terrace Road corridor. Because this is a joint effort of the Cities, County and Iowa DOT, it is important to maintain the cooperation that has been key to the successful advancement of Tower Terrace Road to this point.

PLAN UPDATE PROCESS

The plan update was developed by assembling an Advisory Group, much like the 2010 Plan, representing the four cities (Cedar Rapids, Hiawatha, Marion, and Robins) and Linn County. The Advisory Group also included the Iowa DOT as they are the jurisdictional agency for I-380 and for IA Highway 13, and Corridor MPO Staff as facilitator and project manager. The group members represent a mix of skills and expertise including planners, administrators, engineers, and policy-makers. The Advisory Group was charged with the tasks of determining the Planning Area, reviewing the Plan Vision Statement, and revisiting the Plan Goals, as well as providing feedback on design elements, alignment options, and implementation plan.

The plan update process began with data collection and a series of two meetings with the Advisory Group to work on vision, goals, general design, and alignment. Then, one-on-one meetings were held with each of the Advisory Group members to identify issues and concerns unique to each jurisdiction. Finally, a draft plan was submitted and was the focus of the third and final Advisory Group meeting (meeting minutes of each Advisory Group meeting are in the attached Appendix). A public information meeting was held to present the plan and finalize the process. Figure 6 is a flow chart showing the course of plan update development.

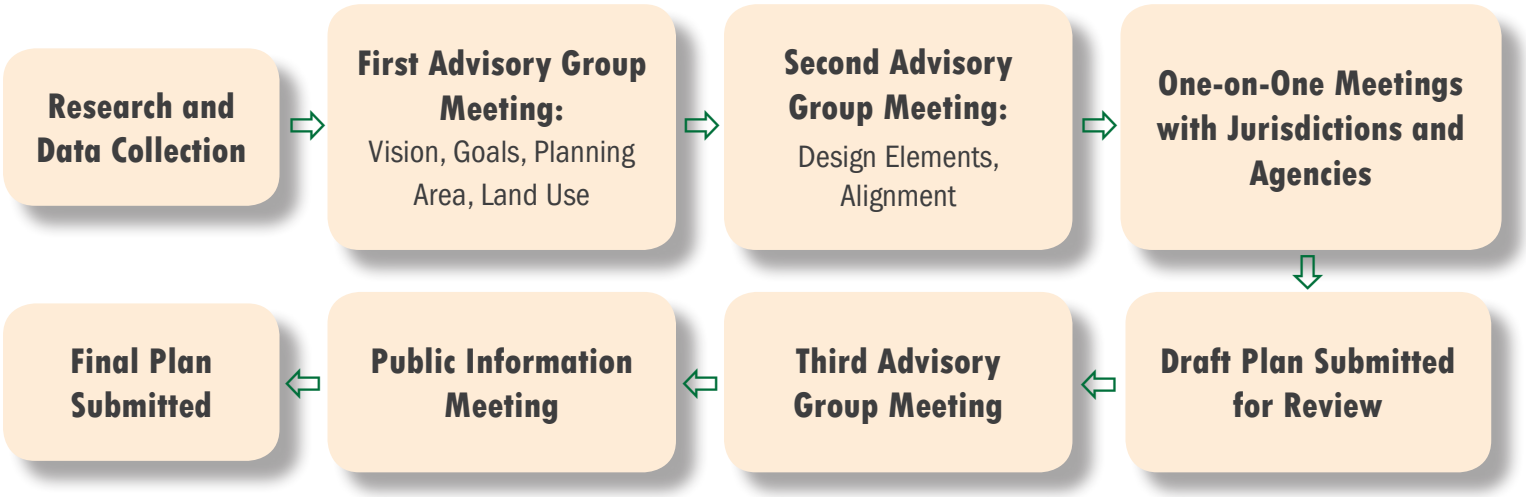


FIGURE 6: Flow Chart of Plan Update Development

INTRODUCTION

As part of the update process, the Vision Statement was slightly revised and is included here in its revised form. Likewise, the original goals were re-examined. The Advisory Group recommended the Goals be less abstract and refined to focus on implementation of the projects.

For reference, a summary of changes to the Tower Terrace Road Corridor Managment Plan are shown in Table 1.

Vision Statement:

The Tower Terrace Road corridor will be a regionally-significant, multi-modal transportation corridor constructed for the benefit of citizens in multiple jurisdictions that is safe, efficient, effective, aesthetically appealing, and environmentally friendly.

Goals:

- Update the document to guide the implementation of the Tower Terrace Road corridor
- Acquire a contiguous east-west transportation corridor
- Build the intended arterial transportation network
- Develop funding sources and agreements for the orderly funding and construction of Tower Terrace Road
- Plant at least 30% of the Tower Terrace Road corridor in native plant species pollinator habitat

SUMMARY OF TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN CHANGES

ORIGINAL PLAN	UPDATED PLAN
Multi-modal corridor not included original plan.	Updated vision statement to emphasize multi-modal transportation and aesthetics.
On-street bike lanes at full build (four vehicle lanes).	Bike lanes only present for initial build. Converted to vehicle lanes at full build.
10-foot wide trail on north side, 6-foot wide sidewalk on south side.	10-foot wide trail on both sides.
12-foot wide travel lanes desirable.	11-foot wide travel lanes desirable.
Planning area terminated at I-380.	Planning area extended west of I-380 to include relocated Edgewood Road.
Included plan view alignment and roadway layout.	Adds plan, profile, and cross section information based on aerial contour data.
Included general location of access points.	Updated access point locations and types based on actual constructed access and supplements plans to show access stubs.
Identified concepts of including trees and landscape along corridor.	Set a minimum goal of 30% pollinator plant mix along the corridor to support the goal of 1,000 acres of pollinator plantings endorsed by the jurisdictions.

TABLE 1: Summary of Tower Terrace Road Corridor Management Plan Changes

PUBLIC INVOLVEMENT

OVERVIEW

Tower Terrace Road has included a public involvement program from the start of plan development. From the 2010 Plan effort, a Stakeholders Group was comprised of more than 30 area residents, including homeowners, developers, business owners, environmental organizations, and school district representatives. This Stakeholder Group was identified to solicit input from those most directly affected by the corridor.

The Stakeholders Group met six times in the initial plan development from 2010. The group was concerned that Tower Terrace Road will someday look like Collins Road. Coinciding with that concern, that group indicated they generally wanted the roadway to be as green as possible, while providing travel accommodations for all modes of transportation. They preferred a boulevard section wide enough to allow room for turn lanes at intersections and street trees where feasible.

As a follow up effort with project Stakeholders, under the Plan Update, Corridor MPO Staff met with a local bicycle advocacy group concerning bicycle accommodation through the Tower Terrace Road interchange over I-380. This group was asked whether they prefer on-street bicycle lanes through an interchange or a proposal from Corridor MPO Transportation Technical Advisory Committee for a single separated trail on one side of the interchange with trail underpasses under the interchange ramps. The latter option would be similar to a design completed by the Iowa DOT in the Des Moines Area (*see Figure 7*).

As can be seen from the figure, a single trail passes underneath the two northerly ramps and uses a switchback alignment in order for the trail to come back up to the bridge overpass level. This design does not require the bicyclists to cross any vehicle traffic on the street. The group was nearly unanimous in supporting the grade separated design, similar to Figure 7.

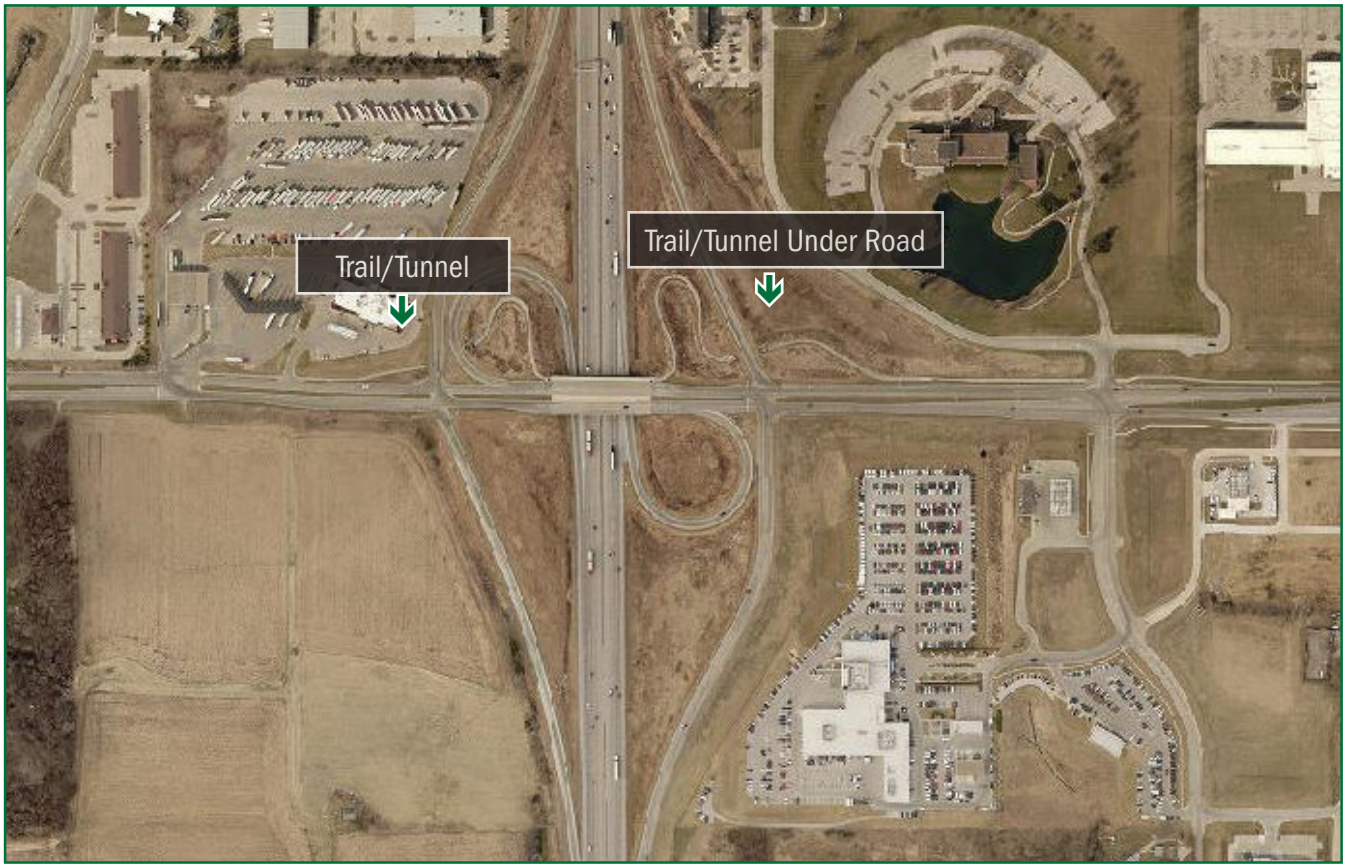


FIGURE 7: Trail Accommodations Through the Interchange at Douglas Avenue and I-80/I-35 in Urbandale; Aerial: Polk County, 2018

PUBLIC INVOLVEMENT

ADVISORY GROUP MEETINGS

From the original effort, the Advisory Group met 15 times over a two-year period to discuss the planning process, fundamental design parameters, and plan implementation. For this plan update, an Advisory Group was again formed and comprised of jurisdictions and agencies along the corridor. This new Advisory Group met three more times to guide the update to the Tower Terrace Road Corridor Management Plan.

JURSIDICTION AND AGENCY MEETINGS

Outside of Advisory Group meetings, individual meetings were held with jurisdictions and agencies along the corridor. These meetings included key staff from the jurisdiction/agency, as well as staff from Corridor MPO and consultant. At these meetings, key issues related to the corridor were discussed. They are summarized n the following paragraphs.

The City of Cedar Rapids is interested in a roundabout analysis at the intersection of relocated East Robins Road and Tower Terrace Road, across from St. Mark's Church driveway. The concern is whether northbound left turning traffic from East Robins Road onto westbound Tower Terrace Road will overwhelm a traffic signal installation during the morning peak hour. Also, Cedar Rapids has development agreements or preliminary platting in place for most of the segments of Tower Terrace Road within the city limits. In particular, from C Avenue west, the schedule of construction of Tower Terrace Road will likely be tied to development along the corridor. The properties along the proposed corridor will be assessed as they develop for one half of a residential street width (unless the development property straddles both sides of Tower Terrace Road, in which case the property would be assessed the full width of a residential street). The City of Cedar Rapids desires to light the corridor from the median.

The City of Hiawatha indicated the pavement on existing Tower Terrace Road from North Center Point Road to Robins Road is in good shape and would like to see that pavement used in place as Tower Terrace Road develops. There is a need for sanitary sewer extension along Tower Terrace Road along this same section. Hiawatha would consider undergrounding the overhead power, although the power lines on the joint city limit line between Hiawatha and Robins is on the Robins side. Hiawatha also noted they wanted to consider North Center Point Road and Tower Terrace Road as a potential location for a roundabout. The driveway for the Tower Terrace Mobile Home Park should be a right-in/right-out driveway due to its close proximity to the proposed interchange. An additional right-in/right-out access may be considered between North Center Point Road and Stamy Road, and Commerce Road should be right-in/right-out. The City of Hiawatha will not assess private property for Tower Terrace Road improvements.

The City of Marion assesses developers along Tower Terrace Road one half of the equivalent value of a 26-foot wide street, 7 inches thick. Marion then leverages that assessment with City funds to build the full width of Tower Terrace Road. Similarly, the City assesses for a 4-foot wide sidewalk and any oversizing for storm sewer or other utilities, such as water mains to meet the City's future needs. If a development occurs after a section of Tower Terrace Road is constructed, a connection fee to the roadway is charged to the developer using the previously described rationale. Marion will convert half of Indian Creek Road to a trail, north of Tower Terrace Road later this year when Tower Terrace Road cuts off existing Indian Creek Road. The City of Marion agrees with building trails on both sides of Tower Terrace Road. In the future, a trail will be extended along Indian Creek and will need to connect to the Tower Terrace Road trail. A previous study of the Tower Terrace Bridge over Indian Creek was completed by the City of Marion and includes bridge costs. West of Indian Creek, Marion's priority is to get Tower Terrace Road constructed since the project already has swap funding. East of Indian Creek, Tower Terrace Road will be constructed as development occurs. The bridge over Indian Creek will be constructed as dollars become available. The City of Marion indicated they anticipate adding right-in/right-out driveways between Irish Drive and Alburnett Road. Also, the City of Marion wants to see a roundabout at 44th Street Extension.

PUBLIC INVOLVEMENT

The City of Robins is very concerned about the funding for the sections of Tower Terrace Road that are in the City of Robins. The concern is that the benefit of Tower Terrace Road to the City of Robins is very modest considering much of the ground around the most expensive part of the project (the two bridges) is the least developable land. There might be some slight interstate access benefit to Robins residents, but nowhere near the value to justify several million dollars investment into Tower Terrace Road. Robins would like to see a comparison of alternatives with an overpass over the Canadian National Railway versus an at-grade railroad crossing. Also, Robins would like to see an alternative comparison of a straight alignment of Tower Terrace Road on the common city limit line with Cedar Rapids between Council Street and Robins Road. Robins would like to see projected traffic volume estimates on Tower Terrace Road for the post-partial build condition. Like the City of Hiawatha, the City of Robins does not intend to assess any private property owners for Tower Terrace Road improvements.

Linn County noted that the County is interested in sustainable practices being used along the corridor, such as including native species for plantings. Linn County also indicated they understand this will be a regional, county project and Linn County may contribute to the cost at some point.

The Iowa DOT meeting focused on the interchange of Tower Terrace Road with I-380. Based on the initial findings of the interchange environmental process, the Iowa DOT reduced the footprint of the proposed interchange to minimize impacts to the existing trailer court on the north side of Tower Terrace Road, west of North Center Point Road. Cedar Rapids and Hiawatha will be responsible for completing the environmental process on their respective sections of the project (Edgewood Road to I-380 and I-380 to North Center Point Road) and implementing the design and construction. Ideally, the DOT would like to bid all three projects together. The DOT's current schedule is 2021 construction of the interchange. There is $4 million of federal-aid available to Hiawatha and Cedar Rapids to apply toward their sections of the overall project.

PUBLIC OUTREACH EVENTS

As part of the Update, a public information meeting was held on Month Date, 2018....[TO BE COMPLETED AFTER THE MEETING – ANY COMMENTS FROM THE MEETING CAN BE INCLUDED IN THE APPENDIX]

DESIGN

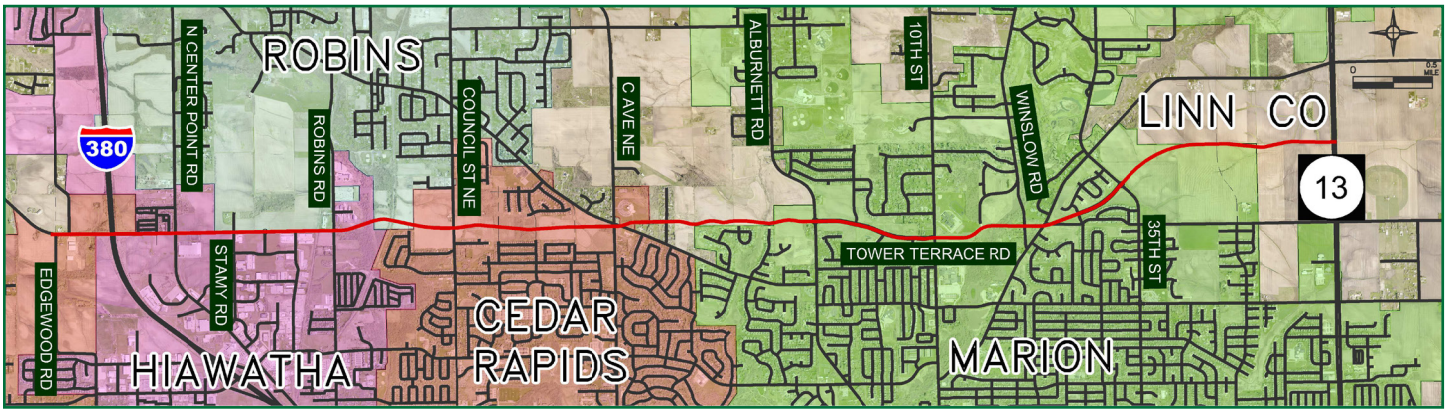


FIGURE 8: Tower Terrace Road Overview Map; Aerial: Linn County, 2018

OVERVIEW

The planning area was expanded to the west of I-380 to include the relocation of Edgewood Road as the western end of the corridor. As such, this plan update covers Tower Terrace Road from Edgewood Road extension to Iowa Highway 13 (*see Figure 8*). *Note*: The north-south arterial roadway west of the I-380 and Tower Terrace Road interchange is currently named Miller Road and will eventually be re-named Edgewood Road. For this plan, Miller Road is referenced as Edgewood Road.

CONFLICT POINTS

The 2010 Tower Terrace Road Corridor Management Plan identified five conflict points:

- C Avenue Intersection with multiple intersection approaches (up to six with C Avenue, Tower Terrace Road, and Main Street/East Robins Road)
- Meadowknolls Neighborhood and concerns about cut through traffic
- North 10th Street Intersection/Linn-Mar Campus and concerns about coordinating the Tower Terrace Road alignment with the proposed new athletic stadium and existing campus buildings
- Grey Fox Drive Connection to Tower Terrace Road and concern about cut through traffic
- Dry Creek/Canadian National Railway Crossing

Conflict Points Already Addressed

Three of the conflict points have already been addressed through construction of or the design of the sections of Tower Terrace Road in these areas:

- C Avenue Intersection
- Meadowknolls Neighborhood
- North 10th Street Intersection/Linn-Mar Campus

C Avenue Intersection

C Avenue and East Main Street/East Robins Road currently intersect at a 22-degree skew angle. C Avenue is a north-south rural route with few accesses north of Tower Terrace Road, while East Main Street/East Robins Road provides a northwest to southeast route with a mix of residential driveways and local street accesses. A traffic signal currently exists at the C Avenue and East Robins Road intersection.

The planned alignment of Tower Terrace Road would create a six-legged intersection at C Avenue and East Main Street/East Robins Road. Six leg intersections are not unheard of, particularly with historical diagonal routes. However, as traffic volumes

grow, signal timing becomes an issue, particularly if good traffic flow is desired on any of the corridors. In order to avoid a six-legged intersection, one route must be excluded, either by realignment or termination (cul-de-sac). As previously considered, it is reasonable to sever the diagonal East Main Street/East Robins Road. This would create a standard, perpendicular intersection between Tower Terrace Road and C Avenue.

East Main Street/East Robins Road will be realigned to connect directly to Tower Terrace Road as offset "T" intersections on either side of the C Avenue Intersection. This would allow travel on the diagonal route that East Main Street/East Robins Road offers, while still providing access to the cardinally oriented routes.

As an alternative, during preliminary design of Tower Terrace Road, a roundabout analysis was performed and determined a four-legged roundabout would operate better than a traffic signal at C Avenue and Tower Terrace Road. Therefore, the conflict point at C Avenue and Tower Terrace Road has been resolved with a roundabout *(see Sheet D.14 in the Appendix)*. Additionally, East Main Street will be re-routed to intersect Tower Terrace Road at Summerset Avenue (*see Sheet D.13 in the Appendix)*, and East Robins Road will be realigned across from St. Mark's Church driveway (*see Sheet D.15 in the Appendix*).

Meadowknolls Neighborhood

East of C Avenue, there is a county subdivision known as Meadowknolls. This 18-home subdivision is only accessed from East Robins Road. Within the subdivision, a 100-foot right-of-way width has been reserved for Tower Terrace Road.

The 100-foot wide right-of-way reserved within the Meadowknolls neighborhood is narrower than the 120-foot or 140-foot wide right-of-way desired for Tower Terrace Road. The goal of the Tower Terrace Road corridor is to provide a safe and efficient transportation accommodations for all modes of travel while providing an aesthetically pleasing roadway that will have positive impacts on the surrounding area. The narrow right-of-way in the Meadowknolls neighborhood will force the dimensions of certain roadway elements to slim down. Several options can be considered, but it is important to provide consistent accommodation throughout the corridor. The proposed typical section maintains the bike lanes and side paths, while reducing the width of green space. The configuration of traveled lanes and side paths provides a recommended 10-foot wide clear zone, but does not leave room for street trees within the median or parking areas in the full buildout, even if certain elements, such as bike lanes, are excluded.

As part of the Tower Terrace Road design from C Avenue to Alburnett Road, neighborhood meetings developed a solution to end Meadowknolls as a cul-de-sac south of Tower Terrace Road. The north leg of Meadowknolls Road meet at a "T" intersection with Tower Terrace Road. The primary concern by the Meadowknolls neighborhood was cut-through traffic; however, both streets are going to be dead-ends so cut-through traffic will not be an issue (*see Sheet D.16 in the Appendix*).

North 10th Street/Linn-Mar Campus

The location of the Tower Terrace Road and North 10th Street intersection was dictated by right-of-way on the west side and the location of Linn-Mar Community School District's new football stadium on the east side. Other impacts to right-of-way design included Linn-Mar's existing softball field, the residential acreage to the north, and an office building with a pond to the south. The property line for the office building in the southwest quadrant of the intersection was shaped during platting to allow for reverse curves on the roadway that would reduce the impact of a 120-foot wide right-of-way on the acreage to the north. While horizontal curvature within an intersection is not ideal, it may serve to reduce the average speed limit as vehicles enter the school campus.

The intersection of Tower Terrace Road and North 10th Street was built with left turn lanes and may warrant additional right turn lanes as through traffic grows in the future.

DESIGN

As Tower Terrace Road bisects the campus, provisions for pedestrian accommodations are important. The planned 120-foot wide right-of-way will allow enough room for a trail on both sides of the road. Proposed sidewalks along North 10th Street were extended north to provide a pedestrian access to Excelsior Middle School.

As planned, Tower Terrace Road has been designed and constructed through the Linn-Mar campus with access arrangements and coordination to avoid campus infrastructure in place (*see Sheets D.22 and D. 23 in the Appendix*).

Remaining Conflict Points

The conflict points remaining to be resolved are the concern of cut through traffic in the Grey Fox Drive neighborhood and the Dry Creek/Canadian National Railway Crossing.

Just east of Robins Road, the future alignment of Tower Terrace Road will cross Dry Creek and a single railroad track, which is owned and operated by the Canadian National Railway. South of Tower Terrace Road and east of the Canadian National Railway track is a residential subdivision that is planned to connect with Tower Terrace Road at Grey Fox Drive. From the 2010 public involvement, concerns were raised by the residents over the proximity of Tower Terrace Road to this subdivision and the potential for cut through traffic from the Tower Terrace Road connection. Looking at the aerial photograph in Figure 9, Grey Fox Drive accesses the neighborhood and does not directly connect through to a major street.

Cut-through traffic is caused by drivers desiring a faster route to a destination. Therefore, the likelihood of cut-through traffic is low as Grey Fox Drive to Woodcrest Street or Fox Tail Drive to Council Street is not a faster route. The faster travel path is continuing on Tower Terrace Road and making a right onto Council Street.

The other conflict point is the crossing of Canadian National Railway and the crossing of Dry Creek. Tower Terrace Road will require a bridge over Dry Creek regardless whether the roadway alignment is curved or straight. Crossing the railroad could be done at-grade with a signalized crossing of the railroad track at the same level or by a grade-separation with a bridge over the railroad track.

The preference of Canadian National Railway is to have a grade-separated crossing over the railroad, primarily because of safety reasons. However, railroad representatives indicated they may consider an at-grade crossing if two other at-grade crossings in the metro area were eliminated. The concept behind eliminating crossings in exchange for a new crossing is to reduce exposure of vehicle traffic to train traffic, thereby reducing the possibility of crashes and limiting or reducing Canadian National Railway's exposure to potential liability. A copy of the correspondence with Canadian National Railway is included in the Appendix. This correspondence includes the minimum horizontal and vertical clearances needed for a bridge over the railroad.

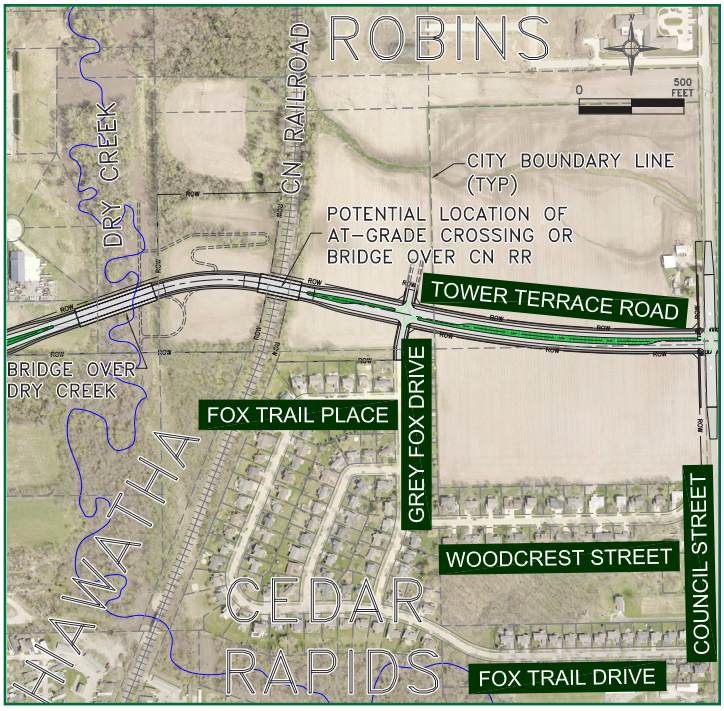


FIGURE 9: Tower Terrace Road at Grey Fox Drive; Aerial: Linn County, 2018

DESIGN

In order to provide the best option for Tower Terrace Road, a cost analysis was completed to compare an at-grade versus grade-separated crossing.

- *At-Grade:* The combined cost of a bridge over Dry Creek and an at-grade rail crossing is approximately $1.4 million.
- *Grade-Separated:* The combined cost of a bridge over Dry Creek and a bridge over the Canadian National Railway is approximately $3.7 million (*See Structural Memorandum in the Appendix for more detail*).
    - The additional construction cost of a bridge over Dry Creek and the railroad is approximately $2.3 million.

The analysis for a grade-separated railroad crossing only includes the construction cost. It does not take into consideration the costs required to remove the two other existing, at-grade railroad crossings. This cost analysis also did not take into consideration the increased delay to vehicle traffic on Tower Terrace Road when a train is present. According to the Federal Railroad Administration crossing inventory, this section of Canadian National Railway carries two trains per day.

To estimate the value of the lost time with an at-grade crossing, the following assumptions were made (*see Table 2 on page 21*):

- USDOT Recommended Hourly Value of Travel Time Savings (VTTS) – All Purpose Trips: $14.10/Hour, adjusted to $22.39/Hour over the 50-year lifespan of the bridge
- Average Daily Traffic on Tower Terrace Road over the life of the bridge (50 Years): 16,600 vehicles per day, from the previous 2010 Tower Terrace Corridor Management Plan
- Estimated train blockage of Tower Terrace Road: 7 minutes per train, estimated from rail crossing delay study of Union Pacific Railroad at Duff Avenue in Ames, Iowa
- Estimated vehicle occupancy: 1.7 persons per vehicle, from the Federal Highway Administration National Household Travel Study

From these assumptions, a present-day cost of delay, excluding inflation, is approximately $4.8 million. This estimate is much more than the estimated $2.3 million in additional construction costs, as noted on page 24.

Using the findings from the delay savings analysis, the bridge over Canadian National Railway is the lower cost alternative. Also, there would be initial costs to remove two existing railroad crossings on Canadian National Railway track somewhere within the metro area. Those costs could likewise be substantial if an existing property, or properties, must to be purchased in order to close the rail crossing.

ESTIMATED COST OF DELAY FOR AT-GRADE RAIL CROSSING OF CANADIAN NATIONAL RAILWAY	
PARAMETER	**VALUE**
Daily Traffic on Tower Terrace Road (Average over life of bridge)	$\frac{16{,}600 \text{ veh}}{\text{day}}$
Arrival Rate at Crossing, Vehicles/Minute	$\frac{16{,}600 \text{ veh}}{\text{day}} \times \frac{1 \text{ day}}{24 \text{ hours}} \text{ x } \frac{1 \text{ hour}}{60 \text{ mins}} = 11.53 \text{ veh/min}$
Proportion of Time Train is Present	$\frac{2 \text{ trains}}{\text{day}} \times \frac{7 \text{ min}}{\text{train}} = 14 \text{ min/day}$
Number of Vehicles Delayed per Day	$\frac{11.53 \text{ veh}}{\text{min}} \times \frac{14 \text{ min}}{\text{day}} = 161.4 \text{ veh/day}$
Number of Minutes Vehicles are Delayed	If a train occupies the track for 7 minutes, assume the average wait is 4 minutes (some vehicles arrive when the train is nearly passed)
Vehicle Delay per Day	$\frac{161.4 \text{ veh}}{\text{day}} \times \frac{4 \text{ min}}{\text{train}} \times 2 \text{ trains} = 1291.2 \text{ veh} \cdot \text{min/day}$
Estimated Person-Hours per Day	$\frac{1291.2 \text{ veh} \cdot \text{min}}{\text{day}} \times \frac{1.2 \text{ person}}{\text{veh}} \times \frac{1 \text{ hour}}{60 \text{ mins}} = 25.82 \text{ person} \cdot \text{hour/day}$
Estimated Daily Cost	$\frac{25.82 \text{ person} \cdot \text{hour}}{\text{day}} \times \frac{\$14.10}{\text{person} \cdot \text{hour}} = \$364.06/\text{day}$
Delay Cost Over Life of Bridge (assume 50 years)	$\frac{\$364.06}{\text{day}} \times \frac{260 \text{ work days}}{\text{year}} \times 50 \text{ years} = \$4{,}732{,}780$

TABLE 2: Estimated Cost of Delay for an At-Grade Rail Crossing of Canadian National Railway

DESIGN

Alternative Tower Terrace Road Alignment for Canadian National Railway Crossing

The City of Robins requested analyzing an alternative, straight alignment of Tower Terrace Road at the crossing of the Canadian National Railway. As shown in Figure 10, the alignment from the 2010 Plan curved Tower Terrace Road north, away from the Grey Fox Drive neighborhood. The curved alignment also creates more separation between Tower Terrace Road and the Grey Fox Drive neighborhood. The existing land along the proposed Tower Terrace Road in the vicinity of the railroad crossing is planned for residential development. The residential development expected here (single-family homes) is less likely to generate the tax revenues needed to recapture the costs of the railroad overpass structure. This places a large financial burden for a key piece of the corridor on the smallest community.

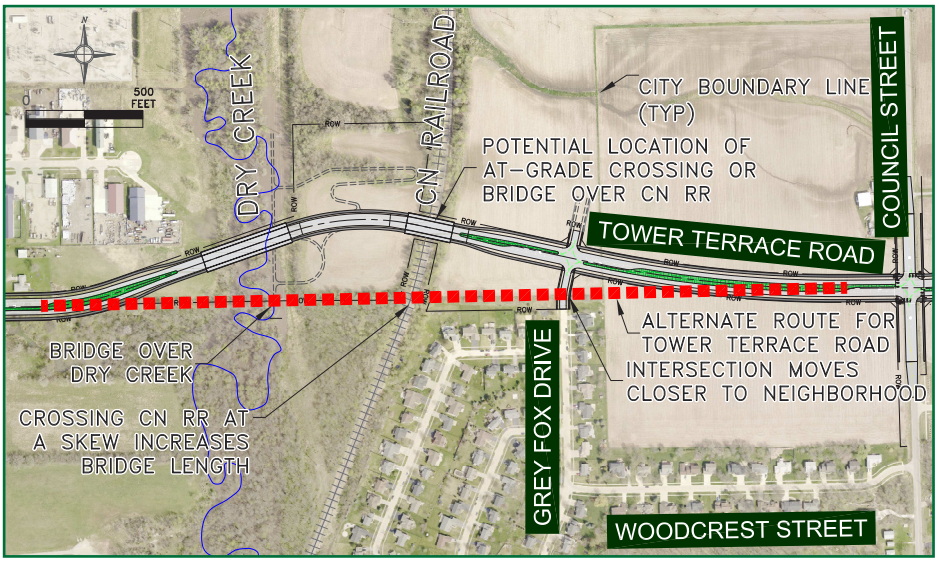


FIGURE 10: Tower Terrace Road Alternative Alignment at Railroad Crossing; Aerial: Linn County, 2018

The analysis of a straight alignment of Tower Terrace Road places the road along the common city limit line between Robins and Cedar Rapids (the north line of the houses along Fox Trail Place). Figure 10 shows a heavy red line representing the alternative Tower Terrace Road alignment.

For the railroad overpass, Tower Terrace Road must be elevated approximately 26 feet to provide proper clearance over the tracks. As such, a retaining wall is necessary to prevent the grading of Tower Terrace Road from encroaching on the backyards and homes on Fox Trail Place. A conceptual before and after picture of what the wall might look like in backyards is shown in Figure 11.

Figure 11 is at a location approximately 300 feet east of the railroad crossing. At this house, the wall would be approximately 17 feet high and near the rear property line of the house. Although decorative treatment could be applied to the wall, it is unlikely to be a desirable feature along the backyards of the houses. The two houses immediately west of this house would have taller walls, as high as 26 feet, in the backyard.

FIGURE 11: Before/After Rendering along Fox Trail Place in Cedar Rapids; Photo: Google 2018

DESIGN

A construction cost comparison was performed for the current alignment (*as shown on Sheet D.09 and D.10 in the Appendix*) and the alternative straight alignment (*depicted in Table 3*) to estimate the cost differential between the two options.

Table 3 summarizes the major cost differences. Because the straight alignment will cross the railroad at a skew, the length of the bridge over the railroad will be longer. There will be less earthwork with the straight alignment since it will require a retaining wall along the houses on Fox Trail Place. However, the straight alignment will require a substantial retaining wall with a decorative treatment. The straight alignment is slightly shorter, so there will be less PCC pavement than the curved alignment. The straight alignment does not require additional right-of-way acquisition, whereas the curved alignment does. The right-of-way costs will be less with the straight alignment because there would be no need to purchase inaccessible land between the backyards on Fox Trail Place and the curved alignment of Tower Terrace Road.

Assuming 80% swap participation, from Table 3, Robins' share of the current alignment option would be about twenty percent (20%) of the $3,076,000 or $615,200. *(Note – this analysis is comparing two alternatives only and is not indicative of total project costs for this area.)*

Under the straight alignment alternative, the project cost is substantially higher than the current alignment, at $4,225,000. Assuming 80% swap participation, while the straight alignment is slightly less expensive for Robins, the overall cost is more expensive than the curved alignment. Splitting the twenty percent (20%) amount equally between Cedar Rapids and Robins results in a Robins share of $422,500.

CONSTRUCTION COST COMPARISON: ALTERNATIVE ALIGNMENT AT RAILROAD		
COST CRITERIA	CURVED ALIGNMENT (CURRENT DESIGN)	STRAIGHT ALIGNMENT (DESIGN ALTERNATIVE)
Canadian National Railway Bridge	$ 2,300,000	$ 2,750,000
Earthwork	$ 610,000	$ 300,000
Retaining Wall	$ -	$ 1,050,000
Granular Wall Backfill	$ -	$ 100,000
PCC Pavement	$ 16,000	$ -
Right-of-way	$ 150,000	$ 25,000
Relative Cost Difference	**$ 3,076,000**	**$ 4,225,000**

TABLE 3: Construction Cost Comparison:
Alternative Tower Terrace Road Alignment at Canadian National Railway

DESIGN

It should be noted that some cost is allocated to the straight alignment alternative to cover temporary construction easements and some physical damages, such as trees, fences, etc., that would likely occur in the backyards of the houses along Fox Trail Place. Additionally, no estimate was made for the aesthetic effect of the wall on the value of the houses or the anticipated negative reaction from those residents. Costs would likely increase due to condemnations being required to obtain the necessary easements, and such costs are extremely difficult to determine.

Because of the heavy impact of the straight alignment on the Fox Trail Place homes, the cost increase to the overall project, and the insignificant change in the cost share for the City of Robins, the straight alignment is not recommended.

DESIGN ELEMENTS

This section reviews the design criteria.

TOWER TERRACE ROAD DESIGN GUIDE UPDATE	
CROSS SECTION ELEMENT	**MINIMUM**
Design Speed/Posted Speed, mph	40 / 35 (Cedar Rapids may post at 40 mph)
Right of Way, ft	120
Access Spacing: Full Access, ft Partial Access (Right-in & out/Left-in), ft	 1,320 600
Travel Lane Width: Outside Lane, ft Additional Thru Lanes, ft Two-Way Left Turn Lanes, ft	 11 11 11
Curb and Gutter Width, ft	2
Trail Width, ft	10
Bike Lane Width, ft (To back of curb)	7 (Bike lane eliminated at full build)
Vertical Alignment: Curve Length, ft Crest K Sag K Maximum Gradient, Percent Minimum Gradient, Percent	 120 44 64 6 0.5
Horizontal Alignment (Radius), ft	675
Stopping Sight Distance, ft	305
Vertical Clearance, ft	22 (Refer to CN grade separation requirements in the attached Appendix)
Clear Zone: Roadway, ft* Trail, ft	 7 3
Object Setback, ft (To back of curb)	3
Bridge Width, ft	84
** Clear zone is measured from the edge of gutter to allow for full build traffic lane to occupy the existing bike lane. Likewise, the median side clear zone should be measured from the full build edge of the traveled way.*	

TABLE 4: Tower Terrace Road Design Guide Update

DESIGN

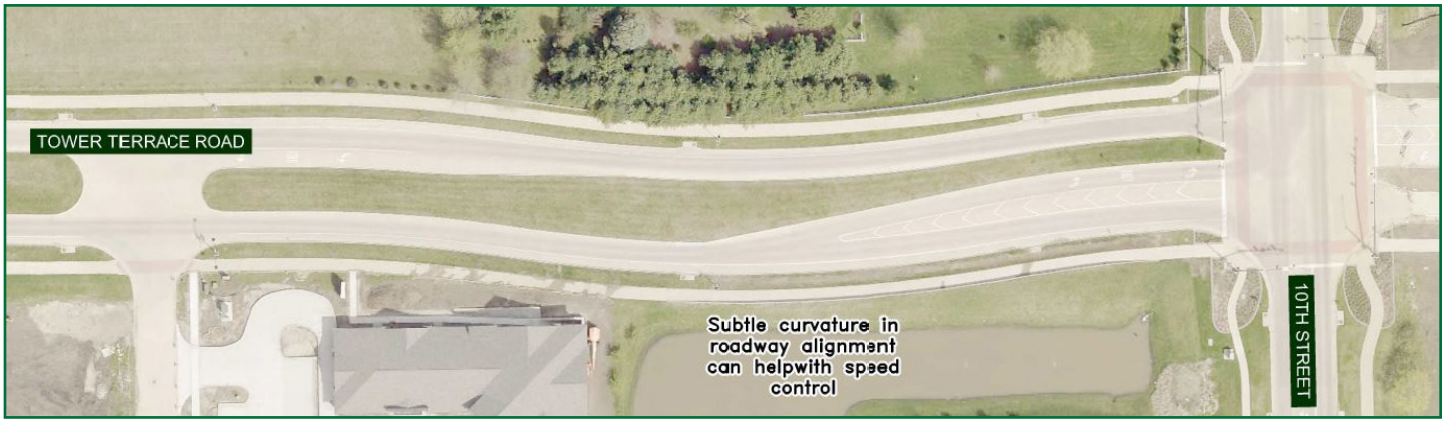


FIGURE 12: Tower Terrace Road, Near 10th Street in Marion; Aerial: Linn County, 2018

Design Speed

Because a substantial portion of the Tower Terrace Road corridor has been planned for decades, land development and platting has defined the general alignment of the corridor in a straight line. With relatively flat grades, it is likely that motorists may drive above the speed limits.

In order to encourage lower speeds, curvature can be added to the roadway. Minor horizontal alignment modifications can be incorporated into the corridor to increase the horizontal curvature of the roadway, similar to what was done in the City of Marion immediately west of North 10th Street (*see Figures 12 and 13*).

FIGURE 13: Tower Terrace Road, Looking West at 10th Street in Marion, 2018

Similarly, vertical curvature can be added to reduce the length of the corridor that can be seen by a driver at any given point while still providing stopping and intersection sight distances. Sight distance limited to meet the design criteria maintains a safe operational speed by limiting the distance visualized by motorists.

Even with these design adjustments, drivers may still exceed the speed limit. The City of Cedar Rapids considered designing the corridor for 45 mph, which may be the observed speeds when Tower Terrace Road is completed. However, with a 45 or 50 mph design speed, clear zone requirements would increase from the current 7 feet to between 16 and 20 feet. This would prevent any fixtures or amenities in the median or along the parkway between the curb and trail, such as street lighting and trees. Therefore, the recommendation is that the design speed remains at 40 mph with the option of posting the speed limit at 40 mph or 35 mph.

DESIGN

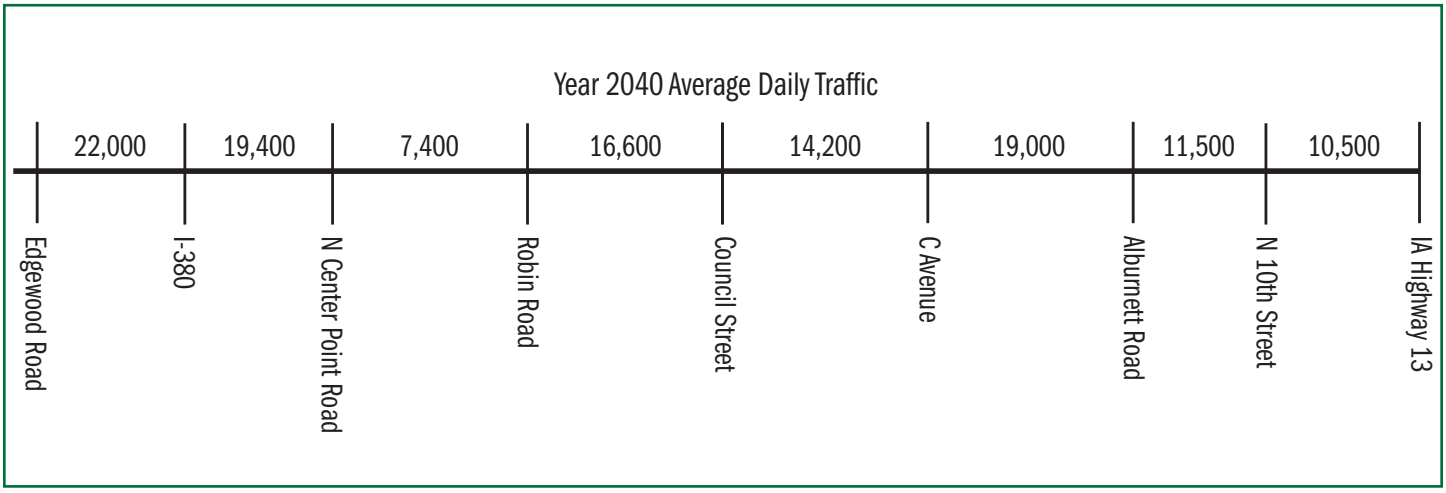


FIGURE 14: Estimated 2040 Traffic Volume Along Project Corridor; Source: Corridor MPO Traffic Model

Traffic

Forecasted 2040 traffic volumes on Tower Terrace Road range from 11,700 vehicles per day (near IA Highway 13) to 24,000 vehicles per day at I-380. The bulk of the corridor (generally from North Center Point Road east to IA Highway 13) is around 6,000 vehicles per day to 15,000 vehicles per day. These volumes can generally be handled by a two-lane roadway, with one lane in each direction and turn lanes at major intersections.

The Iowa DOT is considering, and will likely build, a diverging diamond interchange (DDI) at Tower Terrace Road on I-380. Additional travel lanes near the interchange may need to be added to accommodate the DDI. Traffic volumes through the interchange are predicted to be in the mid-20,000 to 25,000 vehicle per day range, which would normally require two through traffic lanes each way plus turn lanes. Figure 14 is the estimated 2040 traffic volumes along the project corridor based on a synthesis of projections from the available Corridor MPO Traffic Model.

Complete Streets

The jurisdictions involved in planning Tower Terrace Road have been advocating Complete Streets policies for several years. Complete Streets are defined as transportation facilities that include safe, attractive, and comfortable access and travel for all anticipated modes of travel. This would typically include accommodations for vehicular traffic bicyclists (recreational and commuter), pedestrians, (including recreational and fitness users like in-line skaters, runners, walkers and families), and transit.

Tower Terrace Road is envisioned to fully comply with the idea of a complete street. The plans currently include bicycle accommodations in the initial build, with bike lanes and separate trails, as well as accommodations of transit operations.

DESIGN

Green Street

The concept of a green street carries two meanings: One is a street that includes tree plantings and other plant materials to create a greener roadway in terms of appearance. The other meaning intends that sustainable design practices be included in the design of the roadway to lessen its environmental impact. Both of these meanings apply to Tower Terrace Road (*see Figure 15*).

Sustainable design elements are appropriate for Tower Terrace Road as long as they are very carefully considered. Typical sustainable design practices include rain gardens and bioswales for the treatment of storm water runoff. The intent of these measures is to allow rainfall to infiltrate the ground through soil, rather than having the stormwater travel through storm sewers or ditches directly into streams and other waterways. Additionally, rain gardens and bioswales act as filters for stormwater: stormwater picks up pollutants on rooftops and hard surfaces and the rain garden allows these pollutants to be filtered out naturally (*see Figure 16*).

Smaller bioswales could be included in the median design, particularly where significant amounts of stormwater runoff are not expected. It is important for safety reasons that storm water runoff be removed from the pavement of Tower Terrace Road quickly and efficiently so water does not spread into travel lanes, making travel difficult.

Larger stormwater management areas should be located adjacent to Tower Terrace Road in areas such as:

- Existing floodplains around Dry Creek
- Low areas and sinkhole areas between (Council Street through C Avenue)
- Excess right-of-way at the northwest corner of C Avenue and Tower Terrace Road (E. Main Street)
- Low areas and wetlands immediately east of Meadowknolls
- Low area at Christopher Creek immediately west of Newcastle Road
- Low areas on City of Marion property on the east side of Indian Creek
- Drainageway crossings in existing farm fields west of Highway 13

Many of these areas could incorporate minor detention and bioswale facilities to offset some of the increased runoff due to the added impervious area created by Tower Terrace Road (*see Figure 17*).

FIGURE 15: Example Green Street; Photo: Google, 2018

FIGURE 16: Example Bioswale; Photo: Google, 2018

FIGURE 17: Example Detention Basin; Photo: Google, 2018

DESIGN

Access Spacing

The original plan specified full access points at no closer than 1,320 feet (every quarter of a mile) and partial access (right-in/right-out/left turn-In) at 600 feet. Those access spacing dimensions are closer on some of the existing sections of Tower Terrace Road. It has been decided to maintain the stated access spacing to limit the number of intersection conflict points. This helps to promote the future efficiency of the corridor once the surrounding area is fully developed.

Durable Pavement Markings

Pavement markings provide traffic control and guidance for road users (drivers, bicyclists, pedestrians) and include lines, symbols, and words to convey the intended use of the pavement area. Most pavement markings are reflective for visibility during the day, night, and under wet conditions. Once pavement markings are installed on a roadway, the responsible jurisdiction (state, city, or county) must maintain the markings so they are effective in controlling traffic. Over time, all pavement markings fade or are worn off by traffic, or lose their reflectivity and are not effective at night or under adverse weather. To reapply pavement markings not only has a labor and material cost, but also a safety cost to striping crews and the general public as workers must be present in traffic to reapply the markings. As such, the long-term savings of durable pavement markings outweigh the higher initial construction cost, and durable pavement markings should be used on Tower Terrace Road projects. *(See Appendix for Durable Pavement Markings Lifespan).*

Curb and Gutter

Curb and gutter widths are 2 feet from the back of curb to the edge of the gutter pan. On the median side (opposite of the bike lane), the design is to use an 11-foot wide travel lane and 2-foot curb and gutter to provide additional width for the clear zone for median amenities, such as trees and street lights.

Trail Width

The original plan trail width of 10 feet will be maintained and a trail will be present on both the north and south sides of Tower Terrace Road (*see Figure 18*). Trails will not be on the north and south sides of the roadway through the I-380 interchange.

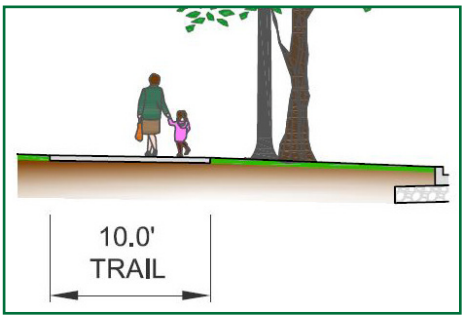


FIGURE 18: Trail Width

Whether trails are carried on both sides of the bridges over Dry Creek, Indian Creek, and the Canadian National Railway should be determined as part of the detailed project design.

Trees

Trees are strongly encouraged in the medians and in the parkway. While ornamental trees can be used depending on the context of a given location, the preference is to plant deciduous shade trees in a variety of species including oaks, maples, walnuts, coffee trees, and so forth. Each community may have a list of specific species they encourage. Currently, with the infestation of Emerald Ash Borer, ash trees are not recommended. Elm trees could be considered if they are resistant to Dutch Elm disease.

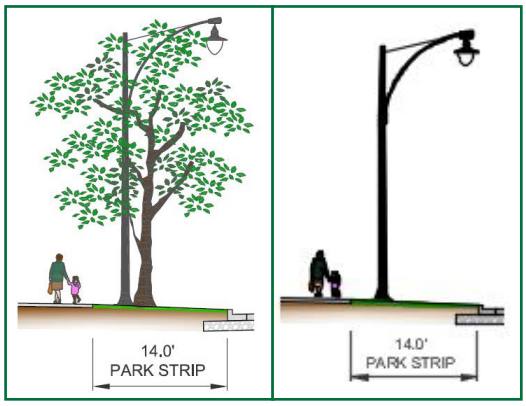


FIGURE 19: Two Park Strip Examples

Trees provide shade for pedestrians and trail users while adding character to the corridor. As they mature, they help block street light pollution onto private property and help slow traffic by providing an enclosed feeling to the roadway. Also, trees bring an element of side friction to the roadway, encouraging slower speeds.

DESIGN

The proximity of plant materials to the roadway must comply with clear zone requirements and not obstruct drivers' safe distance vision, particularly at intersections. However, keeping the materials as close to the roadway as possible helps communicate a feeling of speed even though vehicles may be traveling slower (*see Figure 19*).

Bike Lanes

Current AASHTO design guidelines indicate that the minimum bike lane width is 5 feet. Therefore, a 7-foot total width is recommended, which includes a 5-foot ridable space and a 2-foot curb and gutter. Care must be taken with storm water intake design to ensure any grates in the gutter pan are bicycle rated and any curb opening intakes do not extend into the bike lane.

Sidewalk Width

Because both sides of Tower Terrace Road will have 10-foot wide trails, no sidewalks will be constructed along Tower Terrace Road. Side street sidewalk widths will be constructed to the requirements of each jurisdiction.

Crest Vertical Curve K

The "K" value for a vertical curve describes how sharp a hill or valley in a roadway alignment is constructed. Smaller K values correspond to sharper peaks (crests) and valleys (sags). As discussed previously in the Design Speed section, the desirable Crest Vertical Curve K was reduced from 70, in the original plan, to the minimum value of 44. This reduction is recommended to limit the field of view of motorists, which will reduce motorists exceeding the speed limit. The crest vertical curves need to be designed to provide intersection sight distance. Therefore, the designer of the roadway may exceed the stated value on a case-by-case basis in order to provide the necessary operational safety.

Clear Zone

The minimum roadway clear zone was reduced from the original plan value of 10 feet to 7 feet based on SUDAS. As discussed in Table 4, the minimum clear zone width must be measured from the edge of traveled way under full build conditions to avoid placing objects, such as trees and lighting, within the final clear zone swath (*see Figure 22*).

