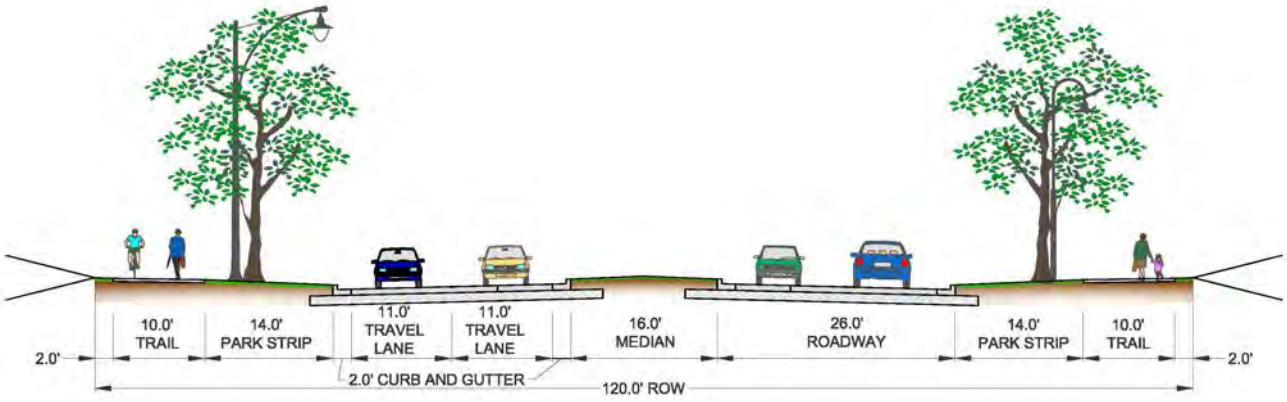
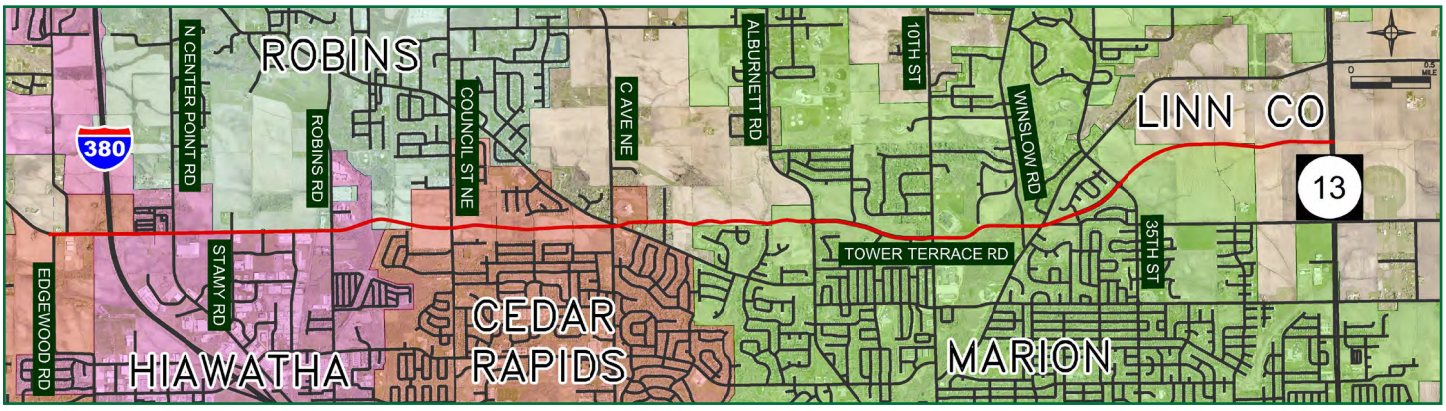
Hiawatha • Robins • Cedar Rapids • Linn County • Marion • Iowa DOT

Tower Terrace Road

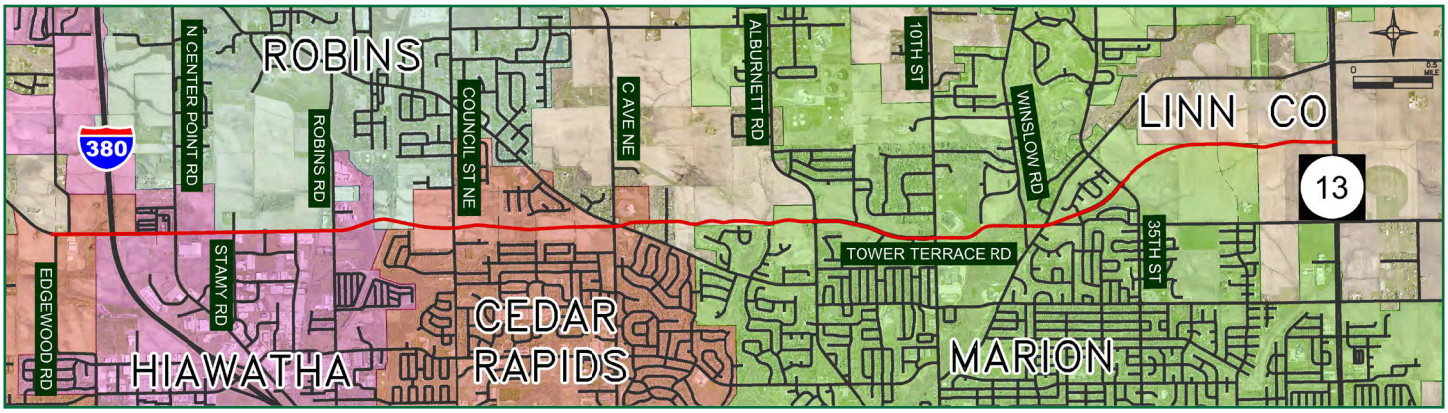
Corridor Management Plan Update

Updated March 2019





Prepared for Corridor MPO by Anderson Bogert



ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

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 the time of this update, the City of Marion has the longest completed Tower Terrace Road segments that follow the 2010 Corridor Management Plan concept.

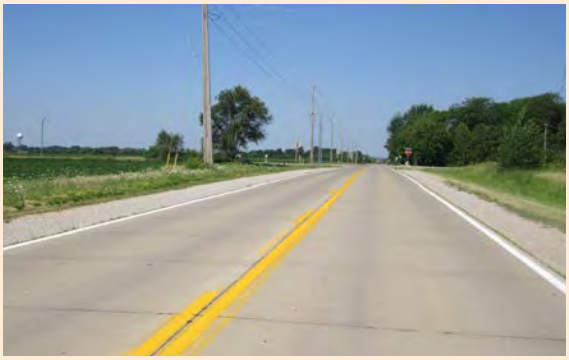

FIGURE 1: Existing Segment of Tower Terrace Road in Hiawatha/Robins, 2018. Aerial: Linn County, 2017

FIGURE 2: Existing Segment of Tower Terrace Road in Marion, near 10th Street, 2018.
Aerial: Linn County, 2017; Photo: City of Marion, 2018

INTRODUCTION

More recently, an interchange at I-380 and Tower Terrace Road is in the 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.

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 principles 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 (*meeting minutes of each Advisory Group meeting are in the Appendix*). Then, one-on-one meetings were held with each of the Advisory Group members to identify issues and concerns unique to each jurisdiction. A draft plan was submitted and was the focus of the third Advisory Group meeting. A public information meeting was held to present the plan and help finalize the process, followed by a fourth Advisory Group meeting. After the fourth meeting, separate outreach from this plan update was completed by the Iowa DOT for the I-380 and Tower Terrace Road interchange. Additional decisions by the Advisory Group and Corridor MPO followed that outreach, and the final, updated Tower Terrace Road Corridor Management Plan Update was completed. Figure 6 is a flow chart showing the course of plan update development.

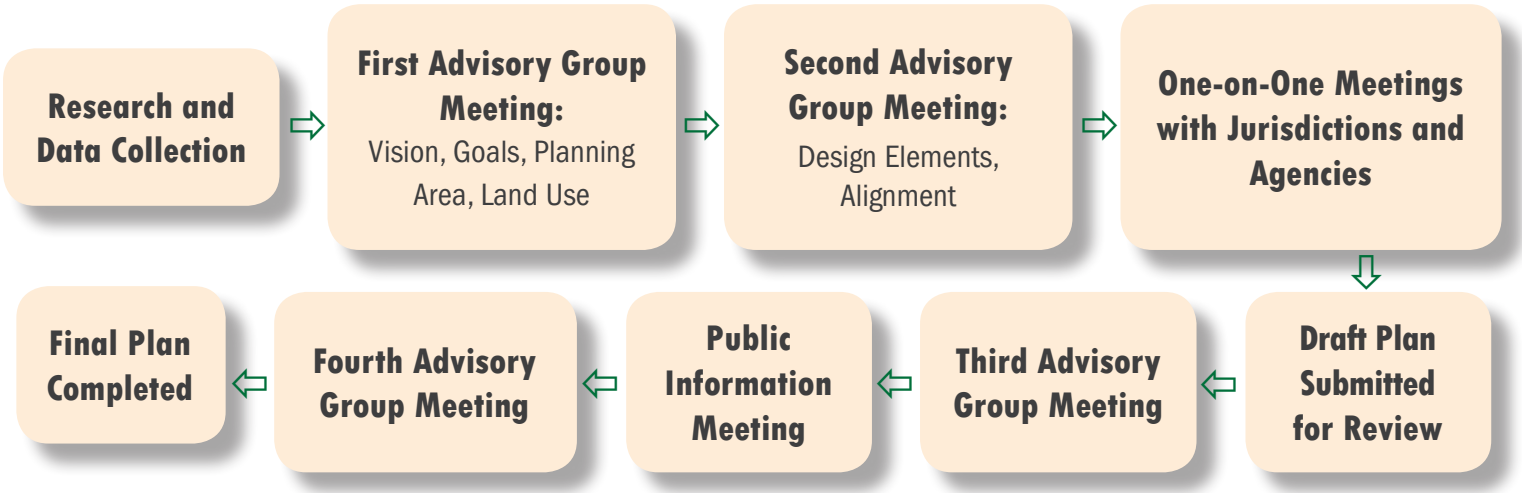

FIGURE 6: Flow Chart of Plan Update Development

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 Management 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 green space 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

PREVIOUS PUBLIC INVOLVEMENT

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 part of the 2010 plan, an Advisory Group met 15 times over a two-year period to discuss the planning process, fundamental design parameters, and plan implementation.

ADVISORY GROUP MEETINGS

For this plan update, an Advisory Group was again formed and comprised of jurisdictions and agencies along the corridor. This new Advisory Group met four times to guide the update to the Tower Terrace Road Corridor Management Plan. Meeting minutes are included in the Appendix.

JURSIDICTION AND AGENCY MEETINGS

Outside of Advisory Group meetings, individual meetings were held with jurisdictions and agencies along the corridor to help inform this plan update. These meetings included key staff from the jurisdiction/agency, as well as staff from the Corridor MPO and consultant. At these meetings, key issues related to the corridor were discussed. These meetings are summarized in the following paragraphs, as well as how the plan update was modified by these meetings.

CITY OF CEDAR RAPIDS

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). Additionally, the City of Cedar Rapids desires to light the corridor from the median, and lighting options are included in the Design section of this update.

