# 167TH STREET
## PFLUMM ROAD TO METCALF AVENUE

# 159th STREET & PFLUMM ROAD INTERSECTION

## PFLUMM ROAD
159TH STREET TO 175TH STREET

## QUIVIRA ROAD
159TH STREET TO 167TH STREET

## SWITZER ROAD
159TH STREET TO 167TH STREET

## ANTIOCH ROAD
159TH STREET TO 167TH STREET

## U.S. 69 HIGHWAY
SOUTHBOUND & NORTHBOUND RAMPS

# 167th STREET & METCALF AVENUE INTERSECTION

# 2003 PRELIMINARY ENGINEERING STUDY
**JUNE 2006**

**PREPARED FOR**

The City of Overland Park KANSAS

Affinis corp

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# *EXECUTIVE SUMMARY*

This preliminary engineering study presents the results to establish preliminary horizontal and vertical alignments for 167th Street from Pflumm Road to Metcalf Avenue, Pflumm Road from 159th Street to 175th Street, Quivira Road from 159th Street to 167th Street, Switzer Road from 159th Street to 167th Street & Antioch Road from 159th Street to 167th Street. Three independent alignment alternatives were evaluated and studied for 167th Street from Pflumm Road to Switzer Road. The purpose of this study was to perform a preliminary design to minimize impacts to existing development and to serve as a planning tool for future development. The findings of this study were coordinated with Johnson County, Johnson County Parks and Recreation Department, Johnson County Executive Airport and the City of Olathe.

More specifically, the major objectives of this study were as follows:

- **Establish Design Criteria** – Establish design guidelines, typical roadway sections and right-of-way widths for 167th Street, 159th Street, Pflumm Road, Quivira Road, Switzer Road, Antioch Road and Metcalf Avenue.
- **Develop Preliminary Horizontal/Vertical Alignment** – Develop preliminary horizontal and vertical alignments for 167th Street, 159th Street, Pflumm Road, Quivira Road, Switzer Road, Antioch Road and Metcalf Avenue.
- **Determine Major Drainage Improvements** – Size facilities for major drainage crossings (bridges and culverts).
- **Determine Total Project Cost** – Provide opinion of probable total project cost including construction, utility relocation, right-of-way, administration, legal and engineering costs based upon 2006 construction costs.

The comprehensive solution to meet the objectives set forth is summarized in subsequent pages in this report:

## 167th Street

Overland Park's standard divided thoroughfare street section, centered on the section line, is used with the following revisions. The corridor between Pflumm Road and Switzer Road is an undeveloped stretch of land without an existing east-west road network. Therefore, three alignment alternatives were initially developed and presented to the City's Public Works Committee for selection of a preferred alternative. The selected preferred alternative included an alignment that will commence at Pflumm Road approximately 1,380' south of the section line. The alignment transitions to the northeast in order to cross Coffee Creek at a location that minimizes the bridge length. The alignment crosses Quivira Road at a point approximately 826' south of and parallel to the north section line. After crossing Coffee Creek east of Quivira Road, the proposed centerline transitions to the section line at a point approximately 1,286' west of Switzer Road where it will continue eastward along the section line through Metcalf Avenue. A special thoroughfare section with varying sidewalk locations will be utilized for isolated sections between Switzer Road and US 69 Highway. Additional detail is contained in this report in the section on '167TH STREET - Proposed Horizontal Alignments'.

**159th Street & Pflumm Road Intersection**
Overland Park's standard divided thoroughfare street section, centered on the section line, is used.

**Pflumm Road**
Overland Park's standard divided thoroughfare street section is used. To minimize the impact to Heritage Park along the west side of Pflumm Road the centerline was shifted 30' east of the section line and will parallel the existing western right-of-way of Pflumm Road. The centerline will transition back to the section line at the end of the left turn lanes both north of 159th Street and south of 175th Street.

**Quivira Road**
Overland Park's standard divided thoroughfare street section is used. To minimize the impact to the adjacent floodway boundary and to reduce the bridge lengths over Coffee Creek, portions of the proposed centerline is shifted to the east. The proposed centerline follows the section line to a point approximately 569' north of the proposed 167th Street and Quivira Road intersection where it transitions to a tangent section that spans Coffee Creek before it transitions back to the section line at a point approximately 2,126' north of the proposed 167th Street and Quivira Road intersection. From that point it continues northward along the section line through 159th Street.

**Switzer Road**
Overland Park's standard divided thoroughfare street section, centered on the section line, is used.

**Antioch Road**
Overland Park's standard divided thoroughfare street section, centered on the section line, is used with the following revisions. A previous study of the intersection of 159th Street and Antioch Road was done by others and set the centerline 40' to the east of the section line in an effort to minimize impacts to the residential properties at this location. Therefore, this study shows the centerline connecting with the previous study's centerline and continuing south beyond the existing residential properties where it then transitions back to the section line. Further, in order to minimize impacts to the residential properties on the west side of Antioch Road south of 167th Street, an offset of the centerline is required. The offset is 20' east of the section line, and continues south to Lot 34 of the Blue Valley West subdivision where it then transitions back to the section line.

**167th Street & Metcalf Avenue Intersection**
Overland Park's standard divided thoroughfare street section, centered on the section line, is used.

# *INTRODUCTION*

The study presented herein was authorized in an agreement between the City of Overland Park and Affinis Corporation on February 16, 2004. The agreement calls for the preparation of a preliminary engineering study and report together with preliminary scaled plans and drawings.

The study establishes a recommended horizontal and vertical alignment for 167th Street from Pflumm Road to Metcalf Avenue, Pflumm Road from 159th Street to 175th Street, Quivira Road from 159th Street to 167th Street, Switzer Road from 159th Street to 167th Street & Antioch Road from 159th Street to 167th Street. Specifically, the study includes the following:

- Recommended typical sections.
- Required right-of-way widths.
- Proposed horizontal and vertical roadway alignments.
- Plan sheets showing existing right-of-way, ownership, utilities and topographic features, locations for retaining walls, construction limits and locations of major drainage structures.
- Bridge analyses including type, size and location.
- Roadway cross sections.
- Opinion of probable project costs.

Each of these items is discussed in the following sections. In addition, plan and profile drawings are part of the report appendix to illustrate the recommended roadway improvements.

This Preliminary Engineering Study has been prepared by Affinis Corporation at the direction of the Public Works Department and represents the best information available to the City Engineer.

## *BASIC INFORMATION AND PROCEDURES*

In the development of the preliminary engineering study, the following information and procedures were utilized:

- Topographic information along the 167th Street, 159th Street, Pflumm Road, Quivira Road, Switzer Road, Antioch Road and Metcalf Avenue corridors was obtained from Johnson County AIMS maps and incorporated into Plan and Profile sheets. The City of Overland Park provided the AIMS maps.
- City ownership and plat maps were utilized to determine property owners and to plot existing R/W and property lines.
- Utility companies were contacted to determine the location of utility lines and easements in the corridor area. The utility information shown on the plan sheets was taken from utility plan sheets supplied to Affinis by each of the utility companies and does not represent field-verified locations.
- The existing surface was modeled from 2-foot AIMS contours. The created surface model has a tolerance of +/- 1 ft. at any given point.
- Field surveys were performed by Affinis to establish the flowlines of existing major drainage facilities, to confirm the setback distances of residences near the proposed R/W, and to assist in the validation of the elevations shown on the AIMS mapping.
- The following future development plans were obtained from the City of Overland Park and were considered in the alignment of Switzer Road:
  - "Lakeshore Estates, Final Plat" prepared by Phelps Engineering, Inc., submitted May 2004.
  - "Wyngate, Preliminary Plat" prepared by Schlagel & Associates, P.A., submitted April 2004.
- The following future sanitary sewer lines were obtained from the City of Overland Park and were considered in the layouts of 167th Street and Switzer Road:
  - "Blue River No. 15" prepared by Payne & Brockway, P.A., submitted May 2004.
  - "Coffee Creek Interceptor" prepared by George Butler Associates, Inc., submitted May 2004.
- The City of Overland Park provided turn bay locations and storage length requirements, as well as traffic counts and projections.
- Design criteria are in accordance with current ordinances for the City of Overland Park, Kansas Department of Transportation and the American Association of State Highway and Transportation Officials' publication "A Policy on Geometric Design of Highways and Streets - 1990."
- Opinions of probable construction costs are based on 2006 dollar values.
- "159th Street – Antioch Road to Metcalf Avenue, Antioch Road – 151st Street to 159th Street Preliminary Engineering Study" prepared by HNTB Corporation, submitted September 1999.
- "151st Street – Quivira Road to Antioch Road, Quivira Road – 151st Street to 159th Street, Switzer Road – 151st Street to 159th Street Preliminary Design Study" prepared by George Butler Associates, Inc., submitted March 2001.
- "159th Street – Pflumm Road to Antioch Road Preliminary Engineering Study" prepared by HNTB Corporation, submitted December 2001.

- "Antioch Road Intersection Improvements – 159th Street to 167th Street" prepared by Payne & Brockway, P.A., submitted May 2003.
- "167th Street Corridor Planning Study" prepared by Bucher, Willis & Ratliff, submitted June 2004.
- "Blue River Watershed Study" prepared by Camp Dresser & McKee Inc., submitted February 1999.

# 167TH STREET

## *EXISTING CONDITIONS*

**Existing Roadway**

167th Street is an east/west thoroughfare serving Overland Park and Johnson County residents. It is a two-lane paved roadway with no shoulders and open ditches. Throughout the project corridor, 167th Street includes portions of the roadway that are in both Overland Park and Johnson County.

167th Street currently does not extend westward beyond Switzer Road. 167th Street is intersected by two highway ramps for U.S. 69, a southbound off ramp and a northbound on ramp. There are also two U.S. 69 bridges that pass over 167th Street – a southbound U.S. 69 bridge and a northbound U.S. 69 bridge. 167th Street has three intersecting thoroughfares – Switzer Road, Antioch Road and Metcalf Avenue. There are also two intersecting residential side streets – Grandview Road and Hardy Street, as well as several intersecting driveways.

**Existing Right-of-Way**

The existing right-of-way is generally 20 feet to 40 feet either side of the section line through undeveloped tracts of land, and 40 feet to 60 feet either side of the section line where subdivisions have been platted. There is no existing right-of-way between Pflumm Road and Switzer Road. The existing right-of-way is shown on the plan drawings in the Appendix.

**Traffic Counts and Projections**

Existing traffic counts indicate a 2,900 Average Daily Traffic (ADT) volume along 167th Street from Switzer Road to Metcalf Avenue. Projected volumes ranging from 29,320 ADT to 43,360 ADT are anticipated for the year 2020. The traffic volume range is due to several variables. The low end of the range assumes a projected 2-lane 167th Street from Antioch Road to Pflumm Road, no interchange at US 69 and 159th Street and a full interchange at US 69 and 167th Street. This scenario assumes a low-density future development. The high end of the range assumes a projected 4-lane 167th Street with full interchanges for US 69 at both 159th Street and 167th Street. This scenario also assumes a high-density future development scenario.

**Existing Land Use**

The properties adjacent to 167th Street include small subdivisions as well as a mix of small and large tracts of land. The current planned zoning for the majority of the study corridor is for agricultural use. Numerous small tracts of land throughout the 167th Street corridor currently are zoned for residential use. There is a large area zoned industrial at the southeast quadrant of the intersection of 167th Street and Switzer Road as well as a large area zoned industrial at the northwest quadrant of the intersection of 167th Street and Metcalf Avenue. Both of the locations zoned industrial include a rock quarry. The rock quarry also owns a small tract of land on the south side of 167th Street between Switzer Road and Antioch Road that is zoned for office use. A Kansas City Power &

Light (KCP&L) utility tract is located on the north side of 167th Street between Switzer Road and Antioch Road. A church is located at the southeast quadrant of 167th Street and Antioch Road. The Kansas Department of Transportation (KDOT) has a maintenance facility at the northeast corner of the intersection of the U.S. 69 northbound ramp and 167th Street.

**Existing Vertical Alignments**

According to the AASHTO design criteria, much of the section of 167th Street between Switzer Road and Metcalf Avenue has limited sight distance. Because the proposed design speed is 50 mph, existing high spots in the profile will need to be cut down and low spots will need to be filled in to meet the new criteria.

**Existing Drainage**

There are currently open ditches adjacent to 167th Street. Ten existing drainage structures cross 167th Street. A 36" corrugated metal pipe crosses 167th Street approximately ¼ mile east of Switzer Road. A 4.5' x 3.5' corrugated metal pipe arch crosses 167th Street approximately 0.4 miles west of Antioch Road. A 42" corrugated metal pipe crosses 167th Street approximately ¼ mile west of Antioch Road. A 24" corrugated metal pipe crosses 167th Street approximately 0.4 miles east of Antioch Road. A 9' x 9' reinforced concrete box crosses 167th Street approximately 100' east of the southbound U.S. 69 off ramp. A 15" reinforced concrete pipe crosses 167th Street under the U.S. 69 bridges. Double 42" corrugated metal pipes cross 167th Street approximately 100' west of the northbound U.S. 69 on ramp. A 15" corrugated metal pipe crosses 167th Street approximately 340' west of Metcalf Avenue. A 6' x 6' reinforced concrete box crosses 167th Street approximately 220' east of Metcalf Avenue. An 18" corrugated metal pipe crosses 167th Street approximately 570' east of Metcalf Avenue. The majority of these structures cannot pass a 100-year event. None of the structures are long enough to accommodate the proposed typical section with adequate clear zone.

## *EXISTING UTILITIES*

The major utilities in the study area are telephone, water, power, gas, sanitary sewers and fiber optic. These utility lines are shown on the plan drawings in the Appendix and are described as follows:

**SBC Telephone**

SBC has buried facilities running along the south side of 167th Street from Switzer Road to Metcalf Avenue except at the following location: the facilities cross 167th Street west of the 167th Street and Antioch Road intersection and then run along the north side of 167th Street until reaching Antioch Road where it proceeds northward up Antioch Road.

**Johnson County Wastewater District**

The Wastewater District has two sewer crossings beneath 167th Street. The first line is an 8" PVC pipe that is placed in a 16" steel casing pipe that crosses 167th Street approximately 690' west of the 167th Street and U.S. 69 southbound ramp intersection.

The second line is a 30" DIP that is placed in a 48" steel casing pipe that crosses 167th Street approximately 80' west of the 167th Street and U.S. 69 southbound ramp intersection. Both of these lines are within a 15' easement.

The Wastewater District is currently designing sewer lines that would parallel Coffee Creek on the north side of proposed 167th Street between Pflumm Road and Switzer Road as shown on the plan drawings in the Appendix.

**Water District No. 1 of Johnson County**

The Water District has a 12" line along the south side of 167th Street west of Switzer Road that continues east for approximately 3,000'. It then crosses to the north side of the road and continues past Antioch Road. The lines are in private easement and relocations would be at the City's expense. There is a 6" line along the south side of 167th Street east of Antioch Road that continues east for approximately 3,000'. It then crosses 167th Street to the north side of the road and continues to Metcalf Avenue.

**Kansas City Power & Light**

KCP&L has overhead facilities along the north side of 167th Street from Switzer Road to Antioch Road. There are overhead facilities on both the north and south side of 167th Street from Antioch Road to Metcalf Avenue.

**Kansas Gas Service**

Kansas Gas Service has a 2" line along the south side of 167th Street beginning approximately 1,200' west of Antioch Road. The line crosses 167th Street to the north side of the road approximately 220' west of Antioch Road and extends along the north side of the road to the intersection of 167th Street and Antioch Road. From Antioch Road to Metcalf Avenue there is line that fluctuates from 2" to 4" along the south side of 167th Street.

**Atmos Energy**

Atmos Energy has a 2" gas line along the north side of 167th Street from Switzer Road to approximately 1,100' west of Antioch Road.

**Time Warner Cable**

Time Warner Cable has overhead facilities attached to KCP&L's poles along the north side of 167th Street from approximately 900' west of Switzer Road to approximately 160' east of Switzer Road. There are underground facilities from approximately 1,000' west of Antioch Road to Antioch Road. There are overhead facilities attached to KCP&L's poles along the north side of 167th Street from approximately 290' west of Antioch Road through Metcalf Avenue.

**Blue Valley School District**

Blue Valley School District has a buried fiber optic line along the north side of 167th Street from Antioch Road to Metcalf Avenue except for a crossing to the south side of the road west of U.S. 69 and then back to the north east of the U.S. 69 northbound ramp.

## *MEDIAN BREAKS AND TURN LANE STORAGE REQUIREMENTS*

The City provided the following recommendations for proposed median break locations and full-width turn lane storage requirements (excluding tapers):

| Location | Northbound | Southbound | Eastbound | Westbound |
|---|---|---|---|---|
| Pflumm Road | | 300 | | 300 |
| Quivira Road | 300 | 300 | 300 | 300 |
| Switzer Road | 300 | 300 | 300 | 300 |
| Antioch Road | 300 | 300 | 300 | 300 |
| US 69-Northbound | | | 217 | |
| Metcalf Avenue | 300 | 300 | 300 | 300 |

## *PRELIMINARY DESIGN*

**Design Criteria**

**TYPICAL SECTIONS**

| | |
|---|---|
| Lane Width | 12'-2" – inside lane<br>13'-0" – outside lane<br>12'-2" – left turn bay |
| Median Width | 24' |
| Parking Lane | None |
| Shoulder | |
| Median | Curb (Type D) |
| Outside | Curb (Type B) |
| Normal Crown | 2.08% (1/4" / ft) |

**SIDE SLOPES**

| | |
|---|---|
| Maximum | 4:1 |

**GEOMETRICS**

| | |
|---|---|
| Design Speed | 50 mph |
| Posted Speed | 45 mph |
| Minimum Curve | 1400' |
| Vertical Alignment | |
| Maximum Grade | 6% |
| Minimum Grade | 1% |
| Stopping Sight Distance | 400' – 475' |
| K Value | 110-150 (Crest)<br>(crest K of 95 will be allowable only in isolated locations)<br>96-110 (Sag) |
| Superelevation Runoff | 1:200 |

**DRAINAGE**

| | |
|---|---|
| Hydrology | Rational Method (<200 acres)<br>SCS TR-55 (>200 acres) |
| Ditch Design | 25 years (Minimum) |
| Drainage Structures (Culverts) | 100-year Design |
| Stream Corridor | 120' Stream Corridor Boundary |

**Proposed Typical Sections**

The typical sections for the proposed roadways are shown in the Appendix. All thoroughfare sections have 10" thick asphaltic concrete pavement over a 6" aggregate base course.

Page 2 of the plans in the Appendix shows the standard four-lane divided thoroughfare section recommended for 167th Street (Pflumm Road to Metcalf Avenue). The roadway width consists of a 13' outside lane and 12'-2" inside lane. Five-foot sidewalks are located 1-foot inside the proposed right-of-way line. A 10' bike/hike trail will be utilized in locations designated by the Greenway Linkages Master Plan and will be located 1-foot inside the proposed right-of-way line. The trail locations are shown in the plans.

**Proposed Right-of-Way**

Right-of-way requirements are indicated on the plan drawings in the Appendix and on the typical section on page 2 of the plans in the Appendix. All thoroughfare sections will include a 120' right-of-way corridor. Permanent drainage easements will be necessary at the ends of the crossroad drainage structures. Temporary construction easements will be necessary along most properties adjacent to construction. Permanent utility easements are present in most of the sub-divided properties. There are, however, locations where additional utility easements will be necessary to accommodate utility relocations. The final locations of the proposed utility easements should be determined during the project design phase when more accurate utility information is available.

