

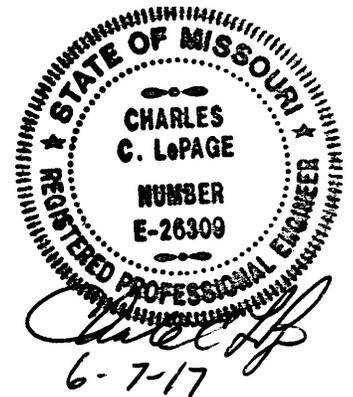
Warsaw, Missouri

Jackson Street Complete Streets Preliminary Engineering Report



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Introduction

For future planning and funding the City of Warsaw has commissioned CFS Engineers to study Jackson Street between Main Street and the Riverside Cemetery. CFS recently completed a Preliminary Engineering Report for the City that addresses transportation issues and needs along the Van Buren Street Corridor. The two studies will assist the city in developing a comprehensive approach to providing multi-modal transportation improvements for the two vitally important routes. Improvements along these two corridors with multi-modal capabilities will encourage redevelopment as outlined in the city's comprehensive plan entitled *Building on Success to Capitalize on the Future*. Additionally, the improved streets will provide multi-modal routes that access parks, commercial and residential areas and community services and amenities.

Over the past 19 years, the city of Warsaw, Missouri has taken proactive steps to make community-wide improvements to their infrastructure. This started with a series of planning processes that looked comprehensively at sewer and water, transportation, community recreation and tourism. The goal of the City was to overcome deficiencies in the infrastructure, develop a more livable community and create an environment that would attract businesses and tourists. The catalyst for creating a livable community derived from a series of strategies and planning documents that were continually updated to reflect successes and short falls. These studies and planning documents outlined community needs and recommended improvements with priorities and cost estimates for budgeting. The City aggressively sought out funding for these much needed improvements with great success. The City has made significant upgrades to its existing utility network and recreational facilities as well as some improvements to the transportation system. The City is now focusing on its attention on addressing the transportation network to better accommodate the citizens of Warsaw along with the increasing number of visitors to the area. In addition, the City desires to improve accessibility to all modes of transportation throughout the community that will encourage the attraction of new residents and businesses.

This new direction by the City of Warsaw was initiated with the adoption of the community's new Comprehensive Plan. This Comprehensive Plan includes a section entitled "Warsaw Livable Community Transportation Improvement Plan (TIP)". The TIP is a very thorough plan on how to improve the community's transportation system that provides great connectivity throughout the City, and capitalizes on the exceptional waterfront trails system that currently exists. The goal of the transportation improvements plan is to create a network of multi-modal streets and pathways that link to the trail system to create a unique transportation system for all who live, visit or conduct business in Warsaw. These highly visible projects will make a statement that Warsaw is a progressive city that is willing to invest in improving the quality of life for all who live, work or visit their community. These improvements will provide everyone with great flexibility, safety and comfort to enjoy the many unique and abundant outdoor beauty and experience opportunities that Warsaw has to offer.

Executive Summary

The Jackson Street Preliminary Engineering Report (PER) project limits extend from the intersection of Main Street to the east, then northwesterly to the Riverside Cemetery at the northern City limits. The purpose of the PER is to evaluate the condition of the existing infrastructure, identify conflicts, issues and limitations for motorists, pedestrians and cyclists, discuss critical needs and determine improvements that will promote multi-modal transportation choices, as well as health and safety for citizens of the community.



The PER addresses needed improvements such as ADA compliant sidewalks, potential for bike lanes, improved storm drainage, streetscapes, lighting, parking and traffic flow and pavement marking and signage.

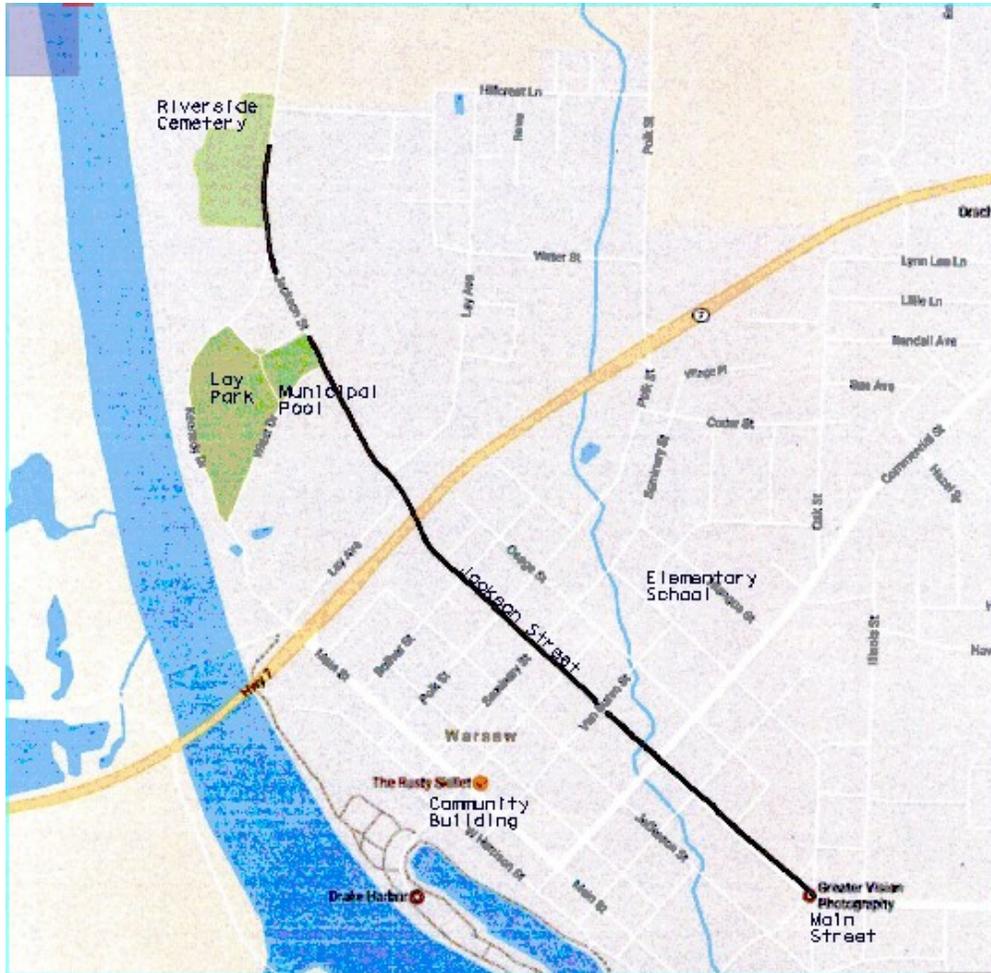
The PER also discusses the environmental permitting process and probable issues that will need to be addressed for agency approval, depending upon which funding source is utilized.

The report provides conceptual design with cost estimates for engineering and surveys, utility adjustments, easements and construction related expenses for various alternatives and includes recommendations for proposed improvements.

The ultimate rationale for the project is to promote Warsaw's goal of developing safe, reliable, and economical transportation choices by investing in walkable and bikeable neighborhoods. As previously mentioned in the 2015 Warsaw Livable Streets Transportation Improvements Plan, Jackson Street was identified as one of the key streets to be improved in order to provide multi-modal connectivity through the heart of the city.

For the Jackson Street corridor, CFS is recommending a proposed project with limits extending from Main Street to the Riverside Cemetery. These improvements would include constructing new sidewalks along both sides of Jackson Street for the entire length of the study area. Between Main Street and the Jackson Street bridge over Route 7, curb and gutter should be constructed with an enclosed storm drainage system. This enclosed system will drain into ditches along the intersecting side roads, and into several large creeks that cross Jackson Street along the corridor. A small amount of retaining wall will need to be constructed along the corridor due to existing walls and grade issues at some locations. West of the bridge over Route 7, curb and gutter with enclosed storm sewers is not recommended due to limited right of way width, utility conflicts and existing shallow ditches and is not cost effective. The existing ditches will require a minimal amount of grading to allow for construction of new sidewalks at the back of the right of way and a multi-use path. Where shoulder parking is currently allowed, the pavement should be widened for on street parking, and additional parking should be constructed near Lay Park. Pavement marking and signage will need to be upgraded for the extent of this project.

The estimated cost to construct these improvements along Jackson Street is approximately \$2.6 million. This estimate includes right of way costs, utility adjustments, engineering, construction administration and inspection.



Jackson Street in Warsaw, MO. Vicinity Map

Existing Conditions

General

Jackson Street runs for about 1.97 miles from the Main Street intersection at the east end to Truman Dam Access Road at the north end. From the Main Street intersection to the City limits at Riverside Cemetery, Jackson Street is approximately 1.2 miles in length. From Main Street to Commercial Street, the corridor is mostly residential with businesses located near the intersection of Commercial Street. West of the Town Branch Creek crossing, the corridor resumes as residential in nature. Properties are mostly single family residences with an apartment complex at the northwest corner of Seminary Street and also along the north side of the street, just east of the Route 7 overpass. From the Route 7 overpass to Kennedy Drive, single family residences exist along the north side, while only one residence exists on the south or west side. The remainder of the property on the south and west side of Jackson from Route 7 to the City limits consists of Lay Park, the community pool, tennis courts, a ball field and the cemetery.