CITY OF HIAWATHA

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 would like to consider North Center Point Road and Tower Terrace Road as a potential location for a roundabout, which is shown as an potential option in this update. Additionally, 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. In the future, an additional right-in/right-out access may be considered between North Center Point Road and Stamy Road, and Commerce

DESIGN

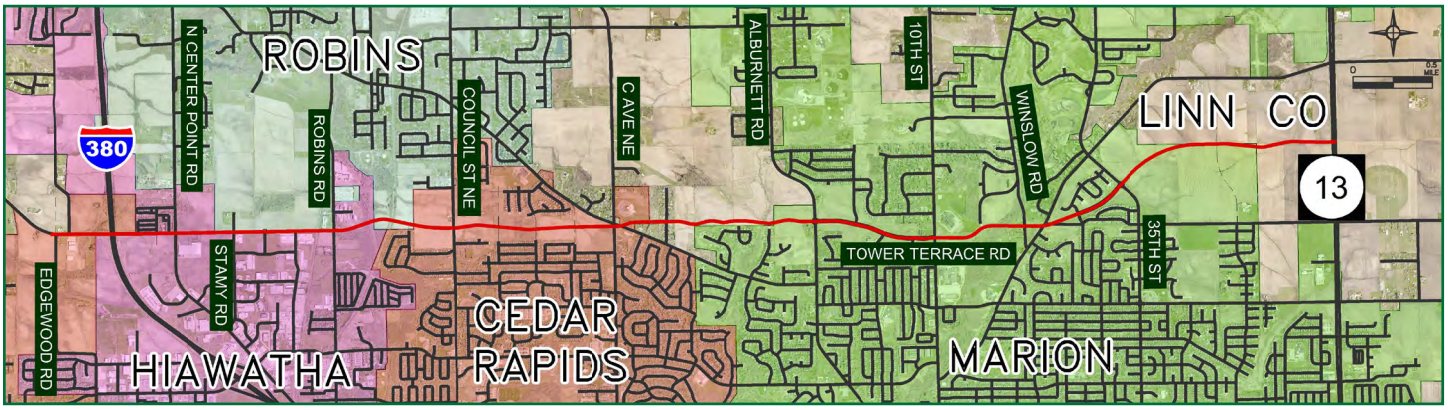

FIGURE 8: Tower Terrace Road Overview Map; Aerial: Linn County, 2018

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 renamed 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

Two additional conflict points were identified in this update:

- I-380 and Tower Terrace Road Trail Crossing
- Cedar Valley Nature Trail conflict with Tower Terrace Road

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.

DESIGN

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*).

Of note, during the design phase, the City of Robins would like to explore a five-legged roundabout at C Avenue and Tower Terrace Road to connect East Main to the roundabout.

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.

DESIGN

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.

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 sidepaths 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*).

I-380 and Tower Terrace Road Trail Crossing

As the I-380 and Tower Terrace Road interchange design progressed, an at-grade, signalized option for the trail crossing was developed. Safety data shows this is a viable alternative to a grade-separated option. At the time of this update, an at-grade, signalized option was planned for the interchange *(see Appendix)*.

Cedar Valley Nature Trail Conflict with Tower Terrace Road

As noted by the City of Hiawatha and this update, the portion of Tower Terrace Road is in good condition where the Cedar Valley Nature Trail crosses the roadway at grade. At such time as to when that portion of Tower Terrace Road is reconstructed, a grade-separated crossing or underpass should be considered.

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 image 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.

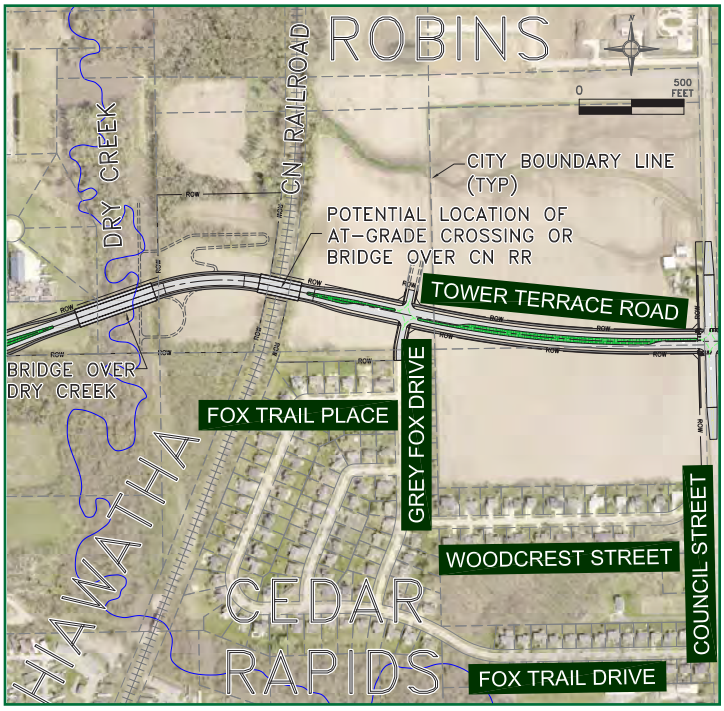

FIGURE 9: Tower Terrace Road at Grey Fox Drive; Aerial: Linn County, 2018

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.

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 above estimate 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., as required by the Canadian National Railway. 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 23*):

- USDOT Recommended Hourly Value of Travel Time Savings (VTTS) – All Purpose Trips: $14.10 per hour, adjusted to $22.39 per 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 25.

Using the findings from the delay savings analysis, the bridge over Canadian National Railway is the lower cost alternative. Also, there would be 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.

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.

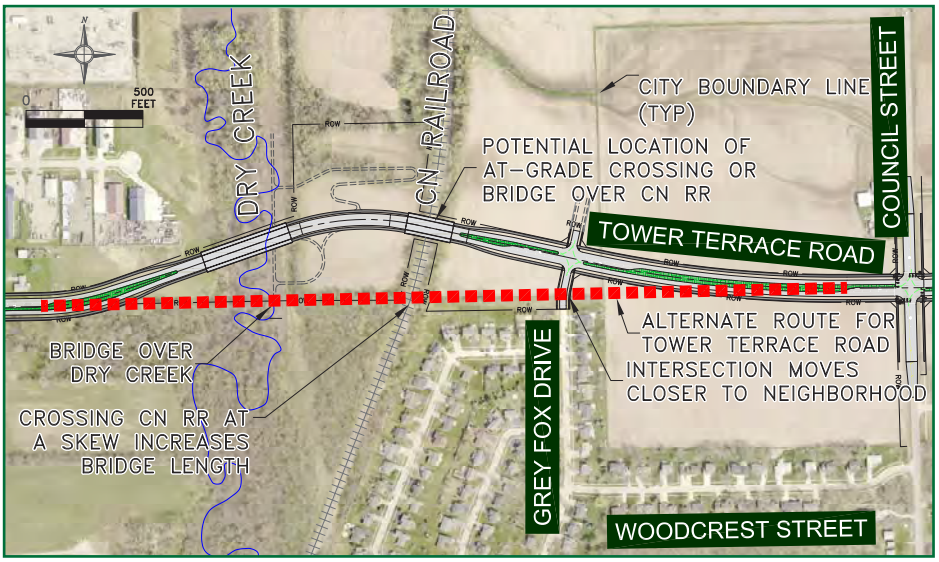

FIGURE 10: Tower Terrace Road Alternative Alignment at Railroad Crossing; Aerial: Linn County, 2018

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 of Straight Alignment along Fox Trail Place in Cedar Rapids, 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.

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.

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

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

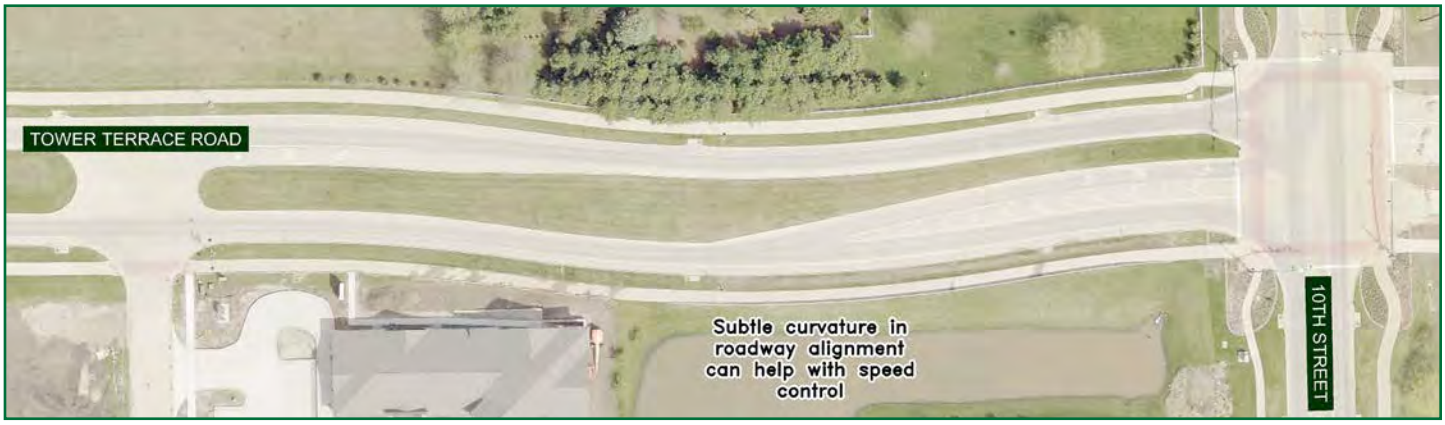

FIGURE 12: Tower Terrace Road, near 10th Street in Marion; Aerial: Linn County, 2018

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

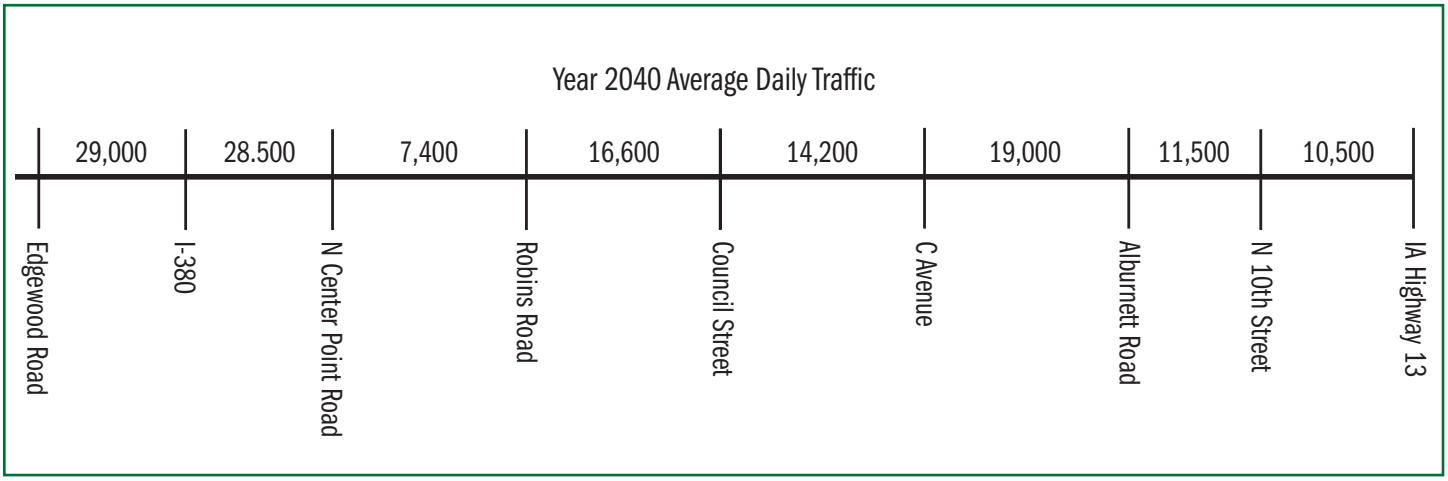

FIGURE 14: Estimated 2040 Traffic Volume Along Project Corridor; Sources: Corridor MPO Traffic Model and Iowa DOT Draft Interchange Justification Report (IJR) Traffic Projections

Traffic

Forecasted 2040 traffic volumes on Tower Terrace Road range from approximately 11,000 vehicles per day (near IA Highway 13) to nearly 30,000 vehicles per day at I-380. The bulk of the corridor (generally from North Center Point Road east to IA Highway 13) is approximately 7,500 vehicles per day to 15,000 vehicles per day.

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 upper 28,000 to 30,000 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 Demand Model and the Iowa DOT draft Interchange Justification Report (IJR) traffic projections.

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

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.

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

Roadway/Pedestrian Crossings

Analysis and best practices for traffic and design should be used for crossing Tower Terrace Road. For instance, where crossings are present, careful consideration should be given to at-grade, at-grade signalized, or grade-separated crossings. Crossings at the I-380 and Tower Terrace Road interchange were under design by the Iowa DOT at the time of this update. At the time of this update, at-grade, signalized crossings have been decided for the crossings at this location.

