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October 23, 2015

Message from the Corridor MPO Policy Board

At the October 13, 2015 Executive Committee meeting and the October 15, 2015 Corridor MPO Policy Board meeting, the Highway 30 Area Study was reviewed and discussed. The study will be a valuable resource to reference as member jurisdictions move forward and decide on the next steps. In addition to the findings of the study, the Policy Board requests that the following comments also be considered moving forward:

- Future trails need to be considered in the study to connect with the existing trail system.
- Safety issues associated with getting traffic on Highway 30 from the existing developments needs to be evaluated.
- Access across the river for non-motorized modes (i.e., bicycle and pedestrian) need to be considered.
- Ensure coordination with area schools.
- Development of the study included significant coordination with staff from the cities of Cedar Rapids, Ely, and Linn County. This coordination should continue.

On October 13 the Executive Committee recommended acceptance of the Highway 30 Area Study by the Policy Board. The Policy Board accepted the study on October 15.

Sincerely,

Monica Vernon
Corridor MPO Policy Board Chair

Final Report Highway 30 Area Study

Prepared for the Corridor MPO by HR Green, Inc. and SB Friedman

October 15, 2015

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I. EXECUTIVE SUMMARY

Requests for development in the U.S. Highway 30 (US 30) area prompted the City of Cedar Rapids to request that the Corridor Metropolitan Planning Organization (CMPO) initiate a study that examines three primary concerns in the context of two development scenarios:

- Determine how the study area would be served with municipal transportation, water, sanitary sewer, and stormwater maintenance;
- Identify environmental impacts to the area based on available information; and
- Complete a fiscal impact analysis for each development scenario to determine if each development scenario is sustainable.

Scenario 1 depicts development that is consistent with EnvisionCR, the City of Cedar Rapids comprehensive plan and the Linn County Comprehensive Plan. This is to say that future land uses are consistent with the existing jurisdictional boundaries of the City and County. Scenario 2 depicts development that is based on a market driven model and anticipates that the entire study area would be annexed to the City of Cedar Rapids.

HR Green and teaming partner SB Friedman Development Advisors worked with CMPO staff, City of Cedar Rapids and Linn County representatives with an emphasis on utilities, public safety, finance and budget as well as planning and development services. Additionally, the Iowa Department of Transportation was engaged in discussions and plan reviews concerning conceptual improvements affecting US 30. Two focus group sessions were also conducted with individuals representing organizations focused on environmental issues and concerns and representatives residing in the area, engaged in farming, and property owners.

A Highway 30 Study Task Force comprised of representatives from the cities of Cedar Rapids and Ely, Linn County, and the Iowa DOT provided monthly feedback and insight concerning the consulting team's efforts.

Findings associated with this study are as follows:

1. *Revenue generated from development with either Scenario does not cover the costs associated with providing City infrastructure and services.*

   The fiscal impact analysis shows that for both scenarios, the payback period for municipal capital investments are significantly more than twice the timeframe for build-out of new development. In effect, this implies that operating revenues (largely property taxes) from new residential uses are inadequate to cover both operating and capital costs within the build-out timeframe of new development. A key factor driving this result is the upfront capital infrastructure load of $91 million and $204 million in Scenarios 1 and 2, respectively. While this investment is needed to facilitate new development in this part of the City, it represents an extraordinary upfront cost that can only be recouped over a significant timeframe after project build-out.

2. *Infrastructure improvements needed to support growth in the Study Area are significant.*

   The improvements needed for Scenario 2 are far greater than Scenario 1. Even so, Scenario 1, which is based on adopted land use plans, requires additional transportation, water, sewer, and stormwater management improvements. The costs associated with these infrastructure improvements are approximately $86 million and $192 million for Scenarios 1 and 2, respectively.

3. *Concerns exist related to safety along the Highway 30 corridor.*

   CMPO 2015 Connections 2040 Long-Range Transportation Plan indicates level of service (LOS) for U.S. Highway 30 at LOS A and B based on future traffic forecasts. At LOS A, traffic is considered free flow with vehicles completely unimpeded. Segments forecasted to be LOS B have traffic considered reasonably unimpeded. The U.S. Highway 30/C Street Interchange is identified as LOS F or flow has completely broken down. As additional growth occurs within the study area it can be reasonably assumed that vehicle trips will also increase on roadways throughout the study area. In addition, results from a focus group discussion comprised of home owners, a farmer, a mining operation representative, and property owner cited transportation challenges stemming from large, slow-moving agricultural vehicles, large semi-tractor traffic, and trips generated by area residents.

4. *Impacts to contiguous forested areas, as well as prime agricultural resources, should be avoided, at a minimum, mitigated.*

   The study area includes environmental conservation/critical natural resource areas, areas with significant topographical slopes, century farms, and productive agricultural land with Corn Suitability Ratings (CSR) of 65 or greater. These characteristics are identified in the EnvisionCR and the Linn County Comprehensive Plan with the express purpose of conserving and protecting said areas. Please refer to Appendix A for a review of these plans and related adopted plans as they pertain to this study area.

5. *The capital costs associated with Scenario 2 are over double that of Scenario 1.*

   In Scenario 1, conceptual infrastructure improvements are focused north of Highway 30 and in the southwestern portion of the Study Area (i.e. South of Highway 30 and west of Ely Road), which is an identified growth area. The total anticipated capital costs for Scenario 1 are just shy of $91 million. The capital costs associated with Scenario 2 are over double that of Scenario 1 (i.e. $204 million). Scenario 2 requires significant improvements, which are necessary in order to accommodate more development than is anticipated by adopted plans.

6. *Compared with Scenario 1, Scenario 2 would take over 3 times as long to pay off the municipal share of capital costs.*

   After synthesizing net operating fiscal impact and capital costs, estimates indicate that it would take approximately 44 years to pay off the municipal share of capital costs in Scenario 1 and 137 years in Scenario 2.

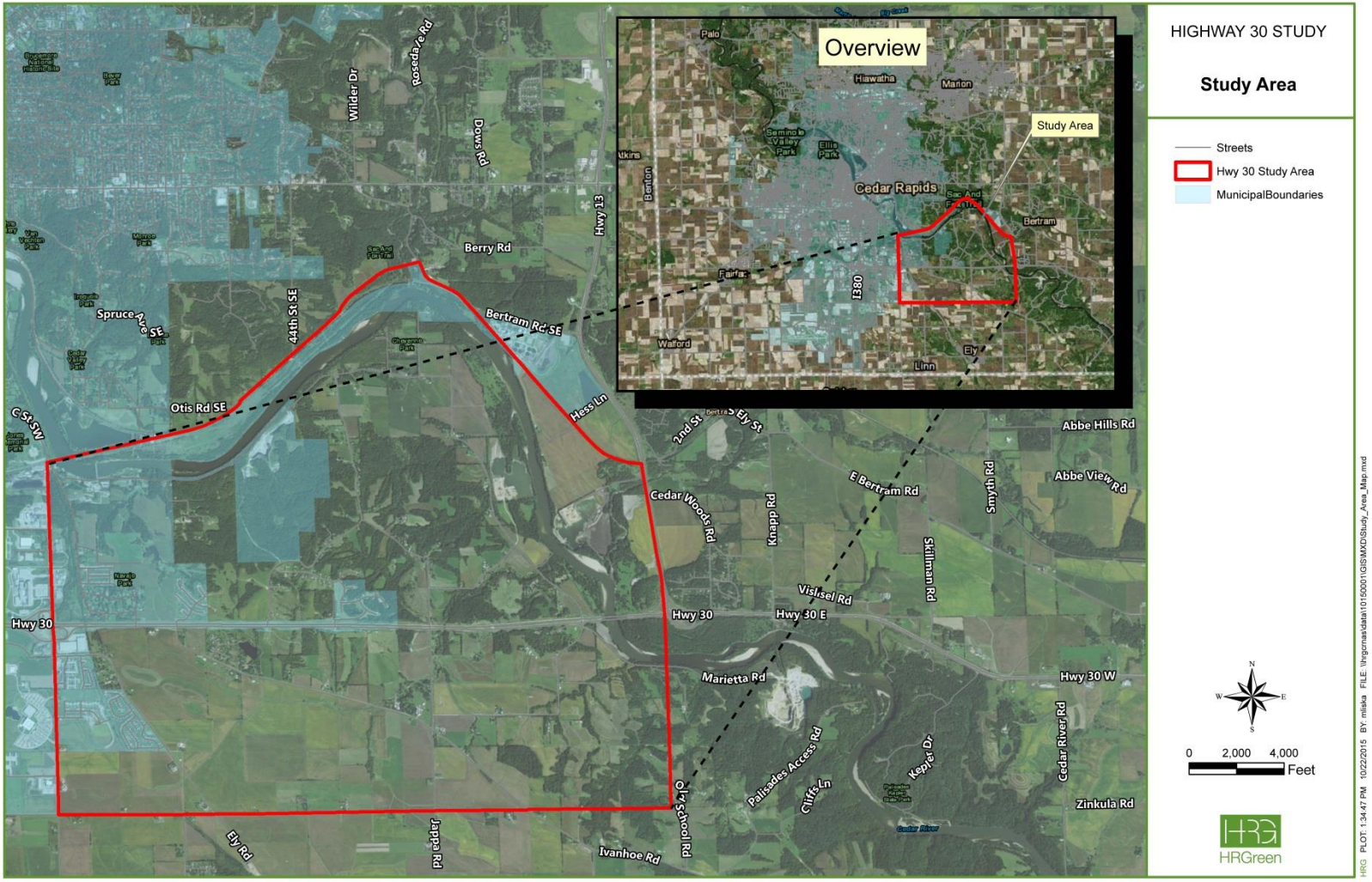
II. INTRODUCTION AND PURPOSE OF THE STUDY

Recent requests for development in the Highway 30 study area (see Map 1 that depicts the study area) and concerns regarding the availability and provision of services prompted the City of Cedar Rapids to seek assistance from the Corridor MPO (CMPO) to examine a series of interrelated initiatives focused on:

- Evaluating the potential impacts from land development and growth within the study area on public infrastructure, including transportation, sanitary sewer, and stormwater management;
- Evaluating the potential impacts that land development and growth within the study area have on environmental and agricultural resources;
- Evaluating the cost associated with the identified impacts; and
- Outlining the key findings of the assessment.

The CMPO selected HR Green and teaming partner SB Friedman to complete an analysis that addressed these concerns in the context of two different development scenarios.

Map 1: Study Area



Source: City of Cedar Rapids

III. METHODOLOGY

The principal focus of this study was to prepare a technical report that summarizes quantifiable findings concerning the impacts of development and the associated cost of serving areas within the study area boundary. In addition, the study team identified ancillary impacts that could serve as a barrier to future development as well as recommendations to address noted concerns (e.g., presence of private utilities and/or environmentally sensitive areas, and improving transportation safety on US Highway 30).

The approach associated with this study includes several specific tasks:

- *Coordination with Project Task Force:* The CMPO assembled a multi-jurisdictional and multi-disciplinary task force to provide general direction and feedback on the study. Representative organizations included the City of Cedar Rapids, Linn County, the Iowa Department of Transportation, and the City of Ely.

- *Quantifying Infrastructure (capital) costs*[1]*:* Infrastructure service needs for the study area were identified, evaluated, and a concept level cost opinion was prepared for transportation improvements, water service, sanitary sewer service, and stormwater management. Values and modeling assumptions were also validated by public officials responsible for respective municipal services.

- *Quantifying operational expenses:* In-person interviews were conducted with managers of municipal departments, such as administration, police, fire, parks and public works. The interviews confirmed initial baseline data from the Comprehensive Annual Financial Report (CAFR) analysis, ascertained municipal level of service standards, and determined associated capital and operational costs of service delivery to the land uses assumed in the two scenarios.

- *Fiscal impact model:* Operational and capital cost models were created to estimate overall fiscal impacts of development in the study area at stabilization[2] for the two growth scenarios. The purpose of this analysis helps to determine whether future revenues from new development in the study area can partially or wholly offset the cost for extending and maintaining new infrastructure and services.

- *Reviewing adopted plans concerning the project area:* Several independently adopted plans including the City of Cedar Rapids Comprehensive Plan (EnvisionCR) adopted in 2015, the Linn County Comprehensive Plan adopted in 2013, and ancillary plans and capital improvements programs – including the Statewide Transportation Improvement Program were reviewed as part of this study. Findings cited in this report identify the relationship that exists between the respective plans and the study area.

[1] Capital costs associated with transportation were relegated to arterial and collector streets. In addition, utilities and stormwater management costs were limited to major study area improvement needs. Figures did not include sub-division/development level cost opinions.

[2] Stabilization refers to the situation where full build-out is complete and costs and revenues become stable for both scenarios.

- *Focus Group discussions:* Two focus group discussions were conducted with a group of environmental/land conservation interests and targeted property owners. These facilitated discussions were designed to gather some qualitative insight on future development within the study area.

IV. EXISTING CONDITIONS OF THE STUDY AREA

- ***Land use:*** The study area (see Map 1) is comprised of approximately 9,500 acres of land with parts of the area being within the jurisdictional boundaries of the City of Cedar Rapids; however, the largest area by land mass is within unincorporated Linn County. Select parts of the study area are within two-miles of the cities of Bertram and Ely.

  While the majority of the study area is comprised of productive agricultural land, several areas abutting US Highway 30 (US 30), Ely Road, and Ivanhoe Road include both urban, low-density residential subdivisions and unincorporated rural subdivisions. Land use characteristics associated with the study area boundaries are summarized below:

  - *North boundary:* The northern boundary includes sections of Otis Road and the Cedar River. Areas south and adjacent to the Cedar River include two quarry operations, Cheyenne City Park, and the City of Cedar Rapids wastewater treatment facility. Much of this area is also identified as an environmental conservation area in the EnvisionCR future land use map. In addition, the Linn County/City of Bertram Strategic Growth Plan also identifies several areas as designated critical resource areas.

  - *East boundary:* Highway 13/151 serves as the eastern boundary of the study area and is largely undeveloped. The southeastern area, near the intersection of US 30 and Highways 13/151 is impacted by a portion of Palisades Kepler State Park.

  - *South boundary:* 76th Avenue Drive SW/Prairie School Road is the southern boundary of the study area and abutting land uses consist of agricultural fields.

  - *West boundary:* C Street SW serves as the western boundary and is comprised with a combination of farming operations as well as service oriented businesses and industries. Immediately adjacent to this area is an Alliant base-load electric generating plant, and City sports venue.

- ***Transportation:*** The Study Area is primarily served east to west by U.S. Highway 30 and north to south by C Street SW and Ely Road SW. North of U.S. Highway 30 there are four Collector roadways (Old River Road SW, Honey Grove Road, Big Bend Road SW, and Andrle Road) that primarily follow topographical features within the Study Area. South of U.S. Highway 30, Ivanhoe Road and Jappa Road are existing Minor Arterials that connect the primarily agricultural land uses to U.S. Highway 30.

  Between C Street SW and Ivanhoe Road, U.S. Highway 30 is designated a Priority 1 Highway with allowable access at fully controlled interchange locations. Currently, there are two access points, East Road SW and Ivanhoe Road/Union Drive SW, which do not meet the requirements of a Priority 1 Highway access location.

- East of Ivanhoe Road, U.S. Highway 30 is a Priority 3 Highway to the Iowa Highway 13 Interchange. As a Priority 3 Highway at-grade access is allowed at a spacing of 1,000 feet. The preferred access spacing for Priority 3 Highways is one-quarter mile. The existing access locations along U.S. Highway 30 east of Ivanhoe Road conform to the allowable spacing for the Priority 3 Highway designation of the segment.

- In 2003, the Linn County Regional Planning Commission (now the CMPO) approved a resolution requesting the Iowa Department of Transportation (Iowa DOT) and local jurisdictions exercising access control to only allow access along U.S. Highway 30 to future interchange locations. Currently, there are no planned interchange improvements between C Street SW and Iowa Highway 13 along U.S. Highway 30 within the Study Area.

CMPO 2015 Connections 2040 Long-Range Transportation Plan indicates level of service (LOS) for U.S. Highway 30 at LOS A and B based on future traffic forecasts. At LOS A, traffic is considered free flow with vehicles completely unimpeded. Segments forecasted to be LOS B have traffic considered reasonably unimpeded. The U.S. Highway 30/C Street Interchange is identified as LOS F or flow has completely broken down. No other roadways within the Study Area are included in this LOS analysis.

As additional growth occurs within the Study Area, it is assumed the vehicle trips will increase on roadways throughout the Study Area. No additional forecasting was completed for the scenarios developed for the Highway 30 Study.

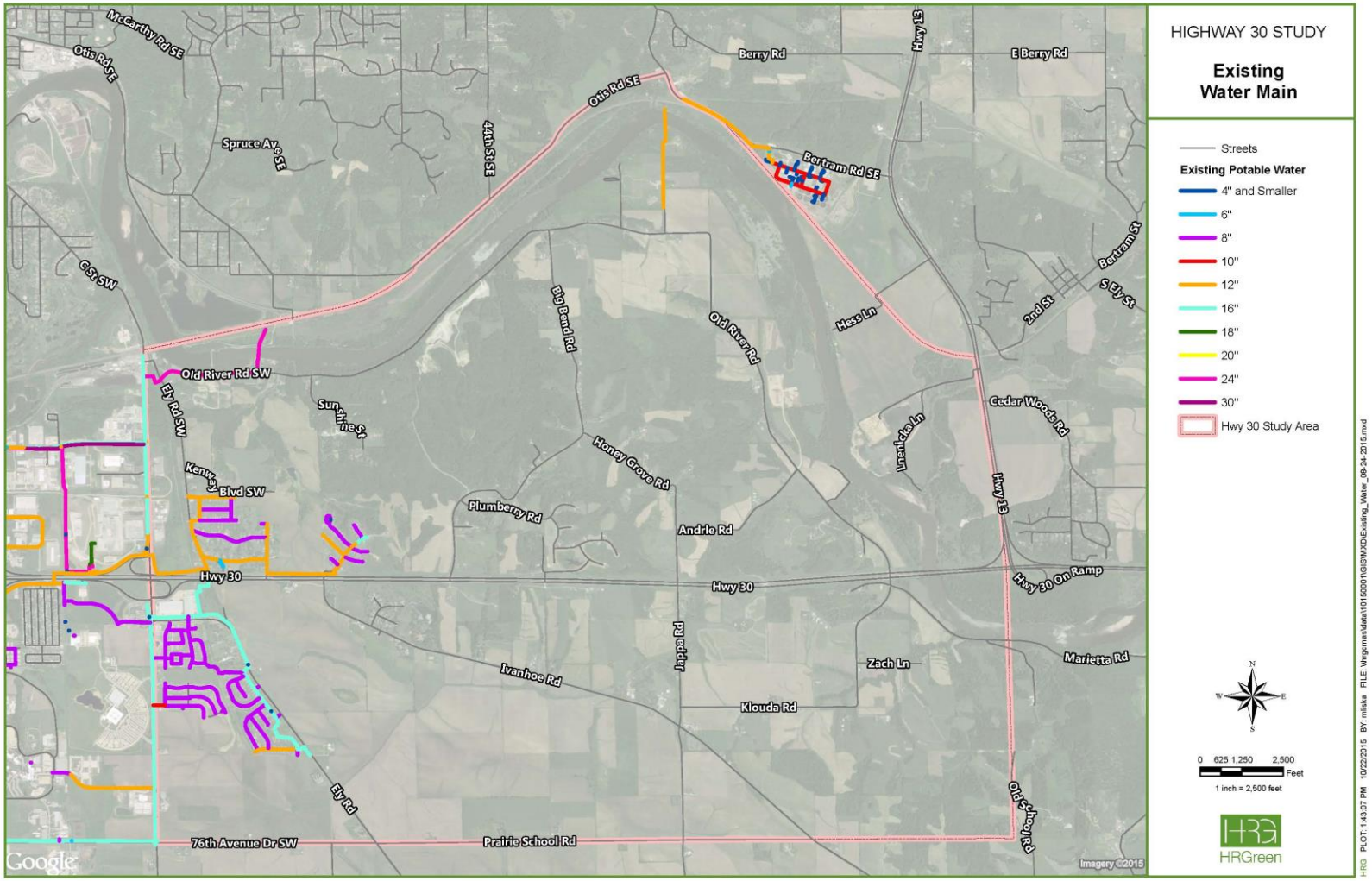
Multimodal transportation within the Study Area is limited and primarily located along the C Street SW corridor. The corridor offers connections to transit, planned trails, and is a gateway to the Study Area with an interchange with U.S. Highway 30.

Transit: Cedar Rapids Transit operates one route, Route 7, along C St SW at the border of the Study Area. Route 7 follows C Street SW during peak times, with a stop at the intersection of C Street SW and 41st Avenue Drive SW. At this time, there are no plans to expand service into the Study Area.

Trail Network: The City of Cedar Rapids Comprehensive Trails Plan, adopted in 2012 and updated in 2015, identifies two primary connection routes on the periphery of the Study Area. One route follows C Street SW along the western Study Area boundary, while another is located north of the Cedar River in the northern section of the Study Area. According to the Plan, the Cedar River Trail Segment would extend through the Study Area just east of the U.S. Highway 30/ C Street SW Interchange, generally following Ely Road SW. The Kirkwood Connector trail segment would also be located within the Study Area following Ely Road SW and C Street SW to 76th Avenue. The Sac & Fox Trail segment is planned north of the Cedar River along the identified primary connection route. The proposed trail would follow Old River Road SW to Andrle Road then turn southwest after crossing U.S. Highway 30 before connecting with the Cedar River Trail near Ely Road SW.

- ***Public Water Service:*** Map 2 depicts current water service to the study area. Service is provided to the Worthington Acres and College Farms subdivisions as well as the residential areas south of US 30 and west of Ely Road. An area recently annexed by the City of Cedar Rapids and served by Plumberry Road is not presently served with city water.

Map 2: Current Public Water Service to the Study Area



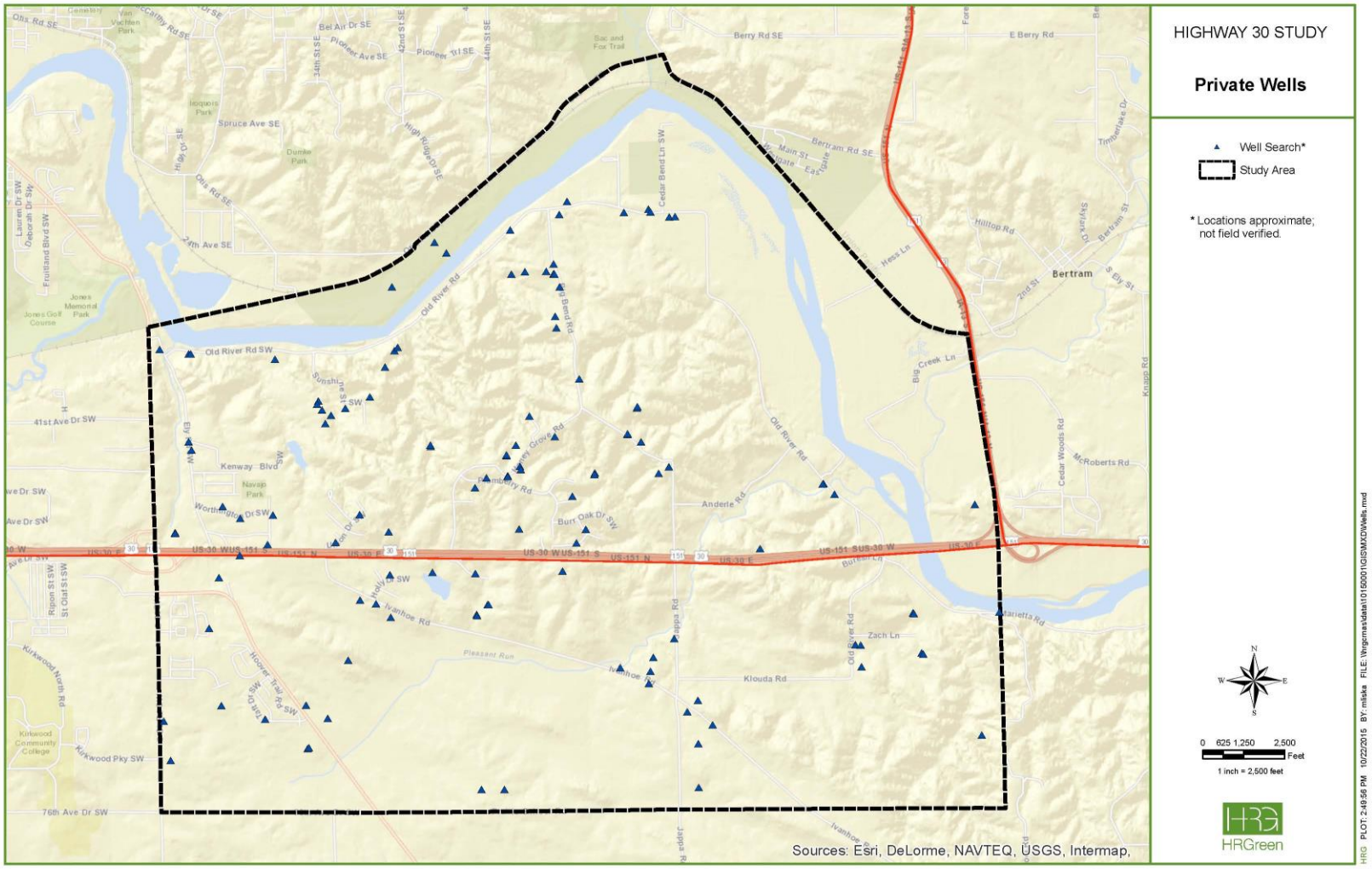
Source: City of Cedar Rapids

Private Water Service: The target area has in excess of 140 private wells. Map 3 shows the identified public and private water supply wells. Public wells serve at least 25 people and/or have at least 15 service connections. The private wells are mostly domestic. There are no large municipal or commercial wells identified. The private wells are shown but there is not much information available, including location accuracy or status (e.g., active, plugged). In general, each farm house or small subdivision (i.e., less than 25 people and 15 connections) will have at least one well.

Public Sanitary Service: Map 4 illustrates current wastewater service to the study area. Service is currently provided to all developed properties that are located within the jurisdictional boundaries of Cedar Rapids, with the exception of the former rural subdivision on Plumberry Road.

