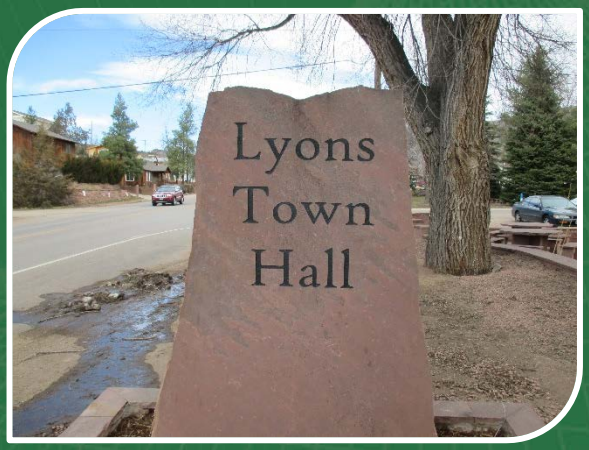
Final – November 3, 2016

Sanitary Sewer System Expansion Feasibility Study

Town of Lyons



Prepared by

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Town of Lyons

September 1, 2016

This report was prepared by:

_____
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Eric Garner, P.E.

This report and Accompanying Tables, Charts, Maps and Data were reviewed by Town Staff and the Utility and Engineering Board.

_____
Jim Blankenship, P.E.,
Town Engineer, Town of Lyons

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Appendices

Executive Summary

J-U-B Engineers investigated the feasibility of constructing sewer infrastructure to serve areas identified by the Town in their Request for Proposals of February 23, 2016 (the map included in the RFP follows this page). We divided the Northwest Lyons Planning Area (NLPA) and the Southwest Lyons Planning Area (SWLPA) into individual service areas defined by conceptual sewer alignments intended to maximize the number of buildable lots served by each alignment. A single conceptual trunk sewer alignment each for the NLPA and the SWLPA was developed, and we produced plan and profile sheets for each. Topography, easements, and difficulty of construction topics for the study areas are considered and addressed. We have generated tables displaying the length, slope, and number of buildable lots for each alignment. We recommend that the Town perform preliminary design studies on any proposed sewers prior to design of infrastructure. An order of magnitude opinion of costs for each conceptual alignment has been developed, a summary of which are displayed in the table below:

Alignment	Length of Sewer Main (ft)	Approx. Length Requiring Rock Removal	No. of Manholes	Approx. Number of Lots Served	Approx. Total Cost of Sewer Main
Apple Valley Rd	11,700	3500	59	75	$2,800,000
CR 69/Old St. Vrain Rd	4,500	0	18	18	$1,100,000
Apple Ridge Rd	3,900	1,950	27	10	$990,000
JJ Kelly Rd	1,660	800	3	3	$370,000
Antelope Dr	2,000	1,000	5	12	$460,000
Indian Lookout Rd	3,200	1,600	20	5	$800,000
County Rd 69 (Bradford)	1,600	0	4	5	$350,000
Bradford St	1,060	0	3	2	$320,000
Red Gulch Rd	4,300	2,000	15	12	$1,000,000
Jasper Dr	3,6000	1,800	36	27	$1,000,000
Flint Gulch	7,650	4,000	27	19	$1,800,000
Sandstone Dr	700	350	3	5	$150,000
Pyrite Way	850	450	2	7	$200,000
Old St. Vrain Dr	4,500	1,200	25	2	$1,100,000
Alignment Construction Assumptions					
Cost per lineal foot of pipe		$200			
Cost per lineal foot of rock		$24			
Cost per manhole		$6,000			

EXHIBIT C

LYONS PLANNING AREA IGA MAP

- Town Limits
- Primary Planning Area
- No Development Area
- Lyons' Interest Area/ Rural Preservation
- Lyons' Planning Area
- CEMEX Area IGA

0 1,000 2,000 Feet

NORTH

March 20, 2012

Northwest Lyons Planning Area (NLPA)

Southwest Lyons Planning Area (SWLPA)

See CEMEX Area IGA

US 36

SH 7

APPLE VALLEY RD

ANTELOPE DR

NOLAN DR

N 53RD ST/VESTA/N 55TH ST

CR 69

RED GULCH RD

OLD ST VRAIN RD

JASPER DR

QUARTZ WAY

HIGHLAND DR

HIGHLAND DR S

SH 66

N 61ST ST

HYGIENE RD

N 59TH ST

Chapter 1

Introduction

Chapter 1 – Introduction

1.1 Purpose of Study

The flooding in September 2013 caused significant damage to the Town of Lyons, including to its wastewater collection and treatment infrastructure. Subsequently, the Town has constructed a new wastewater treatment plant, and rehabilitated much of its damaged sewage collection system, since 2013. The Town has extended its collection system beyond its pre-flood extents in Meadow Park to the west, and 4th Avenue to the south.

The project purpose given in the Town's Request for Proposals (RFP) was:

> *Can the Town of Lyons expand its wastewater collection system to the Apple Valley and South St. Vrain planning areas effectively and with a resilient infrastructure, are there areas that are too remote or inaccessible within the area to efficiently and effectively provide service for, are there capacity issues that may arise from expanding in the planning area and what densities may be considered with the current capacity structure?*

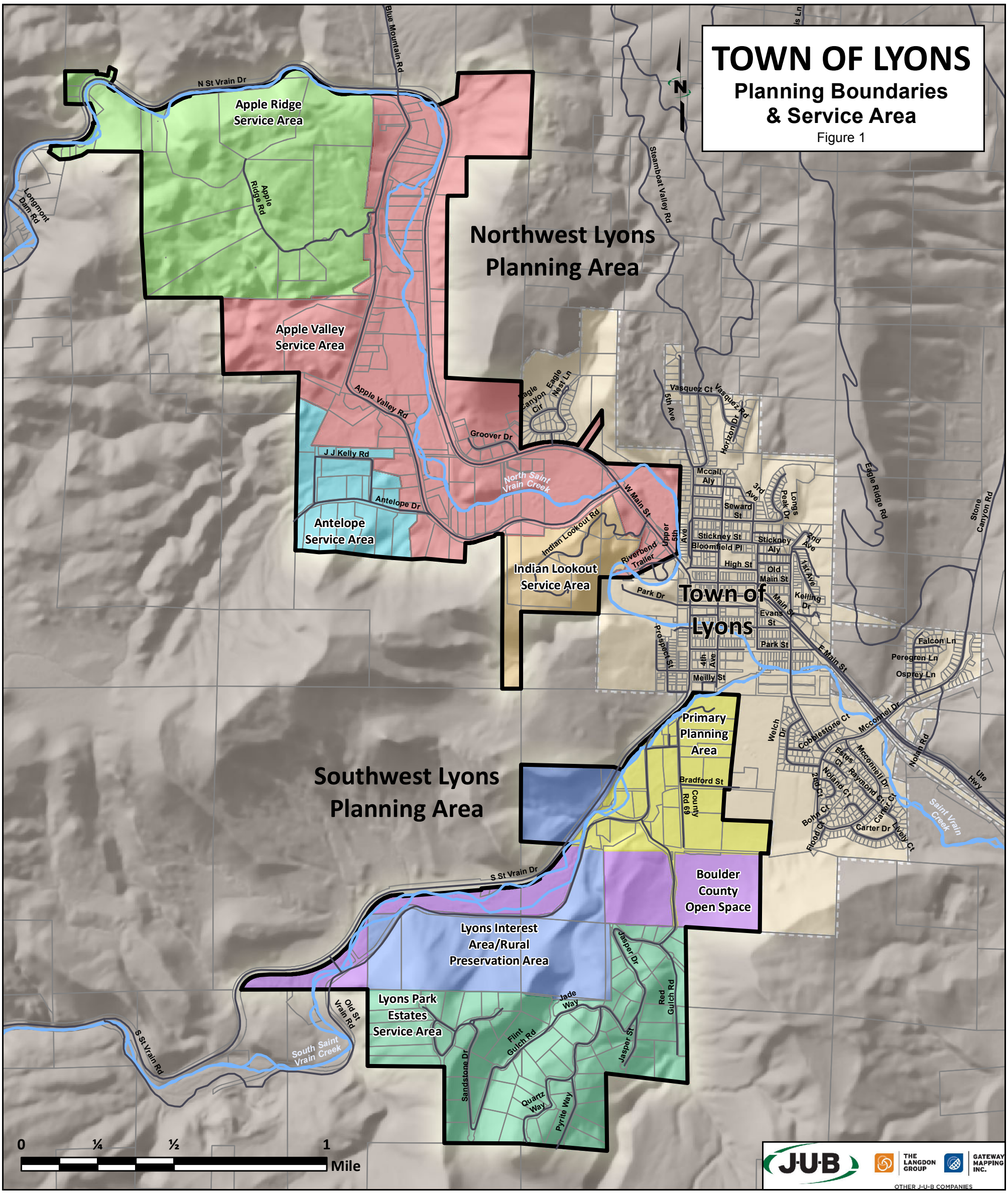
These planning areas were further defined in the Town's IGA (Intergovernmental Agreement) with Boulder County, and in the Town's RFP for this project (see Figure 1). For the purposes of this study, the Apple Valley planning area was designated as the Northwest Lyons Planning Area (NLPA), and includes most of the properties along Apple Valley Road and North St. Vrain Drive, plus additional properties to the west (see Figure 2). The South St. Vrain planning area was designated as the Southwest Lyons Planning Area (SWLPA), and includes properties located to the southwest of the Town limits, primarily along CR 69, Red Gulch Road, and the neighborhood served by Jasper Drive (see Figure 3). All properties outside of the Town limits are currently served by septic systems.