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 21*).

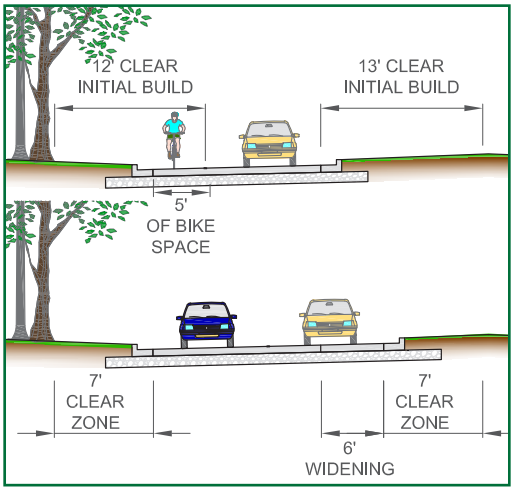

FIGURE 21: Clear Zone for Initial Build (top) and Full Build (bottom)

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 22 and Sheet D.23 in Appendix*). This is needed to transition between the existing Tower Terrace Road and the bridge to avoid replacing

FIGURE 22: Tower Terrace Road, near Winslow Road in Marion, 2018

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.

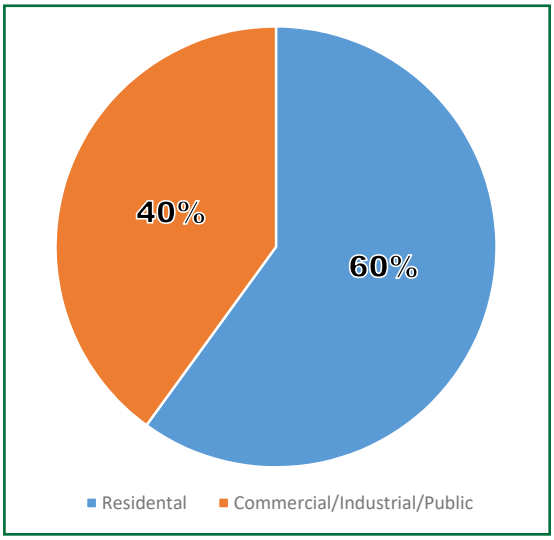

FIGURE 25: Future Land Use Chart

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.

The original and revised typical sections for the initial build are shown in Figure 26, located on page 34.

The original and revised typical sections for the full build are shown in Figure 27, located on page 35.

PROJECTS

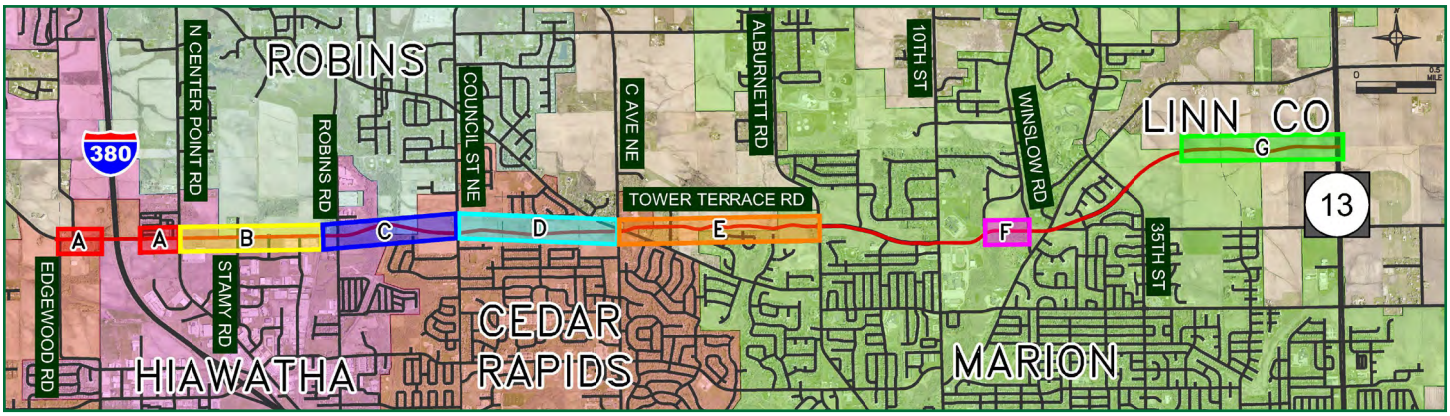

FIGURE 36: Overall Tower Terrace Road Environmental Review Region Map

CONSTRUCTION PROJECT LIMITS		
PROJECT NO.	**PROJECT LIMITS**	**ENVIRONMENTAL STUDY REGION**
A.1	Edgewood Road to W. edge of I-380 Interchange	A
-	I-380 Interchange (By Iowa DOT)	Independent Study by Iowa DOT
A.2	E. Edge of I-380 Interchange to Center Point Road	A
B.1	Center Point Road to Stamy Road	B
B.2	Stamy Road to Robins Road	B
C.1	Robins Road to Council Street (Bridges Over Dry Creek and Canadian National Railway)	C
D.1	Council Street to Turtle Run Extended	D
D.2	Turtle Run Extended to Summerset Extended	D
D.3	Summerset Extended to C Avenue	D
E.1	C Avenue to 900 Feet East of Meadowknolls Road	E
E.2	900 Feet East of Meadowknolls Road to 1/4 Mile West of Alburnett Road	E
E.3	1/4 Mile West of Alburnett Road	E
-	Alburnett Road to Relocated Winslow (Already Built)	Completed Outside Federal Aid
F.1	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
G.1	The Ridge at Indian Creek to One Mile West of Highway 13	G
G.2	One Mile West of IA Highway 13 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.

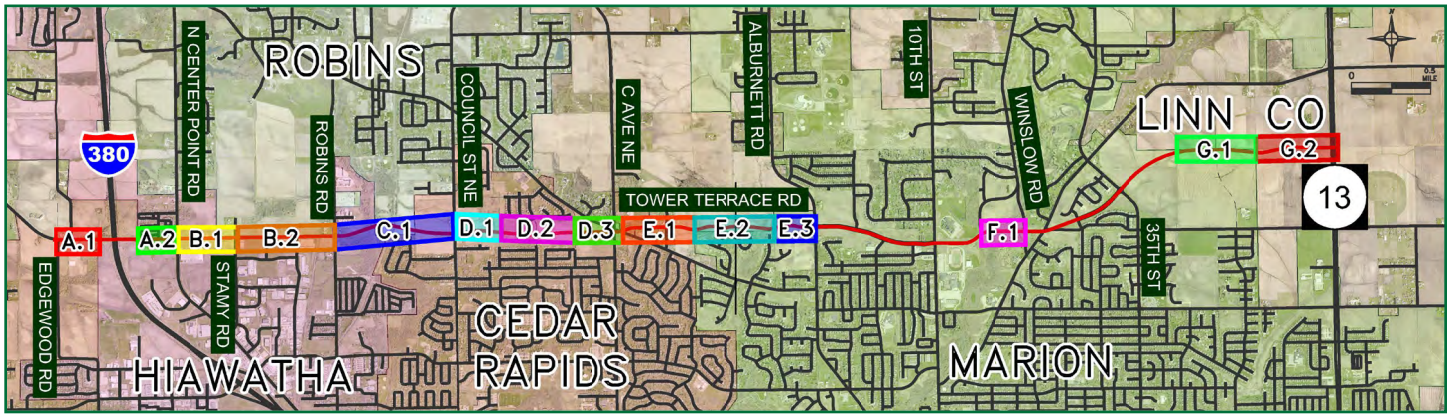

FIGURE 37: Overall Tower Terrace Road Project Phase Map

PROJECT PHASE AND JURISDICTIONAL COSTS					
PROJECT PHASE	COST				
	HIAWATHA	ROBINS	CEDAR RAPIDS	MARION	TOTAL
A.1			$8,191,924		$8,191,924
A.2	$4,323,020				$4,323,020
B.1	$2,430,068	$1,326,448			$3,756,516
B.2	$3,873,713	$3,410,278			$7,283,991
C.1	$8,984,227	$6,756,424	$4,709,633		$20,450,284
D.1			$3,197,771		$3,197,771
D.2			$5,055,268		$5,055,268
D.3			$6,193,316		$6,193,316
E.1			$4,333,555	$1,730,520	$6,064,075
E.2				$6,869,100	$6,869,100
E.3				$2,658,631	$2,658,631
F.1				$12,256,385	$12,256,385
G.1				$5,539,875	$5,539,875
G.2				$5,490,576	$5,490,576
TOTAL	**$19,611,028**	**$11,493,150**	**$31,681,467**	**$34,545,087**	**$97,330,732**

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.

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.

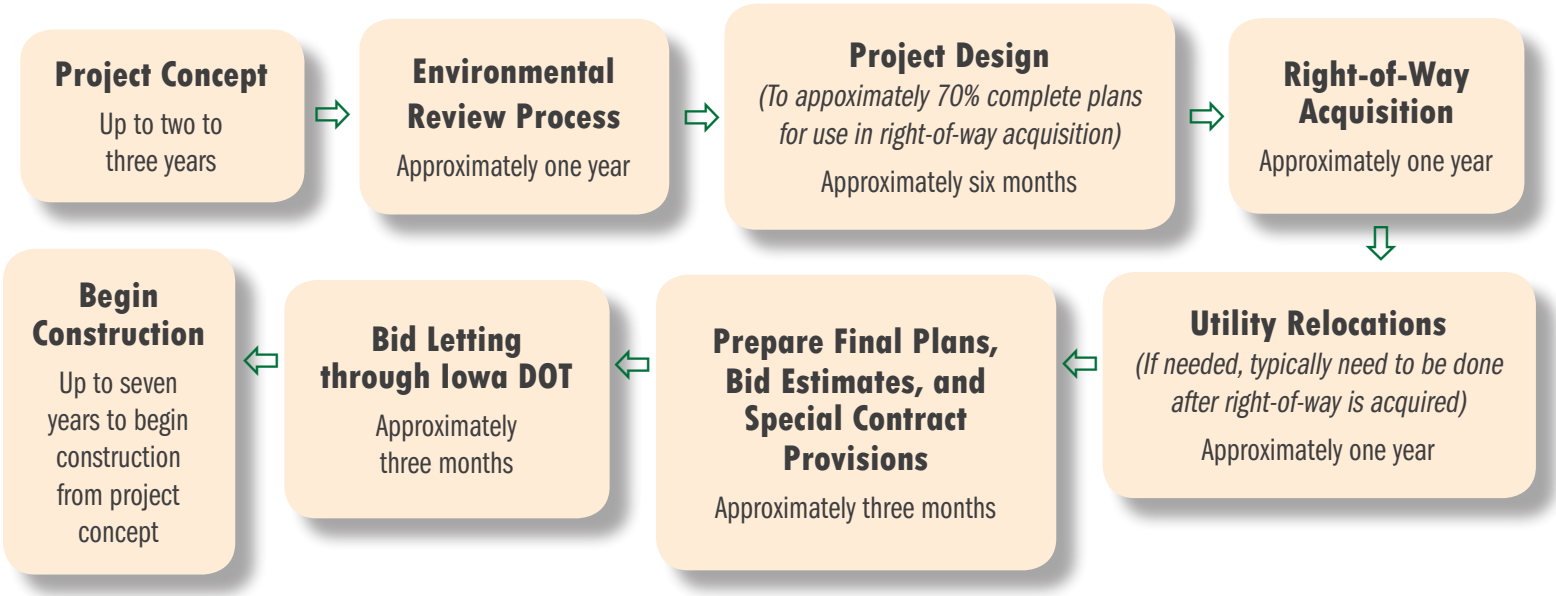

FIGURE 38: Flow Chart of a Typical Project Development Schedule After Funding is Received