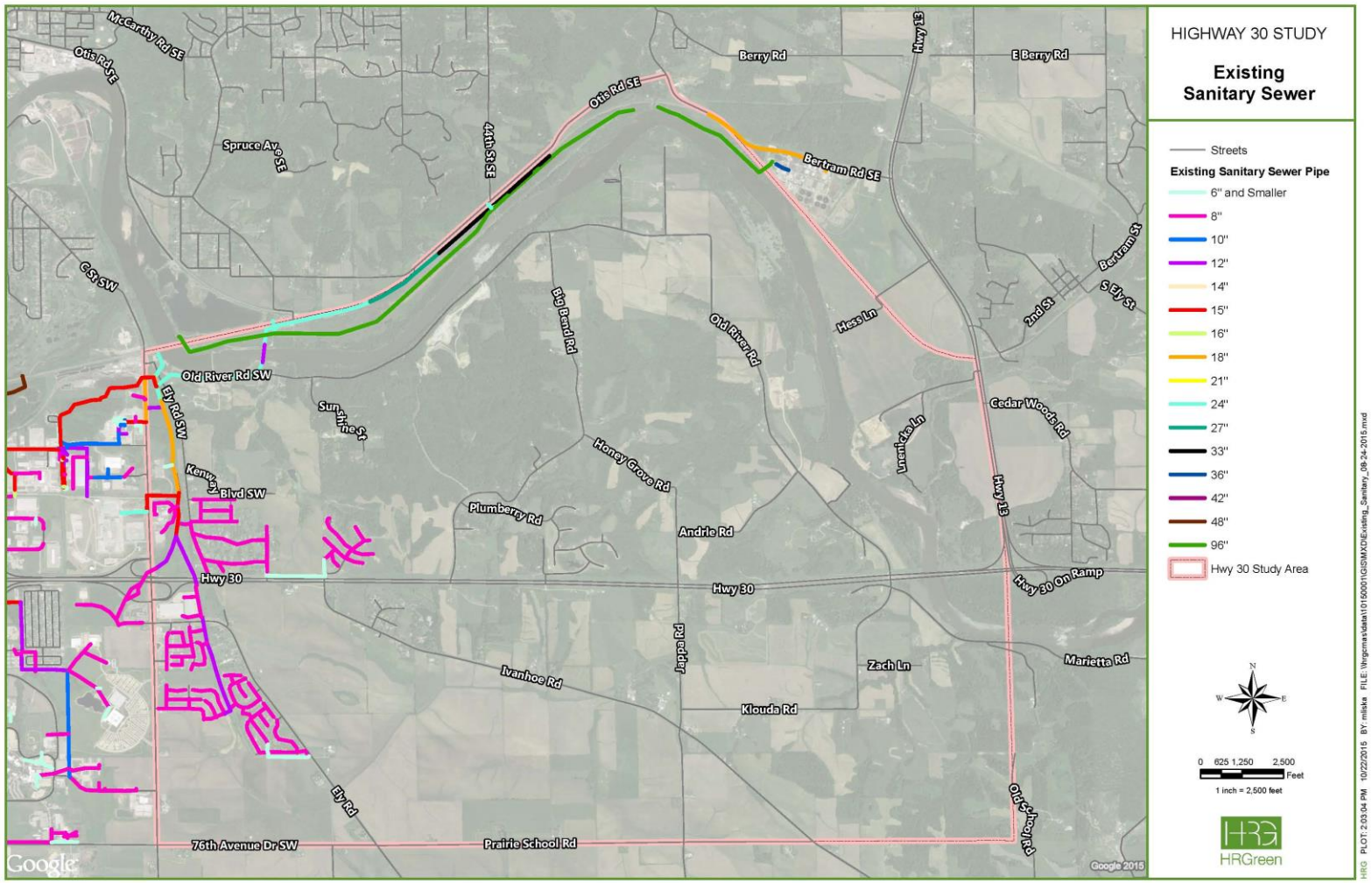
Private Sanitary Sewer Service: The target area has only 8 permitted septic systems. Map 5 shows the permitted systems. The permitted systems are shown but there is not much information available. In general, each farm house will have at least one private septic system, whether permitted, or not.

Map 3: Private Wells within the Study Area



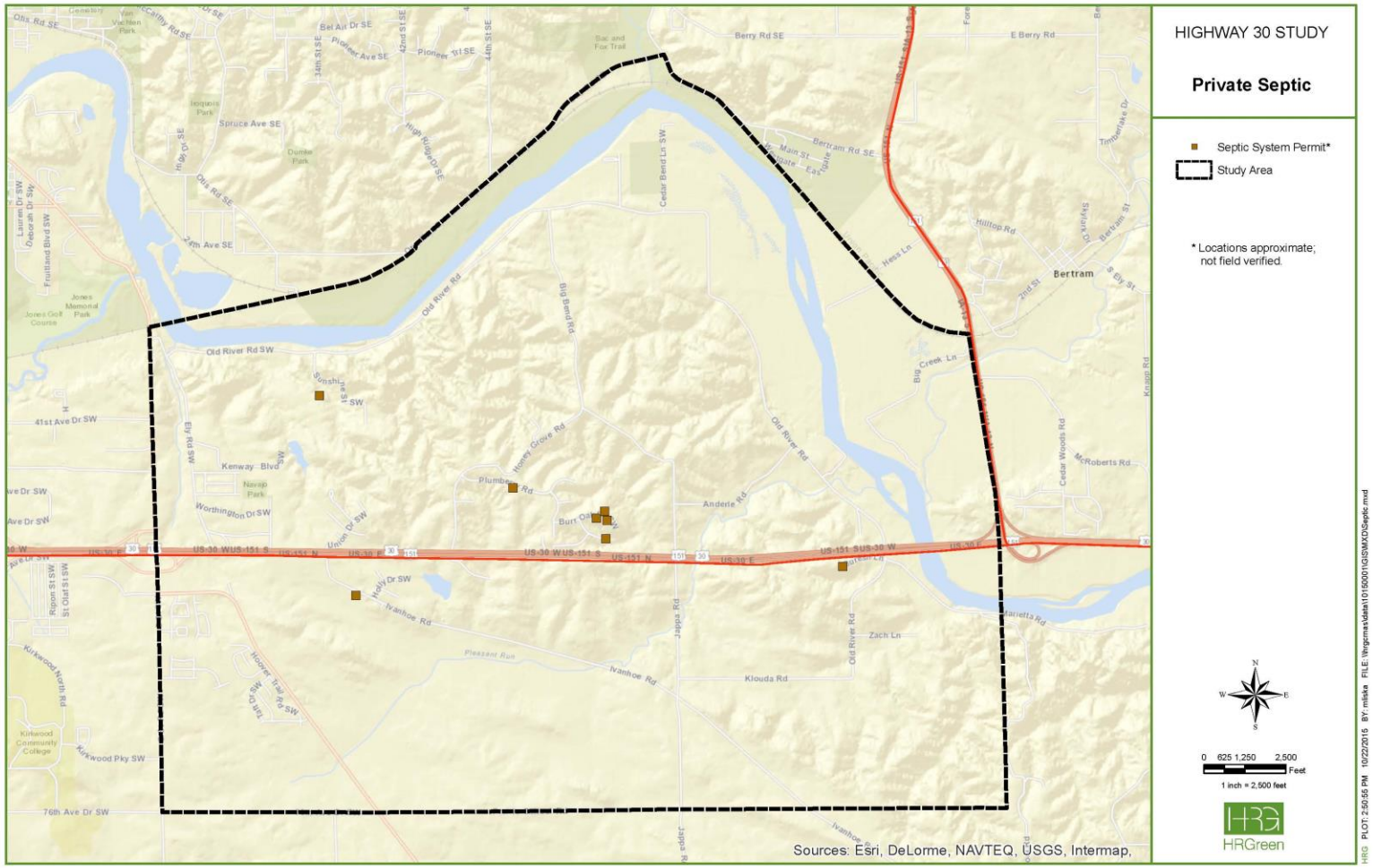
Source: Linn County Health Department

Map 4: Current Sanitary Sewer Service to Study Area



Source: City of Cedar Rapids

Map 5: Private Septic Systems within the Study Area



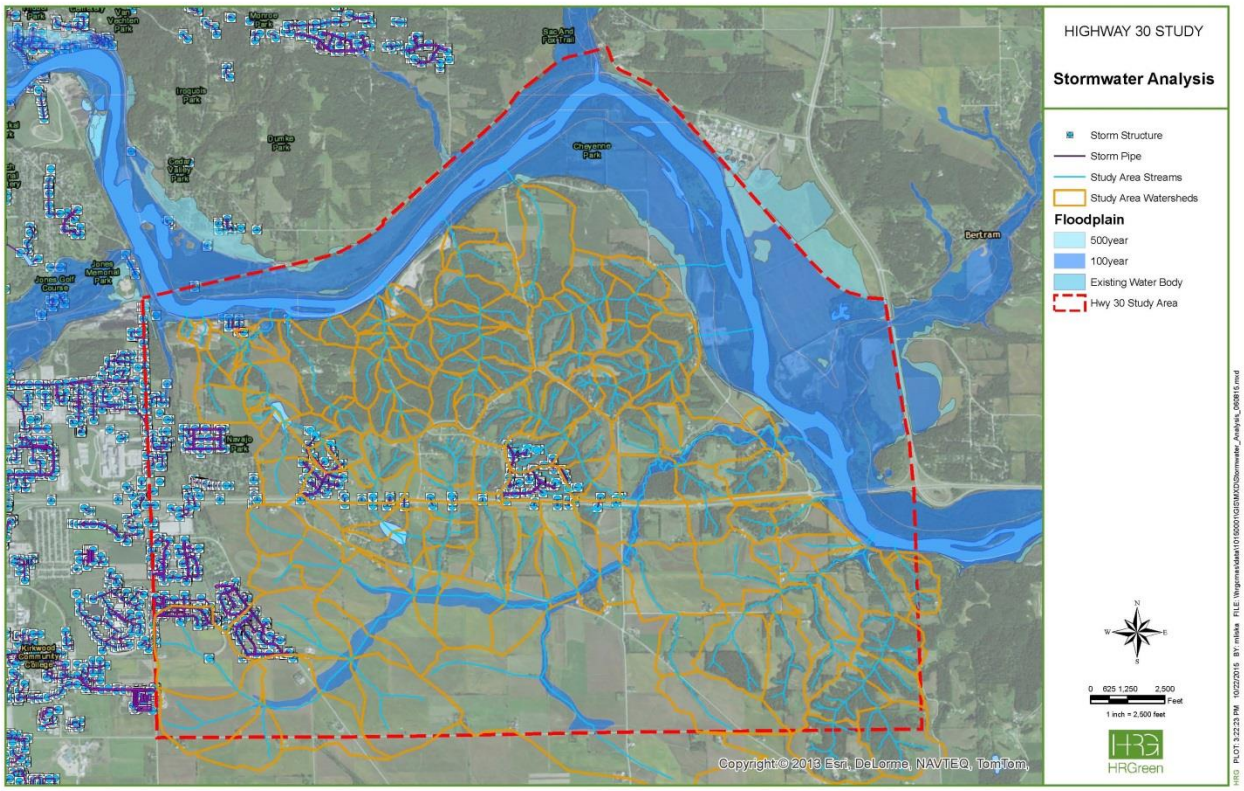
Source: Linn County Health Department

- ***Stormwater Management:*** The study area is comprised of 141 drainage basins (see Map 6). Soil types within the study area range from soil class A (excellent infiltration) to soil class D (poor infiltration). These factors, coupled with the stormwater management techniques summarized in Appendix C were taken into consideration in developing an overall stormwater management approach for the study area.

  Map 7 summarizes the permeability of land based on soil type[3]. In general much of the study area is comprised of A, B, and B/D soil types. This indicates that permeability of soils is relatively good. As such, infiltration-only practices such as infiltration basins and trenches, raingardens and bioretention cells, and native landscaping are possible. In addition, detention-only practices such as wet detention basins, wetlands, wet swales, underground detention (sealed), and green roofs also hold some promise.

  While much of the area does not exhibit poor infiltration characteristics, the few areas that are relatively impermeable can benefit from alternative infiltration practices.

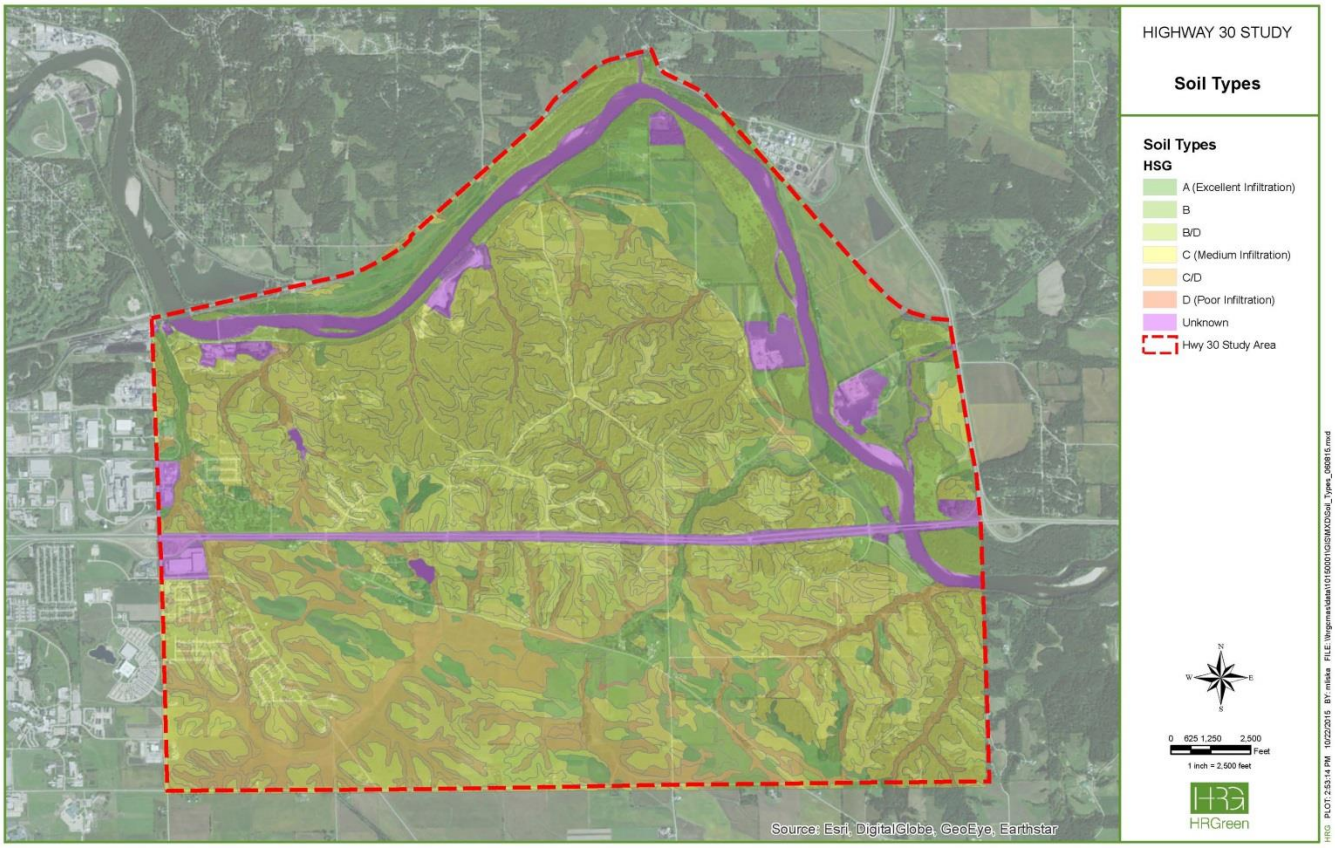
Map 6: Floodplain & Associated Watershed Information



Source: Corridor MPO, HR Green, Iowa DNR, & FEMA

[3] The HSG referenced in Map 7 translates to Hydrological Soils Group.

Map 7: Soil Types and Associated Permeability

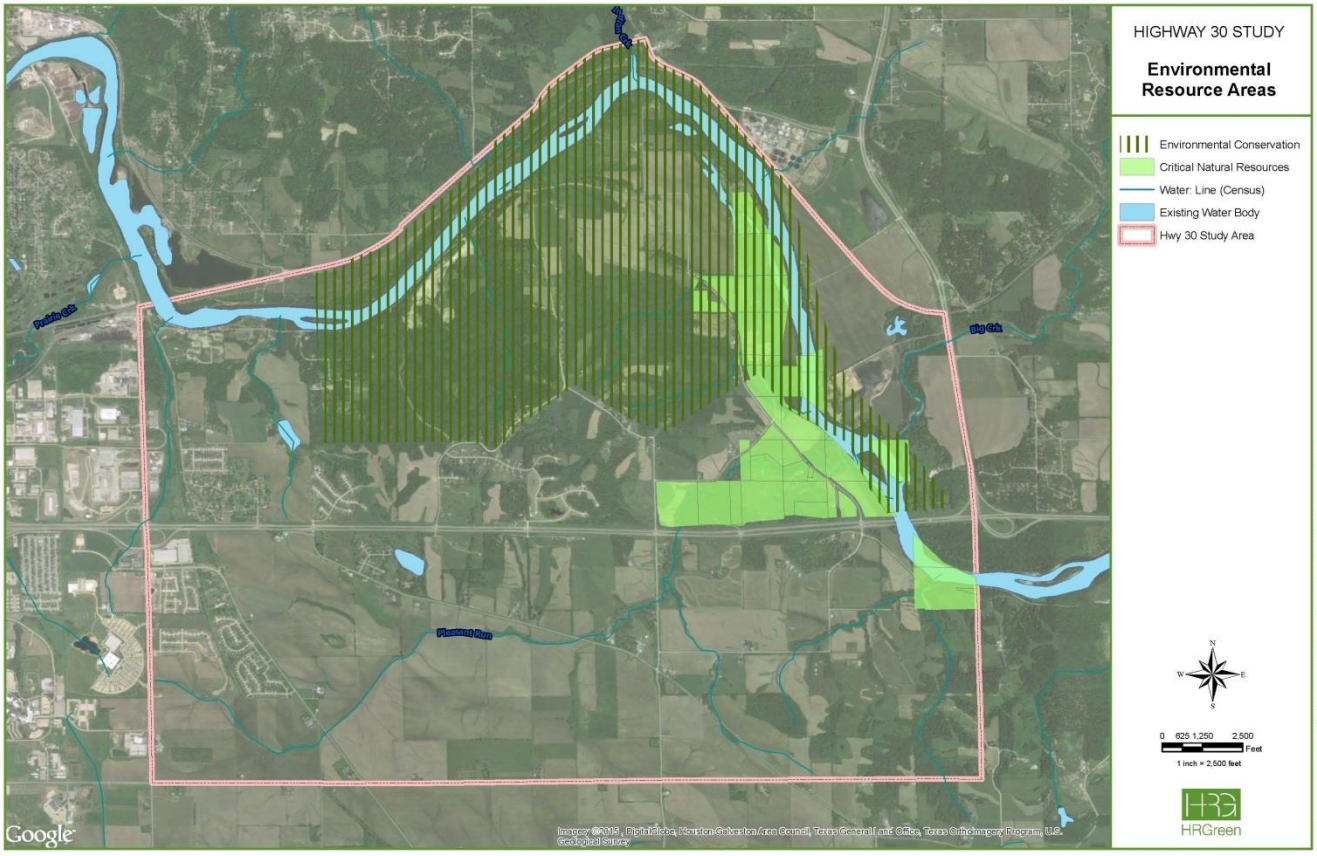


Source: Corridor MPO, HR Green, Iowa DNR, & FEMA

- ***Environmental Resources:*** The study area has several existing environmental and agricultural characteristics. Future land use maps contained in both EnvisionCR and the Linn County Comprehensive Plan designate much of the study area north of US 30 as environmental conservation area and critical natural resource area. These definitions generally characterize high-value natural resource areas that include floodplain, unique natural areas, historic areas, wetlands, existing natural prairies, etc. The summary below highlights some of the more unique environmental characteristics in the area.

    - *Critical Natural Resource Areas:* Map 8 references the environmentally sensitive areas identified in the City of Cedar Rapids and Linn County future land use maps (FLUM). Specifically, the City of Cedar Rapids FLUM includes and Environmental Conservation Overlay and Linn County identifies Critical Natural Resources Area. The purpose of these land use designations is to protect environmentally sensitive areas from impacts resulting from future development.

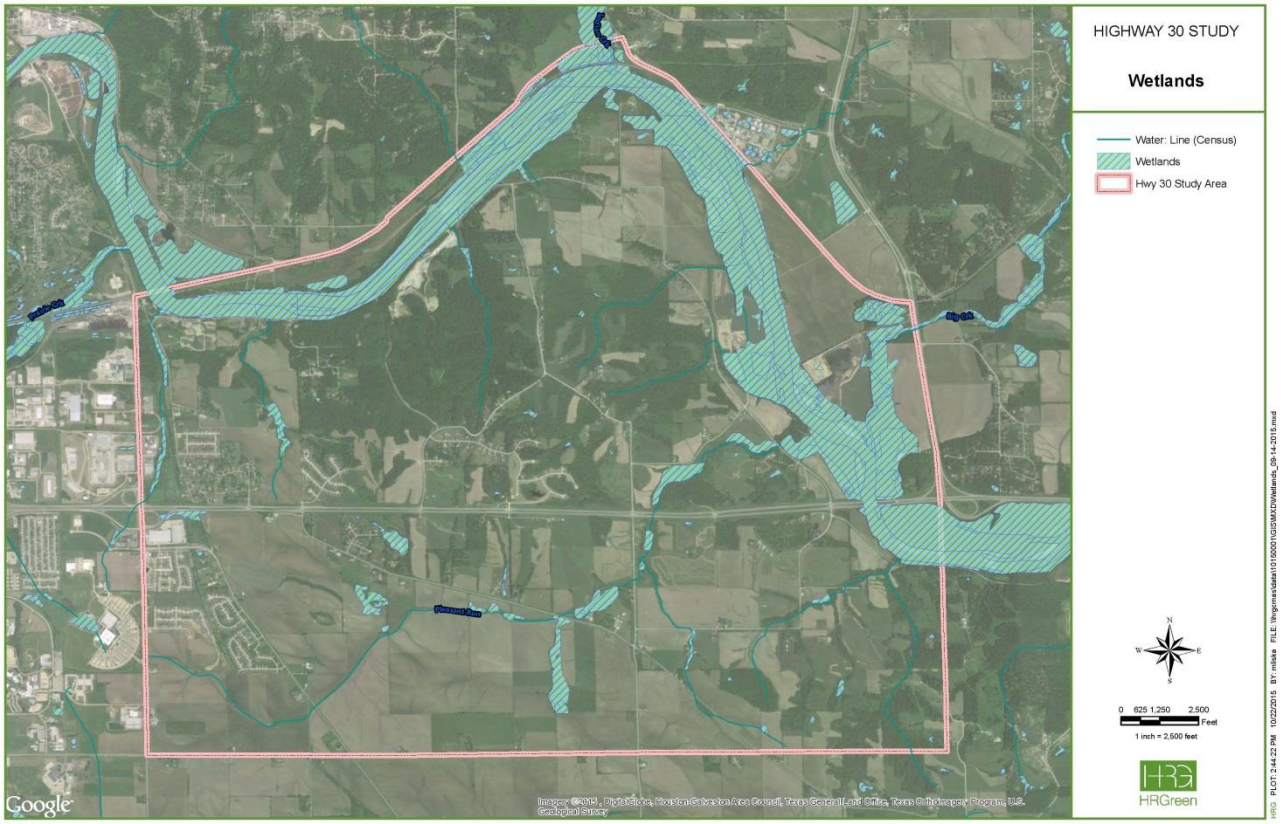
Map 8: Environmental Resources



Source: City of Cedar Rapids, Linn County, Corridor MPO

- *Wetlands:* Map 9 wetlands within the study area. Wetlands are significant because the filter and purify surface water, recharge groundwater as well as help manage stormwater levels. In addition, wetlands are a habitat for fish, other aquatic life, and select land based animals.

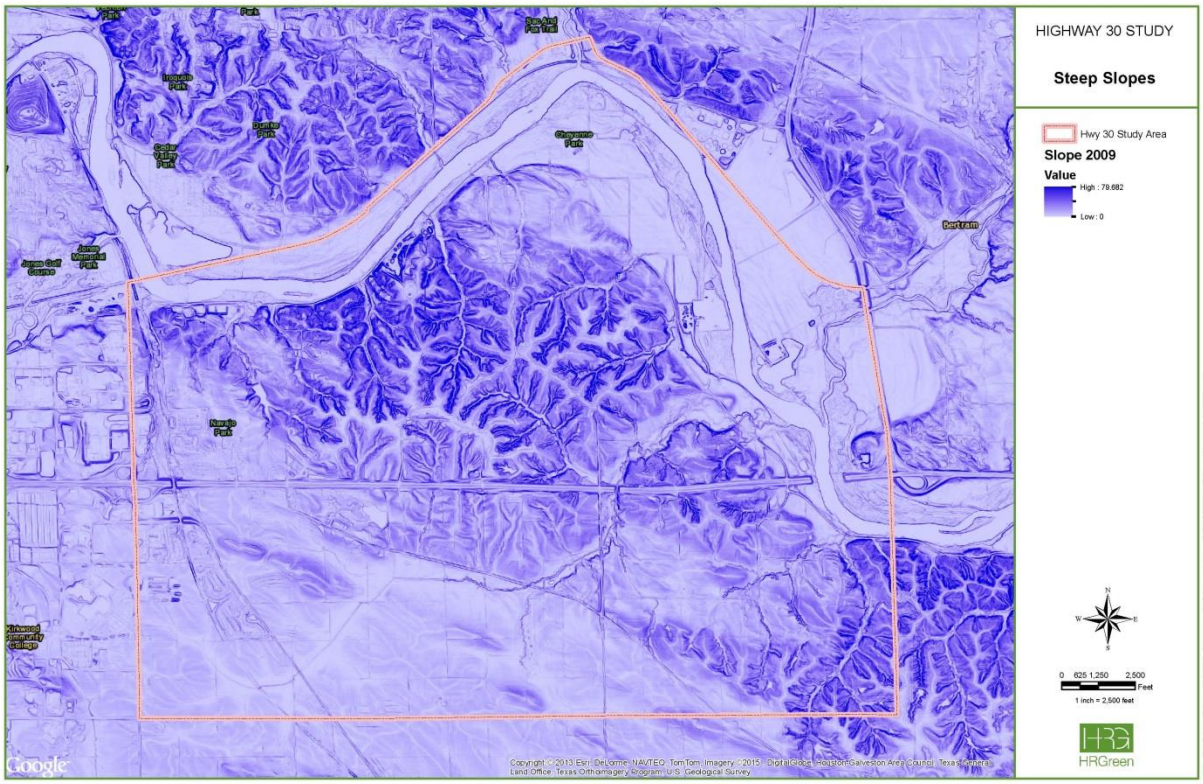
Map 9: Designated Wetlands in the Study Area



Source: Iowa Department of Natural Resources

- *Steep Slopes:* Map 10 represents areas within the study area that has steep slopes and is coupled with soils that have varying degrees of susceptibility to soil erosion.[4] The slopes referenced in this exhibit range from 14% to 60%. In fact, over 20% of the study area is comprised of slopes within this range. Participants in a focus group activity (See Appendix B) cited steep slopes as areas that should be protected.