Horizontal Alignment (Radius)

Similar to the crest vertical curvature, the desirable horizontal curve value was reduced to the minimum radius of 675 feet to limit drivers' field of view to help discourage speeding. There is one location, based on the concept layout completed with this update, in which the end of constructed Tower Terrace Road on the west side of Indian Creek is so close to the proposed bridge location that a tighter than minimum radius will likely be needed (*see Figure 21, and Sheet D.23 in Appendix*). This is needed to transition between the existing

FIGURE 20: Tower Terrace Road, Near 35th Street in Marion, 2018

FIGURE 21: Tower Terrace Road, Near Winslow Road in Marion, 2018

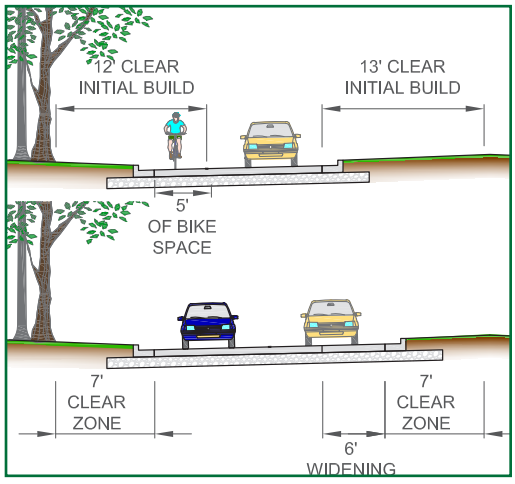


FIGURE 22: Clear Zone

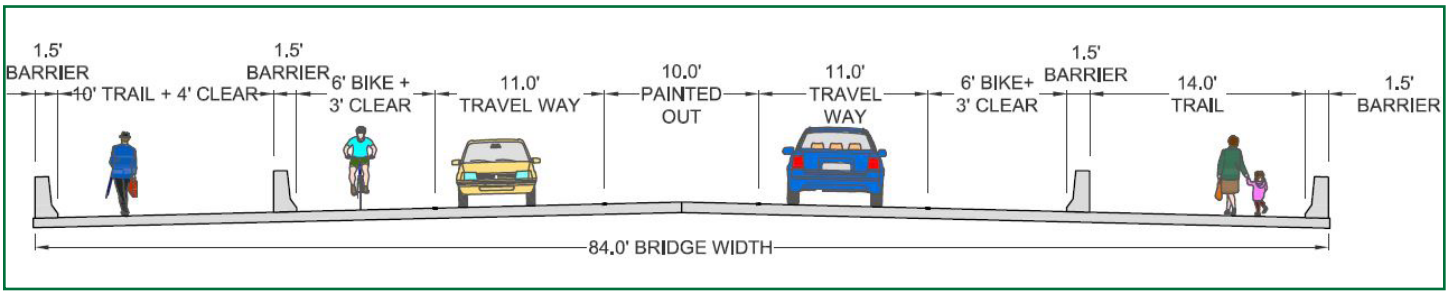


FIGURE 23: Partial Build Out of Tower Terrace Road Bidge

Tower Terrace Road and the bridge to avoid replacing some or all of the intersection of Tower Terrace Road with relocated Winslow Road. In this case, a 510-foot radius did provide a tight enough curve to avoid changing the existing intersection. This radius conforms to the SUDAS minimum radius for a 35 mph design speed. It is possible during the actual design, using survey data, that a larger radius might be employed.

Bridge Width

The concept plans provided by the jurisdictions and the original Tower Terrace Road Corridor Management Plan all show bridge widths at approximately 72 feet.

FIGURE 24: Cedar River Trail, Under I-380, 2003

The actual bridge widths are more likely to be between 80 feet and 90 feet if trails are on both sides of the bridge. With four traffic lanes, plus 3-foot shoulders to the edge of the concrete barrier (which is 1.5 feet wide), plus the trail, plus 2 feet of clearance on either side of the trail between the concrete barriers, and a final concrete barrier on the outside adds up to 84 feet with 11-foot wide traffic lanes (*see Figure 23*). The bridge will be built to accommodate 4 lanes of travel in the future, but will be striped for 2 lanes of travel with bike lanes and a painted median until Tower Terrace Road is expanded to 4 lanes.

At design time, the jurisdiction may decide to only carry a trail across one side of the bridge with the trail on the opposite side of the roadway looping down and crossing under the bridge (*see Figure 24*). A detailed analysis should be performed to determine if crossing one of the trails under the bridge is in fact less costly than simply carrying both trails across the bridge.

For short bridges, the cost of the additional trail length, as well as likely needing retaining walls under the bridge or extra bridge length to accommodate the trail under the bridge and adjacent to what is being crossed, may be more expensive than just carrying trails across both sides. For longer bridges (particularly the bridge over Indian Creek), it may be economically feasible to carry just one trail across the bridge.

DESIGN

TYPICAL SECTIONS

The original corridor plan shows 6.5-foot wide bike lanes on either side of Tower Terrace Road, both in the near-term construction and for the ultimate widening of Tower Terrace Road to a four-lane roadway at full build. The corridor was also envisioned with a 10-foot wide trail on the north side and 6-foot wide sidewalk on the south side. As part of the update process, a fundamental change emerged in the typical section of Tower Terrace Road. For the initial build, bike lanes would be included in the roadway, whereas in the long-term, full build out the roadway would not include bike lanes.

Before full build, a minimum paved width of 20 feet is necessary to allow emergency vehicle access to pass a stalled vehicle or other obstruction. Therefore, the pavement was segregated into a 11-foot wide lane, 2-foot wide curb and gutter at the median, and a 7-foot wide bicycle lane (including curb and gutter width). Long-term, the pavement would be widened into the median to provide an additional through lane. The original plan shows bike lanes in the full build out.

It is anticipated that the long-term need for bike lanes is not necessary, especially with the presence of a trail on both sides of the roadway. Analysis of the existing and planned land use along the corridor shows approximately two-thirds of the corridor is, or will be, developed as residential, as shown in Figure 25 *(see Future Land Use Map in Appendix)*. Having a trail only on the north side of Tower Terrace Road will require trail users on the south side of the road to cross the road to gain access to the trail, creating an unsafe situation and leading to conflicts with pedestrians on the paved trail.

A better solution is to put 10-foot wide trails on both sides of Tower Terrace Road, and under the future conditions, repurpose the bike lane pavement (which will still be needed in the partial build out to provide the 20-foot wide emergency access pavement) into a vehicle traffic lane and only widen 6 feet toward the interior of the median. The 20-foot wide pavement built in the short-term would be widened to 26 feet wide, consisting of two 11-foot wide lanes and two 2-foot wide curbs and gutters.

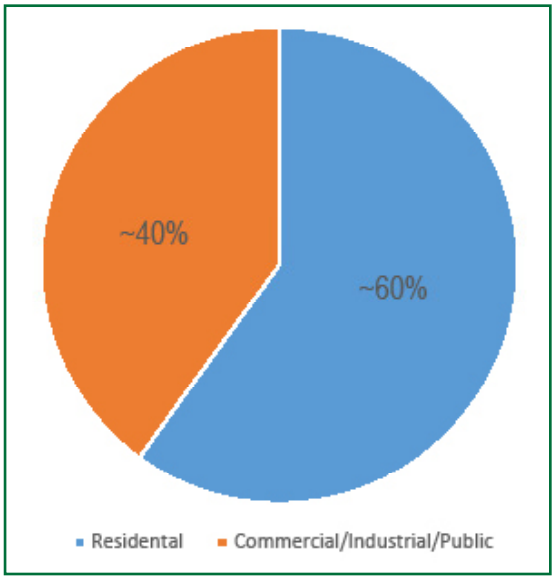


FIGURE 25: Future Land Use Chart

The original and revised typical sections for the near-term, partial build out are shown in Figure 26, located on page 33.

The original and revised typical sections for the long-term, full build out are shown in Figure 27, located on page 34.

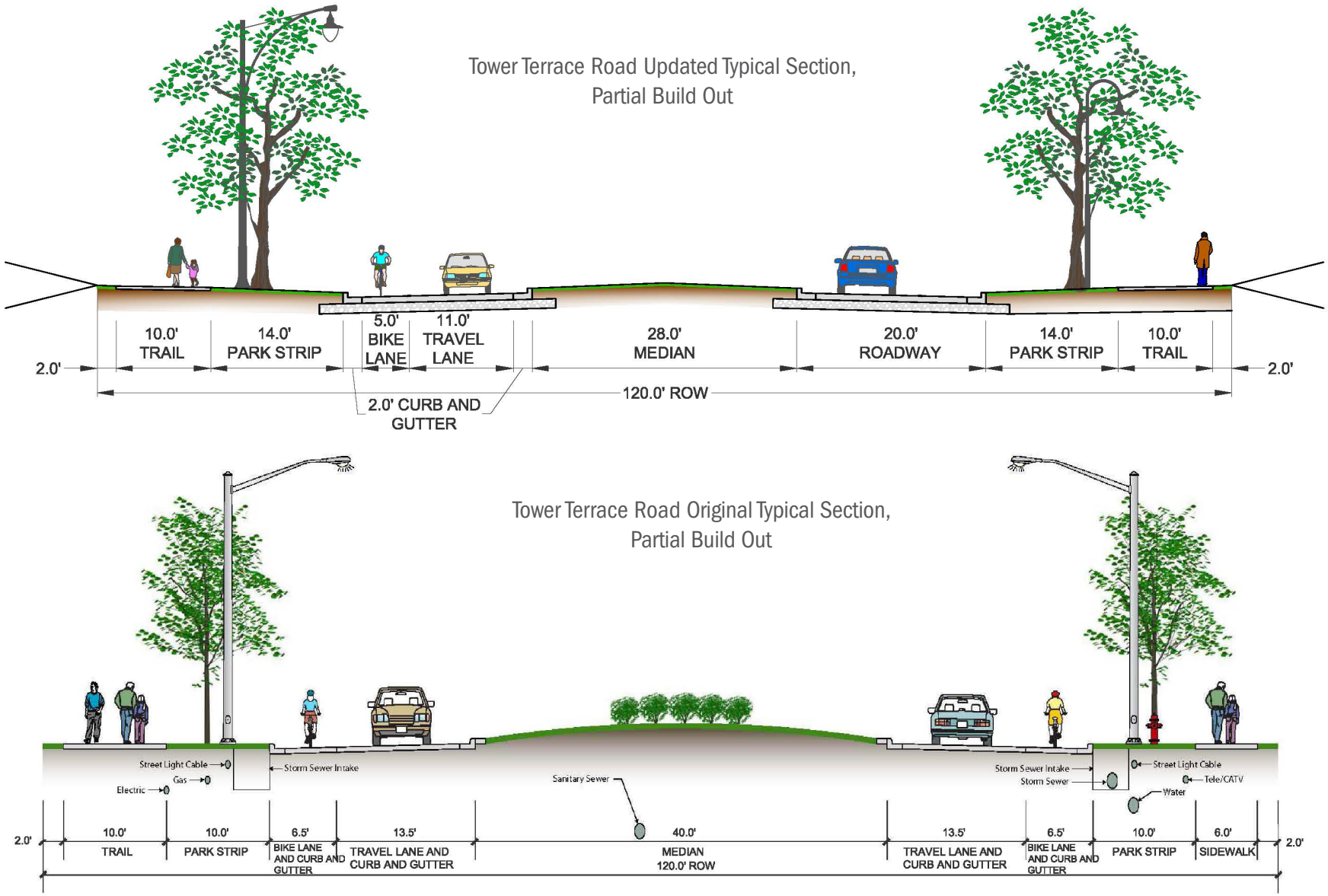


FIGURE 26: Tower Terrace Road Updated (top) and Original (bottom) Typical Sections for the Partial Build Out

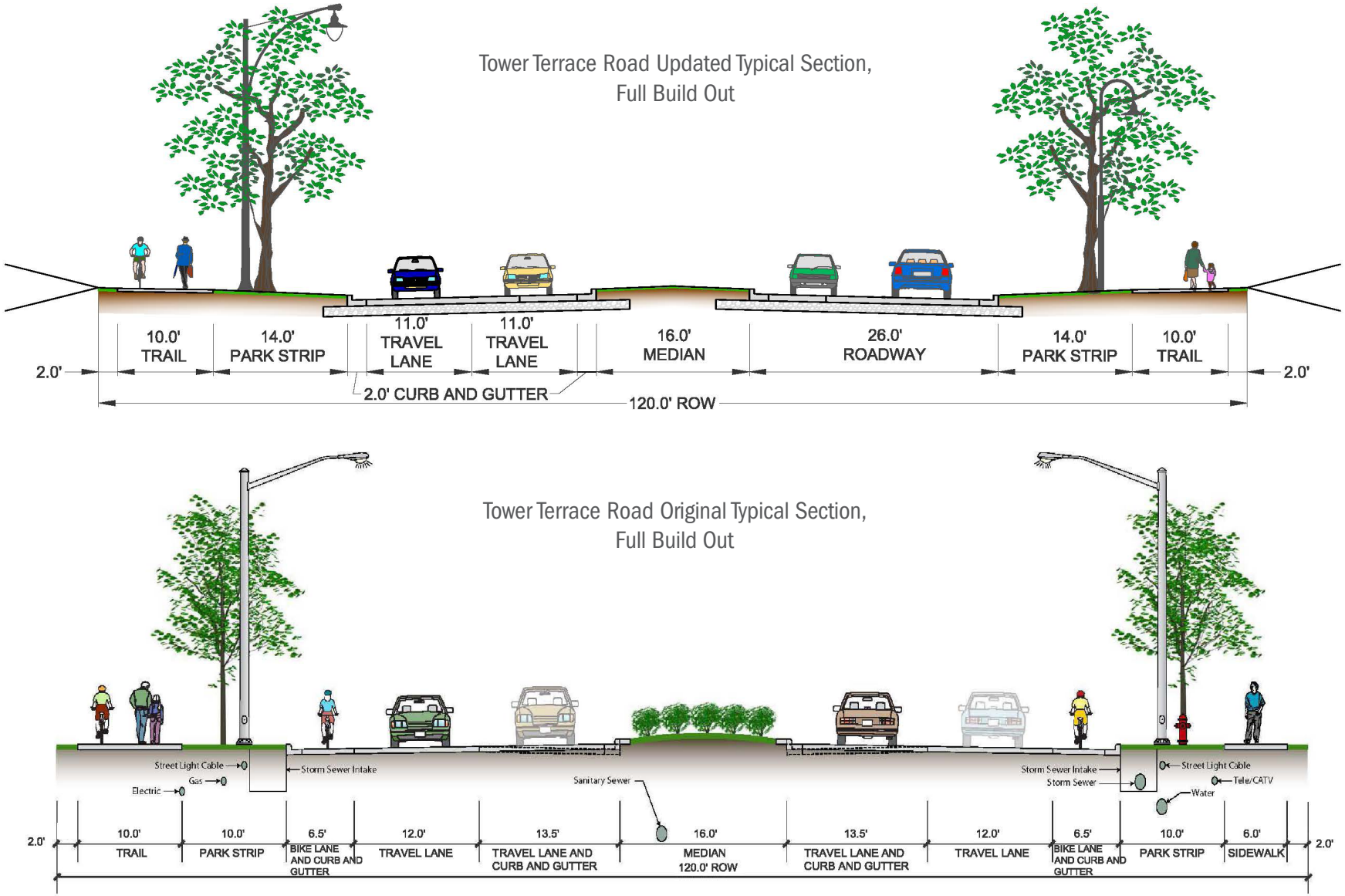


FIGURE 27: Tower Terrace Road Updated (top) and Original (bottom) Typical Sections for the Full Build Out

FIGURE 28: Three-dimensional Rendering of Updated Partial Build Out

An advantage of this change includes less overall pavement. The 6-foot wide sidewalk is converted to a 10-foot wide trail, and in exchange, the original design 32-foot wide pavement section is reduced to 26 feet (a savings of 6 feet of pavement in each direction for a total of 12 feet). Over the length of the project (about 44,000 feet, or 8.3 miles, long), nearly 60,000 square yards of concrete pavement and base material saved, which is roughly $2.9 million that will be saved when widening Tower Terrace Road to its full, four-lane width.

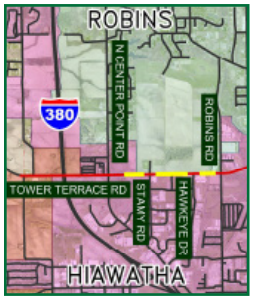
Another advantage of collective changes to the typical cross sections is the improved safety and user accommodation of having a trail on both sides of Tower Terrace Road. Trails on both sides reduces the need for trail users to cross Tower Terrace Road or ride alongside pedestrians on a narrower sidewalk.

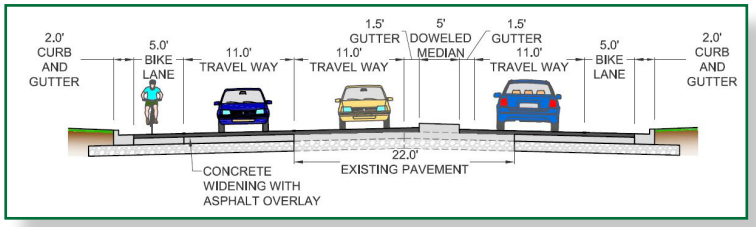
A three-dimensional rendering of the new typical section showing initial build (20-foot wide paving) is shown in Figure 28. The rendering shows a representation of pollinator habitat in the median, as well as a depressed median for the accommodation of storm water infiltration beds, bioswales, and other storm water best management practices. These treatments were touched on in the original plan and the designer should look for opportunities to incorporate these practices (as well as other best practices) into the design. The rendering also shows typical placement of underground utility elements, such as storm sewer (green), water main (blue), gas (yellow), and the other utilities (power and communications).

Other different, typical sections will need to be employed for certain areas along the corridor's alignment. These other typical sections differ from the revised overall typical section for Tower Terrace Road. For example, on Tower Terrace Road between North Center Point Road and Robins Road, the existing two-lane concrete pavement is in reasonably good shape and will likely provide good service for at least 20 more years. The representatives from the City of Hiawatha requested that section of Tower Terrace Road incorporate the existing pavement into the project., at least for the short-term design. Other typical sections are through the bridges and between the bridges over Dry Creek and Canadian National Railway.

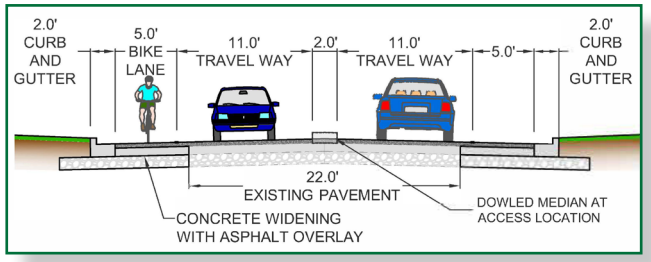
The following page shows Figure 29, which depicts a series of typical sections for Tower Terrace Road, and Council Street, along with a map identifying the locations marked in yellow associated with each typical section.

DESIGN

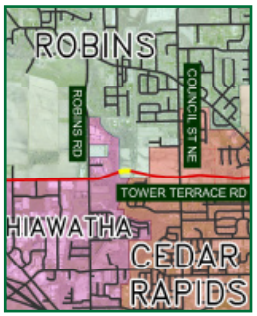


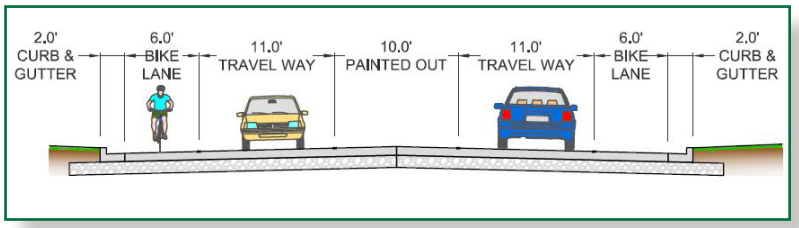


PARTIAL BUILD, WIDENING AT INTERSECTIONS

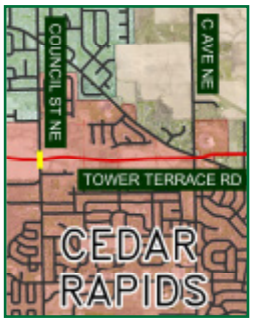


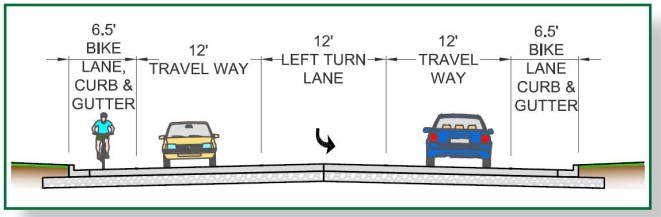
PARTIAL BUILD, WIDEN EXISTING



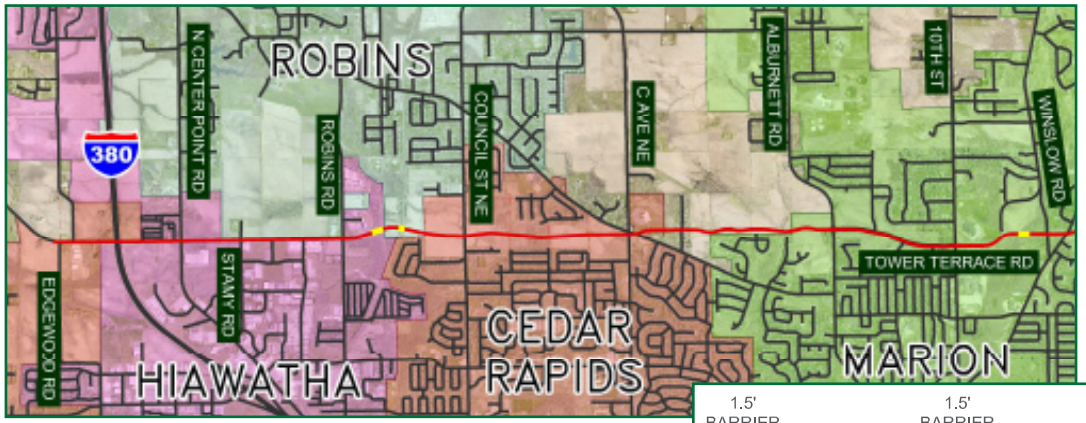


PARTIAL BUILD, BETWEEN BRIDGES





PARTIAL AND FULL BUILD, COUNCIL STREET



PARTIAL BUILD, BRIDGE SECTION

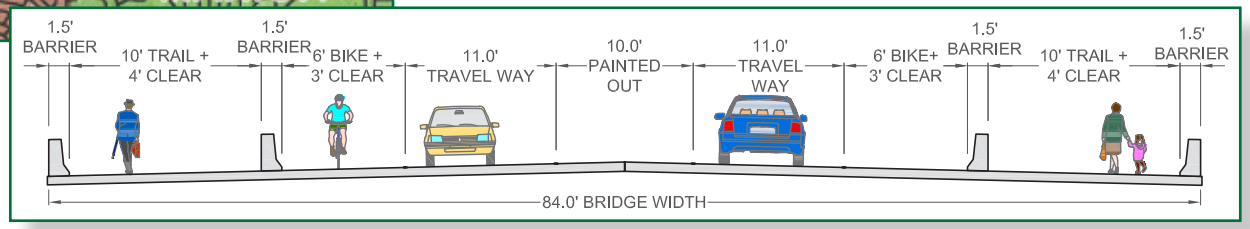


FIGURE 29: A Series of Typical Sections for Tower Terrace Road

DESIGN

The typical section for Council Street includes bicycle lanes, similar to Tower Terrace Road. In general, each major roadway crossed by Tower Terrace Road is improved to a minimum three-lane section (one through lane in each direction and a center left turn bay). According to the City of Cedar Rapids Trails Master Plan, C Avenue is listed as having on-street bicycle accommodations. Council Street is also identified in the master plan, and connects the Dry Creek Trail and the Tower Terrace Trail and is a major arterial through densely populated neighborhoods. Therefore, Council Street was laid out with additional width to accommodate bicycle lanes. Many of the other major streets could include bicycle lanes or accommodations at the discretion of each jurisdiction.

MEDIAN TREATMENTS

There are many options for planting treatments in medians along the Tower Terrace Road corridor. In the City of Marion, most of their sections have been constructed with turf grasses, also called bluegrass, in the median. The construction of Tower Terrace Road provides a unique opportunity to include native plant species that would promote pollinator habitats. This opportunity is in line with Linn County efforts to create 10,000 acres of new pollinator habitat by repurposing land currently mowed or sprayed. Many plant species native to Iowa, including wildflowers such as the Black Eyed-Susan and Butterfly Milkweed, have benefits that would:

- Result in less overall maintenance regarding mowing and watering,
- Result in higher chance of successful establishment of plants since these species are native to Iowa,
- Promote beneficial insects,
- Work well in bioswale applications,
- Provide a pleasant aesthetic, and
- Result in approximately 15 acres of pollinator habitat.

Under full future widening conditions, with a 16-foot wide median, and 14 feet of parkway on either side, simply planting the median in native species would result in between 30% and 40% of the corridor being planted in pollinator habitat. This alone would achieve the goal set for the project. However, there are several areas where uneconomic remnants of private land will need to be acquired, such as around the Dry Creek and Canadian National Railway bridge crossings and the section between Barnsley Lane and Newcastle Road, (*see Sheets D.09 and Sheets D.17 and D.18 in the Appendix*) where additional acres of land could be added to the pollinator habitat.

FIGURE 30: Various Median Treatment Examples; Top Images: Midwest Examples, Google, 2018; Bottom Image: Center Point Road in Hiawatha, Google, 2018

MEDIAN PLANTINGS: POSSIBLE CONCERNS AND BENEFITS

Possible Concerns:

- Salt tolerance near the curb line
- Maintenance expectations
- Native grasses still need spot mowing, spraying, trash removal, and periodic burning
- Native grasses can be highly flammable
- If trees are included in the median treatments, they should be trees that can tolerate native plant species burns, or native species that benefit from burning could be omitted around tree locations.

Possible Benefits:

- Aesthetics
- Environmental considerations
- Pollinator mixes in line with state and regional goals
- Less maintenance than cool season grasses
- Less exposure of staff to traffic
- More drought resistant and evolved to Iowa's climate

DESIGN

Other median treatments, particularly where the median is 4 feet wide, would include hardscape options, such as brick or stained/colored concrete. At wider locations (and in the center of roundabouts) art may be an option. Figure 31 is from a location in the City of Marion depicting a median nose treatment of colored concrete.

Another example from the City of Marion, Figure 32, is a combination of sculpture art and landscaping (primarily day lilies) in the roundabout median at the intersection of Tower Terrace Road and 35th Street.

FIGURE 31: Median Nose Treatment, 29th Avenue Near Indian Creek Bridge in Marion, 2018

STREET LIGHTING

Street lighting in this plan is centered primarily on the preferences of each jurisdiction. Jurisdictions may light the corridor from the parkway (between the outside curbs and the trails) or from the median. Figure 33 shows the two different lighting configurations, side-by-side, on a section of Tower Terrace Road. The yellow and red shading represents the more intense light (yellow) at the light pole location, fading to less intense light (red) as distance from the light source is increased. Both lighting schemes spill light from the right-of-way onto private property. Lighting from the median tends to spill less intense light more uniformly across private property. Lighting from the parkway tends to throw most of the light toward the street but spills more intense light onto private property, generally confined to the vicinity of the light pole.

FIGURE 32: Roundabout Sculpture Art and Landscaping, Tower Terrace Road and 35th Street in Marion, 2018

As trees planted along the parkway mature, the lighting patterns will encounter more interference from tree canopy (particularly in the growing season), which will shade light spillage from the median. On the other hand, lighting from the median may also require pedestrian-level lighting along the trails if tree canopy shades the trail from the median street lights.

Both lighting schemes can be designed to work. In fact, depending on the design or look of the street lighting, different lighting schemes might help separate and identify to the road users when one has crossed from one jurisdiction into another.

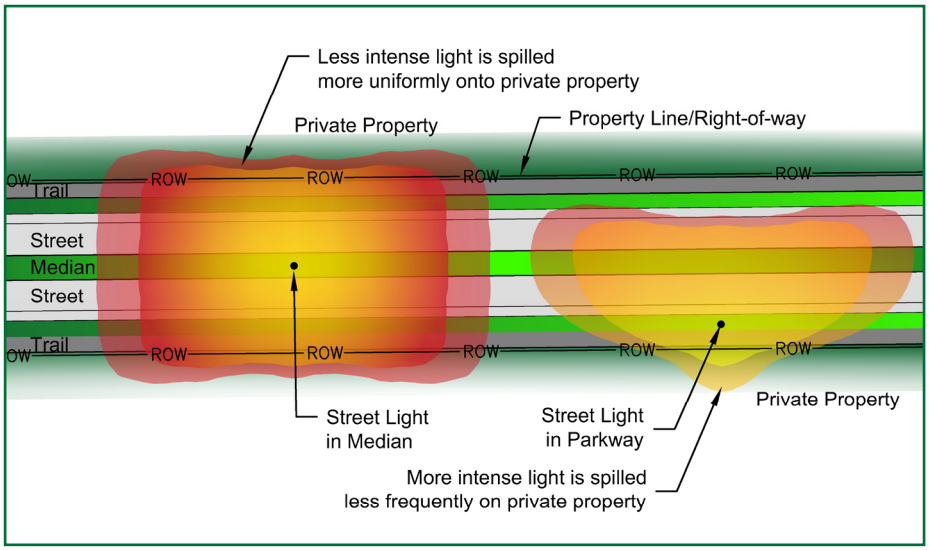


FIGURE 33: Two Side-by-Side Lighting Comparisons

DESIGN

INTERSECTION TREATMENTS

As part of this plan update, several intersections were specifically identified as definite locations for roundabouts, as opposed to signalized intersections (*see Figure 34 and Table 5*). These locations were selected because: the municipality preferred a roundabout treatment, a traffic study was completed recommending a roundabout, or space was available such that a roudabout could be an economically competitive solution. Additional locations could be considered based on the available space. Under all circumstances, a detailed traffic analysis should be performed at each intersection to determine the best intersection traffic control treatment.

For the Tower Terrace Road corridor, the main criteria for a roundabout location is the traffic analysis performed as part of the detailed design. Roundabouts have many benefits and advantages over traffic signals. However, they do not have the flexibility to change operations based on changing traffic volumes such as can be done with traffic signal phasing, sequencing, and timing. Any of the intersections along the corridor could potentially be served by a roundabout. However, a careful analysis of anticipated traffic flows should be done, particularly analyzing heavy left turn movements that can prevent other legs of the roundabout from entering and thereby causing long queues.

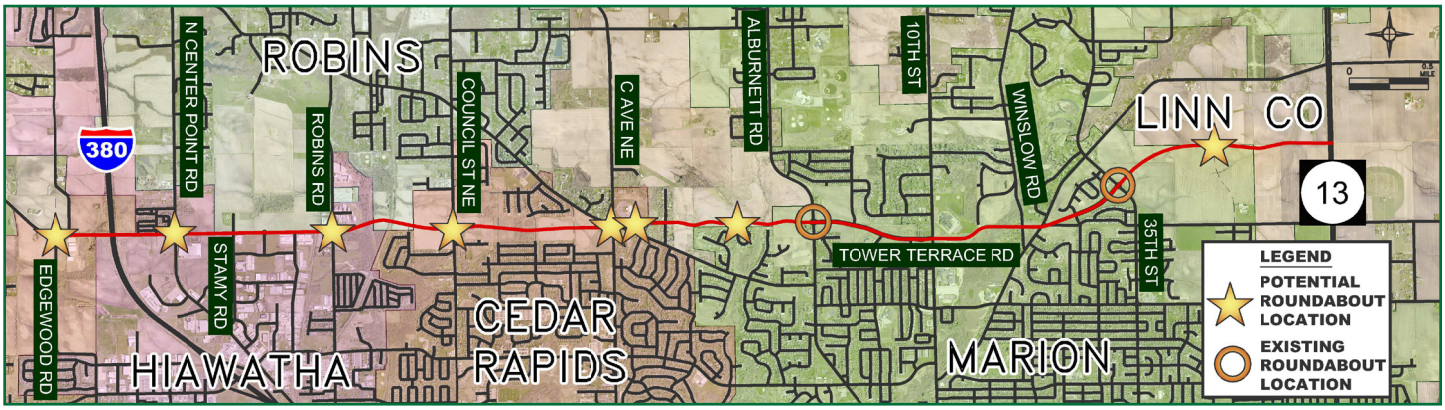


FIGURE 34: Roundabout Locations on Tower Terrace Road; Image: Anderson Bogert

ROUNDABOUT LOCATIONS ON TOWER TERRACE ROAD	
LOCATION	**COMMENT**
Edgewood Road	Space is available
North Center Point Road	Consider due to close proximity of I-380 interchange. Identified by City of Hiawatha
Robins Road	Space is available
Council Street	Space is available
C Avenue NE	Study completed under existing design contract recommends roundabout
Relocated East Robins Road	Concern with queuing between C Avenue and relocated East Robins Road
Barnsley Lane	Identified by City of Marion
44th Street (Extension)	Identified by City of Marion

TABLE 5: Potential Roundabout Locations on Tower Terrace Road

DESIGN

UTILITY ACCOMMODATION

Tower Terrace Road may become a desirable corridor for utility companies to locate their lines to provide service to new development, and close or loop networks of their facilities. It is important to consider the spatial needs for both public and private utilities in the development of the roadway cross section. Possible utility locations have been identified on the cross sections shown previously in Figure 28. These locations are similar to the typical locations set in the Iowa SUDAS standards. If desirable, public utility easement located outside of the roadway right-of-way can be provided for these utilities.

FIGURE 35: Tower Terrace Road, Near Cedar Valley Nature Trail, 2018

Most of the proposed Tower Terrace Road corridor is through undeveloped properties. As such, utility conflicts are expected to be limited in those segments. Public and private utilities will likely be extended along the corridor as part of construction (in the case of storm sewer and water) or after construction and often tied to development of the adjacent land (sanitary sewer, power, communications, gas, etc.).

There are some exceptions along the existing alignment of Tower Terrace Road from Edgewood Road to Robins Road, where existing utilities are present. From a visual review in the field, this segment contains all of the typical utilities including: overhead primary power, water main, sanitary sewer, gas, and communications.

It is likely many of these utilities will need adjustment at the least, and more likely relocation as part of the project. Coordinating utility adjustments and relocation is a normal but critically important part of any design project. Utility relocations take approximately a year from initial notification of the utility of a project through the actual relocation of the facilities. Much of this work can occur simultaneously with other design-related activities. However, it is crucial to relocate utilities ahead of roadway construction to avoid costly delays of construction and prolonged project schedules.

Discussion with the jurisdictions concerning overhead power generally included moving overhead utilities underground. Normally, overhead utilities located in the public right-of-way that are required to move as part of the roadway construction project must do so at the utility owner's expense. However, the additional cost to upgrade to an underground utility is typically borne by the jurisdiction funding the roadway project. The following is a summary of the community positions:

- The City of Cedar Rapids has relocated overhead utilities underground on several major corridors in the City.
- The City of Marion has been constructing Tower Terrace Road without overhead utilities.
- The City of Robins has indicated they are not interested in paying the additional cost to move utilities underground.
- The City of Hiawatha is interested in moving overhead utilities underground on this corridor.

Another utility conflict are the ITC overhead primary power lines along Dry Creek. It is anticipated the vertical alignment of Tower Terrace Road will require the overhead lines to be raised to provide the minimum 16 feet of vertical clearance over the roadway. The existing high voltage steel towers are custom designed, therefore this adjustment includes significant costs. It is anticipated, based on similar project experience by the consultant, that the utility relocation would cost approximately $500,000.

PROJECTS

OVERVIEW

Although the funding for Tower Terrace Road may not include federal-aid, the conditions of the funding through the Corridor MPO require many of the federal-aid processes still be followed (*Refer to the Funding section of this update starting on page 47*). As such, each section of Tower Terrace Road that utilizes federal-aid or swap funds must undergo an environmental review process to ensure the projects comply with National Environmental Policy Act (NEPA) requirements. NEPA requirements include an evaluation of project impacts to:

- Wetlands
- Farmland
- Historic Structures
- Cultural Resources (archaeological and other)
- Endangered Species
- Noise
- Traffic
- Other environmental issues

These environmental reviews must be conducted from one logical terminus to another, which means the study area must connect to something of regional significance on both ends. Once a section is cleared environmentally, the roadway project within that region can be constructed in phases.

Environmental clearances have a shelf life of a few years before they have to be revisited. Performing one large overall environmental review to clear the entire corridor from I-380 to Highway 13 is not practical, or ultimately useful. It is more beneficial to do environmental review on each section of Tower Terrace Road, rather than performing one large overall review of the corridor. If one large review was done, then the environmental clearance would expire before some sections of the project became funded.

In order to be implementable, the corridor has been broken down into sections for environmental review. As described later in this update, each environmental section contains sub-phases of construction projects. Figure 36 and Table 6, on the next page, show an overall corridor map broken down into environmental review sections, and a list of projects within each associated region. It should be noted the projects are numbered and sorted by west to east orientation. The order and number assigned to each project phase on this list does not indicate priority of implementation.

As can be seen in the list on Table 6, the Iowa DOT is preparing their own environmental review of the I-380 interchange. As part of that effort, much of the data and analyses within Region A can be obtained from the Iowa DOT and used by the Cities of Cedar Rapids and Hiawatha for their use in obtaining environmental review clearances for Projects 1 and 2.

Projects 8, 9, 10, and 11 are nearly complete with their environmental review. Right-of-way acquisition is scheduled to begin later in 2018.

In each environmental review section, the construction limits for each project phase were based on the following criteria:

- Construction cost around $5 million, except for the bridge projects.
- Known project limits (e.g., around I-380, between C Avenue and Alburnett Road, etc.).
- Convenient starting and stopping points (e.g., grades are close to existing and can be matched in); attempted to balance the earthwork on a project.
- Property ownership on undeveloped parcels/development-driven projects.

PROJECTS

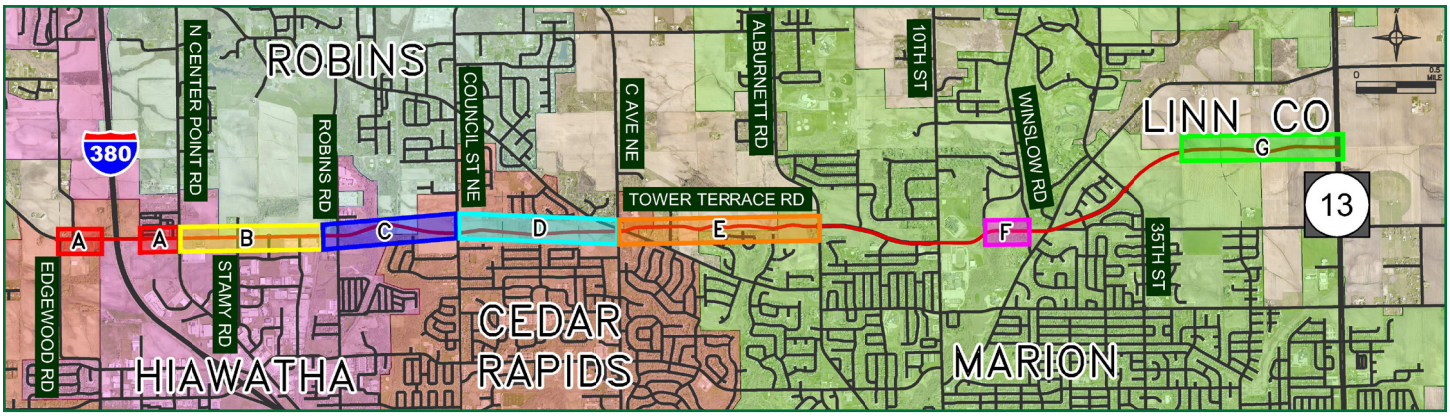


FIGURE 36: Overall Tower Terrace Road Environmental Review Region Map

LIMITS OF PROJECT PHASES WITHIN EACH ENVIRONMENTAL REVIEW SECTION		
PROJECT PHASE	**PROJECT PHASE LIMITS**	**ENVIRONMENTAL REVIEW SECTION**
1	Edgewood Road to W. Edge of I-380 Interchange	A
-	I-380 Interchange (By Iowa DOT)	Independent Study by Iowa DOT
2	E. Edge of I-380 Interchange to Center Point Road	A
3	Center Point Road to Stamy Road	B
4	Stamy Road to Robins Road	B
5	Robins Road to Council Street (Bridges over Dry Creek and Canadian National Railway)	C
6	Council Street to Turtle Run Extended	D
7	Turtle Run Extended to Summerset Extended	D
8	Summerset Extended to C Avenue	E
9	C Avenue to E. Edge of Area C (Annexation Limit)	E
10	E. Edge of Area C (Annexation Limit) to E. Edge of Kloubec Property	E
11	E. Edge of Kloubec Property to Alburnett Road	E
-	Alburnett Road to Relocated Winslow (Already Built)	Completed Outside Federal Aid
12	Relocated Winslow to Existing Winslow (Bridge Over Indian Creek)	F
-	Existing Winslow Road to E. Edge of Abode Development/The Ridge at Indian Creek (Already Built or Designed/Under Construction)	Completed Outside Federal Aid
13	The Ridge at Indian Creek to Beckner-Robinson-Vaughn Farms	G
14	Beckner-Robinson-Vaugh Farms to IA Highway 13	G

TABLE 6: Overall Limits of Project Phases within Each Environmental Review Section

PROJECTS

COST ESTIMATES

Project costs were developed for each of the 14 project segments. Costs for these 14 project segments (*see Figure 37*), as well as totals, are broken down to show the cost to each jurisdiction for each project phase and overall (*see Table 7*). These projects are listed from west to east along Tower Terrace Road. Additionally, cost opinions are based on 2018 construction dollars and inflation is expected to cause cost increases in the future, depending on the timing of construction. A detailed cost opinion breakdown by project phase is included in the Appendix.

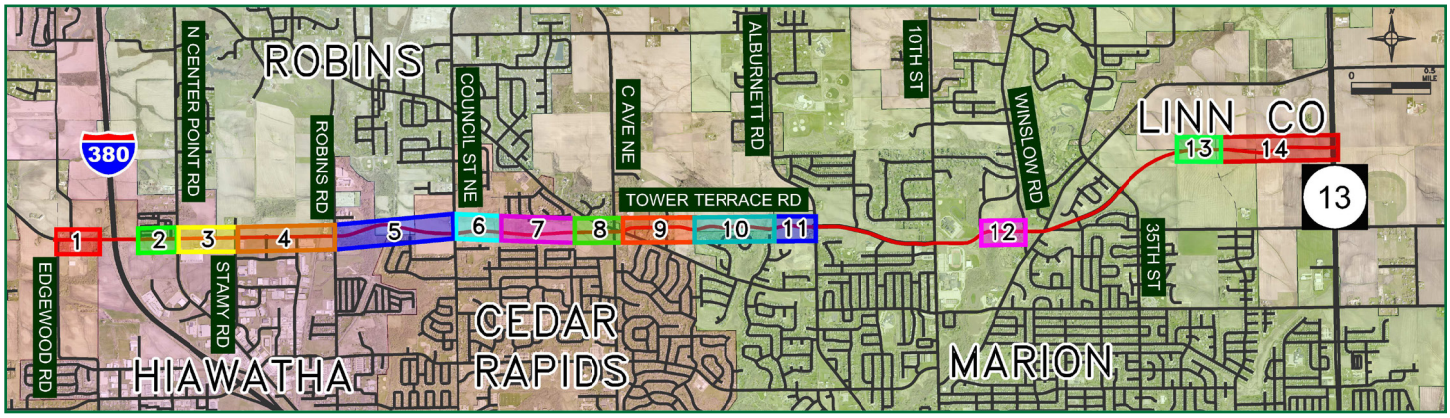


FIGURE 37: Overall Tower Terrace Road Project Phase Map

PROJECT PHASE AND JURISDICTIONAL COSTS					
PROJECT PHASE	COST				
	HIAWATHA	ROBINS	CEDAR RAPIDS	MARION	TOTAL
1			$8,191,924		$8,191,924
2	$4,323,020				$4,323,020
3	$2,430,068	$1,326,448			$3,756,516
4	$3,873,713	$3,410,278			$7,283,991
5	$5,739,287	$7,185,244	$4,709,633		$17,634,164
6			$3,197,771		$3,197,771
7			$5,055,268		$5,055,268
8			$6,193,316		$6,193,316
9			$4,333,555	$1,730,520	$6,064,075
10				$6,869,100	$6,869,100
11				$2,658,631	$2,658,631
12				$11,970,885	$11,970,885
13				$5,539,875	$5,539,875
14				$5,490,576	$5,490,576
TOTAL	**$16,366,088**	**$11,921,970**	**$31,681,467**	**$34,259,587**	**$94,229,112**

TABLE 7: Tower Terrace Road Total Costs by Project, Jurisdiction, and Overall (2018 Dollars)

PROJECTS

Earthwork/Ground Disturbance

As mentioned earlier, an attempt was made to balance the earthwork on the projects to avoid excessive borrow or waste. Because the earthwork computations were created from aerial contours and are very rough, any deficit within 10,000 cubic yards was considered close enough to balanced. Therefore, the earthwork cost estimates would be close enough that in detailed design the earthwork could be reasonably balanced. There are notable exceptions at the bridges where substantial fill will be required. An approximate cost estimate of earthwork by project phase was calculated and is included in the Appendix (page 106).

PRIORITIES

A priority implementation plan was developed for the 14 construction projects tying each to a timeline for initiation. Once each project phase is funded using federal-aid or swap, they will follow the typical schedule for development, as shown in Figure 38.

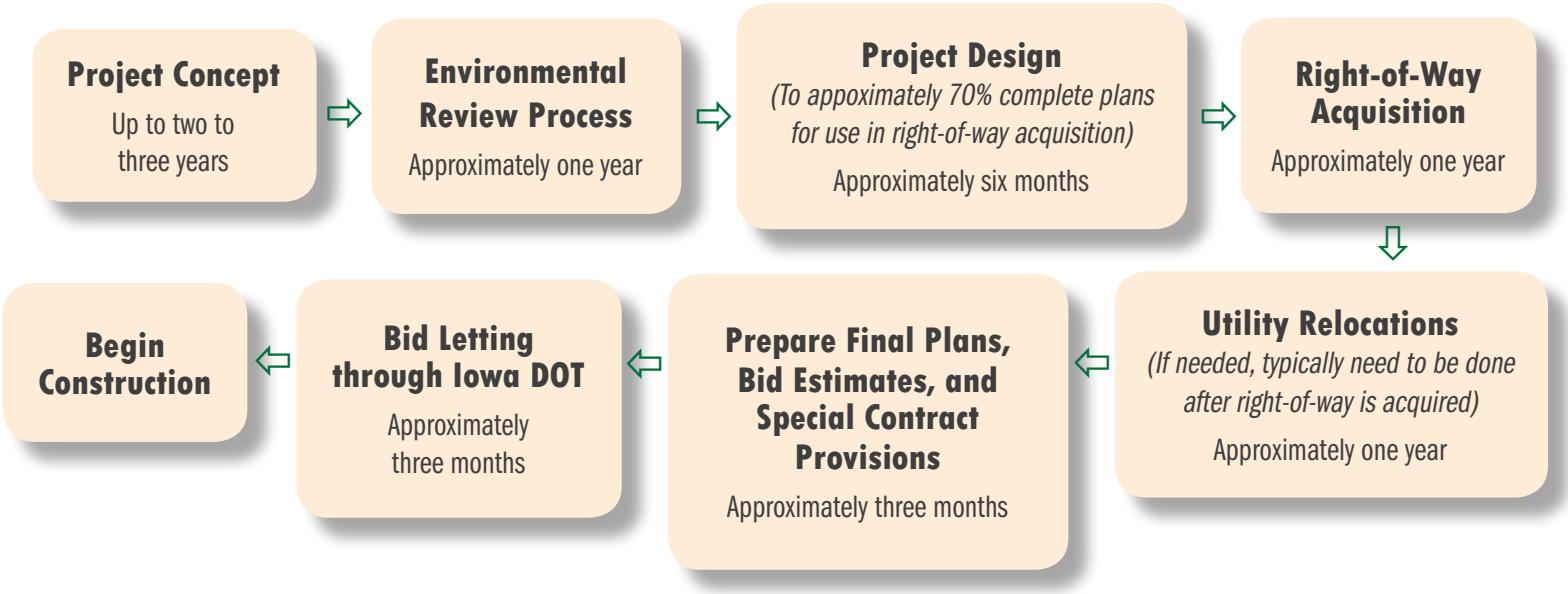


FIGURE 38: Flow Chart of a Typical Project Development Schedule After Funding is Received

It is common for a project to take up to seven years from the time design begins to the time construction begins. Right-of-way acquisition is one of the longer elements not entirely within the control of the sponsoring agency.

The following is a list of the projects in order of priority. The priorities were set first based on how close those projects already were to beginning construction. After that, the criteria encouraged beginning activities (environmental review) on the more difficult projects that will take additional time. The last priority projects were those that are likely to be driven by development, rather than connectivity. Even though those projects may not occur for a while, a development proposal may move a project up in the priority list for a given community. Additionally, development projects may further subdivide the previously listed projects into phases.

The following page includes Figure 39 and Table 8, which provides recommended construction project priorities.

PROJECTS

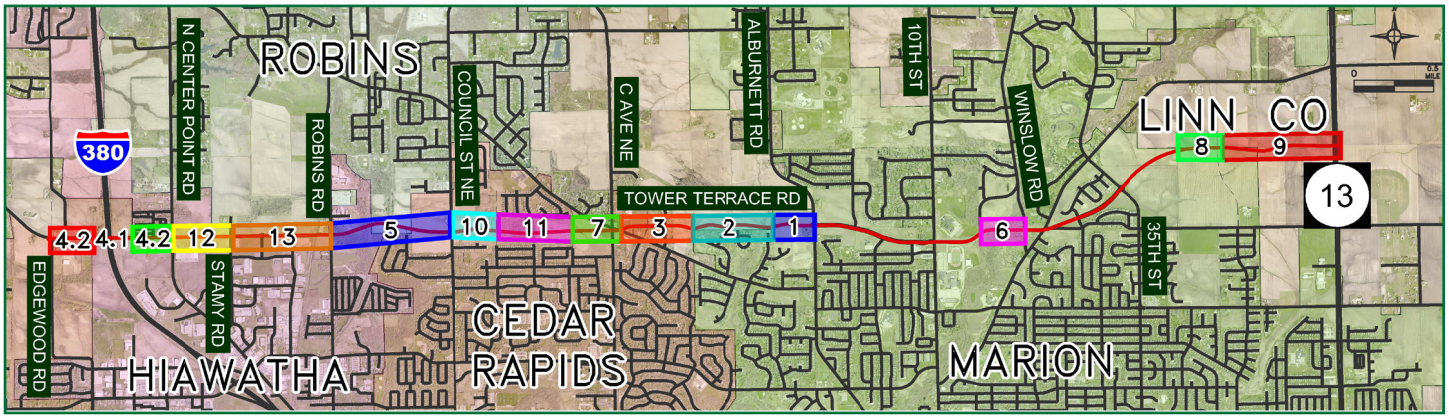


FIGURE 39: Overall Tower Terrace Road Construction Project Priorities Map

CONSTRUCTION PROJECT PRIORITIES			
PROJECT PHASE PRIORITY	**PROJECT PHASE**	**PROJECT PHASE LIMITS**	**COMMENTS**
1	11	E. Edge of Kloubec Property to Alburnett Road	TIP Schedule 2019 Construction
2	10	E. Edge of Area C (Annexation Limit) to E. Edge of Kloubec Property	TIP Schedule 2019 Construction
3	9	C Avenue to E. Edge of Area C (Annexation Limit)	TIP Schedule 2019 Construction
4.1	-	I-380 Interchange (By Iowa DOT)	2021 Construction
4.2	1	Edgewood Road to W. Edge of I-380 Interchange	Build with I-380
4.2	2	E. Edge of I-380 Interchange to Center Point Road	Build with I-380
5	5	Robins Road to Council Street (Bridges Over Dry Creek and Canadian National Railway)	7-8 year Design to Construction
6	12	Relocated Winslow to Existing Winslow (Bridge Over Indian Creek)	7-8 year Design to Construction
7	8	Summerset Extended to C Avenue	TIP Schedule 2020 Construction
8	13	The Ridge at Indian Creek to Beckner-Robinson-Vaughn Farms	Schedule may be tied to development
9	14	Beckner-Robinson-Vaugh Farms to IA Highway 13	Schedule may be tied to development
10	6	Council Street to Turtle Run Extended	Schedule may be tied to development
11	7	Turtle Run Extended to Summerset Extended	Schedule may be tied to development
12	3	Center Point Road to Stamy Road	
13	4	Stamy Road to Robins Road	

TABLE 8: Overall Construction Project Priorites

PROJECTS

Project Priorities 1, 2, and 3

E. Edge of Kloubec Property to Alburnett Road, E. Edge of Area C to E. Edge of Kloubec Property, and C Avenue to E. Edge of Area C

These projects were selected for first priority because they are almost completely through the environmental process, have right-of-way funding programmed for acquisition in 2018/2019, and have funding for construction in place for 2020/2021.

Project Priorities 4.1, 4.2, and 4.3

Edgewood Road to W. Edge of I-380 Interchange, I-380 Interchange, and E. Edge of I-380 Interchange to Center Point Road

These projects were selected for the next round of priority since there is funding in place for part of the construction. Project Priority 4.1 (the I-380 interchange) is being managed by the Iowa DOT and is planned for 2021 construction. Project Priority 4.2 might lag behind the interchange project, depending on the schedule of the environmental clearance process. As such, the schedule for these projects may slip. The key to these two projects is the environmental process.

Project Priority 5

Robins Road to Council Street

This is an expensive, difficult project with a high likelihood of environmental issues and coordination with a major utility (ITC overhead power line) and coordination with Canadian National Railway. This project is vital to the corridor. Without the crossings of Dry Creek and Canadian National Railway, there is no connection to approximately three-fourths of the corridor to I-380. Therefore, this project should begin the engineering and environmental process as soon as possible because this will probably take six or more years to implement. This project would be higher in the priority list if the other projects were not already at least partially funded and substantially ahead in the environmental process.