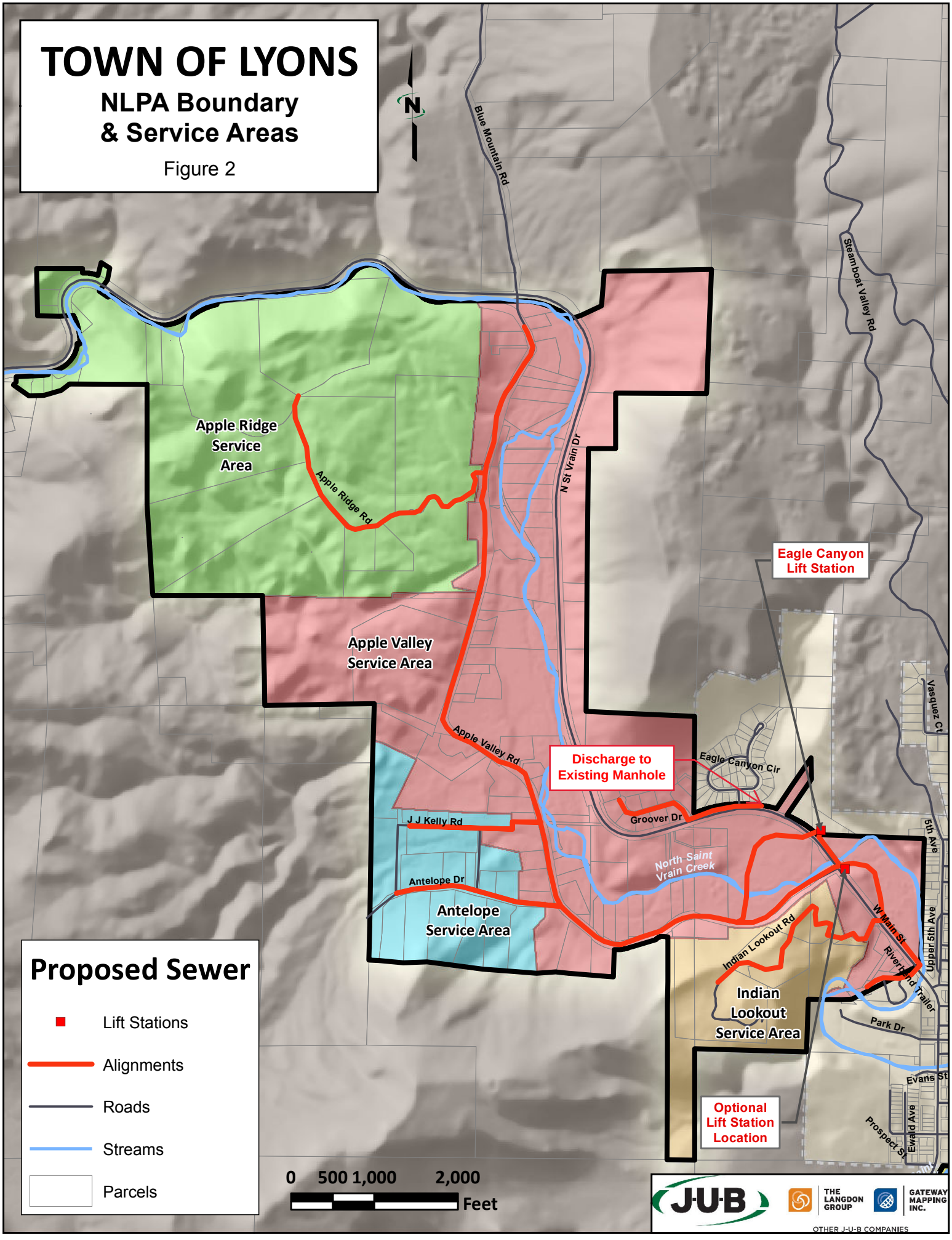
The 2013 flood damaged or destroyed numerous septic systems, particularly in the NLPA. Many of these have been rebuilt at significant cost to the property owners. A number of permits for repair or replacement of septic systems are pending with Boulder County Health, some of which are located in the floodplain, including some in the floodway. The Department has reported that they are working with property owners to find engineered solutions for septic systems located in the floodplain, and as of the writing of this report has not denied any permits.