Map 10: Topographical Features in the Study Area

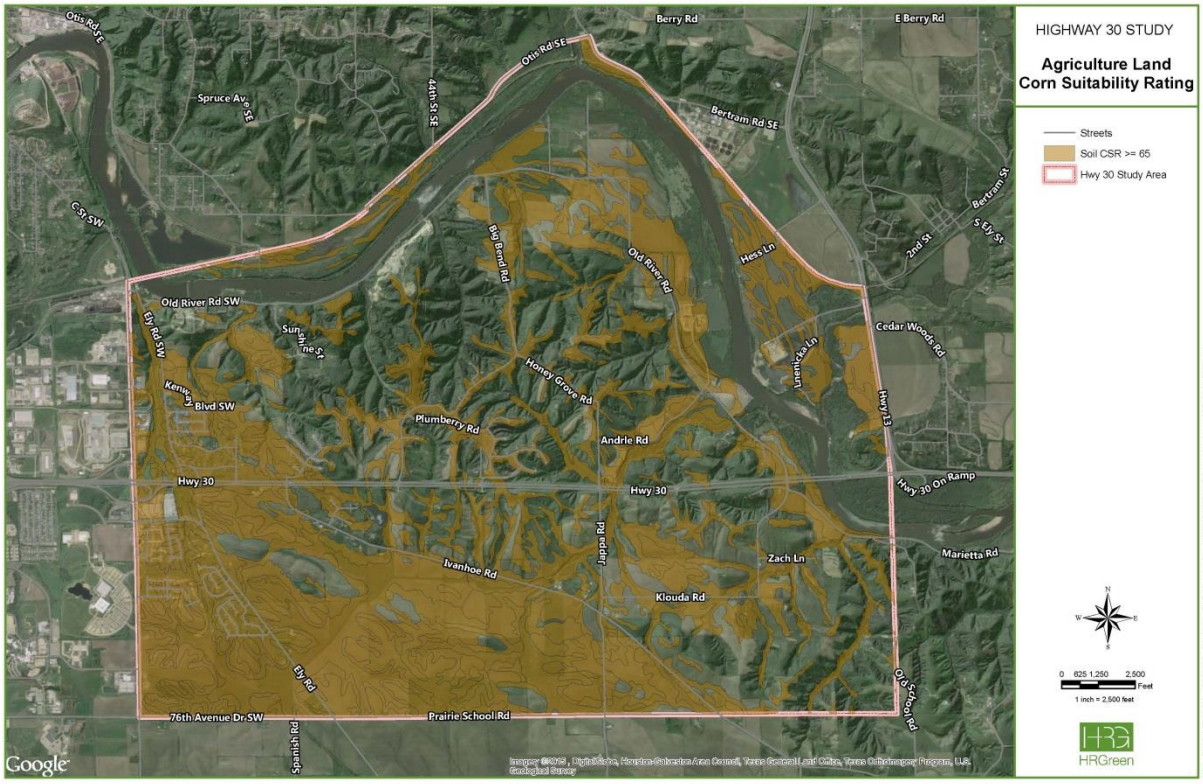


Source: HR Green, Natural Resources Conservation Service

[4] According to the Natural Resources Conservation Service soil erosion characteristics can be described as "slight," "moderate," "severe," or "very severe." A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion-control measures may be needed; "severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and "very severe" indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

- ***Agricultural Resources:*** Much of the study area is comprised of land actively engaged in production agriculture. What is more, much of the study area south of US 30 is characterized by land with a Corn Suitability Rating (CSR) of 65 or greater. The conversion of productive agricultural land to non-agricultural development can have an impact on future land use and development decisions. CSR ratings of 65 or greater are often associated with the most productive agricultural land. Map 11 illustrates land that has a CSR value of 65 or greater. This consideration is often a key decision factor when considering the conversion of highly productive agricultural land to non-agricultural purposes.

Map 11: Soils with CSR Ratings of 65 or Greater



Source: Iowa Department of Natural Resources

Based on data provided by the Iowa Department of Agriculture and Land Stewardship up to 4 farms (see Map 12) within the study area may be designated as Century Farms. Iowa Code has certain provisions concerning Century Farms:

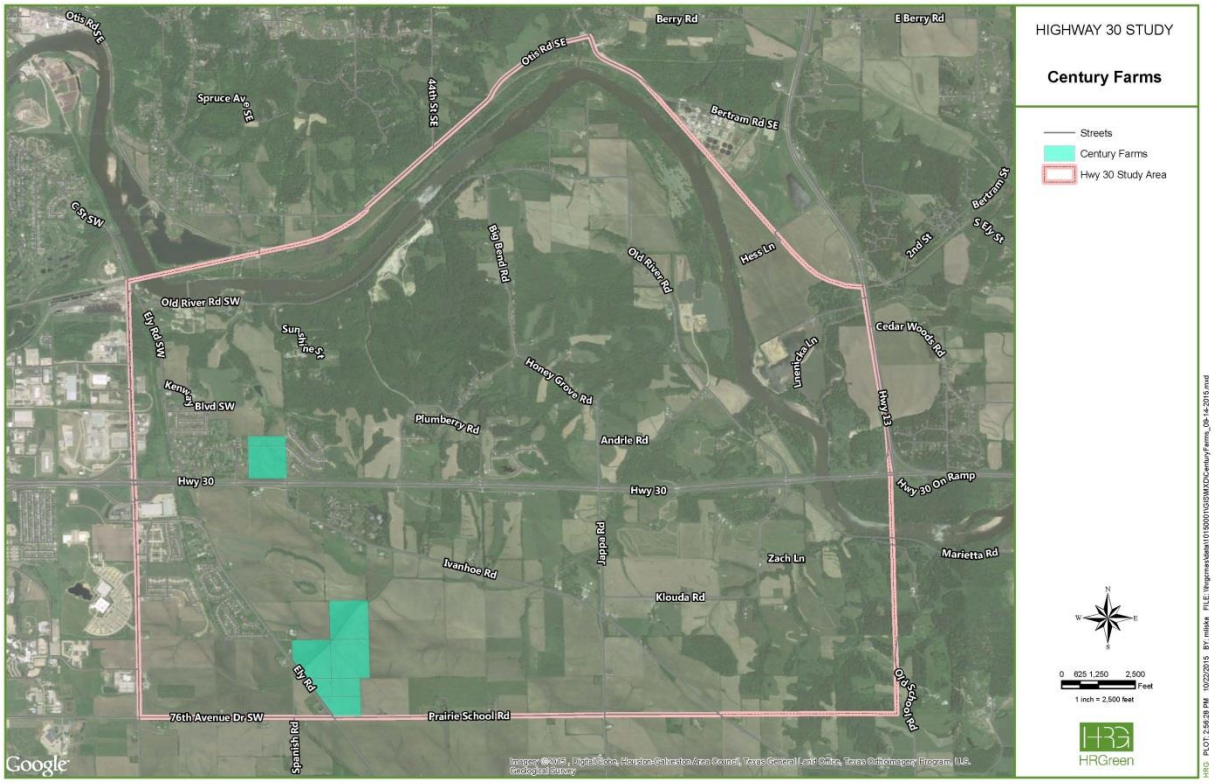
- 368.26 Annexation of certain property: Renders city ordinance(s) adopted for the purpose of regulating protected farmland as unenforceable.

- 403.7 Condemnation of property through the use of eminent domain for economic development purposes: Municipalities may not condemn agricultural land by exercising its eminent domain authority within an economic development area unless the owner

of the agricultural land consents to the condemnation or unless the municipality determines the land is necessary to: 1. Operate a city utility; or 2. Operate a city franchise conferred by the authority to condemn private property under 364.2.

- 403.17 Subsection 10, Economic Development Area: Urban Renewal Areas designated as an *economic development area* shall not include agricultural land, including land which is part of a century farm, unless the owner agrees to include the land.

Map 12: Century Farms in the Study Area



Source: Iowa Department of Agriculture and Land Stewardship

V. SCENARIO 1: PLANNED DEVELOPMENT

- ***Scenario Overview:*** Scenario 1 depicts development that is consistent with EnvisionCR, the City of Cedar Rapids comprehensive plan and the Linn County Comprehensive Plan. The sections below detail transportation and related utility services as well as associated concept level cost opinions for conceptual improvements necessary to accommodate Scenario 1 growth. Please note that exhibits corresponding to transportation and related utility services cite current service locations in addition to the location, size, and costs of conceptual infrastructure necessary to serve the service area described in this scenario.

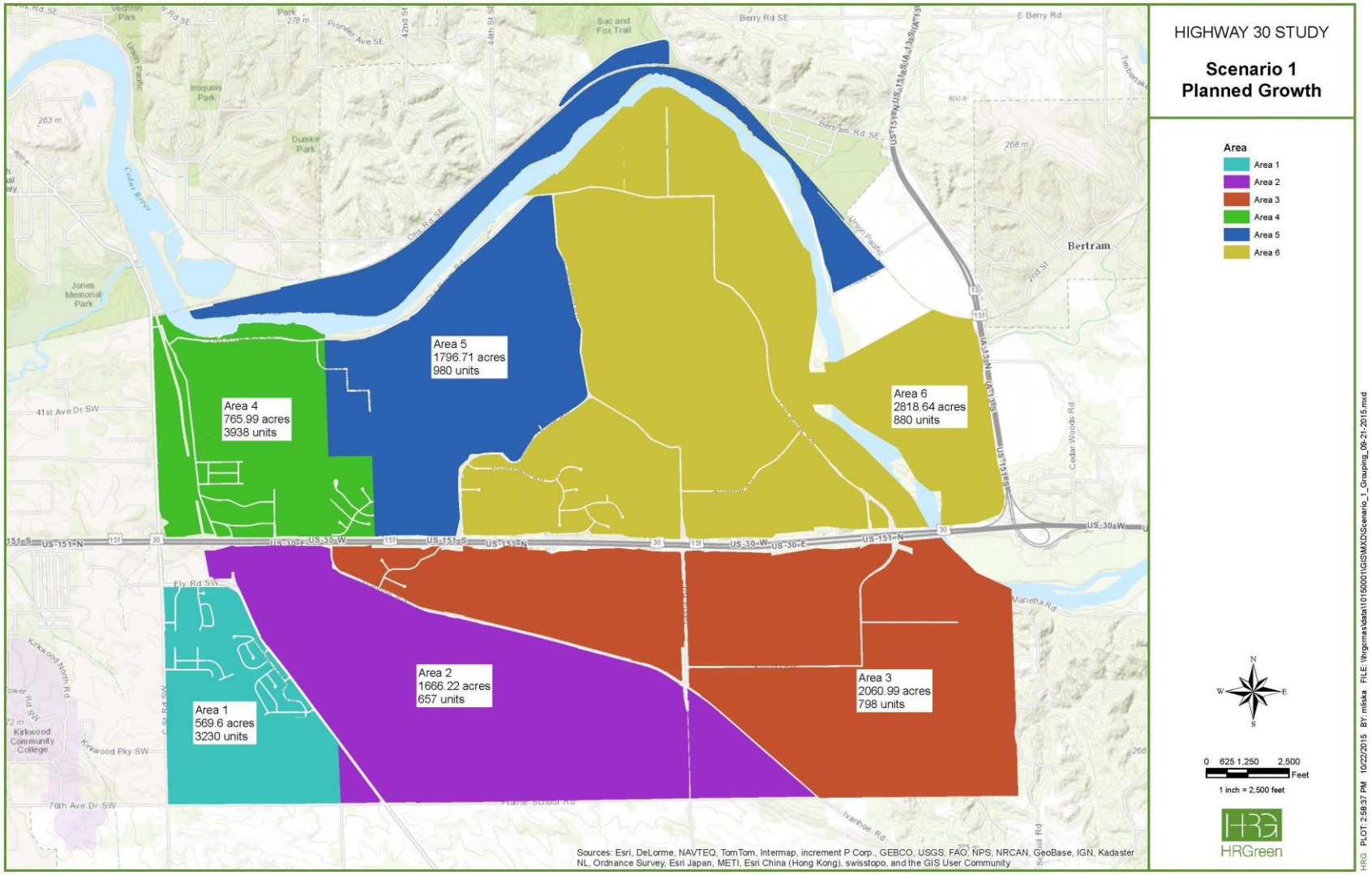
Scenario 1 – Planned Growth: Table 1 and Map show the representative areas and associated acreage and dwelling units for Scenario 1. Please refer to Appendix D for a more detailed summary of land use and associated density information. Ultimately, the Planned Growth applies the adopted future land use and associated development densities for land that is currently located within the jurisdictional boundaries of the City of Cedar Rapids and Linn County. This scenario also assumes that build out for the area is 80% of the average density in the range allowed by the adopted Future Land Use Maps. Some land use densities for designated areas cite a range of acceptable densities. In these cases, the approach calculated the average density range and then applied the 80% factor. For example, the Urban High Intensity land use cites a range of 8 to 40 units per acre. We applied the average units per acre (24) and multiplied this value by 0.8 to calculate the number of units for areas that met this definition.

Table 1

Scenario 1 and Associated Development Densities

Area	Acres	Number of Dwelling Units
1	569.48	3,230
2	1,666.22	657
3	2,060.99	798
4	765.99	3,938
5	1,496.71	980
6	2,818.59	880
Total	9,377.98	10,483

Map 13: Scenario 1 – Planned Growth



Source: City of Cedar Rapids, Linn County, Corridor MPO, HR Green

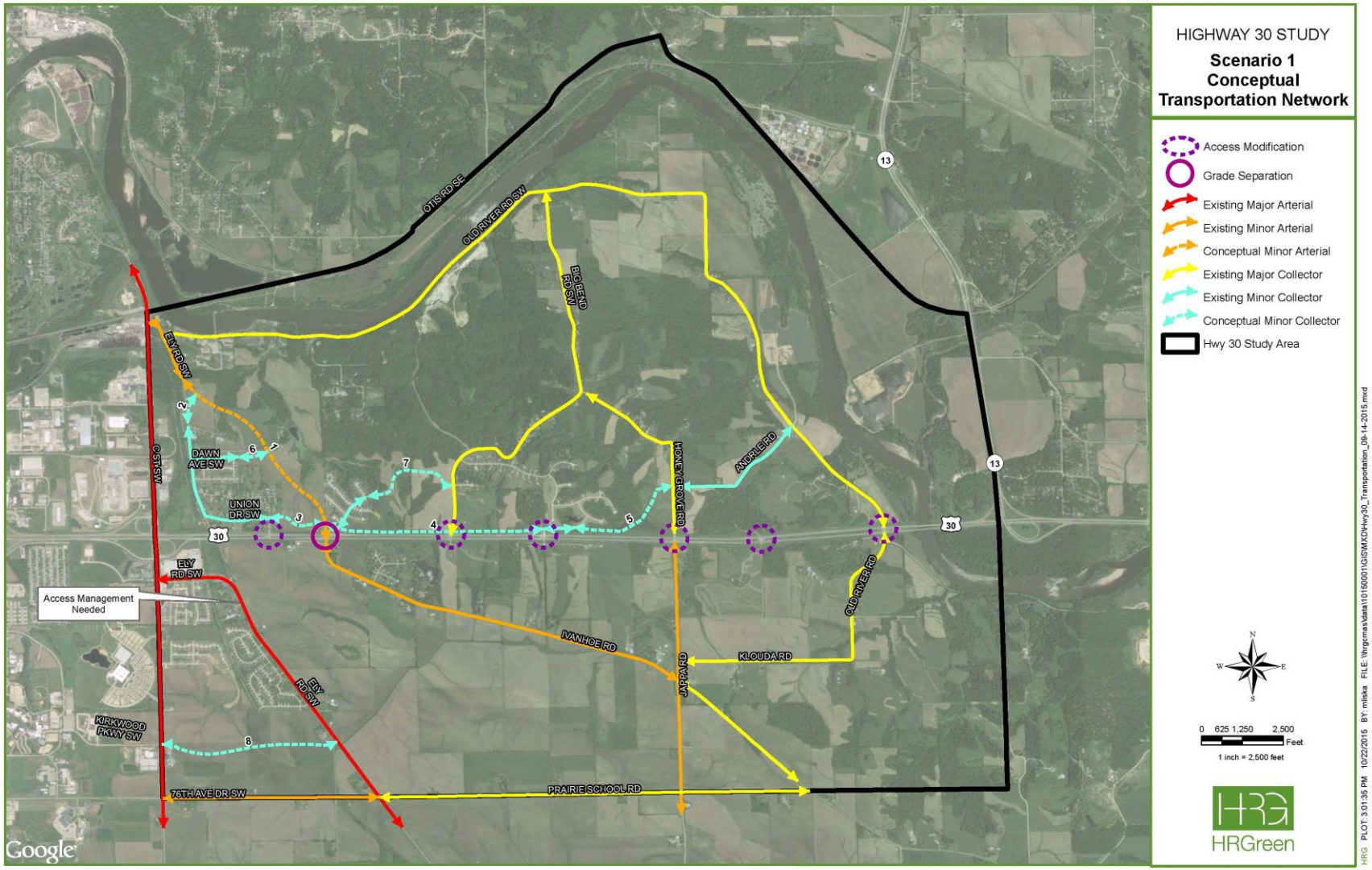
- ***Transportation***
  - *Roadway Connections:* The conceptual transportation network for Scenario 1 (Map 14) expands the existing street network north of U.S. Highway 30 to improve access between existing residential land uses and existing roadways. Primary connections established by Scenario 1 include an additional Minor Arterial between Ivanhoe Road at U.S. Highway 30 and Ely Road SW. This conceptual Minor Arterial provides continuity as an additional route in the southwest portion of the city of Cedar Rapids. This roadway would likely be developed as a three-lane urban cross-section and would support planned growth within the city of Cedar Rapids.

    Along U.S. Highway 30 a conceptual Minor Collector would provide access to existing residential land uses and provide a parallel route to the highway. This roadway would provide a similar function to a frontage or back-age road and would support growth within the city of Cedar Rapids and carry traffic currently utilizing U.S. Highway 30. Additional conceptual Minor Collectors are located north of U.S. Highway 30 to provide additional connections to existing Collector roadways.

    In the southern portion of the Study Area one conceptual roadway is included in Scenario 1. This roadway would connect Kirkwood Parkway SW at C Street SW to Ely Road SW in an identified growth area for the city of Cedar Rapids. This connection would support planned growth between the two Major Arterials and provide access to the future local street network.

    U.S. Highway 30 Access: Access along U.S. Highway 30 would likely not require any new access locations. The conceptual Minor Arterial extending north from Ivanhoe Road would utilize the existing access north of Ivanhoe Road. Modifications to all existing access locations along U.S. Highway 30 to change geometric, safety, or access concerns should be considered during future roadway development. Access modifications, such as, improved signage, turn lane extensions, intersection alternatives (Median U-Turn or Restricted Crossing U-Turn intersections), grade separated overpasses, or other safety improvements should be evaluated further as development occurs or traffic volumes increase the need for improvements. Coordination with the Iowa DOT is recommended as part of any future analysis of the corridor.

Map 14: Scenario 1 Transportation Improvements



Source: City of Cedar Rapids, Linn County, Corridor MPO, & Iowa DOT

One access modification that could provide improved traffic connectivity and safety for Scenario 1 is a grade separation with no direct access to U.S. Highway 30 at the Ivanhoe Road/conceptual Minor Arterial crossing. Providing grade separation at this location would allow north-south traffic continuous flow over U.S. Highway 30, provide non-motorized modes (i.e., bicycle and pedestrian) safe access across Highway 30 and be consistent with the existing Priority 1 rating on U.S. Highway 30 at that location.

With the construction of the conceptual Minor Collectors adjacent to U.S. Highway 30 direct access to residential land uses should be examined to determine operational needs along U.S. Highway 30. As traffic volumes increase in the Study Area, modifications should be considered that provide safe access to adjacent land uses and continuous routes within the Study Area.

- *Concept Level Cost Opinion:* Planning level costs were developed based on recent construction bids for a 3-lane, 4-lane, and 5-lane urban-section roadway built in suburban areas. Transportation improvements are compliant with the Cedar Rapids complete streets policy. The average cost per linear foot per lane is approximately $300. This average cost was used to estimate the cost of constructing the identified conceptual roadways for Scenario 1, shown in Table 4. Based on the City of Cedar Rapids Petition and Assessment Agreement, costs associated with future development were determined based on proposed roadway classification and approximate roadway right-of-way.

  Costs for access modifications and the grade separation of Ivanhoe Road were not included in the planning level cost estimate for Scenario 1. Additional planning and traffic analysis will be required prior to access changes to determine the appropriate modification at each location. In general, costs associated with access modifications and possible grade separations could range from $5 million to $8 million for Scenario 1.

Table 2: Scenario 1 Transportation Improvements Concept Level Cost Opinion

	Segment No.	Name	Termini	Termini	Planning Level Cost (2015 $)	Scenario 1 Total Cost (2015 $)
City Roads	1	Proposed Minor Arterial	Ely Road SW	Union Drive SW	4,030,000	6,630,000
	1	Grade Separation Ramp	Ivanhoe Road SW	North of Hwy 30	2,000,000	
	2	Proposed Minor Collector	New Minor Arterial	Ely Road SW	600,000	
Developer Roads	1	Proposed Minor Arterial	Ely Road SW	Union Drive SW	2,170,000	15,270,000
	3	Proposed Minor Collector	Union Drive SW (at East Road SW)	New Minor Arterial	1,100,000	
	4	Proposed Minor Collector	New Minor Arterial	Inverness Drive	4,000,000	
	5	Proposed Minor Collector	Woodmore Drive SW	Honey Grove Road	2,200,000	
	6	Proposed Minor Collector	Shaman Avenue SW	New Minor Arterial	600,000	
	7	Proposed Minor Collector	Union Drive SW	Honey Grove Road	1,900,000	
	8	Proposed Minor Collector	C Street SW (At Kirkwood Parkway SW)	Ely Road SW	3,300,000	

*Cost estimate based on $300/linear foot/lane, established using recent bid estimates for roadway construction of urban cross-sections.

Source: City of Cedar Rapids, Iowa DOT, HR Green

- ***Water Service***

The current long range planning for the water system in this area includes raising the area included within the study to a higher gradient of 993 feet from the current water gradient of 967 feet. This change will increase the possibility for serving Scenario 1 growth in the study area. However, the preliminary estimates indicate this flow would likely result in the need for expanding the water treatment plant. The system was modeled with the assumption that the 10 States Standard minimum pressure of 35 psi would be provided to the high elevations in the study area. Preliminary estimations indicate the proposed system gradient would be adequate to serve the study area without the need for a booster station.

The system was modeled using one main source from the existing system. This source was modeled as a reservoir set to the future gradient of 983 feet, as directed by the Cedar Rapids Water Division. The reservoir was placed on 76th Avenue SW to simulate the most likely direction from which the water supply will originate. This was also done in accordance with recommendations made by the Cedar Rapids Water Division. The existing distribution capacity of the system outside of the study area, within the existing system, is unknown. It is suggested that a more comprehensive water system study be conducted to confirm the findings of this preliminary study to ensure the proper pressure and demands can be met for this scenario.

In Scenario 1, the land uses were evaluated and design flows were associated with each category. These categories and design flows are listed in Table 3. The locations of current water system as well as conceptual improvements are cited in Map 13.[5] The City of Cedar Rapids NW water treatment facility is located along Ellis Road on the western edge of the City limits. The City of Cedar Rapids J Avenue Water Treatment facility is located approximately five-miles northwest of the study area. Both plants could potentially provide service to the new pressure zone and study area. These facilities would serve the new pressure zone and the study area. Preliminary findings of this analysis are as follows:

- The approximate average flow that would be required to serve the study area is 2.9 MGD[6] or 2,000 gpm
- Development anticipated in Scenario 1 is expected to result in the need to expand the existing treatment capacity of the water plant.
- According to the Cedar Rapids Water Division there would not be a need for additional storage to be constructed in this area.
- A 24" line would be necessary to provide a loop from the intersection of Kirkwood Parkway SW and C Street SW to Old River Road SW.
- Service would be extended along HWY 30 to Woodmore Drive SW through a 16-inch line and looped north to Old River Road SW through a 12-inch line.

Table 3: Scenario 1 Summary of Land Uses & Conceptual Design Flows

Land Use	Area	Population[7]	Loading
	Acres		gpd
Agriculture	2,497	-	-
Civic	27	-	-
Critical Natural Resources	662	-	-
Metro Urban Service	54	178	17,795
Open Space	373	-	-
Urban High Intensity	59	3,519	351,883
Urban Large Lot	-	-	-
Rural Residential	3,983	-	-
Urban Low Intensity	760	17,548	1,754,756
Urban Low Intensity - Environmental Conservation	427	2,819	281,860
Urban Medium Intensity	98	4,514	451,396
Existing Development	434	2,956	295,560
Total	**9,372**	**31,533**	**3,153,251**

Source: City of Cedar Rapids, Linn County, Corridor MPO, HR Green

[5] gpm is Gallons per Minute
[6] MGD is Millions of Gallons per Day
[7] Population projections are based on 2.5 residents for Urban High Intensity and 3.3 residents for all other land use categories

- *Concept Level Cost Opinion:* A concept level cost opinion for water service for the conceptual improvements associated with Scenario 1 is detailed in Table 4. This cost opinion is based on a complete build out of the area and not based on a phased approach.