Portions of Jackson Street have received infrastructure improvements as part of recent City projects, including new water mains, sanitary sewer replacements, minor sidewalk replacements and asphalt street overlays. A new water main is still needed between Polk and Route 7. Route 7 Highway crosses under

Jackson Street near the west limits of this report. This overpass has been studied as a possible location for a bike interchange connection between Route 7 and Jackson Street. Jackson Street serves as a direct arterial through the City, providing access to downtown, US-65, the Eastgate business District, the waterfront, parks, recreational facilities, schools, churches, the library, Truman Dam as well as a link to other major corridors.

Traffic

Jackson Street is currently a primary connector through the City. Vehicular traffic along Jackson Street is heavier than most other streets, as it serves as a direct route to the downtown, US-65, several shopping districts and Truman Dam Access Road. Jackson Street also intersects Van Buren Street, which is a community connector to the North Elementary School and Drake Harbor, both of which are large traffic generators. The elementary school also serves as a transit center for picking up and dropping off students from the other schools in the community. On the west side of town, Jackson Street provides a direct route to Lay Park where the city pool, a baseball field, and other recreational facilities are located. The speed limit along Jackson Street is 25 mph through the city and is reduced to 15 mph through the Lay Park and recreational facilities.

Roadway Sections

The right of way width for Jackson Street between Main Street and Highway 7 is approximately 66 feet. The existing roadway in this area is comprised of asphalt pavement approximately 24 feet wide, with variable width turf shoulders, open ditches, and sidewalks on at least one side of Jackson Street. Shoulder parking is present at several locations consisting of various surfaces including pavement (asphalt), gravel, and turf, located in both commercial and residential areas. The roadway is generally in good condition, with some areas in poor condition, mainly at crossroad intersections. The sidewalk is generally in poor condition between Main Street and Highway 7.

From Highway 7 to the west, the right of way width for Jackson Street is approximately 45 feet. The existing roadway is an approximately 20 feet wide asphalt pavement which appears to be in fairly good condition. From Route 7 to Kennedy Drive, turf shoulders and open ditches line the roadway on the north and east, while the shoulder slopes away from the roadway with no ditches along the south and west side. From Kennedy Drive north to the City limits, the roadway is approximately 18 to 20 feet wide. There is a ditch on the west side of the roadway and only a shoulder on the east side. There are currently no sidewalks west of Route 7, but shoulder parking exists in areas near Lay Park and the ball field.

Sidewalks

Along the north and south sides of Jackson Street, between Main Street and Route 7, the sidewalk is predominantly 4 feet in width. The location of the sidewalk is offset from the existing edge of pavement by approximately 10 to 15 feet and is just inside the existing right of way. The sidewalk along the north side of Jackson Street is mostly continuous from Main Street to Route 7 with a few short gaps, while the sidewalk along the south side is very intermittent.



The condition of the sidewalk on the north side of the roadway, between Main Street and Route 7, is very poor. There are portions of the sidewalk missing, trip hazards and upheaval from tree roots is common. The condition of the sidewalk on the south side is also very poor, and the sidewalk is not continuous between blocks. There are several locations where the sidewalk adjacent to ditches is elevated and unsafe. Some of these locations have handrails, but most do not.

At the southeast corner of State Street, there is a 4 foot sidewalk connecting from the south. At the Commercial Street intersection, the only sidewalk is in the northeast quadrant with no sidewalk connections from Commercial Street in any direction. Approximately 130 feet northwest of the Commercial Street intersection is the Town Branch Creek crossing. A box bridge spans Jackson Street. There is a sidewalk on the north side of the road crossing the creek, but no sidewalk on the south side.



At the Van Buren Street intersection there are currently north-south sidewalk connections in 3 of the 4 quadrants. Future complete street improvements to Van Buren will include constructing sidewalks on both side of the street with connections to Jackson Street sidewalks.

At the Benton Street intersection there is currently a 4 foot sidewalk connection to the south and north on the west side of Benton. The intersection at Seminary Street and at Polk Street have sidewalk connections in the southwest quadrants, connecting to existing 4 foot wide sidewalks. At Bolivar Street there are sidewalk connections in the northeast and southwest quadrants.

There is no sidewalk along the south side of the roadway west of Benton Street. An existing sidewalk continues west of Benton along the north side of the roadway, extends across the bridge over Route 7 and terminates approximately 160 feet west at the Lay Avenue intersection. There are no sidewalks to the northwest of this location.

Storm Water

The storm water and drainage system along Jackson Street is currently handled in roadside ditches and culverts under side roads and driveways. There are several sections of existing culvert pipe that appear to be in good condition and may be able to be used with a future enclosed storm drainage system. These will need to be evaluated with a the design of a future storm sewer system to determine if the pipe sizes are adequate and if the elevations will work with the new system.

Starting at the east end of the project, drainage flows to the west and south. Just east of Ballou there is a drainage ditch on the south side of the street that intercepts storm water and flows southward to Jefferson Street, where it turns westerly to the Town Branch Creek. At the intersection of Ballou Street, there are inadequate ditches and storm water appears to travel down Ballou from the north and flow directly into the intersection. There is a 12 inch pipe culvert crossing under State Street on the north side of the intersection,

but the ditches have silted in and the pipe is likely not functioning well. State Street drains from north to south toward Town Branch Creek. From the north, storm water flows along the east side of State Street is intercepted by a 12 inch culvert that crosses under Jackson Street and outlets to the south. Along the west side State Street, runoff flows from the north into a roadside ditch on the north side of Jackson and then heads westerly to Commercial Street.

At Commercial Street, storm water drains from north to south toward the Town Branch Creek which is about 160 feet south of the intersection. Culverts extend under Jackson Street on both sides of the intersection. The 42 inch culvert under Jackson Street on the east side of the intersection has large concrete head-walls on both ends and outlets into a large ditch south of Jackson Street. This ditch has a retaining wall to the north as well protecting the embankment from erosion. The 18 inch culvert under Jackson Street on the west side of the intersection is about 187 feet in length and outlets directly into the Town Branch Creek. This pipe has a concrete head-wall that is in poor condition. In the northwest quadrant of the intersection there is also an 18 inch culvert that runs to the west approximately 130 feet and into the Town Branch Creek.



As mentioned earlier, approximately 130 feet west of Commercial Street there is a large concrete box culvert (approximately 20 feet by 4 feet) that carries the Town Branch Creek under Jackson Street from north to south. This culvert appears to be in good condition, and sufficiently manages the Town Branch Creek flow under Jackson Street.

On the north side of Jackson, about 75 feet west of the creek there is an existing grate inlet. This inlet has 15 inch culvert carrying storm water from the west and an 18 inch culvert crosses diagonally under Jackson and into the south side ditch that flows to the creek.



At Van Buren Street, culverts with head-walls carry storm water from west to east. A 15 inch culvert is on the north side and an 18 inch culvert in on the south side of Jackson Street. Storm water flows from the south to the intersection and is intercepted by the culverts and ditches on the south side of Jackson. North of the intersection, storm water flows northward towards Osage Street, where it enters the Town Branch Creek.

Between Van Buren and Benton Streets, there is a 160 foot long, 15 inch pipe culvert along the south side of Jackson, that might be useable with a future enclosed drainage system. Where Benton Street intersects Jackson Street, a small box culvert with head-walls carries storm water from west to east on the south side of

the intersection. An 18 inch culvert carries storm water from west to east under Benton Street on the north side of the intersection. In the southeast quadrant, there is a grate inlet between the sidewalk and Benton Street that captures storm water flowing from the south and directs it easterly into the Jackson Street ditch.

There is a 24 inch culvert that extends under Seminary Street on the south side of the intersection, with a large ditch at the inlet on the west and a large ditch on the east side of Seminary Street. A 15 inch culvert carries flow under Seminary on the north side of the intersection. In the southwest quadrant, there are two small sidewalk connections that have culverts under them to carry water from west to east.

At the intersection of Jackson Street and Polk Street, there are culverts on both the north and south sides of the intersection carrying water from west to east. On the south side of Jackson Street the 15 inch culvert crosses under Polk Street and connects to a concrete junction box. From here, a 15 inch culvert extends for about 135 feet to the east and outlets into the roadside ditch. There is 12 inch pipe culvert to the south that collects water and ties into the junction box. In the southwest quadrant, there is approximately 15 feet of paved ditch along Jackson Street that extends from a small culvert on the west to a culvert underneath the sidewalk. The culvert then outlets into a short length of ditch before the inlet of the culvert that extends under Polk Street. On the south side of Jackson, west of Polk there is a 10 inch metal culvert that is partially exposed. This culvert is about 140 feet in length and will not be reusable with a future enclosed system. Between Polk and Bolivar there is a very shallow swale and shoulder parking on the north side of Jackson.

At Bolivar Street, there is a 12 inch culvert with head-walls that extends under Bolivar on the south side of Jackson Street and drains from west to east. A small culvert also runs under the sidewalk in the southeast quadrant of the intersection that carries water east along the south side of Jackson.

West of Bolivar the storm water is mainly carried in small roadside ditches with culverts under private entrances. At the bridge over Highway 7, a concrete swale is located on the southeast corner of the bridge that carries storm water away from the roadway.

Immediately west of Route 7, the storm water flows down Lay Avenue toward Main Street. Northwest of Lay Avenue, the storm water flows southwesterly through Lay Park towards the Osage River. At the intersection of Jackson Street and Kennedy Drive, there is a grate inlet in the south quadrant that collects and diverts storm water to the west, under Kennedy Drive.