TOWN OF LYONS

Planning Boundaries & Service Area

Figure 1




TOWN OF LYONS
NLPA Boundary
& Service Areas
Figure 2
N
Blue Mountain Rd
Steamboat Valley Rd
Apple Ridge Service Area
Apple Ridge Rd
N St Vrain Dr
Eagle Canyon Lift Station
Apple Valley Service Area
Apple Valley Rd
Discharge to Existing Manhole
Eagle Canyon Cir
Vasquez Ct
Groover Dr
J J Kelly Rd
North Saint Vrain Creek
5th Ave
Antelope Dr
Antelope Service Area
W Main St
Upper 5th Ave
Indian Lookout Rd
Riverbend Trailer
Indian Lookout Service Area
Park Dr
Evans St
Optional Lift Station Location
Prospect St
Ewald Ave
Proposed Sewer
Lift Stations
Alignments
Roads
Streams
Parcels
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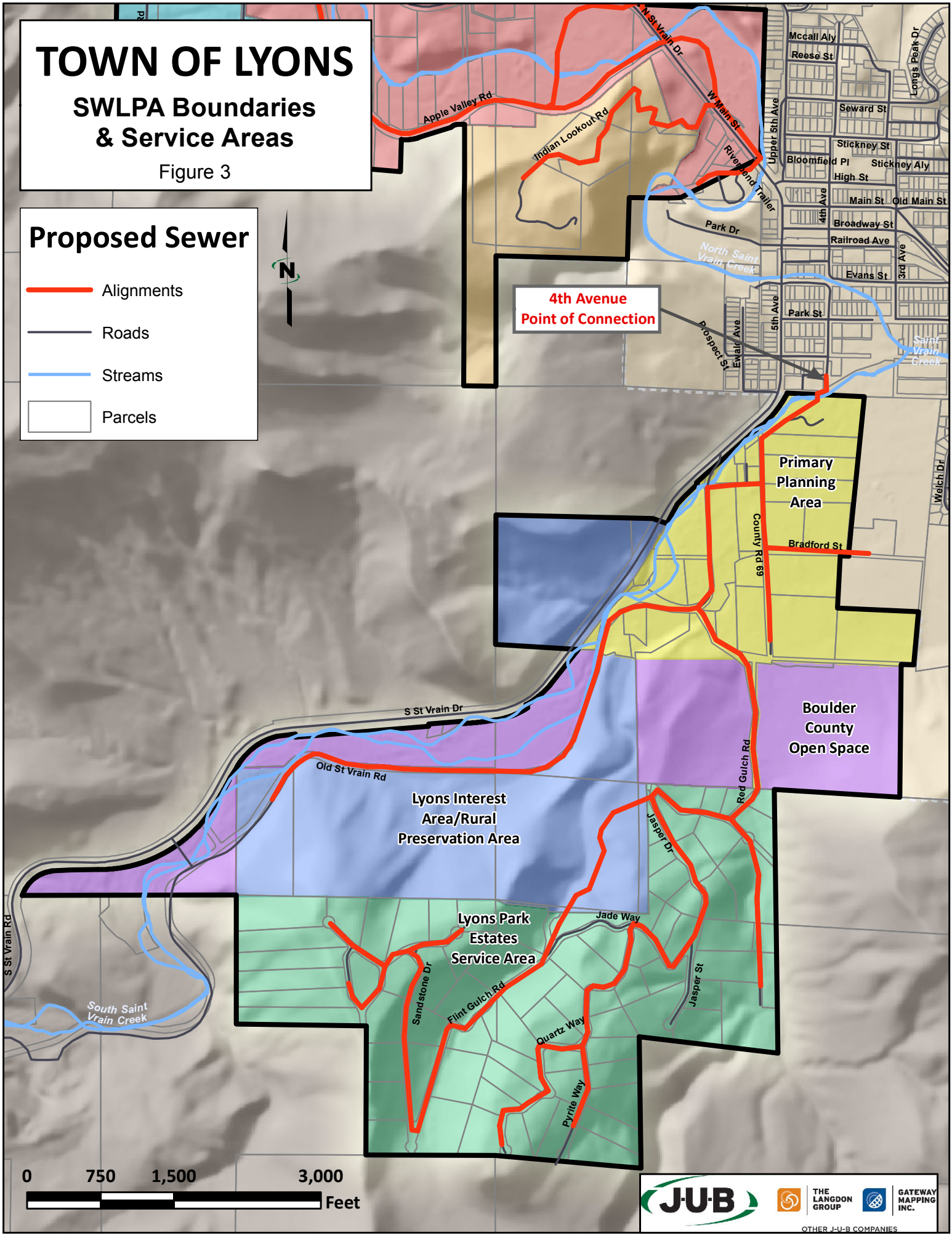
TOWN OF LYONS
SWLPA Boundaries & Service Areas
Figure 3
Proposed Sewer
Alignments
Roads
Streams
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4th Avenue Point of Connection
Primary Planning Area
Boulder County Open Space
Lyons Interest Area/Rural Preservation Area
Lyons Park Estates Service Area
N St Vrain Dr
Apple Valley Rd
Indian Lookout Rd
W Main St
Riverbend Trailer
Park Dr
North Saint Vrain Creek
Prospect St
Ewalt Ave
Park St
Saint Vrain Creek
Mccall Aly
Reese St
Longs Peak Dr
Seward St
Upper 5th Ave
Stickney St
Bloomfield Pl
Stickney Aly
High St
4th Ave
Main St
Old Main St
Broadway St
Railroad Ave
Evans St
3rd Ave
5th Ave
Welch Dr
Bradford St
County Rd 69
S St Vrain Dr
Old St Vrain Rd
Red Gulch Rd
Jasper Dr
Jade Way
Sandstone Dr
Flint Gulch Rd
Quartz Way
Pyrite Way
Jasper St
S St Vrain Rd
South Saint Vrain Creek
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Chapter 2

Description of Existing Conditions

Chapter 2 – Description of Existing Wastewater Infrastructure

2.1 Septic Systems Prior to Flood

Nearly all of the inhabited properties in the study areas are served by onsite wastewater treatment systems (OWTS or septic systems). The low lying areas along Apple Valley Road are typically comprised of septic tanks with leach fields (absorption beds). Some systems have raised beds or use other technologies due to high groundwater or shallow soils over bedrock. Elevated areas, such as along Apple Ridge Road, have a combination of conventional septic systems, Bell-Patt systems, evapotranspiration beds, and raised beds. The latter three systems are used in clayey soils with poor absorption rates, or where bedrock is near to the surface. In low lying elevations of the SWLPA, many owners have septic system designs that are similar to those along Apple Valley Road. In the higher elevations, there are numerous systems designed for shallow soils, such as raised beds.

2.2 Septic Systems Post-Flood

Numerous systems in the low lying areas of the NLPA were damaged or destroyed during the flood. The exact numbers were unavailable for this study. According to Boulder County Public Health Department (BCPH), no permits for repair or replacement have been denied. Some permits are awaiting approval, pending completion of designs for the new conditions. According to BCPH, they are working with residents whose systems sustained heavy damage or destroyed to find solutions. Permits have been issued for systems in the floodway in some cases.

A search of the Assessor's records for the SWLPA revealed no properties under permit review. However, there are several lots located in the floodplain, for which records were not available.

2.3 Eagle Canyon Lift Station

The Eagle Canyon Lift Station is located approximately 850 feet east of Eagle Canyon Circle, adjacent to North St. Vrain Road, and serves the Eagle Canyon subdivision. The lift station is a duplex design, with two (2) 2-horsepower submersible grinder pumps. The lift station pumps through a 4-inch PVC forcemain that follows N. St. Vrain Road east, crossing N. St. Vrain Creek twice and terminating in a manhole near 5th Avenue and Main Street. The lift station pumps 25 feet downhill from the lift station wetwell elevation to the receiving manhole through approximately 2,820 feet of forcemain. The lift station has been identified by the Town as a potential point of connection for a collection system serving the NLPA.

Information provided by the Town indicates that this lift station is approximately 23 years old. The planning process lifespan for a lift station is typically 20 years. We have therefore assumed for purposes of this feasibility study that this lift station would not be in place in its current configuration. The pumps in the lift station are high head, low flow type, and cannot provide flow velocities of 2 ft/s, typically the minimum needed to maintain scour of the forcemain. The upper limit for flow velocity is considered to be 4 to 5 ft/s. Assuming the latter for a design number, the maximum capacity of the forcemain is approximately 235 gpm, with one pump running in a duplex lift station operating in a lead/lag regime. The peak hour flow to the lift station could not exceed this figure without overflowing the wetwell or requiring both pumps to run. Assuming a home occupancy of 4 persons per dwelling unit, and a peaking factor of 3, the forcemain could be expected to serve approximately 3,760 dwelling units. However, the existing pumps are thought to be capable of no more than 30 to 40 gpm, which would serve 480 to 640 units.

As-built drawings provided by the Town indicate that the lift station's wetwell is a circular manhole with interior measurements of 7.5 feet in diameter by 12 feet deep (see Figure 4). The drawings show that the invert of the lift station is 5394.25 feet, and that the high level alarm activates at an elevation of 5400.5 feet. Grade elevation is shown as approximately 5408 feet. The datum used for survey and design of the project is not known. LIDAR data obtained during a post flood survey by Boulder County indicates a ground elevation of 5405.7 feet at this location. Similar data from FEMA yields an elevation at that location of 5408.2 feet. However, through most of the study area elevations the FEMA data is not corrected for vegetation and cannot be considered as reliable as the Boulder County data, and neither is to the accuracy of a ground survey.

2.4 Newer Extensions to Sewage Collection System

The Town is currently reconstructing portions of the sewer system in the Confluence Area. This includes replacement of the existing 6-inch sewer in 4th Avenue with an 8-inch sewer, to one-half block south of Prospect Street. Existing construction plans show a future extension of the sewer in 4th Avenue, south, across S. St. Vrain Creek. This has been identified as a potential point of connection for a collection system serving the SWLPA.