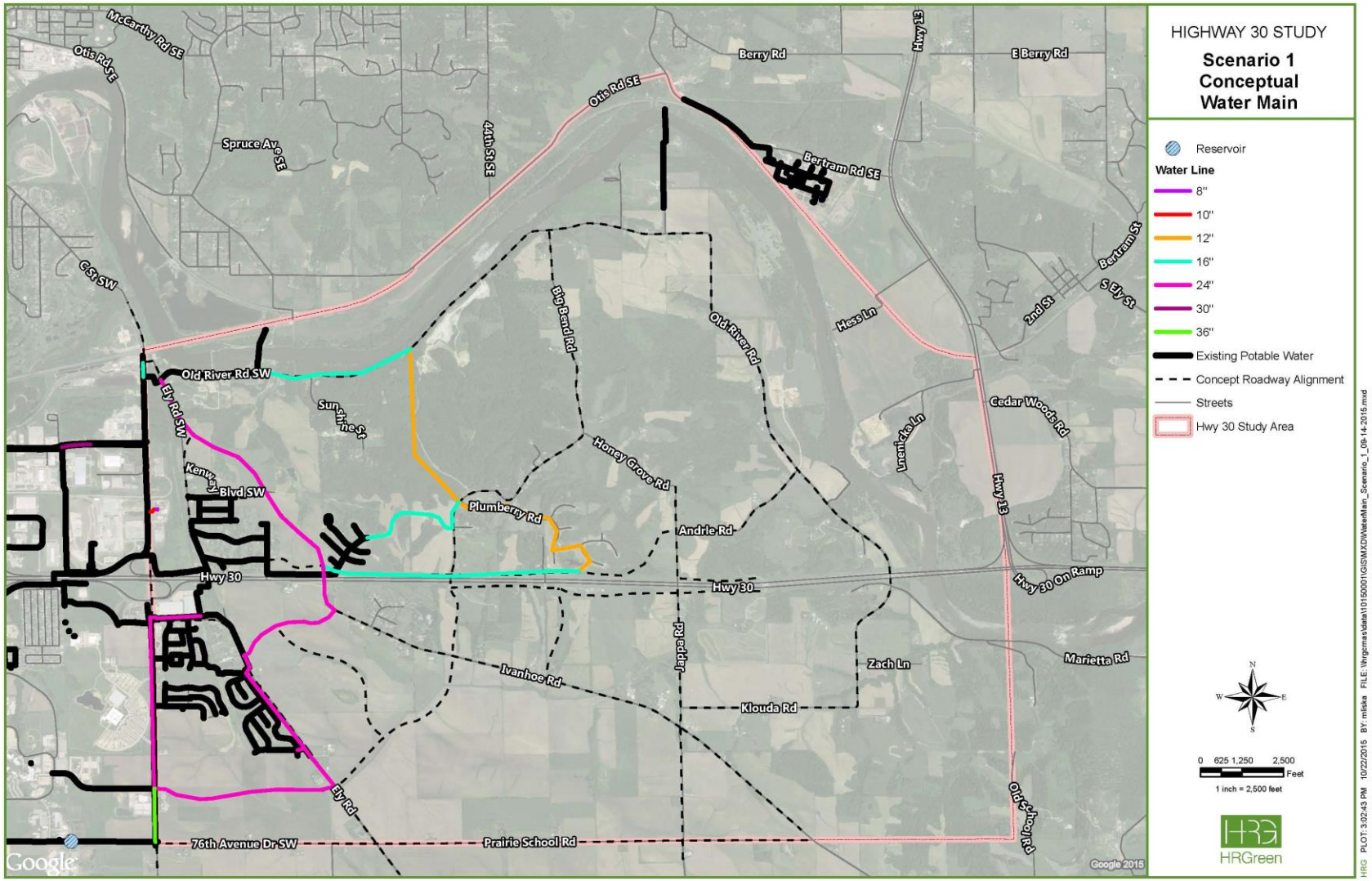
Table 4: Scenario 1 Water Service

Concept Level Cost Opinion

Item	Units	Quantity	Unit Cost	Total
6" Ductile Iron Pipe	LF	196	$125	$25,000
8" Ductile Iron Pipe	LF	1932	$125	$242,000
12" Ductile Iron Pipe	LF	13193	$175	$2,309,000
16" Ductile Iron Pipe	LF	17037	$225	$3,834,000
24" Ductile Iron Pipe	LF	30252	$350	$10,589,000
30" Ductile Iron Pipe	LF	868	$400	$348,000
36" Ductile Iron Pipe	LF	4152	$450	$1,869,000
Hydrants	EA	170	$1,500	$255,000
			Subtotal	$19,471,000
			Contingency	$7,542,400
			Total	**$27,013,400**

Source: City of Cedar Rapids, HR Green

Map 15: Scenario 1 Water Service Improvements



Source: City of Cedar Rapids, HR Green

- ***Sanitary Sewer Service***
  Map 16 cites current sanitary service in the vicinity of the study area as well as in the conceptual improvements for Scenario 1. The only areas served by sanitary sewer service would be developments within the city of Cedar Rapids and areas that are identified for growth in EnvisionCR. Preliminary findings indicate:

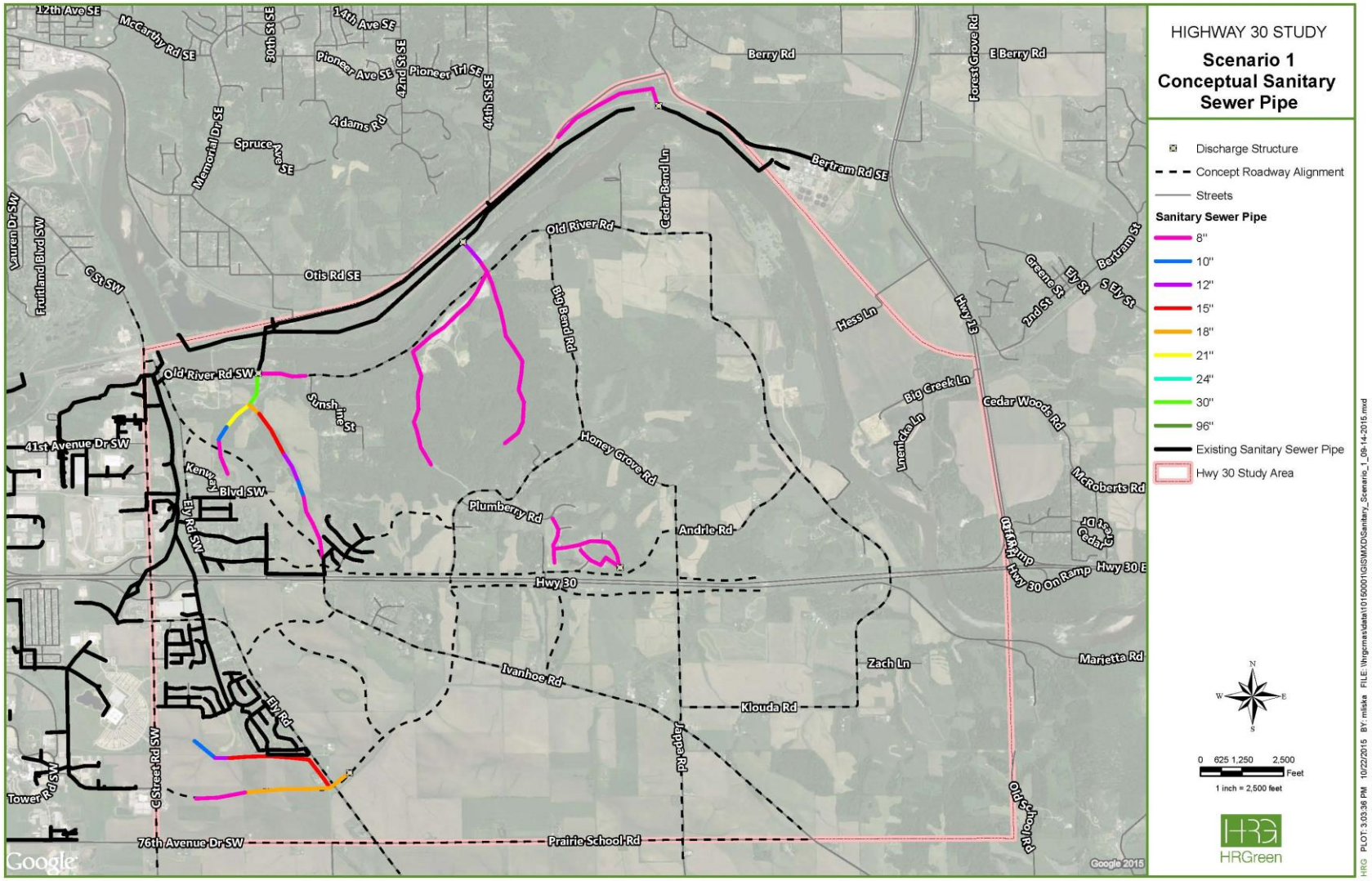
  - An additional average flow of 2.9 MGD is estimated for this area, with an estimated peak flow of 7.9 MGD.
  - The wastewater treatment plant would likely need to be expanded to treat the additional flow
  - Two new lift stations would need to be constructed to serve the proposed development area.
  - A new river crossing would need to be installed to connect at Otis Road.

  Using the loading values as described in Table 3 and the Future Land Use for areas that are not currently developed, the total additional flow expected for Scenario 1 is approximately 2.9 MGD. This results from an estimated population increase of 28,500 people. Using the Cedar Rapids Metropolitan Area Design Standards the peak flow for this area could result in a flow of 7.9 MGD. For modeling purposes a maximum depth to rise percentage of 66% was used to determine adequate pipe sizing for Scenario 1.

  The flow estimates indicate a need for expanding the wastewater treatment plant. In addition, due to terrain the preliminary results indicate that two lift stations may need to be installed to serve a portion of the area on the corner of 76th Avenue Drive SW and C Street Rd SW, as well as the area north of Highway 30 off of Woodmore Drive.

  The two locations that would likely be tie-in points for the gravity sewer are located on Old River Road and at Otis Road. The connection at Otis Road would require a new river crossing to be installed. The existing capacity remaining in the trunk line to the Water Pollution Control Facility is currently unknown and an additional assessment would be required prior to the addition of the conceptual sanitary sewer improvements.

Map 16: Scenario 1 Sanitary Sewer Service Improvements



Source: City of Cedar Rapids, HR Green

- *Concept Level Cost Opinion:* A concept level cost opinion for sanitary sewer service for the conceptual improvements associated with Scenario 1 is detailed in Table 5. This cost opinion is based on a complete build out of the area and not based on a phased approach.

Table 5: Scenario 1 Sanitary Sewer Service Concept Level Cost Opinion[8]

Item	Units[9]	Quantity	Unit Cost	Total
8" Sewer Pipe	LF	28,197	$150	$4,230,000
10" Sewer Pipe	LF	1,744	$200	$349,000
12" Sewer Pipe	LF	2,125	$200	$426,000
15" Sewer Pipe	LF	4,892	$250	$1,224,000
18" Sewer Pipe	LF	3,703	$300	$1,111,000
24" Sewer Pipe	LF	22	$500	$11,000
30" Sewer Pipe	LF	1,012	$600	$608,000
Manholes	EA	110	$5,000	$550,000
Lift Stations	EA	2	$2,000,000	$4,000,000
			Subtotal	$12,509,000
			Contingency	$5,003,600
			Total	**$17,512,600**

Source: City of Cedar Rapids, HR Green

[8] Cost opinions do not include any costs to upgrade the Water Pollution Control Facility.
[9] LF references" linear feet" and EA references "Each."

- ***Stormwater Management***
  The approach to determine stormwater management strategies and formulate a concept level cost opinion involved analyzing geospatial data for the study area including topography, soil types, proposed land use and transportation routes, existing wetlands and streams, and floodplains (methods are discussed more thoroughly in Appendix C). The ultimate needs for stormwater management in new developments include:

  - Local and regional detention basins
  - Culverts and bridges for major waterway / roadway crossings
  - Roadway related storm drainage infrastructure
  - Smaller distributed stormwater Best Management Practices ("BMPs")

  Costs typically borne by the municipality include roadway related infrastructure for major streets such as arterials and collectors, as well as culverts and bridges. The bulk of the remaining costs are typically borne by the developer or the individual parcel owners. Costs borne by the developer that include regional aspects (such as regional detention basins often involving multiple developers or owners) can be managed by the municipality in the form of connection fees, levied per unit (acre or parcel) and used to fund construction of the infrastructure. These arrangements are typically structured to balance, such that there is no actual long-term cost to the municipality.

  The costs listed herein are separated by which entity typically bears the cost, but both types are included because they typically affect each other, and the cost of development as a whole. For instance, encouraging parcel owners to employ installation of distributed stormwater BMPs will reduce the extent of downstream infrastructure required, and can greatly reduce the annual maintenance needs of the downstream infrastructure. This is one example of private expenditure reducing long-term municipal expenditures.

  The overall strategy for estimating the stormwater management needs for scenario 1 and scenario 2 are identical, but the total needs for scenario 1 were reduced related to the lesser extent of total build-out anticipated. The costs included in Table 6 include average unit costs only.

  Concept Level Cost Opinion: Table 6 summarizes the characteristics of stormwater management approach regarding Scenario 1 and a concept level cost opinion for cited improvements. Estimates do not include the cost of purchasing right-of-way for the drainage basins.

Table 6: Scenario 1 Stormwater Management Concept Level Cost Opinion

Road Type	Quantity	Unit[10]	Cost	Total	Cost Typically Borne By:
Stormwater Infrastructure Costs for Collector Streets					Developer
Manholes	152	EA	5000	$760,000	
Intakes	888	EA	3500	$3,108,000	
Pipe	122700	LF	62	$7,551,000	
Stormwater Infrastructure Costs for Arterial Streets					Municipal
Manholes	72	EA	5000	$360,000	
Intakes	400	EA	3500	$ 1,400,000	
Pipe	55200	LF	62	$3,400,000	
Distributed Stormwater Costs					
Detention Basin Costs	1300	AC-FT	N/A	$29,000,000	Municipal*
Major Culvert Costs	43	Locations	N/A	$1,020,000	Municipal
Local Stormwater BMPs	53	AC-FT	N/A	$44,000,000	Developer

Sources: Natural Resources Conservation Service, HR Green

* Detention costs were considered municipal burdens for cost modeling purposes due to interim funding of infrastructure. However, reimbursements made to the stormwater utility as development materializes are meant to offset this investment.

[10] EA represents "each," LF means "linear feet," and AC-FT denotes "acre-feet."

VI. SCENARIO 2: STATUS QUO/MARKET DRIVEN

- ***Scenario Overview:*** As summarized in Section I, Scenario 2 depicts development that is based on a market driven model and anticipates that the entire study area would be within the jurisdictional boundaries of the City of Cedar Rapids. The sections below detail transportation and related utility services as well as associated concept level cost opinions for cited improvements necessary to accommodate Scenario 2 growth. Please note that exhibits corresponding to transportation and related utility services cite current service locations in addition to the location, size, and costs of conceptual infrastructure necessary to serve the service area described in this scenario.

  Scenario 2 – Status Quo / Market Driven Growth: Table 7 and Map 17 show the representative acreage and associated densities for Scenario 2. This scenario includes a combination of the density allowed by the adopted Future Land Use Maps, existing and proposed development, and anticipated densities based on proposed development. Please refer to Appendix E for a more detailed summary of land use and associated density information.

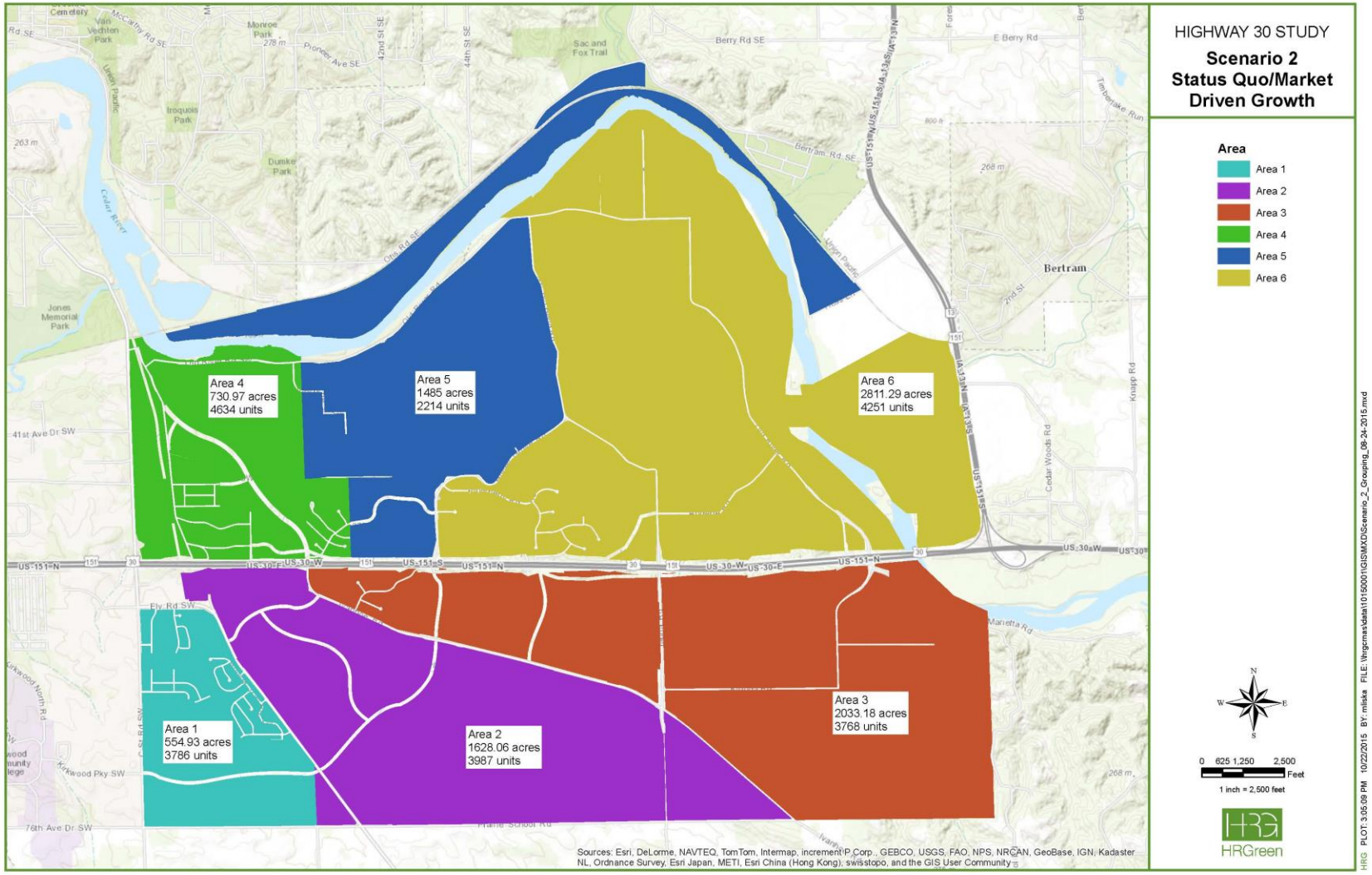
Table 7

Scenario 2 and Associated Development Densities

Area	Total Acres	Number of Dwelling Units
1	554.93	3,786
2	1,628.06	3,987
3	2,033.18	3,768
4	730.97	4,634
5	1,485	2,214
6	2,811.29	4,251
Total	9,243.43	22,640

Source: City of Cedar Rapids, Linn County, Corridor MPO, HR Green

Map 17: Scenario 2 – Status Quo/Market Driven Growth



Source: City of Cedar Rapids, Linn County, Corridor MPO, HR Green

- ***Transportation***

  - *Roadway Connections:* The conceptual transportation network for Scenario 2 (Map 18) builds upon Scenario 1 and expands the street network south of U.S. Highway 30 to improve access between existing roadways. In Scenario 2, two Major Collector roadways provide connections between Ely Road SW and Ivanhoe Road. These roadways would support growth south of U.S. Highway 30 and provide additional travel routes between Ivanhoe Road and C Street SW. The southern conceptual Major Collector would create a continuous route between Ivanhoe Road and C Street SW via the conceptual Minor Collector developed for Scenario 1.

    North of Ivanhoe Road, two conceptual north-south roadways connect to a conceptual Minor Collector located adjacent to U.S. Highway 30. These north-south roadways would support development between Ivanhoe Road and U.S. Highway 30. The conceptual Minor Collector adjacent to U.S. Highway 30 would provide a similar function to a frontage or back-age road.

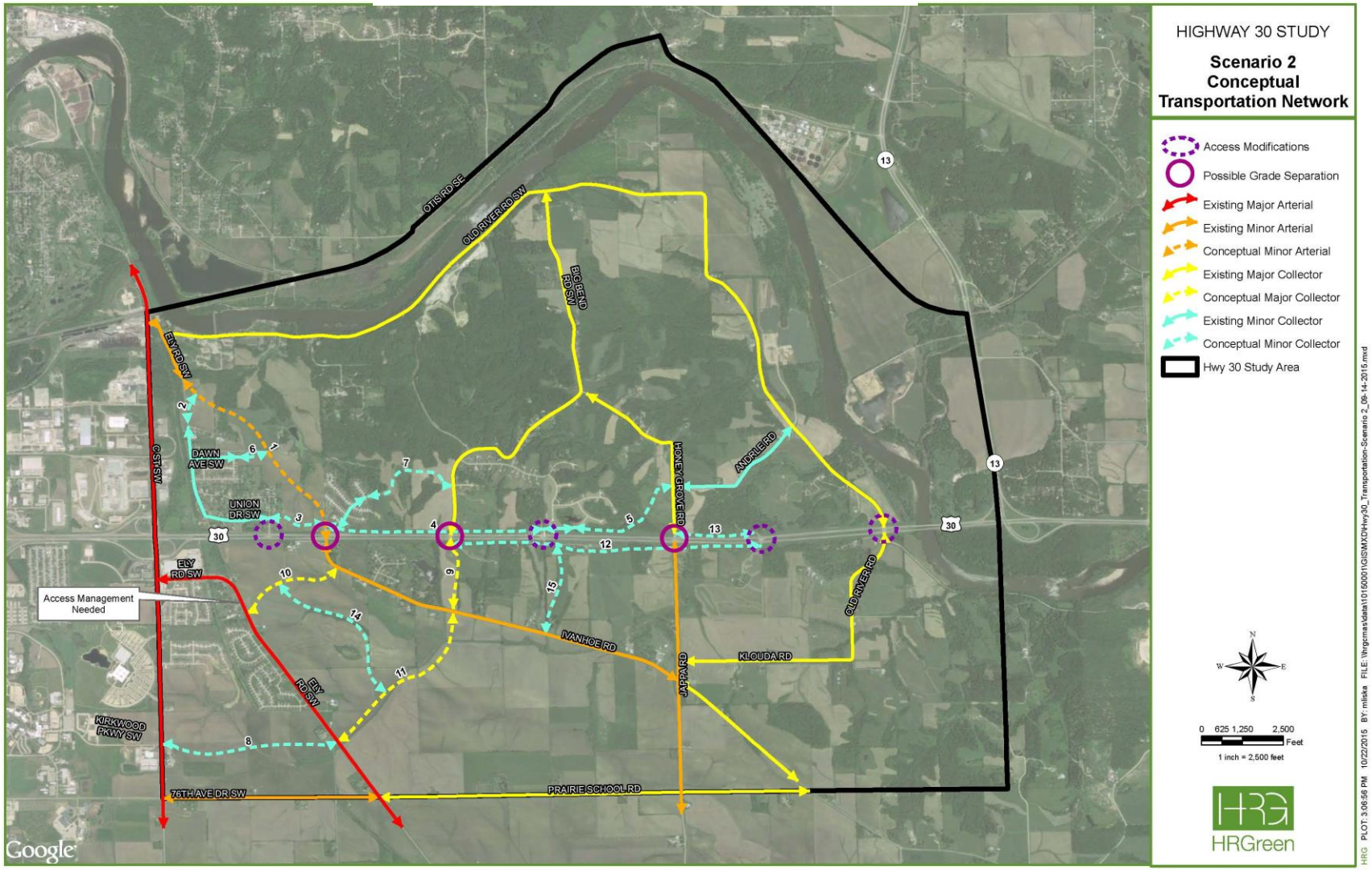
    Two additional Minor Collector roadways would provide access to the existing direct access locations east of Jappa Road north and south of U.S. Highway 30.

  - *U.S. Highway 30 Access:* Access along U.S. Highway 30 would likely not require any new access locations. The conceptual Minor Arterial extending north from Ivanhoe Road would utilize the access north of Ivanhoe Road. The conceptual Major Collector located south of Honey Grove Road would likely require modification to allow for additional traffic and ensure existing property access is provided. Modifications to existing access locations along U.S. Highway 30 to change geometric, safety, or access concerns should be considered during future roadway development. Access modifications, such as, improved signage, turn lane extensions, intersection alternatives (Median U-Turn or Restricted Crossing U-Turn intersections), grade separated intersections or other safety improvements should be evaluated further as development occurs or traffic volumes increase the need for improvements. Coordination with the Iowa DOT is recommended as part of any future analysis of the corridor.

    Three access modifications that could provide improved traffic connectivity and safety for Scenario 2 include grade separations with no direct access to U.S. Highway 30 at the Ivanhoe Road/conceptual Minor Arterial, Honey Grove Road/conceptual Major Collector, and Honey Grove Road/Jappa Road crossings. Providing grade separations at these locations would allow north-south traffic continuous flow over U.S. Highway 30, provide non-motorized modes (i.e., bicycle and pedestrian) safe access across Highway 30, and potentially improve safety as growth occurs within the Study Area.

    With the construction of the conceptual Minor Collectors adjacent to U.S. Highway 30, direct access to residential land uses should be examined to determine operational needs along U.S. Highway 30. As traffic volumes increase within the Study Area, modifications should be considered that provide safe access to adjacent land uses and continuous routes within the Study Area.

Map 18: Scenario 2 Transportation Improvements



Source: City of Cedar Rapids, Corridor MPO, HR Green, & Iowa DOT

- *Concept Level Cost Opinion:* Planning level costs were developed based on recent construction bids for a 3-lane, 4-lane, and 5-lane urban-section roadway built in suburban areas and consistent with the Cedar Rapids complete streets standard. The average cost per linear foot per lane is approximately $300. This average cost was used to estimate the cost of constructing the identified conceptual roadways for Scenario 2, shown in Table 8. Based on the City of Cedar Rapids Petition and Assessment Agreement, costs associated with future development were determined based on proposed roadway classification and approximate roadway right-of-way.

  One access modification that could provide improved traffic connectivity and safety for Scenario 2 is a grade separation with no direct access to U.S. Highway 30 at the Ivanhoe Road/conceptual Minor Arterial crossing. Providing grade separation at this location would allow north-south traffic continuous flow over U.S. Highway 30, provide non-motorized modes (i.e., bicycle and pedestrian) safe access across Highway 30 and be consistent with the existing Priority 1 rating on U.S. Highway 30 at that location.

  Costs for access modifications and possible grade separations[11] were not included in the planning level cost estimate for Scenario 2. Additional planning and traffic analysis will be required prior to access changes to determine the appropriate modification at each location. In general, costs associated with access modifications and possible grade separations could range from $15 million to $24 million for Scenario 2.

[11] This statement does not include the proposed grade separation at Ely Road SW and US 30.

Table 8: Scenario 2 Transportation Improvements Concept Level Cost Opinion[12]

	Segment No.	Name	Termini	Termini	Planning Level Cost (2015 $)	Scenario 2 Total Cost (2015 $)
City Roads	1	Proposed Minor Arterial	Ely Road SW	Union Drive SW	4,030,000	6,630,000
	1	Grade Separation Ramp	Ivanhoe Road SW	North of Hwy 30	2,000,000	
	2	Proposed Minor Collector	New Minor Arterial	Ely Road SW	600,000	
Developer Roads	1	Proposed Minor Arterial	Ely Road SW	Union Drive SW	2,170,000	33,870,000
	3	Proposed Minor Collector	Union Drive SW (at East Road SW)	New Minor Arterial	1,100,000	
	4	Proposed Minor Collector	New Minor Arterial	Inverness Drive	4,000,000	
	5	Proposed Minor Collector	Woodmore Drive SW	Honey Grove Road	2,200,000	
	6	Proposed Minor Collector	Shaman Avenue SW	New Minor Arterial	600,000	
	7	Proposed Minor Collector	Union Drive SW	Honey Grove Road	1,900,000	
	8	Proposed Minor Collector	C Street SW (At Kirkwood Parkway SW)	Ely Road SW	3,300,000	
	9	Proposed Major Collector	Honey Grove Road (at U.S. Highway 30)	Ivanhoe Road	1,400,000	
	10	Proposed Major Collector	Ely Road SW	Ivanhoe Road	2,000,000	
	11	Proposed Major Collector	Ely Road SW	Ivanhoe Road	3,300,000	
	12	Proposed Minor Collector	New Major Collector	Property Access (East of Honey Grove Road)	5,700,000	
	13	Proposed Minor Collector	Honey Grove Road	Property Access (East of Honey Grove Road)	1,400,000	
	14	Proposed Minor Collector	Major Collector	Major Collector	3,100,000	
	15	Proposed Minor Collector	Minor Collector	Ivanhoe Road	1,700,000	

[12] Cost estimate based on $300/linear foot/lane, established using recent bid estimates for roadway construction of urban cross-sections.