**Proposed Horizontal Alignments**

There is no existing roadway between Pflumm Road and Switzer Road; therefore, the centerline will not follow the standard location centered on the section line. However, a standard thoroughfare section is recommended for 167th Street as shown in the Appendix. 167th Street will commence at Pflumm Road parallel to and 60' south of the south property line of tract #108. At the eastern edge of tract #108, 167th Street will begin a curve to the northeast in an effort to cross Coffee Creek at a location that will minimize the bridge length. The proposed centerline will intersect Quivira Road at a point approximately 826' south of and parallel to the section line. After crossing Coffee Creek east of Quivira Road, the proposed centerline will transition to the section line at a point approximately 1,286' west of Switzer Road where it will continue eastward along the section line through Metcalf Avenue. There are locations between Switzer Road and Metcalf Avenue where modified thoroughfare sections will be used. The section modifications include:

- The sidewalk moved to the back of curb to improve driveway access at tract #44 of the property at the northeast corner of 167th Street and Switzer Road.
- The sidewalk relocated to reduce significant fills at the eastern end of the rock quarry property.
- A retaining wall constructed to reduce impacts to the structure at tract #84.
- The sidewalks moved to the back of curb to reduce the impacts to the US 69 bridges over 167th Street.

- The sidewalk relocated with a retaining wall to reduce the extensive cuts on the south side of 167th Street across from the US 69 northbound ramp.
- A retaining wall constructed to reduce impacts to the structure at tract #114.

**Proposed Vertical Alignments**

The minimum design criteria for thoroughfare type roadways is established in the City of Overland Park Municipal Code and the 1990 edition of "A Policy on Geometric Design of Highways and Streets" published by the American Association of State Highway and Transportation Officials. The two main design issues when developing the vertical alignments for these roadways are Stopping Sight Distance (S.S.D.) of a crest vertical curve and the "K" value of a sag vertical curve. The requirements for this project are shown in the Design Criteria section of this report. An exception to the Design Criteria has been followed for the sag curve along 167th Street under the US 69 bridges. Although the U.S. 69 bridges would need to be rebuilt to accommodate the full 4-lane thoroughfare section, the proposed vertical alignment is based upon maintaining the existing U.S. 69 roadway profile as near as practical for the reconstruction of these bridges. Due to the constraints of the minimum AASHTO bridge clearance requirements for US 69 (16'-0") and the cover required for the drainage structures under 167th Street in this location, the minimum "K" requirements cannot be met. Therefore, because the future roadway will be lighted, a minimum comfort speed "K" value of 54 would meet the 167th Street design criteria.

**Historical Considerations**

The Kansas State Historical Society (KSHS) has indicated there are no known archaeological sites or historic structures within the project area and thus the improvements should have no effect on properties listed on the National Register of Historic Places. However, during final design it is recommended that further investigation be explored.

**Environmental Considerations**

The Kansas Department of Health and Environment (KDHE) has indicated the Kansas Department of Transportation (KDOT) property located along the northeast corner of the 167th Street and U.S. 69 intersection could contain above ground and/or underground storage tanks within their property. Additionally, the KDHE Bureau of Environmental Remediation has indicated the presence of a solid waste site at the rock quarry located on the northwest corner of the 167th Street and Metcalf Avenue intersection. Further investigation into both properties will need to be explored at the time of preliminary project design. Coordination with KDHE will be required to ensure their requirements have been satisfied.

The U.S. Fish and Wildlife Service branch of the United States Department of the Interior has indicated the project may be located within the area of the following two federally listed threatened plant species: Mead's milkweed (Asclepias meadii) and the western prairie fringed orchid (Platanthera praeclara). They have recommended a survey be done prior to construction to determine whether these plants are present. They have indicated

the Kansas Biological Survey be contacted for assistance in determining the necessity of and protocols for plant surveys.

The Kansas Biological Survey at the University of Kansas reviewed the proposed alignments and indicated there should be no protected species within the proposed corridors. They indicated the Kansas Department of Wildlife and Parks has the ultimate regulatory responsibility for threatened or endangered species in this area.

The Kansas Department of Wildlife and Parks reviewed the proposed alignments and indicated their office does not anticipate requiring an assessment or permit within the proposed roadway corridors. However, due to the long-range nature of this project, they will require continued correspondence at the time of future design to ensure the continued applicability of their initial assessment report.

**Proposed Bridges**

There are four bridges that will be required throughout the project. Two of the bridges will span Coffee Creek and its tributaries. The bridge flow information summarized in the table below was obtained from the "Blue River Watershed Study". Additionally, both U.S. 69 Highway bridges over 167th Street will need to be rebuilt in order to span the standard thoroughfare section along 167th Street. The U.S. 69 Highway bridges have been designed to provide 16'-0" clearance based on AASHTO Bridge Design, 2002 Edition Section 2.2.3. Locations of bridge structures are shown on the plan and profile sheets in the Appendix.

| Bridge Location | Station | Proposed Type | Spans | Drainage Area (ac.) | $Q_{100}$ (cfs) |
|---|---|---|---|---|---|
| 167th | 154+07 | K4 Prestressed Concrete Girder | 100'-100'-100' | 6,753 | 15,042 |
| 167th | 189+35 | Reinforced Concrete Haunched Slab | 42'-56'-42' | 930 | 4,205 |
| U.S. 69 | Southbound | Reinforced Concrete Haunched Slab | 39'-52'-52'-39' | - | - |
| U.S. 69 | Northbound | Reinforced Concrete Haunched Slab | 39'-52'-52'-39' | - | - |

**Proposed Drainage**

New drainage structures beneath 167th Street will be reinforced concrete boxes and reinforced concrete pipe. The major culvert crossings were sized for a 100-year storm. Water surface elevations were obtained from the "Blue River Watershed Study". A 1' freeboard elevation was utilized in the culvert design. During final design it may be necessary to design a storm system that utilizes area inlets to collect the water at the toes of slope where positive drainage cannot be achieved. Temporary interceptor ditches should be utilized in order to keep large areas of off-site drainage from entering the roadway. The temporary interceptor ditches will only be used where development has not yet occurred. Locations of structures are shown on the plan and profile sheets in the Appendix.

There are thirteen culvert crossings on 167th Street. The data used in analyzing the storm drainage flowing from the adjacent drainage areas is shown in the table below:

| Structure Location | Size | Area (acres) | C Value | Time of Concentration (min) | $i_{100}$ (in/hr) | $Q_{100}$ (cfs) |
|---|---|---|---|---|---|---|
| 94+42 | 60" | 57 | 0.36 | 12.1 | 8.0 | 204 |
| 106+01 | 12'x 6' | 169 | 0.45 | 22.5 | 6.3 | 601 |
| 164+94 165+01 | Dbl. 30" | 11 | 0.55 | 15.5 | 7.2 | 55 |
| 171+82 | 7'x 5' | 78 | 0.55 | 21.2 | 6.5 | 348 |
| 180+16 | 7'x 5' | 51 | 0.55 | 17.3 | 7.0 | 245 |
| 213+19 | 7'x 5' | 53 | 0.55 | 15.1 | 7.4 | 269 |
| 231+86 | 5'x 5' | 60 | 0.55 | 15.4 | 7.3 | 300 |
| 241+45 | 5'x 5' | 49 | 0.55 | 20.2 | 6.6 | 221 |
| (1) 279+03 | 36'x8' Conspan | 747 | 0.55 | 40.3 | 4.7 | 3088 |
| (2) 282+91 | Dbl. 9'x 4' | 152 | 0.55 | 15.1 | 7.3 | 770 |
| (3) 303+20 & 303+36 | Dbl. 54" | 61 | 0.55 | 14.55 | 7.5 | 313 |
| 308+87 | 5'x 5' | 95 | 0.55 | 16.7 | 7.1 | 462 |
| (4) 312+80 | 36" | 10 | 0.55 | 12.9 | 7.8 | 53 |

(1) Flows (Q) for this structure were determined using TR-55. The proposed drainage area for this structure has been modified from the existing drainage area. Currently, there is an existing structure at approximate station 272+25 that carries flow to the north side of 167th Street. The proposed design is for this flow to be piped with the roadway drainage system along the south side of 167th Street and discharge into the 36'x8' Conspan Bridge System. Further, it should be noted the downstream structure south of 167th Street under US 69 is currently a 9'x 9' RCB. This structure would be undersized to carry the future flows and could lead to flooding of the upstream structures along 167th Street. The tailwater calculations for the Conspan structure were insufficient due to the restricted downstream ditch widths and the undersized downstream RCB. It should be noted the proposed design is adequate with the existing constraints of taking no additional right-of-way in this location. However, if the interchange is ever to be improved from a half interchange into a full interchange or if additional right-of-way is planned to be acquired, consideration should be made to move the 36'x8' Conspan structure further to the west. This would allow for flatter back and fore slopes off the southbound U.S. 69 shoulders and wider downstream ditches that would reduce the chance of flooding the upstream 167th Street structures. Also, a structure with a reduced span and greater height could be evaluated as the minimum cover increases with a shift west.

(2) The drainage area for this structure includes the entire area of the APAC rock quarry east of this location. Currently, much of the quarry ponds water and does not drain off the property. In an effort to be conservative with the roadway design of 167th Street at the U.S. 69 interchange, this structure has been designed with the assumption the quarry will be filled in, developed and will drain almost entirely to this structure. However, it is feasible that upon development of the rock quarry, grading could cause approximately half of the drainage area to be discharged south or east of the rock quarry. In that event, the proposed structure at Sta. 282+91 could be reduced in size.

(3) The drainage area for these structures includes approximately half of the APAC rock quarry. Although the proposed structure at Sta. 282+91 has been designed to carry all of the discharge from the APAC rock quarry, it is feasible to assume approximately half of the rock quarry will actually discharge to the structures at Sta. 303+20 and 303+36. Currently, much of the quarry ponds water and does not drain off the property. These structures have been designed with the assumption the quarry will be filled in and developed.

(4) The culvert may need a special area inlet on the upstream end to avoid impacts to the developed properties in that area. This should be investigated during final design.

The U.S. 69 ramps will need to be reconstructed as part of the 167th Street improvements. The data used in analyzing the storm drainage flowing from the adjacent ramp drainage areas is shown in the table below:

**U.S. 69 Southbound Ramp**

There is one structure beneath the U.S. 69 Southbound Ramp. The data used in analyzing the storm drainage flowing from the adjacent drainage areas is shown in the table below:

| Structure Location | Size | Area (acres) | C Value | Time of Concentration (min) | $i_{100}$ (in/hr) | $Q_{100}$ (cfs) |
|---|---|---|---|---|---|---|
| (1) 10+96 | 36'x8' Conspan | 744 | 0.55 | 40.3 | 4.7 | 2937 |

(1) Flows (Q) for this structure were determined using TR-55. The proposed drainage area for this structure has been modified from the existing drainage area. Currently, there is an existing structure at approximate station 272+25 that carries flow to the north side of 167th Street. The proposed design is for this flow to be piped with the roadway drainage system along the south side of 167th Street and discharge into the 36'x8' Conspan Bridge System. Further, it should be noted the downstream structure south of 167th Street under US 69 is currently a 9'x 9' RCB. This structure would be undersized to carry the future flows and could lead to flooding of the upstream structures along 167th Street. The tailwater calculations for the Conspan structure were insufficient due to the restricted downstream ditch widths and the undersized downstream RCB. It should be noted the proposed design is adequate with the existing constraints of taking no additional right-of-way in this location. However, if the interchange is ever to be improved from a half interchange into a full interchange or if additional right-of-way is planned to be acquired, consideration should be made to move the 36'x8' Conspan structure further to the west. This would allow for flatter back and fore slopes off the southbound U.S. 69 shoulders and wider downstream ditches that would reduce the chance of flooding the upstream 167th Street structures. Also, a structure with a reduced span and greater height could be evaluated as the minimum cover increases with a shift west.

**U.S. 69 Northbound Ramp**

There is one culvert crossing beneath the U.S. 69 Northbound Ramp. The data used in analyzing the storm drainage flowing from the adjacent drainage areas is shown in the table below:

| Structure Location | Size | Area (acres) | C Value | Time of Concentration (min) | $i_{100}$ (in/hr) | $Q_{100}$ (cfs) |
|---|---|---|---|---|---|---|
| (1) 10+92 | Dbl. 9'x 4' | 152 | 0.55 | 15.1 | 7.3 | 770 |

(1) The drainage area for this structure includes the entire area of the APAC rock quarry east of this location. Currently, much of the quarry ponds water and does not drain off the property. In an effort to be conservative with the roadway design of 167th Street at the U.S. 69 interchange, this structure has been designed with the assumption the quarry will be filled in, developed and will almost entirely drain to this structure. However, it is feasible that upon development of the rock quarry, grading could dictate approximately half of the drainage area to be discharged south or east of the rock quarry. In that event, the proposed structure at Sta. 10+92 could be reduced in size.

**Proposed Retaining Walls**

Retaining walls will be required at several locations where the extension of the roadway side slopes would adversely affect adjacent landowners. The recommended retaining wall locations are shown on the plans in the Appendix.

Further, a retaining wall will be necessary at the property located along the northeast corner of 167th Street and Switzer Road. A wall will minimize impact to the structure at this property.

A retaining wall will be necessary at the property located along the southeast corner of 167th Street and Hardy Street. A wall will minimize impact to the structure at this property.

A wall is recommended along the south side of 167th Street across from the US 69 northbound ramp in order to minimize the extensive cuts associated with this location.

A wall is recommended along the north side of 167th Street east of Metcalf Avenue in order to minimize impact to the structures at the neighboring properties.

Additionally, a structural retaining wall will be necessary along the east side of the U.S. 69 Northbound Ramp at approximate station 11+50 in order to minimize impact to the drive/parking lot of the Kansas Department of Transportation property.

Further investigation may be needed during the preliminary project design to determine the practicality of using retaining walls shown on the preliminary plans.

**Existing Lakes and Ponds**

A man-made private pond is located on the south side of 167th Street approximately 600' west of the U.S. 69 Southbound Ramp. The proposed roadway will not affect the pond. However, the drainage from the pond will be adjusted from the current layout. Currently, the existing overflow drainage from the pond as well as flow from the surrounding drainage area drains to a 24" CMP that carries the flow to the north side of 167th Street. The proposed design would collect the surrounding drainage area with an area inlet and collect the overflow drainage with an end section. The flows would be carried along the south side of 167th Street in the proposed roadway drainage system and continue to the proposed 36' x 8' Conspan structure.

**Permitting**

Permits will be required before beginning construction activities on this project. Due to the continually changing nature of permitting requirements, it is recommended the engineer review permitting requirements during the project's preliminary design phase. The following permits may be required and should be investigated:

**404 Permit**
**DWR Permit**
**National Pollution Discharge Elimination System (NPDES) Permit**
**6(f) or Environmental Permit** – for Heritage Park property acquisition
**Federal Aviation Administration Form 7460-1**
**City Land Disturbance Permit**
**City Flood Plain Permit**
**FEMA**
**Other**

**Construction**

At the request of the City, cost estimates and other project data have been calculated. They can be found beginning on page 60 at the back of the report. These opinions of probable costs, in addition to previous studies of this area, will assist the City in phasing of roadway construction.

Access to the schools, church, park, KDOT maintenance facility or any other businesses or residences will need to be maintained during construction. Temporary surfacing will be necessary to maintain access. Recommendations for construction phasing and maintenance of traffic during construction will need to be evaluated during each preliminary project design. The cost of earthwork should also be considered during the sequencing of construction. As shown from the table on the following page, various sections of roadway construction will have excess waste material while other sections will require borrow material.

# 159TH STREET & PFLUMM ROAD INTERSECTION

## *EXISTING CONDITIONS*

**Existing Roadway**

159th Street is an east/west thoroughfare serving Overland Park, Olathe and Johnson County residents. It is a two-lane paved roadway with no shoulders and open ditches. 159th Street is bordered on the north side entirely by the City of Olathe. The south side of 159th Street is bordered by Johnson County west of Pflumm Road and Overland Park east of Pflumm Road.

159th Street has one intersecting thoroughfare – Pflumm Road. There is also one intersecting driveway on the north side of the road.

**Existing Right-of-Way**

The existing right-of-way is generally 20 feet either side of the section line through undeveloped tracts of land, and 40 feet to 60 feet either side of the section line where subdivisions have been platted. The existing right-of-way is shown on the plan drawings in the Appendix.

**Traffic Counts and Projections**

Existing traffic counts indicate a 3,619 ADT volume along 159th Street at the intersection of Pflumm Road. Projected volumes ranging from 17,390 ADT to 19,810 ADT are anticipated for the year 2020. The traffic volume range is due to several variables. The low end of the range assumes a projected 2-lane 167th Street from Antioch Road to Pflumm Road, no interchange at US 69 and 159th Street and a full interchange at US 69 and 167th Street. This scenario assumes a low-density future development. The high end of the range assumes a projected 4-lane 167th Street with full interchanges for US 69 at both 159th Street and 167th Street. This scenario also assumes a high-density future development scenario.

**Existing Land Use**

The properties adjacent to 159th Street include a small subdivision as well as a mix of small and large tracts of land. Heritage Park is located along the southwest quadrant of the intersection of 159th Street and Pflumm Road. Johnson County Executive Airport is located east of Pflumm Road on both the north and south sides of 159th Street.

**Existing Vertical Alignments**

According to the AASHTO design criteria, the intersection of 159th Street and Pflumm Road has limited stopping sight distance. Because the proposed design speed is 50 mph, existing high spots in the profile will need to be cut down to meet the new criteria.

**Existing Drainage**

There are currently open ditches along 159th Street.

## *EXISTING UTILITIES*

The major utilities in the study area are telephone, water, power, gas, sanitary sewers and fiber optic. These utility lines are shown on the plan drawings in the Appendix and are described as follows:

**SBC Telephone**
SBC has buried facilities running along the south side of 159th Street west of Pflumm Road and along the north side of 159th Street east of Pflumm Road.

**Johnson County Wastewater District**
The Wastewater District has a 14" DIP force main that crosses 159th Street west of the 159th Street and Pflumm Road intersection.

**Water District No. 1 of Johnson County**
The Water District has a 16" line along the north side of 159th Street. The line crosses to the south side of the road approximately 50' east of Pflumm Road and continues east along 159th Street. The line is in private easement and relocations would be at the City's expense.

**Kansas City Power & Light**
KCP&L has overhead facilities along the north side of 159th Street.

**Williams Communications Company**
Williams Communications Company has a fiber optic line crossing 159th Street approximately 650' west of Pflumm Road.

**Kansas Gas Service**
Kansas Gas Service has a 6" line crossing 159th Street approximately 650' west of Pflumm Road.

**Atmos Energy**
Atmos Energy has an 8" gas line crossing 159th Street approximately 650' west of Pflumm Road as well as an 8" gas line along the south side of 159th Street.

**Magellan Pipeline Company**
Magellan Pipeline Company has two 12" petroleum lines and an 8" petroleum line crossing 159th Street approximately 650' west of Pflumm Road.

**Phillips Pipeline Company**
Phillips Pipeline Company has a 10" petroleum line and an 8" petroleum line crossing 159th Street approximately 600' west of Pflumm Road.