Driveways/Entrances

There are many driveways and entrances along the entire length of Jackson Street within the study corridor, both commercial and residential. The driveways are constructed of a variety of material including aggregate, asphalt, and concrete. Some of the driveways have pipe culverts that extend under them. The profile grade of these driveways are mostly flat to very gentle, with a few that are steeper and may require reconstruction beyond the right of way due to steeper grades.

Parking

Parking along the corridor is mostly in private drives or on the shoulder between Main Street and Highway 7. To the west of Highway 7, parking is allowed on the shoulder and private drives, as well as on-street parking areas near Lay Park. Near the ball field, at Lay Park there are designated paved parking areas just off the roadway, and gravel parking on the shoulder.



Utilities

Utilities along the Jackson Street corridor include water, sanitary sewer, natural gas, telephone, cable and overhead power. Most of the waterlines in this area were replaced recently and should not require much, if any adjustment. The overhead power lines may need to be relocated in some areas to accommodate a widened roadway section with bike lanes and on street parking. Other utilities may require minor adjustments to maintain a clear path for the proposed sidewalks.

Bike Lanes

Currently bike lanes do not exist along Jackson Street. There is adequate room for widening the roadway and adding bike lanes between Main Street and Highway 7. North and west of Highway 7, the existing right of way does not allow for the addition of bike lanes. However the City of Warsaw owns a large tract of land on the south side where a shared use path could be constructed to accommodate bicycle traffic.

Street Lighting

The existing street lighting along Jackson Street is located at the cross road intersections. There are lights on power poles at the intersections between Main Street and Highway 7. No street lighting existing north and west of Highway 7, except at the Lay Park recreation area.

Retaining Walls

There are many retaining walls along Jackson Street. These retaining walls consist of a variety of different materials from small block, to concrete brick, to poured in place concrete. They are present both in the right of way, and on private property.



Cultural Significance

Along the Jackson Street corridor there are many old concrete street markers at the crossroad intersections. The markers have been in place for many years and are likely placed at or near the existing property corners. These markers should be reset with the roadway widening/sidewalk addition, therefore care will need to be taken to remove and replace the markers.



Throughout the corridor there are many older homes that may have historical or architectural significance. These properties in many cases have old retaining walls at the edge of the sidewalk that may be impacted with new sidewalk construction.



Future design phases for Jackson Street improvements will require documentation and review of these properties by the State Historic Preservation Office (SHPO). Environmental clearance will be required prior to beginning any part of the right of way acquisition process, including discussions regarding temporary construction easements. Early environmental review of the corridor will be critical to determine where cultural or historical properties or features require avoidance.

Impacts to the Riverside Cemetery should be avoided. Sidewalks and driveway reconstruction should not be considered as negative impacts, but encroachments should be minimal.

Other potential cultural issues could be churches that exist along the corridor.



Design Challenges

Main Street to Ballou Street

This section of Jackson Street is very flat with no major design challenges. Most of this section is a residential area with a small commercial property at the northwest quadrant of Jackson and Main. The existing sidewalks are offset from the roadway, and small ditches exist between the road and the sidewalk. Approximately 250 feet of the sidewalk on the north side of Jackson Street, west of Main was recently reconstructed and is in good condition. There are sidewalks along most of this stretch of roadway on both sides and shoulder parking on both sides of Jackson Street. Mailboxes line the north side of the road which will need to be removed and reset. There is a small creek or storm water ditch that extends under Jackson approximately 125 feet east of Ballou, which will require the extension of the culvert under the roadway to the



south and north. There is a small retaining wall along the north side for a portion of this stretch which will need to be undisturbed or replaced. There are many sidewalk connections to the shoulder parking from the residential properties with culverts under them. Utility poles are located between the existing sidewalk and roadway on both sides of Jackson Street, which may need to be relocated to accommodate a widened roadway section with bike lanes and 5 foot sidewalks. In order to construct curb and gutters with bike lanes, the shoulder parking will need to be removed or paved and marked in certain locations. This may necessitate construction of a sidewalk at the back of curb through sections where shoulder parking is paved to stay within the existing right of way. With curb and gutter construction, an enclosed storm water system will need to be constructed on both sides of Jackson Street, with outlets at the Town Branch Creek and at the side road intersections.

Ballou Street to State Street

This block of Jackson Street is very flat with roadside ditches and culverts under the entrances and sidewalks on both sides. There is shoulder parking on the south side of the road. There is one mailbox on the north side and at the west end of the block, which will need to be removed and replaced or reset. Private driveways are present on the south side but none on the north. On the north side of Jackson Street, the sidewalk grade is raised from the roadway with a ditch in between the two. Behind the sidewalk on the north, there is a retaining wall running the entire length of this block with the private property above. The retaining wall is concrete block on the east portion and cast in place concrete to the west. There are concrete stairs from each private property through the wall and to the sidewalk. Utility poles exist between the roadway and sidewalk on both sides of the roadway, which will likely need to be relocated. As with the previous roadway section, in order to accommodate the existing on shoulder parking on the south side, as well as a wider roadway section, the sidewalk may need to be constructed at the back of new curb and gutter. To the north, the sidewalk will need



to be constructed at a similar grade to the existing so that the existing stairs can tie in easily. An enclosed storm water system will be required with the addition of curb and gutter.

State Street to Commercial Street

The existing sidewalk on the north side of Jackson through this block is elevated 3 to 4 feet from the roadway grade for about half of the block with a sloping transition to meet the road grade at Commercial Street beginning around mid block. On the south side of the roadway, shoulder parking takes up about half the block from State Street westward. This parking will need to be accounted for in any new design, and a 6 foot wide sidewalk may need to be designed at the back of the curb. There are currently no sidewalks on the south side of Jackson Street through this stretch. In the northeast and southeast quadrant there are commercial properties with entrances from Jackson Street.



The commercial entrances could possibly be narrowed, but careful design will need to be done to ensure that there is accessibility to all vehicles. The northeast quadrant property has an asphalt parking area, while the property in the southeast quadrant has a gravel parking lot. A storm culvert carries storm water under the shoulder parking on the south side from the southeast quadrant of the State Street and Jackson Street intersection to approximately 50 feet east of Commercial Street. The storm water then flows in a ditch along Jackson Street and into large ditches along the east side of Commercial Street.



At Commercial Street, there are large concrete head-walls in the northeast and southeast quadrants for the culvert. In the northeast quadrant, the sidewalk is bridged over the large ditch, with railings for safety. There are mailboxes on the north side that will need to be reset, and utility poles on both sides that may need to be relocated to accommodate the wider roadway section. An enclosed storm water system will also be required if curb and gutters are constructed with culvert extensions to the north and south at Commercial Street.

Commercial Street to Van Buren Street

This section of Jackson Street includes the large box culvert over the Town Branch Creek, approximately 130 feet west of Commercial Street. The large box culvert will need to be extended to the north and south to accommodate a wider roadway section. There is currently a sidewalk crossing over the Town Branch Creek

on the north side of the road with railings and a short raised concrete barrier for pedestrian safety. Two commercial properties will need to have entrances reconstructed and better delineated. At the northwest quadrant of Jackson and Commercial, the entrance currently has head in parking perpendicular to the roadway. The City will need to work with the property owner to come up with a solution that provides a safe pedestrian walkway, while maintaining parking. An option might be to route the sidewalk around the front of the parking spaces and adjacent to the building.



Another location has a large gravel entrance that will likely be narrowed. Sidewalks currently exist only on the north side of the road, behind the existing ditch. An enclosed storm water system will be required with the construction of curb and gutter, and there should be no issues with an offset sidewalk on the north and south for most of this block. However at the southeast corner of Van Buren Street, the residential property has several retaining walls that protrude into the area where a sidewalk would be added. One retaining wall along the sides of the ditch, another on either side of the existing driveway, and one at the east edge and northeast corner of the property. Along the same property, the sidewalk may need to be constructed at the back of the curb to avoid the large retaining walls. At Van Buren Street the design will need to be coordinated with any conceptual or proposed design for the addition of sidewalks and curb and gutter. Utility poles may need to be relocated to accommodate any roadway widening.



Van Buren Street to Benton Street

This portion of Jackson Street has a very gentle grade with sidewalks on both sides and drainage ditches between the roadway and sidewalk for most of the block. Widening of the roadway through this portion may require relocation of the utility poles and mailboxes will need to be removed and reset. Fences as shown to the right may be located on the right of way and need to be removed. Survey of right of way lines will identify all of the locations where fences are placed outside the property lines. Curb and gutter will require an enclosed storm water system. Concrete stairs to one of the private properties on the south side of Jackson will require the sidewalk to meet the grade of the stairs or the stairs will need to be reconstructed.



Benton Street to Seminary Street

This block of Jackson Street has a gentle grade with ditches on both sides of the roadway. Widening the roadway for the addition of bike lanes and an upgraded sidewalk will require less design work through this block on the north side of Jackson. On the south side, the property grade is 4 to 5 feet higher than the roadway grade. In order to construct a widened roadway section, a retaining wall will likely be required or easements and regrading of yards will be warranted. The property in the southwest quadrant of Benton Street and Jackson Street appears to have had stairs down to the roadway in the past, as can be seen in the image to the right. The replacement or the remnants of the stairs to be removed will need to be coordinated with the property



owner. Curb and gutter construction will require an enclosed storm water system. Utility poles will likely need to be relocated, and mailboxes will need relocation in order to construct wider sidewalks and the desired roadway section.