- ***Water Service***

  Map 19 illustrates existing and conceptual water service extensions associated with scenario 2. One main connection was used and modeled as a reservoir to provide flow into the new system. As stated in Scenario 1, it is in the City's long range planning to move this area from a gradient of 967 feet to a gradient of 993 feet. The reservoir was set at a water level of 983', which is what the City of Cedar Rapids identified as the possible water gradient in this area during normal operation of the system. The study area would float off the City's existing gradient zone. Preliminary findings indicate the following:

  - An additional 16-inch line would be required along the south end of C Street.
  - An additional average flow of 7.11 MGD is estimated for this area, with an estimated peak flow of 24 MGD.
  - The Water Treatment Plants would need to be expanded to serve the study area.
  - Additional storage would need to be constructed.
  - The study area would be served by a combination of 12-inch, 16-inch, 24-inch, 36-inch, and 42-inch lines.
  - A booster station would likely be needed to provided adequate pressure and flow to the study area

  An additional 16-inch line may be required along the south end of C Street to add additional capacity for the area. This 16-inch line was added for modeling purposes but is difficult to see within the figure. This additional line would allow for a greater amount of flow to reach the northern end of the study area. It is recommended that a more comprehensives system study be performed to model the flow of water and determine if this additional capacity is indeed needed.

  The system was modeled using a steady-state condition. Pipe sizes are conservative to keep lower water velocities as well as provide a conservative cost estimate. Peak flow and fire flow conditions were preliminarily evaluated to determine the feasibility of the future development. Additional analysis would be required to confirm the preliminary estimates. The future expected demands and land use summary for Scenario 2 is provided in Table 9. It is estimated that an additional average demand of 7.11 million gallons per day would be placed on the water system for Scenario 2. This additional demand would likely require the existing water treatment plants to be expanded.

  In addition, there would be a need for additional finished water storage for study area. The 10- States standard requires finished water storage sized for average day demand conditions. The City water division indicated additional storage would be required to serve the demands associated with Scenario 2. While the additional storage is required, size and location were not determined within the scope of this study. It is recommended that additional storage be considered as part of a future more comprehensive water study if Scenario 2 proceeds as currently detailed.

  Also, please note that this model included the entire study area; there is an area south of Bertram Road and east of the Cedar River that resulted in a dead-end line. In meeting with Water Utility staff, not only is it preferred that dead-end lines be minimized, they also indicated that the area is in the floodplain and, therefore not likely to be developed.

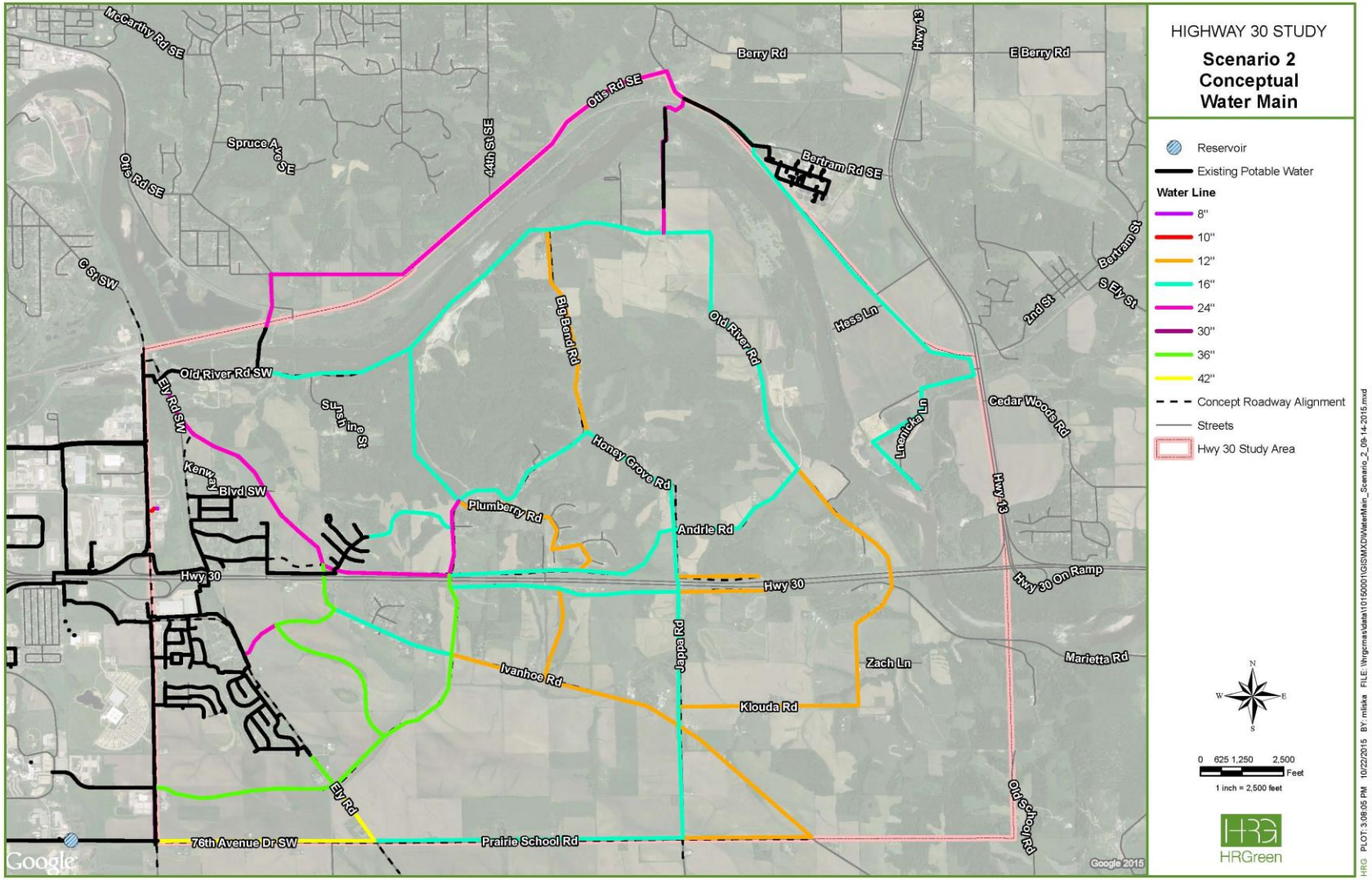
Table 9: Scenario 2 Summary of Land Uses & Conceptual Design Flows

Land Use	Area Acres	Population[13]	Loading gpd
Agriculture	445	3,310	330,971
Civic	27	-	-
Critical Natural Resources	662	219	21,855
Metro Urban Service	54	178	17,808
Open Space	373	-	-
Urban High Intensity	59	3,519	351,883
Urban Large Lot	-	-	-
Rural Residential	6,122	43,121	4,312,084
Urban Low Intensity	705	16,296	1,629,578
Urban Low Intensity - Environmental Conservation	98	4,514	451,396
Urban Medium Intensity	297	520	51,967
Existing Development	433	45,269	6,775,008
Total	**9,274**	**116,945**	**13,942,549**

Source: City of Cedar Rapids, Linn County, Corridor MPO, HR Green

[13] Population projections are based on 2.5 residents for Urban High Intensity and 3.3 residents for all other land use categories

Map 19: Scenario 2 Water Service Improvements



Source: City of Cedar Rapids & HR Green

- *Concept Level Cost Opinion:* Table 10 summarizes the concept level cost opinion for water service based on Scenario 2 development assumptions. This cost opinion is based on a complete build out of the area and not based on a phased approach.

Table 10: Scenario 2 Water Service Concept Level Cost Opinion

Item	Units[14]	Quantity	Unit Cost	Total
6" Ductile Iron Pipe	LF	48	$125	$6,000
8" Ductile Iron Pipe	LF	2103	$125	$263,000
12" Ductile Iron Pipe	LF	52858	$175	$9,251,000
16" Ductile Iron Pipe	LF	101526	$225	$22,844,000
24" Ductile Iron Pipe	LF	38805	$350	$13,582,000
30" Ductile Iron Pipe	LF	868	$400	$348,000
36" Ductile Iron Pipe	LF	23574	$450	$10,609,000
42" Ductile Iron Pipe	LF	11180	$500	$5,590,000
Hydrants	EA	584	$1,500	$876,000
			Subtotal	$63,369,000
			Contingency	$25,331,000
			Total	**$88,700,000**

Source: City of Cedar Rapids & HR Green

- ***Sanitary Sewer Service***
  Scenario 2 assumes that sanitary sewer service would be provided for the entire study area. For modeling purposes, a maximum depth to rise percentage of 66% was applied to determine preliminary pipe sizes. Findings indicate the following:

  - A minimum of two lift stations would be required due to the terrain and location of existing collection system; these would be located south of Bertram Road, east of the river and west of the river, north of Highway 30

  - A minimum of two additional river crossings would be required to serve the study area;

  - An area south of Bertram Road is included in the area to receive sanitary service; however, based on limited development potential in the area and the associated costs of providing service it is highly unlikely that construction of a sanitary main will materialize in this area.

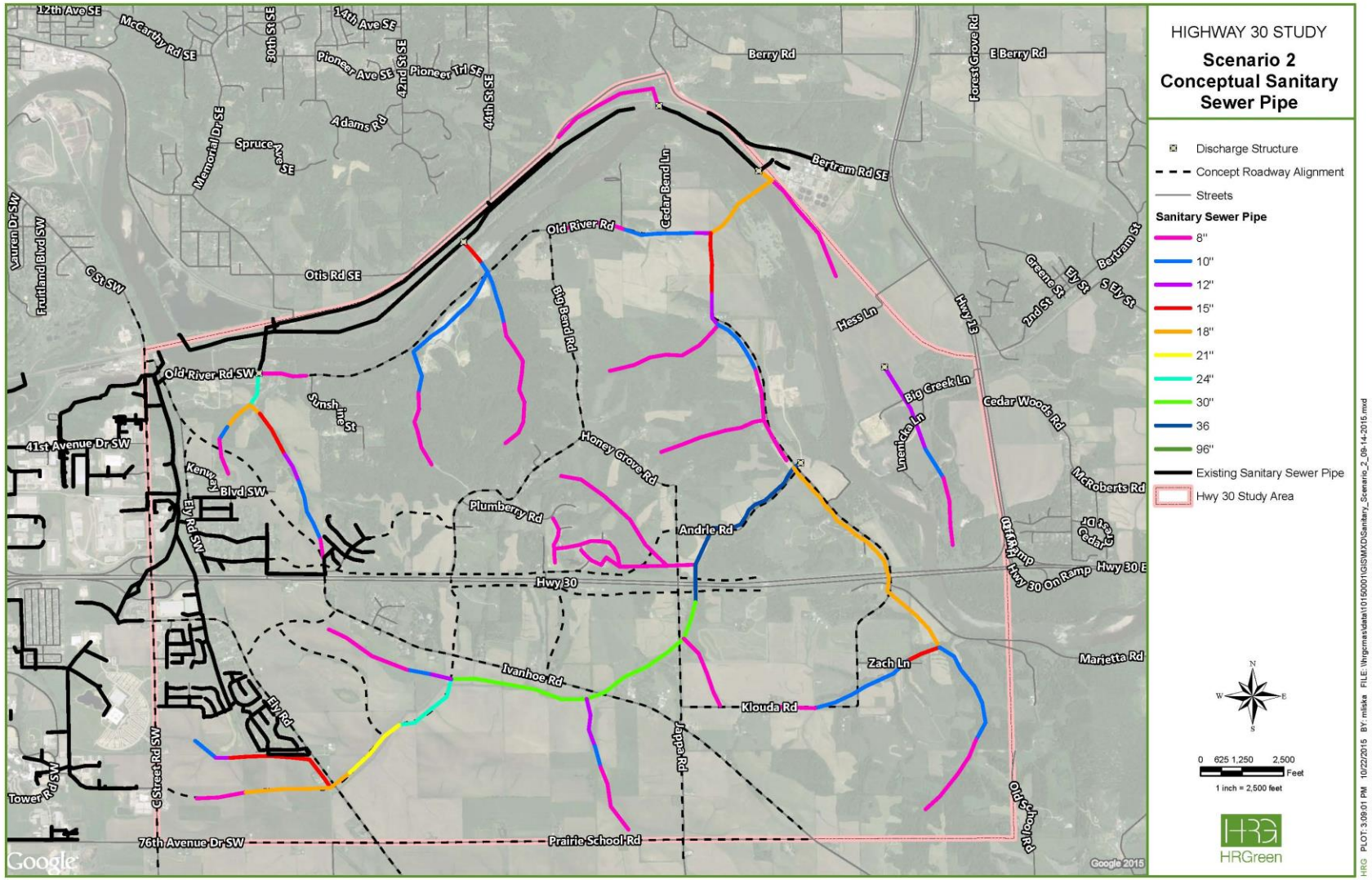
  - An additional average flow of 7.11 MGD is estimated for this area, with an estimated peak flow of 15 MGD.

[14] LF references "linear feet" and EA references "each."

As mentioned in the assessment of Scenario 1, the additional flow would likely result in the need to expand the existing Water Pollution Control Facility. In addition, the existing capacity remaining within the trunk line to the wastewater treatment plant is unknown and future analysis should be provided to determine the ability of this trunk line to accept the future loading.

Map 20 illustrates the sanitary sewer service main locations and sizes as well as associated lift station locations.

Map 20: Scenario 2 Sanitary Sewer Service Improvements



Source: City of Cedar Rapids & HR Green

- *Concept Level Cost Opinion*[15]*:* Table 11 summarizes the cost opinion for serving the study area based on Scenario 2 assumptions. This cost opinion is based on a complete build out of the area and not based on a phased approach.

Table 11: Scenario 2 Sanitary Sewer Service Concept Level Cost Opinion

Item	Units	Quantity	Unit Cost	Total
8" Sewer Pipe	LF	55,397	$150	$8,310,000
10" Sewer Pipe	LF	22,169	$200	$4,434,000
12" Sewer Pipe	LF	7,171	$200	$1,435,000
15" Sewer Pipe	LF	8,545	$250	$2,137,000
18" Sewer Pipe	LF	14,549	$300	$4,365,000
24" Sewer Pipe	LF	3,298	$500	$1,649,000
30" Sewer Pipe	LF	8,788	$600	$5,273,000
36" Sewer Pipe	LF	5,864	$650	$3,812,000
Manholes	EA	320	$5,000	$1,600,000
Lift Stations	EA	2	$2,500,000	$5,000,000
			Subtotal	$38,015,000
			Contingency	$15,206,000
			Total	**$53,221,000**

Source: City of Cedar Rapids & HR Green

- ***Stormwater Management***
  The methodology associated with estimating stormwater management costs are identical for the approach summarized in Scenario 1. Please refer to this section if necessary.

  - *Concept Level Cost Opinion:* Table 12 summarizes select characteristics and associated concept level costs opinions for stormwater management costs attributed to Scenario 2.

[15] Cost opinion does not include costs to upgrade the Water Pollution Control facility.

Table 12: Scenario 2 Stormwater Management Concept Level Cost Opinion

Road Type	Quantity	Unit[16]	Cost	Total	Cost Typically Borne By:
Stormwater Improvement Costs for Collectors					Developer
Manholes	188	EA	5000	$940,000	
Intakes	1100	EA	3500	$3,850,000	
Pipe	154000	LF	62	$9,477,000	
Stormwater Improvement Costs for Arterials					Municipal
Manholes	85	EA	5000	$425,000	
Intakes	500	EA	3500	$1,750,000	
Pipe	68993	LF	62	$4,275,000	
Distributed Stormwater Costs		Stormwater Improvement Costs for Local Streets		Stormwater Improvement Costs for Local Streets	
Detention Basin Costs	1630	AC-FT	N/A	$36,000,000	Municipal*
Major Culvert Costs	53	Locations	Varies	$1,400,000	Municipal
Local Stormwater BMPs	66	AC-FT	N/A	$55,000,000	Developer

Source: City of Cedar Rapids & HR Green

* Detention costs were considered municipal burdens for cost modeling purposes due to interim funding of infrastructure. However, reimbursements made to the stormwater utility as development materializes are meant to offset this investment.

VII. FISCAL IMPACT ANALYSIS

Introduction: This section analyzes the fiscal impact of development of land within the Study Area for the City of Cedar Rapids. Much of the Study Area is currently within unincorporated Linn County; however, for the purposes of the fiscal impact analysis it is assumed the area would be annexed. Recent development proposals and associated annexation petitions have prompted concerns regarding the limited availability of municipal services and capital infrastructure within the Study Area. *SB Friedman* created fiscal models to project the municipal operating and capital costs and revenues at full build-out of the two growth scenarios described in Sections V and VI. The purpose of the fiscal impact analysis is to test whether the revenues from future

[16] EA represents "each," LF means "linear feet," and AC-FT denotes "acre-feet."

development in each scenario could offset the cost of extending and maintaining municipal services and capital infrastructure into the Study Area.

Overview of Scenarios: The scenarios outline two approaches to growth. One is based on adopted land use plans, while the other represents a market-based approach. More specifically, Scenario 1 assumes future land uses and associated densities consistent with the adopted comprehensive plans and future land use maps of the City of Cedar Rapids and Linn County. Based on these plans, Scenario 1 assumes approximately 7,108 new residential units within City jurisdiction in the study area. Development within the Study Area outside of City boundaries is assumed to remain under County jurisdiction. Therefore, these costs and revenues are not accounted for in this model.

Scenario 2 assumes densities based on proposed developments, which exceed the densities allowed by the adopted comprehensive plans. At full build-out, Scenario 2 is projected to accommodate approximately 21,929 residential units, or roughly three times the development of Scenario 1. Details regarding land use and density assumptions are provided in Sections V and VI of this report.

Based on single-family sales data for the study area from the City assessor, the assessed value of rural density/urban low intensity single-family housing product is estimated at $251,000. *SB Friedman* assumed medium intensity townhome product and high intensity apartment product to be $175,000 and $150,000 per unit respectively. Based on the assumed densities and distribution of units in each scenario, the weighted averaged market value per residential unit is estimated at $223,000 in Scenario 1 and $241,000 in Scenario 2, as shown in Table 13. The difference in average value is due primarily to the composition of housing units in each scenario. For example, Scenario 2 is assumed to be comprised of roughly 89% low intensity housing priced at $251,000 compared to 69% low intensity housing at the lower price in Scenario 1, as shown in Table 13. Therefore, because Scenario 2 has a higher proportion of low intensity products, the weighted average market value is higher in Scenario 2 than in Scenario 1.

Table 13: Housing Units by Density and Value

Land Use	Product Type	Assessed Value/Unit [1]	Units per Acre	Scenario 1 Units	Scenario 2 Units
Rural Density and Urban Low Intensity	Single Family	$251,000	</=7	4,888	19,427
Urban Medium Intensity	Townhomes	$175,000	14	1,094	1,094
Urban High Intensity	Garden Apartments	$150,000	24	1,126	1,408
Total				**7,108**	**21,929**
Weighted Average Assessed Values Per Unit				**$223,000**	**$241,000**

[1] Based on average assessed value of single-family residential properties built between 2010 and 2014 as provided by the City Assessor and *SB Friedman* estimates for multifamily properties.
Source: City of Cedar Rapids, HR Green, *SB Friedman*

Development of this magnitude will naturally encourage an increase in the population base of the City. To estimate population generated by new development and annexation, the consulting team reviewed average household size by residential product type, based on Census data, and applied these household sizes to future development. It is estimated that the annexation and full build-out of new residential development would increase the population of the City by approximately 17,495 and 55,793 in Scenarios 1 and 2, respectively. Compared to the City's 2013 population, this represents a population increase of 14% in Scenario 1 and approximately 43% in Scenario 2.

In addition to the population generation associated with Scenario 2, annexation of this magnitude will impact the provision of municipal services such as police and fire protection and public infrastructure, including roads and utilities. Major development program assumptions are outlined below by department:

- *Fire*. While newer buildings typically exhibit less risk from a fire perspective, the Study Area will still need to meet response-time standards of 4 to 5 minutes. Interviews with the City Fire Chief indicated that existing fire stations would not be able to meet these response standards to serve development in the Study Area. To adequately service the Study Area, Scenario 1 assumes the construction of one additional fire station while Scenario 2 assumes the construction of two fire stations.

- *Transportation/Public Works.* This level of development will require the construction of new arterial, collector and residential streets. Estimates for Scenario 1 include a total of 50 new center line miles constructed within the Study Area while Scenario 2 estimates include approximately 301 center line miles, as presented in Table 14. This includes 1.3new miles of arterial streets in both scenarios, 4.3 and 38.2 new miles of collector streets in Scenario 1 and Scenario 2, respectively. In addition, it is anticipated that 44.4 and 261.3 new miles of local residential streets would be constructed in Scenario 1 and 2, respectively. Local residential streets were estimated using ratios of typical subdivision center line miles per acre by density of development provided by HR Green. Based on City policies and development practice, all collector streets and local residential roads are generally paid for by the developer. Therefore, for the purposes of this analysis, only costs related to new arterials and a new grade separation are assumed to be the City's responsibility. However, as all roads are typically built to City standards and dedicated back to the City, they will become responsible for the long-term maintenance of 50 miles of roads in Scenario 1 and 301 miles of roads in Scenario 2. Additional details regarding transportation needs for each scenario are provided in Sections V and VI of this report.

- *Utilities.* Annexation will require the extension of municipal utilities to service new development in the Study Area. Extended utilities include stormwater, sanitary sewer, water distribution and solid waste and recycling. Operating costs associated with these utilities are paid for through user fees and are part of self-supported Enterprise Funds within the City. Therefore, the revenues and costs associated with operations are not included in the fiscal model. However, any municipal share of capital costs for the extensions is accounted for in the total fiscal impact calculations.

It is important to note that these scenarios do not account for any additional retail, public transit, park, or library development within the Study Area. However, at the intensity of development assumed in the scenarios and the associated population generation, it is possible that there would be demand for new parks and an additional library and/or library expansion. In that case, the City would be responsible for the capital and operational costs associated with this additional development.

Table 14: Generation Factors [1]

	Scenario 1	Scenario 2
Acres	2,057	9,243
Residential Units	7,108	21,929
Cumulative Population Generation [2]	17,495	55,793
Center Line Miles [3]	50	301
Arterial	1.3	1.3
Collector	4.3	38.2
Residential	44.4	261.3

[1] Source: City of Cedar Rapids, HR Green, *SB Friedman*.
[2] The population generation is calculated by multiplying the average household size (2.6 persons for single-family attached and detached products and 1.72 persons for multifamily products) by the number of housing units added in each scenario. Source: Census 2000 and 2013 data for Cedar Rapids.
[3] Center line miles for new arterial and collector streets were estimated by HR Green using GIS. Residential streets were estimated using ratios of subdivision center line miles per acre by density. Urban low intensity was estimated at 0.03 center line miles/acre, urban medium intensity was estimated at 0.03 center line miles/acre, and urban high intensity was estimated at 0.01 center line miles/acre.

Fiscal Impact Model Structure and Methodology: To estimate the overall fiscal impacts of development for each scenario at full build-out, operational and capital cost models were created. Scenarios reach stabilization when full build-out is complete and costs and revenues become stable.

- *Operational Fiscal Model.* An operational model was created based on a review of current municipal service standards and budgets. This model was used to estimate the net operational fiscal impact at full build-out, and accounts for the costs and revenues associated with municipal operations by major department.

  Operating revenue projections in the model account for the key ongoing municipal revenue sources that would be derived from developed residential property. These include property taxes, motor fuel taxes, franchise fees and fines/user charges.

  Two approaches were used to estimate the municipal operating expenses associated with the scenarios – the average cost (per capita) approach and an interview-based approach. The average cost approach uses current service cost levels, as presented in the Cedar Rapids FY2015 Budget Book on a per resident basis (or other appropriate allocation method such as per road mile for public works) to predict the future costs associated with new development. Per resident costs are then multiplied by the estimated residential share of

total service costs and the population generation (or other appropriate generation method such as road miles) from the new development to estimate the total costs of municipal services for each scenario. Additionally, interviews were conducted with City staff and various department directors regarding current and future levels of service anticipated within the Study Area due to annexation and development. The final costs of service provision in the operating fiscal model are based on a reconciliation of these two approaches.

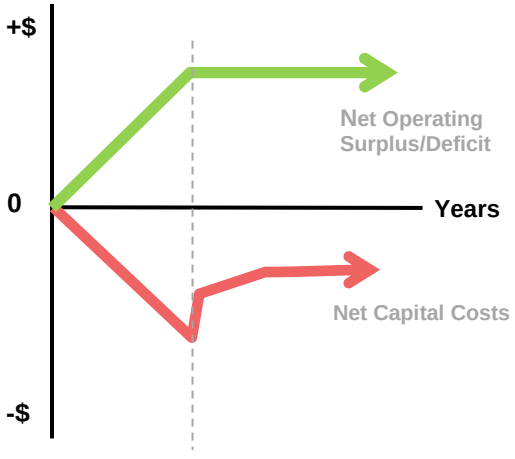
- *Capital Model.* All capital costs that the City would likely incur in each scenario were compiled. Capital costs include the municipal share of capital outlay associated with new development in the Study Area and the new development share of citywide long-term maintenance costs for infrastructure and non-infrastructure improvements. Interviews were conducted with City staff and various department directors regarding anticipated capital improvements due to annexation in each scenario.

- *Net Fiscal Impact.* The total net fiscal impact is a synthesis of both the operational and capital models. Because full build-out of each scenario would likely take several decades, a high-level phasing of net operating surplus and capital costs was conducted. Projected phased net operating surpluses generated from each scenario were compared to the potential debt service needed to pay off capital costs related to each scenario on an annual and cumulative basis. The cumulative cash flow (cumulative Operating Surplus less cumulative Capital costs) was then projected to determine:

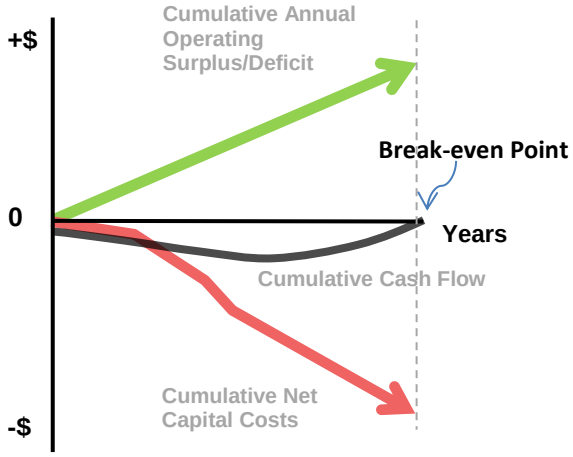
  - Whether the overall net operating revenues are adequate to cover capital costs; and

  - The break-even point or the number of years it would take for cumulative revenues to pay off all accumulated costs.

Annual Fiscal Model



Annual Cumulative Fiscal Model



Operational Fiscal Model Results for Scenarios 1 and 2: New development within the Study Area would add to the City's revenues, but also increase the demand and cost for municipal services. As such, an operational model was constructed to project future revenues and costs attributable to development at full build-out, as outlined in each scenario.

The operational fiscal model projects the costs and revenues associated with the General Fund. Other funds such as self-supporting Enterprise Funds, Internal Service Funds, Debt Service Funds, Special Revenue Funds, and Trust and Agency Funds are excluded from this analysis, and are not separately modeled. These funds were excluded because they are either self-supported by user fees or special charges (such as Enterprise Funds), or because they do not represent core departmental operations associated with municipal service provision.