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

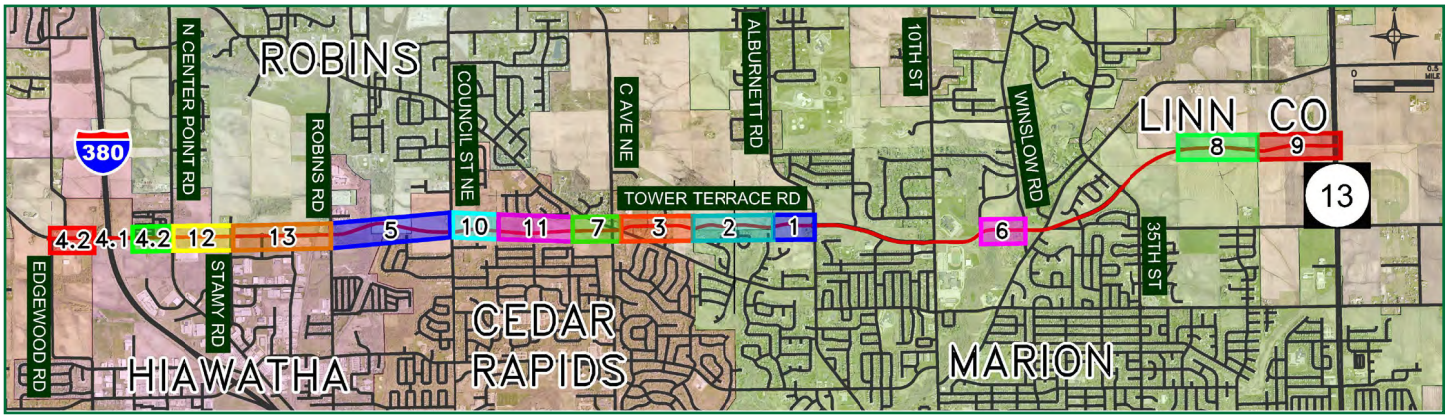

FIGURE 39: Overall Tower Terrace Road Construction Project Priorities Map

CONSTRUCTION PROJECT PRIORITIES			
PROJECT PHASE PRIORITY	**PROJECT PHASE**	**PROJECT PHASE LIMITS**	**COMMENTS**
1	E.3	1/4 Mile West of Alburnett Road	TIP Schedule 2019 Construction
2	E.2	900 Feet East of Meadowknolls Road to 1/4 Mile West of Alburnett Road	TIP Schedule 2019 Construction
3	E.1	C Avenue to 900 Feet East of Meadowknolls Road	TIP Schedule 2019 Construction
4.1	-	I-380 Interchange (By Iowa DOT)	2021 Construction
4.2	A.1	Edgewood Road to W. Edge of I-380 Interchange	Build with I-380 Interchange
4.2	A.2	E. Edge of I-380 Interchange to Center Point Road	Build with I-380 Interchange
5	C.1	Robins Road to Council Street (Bridges Over Dry Creek and Canadian National Railway)	7-8 year Design to Construction
6	F.1	Relocated Winslow to Existing Winslow (Bridge Over Indian Creek)	7-8 year Design to Construction
7	D.3	Summerset Extended to C Avenue	TIP Schedule 2020 Construction
8	G.1	The Ridge at Indian Creek to One Mile West of Highway 13	Schedule may be tied to development
9	G.2	One Mile West of IA Highway 13 to IA Highway 13	Schedule may be tied to development
10	D.1	Council Street to Turtle Run Extended	Schedule may be tied to development
11	D.2	Turtle Run Extended to Summerset Extended	Schedule may be tied to development
12	B.1	Center Point Road to Stamy Road	Pavement in good condition
13	B.2	Stamy Road to Robins Road	Pavement in good condition

TABLE 8: Overall Construction Project Priorites

PROJECTS

Project Priorities 1, 2, and 3

1/4 Mile West of Alburnett Road, 900 Feet East of Meadowknolls Road to 1/4 Mile West of Alburnett Road, and C Avenue to 900 Feet East of Meadowknolls Road

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 and 4.2

I-380 Interchange, Edgewood Road to W. Edge of 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 (Bridges Over Dry Creek and Canadian National Railway)

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 (Bridge Over Indian Creek)

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 One Mile West of Highway 13, One Mile West of IA Highway 13 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

SUMMARY OF PROJECT COSTS BY PROJECT AND JURISDICTION					
	All	HIAWATHA	ROBINS	CEDAR RAPIDS	MARION
Total Construction	$ 72,829,556	$14,446,335	$ 8,618,690	$ 23,424,550	$26,339,980
Engineering	$ 10,924,400	$ 2,167,000	$ 1,292,800	$ 3,513,600	$ 3,951,000
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	$ 6,553,000	$ 1,299,000	$ 776,000	$ 2,108,000	$ 2,370,000
Total Project Cost	**$ 97,330,732**	**$19,611,028**	**$11,493,149**	**$ 31,681,467**	**$34,545,088**
Federal Aid (or swap eligible)	$ 81,932,426	$17,114,513	$10,717,149	$ 24,436,816	$29,663,948
Assume 50% Grant	$ 40,966,213	$ 8,557,256	$ 5,358,575	$ 12,218,408	$14,831,974
Local Grant Match (50%)	$ 40,966,213	$ 8,557,256	$ 5,358,575	$ 12,218,408	$14,831,974
Non-Eligible Costs	$ 15,398,306	$ 2,496,515	$ 776,000	$ 7,244,651	$ 4,881,140
Total Local Funds	**$ 56,364,519**	**$11,053,771**	**$ 6,134,575**	**$ 19,463,059**	**$19,713,114**

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. The City of Robins is in support of this option.

A large project underway for Tower Terrance Road is the I-380 and Tower Terrace Road interchange, which will be funded by the Iowa DOT. Design of the interchange was underway at the time of this update by the Iowa DOT and their consultants and is planned as a diverging diamond interchange.

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 for our region.

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*	1/4 Mile West of 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*	900 Feet East of Meadowknolls Road to 1/4 Mile West of Alburnett Road	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 900 Feet East of Meadowknolls Road	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																							
				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
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						472						5,898								6,370
			Total Funds	-	-	-	-	-	772	500	500	750	564	-	5,898								**8,984**
			Construction												6,294								6,294
			Engineering						944														944
			ROW											681									681
			U/G Elec											500									500
			Const. Admin												566								566
			Total Cost	-	-	-	-	-	944	-	-	-	-	1,181	6,860								**8,984**
		Robins/ October, 2029	SWAP/FA						400	1,000	1,000	750	207										3,357
			Local						367						3,033								3,399
			Total Funds	-	-	-	-	-	767	1,000	1,000	750	207	-	3,033								**6,756**
			Construction												4,891								4,891
			Engineering						734														734
			ROW											692									692
			U/G Elec											-									-
			Const. Admin												440								440
			Total Cost	-	-	-	-	-	734	-	-	-	-	692	5,331								**6,756**
		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										741					3	5,971				6,715
			Total Funds	-	-	-	-	-	-	-	-	-	1,581	2,000	2,000	701	-	3	5,971				**12,256**
			Construction																9,879				9,879
			Engineering										1,482										1,482
			ROW															6					6
			U/G Elec															-					-
			Const. Admin																889				889
			Total Cost	-	-	-	-	-	-	-	-	-	1,482	-	-	-	-	6	10,768				**12,256**

TABLE 10: Cash Flow Diagram by Project; Iowa DOT Draft 2019-2022 Statewide Transportation Improvement Program - 50% 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	1/4 Mile West of Alburnett Road	Marion	50%	11/17/2019	1,753	906
			80%	11/17/2019	1,753	906
2	900 Feet East of Meadowknolls Road to 1/4 Mile West of Alburnett Road	Marion	50%	11/17/2019	3,671	3,198
			80%	11/17/2019	3,671	3,198
3	C Avenue to 900 Feet East of Meadowknolls Road	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	9,390	11,060
			80%	October, 2031	15,023	5,427
6	Relocated Winslow to Existing Winslow (Bridge Over Indian Creek)	Marion	50%	October, 2033	5,674	6,582
			80%	October, 2035	9,078	3,178
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 One Mile West of Highway 13	Marion	50%	October, 2036	2,425	3,115
			80%	October, 2040	3,880	1,660
9	One Mile West of IA Highway 13 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.

TABLE 12: Comparison of Project Timelines with 50% versus 80% Swap Funding

SEGMENT REVIEW SUMMARY

I-380 to Robins Road

This segment will tie into the interstate interchange being designed. Environmental issues include potential 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 are several potential historic structures within this segment that may or may not be directly affected. Two sites to note are the radio tower to the south of Tower Terrace Road and the mobile home park north of Tower Terrace Road that appears to have been established more than 50 years ago; these properties should be reviewed for potential historic significance. Iowa DOT is considering bike and pedestrian accommodations associated with the I-380/Tower Terrace interchange study; a future trail connection along Tower Terrace may be considered in future phases of development.

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 proposed trail, and 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

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relocations required for single-family residential homes. The wooded area along the riparian corridor is possible northern long-eared bat habitat.

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 an Indian Creek tributary and a proposed trail. 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, affects on historic sites, and other environmental impacts, as well as those with a high potential for controversy, 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.

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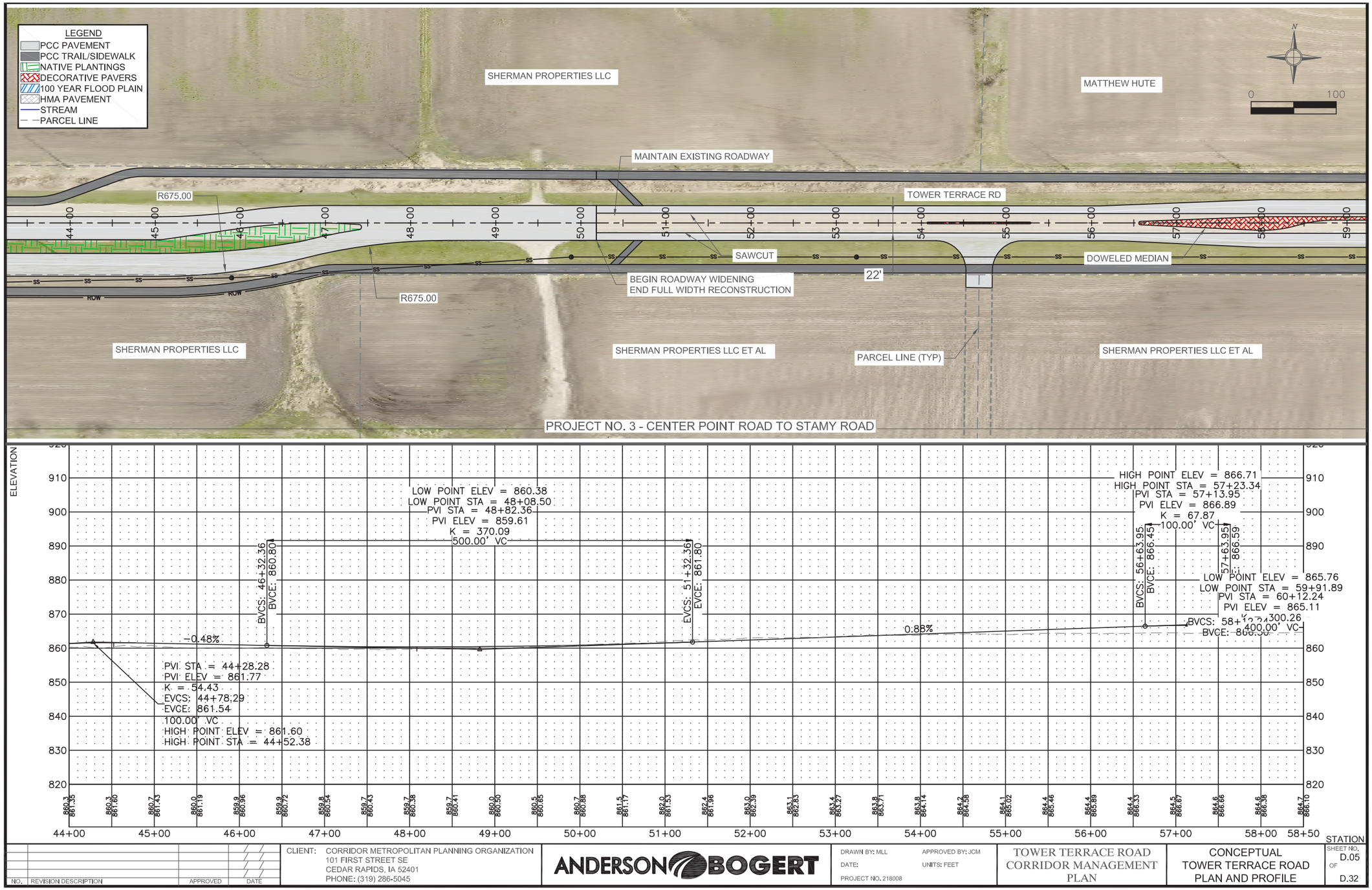
CONCEPTUAL PLAN AND PROFILE SHEETS CENTER POINT ROAD TO STAMY ROAD