Seminary Street to Polk Street

This section of Jackson Street has a gentle grade with sidewalks on both sides and ditches between the roadway and sidewalk. Design challenges include on-shoulder parking at mid block on the south side of Jackson, raised private property grades on the south side including a retaining wall at the southwest quadrant of Seminary Street and Jackson Street, and connection to private sidewalks and steps on the south side of the road. On the north side and toward the west, the sidewalk is supported by a small concrete retaining wall on the backside. A portion of this sidewalk was recently replaced during installation of new waterlines. The sidewalk replacement done with the water line project will not meet the design requirements for complete streets, and therefore will need to be replaced. Replacement of the sidewalk will require grading on the private property or a new retaining wall. If the shoulder parking is to be converted to on street parking rather than removed, a 6 foot wide sidewalk will need to be constructed at the back of the curb and gutter. As



with the other sections of Jackson Street, curb and gutter will require enclosed storm sewer, and utility poles and mailboxes will likely need to be relocated in some areas to accommodate wider sidewalks.

Polk Street to Bolivar Street

From Polk Street to Bolivar Street, the roadway grade is steeper than other portions of Jackson Street, although not unreasonably so. Sidewalks are located on both the north and south of the roadway with ditches between them and the roadway. On the south side of Jackson, there is a section of the sidewalk that is heaving due to an adjacent large tree. On-shoulder parking currently exists on both sides of the roadway that will need to be eliminated or accounted for when designing the cross section for this block. This will require a 6 foot wide sidewalk to be constructed at the back of the curb and gutter.

At the northwest quadrant of Polk Street and Jackson Street, there is a fence that may require replacing in order to widen the roadway for bike lanes and expanded sidewalks.

At the southeast quadrant of Bolivar Street and Jackson Street, the property currently has a concrete block retaining wall approximately 2 foot high that will need to be either designed around or replaced. Mailboxes along the north side of the road will need to be relocated, and utility poles between the existing road and sidewalk may need to be relocated to accommodate the wider sidewalks. There are also concrete stairs on the south side mid block on private property but connected to the sidewalk which will need to be taken into account during the design process. An enclosed storm water system will be required with the addition of curb and gutter to the roadway.



Bolivar Street to Highway 7 Bridge

Between Bolivar Street and the Highway 7 bridge, the roadway grade is manageable, with sidewalks only on the north side of Jackson Street. On the north side toward Bolivar Street, there is currently on-shoulder parking that is paved, although in poor condition. This parking will need to be removed or accounted for in the new design, with a 6 foot wide sidewalk constructed at the back of the curb. The existing sidewalk continues to the Highway 7 bridge, with a sidewalk continuing across the bridge, separated from the roadway with concrete barrier. On the south side there are no sidewalks, and the grade is raised from the roadway behind the existing ditch. Several large trees toward Bolivar Street will likely need to be removed in order to widen the roadway section with bike lanes and sidewalks.



The Highway 7 bridge is about 44 feet wide between the inside of the barrier walls. This is wide enough to easily accommodate a 12 foot through lane in each direction, two – 5 foot bike lanes and an additional 5 foot sidewalk on the south side of the bridge. A barrier should be provided to protect pedestrians on this side of the bridge. A future design should consider incorporating the bike interchange concept and determine where the bike ramps would merge onto Jackson Street and allow for a curb ramp between the sidewalks and the street.

Mailboxes will need to be relocated and utility poles may need to be relocated in order to construct the widened roadway section. Curb and gutter will require an enclosed storm water system in this area.

Highway 7 Bridge to Kennedy Drive

West of Highway 7, the right of way width for Jackson Street narrows from approximately 66 feet to approximately 45 feet. The roadway width also narrows from 24 feet to approximately 21 feet. This portion of the Jackson Street was resurfaced with the waterline replacement project from Kennedy Drive to Lay

Avenue. Sidewalk currently exists from the bridge approximately 160 feet west on the north side of the roadway, but terminates at the Lay Avenue intersection. From Lay Avenue to the west, there is no sidewalk on either side of the roadway. Jackson Street has ditches adjacent to the roadway on the north side, with the grade sloping away from the road on the south side to Wiest Road.

On the north side of Jackson Street, between Lay Avenue and the private drive approximately 500 feet to the west, the roadside grade is raised above the back of the ditch, which will require some grading or a small retaining wall in order to add sidewalks. The narrower right of way west of Highway 7 will make it difficult to widen the roadway for bike lanes, but other options may be available for bike traffic in this area. The property on the south side of Jackson beginning approximately 300 feet west of the Lay Avenue intersection is currently owned by the City of Warsaw. A multi-use path or bikeway could be constructed through this property connecting to the pool and recreational area at Lay Park.



Many private driveways exist along the north side of Jackson which will need to be reconstructed at least to the back of any new sidewalk. The city ball field and city pool are located west of Wiest Road on the south side of Jackson Street, east of Kennedy Drive. There is shoulder parking through this area, both paved and gravel. There is the possibility of expanding this parking, but further investigation should be done. Large trees, utility poles and mailboxes exist through this section, all of which will likely need to be removed or relocated to allow for a widened roadway section. Sidewalk connections to the pool and ball field will also be researched, possibly in several different locations.



The intersection of Kennedy Drive and Jackson, is currently skewed at a very shallow angle. This configuration creates a difficult left turn for those heading north on Jackson Street and a difficult right turn for those heading north on Kennedy Drive. There is a paved area between the two roadways, which is likely used as an unsafe pass through for these turning movements. Reconfiguration of this intersection should be considered to create safer conditions for pedestrians, bicyclists, and vehicular traffic. A roundabout would be a nice way to handle this intersection, but it would need a fairly large footprint to construct and would require additional right of way.



Kennedy Drive to Riverside Cemetery

Jackson Street from Kennedy Drive to the Riverside Cemetery is relatively flat, with ditches on both sides of the roadway. The grade is elevated on both sides of the road, which may cause some problems when constructing sidewalks or widening the roadway. There are large trees on the south side along the cemetery property which will need to be designed around. Utility poles on the north side may need to be relocated if sidewalks are desired on both sides of the roadway. Care should be taken when designing any new sidewalks through this section, as the cemetery is a very important property, and should not be disturbed in any way.



Miscellaneous Design Challenges

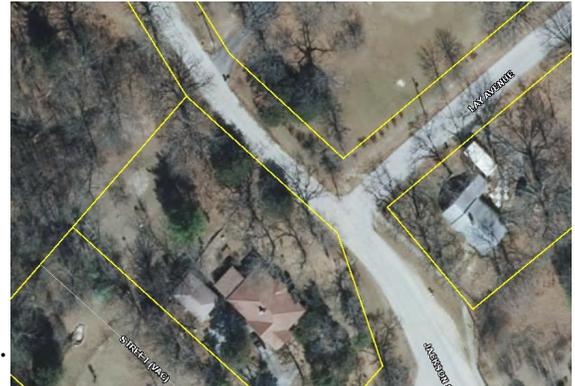
Jackson Street has many other design challenges along the entire corridor. Between Main Street and Highway 7, most of the side road intersections have old concrete street name markers in 2 quadrants. These markers have been present for a long time and have some cultural significance. Care will need to be taken during design and construction to protect these markers, either by leaving them undisturbed, or carefully removing and resetting them.

Many of the residential properties that line Jackson Street currently have sidewalks connecting the buildings to the sidewalks along the roadway. At various locations, these connections have stairs adjacent to the current city sidewalks, which will require the proposed sidewalk design to meet the grade at these steps, or require that the steps be reconstructed.

There are many side road crossings and intersections through the study area. At every intersection, ADA ramps should be designed and constructed to provide accessibility to all pedestrian users. Many of the side roads currently have sidewalks along them. Connections will need to be designed so that pedestrians using the side road sidewalks have access to the new sidewalks along Jackson Street.

Along several blocks of Jackson Street, there is currently parking allowed on the shoulders. The shoulder parking is isolated mostly to the residential areas with little to no off-street parking. Adding curb and gutter and sidewalks will require this parking to be paved, or to provide other areas for parking. Providing new parking areas will require new right of way or easements to be acquired.

Based on the Benton County Geographic Information System (GIS) website, the roadway does not appear to be centered on the existing right of way for most of the project. Because of this, widening of the roadway will likely need to be more on one side than the other. In some locations, such as just west of the Highway 7 bridge at the intersection of Lay Avenue and Jackson Street, the roadway appears to be encroaching on the private property on the south side of Jackson Street. In order to construct sidewalks here, right of way may need to be acquired.



The narrow roadway and right of way width west of Highway 7 will not allow for the same cross section of roadway as to the east. This portion of the project cannot add on-street bike lanes and sidewalks without acquiring right of way. One way to accommodate bike lanes and sidewalks within the 45 foot wide right of way would be to provide two 11 foot lanes, a 5 foot bike lane on either side, 2 foot wide curb and gutters a 6 foot sidewalk at the back of the curb on the north side with a 10 foot wide multi-use path along the City owned property ($11' + 11' + 5' + 5' + 2' + 2' + 6' = 42'$). This would allow 4 feet to provide buffer on either side of the road. Ideally there would be at least 2 feet between the back of the sidewalk and the right of way line. A 280 foot segment of Jackson Street between the south leg of Lay Avenue and Lay Park would be limited from adding the multi-use pathway on the south side, but there are a few options. One option would be to have both on-street bike lanes, but a sidewalk on one side only. A second option would be to provide sidewalks on both sides, but a bike lane on only one side through this area. A third would be to add sidewalks and omit bike lanes altogether through this 280 foot segment of Jackson. A simple and effective method would be using “Sharrow” pavement markings alerting vehicular traffic that bike traffic may be present.