Annual Operating Revenues: The new development and annexation proposed in both scenarios will increase the overall tax base and generate additional revenue for the City (See Table 15). In total, estimates suggest that at full build-out, approximately $14.5 million in revenues may be generated by development within the Study Area in Scenario 1 and $46.0 million in Scenario 2. There are four primary sources of revenue to support General Fund operations: property tax, motor fuel tax, franchise fees, and fines/charges for services. Property tax is the largest revenue source in both Scenarios 1 and 2, representing 69.9% and 73.6% of total projected revenue, respectively. No Local Option Sales Tax ("LOST") is accounted for in this model; however, in theory, additional growth in households in both scenarios would increase total sales in existing retail centers in the City and/or provide sufficient demand for new retail centers within the Study Area, thus generating additional LOST revenues.

Table 15: Projected Annual Municipal Revenues at Full Build-Out (2015 $s)

	Scenario 1	Scenario 2
Property Tax	$10,150,727	$33,844,844
Motor Fuel	$1,705,719	$5,439,800
Franchise Fees (Total)	$836,935	$848,481
Other Revenues	$1,827,887	$5,829,414
Sales Tax	$0	$0
Total Municipal Revenues	**$14,521,268**	**$45,962,539**

Source: *SB Friedman*

Other than the total number of units projected in each scenario, the primary distinction that drives per unit/per capita revenue factors is the density of housing products. As previously mentioned, Scenario 2 has a larger proportion of single-family, low-intensity units as a proportion of the total units, which is reflected in the weighted average calculations for assessed/market value per unit and franchise fees. The operating revenue factors and assumptions utilized to project annual municipal revenues are detailed below and outlined in Table 16**.**

- *Property Tax.* The assumed weighted average market value of new development is used to project the property tax revenue at full build-out. Weighted average market value is based on average assessed value of single-family residential properties built between 2010 and 2014 (inflated) provided by the City Assessor, and *SB Friedman* market value estimates for multifamily properties. The rollback percentage of 54.4% and tax rate of $11.7723 per $1,000 of taxable value was applied to calculate the tax revenue per unit. Since the model

excludes costs and revenues associated with transit and debt service, the tax rate excludes publicly-owned transit levy and the debt service levy.

- *Motor Fuel Tax.* The State of Iowa charges a tax on gasoline purchases. Typically, Iowa DOT distributes this revenue to municipalities on a formula basis; however, interviews with the City Finance Director suggested to account for local motor fuel tax revenue on a per resident basis ($97.50 per resident).

- *Franchise Fees.* The City imposes franchise fees on cable and utility revenues, including a 2% gas franchise fee and a 2% utility franchise fee. Per unit gas franchise fees were estimated based on $856 in weighted average gas consumption per unit for Scenario 1 and $921 for Scenario 2. Per unit utility franchise fees were estimated based on weighted average electric consumption of $1,484 for Scenario 1 and $1,501 for Scenario 2. In addition, we accounted for a 5% telecom franchise fee based on $1,419 in weighted average telecom consumption per unit for Scenarios 1 and 2.

- *Other Revenues.* Other revenues include non-development-related licenses, permits, charges, fines and forfeitures identified in the General Fund that could potentially be charged to residents.

Table 16: Annual Operating Revenue Factors and Assumptions

	Allocation Method	Scenario 1	Scenario 2
Property Tax Calculation			
Assessed/Market Value per unit [1]	Per unit	$223,000	$241,000
Rollback Percentage		54.4%	54.4%
Tax Rate per $1,000 of Taxable Value [2]		$11.7723	$11.7723
Tax Revenue per Unit		$1,428	$1,543
Motor Fuel Tax	Per resident	$97.50	$97.50
Utility Consumption/Franchise Fees [3]			
Gas	Per unit	$17.12	$18.41
Electric	Per unit	$29.69	$30.02
Telecom	Per unit	$70.95	$70.95
Other Non-Development-Related Revenues			
Licenses & Permits	Per resident	$2.02	$2.02
Charges for Services	Per resident	$71.42	$71.42
Fines and Forfeitures	Per resident	$31.05	$31.05
Sales Tax	N/A	$0.00	$0.00

[1] Weighted average market value based on average assessed value of single-family residential properties built between 2010 and 2014 (inflated) provided by the City Assessor and *SB Friedman* estimates for multifamily properties.
[2] Excludes levies for the operation and maintenance of publicly-owned transit and debt service levy. Source: Cedar Rapids FY2015 Budget Book.
[3] Source: City of Cedar Rapids; U.S. Energy Information Administration, Office of Energy Consumption and Efficiency Statistics, 2009 Residential Energy Consumption Survey. Adjusted to 2015 dollars using the Consumer Price Index for Midwest area.

Annual Municipal Operating Expenses: The General Fund service costs were summarized by major categories/departments and include General Government, Community Development/Planning, Parks, Library, Police, Fire and EMS, Public Works, and other departments. As previously mentioned, Enterprise Funds were excluded from the analysis because their operations are self-supported by user fees or special charges.

In total, estimates indicate that approximately $9.6 million in municipal operating expenses may be generated by development within the Study Area in Scenario 1 and $34.7 million in Scenario 2. As presented in Table 17, the primary expense drivers include Police and Public Works.

Table 17: Annual Municipal Operating Expenses at Full Build-Out (2015 $s)

	Scenario 1	Scenario 2
General Government	$1,494,001	$4,764,600
Community Development/Planning/Building	$512,180	$1,633,420
Parks and Recreation	$1,204,733	$3,842,077
Library	$770,058	$2,455,833
Police	$3,328,184	$10,614,090
Fire and EMS	$875,000	$4,080,926
Public Works	$1,097,443	$6,380,867
Other General Fund Departments	$298,108	$950,711
Non-Self-Supporting Enterprise Funds	$0	$0
Total Municipal Operating Expenses	**$9,579,705**	**$34,722,524**

Source: *SB Friedman*

With the exception of Fire/EMS and Public Works, the current operating costs of providing municipal services were determined after a detailed analysis of the City's FY2015 Budget Book. Costs related to Fire/EMS and Public Works were estimated based on interviews and detailed infrastructure analysis conducted by HR Green. Operating expense factors and assumptions utilized to project municipal expenses are detailed below and outlined in Table 19.

- *General Government/Community Development/Police/Other Departments.* The average cost method approach was used to estimate operating costs for these departments. A 73% share of the 2015 budgeted expenses for these departments were estimated to be allocated to residential uses based on the ratio of City population to the total population and non-resident employees within the City.[17] The per resident budget costs by department were then multiplied by the estimated residential share of total service costs, and the population generation from the new development, to estimate the total costs of municipal services for each scenario.

- *Parks and Library.* This model assumes that there are no additional parks or libraries developed within the Study Area. However, it is anticipated that new residents would utilize

[17] *SB Friedman* estimated the ratio of city population to the total population and non-resident employees within the City using data from the U.S. Census American Community Survey and LEHD "OnTheMap", inflated to 2014. There are approximately 130,140 residents and roughly 48,048 non-resident employees. Thus, residents represent 73% of the total resident and non-resident employee total.

existing libraries, parks and recreational resources within Cedar Rapids. Thus, municipal operating expenses related to these departments have been accounted for using the average cost method approach.

- *Fire.* In Scenario 1, the assumed cost of construction of one new fire station at the intersection of Ivanhoe Street and the new arterial street with partial operations (based on interviews with the City Fire Chief). Per conversations with the Fire Chief, personnel costs would account for two full-time equivalent firefighters and one captain for each of the three shifts, and an additional $20,000 in annual maintenance costs. Based on the assumed location and two-mile service catchment (per conversations with Fire Department staff), approximately 71% percent of the catchment is within Study Area boundaries. Thus, 71% of operating costs are attributable to the Study Area in Scenario 1. Due to the magnitude of build-out in Scenario 2, it was assumed that two new fire stations with full operations would be necessary. Scenario 2 utilizes an average cost method per fire station with 100% of operational costs attributable to the Study Area, per the City of Cedar Rapids FY2015 Budget Book.

- *Public Works.* Per City policy, all new roads are built to City standards and dedicated back to the City. Thus, the City is responsible for all maintenance costs associated with arterial, collector and residential streets within the Study Area. Routine maintenance includes snow removal, street lighting, street sweeping, mud-jacking and pad-leveling, grinding and resurfacing, crack fill and repair, curb repairs, pothole patching, pavement markings, traffic signage, traffic signals, landscaping and beautification, median maintenance, and other miscellaneous services. Maintenance costs per center line mile by road type were provided by the Cedar Rapids Department of Public Works and are presented in Table 18.

Table 18: Annual Municipal Routine Maintenance Cost per Center Line Mile

Class	Cost
Arterial	$30,150
Collector	$24,169
Residential	$21,491

Source: Cedar Rapids Department of Public Works

- *Enterprise Funds.* Per conversations with City departmental staff, all Enterprise Funds are considered to be self-supporting. There is anticipated to be no additional incremental operational costs associated with extending services. Enterprise Fund costs include: Transit, Golf, Water, Water Pollution Control, Sanitary Sewer Maintenance, Storm Sewer Maintenance, Solid Waste and Recycling, Parking, Ice Area, Paramount Theatre, Convention Center, Arena, Hotel, and the Eastern Iowa Airport.

Table 19: Annual Operating Expense Factors and Assumptions [1]

Budget Category	Percent Allocation to Residential	Allocation Method	Scenario 1	Scenario 2
General Government [2]	73%	Per resident	$117	$117
Community Development/Planning/Building [3]	73%	Per resident	$40	$40
Parks	100%	Per resident	$69	$69
Library	100%	Per resident	$44	$44
Police	73%	Per resident	$260	$260
Fire and EMS [4]	NA	Based on interviews and Per fire station	$875,000	$4,080,926
Public Works [5]	NA	Per center line mile (applied to new roads in study area)	$21,948	$21,869
Other Departments [6]	73%	Per resident	$0	$0
Non-Self-Supporting Enterprise Funds [7]	N/A	N/A	$0	$0

[1] All expenses are calculated using the average cost method approach, with the exception of those noted below. Source: City of Cedar Rapids FY2015 Budget Book.
[2] Includes the following departments: Information Technology, Finance, Purchasing, Human Resources, Attorney, City Manager, Council and Mayor, and City Clerk.
[3] Includes the following departments: Building Services, Building Demolition, Community Development, and Development Services.
[4] Fire and EMS operating expenses were not allocated on a residential basis. These costs were allocated based on partial and full operation of the assumed fire stations and allocated based on interviews or on a per station basis. Source: City of Cedar Rapids FY 2015 Budget Book; Interviews with Cedar Rapids Chief of Fire on April 8, 2015; *SB Friedman.*
[5] Public works maintenance costs were not allocated on a residential basis. These costs were allocated based on center line mile maintenance cost estimates. Source: City of Cedar Rapids Department of Public Works.
[6] Includes the following departments: School Crossing Guards, Bridge Maintenance, Contingent, Civil Rights, Gateway Maintenance, Downtown District, Capital Replacement, Pooled Revenues, Dam Operations, Investment Earnings, Memorial, Band, and Agricultural Lands.
[7] Per conversations with City departmental staff, all Enterprise Funds are considered to be self-supporting.

Annual Operating Surplus/Deficit: The operational fiscal analysis is constructed to present the costs of service delivery to potential new development in Scenarios 1 and 2, compared to projected revenues, to determine whether or not the development supports itself from a fiscal operating perspective. Overall, the proposed scenarios are expected to generate a net operating surplus for the City based on the assumed service cost levels and market assumptions made in this analysis. At full build-out the operating fiscal impact is estimated at $4.9 million in Scenario 1 and $11.0 million in Scenario 2, as shown in Table 20.

The operating fiscal model does not account for capital costs associated with new development and annexation. Projected surplus generated from each scenario can potentially be used to finance capital improvements associated with the project. This concept is further analyzed in the following section.

Table 20: Annual Net Operational Impacts by Scenario at Full Build-Out (2015 $s)

	Scenario 1	Scenario 2
Municipal Revenues		
Property Tax	$10,150,727	$33,844,844
Motor Fuel	$1,705,719	$5,439,800
Franchise Fees (Total)	$836,935	$848,481
Other Revenues	$1,827,887	$5,829,414
Sales Tax	$0	$0
Total Municipal Revenues	**$14,521,268**	**$45,962,539**
Municipal Expenditures		
General Government	-$1,494,001	-$4,764,600
Community Development/Planning/Building	-$512,180	-$1,633,420
Parks and Recreation	-$1,204,733	-$3,842,077
Library	-$770,058	-$2,455,833
Police	-$3,328,184	-$10,614,090
Fire and EMS	-$875,000	-$4,080,926
Public Works	-$1,097,443	-$6,576,763
Other General Fund Departments	-$298,108	-$950,711
Non-Self-Supporting Enterprise Funds	$0	$0
Total Municipal Expenditures	**-$9,579,705**	**-$34,918,420**
Net Fiscal Operating Impact	**$4,941,562**	**$11,044,120**

Source: *SB Friedman*

Capital Model: The capital fiscal model projects all municipal capital costs associated with new development in the Study Area. Three categories of capital costs are envisioned as follows:

- *Capital costs to facilitate and serve new development.* This includes infrastructure extensions related to new roads, sewer, water and stormwater to facilitate new

development in the Study Area, and new public safety facilities and equipment such as fire stations, fire trucks and squad cars to serve new development.

- *Long-term maintenance costs of streets.* These costs are related to repair and repaving of roads at the end of their 20- to 40-year lifecycle.

- *Citywide non-infrastructure capital costs.* This includes all capital improvements within non-infrastructure departments/funds including Parks, Recreation, Trail, Forestry, Veterans Stadium, Animal Control, Downtown, Aquatic, Information Technology, Building Demolitions, City Facilities, and the Growth Reinvestment Initiative.

Annual municipal costs for each category are described below.

Capital Costs to Facilitate and Serve New Development: Infrastructure needs for the Study Area were identified and a concept-level cost opinion was prepared for transportation improvements, water service, sanitary sewer service and stormwater management. Values and modeling assumptions were validated by public officials responsible for respective capital improvements. In addition, interviews were conducted with City staff and various department directors regarding current and future capital needs anticipated due to annexation, including the directors of the Fire Department and Police Department. As previously mentioned, these scenarios do not account for any additional park, public transit or library development within the Study Area.

Estimates indicate that approximately $91.0 million and $204.6 million in total municipal capital costs would be incurred in Scenario 1 and Scenario 2, respectively, as presented in Table 21. Key drivers of municipal capital cost are outlined below:

- *Fire.* Scenario 1 assumes the development of a new fire station located at the intersection of Ivanhoe Street and the new arterial street, and the addition of four fire trucks. Based on a two-mile service catchment area (per conversations with Fire Department staff), 71% of capital costs were allocated to the Study Area in Scenario 1. In Scenario 2, due to the magnitude of development, it is likely that two additional fire stations are required to provide adequate response times within the Study Area. Thus, Scenario 2 includes the full development of two new fire stations and eight new fire trucks with 100% of capital costs allocated to the Study Area.

- *Police.* Based on initial conversations with Police staff, both scenarios assume the addition of three squad cars. Scenario 1 assumes equipment for three new officers while Scenario 2 assumes the addition of equipment for six new officers. Capital expenses are subject to change based on further conversations with Police staff.

- *Road.* The model assumes that the City is responsible for costs associated with the construction of a new minor arterial road connecting Ely Road to Union Drive (1.3 center line miles) and a new grade separation to provide access to Highway 30. Based on City policy, the upfront capital costs of all collector and local residential streets are assumed to be borne by the developer.

- *Stormwater.* The City is responsible for stormwater costs associated with arterial roadways and culvert costs. The developer is assumed to bear the stormwater costs associated with major/minor collectors and subdivision roads. The total detention cost is initially paid for by the municipality but is typically repaid by the developer as new development materializes.

- *Sanitary Sewer.* The primary drivers for municipal costs associated with sanitary sewer service is the likely need to expand the wastewater treatment plant as well as the significant amount of infrastructure required to collect and convey wastewater to the Water Pollution Control Facility. In addition, preliminary analysis indicates that due to variable terrain and the location of development, lift stations may be required to serve portions of the Study Area.

- *Water Distribution.* The primary driver for municipal costs associated with the water distribution service is possible need to expand the water treatment facilities. In addition, a large amount of infrastructure will need to be constructed before development is commenced. A booster station may also be required for certain portions of the study area.

- *Solid Waste Recycling.* Capital costs account for the addition of one garbage truck to service annexed areas. Trucks hold upwards of 10 tons and typically make only one trip to the landfill, which is located at the corner of Highway 13 and County Home Road.

Table 21: Total Municipal Capital Costs

	Scenario 1	Scenario 2
Fire [1]	**$4,118,000**	**$11,600,000**
Fire Trucks	$1,988,000	$5,600,000
Fire Station	$2,130,000	$6,000,000
Police [2]	**$200,376**	**$235,752**
Cost to equip	$35,376	$70,752
Squad Car	$165,000	$165,000
Road [3]	**$6,630,000**	**$6,630,000**
Proposed Minor Arterial	$4,630,000	$4,630,000
Estimated Grade Separation Ramp	$2,000,000	$2,000,000
Stormwater [4]	**$35,180,000**	**$43,850,000**
Total Detention Cost	$29,000,000	$36,000,000
Roadway Cost (Major/Minor Arterial)	$5,160,000	$6,450,000
Culvert Cost	$1,020,000	$1,400,000
Sanitary Sewer [4]	**$17,512,600**	**$53,221,000**
Sewer Pipes	$7,959,000	$31,415,000
Manholes	$550,000	$1,600,000
Lift Stations	$4,000,000	$5,000,000
Contingency	$5,003,600	$15,206,000
Water Distribution [4]	**$27,013,400**	**$88,700,000**
Ductile Iron Pipe	$18,970,000	$62,489,000
Hydrants	$255,000	$867,000
Contingency	$7,788,400	$25,344,000
Solid Waste Recycling [5]	**$320,000**	**$320,000**
Parks	**$0**	**$0**
Library	**$0**	**$0**
Transit	**$0**	**$0**
Total	**$90,974,376**	**$204,556,752**

[1] Source: Cedar Rapids Fire Department.
[2] Source: Cedar Rapids Police Department.
[3]Planning level costs were developed based on recent construction bids for a 3-lane, 4-lane, and 5-lane urban-section roadway built in suburban areas. The average cost per linear foot per lane in approximately $300. Grade separation costs were estimated based on costs for similar projects. The estimated costs for the grade separation at Ivanhoe Road are exclusive to that improvement. Source: HR Green, Cedar Rapids Department of Public Works.
[4] Source: HR Green
[5] Source: Cedar Rapids Solid Waste and Recycling Division.

Annual Long-Term Maintenance Costs of Streets: The construction of additional roads creates a long-term liability for the City, as this infrastructure will need to be maintained in the future. Lifecycles of infrastructure vary between 20 to 40 years depending on the type of infrastructure. Over an 80-year period, the annual uninflated long-term maintenance cost for arterial streets is approximately $56,215 per center line mile and roughly $38,353 per center line mile for collector and residential streets, as indicated by the Cedar Rapids Director of Public Works.

Because major repair costs for collector and local roads are incurred between 40 and 80 years after initial construction, the costs of long-term road maintenance related to the 50 and 301 new lane miles of roads in Scenarios 1 and 2 would be incurred by future generations. Therefore, rather than estimating these lump sum future costs attributable to the specific new roads being developed in each scenario, the capital model accounts for the new development's share of citywide long-term improvement and maintenance costs on roads, based on the typical annual capital expenditures of the City for roads.

The 2015 City of Cedar Rapids 10-Year Capital Improvement Plan indicates that approximately 90% of citywide roads will need some form of work within the next 10 to 12 years. To address street maintenance issues, in 2014 the City implemented a street improvement program, referred to as "Paving for Progress," which was intended to improve and maintain the road network over a 10-year period. Consequently, the cost of long-term street maintenance significantly increased in City budgets.

To account for year-to-year difference in long-term infrastructure improvements, the model utilized four-year averages of capital expenditures from 2013 to 2016 and estimated the associated average per resident costs (Tables 22 and 23). Roads are utilized by both residents and non-resident employees/visitors, thus the per-resident costs only account for the residential portion (73%[18]) of infrastructure costs. Local government grants, transfers in, and proceeds of long-term General Obligation bonds were used to estimate typical City funding and excludes any state or federal grants. These per resident estimates were then multiplied by the cumulative population generation in the two scenarios to estimate the total municipal capital cost for non-infrastructure capital improvements for each scenario. Based on this methodology, after full build-out, Scenario 1 is projected to incur annual long-term maintenance costs of $2.4 million, and Scenario 2 is projected to incur annual costs of $7.6 million.

Table 22: Annual Per Resident Municipal Expenditures on Long-Term Maintenance of Streets

	Capital Costs for Maintenance and Repairs of Streets	Per Resident Costs
2016 (Budget)	$30,156,066	$169.24
2015 (Budget)	$31,381,919	$176.12
2014 (Actual)	$19,935,354	$111.88
2013 (Actual)	$15,057,566	$84.50
4-year average (2013-2016)	$24,132,726	$135.43

Source: Cedar Rapids FY2015 Budget Book, *SB Friedman*

[18] The 73% share for residential uses was based on the ratio of City population to the total population and non-resident employees within the City.

Table 23: Projected Annual Expenditures on Long-Term Maintenance of Streets At Full Build-out

	4-year Average Cost per Resident	Scenario 1	Scenario 2
Streets	$135.43	$2,369,361	$7,556,256

Source: Cedar Rapids FY2015 Budget Book, *SB Friedman*

Annual Non-Infrastructure Capital Costs: As more development occurs, the citywide service and associated capital needs is expected to increase. This analysis estimates the typical non-infrastructure capital burden per capita on an annual basis and allocates the residential share of the costs attributable to new development. Based on the 2015 City Budget Non-infrastructure capital costs related to the following are accounted for: Parks, Recreation, Trail, Forestry, Fire, Police, Veterans Stadium, Animal Control, Downtown, Aquatic, Information Technology, Building Demolitions, City Facilities, and the Growth Reinvestment Initiative. A similar average cost approach was used for non-infrastructure capital funds as long-term maintenance of infrastructure funds, in that per resident cost estimates were used to predict the future non-infrastructure capital cost share for new development (See Table 24). Thus, similar to costs for long-term maintenance of infrastructure, the per resident costs were derived from the Cedar Rapids FY2015 Budget Book and only accounts for the residential portion of local government funding sources. These capital projects are financed with revenue other than Enterprise or Internal Service Fund monies. Based on this methodology, Scenario 1 is projected to incur an additional $557,662 in annual non-infrastructure capital costs and Scenario 2 is projected to incur approximately $1.8 million annually at full build-out.

Table 24: Projected Annual Municipal Expenditures on Non-Infrastructure Capital at Full Build-out

Capital Project Funds	Per resident	Scenario 1	Scenario 2
Trail	$3.09	$53,999	$172,212
Park	$0.34	$5,891	$18,787
Fire	$3.93	$68,726	$219,179
Forestry	$1.02	$17,820	$56,830
Police	$0.84	$14,727	$46,967
Recreation	$1.40	$24,545	$78,278
Veterans Stadium	$2.81	$49,090	$156,556
Animal control	$0.04	$687	$2,192
Downtown	$0.56	$9,818	$31,311
Aquatic	$1.63	$28,448	$90,724
Building Demolitions	$0.42	$7,364	$23,483
Information Technology	$0.84	$14,727	$46,967
City Facilities	$2.81	$49,090	$156,556
Growth Reinvestment Initiative	$12.16	$212,730	$678,428
Total	**$31.88**	**$557,662**	**$1,778,471**

Source: Cedar Rapids FY2015 Budget Book, *SB Friedman*

Net Fiscal Impact: The total net fiscal impact is a synthesis of both the operational and capital models. Because full build-out of each scenario would likely take several decades, the revenues and costs would be incurred over several years. Some of the capital costs, such as new arterial roads and sewer/water line extensions, may need to be incurred upfront to facilitate development and some, such as longer-term major capital maintenance of new roads, would be incurred over several years after build-out. To account for these variations in timing of capital costs and the generation of revenues over several decades, a high-level phasing of net operating surplus and capital costs was conducted. The synthesis of all revenues and costs were conducted to:

- Test whether operating surpluses from development could eventually repay capital costs over time; and
- Estimate the approximate timeframe in years that it would take to pay off the municipal share of capital costs.

After synthesizing net operating fiscal impact and capital costs, estimates indicate that it would take approximately 44 years to pay off the municipal share of capital costs in Scenario 1 and 137 years in Scenario 2. Net fiscal impact calculations are presented in 2015 dollars and are included in Figures 1 and 2 for Scenarios 1 and 2, respectively. Key assumptions are outlined below:

- *Absorption/Phasing of Development.* Residential build-out of this magnitude would likely occur over a length of time. Based on a review of historical building permits in the City of Cedar Rapids, the model assumes that approximately 440 units could be absorbed annually. Thus, Scenario 1 is projected to be fully built out with 7,108 units in 16 years, while Scenario 2 is estimated to reach full build-out of the 21,929 units in 50 years.

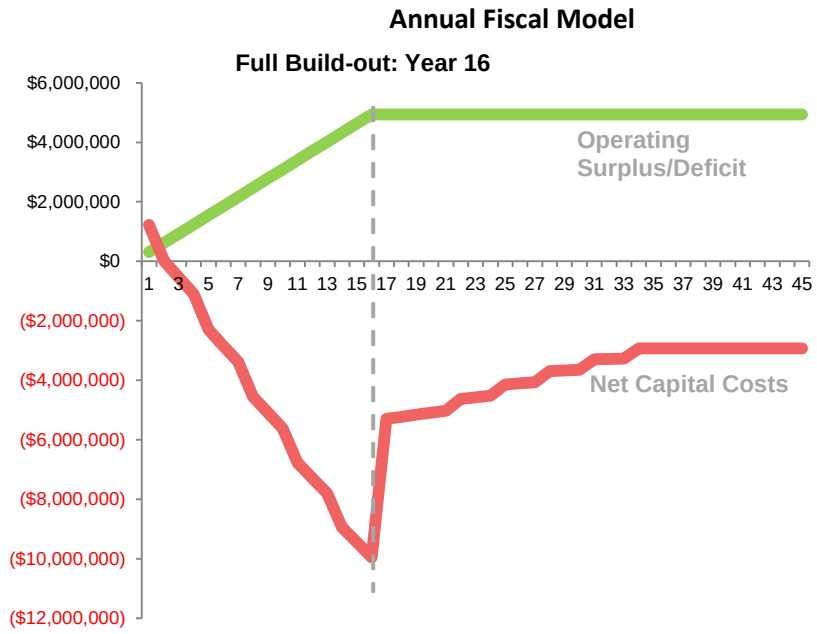
- *Net Operating Surplus.* The net operating surplus is phased in proportion to the number of units absorbed in each scenario. Thus, Scenario 1 reaches full build-out in Year 16 while Scenario 2 reaches full build-out in Year 50.

- *Capital Costs to Facilitate and Serve New Development.* The model assumes that capital costs would be incurred through a combination of pay-as-you-go (cash advances) and debt financing, assuming a 60% to 40% split, respectively. The capital costs of development are incurred over the construction period of development. Thus, Scenario 1 assumes that debt is issued through five issuances, while Scenario 2 assumes that debt is issued through 16 issuances. Both scenarios include 10% issuance costs and assume a 5% interest rate with an average term of 20 years. Debt service payments were converted to current 2015 dollars.