**Time Warner Cable**
Time Warner Cable has a fiber optic line on the south side of 159th Street. Time Warner has facilities on the north side of 159th Street that are attached to KCP&L's poles.

## *MEDIAN BREAKS AND TURN LANE STORAGE REQUIREMENTS*

The City provided the following recommendations for proposed median break locations and full-width turn lane storage requirements (excluding tapers):

| Location | Northbound | Southbound | Eastbound | Westbound |
|---|---|---|---|---|
| Pflumm Road | 300 | 300 | 300 | 280 |

## *PRELIMINARY DESIGN*

**Design Criteria**

**TYPICAL SECTIONS**

| | |
|---|---|
| Lane Width | 12'-2" – inside lane<br>13'-0" – outside lane<br>12'-2" – left turn bay |
| Median Width | 24' |
| Parking Lane | None |
| Shoulder | |
| Median | Curb (Type D) |
| Outside | Curb (Type B) |
| Normal Crown | 2.08% (1/4" / ft) |

**SIDE SLOPES**

| | |
|---|---|
| Maximum | 4:1 |

**GEOMETRICS**

| | |
|---|---|
| Design Speed | 50 mph |
| Posted Speed | 45 mph |
| Minimum Curve | 1400' |
| Vertical Alignment | |
| Maximum Grade | 6% |
| Minimum Grade | 1% |
| Stopping Sight Distance | 400' – 475' |
| K Value | 110-150 (Crest)<br>(crest K of 95 will be allowable only in isolated locations)<br>96-110 (Sag) |
| Superelevation Runoff | 1:200 |

**DRAINAGE**

| | |
|---|---|
| Hydrology | Rational Method (<200 acres)<br>SCS TR-55 (>200 acres) |
| Ditch Design | 25 years (Minimum) |
| Drainage Structures (Culverts) | 100-year Design |
| Stream Corridor | 120' Stream Corridor Boundary |

**Proposed Typical Sections**

The typical sections for the proposed roadways are shown in the Appendix. All thoroughfare sections have 10" thick asphaltic concrete pavement over a 6" aggregate base course.

Page 2 of the plans in the Appendix shows the standard four-lane divided thoroughfare section recommended for the 159th Street and Pflumm Road Intersection. This section includes a 24' raised median to accommodate a 12'-2" single left turn. The roadway width consists of a 13' outside lane and 12'-2" inside lane. Five-foot sidewalks are located 1-foot inside the proposed right-of-way line. A 10' bike/hike trail will be utilized in locations designated by the Greenway Linkages Master Plan and will be located 1-foot inside the proposed right-of-way line. The trail locations are shown in the plans.

**Proposed Right-of-Way**

Right-of-way requirements are indicated on the plan drawings in the Appendix and on the typical section on page 2 of the plans in the Appendix. All thoroughfare sections will include a 120' right-of-way corridor. Permanent drainage easements will be necessary at the ends of the crossroad drainage structures. Temporary construction easements will be necessary along most properties adjacent to construction. Permanent utility easements are present in most of the sub-divided properties. There are, however, locations where additional utility easements will be necessary to accommodate utility relocations. The final locations of the proposed utility easements should be determined during the project design phase when more accurate utility information is available.

**Proposed Horizontal Alignments**

A standard thoroughfare section, centered on the section line, is recommended for 159th Street as shown in the Appendix.

**Proposed Vertical Alignments**

The minimum design criteria for thoroughfare type roadways is established in the City of Overland Park Municipal Code and the 1990 edition of "A Policy on Geometric Design of Highways and Streets" published by the American Association of State Highway and Transportation Officials. The two main design issues when developing the vertical alignments for these roadways are Stopping Sight Distance (S.S.D.) of a crest vertical curve and the "K" value of a sag vertical curve. The requirements for this project are shown in the Design Criteria section of this report.

**Historical Considerations**

The Kansas State Historical Society (KSHS) has indicated there are no known archaeological sites or historic structures within the project area and thus the improvements should have no effect on properties listed on the National Register of Historic Places. However, during final design it is recommended that further investigation be explored.

## Environmental Considerations

The Kansas Department of Health and Environment (KDHE) has indicated the Kansas Department of Transportation (KDOT) property located along the northeast corner of the 167th Street and U.S. 69 intersection could contain above ground and/or underground storage tanks within their property. Additionally, the KDHE Bureau of Environmental Remediation has indicated the presence of a solid waste site at the rock quarry located on the northwest corner of the 167th Street and Metcalf Avenue intersection. Further investigation into both properties will need to be explored at the time of preliminary project design. Coordination with KDHE will be required to ensure their requirements have been satisfied.

The U.S. Fish and Wildlife Service branch of the United States Department of the Interior has indicated the project may be located within the area of the following two federally listed threatened plant species: Mead's milkweed (Asclepias meadii) and the western prairie fringed orchid (Platanthera praeclara). They have recommended a survey be done prior to construction to determine whether these plants are present. They have indicated the Kansas Biological Survey be contacted for assistance in determining the necessity of and protocols for plant surveys.

The Kansas Biological Survey at the University of Kansas reviewed the proposed alignments and indicated there should be no protected species within the proposed corridors. They indicated the Kansas Department of Wildlife and Parks has the ultimate regulatory responsibility for threatened or endangered species in this area.

The Kansas Department of Wildlife and Parks reviewed the proposed alignments and indicated their office does not anticipate requiring an assessment or permit within the proposed roadway corridors. However, due to the long-range nature of this project, they will require continued correspondence at the time of future design to ensure the continued applicability of their initial assessment report.

## Proposed Drainage

There are no major drainage crossings required as part of the 159th Street and Pflumm Road intersection improvements. However, during final design it may be necessary to design a storm system that utilizes area inlets to collect the water at the toes of slope where positive drainage cannot be achieved. Temporary interceptor ditches should be utilized in order to keep large areas of off-site drainage from entering the roadway. The temporary interceptor ditches will only be used where development has not yet occurred. However, we do not recommend use of the ditches at the west end of 159th Street where underground utility cover for multiple petroleum, gas and fiber lines must be preserved.

## Permitting

Permits will be required before beginning construction activities on this project. Due to the continually changing nature of permitting requirements, it is recommended the engineer review permitting requirements during the project's preliminary design phase. The following permits may be required and should be investigated:

**404 Permit**
**DWR Permit**
**National Pollution Discharge Elimination System (NPDES) Permit**
**6(f) or Environmental Permit** – for Heritage Park property acquisition
**Federal Aviation Administration Form 7460-1**
**City Land Disturbance Permit**
**City Flood Plain Permit**
**FEMA**
**Other**

**Construction**

At the request of the City, cost estimates and other project data have been calculated. They can be found beginning on page 60 at the back of the report. These opinions of probable costs, in addition to previous studies of this area, will assist the City in phasing of roadway construction.

Access to the schools, church, park, KDOT maintenance facility or any other businesses or residences will need to be maintained during construction. Temporary surfacing will be necessary to maintain access. Recommendations for construction phasing and maintenance of traffic during construction will need to be evaluated during each preliminary project design. The cost of earthwork should also be considered during the sequencing of construction. As shown from the table on the following page, various sections of roadway construction will have excess waste material while other sections will require borrow material.

# PFLUMM ROAD

## *EXISTING CONDITIONS*

**Existing Roadway**

Pflumm Road is a north/south thoroughfare serving Overland Park and Johnson County residents. It is a two-lane paved roadway with no shoulders and open ditches. Throughout the project corridor, Pflumm Road includes portions of the roadway that are in both Overland Park, Johnson County and Olathe.

Pflumm Road has two intersecting thoroughfares – 159th Street and 175th Street. There are also several intersecting driveways including the main entrance to Heritage Park.

**Existing Right-of-Way**

The existing right-of-way is generally 20 feet to 30 feet either side of the section line through undeveloped tracts of land. Based on a previous preliminary engineering study, future right-of-way will include 60 feet either side of the section line near the 159th Street and Pflumm Road intersection. The existing right-of-way is generally 40 feet to 60 feet either side of the section line near the intersection of 175th Street and Pflumm Road. The existing right-of-way is shown on the plan drawings in the Appendix.

**Traffic Counts and Projections**

Existing traffic counts indicate an 844 ADT volume along Pflumm Road from 175th Street to 159th Street and for Pflumm Road at the intersection of 159th Street. Projected volumes ranging from 23,700 ADT to 30,430 ADT are anticipated for the year 2020. The traffic volume range is due to several variables. The low end of the range assumes a projected 2-lane 167th Street from Antioch Road to Pflumm Road, no interchange at US 69 and 159th Street and a full interchange at US 69 and 167th Street. This scenario assumes a low-density future development. The high end of the range assumes a projected 4-lane 167th Street with full interchanges for US 69 at both 159th Street and 167th Street. This scenario also assumes a high-density future development scenario.

**Existing Land Use**

The properties adjacent to Pflumm Road consist primarily of several large tracts of land. The current planned zoning for the majority of the study corridor is for park use. Heritage Park runs along the west side of Pflumm Road from 159th Street to 175th Street. Johnson County Executive Airport is located on the east side of Pflumm Road. There are also several small tracts of land along the east side of Pflumm Road that are currently zoned for residential use.

**Existing Vertical Alignments**

According to the AASHTO design criteria, the section of Pflumm Road between 159th Street and 167th Street has limited stopping sight distance. Currently, the speed limit along Pflumm Road is 35 mph. Because the proposed design speed is 50 mph, existing high spots in the profile will need to be cut down and low spots will need to be filled in to meet the new criteria.

**Existing Drainage**

There are currently open ditches adjacent to Pflumm Road. There are four existing drainage structures crossing Pflumm Road. One of the existing structures is a 130' 3-span bridge that crosses over Coffee Creek. A 36" reinforced concrete pipe crosses Pflumm Road approximately one mile north of 175th Street as well as double 48" reinforced concrete pipes that cross Pflumm Road approximately ¾ miles north of 175th Street. A 7' x 6.5' reinforced concrete box crosses Pflumm Road approximately 0.5 miles north of 175th Street. These structures cannot pass a 100-year event. None of the structures are long enough to accommodate the proposed typical section with adequate clear zone.

## *EXISTING UTILITIES*

The major utilities in the study area are telephone, water, power, gas, sanitary sewers and fiber optic. These utility lines are shown on the plan drawings in the Appendix and are described as follows:

**SBC Telephone**

SBC has buried facilities running along the east side of Pflumm Road from about ¼ mile north of 175th Street to 159th Street.

**Johnson County Wastewater District**

The Wastewater District has a 14" DIP force main that is approximately 70' west of the section line and runs along Pflumm Road from 159th Street to approximately 3200' south of 159th Street where it crosses Pflumm Road and goes east. There is also a 42" RCP line that crosses Pflumm Road approximately 3600' south of 159th Street.

**Water District No. 1 of Johnson County**

The Water District has a 4" line along the east side of Pflumm Road north of 175th Street that continues north for approximately 300'. The 4" line then reduces to a 2" line and extends northerly for approximately 1600'. The 2" line then increases to an 8" line and extends to the north property line of the Sutherland tract. The Water District has a 1 ½" line on the east side of Pflumm Road that begins approximately 400' south of the Heritage Park access road and extends north to 159th Street. There is a 16" main along 159th Street that crosses 159th Street along the east side of the intersection of 159th Street and Pflumm Road. There is an 8" line along the east side of Pflumm Road north of 159th Street. The lines are in private easement and relocations would be at the City's expense.

**Kansas City Power & Light**

KCP&L has overhead facilities along the west side of Pflumm Road from 175th Street to approximately 300' past the north property line of the Sutherland tract. There are overhead facilities along the east side of Pflumm Road from south of the Pflumm Road bridge to 159th Street.

**Atmos Energy**

Atmos Energy has a 3" gas line along the west side of Pflumm Road north of 159th Street. The lines are in private easement and relocations would be at the City's expense.

## *MEDIAN BREAKS AND TURN LANE STORAGE REQUIREMENTS*

The City provided the following recommendations for proposed median break locations and full-width turn lane storage requirements (excluding tapers):

| Location | Northbound | Southbound | Eastbound | Westbound |
|---|---|---|---|---|
| 159th Street | 300 | 300 | 300 | 280 |
| Heritage Park (Drive south of 159th Street) | 200 | | | |
| 167th Street | | 300 | | 300 |
| Heritage Park (Drive north of 175th Street) | 250 | 200 | | |
| 175th Street | 300 | 300 | | |

## *PRELIMINARY DESIGN*

**Design Criteria**

**TYPICAL SECTIONS**

| | |
|---|---|
| Lane Width | 12'-2" – inside lane<br>13'-0" – outside lane<br>12'-2" – left turn bay |
| Median Width | 24' |
| Parking Lane | None |
| Shoulder | |
| Median | Curb (Type D) |
| Outside | Curb (Type B) |
| Normal Crown | 2.08% (1/4" / ft) |

**SIDE SLOPES**

| | |
|---|---|
| Maximum | 4:1 |

**GEOMETRICS**

| | |
|---|---|
| Design Speed | 50 mph |
| Posted Speed | 45 mph |
| Minimum Curve | 1400' |
| Vertical Alignment | |
| Maximum Grade | 6% |
| Minimum Grade | 1% |
| Stopping Sight Distance | 400' – 475' |
| K Value | 110-150 (Crest)<br>(crest K of 95 will be allowable only in isolated locations)<br>96-110 (Sag) |
| Superelevation Runoff | 1:200 |

**DRAINAGE**

| | |
|---|---|
| Hydrology | Rational Method (<200 acres)<br>SCS TR-55 (>200 acres) |
| Ditch Design | 25 years (Minimum) |
| Drainage Structures (Culverts) | 100-year Design |
| Stream Corridor | 120' Stream Corridor Boundary |

**Proposed Typical Sections**

The typical sections for the proposed roadways are shown in the Appendix. All thoroughfare sections have 10" thick asphaltic concrete pavement over a 6" aggregate base course.

Page 2 of the plans in the Appendix shows the standard four-lane divided thoroughfare section recommended for Pflumm Road (159th Street to 175th Street). This section includes a 24' raised median to accommodate a 12'-2" single left turn. The roadway width consists of a 13' outside lane and 12'-2" inside lane. Five-foot sidewalks are located 1-foot inside the proposed right-of-way line. A 10' bike/hike trail will be utilized in locations designated by the Greenway Linkages Master Plan and will be located 1-foot inside the proposed right-of-way line. The trail locations are shown in the plans.

**Proposed Right-of-Way**

Right-of-way requirements are indicated on the plan drawings in the Appendix and on the typical section on page 2 of the plans in the Appendix. All thoroughfare sections will include a 120' right-of-way corridor. Permanent drainage easements will be necessary at the ends of the crossroad drainage structures. Temporary construction easements will be necessary along most properties adjacent to construction. Permanent utility easements are present in most of the sub-divided properties. There are, however, locations where additional utility easements will be necessary to accommodate utility relocations. The final locations of the proposed utility easements should be determined during the project design phase when more accurate utility information is available.

**Proposed Horizontal Alignments**

A standard thoroughfare section is recommended for Pflumm Road as shown in the Appendix. To minimize the impact to Heritage Park along the west side of Pflumm Road the centerline was shifted 30' east of the section line and will parallel the existing western right-of-way of Pflumm Road. The centerline will transition back to the section line at the end of the left turn lanes both north of 159th Street and south of 175th Street. A modified thoroughfare section is necessary for two locations along Pflumm Road: the sidewalk is relocated to avoid impact to a pond at tract #109 of the Heritage Park property at approximate station 60+00; and an integral sidewalk retaining wall is used with a 4' green space to avoid impact to the parking lot at tract #140 of the City of Olathe property at the northeast corner of the 159th Street and Pflumm Road intersection.

**Proposed Vertical Alignments**

The minimum design criteria for thoroughfare type roadways is established in the City of Overland Park Municipal Code and the 1990 edition of "A Policy on Geometric Design of Highways and Streets" published by the American Association of State Highway and Transportation Officials. The two main design issues when developing the vertical alignments for these roadways are Stopping Sight Distance (S.S.D.) of a crest vertical curve and the "K" value of a sag vertical curve. The requirements for this project are shown in the Design Criteria section of this report.

**Historical Considerations**

The Kansas State Historical Society (KSHS) has indicated there are no known archaeological sites or historic structures within the project area and thus the improvements should have no effect on properties listed on the National Register of Historic Places. However, during final design it is recommended that further investigation be explored.

**Environmental Considerations**

The Kansas Department of Health and Environment (KDHE) has indicated the Kansas Department of Transportation (KDOT) property located along the northeast corner of the 167th Street and U.S. 69 intersection could contain above ground and/or underground storage tanks within their property. Additionally, the KDHE Bureau of Environmental Remediation has indicated the presence of a solid waste site at the rock quarry located on the northwest corner of the 167th Street and Metcalf Avenue intersection. Further investigation into both properties will need to be explored at the time of preliminary project design. Coordination with KDHE will be required to ensure their requirements have been satisfied.

The U.S. Fish and Wildlife Service branch of the United States Department of the Interior has indicated the project may be located within the area of the following two federally listed threatened plant species: Mead's milkweed (Asclepias meadii) and the western prairie fringed orchid (Platanthera praeclara). They have recommended a survey be done prior to construction to determine whether these plants are present. They have indicated the Kansas Biological Survey be contacted for assistance in determining the necessity of and protocols for plant surveys.

The Kansas Biological Survey at the University of Kansas reviewed the proposed alignments and indicated there should be no protected species within the proposed corridors. They indicated the Kansas Department of Wildlife and Parks has the ultimate regulatory responsibility for threatened or endangered species in this area.

The Kansas Department of Wildlife and Parks reviewed the proposed alignments and indicated their office does not anticipate requiring an assessment or permit within the proposed roadway corridors. However, due to the long-range nature of this project, they will require continued correspondence at the time of future design to ensure the continued applicability of their initial assessment report.

**Proposed Bridges**

There is one bridge that will be required throughout the project. The bridge will span Coffee Creek. The bridge flow information summarized in the table below was obtained from the "Blue River Watershed Study". Location of the bridge structure is shown on the plan and profile sheets in the Appendix.

| Bridge Location | Station | Proposed Type | Spans | Drainage Area (ac.) | $Q_{100}$ (cfs) |
|---|---|---|---|---|---|
| Pflumm | 86+63 | Reinforced Concrete Haunched Slab | 48'-64'-48' | 4,823 | 13,328 |

**Proposed Drainage**

New drainage structures beneath Pflumm Road will be reinforced concrete boxes and reinforced concrete pipe. The major culvert crossings were sized for a 100-year storm. A 1' freeboard elevation was utilized in the culvert design. During final design it may be necessary to design a storm system that utilizes area inlets to collect the water at the toes of slope where positive drainage cannot be achieved. Temporary interceptor ditches should be utilized in order to keep large areas of off-site drainage from entering the roadway. The temporary interceptor ditches will only be used where development has not yet occurred. Locations of structures are shown on the plan and profile sheets in the Appendix.