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ANDERSON BOGERT

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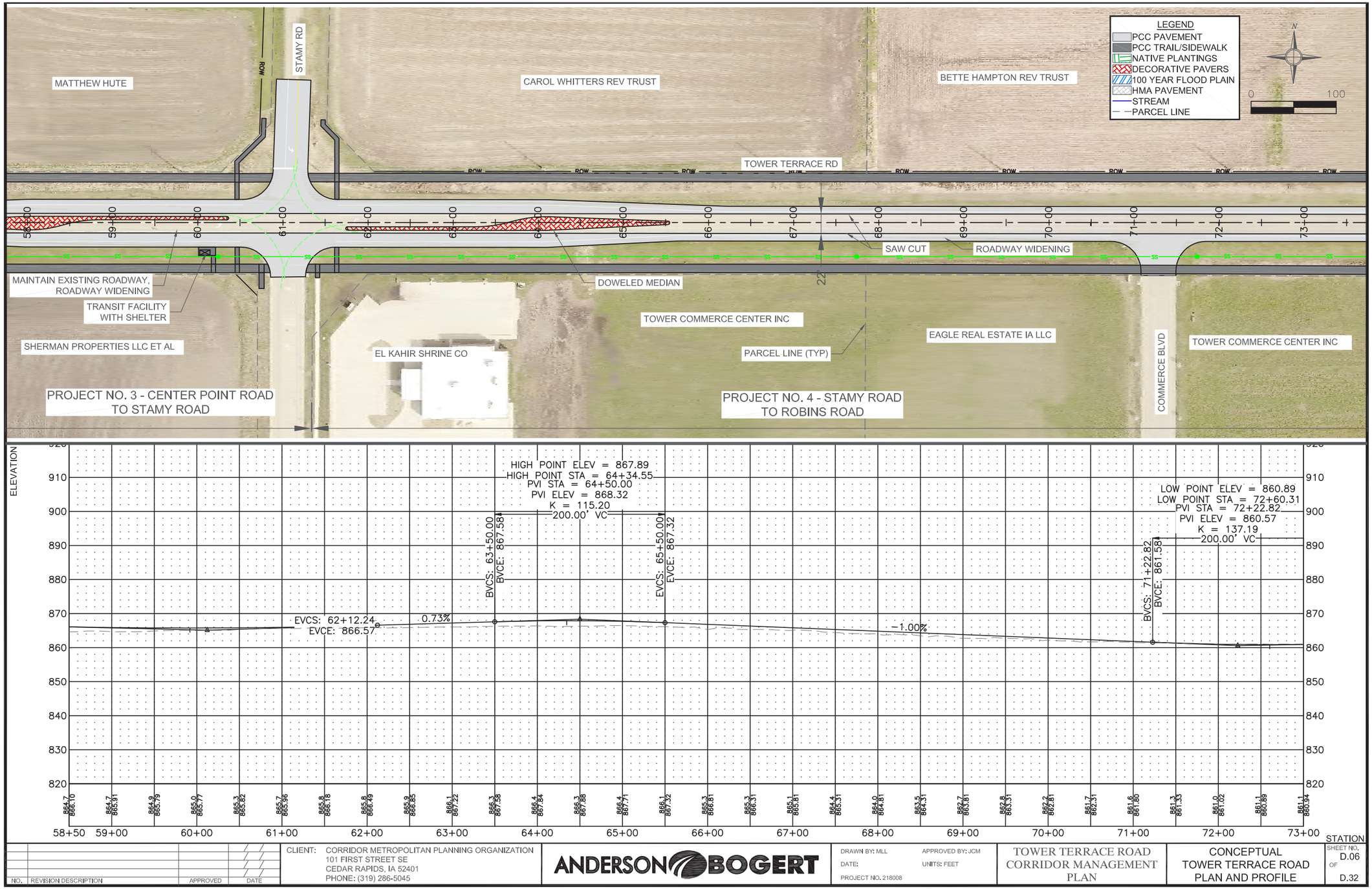
PROJECT NO. 218008

TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN

CONCEPTUAL TOWER TERRACE ROAD PLAN AND PROFILE

SHEET NO. D.05 OF D.32

CONCEPTUAL PLAN AND PROFILE SHEETS STAMY ROAD TO ROBINS ROAD



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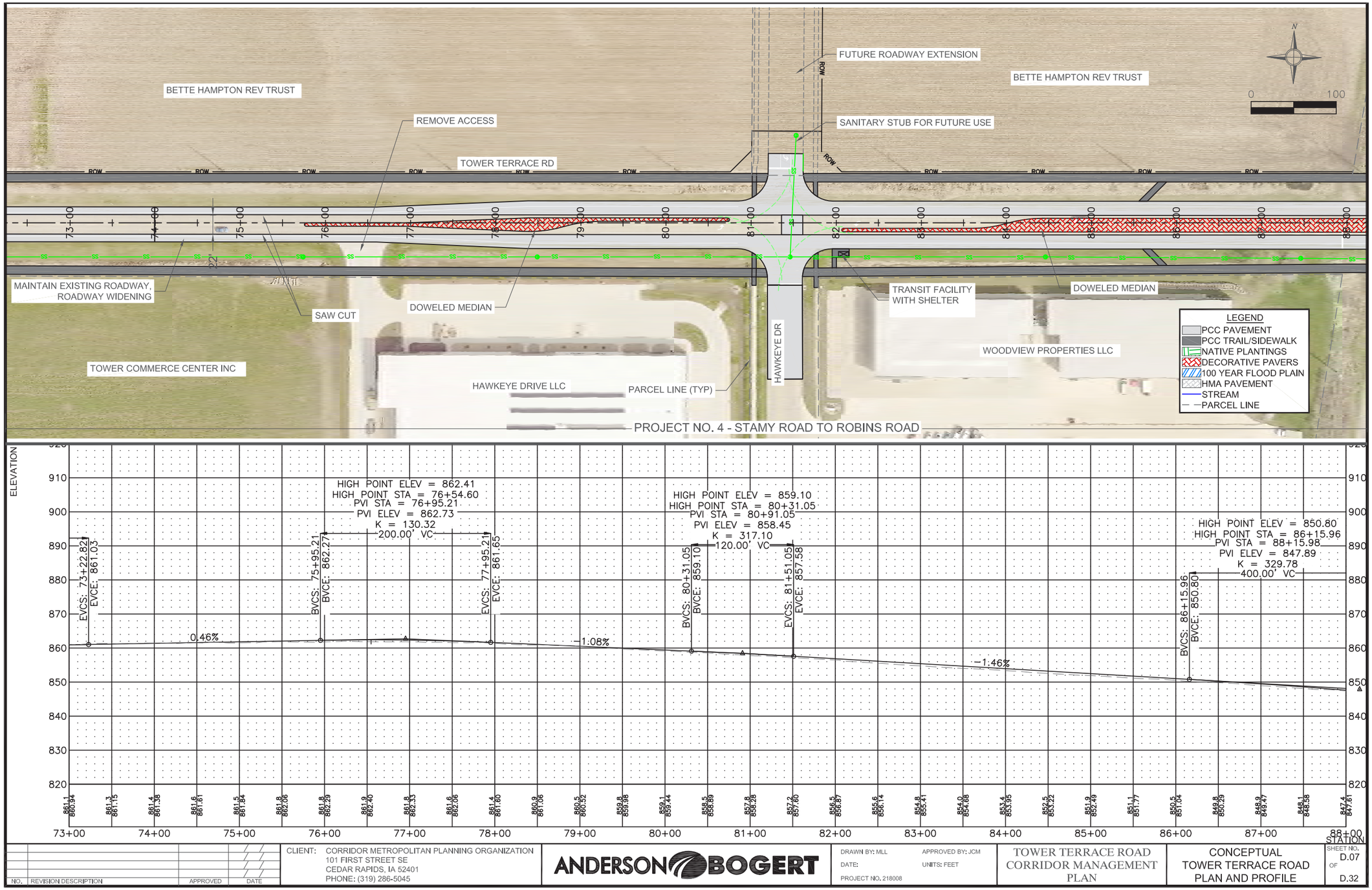
TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN

CONCEPTUAL
TOWER TERRACE ROAD
PLAN AND PROFILE

SHEET NO. D.06 OF D.32

CONCEPTUAL PLAN AND PROFILE SHEETS STAMY ROAD TO ROBINS ROAD



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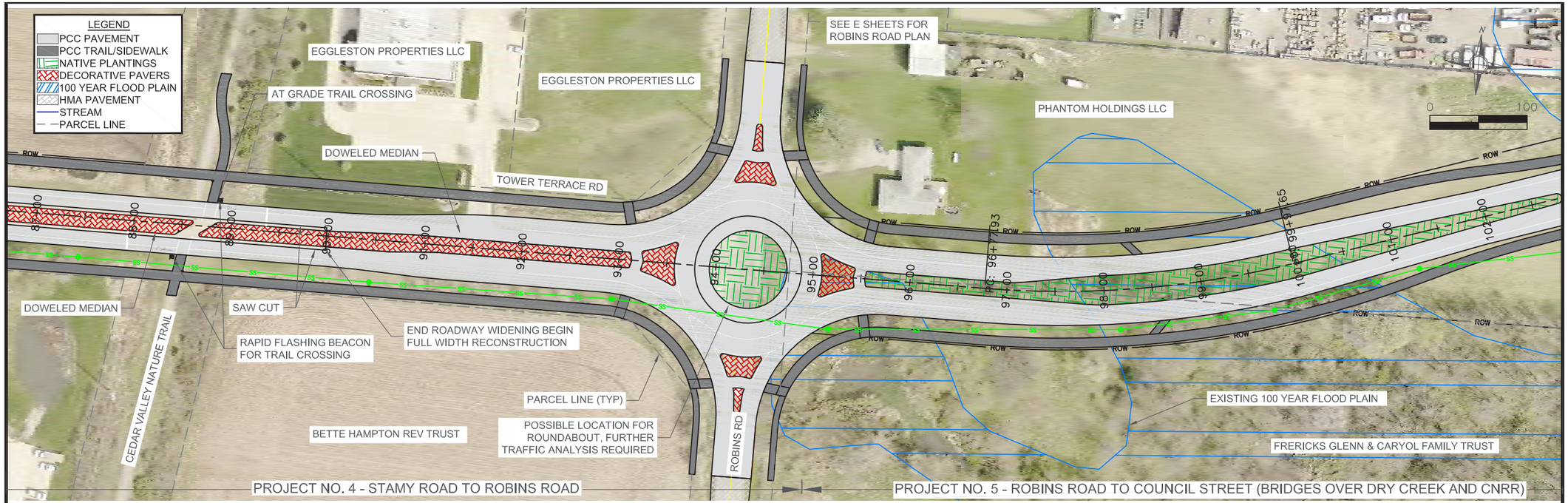
TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN

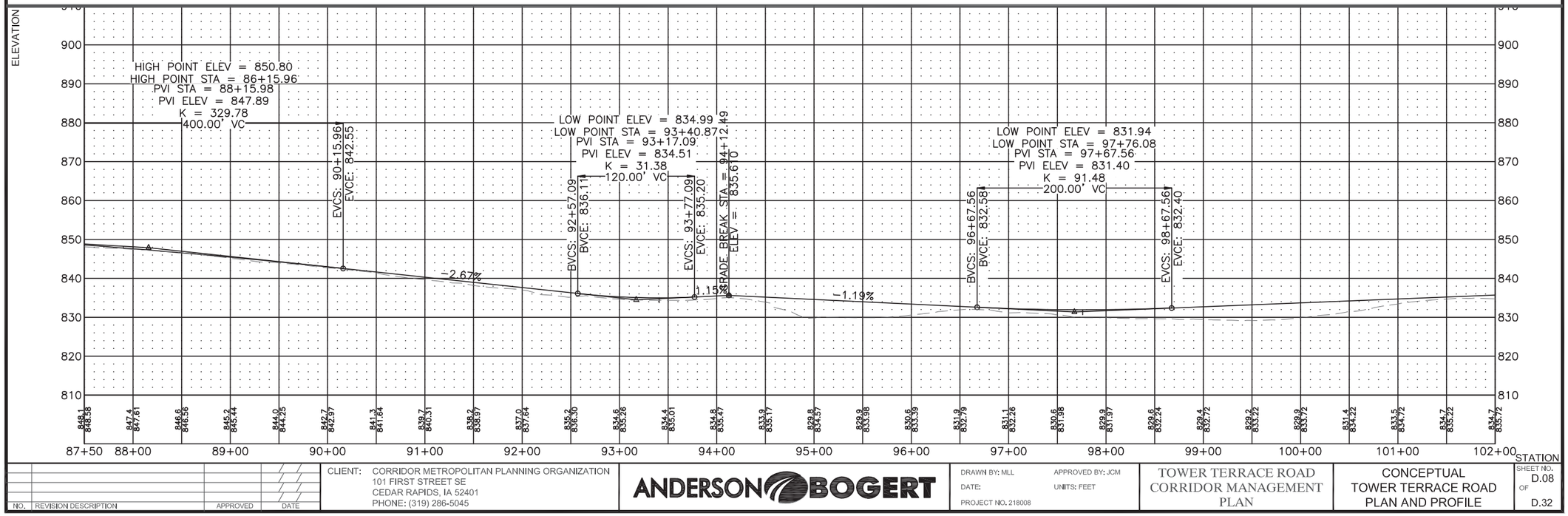
CONCEPTUAL TOWER TERRACE ROAD PLAN AND PROFILE

SHEET NO. D.07 OF D.32

CONCEPTUAL PLAN AND PROFILE SHEETS

STAMY ROAD TO ROBINS ROAD & ROBINS ROAD TO COUNCIL STREET (BRIDGES OVER DRY CREEK AND CANADIAN NATIONAL RAILWAY)





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TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN

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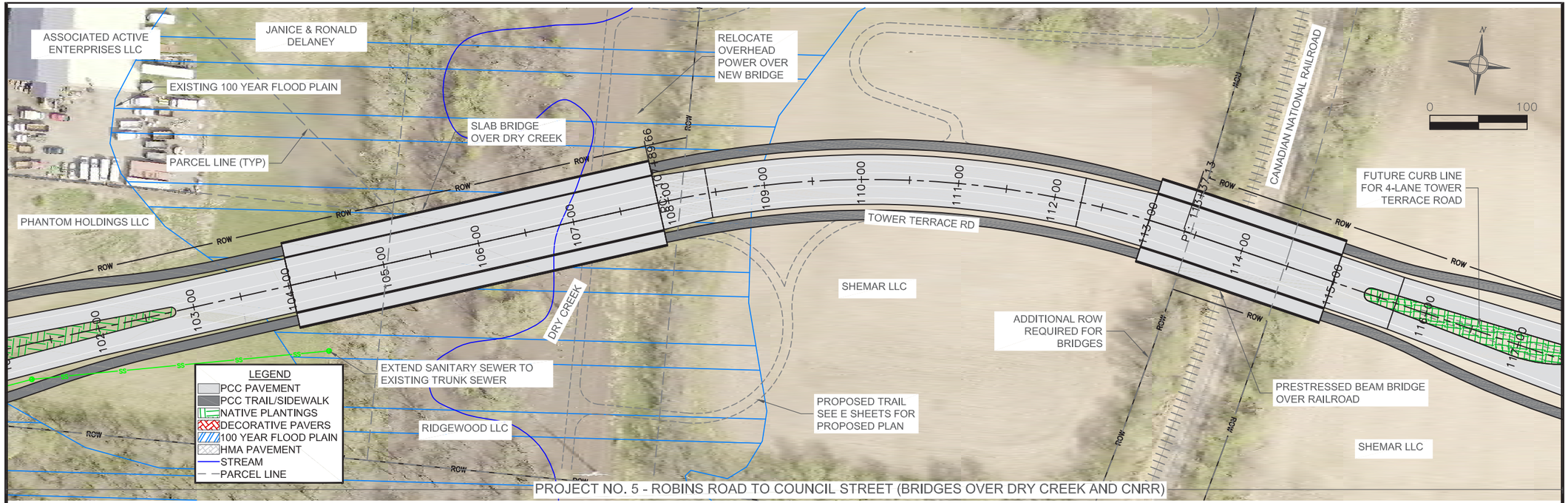
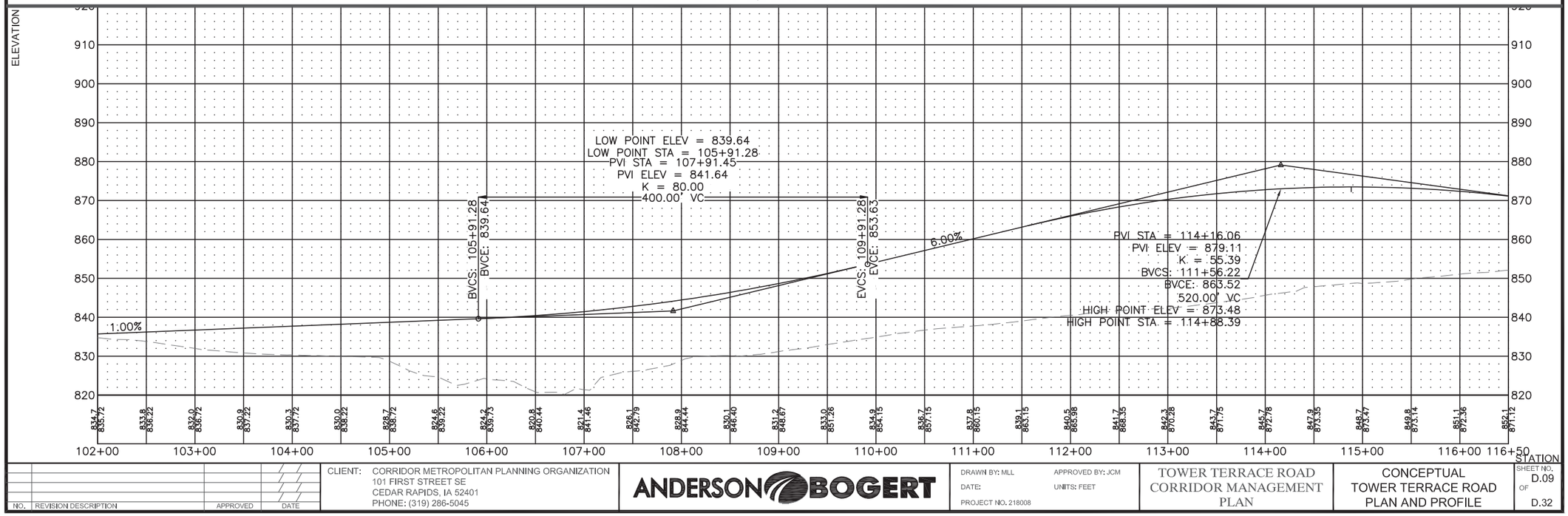
PLAN AND PROFILE

SHEET NO. D.08 OF D.32

CONCEPTUAL PLAN AND PROFILE SHEETS ROBINS ROAD TO COUNCIL STREET (BRIDGES OVER DRY CREEK AND CANADIAN NATIONAL RAILWAY)





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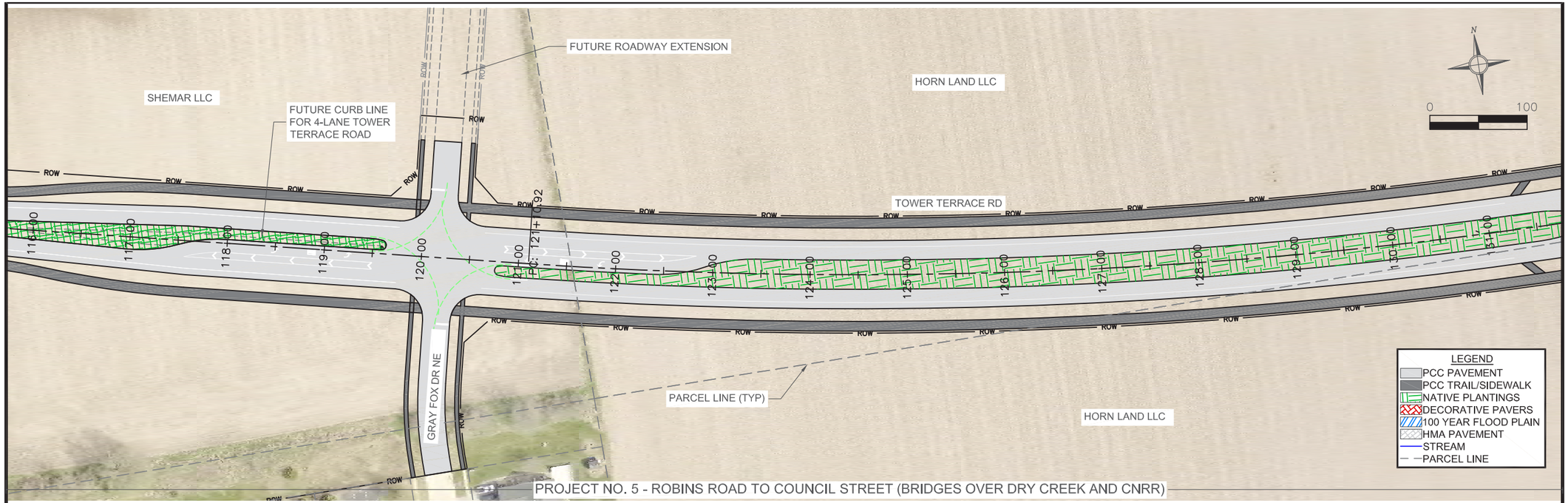
TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN

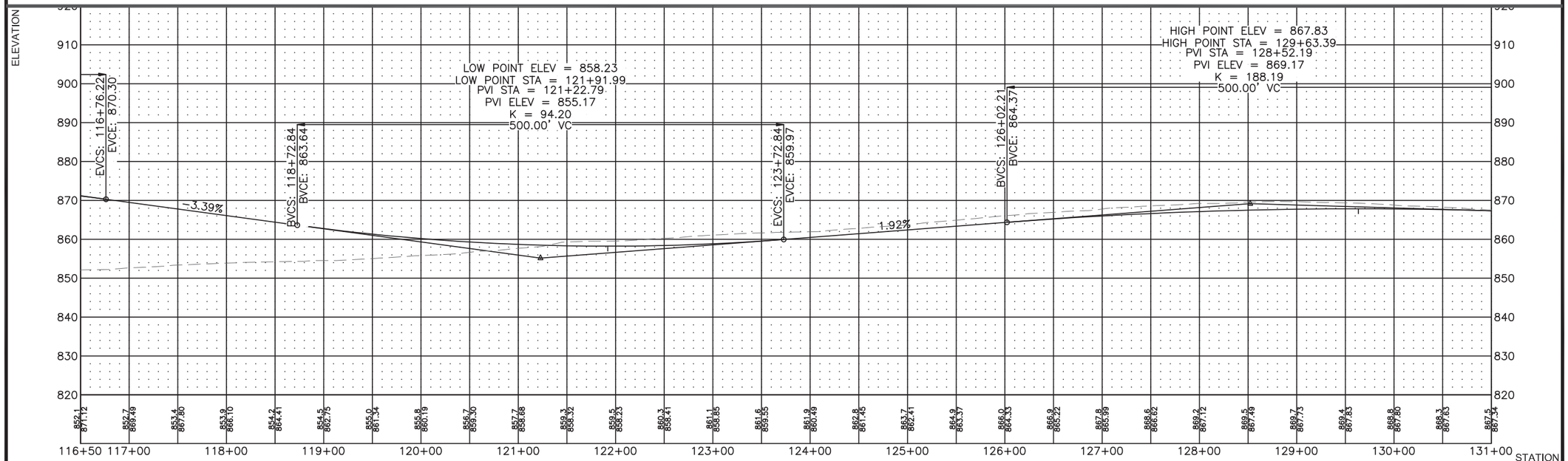
CONCEPTUAL TOWER TERRACE ROAD PLAN AND PROFILE

SHEET NO. D.09 OF D.32

CONCEPTUAL PLAN AND PROFILE SHEETS ROBINS ROAD TO COUNCIL STREET (BRIDGES OVER DRY CREEK AND CANADIAN NATIONAL RAILWAY)