Project Priority 6

Relocated Winslow to Existing Winslow

This is the second most expensive and second most difficult project along the corridor. This project will also require additional time to develop due to the high likelihood of environmental issues surrounding Indian Creek. However, this project does have the advantage that the City of Marion owns much of the land needed to construct the improvements. Assembling the funds for this project and initiating the environmental process will be important to maintain this project schedule.

Project Priority 7 through 11

Summerset Extended to C Avenue, The Ridge at Indian Creek to Beckner-Robinson-Vaughn Farms, Beckner-Robinson-Vaughn Farms to IA Highway 13, Council Street to Turtle Run Extended, and Turtle Run Extended to Summerset Extended

These projects will likely occur as development occurs along the corridor. For example, Project Priority 7 (from Summerset to C Avenue) will be tied primarily to the development of a Hy-Vee site at the southwest corner of C Avenue and Tower Terrace Road.

Project Priority 12 and 13

Center Point Road to Stamy Road and Stamy Road to Robins Road

The City of Hiawatha has indicated a preference to use the existing Tower Terrace Road pavement since this section of Tower Terrace Road is already functional as a two-lane roadway. This roadway can do so until congestion requires widening to provide turn lanes at the intersections and the other traffic-related controls and amenities. At some point in the future, when the existing pavement is in need of replacement, this section of Tower Terrace Road can be replaced with the typical section of Tower Terrace Road.

FUNDING

OVERVIEW

Each jurisdiction is primarily responsible for the construction and maintenance of Tower Terrace Road within their boundaries. The jurisdictions have external and internal funding sources (refer to the next section) to apply towards project implementation.

The project costs consist of the following main items:

- Construction
- Right-of-way acquisition
- Utility relocations, primarily undergrounding utilities or moving utilities in private easements
- New utilities, primarily water main extensions
- Engineering (environmental studies, design, plan preparation, and bidding assistance, etc.)
- Construction administration (construction inspection and managing the construction contract)

Figure 40 shows a typical proportion of each of the above project cost categories.

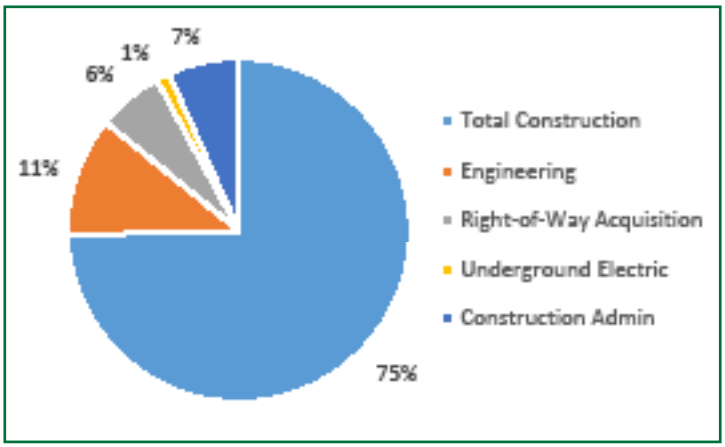


FIGURE 40: Typical Proportions of Project Costs

As can be seen on Figure 40, the bulk of the project costs occur during construction and as much as 25% of project costs occur during the engineering, right-of-way, and other phases. In terms of funding, not all of these cost categories qualify for participation in federal-aid (note that for purposes of finance discussion, the terms federal-aid and swap funds will be used interchangeably). For example, building new utilities or moving overhead utilities underground would generally not be eligible for federal-aid. Engineering and construction administration can be financed with federal-aid, but the process to obtain services and make contract changes can be cumbersome and time consuming. Due to these concerns, many communities opt to use local funding for both of these items and utilize federal-aid on construction and right-of-way acquisition phases of a project.

Table 9, on the following page, adds a funding scenario, assuming half of the eligible construction and right-of-way costs are funded with federal-aid/swap funds.

FUNDING

SUMMARY OF PROJECT COSTS BY PROJECT AND JURISDICTION					
	ALL	HIAWATHA	ROBINS	CEDAR RAPIDS	MARION
Total Construction	$ 70,328,136	$11,828,995	$ 8,964,610	$ 23,424,550	$26,109,980
Engineering	$ 10,549,200	$ 1,774,400	$ 1,344,700	$ 3,513,600	$ 3,916,500
Right-of-way Acquisition	$ 5,823,777	$ 898,692	$ 805,659	$ 2,235,317	$ 1,884,108
Underground Electric	$ 1,200,000	$ 800,000	$ -	$ 400,000	$ -
Construction Admin	$ 6,328,000	$ 1,064,000	$ 807,000	$ 2,108,000	$ 2,349,000
Total Project Cost	**$ 94,229,112**	**$16,366,088**	**$11,921,969**	**$ 31,681,467**	**$34,259,588**
Federal Aid (or swap eligible)	$ 79,055,806	$14,104,573	$11,114,969	$ 24,436,816	$29,399,448
Assume 50% Grant	$ 39,527,903	$ 7,052,286	$ 5,557,485	$ 12,218,408	$14,699,724
Local Grant Match (50%)	$ 39,527,903	$ 7,052,286	$ 5,557,485	$ 12,218,408	$14,699,724
Non-Eligible Costs	$ 15,173,306	$ 2,261,515	$ 807,000	$ 7,244,651	$ 4,860,140
Total Local Funds	**$ 54,701,209**	**$ 9,313,801**	**$ 6,364,485**	**$ 19,463,059**	**$19,559,864**

TABLE 9: Summary of Project Costs by Project and Jurisdiction (2018 Dollars)

The summary shows approximately $37 million in federal-aid/swap funds will be applied toward Tower Terrace Road. Some of this funding has already been secured:

- Federal-aid for the east and west approach legs of the Tower Terrace Road interchange (Projects 1 and 2): $4 million
- Swap funds for Tower Terrace Road from C Avenue to Alburnett Road (Projects 8, 9, 10, and 11): $11.9 million

Based on the above allocations already in place, there would remain about $20 million in swap funds to be allocated using the Corridor MPO's annual allocations. Currently, the Corridor MPO receives approximately $5.5 million per year. If $2.5 million per year were allocated toward Tower Terrace Road, the balance could be attained in about 8 to 12 years, leaving some room for inflation.

It is important to note that the unfunded balance of local funds totals approximately $58 million. Currently, the above summary shows only the municipal jurisdictions. To help solve this, Linn County could also participate in some fashion. For example, if the $58 million could be divided in five ways, this would result in just under $12 million per jurisdiction. Perhaps Linn County could participate up to $12 million to be distributed evenly to the other four municipalities ($3 million each). Alternatively, the distribution could be prorated based on need.

For example, because Robins is a relatively small community, and the access benefits of Tower Terrace Road are limited essentially to the area west of the Canadian National Railway, the value the City of Robins receives is less considering the high cost of the infrastructure to cross the railroad. One scenario could apply $5 million toward Robins local share and split the remaining $7 million to the other three municipalities.

An effort, initiated by one of the Corridor MPO Transportation Technical Advisory Committee members, by the Cities of Cedar Rapids and Hiawatha is underway to remove the bicycle lanes from the I-380 Diverging Diamond Interchange and instead realigning the trail to the north side of the interchange, using underpasses at the two north side ramps. The trail would be carried along the north side of the bridge, but bicycle and pedestrian traffic would not have to cross any of the interchange lanes at-grade.

FUNDING

ALTERNATIVE FUNDING SOURCES

Alternative funding sources do exist and there are a few funding sources available to counties and municipalities. These include both federal and non-federal sources.

Federal-aid sources include:

- *Iowa Clean Air Attainment Program (ICAAP):* Funding is usually in the $0.5-$1 million range
- *BUILD Grant:* Funding ranges from $5 million (at a minimum) to $25 million (maximum)

The Better Utilizing Investments to Leverage Development (BUILD) Grant program has recently replaced the TIGER Grant program. As this is a new program, there are some unknowns that would need to be determined if this is a chosen funding source. However, this grant program is anticipated to be very similar to the TIGER Grant program. The criteria for the BUILD grant include:

Merit criteria:

- Safety
- State of Good Repair
- Economic Competitiveness
- Environmental Protection
- Quality of Life
- Innovation
- Partnership
- Non-Federal Revenue for Transportation Infrastructure Investment

Other criteria:

- Demonstrated Project Readiness
- Project Costs and Benefits

Additional considerations:

- Geographic diversity among recipients

The cooperation of multiple jurisdictions in the Tower Terrace Road project is a key strength regarding the possibility of obtaining a BUILD grant. Geographic diversity may or may not be a strength, depending on other applications from within the State of Iowa.

"How has Marion been able to build portions of Tower Terrace Road?"

A common question seems to be how the City of Marion has been able to build portions of Tower Terrace Road.

The City of Marion assesses developers at the time of development a participation cost. This cost is the equivalent of half of a 26-foot wide street of 7-inch thick pavement the length of the development frontage. This assumes the frontage is only on one side of Tower Terrace Road, which is common. The City of Marion pays for the increased width and thickness of the pavement that is actually constructed. The developer also pays for the equivalent of a 4-foot wide, 4-inch thick sidewalk on their side of the road, and the City of Marion pays for the increased width and thickness for the trail. Also, the developer pays for water, storm, and sanitary service to the site, and the City of Marion pays for any increase in size needed for future capacity.

Although hard to estimate precisely, the private contributions roughly amount to 15% of construction cost (or about 10% of total project cost) per side of the street. This is up to 20% to 30% total. When a developer along the corridor is ready to begin a development, the agreement is made. Typically, the jurisdiction finances the project money up front to build the roadway and charges the developer for their share of the costs. The property owner on the other side of the road is charged when that side is developed and connected to the corridor. Essentially, this is a connection fee similar to water and sewer main connection fees.

Cedar Rapids has a very similar development policy.

FUNDING

A few weaknesses have also been identified for this project and possible receipt of a BUILD Grant. The weaknesses of this project include:

- *Non-Federal Revenue:* This means the program administrators want to have federal participation at about 50% or less.
- *Demonstrated Project Readiness:* This means at least the environmental process is complete and is even better if right-of-way has been acquired. The program administrators are typically interested in "shovel ready" projects.
- The BUILD program has an emphasis on rural projects, which may be a weakness.

Properly preparing a BUILD grant application takes time. Political consensus with state and federal legislators is important, as well as a ground campaign to develop support both from a letter writing standpoint but also private financial participation in the project. Two years of groundwork preparing for a BUILD grant application would not be out of question.

State and local funds are also possible funding sources. These funds include:

- *Revitalize Iowa's Sound Economy (RISE):* For speculative roadway improvements, 2017 grants ranged from $72,000 to just under $4 million
- *Tax Increment Finance (TIF):* Depending on the community, and whether TIF districts are available, TIF funds can be used to bond projects and pay off the bond using the incremental tax from development. Available funds are tied to the value of the TIF district.
- *Assessments, Connection Fees, Development Agreements:* Assess a portion of the cost of the roadway improvements to private developers to recapture some of the land value increase conferred upon adjacent property by the public improvement. Cedar Rapids and Marion employ both of these techniques.
- *General Obligation Bonds (GOB):* The public entity borrows money against the future revenues expected to be generated by the City through taxes, fees, etc. over time.

TIMELINE OF FUNDING

Total funding amounts provide relative scope of the project; however, all funding is not instantaneously available. Table 10, on the following pages, attempts to tie the funding and expenses to a timeline, creating a cash flow diagram. The funding amounts through fiscal year 2022 are taken from the Iowa DOT's Draft 2019-2022 Statewide Transportation Improvement Program. Beyond 2022, funding amounts for swap funds/federal-aid are assumed to be $2 million per year. Table 10 is based on funding swap-eligible costs to 50%. This is not a cap, but a strategy to accelerate the pace of construction.

Table 11 is based on funding swap-eligible costs to 80%, which is the current Corridor MPO policy. Finally, Figure 41 is a graphic comparison of the two scenarios shown in Tables 10 and 11. As can be seen from Figure 41, the schedule for 80% swap funding level is about 8 years longer than 50%. Also, some of the development-driven projects, such as Project Priorities 7 through 13, may move in the schedule based on development demand and/or may not ultimately use swap funds.

It should be noted in both Table 10 and 11 and in Figure 41, based on past practice of the cities, engineering is considered swap-eligible for all communities, but Cedar Rapids typically uses local funds for engineering. The effect of this assumption is most projects begin the engineering/concepting when the swap funds are available. However, the projects where Cedar Rapids is the sole project sponsor, the engineering begins earlier than when swap funds are available. Using local funds for project engineering is a recommended practice, because it can accelerate the project schedule, and it is encouraged by the Iowa DOT.

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 50% SWAP FUND PARTICIPATION																						
				Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																		
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date		FFY19	FFY20	FFY21	FFY22	FFY23	FFY24	FFY25	FFY26	FFY27	FFY28	FFY29	FFY30	FFY31	FFY32	FFY33	FFY34	FFY35	FFY36	FFY37	Grand Totals
1*	E. Edge of Kloubec Property to Alburnett Road	Marion/ 11/17/2019	SWAP/FA	194	1,559																		1,753
			Local	341	565																		906
			Total Funds	535	2,124	-																	**2,659**
			Construction		1,949																		1,949
			Engineering	292																			292
			ROW	243																			243
			U/G Elec																				-
			Const. Admin		175																		175
			Total Cost	535	2,124																		**2,659**
2*	E. Edge of Area C (Annexation Limit) to E. Edge of Kloubec Property	Marion/ 11/17/2019	SWAP/FA	518	3,153																		3,671
			Local	882	2,316	-																	3,198
			Total Funds	1,400	5,469	-																	**6,869**
			Construction		5,017																		5,017
			Engineering	753																			753
			ROW	647																			647
			U/G Elec																				-
			Const. Admin		452																		452
			Total Cost	1,400	5,469	-																	**6,869**
3*	C Avenue to E. Edge of Area C (Annexation Limit)	Cedar Rapids/ 11/17/2019	SWAP/FA	160	1,755																		1,915
			Local	878	1,839																		2,717
			Total Funds	1,038	3,594	-																	**4,632**
			Construction		3,297																		3,297
			Engineering	495																			495
			ROW	246																			246
			U/G Elec																				-
			Const. Admin	297	297																		594
			Total Cost	1,038	3,594	-																	**4,632**
		Marion/ 11/17/2019	SWAP/FA	60	703																		763
			Local	232	735																		967
			Total Funds	292	1,438	-																	**1,730**
			Construction		1,319																		1,319
			Engineering	198																			198
			ROW	94																			94
			U/G Elec																				-
			Const. Admin		119																		119
			Total Cost	292	1,438	-																	**1,730**

TABLE 10: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 50% SWAP

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 50% SWAP FUND PARTICIPATION																						
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date		Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																		Grand Totals
				FFY19	FFY20	FFY21	FFY22	FFY23	FFY24	FFY25	FFY26	FFY27	FFY28	FFY29	FFY30	FFY31	FFY32	FFY33	FFY34	FFY35	FFY36	FFY37	
4	Edgewood Road to W. Edge of I-380 Interchange	Cedar Rapids/ October, 2025	SWAP/FA					2,000	1,000	76													3,076
			Local				857			703	3,556												5,116
			Total Funds	-	-	-	857	2,000	1,000	779	3,556												**8,192**
			Construction								5,714												5,714
			Engineering				857																857
			ROW							806													806
			U/G Elec							300													300
			Const. Admin								514												514
			Total Cost	-	-	-	857	-	-	1,106	6,228												**8,192**
4*	E. Edge of I-380 Interchange to Center Point Road	Hiawatha/ October, 2025	SWAP/FA				1,810																1,810
			Local				237			353	1,923												2,513
			Total Funds	-	-	-	2,047	-	-	353	1,923												**4,323**
			Construction								3,159												3,159
			Engineering				474																474
			ROW							106													106
			U/G Elec							300													300
			Const. Admin								284												284
			Total Cost	-	-	-	474	-	-	406	3,443												**4,323**

TABLE 10: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 50% SWAP

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 50% SWAP FUND PARTICIPATION																						
				Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																		
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date		FFY19	FFY20	FFY21	FFY22	FFY23	FFY24	FFY25	FFY26	FFY27	FFY28	FFY29	FFY30	FFY31	FFY32	FFY33	FFY34	FFY35	FFY36	FFY37	Grand Totals
5	Robins Road to Council Street (Bridges Over Dry Creek and Canadian National Railway)	Hiawatha/ October, 2029	SWAP/FA						300	500	500	750	564										2,614
			Local						276						2,850								3,125
			Total Funds	-	-	-	-	-	576	500	500	750	564	-	2,850								**5,739**
			Construction												3,676								3,676
			Engineering						551														551
			ROW											681									681
			U/G Elec											500									500
			Const. Admin												331								331
			Total Cost	-	-	-	-	-	551	-	-	-	-	1,181	4,007								**5,739**
		Robins/ October, 2029	SWAP/FA						400	1,000	1,000	750	207										3,357
			Local						393						3,435								3,828
			Total Funds	-	-	-	-	-	793	1,000	1,000	750	207	-	3,435								**7,185**
			Construction												5,237								5,237
			Engineering						786														786
			ROW											692									692
			U/G Elec											-									-
			Const. Admin												471								471
			Total Cost	-	-	-	-	-	786	-	-	-	-	692	5,708								**7,185**
		Cedar Rapids/ October, 2029	SWAP/FA						300	424	500	500	389										2,113
			Local						264					169	2,163								2,597
			Total Funds	-	-	-	-	-	564	424	500	500	389	169	2,163								**4,710**
			Construction												3,526								3,526
			Engineering						529														529
			ROW											337									337
			U/G Elec											-									-
			Const. Admin												317								317
			Total Cost	-	-	-	-	-	529	-	-	-	-	337	3,843								**4,710**
6	Relocated Winslow to Existing Winslow (Bridge Over Indian Creek)	Marion/ October, 2033	SWAP/FA										840	2,000	2,000	701							5,541
			Local										724					3	5,703				6,430
			Total Funds	-	-	-	-	-	-	-	-	-	1,564	2,000	2,000	701	-	3	5,703				**11,971**
			Construction																9,649				9,649
			Engineering										1,447										1,447
			ROW															6					6
			U/G Elec															-					-
			Const. Admin																868				868
			Total Cost	-	-	-	-	-	-	-	-	-	1,447	-	-	-	-	6	10,517				**11,971**

TABLE 10: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 50% SWAP

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 50% SWAP FUND PARTICIPATION																						
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date		Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																		Grand Totals
				FFY19	FFY20	FFY21	FFY22	FFY23	FFY24	FFY25	FFY26	FFY27	FFY28	FFY29	FFY30	FFY31	FFY32	FFY33	FFY34	FFY35	FFY36	FFY37	
7*	Summerset Extended to C Avenue	Cedar Rapids 11/17/2020	SWAP/FA	184		3,652																	3,836
			Local	681		1,653																	2,334
			Total Funds	865	-	5,305	-																**6,170**
			Construction			4,774																	4,774
			Engineering	692																			692
			ROW	173																			173
			U/G Elec			100																	100
			Const. Admin			430																	430
			Total Cost	865	-	5,304																	**6,170**
8	The Ridge at Indian Creek to Beckner-Robinson-Vaughn Farms	Marion/ October, 2036	SWAP/FA													1,299	1,126					2,425
			Local													304					253	2,557	3,115
			Total Funds									-	-	-	-	1,603	1,126	-	-	-	253	2,557	**5,540**
			Construction																			4,059	4,059
			Engineering													609							609
			ROW																		507		507
			U/G Elec																		-		-
			Const. Admin																			365	365
			Total Cost									-	-	-	-	609	-	-	-	-	507	4,424	**5,540**

TABLE 10: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 50% SWAP

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 50% SWAP FUND PARTICIPATION																							
				Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																			
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date		FFY28		FFY32	FFY33	FFY34	FFY35	FFY36	FFY37	FFY38	FFY39	FFY40	FFY41	FFY42	FFY43	FFY44	FFY45	FFY46	FFY47	FFY48	Grand Totals
9	Beckner-Robinson-Vaugh Farms to IA Highway 13	Marion/ October, 2037	SWAP/FA		SHIFT CALENDAR TO EARLIER FFY	874	1,538																2,412
			Local			309					194	2,576											3,079
			Total Funds			1,183	1,538	-	-	-	194	2,576	-	-	-	-	-	-					**5,491**
			Construction									4,116											4,116
			Engineering			617																	617
			ROW								387												387
			U/G Elec								-												-
			Const. Admin									370											370
			Total Cost			617	-	-	-	-	387	4,486	-	-	-	-	-	-					**5,491**
10	Council Street to Turtle Run Extended	Cedar Rapids/ October, 2033	SWAP/FA				462	729															1,191
			Local	357			124	1,525															2,007
			Total Funds	357		-	586	2,254	-	-	-	-	-	-	-	-	-	-	-				**3,198**
			Construction					2,378															2,378
			Engineering	357																			357
			ROW				249																249
			U/G Elec															-					-
			Const. Admin					214															214
			Total Cost	357		-	249	2,592	-	-	-	-	-	-	-	-	-	-	-				**3,198**
11	Turtle Run Extended to Summerset Extended	Cedar Rapids/ October, 2034	SWAP/FA					1,271	647														1,918
			Local	560				212	2,365														3,137
			Total Funds	560	-	-	-	1,483	3,012	-	-	-	-	-	-	-	-	-					**5,055**
			Construction						3,734														3,734
			Engineering	560																			560
			ROW					425															425
			U/G Elec					-															-
			Const. Admin						336														336
			Total Cost	560	-	-	-	425	4,070	-	-	-	-	-	-	-	-	-	-	-			**5,055**

TABLE 10: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 50% SWAP

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 50% SWAP FUND PARTICIPATION																						
				Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																		
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date		FFY28		FFY32	FFY33	FFY34	FFY35	FFY36	FFY37	FFY38	FFY39	FFY40	FFY41	FFY42	FFY43	FFY44	FFY45	FFY46	FFY47	FFY48	Grand Totals
12	Center Point Road to Stamy Road	Hiawatha/ October, 2040	SWAP/FA						907	67													974
			Local						146					10	1,300								1,456
			Total Funds	-	-	-	-	-	1,052	67	-	-	-	10	1,300	-	-	-	-	-	-		**2,430**
			Construction												1,944								1,944
			Engineering						292														292
			ROW											20									20
			U/G Elec											-									-
			Const. Admin												175								175
			Total Cost	-	-	-	-	-	292	-	-	-	-	20	2,119	-	-	-	-	-	-		**2,430**
		Robins/ October, 2040	SWAP/FA						446	171													617
			Local						77					31	602					-			709
			Total Funds	-	-	-	-	-	523	171	-	-	-	31	602	-	-	-	-	-	-		**1,326**
			Construction												1,020								1,020
			Engineering						153														153
			ROW											61									61
			U/G Elec											-									-
			Const. Admin												92								92
			Total Cost	-	-	-	-	-	153	-	-	-	-	61	1,112	-	-	-	-	-	-		**1,326**
13	Stamy Road to Robins Road	Hiawatha/ October, 2041	SWAP/FA							881	774												1,655
			Local							229					46	1,944							2,219
			Total Funds	-	-	-	-	-	-	1,110	774	-	-	-	46	1,944	-	-	-	-	-	-	**3,874**
			Construction													3,050							3,050
			Engineering							458													458
			ROW												92								92
			U/G Elec												-								-
			Const. Admin													274							274
			Total Cost	-	-	-	-	-	-	458	-	-	-	-	92	3,324	-	-	-	-	-	-	**3,874**
		Robins/ October, 2041	SWAP/FA							881	702												1,583
			Local							203					26	1,598							1,827
			Total Funds	-	-	-	-	-	-	1,084	702	-	-	-	26	1,598	-	-	-	-	-	-	**3,410**
			Construction													2,707							2,707
			Engineering							406													406
			ROW												53								53
			U/G Elec												-								-
			Const. Admin													244							244
			Total Cost	-	-	-	-	-	-	406	-	-	-	-	53	2,951	-	-	-	-	-	-	**3,410**

* NOTE: Denotes projects with programmed funding already in the Transportation Improvement Program (TIP)

TABLE 10: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 50% SWAP

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 80% SWAP FUND PARTICIPATION																					
				Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																	
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date		FFY19	FFY20	FFY21	FFY22	FFY23	FFY24	FFY25	FFY26	FFY27	FFY28	FFY29	FFY30	FFY31	FFY32	FFY33	FFY34	FFY35	FFY36	Grand Totals
1*	E. Edge of Kloubec Property to Alburnett Road	Marion/ 11/17/2019	SWAP/FA	194	1,559																	1,753
			Local	341	565																	906
			Total Funds	535	2,124	-																**2,659**
			Construction		1,949																	1,949
			Engineering	292																		292
			ROW	243																		243
			U/G Elec																			-
			Const. Admin		175																	175
			Total Cost	535	2,124																	**2,659**
2*	E. Edge of Area C (Annexation Limit) to E. Edge of Kloubec Property	Marion/ 11/17/2019	SWAP/FA	518	3,153																	3,671
			Local	882	2,316	-																3,198
			Total Funds	1,400	5,469	-																**6,869**
			Construction		5,017																	5,017
			Engineering	753																		753
			ROW	647																		647
			U/G Elec																			-
			Const. Admin		452																	452
			Total Cost	1,400	5,469	-																**6,869**
3*	C Avenue to E. Edge of Area C (Annexation Limit)	Cedar Rapids/ 11/17/2019	SWAP/FA	160	1,755																	1,915
			Local	878	1,839																	2,717
			Total Funds	1,038	3,594	-																**4,632**
			Construction		3,297																	3,297
			Engineering	495																		495
			ROW	246																		246
			U/G Elec																			-
			Const. Admin	297	297																	594
			Total Cost	1,038	3,594	-																**4,632**
		Marion/ 11/17/2019	SWAP/FA	60	703																	763
			Local	232	735																	967
			Total Funds	292	1,438	-																**1,730**
			Construction		1,319																	1,319
			Engineering	198																		198
			ROW	94																		94
			U/G Elec																			-
			Const. Admin		119																	119
			Total Cost	292	1,438	-																**1,730**

TABLE 11: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 80% SWAP

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 80% SWAP FUND PARTICIPATION																					
				Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																	
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date		FFY19	FFY20	FFY21	FFY22	FFY23	FFY24	FFY25	FFY26	FFY27	FFY28	FFY29	FFY30	FFY31	FFY32	FFY33	FFY34	FFY35	FFY36	Grand Totals
4	Edgewood Road to W. Edge of I-380 Interchange	Cedar Rapids/ October, 2025	SWAP/FA					2,000	2,000	920												4,920
			Local		857					161	2,254											3,272
			Total Funds	-	857	-	-	2,000	2,000	1,081	2,254											**8,192**
			Construction								5,714											5,714
			Engineering		857																	857
			ROW							806												806
			U/G Elec							300												300
			Const. Admin								514											514
			Total Cost	-	857	-	-	-	-	1,106	6,228											**8,192**
4*	E. Edge of I-380 Interchange to Center Point Road	Hiawatha/ October, 2025	SWAP/FA				2,000			896												2,896
			Local				95			21	1,311											1,427
			Total Funds	-	-	-	2,095	-	-	917	1,311											**4,323**
			Construction								3,159											3,159
			Engineering				474															474
			ROW							106												106
			U/G Elec							300												300
			Const. Admin								284											284
			Total Cost	-	-	-	474	-	-	406	3,443											**4,323**

TABLE 11: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 80% SWAP

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 80% SWAP FUND PARTICIPATION																					
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date		Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																	Grand Totals
				FFY19	FFY20	FFY21	FFY22	FFY23	FFY24	FFY25	FFY26	FFY27	FFY28	FFY29	FFY30	FFY31	FFY32	FFY33	FFY34	FFY35	FFY36	
5	Robins Road to Council Street (Bridges Over Dry Creek and Canadian National Railway)	Hiawatha/ October, 2031	SWAP/FA							184	137	700	700	700	700	700	361					4,182
			Local								110					136	1,311					1,557
			Total Funds	-	-	-	-	-	-	184	247	700	700	700	700	836	1,672					**5,739**
			Construction														3,676					3,676
			Engineering								551											551
			ROW													681						681
			U/G Elec													500						500
			Const. Admin														331					331
			Total Cost	-	-	-	-	-	-	-	551	-	-	-	-	1,181	4,007					**5,739**
		Robins/ October, 2031	SWAP/FA								1,150	800	800	800	800	800	222					5,372
			Local								157					138	1,518					1,813
			Total Funds	-	-	-	-	-	-	-	1,307	800	800	800	800	938	1,740					**7,185**
			Construction														5,237					5,237
			Engineering								786											786
			ROW													692						692
			U/G Elec													-						-
			Const. Admin														471					471
			Total Cost	-	-	-	-	-	-	-	786	-	-	-	-	692	5,708					**7,185**
		Cedar Rapids/ October, 2031	SWAP/FA								713	500	500	500	500	500	168					3,381
			Local						-		106					67	1,155					1,329
			Total Funds	-	-	-	-	-	-	-	819	500	500	500	500	567	1,323					**4,710**
			Construction														3,526					3,526
			Engineering								529											529
			ROW													337						337
			U/G Elec							-												-
			Const. Admin														317					317
			Total Cost	-	-	-	-	-	-	-	529	-	-	-	-	337	3,843					**4,710**

TABLE 11: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 80% SWAP

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 80% SWAP FUND PARTICIPATION																					
				Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																	
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date		FFY19	FFY20	FFY21		FFY31	FFY32	FFY33	FFY34	FFY35	FFY36	FFY37	FFY38	FFY39	FFY40	FFY41	FFY42	FFY43	FFY44	Grand Totals
6	Relocated Winslow to Existing Winslow (Bridge Over Indian Creek)	Marion/ October, 2035	SWAP/FA				SHIFT CALENDAR TO FFY31	1,249	2,000	2,000	2,000	1,617										8,866
			Local					289				1	2,814						-			3,105
			Total Funds	-	-	-		1,538	2,000	2,000	2,000	1,618	2,814	-	-	-	-	-	-	-		**11,971**
			Construction										9,649									9,649
			Engineering					1,447														1,447
			ROW									6										6
			U/G Elec									-										-
			Const. Admin										868									868
			Total Cost	-	-	-		1,447	-	-	-	6	10,517	-	-	-	-	-	-	-		**11,971**
7*	Summerset Extended to C Avenue	Cedar Rapids 11/17/2020	SWAP/FA	184		3,652																3,836
			Local	681		1,653																2,334
			Total Funds	865	-	5,305	-															**6,170**
			Construction			4,774																4,774
			Engineering	692																		692
			ROW	173																		173
			U/G Elec			100																100
			Const. Admin			430																430
			Total Cost	865	-	5,304																**6,170**

TABLE 11: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 80% SWAP

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 80% SWAP FUND PARTICIPATION																						
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date		Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																		Grand Totals
					FFY35	FFY36	FFY37	FFY38	FFY39	FFY40	FFY41	FFY42	FFY43	FFY44	FFY45	FFY46	FFY47	FFY48	FFY49	FFY50	FFY51	
8	The Ridge at Indian Creek to Beckner-Robinson-Vaughn Farms	Marion/ October, 2040	SWAP/FA	SHIFT CALENDAR TO FFY35	383	2,000	1,497															3,880
			Local		304					101	1,254											1,660
			Total Funds		687	2,000	1,497	-	-	101	1,254	-	-	-	-	-	-					**5,540**
			Construction								4,059											4,059
			Engineering		609																	609
			ROW							507												507
			U/G Elec							-												-
			Const. Admin								365											365
			Total Cost		609	-	-	-	-	507	4,424	-	-	-	-	-	-					**5,540**
9	Beckner-Robinson-Vaugh Farms to IA Highway 13	Marion/ October, 2042	SWAP/FA				503	2,000	1,357													3,860
			Local				309			-		77	1,244				-					1,631
			Total Funds		-	-	812	2,000	1,357	-	-	77	1,244	-	-	-	-		-			**5,491**
			Construction										4,116									4,116
			Engineering				617															617
			ROW									387										387
			U/G Elec									-										-
			Const. Admin										370									370
			Total Cost		-	-	617	-	-	-	-	387	4,486	-	-	-	-		-			**5,491**
10	Council Street to Turtle Run Extended	Cedar Rapids/ October, 2038	SWAP/FA						643	1,262												1,905
			Local		357				50	886									-			1,293
			Total Funds	-	357	-	-	-	693	2,148	-	-	-	-	-	-	-		-	-		**3,198**
			Construction							2,378												2,378
			Engineering		357																	357
			ROW						249													249
			U/G Elec						-													-
			Const. Admin							214												214
			Total Cost	-	357	-	-	-	249	2,592	-	-	-	-	-	-	-		-	-		**3,198**
11	Turtle Run Extended to Summerset Extended	Cedar Rapids/ October, 2042	SWAP/FA							738	2,000	330										3,068
			Local				560				85	1,342								-		1,987
			Total Funds	-	-	-	560	-	-	738	2,085	1,672	-	-	-	-	-		-	-	-	**5,055**
			Construction									3,734										3,734
			Engineering				560															560
			ROW								425											425
			U/G Elec								-											-
			Const. Admin									336										336
			Total Cost	-	-	-	560	-	-	-	425	4,070	-	-	-	-	-		-	-	-	**5,055**

TABLE 11: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 80% SWAP

FUNDING

PROJECT CASH FLOW OF EXPENSES AND FUNDING - ASSUMING 80% SWAP FUND PARTICIPATION																					
				Amounts in 1000's of 2018 Dollars - NOT adjusted for inflation																	
Proiority No.	Location on Tower Terrace Road:	Community/ Letting Date			FFY35	FFY36	FFY37	FFY38	FFY39	FFY40	FFY41	FFY42	FFY43	FFY44	FFY45	FFY46	FFY47	FFY48	FFY49	FFY50	FFY51	Grand Totals
12	Center Point Road to Stamy Road	Hiawatha/ October, 2047	SWAP/FA									1,119	439								1,558
			Local									58		-			4	810			872
			Total Funds	-	-	-	-	-	-	-	-	1,177	439	-	-	-	4	810	-	-	-	**2,430**
			Construction															1,944				1,944
			Engineering									292										292
			ROW														20					20
			U/G Elec														-					-
			Const. Admin															175				175
			Total Cost	-	-	-	-	-	-	-	-	292	-	-	-	-	20	2,119	-	-	-	**2,430**
		Robins/ October, 2047	SWAP/FA									551	437								988
			Local									31					12	296			338
			Total Funds	-	-	-	-	-	-	-	-	582	437	-	-	-	12	296	-	-	-	**1,326**
			Construction															1,020				1,020
			Engineering									153										153
			ROW														61					61
			U/G Elec														-					-
			Const. Admin															92				92
			Total Cost	-	-	-	-	-	-	-	-	153	-	-	-	-	61	1,112	-	-	-	**1,326**
13	Stamy Road to Robins Road	Hiawatha/ October, 2048	SWAP/FA										562	1,000	1,086							2,648
			Local										92					18	1,116			1,226
			Total Funds	-	-	-	-	-	-	-	-	-	654	1,000	1,086	-	-	18	1,116	-	-	**3,874**
			Construction																3,050			3,050
			Engineering										458									458
			ROW															92				92
			U/G Elec															-				-
			Const. Admin																274			274
			Total Cost	-	-	-	-	-	-	-	-	-	458	-	-	-	-	92	3,324	-	-	**3,874**
		Robins/ October, 2048	SWAP/FA										562	1,000	971							2,533
			Local										81					11	786			877
			Total Funds	-	-	-	-	-	-	-	-	-	643	1,000	971	-	-	11	786	-	-	**3,410**
			Construction																2,707			2,707
			Engineering										406									406
			ROW															53				53
			U/G Elec															-				-
			Const. Admin																244			244
			Total Cost	-	-	-	-	-	-	-	-	-	406	-	-	-	-	53	2,951	-	-	**3,410**

* NOTE: Denotes projects with programmed funding already in the Transportation Improvement Program (TIP)

TABLE 11: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 80% SWAP

FUNDING

PROJECT TIMELINES WITH 50% SWAP FUNDS VERSUS 80% SWAP FUND (2018 DOLLARS)

Proiority No.	Location on Tower Terrace Road:	Community	Funding Scenario	Letting Date	Amounts in $1,000's SWAP	LOCAL
1	E. Edge of Kloubec Property to Alburnett Road	Marion	50%	11/17/2019	1,753	906
			80%	11/17/2019	1,753	906
2	E. Edge of Area C (Annexation Limit) to E. Edge of Kloubec Property	Marion	50%	11/17/2019	3,671	3,198
			80%	11/17/2019	3,671	3,198
3	C Avenue to E. Edge of Area C (Annexation Limit)	Cedar Rapids/ Marion	50%	11/17/2019	2,678	3,684
			80%	11/17/2019	2,678	3,684
4	Edgewood Road to W. Edge of I-380 Interchange	Cedar Rapids	50%	October, 2025	3,076	5,116
			80%	October, 2025	4,920	3,272
4	E. Edge of I-380 Interchange to Center Point Road	Hiawatha	50%	October, 2025	2,000	2,513
			80%	October, 2025	2,896	1,427
5	Robins Road to Council Street (Bridges Over Dry Creek and Canadian National Railway)	Haiwatha/ Robins/ Cedar Rapids	50%	October, 2029	8,084	9,550
			80%	October, 2031	12,935	4,699
6	Relocated Winslow to Existing Winslow (Bridge Over Indian Creek)	Marion	50%	October, 2033	5,541	6,430
			80%	October, 2035	8,866	3,105
7	Summerset Extended to C Avenue	Cedar Rapids	50%	11/17/2020	3,836	2,334
			80%	11/17/2020	3,836	2,334
8	The Ridge at Indian Creek to Beckner-Robinson-Vaughn Farms	Marion	50%	October, 2036	2,425	3,115
			80%	October, 2040	3,880	1,660
9	Beckner-Robinson-Vaugh Farms to IA Highway 13	Marion	50%	October, 2037	2,412	3,079
			80%	October, 2042	3,860	1,631
10	Council Street to Turtle Run Extended	Cedar Rapids	50%	October, 2033	1,191	2,007
			80%	October, 2038	1,905	1,293
11	Turtle Run Extended to Summerset Extended	Cedar Rapids	50%	October, 2034	1,917	3,138
			80%	October, 2042	3,068	1,987
12	Center Point Road to Stamy Road	Hiawatha/ Robins	50%	October, 2040	1,591	2,165
			80%	October, 2047	2,546	1,210
13	Stamy Road to Robins Road	Hiawatha/ Robins	50%	October, 2041	3,238	4,046
			80%	October, 2048	5,181	2,103

Timelines based on $2 Million annual allocation toward Tower Terrace Road

Timelines are from start of engineering to bid letting. An additional two years are estimated for construction of each project. Bridge projects may take 3 years.

FIGURE 41: Comparison of 50% Versus 80% SWAP Funding

MEETING MINUTES

Tower Terrace Road Corridor Management Plan Update
Advisory Group Kickoff
April 25, 2018

Jurisdiction Attendees: John Witt, Breena Fall, Brad Ketels, Chuck Hinz, Kesha Billings, Michael Barkalow, Kim Downs, John Bender

Corridor MPO Attendees: Bill Micheel, Brandon Whyte, Hilary Hershner

Consultant Attendees: Jeff Morrow, Michaela LeClair, Megan Moffitt, Laura Lutz-Zimmerman, Mike Kurek

Absent: Kent Ellis

1. **Introductions:** All introduced name and role

2. **Overview of Project**
   a. Original Study
   Meeting Notes: GENERAL OVERVIEW
   b. Role of Advisory Group
   Meeting Notes: Discussed that the Advisory Group is made up of constituent/jurisdiction members and will help guide the update to the TTR Corridor Management Plan; input is desired from everyone; ultimately this will be the jurisdiction/constituent project
   c. Goals and Vision
   Meeting Notes:
      i. Vision: Original vision generally acceptable; Slightly modified to a new suggested vision of: A regionally-significant, multi-modal transportation corridor constructed for the benefit of citizens in multiple jurisdictions that is safe, efficient, effective, aesthetically appealing, and environmentally friendly.
      ii. Goals: Original goals generally acceptable; want to make this update a planning tool toward the orderly funding and construction of TTR

3. **Planning Area**
   Meeting Notes: Reviewed land uses for jurisdictions; also discussed limited access to about 1,000 feet; with land use and expected future needs, discussed that lower rather than high speeds were desired (although may be difficult to control until development catches up in some areas)

4. **Schedule**

   Meeting Notes:

   a. Discussed schedule to of the TTR Corridor Management Plan Update: All seemed that the schedule was sufficient; approval from Corridor MPO and jurisdictions will ultimately be needed.
   b. Schedule of various TTR portions: Discussed that bite-sized pieces of TTR may be beneficial to have an actionable, fundable project for future; this may include jurisdictions working together or staying separate (if feasible)

5. **General Discussion**

   Meeting Notes:

   a. Environmentally-friendly: It was discussed that environmentally-friendly design should be included, which is currently still in the vision statement.
      i. Suggestion of native grasses and pollinators instead of grass, when possible; desire to come to a consensus among jurisdictions
         1. Consultant to bring ideas to next meeting
      ii. Maintenance also needs to be addressed
   b. Trees: Desire for some kind of trees in the design
   c. Lighting: Desire for some kind of lighting along the corridor
   d. Aesthetics: Balance of visually appealing and cost/maintenance needs
   e. Safety: Need to keep safety for all users top of mind
   f. Environmental: Map of possible environmental issues was provided for all to review (Map Attached)
      i. Some segments will require more intense review
   g. Railroad: Need to address Canadian National (CN) railroad and make contact
   h. Bridge: Need to address bridges needed throughout corridor to balance cost and aesthetics
   i. Future I-380 Interchange: Need to address this future project with the plan update
   j. Cost: Need to keep cost in mind; also need to update costs so the project corridors have a realistic idea of what is needed for funding.
   k. Funding: Update will look into funding strategies that may be available
   l. Action-oriented plan: Desire actionable plan that includes a logical order of schedule and helps decide funding and priority areas
   m. General theme: All seemed to agree that a plan adopted by all is desired and that plan needs to have consistency while allowing jurisdictions to have some flexibility depending on different issues they may encounter.

6. **Next Meeting**

   Meeting Notes: Doodle poll will be sent; next meeting to be held in May

MEETING MINUTES

Tower Terrace Road Corridor Management Plan Update
Advisory Group
May 30, 2018

Jurisdiction Attendees: John Witt, Breena Fall, Kent Ellis, Chuck Hinz, Kesha Billings, Michael Barkalow, Kim Downs, John Bender

Corridor MPO Attendees: Bill Micheel, Brandon Whyte, Hilary Hershner

Consultant Attendees: Jeff Morrow, Michaela LeClair, Megan Moffitt, Mike Kurek

Absent: Brad Ketels

1. PowerPoint Presentation
    a. Schedule: Reviewed schedule with the group and next steps
    b. Vision Statement: Reviewed revised vision statement
        i. Some discussion if additional verbiage was needed to define the corridor, but it was decided not to include additional language
    c. Goals: Reviewed goals
    d. Planning Area: Reviewed planning area
    e. Land Use: Reviewed land use map
        i. Took questions about how density was determined
        ii. Discussed that approximately 60% of land use is zoned for residential use
        iii. Discussed that a portion of Cedar Rapids to the west is not currently deemed a developable space
        iv. Discussed that future growth and estimations of when development is likely will be key. A realistic timeframe is needed.
        v. Will print larger map and materials for future meetings
    f. Design Elements:
        i. Discussed the original plan, general design elements, and possible differences in the update
        ii. Discussed the requirements of the Long Range Transportation Plan (LRTP)
            1. Per this plan: low speed major arterial is 25-35 mph, planted medians are preferred, and 10’ sidepath OR 3’ min physical barrier with 5’ min travel area (protected bike lane)
        iii. Showed various median treatment options, as well as concerns and benefits of the options shown
            1. Grass, bioswales, landscaped, native plants/grasses, combinations, paved, nose treatments

a. It was discussed if medians could be narrowed to help with right of way acquisition
b. It was also discussed that right of way should not be compromised because space needs to be provided for utilities and other considerations
c. It was also discussed that storm water management best practices are encouraged
d. Medians will be discussed more with jurisdictions in June meetings and a recommendation will be brought forward to the group

iv. Access Spacing was discussed with what the original plan intended and what has been developed, with some exceptions shown
    1. Group had consensus that the original intent of 1,200' permanent and 600' partial access should be maintained
    2. Also discussed that all jurisdictions are recommitted to this effort
v. Lighting options were shown, as well as benefits and challenges for lighting in the medians and on the edge of the roadway.
    1. Discussed that lighting may be one of the elements for jurisdictions to determine
    2. The intent is to incorporate lighting
vi. Cross sections were shown of the original study and an updated option with 10' sidepaths on both sides and omitting the bike lane at the full build
    1. Revised option still provides partial and full build
    2. Anticipated cost savings with the revised option were provided (both in right of way needs and construction costs)
    3. CMPO discussed that the City of Marion BPAC already approved this kind of revised option with 10' lanes on both sides of the road
vii. Speed was discussed regarding the posted speed
    1. Since 60% of land use shows residential, a 35 mph speed is recommended
    2. Until development happens, motorists traveling at a higher speed will be a concern
        a. This may be able to be controlled by various median treatments, such as adding ornamental trees, grasses, etc.
        b. This may also be able to be controlled by vertical alignment changes so drivers cannot see too far ahead in the travel lane
viii. Traffic estimating was discussed, especially considering development of the future I-380 interchange
    1. Update will consider future interchange
    2. CMPO will be updating their traffic model
        a. They will match the update phasing and funding to findings
ix. Alignment was discussed

1. Horizontal alignment more or less set
2. Vertical alignment may be able to be adjusted to help with speeding issues and concerns
3. I-380 interchange should plan to accommodate the trail in some way
    a. Could use the interchange example from the City of Urbandale, which was shown at the meeting.
        i. Tunnels under the roadway
    b. Will eventually need to discuss if the trail should be on both sides or one side and reconnect on the roadway after the interchange

x. The CN Railroad was contacted after the last meeting and they provided requirements for alignment, roadway, and bridge, as well as figures estimating road, signals, lights, gates, etc.
    1. RR prefers grade separation
        a. If at grade is selected, they would consider a new crossing if 2 crossing closures were offered in the same region
    2. At grade and grade separated was discussed as a group

xi. Estimated slab bridge options were provided and discussed
    1. The general consensus was that a grade separated bridge crossing may make more sense

xii. A brief recap of the environmental review was provided without discussion needed.

2. General Discussion: General discussion took place throughout the PowerPoint presentation

3. Schedule/Next Steps: Next steps are to meet individually with jurisdictions in June, then gather the Advisory Group in July. A public meeting will be held in July or early August. Draft plan will be delivered in August and final plan in September. (see schedule)

hold for AG meeting #3

hold for AG meeting #3

From: Nicholas Burwell [mailto:Nicholas.Burwell@cn.ca]
Sent: Monday, April 30, 2018 3:26 PM
To: Jeff Morrow <jmorrow@anderson-bogert.com>
Subject: RE: Tower Terrace Road in Robins Iowa

Jeff,

CCP is opposed to adding new at grade crossings, if a new grade crossing is required with this project it should be considered as a grade separation. If a grade separation is not elected CCP would consider a new crossing if 2 crossing closures are offered in the same region of the state on CCP.

From: Jeff Morrow [mailto:jmorrow@anderson-bogert.com]
Sent: Monday, March 26, 2018 5:20 PM
To: Nicholas Burwell <Nicholas.Burwell@cn.ca>
Subject: Tower Terrace Road in Robins Iowa

Hi Nick –

I am working with the Cities of Hiawatha, Robins, Cedar Rapids, and Marion on a new roadway corridor that will cross the CN railroad at the location shown in the attached aerial photo. The proposal is for an at-grade crossing. Tower Terrace Road is an arterial roadway. The current plan is for a two-lane road, but ultimately could be widened to the interior to a four lane roadway section. I have also included a typical section of Tower Terrace Road.

The overall Tower Terrace Road project extends from IA Highway 13 in Marion, west to I-380 in Hiawatha. This particular rail crossing is located in the City of Robins.

We are in the early planning stages of the project and we need to work with CN Railroad to develop this crossing concept. Can you tell me what the process and costs (order of magnitude) would be to construct a new at-grade railroad crossing of CN Track at this location? Please let me know if you have questions or need additional information.

Thanks,

Jeff Morrow

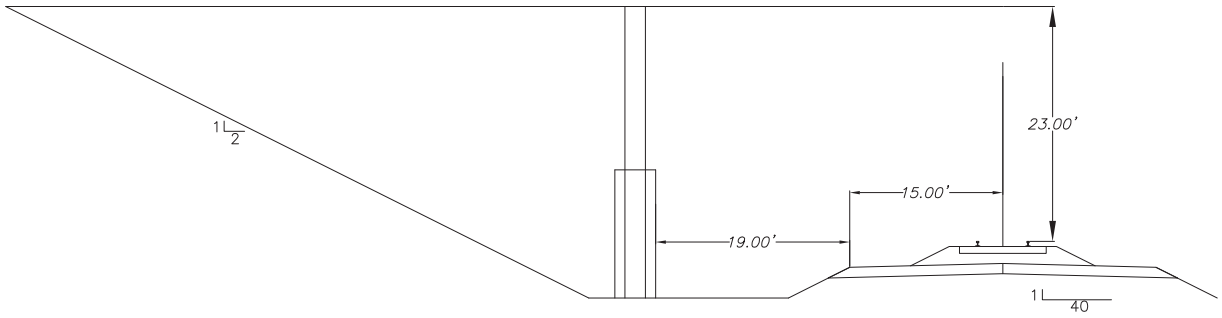
ANDERSON BOGERT
4001 River Ridge Drive NE, Cedar Rapids, IA 52402
jmorrow@anderson-bogert.com | http://www.anderson-bogert.com

319.377.4629 Office
319.361.0534 Cell
319.377.8498 Fax

From: Nicholas Burwell [mailto:Nicholas.Burwell@cn.ca]
Sent: Monday, April 30, 2018 4:42 PM
To: Jeff Morrow <jmorrow@anderson-bogert.com>
Subject: clearance diagram

1. Roadbed–
    a. Assumed typical section: (may be revised per geotechnical recommendations)
        i. 115 lb rail
        ii. 7”x9”x8.5’ wood ties @ 19.5” O.C.
        iii. 12” minimum ballast under tie
        iv. 12” minimum subballast
        v. Trackside ditches where necessary to convey drainage
            1. 3’ deep x 4’ flat bottom minimum
            2. 3’ deep x 10’ flat bottom preferred
2. Clearances –
    a. 23’-0” minimum vertical clearance at overpasses in final alignment
    b. 34’-0” minimum horizontal clearance to pier footing at overpasses (protected) in final alignment

Without an exact crossing length to figure the estimate on, you can use about $2000/ft for crossings wider than 50 feet as a rough estimate, without signals, lights and gates. Rough estimate for signals, lights, and gates for a 2 lane road is $250K could be more depending upon power availability, terrain for placement of bungalow and signal masts, etc.



Clearance Diagram

OFFICE OF THE ASSISTANT CHIEF ENGINEER - STRUCTURES

Feb. 2008

Submission and Design Guidelines for Crash Walls

1. Covering Letter and Required Documentation for review by CN Structures-Edmonton

- Summary of items enclosed,
- A Location or Key Plan to be used to identify the mileage and subdivision, the classification of the rail line, and the maximum speed for freight and passenger rail traffic, on CN-owned or operated corridors.
- Name, phone, fax and e-mail address of contact.

2. Geotechnical Report

- Soil properties used in design, and how determined,
- Borehole logs including location plan, if required to support these properties,
- Narrative report describing soil and ground water conditions, if required as above.

3. Design of Crash Walls

- Calculations analyzing proposed crash wall for Load Cases 1 to 4, considered representative of a derailed train, signed and sealed by a professional engineer.
- Freight Train Load Case 1 - Glancing Blow: three locomotives weighing 200 tons each plus six cars weighing 143 tons each, impacting the wall at 10 degrees to the wall,
- Freight Train Load Case 2 - Direct Impact: single car weighing 143 tons impacting the wall at 90 degrees to the wall.
- Passenger Train Load Case 3 - Glancing Blow: two locomotives weighing 118 tons plus six cars weighing 74 tons each impacting the wall at 10 degrees to the wall.
- Passenger Train Load Case 4 - Direct Impact: single locomotive weighing 118 tons impacting the wall at 90 degrees to the wall.
- The analysis should reflect the specified track speeds for passenger and/or freight trains applicable within the subject corridor.
- To assist in designing the structure for the above load cases, use:

- Speed of derailed equipment impacting the wall = appropriate track speed,
- Height of application of impact force = 3 feet above ground
- Minimum height of wall facing tracks = 7 feet above top of rail elevation.

- For energy dissipation, assume:
  - Plastic deformation of individual car due to direct impact = 1 foot (maximum),
  - Total compression of linkages and equipment of the two or three locomotive and six car consist = 10 feet (maximum),
  - Deflection of wall to be determined by the designer.
- The design must incorporate horizontal and vertical continuity to distribute the loads from the derailed train.

4. Drawings - (2 hard copies as well as .pdf format)

- Site plan clearly showing property line, location of wall structure, centre-line and elevation of nearest rail track,
- Layout and structural details of proposed structure, including all material notes and specs and construction procedures/phasing. All drawings signed and sealed by a professional engineer.
- Extent and treatment of any temporary excavations on railway property.

5. Fees

A review fee of $2500 plus GST covers the cost of a standard review. If additional submissions, site visits, meetings, review of more than one alternative or unusually complex designs are involved, additional fees may be requested.

6. Post-Construction Certificate

- Engineer's certificate of completion describing actual construction, and certifying that the structure was built as per approved drawings,
- Copy of as-built drawings, as part of the engineer's certification of completion

Access to Railway Operating Rights-of-Way

Permits **MUST** be obtained before entering into any Railway Operating right-of-way.

Some or all of the following may also be required: - proper railway flagging protection, cable locates, liability insurance, release of liability, safety training.

CN will provide guidance as to the proper process to be followed in this regard.

Communication for Submissions

All correspondence during the review process should be directed to the appropriate divisional Technical Services Department.