There are four culvert crossings on Pflumm Road. The data used in analyzing the storm drainage flowing from the adjacent drainage areas is shown in the table below:

| Structure Location | Size | Area (acres) | C Value | Time of Concentration (min) | $i_{100}$ (in/hr) | $Q_{100}$ (cfs) |
|---|---|---|---|---|---|---|
| 13+16 | 48" | 26 | 0.43 | 11.9 | 8.1 | 115 |
| (1) 41+93 | 54" | 65 | 0.3 | 22.5 | 6.3 | 155 |
| 54+48 | 48" | 46 | 0.3 | 12.1 | 8.0 | 137 |
| 66+35 | 30" | 9 | 0.3 | 6.6 | 9.7 | 34 |
| 131+40 | Dbl. 11'x 4' | 73 | 0.7 | 15.6 | 7.3 | 462 |

(1) The culvert may need a curb inlet on the upstream end connecting to a storm sewer system to drain the existing pond overflow and the drainage area on the west side of Pflumm Road.

**Proposed Retaining Walls**

Retaining walls will be required at several locations where the extension of the roadway side slopes would adversely affect adjacent landowners. The recommended retaining wall locations are shown on the plans in the Appendix.

Further, a retaining wall will be necessary along the Heritage Park property at approximate station 59+00 in order to minimize impact to the nearby pond.

Further investigation may be needed during the preliminary project design to determine the practicality of using retaining walls shown on the preliminary plans.

**Existing Lakes and Ponds**

A man-made private lake is located along the west side of Pflumm Road approximately 2,200' north of 175$^{th}$ Street. The proposed roadway will not affect the lake. The existing 18" CMP that collects the overflow drainage will be connected to the proposed roadway drainage system.

**Permitting**

Permits will be required before beginning construction activities on this project. Due to the continually changing nature of permitting requirements, it is recommended the

engineer review permitting requirements during the project's preliminary design phase. The following permits may be required and should be investigated:

**404 Permit**
**DWR Permit**
**National Pollution Discharge Elimination System (NPDES) Permit**
**6(f) or Environmental Permit** – for Heritage Park property acquisition
**Federal Aviation Administration Form 7460-1**
**City Land Disturbance Permit**
**City Flood Plain Permit**
**FEMA**
**Other**

**Construction**

At the request of the City, cost estimates and other project data have been calculated. They can be found beginning on page 60 at the back of the report. These opinions of probable costs, in addition to previous studies of this area, will assist the City in phasing of roadway construction.

Access to the schools, church, park, KDOT maintenance facility or any other businesses or residences will need to be maintained during construction. Temporary surfacing will be necessary to maintain access. Recommendations for construction phasing and maintenance of traffic during construction will need to be evaluated during each preliminary project design. The cost of earthwork should also be considered during the sequencing of construction. As shown from the table on the following page, various sections of roadway construction will have excess waste material while other sections will require borrow material.

# QUIVIRA ROAD

## *EXISTING CONDITIONS*

**Existing Roadway**

Quivira Road is a north/south thoroughfare serving Overland Park and Johnson County residents. It is a two-lane paved roadway with no shoulders and open ditches. Quivira Road is bordered entirely by Overland Park except a portion of the project corridor which is part of Johnson County.

Quivira Road has one intersecting thoroughfare – 159th Street, as well as several intersecting residential driveways.

**Existing Right-of-Way**

The existing right-of-way is generally 20 feet to 40 feet either side of the section line through undeveloped tracts of land. Based on a previous preliminary engineering study, future right-of-way is 60 feet either side of the section line near the 159th Street and Quivira Road intersection. The existing right-of-way is shown on the plan drawings in the Appendix.

**Traffic Counts and Projections**

Existing traffic counts indicate a 652 ADT volume along Quivira Road from 167th Street to 159th Street. Projected volumes ranging from 14,210 ADT to 20,510 ADT are anticipated for the year 2020. The traffic volume range is due to several variables. The low end of the range assumes a projected 2-lane 167th Street from Antioch Road to Pflumm Road, no interchange at US 69 and 159th Street and a full interchange at US 69 and 167th Street. This scenario assumes a low-density future development. The high end of the range assumes a projected 4-lane 167th Street with full interchanges for US 69 at both 159th Street and 167th Street. This scenario also assumes a high-density future development scenario.

**Existing Land Use**

The properties adjacent to Quivira Road consist of a mix of several small and large tracts of land. The current planned zoning for the majority of the study corridor is for agricultural use. There are also several small tracts of land along Quivira Road that are currently zoned for residential use.

**Existing Vertical Alignments**

According to the AASHTO design criteria, the southern section of the Quivira Road corridor has limited stopping sight distance. Currently, the speed limit along Quivira Road is 35 mph. Because the proposed design speed is 50 mph, existing high spots in the profile will need to be cut down and low spots will need to be filled in to meet the new criteria.

**Existing Drainage**
There are currently open ditches adjacent to Quivira Road. There are two existing drainage structures crossing Quivira Road. One of the existing structures is a 110' 3-span bridge that crosses over Coffee Creek. A double 8' x 5' reinforced concrete box crosses Quivira Road approximately ¾ miles south of 159th Street. These structures cannot pass a 100-year event. None of the structures are long enough to accommodate the proposed typical section with adequate clear zone.

## *EXISTING UTILITIES*

The major utilities in the study area are telephone, water, power, gas, sanitary sewers and fiber optic. These utility lines are shown on the plan drawings in the Appendix and are described as follows:

**SBC Telephone**
SBC has overhead facilities running along the east side of Quivira Road.

**Johnson County Wastewater District**
The Wastewater District is currently designing sewer lines that would cross Quivira Road from the west approximately 100' north of the existing Quivira Road bridge.

**Water District No. 1 of Johnson County**
The Water District has a 36" line along the east side of Quivira Road. The line crosses to the west side of the road approximately 60' south of the Quivira Road bridge and continues north to 159th Street. The lines are in private easement and relocations would be at the City's expense.

**Kansas City Power & Light**
KCP&L has overhead facilities along the both the west side and east side of Quivira Road from south of 167th Street to 159th Street.

## *MEDIAN BREAKS AND TURN LANE STORAGE REQUIREMENTS*

The City provided the following recommendations for proposed median break locations and full-width turn lane storage requirements (excluding tapers):

| Location | Northbound | Southbound | Eastbound | Westbound |
|---|---|---|---|---|
| 167th Street | 300 | 300 | 300 | 300 |

# *PRELIMINARY DESIGN*

**Design Criteria**

**TYPICAL SECTIONS**

| | |
|---|---|
| Lane Width | 12'-2" – inside lane<br>13'-0" – outside lane<br>12'-2" – left turn bay |
| Median Width | 24' |
| Parking Lane | None |
| Shoulder | |
| Median | Curb (Type D) |
| Outside | Curb (Type B) |
| Normal Crown | 2.08% (1/4" / ft) |

**SIDE SLOPES**

| | |
|---|---|
| Maximum | 4:1 |

**GEOMETRICS**

| | |
|---|---|
| Design Speed | 50 mph |
| Posted Speed | 45 mph |
| Minimum Curve | 1400' |
| Vertical Alignment | |
| Maximum Grade | 6% |
| Minimum Grade | 1% |
| Stopping Sight Distance | 400' – 475' |
| K Value | 110-150 (Crest)<br>(crest K of 95 will be allowable only in isolated locations)<br>96-110 (Sag) |
| Superelevation Runoff | 1:200 |

**DRAINAGE**

| | |
|---|---|
| Hydrology | Rational Method (<200 acres)<br>SCS TR-55 (>200 acres) |
| Ditch Design | 25 years (Minimum) |
| Drainage Structures (Culverts) | 100-year Design |
| Stream Corridor | 120' Stream Corridor Boundary |

**Proposed Typical Sections**

The typical sections for the proposed roadways are shown in the Appendix. All thoroughfare sections have 10" thick asphaltic concrete pavement over a 6" aggregate base course.

Page 2 of the plans in the Appendix shows the standard four-lane divided thoroughfare section recommended for Quivira Road (159th Street to 167th Street). This section includes a 24' raised median to accommodate a 12'-2" single left turn. The roadway width consists of a 13' outside lane and 12'-2" inside lane. Five-foot sidewalks are located 1-foot inside the proposed right-of-way line. A 10' bike/hike trail will be utilized in locations designated by the Greenway Linkages Master Plan and will be located 1-foot inside the proposed right-of-way line. The trail locations are shown in the plans.

**Proposed Right-of-Way**

Right-of-way requirements are indicated on the plan drawings in the Appendix and on the typical section on page 2 of the plans in the Appendix. All thoroughfare sections will include a 120' right-of-way corridor. Permanent drainage easements will be necessary at the ends of the crossroad drainage structures. Temporary construction easements will be necessary along most properties adjacent to construction. Permanent utility easements are present in most of the sub-divided properties. There are, however, locations where additional utility easements will be necessary to accommodate utility relocations. The final locations of the proposed utility easements should be determined during the project design phase when more accurate utility information is available.

**Proposed Horizontal Alignments**

A standard thoroughfare section, centered on the section line, is recommended for Quivira Road as shown in the Appendix with the following exception. To minimize impact to the adjacent floodway boundary and to reduce the bridge length over Coffee Creek, the proposed centerline has been shifted to the east. The proposed centerline follows the section line to a point approximately 569' north of the proposed 167th Street and Quivira Road intersection. At this point it transitions to a tangent that spans Coffee Creek before transitioning back to the section line at a point approximately 2,126' north of the proposed 167th Street and Quivira Road intersection. Here it continues northerly along the section line through 159th Street. A modified thoroughfare section is necessary for one location along Quivira Road: the sidewalk is relocated along the west side of the roadway in order to minimize impact to the floodway boundary at approximate station 34+00.

**Proposed Vertical Alignments**

The minimum design criteria for thoroughfare type roadways is established in the City of Overland Park Municipal Code and the 1990 edition of "A Policy on Geometric Design of Highways and Streets" published by the American Association of State Highway and Transportation Officials. The two main design issues when developing the vertical alignments for these roadways are Stopping Sight Distance (S.S.D.) of a crest vertical curve and the "K" value of a sag vertical curve. The requirements for this project are shown in the Design Criteria section of this report.

**Historical Considerations**

The Kansas State Historical Society (KSHS) has indicated there are no known archaeological sites or historic structures within the project area and thus the improvements should have no effect on properties listed on the National Register of Historic Places. However, during final design it is recommended that further investigation be explored.

**Environmental Considerations**

The Kansas Department of Health and Environment (KDHE) has indicated the Kansas Department of Transportation (KDOT) property located along the northeast corner of the 167th Street and U.S. 69 intersection could contain above ground and/or underground storage tanks within their property. Additionally, the KDHE Bureau of Environmental Remediation has indicated the presence of a solid waste site at the rock quarry located on the northwest corner of the 167th Street and Metcalf Avenue intersection. Further investigation into both properties will need to be explored at the time of preliminary project design. Coordination with KDHE will be required to ensure their requirements have been satisfied.

The U.S. Fish and Wildlife Service branch of the United States Department of the Interior has indicated the project may be located within the area of the following two federally listed threatened plant species: Mead's milkweed (Asclepias meadii) and the western prairie fringed orchid (Platanthera praeclara). They have recommended a survey be done prior to construction to determine whether these plants are present. They have indicated the Kansas Biological Survey be contacted for assistance in determining the necessity of and protocols for plant surveys.

The Kansas Biological Survey at the University of Kansas reviewed the proposed alignments and indicated there should be no protected species within the proposed corridors. They indicated the Kansas Department of Wildlife and Parks has the ultimate regulatory responsibility for threatened or endangered species in this area.

The Kansas Department of Wildlife and Parks reviewed the proposed alignments and indicated their office does not anticipate requiring an assessment or permit within the proposed roadway corridors. However, due to the long-range nature of this project, they will require continued correspondence at the time of future design to ensure the continued applicability of their initial assessment report.

**Proposed Bridges**

There are two bridges that will be required throughout the project. Both of the bridges will span Coffee Creek and its tributaries. The bridge flow information summarized in the table below was obtained from the "Blue River Watershed Study".

| Bridge Location | Station | Proposed Type | Spans | Drainage Area (ac.) | $Q_{100}$ (cfs) |
|---|---|---|---|---|---|
| Quivira | 22+65 | K4 Prestressed Concrete Girder | 100'-100'-100' | 1,298 | 15,190 |
| Quivira | 36+28 | Reinforced Concrete Haunched Slab | 36'-48'-36' | 305 | 1,684 |

**Proposed Drainage**

There are no major drainage crossings required as part of the Quivira Road improvements. However, during final design it may be necessary to design a storm system that utilizes area inlets to collect the water at the toes of slope where positive drainage cannot be achieved. Temporary interceptor ditches should be utilized in order to keep large areas of off-site drainage from entering the roadway. The temporary interceptor ditches will only be used where development has not yet occurred.

There is an existing ditch draining easterly that turns at Quivira Road and runs south along the western side of the existing roadway at approximate station 47+00. This ditch will be filled in with the future roadway. Future development should be aware that the water carried in the ditch would need to be collected in the future roadway drainage system or conveyed in a ditch located outside of the future roadway right-of-way.

**Permitting**

Permits will be required before beginning construction activities on this project. Due to the continually changing nature of permitting requirements, it is recommended the engineer review permitting requirements during the project's preliminary design phase. The following permits may be required and should be investigated:

**404 Permit**
**DWR Permit**
**National Pollution Discharge Elimination System (NPDES) Permit**
**6(f) or Environmental Permit** – for Heritage Park property acquisition
**Federal Aviation Administration Form 7460-1**
**City Land Disturbance Permit**
**City Flood Plain Permit**
**FEMA**
**Other**

**Construction**

At the request of the City, cost estimates and other project data have been calculated. They can be found beginning on page 60 at the back of the report. These opinions of probable costs, in addition to previous studies of this area, will assist the City in phasing of roadway construction.

Access to the schools, church, park, KDOT maintenance facility or any other businesses or residences will need to be maintained during construction. Temporary surfacing will be necessary to maintain access. Recommendations for construction phasing and maintenance of traffic during construction will need to be evaluated during each preliminary project design. The cost of earthwork should also be considered during the sequencing of construction. As shown from the table on the following page, various sections of roadway construction will have excess waste material while other sections will require borrow material.

# SWITZER ROAD

## *EXISTING CONDITIONS*

**Existing Roadway**

Switzer Road is a north/south thoroughfare serving Overland Park and Johnson County residents. It is a two-lane paved roadway with no shoulders and open ditches. Switzer Road is bordered entirely by Overland Park from 159th Street to 167th Street.

Switzer Road has two intersecting thoroughfares – 159th Street and 167th Street. There is also one intersecting residential side street – 164th Street, as well as numerous intersecting residential driveways.

**Existing Right-of-Way**

The existing right-of-way is generally 20 feet either side of the section line through undeveloped tracts of land, and is generally 40 feet either side of the section line where subdivisions have been platted. Based on a previous preliminary engineering study, future right-of-way is 60 feet either side of the section line near the 159th Street and Switzer Road intersection. The existing right-of-way is shown on the plan drawings in the Appendix.

**Traffic Counts and Projections**

Existing traffic counts indicate a 1,176 ADT volume along Switzer Road from 167th Street to 159th Street. Projected volumes ranging from 10,300 ADT to 18,810 ADT are anticipated for the year 2020. The traffic volume range is due to several variables. The low end of the range assumes a projected 2-lane 167th Street from Antioch Road to Pflumm Road, no interchange at US 69 and 159th Street and a full interchange at US 69 and 167th Street. This scenario assumes a low-density future development. The high end of the range assumes a projected 4-lane 167th Street with full interchanges for US 69 at both 159th Street and 167th Street. This scenario also assumes a high-density future development scenario.

**Existing Land Use**

The properties adjacent to Switzer Road include small subdivisions and a mix of small and large tracts of land. The current planned zoning for the majority of the study corridor is for agricultural use. There are also numerous small tracts of land along Switzer Road that are currently zoned for residential use.

**Existing Vertical Alignments**

According to the AASHTO design criteria, the intersection of 167th Street and Switzer Road has limited stopping sight distance. Currently, the speed limit along Switzer Road is 35 mph. Because the proposed design speed is 50 mph, the existing high spot in the profile will need to be cut down to meet the new criteria.

**Existing Drainage**
There are currently open ditches adjacent to Switzer Road. There is one existing drainage structure crossing Switzer Road: a double 60" reinforced concrete pipe crosses Switzer Road approximately 1000' north of 167th Street. This structure cannot pass a 100-year event. The structure is not long enough to accommodate the proposed typical section with adequate clear zone.

## *EXISTING UTILITIES*

The major utilities in the study area are telephone, water, power, gas, sanitary sewers and fiber optic. These utility lines are shown on the plan drawings in the Appendix and are described as follows:

**SBC Telephone**
SBC has buried facilities running along the west side of Switzer Road.

**Johnson County Wastewater District**
The Wastewater District is currently designing sewer lines that would cross Switzer Road from the west and run southward along the east side of Switzer Road from approximately 500' north of 164th Street to approximately 900' north of 167th Street where it would then cross Switzer Road again and proceed west.

**Water District No. 1 of Johnson County**
The Water District has a 12" line along the west side of Switzer Road south of the intersection of 167th Street and Switzer Road. The line crosses to the east side of Switzer Road on the south side of the intersection. The line crosses back to the west side of Switzer Road at 164th Street and reduces to an 8" line. The 8" line extends northerly to 159th Street. Most of the lines are in private easement and relocations would be at the City's expense.

**Kansas City Power & Light**
KCP&L has overhead facilities along the east side of Switzer Road from south of 167th Street to 159th Street.

**Atmos Energy**
Atmos Energy has a 2" line along the west side of Switzer Road from south of 167th Street to approximately 1100' north of 164th Street where the line crosses Switzer Road to the east side of the road and extends to 159th Street.

**Time Warner Cable**
Time Warner Cable has overhead facilities attached to KCP&L's poles along the east side of Switzer Road from south of 167th Street to 159th Street.

## *MEDIAN BREAKS AND TURN LANE STORAGE REQUIREMENTS*

| Location | Northbound | Southbound | Eastbound | Westbound |
|---|---|---|---|---|
| 162nd Street | 200 | 200 | | |
| 164th Street | 150 | 200 | | |
| 167th Street | 300 | 300 | 300 | 300 |

## *PRELIMINARY DESIGN*

**Design Criteria**

**TYPICAL SECTIONS**

| | |
|---|---|
| Lane Width | 12'-2" – inside lane<br>13'-0" – outside lane<br>12'-2" – left turn bay |
| Median Width | 24' |
| Parking Lane | None |
| Shoulder | |
| Median | Curb (Type D) |
| Outside | Curb (Type B) |
| Normal Crown | 2.08% (1/4" / ft) |

**SIDE SLOPES**

| | |
|---|---|
| Maximum | 4:1 |

**GEOMETRICS**

| | |
|---|---|
| Design Speed | 50 mph |
| Posted Speed | 45 mph |
| Minimum Curve | 1400' |
| Vertical Alignment | |
| Maximum Grade | 6% |
| Minimum Grade | 1% |
| Stopping Sight Distance | 400' – 475' |
| K Value | 110-150 (Crest)<br>(crest K of 95 will be allowable only in isolated locations)<br>96-110 (Sag) |
| Superelevation Runoff | 1:200 |

**DRAINAGE**

| | |
|---|---|
| Hydrology | Rational Method (<200 acres)<br>SCS TR-55 (>200 acres) |
| Ditch Design | 25 years (Minimum) |
| Drainage Structures (Culverts) | 100-year Design |
| Stream Corridor | 120' Stream Corridor Boundary |

**Proposed Typical Sections**

The typical sections for the proposed roadways are shown in the Appendix. All thoroughfare sections have 10" thick asphaltic concrete pavement over a 6" aggregate base course.