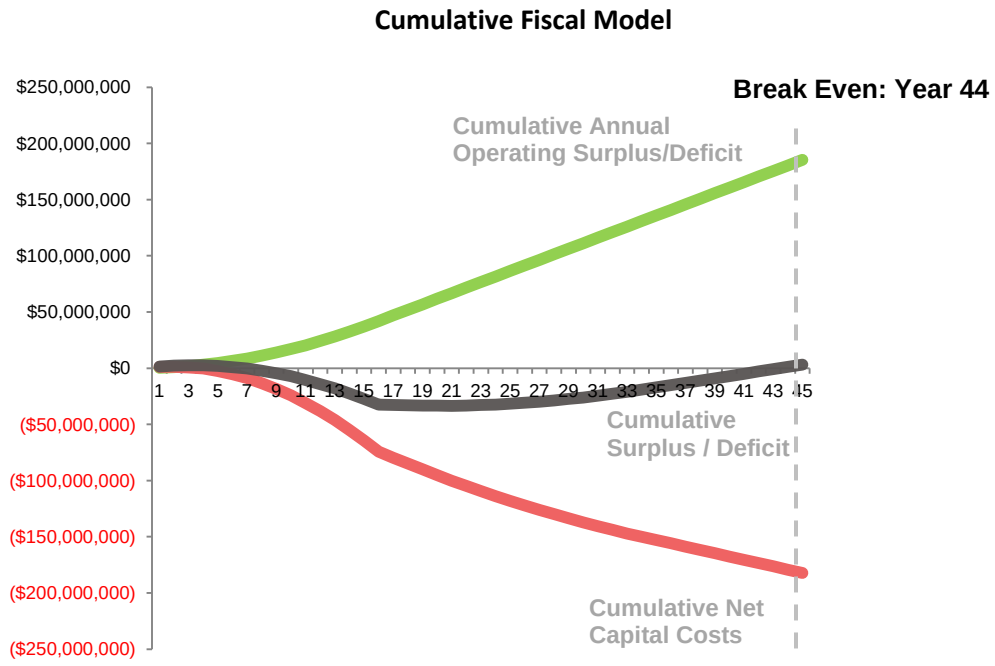
- *Annual Long-Term Street Maintenance and Non-Infrastructure Capital Costs.* Annual infrastructure and non-infrastructure capital costs are phased in proportion to population generation.

- *Reimbursement for Detention.* Based on City policies and development practice, the model assumes that the City would be reimbursed for upfront costs incurred associated with the stormwater detention system. Reimbursement payments were included in equal installments through build-out in both scenarios.

Figure 1: Scenario 1 Net Fiscal Impact and Break-Even Year Estimate



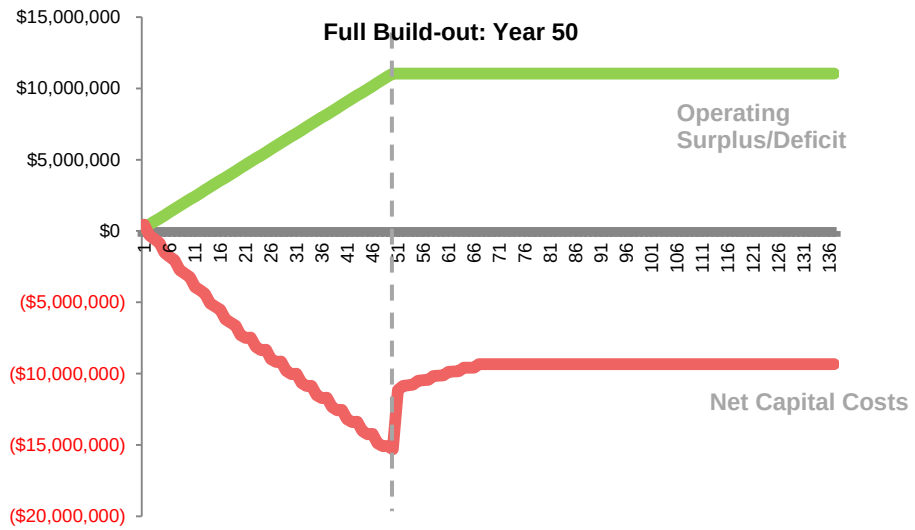
Source: *SB Friedman*



Source: *SB Friedman*

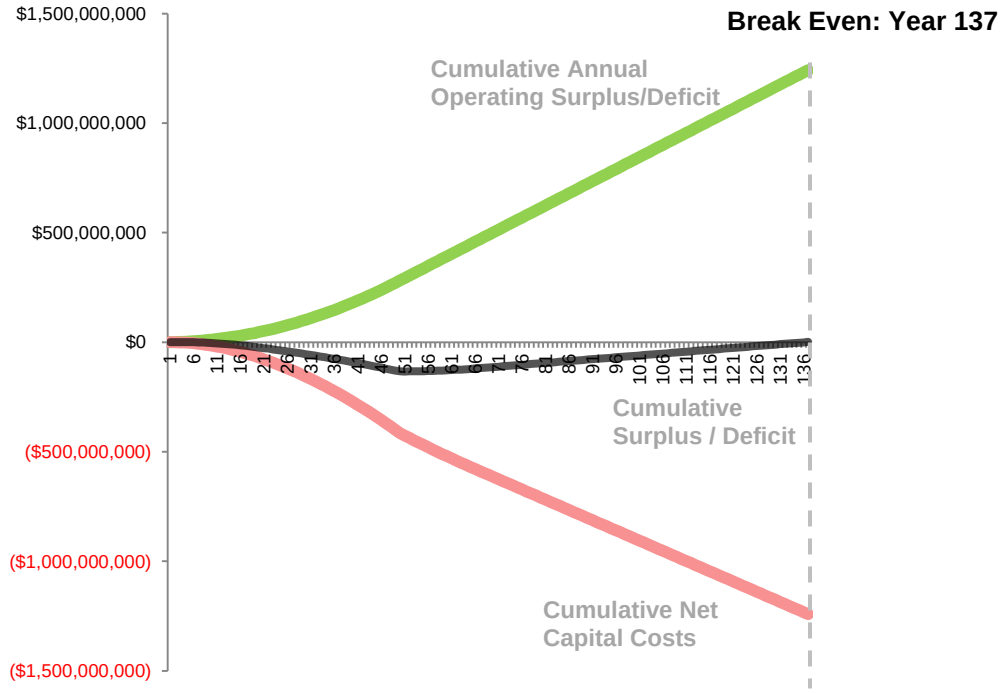
Figure 2: Scenario 2 Net Fiscal Impact and Break-Even Year Estimate

Annual Fiscal Model



Source: *SB Friedman*

Cumulative Fiscal Model



Source: *SB Friedman*

Implications of Fiscal Impact Results: The fiscal impact analysis shows that for both scenarios, the payback period for municipal capital investments are significantly more than twice the timeframe for build-out of new development. In effect, this implies that operating revenues (largely property taxes) from new residential uses are inadequate to cover both operating and capital costs within the build-out timeframe of new development. A key factor driving this result is the upfront capital infrastructure load of $91 million and $204 million in Scenarios 1 and 2, respectively. While this investment is needed to facilitate new development in this part of the City, it represents an extraordinary upfront cost that can only be recouped over a significant timeframe after project build-out.

Sensitivity Analysis: Key factors that could reduce the timeframe to reach the break-even point when cumulative revenues begin to exceed costs are as follows:

- *Higher Average Market Value of Homes.* The market values of for-sale residential products are based on historical single-family averages in the Study Area, as well as assumptions made by *SB Friedman* for multifamily units. Changes in these values would significantly impact the result. Higher average home values would increase the net operating surplus and decrease the time in which it takes the municipality to pay off capital costs.

- *Including Additional Revenue Sources.* This model assumes that the net operating surplus is the primary source for capital repayment. However, LOST has historically been used to fund capital projects. In November of 2013, Cedar Rapids approved a one-cent LOST specifically for maintenance, repair, construction and reconstruction of roads within Cedar Rapids. This funding source is not accounted for in this model; however, the large number of residents in new households (in both scenarios) would shop at local stores and increase citywide LOST revenues. Continuing LOST as a source of repayment for capital costs and accounting for LOST revenues attributable to the new household spending would decrease the time in which it takes the municipality to pay off capital costs.

- *Reducing the Capital Cost Burden.* This model assumes a substantial financial contribution by the City to pay for infrastructure extensions that would facilitate new development. Reducing the City's contribution through securing federal and state grants and/or increasing developer contributions would decrease the time in which it takes the municipality to pay off capital debt.

  To test the sensitivity of the model and estimate the impact of these assumptions, the model calculated the net fiscal impact associated with the following assumptions:

  - Inclusion of LOST revenue, calculated on a per capita basis based on actual FY2015 budgets;
  - 10% increase in market value of homes; and
  - 50% reduction in upfront capital costs.

  A summary of the repayment timeframes under these assumptions for each scenario is presented in Table 25.

Table 25: Sensitivity Analysis

Sensitivity Analysis	Break-Even Year	
	Scenario 1	Scenario 2
Baseline As-Is Analysis Results	44	137
Include LOST Revenues	26	38
10% Increase in Market Value of Homes	32	62
50% Reduction in Upfront Capital Costs to Facilitate New Development	36	112

Source: *SB Friedman*

As shown in Table25 above, each of the sensitivity tests improve the net financial outcome for the City by reducing the payback timeframe of upfront capital costs. This suggests that one or more of the following alternatives should be considered by the City to achieve long-term fiscal balance:

- Continuation of LOST revenues to pay for road improvements;
- Consideration of relatively higher market-value development within the Study Area; and/or
- Seeking state and federal grants or greater developer contributions for upfront capital costs within the Study Area.

VIII. POTENTIAL NON-FINANCIAL IMPACTS TO DEVELOPMENT WITHIN THE STUDY AREA

The Fiscal Impact Analysis summarized in Section VII of the report details the fiscal implications associated with facilitating development within the study area. However, to provide a more comprehensive perspective about the implications of future development in the study area this section highlights several non-financial impacts that have the potential to impact future development efforts.

- *Presence of private sceptic systems and wells:* The presence of private wells and septic systems can create challenges in transforming rural developments into subdivisions that are constructed to an urban design standard. In addition, rural residential areas that have private well and septic systems are also prone to failure. As such, these conditions can pose adverse impacts to human health and the environment. Design requirements associated with the creation of septic fields often create economic challenges for converting private systems to standard municipal utility systems. While the costs associated with converting private systems to public utility service as well as the cost implications associated with potential impacts to the environment were not part of this study, it is worth noting that this issue can translate to financial, environmental, and social impacts.

  The target area has in excess of 140 private wells. Public wells serve at least 25 people and/or have at least 15 service connections. The target area has only 8 permitted septic systems. In general, each farm house will have at least one private septic system, whether permitted, or not.

- *Avoidance of building within the 500-year floodplain elevation:* While the impacts of the 2008 Flood event are not part of this study, recent developments associated with the Flood Control System Master Plan indicate the some areas are more susceptible to future flood events. As such, it is advisable to avoid development within the 500-year floodplain elevation.

- *Developing environmentally sensitive areas can create tangible consequences:* Feedback provided by representative organizations participating in the environmental focus group cited a desire to protect floodplain and riparian areas as well as forest and timbered areas; avoid development on steep slopes (i.e., slopes with 12% and up); and avoidance of fragmenting large parcel conservation areas. For more detailed information on the Focus Group meeting, please reference Appendix B.

  It is also worth noting that several parts of the study area (see Map 2) north of US 30 are identified as an Environmental Conservation Area and subject to a future Environmental Conservation Overlay district. By the definition provided in EnvisionCR, Environmental Conservation Overlay areas exhibit characteristics that should be protected from development. These areas included wetlands, prairies, floodplains, drainage channels, and scenic corridors.

  The Linn County Comprehensive Plan – more specifically the City of Bertram and Linn County City County Strategic Growth Plan references County designated Critical Natural Resource Areas. This designation is intended to conserve and protect "high-value" natural resource areas, including floodplains, unique natural areas, historic areas, wetlands, existing natural prairies, and other environmentally designated areas. Designated areas are also intended to protect the quantity and quality of potable groundwater and surface water supplies, protect access and availability to the county's mineral resources, and conserve soil resources.

- *Existing development in the study area notes safety and service issues:* Representatives from the Property Owner Focus Group cited a number of issues associated with living in the area. For example, lower water pressures prompts home owners to purchase private booster station to improve water pressure; traffic issues associated with subdivision streets that intersect with US 30 create traffic safety concerns and make other forms of transportation (e.g., bicycles) prohibitive. Traffic conflicts are also common between area residents, farmers with large, slow-moving agricultural equipment as well as several mining operations located within the study area. Participants expressed concerns that further development in the absence of improvements to US 30 will likely exacerbate current experiences. For more detailed information on the Focus Group meeting, please reference Appendix B.

IX. KEY FINDINGS

The principal focus of this study is to assess the impacts and associated costs from land development and growth in the study area. This section summarizes the key findings of this technical assessment.

1. *Revenue generated from development with either Scenario does not cover the costs associated with providing City infrastructure and services.*

   The fiscal impact analysis shows that for both scenarios, the payback period for municipal capital investments are significantly more than twice the timeframe for build-out of new development. In effect, this implies that operating revenues (largely property taxes) from new residential uses are inadequate to cover both operating and capital costs within the build-out timeframe of new development. A key factor driving this result is the upfront capital infrastructure load of $91 million and $204 million in Scenarios 1 and 2, respectively. While this investment is needed to facilitate new development in this part of the City, it represents an extraordinary upfront cost that can only be recouped over a significant timeframe after project build-out.

2. *Infrastructure improvements needed to support growth in the Study Area are significant.*

   The improvements needed for Scenario 2 are far greater than Scenario 1. Even so, Scenario 1, which is based on adopted land use plans, requires additional transportation, water, sewer, and stormwater management improvements. The costs associated with these infrastructure improvements are approximately $86 million and $192 million for Scenarios 1 and 2, respectively.

3. *Concerns exist related to safety along the Highway 30 corridor.*

   CMPO 2015 Connections 2040 Long-Range Transportation Plan indicates level of service (LOS) for U.S. Highway 30 at LOS A and B based on future traffic forecasts. At LOS A, traffic is considered free flow with vehicles completely unimpeded. Segments forecasted to be LOS B have traffic considered reasonably unimpeded. The U.S. Highway 30/C Street Interchange is identified as LOS F or flow has completely broken down. As additional growth occurs within the study area it can be reasonably assumed that vehicle trips will also increase on roadways throughout the study area. In addition, results from a focus group discussion comprised of home owners, a farmer, a mining operation representative, and property owner cited transportation challenges stemming from large, slow-moving agricultural vehicles, large semi-tractor traffic, and trips generated by area residents.

4. *Impacts to contiguous forested areas, as well as prime agricultural resources, should be avoided, at a minimum, mitigated.*

   The study area includes environmental conservation/critical natural resource areas, areas with significant topographical slopes, century farms, and productive agricultural land with Corn Suitability Ratings (CSR) of 65 or greater. These characteristics are identified in the EnvisionCR and the Linn County Comprehensive Plan with the express purpose of conserving and protecting said areas. Please refer to Appendix A for a review of these plans and related adopted plans as they pertain to this study area.

5. *The capital costs associated with Scenario 2 are over double that of Scenario 1.*

   In Scenario 1, infrastructure improvements are focused north of Highway 30 and in the southwestern portion of the Study Area (i.e. South of Highway 30 and west of Ely Road), which is

an identified growth area. The total anticipated capital costs for Scenario are just shy of $91 million. The capital costs associated with Scenario 2 are over double that of Scenario 1 (i.e. $204 million). Scenario 2 requires significant improvements, which are necessary in order to accommodate more development than is anticipated by adopted plans.

6. *Compared with Scenario 1, Scenario 2 would take over 3 times as long to pay off the municipal share of capital costs.*

   After synthesizing net operating fiscal impact and capital costs, estimates indicate that it would take approximately 44 years to pay off the municipal share of capital costs in Scenario 1 and 137 years in Scenario 2.

APPENDIX A: ADOPTED PLANS

Adopted plans provide important context and insight into how past decisions may affect future growth patterns. The plans often help determine policies, create priorities, align visions, and direct capital expenditures within a community. It is also worth noting that the adopted land use policy was developed through a comprehensive planning process that included multiple stakeholders, assembly and evaluation of information, and creation of recommendations that are consistent with the Linn County and Cedar Rapids' long range planning and development goals. This addendum provides an overview of adopted plans and program resources that influence the future development of this area.

- *EnvisionCR - A Comprehensive Plan for Cedar Rapids, Iowa: EnvisionCR* was adopted by the City of Cedar Rapids City Council on January 27, 2015. The document provides "a vision for the future of Cedar Rapids, with a focus on priorities for city policies and public investments in the next 20 years." Strategic themes underpinning the plan- sustainability, health, place-making, and efficiency- formed the basis for its six guiding elements:

  - StrengthenCR. Make bold moves in community planning to retain the character of neighborhoods and corridors.
  - GrowCR. Make bold moves in future planning to encourage sustainable connections of growth areas to existing neighborhoods.
  - ConnectCR. Create a culture that enhances transportation options for pedestrians and cyclists through complete streets, trails, and public transportation.
  - GreenCR. Buffer and connect existing parks, trails, and streams to build a natural network in addition to regional collaborations and individual efforts to improve stormwater management, water quality, wildlife habitat, and outdoor recreation.
  - InvestCR. Make Cedar Rapids a desirable place for businesses to start, move, and grow by leveraging resources to invest in business districts and amenities that keep and attract a skilled workforce.
  - ProtectCR. Provide quality services to increase neighborhood safety and keep moving forward with the flood control system.

  Plan Elements Focusing on the Study Area:

  - GrowCR*:* The future land use map cited in *EnvisionCR* offers a strategic approach to manage new development on the urban fringe in a framework of several defined growth areas. These lands are recommended for reserve until opportunities for infill development and redevelopment elsewhere in Cedar Rapids are exhausted. Only the southwestern portion of the study area falls within one of plan's five designated "Potential Growth Areas." The specific portion of the "South Area" bound by 76th Avenue Drive SW to the south, C Street SW to the east, Prairie Rose Drive SW to the north, and Ely Road SW depicts future urban low-and-medium intensity residential use equating to approximately 2-12 household/acre. The plan acknowledges that a new lift station will likely be needed to serve the homes.

  - *EnvisionCR* has a stated goal of connecting growing areas to existing neighborhoods via a comprehensive street network and through readily-available alternative options for transportation such as walking, biking, and public transit. This approach "helps maintain and enhance overall community character by extending Cedar Rapids' distinctive pattern of

neighborhoods." Consequently, the plan highlights a new collector street linking Ely Road at its intersection with C Street SW to the western portion of the study area. The planned roadway would better link employers such as Yellow Book with the undeveloped land. Several suggested trails would similarly connect the study area to the larger transportation fabric of the area.

- ConnectCR: The comprehensive plan seeks to "Support the development of an effective, regional, multi-modal transportation system." This goal requires the City identify and prioritize future infrastructure needs. The plan categorizes C Street SW as a "Vision Project" meaning it is included in the Long Range Transportation Plan (Connections 2040) and is identified as a "long-term improvement to roadways and address access, traffic, safety, and/or multi-modal issues impacting the City of Cedar Rapids." The referenced roadway forms the western boundary of the study area. Proposed improvements include reconstructing and widening C Street SW from Fruitland Boulevard SW to IA- 30 to enhance the city's transportation network. No explicit timeframe exists for its completion.

  The plan categorizes 76th Avenue Drive SW as a "Possible Growth Area Project" meaning it is not included in the CMPO's Long Range Transportation Plan but rather as a "potential improvement to support connectivity within Future Growth Areas identified in *EnvisionCR*." The referenced roadway forms a portion of the southern border of the project area. Proposed improvements include reconstructing and widening 76th Avenue Drive SW from Kirkwood Boulevard SW to Ely Road SW. The project does not have an identified timeframe for completion or a designated funding source, allowing it to be implemented in conjunction with development.

- GreenCR: A large portion of the study area located north of U.S. 30 falls within a "Critical Natural Resource Area which includes the Indian Creek Nature Center." *EnvisionCR* recommends the City include these areas in an Environmental Conservation Overlay (EC) designed to maintain the natural resource functions of these lands including erosion prevention/ watershed protection, potentially some modest level of flood mitigation, wildlife/habitat protection, and potential recreation functions. EC areas are suggested to be protected from development but can be incorporated into the trail system as appropriate.

- ProtectCR: The southwestern portion of the study area bound by 76th Avenue Drive SW to the south, C Street SW to the east, Prairie Rose Drive SW to the north, and Ely Road SW to the west falls within an area requiring study for future development with regards to sanitary and storm sewer access. The City believes improvements (e.g. water tower, lift station, etc.) would be needed but that the area could be serviced.

- StrengthenCR: EnvisionCR states articulates a goal that encourages infill development and development opportunities within the city's jurisdictional boarders before expanding at the urban fringe. This practice benefits from the availability of current utilities and associated municipal services rather than perpetuate a practice of facilitating fringe area growth and stressing the community's ability to expand and maintain new service areas.

- *Linn County Comprehensive Plan - A Smarter Course: Building on the Past, Embracing the Future of Rural Linn County:* Adopted by the Linn County Board of Supervisors on July 19, 2013, the

Plan is designed to guide the "physical, social, and economic development in the county for the next 20 years." The plan reviews a variety of factors influencing future growth including transportation, economic development and employment, resources, sustainability, livability, hazards, and alternative and renewable energy in an effort to satisfy three primary issues:

- Balance rural and urban interests;
- Incorporate the Iowa Smart Planning Principles and Elements; and
- Promote intergovernmental and regional cooperation.

County officials commissioned the plan to update the Linn County Rural Land Use Plan "Chart the Course: A Vision for the Future of Linn County" adopted in 2000.

Plan Elements Focusing on the Study Area:

The future land use map contained in the Linn County Comprehensive Plan did not reference any specific provisions for the study area; however, the cities of Bertram and Ely have formulated a City/County Strategic Growth Plan and Agreement with Linn County to address future development and review procedures. Some areas included in these agreements also fall within the study area boundaries. The narrative that follows summarizes the purpose of the agreement and its relationship to the study area.

- *City/County Strategic Growth Plan and Agreement - City of Bertram and Linn County 2003-2023:* The document guides planning and development within the two-mile area surrounding Bertram to manage growth and make efficient use of the area's resources. The intent of the plan and resulting intergovernmental 28E agreement is to ensure new development will fit into the existing small-town, rural character of the area and that open space and prime farmland will be preserved.

Plan Elements Focusing on the Study Area: The City of Bertram is located adjacent to the northeast of the study area; therefore, the eastern portion of the study area is located within the two-mile extraterritorial jurisdiction of the community governed by the *City/County Strategic Growth Plan and Agreement*. This allows the community to review and approve development proposals such as subdivisions, conditional use permits, rezoning requests, etc. in the fringe area.

Land use designations cited in this plan that fall within the study area boundary reference Bertram's Urban Service Area boundary to the west of Highway 13/151 and a Linn County Designated Critical Resource Area.

- *City of Ely and Linn County 2007 - 2027:* The plan offers a framework for appropriate growth and development for the two-mile area surrounding Ely over 20-year period. The document and related intergovernmental agreement provides for the coordinated implementation of the County and City Land Use Plans in the referenced fringe area. Ely and Linn County intend to manage future growth in the fringe-area by encouraging: 1) Compact, incremental residential growth in the Urban Service Area, 2) Commercial growth in appropriate areas, 3) Rural-residential growth in appropriate areas, and 4) The protection of farming operations, environmentally sensitive land and the quality of life area residents have come to expect.

Plan Elements Focusing on the Study Area: The City of Ely is located just southeast of the study area; therefore, the southern portion of the study area is located within the two-mile extraterritorial jurisdiction of the community governed by the *City/County Strategic Growth Plan and Agreement*. This allows the community to review and approve development proposals such as subdivisions, conditional use permits, rezoning requests, etc. in the fringe area.

Limits of the intergovernmental agreement extend north of Prairie School Road and a small section east of Jappa Road is designated as Rural Residential.

- *Cedar Rapids Parks & Recreation Master Plan:* The City of Cedar Rapids City Council adopted the *City of Cedar Rapids Parks and Recreation Master Plan* on April 13, 2010. The document has a stated purpose to "establish clear goals and strategies that will provide direction to Department staff and elected officials to enhance the community's parks and recreation programs, services, and facilities" over a 15-year time period. Specifically, the plan achieves the following:

  - Prioritizes investments to ensure a system that meets community needs.
  - Establishes strategies to improve operational efficiencies, cost recovery, and land acceptance standards.
  - Demonstrates community need and support to assist in the pursuit of alternative funding.
  - Ensures a system that accommodates changing community demographics.
  - Ensures a parks and recreation system that is sustainable and financially feasible into the future.

  Plan Elements Focusing on the Study Area: The northeast portion of the study area is included within the 134.2-acre Cedar Valley Lake Urban Fishery. The designated "large urban park" extends onto both sides of the Cedar River. Further, Navajo Park adjoins Worthington Acres located at the terminus of Navajo Avenue SW. The 10-acre "neighborhood park" is within the western portion of the study area. Tait Cummins sports complex, a "special use park," adjoins the study area to the northwest. The Cedar River Trail and Hoover Nature Trail bisect the study area from northwest to southeast as part of a larger system connecting.

  The Geo-Referenced Amenities Standards Process (GRASP) Level of Service Analysis measurement of the current delivery of service indicates the southern study area is predominately "below target minimum" while the northern portion is predominately "at or above target minimum." GRASP methodology measures recreational level-of-service, or the ability of the system to satisfy the needs of the public, considering the quantity, distribution, quality, comfort and convenience, and overall design and ambiance of parks and facilities.

  - The study area falls within the lowest two tiers of the GRASP analysis on neighborhood access to recreational facilities.
  - The study area falls within the "less access" or "no service" categories in the GRASP analysis walking access to recreational facilities.
  - The study area falls within the lowest tier of access or the "no service" category in the GRASP analysis on neighborhood access to parks larger than one acre.

The *City of Cedar Rapids Parks and Recreation Master Plan* also cites potential for converting portions of Navajo Park and Tait Cummins sports complex from parkland to prairie in an effort to save future maintenance and mowing expenses.

- *Capital Improvement Project 5-Year Plan***:** The City of Cedar Rapids prepared the *Capital Improvements Project 5-Year Plan* as part of its FY 2016 budget. The document outlines planned capital improvement projects financed with tax supported debt, enterprise or internal service monies, intergovernmental grants, or other funding sources for a five-year period from FY 2016 to FY 2020.