PROJECT NO. 5 - ROBINS ROAD TO COUNCIL STREET (BRIDGES OVER DRY CREEK AND CNRR)



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CONCEPTUAL TOWER TERRACE ROAD PLAN AND PROFILE

SHEET NO. D.10 OF D.32

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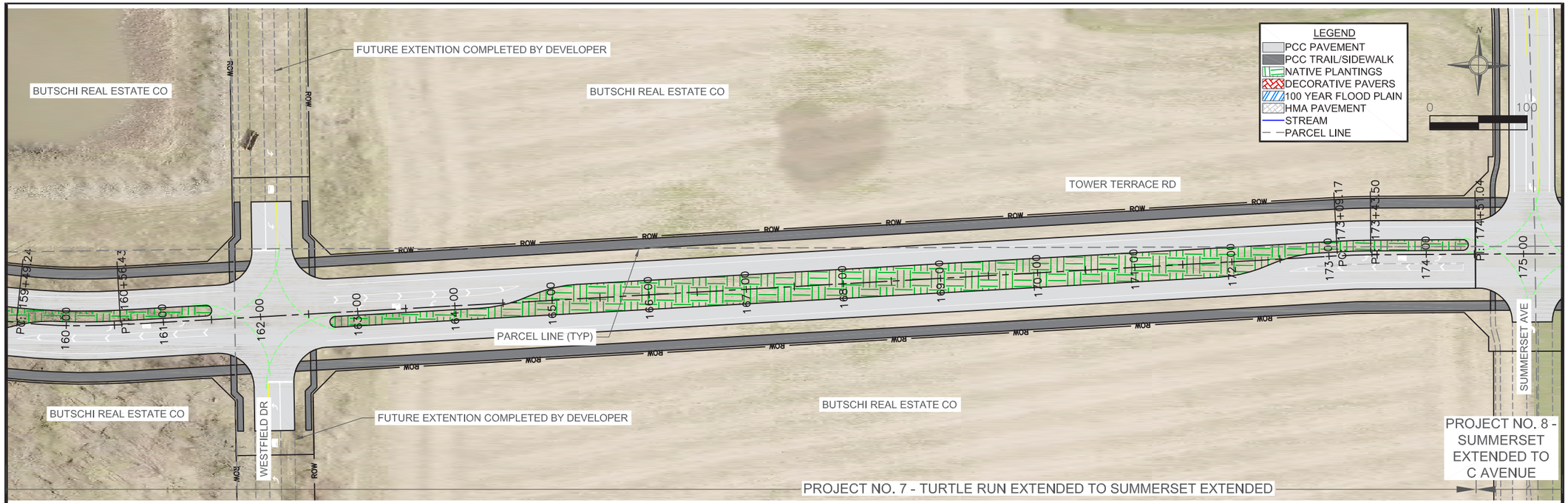

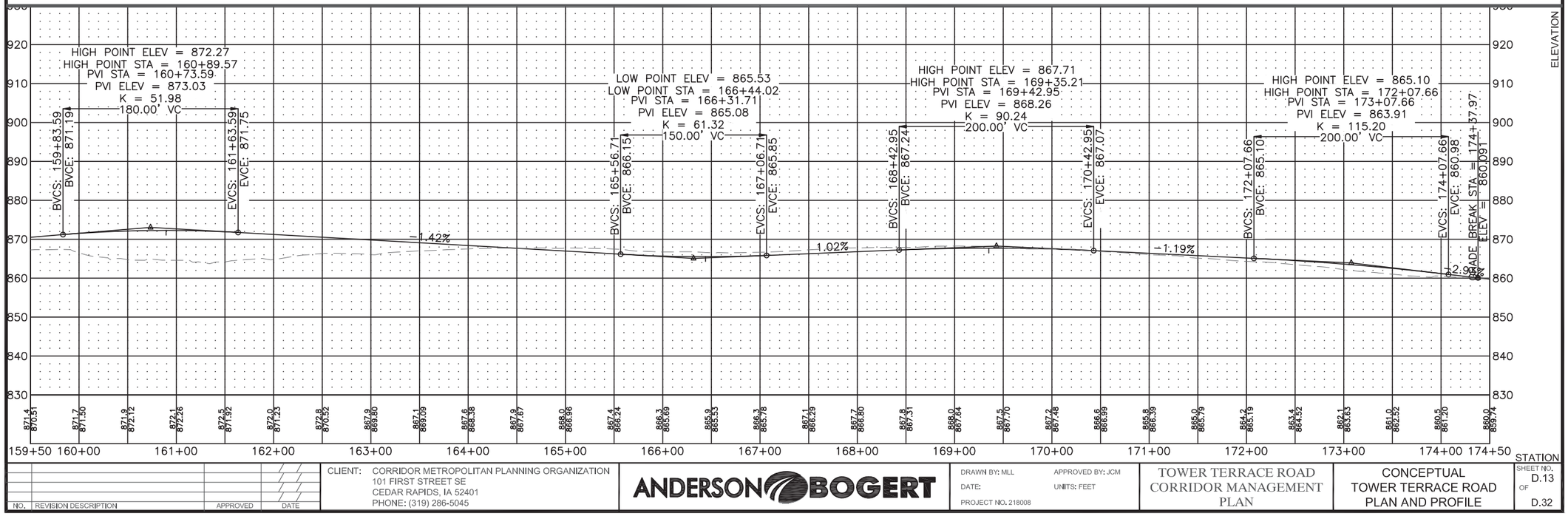

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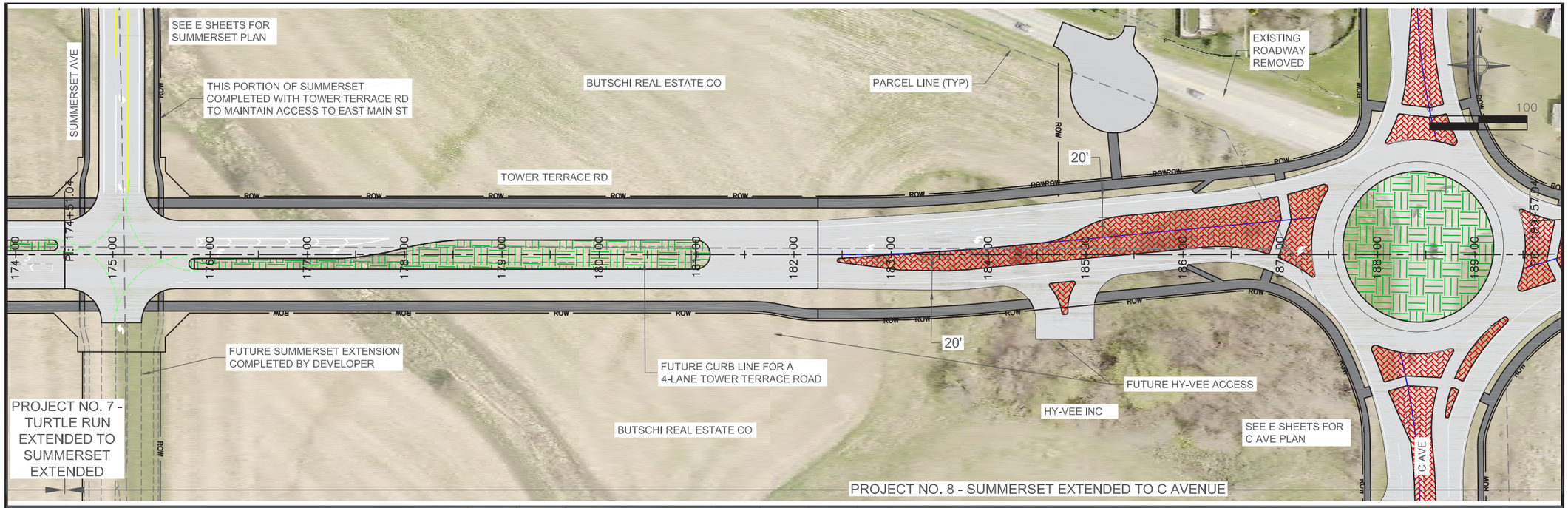
TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN

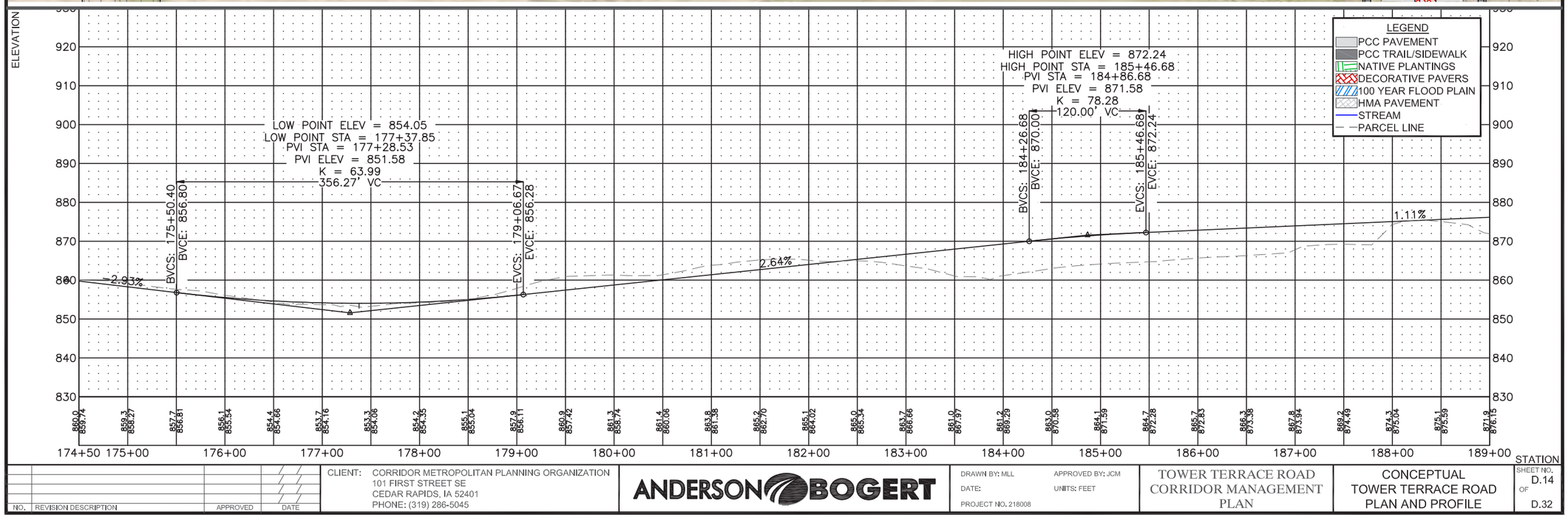
CONCEPTUAL TOWER TERRACE ROAD PLAN AND PROFILE

SHEET NO. D.13 OF D.32

CONCEPTUAL PLAN AND PROFILE SHEETS

TURTLE RUN EXTENDED TO SUMMERSET EXTENDED & SUMMERSET EXTENDED TO C AVENUE





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NO.	REVISION DESCRIPTION	APPROVED	DATE