Page 2 of the plans in the Appendix shows the standard four-lane divided thoroughfare section recommended for Switzer Road (159th Street to 167th Street). This section includes a 24' raised median to accommodate a 12'-2" single left turn. The roadway width consists of a 13' outside lane and 12'-2" inside lane. Five-foot sidewalks are located 1-foot inside the proposed right-of-way line. A 10' bike/hike trail will be utilized in locations designated by the Greenway Linkages Master Plan and will be located 1-foot inside the proposed right-of-way line. The trail locations are shown in the plans.

**Proposed Right-of-Way**

Right-of-way requirements are indicated on the plan drawings in the Appendix and on the typical section on page 2 of the plans in the Appendix. All thoroughfare sections will include a 120' right-of-way corridor. Permanent drainage easements will be necessary at the ends of the crossroad drainage structures. Temporary construction easements will be necessary along most properties adjacent to construction. Permanent utility easements are present in most of the sub-divided properties. There are, however, locations where additional utility easements will be necessary to accommodate utility relocations. The final locations of the proposed utility easements should be determined during the project design phase when more accurate utility information is available.

**Proposed Horizontal Alignments**

A standard thoroughfare section, centered on the section line, is recommended for Switzer Road as shown in the Appendix. The alignment will include a modified thoroughfare section near tract #44 where the sidewalk is located at the back of curb in an effort to reduce impacts to the house.

**Proposed Vertical Alignments**

The minimum design criteria for thoroughfare type roadways is established in the City of Overland Park Municipal Code and the 1990 edition of "A Policy on Geometric Design of Highways and Streets" published by the American Association of State Highway and Transportation Officials. The two main design issues when developing the vertical alignments for these roadways are Stopping Sight Distance (S.S.D.) of a crest vertical curve and the "K" value of a sag vertical curve. The requirements for this project are shown in the Design Criteria section of this report.

**Historical Considerations**

The Kansas State Historical Society (KSHS) has indicated there are no known archaeological sites or historic structures within the project area and thus the improvements should have no effect on properties listed on the National Register of Historic Places. However, during final design it is recommended that further investigation be explored.

## Environmental Considerations

The Kansas Department of Health and Environment (KDHE) has indicated the Kansas Department of Transportation (KDOT) property located along the northeast corner of the 167th Street and U.S. 69 intersection could contain above ground and/or underground storage tanks within their property. Additionally, the KDHE Bureau of Environmental Remediation has indicated the presence of a solid waste site at the rock quarry located on the northwest corner of the 167th Street and Metcalf Avenue intersection. Further investigation into both properties will need to be explored at the time of preliminary project design. Coordination with KDHE will be required to ensure their requirements have been satisfied.

The U.S. Fish and Wildlife Service branch of the United States Department of the Interior has indicated the project may be located within the area of the following two federally listed threatened plant species: Mead's milkweed (Asclepias meadii) and the western prairie fringed orchid (Platanthera praeclara). They have recommended a survey be done prior to construction to determine whether these plants are present. They have indicated the Kansas Biological Survey be contacted for assistance in determining the necessity of and protocols for plant surveys.

The Kansas Biological Survey at the University of Kansas reviewed the proposed alignments and indicated there should be no protected species within the proposed corridors. They indicated the Kansas Department of Wildlife and Parks has the ultimate regulatory responsibility for threatened or endangered species in this area.

The Kansas Department of Wildlife and Parks reviewed the proposed alignments and indicated their office does not anticipate requiring an assessment or permit within the proposed roadway corridors. However, due to the long-range nature of this project, they will require continued correspondence at the time of future design to ensure the continued applicability of their initial assessment report.

## Proposed Drainage

New drainage structures beneath Switzer Road will be reinforced concrete boxes. The major culvert crossings were sized for a 100-year storm. Water surface elevations were obtained from the "Blue River Watershed Study". A 1' freeboard elevation was utilized in the culvert design. During final design it may be necessary to design a storm system that utilizes area inlets to collect the water at the toes of slope where positive drainage cannot be achieved. Temporary interceptor ditches should be utilized in order to keep large areas of off-site drainage from entering the roadway. The temporary interceptor ditches will only be used where development has not yet occurred. Locations of structures are shown on the plan and profile sheets in the Appendix.

There is one culvert crossing on Switzer Road and two culvert crossings under driveways with connections to Switzer Road. There is an existing ditch along the west side of existing Switzer Road that will be filled in with the future roadway. Future development should be aware that the ditch would need to be relocated outside of the future right-of-

way in order to carry the water downstream to Coffee Creek. The data used in analyzing the storm drainage flowing from the adjacent drainage areas is shown in the table below:

| Structure Location | Size | Area (acres) | C Value | Time of Concentration (min) | $i_{100}$ (in/hr) | $Q_{100}$ (cfs) |
|---|---|---|---|---|---|---|
| (1) 30+80 | Dbl. 14'x 7' | 479 | 0.55 | 36.5 | 5.0 | 1904 |
| (1) 31+33, Lt | Dbl. 8'x 5' | 402 | 0.55 | 36.5 | 5.0 | 2020 |
| (1) 34+47,Lt. | Dbl. 8'x 5' | 402 | 0.55 | 36.5 | 5.0 | 2020 |

(1) Flows (Q) for this structure were determined using the HEC-RAS output from the "Blue River Watershed Study".

**Permitting**

Permits will be required before beginning construction activities on this project. Due to the continually changing nature of permitting requirements, it is recommended the engineer review permitting requirements during the project's preliminary design phase. The following permits may be required and should be investigated:

**404 Permit**
**DWR Permit**
**National Pollution Discharge Elimination System (NPDES) Permit**
**6(f) or Environmental Permit** – for Heritage Park property acquisition
**Federal Aviation Administration Form 7460-1**
**City Land Disturbance Permit**
**City Flood Plain Permit**
**FEMA**
**Other**

**Construction**

At the request of the City, cost estimates and other project data have been calculated. They can be found beginning on page 60 at the back of the report. These opinions of probable costs, in addition to previous studies of this area, will assist the City in phasing of roadway construction.

Access to the schools, church, park, KDOT maintenance facility or any other businesses or residences will need to be maintained during construction. Temporary surfacing will be necessary to maintain access. Recommendations for construction phasing and maintenance of traffic during construction will need to be evaluated during each preliminary project design. The cost of earthwork should also be considered during the sequencing of construction. As shown from the table on the following page, various sections of roadway construction will have excess waste material while other sections will require borrow material.

# ANTIOCH ROAD

## *EXISTING AND PROJECTED CONDITIONS*

**Existing Roadway**

Antioch Road is a north/south thoroughfare serving Overland Park and Johnson County residents. It is a two-lane paved roadway with no shoulders and open ditches. The intersection at 167th Street and Antioch Road was recently provided with interim improvements. An additional lane was added for each leg of the intersection to accommodate the increased turning movements associated with the recently constructed Blue Valley Schools along Antioch Road. Antioch Road is bordered entirely by Overland Park except a portion of the project corridor which is part of Johnson County.

Antioch Road has two intersecting thoroughfares – 159th Street and 167th Street. There is also one intersecting residential side street – 165th Street, as well as several intersecting driveways including two entrances to the Blue Valley Schools along the west side of the road.

**Existing Right-of-Way**

The existing right-of-way is generally 20 feet either side of the section line through undeveloped tracts of land, and is generally 40 feet to 60 feet either side of the section line where subdivisions have been platted. Based on a previous preliminary engineering study that included an alignment shift off of the section line, future right-of-way is generally 20 feet to 100 feet either side of the section line near the 159th Street and Antioch Road intersection. The existing right-of-way is generally 50 feet either side of the section line near the intersection of 167th Street and Antioch Road. The existing right-of-way is shown on the plan drawings in the Appendix.

**Traffic Counts and Projections**

Existing traffic counts indicate a 5,400 ADT volume along Antioch Road from 167th Street to 159th Street. Projected volumes ranging from 16,270 ADT to 20,780 ADT are anticipated for the year 2020. The traffic volume range is due to several variables. The low end of the range assumes a projected 2-lane 167th Street from Antioch Road to Pflumm Road, no interchange at US 69 and 159th Street and a full interchange at US 69 and 167th Street. This scenario assumes a low-density future development. The high end of the range assumes a projected 4-lane 167th Street with full interchanges for US 69 at both 159th Street and 167th Street. This scenario also assumes a high-density future development scenario.

**Existing Land Use**

The properties adjacent to Antioch Road include small subdivisions and a mix of small and large tracts of land. The current planned zoning for the majority of the study corridor is for agricultural use. The Blue Valley School District has several large tracts of land along the west side of Antioch Road between 151st Street and 159th Street. The First Apostolic Church is located at the southeast quadrant of 167th Street and Antioch Road.

There are also numerous small tracts of land along Antioch Road that are currently zoned for residential use.

**Existing Vertical Alignments**

According to the AASHTO design criteria, the intersection of 167th Street and Antioch Road has limited stopping sight distance as does much of the section of Antioch Road between 159th Street and 167th Street. Currently, the speed limit along Antioch Road is 35 mph. Because the proposed design speed is 50 mph, existing high spots in the profile will need to be cut down and low spots will need to be filled in to meet the new criteria.

**Existing Drainage**

There are currently open ditches adjacent to Antioch Road. There are five existing drainage structures crossing Antioch Road. A 48" corrugated metal pipe crosses Antioch Road approximately 0.3 miles south of 167th Street. A 24" corrugated metal pipe crosses Antioch Road approximately 605' north of 167th Street. A 24" reinforced concrete pipe crosses Antioch Road approximately ¼ mile north of 167th Street. A 48" corrugated metal pipe crosses Antioch Road approximately 0.4 miles north of 167th Street. A 6' x 10' elliptical corrugated metal pipe crosses Antioch Road approximately 1100' south of 159th Street. These structures cannot pass a 100-year event. None of the structures are long enough to accommodate the proposed typical section with adequate clear zone.

## *EXISTING UTILITIES*

The major utilities in the study area are telephone, water, power, gas, sanitary sewers and fiber optic. These utility lines are shown on the plan drawings in the Appendix and are described as follows:

**SBC Telephone**

SBC has buried facilities running along both sides of the road at the intersection of 159th Street and Antioch Road. The facilities are only along the east side of Antioch Road from 167th Street to just south of the intersection of 159th Street and Antioch Road.

**Johnson County Wastewater District**

The Wastewater District has two sewer crossings beneath Antioch Road. The first line is a 15" PVC pipe placed in a 30" steel casing pipe that crosses Antioch Road approximately 1070' south of the Antioch Road and 159th Street intersection. The second crossing of Antioch Road is at approximately 440' north of 165th Street. This is an 8" PVC pipe that is placed in a 16" steel casing pipe. Both of these lines are within a 15' easement.

**Water District No. 1 of Johnson County**

The Water District has an 8" line along the west side of Antioch Road south of the intersection of 167th Street and Antioch Road. There is a 12" line along the east side of Antioch Road from south of 167th Street to 159th Street. There are 3 laterals from the 12" main: a 12" line that crosses Antioch Road at 165th Street, an 8" line that crosses at the

southern driveway to the School District and an 8" line that crosses at the northern driveway to the School District. Most of the lines are in private easement and relocations would be at the City's expense.

**Kansas City Power & Light**
KCP&L has overhead facilities along the west side of Antioch Road from south of 167th Street to 167th Street. There are overhead facilities on the east side of the road from 167th Street to the south edge of the Pleasant Hills subdivision at which point there are overhead facilities on both the west side and east side of Antioch Road.

**Kansas Gas Service**
Kansas Gas Service has a 2" line along the east side of Antioch Road from south of 167th Street to 167th Street. There is a 2" line along the west side of Antioch Road from 167th Street to approximately 500' south of 165th Street. The line then increases to an 8" line from approximately 500' south of 165th Street to the south edge of the Pleasant Hills subdivision where it then decreases to a 2" line to 159th Street.

**Time Warner Cable**
Time Warner Cable has overhead facilities attached to KCP&L's poles along the west side of Antioch Road beginning approximately 400' south of 167th Street to the north side of the 167th Street and Antioch Road intersection where service crosses Antioch Road to the east side of the road and continues to 159th Street.

**Blue Valley School District**
Blue Valley School District has a buried fiber optic line along the east side of Antioch Road from 167th Street to 159th Street. There is a crossing of Antioch Road into the School's property at approximately 50' north of the School's south property line.

## *MEDIAN BREAKS AND TURN LANE STORAGE REQUIREMENTS*

The City provided the following recommendations for proposed median break locations and full-width turn lane storage requirements (excluding tapers):

| Location | Northbound | Southbound | Eastbound | Westbound |
|---|---|---|---|---|
| BV West HS (North Drive) | 250 | 200 | | |
| BV West HS (South Drive) | 250 | 200 | | |
| 165th Street | 250 | 200 | | |
| 167th Street | 300 | 300 | 300 | 300 |

## *PRELIMINARY DESIGN*

**Design Criteria**

**TYPICAL SECTIONS**

| | |
|---|---|
| Lane Width | 12'-2" – inside lane<br>13'-0" – outside lane<br>12'-2" – left turn bay |
| Median Width | 24' |
| Parking Lane | None |
| Shoulder | |
| Median | Curb (Type D) |
| Outside | Curb (Type B) |
| Normal Crown | 2.08% (1/4" / ft) |

**SIDE SLOPES**

| | |
|---|---|
| Maximum | 4:1 |

**GEOMETRICS**

| | |
|---|---|
| Design Speed | 50 mph |
| Posted Speed | 45 mph |
| Minimum Curve | 1400' |
| Vertical Alignment | |
| Maximum Grade | 6% |
| Minimum Grade | 1% |
| Stopping Sight Distance | 400' – 475' |
| K Value | 110-150 (Crest)<br>(crest K of 95 will be allowable only in isolated locations)<br>96-110 (Sag) |
| Superelevation Runoff | 1:200 |

**DRAINAGE**

| | |
|---|---|
| Hydrology | Rational Method (<200 acres)<br>SCS TR-55 (>200 acres) |
| Ditch Design | 25 years (Minimum) |
| Drainage Structures (Culverts) | 100-year Design |
| Stream Corridor | 120' Stream Corridor Boundary |

**Proposed Typical Sections**

The typical sections for the proposed roadways are shown in the Appendix. All thoroughfare sections have 10" thick asphaltic concrete pavement over a 6" aggregate base course.

Page 2 of the plans in the Appendix shows the standard four-lane divided thoroughfare section recommended for Antioch Road (159th Street to 167th Street). This section includes a 24' raised median to accommodate a 12'-2" single left turn. The roadway width consists of a 13' outside lane and 12'-2" inside lane. Five-foot sidewalks are located 1-foot inside the proposed right-of-way line. A 10' bike/hike trail will be utilized in locations designated by the Greenway Linkages Master Plan and will be located 1-foot inside the proposed right-of-way line. The trail locations are shown in the plans.

**Proposed Right-of-Way**

Right-of-way requirements are indicated on the plan drawings in the Appendix and on the typical section on page 2 of the plans in the Appendix. All thoroughfare sections will include a 120' right-of-way corridor. Permanent drainage easements will be necessary at the ends of the crossroad drainage structures. Temporary construction easements will be necessary along most properties adjacent to construction. Permanent utility easements are present in most of the sub-divided properties. There are, however, locations where additional utility easements will be necessary to accommodate utility relocations. The final locations of the proposed utility easements should be determined during the project design phase when more accurate utility information is available.

**Proposed Horizontal Alignments**

The proposed centerline follows the section line before transitioning to an offset alignment 20' east of the section line at a point approximately 900' south of 167th Street. This was necessary to minimize impacts to the properties south of 167th Street along the west side of Antioch Road. The offset alignment continues through the 167th Street and Antioch Road intersection before transitioning back to the section line at a point approximately 857' north of 167th Street. The section line alignment continues to a point approximately 455' south of 159th Street where the centerline begins a transition to connect with the centerline that was previously established as part of the 159th Street and Antioch Road intersection preliminary engineering study. That study proposed a 40' alignment offset to the east in order to avoid impact to the homes southwest of the intersection. Therefore, Antioch Road will tie into this offset. A standard thoroughfare section is recommended for Antioch Road as shown in the Appendix.

**Proposed Vertical Alignments**

The minimum design criteria for thoroughfare type roadways is established in the City of Overland Park Municipal Code and the 1990 edition of "A Policy on Geometric Design of Highways and Streets" published by the American Association of State Highway and Transportation Officials. The two main design issues when developing the vertical alignments for these roadways are Stopping Sight Distance (S.S.D.) of a crest vertical curve and the "K" value of a sag vertical curve. The requirements for this project are shown in the Design Criteria section of this report.

**Historical Considerations**

The Kansas State Historical Society (KSHS) has indicated there are no known archaeological sites or historic structures within the project area and thus the improvements should have no effect on properties listed on the National Register of Historic Places. However, during final design it is recommended that further investigation be explored.

**Environmental Considerations**

The Kansas Department of Health and Environment (KDHE) has indicated the Kansas Department of Transportation (KDOT) property located along the northeast corner of the 167th Street and U.S. 69 intersection could contain above ground and/or underground storage tanks within their property. Additionally, the KDHE Bureau of Environmental Remediation has indicated the presence of a solid waste site at the rock quarry located on the northwest corner of the 167th Street and Metcalf Avenue intersection. Further investigation into both properties will need to be explored at the time of preliminary project design. Coordination with KDHE will be required to ensure their requirements have been satisfied.

The U.S. Fish and Wildlife Service branch of the United States Department of the Interior has indicated the project may be located within the area of the following two federally listed threatened plant species: Mead's milkweed (Asclepias meadii) and the western prairie fringed orchid (Platanthera praeclara). They have recommended a survey be done prior to construction to determine whether these plants are present. They have indicated the Kansas Biological Survey be contacted for assistance in determining the necessity of and protocols for plant surveys.

The Kansas Biological Survey at the University of Kansas reviewed the proposed alignments and indicated there should be no protected species within the proposed corridors. They indicated the Kansas Department of Wildlife and Parks has the ultimate regulatory responsibility for threatened or endangered species in this area.

The Kansas Department of Wildlife and Parks reviewed the proposed alignments and indicated their office does not anticipate requiring an assessment or permit within the proposed roadway corridors. However, due to the long-range nature of this project, they will require continued correspondence at the time of future design to ensure the continued applicability of their initial assessment report.

**Proposed Drainage**

New drainage structures beneath Antioch Road will be reinforced concrete boxes and reinforced concrete pipe. The major culvert crossings were sized for a 100-year storm. A 1' freeboard elevation was utilized in the culvert design. During final design it may be necessary to design a storm system that utilizes area inlets to collect the water at the toes of slope where positive drainage cannot be achieved. Temporary interceptor ditches should be utilized in order to keep large areas of off-site drainage from entering the roadway. The temporary interceptor ditches will only be used where development has

not yet occurred. Locations of structures are shown on the plan and profile sheets in the Appendix.

There are five culvert crossings beneath Antioch Road. The data used in analyzing the storm drainage flowing from the adjacent drainage areas is shown in the table below:

| Structure Location | Size | Area (acres) | C Value | Time of Concentration (min) | $i_{100}$ (in/hr) | $Q_{100}$ (cfs) |
|---|---|---|---|---|---|---|
| 4+10 | 48" | 31 | 0.55 | 14.9 | 7.4 | 157 |
| 26+31 | 30" | 8 | 0.55 | 12.9 | 7.8 | 43 |
| 35+00 | 42" | 11 | 0.55 | 13.0 | 7.8 | 61 |
| 43+54 | 6'x 5' | 55 | 0.55 | 12.5 | 7.9 | 298 |
| (1) 61+80 | Dbl. 11'x 6' | 216 | 0.55 | 18.3 | 6.9 | 1138 |

(1) Flows (Q) for this structure were determined using TR-55.