The railway will notify the applicant when the report has been reviewed and accepted.

Liability and Responsibility

The review will be undertaken with the understanding that neither the railway nor its consultants shall have any responsibility nor liability whatsoever for the design or adequacy of the crash wall, notwithstanding that any plans or specifications may have been reviewed by the railway or its consultants. No such review shall be deemed to limit the applicant's full responsibility for the design and construction adequacy of the works.

Office of the Assistant Chief Engineer

Edmonton, Alberta

Feb. 2008

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM EDGEWOOD ROAD TO WEST EDGE OF I-380 INTERCHANGE					Project 1 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
1	CLEAR+GRUBB	LS	1	$ 10,000	$ 10,000
2	EXCAVATION, CL 10, RDWY+BORROW	CY	30000	$ 5	$ 150,000
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	7800	$ 7	$ 50,700
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	2050	$ 3	$ 6,150
5	MODIFIED SUBBASE	CY	4500	$ 40	$ 180,000
6	SHLD CONSTRUCTION, EARTH	STA	83	$ 450	$ 37,350
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	20500	$ 45	$ 922,500
8	MEDIAN, PCC, 6"	SY	225	$ 86	$ 19,350
9	PCC PAV'T SAMPLE	LS	1	$ 3,000	$ 3,000
10	HMA (1M ESAL) BASE, 3/4" (8" THICK)	TON	2115	$ 62	$ 131,130
11	HMA (1M ESAL) SURF, 1/2", NO FRIC (2" THICK)	TON	535	$ 58	$ 31,030
12	ASPH BINDER, PG 58-28	TON	159	$ 570	$ 90,630
13	HMA PAV'T SAMPLE	LS	1	$ 4,000	$ 4,000
14	HMA, DRIVEWAY	SY	500	$ 66	$ 33,000
15	GRANULAR BACKFILL	CY	5460	$ 33	$ 180,180
16	APRON, CONC	EACH	8	$ 1,500	$ 12,000
17	INTAKE, SW-510	EACH	70	$ 6,500	$ 455,000
18	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	8300	$ 11	$ 91,300
19	SUBDRAIN OUTLET (RF-19C)	EACH	70	$ 300	$ 21,000
20	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	5,900	$ 70	$ 413,000
21	ENGINEER FABRIC	SY	800	$ 4	$ 3,000
22	REVETMENT, CLASS E	TON	128	$ 44	$ 5,632
23	RMVL OF PAV'T	SY	17200	$ 16	$ 275,200
24	RECREATIONAL TRAIL, PCC, 5"	SY	1100	$ 35	$ 38,500
25	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	10	$ 440	$ 4,400
26	SIDEWALK, PCC, 4"	SY	1390	$ 45	$ 62,550
27	SIDEWALK, PCC, 6"	SY	40	$ 85	$ 3,400
28	DETECTABLE WARNING - CURB RAMP	SF	150	$ 37	$ 5,550
29	DRIVEWAY, P.C. CONCRETE, 8 IN	SY	120	$ 65	$ 7,800
30	RMVL OF PAVED DRIVEWAY	SY	120	$ 12	$ 1,440
31	LIGHTING POLES	EACH	40	$ 5,000	$ 200,000
32	ELECTRICAL CIRCUIT	LF	4,150	$ 13	$ 53,950
33	HANDHOLE AND JUNCTION BOX	EACH	6	$ 900	$ 5,400
34	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	300	$ 22	$ 6,600
35	TYPE A SIGN, SHEET ALUM	SF	60	$ 22	$ 1,320
36	TRAFFIC SIGNALIZATION	EACH	1	$ 300,000	$ 300,000
37	CONSTRUCTION SURVEY	LS	1	$ 50,000	$ 50,000
38	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	135	$ 175	$ 23,625
39	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	36	$ 120	$ 4,320
40	GROOVE CUT - PAV'T MARK	STA	135	$ 55	$ 7,425
41	GROOVE CUT - SYMBOL+LEGEND	EACH	36	$ 115	$ 4,140
42	TRAFFIC CONTROL	LS	1	$ 150,000	$ 150,000
43	FLAGGER	EACH	40	$ 425	$ 17,000
44	MOBILIZATION	LS	1	$ 200,000	$ 200,000
45	MODULAR BLOCK RETAIN WALL	SF	300	$ 100	$ 30,000
46	TRENCH COMPACTION TESTING	LS	1	$ 8,500	$ 8,500
47	ADJUST FIRE HYDRANT	EACH	2	$ 3,500	$ 7,000
48	FIRE HYDRANT ASSEMBLIES	EACH	2	$ 4,800	$ 9,600
49	GATE VALVE+VALVE BOX, 8"	EACH	2	$ 1,700	$ 3,400
50	WATER MAIN, DUCTILE IRON, 8"	LF	3,125	$ 77	$ 240,625

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM EDGEWOOD ROAD TO WEST EDGE OF I-380 INTERCHANGE					Project 1 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
51	WATER MAIN FITTING	LB	9375	$ 10	$ 93,750
52	TAPPING SLEEVE+VALVE	EACH	2	$ 3,250	$ 6,500
53	DECORATIVE BRICK PAVERS	SY	300	$ 125	$ 37,500
54	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	500	$ 26	$ 13,000
55	MOW	ACRE	15	$ 150	$ 2,250
56	MULCH	ACRE	5	$ 700	$ 3,500
57	SEED+FERTILIZE (URBAN)	ACRE	5	$ 2,800	$ 14,000
58	STABILIZE CROP - SEED+FERTILIZE	ACRE	5	$ 2,000	$ 10,000
59	SILT FENCE	LF	6225	$ 3	$ 18,675
60	SILT FENCE-DITCH CHECKS	LF	620	$ 3	$ 1,550
61	SILT BASIN	EACH	4	$ 400	$ 1,600
62	RMVL OF SILT FENCE	LF	6225	$ 1	$ 6,225
63	RMVL OF SILT FENCE-DITCH CHECK	LF	620	$ 1	$ 620
64	CLEAN-OUT OF SILT FENCE	LF	3112.5	$ 2	$ 4,669
65	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	310	$ 2	$ 465
66	MULCH, SHREDDED BARK	CY	412	$ 45	$ 18,540
67	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	300	$ 50	$ 15,000
68	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	312	$ 250	$ 78,000

Sub-Total Construction:	$	4,897,540
Incentives:	$	82,280
Contingency (15%):	$	734,600
Total Construction:	$	5,714,420
Engineering (15%)	$	857,200
Right-of-way:	$	806,304
Underground Electric:	$	300,000
Construction Admin (9%):	$	514,000
TOTALS:	$	8,191,924

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$**	**8,191,924**
Less Utilities:	$	(369,375)
Less Engineering/Construction Admin:	$	(1,371,200)
Less Underground Electric:	$	(300,000)
STBG Eligible Costs:	$	6,151,349
Maximum STBG Request (80%):	**$**	**4,921,079**
20% Match:	$	1,230,270

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM EAST EDGE OF I380 INTERCHANGE TO CENTER POINT ROAD					Project 2 07-17-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
1	CLEAR+GRUBB	LS	1	$ 10,000	$ 10,000
2	EXCAVATION, CL 10, RDWY+BORROW	CY	10321	$ 5	$ 51,605
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	5300	$ 7	$ 34,450
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	1326	$ 3	$ 3,978
5	MODIFIED SUBBASE	CY	2004	$ 40	$ 80,160
6	SHLD CONSTRUCTION, EARTH	STA	33.6	$ 450	$ 15,120
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	13260	$ 45	$ 596,700
8	MEDIAN, PCC, 6"	SY	100	$ 86	$ 8,600
9	PCC PAV'T SAMPLE	LS	1	$ 3,000	$ 3,000
10	HMA, DRIVEWAY	SY	500	$ 66	$ 33,000
11	GRANULAR BACKFILL	CY	2710	$ 33	$ 89,430
12	APRON, CONC	EACH	2	$ 1,500	$ 3,000
13	INTAKE, SW-510	EACH	50	$ 6,500	$ 325,000
14	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	3360	$ 11	$ 36,960
15	SUBDRAIN OUTLET (RF-19C)	EACH	50	$ 300	$ 15,000
16	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	2,930	$ 70	$ 205,100
17	ENGINEER FABRIC	SY	200	$ 4	$ 750
18	REVETMENT, CLASS E	TON	32	$ 44	$ 1,408
19	RMVL OF PAV'T	SY	4850	$ 16	$ 77,600
20	RECREATIONAL TRAIL, PCC, 5"	SY	1530	$ 35	$ 53,550
21	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	13.8	$ 440	$ 6,072
22	SIDEWALK, PCC, 4"	SY	210	$ 45	$ 9,450
23	SIDEWALK, PCC, 6"	SY	12	$ 85	$ 1,020
24	DETECTABLE WARNING - CURB RAMP	SF	130	$ 37	$ 4,810
25	DRIVEWAY, P.C. CONCRETE, 8 IN	SY	40	$ 65	$ 2,600
26	RMVL OF PAVED DRIVEWAY	SY	250	$ 12	$ 3,000
27	LIGHTING POLES	EACH	20	$ 5,000	$ 100,000
28	ELECTRICAL CIRCUIT	LF	1,680	$ 13	$ 21,840
29	HANDHOLE AND JUNCTION BOX	EACH	6	$ 900	$ 5,400
30	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	300	$ 22	$ 6,600
31	TYPE A SIGN, SHEET ALUM	SF	60	$ 22	$ 1,320
32	TRAFFIC SIGNALIZATION	EACH	1	$ 300,000	$ 300,000
33	CONSTRUCTION SURVEY	LS	1	$ 30,000	$ 30,000
34	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	55	$ 175	$ 9,625
35	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	12	$ 120	$ 1,440
36	GROOVE CUT - PAV'T MARK	STA	55	$ 55	$ 3,025
37	GROOVE CUT - SYMBOL+LEGEND	EACH	12	$ 115	$ 1,380
38	TRAFFIC CONTROL	LS	1	$ 100,000	$ 100,000
39	FLAGGER	EACH	60	$ 425	$ 25,500
40	MOBILIZATION	LS	1	$ 200,000	$ 200,000
41	TRENCH COMPACTION TESTING	LS	1	$ 8,500	$ 8,500
42	MANHOLE, SANITARY SEWER, SW-301, 60 IN.	EACH	3	$ 8,500	$ 25,500
43	SANITARY SEWER GRAVITY MAIN, TRENCHED, 8 IN.	LF	850	$ 100	$ 85,000
44	DECORATIVE BRICK PAVERS	SY	200	$ 125	$ 25,000
45	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	500	$ 26	$ 13,000
46	MOW	ACRE	9	$ 150	$ 1,350
47	MULCH	ACRE	3	$ 700	$ 2,100
48	SEED+FERTILIZE (URBAN)	ACRE	3	$ 2,800	$ 8,400
49	STABILIZE CROP - SEED+FERTILIZE	ACRE	3	$ 2,000	$ 6,000
50	SILT FENCE	LF	2520	$ 3	$ 7,560

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM EAST EDGE OF I380 INTERCHANGE TO CENTER POINT ROAD					Project 2 07-17-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
51	SILT FENCE-DITCH CHECKS	LF	250	$ 3	$ 625
52	SILT BASIN	EACH	4	$ 400	$ 1,600
53	RMVL OF SILT FENCE	LF	2520	$ 1	$ 2,520
54	RMVL OF SILT FENCE-DITCH CHECK	LF	250	$ 1	$ 250
55	CLEAN-OUT OF SILT FENCE	LF	1260	$ 2	$ 1,890
56	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	125	$ 2	$ 188
57	MULCH, SHREDDED BARK	CY	159.3333333	$ 45	$ 7,170
58	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	100	$ 50	$ 5,000
59	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	126	$ 250	$ 31,500

Sub-Total Construction:	$	2,710,650
Incentives:	$	41,770
Contingency (15%):	$	406,600
Total Construction:	$	3,159,020
Engineering (15%)	$	473,900
Right-of-way:	$	106,100
Underground Electric:	$	300,000
Construction Admin (9%)	$	284,000
TOTALS:	$	4,323,020

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$**	**4,323,020**
Less Construction Admin:	$	(284,000)
Less Utilities:	$	(119,000)
Less Underground Electric:	$	(300,000)
STBG Eligible Costs:	$	3,620,020
Maximum STBG Request (80%):	**$**	**2,896,016**
20% Match:	$	724,004

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM CENTER POINT ROAD TO STAMY ROAD										Project 3 06-28-18
ITEM NO.	ITEM	UNIT			QUANTITY	UNIT PRICE			COSTS	
			HIAWATHA	ROBINS	TOTAL		HIAWATHA	ROBINS	TOTAL	
1	CLEAR+GRUBB	LS	0.6	0.4	1.0	$ 8,000	$ 4,800	$ 3,200	$ 8,000	
2	EXCAVATION, CL 10, RDWY+BORROW	CY	5762.4	3841.6	9604	$ 5	$ 28,812	$ 19,208	$ 48,020	
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	2820	1880	4700	$ 7	$ 18,330	$ 12,220	$ 30,550	
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	409	314	723	$ 3	$ 1,227	$ 942	$ 2,169	
5	MODIFIED SUBBASE	CY	890	680	1570	$ 40	$ 35,600	$ 27,200	$ 62,800	
6	SHLD CONSTRUCTION, EARTH	STA	36	20	56	$ 450	$ 16,200	$ 9,000	$ 25,200	
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	4092.5	3142.5	7235.0	$ 45	$ 184,163	$ 141,413	$ 325,575	
8	MEDIAN, PCC, 6"	SY	0	100	100.0	$ 86	$ -	$ 8,600	$ 8,600	
9	PCC PAV'T SAMPLE	LS	0.6	0.4	1.0	$ 3,000	$ 1,800	$ 1,200	$ 3,000	
10	HMA, DRIVEWAY	SY	100.0	0.0	100.0	$ 66	$ 6,600	$ -	$ 6,600	
11	GRANULAR BACKFILL	CY	2330	1360	3690	$ 33	$ 76,890	$ 44,880	$ 121,770	
12	APRON, CONC	EACH	2	2	4	$ 1,500	$ 3,000	$ 3,000	$ 6,000	
13	INTAKE, SW-510	EACH	30	20	80	$ 6,500	$ 195,000	$ 130,000	$ 520,000	
14	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	3630	2030	5660	$ 11	$ 39,930	$ 22,330	$ 62,260	
15	SUBDRAIN OUTLET (RF-19C)	EACH	30	20	80	$ 300	$ 9,000	$ 6,000	$ 24,000	
16	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	2,515	1,465	3,980	$ 70	$ 176,050	$ 102,550	$ 278,600	
17	ENGINEER FABRIC	SY	200	200	400	$ 4	$ 750	$ 750	$ 1,500	
18	REVETMENT, CLASS E	TON	32	32	64	$ 44	$ 1,408	$ 1,408	$ 2,816	
19	RMVL OF PAV'T	SY	655	320	975	$ 16	$ 10,480	$ 5,120	$ 15,600	
20	RECREATIONAL TRAIL, PCC, 5"	SY	2400	1800	5400	$ 35	$ 84,000	$ 63,000	$ 189,000	
21	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	21.6	16.2	37.8	$ 440	$ 9,504	$ 7,128	$ 16,632	
22	SIDEWALK, PCC, 4"	SY	100	44	356	$ 45	$ 4,500	$ 1,980	$ 16,020	
23	SIDEWALK, PCC, 6"	SY	19	25	44	$ 85	$ 1,615	$ 2,125	$ 3,740	
24	DETECTABLE WARNING - CURB RAMP	SF	56	72	128	$ 37	$ 2,072	$ 2,664	$ 4,736	
25	DRIVEWAY, P.C. CONCRETE, 8 IN	SY	260	0	260	$ 65	$ 16,900	$ -	$ 16,900	
26	RMVL OF PAVED DRIVEWAY	SY	260	0	260	$ 12	$ 3,120	$ -	$ 3,120	
27	LIGHTING POLES	EACH	20	10	30	$ 5,000	$ 100,000	$ 50,000	$ 150,000	
28	ELECTRICAL CIRCUIT	LF	1,965	965	2,430	$ 13	$ 25,545	$ 12,545	$ 31,590	
29	HANDHOLE AND JUNCTION BOX	EACH	4	2	6	$ 900	$ 3,600	$ 1,800	$ 5,400	
30	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	180	120	300	$ 22	$ 3,960	$ 2,640	$ 6,600	
31	TYPE A SIGN, SHEET ALUM	SF	36	24	60	$ 22	$ 792	$ 528	$ 1,320	
32	CONSTRUCTION SURVEY	LS	0.6	0.4	1	$ 50,000	$ 30,000	$ 20,000	$ 50,000	
33	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	48	33	81	$ 175	$ 8,400	$ 5,775	$ 14,175	
34	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	4	4	8	$ 120	$ 480	$ 480	$ 960	
35	GROOVE CUT - PAV'T MARK	STA	48	33	81	$ 55	$ 2,640	$ 1,815	$ 4,455	
36	GROOVE CUT - SYMBOL+LEGEND	EACH	4	4	8	$ 115	$ 460	$ 460	$ 920	
37	TRAFFIC CONTROL	LS	0.6	0.4	1	$ 100,000	$ 60,000	$ 40,000	$ 100,000	
38	FLAGGER	EACH	30	20	50	$ 425	$ 12,750	$ 8,500	$ 21,250	
39	MOBILIZATION	LS	0.6	0.4	1	$ 200,000	$ 120,000	$ 80,000	$ 750,000	
40	TRENCH COMPACTION TESTING	LS	1.0	0.0	1	$ 8,500	$ 8,500	$ -	$ 8,500	
41	MANHOLE, SANITARY SEWER, SW-301, 60 IN.	EACH	7	0	7	$ 8,500	$ 59,500	$ -	$ 59,500	
42	SANITARY SEWER GRAVITY MAIN, TRENCHED, 8 IN.	LF	2400	0	2400	$ 100	$ 240,000	$ -	$ 240,000	
43	DECORATIVE BRICK PAVERS	SY	50	50	100	$ 125	$ 6,250	$ 6,250	$ 12,500	
44	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	50	50	100	$ 26	$ 1,300	$ 1,300	$ 2,600	
45	MOW	ACRE	9	6	15	$ 150	$ 1,350	$ 900	$ 2,250	
46	MULCH	ACRE	3	2	5	$ 700	$ 2,100	$ 1,400	$ 3,500	
47	SEED+FERTILIZE (URBAN)	ACRE	3	2	5	$ 2,800	$ 8,400	$ 5,600	$ 14,000	
48	STABILIZE CROP - SEED+FERTILIZE	ACRE	3	2	5	$ 2,000	$ 6,000	$ 4,000	$ 10,000	
49	SILT FENCE	LF	2723	1523	4246	$ 3	$ 8,169	$ 4,569	$ 12,738	
50	SILT FENCE-DITCH CHECKS	LF	270	150	420	$ 3	$ 675	$ 375	$ 1,050	

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM CENTER POINT ROAD TO STAMY ROAD									Project 3 06-28-18
ITEM NO.	ITEM	UNIT			QUANTITY	UNIT PRICE			COSTS
			HIAWATHA	ROBINS	TOTAL		HIAWATHA	ROBINS	TOTAL
51	SILT BASIN	EACH	2	2	4	$ 400	$ 800	$ 800	$ 1,600
52	RMVL OF SILT FENCE	LF	2723	1523	4246	$ 1	$ 2,723	$ 1,523	$ 4,246
53	RMVL OF SILT FENCE-DITCH CHECK	LF	270	150	420	$ 1	$ 270	$ 150	$ 420
54	CLEAN-OUT OF SILT FENCE	LF	1362	762	2124	$ 2	$ 2,043	$ 1,143	$ 3,186
55	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	135	75	210	$ 2	$ 203	$ 113	$ 315
56	MULCH, SHREDDED BARK	CY	130	40	170	$ 45	$ 5,850	$ 1,800	$ 7,650
57	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	240	60	300	$ 50	$ 12,000	$ 3,000	$ 15,000
58	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	50	20	70	$ 250	$ 12,500	$ 5,000	$ 17,500

Sub-Total Construction:	$ 1,679,010	$ 878,380	$ 2,557,390
Incentives:	$ 12,900	$ 9,900	$ 22,800
Contingency (15%):	$ 251,900	$ 131,800	$ 383,700
Total Construction:	$ 1,943,810	$ 1,020,080	$ 2,963,890
Engineering (15%)	$ 291,600	$ 153,000	$ 444,600
Right-of-way:	$ 19,658	$ 61,368	$ 81,025
Underground Electric:	$ -	$ -	$ -
Construction Admin (9%):	$ 175,000	$ 92,000	$ 267,000
TOTALS:	$ 2,430,068	$ 1,326,448	$ 3,756,515
FEDERAL AID (OR SWAP) ELIGIBLE COSTS			
Total Costs:	**$ 2,430,068**	**$ 1,326,448**	**$ 3,756,515**
Less Utilities:	$ (308,000)	$ -	$ (308,000)
Less Construction Admin:	$ (175,000)	$ (92,000)	$ (267,000)
Less Underground Electric:	$ -	$ -	$ -
STBG Eligible Costs:	$ 1,947,068	$ 1,234,448	$ 3,181,515
Maximum STBG Request (80%):	**$ 1,557,654**	**$ 987,558**	**$ 2,545,212**
20% Match:	$ 389,414	$ 246,890	$ 636,303

APPENDIX COST OPINION: EAST OF STAMY ROAD THROUGH ROBINS ROAD

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM EAST OF STAMY ROAD THROUGH ROBINS ROAD									Project 4 06-28-18
ITEM NO.	ITEM	UNIT			QUANTITY	UNIT PRICE			COSTS
			HIAWATHA	ROBINS	TOTAL		HIAWATHA	ROBINS	TOTAL
1	CLEAR+GRUBB	LS	0.5	0.5	1	$ 8,500	$ 4,250	$ 4,250	$ 8,500
2	EXCAVATION, CL 10, RDWY+BORROW	CY	3722	3722	7444	$ 5	$ 18,610	$ 18,610	$ 37,220
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	4150	4150	8300	$ 7	$ 26,975	$ 26,975	$ 53,950
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	524.5	524.5	1049	$ 3	$ 1,574	$ 1,574	$ 3,147
5	MODIFIED SUBBASE	CY	2526	2526	5052	$ 40	$ 101,040	$ 101,040	$ 202,080
6	SHLD CONSTRUCTION, EARTH	STA	33	33	66	$ 450	$ 14,850	$ 14,850	$ 29,700
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	5242.5	5242.5	10485	$ 45	$ 235,913	$ 235,913	$ 471,825
8	MEDIAN, DOWELLED PCC, 6"	SY	260	260	520	$ 86	$ 22,360	$ 22,360	$ 44,720
9	PCC PAV'T SAMPLE	LS	0.5	0.5	1	$ 3,000	$ 1,500	$ 1,500	$ 3,000
10	HMA (1M ESAL) BASE, 3/4" (8" THICK)	TON	1245	1245	2490	$ 62	$ 77,190	$ 77,190	$ 154,380
11	HMA (1M ESAL) SURF, 1/2", NO FRIC (2" THICK)	TON	972.5	972.5	1945	$ 58	$ 56,405	$ 56,405	$ 112,810
12	ASPH BINDER, PG 58-28	TON	133.05	133.05	266.1	$ 570	$ 75,839	$ 75,839	$ 151,677
13	HMA PAV'T SAMPLE	LS	0.5	0.5	1	$ 4,000	$ 2,000	$ 2,000	$ 4,000
14	HMA, DRIVEWAY	SY	125	125	250	$ 66	$ 8,250	$ 8,250	$ 16,500
15	GRANULAR BACKFILL	CY	3290	3290	6580	$ 33	$ 108,570	$ 108,570	$ 217,140
16	APRON, CONC	EACH	2	2	4	$ 1,500	$ 3,000	$ 3,000	$ 6,000
17	INTAKE, SW-510	EACH	55	55	110	$ 6,500	$ 357,500	$ 357,500	$ 715,000
18	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	4351	4351	8702	$ 11	$ 47,861	$ 47,861	$ 95,722
19	SUBDRAIN OUTLET (RF-19C)	EACH	55	55	110	$ 300	$ 16,500	$ 16,500	$ 33,000
20	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	3550.5	3550.5	7,101	$ 70	$ 248,535	$ 248,535	$ 497,070
21	ENGINEER FABRIC	SY	200	200	400	$ 4	$ 750	$ 750	$ 1,500
22	REVETMENT, CLASS E	TON	32	32	64	$ 44	$ 1,408	$ 1,408	$ 2,816
23	RMVL OF PAV'T	SY	2100	2100	4200	$ 16	$ 33,600	$ 33,600	$ 67,200
24	RECREATIONAL TRAIL, PCC, 5"	SY	2330	2360	4690	$ 35	$ 81,550	$ 82,600	$ 164,150
25	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	20	20	40	$ 440	$ 8,800	$ 8,800	$ 17,600
26	SIDEWALK, PCC, 4"	SY	220	270	490	$ 45	$ 9,900	$ 12,150	$ 22,050
27	SIDEWALK, PCC, 6"	SY	50	50	100	$ 85	$ 4,250	$ 4,250	$ 8,500
28	DETECTABLE WARNING - CURB RAMP	SF	130	130	260	$ 37	$ 4,810	$ 4,810	$ 9,620
29	DRIVEWAY, P.C. CONCRETE, 8 IN	SY	265	550	815	$ 65	$ 17,225	$ 35,750	$ 52,975
30	RMVL OF PAVED DRIVEWAY	SY	265	250	515	$ 12	$ 3,180	$ 3,000	$ 6,180
31	RECTANGULAR RAPID FLASHING BEACON (TRAIL CROSSING)	EACH	0.5	0.5	1	$ 100,000	$ 50,000	$ 50,000	$ 100,000
32	LIGHTING POLES	EACH	20	20	40	$ 5,000	$ 100,000	$ 100,000	$ 200,000
33	ELECTRICAL CIRCUIT	LF	1660.5	1660.5	3,321	$ 13	$ 21,587	$ 21,587	$ 43,173
34	HANDHOLE AND JUNCTION BOX	EACH	3	3	6	$ 900	$ 2,700	$ 2,700	$ 5,400
35	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	100	100	200	$ 22	$ 2,200	$ 2,200	$ 4,400
36	TYPE A SIGN, SHEET ALUM	SF	20	20	40	$ 22	$ 440	$ 440	$ 880
37	TRAFFIC SIGNALIZATION	EACH	0.5	0.5	1	$ 300,000	$ 150,000	$ 150,000	$ 300,000
38	CONSTRUCTION SURVEY	LS	0.5	0.5	1	$ 50,000	$ 25,000	$ 25,000	$ 50,000
39	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	39	39	78	$ 175	$ 6,825	$ 6,825	$ 13,650
40	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	9	9	18	$ 120	$ 1,080	$ 1,080	$ 2,160
41	GROOVE CUT - PAV'T MARK	STA	39	39	78	$ 55	$ 2,145	$ 2,145	$ 4,290
42	GROOVE CUT - SYMBOL+LEGEND	EACH	9	9	18	$ 115	$ 1,035	$ 1,035	$ 2,070
43	TRAFFIC CONTROL	LS	0.5	0.5	1	$ 80,000	$ 40,000	$ 40,000	$ 80,000
44	FLAGGER	EACH	50	50	100	$ 425	$ 21,250	$ 21,250	$ 42,500
45	MOBILIZATION	LS	0.5	0.5	1	$ 340,000	$ 170,000	$ 170,000	$ 340,000
46	MODULAR BLOCK RETAIN WALL	SF	300	0	300	$ 100	$ 30,000	$ -	$ 30,000
47	TRENCH COMPACTION TESTING	LS	1	0	1	$ 8,500	$ 8,500	$ -	$ 8,500
48	ADJUST FIRE HYDRANT	EACH	2	0	2	$ 3,500	$ 7,000	$ -	$ 7,000
49	MANHOLE, SANITARY SEWER, SW-301, 60 IN.	EACH	6	0	6	$ 8,500	$ 51,000	$ -	$ 51,000
50	SANITARY SEWER GRAVITY MAIN, TRENCHED, 8 IN.	LF	2230	0	2230	$ 100	$ 223,000	$ -	$ 223,000

APPENDIX COST OPINION: EAST OF STAMY ROAD THROUGH ROBINS ROAD

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM EAST OF STAMY ROAD THROUGH ROBINS ROAD									Project 4 06-28-18
ITEM NO.	ITEM	UNIT			QUANTITY	UNIT PRICE			COSTS
			HIAWATHA	ROBINS	TOTAL		HIAWATHA	ROBINS	TOTAL
51	DECORATIVE BRICK PAVERS	SY	150	150	300	$ 125	$ 18,750	$ 18,750	$ 37,500
52	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	250	250	500	$ 26	$ 6,500	$ 6,500	$ 13,000
53	MOW	ACRE	12	12	24	$ 150	$ 1,800	$ 1,800	$ 3,600
54	MULCH	ACRE	4	4	8	$ 700	$ 2,800	$ 2,800	$ 5,600
55	SEED+FERTILIZE (URBAN)	ACRE	4	4	8	$ 2,800	$ 11,200	$ 11,200	$ 22,400
56	STABILIZE CROP - SEED+FERTILIZE	ACRE	4	4	8	$ 2,000	$ 8,000	$ 8,000	$ 16,000
57	SILT FENCE	LF	3263.5	3263.5	6527	$ 3	$ 9,791	$ 9,791	$ 19,581
58	SILT FENCE-DITCH CHECKS	LF	325	325	650	$ 3	$ 813	$ 813	$ 1,625
59	SILT BASIN	EACH	2	2	4	$ 400	$ 800	$ 800	$ 1,600
60	RMVL OF SILT FENCE	LF	3263.5	3263.5	6527	$ 1	$ 3,264	$ 3,264	$ 6,527
61	RMVL OF SILT FENCE-DITCH CHECK	LF	325	325	650	$ 1	$ 325	$ 325	$ 650
62	CLEAN-OUT OF SILT FENCE	LF	1631.75	1631.75	3263.5	$ 2	$ 2,448	$ 2,448	$ 4,895
63	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	162.5	162.5	325	$ 2	$ 244	$ 244	$ 488
64	MULCH, SHREDDED BARK	CY	173.5	173.5	347	$ 45	$ 7,808	$ 7,808	$ 15,615
65	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	25	25	50	$ 50	$ 1,250	$ 1,250	$ 2,500
66	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	165	165	330	$ 250	$ 41,250	$ 41,250	$ 82,500

Sub-Total Construction:	$ 2,624,995	$ 2,327,140	$ 4,952,136
Incentives:	$ 31,180	$ 31,180	$ 62,360
Contingency (15%):	$ 393,700	$ 349,100	$ 742,800
Total Construction:	$ 3,049,875	$ 2,707,420	$ 5,757,296
Engineering (15%)	$ 457,500	$ 406,100	$ 863,600
Right-of-way:	$ 92,338	$ 52,758	$ 145,095
Underground Electric:	$ -	$ -	$ -
Construction Admin (9%)	$ 274,000	$ 244,000	$ 518,000
TOTALS:	$ 3,873,713	$ 3,410,278	$ 7,283,991

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$ 3,873,713**	**$ 3,410,278**	**$ 7,283,991**
Less Utilities:	$ (289,500)	$ -	$ (289,500)
Less Construction Admin:	$ (274,000)	$ (244,000)	$ (518,000)
Less Underground Electric:	$ -	$ -	$ -
STBG Eligible Costs:	$ 3,310,213	$ 3,166,278	$ 6,476,491
Maximum STBG Request (80%):	**$ 2,648,170**	**$ 2,533,022**	**$ 5,181,193**
20% Match:	$ 662,043	$ 633,256	$ 1,295,298

APPENDIX COST OPINION: ROBINS ROAD TO COUNCIL STREET

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM ROBINS ROAD TO COUNCIL STREET (BRIDGES OVER DRY CREEK AND CNRR)												Project 5 07-14-18
ITEM NO.	ITEM	UNIT				QUANTITY	UNIT PRICE				COSTS	
			HIAWATHA	ROBINS	CEDAR RAPIDS	TOTAL		HIAWATHA	ROBINS	CEDAR RAPIDS	TOTAL	
1	CLEAR+GRUBB	LS	0.6	0.3	0.1	1.0	$ 25,000	$ 15,000	$ 7,500	$ 2,500	$ 25,000	
2	EXCAVATION, CL 10, RDWY+BORROW	CY	77709	77709	38854	194272	$ 5	$ 388,545	$ 388,545	$ 194,270	$ 971,360	
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	5200	11600	5900	22700	$ 7	$ 33,800	$ 75,400	$ 38,350	$ 147,550	
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	470	760	1080	2310	$ 3	$ 1,410	$ 2,280	$ 3,240	$ 6,930	
5	MODIFIED SUBBASE	CY	1865	1734	2375	5974	$ 40	$ 74,600	$ 69,360	$ 95,000	$ 238,960	
6	SHLD CONSTRUCTION, EARTH	STA	28.9	26.88	44.76	100.54	$ 450	$ 13,005	$ 12,096	$ 20,142	$ 45,243	
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	4700	7600	10800	23100.0	$ 45	$ 211,500	$ 342,000	$ 486,000	$ 1,039,500	
8	MEDIAN, PCC, 6"	SY	75.0	75.0	75.0	225.0	$ 86	$ 6,450	$ 6,450	$ 6,450	$ 19,350	
9	PCC PAV'T SAMPLE	LS	0.2	0.3	0.5	1.0	$ 3,000	$ 600	$ 900	$ 1,500	$ 3,000	
10	HMA (1M ESAL) BASE, 3/4" (8" THICK)	TON	0.0	0.0	720.0	720.0	$ 62	$ -	$ -	$ 44,640	$ 44,640	
11	HMA (1M ESAL) SURF, 1/2", NO FRIC (2" THICK)	TON	0.0	0.0	180.0	180.0	$ 58	$ -	$ -	$ 10,440	$ 10,440	
12	ASPH BINDER, PG 58-28	TON	0	0	54	54.0	$ 570	$ -	$ -	$ 30,780	$ 30,780	
13	HMA PAV'T SAMPLE	LS	0.0	0.0	1.0	1.0	$ 4,000	$ -	$ -	$ 4,000	$ 4,000	
14	HMA, DRIVEWAY	SY	0.0	0.0	225.0	225.0	$ 66	$ -	$ -	$ 14,850	$ 14,850	
15	GRANULAR BACKFILL	CY	2260	2170	3230	7660.0	$ 33	$ 74,580	$ 71,610	$ 106,590	$ 252,780	
16	APRON, CONC	EACH	4	4	4	12.0	$ 1,500	$ 6,000	$ 6,000	$ 6,000	$ 18,000	
17	INTAKE, SW-510	EACH	40	40	50	130.0	$ 6,500	$ 260,000	$ 260,000	$ 325,000	$ 845,000	
18	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	2890	2688	4476	10054.0	$ 11	$ 31,790	$ 29,568	$ 49,236	$ 110,594	
19	SUBDRAIN OUTLET (RF-19C)	EACH	40	40	50	130.0	$ 300	$ 12,000	$ 12,000	$ 15,000	$ 39,000	
20	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	2,445	2,344	3,488	8277.0	$ 70	$ 171,150	$ 164,080	$ 244,160	$ 579,390	
21	ENGINEER FABRIC	SY	400	400	400	1200.0	$ 4	$ 1,500	$ 1,500	$ 1,500	$ 4,500	
22	REVETMENT, CLASS E	TON	64	64	64	192.0	$ 44	$ 2,816	$ 2,816	$ 2,816	$ 8,448	
23	RMVL OF PAV'T	SY	0	0	2750	2750.0	$ 16	$ -	$ -	$ 44,000	$ 44,000	
24	RECREATIONAL TRAIL, PCC, 5"	SY	2110	2700	3150	7960.0	$ 35	$ 73,850	$ 94,500	$ 110,250	$ 278,600	
25	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	19	24	28	71.0	$ 440	$ 8,360	$ 10,560	$ 12,320	$ 31,240	
26	SIDEWALK, PCC, 4"	SY	0	120	710	830.0	$ 45	$ -	$ 5,400	$ 31,950	$ 37,350	
27	SIDEWALK, PCC, 6"	SY	0	40	50	90.0	$ 85	$ -	$ 3,400	$ 4,250	$ 7,650	
28	DETECTABLE WARNING - CURB RAMP	SF	0	112	128	240.0	$ 37	$ -	$ 4,144	$ 4,736	$ 8,880	
29	DRIVEWAY, P.C. CONCRETE, 8 IN	SY	0	0	0	0.0	$ 65	$ -	$ -	$ -	$ -	
30	RMVL OF PAVED DRIVEWAY	SY	0	0	0	0.0	$ 12	$ -	$ -	$ -	$ -	
31	LIGHTING POLES	EACH	20	20	20	60.0	$ 5,000	$ 100,000	$ 100,000	$ 100,000	$ 300,000	
32	ELECTRICAL CIRCUIT	LF	1,445	1,344	1,298	4087.0	$ 13	$ 18,785	$ 17,472	$ 16,874	$ 53,131	
33	HANDHOLE AND JUNCTION BOX	EACH	4	4	4	12.0	$ 900	$ 3,600	$ 3,600	$ 3,600	$ 10,800	
34	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	150	150	200	500.0	$ 22	$ 3,300	$ 3,300	$ 4,400	$ 11,000	
35	TYPE A SIGN, SHEET ALUM	SF	30	30	40	100.0	$ 22	$ 660	$ 660	$ 880	$ 2,200	
36	TRAFFIC SIGNALIZATION	EACH	0	0	1	1.0	$ 300,000	$ -	$ -	$ 300,000	$ 300,000	
37	CONSTRUCTION SURVEY	LS	0.4	0.4	0.2	1.0	$ 50,000	$ 20,000	$ 20,000	$ 10,000	$ 50,000	
38	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	40	47	77	164.0	$ 175	$ 7,000	$ 8,225	$ 13,475	$ 28,700	
39	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	3	3	12	18.0	$ 120	$ 360	$ 360	$ 1,440	$ 2,160	
40	GROOVE CUT - PAV'T MARK	STA	40	47	77	164.0	$ 55	$ 2,200	$ 2,585	$ 4,235	$ 9,020	
41	GROOVE CUT - SYMBOL+LEGEND	EACH	3	3	12	18.0	$ 115	$ 345	$ 345	$ 1,380	$ 2,070	
42	TRAFFIC CONTROL	LS	0.1	0.0	0.9	1.0	$ 250,000	$ 25,000	$ -	$ 225,000	$ 250,000	
43	FLAGGER	EACH	15	0	30	45.0	$ 425	$ 6,375	$ -	$ 12,750	$ 19,125	
44	MOBILIZATION	LS	0.4	0.4	0.2	1.0	$ 650,000	$ 260,000	$ 260,000	$ 130,000	$ 750,000	
45	MODULAR BLOCK RETAIN WALL	SF	300	300	300	900.0	$ 100	$ 30,000	$ 30,000	$ 30,000	$ 90,000	
46	TRENCH COMPACTION TESTING	LS	0.4	0.0	0.6	1.0	$ 8,500	$ 3,400	$ -	$ 5,100	$ 8,500	
47	ADJUST FIRE HYDRANT	EACH	1	0	1	2.0	$ 3,500	$ 3,500	$ -	$ 3,500	$ 7,000	
48	FIRE HYDRANT ASSEMBLIES	EACH	2	0	2	4.0	$ 4,800	$ 9,600	$ -	$ 9,600	$ 19,200	
49	GATE VALVE+VALVE BOX, 8"	EACH	2	0	2	4.0	$ 1,700	$ 3,400	$ -	$ 3,400	$ 6,800	
50	WATER MAIN, DUCTILE IRON, 8"	LF	1,445	0	1,298	2743.0	$ 77	$ 111,265	$ -	$ 99,946	$ 211,211	

APPENDIX COST OPINION: ROBINS ROAD TO COUNCIL STREET

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM ROBINS ROAD TO COUNCIL STREET (BRIDGES OVER DRY CREEK AND CNRR)											Project 5 07-14-18
ITEM NO.	ITEM	UNIT				QUANTITY	UNIT PRICE				COSTS
			HIAWATHA	ROBINS	CEDAR RAPIDS	TOTAL		HIAWATHA	ROBINS	CEDAR RAPIDS	TOTAL
51	WATER MAIN FITTING	LB	4335	0	3894	8229.0	$ 10	$ 43,350	$ -	$ 38,940	$ 82,290
52	TAPPING SLEEVE+VALVE	EACH	2	0	2	4.0	$ 3,250	$ 6,500	$ -	$ 6,500	$ 13,000
53	SLAB BRIDGE OVER DRY CREEK	LS	1	0	0	1.0	$ 1,024,064	$ 1,024,064	$ -	$ -	$ 1,024,064
54	PRESTRESSED BEAM BRIDGE OVER RAILROAD	LS	0	1	0	1.0	$ 2,335,827	$ -	$ 2,335,827	$ -	$ 2,335,827
55	DECORATIVE BRICK PAVERS	SY	100	100	100	300.0	$ 125	$ 12,500	$ 12,500	$ 12,500	$ 37,500
56	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	1000	2500	500	4000.0	$ 26	$ 26,000	$ 65,000	$ 13,000	$ 104,000
57	MOW	ACRE	21	36	12	69.0	$ 150	$ 3,150	$ 5,400	$ 1,800	$ 10,350
58	MULCH	ACRE	7	12	4	23.0	$ 700	$ 4,900	$ 8,400	$ 2,800	$ 16,100
59	SEED+FERTILIZE (URBAN)	ACRE	7	12	4	23.0	$ 2,800	$ 19,600	$ 33,600	$ 11,200	$ 64,400
60	STABILIZE CROP - SEED+FERTILIZE	ACRE	7	12	4	23.0	$ 2,000	$ 14,000	$ 24,000	$ 8,000	$ 46,000
61	SILT FENCE	LF	2168	2016	3357	7541.0	$ 3	$ 6,504	$ 6,048	$ 10,071	$ 22,623
62	SILT FENCE-DITCH CHECKS	LF	220	200	340	760.0	$ 3	$ 550	$ 500	$ 850	$ 1,900
63	SILT BASIN	EACH	4	4	2	10.0	$ 400	$ 1,600	$ 1,600	$ 800	$ 4,000
64	RMVL OF SILT FENCE	LF	2168	2016	3357	7541.0	$ 1	$ 2,168	$ 2,016	$ 3,357	$ 7,541
65	RMVL OF SILT FENCE-DITCH CHECK	LF	220	200	340	760.0	$ 1	$ 220	$ 200	$ 340	$ 760
66	CLEAN-OUT OF SILT FENCE	LF	1084	1008	1679	3771.0	$ 2	$ 1,626	$ 1,512	$ 2,519	$ 5,657
67	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	110	100	170	380.0	$ 2	$ 165	$ 150	$ 255	$ 570
68	MULCH, SHREDDED BARK	CY	72	67	112	251.0	$ 45	$ 3,240	$ 3,015	$ 5,040	$ 11,295
69	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	0	0	0	0.0	$ 50	$ -	$ -	$ -	$ -
70	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	72	67	112	251.0	$ 250	$ 18,000	$ 16,750	$ 28,000	$ 62,750

Sub-Total Construction:	$ 3,183,880.00	$ 4,533,170.00	$ 3,031,520.00	$ 10,748,570.00
Incentives:	$ 14,810.00	$ 23,940.00	$ 40,040.00	$ 78,790.00
Contingency (15%):	$ 477,600.00	$ 680,000.00	$ 454,700.00	$ 1,612,300.00
Total Construction:	$ 3,676,290.00	$ 5,237,110.00	$ 3,526,260.00	$ 12,439,660.00
Engineering (15%)	$ 551,400.00	$ 785,600.00	$ 528,900.00	$ 1,865,900.00
Right-of-way:	$ 680,597.40	$ 691,534.10	$ 337,473.10	$ 1,709,604.60
Underground Electric:	$ -	$ -	$ -	$ -
Relocate Electric Transmission:	$ 500,000.00	$ -	$ -	$ 500,000.00
Construction Admin (9%)	$ 331,000.00	$ 471,000.00	$ 317,000.00	$ 1,119,000.00
TOTALS:	$ 5,739,287.40	$ 7,185,244.10	$ 4,709,633.10	$ 17,634,164.60

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$ 5,739,287.40**	**$ 7,185,244.10**	**$ 4,709,633.10**	**$ 17,634,164.60**
Less Utilities:	$ (181,015.00)	$ -	$ (166,986.00)	$ (348,001.00)
Less Construction Admin:	$ (331,000.00)	$ (471,000.00)	$ (317,000.00)	$ (1,119,000.00)
Less Underground Electric:	$ -	$ -	$ -	$ -
Less Relocate Electric Transmission:	$ -	$ -	$ -	$ -
STBG Eligible Costs:	$ 5,227,272.40	$ 6,714,244.10	$ 4,225,647.10	$ 16,167,163.60
Maximum STBG Request (80%):	**$ 4,181,817.92**	**$ 5,371,395.28**	**$ 3,380,517.68**	**$ 12,933,730.88**
20% Match:	$ 1,045,454.48	$ 1,342,848.82	$ 845,129.42	$ 3,233,432.72

APPENDIX COST OPINION: COUNCIL STREET TO TURTLE RUN EXTENDED

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM COUNCIL STREET TO TURTLE RUN					Project 6 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
1	CLEAR+GRUBB	LS	1	$ 3,500	$ 3,500
2	EXCAVATION, CL 10, RDWY+BORROW	CY	7403	$ 5	$ 37,015
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	4500	$ 7	$ 29,250
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	880	$ 3	$ 2,640
5	MODIFIED SUBBASE	CY	2047	$ 40	$ 81,880
6	SHLD CONSTRUCTION, EARTH	STA	33	$ 450	$ 14,850
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	8800	$ 45	$ 396,000
8	MEDIAN, PCC, 6"	SY	225	$ 86	$ 19,350
9	PCC PAV'T SAMPLE	LS	1	$ 3,000	$ 3,000
10	GRANULAR BACKFILL	CY	2690	$ 33	$ 88,770
11	APRON, CONC	EACH	2	$ 1,500	$ 3,000
12	INTAKE, SW-510	EACH	50	$ 6,500	$ 325,000
13	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	3300	$ 11	$ 36,300
14	SUBDRAIN OUTLET (RF-19C)	EACH	50	$ 300	$ 15,000
15	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	2,900	$ 70	$ 203,000
16	ENGINEER FABRIC	SY	200	$ 4	$ 750
17	REVETMENT, CLASS E	TON	32	$ 44	$ 1,408
18	RECREATIONAL TRAIL, PCC, 5"	SY	3333	$ 35	$ 116,655
19	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	30	$ 440	$ 13,200
20	SIDEWALK, PCC, 4"	SY	220	$ 45	$ 9,900
21	SIDEWALK, PCC, 6"	SY	45	$ 85	$ 3,825
22	DETECTABLE WARNING - CURB RAMP	SF	128	$ 37	$ 4,736
23	LIGHTING POLES	EACH	20	$ 5,000	$ 100,000
24	ELECTRICAL CIRCUIT	LF	1,650	$ 13	$ 21,450
25	HANDHOLE AND JUNCTION BOX	EACH	4	$ 900	$ 3,600
26	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	200	$ 22	$ 4,400
27	TYPE A SIGN, SHEET ALUM	SF	40	$ 22	$ 880
28	CONSTRUCTION SURVEY	LS	1	$ 20,000	$ 20,000
29	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	50	$ 175	$ 8,750
30	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	8	$ 120	$ 960
31	GROOVE CUT - PAV'T MARK	STA	50	$ 55	$ 2,750
32	GROOVE CUT - SYMBOL+LEGEND	EACH	8	$ 115	$ 920
33	TRAFFIC CONTROL	LS	1	$ 20,000	$ 20,000
34	FLAGGER	EACH	20	$ 425	$ 8,500
35	MOBILIZATION	LS	1	$ 100,000	$ 100,000
36	TRENCH COMPACTION TESTING	LS	1	$ 8,500	$ 8,500
37	FIRE HYDRANT ASSEMBLIES	EACH	2	$ 4,800	$ 9,600
38	GATE VALVE+VALVE BOX, 8"	EACH	4	$ 1,700	$ 6,800
39	WATER MAIN, DUCTILE IRON, 8"	LF	2,000	$ 77	$ 154,000
40	WATER MAIN FITTING	LB	6000	$ 10	$ 60,000
41	TAPPING SLEEVE+VALVE	EACH	2	$ 3,250	$ 6,500
42	DECORATIVE BRICK PAVERS	SY	150	$ 125	$ 18,750
43	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	100	$ 26	$ 2,600
44	MOW	ACRE	12	$ 150	$ 1,800
45	MULCH	ACRE	4	$ 700	$ 2,800
46	SEED+FERTILIZE (URBAN)	ACRE	4	$ 2,800	$ 11,200
47	STABILIZE CROP - SEED+FERTILIZE	ACRE	4	$ 2,000	$ 8,000
48	SILT FENCE	LF	2475	$ 3	$ 7,425
49	SILT FENCE-DITCH CHECKS	LF	250	$ 3	$ 625
50	SILT BASIN	EACH	2	$ 400	$ 800

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM COUNCIL STREET TO TURTLE RUN					Project 6 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
51	RMVL OF SILT FENCE	LF	2475	$ 1	$ 2,475
52	RMVL OF SILT FENCE-DITCH CHECK	LF	250	$ 1	$ 250
53	CLEAN-OUT OF SILT FENCE	LF	1237.5	$ 2	$ 1,856
54	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	125	$ 2	$ 188
55	MULCH, SHREDDED BARK	CY	133	$ 45	$ 5,985
56	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	20	$ 50	$ 1,000
57	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	126	$ 250	$ 31,500

Sub-Total Construction:	$	2,043,890
Incentives:	$	27,720
Contingency (15%):	$	306,600
Total Construction:	$	2,378,210
Engineering (15%):	$	356,700
Right-of-way:	$	248,861
Underground Electric:	$	-
Construction Admin (9%):	$	214,000
TOTALS:	$	3,197,771

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$**	**3,197,771**
Less Utilities:	$	(245,400)
Less Engineering/Construction Admin:	$	(570,700)
Less Underground Electric:	$	-
STBG Eligible Costs:	$	2,381,671
Maximum STBG Request (80%):	**$**	**1,905,337**
20% Match:	$	476,334

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM TURTLE RUN EXTENDED TO SUMMERSET EXTENDED					Project 7 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
1	CLEAR+GRUBB	LS	1	$ 20,000	$ 20,000
2	EXCAVATION, CL 10, RDWY+BORROW	CY	15312	$ 5	$ 76,560
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	7700	$ 7	$ 50,050
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	1362.3	$ 3	$ 4,087
5	MODIFIED SUBBASE	CY	3525	$ 40	$ 141,000
6	SHLD CONSTRUCTION, EARTH	STA	57	$ 450	$ 25,650
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	13623	$ 45	$ 613,035
8	MEDIAN, PCC, 6"	SY	225	$ 86	$ 19,350
9	PCC PAV'T SAMPLE	LS	1	$ 3,000	$ 3,000
10	GRANULAR BACKFILL	CY	4490	$ 33	$ 148,170
11	APRON, CONC	EACH	6	$ 1,500	$ 9,000
12	INTAKE, SW-510	EACH	80	$ 6,500	$ 520,000
13	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	5700	$ 11	$ 62,700
14	SUBDRAIN OUTLET (RF-19C)	EACH	80	$ 300	$ 24,000
15	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	4,850	$ 70	$ 339,500
16	ENGINEER FABRIC	SY	600	$ 4	$ 2,250
17	REVETMENT, CLASS E	TON	96	$ 44	$ 4,224
18	RECREATIONAL TRAIL, PCC, 5"	SY	5000	$ 35	$ 175,000
19	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	45	$ 440	$ 19,800
20	SIDEWALK, PCC, 4"	SY	600	$ 45	$ 27,000
21	SIDEWALK, PCC, 6"	SY	45	$ 85	$ 3,825
22	DETECTABLE WARNING - CURB RAMP	SF	128	$ 37	$ 4,736
23	LIGHTING POLES	EACH	30	$ 5,000	$ 150,000
24	ELECTRICAL CIRCUIT	LF	2,850	$ 13	$ 37,050
25	HANDHOLE AND JUNCTION BOX	EACH	4	$ 900	$ 3,600
26	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	300	$ 22	$ 6,600
27	TYPE A SIGN, SHEET ALUM	SF	60	$ 22	$ 1,320
28	CONSTRUCTION SURVEY	LS	1	$ 20,000	$ 20,000
29	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	68	$ 175	$ 11,900
30	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	14	$ 120	$ 1,680
31	GROOVE CUT - PAV'T MARK	STA	68	$ 55	$ 3,740
32	GROOVE CUT - SYMBOL+LEGEND	EACH	14	$ 115	$ 1,610
33	TRAFFIC CONTROL	LS	1	$ 15,000	$ 15,000
34	FLAGGER	EACH	20	$ 425	$ 8,500
35	MOBILIZATION	LS	1	$ 150,000	$ 150,000
36	TRENCH COMPACTION TESTING	LS	1	$ 8,500	$ 8,500
37	FIRE HYDRANT ASSEMBLIES	EACH	3	$ 4,800	$ 14,400
38	GATE VALVE+VALVE BOX, 8"	EACH	6	$ 1,700	$ 10,200
39	WATER MAIN, DUCTILE IRON, 8"	LF	2,720	$ 77	$ 209,440
40	WATER MAIN FITTING	LB	8160	$ 10	$ 81,600
41	DECORATIVE BRICK PAVERS	SY	500	$ 125	$ 62,500
42	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	100	$ 26	$ 2,600
43	MOW	ACRE	18	$ 150	$ 2,700
44	MULCH	ACRE	6	$ 700	$ 4,200
45	SEED+FERTILIZE (URBAN)	ACRE	6	$ 2,800	$ 16,800
46	STABILIZE CROP - SEED+FERTILIZE	ACRE	6	$ 2,000	$ 12,000
47	SILT FENCE	LF	4275	$ 3	$ 12,825
48	SILT FENCE-DITCH CHECKS	LF	430	$ 3	$ 1,075
49	SILT BASIN	EACH	4	$ 400	$ 1,600
50	RMVL OF SILT FENCE	LF	4275	$ 1	$ 4,275