Conceptual Design

Proposed Improvements

To accommodate new sidewalks, bike lanes, and better control the storm water runoff, curb and gutter should be constructed along Jackson from Main Street to Highway 7. A 36 foot back of curb to back of curb roadway cross section with 2 – 11 foot lanes, 2 – 5 foot bike lanes and 2 foot curb and gutter would allow for reconstruction of the sidewalk and allow room for separation from the roadway and grading within the right of way. In addition to curb and gutter roadway improvements, a mill and asphalt overlay would be beneficial to Jackson Street, at least in some portions. The existing roadside features, such as on-street parking as well potential utility issues may require that the sidewalk be designed at the back of the curb adjacent to the roadway in some locations. Street lighting should also be considered for proposed improvements.



The new sidewalk would be 5 foot wide for most of the corridor, along both sides of the road. In some locations, where the sidewalk would be at the back of curb, it would need to be 6 feet wide. At the Town Branch Creek crossing, west of Commercial Street, the existing box culvert will need to be extended to the north and south in order accommodate the new roadway section.

With the addition of curb and gutter to Jackson Street, an enclosed storm sewer system will be required. This storm sewer system would collect and divert the runoff to existing ditches along the side roads, as well as to several large drainage ditches and streams through the corridor. There are roadside culverts along several stretches of Jackson Street in the study area. Re-use of the existing culvert pipes as part of a larger storm sewer system would save budget and should be investigated in future design phases. For the purposes of this report, new inlet structures and piping will be assumed to be required throughout the corridor.

It is possible for portions of Jackson to be upgraded with new sidewalks without the addition of curb and gutter. The portion west of Highway 7 would be considered for this option, as the right of way width is very narrow, and the roadside ditches appear to be handling the current storm water runoff efficiently.

Parking

On-street or on the shoulder parking should be maintained where it currently exists if possible. The shoulder parking should be paved with curb and gutter at the back of the parking area or a rollback curb and gutter could be placed at the edge of the street. These areas may require the sidewalk to be constructed at the back of the curb and be 6 foot wide.

Some commercial properties, such as on the north side of Jackson Street just west of Commercial street, currently have head in parking off the roadway. This parking should be revised to better accommodate sidewalks and pedestrians.

Bike Accommodations

In addition to the pedestrian upgrades along Jackson Street, enhancements for bike transportation should be included. Jackson Street has sufficient right of way to include widening for bike lanes between Main Street and Highway 7. Ditches are mostly very shallow along Jackson Street in this area and would not require a significant amount of earthwork to widen and add bike lanes. The ditches would be eliminated and curb and gutter with enclosed storm sewers would be required.

At the Route 7 bridge, future design should include accommodations for bike ramps coming off of Route 7 and connecting to Jackson Street. The 2016 TEAP study prepared for the City of Warsaw included conceptual design for ramps connecting to the east side of Jackson Street on the north and south ends of the bridge. Jackson Street complete street improvements should include curb ramps near the bridge ends, at the edge of the roadway that would allow bike ramps to connect with on-street bike lanes or the travel lanes without having to ride over curbs.

West of Highway 7, the narrow right of way width presents challenges for widening to add bike lanes. Shared use lanes would be one option for this section of Jackson. Younger bicyclists could use the sidewalk and avoid riding in the roadway. This would be the least expensive option for this portion of Jackson Street. If the City chose to extend both bike lanes and sidewalks northerly from the Route 7 bridge, right of way acquisition would be required. This would be apply to about 340 feet of roadway from the north end of the bridge to the beginning of Lay Park.

Another option for the area north of Route 7 would be to add a bike lane and sidewalk on the northeast side of the road and construct a multi-use pathway off the roadway on the south side. This would start at the beginning of Lay Park and extend through the recreational areas up to Kennedy Drive. The mixed-use path could meander through this parkland to avoid trees and create a more aesthetically pleasing path. The area between Route 7 and the park would maintain the existing roadway width and receive signage and pavement markings for sharing the road and would include sidewalks on both sides of the roadway. The sidewalk along the south side could transition to a wider multi-use pathway after it crossed into the Lay Park property. See the conceptual rendering on the following page for an example of how the multi-use path combined with a sidewalk and bike lane on the north side could be applied.



Concept of multi-use path combined with on-street bike lane and sidewalk beginning at Lay Park

Environmental

The environmental concerns of a Jackson Street project are minimal. Section 106 clearance will be required for potential impacts to properties and structures. Section 404 permits would be required for work done in the Town Branch Creek west of Commercial Street, which will be impacted with culvert widening. Impacts to Public Lands such as the ball field, community pool and Lay Park as well as Riverside Cemetery would warrant the need for Section 4f clearance. Other environmental concerns will most likely be covered by a Storm Water Pollution Protection Plan (SWPPP). There are not likely to be any issues with threatened and endangered species and no farmland will be impacted. The National Environmental Protection Act (NEPA) process must be adhered to if federal funds are utilized for improvements to the corridor.

Street Lighting

Street lighting is present on power poles at some locations along the corridor, mainly at the cross road intersections. In addition to other improvements, pedestrian/street lighting should be considered along Jackson Street. As mentioned above, Jackson Street is a major pedestrian and bicycle thoroughfare through the heart of the city. The addition of lighting would provide additional safety for pedestrians and vehicle traffic. The street lighting fixtures should be similar to those already installed in other areas around the City of Warsaw.

Easements and Right of Way

Most of this project can be constructed within the existing right of way for Jackson Street and the side roads. The exception to this will be the area northwest of Highway 7, and possibly in some areas where on street parking will be constructed. Temporary construction easements will be required along the corridor to reconstruct driveways, private sidewalks, remove existing structures, build storm sewers and regrade slopes. Additional right of way will likely be required north of the Highway 7 bridge where the roadway is close to or encroaches on the adjacent property.

Recommendations

Bike Lanes

CFS recommends that Jackson street be widened to a 36 foot cross section with 2 – 11 foot lanes, 2 – 5 foot bike lanes and 2 foot curb and gutter on both sides of the road from Main Street to Highway 7. This will provide additional safety for bicyclists using Jackson Street as a thoroughfare through the city. Across the bridge over Route 7, striping and pavement markings should be added to include 5 foot bike lanes in both directions. Northwest of Highway 7, the existing roadway should remain unchanged from the bridge to Lay Park. This approximately 340 foot segment of roadway should have “Share the Road” signage and “sharrow” pavement markings. From Lay Park northward to Kennedy Drive, a bike lane should be added to the northeast side of the roadway and a multi-use pathway should be added on the southwest side, off the roadway. North of Kennedy Drive to the City limits, the existing roadway varies between 18 feet to 20 feet wide. Widening to provide designated bike lanes is a possibility, but may not be a good decision, as there is not a good termination or connection to another route. Widening the roadway to at least 24 feet and adding signage and pavement markings to share the road would be a better alternative. Future widening of Jackson Street northward to the Truman Dam Access Road would be a more prudent time to add bike lanes. Pavement marking and signage should be included along the entire corridor to designate the bike route, bike lanes and shared lanes.

Sidewalks

CFS recommends that a 5 foot wide sidewalk be constructed 5 feet behind the new curb and gutter where possible. This buffer space could be narrowed to 2 or 3 feet with a 5 foot sidewalk in some areas if necessary. In areas where on street parking would be constructed, the sidewalk should be constructed at the back of the curb and at a width of 6 feet. Across the bridge over Route 7, a 5 foot sidewalk should be created along the west side by installing a concrete barrier to separate the sidewalk from the bike lane. From the north end of the bridge to Lay Park, sidewalks should be constructed. A 5 foot wide sidewalk with a buffer between the back of curb is preferable, but a 6 foot wide sidewalk at the back of curb is also acceptable. Beginning at Lay Park, providing that a bike lane is added, a 6 foot wide sidewalk should be constructed behind the back of the curb along the northeast side. A 10 foot wide multi-use trail should be constructed on the southwest side of Jackson Street northward to Kennedy Drive. The City of Warsaw currently owns the property on the west side of Jackson Street in this area that could be used for the multi-use trail. North of Kennedy Drive, we recommend constructing a sidewalk along the west side of the roadway up to the main entrance to Riverside Cemetery. This sidewalk should be offset a minimum of 6 feet from the edge of the roadway.

Crosswalks should be marked at all intersections on both Jackson Street and the side roads. ADA curb ramps should be installed at all side roads and at driveways where sidewalks are located directly behind the curb.

Storm Drainage

With the addition of curb and gutter, an enclosed storm drainage system will be required along this entire length of Jackson Street. The enclosed storm sewer system will outlet into the side road ditches and several large drainage streams along the corridor. Curb inlets would mostly be utilized to intercept street drainage with grate inlets used at some locations where they would not stick out into the bike lanes. Where sidewalks are constructed at the back of the sidewalk it would be preferable to use grate inlets located in the gutters, instead of curb inlets which sit behind the curb. Sidewalks rise and fall with weather changes throughout the year. Storm inlets are not susceptible to these elevation changes because they are typically constructed to depths below the frost line. Over the years these elevation changes from freezing and thawing create trip hazards where sidewalks go across drainage inlets and so this scenario should be avoided. Where grate inlets are installed in the gutters, they should be bicycle safe. Existing pipe culverts should be utilized where they meet the drainage design requirements and are in suitable condition.