Lyons completed construction in 2015 of a new 8-inch sewer west through Meadow Park, and proceeding north across N. St. Vrain Creek to the River Bend facility. This 8-inch sewer has been identified by the Town as a potential point of connection for a collection system serving the NLPA.

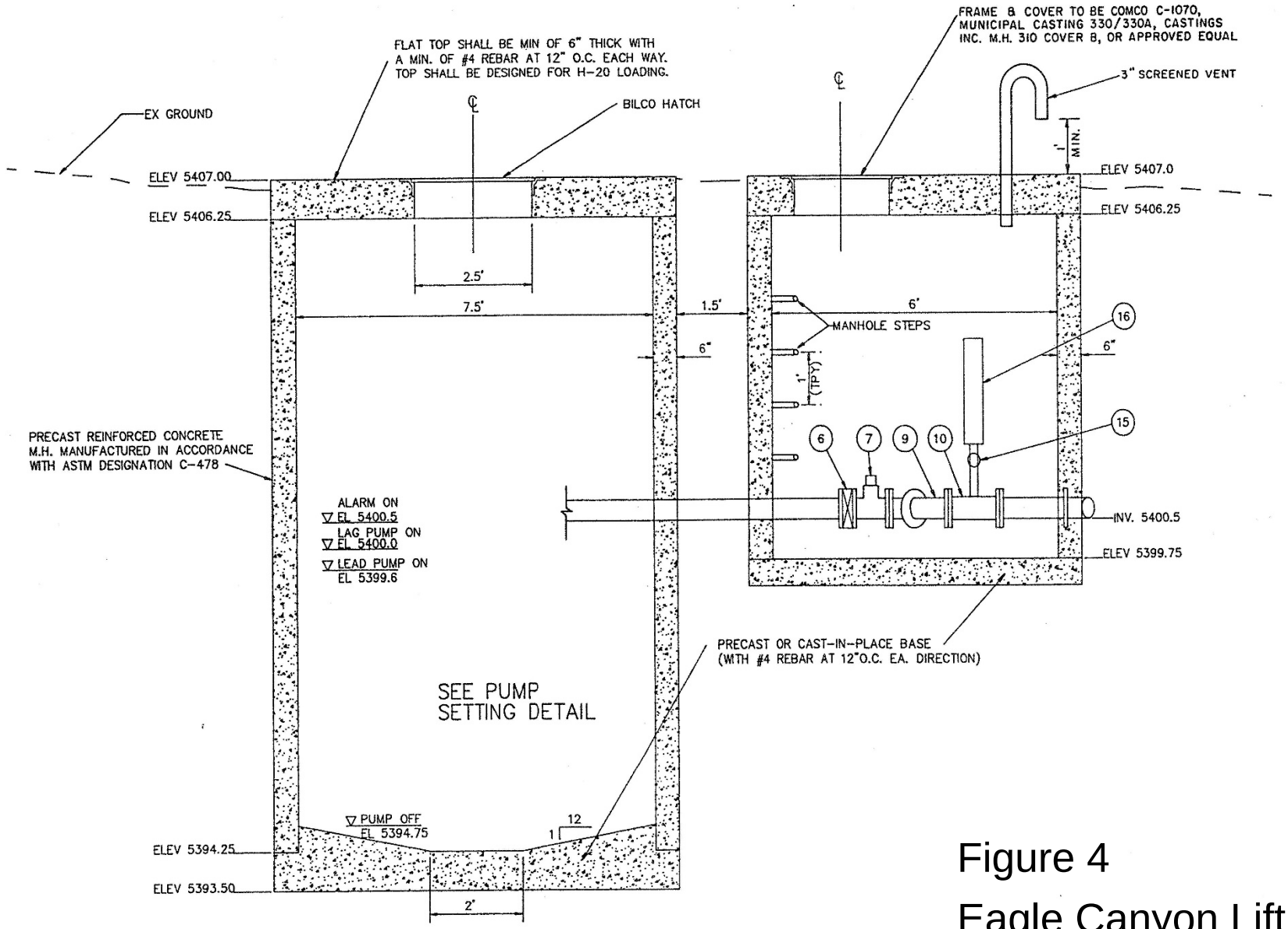


Figure 4

Eagle Canyon Lift Station

2.5 Downstream Conveyances

Insufficient information was available on the existing sewer infrastructure within the Town limits to estimate the remaining capacity of the conveyance system, as of the writing of this report. Approximately 680 feet of the 8-inch trunk sewer in Evans Street, between 3rd and 4th Avenues, was reconstructed in 2012. A one block section of the combined outfall in Park Street was replaced in 2013. However, the capacity of most reaches of the two trunk lines, and the common outfall, is unknown.

The Town reports that the conveyance capacity through the town may be limited. The average ground slope of the system from the intersection of 5th Avenue and Main Street to the wastewater treatment plant (WWTP) is approximately 1.3%. The average ground slope of the system from the intersection of 4th Avenue and Prospect Street is 0.5%. These slopes are based on LIDAR data gathered by Boulder County after the September 2013 flood. The capacity of an 8-inch sewer flowing 90% full at 0.5% slope is approximately 400 gallons per minute (gpm), enough to serve approximately 1,800 homes.

A number of technologies exist for rehabilitating existing sewer lines and increasing their capacity. Lining systems can decrease the roughness coefficient of pipes, creating smoother walls that more readily pass fluids. Pipe bursting can be used to increase the diameter of an existing sewer, significantly increasing its capacity. These technologies require less excavation of streets, reducing impacts on residents and traffic.

2.6 Design Criteria

JVA Consulting Engineers produced a 2011 Wastewater Feasibility Study for the Town. Information from this study was used in a Preliminary Engineering Report developed by Honeywell and Tetra Tech for upgrade or replacement of the Town's existing wastewater treatment plant. The analyses in these reports determined several criteria for predicting wastewater flows in the future. These include 70 gallons per capita per day (gpcd) of wastewater, a peaking factor (ratio of maximum daily flow to average daily flow) of 2.33, and 138.5 gallons per day of sewage per household. These numbers were used calculate potential wastewater flows in proposed sewers.

The Town's Wastewater Collection System Design Standards require a minimum velocity under peak flow conditions of 2 feet per second (fps) for sewers less than 10 inches in diameter, and a maximum velocity of 15 fps. Minimum allowable slopes are 0.4% for 8-inch sewers and 0.28% for 10-inch sewers. The maximum distance allowed between manholes is 400 feet. The minimum diameter for sewers is 8 inches.

We have assumed Mannings roughness coefficients of 0.011 for newer sewers and 0.013 for older sewers for determining sewer capacity. We have assumed that sewers would be aligned within road rights-of-way (ROW) to minimize the number of easements required, with certain exceptions discussed later in this report. We have assumed that homes located at an elevation below the nearest sewer would use household lift stations to discharge to the sewer. One option for doing this is to have households pump to a common 1-1/4-inch low pressure sewer that would discharge to a manhole. This low pressure sewer could be installed in the same trench as the gravity sewer.

Chapter 3

Northwest Lyons Planning Area (NLPA)

Chapter 3 – Northwest Lyons Planning Area (NLPA)

3.1 Planning Area Characteristics

3.1.1 Geography

The NLPA is identified in the Town's Intergovernmental Agreement (IGA) with Boulder County, last renewed in 2012 (see Figure 2, Section 1). The total feasibility study area is approximately 1,070 acres, including road ROW, outlots, etc. Many of the properties between Apple Valley Road and North St. Vrain Creek are located in the 100-year floodplain shown on Flood Insurance Rate Maps (FIRM) numbers 08013C0231J and 08013C0232J, or in the interim floodplain depicted on the County Assessor website.