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM TURTLE RUN EXTENDED TO SUMMERSET EXTENDED					Project 7 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
51	RMVL OF SILT FENCE-DITCH CHECK	LF	430	$ 1	$ 430
52	CLEAN-OUT OF SILT FENCE	LF	2137.5	$ 2	$ 3,206
53	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	215	$ 2	$ 323
54	MULCH, SHREDDED BARK	CY	72	$ 45	$ 3,240
55	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	216	$ 250	$ 54,000

Sub-Total Construction:	$	3,209,850
Incentives:	$	42,920
Contingency (15%):	$	481,500
Total Construction:	$	3,734,270
Engineering (15%):	$	560,100
Right-of-way:	$	424,898
Underground Electric:	$	-
Construction Admin (9%):	$	336,000
TOTALS:	$	5,055,268

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$**	**5,055,268**
Less Utilities:	$	(324,140)
Less Engineering/Construction Admin:	$	(896,100)
Less Underground Electric:	$	-
STBG Eligible Costs:	$	3,835,028
Maximum STBG Request (80%)	**$**	**3,068,022**
20% Match:	$	767,006

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM SUMMERSET EXTENDED TO C AVENUE					Project 8 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
1	CLEAR+GRUBB	LS	1	$ 8,500	$ 8,500
2	EXCAVATION, CL 10, RDWY+BORROW	CY	43224	$ 5	$ 216,120
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	6700	$ 7	$ 43,550
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	300	$ 3	$ 900
5	MODIFIED SUBBASE	CY	3529	$ 40	$ 141,160
6	SHLD CONSTRUCTION, EARTH	STA	75	$ 450	$ 33,750
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	28800	$ 45	$ 1,296,000
8	MEDIAN, PCC, 6"	SY	530	$ 60	$ 31,800
9	PCC PAV'T SAMPLE	LS	1	$ 3,000	$ 3,000
10	HMA (1M ESAL) BASE, 3/4" (8" THICK)	TON	270	$ 62	$ 16,740
11	HMA (1M ESAL) SURF, 1/2", NO FRIC (2" THICK)	TON	90	$ 58	$ 5,220
12	ASPH BINDER, PG 58-28	TON	21.6	$ 570	$ 12,312
13	HMA PAV'T SAMPLE	LS	1	$ 4,000	$ 4,000
14	HMA, DRIVEWAY	SY	100	$ 66	$ 6,600
15	GRANULAR BACKFILL	CY	3520	$ 33	$ 116,160
16	APRON, CONC	EACH	2	$ 1,500	$ 3,000
17	INTAKE, SW-510	EACH	50	$ 4,500	$ 225,000
18	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	7500	$ 11	$ 82,500
19	SUBDRAIN OUTLET (RF-19C)	EACH	50	$ 300	$ 15,000
20	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	3,800	$ 70	$ 266,000
21	ENGINEER FABRIC	SY	200	$ 4	$ 750
22	REVETMENT, CLASS E	TON	32	$ 44	$ 1,408
23	RMVL OF PAV'T	SY	7250	$ 16	$ 116,000
24	RECREATIONAL TRAIL, PCC, 5"	SY	3000	$ 35	$ 105,000
25	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	33	$ 440	$ 14,520
26	SIDEWALK, PCC, 4"	SY	2133	$ 45	$ 95,985
27	SIDEWALK, PCC, 6"	SY	400	$ 85	$ 34,000
28	DETECTABLE WARNING - CURB RAMP	SF	560	$ 37	$ 20,720
29	DRIVEWAY, P.C. CONCRETE, 8 IN	SY	320	$ 65	$ 20,800
30	RMVL OF PAVED DRIVEWAY	SY	120	$ 12	$ 1,440
31	LIGHTING POLES	EACH	20	$ 5,000	$ 100,000
32	ELECTRICAL CIRCUIT	LF	1,350	$ 13	$ 17,550
33	HANDHOLE AND JUNCTION BOX	EACH	4	$ 900	$ 3,600
34	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	500	$ 22	$ 11,000
35	TYPE A SIGN, SHEET ALUM	SF	100	$ 22	$ 2,200
36	RMVL OF TRAFFIC SIGNALIZATION	LS	1	$ 7,000	$ 7,000
37	CONSTRUCTION SURVEY	LS	1	$ 25,000	$ 25,000
38	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	150	$ 175	$ 26,250
39	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	25	$ 120	$ 3,000
40	GROOVE CUT - PAV'T MARK	STA	150	$ 55	$ 8,250
41	GROOVE CUT - SYMBOL+LEGEND	EACH	25	$ 115	$ 2,875
42	TRAFFIC CONTROL	LS	1	$ 50,000	$ 50,000
43	FLAGGER	EACH	60	$ 425	$ 25,500
44	MOBILIZATION	LS	1	$ 150,000	$ 150,000
45	MODULAR BLOCK RETAIN WALL	SF	1000	$ 100	$ 100,000
46	TRENCH COMPACTION TESTING	LS	1	$ 8,500	$ 8,500
47	ADJUST FIRE HYDRANT	EACH	2	$ 3,500	$ 7,000
48	FIRE HYDRANT ASSEMBLIES	EACH	6	$ 4,800	$ 28,800
49	GATE VALVE+VALVE BOX, 8"	EACH	6	$ 1,700	$ 10,200
50	WATER MAIN, DUCTILE IRON, 8"	LF	1,500	$ 77	$ 115,500

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM SUMMERSET EXTENDED TO C AVENUE					Project 8 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
51	WATER MAIN, DUCTILE IRON, 12"	LF	1,350	$ 80	$ 108,000
52	WATER MAIN FITTING	LB	8550	$ 10	$ 85,500
53	RELOCATE WATER SERVICE, 2" OR LESS	EACH	6	$ 3,500	$ 21,000
54	ADJUST WATER SERVICE STOP BOX	EACH	6	$ 1,500	$ 9,000
55	TAPPING SLEEVE+VALVE	EACH	2	$ 3,250	$ 6,500
56	DECORATIVE BRICK PAVERS	SY	300	$ 125	$ 37,500
57	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	100	$ 26	$ 2,600
58	MOW	ACRE	35	$ 150	$ 5,250
59	MULCH	ACRE	7	$ 700	$ 4,900
60	SEED+FERTILIZE (URBAN)	ACRE	7	$ 2,800	$ 19,600
61	STABILIZE CROP - SEED+FERTILIZE	ACRE	7	$ 2,000	$ 14,000
62	SILT FENCE	LF	4280	$ 3	$ 12,840
63	SILT FENCE-DITCH CHECKS	LF	430	$ 3	$ 1,075
64	SILT BASIN	EACH	4	$ 400	$ 1,600
65	RMVL OF SILT FENCE	LF	4280	$ 1	$ 4,280
66	RMVL OF SILT FENCE-DITCH CHECK	LF	430	$ 1	$ 430
67	CLEAN-OUT OF SILT FENCE	LF	2140	$ 2	$ 3,210
68	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	215	$ 2	$ 323
69	MULCH, SHREDDED BARK	CY	332	$ 45	$ 14,940
70	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	150	$ 50	$ 7,500
71	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	282	$ 250	$ 70,500

Sub-Total Construction:	$	4,070,710
Incentives:	$	93,120
Contingency (15%):	$	610,600
Total Construction:	$	4,774,430
Engineering (15%):	$	716,200
Right-of-way:	$	172,686
Underground Electric:	$	100,000
Construction Admin (9%):	$	430,000
TOTALS:	$	6,193,316

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$**	**6,193,316**
Less Utilities:	$	(400,000)
Less Engineering/Construction Admin:	$	(1,146,200)
Less Underground Electric:	$	(100,000)
STBG Eligible Costs:	$	4,547,116
Maximum STBG Request (80%)	**$**	**3,637,693**
20% Match:	$	909,423

APPENDIX COST OPINION: C AVENUE TO EAST EDGE OF AREA C

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM C AVENUE TO EAST EDGE OF AREA C (ANNEXATION LIMIT)										Project 9 07-14-18
ITEM NO.	ITEM	UNIT			QUANTITY	UNIT PRICE			COSTS	
			CEDAR RAPIDS	MARION	TOTAL		CEDAR RAPIDS	MARION	TOTAL	
1	CLEAR+GRUBB	LS	0.7	0.3	1	$ 10,000	$ 7,000	$ 3,000	$ 10,000	
2	EXCAVATION, CL 10, RDWY+BORROW	CY	54560.1	23382.9	77943	$ 5	$ 272,801	$ 116,915	$ 389,715	
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	4970	2130	7100	$ 7	$ 32,305	$ 13,845	$ 46,150	
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	1101.94	472.26	1574.2	$ 3	$ 3,306	$ 1,417	$ 4,723	
5	MODIFIED SUBBASE	CY	2622.2	1123.8	3746	$ 40	$ 104,888	$ 44,952	$ 149,840	
6	SHLD CONSTRUCTION, EARTH	STA	44.1	18.9	63	$ 450	$ 19,845	$ 8,505	$ 28,350	
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	11962	3780	15742	$ 45	$ 538,290	$ 170,100	$ 708,390	
8	MEDIAN, PCC, 6"	SY	157.5	67.5	225	$ 86	$ 13,545	$ 5,805	$ 19,350	
9	PCC PAV'T SAMPLE	LS	0.7	0.3	1	$ 3,000	$ 2,100	$ 900	$ 3,000	
10	HMA (1M ESAL) BASE, 3/4" (8" THICK)	TON	75	75	150	$ 62	$ 4,650	$ 4,650	$ 9,300	
11	HMA (1M ESAL) SURF, 1/2", NO FRIC (2" THICK)	TON	18.75	18.75	37.5	$ 58	$ 1,088	$ 1,088	$ 2,175	
12	ASPH BINDER, PG 58-28	TON	5.625	5.625	11.25	$ 570	$ 3,206	$ 3,206	$ 6,413	
13	HMA PAV'T SAMPLE	LS	0.5	0.5	1	$ 4,000	$ 2,000	$ 2,000	$ 4,000	
14	HMA, DRIVEWAY	SY	50	50	100	$ 66	$ 3,300	$ 3,300	$ 6,600	
15	GRANULAR BACKFILL	CY	3325	1425	4750	$ 33	$ 109,725	$ 47,025	$ 156,750	
16	APRON, CONC	EACH	1.4	0.6	2	$ 1,500	$ 2,100	$ 900	$ 3,000	
17	INTAKE, SW-510	EACH	56	24	80	$ 6,500	$ 364,000	$ 156,000	$ 520,000	
18	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	4375	1875	6250	$ 11	$ 48,125	$ 20,625	$ 68,750	
19	SUBDRAIN OUTLET (RF-19C)	EACH	56	24	80	$ 300	$ 16,800	$ 7,200	$ 24,000	
20	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	3587.5	1537.5	5,125	$ 70	$ 251,125	$ 107,625	$ 358,750	
21	ENGINEER FABRIC	SY	140	60	200	$ 4	$ 525	$ 225	$ 750	
22	REVETMENT, CLASS E	TON	22.4	9.6	32	$ 44	$ 986	$ 422	$ 1,408	
23	RMVL OF PAV'T	SY	4205.5	666.5	4872	$ 16	$ 67,288	$ 10,664	$ 77,952	
24	RECREATIONAL TRAIL, PCC, 5"	SY	3238.5	1305.5	4544	$ 35	$ 113,348	$ 45,693	$ 159,040	
25	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	29	12	41	$ 440	$ 12,760	$ 5,280	$ 18,040	
26	SIDEWALK, PCC, 4"	SY	215	0	215	$ 45	$ 9,675	$ -	$ 9,675	
27	SIDEWALK, PCC, 6"	SY	58	3	61	$ 85	$ 4,930	$ 255	$ 5,185	
28	DETECTABLE WARNING - CURB RAMP	SF	125	52	177	$ 37	$ 4,625	$ 1,924	$ 6,549	
29	DRIVEWAY, P.C. CONCRETE, 8 IN	SY	60	60	120	$ 65	$ 3,900	$ 3,900	$ 7,800	
30	RMVL OF PAVED DRIVEWAY	SY	175	175	350	$ 12	$ 2,100	$ 2,100	$ 4,200	
31	LIGHTING POLES	EACH	21	9	30	$ 5,000	$ 105,000	$ 45,000	$ 150,000	
32	ELECTRICAL CIRCUIT	LF	2187.5	937.5	3,125	$ 13	$ 28,438	$ 12,188	$ 40,625	
33	HANDHOLE AND JUNCTION BOX	EACH	4	2	6	$ 900	$ 3,600	$ 1,800	$ 5,400	
34	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	350	150	500	$ 22	$ 7,700	$ 3,300	$ 11,000	
35	TYPE A SIGN, SHEET ALUM	SF	70	30	100	$ 22	$ 1,540	$ 660	$ 2,200	
36	CONSTRUCTION SURVEY	LS	0.7	0.3	1	$ 25,000	$ 17,500	$ 7,500	$ 25,000	
37	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	63	27	90	$ 175	$ 11,025	$ 4,725	$ 15,750	
38	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	12	3	15	$ 120	$ 1,440	$ 360	$ 1,800	
39	GROOVE CUT - PAV'T MARK	STA	63	27	90	$ 55	$ 3,465	$ 1,485	$ 4,950	
40	GROOVE CUT - SYMBOL+LEGEND	EACH	12	3	15	$ 115	$ 1,380	$ 345	$ 1,725	
41	TRAFFIC CONTROL	LS	0.7	0.3	1	$ 70,000	$ 49,000	$ 21,000	$ 70,000	
42	FLAGGER	EACH	28	12	40	$ 425	$ 11,900	$ 5,100	$ 17,000	
43	MOBILIZATION	LS	0.7	0.3	1	$ 200,000	$ 140,000	$ 60,000	$ 200,000	
44	MODULAR BLOCK RETAIN WALL	SF	500	500	1000	$ 100	$ 50,000	$ 50,000	$ 100,000	
45	TRENCH COMPACTION TESTING	LS	0.7	0.3	1	$ 8,500	$ 5,950	$ 2,550	$ 8,500	
46	ADJUST FIRE HYDRANT	EACH	2	0	2	$ 3,500	$ 7,000	$ -	$ 7,000	
47	FIRE HYDRANT ASSEMBLIES	EACH	3	1	4	$ 4,800	$ 14,400	$ 4,800	$ 19,200	
48	GATE VALVE+VALVE BOX, 8"	EACH	4	2	6	$ 1,700	$ 6,800	$ 3,400	$ 10,200	
49	WATER MAIN, DUCTILE IRON, 8"	LF	1950	600	2550	$ 77	$ 150,150	$ 46,200	$ 196,350	
50	WATER MAIN FITTING	LB	5850	1800	7650	$ 10	$ 58,500	$ 18,000	$ 76,500	

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM C AVENUE TO EAST EDGE OF AREA C (ANNEXATION LIMIT)									Project 9 07-14-18
ITEM NO.	ITEM	UNIT			QUANTITY	UNIT PRICE			COSTS
			CEDAR RAPIDS	MARION	TOTAL		CEDAR RAPIDS	MARION	TOTAL
51	TAPPING SLEEVE+VALVE	EACH	1	0	1	$ 3,250	$ 3,250	$ -	$ 3,250
52	DECORATIVE BRICK PAVERS	SY	210	90	300	$ 125	$ 26,250	$ 11,250	$ 37,500
53	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	140	60	200	$ 26	$ 3,640	$ 1,560	$ 5,200
54	MOW	ACRE	12.6	5.4	18	$ 150	$ 1,890	$ 810	$ 2,700
55	MULCH	ACRE	4.2	1.8	6	$ 700	$ 2,940	$ 1,260	$ 4,200
56	SEED+FERTILIZE (URBAN)	ACRE	4.2	1.8	6	$ 2,800	$ 11,760	$ 5,040	$ 16,800
57	STABILIZE CROP - SEED+FERTILIZE	ACRE	4.2	1.8	6	$ 2,000	$ 8,400	$ 3,600	$ 12,000
58	SILT FENCE	LF	3281.25	1406.25	4687.5	$ 3	$ 9,844	$ 4,219	$ 14,063
59	SILT FENCE-DITCH CHECKS	LF	329	141	470	$ 3	$ 823	$ 353	$ 1,175
60	SILT BASIN	EACH	2	2	4	$ 400	$ 800	$ 800	$ 1,600
61	RMVL OF SILT FENCE	LF	3281.25	1406.25	4687.5	$ 1	$ 3,281	$ 1,406	$ 4,688
62	RMVL OF SILT FENCE-DITCH CHECK	LF	329	141	470	$ 1	$ 329	$ 141	$ 470
63	CLEAN-OUT OF SILT FENCE	LF	1640.625	703.125	2343.75	$ 2	$ 2,461	$ 1,055	$ 3,516
64	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	164.5	70.5	235	$ 2	$ 247	$ 106	$ 353
65	MULCH, SHREDDED BARK	CY	235.9	101.1	337	$ 45	$ 10,616	$ 4,550	$ 15,165
66	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	210	90	300	$ 50	$ 10,500	$ 4,500	$ 15,000
67	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	166	71	237	$ 250	$ 41,500	$ 17,750	$ 59,250

Sub-Total Construction:	$ 2,833,650	$ 1,136,330	$ 3,969,980
Incentives:	$ 38,310	$ 12,540	$ 50,850
Contingency (15%):	$ 425,000	$ 170,400	$ 595,400
Total Construction:	$ 3,296,960	$ 1,319,270	$ 4,616,230
Engineering (15%):	$ 494,500	$ 197,900	$ 692,400
Right-of-way:	$ 245,095	$ 94,350	$ 339,445
Underground Electric:	$ -	$ -	$ -
Construction Admin (9%):	$ 297,000	$ 119,000	$ 416,000
TOTALS:	$ 4,333,555	$ 1,730,520	$ 6,064,075
FEDERAL AID (OR SWAP) ELIGIBLE COSTS			
Total Costs:	**$ 4,333,555**	**$ 1,730,520**	**$ 6,064,075**
Less Utilities:	$ (246,050)	$ (74,950)	$ (321,000)
Less Engineering/Construction Admin:	$ (791,500)	$ (316,900)	$ (1,108,400)
Less Underground Electric:	$ -	$ -	$ -
STBG Eligible Costs:	$ 3,296,005	$ 1,338,670	$ 4,634,675
Maximum STBG Request (80%)	**$ 2,636,804**	**$ 1,070,936**	**$ 3,707,740**
20% Match:	$ 659,201	$ 267,734	$ 926,935

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM EAST EDGE OF AREA C (ANNEXATION LIMIT) TO EAST EDGE OF KLOUBEC PROPERTY					Project 10 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
1	CLEAR+GRUBB	LS	1	$ 10,000	$ 10,000
2	EXCAVATION, CL 10, RDWY+BORROW	CY	49009	$ 5	$ 245,045
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	7900	$ 7	$ 51,350
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	1611	$ 3	$ 4,833
5	MODIFIED SUBBASE	CY	3873	$ 40	$ 154,920
6	SHLD CONSTRUCTION, EARTH	STA	66	$ 450	$ 29,700
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	16110	$ 45	$ 724,950
8	MEDIAN, PCC, 6"	SY	225	$ 86	$ 19,350
9	PCC PAV'T SAMPLE	LS	1	$ 3,000	$ 3,000
10	HMA, DRIVEWAY	SY	200	$ 66	$ 13,200
11	GRANULAR BACKFILL	CY	4860	$ 33	$ 160,380
12	APRON, CONC	EACH	4	$ 1,500	$ 6,000
13	INTAKE, SW-510	EACH	80	$ 6,500	$ 520,000
14	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	6508	$ 11	$ 71,588
15	SUBDRAIN OUTLET (RF-19C)	EACH	80	$ 300	$ 24,000
16	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	5,254	$ 70	$ 367,780
17	ENGINEER FABRIC	SY	400	$ 4	$ 1,500
18	REVETMENT, CLASS E	TON	1000	$ 44	$ 44,000
19	RMVL OF PAV'T	SY	150	$ 16	$ 2,400
20	RECREATIONAL TRAIL, PCC, 5"	SY	5907	$ 35	$ 206,745
21	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	53	$ 440	$ 23,320
22	SIDEWALK, PCC, 4"	SY	460	$ 45	$ 20,700
23	SIDEWALK, PCC, 6"	SY	90	$ 85	$ 7,650
24	DETECTABLE WARNING - CURB RAMP	SF	264	$ 37	$ 9,768
25	LIGHTING POLES	EACH	30	$ 5,000	$ 150,000
26	ELECTRICAL CIRCUIT	LF	3,254	$ 13	$ 42,302
27	HANDHOLE AND JUNCTION BOX	EACH	4	$ 900	$ 3,600
28	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	300	$ 22	$ 6,600
29	TYPE A SIGN, SHEET ALUM	SF	60	$ 22	$ 1,320
30	CONSTRUCTION SURVEY	LS	1	$ 25,000	$ 25,000
31	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	58	$ 175	$ 10,150
32	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	3	$ 120	$ 360
33	GROOVE CUT - PAV'T MARK	STA	58	$ 55	$ 3,190
34	GROOVE CUT - SYMBOL+LEGEND	EACH	3	$ 115	$ 345
35	TRAFFIC CONTROL	LS	1	$ 15,000	$ 15,000
36	FLAGGER	EACH	10	$ 425	$ 4,250
37	MOBILIZATION	LS	1	$ 120,000	$ 120,000
38	TRENCH COMPACTION TESTING	LS	1	$ 8,500	$ 8,500
39	ADJUST FIRE HYDRANT	EACH	2	$ 3,500	$ 7,000
40	FIRE HYDRANT ASSEMBLIES	EACH	3	$ 4,800	$ 14,400
41	GATE VALVE+VALVE BOX, 8"	EACH	5	$ 1,700	$ 8,500
42	WATER MAIN, DUCTILE IRON, 8"	LF	3,254	$ 77	$ 250,558
43	WATER MAIN FITTING	LB	9762	$ 10	$ 97,620
44	TAPPING SLEEVE+VALVE	EACH	2	$ 3,250	$ 6,500
45	PRECAST CONCRETE CULVERT	LS	1	$ 500,000	$ 500,000
46	DECORATIVE BRICK PAVERS	SY	800	$ 125	$ 100,000
47	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	1500	$ 26	$ 39,000
48	MOW	ACRE	36	$ 150	$ 5,400
49	MULCH	ACRE	12	$ 700	$ 8,400
50	SEED+FERTILIZE (URBAN)	ACRE	12	$ 2,800	$ 33,600

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM EAST EDGE OF AREA C (ANNEXATION LIMIT) TO EAST EDGE OF KLOUBEC PROPERTY					Project 10 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
51	STABILIZE CROP - SEED+FERTILIZE	ACRE	12	$ 2,000	$ 24,000
52	SILT FENCE	LF	4881	$ 3	$ 14,643
53	SILT FENCE-DITCH CHECKS	LF	490	$ 3	$ 1,225
54	SILT BASIN	EACH	8	$ 400	$ 3,200
55	RMVL OF SILT FENCE	LF	4881	$ 1	$ 4,881
56	RMVL OF SILT FENCE-DITCH CHECK	LF	490	$ 1	$ 490
57	CLEAN-OUT OF SILT FENCE	LF	2440.5	$ 2	$ 3,661
58	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	245	$ 2	$ 368
59	MULCH, SHREDDED BARK	CY	296	$ 45	$ 13,320
60	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	150	$ 50	$ 7,500
61	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	246	$ 250	$ 61,500

Sub-Total Construction:	$	4,318,560.00
Incentives:	$	50,750.00
Contingency (15%):	$	647,800.00
Total Construction:	$	5,017,110.00
Engineering (15%):	$	752,600.00
Right-of-way:	$	647,390.00
Underground Electric:	$	-
Construction Admin (9%):	$	452,000.00
TOTALS:	$	6,869,100.00

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$**	**6,869,100.00**
Less Utilities:	$	(393,078.00)
Less Engineering/Construction Admin:	$	(1,204,600.00)
Less Underground Electric:	$	-
STBG Eligible Costs:	$	5,271,422.00
Maximum STBG Request (80%)	**$**	**4,217,137.60**
20% Match:	$	1,054,284.40

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM EAST EDGE OF KLOUBEC PROPERY TO ALBURNETT ROAD					Project 11 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
1	CLEAR+GRUBB	LS	1	$ 10,000	$ 10,000
2	EXCAVATION, CL 10, RDWY+BORROW	CY	9260	$ 5	$ 46,300
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	3800	$ 7	$ 24,700
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	762.6	$ 3	$ 2,288
5	MODIFIED SUBBASE	CY	1668	$ 40	$ 66,720
6	SHLD CONSTRUCTION, EARTH	STA	27	$ 450	$ 12,150
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	7626	$ 45	$ 343,170
8	MEDIAN, PCC, 6"	SY	225	$ 86	$ 19,350
9	PCC PAV'T SAMPLE	LS	1	$ 3,000	$ 3,000
10	GRANULAR BACKFILL	CY	2150	$ 33	$ 70,950
11	APRON, CONC	EACH	2	$ 1,500	$ 3,000
12	INTAKE, SW-510	EACH	40	$ 6,500	$ 260,000
13	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	2646	$ 11	$ 29,106
14	SUBDRAIN OUTLET (RF-19C)	EACH	40	$ 300	$ 12,000
15	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	2,323	$ 70	$ 162,610
16	ENGINEER FABRIC	SY	200	$ 4	$ 750
17	REVETMENT, CLASS E	TON	32	$ 44	$ 1,408
18	RECREATIONAL TRAIL, PCC, 5"	SY	2780	$ 35	$ 97,300
19	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	25	$ 440	$ 11,000
20	SIDEWALK, PCC, 6"	SY	28	$ 85	$ 2,380
21	DETECTABLE WARNING - CURB RAMP	SF	80	$ 37	$ 2,960
22	LIGHTING POLES	EACH	20	$ 5,000	$ 100,000
23	ELECTRICAL CIRCUIT	LF	1,323	$ 13	$ 17,199
24	HANDHOLE AND JUNCTION BOX	EACH	2	$ 900	$ 1,800
25	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	100	$ 22	$ 2,200
26	TYPE A SIGN, SHEET ALUM	SF	20	$ 22	$ 440
27	CONSTRUCTION SURVEY	LS	1	$ 15,000	$ 15,000
28	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	20	$ 175	$ 3,500
29	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	6	$ 120	$ 720
30	GROOVE CUT - PAV'T MARK	STA	20	$ 55	$ 1,100
31	GROOVE CUT - SYMBOL+LEGEND	EACH	6	$ 115	$ 690
32	TRAFFIC CONTROL	LS	1	$ 10,000	$ 10,000
33	FLAGGER	EACH	10	$ 425	$ 4,250
34	MOBILIZATION	LS	1	$ 75,000	$ 75,000
35	TRENCH COMPACTION TESTING	LS	1	$ 8,500	$ 8,500
36	FIRE HYDRANT ASSEMBLIES	EACH	2	$ 4,800	$ 9,600
37	GATE VALVE+VALVE BOX, 8"	EACH	4	$ 1,700	$ 6,800
38	WATER MAIN, DUCTILE IRON, 8"	LF	1,251	$ 77	$ 96,327
39	WATER MAIN FITTING	LB	3753	$ 10	$ 37,530
40	DECORATIVE BRICK PAVERS	SY	300	$ 125	$ 37,500
41	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	50	$ 26	$ 1,300
42	MOW	ACRE	9	$ 150	$ 1,350
43	MULCH	ACRE	3	$ 700	$ 2,100
44	SEED+FERTILIZE (URBAN)	ACRE	3	$ 2,800	$ 8,400
45	STABILIZE CROP - SEED+FERTILIZE	ACRE	3	$ 2,000	$ 6,000
46	SILT FENCE	LF	1984.5	$ 3	$ 5,954
47	SILT FENCE-DITCH CHECKS	LF	200	$ 3	$ 500
48	SILT BASIN	EACH	4	$ 400	$ 1,600
49	RMVL OF SILT FENCE	LF	1984.5	$ 1	$ 1,985
50	RMVL OF SILT FENCE-DITCH CHECK	LF	200	$ 1	$ 200

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM EAST EDGE OF KLOUBEC PROPERY TO ALBURNETT ROAD					Project 11 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
51	CLEAN-OUT OF SILT FENCE	LF	992.25	$ 2	$ 1,488
52	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	100	$ 2	$ 150
53	MULCH, SHREDDED BARK	CY	119	$ 45	$ 5,355
54	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	50	$ 50	$ 2,500
55	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	102	$ 250	$ 25,500

Sub-Total Construction:	$	1,673,680
Incentives:	$	24,030
Contingency (15%):	$	251,100
Total Construction:	$	1,948,810
Engineering (15%):	$	292,300
Right-of-way:	$	242,521
Underground Electric:	$	-
Construction Admin (9%):	$	175,000
TOTALS:	$	2,658,631

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$**	**2,658,631**
Less Utilities:	$	(158,757)
Less Engineering/Construction Admin:	$	(467,300)
Less Underground Electric:	$	-
STBG Eligible Costs:	$	2,032,574
Maximum STBG Request (80%)	**$**	**1,626,060**
20% Match:	$	406,515

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM RELOCATED WINSLOW TO EXISTING WINSLOW (BRIDGE OVER INDIAN CREEK)					Project 12 07-14-21
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
1	CLEAR+GRUBB	LS	1	$ 20,000	$ 20,000
2	EXCAVATION, CL 10, RDWY+BORROW	CY	33618	$ 5	$ 168,090
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	6744	$ 7	$ 43,836
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	1565.5	$ 3	$ 4,697
5	MODIFIED SUBBASE	CY	19569	$ 40	$ 782,760
6	SHLD CONSTRUCTION, EARTH	STA	64	$ 450	$ 28,800
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	15655	$ 45	$ 704,475
8	MEDIAN, PCC, 6"	SY	225	$ 86	$ 19,350
9	PCC PAV'T SAMPLE	LS	1	$ 3,000	$ 3,000
10	HMA (1M ESAL) BASE, 3/4" (8" THICK)	TON	335	$ 62	$ 20,770
11	HMA (1M ESAL) SURF, 1/2", NO FRIC (2" THICK)	TON	84	$ 58	$ 4,872
12	ASPH BINDER, PG 58-28	TON	25	$ 570	$ 14,250
13	HMA PAV'T SAMPLE	LS	1	$ 4,000	$ 4,000
14	HMA, DRIVEWAY	SY	70	$ 66	$ 4,620
15	GRANULAR BACKFILL	CY	4560	$ 33	$ 150,480
16	APRON, CONC	EACH	6	$ 1,500	$ 9,000
17	INTAKE, SW-510	EACH	70	$ 6,500	$ 455,000
18	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	6350	$ 11	$ 69,850
19	SUBDRAIN OUTLET (RF-19C)	EACH	70	$ 300	$ 21,000
20	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	4,925	$ 70	$ 344,750
21	ENGINEER FABRIC	SY	600	$ 4	$ 2,250
22	REVETMENT, CLASS E	TON	1000	$ 44	$ 44,000
23	RMVL OF PAV'T	SY	5500	$ 10	$ 55,000
24	RECREATIONAL TRAIL, PCC, 5"	SY	6222	$ 35	$ 217,770
25	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	56	$ 440	$ 24,640
26	SIDEWALK, PCC, 4"	SY	100	$ 45	$ 4,500
27	SIDEWALK, PCC, 6"	SY	15	$ 85	$ 1,275
28	DETECTABLE WARNING - CURB RAMP	SF	40	$ 37	$ 1,480
29	RMVL OF PAVED DRIVEWAY	SY	40	$ 12	$ 480
30	LIGHTING POLES	EACH	30	$ 5,000	$ 150,000
31	ELECTRICAL CIRCUIT	LF	3,175	$ 13	$ 41,275
32	HANDHOLE AND JUNCTION BOX	EACH	5	$ 900	$ 4,500
33	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	200	$ 22	$ 4,400
34	TYPE A SIGN, SHEET ALUM	SF	40	$ 22	$ 880
35	CONSTRUCTION SURVEY	LS	1	$ 50,000	$ 50,000
36	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	96	$ 175	$ 16,800
37	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	9	$ 120	$ 1,080
38	GROOVE CUT - PAV'T MARK	STA	96	$ 55	$ 5,280
39	GROOVE CUT - SYMBOL+LEGEND	EACH	9	$ 115	$ 1,035
40	TRAFFIC CONTROL	LS	1	$ 30,000	$ 30,000
41	FLAGGER	EACH	40	$ 425	$ 17,000
42	MOBILIZATION	LS	1	$ 350,000	$ 350,000
43	MODULAR BLOCK RETAIN WALL	SF	1000	$ 100	$ 100,000
44	TRENCH COMPACTION TESTING	LS	1	$ 8,500	$ 8,500
45	ADJUST FIRE HYDRANT	EACH	2	$ 3,500	$ 7,000
46	FIRE HYDRANT ASSEMBLIES	EACH	1	$ 4,800	$ 4,800
47	PRECAST PRESTRESS BRIDGE OVER INDIAN CREEK	LS	1	$ 4,100,000	$ 4,100,000
48	DECORATIVE BRICK PAVERS	SY	500	$ 125	$ 62,500
49	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	500	$ 26	$ 13,000
50	MOW	ACRE	18	$ 150	$ 2,700

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM RELOCATED WINSLOW TO EXISTING WINSLOW (BRIDGE OVER INDIAN CREEK)					Project 12 07-14-21
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
51	MULCH	ACRE	6	$ 700	$ 4,200
52	SEED+FERTILIZE (URBAN)	ACRE	6	$ 2,800	$ 16,800
53	STABILIZE CROP - SEED+FERTILIZE	ACRE	6	$ 2,000	$ 12,000
54	SILT FENCE	LF	4762.5	$ 3	$ 14,288
55	SILT FENCE-DITCH CHECKS	LF	480	$ 3	$ 1,200
56	SILT BASIN	EACH	4	$ 400	$ 1,600
57	RMVL OF SILT FENCE	LF	4762.5	$ 1	$ 4,763
58	RMVL OF SILT FENCE-DITCH CHECK	LF	480	$ 1	$ 480
59	CLEAN-OUT OF SILT FENCE	LF	2381.25	$ 2	$ 3,572
60	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	240	$ 2	$ 360
61	MULCH, SHREDDED BARK	CY	340	$ 45	$ 15,300
62	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	300	$ 50	$ 15,000
63	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	240	$ 250	$ 60,000

Sub-Total Construction:	$	8,345,310
Incentives:	$	52,110
Contingency (15%):	$	1,251,800
Total Construction:	$	9,649,220
Engineering (15%):	$	1,447,400
Right-of-way:	$	6,265
Underground Electric:	$	-
Construction Admin (9%):	$	868,000
TOTALS:	$	11,970,885

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$**	**11,970,885**
Less Utilities:	$	(20,300)
Less Construction Admin:	$	(868,000)
Less Underground Electric:	$	-
STBG Eligible Costs:	$	11,082,585
Maximum STBG Request (80%)	**$**	**8,866,068**
20% Match:	$	2,216,517

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM THE RIDGE AT INDIAN CREEK TO BECKNER-ROBINSON/VAUGHN FARMS					Project 13 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
1	CLEAR+GRUBB	LS	1	$ 3,500	$ 3,500
2	EXCAVATION, CL 10, RDWY+BORROW	CY	16590	$ 5	$ 82,950
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	9300	$ 7	$ 60,450
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	1946	$ 3	$ 5,838
5	MODIFIED SUBBASE	CY	3596	$ 40	$ 143,840
6	SHLD CONSTRUCTION, EARTH	STA	57	$ 450	$ 25,650
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	19460	$ 45	$ 875,700
8	MEDIAN, PCC, 6"	SY	400	$ 86	$ 34,400
9	PCC PAV'T SAMPLE	LS	1	$ 3,000	$ 3,000
10	GRANULAR BACKFILL	CY	4490	$ 33	$ 148,170
11	APRON, CONC	EACH	4	$ 1,500	$ 6,000
12	INTAKE, SW-510	EACH	80	$ 6,500	$ 520,000
13	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	5700	$ 11	$ 62,700
14	SUBDRAIN OUTLET (RF-19C)	EACH	80	$ 300	$ 24,000
15	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	4,850	$ 70	$ 339,500
16	ENGINEER FABRIC	SY	400	$ 4	$ 1,500
17	REVETMENT, CLASS E	TON	64	$ 44	$ 2,816
18	RECREATIONAL TRAIL, PCC, 5"	SY	6000	$ 35	$ 210,000
19	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	54	$ 440	$ 23,760
20	SIDEWALK, PCC, 4"	SY	630	$ 45	$ 28,350
21	SIDEWALK, PCC, 6"	SY	200	$ 85	$ 17,000
22	DETECTABLE WARNING - CURB RAMP	SF	416	$ 37	$ 15,392
23	LIGHTING POLES	EACH	30	$ 5,000	$ 150,000
24	ELECTRICAL CIRCUIT	LF	2,850	$ 13	$ 37,050
25	HANDHOLE AND JUNCTION BOX	EACH	4	$ 900	$ 3,600
26	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	300	$ 22	$ 6,600
27	TYPE A SIGN, SHEET ALUM	SF	60	$ 22	$ 1,320
28	CONSTRUCTION SURVEY	LS	1	$ 20,000	$ 20,000
29	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	74	$ 175	$ 12,950
30	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	11	$ 120	$ 1,320
31	GROOVE CUT - PAV'T MARK	STA	74	$ 55	$ 4,070
32	GROOVE CUT - SYMBOL+LEGEND	EACH	11	$ 115	$ 1,265
33	TRAFFIC CONTROL	LS	1	$ 10,000	$ 10,000
34	FLAGGER	EACH	10	$ 425	$ 4,250
35	MOBILIZATION	LS	1	$ 100,000	$ 100,000
36	TRENCH COMPACTION TESTING	LS	1	$ 8,500	$ 8,500
37	FIRE HYDRANT ASSEMBLIES	EACH	4	$ 4,800	$ 19,200
38	GATE VALVE+VALVE BOX, 8"	EACH	5	$ 1,700	$ 8,500
39	WATER MAIN, DUCTILE IRON, 8"	LF	2,700	$ 77	$ 207,900
40	WATER MAIN FITTING	LB	8100	$ 10	$ 81,000
41	DECORATIVE BRICK PAVERS	SY	300	$ 125	$ 37,500
42	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	100	$ 26	$ 2,600
43	MOW	ACRE	18	$ 150	$ 2,700
44	MULCH	ACRE	6	$ 700	$ 4,200
45	SEED+FERTILIZE (URBAN)	ACRE	6	$ 2,800	$ 16,800
46	STABILIZE CROP - SEED+FERTILIZE	ACRE	6	$ 2,000	$ 12,000
47	SILT FENCE	LF	4275	$ 3	$ 12,825
48	SILT FENCE-DITCH CHECKS	LF	430	$ 3	$ 1,075
49	SILT BASIN	EACH	4	$ 400	$ 1,600
50	RMVL OF SILT FENCE	LF	4275	$ 1	$ 4,275

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM THE RIDGE AT INDIAN CREEK TO BECKNER-ROBINSON/VAUGHN FARMS					Project 13 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
51	RMVL OF SILT FENCE-DITCH CHECK	LF	430	$ 1	$ 430
52	CLEAN-OUT OF SILT FENCE	LF	2137.5	$ 2	$ 3,206
53	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	215	$ 2	$ 323
54	MULCH, SHREDDED BARK	CY	223	$ 45	$ 10,035
55	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	20	$ 50	$ 1,000
56	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	216	$ 250	$ 54,000

Sub-Total Construction:	$	3,476,610
Incentives:	$	61,300
Contingency (15%):	$	521,500
Total Construction:	$	4,059,410
Engineering (15%):	$	608,900
Right-of-way:	$	506,565
Underground Electric:	$	-
Construction Admin (9%):	$	365,000
TOTALS:	$	5,539,875

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$**	**5,539,875**
Less Utilities:	$	(325,100)
Less Construction Admin:	$	(365,000)
Less Underground Electric:	$	-
STBG Eligible Costs:	$	4,849,775
Maximum STBG Request (80%)	**$**	**3,879,820**
20% Match:	$	969,955

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM BECKNER-ROBINSON/VAUGH FARMS TO IA HIGHWAY 13					Project 14 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
1	CLEAR+GRUBB	LS	1	$ 3,500	$ 3,500
2	EXCAVATION, CL 10, RDWY+BORROW	CY	18307	$ 5	$ 91,535
3	TOPSOIL, STRIP, SALVAGE+SPREAD	CY	7500	$ 7	$ 48,750
4	SUBGRADE STABIL MAT'L, POLYMER GRID	SY	1653.4	$ 3	$ 4,960
5	MODIFIED SUBBASE	CY	3265	$ 40	$ 130,600
6	SHLD CONSTRUCTION, EARTH	STA	53	$ 450	$ 23,850
7	STD/S-F PCC PAV'T, CL C CL 2, 9"	SY	16534	$ 45	$ 744,030
8	MEDIAN, PCC, 6"	SY	150	$ 86	$ 12,900
9	PCC PAV'T SAMPLE	LS	1	$ 3,000	$ 3,000
10	GRANULAR SHOULDERS, TYPE A	TON	135	$ 30	$ 4,050
11	GRANULAR BACKFILL	CY	4040	$ 33	$ 133,320
12	APRON, CONC	EACH	8	$ 1,500	$ 12,000
13	INTAKE, SW-510	EACH	70	$ 6,500	$ 455,000
14	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	5230	$ 11	$ 57,530
15	SUBDRAIN OUTLET (RF-19C)	EACH	70	$ 300	$ 21,000
16	STORM SWR G-MAIN,TRENCHED, RCP 2000D	LF	4,365	$ 70	$ 305,550
17	ENGINEER FABRIC	SY	800	$ 4	$ 3,000
18	REVETMENT, CLASS E	TON	128	$ 44	$ 5,632
19	RMVL OF PAV'T	SY	250	$ 16	$ 4,000
20	RECREATIONAL TRAIL, PCC, 5"	SY	5367	$ 35	$ 187,845
21	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	48	$ 440	$ 21,120
22	SIDEWALK, PCC, 4"	SY	160	$ 45	$ 7,200
23	SIDEWALK, PCC, 6"	SY	60	$ 85	$ 5,100
24	DETECTABLE WARNING - CURB RAMP	SF	168	$ 37	$ 6,216
25	LIGHTING POLES	EACH	30	$ 5,000	$ 150,000
26	ELECTRICAL CIRCUIT	LF	2,615	$ 13	$ 33,995
27	HANDHOLE AND JUNCTION BOX	EACH	6	$ 900	$ 5,400
28	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	400	$ 22	$ 8,800
29	TYPE A SIGN, SHEET ALUM	SF	80	$ 22	$ 1,760
30	TRAFFIC SIGNALIZATION	EACH	1	$ 300,000	$ 300,000
31	CONSTRUCTION SURVEY	LS	1	$ 30,000	$ 30,000
32	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	87	$ 175	$ 15,225
33	PAINTED SYMBOL+LEGEND,HIBUILD WATERBORNE	EACH	20	$ 120	$ 2,400
34	GROOVE CUT - PAV'T MARK	STA	87	$ 55	$ 4,785
35	GROOVE CUT - SYMBOL+LEGEND	EACH	20	$ 115	$ 2,300
36	TRAFFIC CONTROL	LS	1	$ 70,000	$ 70,000
37	FLAGGER	EACH	30	$ 425	$ 12,750
38	MOBILIZATION	LS	1	$ 150,000	$ 150,000
39	TRENCH COMPACTION TESTING	LS	1	$ 8,500	$ 8,500
40	FIRE HYDRANT ASSEMBLIES	EACH	4	$ 4,800	$ 19,200
41	GATE VALVE+VALVE BOX, 8"	EACH	4	$ 1,700	$ 6,800
42	WATER MAIN, DUCTILE IRON, 8"	LF	2,415	$ 77	$ 185,955
43	WATER MAIN FITTING	LB	7245	$ 10	$ 72,450
44	TAPPING SLEEVE+VALVE	EACH	1	$ 3,250	$ 3,250
45	DECORATIVE BRICK PAVERS	SY	300	$ 125	$ 37,500
46	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	150	$ 26	$ 3,900
47	MOW	ACRE	18	$ 150	$ 2,700
48	MULCH	ACRE	6	$ 700	$ 4,200
49	SEED+FERTILIZE (URBAN)	ACRE	6	$ 2,800	$ 16,800
50	STABILIZE CROP - SEED+FERTILIZE	ACRE	6	$ 2,000	$ 12,000

ESTIMATED PROJECT QUANTITIES - TOWER TERRACE ROAD FROM BECKNER-ROBINSON/VAUGH FARMS TO IA HIGHWAY 13					Project 14 07-14-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
51	SILT FENCE	LF	3922.5	$ 3	$ 11,768
52	SILT FENCE-DITCH CHECKS	LF	390	$ 3	$ 975
53	SILT BASIN	EACH	4	$ 400	$ 1,600
54	RMVL OF SILT FENCE	LF	3922.5	$ 1	$ 3,923
55	RMVL OF SILT FENCE-DITCH CHECK	LF	390	$ 1	$ 390
56	CLEAN-OUT OF SILT FENCE	LF	1961.25	$ 2	$ 2,942
57	CLEAN-OUT OF SILT FENCE-DITCH CHECK	LF	195	$ 2	$ 293
58	MULCH, SHREDDED BARK	CY	205	$ 45	$ 9,225
59	SHRUBS, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	20	$ 50	$ 1,000
60	TREES, FURNISHED AND INSTALLED (WITH WARRANTY)	EACH	198	$ 250	$ 49,500

Sub-Total Construction:	$	3,533,970
Incentives:	$	52,090
Contingency (15%):	$	530,100
Total Construction:	$	4,116,160
Engineering (15%):	$	617,400
Right-of-way:	$	387,016
Underground Electric:	$	-
Construction Admin (9%):	$	370,000
TOTALS:	$	5,490,576

FEDERAL AID (OR SWAP) ELIGIBLE COSTS

Total Costs:	**$**	**5,490,576**
Less Utilities:	$	(296,155)
Less Construction Admin:	$	(370,000)
Less Underground Electric:	$	-
STBG Eligible Costs:	$	4,824,421
Maximum STBG Request (80%)	**$**	**3,859,537**
20% Match:	$	964,884

ESTIMATED ADDITIONAL PROJECT QUANTITIES - PEDESTRIAN UNDERPASS I-380 AND TOWER TERRACE ROAD					100-1A 06-28-18
ITEM NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	COSTS
1	CLEAR+GRUBB	LS	1	$ 5,000	$ 5,000
2	EXCAVATION, CL 10, RDWY+BORROW	CY	25000	$ 5	$ 125,000
3	MODIFIED SUBBASE (UNDER CULVERTS)	CY	100	$ 40	$ 4,000
4	GRANULAR BACKFILL	CY	400	$ 33	$ 13,200
5	SUBDRAIN, LONGITUDINAL, (SHLD) 6"	LF	200	$ 11	$ 2,200
6	RECREATIONAL TRAIL, PCC, 5"	SY	4200	$ 35	$ 147,000
7	SPECIAL COMPACTION OF SUBGRADE/REC TRAIL	STA	38	$ 440	$ 16,720
8	UNDER DECK LIGHTING	EACH	8	$ 1,500	$ 12,000
9	ELECTRICAL CIRCUIT	LF	2,000	$ 13	$ 26,000
10	HANDHOLE AND JUNCTION BOX	EACH	4	$ 900	$ 3,600
11	WOOD POST-TYPE A/B SIGN, 4"X4"	LF	200	$ 22	$ 4,400
12	TYPE A SIGN, SHEET ALUM	SF	40	$ 22	$ 880
13	CONSTRUCTION SURVEY	LS	1	$ 2,500	$ 2,500
14	PAINTED PAV'T MARK, HIGHBUILD WATERBORNE	STA	64	$ 175	$ 11,200
15	MOBILIZATION	LS	1	$ 35,000	$ 35,000
16	MODULAR BLOCK RETAIN WALL	SF	7500	$ 60	$ 450,000
17	PRECAST CONCRETE CULVERT (12' x 14')	LF	100	$ 1,500	$ 150,000
18	SLOPE PROTECTION, WOOD EXCELSIOR	SQ	1500	$ 26	$ 39,000
19	MOW	ACRE	1	$ 150	$ 150
20	MULCH	ACRE	1	$ 700	$ 700
21	SEED+FERTILIZE (URBAN)	ACRE	1	$ 2,800	$ 2,800
22	STABILIZE CROP - SEED+FERTILIZE	ACRE	1	$ 2,000	$ 2,000

Sub-Total Construction:	$	1,053,350
Incentives:	$	-
Contingency (15%):	$	158,000
Total Construction:	$	1,211,350

DURABLE PAVEMENT MARKINGS

Pavement markings provide traffic control and guidance for road users (drivers, bicyclists, pedestrians) and include lines, symbols, and words to convey the intended use of the pavement area. Most pavement markings are reflective for visibility during the day, night, and under raining conditions. Once pavement markings are installed on a roadway, the responsible jurisdiction (state, city, or county) must maintain the markings so they are effective in controlling traffic. Over time, all pavement markings fade or are worn off by traffic, or lose their reflectivity and are not effective at night or under adverse weather. To reapply pavement markings not only has a labor and material cost, but also a safety cost to striping crews and the general public as workers must be present in traffic to reapply the markings.

The following costs and lifespan information are taken from work by the University of Illinois, in conjunction with the Illinois Department of Transportation in their report “Pavement Marking Selection, Installation and Inspection Manual”, August, 2015.

Simple pavement marking materials like waterborne paints are low cost, at around $0.10 per foot of 4-inch wide marking (an industry standard minimum width). But under high traffic (more than 7,000 vehicles per day) tend to wear off frequently and may only last 1 to 2 years. Most waterborne paints are not considered durable pavement markings. Transverse pavement markings such as stop bars and cross walk markings which are subject to a lot of wheel traffic can wear off in as little as 6 months. Longitudinal markings (edge lines and so forth) usually last closer to the 2-year point as they are not being driven on directly day in and day out. While waterborne paints provide longer, satisfactory life on low volume roads, durable pavement markings are normally installed on higher volume roads.

Durable pavement markings are markings intended to last several years without reapplication under high traffic exposure. These include Epoxy based paints, Polyurea and Urethane based paints, hot applied thermoplastic, and preformed cold plastic markings. On Hot Mix Asphalt (HMA) pavement, preformed plastic pavement markings are rolled into the hot asphalt as it is constructed and are very durable (lasting 7 to 9 years before needing reapplication). Thermoplastics and the other listed pains generally have similar life spans of around 5 to 9 years. Durable pavement markings tend to bond very tightly to HMA pavement surfaces and withstand abrasive environments from snowplows and salt/sand action under tires. Durable pavement markings for HMA typically cost between $0.22 per foot up to $0.97 per foot.

Concrete pavements tend not to bond as well with any pavement markings, compared to HMA. Even the durable marking materials listed previously tend to become rigid at cold temperatures and pop off of the concrete surface especially under snowplow blades. To prevent the markings from separating from the pavement under snowplowing, grooves are ground into the concrete pavement surface at the pavement marking locations so the surface of the pavement markings sit at, or just slightly below the surface of the pavement. Durable pavement markings for concrete pavement cost between $0.26 per foot up to $0.56 per foot.

Comparing durable pavement marking costs to non-durable marking costs, the durable markings can cost anywhere from two to ten times as much as non-durable markings. On average, durable markings usually run about five times the cost of non-durable markings. However, the lifespan of durable pavement markings generally range between five and ten times the life of non-durable markings. Therefore, while the initial cost of the pavement markings are higher for durable materials, the lifespan and much lower frequency of pavement marking maintenance more than make up the difference in cost.

EARTHWORK COST ESTIMATE BY PROJECT PHASE				
PROJECT PHASE	PROJECT PHASE LIMITS	NET EARTHWORK (CUBIC YARDS)	TOTAL CUT (CUBIC YARDS)	TOTAL FILL (CUBIC YARDS)
1	Edgewood Road to W. Edge of I-380 Interchange	9,316	13,105	3,789
-	I-380 Interchange (By Iowa DOT)	-	-	-
2	E. Edge of I-380 Interchange to Center Point Road	9,940	10,321	381
3	Center Point Road to Stamy Road	(3,642)	5,962	9,604
4	Stamy Road to Robins Road	(3,246)	4,199	7,444
5	Robins Road to Council Street (Bridges Over Dry Creek and Canadian National Railway)	(176,356)	17,916	194,272
6	Council Street to Turtle Run Extended	2,684	7,403	4,719
7	Turtle Run Extended to Summerset Extended	3,555	15,312	11,758
8	Summerset Extended to C Avenue	29,959	43,224	13,264
9	C Avenue to E. Edge of Area C (Annexation Limit)	69,297	77,943	8,645
10	E. Edge of Area C (Annexation Limit) to E. Edge of Kloubec Property	(43,798)	5,211	49,009
11	E. Edge of Kloubec Property to Alburnett Road	6,380	9,260	2,880
-	Alburnett Road to Relocated Winslow (Already Built)	-	-	-
12	Relocated Winslow to Existing Winslow (Bridge Over Indian Creek)	(25,767)	7,851	33,618
-	Existing Winslow Road to E. Edge of Abode Development/The Ridge at Indian Creek (Already Built or Designed/Under Construction)	-	-	-
13	The Ridge at Indian Creek to Beckner-Ronbinson-Vaughn Farms	9,049	16,590	7,541
14	Beckner-Robinson-Vaugh Farms to IA Highway 13	(3,993)	14,314	18,307

Memorandum

Date: Friday, June 01, 2018

Project: Tower Terrace Road Corridor Management Plan Update

To: Corridor MPO

From: HDR Engineering

Subject: Environmental Review

METHODOLOGY

HDR reviewed the corridor identified in the Tower Terrace Road Corridor Management Plan from just west of I-380 east to Iowa Highway 13. The Plan subdivided the corridor into seven segments, which may or may not represent logical termini of independent utility (whereby a segment could be constructed and function as a transportation improvement independently, whether or not other segments were constructed). Roadway construction has occurred on some of the segments identified in the Plan and design is occurring for segments or portions of other segments. The Federal Highway Administration (FHWA) would provide input on whether unconstructed segments seeking federal funds for construction would have logical termini and independent utility; however this would not be required for locally funded segments

HDR gathered environmental and other related geographic information system (GIS) data from shapefiles available from Linn County and Cedar Rapids, as well as Iowa Department of Natural Resources (Iowa DNR) shapefiles, and created a GIS database. Data acquired included: shapefiles of wetland, floodway, floodplain, and conservation/recreation/park area boundaries; stream and trail lines, and locations of groundwater wells, leaking underground storage tank sites, and contaminated sites. Locations of schools, churches, cemeteries, and airports were also acquired. Municipal boundaries were acquired to identify limits of Hiawatha, Robins, Marion, and Cedar Rapids. The National Park Service database of sites listed on the National Register of Historic Places (NRHP) was reviewed, and no listed sites were shown within the corridor. However, the Linn County Assessor's files were reviewed to identify existing structures that were approximately 50 years or older, and these locations were digitized and added to the database. Additionally, Iowa DNR's database of aerial photographs were reviewed and used to confirm that the corridor likely contains remnants of former farmsteads and other buildings that no longer exist in the most recent aerial photographs, and could exist as archaeological resources.