**Existing Lakes and Ponds**

A man-made private lake is located on the east side of Antioch Road south of 167th Street. The wider proposed roadway section as well as the extension of the grading limits will affect this lake. In addition, the saturated ground near the lake could pose construction problems. It is recommended that the lake be drained during construction of the proposed roadway and that the west berm of the lake be moved to the east, outside of the proposed right-of-way. Further investigation will be needed during the preliminary project design to determine whether the measures used in this study are practical or if there are other alternatives.

A man-made private pond is located along the east side of Antioch Road approximately 400' north of 167th Street. The proposed roadway will not affect the pond.

**Permitting**

Permits will be required before beginning construction activities on this project. Due to the continually changing nature of permitting requirements, it is recommended the engineer review permitting requirements during the project's preliminary design phase. The following permits may be required and should be investigated:

**404 Permit**
**DWR Permit**
**National Pollution Discharge Elimination System (NPDES) Permit**
**6(f) or Environmental Permit** – for Heritage Park property acquisition
**Federal Aviation Administration Form 7460-1**
**City Land Disturbance Permit**
**City Flood Plain Permit**
**FEMA**
**Other**

**Construction**

At the request of the City, cost estimates and other project data have been calculated. They can be found beginning on page 60 at the back of the report. These opinions of probable costs, in addition to previous studies of this area, will assist the City in phasing of roadway construction.

Access to the schools, church, park, KDOT maintenance facility or any other businesses or residences will need to be maintained during construction. Temporary surfacing will be necessary to maintain access. Recommendations for construction phasing and maintenance of traffic during construction will need to be evaluated during each preliminary project design. The cost of earthwork should also be considered during the sequencing of construction. As shown from the table on the following page, various sections of roadway construction will have excess waste material while other sections will require borrow material.

# 167TH STREET & METCALF AVENUE INTERSECTION

## *EXISTING AND PROJECTED CONDITIONS*

**Existing Roadway**

Metcalf Avenue is a north/south thoroughfare serving Overland Park and Johnson County residents. It is a two-lane paved roadway with no shoulders and open ditches. Portions of Metcalf Avenue are bordered by both Overland Park and Johnson County.

Metcalf Avenue has one intersecting thoroughfare – 167th Street. There is also one intersecting residential side street – 166th Terrace, as well as several intersecting residential driveways on the east side of the road.

**Existing Right-of-Way**

The existing right-of-way is generally 30 feet either side of the section line through undeveloped tracts of land, and is also generally 30 feet either side of the section line where subdivisions have been platted. The existing right-of-way is shown on the plan drawings in the Appendix.

**Traffic Counts and Projections**

Existing traffic counts indicate a 4,900 ADT volume along Metcalf Avenue at the intersection of 167th Street. Projected volumes ranging from 18,470 ADT to 21,500 ADT are anticipated for the year 2020. The traffic volume range is due to several variables. The low end of the range assumes a projected 2-lane 167th Street from Antioch Road to Pflumm Road, no interchange at US 69 and 159th Street and a full interchange at US 69 and 167th Street. This scenario assumes a low-density future development. The high end of the range assumes a projected 4-lane 167th Street with full interchanges for US 69 at both 159th Street and 167th Street. This scenario also assumes a high-density future development scenario.

**Existing Land Use**

The properties adjacent to Metcalf Avenue consist of several large tracts of land as well as several small tracts of land. A rock quarry is located along the northwest quadrant of the intersection of 167th Street and Metcalf Avenue. The northeast quadrant of 167th Street and Metcalf Avenue intersection is currently zoned for residential use. Both the southwest and southeast quadrant of the intersection of 167th Street and Metcalf Avenue are currently vacant tracts of land zoned for agricultural use.

**Existing Vertical Alignments**

According to the AASHTO design criteria, the northern section of the Metcalf Avenue corridor has limited stopping sight distance. Currently, the speed limit along Metcalf Avenue is 35 mph. However, because the proposed design speed is 50 mph, existing high spots in the profile will need to be cut down and low spots will need to be filled in to meet the new criteria.

**Existing Drainage**
There are currently open ditches adjacent to Metcalf Avenue. There are two existing drainage structures crossing Metcalf Avenue. An 18" x 30" elliptical pipe crosses Metcalf Avenue approximately 260' south of 167th Street. A 4' x 10' reinforced concrete box crosses Metcalf Avenue approximately 700' north of 167th Street. These structures cannot pass a 100-year event. None of the structures are long enough to accommodate the proposed typical section with adequate clear zone.

## *EXISTING UTILITIES*

The major utilities in the study area are telephone, water, power, gas, sanitary sewers and fiber optic. These utility lines are shown on the plan drawings in the Appendix and are described as follows:

**SBC Telephone**
SBC has buried facilities running along the east side of Metcalf Avenue.

**Water District No. 1 of Johnson County**
The Water District has a 6" line along the west side of Metcalf Avenue. There are 2 laterals from the 6" main: a 6" line that crosses Metcalf Avenue at 166th Terrace and a 2" line that crosses Metcalf Avenue at 165th Street.

**Kansas City Power & Light**
KCP&L has overhead facilities along both the west and east side of Metcalf Avenue south of 167th Street. The eastern facilities cross to the west side of the road at the intersection of 167th Street and Metcalf Avenue and then proceed along the west side of Metcalf Avenue north of 167th Street.

**Kansas Gas Service**
Kansas Gas Service has a 4" line along the east side of Metcalf Avenue from south of 167th Street to 166th Terrace. The line increases to a 6" line north of 166th Terrace.

**Time Warner Cable**
Time Warner Cable has overhead facilities attached to KCP&L's poles along the west side of Metcalf Avenue.

## *MEDIAN BREAKS AND TURN LANE STORAGE REQUIREMENTS*

The City provided the following recommendations for proposed median break locations and full-width turn lane storage requirements (excluding tapers):

| Location | Northbound | Southbound | Eastbound | Westbound |
|---|---|---|---|---|
| 167th Street | 300 | 300 | 300 | 300 |

# PRELIMINARY DESIGN

**Design Criteria**

**TYPICAL SECTIONS**

| | |
|---|---|
| Lane Width | 12'-2" – inside lane<br>13'-0" – outside lane<br>12'-2" – left turn bay |
| Median Width | 24' |
| Parking Lane | None |
| Shoulder | |
| Median | Curb (Type D) |
| Outside | Curb (Type B) |
| Normal Crown | 2.08% (1/4" / ft) |

**SIDE SLOPES**

| | |
|---|---|
| Maximum | 4:1 |

**GEOMETRICS**

| | |
|---|---|
| Design Speed | 50 mph |
| Posted Speed | 45 mph |
| Minimum Curve | 1400' |
| Vertical Alignment | |
| Maximum Grade | 6% |
| Minimum Grade | 1% |
| Stopping Sight Distance | 400' – 475' |
| K Value | 110-150 (Crest)<br>(crest K of 95 will be allowable only in isolated locations)<br>96-110 (Sag) |
| Superelevation Runoff | 1:200 |

**DRAINAGE**

| | |
|---|---|
| Hydrology | Rational Method (<200 acres)<br>SCS TR-55 (>200 acres) |
| Ditch Design | 25 years (Minimum) |
| Drainage Structures (Culverts) | 100-year Design |
| Stream Corridor | 120' Stream Corridor Boundary |

**Proposed Typical Sections**

The typical sections for the proposed roadways are shown in the Appendix. All thoroughfare sections have 10" thick asphaltic concrete pavement over a 6" aggregate base course.

Page 2 of the plans in the Appendix shows the standard four-lane divided thoroughfare section recommended for the 167th Street and Metcalf Avenue Intersection. This section includes a 24' raised median to accommodate a 12'-2" single left turn. The roadway width consists of a 13' outside lane and 12'-2" inside lane. Five-foot sidewalks are located 1-foot inside the proposed right-of-way line. A 10' bike/hike trail will be utilized in locations designated by the Greenway Linkages Master Plan and will be located 1-foot inside the proposed right-of-way line. The trail locations are shown in the plans.

**Proposed Right-of-Way**

Right-of-way requirements are indicated on the plan drawings in the Appendix and on the typical section on page 2 of the plans in the Appendix. All thoroughfare sections will include a 120' right-of-way corridor. Permanent drainage easements will be necessary at the ends of the crossroad drainage structures. Temporary construction easements will be necessary along most properties adjacent to construction. Permanent utility easements are present in most of the sub-divided properties. There are, however, locations where additional utility easements will be necessary to accommodate utility relocations. The final locations of the proposed utility easements should be determined during the project design phase when more accurate utility information is available.

**Proposed Horizontal Alignments**

A standard thoroughfare section, centered on the section line, is recommended for Metcalf Avenue as shown in the Appendix.

**Proposed Vertical Alignments**

The minimum design criteria for thoroughfare type roadways is established in the City of Overland Park Municipal Code and the 1990 edition of "A Policy on Geometric Design of Highways and Streets" published by the American Association of State Highway and Transportation Officials. The two main design issues when developing the vertical alignments for these roadways are Stopping Sight Distance (S.S.D.) of a crest vertical curve and the "K" value of a sag vertical curve. The requirements for this project are shown in the Design Criteria section of this report.

**Historical Considerations**

The Kansas State Historical Society (KSHS) has indicated there are no known archaeological sites or historic structures within the project area and thus the improvements should have no effect on properties listed on the National Register of Historic Places. However, during final design it is recommended that further investigation be explored.

## Environmental Considerations

The Kansas Department of Health and Environment (KDHE) has indicated the Kansas Department of Transportation (KDOT) property located along the northeast corner of the 167th Street and U.S. 69 intersection could contain above ground and/or underground storage tanks within their property. Additionally, the KDHE Bureau of Environmental Remediation has indicated the presence of a solid waste site at the rock quarry located on the northwest corner of the 167th Street and Metcalf Avenue intersection. Further investigation into both properties will need to be explored at the time of preliminary project design. Coordination with KDHE will be required to ensure their requirements have been satisfied.

The U.S. Fish and Wildlife Service branch of the United States Department of the Interior has indicated the project may be located within the area of the following two federally listed threatened plant species: Mead's milkweed (Asclepias meadii) and the western prairie fringed orchid (Platanthera praeclara). They have recommended a survey be done prior to construction to determine whether these plants are present. They have indicated the Kansas Biological Survey be contacted for assistance in determining the necessity of and protocols for plant surveys.

The Kansas Biological Survey at the University of Kansas reviewed the proposed alignments and indicated there should be no protected species within the proposed corridors. They indicated the Kansas Department of Wildlife and Parks has the ultimate regulatory responsibility for threatened or endangered species in this area.

The Kansas Department of Wildlife and Parks reviewed the proposed alignments and indicated their office does not anticipate requiring an assessment or permit within the proposed roadway corridors. However, due to the long-range nature of this project, they will require continued correspondence at the time of future design to ensure the continued applicability of their initial assessment report.

## Proposed Drainage

New drainage structures beneath Metcalf Avenue will be reinforced concrete boxes. The major culvert crossings were sized for a 100-year storm. A 1' freeboard elevation was utilized in the culvert design. During final design it may be necessary to design a storm system that utilizes area inlets to collect the water at the toes of slope where positive drainage cannot be achieved. Temporary interceptor ditches should be utilized in order to keep large areas of off-site drainage from entering the roadway. The temporary interceptor ditches will only be used where development has not yet occurred. Locations of structures are shown on the plan and profile sheets in the Appendix.

There are two culvert crossings beneath Metcalf Avenue and one culvert alongside Metcalf Avenue that crosses beneath 166th Terrace. The data used in analyzing the storm drainage flowing from the adjacent drainage areas is shown in the table below:

| Structure Location | Size | Area (acres) | C Value | Time of Concentration (min) | $i_{100}$ (in/hr) | $Q_{100}$ (cfs) |
|---|---|---|---|---|---|---|
| 17+39 | 5'x 5' | 76 | 0.55 | 12.3 | 7.5 | 394 |
| (1) 25+65 | 5'x 5' | 45 | 0.55 | 16.7 | 7.1 | 430 |
| (2) 20+48 | 5'x 4.5' | 41 | 0.55 | 14.7 | 7.4 | 210 |

(1) Flow for this structure will include flow coming from structure under 166th Terrace.

(2) Stationing is for 166th Terrace. Structure carries flow under 166th Terrace, adjacent to Metcalf Avenue and connects with structure under Metcalf Avenue at station 25+65.

**Proposed Retaining Walls**

Retaining walls will be required at several locations where the extension of the roadway side slopes would adversely affect adjacent landowners. The recommended retaining wall locations are shown on the plans in the Appendix.

A retaining wall will be necessary along the rock quarry property along the west side of Metcalf Avenue to minimize the potential of extensive rock cuts. Geotechnical investigations during preliminary design will be necessary to determine the need for this wall.

Further investigation may be needed during the preliminary project design to determine the practicality of using retaining walls shown on the preliminary plans.

**Permitting**

Permits will be required before beginning construction activities on this project. Due to the continually changing nature of permitting requirements, it is recommended the engineer review permitting requirements during the project's preliminary design phase. The following permits may be required and should be investigated:

**404 Permit**
**DWR Permit**
**National Pollution Discharge Elimination System (NPDES) Permit**
**6(f) or Environmental Permit** – for Heritage Park property acquisition
**Federal Aviation Administration Form 7460-1**
**City Land Disturbance Permit**
**City Flood Plain Permit**
**FEMA**
**Other**

**Construction**

At the request of the City, cost estimates and other project data have been calculated. They can be found beginning on page 60 at the back of the report. These opinions of probable costs, in addition to previous studies of this area, will assist the City in phasing of roadway construction.

Access to the schools, church, park, KDOT maintenance facility or any other businesses or residences will need to be maintained during construction. Temporary surfacing will

be necessary to maintain access. Recommendations for construction phasing and maintenance of traffic during construction will need to be evaluated during each preliminary project design. The cost of earthwork should also be considered during the sequencing of construction. As shown from the table on the following page, various sections of roadway construction will have excess waste material while other sections will require borrow material.

## Estimated Earthwork Volumes

| Unclassified Excavation | Compaction | Waste/Borrow |
|---|---|---|
| **167th/Pflumm Intersection** | | |
| 5,374 | 24,823 | 19,449 cu. yd. Borrow |
| | | |
| **167th (Pflumm to Quivira)** | | |
| 35,722 | 13,518 | 22,204 cu. yd. Waste |
| | | |
| **167th/Quivira Intersection** | | |
| 25,670 | 19,977 | 5,693 cu. yd. Waste |
| | | |
| **167th (Quivira to Switzer)** | | |
| 12,592 | 55,533 | 42,941 cu. yd. Borrow |
| | | |
| **167th/Switzer Intersection** | | |
| 52,247 | 2,103 | 50,144 cu. yd. Waste |
| | | |
| **167th (Switzer to Antioch)** | | |
| 58,315 | 40,125 | 18,190 cu. yd. Waste |
| | | |
| **167th/Antioch Intersection** | | |
| 16,251 | 24,916 | 8,665 cu. yd. Borrow |
| | | |
| **167th (Antioch to Metcalf)** | | |
| 121,233 | 16,173 | 105,060 cu. yd. Waste |
| | | |
| **167th/Metcalf Intersection** | | |
| 33,716 | 46,479 | 12,763 cu. yd. Borrow |
| | | |
| **159th/Pflumm Intersection** | | |
| 16,634 | 12,753 | 3,881 cu. yd. Waste |
| | | |
| **Pflumm (159th to 167th)** | | |
| 51,494 | 115,083 | 63,589 cu. yd. Borrow |
| | | |
| **Pflumm (167th to 175th)** | | |
| 38,993 | 33,924 | 5,069 cu. yd. Waste |
| | | |
| **175th & Pflumm Intersection** | | |
| 4,790 | 11,765 | 6,975 cu. yd. Borrow |
| | | |
| **Quivira (159th to 167th)** | | |
| 30,013 | 27,620 | 2,393 cu. yd. Waste |
| | | |
| **Switzer (159th to 167th)** | | |
| 23,303 | 36,292 | 12,989 cu. yd. Borrow |
| | | |
| **Antioch (159th to 167th)** | | |
| 43,628 | 25,370 | 18,258 cu. yd. Waste |

Note: All volumes shown are unadjusted volumes. No shrinkage factor has been applied.

## ***OPINIONS OF PROBABLE COSTS***

### Preliminary Project Cost Estimate

| | 167th/ Pflumm Intersection | 167th (Pflumm to Quivira) | 167th/ Quivira Intersection | 167th (Quivira to Switzer) | 167th/ Switzer Intersection | 167th (Switzer to Antioch) | 167th/ Antioch Intersection | 167th (Antioch to Metcalf) | 167th/ Metcalf Intersection | 159th/ Pflumm Intersection | Pflumm (159th to 167th) | Pflumm (167th to 175th) | 175th/ Pflumm Intersection | Quivira (159th to 167th) | Switzer (159th to 167th) | Antioch (159th to 167th) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Construction Cost | $1,791,661 | $4,553,271 | $2,419,742 | $9,977,113 | $2,993,801 | $5,239,830 | $3,209,713 | $13,216,851 | $4,129,360 | $2,584,717 | $8,913,897 | $3,586,781 | $1,750,774 | $9,349,097 | $5,096,739 | $5,601,842 |
| 2 Estimated Change Orders | $89,583 | $227,664 | $120,987 | $498,856 | $149,690 | $261,991 | $160,486 | $660,843 | $206,468 | $129,236 | $445,695 | $179,339 | $87,539 | $467,455 | $254,837 | $280,092 |
| 3 Engineering | | | | | | | | | | | | | | | | |
| *Final Design* | $179,166 | $455,327 | $241,974 | $997,711 | $299,380 | $523,983 | $320,971 | $1,321,685 | $412,936 | $258,472 | $891,390 | $358,678 | $175,077 | $934,910 | $509,674 | $560,184 |
| *Conultant EDC* | $17,917 | $45,533 | $24,197 | $99,771 | $29,938 | $52,398 | $32,097 | $132,169 | $41,294 | $25,847 | $89,139 | $35,868 | $17,508 | $93,491 | $50,967 | $56,018 |
| City Inspection (if Federal/CARS/SMAC/Other Cities Eligible) | $53,750 | $136,598 | $72,592 | $299,313 | $89,814 | $157,195 | $96,291 | $396,506 | $123,881 | $77,542 | $267,417 | $107,603 | $52,523 | $280,473 | $152,902 | $168,055 |
| 4 Material Testing | $17,917 | $45,533 | $24,197 | $99,771 | $29,938 | $52,398 | $32,097 | $132,169 | $41,294 | $25,847 | $89,139 | $35,868 | $17,508 | $93,491 | $50,967 | $56,018 |
| 5 Project Administration | $17,917 | $45,533 | $24,197 | $99,771 | $29,938 | $52,398 | $32,097 | $132,169 | $41,294 | $25,847 | $89,139 | $35,868 | $17,508 | $93,491 | $50,967 | $56,018 |
| 6 Legal Publications, Blueprinting, Misc. | $8,958 | $22,766 | $12,099 | $49,886 | $14,969 | $26,199 | $16,049 | $66,084 | $20,647 | $12,924 | $44,569 | $17,934 | $8,754 | $46,745 | $25,484 | $28,009 |
| 7 Ownership Certificates/Title Report | $8,958 | $22,766 | $12,099 | $49,886 | $14,969 | $26,199 | $16,049 | $66,084 | $20,647 | $12,924 | $44,569 | $17,934 | $8,754 | $46,745 | $25,484 | $28,009 |
| 8 R/W & Easement Acquisitions | $208,335 | $1,128,410 | $489,687 | $1,300,279 | $450,725 | $790,529 | $482,088 | $667,004 | $616,577 | $351,285 | $1,141,096 | $525,920 | $257,920 | $870,249 | $859,365 | $551,840 |
| 9 Utility Relocations | $26,550 | $0 | $77,000 | $20,000 | $155,300 | $460,300 | $51,025 | $806,670 | $183,200 | $76,950 | $53,550 | $114,980 | $8,420 | $635,250 | $544,050 | $35,000 |
| **Total Project Cost** | **$2,420,712** | **$6,683,401** | **$3,518,773** | **$13,492,357** | **$4,258,462** | **$7,643,422** | **$4,448,963** | **$17,598,232** | **$5,837,597** | **$3,581,589** | **$12,069,601** | **$5,016,772** | **$2,402,285** | **$12,911,398** | **$7,621,436** | **$7,421,087** |

## Utility Relocation Costs

Based on preliminary information, it appears several of the existing utilities will need to be relocated. No subsurface investigations of existing facilities were performed during this study. Therefore, during final design additional information should be obtained to evaluate more accurately the possibility of avoiding some of the facilities that were assumed to need relocation in this study. The following tables provide a summary of potential utility relocations and opinions of relocation costs for those utilities located in private easement.