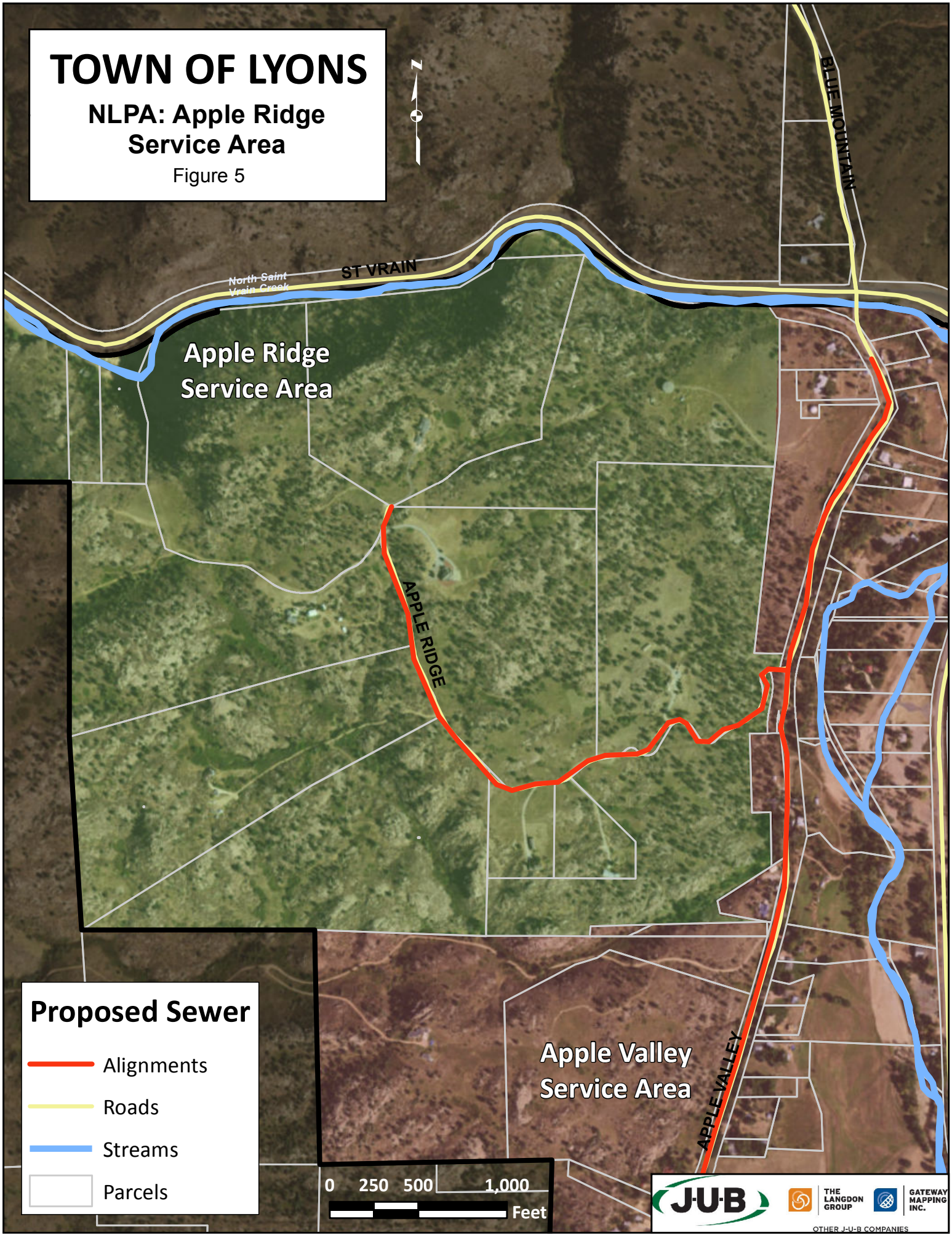
The highest density development in the NLPA is situated near North St. Vrain Creek, along either Apple Valley Road or North St. Vrain Drive. Lower density development is located on the hills and ridges west of North St. Vrain Creek along Apple Ridge Road, Antelope Drive, and Indian Lookout Road.

The Primary Planning Area (PPA) includes the Apple Valley and Antelope service areas, with the remainder identified as Lyons' Interest Area/Rural Preservation (IARP, see Figure 2, Section 1). The exception is the eastern portion of the Stone Mountain Lodge property, identified on the IGA map as a "No Development Area." The PPA includes Apple Valley Road, North St. Vrain Drive, and the Antelope Drive/JJ Kelly Lane area. Development along Apple Ridge Road lies in the IARP area, and development along Indian Lookout Road lies within the Town limits.

3.1.2 Existing Development Density

A developable lot is defined in this study as a lot that is held in private hands and on which businesses or domiciles exist, or could be constructed; or a publically owned property that could potentially have facilities requiring waste disposal now or in the future. Several properties in the feasibility study area are owned by either Boulder County, the City of Longmont, or the Town of Lyons. The potential exists for some of these properties to have bathroom facilities constructed. We have divided the NLPA into five service areas as follows (see Figure 2, Section 1):

- Apple Ridge Service Area – This service area is served by Apple Ridge Road (see Figure 5). There are 10 total developable lots adjacent to the roadway. Most lots are approximately 35 acres in size, with the exception of two smaller lots along the south side of Apple Ridge Road. Apple Ridge Road is approximately 3,900' in length from Apple Valley Road to its terminus.


TOWN OF LYONS
NLPA: Apple Ridge Service Area
Figure 5
N
BLUE MOUNTAIN
North Saint Vrain Creek
ST VRAIN
Apple Ridge Service Area
APPLE RIDGE
Apple Valley Service Area
APPLE VALLEY
Proposed Sewer
Alignments
Roads
Streams
Parcels
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- Antelope Service Area – there are 18 developable lots distributed along the Antelope Drive and JJ Kelly Road, ranging in size from 1 to 7 acres (see Figure 6). Most of the properties on the south side of Antelope Drive could be served by a gravity sewer in the road. However, properties on the north side of the Antelope Drive, and along JJ Kelly Road, drain to the northeast. Alternatives for serving these properties are discussed below.

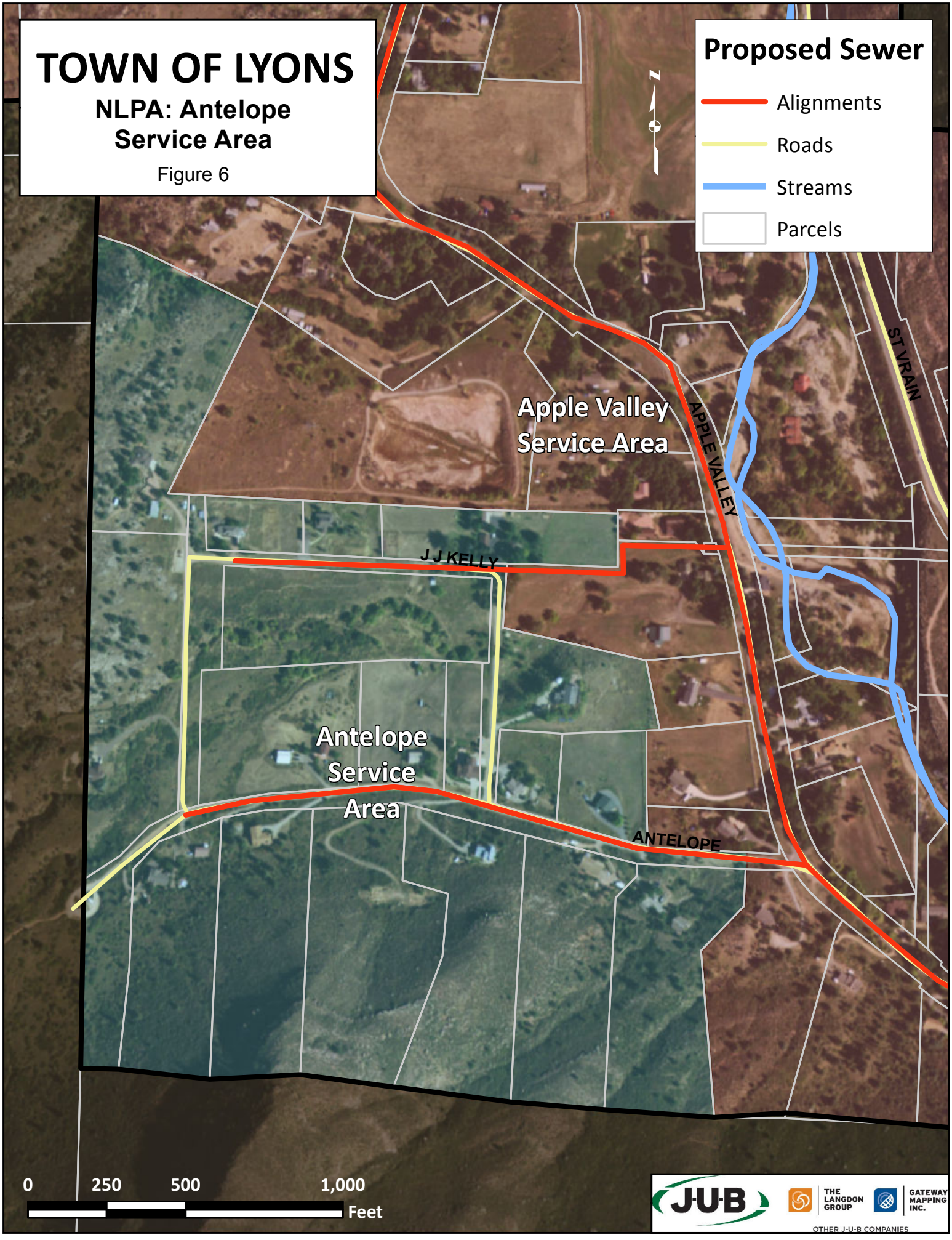
- Apple Valley Service Area – there are 75 developable lots are located on either side of the Apple Valley Road, distributed along its 12,000-foot length (see Figure 7). The road parallels North St. Vrain Creek for most of this distance. Approximately three-quarters of the developed properties lie between the road and North St. Vrain Creek. In addition, a number of lots with North St. Vrain Drive addresses have homes built between North St. Vrain Creek and Apple Valley Road, and would likely be served by a sewer aligned in either Apple Valley Road or along the west bank of North St. Vrain Creek.