After developing the database and plotting the results on recent aerial photographs, we drove along public right-of-way (ROW) within the corridor and reviewed the presence of mapped resources and identified additional features that were added to the GIS database. There were several areas not completely visible from public ROW; consequently, the entire study area was not reviewed via windshield reconnaissance. The site visit did not involve verification/delineation of boundaries provided via shapefiles in the desktop review. Wetland and other waters of the U.S. boundaries acquired from U.S. Fish and Wildlife (USFWS) National Wetlands Inventory (NWI) are based on aerial photography review. However, we also noticed potential ditch wetlands along Tower Terrace Road between Center Point Road and Robins Road, and that NWI wetlands near Meadow Knolls appear to be farmed. Eventually, wetland boundaries would need field delineation to confirm their actual location (as well as identify potential wetlands not shown in the NWI such as agricultural wetlands) and determine if construction of a transportation corridor would impact these features and require acquisition of Clean Water Act Section 404 permits.

Table 1 identifies potential environmental constraints to address for each segment, and identifies which segments or portions of segments have been constructed or are being designed. Table 2 notes potential environmental permits or approvals that would be needed for each segment. The segment of Tower Terrance Road from Alburnett Road to 10th Street has been completely constructed; consequently, although listed as one of the seven segments in the table, no constraints, permits, or approvals are listed. Portions of the 10th Street to Indian Creek Road segment and Indian Creek Road to Iowa Highway 13 segment have been constructed.

hdrinc.com 5815 Council Street NE, Suite B, Cedar Rapids, IA 52402-5893
(319) 373-2536

Table 1—Potential Environmental Issues by Segment

	I-380-Robins Road	Robins Road – Council Street NE	Council Street NE – C Avenue NE	C Avenue NE – Alburnett Road	Alburnett Road – 10th Street	10th Street – Indian Creek Road	Indian Creek Road – Iowa Highway 13
Design/ Construction Status	I-380 Interchange design is ongoing for approximately 1,500 feet from west of the interstate to near Tower Terrace Mobile Home park.	Future design and construction	Design is ongoing for approximately 1,300 feet from Summerset Ave NE to C Avenue NE. Future design of Council Street NE to Summerset Ave.	Design is ongoing for approximately 6,500 feet of entire segment	Segment constructed of approximately 3,800 feet	Approximately 1,500 feet constructed from 10th St east to Winslow Rd. From Winslow Rd to Indian Creek Rd. not constructed.	Approximately 1,400 feet constructed from Lennon Lane east to 35th Street. From 35th Street to Iowa Highway 13 not constructed
Resources							
Wetlands	Intermittent tributary to Dry Creek with associated NWI wetlands. Ditch wetlands observed along Tower Terrace Road,	Intermittent tributary to Dry Creek and associated wetlands. Perennial Dry Creek with associated NWI wetlands.	Two intermittent tributaries to Dry Creek and associated NWI wetlands. NWI wetland associated with a farm pond located south of Tiburan Road.	Four intermittent tributaries to Dry Creek and associated NWI wetlands.	N/A	Two intermittent tributaries to Indian Creek and associated wetlands. Perennial Indian Creek and associated NWI wetlands.	Three intermittent tributaries to Indian Creek and associated NWI wetlands.
Floodways and Floodplains	---	Floodway and 100-year floodplain for Dry Creek	---	100-year floodplain for a tributary to Dry Creek	N/A	Floodway and 100-year floodplain for Indian Creek and its tributaries.	---
Threatened and Endangered Species	Low potential for presence of state or federally listed T&E species. Area consists of agricultural, residential, and industrial land.	Medium potential for presence of state or federally listed T&E species. Dry Creek lacks sufficient size and flow for mussel species. Potential roosting habitat for northern-long eared bat within creek riparian corridor. Remaining area consists of agricultural land or residential developments.	Medium potential for presence of state or federally listed T&E species. Potential roosting habitat for northern long-eared bat in riparian areas within the segment.	Low potential for presence of state or federally listed T&E species. Area consists of agricultural land and residential developments. Low concentration of trees providing suitable roosting habitat for northern long-eared bat.	N/A	Medium to low potential for presence of state of federally listed T&E species. Indian Creek lacks sufficient size and flow for mussel species. Potential roosting habitat for northern-long eared bat within creek riparian corridor is less dense than Dry Creek. Remaining area consists of agricultural land or residential developments.	Low potential for presence of state or federally listed T&E species. Land consists of agricultural land. One riparian area associated with an intermittent stream west of Iowa Highway 13 provides potentially suitable roosting habitat for northern long-eared bat.
Cultural Resources	Multiple potential historic structures, and potential sites for structural archeological remnants.	1 existing potential historic structure.	1 existing potential historic structure.	2 existing potential historic structures.	N/A	2 existing potential historic structures.	Potential sites for structural archeological remnants.
Regulated Materials	---	The substation likely stores regulated materials.	---	---	N/A	One leaking underground storage tank site located on Linn-Mar High School property was closed with no further action required, and is adjacent to previously constructed subsegment.	---
Visual Aesthetics	Farmland, residential, and industrial facilities throughout segment.	Farmland, residential developments, and riparian corridor associated with Dry Creek located within the segment,	Farmland and residential developments throughout segment,	Farmland and residential developments throughout segment,	N/A	Farmland, residential developments, and riparian corridor associated with Indian Creek located within the segment	Farmland throughout segment, with some residences in western portion of segment.
Noise	Tower Terrace Mobile Home Park located west of Center Point Road. Remaining area consists of industrial/ agricultural land. Low potential for noise impact.	Single-family residential homes located within the segment makes noise a potential issue.	Single-family residential homes located within the segment makes noise a potential issue.	Believers in Grace Fellowship and Saint Mark Lutheran Church are located north of Main Street and east of C Avenue NE. The presence of churches and single-family residential homes within the segment make noise a potential issue.	N/A	A middle school, high school, and single-family residence homes are located within the segment makes noise a potential issue.	Single-family residential homes located within the segment makes noise a potential issue.
Residences	Potential relocations. Tower Terrace Mobile Home Park is a likely area of an Environmental Justice (low-income) population.	Potential relocations of single-family residential homes.	Single-family residential homes.	Potential relocations of single-family residential homes.	N/A	Potential relocations of single-family residential homes.	Single-family residential homes.
Section 4(f) Parks and Recreational Areas	Trail along Center Point Road extends south from Tower Terrace Road. Cedar Valley Nature Trail crosses the segment.	---	---	---	N/A	Track and recreational fields associated with Excelsior Middle School and Linn-Mar High School. Trail north and south of Tower Terrace Road, and east of 10th Street.	Trail north and south of Tower Terrace Road, east of 35th Street, and south of 35th Avenue.

hdrinc.com 5815 Council Street NE, Suite B, Cedar Rapids, IA 52402-5893
(319) 373-2536

Table 2 – Potential Environmental Permits or Approvals by Segment

	I-380-Robins Road	Robins Road – Council Street NE	Council Street NE – C Avenue NE	C Avenue NE – Alburnett Road	Alburnett Road – 10th Street	10th Street – Indian Creek Road	Indian Creek Road – Iowa Highway 13
Potential NEPA documentation classification[1]	Categorical Exclusion	Environmental Assessment	Categorical Exclusion/Environmental Assessment	Categorical Exclusion/Environmental Assessment	N/A	Categorical Exclusion/Environmental Assessment	Categorical Exclusion
Wetland delineation/Section 404/401 Permit	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Cultural resource surveys/ Section 106 consultation	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Floodplain permit	No	Yes	No	Yes	N/A	Yes	No
Stormwater construction permit	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Railroad crossing approval	No	Yes	No	No	N/A	No	No
Grading and other building permits	Yes	Yes	Yes	Yes	N/A	Yes	Yes

[1] If Federal funds are used, FHWA and DOT will determine the level of NEPA documentation necessary. The documentation type listed is based on prior experience and may not reflect FHWA's final decision.

hdrinc.com 5815 Council Street NE, Suite B, Cedar Rapids, IA 52402-5893
(319) 373-2536

SUMMARY BY SEGMENT

I-380 to Robins Road

This segment will tie into the interstate interchange being designed. Environmental issues include ditch wetlands and the mobile home park adjacent to Tower Terrace Road, and the connection to the Center Point Road Trail and crossing of the Cedar Valley Nature Trail, with a parallel high-voltage transmission line. The Tower Terrace Mobile Home Park proximity may require relocations, affecting an environmental justice population. There is a potential historic structure approximately 400 feet north of the current alignment of Tower Terrace Road, and the mobile home park appears to have been established more than 50 years ago, and should be reviewed for potential historic significance.

Robins Road to Council Street NE

The Robins Road to Council Street NE segment presents the greatest environmental challenge, involving crossing Dry Creek (and its floodway, floodplain, and associated wetlands), the Canadian National Railway track (also used by Chicago, Central & Pacific Railroad), and a high-voltage transmission line from the nearby substation parallels Dry Creek on its east bank. High-voltage transmission lines are also present in east-west alignment in the northern portion of the corridor. The Corridor Management Plan identified a potential wetland mitigation site in an area south of the proposed Tower Terrace Road, between the creek and railroad. The wooded area is along a riparian environment, and is likely suitable habitat for northern long-eared bats. There is also a potential historic structure west of Council Street, near the center of the corridor. The need for residential relocations are possible in this segment.

Council Street NE to C Avenue NE

This segment includes a pond with likely wetlands near the center of the corridor and some groundwater wells. High-voltage transmission lines are along the east side of Council Street. There would be a crossing of a Dry Creek tributary, with some wooded area being possible northern long-eared bat habitat.

C Avenue NE to Alburnett Road

This segment presents geometric challenges for a crossing of C Avenue and Robins Road with an adjacent house of worship and nearby potential historic site. There is also a potential historic site near Alburnett Road. It is possible that there would be relocations required for single-family residential homes. There is a potential farmed wetland area associated with a tributary of Dry Creek. One of the crossings of a Dry Creek tributary includes a designated 100-year floodplain west of Alburnett Road.

Alburnett Road to 10th Street

This segment has been constructed, so a description of environmental constraints within the corridor has not been compiled.

10th Street to Indian Creek Road

The crossing of Indian Creek in this segment includes a designated floodway and 100-year floodplain, located near two potential historic structures. Extension of Tower Terrace Road east of Winslow Road would likely involve connection to the existing trail system on either side of Tower Terrace Road. It is possible that there would be relocations required for single-family residential homes. The wooded area along the riparian corridor is possible northern long-eared bat habitat.

hdrinc.com 5815 Council Street NE, Suite B, Cedar Rapids, IA 52402-5893
(319) 373-2536

Indian Creek Road to Iowa Highway 13

Much of the potential alignment of Tower Terrace Road would traverse agricultural lands in this segment. The connection west to Indian Creek Road would intersect and Indian Creek tributary. The alignment would intersect a transmission line and a narrow riparian area, which is potential bat habitat, near Iowa Highway 13.

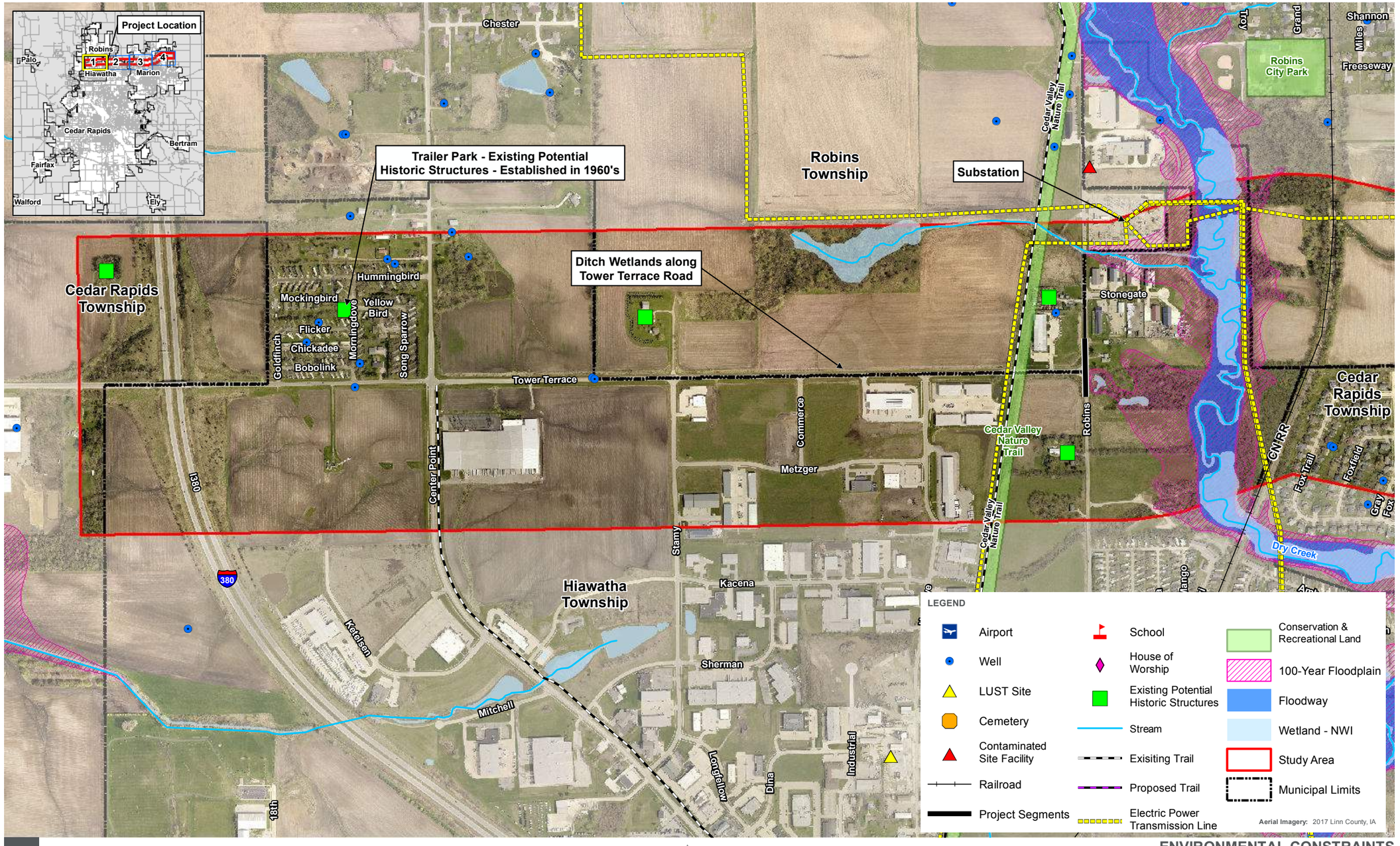
PERMITS AND APPROVAL SUMMARY

A variety of permits and approvals would likely be needed before construction of the remaining unconstructed segments and subsegments of Tower Terrace Road corridor.

- National Pollutant Discharge Elimination System permits for grading disturbance of an acre or more of ground, with Stormwater Pollution Prevention Plans [all unconstructed segments and subsegments]
- Section 404 of the Clean Water Act permits for impacts to wetlands and other waters of the U.S. (such as Dry Creek and Indian Creek and their tributaries) with Section 401 Water Quality Certification [all unconstructed segments and subsegments]. Section 404 permitting requires compliance with requirements of Section 106 of the National Historic Preservation Act and Section 7 of the Endangered Species Act.
- Iowa DNR and local Floodplain Permits [Robins Road to Council Street, C Avenue to Alburnett Road, and 10th Street to Indian Creek Road]
- Railroad crossing approval [Robins Road to Council Street]
- Linn County ROW permit [all unconstructed segments and subsegments]
- City of Cedar Rapids rezoning application, major erosion permit, preliminary site development plan and administrative site development plan, public ROW/excavation permit, driveway construction permit, and sewer permit [applicable segments and subsegments]
- City of Robins building permit, erosion control permit, ROW permit, and permits as needed for fence, maintenance, building demolition, and sign construction [applicable segments and subsegments]
- City of Hiawatha building permit, ROW permit, filling/grading/erosion control permit, and demolition permit [applicable segments and subsegments]
- City of Marion excavation/erosion control permit [applicable segments and subsegments]

If Federal funds are used, NEPA requirements would apply, and it is possible that use of SWAP funding might also involve NEPA compliance based on the use of Federal funds for design and proposed construction of the I-380 Tower Terrace Road interchange. The segments with potential to cause relocations, destruction of potential bat habitat, effects on historic sites, and other environmental impacts are more likely to need to be addressed via an Environmental Assessment (such as the Robins Road to Council Street segment), whereas those segments with few environmental impacts (such as the Indian Creek Road to Iowa Highway 13 segment) could potentially meet NEPA requirements via a Categorical Exclusion. Coordination with Iowa DOT and FHWA will be needed to determine if SWAP funding will require NEPA compliance or more limited environmental and cultural reviews.

hdrinc.com 5815 Council Street NE, Suite B, Cedar Rapids, IA 52402-5893
(319) 373-2536



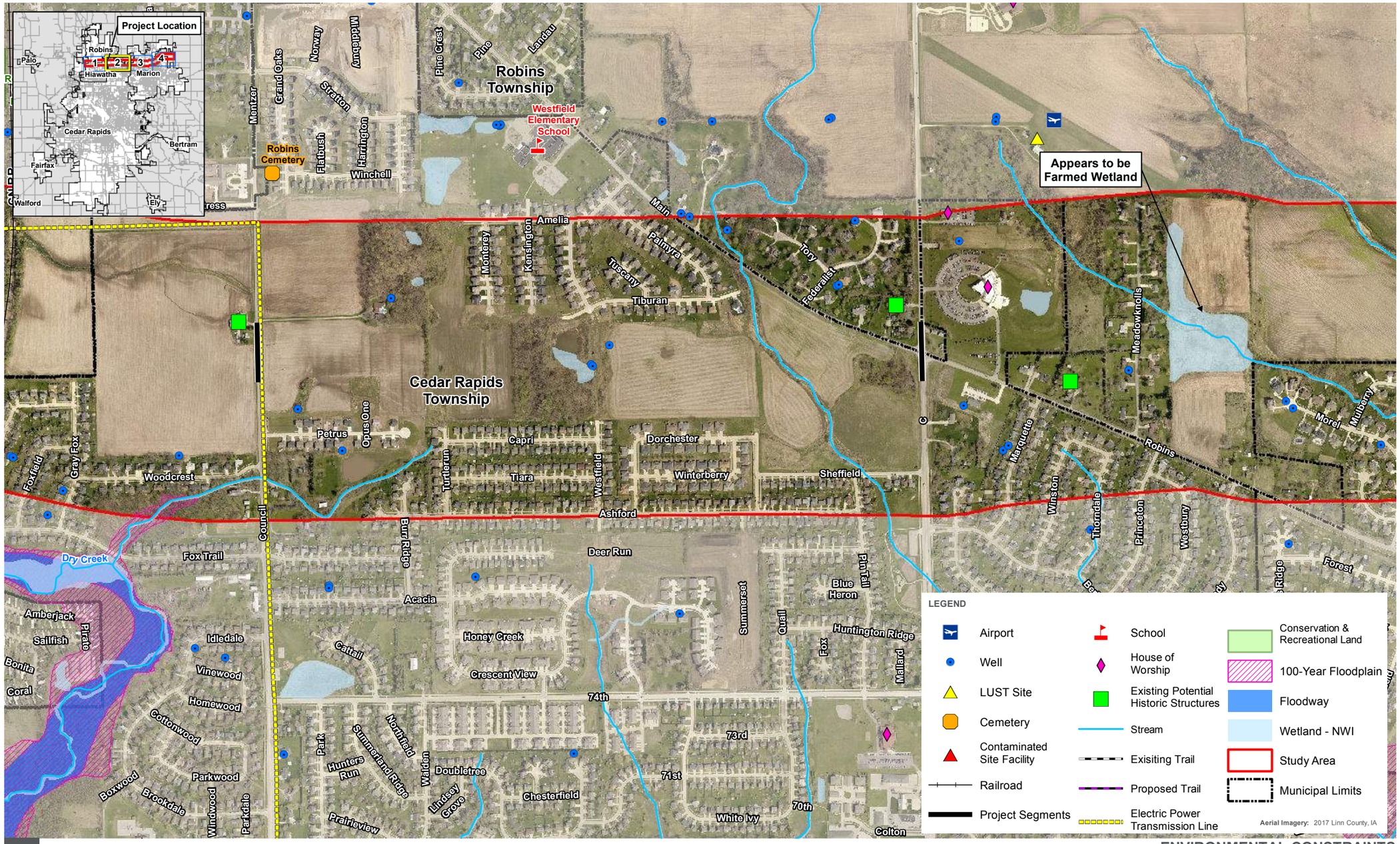
ENVIRONMENTAL CONSTRAINTS

TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN UPDATE

FIGURE 1 SHEET 1 OF 4

PATH: Z:\PROJECTS\ANDERSON_BOGERT\10110644_AB_TOWERTERRACECORRMNGTPLAN\MAP_DOCS\DRAFT\MAP_11X17_FIG1_ENV_CONSTRAINTS_EXPANDED.MXD - USER: TTALBITZ - DATE: 5/30/2018

UPDATED ON: 5/30/2018



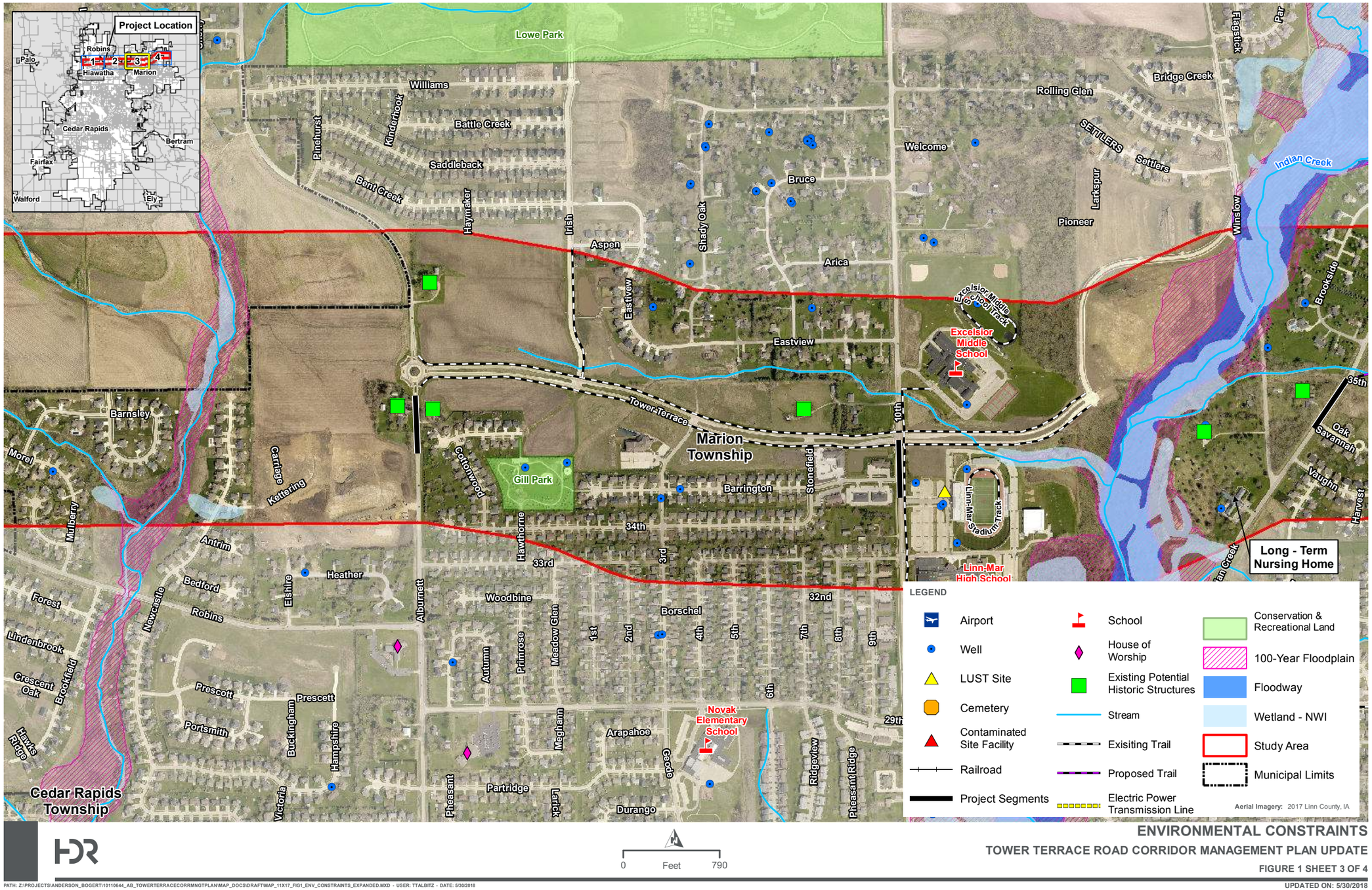
ENVIRONMENTAL CONSTRAINTS

TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN UPDATE

FIGURE 1 SHEET 2 OF 4

PATH: Z:\PROJECTS\ANDERSON_BOGERT\10110644_AB_TOWERTERRACECORRMNGTPLAN\MAP_DOCS\DRAFTMAP_11X17_FIG1_ENV_CONSTRAINTS_EXPANDED.MXD - USER: TTALBITZ - DATE: 5/30/2018

UPDATED ON: 5/30/2018



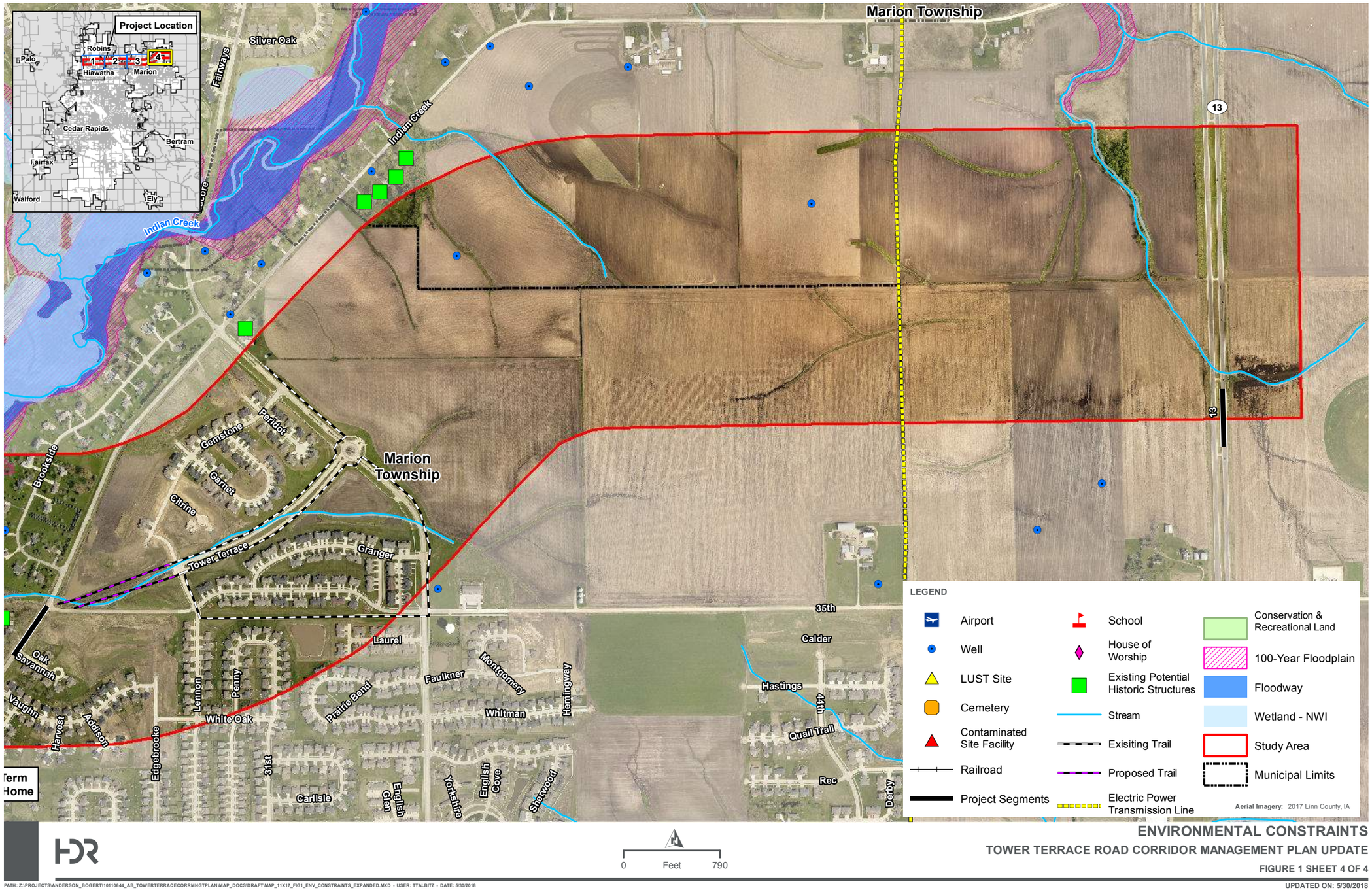
ENVIRONMENTAL CONSTRAINTS

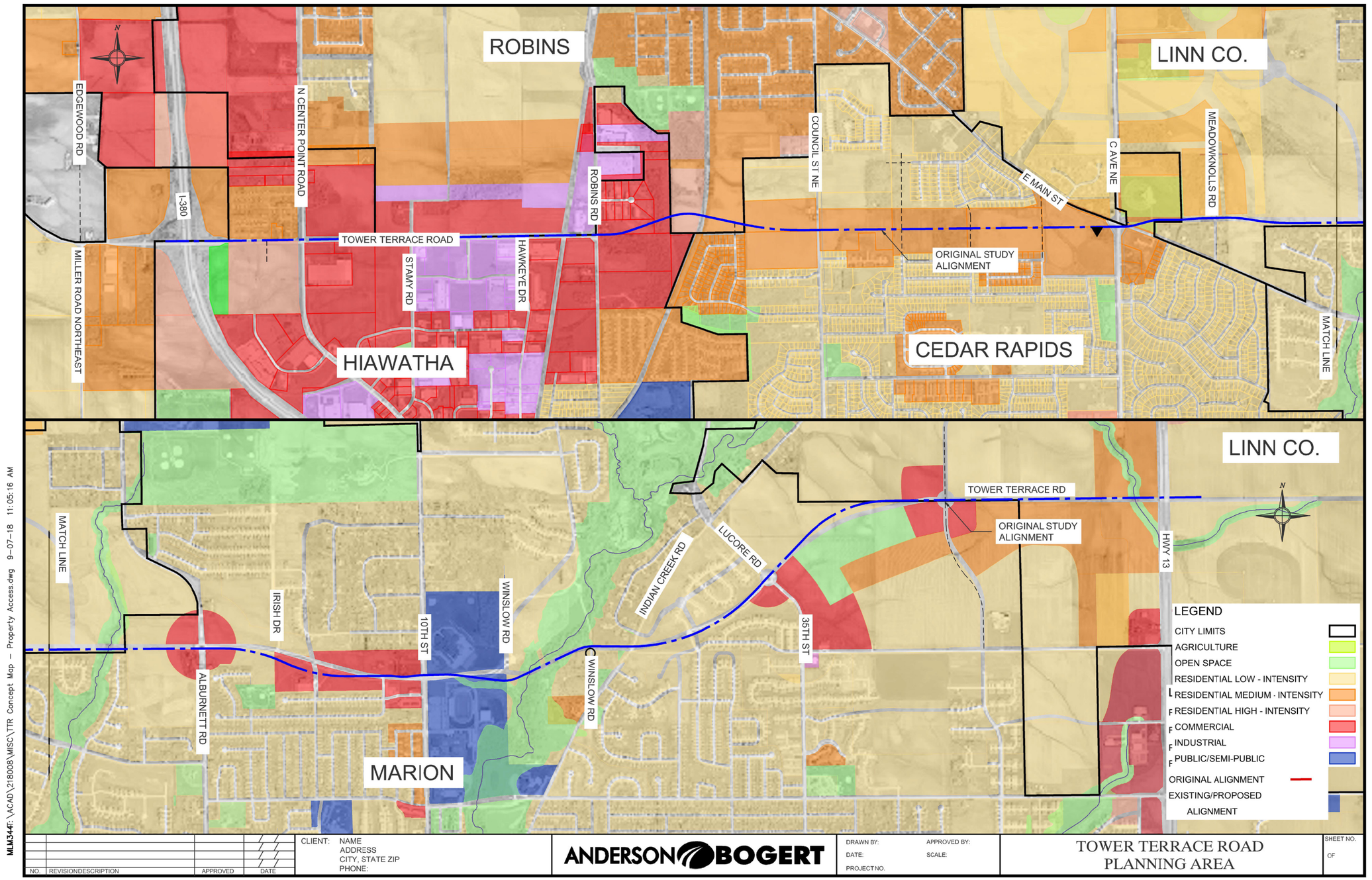
TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN UPDATE

FIGURE 1 SHEET 3 OF 4

PATH: Z:\PROJECTS\ANDERSON_BOGERT\10110644_AB_TOWERTERRACECORRMNGTPLAN\MAP_DOCS\DRAFT\MAP_11X17_FIG1_ENV_CONSTRAINTS_EXPANDED.MXD - USER: TTALBITZ - DATE: 5/30/2018

UPDATED ON: 5/30/2018


Project Location
Robins
Palo
Hiawatha
Marion
Cedar Rapids
Bertram
Fairfax
Walford
Ely
1
2
3
4
Marion Township
Silver Oak
Fairways
Indian Creek
Indian Creek
Marion Township
Brookside
Gemstone
Peridot
Garnet
Citrine
Tower Terrace
Granger
Oak Savannah
Laurel
Faulkner
Montgomery
Hemingway
Prairie Bend
Whitman
White Oak
Vaughn
Harvest
Addison
Lennon
Perry
Edgebrooke
31st
Carlisle
English Glen
Yorkshire
English Cove
Sherwood
35th
Calder
Hastings
44th
Quail Trail
Rec
Derby
13
LEGEND
Airport
Well
LUST Site
Cemetery
Contaminated Site Facility
Railroad
Project Segments
School
House of Worship
Existing Potential Historic Structures
Stream
Exisiting Trail
Proposed Trail
Electric Power Transmission Line
Conservation & Recreational Land
100-Year Floodplain
Floodway
Wetland - NWI
Study Area
Municipal Limits
Aerial Imagery: 2017 Linn County, IA
0
Feet
790
ENVIRONMENTAL CONSTRAINTS
TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN UPDATE
FIGURE 1 SHEET 4 OF 4
PATH: Z:\PROJECTS\ANDERSON_BOGERT\10110644_AB_TOWERTERRACECORRMNGTPLAN\MAP_DOCS\DRAFT\MAP_11X17_FIG1_ENV_CONSTRAINTS_EXPANDED.MXD - USER: TTALBITZ - DATE: 5/30/2018
UPDATED ON: 5/30/2018


ROBINS
LINN CO.
EDGEWOOD RD
N CENTER POINT ROAD
I-380
ROBINS RD
COUNCIL ST NE
E MAIN ST
C AVE NE
MEADOWKNOLLS RD
TOWER TERRACE ROAD
STAMY RD
HAWKEYE DR
ORIGINAL STUDY ALIGNMENT
MILLER ROAD NORTHEAST
HIAWATHA
CEDAR RAPIDS
MATCH LINE
LINN CO.
TOWER TERRACE RD
ORIGINAL STUDY ALIGNMENT
HWY 13
MATCH LINE
IRISH DR
10TH ST
WINSLOW RD
INDIAN CREEK RD
LUCORE RD
35TH ST
C WINSLOW RD
ALBURNETT RD
MARION
LEGEND
CITY LIMITS
AGRICULTURE
OPEN SPACE
RESIDENTIAL LOW - INTENSITY
RESIDENTIAL MEDIUM - INTENSITY
RESIDENTIAL HIGH - INTENSITY
COMMERCIAL
INDUSTRIAL
PUBLIC/SEMI-PUBLIC
ORIGINAL ALIGNMENT
EXISTING/PROPOSED ALIGNMENT
MLM344: \ACAD\218008\MISC\TTR Concept Map – Property Access.dwg 9-07-18 11:05:16 AM
NO. REVISIONDESCRIPTION APPROVED DATE
CLIENT: NAME ADDRESS CITY, STATE ZIP PHONE:
ANDERSON BOGERT
DRAWN BY: APPROVED BY:
DATE: SCALE:
PROJECT NO.
TOWER TERRACE ROAD PLANNING AREA
SHEET NO. OF

PLAN AND PROFILE SHEETS OVERVIEW PAGE

PLAN AND PROFILE SHEETS EAST EDGE OF I-380 INTERCHANGE TO CENTER POINT ROAD

PLAN AND PROFILE SHEETS CENTER POINT ROAD TO STAMY ROAD

PLAN AND PROFILE SHEETS ROBINS ROAD TO COUNCIL STREET (BRIDGES OF DRY CREEK AND CANANDIAN NATIONAL RAILWAY)

PLAN AND PROFILE SHEETS COUNCIL STREET TO TURTLE RUN EXTENDED

PLAN AND PROFILE SHEETS TURTLE RUN EXTENDED TO SUMMERSET EXTENDED

PLAN AND PROFILE SHEETS SUMMERSET EXTENDED TO C AVENUE

PLAN AND PROFILE SHEETS C AVENUE TO EAST EDGE OF AREA C

PLAN AND PROFILE SHEETS EAST EDGE OF AREA C TO EAST EDGE OF KLOUBEC PROPERTY

PLAN AND PROFILE SHEETS EAST EDGE OF KLOUBEC PROPERTY TO ALBURNETT ROAD

PLAN AND PROFILE SHEETS RELOCATED WINSLOW TO EXISTING WINSLOW

PLAN AND PROFILE SHEETS THE RIDGE AT INDIAN CREEK TO BECKNER-ROBINSON-VAUGHN FARMS

PLAN AND PROFILE SHEETS BECKNER-ROBINSON-VAUGHN FARMS TO IA HIGHWAY 13

PLAN AND PROFILE SHEETS I-380 PEDESTRIAN UNDERPASS

Memorandum

Date: Friday, June 01, 2018

Project: Tower Terrace Road Corridor Management Plan Update

To: Corridor MPO

From: Aleksander T. Nelson

Subject: Structural Review

SELECTION OF BRIDGE TYPE

A continuous concrete slab bridge was selected as the bridge type to cross over Dry Creek due to cost being the primary constraint. According to the Iowa Department of Transportation preliminary costing guide, a continuous concrete slab bridge is the least expensive bridge type among all other bridge types. From the Iowa Department of Transportation preliminary costing guide, It was determined that a base price of $90 per square foot plus contingency and mobilization for a total cost of $117 per square foot would provide a reliable preliminary estimate for the continuous concrete slab bridge over Dry Creek. Open rails were also selected assuming drainage into the creek is acceptable.

AESTHETICS

Aesthetic treatments including the use of surface textures and ornamentation with decorative stamped or colored concrete, decorative railings, lighting, or other miscellaneous details would add 10% or 12 $/SF to the overall cost of the bridge.

GEOMETRICS

A three span bridge with a slab thickness of 1’-8” was selected for the crossing over Dry Creek. A desktop review of the proposed crossing measured to about 120 feet in length and therefore a continuous concrete slab bridges with a standard length of 120 feet was selected. The width of the bridge includes four 12 foot driving lanes, two 10 foot shoulders which can accommodate a protected walkway/bike path, and two 1.58 feet parapets for a total deck width of about 71 feet. These geometrics follow the Iowa Department of Transportation Standard Plans for Continuous Concrete Slab Bridges.

OPTION #1 - AT-GRADE CROSSING

Option #1 is the least expensive option and includes a continuous concrete slab bridge crossing Dry Creek and an at-grade crossing at the railroad. Based on typical costs for a signalized railroad crossing, an at-grade crossing would add approximately $250,000 to the project.

The total cost for the continuous concrete slab bridge plus the at-grade crossing is $1,274,000. Aesthetics for the continuous concrete slab bridge would add an additional $102,000 to the total cost, for a total cost of $1,376,000.

OPTION #2 - GRADE SEPERATED CROSSING

Option #2 include a continuous concrete slab bridge crossing Dry Creek and a prestressed beam bridge over the railroad to create a grade separated crossing. The prestressed beam bridge over the railroad has a base cost of 100 $/SF plus an allowance for work over the railroad, contingency and mobilization for a total cost of 162.5 $/SF. The prestressed beam bridge would have a total length of 202 feet and a width the same as the concrete slab bridge. This bridge would be a three span bridge with span lengths of 61’-77’-61’.

The total cost for the continuous concrete slab bridge plus the prestressed beam bridge over the railroad is $3,360,000. Aesthetic treatments for both bridges would add an additional $336,000 to the total cost, for a total cost of $3,696,000.

hdrinc.com 5815 Council Street NE, Suite B, Cedar Rapids, IA 52402-5893
(319) 373-2536

Tower Terrace Road Cost Options for Structures

ATN - 5-23-2018

Option 1 - Slab Bridge over creek - at grade rail crossing

Slab Bridge - 120' Iowa DOT standard

Length =	123.00	ft
Width =	71.16	ft
Area =	8753	ft^2

Cost

Base =	90	$/sqft
Mobilization =	10%	
Contingency =	20%	
Aesthetics =	10%	
Total (without Aesthetics) =	117.0	$/sqft
Aesthetics =	11.7	$/sqft

Railroad Crossing

At grade switches = $250,000

Option 1 - Slab Bridge over creek - at grade rail crossing

Costs =	**$1,274,064**
Aesthetics =	**$102,406**
Total Costs =	**$1,376,470**

Option 2 - Slab Bridge over creek - Prestressed beam bridge over railroad

Slab Bridge - 120' Iowa DOT standard

Length =	123.00	ft
Width =	71.16	ft
Area =	8753	ft^2

Cost

Base =	90	$/sqft
Mobilization =	10%	
Contingency =	20%	
Aesthetics =	10%	
Total (without Aesthetics) =	117.0	$/sqft
Aesthetics =	11.7	$/sqft

Railroad Crossing - 61'-77'-61' spans

Length =	202.00	ft
Width =	71.16	ft
Area =	14374	ft^2

Cost

Base =	100	$/sqft
Railroad =	25	$/sqft
Mobilization =	10%	
Contingency =	20%	
Aesthetics =	10%	
Total (without Aesthetics) =	162.5	$/sqft
Aesthetics =	16.3	$/sqft

Option 2 - Slab Bridge over creek - Prestressed beam bridge over railroad

Costs =	**$3,359,891**
Aesthetics =	**$335,989**
Total Costs =	**$3,695,880**

Drilled shafts socketed into rock may be an option on some sites [BDM 6.3.1.1].

- **Aesthetics:** If aesthetics is a consideration, the designer will need to follow the pier type and style established for the bridge.

3.7.5 Wing walls

The preliminary designer shall verify that abutment wing walls provide an acceptable slope from the end wing to the berm. For typical PPCB or CWPG bridges, there should be no need to change standard wing wall lengths. However, if any of the following conditions apply, the designer shall check the need to increase wing wall lengths per criteria defined by BDM 6.5.4.3.1:

- Skew greater than 30 degrees
- Superelevation
- Beam depth greater than 63 inches, the BTE beam depth.

Refer to the commentary for details on the wing length check and design methods. Note that a 2.5:1 slope extended from the top of berm should be used for designing wings, even for situations with flatter berm slopes.

Any wing walls requiring more than 5 feet beyond the standard wing extension length may be steepened to a 2:1 slope pending approval by the section leader. Non-standard wing lengths should be noted as such on the TSL. Final design will determine how the additional wing length will be addressed.

3.8 Cost estimates

For preliminary cost estimating, the designer should use the costs in Table 3.8, recognizing that the estimates will be reasonably valid for comparing bridge options but not accurate for current construction costs. For a typical new bridge cost estimate, multiply the unit cost in the table by the bridge deck area, measured from outside edge to outside edge of deck and from face to face of paving notch. Adjust the cost upward for complexity, staging, and other applicable costs using the amounts listed in the table. If the construction situation is highly unusual, consult the supervising Section Leader.

Table 3.8. Preliminary costs for typical Iowa bridges

Cost Item	Unit Cost (1), (2)
New continuous concrete slab (CCS) bridge	$ 90/ft^2
New pretensioned prestressed concrete beam (PPCB) bridge	$ 100/ft^2
New bulb tee (BT) bridge	$ 105/ft^2
New rolled steel beam three-span standard bridge	$ 105/ft^2
New continuous welded plate girder (CWPG) bridge	$ 130/ft^2
Complex bridges: variable width, urban area such as Des Moines, construction over traffic	Add for each item $5.00/ft^2
Staged bridges	Add 10%
Cofferdam for pier construction	$25,000 per pier
Detour Bridge 40-foot span, 3 panel 32-foot width	$40,000 per span
Bridge removal	$7.00/ft^2
Bridge widening, including removal and staging	$ 200/ft^2
Bridge aesthetics	Add 3% (5)
RCB Culvert (CIP), in close proximity or corridor projects	$ 600 /yd^3 (4)
RCB Culvert (CIP), individual projects or extensions	$ 650 /yd^3 (4)
Mobilization	10%
Contingency	B0 =20% (3) D0, B1, D2 = 15% B2= 5%

IOWA DOT
Highway Division

J40–06 CONTINUOUS CONCRETE SLAB BRIDGE STANDARDS

8/23/2016 2:21:13 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-00-06 11x17_pdf.pltcfg

INDEX FOR J40-06 STANDARDS:

REVISED 06-13 - REVISION FOR LRFD PILE DESIGN.

GENERAL NOTES:

THE J40-06 BRIDGE STANDARDS, IF PROPERLY USED, PROVIDE THE STRUCTURAL PLANS NECESSARY TO CONSTRUCT THREE SPAN 40' ROADWAY CONTINUOUS CONCRETE SLAB BRIDGES WITH LENGTHS OF 70'-0, 80'-0, 90'-0, 100'-0, 110'-0, 120'-0, 130'-0, 140'-0 AND 150'-0.

THESE BRIDGES MAY BE BUILT ON A 0°, 15°, 30° OR 45° SKEW. THESE PLANS SHOW THE BRIDGES SKEWED IN ONE DIRECTION, BUT ALL DIMENSIONS AND DETAILS WOULD BE THE SAME FOR THE OPPOSITE SKEW.

THESE STANDARDS GIVE MOST OF THE INFORMATION NECESSARY TO BUILD THESE BRIDGES. HOWEVER, THE FOLLOWING ADDITIONAL INFORMATION IS REQUIRED FOR USE ON PRIMARY ROUTES. FOR SECONDARY ROUTES THE ENGINEER MAY NOT REQUIRE ALL SHEETS TO BE PROVIDED:

1. TITLE SHEET WITH ENGINEERS SEAL
2. ESTIMATED QUANTITIES TOTALS INCLUDING CLASS 20 EXCAVATION FOR BRIDGE
3. SITUATION PLAN LAYOUT OF BRIDGE
4. TOP OF SLAB ELEVATIONS LAYOUT
5. BOTTOM OF ABUTMENT FOOTING ELEVATIONS
6. BOTTOM OF PIER CAP ELEVATIONS
7. PILING DESIGN INFORMATION
8. SLOPE PROTECTION LAYOUT IF NEEDED
9. CONDUIT LAYOUT
10. LIGHTING LAYOUT IF NEEDED

FOR CLARITY, MOST SECTIONS SHOWN ON THE FOLLOWING SHEETS ARE DRAWN WITH BARRIER RAIL ONLY. THESE SECTIONS WILL BE IDENTICAL FOR OPEN RAIL DESIGN WITH ANY MODIFICATIONS SHOWN ON SHEET J40-48-06 AND J40-49-06.

THESE BRIDGES ARE DESIGNED FOR HL93 LOADING PLUS 20 LBS. PER SQ. FT. OF ROADWAY FOR FUTURE WEARING SURFACE. CONTROL OF CRACKING BY DISTRIBUTION OF REINFORCEMENT FOR SLAB DESIGN BASED ON PRE LRFD 2005 INTERIMS.

NOTE THAT WHEN APPROACH PAVEMENT IS TO BE PLACED, THE TEMPORARY PAVING BLOCKS SHALL BE REMOVED AND A PROPER JOINT FOR EXPANSION SHALL BE PROVIDED BETWEEN THE BRIDGE AND THE APPROACH PAVING.

THE FLOOR SLAB AS SHOWN INCLUDES $\frac{1}{2}$" INTEGRAL WEARING SURFACE.

THE ABUTMENTS FOR THESE BRIDGES ARE BUILT INTEGRAL WITH THE SUPERSTRUCTURE. THEREFORE, IT IS IMPORTANT THAT A PROPER JOINT FOR EXPANSION BE PROVIDED BETWEEN THE BRIDGE AND APPROACH PAVING, WHEN APPROACH PAVING IS NEEDED.

THE ABUTMENT DESIGN UTILIZED ON THESE BRIDGES RESTRICTS THEIR USE IN THE FOLLOWING MANNER:

(1) THESE BRIDGES ARE NOT TO BE USED WHEN POINT BEARING FOR THE ABUTMENT STEEL PILING WOULD BE OBTAINED ON ROCK AT A DISTANCE LESS THAN 15 FEET FROM THE BOTTOM OF FOOTING.

(2) FOR THE 140 FOOT AND 150 FOOT LONG BRIDGES THE ABUTMENT PILING ARE TO BE DRIVEN THROUGH OVERSIZED HOLES PREBORED TO A MINIMUM OF 10 FEET BELOW THE BELOW THE BOTTOM OF FOOTING. THE PREBORED HOLES SHALL BE IN ACCORDANCE WITH SECTION 2501.03, Q OF THE STANDARD SPECIFICATIONS. THE ELEVATION OF THE BOTTOM OF THE PREBORED HOLE SHALL BE SHOWN ON THE PLANS.

(3) IF ROCK IS ENCOUNTERED LESS THAN 5 FOOT BELOW THE PREBORED HOLES, A SPECIAL ANALYSIS WILL BE REQUIRED. WHEN PREBORING IS NOT REQUIRED FOR THE ABUTMENT FOOTING AND ROCK IS ENCOUNTERED LESS THAN 10 FOOT BELOW THE BOTTOM OF ABUTMENT FOOTING, A SPECIAL ANALYSIS WILL BE REQUIRED.

THE PIERS AND ABUTMENTS FOR THESE STANDARDS HAVE BEEN DESIGNED FOR THE USE OF BOTH FRICTION AND POINT BEARING PILES. IT IS NECESSARY THAT THE TYPE AND LENGTH FOR BOTH THE ABUTMENT AND PIER PILES BE DESIGNATED ON THE FRONT SHEET OF THE PLANS.

THE INTEGRAL ABUTMENTS AND PILE BENTS FOR THESE J40 STANDARDS HAVE BEEN DESIGNED FOR THE USE OF VARIOUS TYPES OF PILE FOOTINGS AS FOLLOWS.

- INTEGRAL ABUTMENTS: TIMBER PILES OR HP10x42 PILES AT BRIDGE DESIGN MANUAL(BDM) ARTICLE 6.2.6.1 STRUCTURAL RESISTANCE LEVEL-1 (SRL-1)
- PILE BENTS: STANDARD CONCRETE-FILLED STEEL PIPE PILES (PIOL), STANDARD PRESTRESSED CONCRETE PILES (PIOL), OR STANDARD H-PILES (PIOL AND SRL-1)

BECAUSE THESE BRIDGE STANDARDS HAVE BEEN REVISED FOR LRFD BASED ON 2012-COMPLETED IOWA STATE UNIVERSITY RESEARCH, FOR PILE FOUNDATIONS THE DESIGNER WILL NEED TO DETERMINE THE CONSTRUCTION CONTROL METHOD, CONTRACT LENGTH, AND DRIVING TARGET AND GIVE THAT INFORMATION ON THE FRONT SHEET OF THE PLANS. BRIDGE DESIGN MANUAL CADD NOTES E177, E718, E719, E818, AND E819 ARE APPROPRIATE FOR THAT PURPOSE. THE NOTES, AS WELL AS THE BRIDGE DESIGN MANUAL AND DESIGN EXAMPLES, ARE AVAILABLE ON THE OFFICE OF BRIDGES AND STRUCTURES WEB SITE: HTTP://WWW.IOWADOT.GOV/BRIDGE/INDEX.HTM.

STRUCTURAL RESISTANCE LEVEL-1 (SRL-1) REPLACES THE 50 TON STEEL PILE DESIGNATION.

FOR MORE INFORMATION ON SRL-1, SEE THE BRIDGE DESIGN MANUAL, LOCATED ON THE IOWA DEPARTMENT OF TRANSPORTATION, OFFICE OF BRIDGES AND STRUCTURES WEB SITE.

FOR PIERS SUBJECT TO SCOUR THE DESIGN BEARING SHALL BE OBTAINED BELOW SCOUR ELEVATION. SCOUR ELEVATION SHALL BE SHOWN ON THE FRONT SHEET.

KEYWAY DIMENSIONS SHOWN ON THE PLANS ARE BASED ON NOMINAL DIMENSIONS UNLESS STATED OTHERWISE. IN ADDITION, THE BEVEL USED ON THE KEYWAY SHALL BE LIMITED TO A MAXIMUM OF 10 DEGREES FROM VERTICAL.