West of Highway 7, an enclosed storm water system will be required if the road is widened to include a bike lane or just improved to wider travel-way. If the road is not widened, shallow ditches could be utilized with 5 foot sidewalks offset no more than 6 feet from the edge of the roadway.

On Street Parking

Where on street parallel parking is required between Main Street and Highway 7, the parking area should be 8 feet wide and parallel to the roadway. Bike lanes should be striped between the drive lane and the parallel parking. West of Highway 7 along the Lay Park recreation area, the existing parking should remain, and if desired, some additional parking added. This parking will be head-in parking, or converted to angled parking for safety. In the area near Commercial Street that currently has head-in parking off the roadway, this should remain if possible. Some of the existing parking along shoulders should be eliminated, especially if it is in front of a residence that has a driveway.

Street Lighting

Street lighting is recommended along the entire corridor between Main Street and Kennedy Drive. This street lighting should be similar in appearance to other existing street lighting in the City of Warsaw. Funding may be sufficient to include street lighting for any particular project, but installing conduit for future lighting across streets and driveways should be included at a minimum. It may be that street lighting is only initially affordable at intersections.

Entrances

Commercial entrances along the corridor should be narrowed wherever possible. The current entrances are very wide, some without much delineation. These entrances should be no more than 24 wide depending on the traffic conditions. Residential entrances should be reconstructed as concrete to the back of new sidewalk, and constructed to match the existing driveway material to the right of way line or beyond depending on the current grade.

Water Lines

A new 8 inch water-main should be installed between Polk Street and the Route 7 overpass prior to complete street improvements to the Jackson Street corridor. If these are not completed prior to roadway improvements, they should be included with the proposed roadway recommendations.

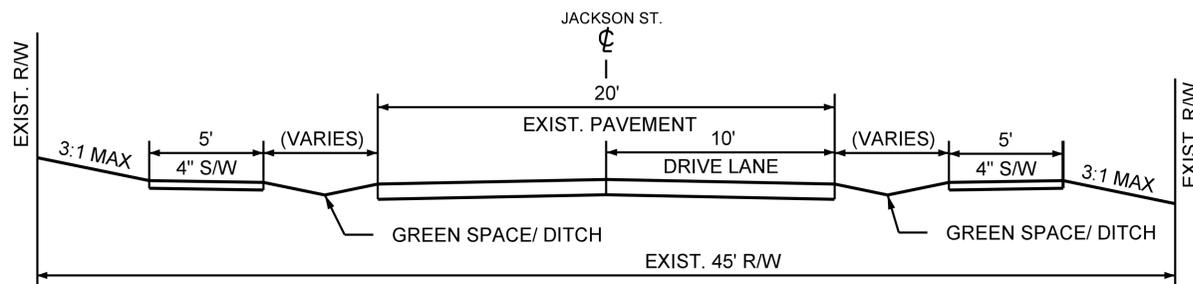
WARSAW, MISSOURI

**Exhibit A – Street Improvements
Jackson Street from Main Street to Riverside Cemetery
OPINION OF PROBABLE COSTS**

ITEM		QTY.	UNIT	UNIT COST	COST (\$)
Removal of Improvements		1	L SUM	\$33,000.00	\$33,000.00
Common Excavation		2,610	CY	\$15.00	\$39,150.00
Compacting Embankment		2,610	CY	\$5.00	\$13,050.00
6" Asphaltic Concrete Pavement (Road Widening)		1,468	TON	\$90.00	\$132,120.00
4" Concrete Sidewalk		4,296	SY	\$52.00	\$223,392.00
10' Multi-Use Trail		795	SY	\$52.00	\$41,340.00
4" Aggregate Base		13,500	SY	\$10.00	\$135,000.00
ADA Ramps		190	SY	\$75.00	\$14,250.00
Truncated Domes		570	SF	\$26.00	\$14,820.00
Curb & Gutter		6,100	LF	\$36.00	\$219,600.00
Curb Transitions		340	LF	\$36.00	\$12,240.00
Small Block Retaining Wall		2,000	SF	\$35.00	\$70,000.00
Paved Approach (driveways)		1,502	SY	\$64.00	\$96,128.00
Handrail		20	LF	\$50.00	\$1,000.00
Curb Inlets		42	EA	\$650.00	\$27,300.00
Storm Pipe Culverts		6,290	LF	\$48.00	\$301,920.00
Flared End Section		30	EA	\$600.00	\$18,000.00
Box Culvert Extension		50.0	CY	\$600.00	\$30,000.00
Crosswalk Markings (6" White)		2,075	LF	\$8.00	\$16,600.00
4" Yellow Pavement Marking		6,380	LF	\$0.30	\$1,914.00
4" White Pavement Marking		5,995	LF	\$0.30	\$1,798.50
Pavement Marking (Restore Parking)		444	LF	\$3.15	\$1,398.60
Bike Lane Pavement Marking		24	EA	\$450.00	\$10,800.00
Share the Road Signage		24	EA	\$550.00	\$13,200.00
Stop Sign		30	EA	\$550.00	\$16,500.00
Street Lighting		45	EA	\$5,000.00	\$225,000.00
Remove and Replace Street Name Markers		15	EA	\$250.00	\$3,750.00
Concrete Barrier		250	LF	\$75.00	\$18,750.00
Erosion Control		1	LSUM	\$11,000.00	\$11,000.00
Traffic Control		1	LSUM	\$11,000.00	\$11,000.00
Seed, mulch, etc		2.7	ACRE	\$3,000.00	\$8,010.00
Misc Concrete & Masonry		1	L SUM	\$11,000.00	\$11,000.00
Misc Drainage Corrections		1	L SUM	\$11,000.00	\$11,000.00
				subtotal	\$1,784,031.10
Contractor Construction Staking	{1.8%}	1	LSUM	\$32,112.56	\$32,112.56
Mobilization	{4.0%}	1	LSUM	\$71,361.24	\$71,361.24
Subtotal					\$1,887,504.90
Contingency 15%					\$283,125.74
Total					\$2,170,630.64
			Engineering & Surveying Costs (11%)		\$238,769.37
			Construction Administration Costs (6%)		\$130,237.84
			Right-of-Way Costs		\$35,000.00
			Utility Relocations		\$25,000.00
			Grand Total		\$2,599,637.85