- North St. Vrain Drive, Groover Drive, and West Main Street – There are approximately 13 lots between North St. Vrain Drive and North St. Vrain Creek that could be or have been developed with dwellings that could be located only on the east side of North St. Vrain Creek (see Figure 7). There are also approximately 20 buildable lots on Groover Drive and the east side of North St. Vrain Drive, and 8 buildable lots along West Main Street.

- Indian Lookout Service Area – There are 5 developable lots located along the 3,000-foot length of Indian Lookout Road (see Figure 9). Lots along this road range in size from 5 to 26 acres.

3.2 Conceptual Alignments & Service Areas

It is estimated that all of the proposed sewers would have a depth of flow less than 15% of the full depth of the pipe, based on the design criteria in Section 2.6, and assuming that all sewers are 8 inches in diameter. This is due to the low flow conditions we would anticipate. Low flow conditions are a result of the low development densities along the sewer alignments. Solids may build up more quickly in these sewers compared to sewers within the Town limits, due to the limited flushing action. It is typical for sewer utilities to clean sewers every one to three years. Sewers in the NLPA may need cleaning on an annual basis.


TOWN OF LYONS
NLPA: Antelope Service Area
Figure 6
Proposed Sewer
Alignments
Roads
Streams
Parcels
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Apple Valley Service Area
APPLE VALLEY
ST VRAIN
J J KELLY
Antelope Service Area
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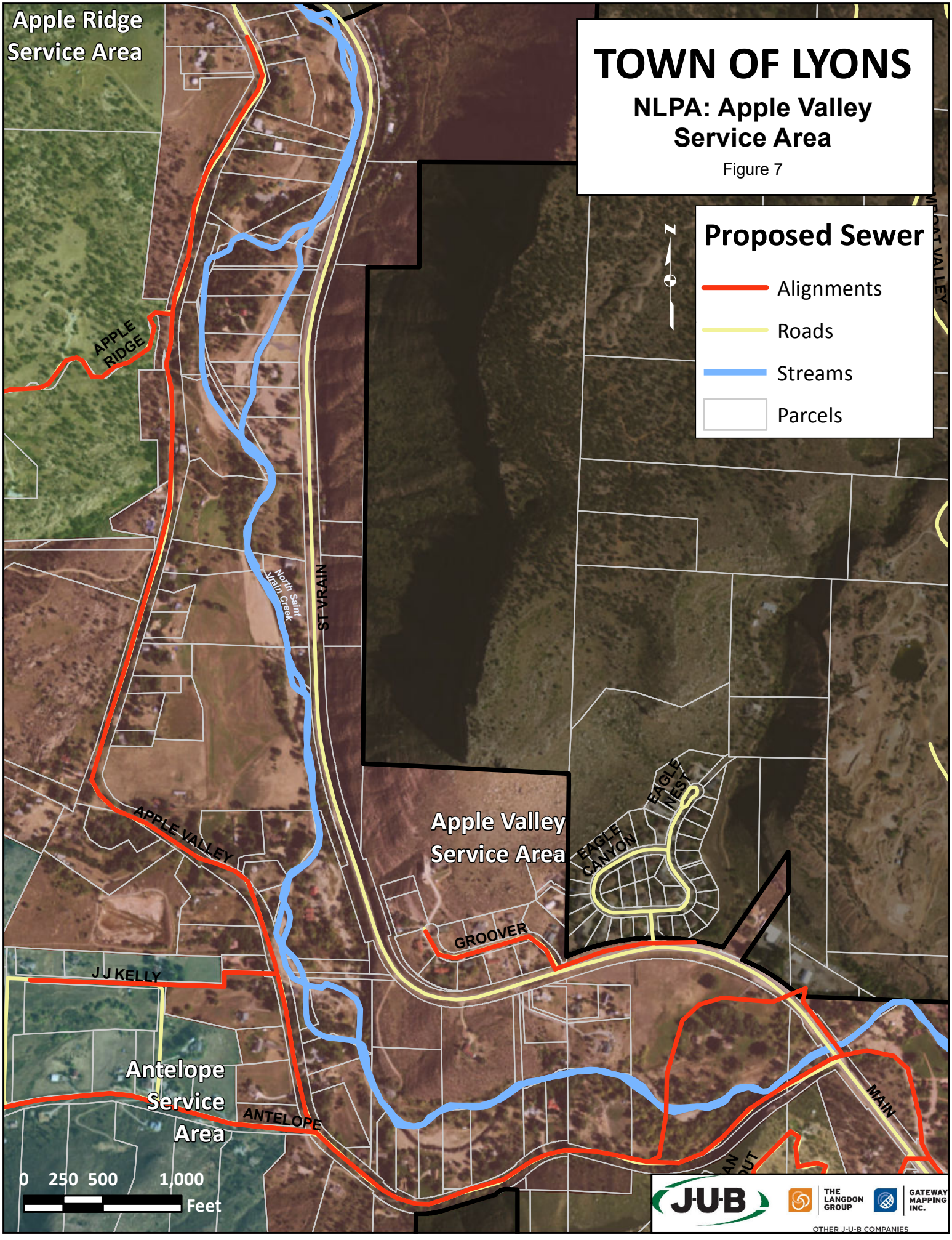
TOWN OF LYONS
NLPA: Apple Valley Service Area
Figure 7
Proposed Sewer
Alignments
Roads
Streams
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Apple Ridge Service Area
APPLE RIDGE
APPLE VALLEY
North Saint Vrain Creek
ST VRAIN
Apple Valley Service Area
EAGLE NEST
EAGLE CANYON
GROOVER
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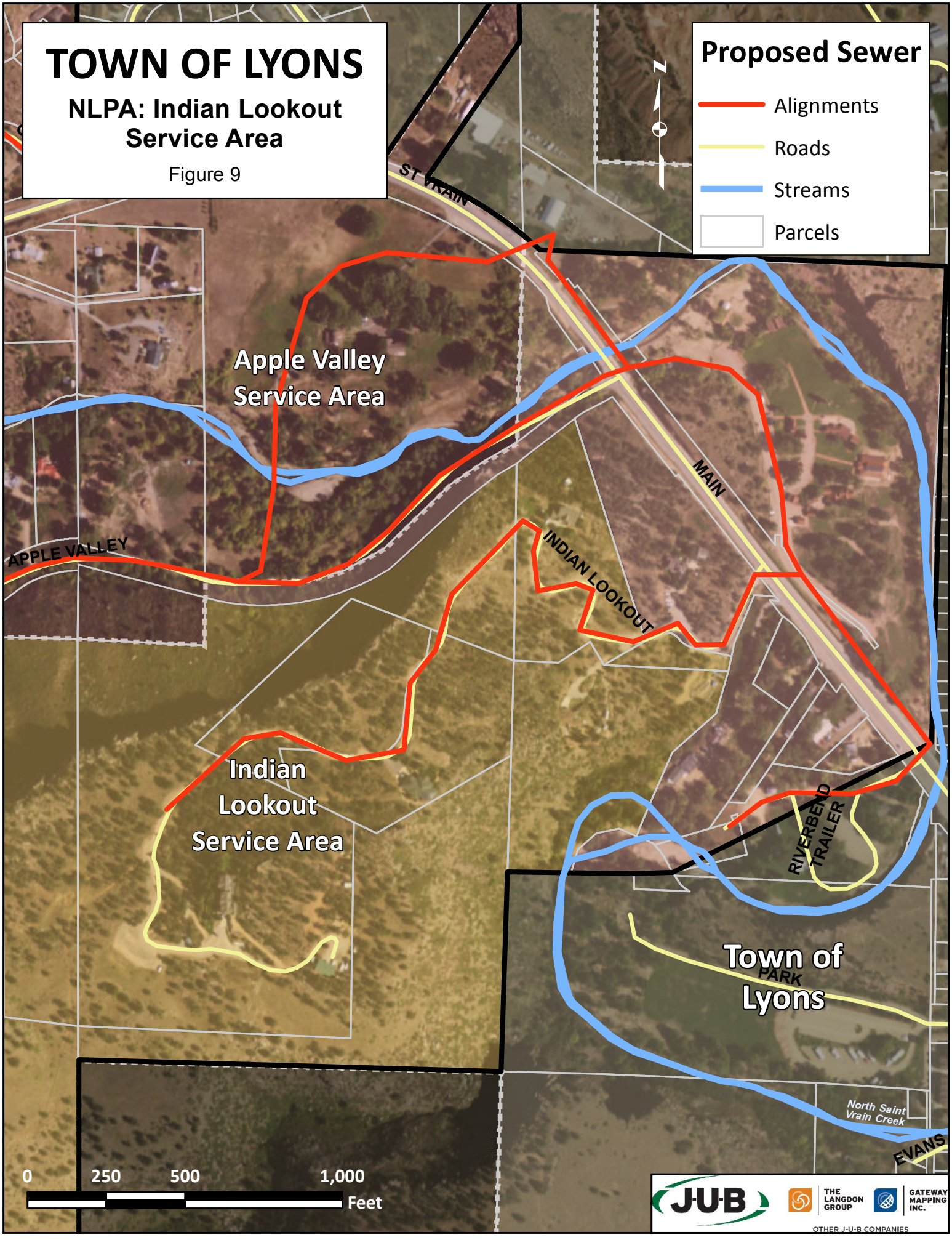
TOWN OF LYONS
NLPA: Indian Lookout Service Area
Figure 9
Proposed Sewer
Alignments
Roads
Streams
Parcels
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ST VRAIN
Apple Valley Service Area
APPLE VALLEY
MAIN
INDIAN LOOKOUT
Indian Lookout Service Area
RIVERBEND TRAILER
Town of Lyons
PARK
North Saint Vrain Creek
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3.2.1 Assumptions