  Plan Elements Focusing on the Study Area: Several public infrastructure improvements are included within upcoming city budgets. The following provides a brief overview of each project:

  - Extension of Old River Road to C Street. Funds for project programmed in FY 2016 and FY 2017.
  - Water main extension from Old River Road south to Navajo Avenue, east of C Street SW. Project will be completed in conjunction with new Kirkwood elevated tank. Funds for project programmed in FY 2016, FY 2017, and FY 2018.
  - Water main extension from river crossing south of Fir Road to Otis and Cole Roads. Project will be completed in conjunction with new Kirkwood elevated tank. Funds for project programmed in FY 2016, FY 2017, and FY 2018.
  - Sanitary sewer improvements along Indian Creek from Otis Road to Dry Creek. Project will replace existing 42 inch sanitary sewer with a 60 inch sanitary sewer to provide additional capacity to upstream areas.

- *Linn County Capital Improvements Program:* The Linn County Capital Improvement Program (CIP) is a section of the *Annual Budget for Linn County, Iowa: Fiscal Year 2016* adopted by the Linn County Board of Supervisors. The policy making and management tool facilitates the planning, scheduling and execution of a series of public improvements for building assets and grounds over a five-year period that is reassessed each year. A prioritized list is developed based upon assessment of need and importance within the constraints of the County's ability to finance, implement and administer the projects.

  Plan Elements Focusing on the Study Area: No projects cited in the CIP correspond to the study area.

- *FY 2016 – 2019 DRAFT Statewide Transportation Improvement Program (STIP):* The Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) approved the State of Iowa's FY 2015-2018 Statewide Transportation Improvement Program (STIP) on September 16, 2014. The document provides a listing of all candidate projects for FHWA and FTA federal aid for a period of four federal fiscal years (FFY).

  Plan Elements Focusing on the Study Area: No surface transportation projects are scheduled within the study area during the referenced timeframe. Several minor improvements are programmed within close proximity.

  - Bowling Street Trail: Widen existing bridge over Highway 30 from north ramp to south ramp. The project is programmed for FY 2017.

- U.S 151: Bridge deck overlay project at the eastern junction of US 30 and US 151 in the City of Cedar Rapids. This project is programmed for FY 2019.

- *Connections 2040:* This document represents the Corridor MPO's 2040 Long Range Transportation Plan (LRTP). The Long Range Transportation Plan is the federally required long-range (20+year) strategy and capital improvement program developed to guide the effective investment of public funds in multimodal transportation facilities for the metropolitan planning organization area. The Plan provides the context from which the region's Transportation Improvement Program (TIP), a five-year capital improvement program for implementing highway, transit, and bikeway projects, is drawn. The plan was adopted by the Policy Board on July 30, 2015. Projects cited in Connections 2040 that have some relevance to the study area include:

  - C Street SW improvements from Wilson Avenue to south of Old Ely Road; and
  - The Otis Road Trail extension

APPENDIX B: FOCUS GROUP FEEDBACK

Two focus group sessions were conducted with stakeholder groups. One group was comprised of individuals representing environmental and conservation organizations, including Linn County Conservation, Trees Forever, Linn County Soil and Water Conservation District, Linn County Trails Association, and the Cedar Rapids Chapter of the Sierra Club. The second group included land owners, businesses, and residents from the study area. The purpose of these sessions was to engage stakeholders in a series of discussion topics designed to identify issues, concerns, and perceptions associated with future development within the study area. A summary of the questions and feedback is summarized below.

- *Environmental Focus Group*

  - Question 1: What portions of the study area are most environmentally sensitive and should be preserved and protected by future development, if possible?
    - Floodplain and riparian areas;
    - Forest and timbered areas;
    - Steep slopes with high erosion classes (steep slopes being greater that 12% - 15% grades);
    - Wildlife and cross-pollination corridors should be maintained;
    - Large parcel conservation areas should not be fragmented. It was suggested that conservation easements would serve as a possible solution;
    - Preserve large tree canopies and grasslands;
    - Unknown historical features and archeological resources.

  - Question 2: Identify some of the impacts that development either in or near these environmentally sensitive areas may create.
    - Destabilization of stormwater detention areas;
    - Greenhouse gas emissions;
    - Increase impermeable surfaces;
    - Increased congestion due to increasing population and trip generation;
    - Possible job creation;
    - Light pollution;
    - Impacts to habitats brought on by increased noise;
    - Decreased stormwater infiltration;
    - Reduction of farm land;
    - Limit opportunities for local food production;
    - Avoid developments at higher elevations;
    - Neglect that sometimes occurs when new development occurs;
    - Curtail hunting in certain areas due to new home construction.

  - Question 3: What portions of the study area are highly productive agricultural lands that should be preserved for agricultural purposes, if possible?
    - Areas south of Highway 30;
    - Remnant prairies.

- Question 4: Identify some of the impacts that development either in or near these agricultural lands may create.
  - User (farmer/resident) conflicts due to generation of dust from farming operations, runoff, etc.;
  - More impermeable surfaces;
  - Alteration in nutrients brought on by increased runoff from farms on adjacent residential areas;
  - Removal of trees;
  - Potential changes in subsurface drainage;
  - Curtail localized food production;
  - Roadway safety brought on by the movement of farm equipment, residential traffic, etc.;
  - Disruption to wildlife and pollination. It was suggested that the area might be a good candidate for "wildlife habitat designation."
  - Pesticide applications (real or perceived) on neighborhoods and potential affects to human health;
  - Interface between agricultural machinery and urban areas/neighborhoods.

- Question 5: What, if any, additional insights or feedback would you provide concerning future development within the study area?
  - Improve infiltration characteristics in subdivisions and commercial design;
  - Encourage compact development;
  - Preserve a corridor for light rail from Cedar Rapids to Iowa City;
  - Encourage conservation design;
  - Encourage connectivity with trails, parks, and neighborhoods;
  - Facilitate multi-modal transportation options.

- *Property Owners Focus Group*

  - Question 1: For those of you with homes or businesses within the study area, what issues or concerns do you have about existing services, such as water, sewer?
    - A farmer from the area indicated he is on a well and septic system;
    - Water pressure is lower due to a dead end loop. One resident indicated he had to invest in a private booster station to improve water pressure;
    - The area is served by a private lift station and owners expressed a desire that the city should assume responsibility for lift stations;
    - Traffic safety issues at streets that intersect with Highway 30 – particularly Union Drive. In addition, many residential areas only have one point of access;
    - Bicycle and pedestrian access on Highway 30 is dangerous;
    - Ivanhoe Road traffic travels at fast speeds and lacks frequent police patrols;
    - Access to technology (fiber for data/computer use) is not attainable through area service providers.

  - Question 2: For those of you with homes and businesses within the study area, what issues or concerns do you have with the transportation network?
    - Farming operations are impacted between 12:00 noon and evening hours due to car traffic and slow-moving farm vehicles. Also, farm equipment can take up a lot of roadway;

- Stormwater runoff from residential areas impact agricultural fields;
- Limited access for emergency vehicles;
- Connection to Honey Grove Road poses challenges for operating quarries because of the conflicts between heavy trucks and cars;
- Further development could hinder quarry operations;
- Impacts from the Mt. Vernon/Lisbon bypass could create increased traffic volumes on Highway 30 and pose challenges for access to the highway;
- Snow removal to the area is a low priority;
- Need for improved railroad crossing safety.

- Question 3: If the area is developed further, what concerns do you have on how that development will impact existing services, transportation, ability to farm/operate businesses, other?
  - A farmer indicated that C Street would require widening to improve access from farming operations and reduce conflicts with residential and business traffic;
  - Potential drop in water pressure – beyond what's currently being experienced;
  - Increased performance challenges for sanitary sewer systems;
  - Increased traffic conflicts resulting from quarry operation and resident travel.

- Question 4: What, if any, additional insights or feedback would you provide concerning future development within the study area?
  - Future land uses (if not agricultural) should be residential;
  - Some would like to see growth in the area;
  - Several commented about enjoying living in the area.

APPENDIX C: BACKGROUND INFORMATION CONCERNING STORMWATER MANAGMENT

Three primary stormwater management scales were considered to serve the study area. A brief description of each approach is summarized below. Actual implementation is typically a combination of the approaches, weighted according to the preferences of the managing entity.

Regional Detention/Retention: Regional detention means using large ponds to collect and detain runoff from entire development areas (regions), instead of smaller, more frequent "local" detention ponds. Because they usually serve multiple small watersheds, regional basins are usually located low in the watershed, often within existing intermittent streams or flow lines (detention is NOT permitted within existing natural wetlands or most regulatory floodplains). The feasibility of using regional (or "online") detention was evaluated throughout the study area and it was not deemed feasible for most of it since detention or retention is not allowed in mapped, regulatory floodplains. Regional detention may be feasible higher in the watershed where commercial and higher density land use is specified and site by site detention may not be as cost effective. These regional detention areas could be installed within existing drainage ways in areas zoned as open space. Regional detention basins can also be designed as multi-use areas, for example a soccer field could be located in a large basin that is flooded only occasionally.

Conventional Localized Detention/Retention: Local detention is recommended for most of the project area. Developments should be required to adhere to the City standard of limiting the rate of runoff from the 5-year through 100-year frequency storm events to the existing, pre-developed peak runoff from a 5-year event. Enforcing this standard would ensure that the cost of detention is included in the development of each site. Emphasis should be placed on detention that also improves water quality – such as bio-filters, wet ponds or wetlands – or reduces runoff volume such as infiltration oriented practices. In commercial and high density areas, permeable pavement and underground facilities such as infiltration chambers may be a better fit than conventional detention practices that take up valuable land area. These types of "stormwater BMPs" (Best Management Practices) are increasingly common and may qualify for funding assistance. Outlet structures from detention and retention facilities should be multi-stage to allow for controlled release of the water quality and channel protection volumes (the runoff from 1.25 and 2.4 inch storms, respectively).

Small Scale Stormwater Management Techniques: The use of smaller, more numerous stormwater BMPs, such as bioretention cells, rain gardens, native landscaping, rain barrels, and other small scale stormwater treatment techniques should be incorporated into site development whenever possible. These types of practices offer the best downstream results when they are distributed across the landscape, each unit serving a relatively small drainage area. These stormwater management techniques are intended to infiltrate water close to the source, thus reducing both the rate and volume of stormwater reaching the drainageways and creeks and ultimately reducing downstream erosion and pollutant loading. It is recommended that developments be required to utilize these types of facilities to infiltrate the Water Quality Volume at a minimum. Ideally, the Channel Protection Volume would be treated and/or infiltrated onsite (the concepts of Water Quality volume and Channel Protection volume are described thoroughly in the Iowa Stormwater Management Manual). While the City requirement of releasing at the 5-year pre-development rate is excellent for reducing downstream flooding and severe-event stream erosion, it is the smaller, more frequent storms that have been shown to cause the most overall erosion and water quality degradation in channels, creeks, and rivers. These practices will promote healthy, attractive waterways and allow stormwater that does not infiltrate to function as a community amenity instead of a nuisance.

Stormwater Management Cost Estimation Methods

- Drainage Basin Delineation: The drainage basins were delineated by first finding the topographical flow paths and streams based on LiDAR derived 2 foot contours. Once the flows paths were determined, drainage points of interest were specified. The drainage points were located where two or more tributaries joined, or the stream crossed a roadway. The drainage basins for each point were determined using LiDAR contours as well. For the indicated study region, 141 basins were defined.

- Stormwater Runoff Estimates (Development Type, Typical Imperviousness, and Soil Types): The land uses were assigned land use-specific typical imperviousness values based on standard development scenarios. The typical percent imperviousness for each land use was multiplied by the area of the area within each sub-basin to yield the area, in acres, of imperviousness for that drainage basin.

  Soil data was obtained from the Natural Resources Conservation Service (NRCS) and was analyzed for the area of interest. The soil data was codified based on each soil type's "Hydrologic Soil Group" which categorizes soils based on runoff / infiltration potential. The soil groups range from "A" (low runoff / excellent infiltration) to "D" (high runoff / poor infiltration). This soil data determines if infiltration based "Best Management Practices" (BMPs) should be installed and how they will perform in the area. The study area is well suited to infiltration based stormwater BMPs based on soil type and topography.

  Using the NRCS "TR-55" method, the direct runoff depth for each basin was determined for a variety of storm events. The TR-55 method incorporates the Hydrologic Soil Group, typical land surface slopes, and proposed development scenarios (land use and imperviousness). The runoff depths were estimated in inches by basin, then multiplied by the basin area to estimate acre-feet of runoff, which can be used to estimate the detention storage needed for each basin. The detention volume was estimated by subtracting the direct runoff volumes of the 5-year storm from the 100-year storm. This method gives a reasonable approximation of the detention required by ordinances specifying that the post-development condition 100-year runoff rates not exceed runoff rates from the 5-year pre-development condition. This method produces rough estimates only. The actual detention volumes required will be based on detailed analysis of each specific development region. The construction costs associated with dry detention ponds ranges considerably, but can be estimated based on detention volume. The volume to cost estimation is based on $C = 12.4V^{0.760}$ where C is construction/design/permitting cost and V is volume needed to control the 10-year storm (From EPA – NPDES fact sheet)

- Local Storm Water BMPs: Local (onsite) storm water BMPs reduce total runoff, reduce maintenance on other storm infrastructure, improve wildlife and aesthetics, and are increasingly mandated by post construction ordinances.

  The area of imperviousness for each basin gives a reasonable estimate of the total amount of stormwater BMPs that will be necessary to meet typical post construction stormwater ordinances based on the "Water Quality Volume" (runoff from a 1.25" rain event). A standard estimate for stormwater BMPs meeting the water quality volume criteria is $45,000 per impervious acre served. These installations are typically small, and sited per parcel or perhaps per block.

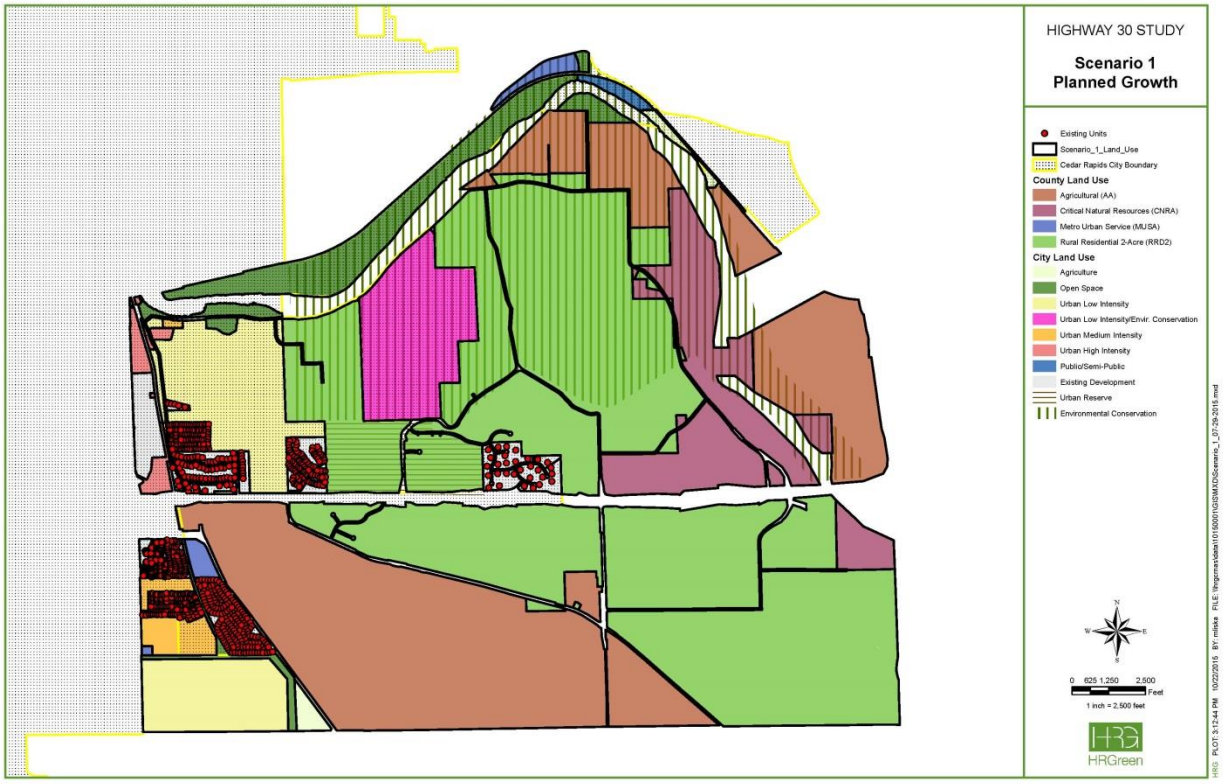
- Roadway Cost (Arterial/Collector Streets): The construction costs for the roadway drainage is based on the number of outfalls, intakes, manholes and total length of piping needed. Basic assumptions include, for example, 1 manhole per 1000 feet of roadway, 2 intakes per 300 feet, one 15" cross-run per 300 feet, and an average longitudinal pipe size of 24 inches. For local streets within the study area, it was assumed that the layout would be similar to the areas already developed or the proposed Camelback subdivision development. The potential cost for local roadway drainage is provided for an example of development related roadway drainage.

- Culvert Cost: Using the rational method and US Geological Survey (USGS) Stream Stats for Iowa, approximate flow rates were determined for each significant stream crossing. The entire study area consisted of 53 drainage points at an existing or a proposed roadway. Using the flow rates at each drainage point, a culvert size for each crossing was determined such that overtopping of the roadway during the 100-year event is avoided. The estimated cost for installing culverts for the study area was determined based on the size and type of culvert and the width of the road.

  There were several instances where the appropriate culvert size to handle the 100-year storm would result in a choice of installing a triple box culvert or a bridge. These locations typically occur on existing roads and where bridges or box culverts already exist. It was assumed that the existing bridges would be left as they are already designed for the approximate flows associated with that point. Therefore the cost for building bridges and/or large box culverts was left out of this analysis. However, if a new bridge or large box culvert would need to be constructed, the cost could range from $500,000 to $1,000,000 depending on the size and length.

APPENDIX D: SCENARIO 1 LAND USE AND DENSITY DETAIL

Scenario 1



Source: City of Cedar Rapids, Linn County, Corridor MPO, HR Green

Scenario 1 & Associated Development Densities[19]

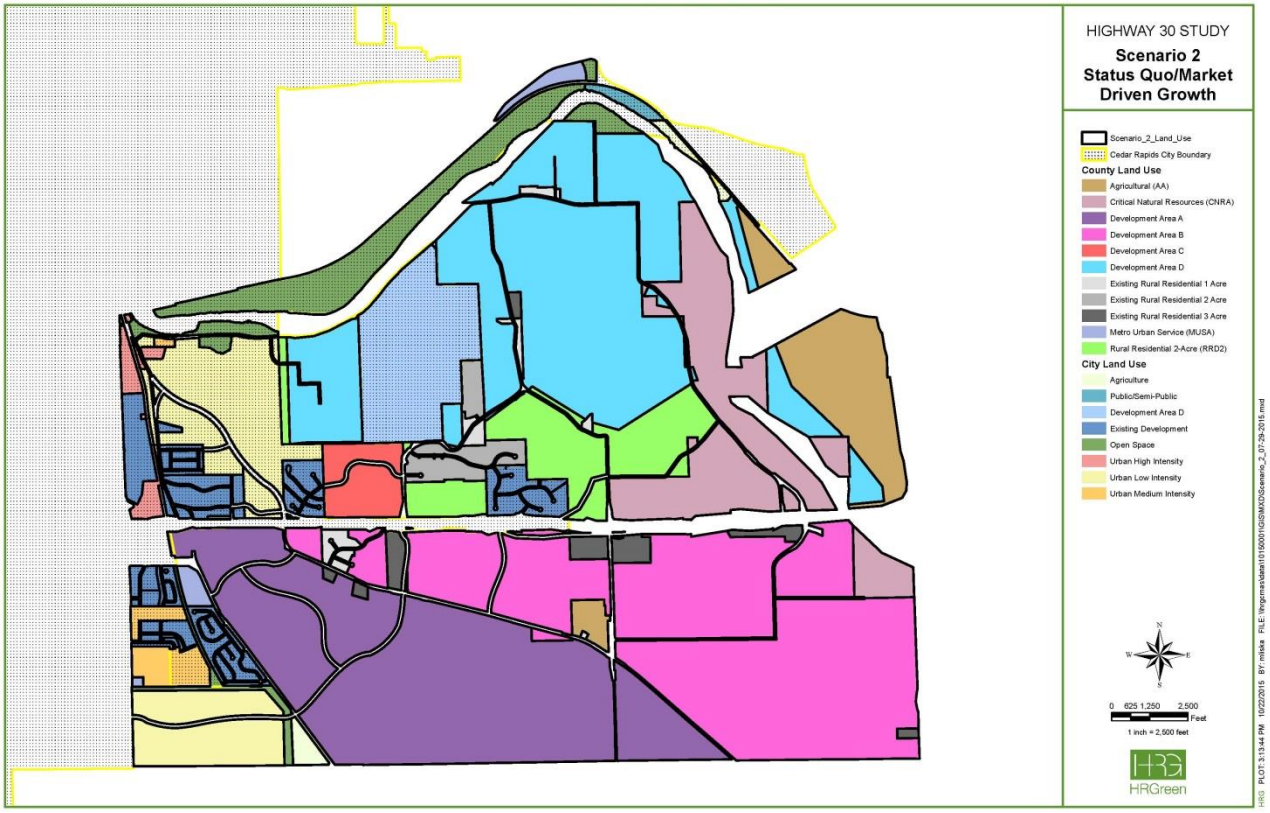
Scenario 1	Future Land Use	Density	Acres	Assumed Avg. Units/Acre	Number of Units	Location
	Agriculture	at least 40 acres per unit	24.90	0.025	0	Areas West of Ely Rd & South of Hwy 30
	Open Space	Not Applicable	42.01	0	0	Areas West of Ely Rd & South of Hwy 30
	Urban Low Intensity	2 to 12 units per acre	276.62	7	1,549	Areas West of Ely Rd & South of Hwy 30
	Urban Medium Intensity	4 to 24 units per acre	93.41	14	1,046	Areas West of Ely Rd & South of Hwy 30
	Future Land Use	**Density**	**Acres**	**Assumed Avg. Units/Acre**	**Number of Units**	**Location**
	Agriculture	at least 40 acres per unit	19.22	0.025	0	Areas North of Hwy 30 within the City of Cedar Rapids
	Civic	Not Applicable	26.91	0	0	Areas North of Hwy 30 within the City of Cedar Rapids
	Open Space	Not Applicable	383.11	0	0	Areas North of Hwy 30 within the City of Cedar Rapids
	Urban High Intensity	8 to 40 units per acre	58.63	24	1,126	Areas North of Hwy 30 within the City of Cedar Rapids
	Urban Medium Intensity	4 to 24 units per acre	4.34	14	49	Areas North of Hwy 30 within the City of Cedar Rapids
	Urban Low Intensity	2 to 12 units per acre	443.59	7	2,484	Areas North of Hwy 30 within the City of Cedar Rapids
	Urban Low Intensity - Environmen	2 units per acre	427.06		683	Areas North of Hwy 30 within the City of Cedar Rapids
	Future Land Use	**Density**	**Acres**	**Assumed Avg. Units/Acre**	**Number of Units**	**Location**
	Agriculture	1 unit per 2 acres	2,452.43	0.5	981	Brown Shading
	Critical Natural Resources	1 unit per 35 acres	689.81	0.029	16	Areas Mostly North but some South of Hwy 30 on the East Side of the Study Area
	Metro Urban Service	1 unit per acre	53.93	1	43	Areas along extreme North side of Study area and Areas West of Ely RD.
	Rural Residential 2-Acre	1 unit per 2 acres	3,955.43	0.5	1,582	Bright Green (Medium Apple Green) Shading
	Existing Development		426.81		924	Light Gray Shading
	Number of units		**9,378.21**		**10,484**	

Source: City of Cedar Rapids, Linn County, Corridor MPO, HR Green

[19] Please note that the discrepancy between total area and number of units cited in this table and other sections of this report are based on applying the same criteria but rounding values associated with assimilating smaller areas into a larger sub-area.

APPENDIX E: SCENARIO 2 LAND USE AND DENSITY DETAIL

Scenario 2



Source: City of Cedar Rapids, Linn County, Corridor MPO, HR Green

Scenario 2 & Associated Development Densities[20]

Scenario 2	Future Land Use	Density	Acres	Assumed Avg. Units/Acre	Number of Units	Location
	Agriculture	at least 40 acres per unit	24.63	40	0	Areas West of Ely Rd & South of Hwy 30
	Open Space	Not Applicable	41.34	0	0	Areas West of Ely Rd & South of Hwy 30
	Urban Low Intensity	2 to 12 units per acre	262.78	7	1,472	Areas West of Ely Rd & South of Hwy 30
	Urban Medium Intensity	4 to 24 units per acre	93.37	14	1,046	Areas West of Ely Rd & South of Hwy 30
	Future Land Use	**Density**	**Acres**	**Avg. Units/Acre**	**Number of Units**	**Location**
	Agriculture	at least 40 acres per unit	19.22	40	0	Areas North of Hwy 30 within the City of Cedar Rapids
	Civic	Not Applicable	26.91	0	0	Areas North of Hwy 30 within the City of Cedar Rapids
	Open Space	Not Applicable	383.12	0	0	Areas North of Hwy 30 within the City of Cedar Rapids
	Urban High Intensity	8 to 40 units per acre	58.65	24	1,408	Areas North of Hwy 30 within the City of Cedar Rapids
	Urban Medium Intensity	4 to 24 units per acre	4.34	14	49	Areas North of Hwy 30 within the City of Cedar Rapids
	Urban Low Intensity	2 to 12 units per acre	412.38	7	2,887	Areas North of Hwy 30 within the City of Cedar Rapids
	Development Area D	2 units per acre	427.06		854	Blue (Yogo Blue) Shading within the City of Cedar Rapdis
	Future Land Use	**Density**	**Acres**	**Avg. Units/Acre**	**Number of Units**	**Location**
	Agriculture	2.5 units per acre	400.74	N/A	1,002	Brown Shading
	Critical Natural Resources	1 unit per 10 acres	689.41	10	69	Areas Mostly North but some South of Hwy 30 on the East Side of the Study Area
	Development Area A	2.5 units per acre	1587.21		3,968	Purple Shading that includes Camelback Area
	Development Area B	2 units per acre	1813.34		3,627	Pink (Ginger Pink) Shading
	Development Area C	2.1 units per acre	134.49	N/A	282	Proposed College Farms Addition (Red Shading)
	Development Area D	2 units per acre	1650.85		3,302	Blue (Big Sky) Shading
	Existing Rural Residential 1-Acre	1 unit per acre	63.18		48	Light Gray Shading
	Existing Rural Residential 2-Acre	1 unit per 2 acres	116.73		34	Dark Gray Shading
	Existing Rural Residential 3-Acre	1 unit per 3 acres	108.91		12	Black Shading
	Metro Urban Service	1 unit per acre	53.96	1	43	Areas along extreme North side of Study area and Areas West of Ely RD.
	Rural Residential 2-Acre	2 units per acre	451.64	2	903	Bright Green (Medium Apple Green) Shading
	Existing Development		418.8		924	Dark Blue Shading
	Number of units		**9243.06**		**21,929**	

Source: City of Cedar Rapids, Linn County, Corridor MPO, HR Green

[20] Please note that the discrepancy between total area and number of units cited in this table and other sections of this report are based on applying the same criteria but rounding values associated with assimilating smaller areas into a larger sub-area.