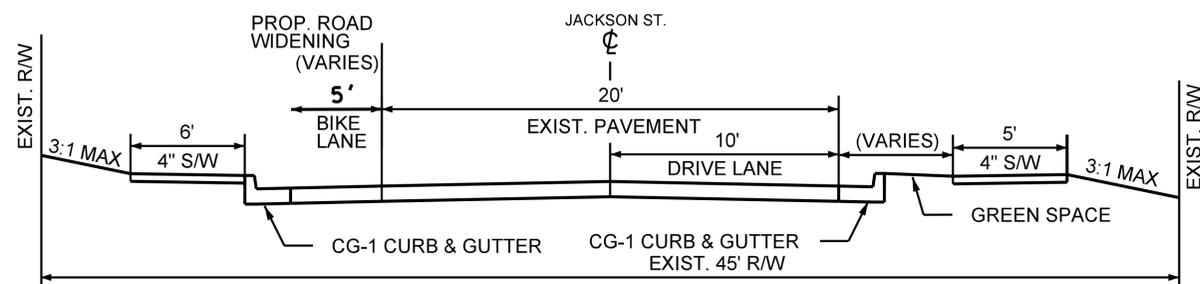
PROPOSED JACKSON STREET TYPICAL SECTION
WEST OF HIGHWAY 7 BRIDGE



JACKSON STREET
COMPLETE STREET
IMPROVEMENT
PAGE 01

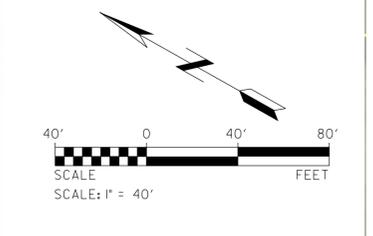
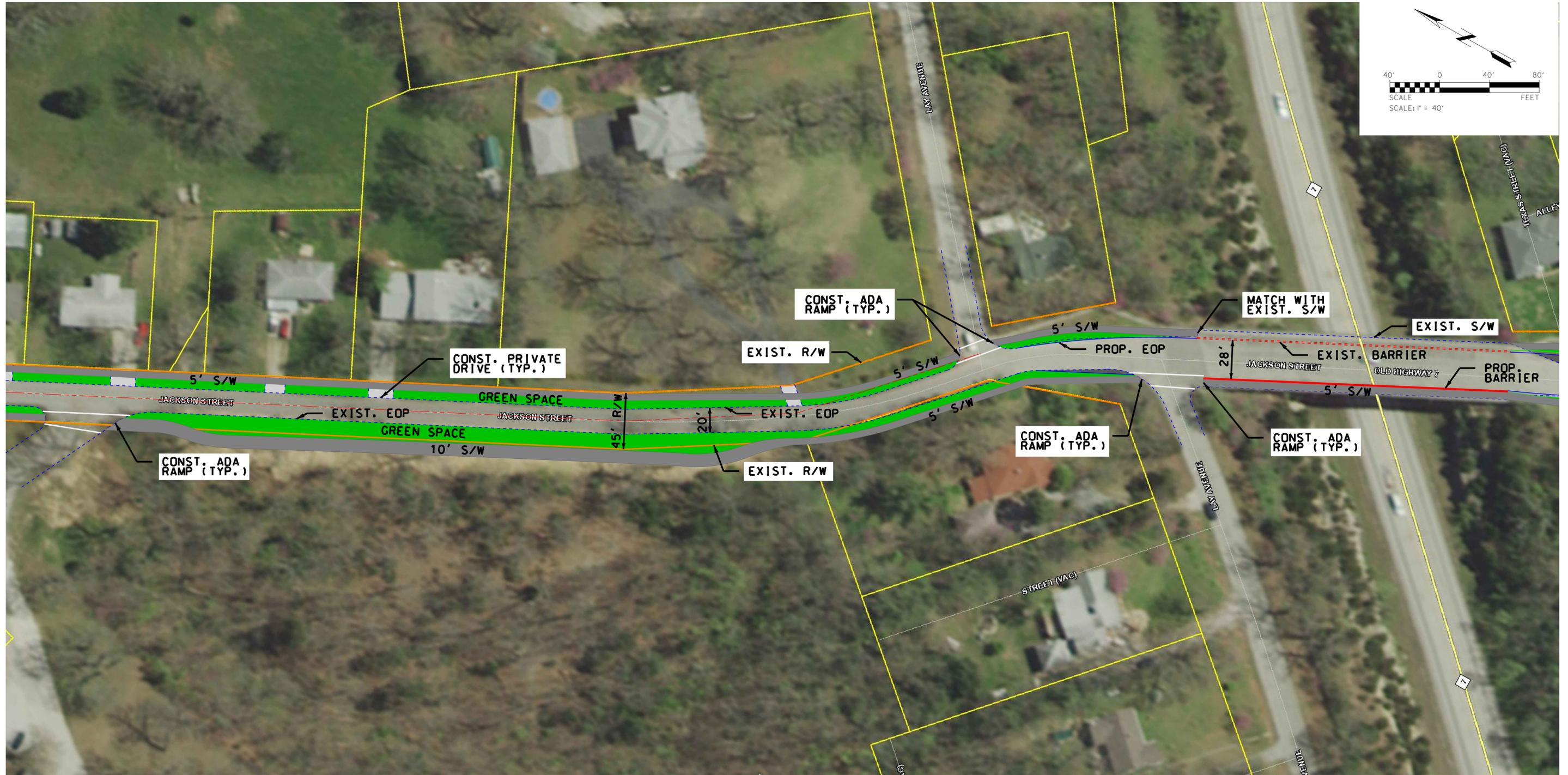


PROPOSED JACKSON STREET TYPICAL SECTION
KENNEDY DRIVE TO LAY AVENUE

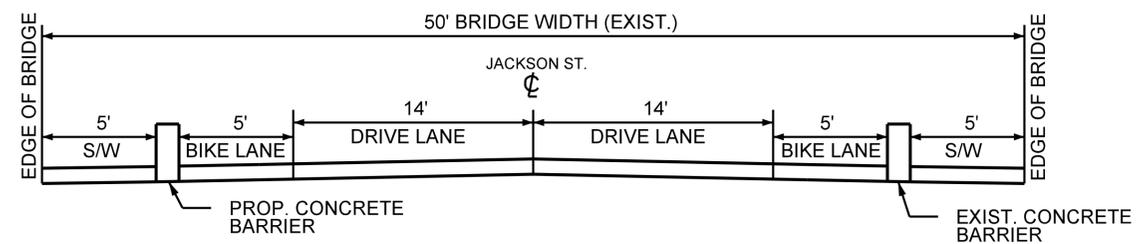


JACKSON STREET
COMPLETE STREET
IMPROVEMENT
ALTERNATE

PAGE 01



PROPOSED JACKSON STREET TYPICAL SECTION
AT HIGHWAY 7 BRIDGE

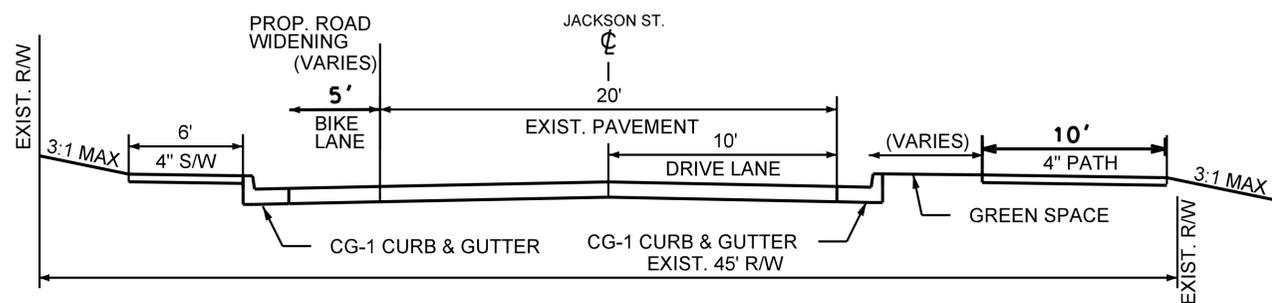


**JACKSON STREET
COMPLETE STREET
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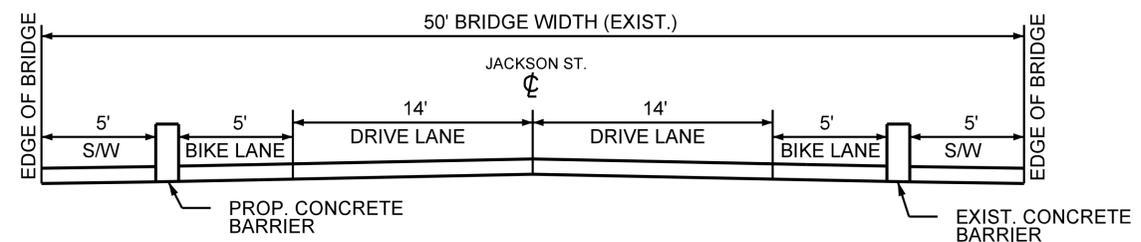
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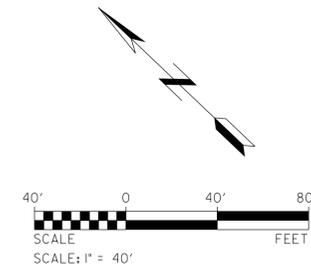
PROPOSED JACKSON STREET TYPICAL SECTION WEST OF LAY AVENUE