**167th/Pflumm Intersection**

| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
|---|---|---|---|---|
| Water District No. 1 | 8" DI Waterline | 590 | $45 | $26,550 |
| | | | **Subtotal=** | $26,550 |

**167th (Pflumm to Quivira)**

| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
|---|---|---|---|---|
| | | | | $0 |
| | | | **Subtotal=** | $0 |

**167th/Quivira Intersection**

| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
|---|---|---|---|---|
| Water District No. 1 | 36" Transmission Line | 350 | $220 | $77,000 |
| | | | **Subtotal=** | $77,000 |

**167th (Quivira to Switzer)**

| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
|---|---|---|---|---|
| Johnson County Wastewater | Sanitary Line | 500 | $40 | $20,000 |
| | | | **Subtotal=** | $20,000 |

**167th/Switzer Intersection**

| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
|---|---|---|---|---|
| Water District No. 1 | 12" DI Waterline | 590 | $70 | $41,300 |
| Atmos Energy | 2" Gas Line | 1,900 | $20 | $38,000 |
| SBC | Telephone Line | 1,900 | $40 | $76,000 |
| | | | **Subtotal=** | $155,300 |

**167th (Switzer to Antioch)**

| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
|---|---|---|---|---|
| Water District No. 1 | 12" DI Waterline | 3,730 | $70 | $261,100 |
| Atmos Energy | 2" Gas Line | 3,000 | $20 | $60,000 |
| SBC | Telephone Line | 3,480 | $40 | $139,200 |
| | | | **Subtotal=** | $460,300 |

| **167th/Antioch Intersection** | | | | |
|---|---|---|---|---|
| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
| Water District No. 1 | 12" DI Waterline | 400 | $70 | $28,000 |
| Water District No. 1 | 6" DI Waterline | 115 | $35 | $4,025 |
| Kansas Gas Service | 2" Gas Line | 950 | $20 | $19,000 |
| | | | **Subtotal=** | $51,025 |

| **167th (Antioch to Metcalf)** | | | | |
|---|---|---|---|---|
| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
| | 6" DI Waterline | 3,710 | $35 | $129,850 |
| Kansas Gas Service | 4" Gas Line | 3,240 | $25 | $81,000 |
| Kansas Gas Service | 2" Gas Line | 1,040 | $20 | $20,800 |
| SBC | Telephone Line | 4,280 | $40 | $171,200 |
| Kansas City Power & Light | Overhead Power | 6,164 | $55 | $339,020 |
| Blue Valley School District | Fiber Optic | 2,160 | $30 | $64,800 |
| | | | **Subtotal=** | $806,670 |

| **167th/Metcalf Intersection** | | | | |
|---|---|---|---|---|
| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
| SBC | Telephone Line | 480 | $40 | $19,200 |
| Kansas City Power & Light | Overhead Power | 2,720 | $55 | $149,600 |
| Blue Valley School District | Fiber Optic | 480 | $30 | $14,400 |
| | | | **Subtotal=** | $183,200 |

| **159th/Pflumm Intersection** | | | | |
|---|---|---|---|---|
| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
| Water District No. 1 | 1 1/2" PVC Waterline | 430 | $15 | $6,450 |
| Water District No. 1 | 16" DI Waterline | 705 | $100 | $70,500 |
| | | | **Subtotal=** | $76,950 |

| **Pflumm (159th to 167th)** | | | | |
|---|---|---|---|---|
| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
| Water District No. 1 | 1 1/2" PVC Waterline | 930 | $15 | $13,950 |
| Water District No. 1 | 8" DI Waterline | 880 | $45 | $39,600 |
| | | | **Subtotal=** | $53,550 |

| **Pflumm (167th to 175th)** | | | | |
|---|---|---|---|---|
| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
| Water District No. 1 | 2" PVC Waterline | 1,519 | $20 | $30,380 |
| Water District No. 1 | 8" DI Waterline | 1,880 | $45 | $84,600 |
| | | | **Subtotal=** | $114,980 |

| **175th/Pflumm Intersection** | | | | |
|---|---|---|---|---|
| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
| Water District No. 1 | 2" PVC Waterline | 421 | $20 | $8,420 |
| | | | **Subtotal=** | $8,420 |

| **Quivira (159th to 167th)** | | | | |
|---|---|---|---|---|
| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
| Water District No. 1 | 36" Transmission Line | 300 | $220 | $66,000 |
| Kansas City Power & Light | Overhead Power | 10,350 | $55 | $569,250 |
| | | | **Subtotal=** | $635,250 |

| **Switzer (159th to 167th)** | | | | |
|---|---|---|---|---|
| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
| Water District No. 1 | 12" DI Waterline | 700 | $70 | $49,000 |
| Water District No. 1 | 8" DI Waterline | 500 | $45 | $22,500 |
| Atmos Energy | 2" Gas Line | 3,060 | $20 | $61,200 |
| SBC | Telephone Line | 4,330 | $40 | $173,200 |
| Kansas City Power & Light | Overhead Power | 4,330 | $55 | $238,150 |
| | | | **Subtotal=** | $544,050 |

| **Antioch (159th to 167th)** | | | | |
|---|---|---|---|---|
| Utility Company | Description | Length (ft) | Cost/ft | Relocation Cost |
| Water District No. 1 | 12" DI Waterline | 500 | $70 | $35,000 |
| | | | **Subtotal=** | $35,000 |

**Right-of-Way Costs**

Additional right-of-way and easements will be required for these projects as summarized below. All right-of-way costs are based on information obtained from the City of Overland Park. Costs include right-of-way, drainage and temporary construction easements.

The following unit costs were used to develop the proposed right-of-way costs for the different sections:

Platted
Right-of-Way……...$3.80 per square foot
Permanent Drainage Easement……$1.90 per square foot
Temporary Construction Easement…….$0.95 per square foot

Unplatted
Right-of-Way……...$1.90 per square foot
Permanent Drainage Easement……$0.95 per square foot
Temporary Construction Easement…….$0.48 per square foot

The tracts of land that have structures that will potentially need to be removed are:

Tract no.'s 7, 18, 19 and 87

The costs associated with the potential structure removals have been added into the right-of-way costs. The actual value of each house will be determined during the appraisal process. This is to assist the City in determining the potential for right-of-way acquisition for each section.

| Right-of-Way | Permanent Drainage Easement | Temporary Construction Easement |
|---|---|---|
| **167th/Pflumm Intersection** | | |
| $168,011 | $7,862 | $32,462 |
| **167th (Pflumm to Quivira)** | | |
| $998,961 | $9,518 | $119,931 |
| **167th/Quivira Intersection** | | |
| $421,943 | $0 | $67,744 |
| **167th (Quivira to Switzer)** | | |
| $1,085,549 | $13,840 | $200,891 |
| **167th/Switzer Intersection** | | |
| $378,248 | $0 | $72,477 |
| **167th (Switzer to Antioch)** | | |
| $595,737 | $15,011 | $179,781 |

**167th/Antioch Intersection**

| | | |
|---|---|---|
| $371,262 | $2,280 | $108,546 |

**167th (Antioch to Metcalf)**

| | | |
|---|---|---|
| $537,311 | $0 | $154,524 |

**167th/Metcalf Intersection**

| | | |
|---|---|---|
| $405,893 | $28,064 | $182,620 |

**159th/Pflumm Intersection**

| | | |
|---|---|---|
| $295,467 | $2,483 | $53,334 |

**Pflumm (159th to 167th)**

| | | |
|---|---|---|
| $851,352 | $2,897 | $286,848 |

**Pflumm (167th to 175th)**

| | | |
|---|---|---|
| $387,345 | $18,098 | $120,476 |

**175th & Pflumm Intersection**

| | | |
|---|---|---|
| $222,481 | $1,503 | $33,937 |

**Quivira (159th to 167th)**

| | | |
|---|---|---|
| $725,013 | $0 | $145,236 |

**Switzer (159th to 167th)**

| | | |
|---|---|---|
| $755,795 | $11,587 | $91,983 |

**Antioch (159th to 167th)**

| | | |
|---|---|---|
| $346,921 | $23,809 | $181,110 |

**Construction Costs**

Detailed preliminary opinions of probable cost are shown on the following pages. Separate quantities and construction costs have been figured for each of the following:

- 167th Street & Pflumm Road Intersection
- 167th Street (Pflumm Road to Quivira Road)
- 167th Street & Quivira Road Intersection
- 167th Street (Quivira Road to Switzer Road)
- 167th Street & Switzer Road Intersection
- 167th Street (Switzer Road to Antioch Road)
- 167th Street & Antioch Road Intersection
- 167th Street (Antioch Road to Metcalf Avenue)
- 167th Street & Metcalf Avenue Intersection
- 159th Street & Pflumm Road Intersection
- Pflumm Road (159th Street to 167th Street)
- Pflumm Road (167th Street to 175th Street)
- 175th Street & Pflumm Road Intersection
- Quivira Road (159th Street to 167th Street)
- Switzer Road (159th Street to 167th Street)
- Antioch Road (159th Street to 167th Street)

**2003 Preliminary Enginnering Study Quantities/Construction Costs**

| Item Description | Unit | Unit Price | 167th/Pflumm Intersection | | 167th (Pflumm to Quivira) | | 167th/Quivira Intersection | | 167th (Quivira to Switzer) | | 167th/Switzer Intersection | | 167th (Switzer to Antioch) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Approx. Quantity | Total | Approx. Quantity | Total | Approx. Quantity | Total | Approx. Quantity | Total | Approx. Quantity | Total | Approx. Quantity | Total |
| Clearing & Grubbing | lump sum | lump sum | 1 | $150,000 | 1 | $250,000 | 1 | $20,000 | 1 | $250,000 | 1 | $30,000 | 1 | $125,000 |
| Removal of Existing Structures | lump sum | lump sum | 1 | $22,659 | 1 | $59,288 | 1 | $30,505 | 1 | $133,867 | 1 | $38,398 | 1 | $68,728 |
| Haunched Slab Bridge | s.f. | $80 | 0 | $0 | 0 | $0 | 0 | $0 | 13,720 | $1,097,600 | 0 | $0 | 0 | $0 |
| Prestressed Concrete Girder Bridge | s.f. | $90 | 0 | $0 | 0 | $0 | 0 | $0 | 29,400 | $2,646,000 | 0 | $0 | 0 | $0 |
| Unclassified Excavation | c.y. | $15 | 5,374 | $80,610 | 35,722 | $535,830 | 25,670 | $385,050 | 12,592 | $188,880 | 52,247 | $783,705 | 58,315 | $874,725 |
| Compaction of Earthwork (All Types) | c.y. | $4 | 24,823 | $99,292 | 13,518 | $54,072 | 19,977 | $79,908 | 55,533 | $222,132 | 2,103 | $8,412 | 40,125 | $160,500 |
| Embankment (Contractor Furnished) | c.y. | $12 | 19,449 | $233,388 | 0 | $0 | 0 | $0 | 42,941 | $515,292 | 0 | $0 | 0 | $0 |
| Asphaltic Concrete Surface Course | tons | $70 | 616 | $43,124 | 2,072 | $145,072 | 1,295 | $90,677 | 1,717 | $120,171 | 1,297 | $90,823 | 2,145 | $150,167 |
| Asphaltic Concrete Intermediate Course | tons | $60 | 3,640 | $218,385 | 12,483 | $748,967 | 7,632 | $457,897 | 10,285 | $617,076 | 7,643 | $458,608 | 12,958 | $777,470 |
| Aggregate Base Course (OP Special) | s.y. | $8 | 8,636 | $69,086 | 30,744 | $245,950 | 17,847 | $142,775 | 25,316 | $202,526 | 17,873 | $142,984 | 31,778 | $254,227 |
| Fly Ash | tons | $40 | 513 | $20,519 | 1,459 | $58,360 | 912 | $36,478 | 1,209 | $48,343 | 913 | $36,537 | 1,510 | $60,410 |
| Manipulation for Fly Ash Treated Subgrad | s.y. | $4 | 8,636 | $34,543 | 24,562 | $98,250 | 15,353 | $61,411 | 20,346 | $81,385 | 15,377 | $61,510 | 25,425 | $101,700 |
| Curb & Gutter, Combined (Type B) | l.f. | $15 | 1,984 | $29,760 | 8,784 | $131,760 | 3,602 | $54,030 | 7,369 | $110,535 | 3,605 | $54,075 | 8,684 | $130,260 |
| Curb (Type D) | l.f. | $12 | 1,769 | $21,228 | 8,784 | $105,408 | 3,461 | $41,532 | 6,616 | $79,392 | 3,461 | $41,532 | 9,528 | $114,336 |
| Concrete Median Nose | each | $1,500 | 3 | $4,500 | 0 | $0 | 5 | $7,500 | 0 | $0 | 0 | $0 | 0 | $0 |
| Concrete Entrance Pavement (8") | s.y. | $65 | 0 | $0 | 0 | $0 | 80 | $5,200 | 115 | $7,446 | 1,035 | $67,246 | 1,736 | $112,833 |
| KCMMB 4k Concrete (ISRW) | c.y. | $600 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 13 | $7,800 | 0 | $0 |
| Reinforced Concrete Structural Wall | c.y. | $900 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| Sidewalk Construction | s.y. | $42 | 1,094 | $45,967 | 4,880 | $204,955 | 1,965 | $82,535 | 4,315 | $181,211 | 1,476 | $62,006 | 4,708 | $197,741 |
| A.C. Bike Trail | tons | $65 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 217 | $14,073 | 0 | $0 |
| Underdrain (6") (all types) | l.f. | $14 | 1,984 | $27,776 | 8,784 | $122,976 | 3,602 | $50,428 | 7,369 | $103,166 | 3,605 | $50,470 | 8,684 | $121,576 |
| 27" RCP Class III Storm Sewer | l.f. | $60 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 30" RCP Class III Storm Sewer | l.f. | $70 | 0 | $0 | 0 | $0 | 0 | $0 | 280 | $19,600 | 0 | $0 | 0 | $0 |
| 36" RCP Class III Storm Sewer | l.f. | $85 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 42" RCP Class III Storm Sewer | l.f. | $105 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 48" RCP Class III Storm Sewer | l.f. | $140 | 183 | $25,620 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 54" RCP Class III Storm Sewer | l.f. | $190 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 60" RCP Class III Storm Sewer | l.f. | $250 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 5' x 4.5' Reinforced Concrete Box Culvert | l.f. | $320 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 5' x 5' Reinforced Concrete Box Culvert | l.f. | $350 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 380 | $133,000 |
| 6' x 5' Reinforced Concrete Box Culvert | l.f. | $425 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 7' x 5' Reinforced Concrete Box Culvert | l.f. | $500 | 0 | $0 | 0 | $0 | 0 | $0 | 332 | $166,000 | 0 | $0 | 148 | $74,000 |
| 8' x 5' Reinforced Concrete Box Culvert | l.f. | $575 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 9' x 4' Reinforced Concrete Box Culvert | l.f. | $550 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 11' x 4' Reinforced Concrete Box Culvert | l.f. | $650 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 11' x 6' Reinforced Concrete Box Culvert | l.f. | $900 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 12' x 6' Reinforced Concrete Box Culvert | l.f. | $1,000 | 0 | $0 | 233 | $233,000 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 14' x 7' Reinforced Concrete Box Culvert | l.f. | $1,300 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 36' x 8' CONSPAN Structure | l.f. | $1,700 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 27" RCP Class III End Section | each | $800 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 30" RCP Class III End Section | each | $950 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 36" RCP Class III End Section | each | $1,200 | 0 | $0 | 0 | $0 | 0 | $0 | 2 | $2,400 | 0 | $0 | 0 | $0 |
| 42" RCP Class III End Section | each | $1,500 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 48" RCP Class III End Section | each | $1,800 | 2 | $3,600 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 54" RCP Class III End Section | each | $2,200 | 2 | $4,400 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 60" RCP Class III End Section | each | $2,700 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 4 | $10,800 |
| Stone Rip Rap | s.y. | $55 | 297 | $16,317 | 142 | $7,822 | 0 | $0 | 108 | $5,940 | 0 | $0 | 231 | $12,699 |
| Seed | ac. | $2,000 | 2.42 | $4,845 | 10.99 | $21,972 | 4.91 | $9,820 | 14.13 | $28,256 | 5.07 | $10,133 | 12.48 | $24,969 |
| Storm Sewer System | lump sum | lump sum | 1 | $173,343 | 1 | $453,552 | 1 | $233,362 | 1 | $1,024,083 | 1 | $293,747 | 1 | $525,771 |
| Contractor Construction Staking | lump sum | lump sum | 1 | $34,669 | 1 | $90,710 | 1 | $46,672 | 1 | $204,817 | 1 | $58,749 | 1 | $105,154 |
| Permanent Signing & Pavement Marking | lump sum | lump sum | 1 | $23,112 | 1 | $60,474 | 1 | $31,115 | 1 | $136,544 | 1 | $39,166 | 1 | $70,103 |
| Electric Lighting System | lump sum | lump sum | 0 | $0 | 1 | $210,000 | 0 | $0 | 1 | $210,000 | 0 | $0 | 1 | $210,000 |
| Traffic Control | lump sum | lump sum | 1 | $46,225 | 1 | $120,947 | 1 | $62,230 | 1 | $273,089 | 1 | $78,332 | 1 | $140,206 |
| Traffic Signal Installation | lump sum | lump sum | 1 | $125,000 | 0 | $0 | 1 | $175,000 | 0 | $0 | 1 | $175,000 | 0 | $0 |
| Subtotal | | | | $1,557,966 | | $3,959,366 | | $2,104,124 | | $8,675,750 | | $2,603,305 | | $4,556,374 |
| Contingency (15%) | | | | $233,695 | | $593,905 | | $315,619 | | $1,301,363 | | $390,496 | | $683,456 |
| Utility Relocations | lump sum | lump sum | 1 | $26,550 | 0 | $0 | 1 | $77,000 | 0 | $20,000 | 1 | $155,300 | 0 | $460,300 |
| R/W & Easement Acquisition | lump sum | lump sum | 1 | $208,335 | 0 | $1,128,410 | 1 | $489,687 | 0 | $1,300,279 | 1 | $450,725 | 0 | $790,529 |
| TOTAL | | | | **$2,026,546** | | **$5,681,681** | | **$2,986,429** | | **$11,297,392** | | **$3,599,826** | | **$6,490,659** |