CLIENT: CORRIDOR METROPOLITAN PLANNING ORGANIZATION
101 FIRST STREET SE
CEDAR RAPIDS, IA 52401
PHONE: (319) 286-5045

ANDERSON BOGERT

DRAWN BY: MLL | APPROVED BY: JCM
DATE: | UNITS: FEET
PROJECT NO. 218008

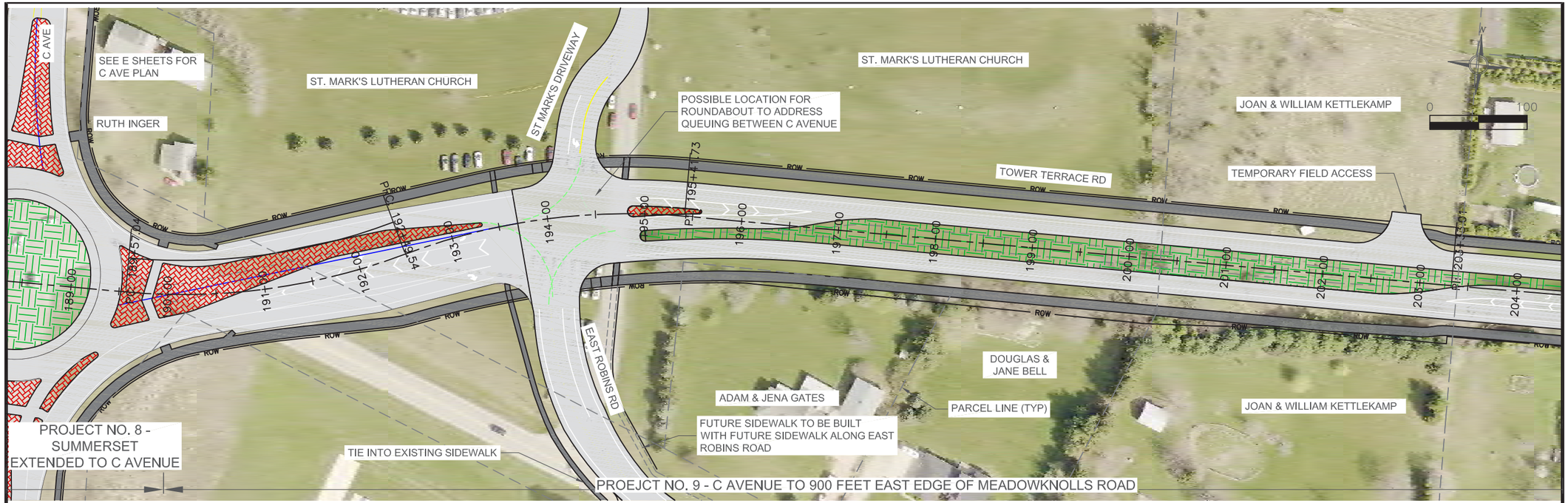
TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN

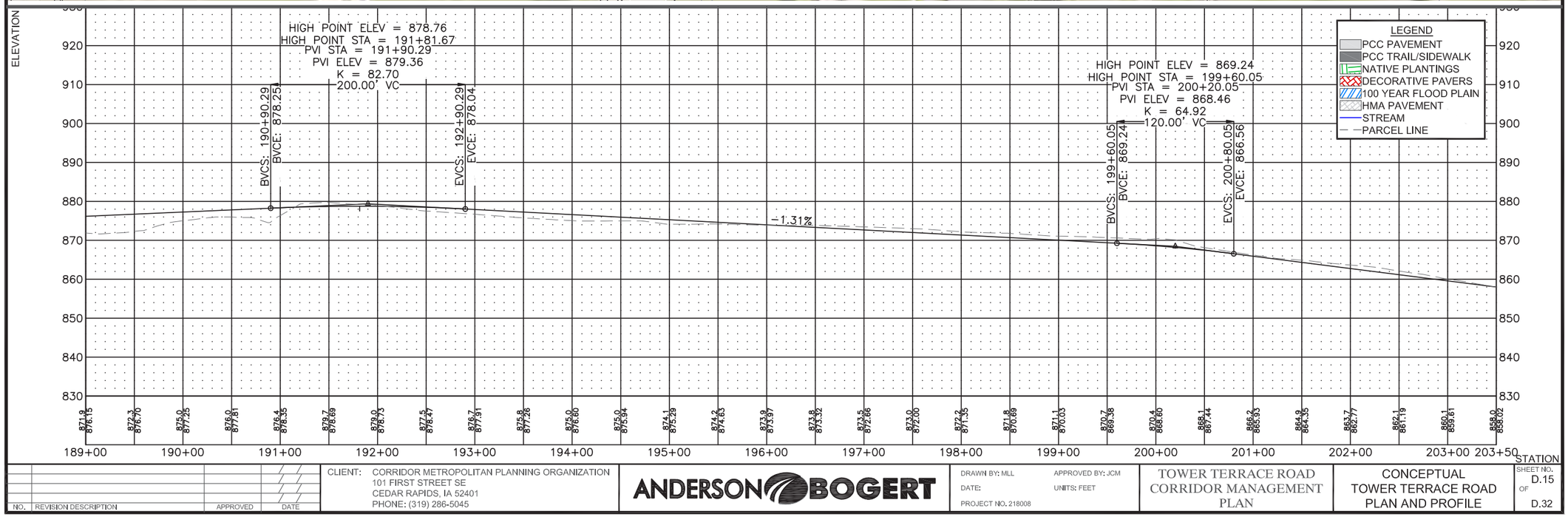
CONCEPTUAL TOWER TERRACE ROAD PLAN AND PROFILE

SHEET NO. D.14 OF D.32

CONCEPTUAL PLAN AND PROFILE SHEETS

SUMMERSET EXTENDED TO C AVENUE & C AVENUE TO 900 FEET EAST OF MEADOWKNOLLS ROAD





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NO.	REVISION DESCRIPTION	APPROVED	DATE

CLIENT: CORRIDOR METROPOLITAN PLANNING ORGANIZATION
101 FIRST STREET SE
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ANDERSON BOGERT

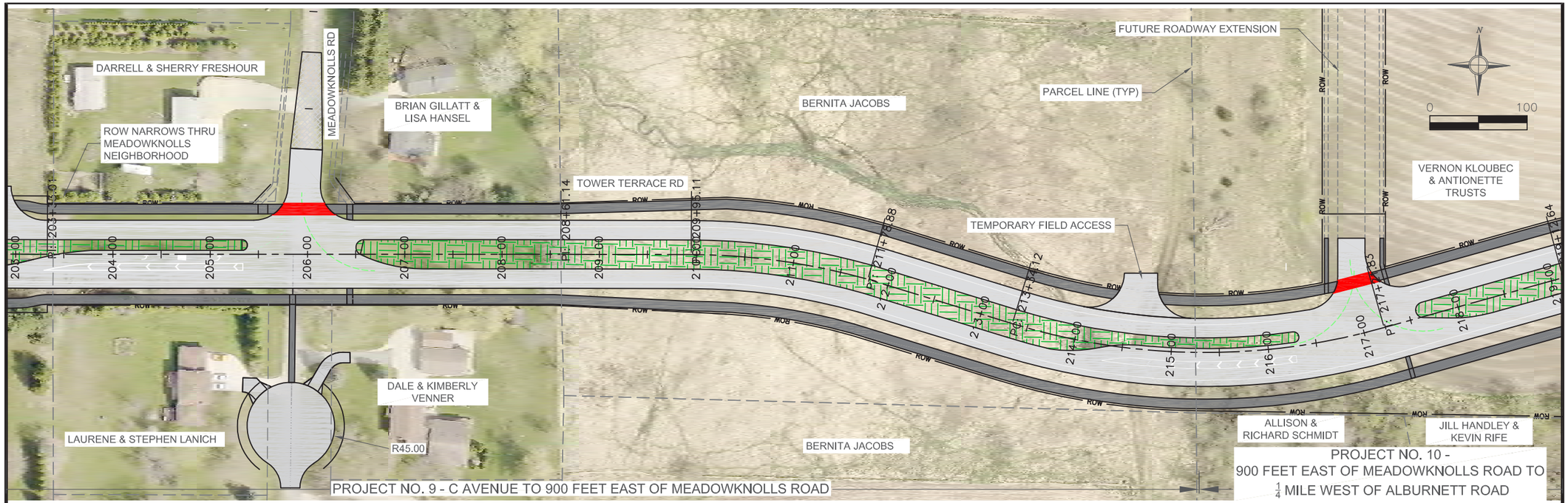
DRAWN BY: MLL | APPROVED BY: JCM
DATE: | UNITS: FEET
PROJECT NO. 218008

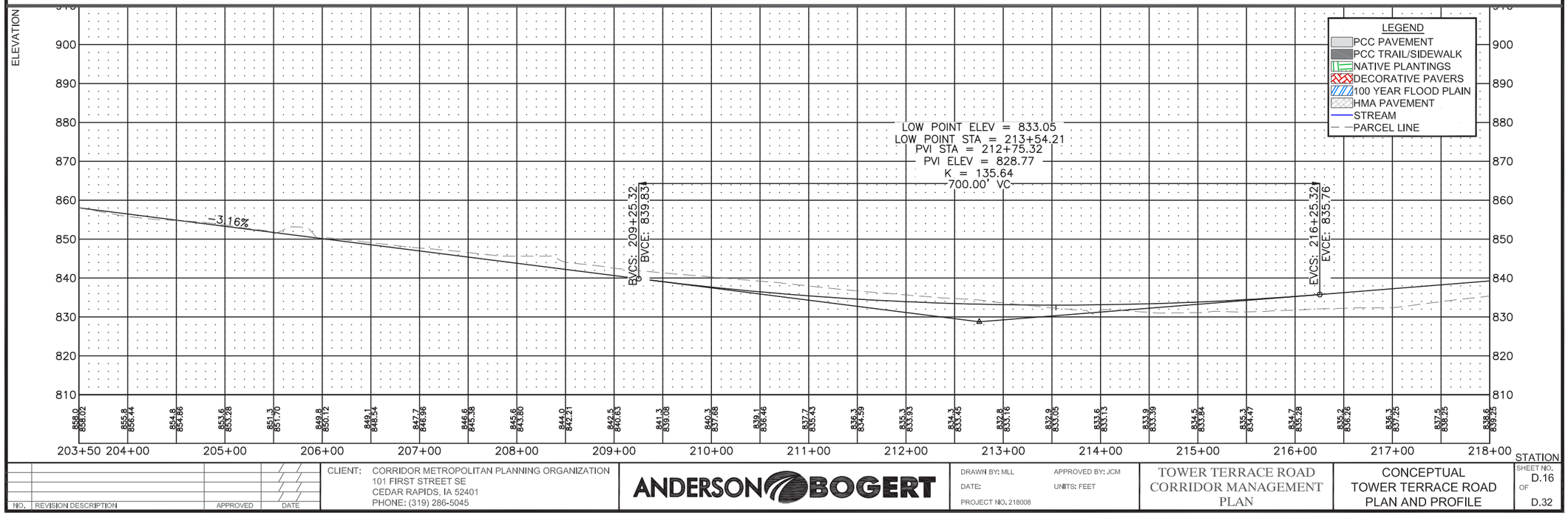
TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN

CONCEPTUAL TOWER TERRACE ROAD PLAN AND PROFILE

SHEET NO. D.15 OF D.32

CONCEPTUAL PLAN AND PROFILE SHEETS C AVENUE TO 900 FEET EAST OF MEADOWKNOLLS ROAD & 900 FEET EAST OF MEADOWKNOLLS TO 1/4 MILE WEST OF ALBURNETT ROAD





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NO.	REVISION DESCRIPTION	APPROVED	DATE

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101 FIRST STREET SE
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ANDERSON BOGERT

DRAWN BY: MLL APPROVED BY: JCM
DATE: UNITS: FEET
PROJECT NO. 218008

TOWER TERRACE ROAD CORRIDOR MANAGEMENT PLAN

CONCEPTUAL TOWER TERRACE ROAD PLAN AND PROFILE

SHEET NO. D.16 OF D.32