We have assumed that sewer construction would occur within existing road ROW for nearly all alignments in both the NLPA and the SWLPA. A few exceptions are noted where it would be necessary to deviate from the road ROW and construct within easements across private properties, due to the fact that some of the roads do not follow the natural drainage patterns. We have also addressed an alternative, discussed later in this report, for a trunk line serving Apple Valley. In these cases we have identified the necessity for easements. The project scope did not require identification of specific property owners from whom easements would be required. This determination would be made during a preliminary design study. We assumed that where a dwelling is below the sewer main in elevation, it would discharge to a low pressure sewer laid parallel to the gravity sewer.

3.2.2 Apple Valley Road

A sewer approximately 12,000 feet long aligned in Apple Valley Road could serve the properties along Apple Valley Road, as well as properties with North St. Vrain Drive addresses on the south side of North St. Vrain Creek (see Appendices for plan and profile drawings of this alignment). This alignment is relatively flat, with an average slope of 1.1%, with the majority of the alignment being between 0.50% and 0.60%. The minimum slope allowed by Town standards is 0.40%. The maximum flow velocity would be approximately 1.5 fps or less in most of the sewer, and it may be necessary to perform routine flushing to prevent buildup of solids. An 8-inch diameter sewer would be sufficient to serve the Apple Valley Service Area, and would have the capacity to receive wastewater from lots along Antelope Drive, JJ Kelly Road, and Apple Ridge Road. Most or all of the homes between the Apple Valley Road and North St. Vrain Creek would require household lift stations.

A sewer aligned in Apple Valley Road could not discharge by gravity to the Eagle Canyon lift station because the invert of the station's wetwell is above the elevation of the streambed where Apple Valley Road intersects North St. Vrain Drive. It would be necessary for a sewer aligned in Apple Valley Road to diverge from the road several hundred feet to the west of North St. Vrain Road cross North St. Vrain Creek several hundred feet upstream of the intersection in order for it to discharge to the lift station. We have identified one possible alignment that would cross a large parcel of land adjacent to both Apple Valley Road and North St. Vrain Drive (see Appendices).

An alternative to an alignment in Apple Valley Road is an alignment along the west bank of North St. Vrain Creek. This alignment would require 36 to 40 easements for construction. Approximately 15 property owners on the east side of Apple Valley Road and 14 on the west side would need to obtain private easements to connect services to this sewer.

The Town would need easements for sewers serving Apple Ridge Road, JJ Kelly Drive and Antelope Drive in order to tie into this alignment. The advantage is that most homes could connect to this sewer by gravity. The length and slope of this alignment would be similar to the alignment in Apple Valley Road. The choice of a final alignment for this option would be determined through a site specific preliminary engineering study.

Alignment	Length (ft)	Slope	No. of Lots
Apple Valley Road	12,000	1.1%	75+

3.2.3 North St. Vrain Drive, Groover Drive and West Main Street

There are a total of approximately 41 buildable lots along North St. Vrain Drive, Groover Drive and West Main Street. If a sewer were constructed to the south and west of North St. Vrain Creek, either in Apple Valley Road or along the west and south bank of North St. Vrain Creek, the services for 33 of these lots would need to be bored underneath the stream to reach the Apple Valley Sewer. Household lift stations would be necessary for this alternative.

An alternative would be to construct approximately 10,000 feet of sewer aligned on the east side of North St. Vrain Road, with an additional 1,100 feet of sewer in Groover Drive (see Figure 8). This sewer would outfall to a proposed lift station at the west end of Main Street, via a bored crossing of North St. Vrain Creek. This proposed lift station is discussed in Section 3.3. This sewer system would serve nearly all 33 lots. Services for approximately 15 lots would need to be bored under North St. Vrain Drive and pumped from household lift stations. This alignment would likely require construction within the roadway for part of its length, and within the road ROW for the majority of its length.

Groover Drive by itself serves 10 lots. A sewer approximately 1,950 feet in length with an average slope of 6.0% could serve these lots, discharging to an existing manhole in North St. Vrain Drive that serves the Eagle Canyon subdivision.