THESE BRIDGE PLANS LABEL ALL REINFORCING STEEL WITH ENGLISH NOTATION (5a1 IS $\frac{5}{8}$ INCH DIAMETER BAR). ENGLISH REINFORCING STEEL RECEIVED IN THE FIELD MAY DISPLAY THE FOLLOWING "BAR DESIGNATION". THE "BAR DESIGNATION" IS THE STAMPED IMPRESSION ON THE REINFORCING BARS, AND IS EQUIVALENT TO THE BAR DIAMETER IN MILLIMETERS.

ENGLISH SIZE	3	4	5	6	7	8	9	10	11
BAR DESIGNATION	10	13	16	19	22	25	29	32	36

SPECIFICATIONS:

DESIGN: AASHTO LRFD, SERIES OF 2004 WITH INTERIM 2005.

CONSTRUCTION: IOWA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, SERIES 2012, PLUS APPLICABLE GENERAL SUPPLEMENTAL SPECIFICATIONS, DEVELOPMENTAL SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS SHALL APPLY TO CONSTRUCTION WORK ON THIS PROJECT.

DESIGN STRESSES:

DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE IN ACCORDANCE WITH THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 3rd Ed, SERIES OF 2004.
REINFORCING STEEL IN ACCORDANCE WITH LRFD AASHTO SECTION 5, GRADE 60.
CONCRETE IN ACCORDANCE WITH LRFD AASHTO SECTION 5, f'c = 3,500 PSI,
STRUCTURAL STEEL IN ACCORDANCE WITH LRFD AASHTO SECTION 6. ASTM A709 GRADE 36 OR GRADE 50 (AASHTO M270 GRADE 36 OR GRADE 50).
n = 9 FOR TENSION STEEL
2n = 18 FOR COMPRESSION STEEL
HL-93 LIVE LOAD PLUS 20 LBS. PER SQ. FT. FOR FUTURE WEARING SURFACE.
END SPAN LENGTH IS USED TO CALCULATE EQUIVALENT WIDTH IN LIVE LOAD DISTRIBUTION.
SIX FOOT OF APPROACH SLAB DEAD & LIVE LOAD INCLUDED IN ABUTMENT LOADS.
CONTROL OF CRACKING BY DISTRIBUTION OF REINFORCEMENT FOR SLAB DESIGN BASED ON PRE 2005 LRFD INTERMS.

06-13
LATEST REVISION DATE

Marcus K. McCandless
APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

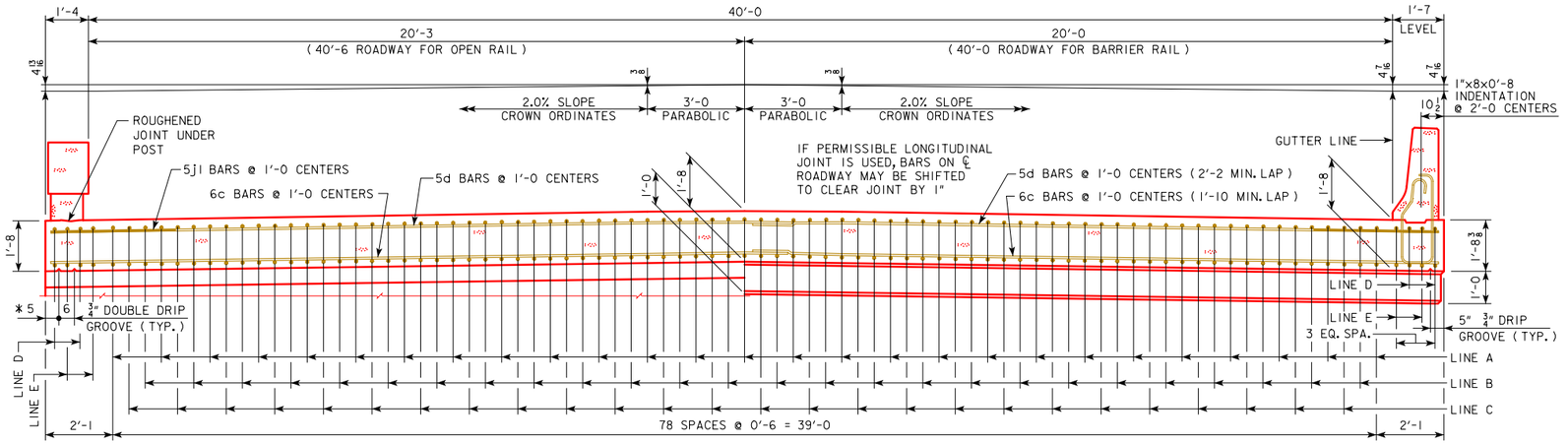
STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

CONTINUOUS CONCRETE SLAB BRIDGES

NOVEMBER, 2006

INDEX AND GENERAL NOTES | J40-01-06

8/23/2016 2:21:14 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-01-06 11x17_pdf.pltcfg



* NOTE: DOUBLE DRIP GROOVES FOR OPEN RAIL OPTION ONLY.

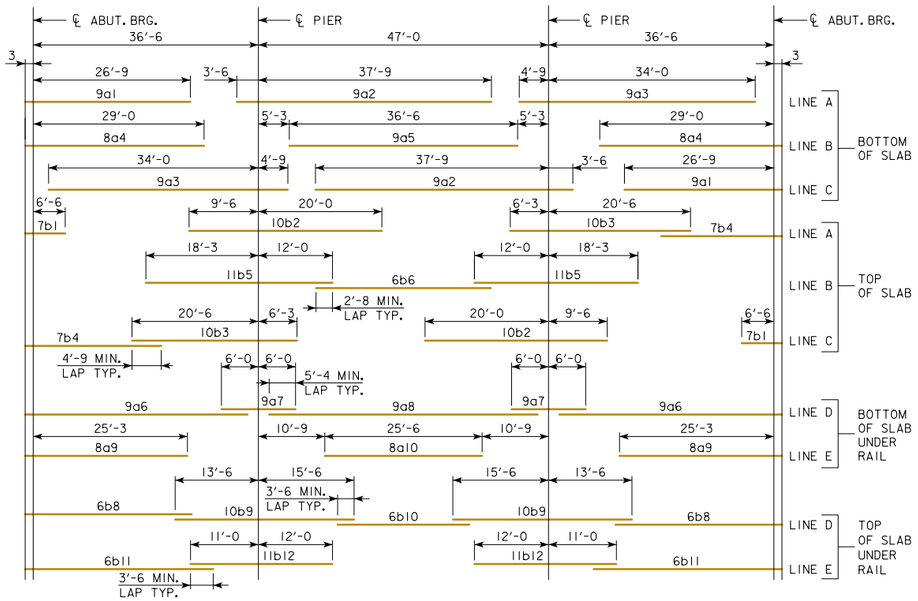
HALF SECTION NEAR ABUTMENT

SLAB CROSS-SECTIONAL AREA FOR OPEN RAIL = 71.94 SQ.FT.

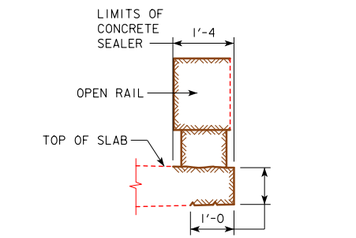
HALF SECTION NEAR PIER

SLAB CROSS-SECTIONAL AREA FOR BARRIER RAIL = 71.99 SQ.FT.

NOTE: TOP LONGITUDINAL REINFORCING STEEL IS TO BE PARALLEL TO AND 2 1/2" CLEAR BELOW TOP OF SLAB. BOTTOM LONGITUDINAL REINFORCING STEEL IS TO BE PARALLEL TO AND 1 1/2" CLEAR ABOVE BOTTOM OF SLAB. REINFORCING STEEL IS TO BE SECURELY WIRED IN PLACE AND ADEQUATELY SUPPORTED ON BAR CHAIRS BEFORE CONCRETE IS POURED. I.M. 451.01 REQUIREMENTS SHALL APPLY FOR BAR CHAIRS.



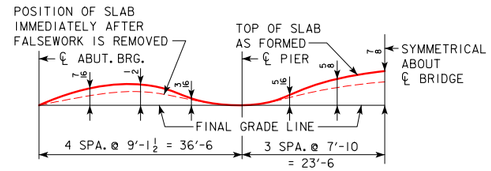
PLACEMENT FOR LONGITUDINAL REINFORCEMENT



CONCRETE SEALER LIMITS FOR OPEN RAILS

CONCRETE SEALER SHALL BE APPLIED TO BOTH SIDES OF BRIDGE SLAB ON THE TOP, EDGE OF SLAB AND UNDER THE SLAB. THE CONCRETE SEALER SHALL ALSO BE APPLIED TO THE OPEN RAIL ON THE TOP, TRAFFIC FACE SIDE, BOTTOM OF RAIL, AND ON ALL SIDES OF THE OPEN RAIL POSTS.

THE CONCRETE SEALER LIMITS ARE SHOWN IN THE DETAIL AND SHALL APPLY TO THE FULL LENGTH OF BRIDGE. CONCRETE SEALER SHALL BE APPLIED IN ACCORDANCE WITH ARTICLE 2403.03, P, 3 OF THE STANDARD SPECIFICATIONS.



FORM CAMBER DIAGRAM

THIS DIAGRAM SHOWS THE FORM CAMBER REQUIRED TO COMPENSATE FOR THE ANTICIPATED ULTIMATE DEAD LOAD DEFLECTION. THE ABOVE DIMENSIONS DO NOT INCLUDE ANY ALLOWANCE FOR FORM DEFLECTION OR FALSEWORK SETTLEMENT.

REVISED 07-16 DATE ON SHEET CHANGED TO CORRECT CLERICAL ERROR.

07-2016
LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

CONTINUOUS CONCRETE SLAB BRIDGES

NOVEMBER, 2006

SUPERSTRUCTURE DETAILS 120'-0 BRIDGE

J40-12-06

8/23/2016 2:21:47 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-12-06 11x17_pdf.pltcfg

BILL OF REINFORCING STEEL FOR SUPERSTRUCTURE - 120' BRIDGE

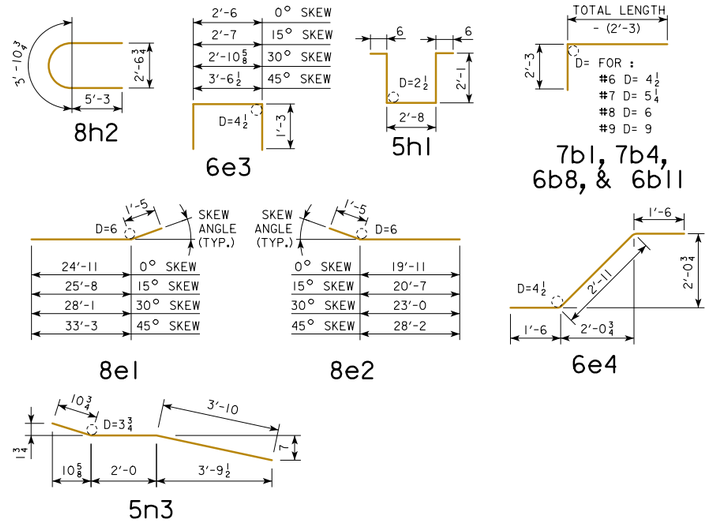
LOCATION \ SKEW	SHAPE	BAR	0° NO.	0° LENGTH	0° WEIGHT	15° NO.	15° LENGTH	15° WEIGHT	30° NO.	30° LENGTH	30° WEIGHT	45° NO.	45° LENGTH	45° WEIGHT
SLAB LONGITUDINAL BOTTOM		9a1	53	27'-0	4866	53	27'-0	4866	53	27'-0	4866	53	27'-0	4866
SLAB LONGITUDINAL BOTTOM		9a2	53	41'-3	7434	53	41'-3	7434	53	41'-3	7434	53	41'-3	7434
SLAB LONGITUDINAL BOTTOM		9a3	53	38'-9	6983	53	38'-9	6983	53	38'-9	6983	53	38'-9	6983
SLAB LONGITUDINAL BOTTOM		8a4	52	29'-3	4062	52	29'-3	4062	52	29'-3	4062	52	29'-3	4062
SLAB LONGITUDINAL BOTTOM		9a5	26	36'-6	3227	26	36'-6	3227	26	36'-6	3227	26	36'-6	3227
SLAB LONGITUDINAL BOTTOM, AT RAIL		9a6	8	36'-1	982	8	36'-1	982	8	36'-1	982	8	36'-1	982
SLAB LONGITUDINAL BOTTOM, AT RAIL		9a7	8	12'-0	327	8	12'-0	327	8	12'-0	327	8	12'-0	327
SLAB LONGITUDINAL BOTTOM, AT RAIL		9a8	4	45'-8	622	4	45'-8	622	4	45'-8	622	4	45'-8	622
SLAB LONGITUDINAL BOTTOM, AT RAIL		8a9	8	25'-6	545	8	25'-6	545	8	25'-6	545	8	25'-6	545
SLAB LONGITUDINAL BOTTOM, AT RAIL		8a10	4	25'-6	273	4	25'-6	273	4	25'-6	273	4	25'-6	273
SLAB LONGITUDINAL TOP		7b1	53	9'-0	975	53	9'-0	975	53	9'-0	975	53	9'-0	975
SLAB LONGITUDINAL TOP		10b2	53	29'-6	6728	53	29'-6	6728	53	29'-6	6728	53	29'-6	6728
SLAB LONGITUDINAL TOP		10b3	53	26'-9	6101	53	26'-9	6101	53	26'-9	6101	53	26'-9	6101
SLAB LONGITUDINAL TOP		7b4	53	23'-3	2519	53	23'-3	2519	53	23'-3	2519	53	23'-3	2519
SLAB LONGITUDINAL TOP		11b5	52	30'-3	8358	52	30'-3	8358	52	30'-3	8358	52	30'-3	8358
SLAB LONGITUDINAL TOP		6b6	26	28'-4	1107	26	28'-4	1107	26	28'-4	1107	26	28'-4	1107
SLAB LONGITUDINAL TOP, AT RAIL		6b8	8	29'-0	349	8	29'-0	349	8	29'-0	349	8	29'-0	349
SLAB LONGITUDINAL TOP, AT RAIL		10b9	8	29'-0	999	8	29'-0	999	8	29'-0	999	8	29'-0	999
SLAB LONGITUDINAL TOP, AT RAIL		6b10	4	23'-0	139	4	23'-0	139	4	23'-0	139	4	23'-0	139
SLAB LONGITUDINAL TOP, AT RAIL		6b11	8	31'-6	379	8	31'-6	379	8	31'-6	379	8	31'-6	379
SLAB LONGITUDINAL TOP, AT RAIL		11b12	8	23'-0	978	8	23'-0	978	8	23'-0	978	8	23'-0	978
SLAB TRANSVERSE BOTTOM		6c1	117	23'-5	4116	117	24'-3	4262	108	23'-5	3799	98	23'-5	3447
SLAB TRANSVERSE BOTTOM		6c2	117	21'-3	3735	117	22'-0	3867	109	21'-3	3480	101	21'-3	3224
SLAB TRANSVERSE ENDS, BOTTOM		6c3	-	-	-	-	-	-	12	VARIES	223	20	VARIES	411
SLAB TRANSVERSE ENDS, BOTTOM		6c4	-	-	-	-	-	-	11	VARIES	219	20	VARIES	386
SLAB TRANSVERSE ENDS, BOTTOM		6c5	-	-	-	-	-	-	11	VARIES	176	18	VARIES	302
SLAB TRANSVERSE ENDS, BOTTOM		6c6	-	-	-	-	-	-	11	VARIES	190	17	VARIES	311
SLAB TRANSVERSE TOP		5d1	117	23'-9	2899	117	24'-7	3000	108	23'-9	2676	98	23'-9	2428
SLAB TRANSVERSE TOP		5d2	117	21'-3	2594	117	22'-0	2685	109	21'-3	2416	101	21'-3	2239
SLAB TRANSVERSE ENDS, TOP		5d3	-	-	-	-	-	-	12	VARIES	155	20	VARIES	286
SLAB TRANSVERSE ENDS, TOP		5d4	-	-	-	-	-	-	11	VARIES	152	20	VARIES	268
SLAB TRANSVERSE ENDS, TOP		5d5	-	-	-	-	-	-	11	VARIES	122	18	VARIES	210
SLAB TRANSVERSE ENDS, TOP		5d6	-	-	-	-	-	-	11	VARIES	132	17	VARIES	216
SLAB, TRANSVERSE AT ABUTMENT		8e1	18	26'-4	1266	18	27'-1	1302	18	29'-6	1418	18	34'-8	1667
SLAB, TRANSVERSE AT ABUTMENT		8e2	18	21'-4	1026	18	22'-0	1058	18	24'-5	1174	18	29'-7	1422
SLAB, HAIRPINS, AT ABUTMENT		6e3	92	5'-0	691	92	5'-1	703	92	5'-5	749	92	6'-1	841
SLAB, DIAGONALS, AT ABUTMENT		6e4	92	5'-11	818	92	5'-11	818	92	5'-11	818	92	5'-11	818
PIER CAP HOOPS		5h1	52	7'-10	425	52	7'-10	425	78	7'-10	638	104	7'-10	850
PIER CAP ENDS		8h2	4	14'-5	154	4	14'-5	154	4	14'-5	154	4	14'-5	154
PIER CAP, BOTTOM LONGITUDINAL		8h3	8	25'-5	543	8	26'-7	568	8	29'-4	627	8	35'-0	748
PIER CAP, BOTTOM LONGITUDINAL		8h4	8	19'-11	426	8	20'-3	433	8	22'-2	474	8	26'-10	574
PIER CAP, TOP LONGITUDINAL		8h5	4	26'-2	280	4	27'-5	293	4	30'-4	324	4	36'-1	386
PIER CAP, TOP LONGITUDINAL		8h6	4	21'-5	229	4	21'-10	234	4	23'-11	256	4	28'-8	307
TOP OF SLAB, TRANSVERSE, AT RAIL		5j1	232	8'-6	2057	232	8'-6	2057	222	8'-6	1969	216	8'-6	1915
WING, VERTICAL		5m1	40	4'-5	185	40	4'-5	185	40	4'-5	185	40	4'-5	185
WING, HORIZONTAL BACK FACE		5n1	24	6'-8	167	24	6'-8	167	24	6'-8	167	24	6'-8	167
WING, HORIZONTAL TRAFFIC FACE		5n3	24	6'-9	169	24	6'-9	169	24	6'-9	169	24	6'-9	169
SUB TOTAL - LBS.					79,733			80,333			80,815			81,884
BARRIER RAIL - SEE LIST ON RAIL SHEET J40-46-06					7536			7536			7536			7536
OPEN RAIL - SEE LIST ON RAIL SHEET J40-49-06					8061			8061			8061			8061
TOTAL - LBS. WITH MONOLITHIC PIER CAP		WITH BARRIER RAIL			87,269			87,869			88,357			89,420
		WITH OPEN RAIL			87,794			88,394			88,876			89,945
TOTAL - LBS. WITH NON-MONOLITHIC PIER CAP		WITH BARRIER RAIL			85,212			85,762			85,878			86,401
SAME AS ABOVE EXCEPT ALL "h" BARS DELETED		WITH OPEN RAIL			85,737			86,287			86,403			86,926

ESTIMATED QUANTITIES FOR SUPERSTRUCTURE - 120' BRIDGE

ITEM		SKEW	WITH MONOLITHIC PIER CAP 0°	15°	30°	45°	WITH NON-MONOLITHIC PIER CAP 0°	15°	30°	45°
WITH BARRIER RAIL	*STRUCTURAL CONCRETE (BRIDGE)	C.Y.	350.5	351.5	354.7	361.8	344.5	345.2	347.8	353.4
	REINFORCING STEEL EPOXY COATED	LBS.	87,269	87,869	88,357	89,420	85,212	85,762	85,878	86,401
CONCRETE BARRIER OR OPEN RAIL		LIN. FT.	262.0	262.2	262.9	264.5	262.0	262.2	262.9	264.5
WITH OPEN RAIL	*STRUCTURAL CONCRETE (BRIDGE)	C.Y.	350.3	351.2	354.5	361.6	344.3	345.0	347.6	353.2
	REINFORCING STEEL EPOXY COATED	LBS.	87,794	88,394	88,876	89,945	85,737	86,287	86,403	86,926

* INCLUDES 4 WINGS @ 0.68 C.Y. EACH; EXCLUDES RAIL CONCRETE.

BENT BAR DETAILS



NOTE: ALL DIMENSIONS ARE OUT TO OUT. D = PIN DIAMETER.

NOTES:

ALL REINFORCING STEEL SHALL BE EPOXY COATED.

THE TRANSVERSE REBARS ARE DETAILED WITH A SPLICE LAP. AT THE CONTRACTOR'S OPTION, THIS LAP MAY BE ELIMINATED BY FURNISHING FULL LENGTH BARS WITH NO REDUCTION IN PAY WEIGHT FOR SAME.

REVISED 07-09 - OPEN RAIL REINF. QTYS. CHANGED WHICH CHANGED TOTAL REINF. QTYS.

07-09 LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWA DOT Highway Division

STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

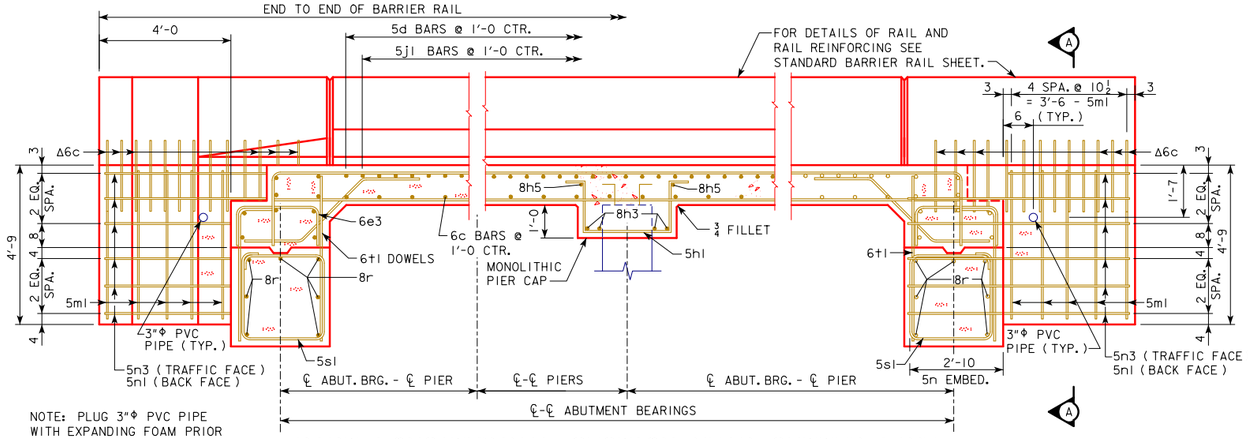
CONTINUOUS CONCRETE SLAB BRIDGES

NOVEMBER, 2006

SUPERSTRUCTURE DETAILS 120'-0 BRIDGE

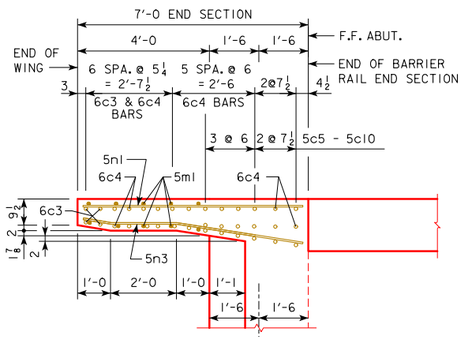
J40-13-06

8/23/2016 2:21:49 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-13-06 11x17_pdf.pltcfg

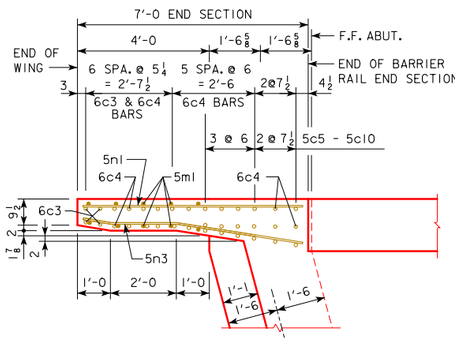


NOTE: PLUG 3"Φ PVC PIPE WITH EXPANDING FOAM PRIOR TO BACKFILLING BEHIND ABUTMENTS.

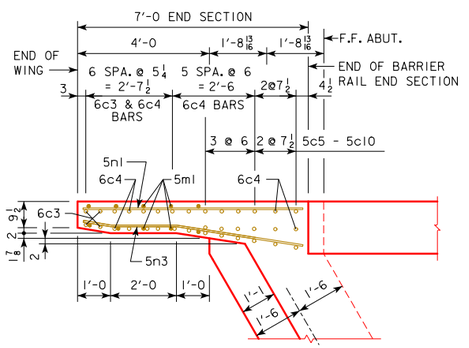
PART LONGITUDINAL SECTION NEAR GUTTER LINE



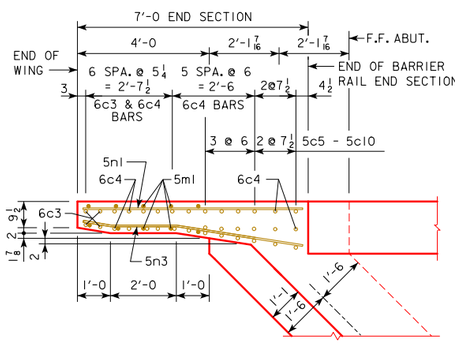
PART PLAN 0° SKEW
(RAILING NOT SHOWN)



PART PLAN 15° SKEW
(RAILING NOT SHOWN)

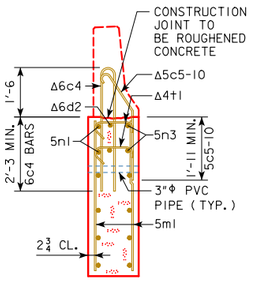


PART PLAN 30° SKEW
(RAILING NOT SHOWN)



PART PLAN 45° SKEW
(RAILING NOT SHOWN)

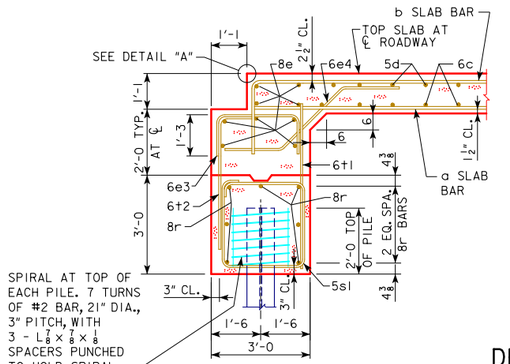
NOTE: REINFORCING LAYOUT IN PART PLANS 0°, 15°, 30° & 45° SKEWS ARE FOR BARRIER RAIL ONLY. SEE SHEET J40-48-06 FOR OPEN RAIL.



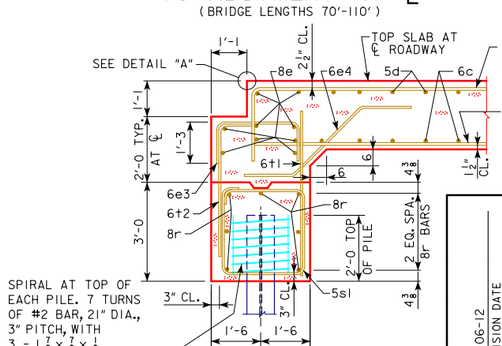
SECTION A-A

Δ NOTE: SEE END SECTION DETAILS IN THESE PLANS FOR DETAILS OF BARRIER RAIL END SECTION. REINFORCING BARS 6c3, 6c4, 5c5-10, 6d2 & 4t1 ARE INCLUDED IN THE SUPERSTRUCTURE QUANTITIES.

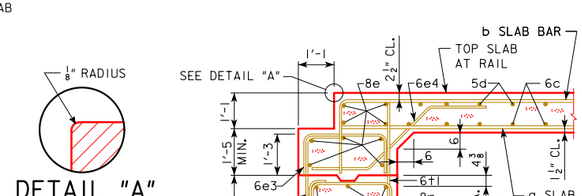
NOTE: 5ml & 5nl BARS ARE INCLUDED IN SUPERSTRUCTURE BAR LIST. 5c, 6c, 6d & 4t1 BARS ARE INCLUDED IN BARRIER RAIL BAR LIST.



SECTION NORMAL TO ABUTMENT AT ℄
(BRIDGE LENGTHS 70'-110')



SECTION NORMAL TO ABUTMENT AT ℄
(BRIDGE LENGTHS 120'-150')



DETAIL "A"

SECTION NORMAL TO ABUTMENT AT GUTTERLINE

SUPERSTRUCTURE NOTES:

THIS BRIDGE IS DESIGNED FOR HL-93 LOADING PLUS AN ALLOWANCE OF 20 POUNDS PER SQUARE FOOT OF ROADWAY FOR FUTURE WEARING SURFACE.

THE SLAB AS SHOWN INCLUDES A ½ INCH INTEGRAL WEARING SURFACE.

THE MINIMUM CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR SHALL BE 2 INCHES UNLESS OTHERWISE NOTED OR SHOWN. ALL REINFORCING STEEL IS TO BE SECURELY WIRED IN PLACE. SEE "BAR CHAIR NOTE".

ALL REINFORCING SHALL BE GRADE 60.

THE CONCRETE SLAB IS TO BE PLACED WITH A MINIMUM OF CONSTRUCTION JOINTS. PROCEDURES FOR PLACING SLAB CONCRETE SHALL BE SUBMITTED FOR APPROVAL TOGETHER WITH A STATEMENT OF THE PROPOSED METHOD AND EVIDENCE THAT THE CONTRACTOR POSSESSES THE NECESSARY EQUIPMENT AND FACILITIES TO ACCOMPLISH THE REQUIRED RESULT. SLAB FALSEWORK SHALL BE REMOVED PRIOR TO CONSTRUCTION OF THE BARRIER RAILS.

NOTE THAT WHEN PORTLAND CEMENT APPROACH PAVEMENT IS PLACED, COMPRESSIBLE JOINT MATERIAL MUST BE USED BETWEEN PAVEMENT AND END OF BRIDGE.

IF NECESSARY TO PREVENT DAMAGE TO THE END OF THE BRIDGE DECK OR BACKWALL FROM CONSTRUCTION EQUIPMENT, AN APPROPRIATE METHOD OF PROTECTION APPROVED BY THE ENGINEER SHALL BE PROVIDED BY THE BRIDGE CONTRACTOR AT NO EXTRA COST TO THE STATE.

COST OF FURNISHING AND PLACING 3"Φ PVC PIPE IN EACH WING IS INCLUDED IN THE PRICE BID FOR STRUCTURAL CONCRETE.

BAR CHAIR NOTE:

TOP MAT OF REINFORCING STEEL IS TO BE SUPPORTED BY INDIVIDUAL BAR CHAIRS SPACED AT NOT MORE THAN 3'-0 CENTERS LONGITUDINALLY AND TRANSVERSELY. THE BOTTOM MAT OF REINFORCING STEEL IS TO BE SUPPORTED BY INDIVIDUAL BAR CHAIRS SPACED AT NOT MORE THAN 3'-0 CENTERS LONGITUDINALLY AND TRANSVERSELY, OR BY CONTINUOUS ROWS OF BAR HIGH CHAIRS OR SLAB BOLSTERS SPACED 4'-0 APART. I.M. 451.01 REQUIREMENTS SHALL APPLY FOR BAR CHAIRS, BAR HIGH CHAIRS, AND SLAB BOLSTERS.

REVISED 06-12 - I.M. REQUIREMENT ADDED TO BAR CHAIR NOTE.

IOWA DOT *Highway Division*

STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

CONTINUOUS CONCRETE SLAB BRIDGES

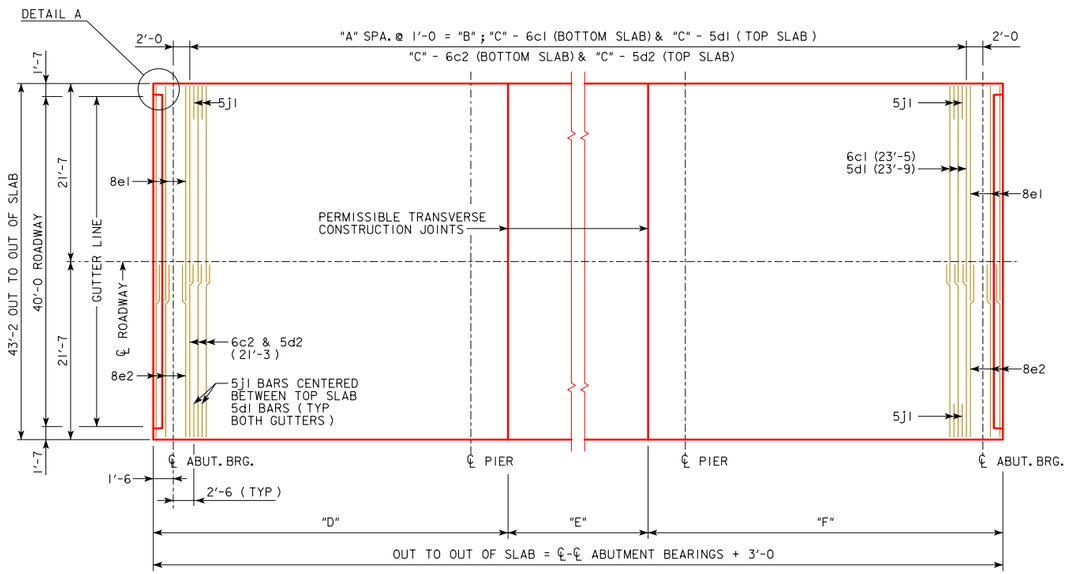
NOVEMBER, 2006

SUPERSTRUCTURE DETAILS ALL BRIDGES	J40-20-06

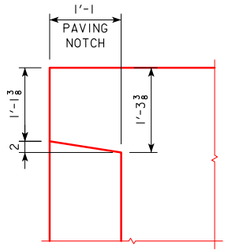
06-12 LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

8/23/2016 2:22:10 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-20-06 11x17_pdf.pltcfg

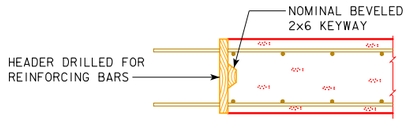


0° SKEW
TRANSVERSE REINFORCING STEEL LAYOUT

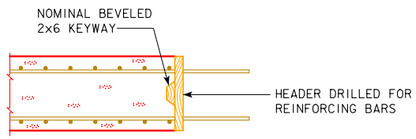


DETAIL A

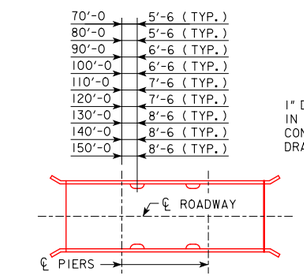
0° TRANSV. REINF. DIMENSION TABLE						
BRIDGE	"A"	"B"	"C"	"D"	"E"	"F"
70' BRIDGE	66	66'-0	67	28'-0	17'-0	28'-0
80' BRIDGE	76	76'-0	77	32'-0	19'-0	32'-0
90' BRIDGE	86	86'-0	87	36'-0	21'-0	36'-0
100' BRIDGE	96	96'-0	97	40'-0	23'-0	40'-0
110' BRIDGE	106	106'-0	107	44'-0	25'-0	44'-0
120' BRIDGE	116	116'-0	117	48'-0	27'-0	48'-0
130' BRIDGE	126	126'-0	127	52'-0	29'-0	52'-0
140' BRIDGE	136	136'-0	137	56'-0	31'-0	56'-0
150' BRIDGE	146	146'-0	147	60'-0	33'-0	60'-0



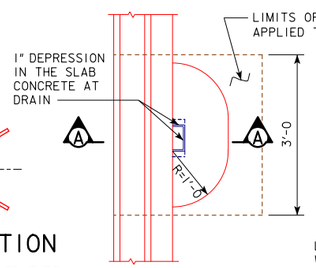
TRANSVERSE CONSTR.
JOINT



LONGITUDINAL CONSTR.
JOINT



FLOOR DRAIN LOCATION



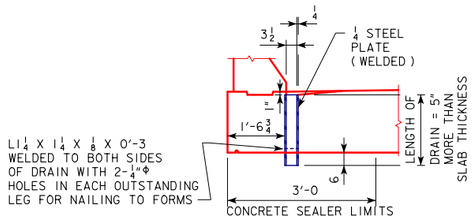
PART PLAN

NOTE: 4" X 8" OUTSIDE DIMENSION ROLLED TUBE WITH 1/4" WALL THICKNESS MAY BE SUBSTITUTED FOR THE WELDED DRAIN SHOWN.

FLOOR DRAIN DETAILS

(USE FOR BARRIER RAIL ONLY, NOT REQUIRED FOR OPEN RAIL)

NOTE: DRAINS ARE TO BE GALVANIZED. INCLUDE COST OF DRAINS IN PRICE BID FOR "STRUCTURAL CONCRETE". 4 DRAINS REQUIRED.



L1 1/4 X 1 1/4 X 1/8 X 0'-3 WELDED TO BOTH SIDES OF DRAIN WITH 2-1/4"Ø HOLES IN EACH OUTSTANDING LEG FOR NAILING TO FORMS

SECTION A-A

WEIGHT OF ONE FLOOR DRAIN			
SPAN	WEIGHT, LBS.	SPAN	WEIGHT, LBS.
70'-0	32	120'-0	41
80'-0	33	130'-0	43
90'-0	35	140'-0	45
100'-0	37	150'-0	48
110'-0	39		

REVISED 07-09 - CHANGED THE DRAIN ANGLES DETAILS ON SECTION A-A.

07-09
LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

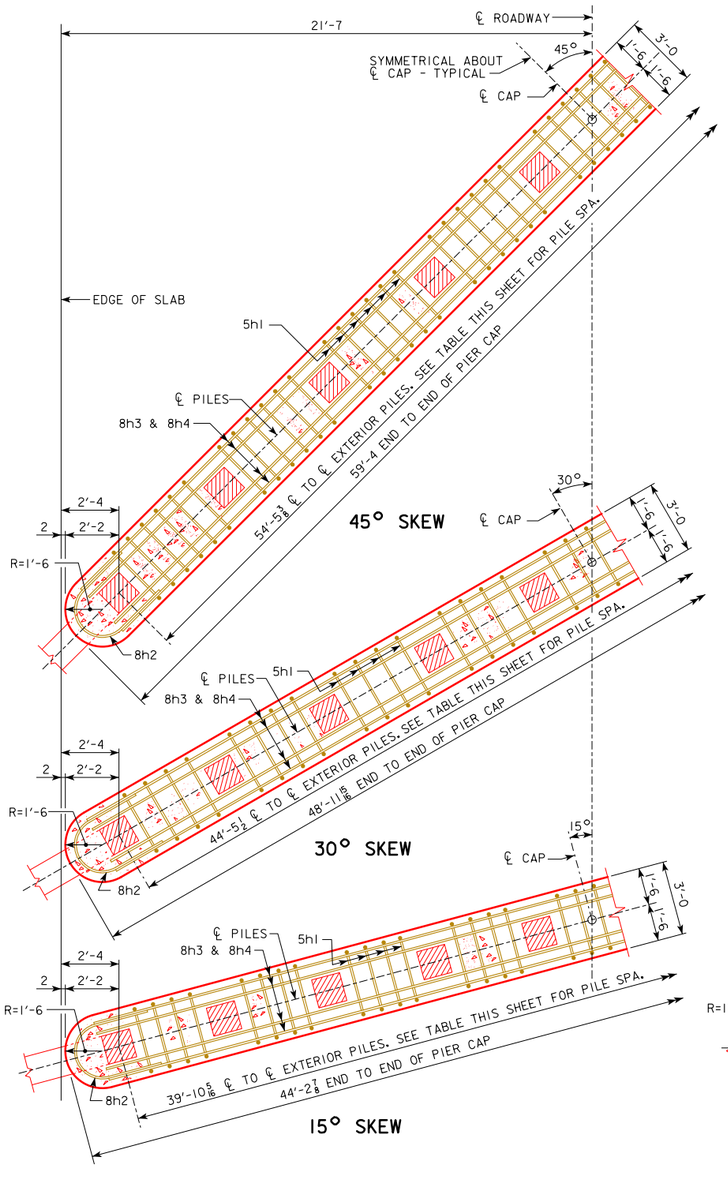
CONTINUOUS CONCRETE SLAB BRIDGES

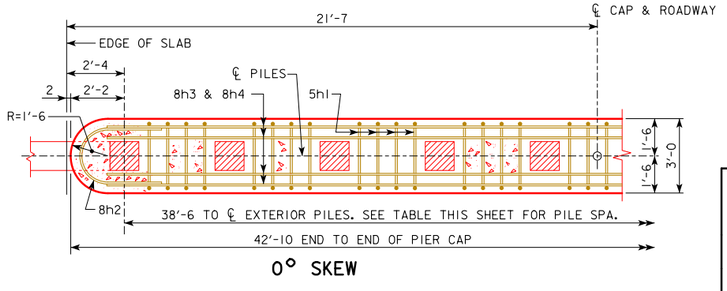
NOVEMBER, 2006

SUPERSTRUCTURE DETAILS
ALL BRIDGES
0° SKEW

J40-21-06

8/23/2016 2:22:12 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-21-06 11x17_pdf.pltcfg





HALF SECTION BELOW SLAB

NOTE: NUMBER OF PILES AND STIRRUPS SHOWN ARE FOR A 70'-0 BRIDGE.
CAP DIMENSIONS ARE TYPICAL FOR ALL BRIDGES.

TYPICAL NUMBERS OF PILES AND SPACINGS AND FACTORED PIER LOADS

	BRIDGE LENGTH	70'-0	80'-0	90'-0	100'-0	110'-0	120'-0	130'-0	140'-0	150'-0
①	TYP. NO. OF PILES	10	10	10	11	12	14	15	16	16
	TYP. PILE SPACES @ 0°	9 SPA. @ ABOUT 4'-3	9 SPA. @ ABOUT 4'-3	9 SPA. @ ABOUT 4'-3	10 SPA. @ ABOUT 3'-10	11 SPA. @ 3'-6	② 13 SPA. @ ABOUT 2'-11	③ 14 SPA. @ ABOUT 2'-9	③ 15 SPA. @ ABOUT 2'-7	③ 15 SPA. @ ABOUT 2'-7
	TYP. PILE SPACES @ 15°	9 SPA. @ ABOUT 4'-5	9 SPA. @ ABOUT 4'-5	9 SPA. @ ABOUT 4'-5	10 SPA. @ ABOUT 4'-0	11 SPA. @ ABOUT 3'-7	② 13 SPA. @ ABOUT 3'-0	③ 14 SPA. @ ABOUT 2'-10	③ 15 SPA. @ ABOUT 2'-8	③ 15 SPA. @ ABOUT 2'-8
	TYP. PILE SPACES @ 30°	9 SPA. @ ABOUT 4'-11	9 SPA. @ ABOUT 4'-11	9 SPA. @ ABOUT 4'-11	10 SPA. @ ABOUT 4'-5	11 SPA. @ ABOUT 4'-1	13 SPA. @ ABOUT 3'-5	② 14 SPA. @ ABOUT 3'-2	② 15 SPA. @ ABOUT 3'-0	② 15 SPA. @ ABOUT 3'-0
	TYP. PILE SPACES @ 45°	9 SPA. @ ABOUT 6'-1	9 SPA. @ ABOUT 6'-1	9 SPA. @ ABOUT 6'-1	10 SPA. @ ABOUT 5'-5	11 SPA. @ ABOUT 4'-11	13 SPA. @ ABOUT 4'-2	14 SPA. @ ABOUT 3'-11	15 SPA. @ ABOUT 3'-8	15 SPA. @ ABOUT 3'-8
④	PU, STRENGTH I DESIGN LOAD FOR PIER (KIPS)	812 KIPS	900 KIPS	1001 KIPS	1109 KIPS	1215 KIPS	1341 KIPS	1465 KIPS	1595 KIPS	1739 KIPS

① THIS TYPICAL NUMBER OF PLES MAY NEED TO BE MODIFIED DEPENDING ON SELECTED PIOL PILE TYPE AND SIZE, HEIGHT, AND RESISTANCE. IF THE NUMBER OF PILES IS DIFFERENT THAN IN THE TABLE FOR THE BRIDGE LENGTH, THE NUMBER OF 5h1 BARS AND OTHER QUANTITIES NEED TO BE CHECKED AND ADJUSTED AS NEEDED. PILES 10 INCHES AND 12 INCHES IN SIZE MUST BE SPACED 2'-6 OR MORE, PILES 14 INCHES IN SIZE MUST BE SPACED 2'-11 OR MORE, AND PILES 16 INCHES IN SIZE MUST BE SPACED 3'-4 OR MORE.

② MAXIMUM PIOL PILE SIZE AT THIS SPACING IS 14 INCHES.

③ MAXIMUM PIOL PILE SIZE AT THIS SPACING IS 12 INCHES.

④ STRENGTH I PIER DESIGN LOAD INCLUDES DYNAMIC LOAD ALLOWANCE (IM), AND PIER CAP WEIGHT IS BASED ON 45° SKEW. USE THIS PU FOR DETERMINING NUMBER OF PILES AND PILE LENGTH.

PIER NOTES:

ALL MONOLITHIC PIER CAP REINFORCING AND CONCRETE IS INCLUDED IN SUPERSTRUCTURE ESTIMATE OF QUANTITIES.

THE MINIMUM CLEAR DISTANCE FROM THE FACE OF THE CONCRETE TO NEAR REINFORCING BAR IS TO BE 2" UNLESS OTHERWISE NOTED OR SHOWN.

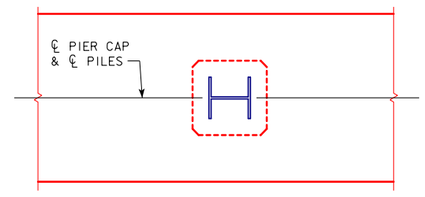
THE PIER PILES ARE TO BE DRIVEN TO FULL PENETRATION, IF PRACTICABLE, BUT IN NO CASE TO A BEARING VALUE LESS THAN THE PILE BEARING REQUIRED FOR EACH BRIDGE LENGTH AS SHOWN ON THIS SHEET. ADDITIONAL DRIVING CAPACITY MAY BE REQUIRED THROUGH SCOURABLE LAYERS. REFER TO GENERAL PLAN NOTES FOR ADDITIONAL INFORMATION.

CAP STEEL AS DETAILED ON PIOL STANDARD PILE DRAWING IS REQUIRED FOR MONOLITHIC PIER CAPS.

THE CONCRETE QUANTITIES ARE BASED ON THE USE OF TYPE 3 PILING. IF TYPE 1 OR TYPE 2 IS USED, THE CONCRETE QUANTITIES MAY BE ADJUSTED TO ACCOUNT FOR THE CONCRETE DISPLACED BY THE PILING.

ALL REINFORCING STEEL IS TO BE GRADE 60.

PIER PILING WAS DESIGNED FOR HL-93 LOADING WITH AN ALLOWANCE FOR 20 LBS. PER SQ. FT. FUTURE WEARING SURFACE.



PILE ORIENTATION DETAIL FOR TYPE 3 TRESTLE BENT PILES

CORRECTION 05-14 - CHANGED THE BAR LABEL FROM 5d1 TO 5h1 IN ENCIRCLED NOTE 1.

05-14 LATEST REVISION DATE

Kevin K. McDonald APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

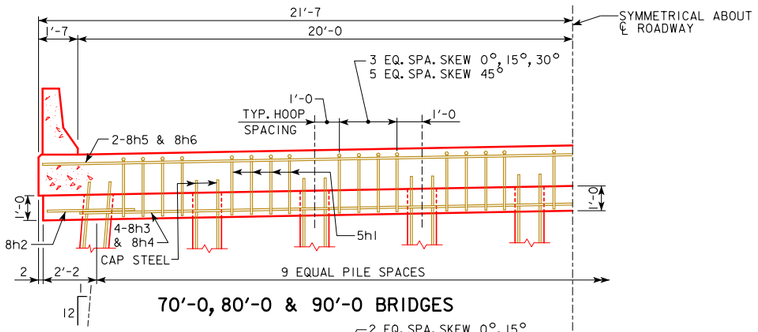
CONTINUOUS CONCRETE SLAB BRIDGES

NOVEMBER, 2006

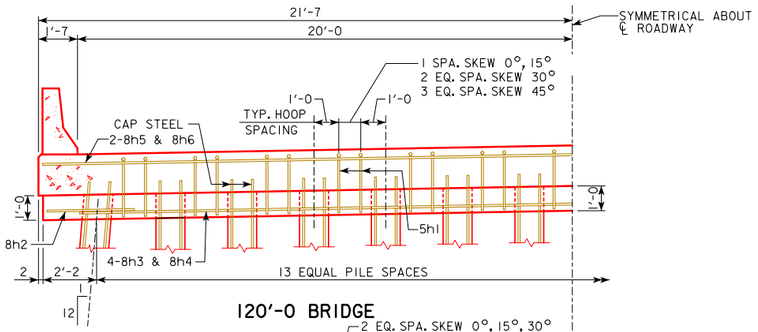
MONOLITHIC PIER CAP DETAILS ALL BRIDGES

J40-25-06

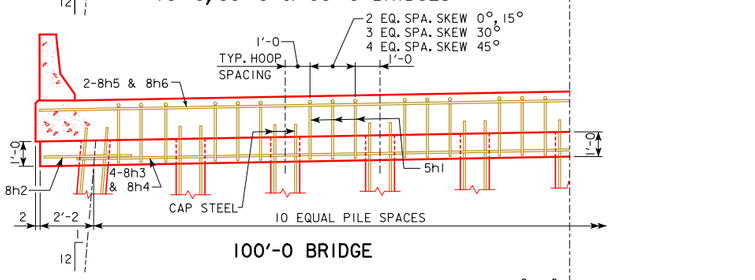
8/23/2016 2:22:19 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-25-06 11x17_pdf.pltcfg



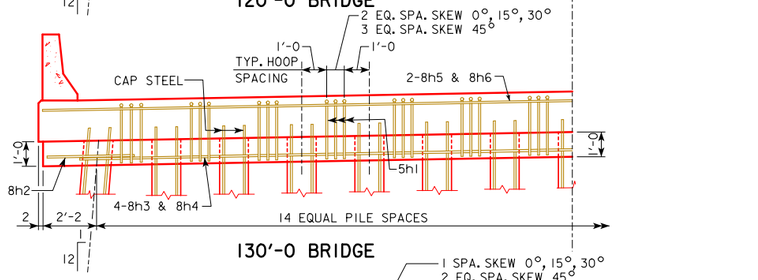
70'-0, 80'-0 & 90'-0 BRIDGES



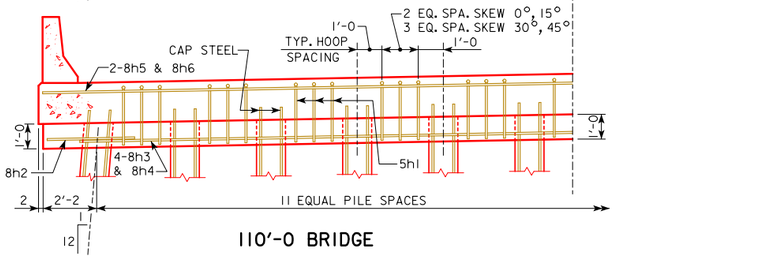
120'-0 BRIDGE



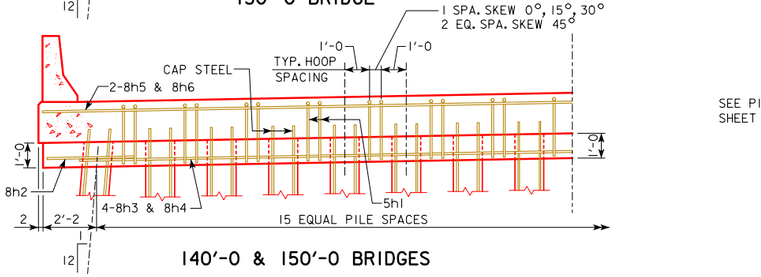
100'-0 BRIDGE



130'-0 BRIDGE



110'-0 BRIDGE

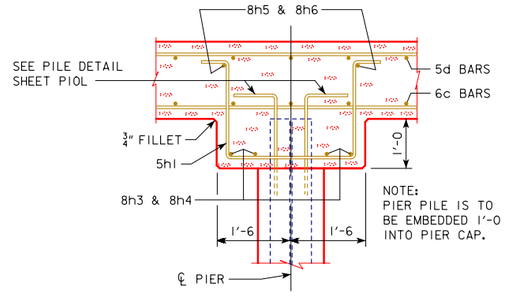


140'-0 & 150'-0 BRIDGES

HALF SECTION NEAR PIER

SHOWING STIRRUP SPACING AND NUMBER OF PILING

NOTE: BOTTOM OF CAP ELEVATIONS WILL BE REQUIRED AT THE ℄ OF ROADWAY AND AT EACH EXTERIOR PILE.



TYPICAL CAP SECTION

REVISED 11-08 - REVISED PILES REQUIRED FOR 120'-0 AND 130'-0 BRIDGES.