**2003 Preliminary Enginnering Study Quantities/Construction Cost**

| Item Description | Unit | Unit Price | 167th/Antioch Intersection | | 167th (Antioch to Metcalf) | | 167th/Metcalf Intersection | | 159th/Pflumm Intersection | | Pflumm (159th to 167th) | | Pflumm (167th to 175th) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Approx. Quantity | Total | Approx. Quantity | Total | Approx. Quantity | Total | Approx. Quantity | Total | Approx. Quantity | Total | Approx. Quantity | Total |
| Clearing & Grubbing | lump sum | lump sum | 1 | $70,000 | 1 | $150,000 | 1 | $150,000 | 1 | $20,000 | 1 | $150,000 | 1 | $70,000 |
| Removal of Existing Structures | lump sum | lump sum | 1 | $40,576 | 1 | $174,461 | 1 | $54,012 | 1 | $32,773 | 1 | $118,299 | 1 | $46,473 |
| Haunched Slab Bridge | s.f. | $80 | 0 | $0 | 35,672 | $2,853,760 | 0 | $0 | 0 | $0 | 15,680 | $1,254,400 | 0 | $0 |
| Prestressed Concrete Girder Bridge | s.f. | $90 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| Unclassified Excavation | c.y. | $15 | 16,251 | $243,765 | 121,233 | $1,818,495 | 33,716 | $505,740 | 16,634 | $249,510 | 51,494 | $772,410 | 38,993 | $584,895 |
| Compaction of Earthwork (All Types) | c.y. | $4 | 24,916 | $99,664 | 16,173 | $64,692 | 46,479 | $185,916 | 12,753 | $51,012 | 115,083 | $460,332 | 33,924 | $135,696 |
| Embankment (Contractor Furnished) | c.y. | $12 | 8,665 | $103,980 | 0 | $0 | 12,763 | $153,156 | 0 | $0 | 63,589 | $763,068 | 0 | $0 |
| Asphaltic Concrete Surface Course | tons | $70 | 1,732 | $121,244 | 2,679 | $187,552 | 1,653 | $115,707 | 1,538 | $107,679 | 2,669 | $186,817 | 1,698 | $118,832 |
| Asphaltic Concrete Intermediate Course | tons | $60 | 10,261 | $615,633 | 15,859 | $951,557 | 9,658 | $579,471 | 9,005 | $540,275 | 16,020 | $961,175 | 10,168 | $610,089 |
| Aggregate Base Course (OP Special) | s.y. | $8 | 24,316 | $194,532 | 37,983 | $303,861 | 22,084 | $176,675 | 20,716 | $165,728 | 39,012 | $312,099 | 24,824 | $198,589 |
| Fly Ash | tons | $40 | 1,219 | $48,775 | 1,886 | $75,449 | 1,164 | $46,547 | 1,083 | $43,318 | 1,879 | $75,154 | 1,195 | $47,804 |
| Manipulation for Fly Ash Treated Subgrad | s.y. | $4 | 20,528 | $82,112 | 31,755 | $127,019 | 19,591 | $78,362 | 18,231 | $72,926 | 31,630 | $126,521 | 20,120 | $80,479 |
| Curb & Gutter, Combined (Type B) | l.f. | $15 | 5,443 | $81,645 | 9,406 | $141,090 | 3,601 | $54,015 | 3,607 | $54,105 | 10,376 | $155,640 | 6,798 | $101,970 |
| Curb (Type D) | l.f. | $12 | 5,297 | $63,564 | 8,043 | $96,516 | 3,461 | $41,532 | 3,420 | $41,040 | 10,656 | $127,872 | 6,520 | $78,240 |
| Concrete Median Nose | each | $1,500 | 5 | $7,500 | 4 | $6,000 | 7 | $10,500 | 6 | $9,000 | 2 | $3,000 | 2 | $3,000 |
| Concrete Entrance Pavement (8") | s.y. | $65 | 863 | $56,124 | 1,354 | $88,010 | 277 | $18,012 | 254 | $16,510 | 1,721 | $111,843 | 0 | $0 |
| KCMMB 4k Concrete (ISRW) | c.y. | $600 | 0 | $0 | 82 | $49,200 | 15 | $9,000 | 0 | $0 | 0 | $0 | 0 | $0 |
| Reinforced Concrete Structural Wall | c.y. | $900 | 0 | $0 | 252 | $226,800 | 36 | $32,400 | 0 | $0 | 0 | $0 | 0 | $0 |
| Sidewalk Construction | s.y. | $42 | 3,260 | $136,901 | 4,307 | $180,880 | 1,822 | $76,533 | 1,709 | $71,769 | 5,986 | $251,398 | 2,681 | $112,621 |
| A.C. Bike Trail | tons | $65 | 0 | $0 | 0 | $0 | 0 | $0 | 105 | $6,845 | 0 | $0 | 478 | $31,080 |
| Underdrain (6") (all types) | l.f. | $14 | 5,443 | $76,202 | 9,406 | $131,684 | 3,601 | $50,414 | 3,607 | $50,498 | 10,376 | $145,264 | 6,798 | $95,172 |
| 27" RCP Class III Storm Sewer | l.f. | $60 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 30" RCP Class III Storm Sewer | l.f. | $70 | 0 | $0 | 103 | $7,210 | 0 | $0 | 0 | $0 | 217 | $15,190 | 0 | $0 |
| 36" RCP Class III Storm Sewer | l.f. | $85 | 0 | $0 | 0 | $0 | 142 | $12,070 | 0 | $0 | 0 | $0 | 0 | $0 |
| 42" RCP Class III Storm Sewer | l.f. | $105 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 48" RCP Class III Storm Sewer | l.f. | $140 | 77 | $10,780 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 54" RCP Class III Storm Sewer | l.f. | $190 | 0 | $0 | 0 | $0 | 346 | $65,740 | 0 | $0 | 0 | $0 | 161 | $30,590 |
| 60" RCP Class III Storm Sewer | l.f. | $250 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 5' x 4.5' Reinforced Concrete Box Culvert | l.f. | $320 | 0 | $0 | 0 | $0 | 179 | $57,280 | 0 | $0 | 0 | $0 | 0 | $0 |
| 5' x 5' Reinforced Concrete Box Culvert | l.f. | $350 | 0 | $0 | 0 | $0 | 682 | $238,700 | 0 | $0 | 0 | $0 | 0 | $0 |
| 6' x 5' Reinforced Concrete Box Culvert | l.f. | $425 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 7' x 5' Reinforced Concrete Box Culvert | l.f. | $500 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 8' x 5' Reinforced Concrete Box Culvert | l.f. | $575 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 9' x 4' Reinforced Concrete Box Culvert | l.f. | $550 | 0 | $0 | 900 | $495,000 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 11' x 4' Reinforced Concrete Box Culvert | l.f. | $650 | 0 | $0 | 0 | $0 | 0 | $0 | 187 | $121,550 | 0 | $0 | 0 | $0 |
| 11' x 6' Reinforced Concrete Box Culvert | l.f. | $900 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 12' x 6' Reinforced Concrete Box Culvert | l.f. | $1,000 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 14' x 7' Reinforced Concrete Box Culvert | l.f. | $1,300 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 36' x 8' CONSPAN Structure | l.f. | $1,700 | 0 | $0 | 315 | $535,500 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 27" RCP Class III End Section | each | $800 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 30" RCP Class III End Section | each | $950 | 0 | $0 | 2 | $1,900 | 0 | $0 | 0 | $0 | 2 | $1,900 | 0 | $0 |
| 36" RCP Class III End Section | each | $1,200 | 0 | $0 | 0 | $0 | 2 | $2,400 | 0 | $0 | 0 | $0 | 0 | $0 |
| 42" RCP Class III End Section | each | $1,500 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 48" RCP Class III End Section | each | $1,800 | 2 | $3,600 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 2 | $3,600 |
| 54" RCP Class III End Section | each | $2,200 | 0 | $0 | 0 | $0 | 4 | $8,800 | 0 | $0 | 0 | $0 | 0 | $0 |
| 60" RCP Class III End Section | each | $2,700 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| Stone Rip Rap | s.y. | $55 | 32 | $1,760 | 3,786 | $208,230 | 261 | $14,379 | 162 | $8,916 | 15 | $819 | 32 | $1,760 |
| Seed | ac. | $2,000 | 5.52 | $11,041 | 11.32 | $22,645 | 8.64 | $17,272 | 3.99 | $7,982 | 20.02 | $40,038 | 9.61 | $19,224 |
| Storm Sewer System | lump sum | lump sum | 1 | $310,410 | 1 | $1,334,627 | 1 | $413,195 | 1 | $250,715 | 1 | $904,986 | 1 | $355,517 |
| Contractor Construction Staking | lump sum | lump sum | 1 | $62,082 | 1 | $266,925 | 1 | $82,639 | 1 | $50,143 | 1 | $180,997 | 1 | $71,103 |
| Permanent Signing & Pavement Marking | lump sum | lump sum | 1 | $41,388 | 1 | $177,950 | 1 | $55,093 | 1 | $33,429 | 1 | $120,665 | 1 | $47,402 |
| Electric Lighting System | lump sum | lump sum | 1 | $50,000 | 1 | $210,000 | 0 | $0 | 0 | $0 | 1 | $270,000 | 1 | $180,000 |
| Traffic Control | lump sum | lump sum | 1 | $82,776 | 1 | $355,900 | 1 | $110,185 | 1 | $66,857 | 1 | $241,330 | 1 | $94,805 |
| Traffic Signal Installation | lump sum | lump sum | 1 | $175,000 | 2 | $250,000 | 1 | $175,000 | 1 | $175,000 | 0 | $0 | 0 | $0 |
| Subtotal | | | | $2,791,055 | | $11,492,914 | | $3,590,748 | | $2,247,580 | | $7,751,215 | | $3,118,940 |
| Contingency (15%) | | | | $418,658 | | $1,723,937 | | $538,612 | | $337,137 | | $1,162,682 | | $467,841 |
| Utility Relocations | lump sum | lump sum | 1 | $51,025 | 0 | $64,800 | 1 | $14,400 | 0 | $70,500 | 1 | $39,600 | 0 | $84,600 |
| R/W & Easement Acquisition | lump sum | lump sum | 1 | $482,088 | 0 | $667,004 | 1 | $616,577 | 0 | $351,285 | 1 | $1,141,096 | 0 | $525,920 |
| TOTAL | | | | **$3,742,826** | | **$13,948,655** | | **$4,760,337** | | **$3,006,501** | | **$10,094,594** | | **$4,197,300** |

**2003 Preliminary Enginnering Study Quantities/Construction Cost**

| Item Description | Unit | Unit Price | 175th/Pflumm Intersection Approx. Quantity | 175th/Pflumm Intersection Total | Quivira (159th to 167th) Approx. Quantity | Quivira (159th to 167th) Total | Switzer (159th to 167th) Approx. Quantity | Switzer (159th to 167th) Total | Antioch (159th to 167th) Approx. Quantity | Antioch (159th to 167th) Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Clearing & Grubbing | lump sum | lump sum | 1 | $30,000 | 1 | $100,000 | 1 | $80,000 | 1 | $60,000 |
| Removal of Existing Structures | lump sum | lump sum | 1 | $21,306 | 1 | $124,599 | 1 | $66,761 | 1 | $73,706 |
| Haunched Slab Bridge | s.f. | $80 | 0 | $0 | 11,760 | $940,800 | 0 | $0 | 0 | $0 |
| Prestressed Concrete Girder Bridge | s.f. | $90 | 0 | $0 | 29,400 | $2,646,000 | 0 | $0 | 0 | $0 |
| Unclassified Excavation | c.y. | $15 | 4,790 | $71,850 | 30,013 | $450,195 | 23,303 | $349,545 | 43,628 | $654,420 |
| Compaction of Earthwork (All Types) | c.y. | $4 | 11,765 | $47,060 | 27,620 | $110,480 | 36,292 | $145,168 | 25,370 | $101,480 |
| Embankment (Contractor Furnished) | c.y. | $12 | 6,975 | $83,700 | 0 | $0 | 12,989 | $155,868 | 0 | $0 |
| Asphaltic Concrete Surface Course | tons | $70 | 997 | $69,823 | 2,167 | $151,666 | 2,262 | $158,349 | 2,812 | $196,807 |
| Asphaltic Concrete Intermediate Course | tons | $60 | 5,880 | $352,807 | 13,040 | $782,373 | 13,503 | $810,166 | 16,598 | $995,890 |
| Aggregate Base Course (OP Special) | s.y. | $8 | 13,810 | $110,477 | 32,070 | $256,559 | 32,720 | $261,757 | 39,429 | $315,431 |
| Fly Ash | tons | $40 | 702 | $28,089 | 1,525 | $61,013 | 1,593 | $63,702 | 1,979 | $79,173 |
| Manipulation for Fly Ash Treated Subgrad | s.y. | $4 | 11,822 | $47,288 | 25,679 | $102,716 | 26,810 | $107,242 | 33,322 | $133,287 |
| Curb & Gutter, Combined (Type B) | l.f. | $15 | 2,905 | $43,575 | 9,099 | $136,485 | 8,580 | $128,700 | 9,201 | $138,015 |
| Curb (Type D) | l.f. | $12 | 2,708 | $32,496 | 9,057 | $108,684 | 8,132 | $97,584 | 7,920 | $95,040 |
| Concrete Median Nose | each | $1,500 | 2 | $3,000 | 0 | $0 | 4 | $6,000 | 6 | $9,000 |
| Concrete Entrance Pavement (8") | s.y. | $65 | 345 | $22,447 | 676 | $43,947 | 1,272 | $82,709 | 1,737 | $112,934 |
| KCMMB 4k Concrete (ISRW) | c.y. | $600 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| Reinforced Concrete Structural Wall | c.y. | $900 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| Sidewalk Construction | s.y. | $42 | 761 | $31,948 | 2,742 | $115,178 | 2,305 | $96,829 | 3,241 | $136,127 |
| A.C. Bike Trail | tons | $65 | 341 | $22,165 | 1,094 | $71,104 | 1,050 | $68,273 | 687 | $44,657 |
| Underdrain (6") (all types) | l.f. | $14 | 2,905 | $40,670 | 9,099 | $127,386 | 8,580 | $120,120 | 9,201 | $128,814 |
| 27" RCP Class III Storm Sewer | l.f. | $60 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 30" RCP Class III Storm Sewer | l.f. | $70 | 0 | $0 | 0 | $0 | 0 | $0 | 202 | $14,140 |
| 36" RCP Class III Storm Sewer | l.f. | $85 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 42" RCP Class III Storm Sewer | l.f. | $105 | 0 | $0 | 0 | $0 | 0 | $0 | 143 | $15,015 |
| 48" RCP Class III Storm Sewer | l.f. | $140 | 145 | $20,300 | 0 | $0 | 0 | $0 | 0 | $0 |
| 54" RCP Class III Storm Sewer | l.f. | $190 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 60" RCP Class III Storm Sewer | l.f. | $250 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 5' x 4.5' Reinforced Concrete Box Culvert | l.f. | $320 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 5' x 5' Reinforced Concrete Box Culvert | l.f. | $350 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 6' x 5' Reinforced Concrete Box Culvert | l.f. | $425 | 0 | $0 | 0 | $0 | 0 | $0 | 191 | $81,175 |
| 7' x 5' Reinforced Concrete Box Culvert | l.f. | $500 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 8' x 5' Reinforced Concrete Box Culvert | l.f. | $575 | 0 | $0 | 0 | $0 | 192 | $192,000 | 0 | $0 |
| 9' x 4' Reinforced Concrete Box Culvert | l.f. | $550 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 11' x 4' Reinforced Concrete Box Culvert | l.f. | $650 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 11' x 6' Reinforced Concrete Box Culvert | l.f. | $900 | 0 | $0 | 0 | $0 | 0 | $0 | 364 | $327,600 |
| 12' x 6' Reinforced Concrete Box Culvert | l.f. | $1,000 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 14' x 7' Reinforced Concrete Box Culvert | l.f. | $1,300 | 0 | $0 | 0 | $0 | 286 | $371,800 | 0 | $0 |
| 36' x 8' CONSPAN Structure | l.f. | $1,700 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 27" RCP Class III End Section | each | $800 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 30" RCP Class III End Section | each | $950 | 0 | $0 | 0 | $0 | 0 | $0 | 2 | $1,900 |
| 36" RCP Class III End Section | each | $1,200 | 0 | $0 | 0 | $0 | 0 | $0 | 2 | $2,400 |
| 42" RCP Class III End Section | each | $1,500 | 2 | $3,000 | 0 | $0 | 0 | $0 | 0 | $0 |
| 48" RCP Class III End Section | each | $1,800 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 54" RCP Class III End Section | each | $2,200 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| 60" RCP Class III End Section | each | $2,700 | 0 | $0 | 0 | $0 | 0 | $0 | 0 | $0 |
| Stone Rip Rap | s.y. | $55 | 26 | $1,442 | 0 | $0 | 496 | $27,298 | 340 | $18,700 |
| Seed | ac. | $2,000 | 1.59 | $3,180 | 12.69 | $25,372 | 7.46 | $14,926 | 11.65 | $23,296 |
| Storm Sewer System | lump sum | lump sum | 1 | $162,993 | 1 | $953,183 | 1 | $510,719 | 1 | $563,851 |
| Contractor Construction Staking | lump sum | lump sum | 1 | $32,599 | 1 | $190,637 | 1 | $102,144 | 1 | $112,770 |
| Permanent Signing & Pavement Marking | lump sum | lump sum | 1 | $21,732 | 1 | $127,091 | 1 | $68,096 | 1 | $75,180 |
| Electric Lighting System | lump sum | lump sum | 0 | $0 | 1 | $250,000 | 1 | $210,000 | 1 | $210,000 |
| Traffic Control | lump sum | lump sum | 1 | $43,465 | 1 | $254,182 | 1 | $136,192 | 1 | $150,360 |
| Traffic Signal Installation | lump sum | lump sum | 1 | $175,000 | 0 | $0 | 0 | $0 | 0 | $0 |
| Subtotal | | | | $1,522,412 | | $8,129,650 | | $4,431,947 | | $4,871,167 |
| Contingency (15%) | | | | $228,362 | | $1,219,447 | | $664,792 | | $730,675 |
| Utility Relocations | lump sum | lump sum | 1 | $8,420 | 1 | $569,250 | 0 | $238,150 | 1 | $35,000 |
| R/W & Easement Acquisition | lump sum | lump sum | 1 | $257,920 | 1 | $870,249 | 0 | $859,365 | 1 | $551,840 |
| TOTAL | | | | **$2,017,114** | | **$10,788,596** | | **$6,194,254** | | **$6,188,682** |