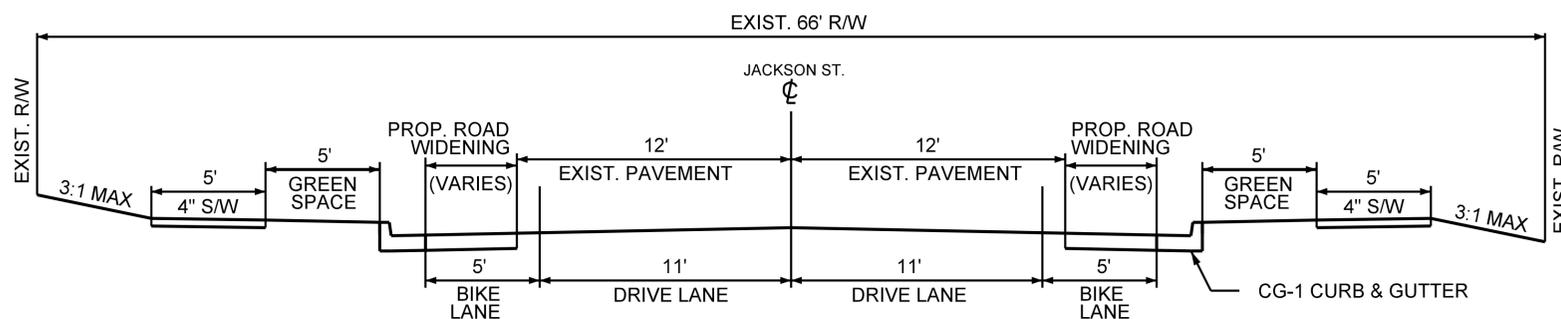
PROPOSED JACKSON STREET TYPICAL SECTION AT HIGHWAY 7 BRIDGE



JACKSON STREET COMPLETE STREET IMPROVEMENT ALTERNATE
PAGE 02

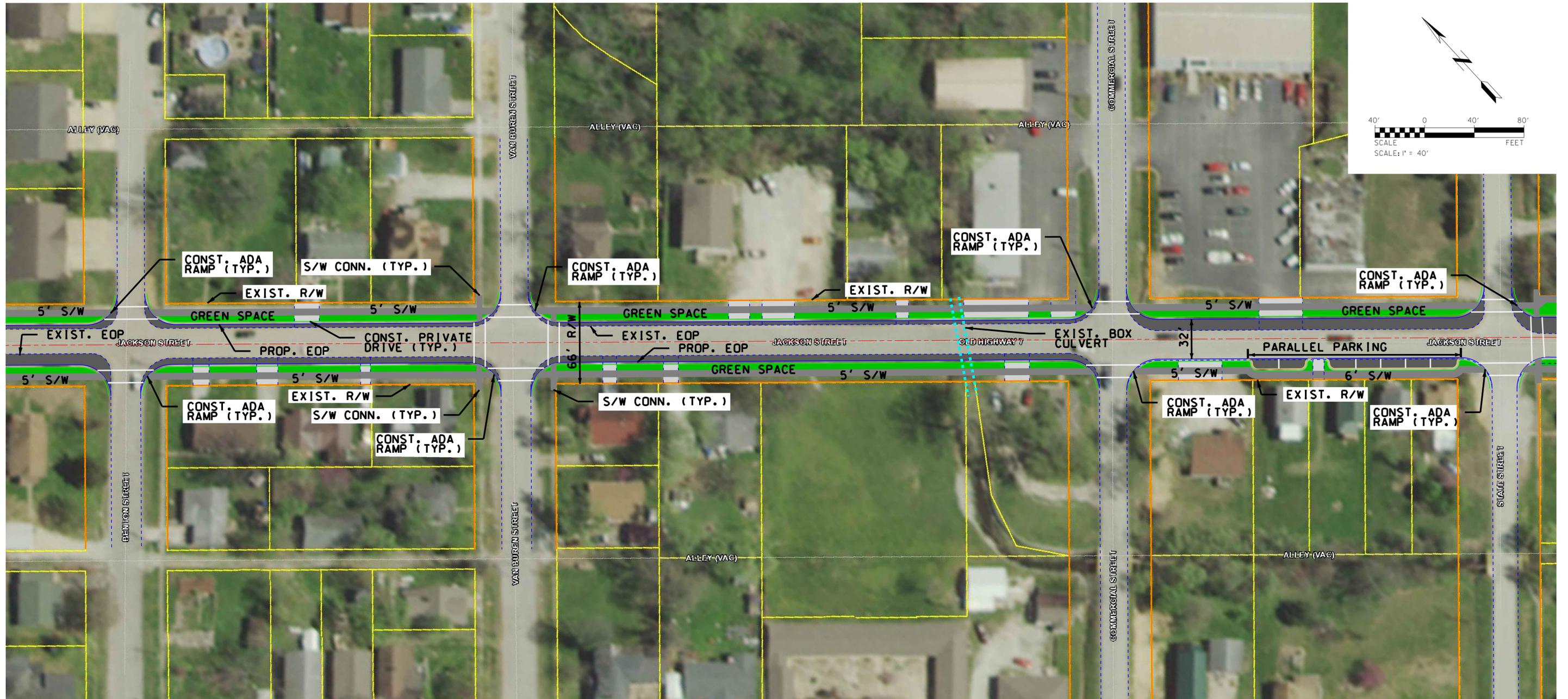


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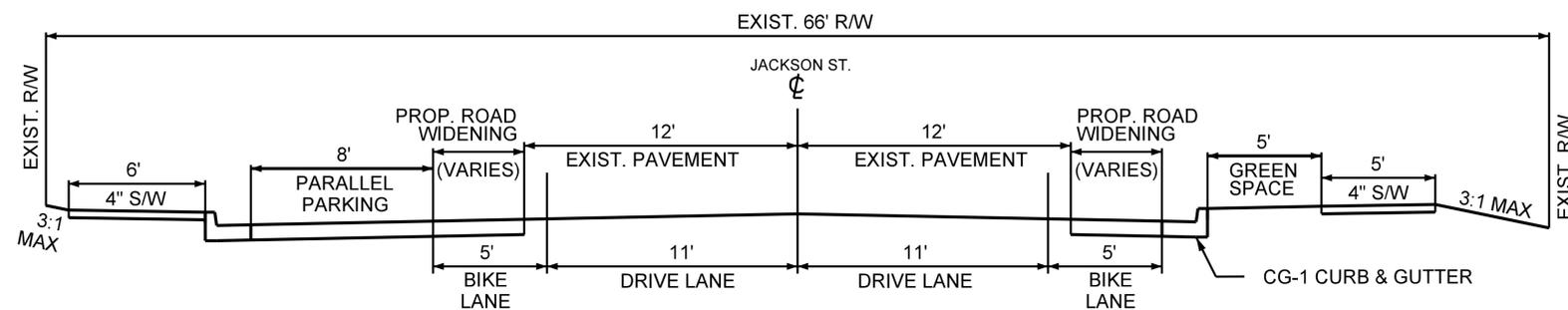


**JACKSON STREET
COMPLETE STREET
IMPROVEMENT**

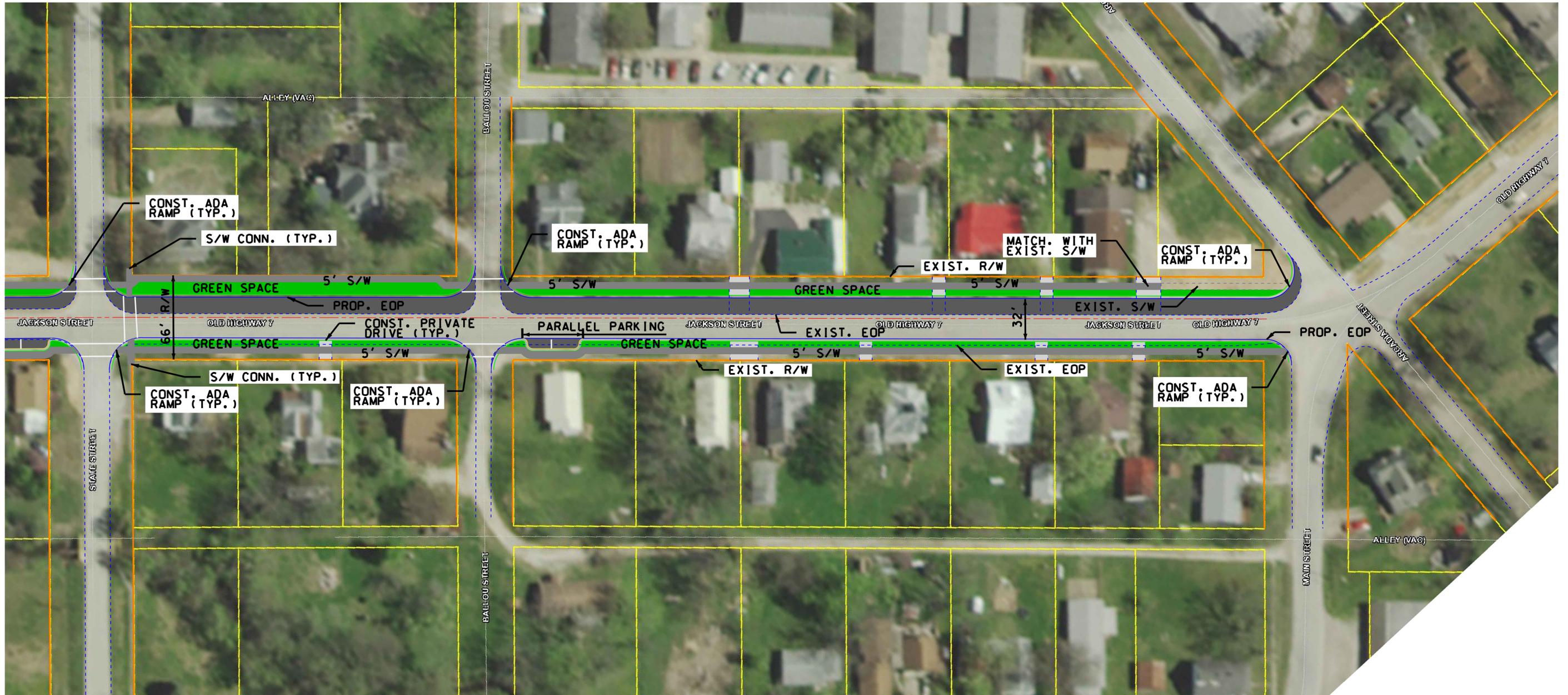
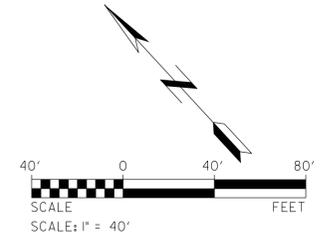
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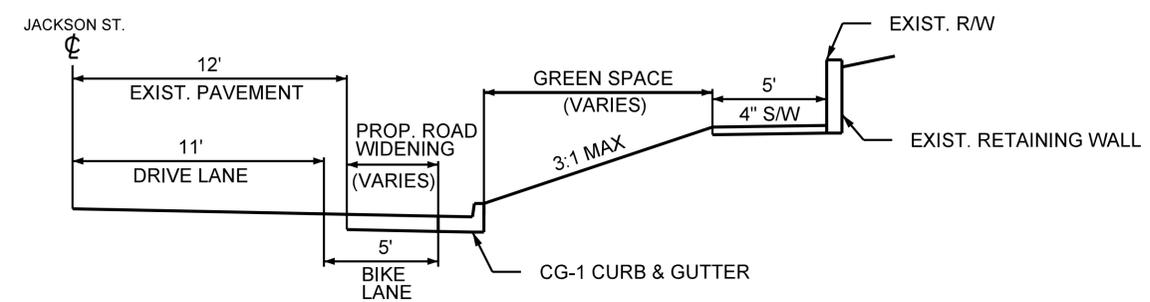
PROPOSED JACKSON STREET TYPICAL SECTION
ON STREET PARALLEL PARKING



JACKSON STREET
COMPLETE STREET
IMPROVEMENT
PAGE 04



PROPOSED JACKSON STREET TYPICAL SECTION
BALLOU STREET TO STATE STREET



JACKSON STREET
COMPLETE STREET
IMPROVEMENT
PAGE 05