11-08 LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

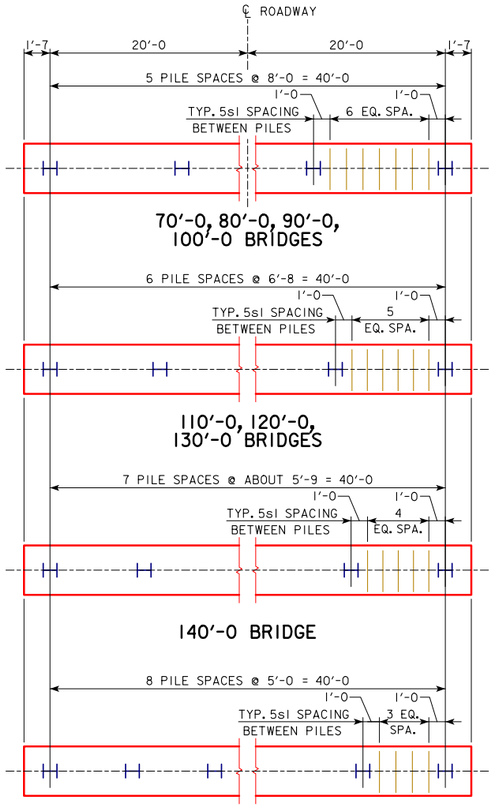
CONTINUOUS CONCRETE SLAB BRIDGES

NOVEMBER, 2006

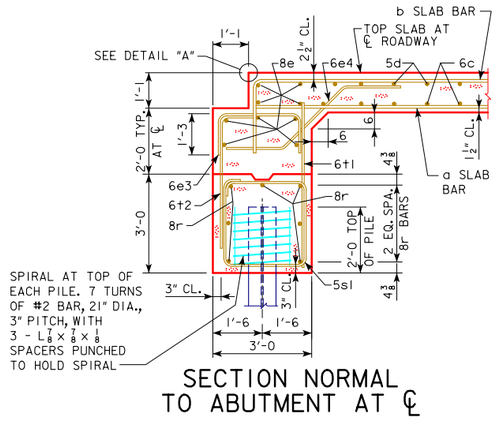
MONOLITHIC PIER CAP DETAILS ALL BRIDGES

J40-26-06

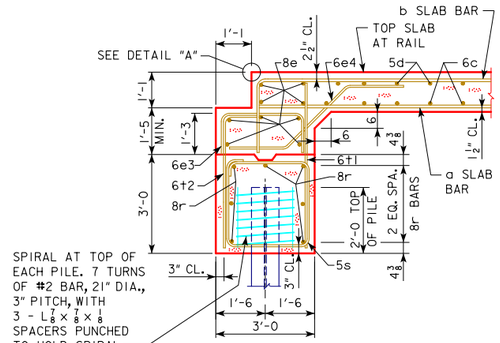
8/23/2016 2:22:21 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-26-06 11x17_pdf.pltcfg



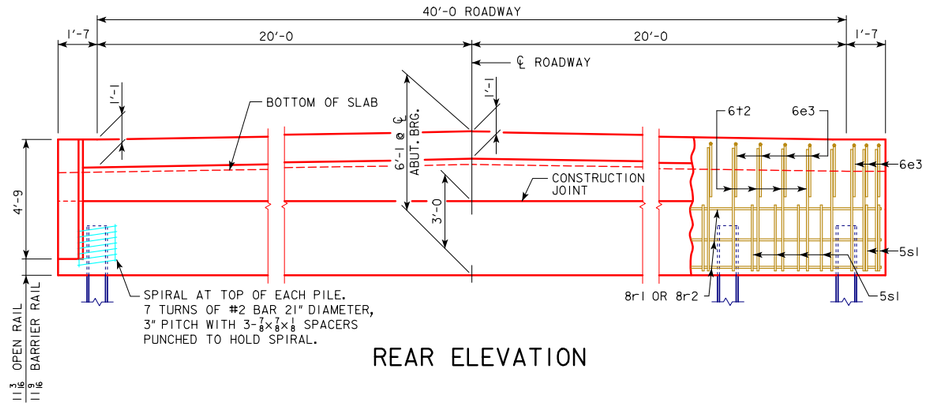
PILE PLAN - 0° SKEW
STEEL PILING



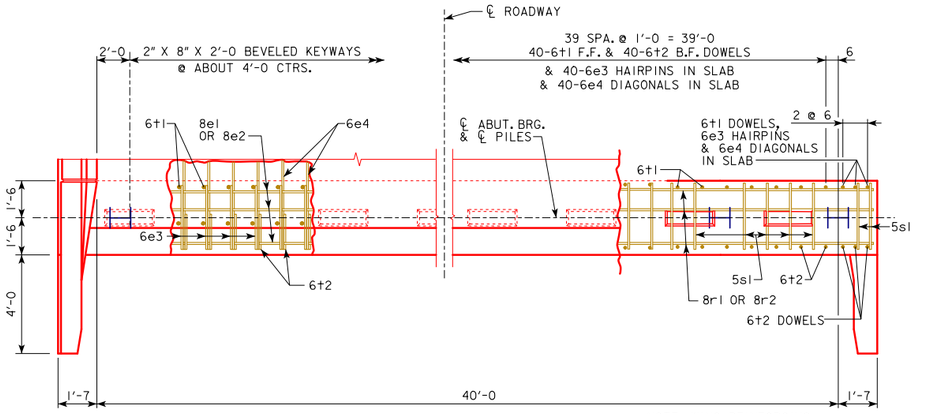
SECTION NORMAL TO ABUTMENT AT ℄



SECTION NORMAL TO ABUTMENT AT GUTTERLINE



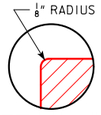
REAR ELEVATION



PLAN VIEW

NOTE: WING REINFORCING AND RAIL NOT SHOWN.

6e3, 6e4 AND 8e ARE INCLUDED WITH SUPERSTRUCTURE QUANTITIES.



DETAIL "A"

ABUTMENT NOTES:

ALL PILING ARE HP 10 X 42.

THE CONCRETE AND REINFORCING STEEL FOR THE WINGS IS INCLUDED WITH THE SUPERSTRUCTURE.

DETAILS ON THIS SHEET ARE TO BE USED ONLY WHEN ABUTMENTS ARE PLACED ON STEEL PILES. IF ROCK IS ENCOUNTERED CLOSER THAN 12' BELOW ABUTMENT FOOTING, SPECIAL ANALYSIS MAY BE REQUIRED.

THE MINIMUM CLEAR DISTANCE FROM THE FACE OF THE CONCRETE TO NEAR REINFORCING BAR IS TO BE 2 INCHES UNLESS OTHERWISE NOTED OR SHOWN.

STEEL ABUTMENT PILES SHALL BE DRIVEN TO FULL PENETRATION IF PRACTICABLE BUT IN NO CASE TO A BEARING VALUE LESS THAN SHOWN IN DESIGN PLANS.

ALL REINFORCING STEEL IS TO BE GRADE 60.

ABUTMENT PILING WAS DESIGNED FOR HL-93 LOADING WITH AN ALLOWANCE FOR 20 LBS. PER SQ. FT. FUTURE WEARING SURFACE.

NUMBER OF PILES AND ABUTMENT DESIGN LOADS

BRIDGE LENGTH	70'-0	80'-0	90'-0	100'-0	110'-0	120'-0	130'-0	140'-0	150'-0
PILING - NUMBER	6	6	6	6	7	7	7	8	9
PU, STRENGTH I DESIGN LOAD - KIPS	483	515	546	585	623	666	708	Δ 830	Δ 879

Δ INCLUDES DYNAMIC LOAD ALLOWANCE

NOTE: PU, STRENGTH I DESIGN LOAD (KIPS) IS NOT THE VALUE USED IN THE FIELD FOR DRIVING PILES.

06-13
LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

CONTINUOUS CONCRETE SLAB BRIDGES

NOVEMBER, 2006

ABUTMENT DETAILS 0° SKEW - STEEL PILING

J40-39-06

REVISED 06-13 - REVISION FOR LRFD PILE DESIGN.

8/23/2016 2:22:51 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-39-06 11x17_pdf.pltcfg

BILL OF REINFORCING STEEL - ONE ABUTMENT - 0° SKEW

BRIDGE LENGTH				70'-0		80'-0		90'-0		100'-0		110'-0		120'-0		130'-0		140'-0		150'-0	
MARK	LOCATION	SHAPE	LENGTH	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT
8r1	ABUTMENT FOOTING LONGITUDINAL		26'-4	7	492	7	492	7	492	7	492	7	492	7	492	7	492	7	492	7	492
8r2	ABUTMENT FOOTING LONGITUDINAL		21'-4	7	399	7	399	7	399	7	399	7	399	7	399	7	399	7	399	7	399
5s1	ABUTMENT FOOTING HOOPS		11'-0	39	447	39	447	39	447	39	447	40	459	40	459	40	459	39	447	36	413
6t1	FOOTING TO SLAB DOWELS		5'-0	46	345	46	345	46	345	46	345	46	345	46	345	46	345	46	345	46	345
6t2	FOOTING TO SLAB DOWELS		5'-7	46	386	46	386	46	386	46	386	46	386	46	386	46	386	46	386	46	386
#2	PILE SPIRAL		38'-6	6	39	6	39	6	39	6	39	7	45	7	45	7	45	8	51	9	58
	SPIRAL SPACERS - L $\frac{7}{8}$ X $\frac{7}{8}$ X $\frac{1}{8}$ X 0.70		1'-10	18	24	18	24	18	24	18	24	21	27	21	27	21	27	24	31	27	35
REINFORCING STEEL EPOXY COATED - TOTAL (LBS.)					2132		2132		2132		2132		2153		2153		2153		2151		2128

BILL OF REINFORCING STEEL - ONE ABUTMENT - 15° SKEW

BRIDGE LENGTH				70'-0		80'-0		90'-0		100'-0		110'-0		120'-0		130'-0		140'-0		150'-0	
MARK	LOCATION	SHAPE	LENGTH	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT
8r1	ABUTMENT FOOTING LONGITUDINAL		27'-2	7	508	7	508	7	508	7	508	7	508	7	508	7	508	7	508	7	508
8r2	ABUTMENT FOOTING LONGITUDINAL		22'-1	7	413	7	413	7	413	7	413	7	413	7	413	7	413	7	413	7	413
5s1	ABUTMENT FOOTING HOOPS		11'-0	36	413	36	413	36	413	36	413	36	413	36	413	35	402	40	459	40	459
5s2	ABUTMENT FOOTING HOOPS		11'-3	4	47	4	47	4	47	4	47	4	47	4	47	4	47	4	47	4	47
6t1	FOOTING TO SLAB DOWELS		5'-0	46	345	46	345	46	345	46	345	46	345	46	345	46	345	46	345	46	345
6t2	FOOTING TO SLAB DOWELS		5'-7	46	386	46	386	46	386	46	386	46	386	46	386	46	386	46	386	46	386
#2	PILE SPIRAL		38'-6	7	45	7	45	7	45	7	45	7	45	7	45	8	51	9	58	9	58
	SPIRAL SPACERS - L $\frac{7}{8}$ X $\frac{7}{8}$ X $\frac{1}{8}$ X 0.70		1'-10	21	27	21	27	21	27	21	27	21	27	21	27	24	31	27	35	27	35
REINFORCING STEEL EPOXY COATED - TOTAL (LBS.)					2184		2184		2184		2184		2184		2184		2183		2251		2251

BILL OF REINFORCING STEEL - ONE ABUTMENT - 30° SKEW

BRIDGE LENGTH				70'-0		80'-0		90'-0		100'-0		110'-0		120'-0		130'-0		140'-0		150'-0	
MARK	LOCATION	SHAPE	LENGTH	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT
8r1	ABUTMENT FOOTING LONGITUDINAL		29'-6	7	551	7	551	7	551	7	551	7	551	7	551	7	551	7	551	7	551
8r2	ABUTMENT FOOTING LONGITUDINAL		24'-5	7	456	7	456	7	456	7	456	7	456	7	456	7	456	7	456	7	456
5s1	ABUTMENT FOOTING HOOPS		11'-0	42	482	42	482	42	482	42	482	42	482	42	482	42	482	40	459	40	459
5s2	ABUTMENT FOOTING HOOPS		11'-11	4	50	4	50	4	50	4	50	4	50	4	50	4	50	4	50	4	50
6t1	FOOTING TO SLAB DOWELS		5'-0	46	345	46	345	46	345	46	345	46	345	46	345	46	345	46	345	46	345
6t2	FOOTING TO SLAB DOWELS		5'-7	46	386	46	386	46	386	46	386	46	386	46	386	46	386	46	386	46	386
#2	PILE SPIRAL		38'-6	7	45	7	45	7	45	7	45	7	45	7	45	8	51	9	58	9	58
	SPIRAL SPACERS - L $\frac{7}{8}$ X $\frac{7}{8}$ X $\frac{1}{8}$ X 0.70		1'-10	21	27	21	27	21	27	21	27	21	27	21	27	24	31	27	35	27	35
REINFORCING STEEL EPOXY COATED - TOTAL (LBS.)					2342		2342		2342		2342		2342		2342		2352		2340		2340

BILL OF REINFORCING STEEL - ONE ABUTMENT - 45° SKEW

BRIDGE LENGTH				70'-0		80'-0		90'-0		100'-0		110'-0		120'-0		130'-0		140'-0		150'-0	
MARK	LOCATION	SHAPE	LENGTH	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT	NO.	WEIGHT
8r1	ABUTMENT FOOTING LONGITUDINAL		34'-8	7	648	7	648	7	648	7	648	7	648	7	648	7	648	7	648	7	648
8r2	ABUTMENT FOOTING LONGITUDINAL		29'-7	7	553	7	553	7	553	7	553	7	553	7	553	7	553	7	553	7	553
5s1	ABUTMENT FOOTING HOOPS		11'-0	56	642	56	642	56	642	56	642	56	642	56	642	56	642	56	642	54	620
5s2	ABUTMENT FOOTING HOOPS		13'-6	4	56	4	56	4	56	4	56	4	56	4	56	4	56	4	56	4	56
6t1	FOOTING TO SLAB DOWELS		5'-0	46	345	46	345	46	345	46	345	46	345	46	345	46	345	46	345	46	345
6t2	FOOTING TO SLAB DOWELS		5'-7	46	386	46	386	46	386	46	386	46	386	46	386	46	386	46	386	46	386
#2	PILE SPIRAL		38'-6	9	58	9	58	9	58	9	58	9	58	9	58	9	58	9	58	10	64
	SPIRAL SPACERS - L $\frac{7}{8}$ X $\frac{7}{8}$ X $\frac{1}{8}$ X 0.70		1'-10	27	35	27	35	27	35	27	35	27	35	27	35	27	35	27	35	30	39
REINFORCING STEEL EPOXY COATED - TOTAL (LBS.)					2723		2723		2723		2723		2723		2723		2723		2723		2711

NOTE: THE PILE SPIRALS AND SPIRAL SPACERS ARE TO BE NON-COATED REINFORCING BUT MAY BE EPOXY COATED AT THE CONTRACTORS OPTION AND EXPENSE.

ESTIMATED QUANTITIES - ONE ABUT. - 0° SKEW

LOCATION	UNIT	QUANTITY								
BRIDGE LENGTH		70'-0	80'-0	90'-0	100'-0	110'-0	120'-0	130'-0	140'-0	150'-0
STRUCTURAL CONCRETE (BRIDGE)	C.Y.	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
REINFORCING STEEL EPOXY COATED	LBS.	2132	2132	2132	2132	2153	2153	2153	2151	2128
STEEL PILING HP 10 X 42	NO.	6	6	6	6	7	7	7	8	9
PREBORE HOLES	FT.	-	-	-	-	-	-	-	80	90

ESTIMATED QUANTITIES - ONE ABUT. - 15° SKEW

LOCATION	UNIT	QUANTITY								
BRIDGE LENGTH		70'-0	80'-0	90'-0	100'-0	110'-0	120'-0	130'-0	140'-0	150'-0
STRUCTURAL CONCRETE (BRIDGE)	C.Y.	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9
REINFORCING STEEL EPOXY COATED	LBS.	2184	2184	2184	2184	2184	2184	2183	2251	2251
STEEL PILING HP 10 X 42	NO.	7	7	7	7	7	7	8	9	9
PREBORE HOLES	FT.	-	-	-	-	-	-	-	90	90

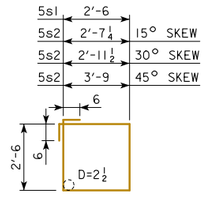
ESTIMATED QUANTITIES - ONE ABUT. - 30° SKEW

LOCATION	UNIT	QUANTITY								
BRIDGE LENGTH		70'-0	80'-0	90'-0	100'-0	110'-0	120'-0	130'-0	140'-0	150'-0
STRUCTURAL CONCRETE (BRIDGE)	C.Y.	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6
REINFORCING STEEL EPOXY COATED	LBS.	2342	2342	2342	2342	2342	2342	2352	2340	2340
STEEL PILING HP 10 X 42	NO.	7	7	7	7	7	7	8	9	9
PREBORE HOLES	FT.	-	-	-	-	-	-	-	90	90

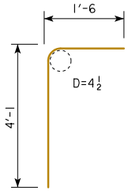
ESTIMATED QUANTITIES - ONE ABUT. - 45° SKEW

LOCATION	UNIT	QUANTITY								
BRIDGE LENGTH		70'-0	80'-0	90'-0	100'-0	110'-0	120'-0	130'-0	140'-0	150'-0
STRUCTURAL CONCRETE (BRIDGE)	C.Y.	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4
REINFORCING STEEL EPOXY COATED	LBS.	2723	2723	2723	2723	2723	2723	2723	2723	2711
STEEL PILING HP 10 X 42	NO.	9	9	9	9	9	9	9	9	10
PREBORE HOLES	FT.	-	-	-	-	-	-	-	90	100

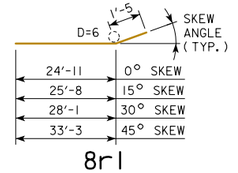
BENT BAR DETAILS



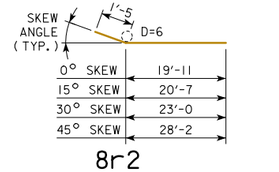
5s1 & 5s2



6t2



8r1



8r2

NOTE: DIMENSIONS ARE OUT TO OUT. D = PIN DIAMETER.

REVISED 07-09 - CONCRETE QUANTITIES CHANGED.

07-09
LATEST REVISION DATE

Marcus K. McGrath
APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

CONTINUOUS CONCRETE SLAB BRIDGES

NOVEMBER, 2006

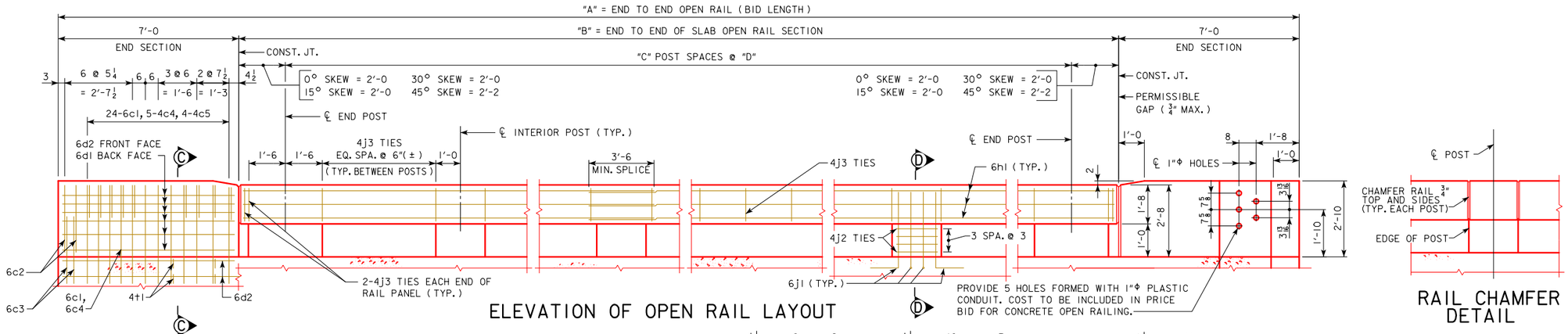
ABUTMENT DETAILS STEEL PILING

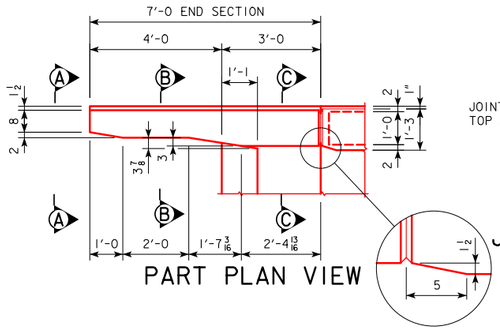
J40-44-06

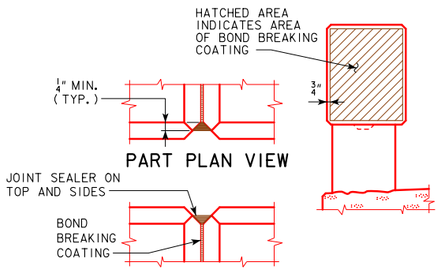
8/23/2016 2:23:02 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-44-06 11x17_pdf.pltcfg

TABLE OF OPEN RAIL DIMENSIONS AND NUMBERS

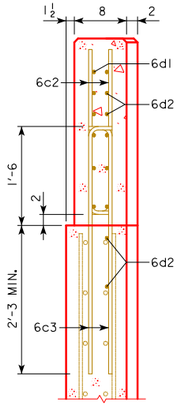
℄-℄ ABUT. BRG		70′-0				80′-0				90′-0				100′-0				110′-0				120′-0				130′-0				140′-0				150′-0			
SKEW		0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°
DIMENSION OR NUMBER	A (FT.-IN.)	81′-0	81′-1¼	81′-5½	82′-3	91′-0	91′-1¼	91′-5½	92′-3	101′-0	101′-1¼	101′-5½	102′-3	111′-0	111′-1¼	111′-5½	112′-3	121′-0	121′-1¼	121′-5½	122′-3	131′-0	131′-1¼	131′-5½	132′-3	141′-0	141′-1¼	141′-5½	142′-3	151′-0	151′-1¼	151′-5½	152′-3	161′-0	161′-1¼	161′-5½	162′-3
	B (FT.-IN.)	67′-0	67′-1¼	67′-5½	68′-3	77′-0	77′-1¼	77′-5½	78′-3	87′-0	87′-1¼	87′-5½	88′-3	97′-0	97′-1¼	97′-5½	98′-3	107′-0	107′-1¼	107′-5½	108′-3	117′-0	117′-1¼	117′-5½	118′-3	127′-0	127′-1¼	127′-5½	128′-3	137′-0	137′-1¼	137′-5½	138′-3	147′-0	147′-1¼	147′-5½	148′-3
	C	8	8	8	8	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18
	D (FT.-IN.)	7′-10½	7′-10¹¹⁄₁₆	7′-11⅜	7′-11⅞	7′-3⅝	7′-3¾	7′-4⅜	7′-4¹¹⁄₁₆	7′-6⁹⁄₁₆	7′-6¹¹⁄₁₆	7′-7⅛	7′-7⅝	7′-9	7′-9⅛	7′-9⅜	7′-9¹⁵⁄₁₆	7′-11⅛	7′-11⅜	7′-11½	7′-11¹⁵⁄₁₆	7′-6⅜	7′-6½	7′-6¾	7′-7⅛	7′-8¼	7′-8⅝	7′-8⅝	7′-8¹⁵⁄₁₆	7′-9⅞	7′-9¹⁵⁄₁₆	7′-10⅜	7′-10½	7′-11⅝	7′-11⅜	7′-11⅝	7′-11¹⁵⁄₁₆

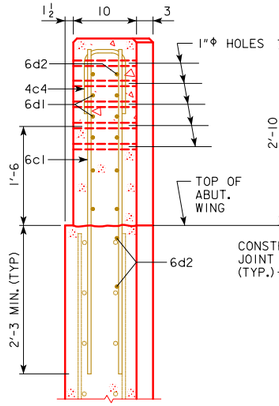


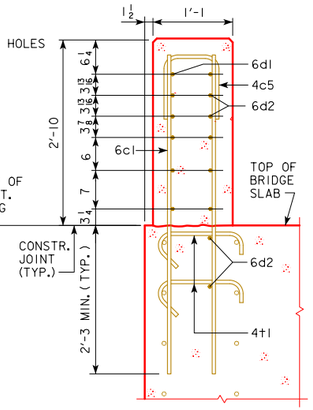


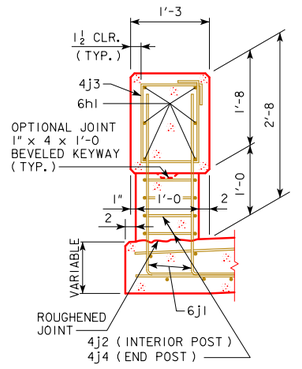


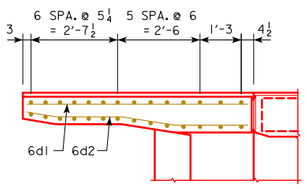
JOINT DETAILS AT END SECTION

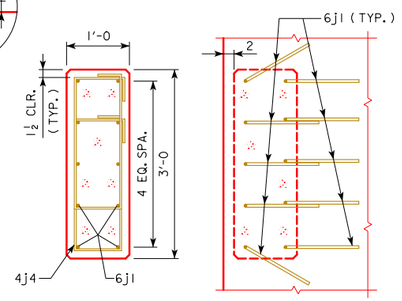


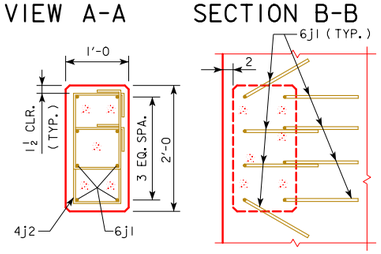












REVISED 11-08 - CHANGED END SECTION SHAPE AND REINFORCEMENT. RAIL DEPTH CHANGED TO 1′-8.

IOWADOT Highway Division

STANDARD DESIGN - 40′ ROADWAY, 3 SPAN BRIDGES

CONTINUOUS CONCRETE SLAB BRIDGES

NOVEMBER, 2006

11-08 LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

OPEN RAIL DETAILS (TL-4)

J40-48-06

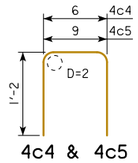
8/23/2016 2:23:08 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-48-06 11x17_pdf.pltcfg

EPOXY REINFORCING STEEL-TWO OPEN RAILS

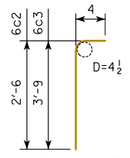
BRIDGE LENGTH			70'-0			80'-0			90'-0			100'-0			110'-0			120'-0			130'-0			140'-0			150'-0		
BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT
6c1	VERTICAL		96	4'-11	709	96	4'-11	709	96	4'-11	709	96	4'-11	709	96	4'-11	709	96	4'-11	709	96	4'-11	709	96	4'-11	709	96	4'-11	709
6c2	VERTICAL		16	2'-10	68	16	2'-10	68	16	2'-10	68	16	2'-10	68	16	2'-10	68	16	2'-10	68	16	2'-10	68	16	2'-10	68	16	2'-10	68
6c3	VERTICAL		16	4'-1	98	16	4'-1	98	16	4'-1	98	16	4'-1	98	16	4'-1	98	16	4'-1	98	16	4'-1	98	16	4'-1	98	16	4'-1	98
4c4	VERTICAL HOOPS		20	2'-10	38	20	2'-10	38	20	2'-10	38	20	2'-10	38	20	2'-10	38	20	2'-10	38	20	2'-10	38	20	2'-10	38	20	2'-10	38
4c5	VERTICAL HOOPS		16	3'-1	33	16	3'-1	33	16	3'-1	33	16	3'-1	33	16	3'-1	33	16	3'-1	33	16	3'-1	33	16	3'-1	33	16	3'-1	33
6d1	HORIZONTAL		24	6'-8	240	24	6'-8	240	24	6'-8	240	24	6'-8	240	24	6'-8	240	24	6'-8	240	24	6'-8	240	24	6'-8	240	24	6'-8	240
6d2	HORIZONTAL		32	6'-9	324	32	6'-9	324	32	6'-9	324	32	6'-9	324	32	6'-9	324	32	6'-9	324	32	6'-9	324	32	6'-9	324	32	6'-9	324
6h1	LONGITUDINAL OPEN RAIL		24	35'-9	1289	36	28'-4	1532	36	31'-8	1712	36	35'-0	1893	36	38'-4	2073	48	32'-2	2319	48	34'-8	2499	48	37'-2	2680	60	32'-5	2921
6j1	VERTICAL DOWELS OPEN RAIL		152	4'-6	1027	184	4'-7	1267	200	4'-8	1402	216	4'-9	1541	232	4'-10	1684	264	4'-11	1950	280	5'-1	2138	296	5'-2	2297	312	5'-3	2460
4j2	HOOPS INTERIOR POSTS		112	4'-8	349	144	4'-8	449	160	4'-8	499	176	4'-8	549	192	4'-8	599	224	4'-8	698	240	4'-8	748	256	4'-8	798	272	4'-8	848
4j3	HOOPS OPEN RAIL		212	5'-5	767	244	5'-5	883	290	5'-5	1049	316	5'-5	1143	342	5'-5	1237	394	5'-5	1426	420	5'-5	1520	446	5'-5	1614	472	5'-5	1708
4j4	HOOPS END POSTS		32	6'-5	137	32	6'-5	137	32	6'-5	137	32	6'-5	137	32	6'-5	137	32	6'-5	137	32	6'-5	137	32	6'-5	137	32	6'-5	137
4t1	WING FOOTING TIE BARS		16	VARIES	21	16	VARIES	21	16	VARIES	21	16	VARIES	21	16	VARIES	21	16	VARIES	21	16	VARIES	21	16	VARIES	21	16	VARIES	21
(INCLUDE WITH SUPERSTRUCTURE REINFORCING)		TOTAL (LBS.)			5100			5799			6330			6794			7261			8061			8573			9057			9605

REINFORCING QUANTITIES SHOWN ARE BASED ON 45° SKEW BID LENGTHS.

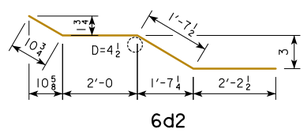
BENT BAR DETAILS



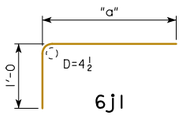
4c4 & 4c5



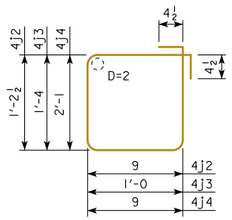
6c2 & 6c3



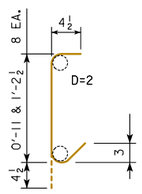
6d2



6j1



4j2, 4j3, 4j4



4t1

6j1 BARS		
BRIDGE	"a"	LENGTH
70'	3'-6	4'-6
80'	3'-7	4'-7
90'	3'-8	4'-8
100'	3'-9	4'-9
110'	3'-10	4'-10
120'	3'-11	4'-11
130'	4'-1	5'-1
140'	4'-2	5'-2
150'	4'-3	5'-3

NOTE: ALL DIMENSIONS ARE OUT TO OUT.
D = PIN DIAMETER

CONCRETE PLACEMENT QUANTITIES

NOTE: THESE VALUES TO BE USED FOR ALL SKEWS.

BRIDGE LENGTH	70'-0	80'-0	90'-0	100'-0	110'-0	120'-0	130'-0	140'-0	150'-0
*STANDARD SECTION CU. YDS.	12.2	14.0	15.7	17.4	19.1	21.0	22.7	24.4	26.0
END SECTION 4 @ 0.687 CU. YDS.	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
TOTAL CU. YDS.	15.0	16.8	18.5	20.2	21.9	23.8	25.5	27.2	28.8

* CONCRETE QUANTITIES SHOWN ARE BASED ON 45° SKEW BID LENGTHS.

CONCRETE OPEN RAIL QUANTITIES

BRIDGE LENGTH		UNIT	70'-0	80'-0	90'-0	100'-0	110'-0	120'-0	130'-0	140'-0	150'-0
CONCRETE OPEN RAILING, TL-4	0° SKEW	L.F.	162.0	182.0	202.0	222.0	242.0	262.0	282.0	302.0	322.0
CONCRETE OPEN RAILING, TL-4	15° SKEW	L.F.	162.2	182.2	202.2	222.2	242.2	262.2	282.2	302.2	322.2
CONCRETE OPEN RAILING, TL-4	30° SKEW	L.F.	162.9	182.9	202.9	222.9	242.9	262.9	282.9	302.9	322.9
CONCRETE OPEN RAILING, TL-4	45° SKEW	L.F.	164.5	184.5	204.5	224.5	244.5	264.5	284.5	304.5	324.5

OPEN RAIL NOTES:

MINIMUM CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2" UNLESS OTHERWISE NOTED OR SHOWN.

COST OF THE JOINT SEALER AND BOND BREAKER SHALL BE CONSIDERED INCIDENTAL TO OTHER CONSTRUCTION.

THE CONCRETE OPEN RAIL IS TO BE BID ON A LINEAL FOOT BASIS MEASURED FROM END TO END OF RAIL. THE NUMBER OF LINEAL FEET OF OPEN RAIL INSTALLED WILL BE PAID FOR AT THE CONTRACT PRICE PER LINEAL FOOT. PRICE BID FOR "CONCRETE OPEN RAILING, TL-4" SHALL BE FULL COMPENSATION FOR FURNISHING ALL MATERIAL, EXCLUDING REINFORCING STEEL, AND ALL OF THE EQUIPMENT AND LABOR REQUIRED TO CONSTRUCT THE RAIL IN ACCORDANCE WITH THESE PLANS AND CURRENT SPECIFICATIONS.

ALL OPEN RAIL CONCRETE IS TO BE CLASS C.

ALL REINFORCING STEEL SHALL BE EPOXY COATED.

THE JOINT SEALER SHALL BE LIGHT GRAY NONSAG LATEX CAULKING SEALER MARKETED FOR OUTDOOR USE. NO TESTING OR CERTIFICATION IS REQUIRED.

TOP OF THE OPEN RAIL IS TO BE PARALLEL TO THEORETICAL ℄ GRADE.

IF CONDUIT IS REQUIRED IN THIS PLAN THE RIGID STEEL CONDUIT, JUNCTION BOXES AND FITTINGS INCLUDING LABOR AND ANY ADDITIONAL WORK TO DO THE INSTALLATION IS CONSIDERED INCIDENTAL TO THE COST OF THE RAILING.

REVISED 07-09 - NUMBER OF 6d1 & 6d2 BARS CHANGED AND IS REFLECTED IN THE WEIGHT CHANGES.
REVISED 07-2016 - REMOVED OPEN RAIL NOTE STATING "ALL OPEN RAIL REINFORCING STEEL IS TO BE INCLUDED WITH THE SUPERSTRUCTURE REINFORCING STEEL."

07-2016 LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

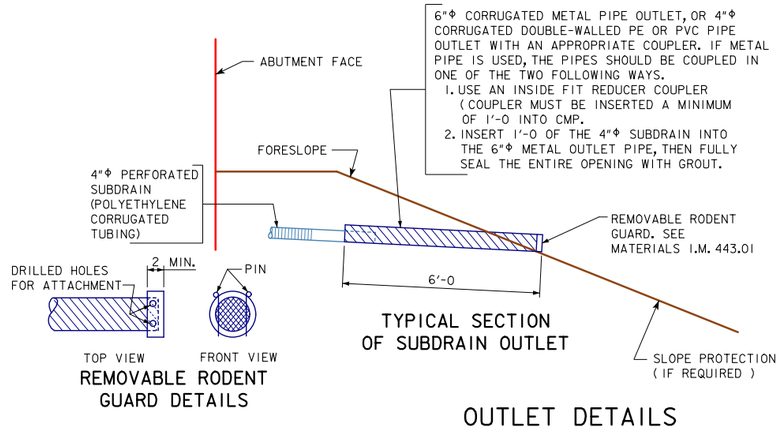
CONTINUOUS CONCRETE SLAB BRIDGES

NOVEMBER, 2006

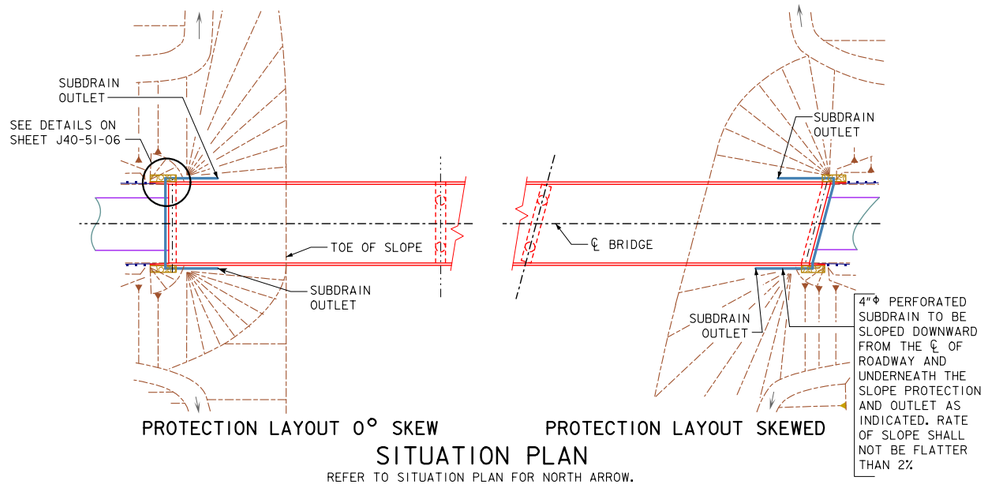
OPEN RAIL DETAILS (TL-4)

J40-49-06

8/23/2016 2:23:15 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-49-06 11x17_pdf.pltcfg



OUTLET DETAILS



SITUATION PLAN

REFER TO SITUATION PLAN FOR NORTH ARROW.

REVISED 11-08 - REMOVED GRANULAR BACKFILL DETAILS.

11-08
LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

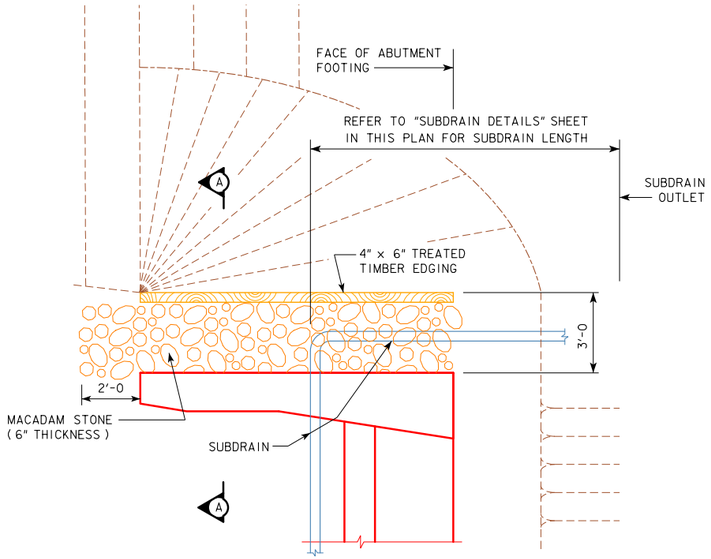
STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

CONTINUOUS CONCRETE SLAB BRIDGES

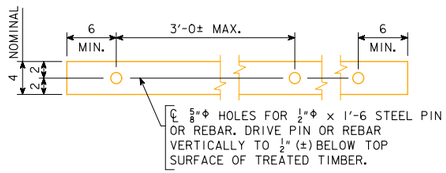
NOVEMBER, 2006

SUBDRAIN DETAILS | J40-50-06

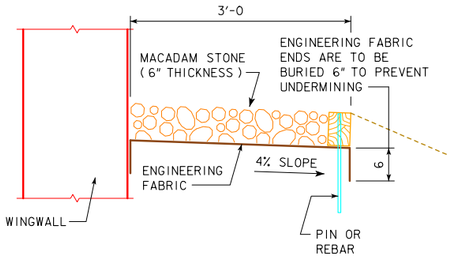
8/23/2016 2:23:17 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-50-06 11x17_pdf.pltcfg



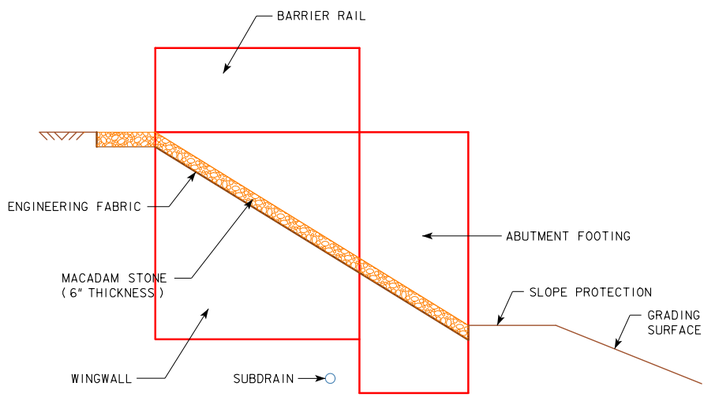
TOP VIEW OF WING ARMORING



4" x 6" TREATED TIMBER EDGING DETAILS



SECTION A-A



PROFILE VIEW OF WING ARMORING

SUBDRAIN NOTES:

SEE J40-50-06 AND "SITUATION PLAN" SHEETS FOR DETAILS OF PLACING ALL SUBDRAINS AND SUBDRAIN OUTLETS REQUIRED FOR THIS STRUCTURE.

THE BRIDGE CONTRACTOR IS TO INSTALL SUBDRAINS BEHIND THE ABUTMENT. THE SUBDRAINS SHALL BE 4" IN DIAMETER AND BE IN ACCORDANCE WITH ARTICLE 4143.01, B, OF THE STANDARD SPECIFICATIONS. THE SUBDRAIN OUTLET SHALL CONSIST OF A 6'-0 LENGTH OF PIPE WITH A REMOVABLE RODENT GUARD.

THE DIMENSIONS SHOWN FOR THE PROPOSED SUBDRAINS ARE BASED ON THE PROPOSED GRADING LAYOUT OF BRIDGE BERMS. THE DIMENSIONS SHOWN ARE FOR ESTIMATING ONLY. REQUIRED LENGTHS AND GENERAL LOCATIONS OF SUBDRAINS ARE SUBJECT TO CHANGE DUE TO FIELD ADJUSTMENTS OF THE GRADING LAYOUT.

THE COST OF FURNISHING AND PLACING SUBDRAIN (INCLUDING EXCAVATION), GRANULAR BACKFILL, POROUS BACKFILL, AND SUBDRAIN OUTLET IS TO BE INCLUDED IN THE PRICE BID FOR "STRUCTURAL CONCRETE (BRIDGE)". NO EXTRA PAYMENT WILL BE MADE.

MACADAM STONE WING ARMORING NOTES:

MACADAM STONE SHALL BE PLACED ALONG THE SIDE OF THE WING AND ABUTMENT FOOTING. THIS IS TYPICAL AT EACH CORNER OF THE BRIDGE UNLESS OTHERWISE NOTED IN THE PLANS. THE MACADAM STONE AT THESE LOCATIONS SHALL BE UNDERLAYED WITH ENGINEERING FABRIC AND BE IN ACCORDANCE WITH ARTICLE 4196.01, B, 3, OF THE STANDARD SPECIFICATIONS.

THE BRIDGE BERM FORESLOPE SHALL BE COMPACTED AND SHAPED AS SHOWN ON THESE PLANS, THE SITUATION PLAN AND AS DIRECTED BY THE ENGINEER. THE BERM FORESLOPE SHALL BE FIRM WHEN THE ENGINEERING FABRIC AND MACADAM STONE ARE PLACED.

THE ENGINEERING FABRIC SHALL BE IN ACCORDANCE WITH ARTICLE 4196.01, B, 3, OF THE STANDARD SPECIFICATIONS. IF THE ENGINEERING FABRIC IS LAPPED THE LAPS SHALL BE A MINIMUM OF ONE FOOT IN LENGTH, SHINGLE FASHION WITH UP SLOPE LAP PIECE ON TOP AND STAPLED FOR CONTINUITY.

THE MACADAM STONE SHALL BE IN ACCORDANCE WITH ARTICLE 4122.02, OF THE STANDARD SPECIFICATIONS FOR COARSE MATERIAL (NO CHOKE STONE IS ALLOWED).

WOOD PRESERVATIVE TREATMENT FOR THE TIMBER EDGING SHALL MEET THE REQUIREMENTS FOR GUARDRAIL POSTS, SAWED FOUR SIDES, AND BE IN ACCORDANCE WITH SECTION 4161, OF THE STANDARD SPECIFICATIONS.

THE MACADAM STONE SHALL BE DEPOSITED, SPREAD, CONSOLIDATED AND SHAPED BY MECHANICAL OR HAND METHODS THAT WILL PROVIDE UNIFORM DEPTH AND DENSITY AND PROVIDE UNIFORM SURFACE APPEARANCE.

PAYMENT FOR THE BRIDGE WING ARMORING SHALL BE INCIDENTAL TO THE BID ITEM "STRUCTURAL CONCRETE (BRIDGE)" AND SHALL INCLUDE COSTS OF ALL MATERIAL AND LABOR TO CONSTRUCT THE WING ARMORING AS SHOWN ON THESE PLANS.

REVISED 09-14 - THE AREA OF MACADAM STONE WAS EXTENDED 2'-0 IN FRONT OF THE BRIDGE WING.

09-14 LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWA DOT Highway Division

STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

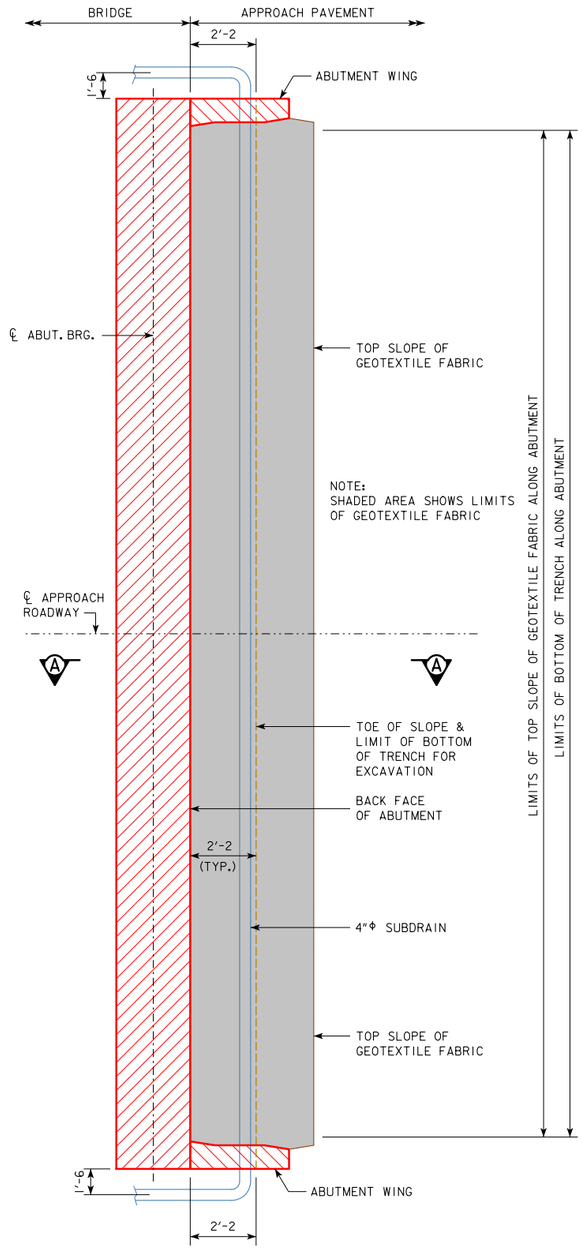
CONTINUOUS CONCRETE SLAB BRIDGES

NOVEMBER, 2006

WING ARMORING DETAILS

J40-51-06

8/23/2016 2:23:18 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-51-06 11x17_pdf.pltcfg



ABUTMENT PLAN

ABUTMENT BACKFILL PROCESS:

THE BASE OF THE EXCAVATION SUBGRADE BEHIND THE ABUTMENT IS TO BE GRADED WITH A 4% SLOPE AWAY FROM THE ABUTMENT FOOTING AND A 2% CROSS SLOPE IN THE DIRECTION OF THE SUBDRAIN OUTLET. THIS EXCAVATION SHAPING IS TO BE DONE PRIOR TO BEGINNING INSTALLATION OF THE GEOTEXTILE AND BACKFILL MATERIAL.

AFTER THE SUBGRADE HAS BEEN SHAPED, THE GEOTEXTILE FABRIC SHALL BE INSTALLED IN ACCORDANCE WITH THE DETAILS SHOWN. THE FABRIC IS INTENDED TO BE INSTALLED IN THE BASE OF THE EXCAVATION AND EXTENDED VERTICALLY UP THE ABUTMENT BACKWALL, ABUTMENT WING WALLS, AND EXCAVATION FACE TO A HEIGHT THAT WILL BE APPROXIMATELY 1 TO 2 FOOT HIGHER THAN THE HEIGHT OF THE POROUS BACKFILL PLACEMENT AS SHOWN IN THE "BACKFILL DETAILS" ON THIS SHEET. THE STRIPS OF THE FABRIC PLACED SHALL OVERLAP APPROXIMATELY 1 FOOT AND SHALL BE PINNED IN PLACE. THE FABRIC SHALL BE ATTACHED TO THE ABUTMENT BY USING LATH FOLDED IN THE FABRIC AND SECURED TO THE CONCRETE WITH SHALLOW CONCRETE NAILS. THE FABRIC PLACED AGAINST THE EXCAVATION FACE SHALL BE PINNED.

WHEN THE FABRIC IS IN PLACE, THE SUBDRAIN SHALL BE INSTALLED DIRECTLY ON THE FABRIC AT THE TOE OF THE REAR EXCAVATION SLOPE. A SLOT WILL NEED TO BE CUT IN THE FABRIC AT THE POINT WHERE THE SUBDRAIN EXITS THE FABRIC NEAR THE END OF THE ABUTMENT WING WALL.

POROUS BACKFILL IS THEN PLACED AND LEVELED, NO COMPACTION IS REQUIRED.

THE REMAINING WORK INVOLVES BACKFILLING WITH FLOODABLE BACKFILL, SURFACE FLOODING, AND VIBRATORY COMPACTION. THE FLOODABLE BACKFILL MATERIAL SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS. THE FLOODABLE BACKFILL SHALL BE PLACED IN INDIVIDUAL LIFTS, SURFACE FLOODED, AND COMPACTED WITH VIBRATORY COMPACTION TO ENSURE FULL CONSOLIDATION. LIMIT THE LOOSE LIFTS TO NO MORE THAN 2 FEET OF THICKNESS.

START SURFACE FLOODING FOR EACH FLOODABLE BACKFILL LIFT AT THE HIGH POINT OF THE SUBDRAIN AND PROGRESS TO THE LOW POINT WHERE THE SUBDRAIN EXITS THE FABRIC. TO ENSURE UNIFORM SURFACE FLOODING, WATER RUNNING FULL IN A 2-INCH DIAMETER HOSE SHOULD BE SPRAYED IN SUCCESSIVE 6-FOOT TO 8-FOOT INCREMENTS FOR 5 MINUTES WITHIN EACH INCREMENT.

FLOODABLE BACKFILL LIFT PLACEMENT, FLOODING, AND COMPACTION SHALL PROGRESS UNTIL THE REQUIRED FULL THICKNESS OF THE ABUTMENT BACKFILL HAS BEEN COMPLETED.

WATER REQUIRED FOR FLOODING, SUBDRAINS, POROUS BACKFILL, FLOODABLE BACKFILL, AND GEOTEXTILE FABRIC FURNISHED AT THE BRIDGE ABUTMENTS WILL NOT BE MEASURED SEPARATELY FOR PAYMENT.

THE COST OF WATER REQUIRED FOR FLOODING, SUBDRAINS, POROUS BACKFILL, FLOODABLE BACKFILL, AND GEOTEXTILE FABRIC FURNISHED AT THE BRIDGE ABUTMENTS SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE BID FOR STRUCTURAL CONCRETE.

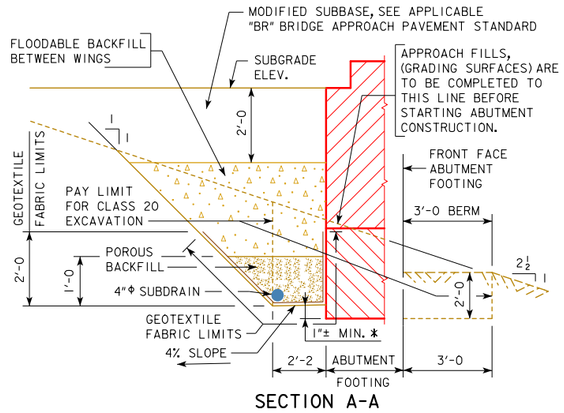
NOTE:
SEE SUBDRAIN DETAILS SHEET FOR DETAILS NOT SHOWN ON THIS SHEET WHICH ARE PERTINENT TO THIS STRUCTURE.

NOTE:

SUBDRAIN SHALL SLOPE DOWNWARD 2% FROM ℄ APPROACH ROADWAY WHEN OUTLETTING BOTH SIDES OF THE ABUTMENT.

SUBDRAIN SHALL SLOPE DOWNWARD 2% FROM HIGH END WHEN OUTLETTING AT ONE END OF THE ABUTMENT.

THE GEOTEXTILE FABRIC SHALL BE IN ACCORDANCE WITH ARTICLE 4196.01, B, 6 OF THE STANDARD SPECIFICATIONS. IF THE ENGINEERING FABRIC IS LAPPED THE LAPS SHALL BE A MINIMUM OF ONE FOOT IN LENGTH, SHINGLE FASHION WITH UP SLOPE LAP PIECE ON TOP AND STAPLED FOR CONTINUITY.



SECTION A-A

BACKFILL DETAILS

NOTE: GEOTEXTILE FABRIC WILL BE ATTACHED TO FACE OF ABUTMENT FOOTING AND WINGS.

* DIMENSION VARIES DUE TO 2% SUBDRAIN SLOPE.

REVISED 09-14 - THE TECHNICAL DATA INFORMATION TABLE WAS REMOVED AND A NOTE ADDED TO REFER TO THE STANDARDS SPECIFICATIONS FOR THIS INFORMATION.
REVISED 07-2016 - CHANGED THE BRIDGE APPROACH PAVEMENT STANDARD TO "BR" (WAS "RK").

07-2016 LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWA DOT Highway Division

STANDARD DESIGN - 40' ROADWAY, 3 SPAN BRIDGES

CONTINUOUS CONCRETE SLAB BRIDGES

DECEMBER, 2008

ABUTMENT BACKFILL DETAILS FOR 0° SKEWS

J40-52-06

8/23/2016 2:23:20 PM bkloss W:\Highway\Bridge\MethodsSection\CADD Concept Drafts\J40-06.dgn J40-52-06 11x17_pdf.pltcfg

TYPICAL CROSS SECTIONS SUBTITLE

TYPICAL CROSS SECTIONS SUBTITLE

TYPICAL CROSS SECTIONS SUBTITLE

TYPICAL CROSS SECTIONS SUBTITLE

TYPICAL CROSS SECTIONS SUBTITLE