Alignment	Length (ft)	Slope	No. of Lots
North St. Vrain Dr/Groover Dr	11,000	1.0%	41
Groover Drive	1,950	6.0%	10

3.2.4 Antelope Drive and JJ Kelly Road

Antelope Drive and JJ Kelly Road serve an area on the western slope Apple Valley. Lots range from 1 to 7 acres in size. A sewer approximately 2,000 feet in length aligned in Antelope Drive could serve 12 lots. This alignment would have an average slope of approximately 5.9%. The homes on the north side of the road would require household lift stations to connect to the sewer. It is likely that significant rock excavation would be required during construction of this sewer.

A sewer approximately 1,650 feet in length, aligned in the east-west portion of JJ Kelly Road and in easement east to the Apple Valley trunk line could serve three (3) homes. The alignment would have an average slope of approximately 4.6%. Construction of this alignment would likely require significant rock excavation.

Alignment	Length (ft)	Slope	No. of Lots
Antelope Drive	2,000	5.9%	12
JJ Kelly Road	1,650	4.6%	3

3.2.5 Apple Ridge Road and Indian Lookout Road

Apple Ridge Road and Indian Lookout Road are both steep roads serving estate lots. A sewer approximately 3,900 feet in length and aligned in Apple Ridge Road could serve 10 buildable lots. This alignment has an average slope of 8.5%. It is likely that significant rock excavation would be required to construct this sewer. Household lift stations would be required for some lots.

A sewer approximately 3,200 feet in length and aligned in Indian Lookout Road could serve five (5) buildable lots. The alignment has an average slope of 11.0%. It is likely that significant rock excavation would be required to construct this sewer. Household lift stations would be required for some lots. The intersection between the foot of Indian Lookout Road and West Main Street is southeast and down gradient from the Eagle Canyon lift station, therefore a sewer aligned in Indian Lookout Road could not discharge to the lift station. One option for the outfall of this sewer would be the manhole at Main Street and 5th Avenue, in to which the Eagle Canyon forcemain discharges. This would require an additional 1,000 feet of sewer along West Main Street, and an aerial crossing of North St. Vrain Creek. Another option would be to construct the sewer from the base of Indian Lookout Road southeast along Main Street and then across private property to the Riverbend facility. This would result in a total of approximately 4,000 feet of sewer.

Alignment	Length (ft)	Slope	No. of Lots
Apple Ridge Road	3,900	8.5%	10
Indian Lookout Road	3,200	1%	3

3.3 Potential Points of Connection

Two potential points of connection have been identified by Town staff; the Eagle Canyon lift station on North St. Vrain Road, and the recently completed sewer at River Bend. Any gravity connection by a sewer in Apple Valley Road to the lift station would require crossing North St. Vrain Creek upstream of the station. One possible alignment would be to cross a 26-acre parcel of land on the south side of North St. Vrain Drive. The sewer would need to traverse through the middle of the property to avoid inadequate or excessive depths of cover or negative grades, before crossing North St. Vrain Creek.

An alternative to crossing the 26-acre parcel would be to build a new lift station to the southeast of the existing Eagle Canyon lift station, on the south side of North St. Vrain Creek. A sewer in Apple Valley Road could flow by gravity to this lift station through a bore under North St. Vrain Drive. The gravity sewer that currently connects the Eagle Canyon subdivision to the lift station would need to be extended southeast to the new lift station location, via a crossing under North St. Vrain Creek.

The second point of connection identified by the Town is at the River Bend facility, where the Town has constructed a new sewer across North St. Vrain Creek. A sewer could be constructed either from the existing lift station site, or from the lower intersection of Apple Valley Road and North St. Vrain Drive, parallel to the alignment of the forcemain. The sewer would cross Main Street at the entrance to Riverbend and extend across that property to a connection to the Town's existing sewer. This sewer could potentially serve Apple Valley, North St. Vrain Drive, Groover Drive, and the Eagle Canyon subdivision by gravity. The Town could then abandon its existing lift station.

Chapter 4

Southwest Lyons Planning Area (SWLPA)

Chapter 4 – Southwest Lyons Planning Area (SWLPA)

4.1 Planning Area Characteristics

4.1.1 Geography

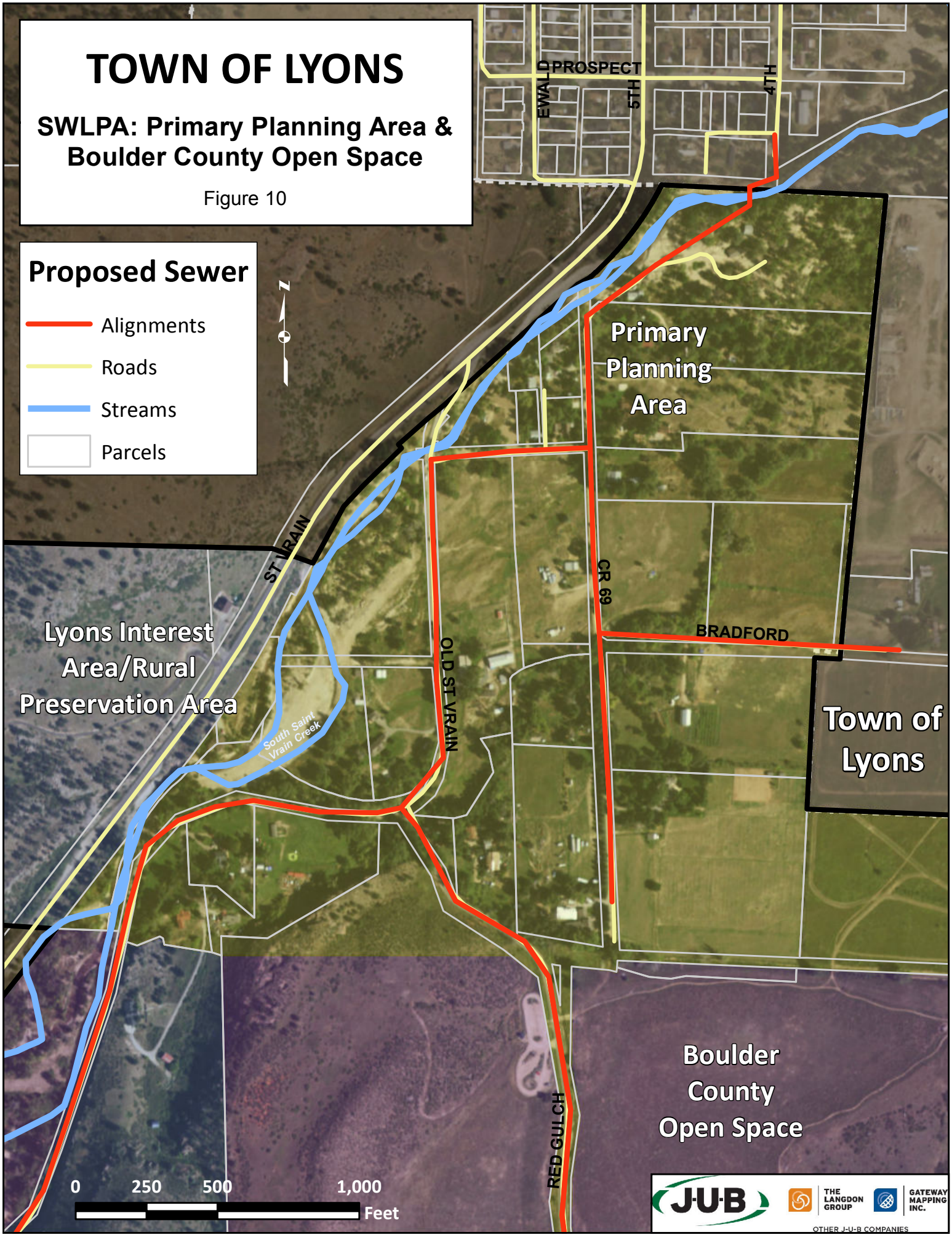
The SWLPA, like the NLPA, is identified in the Town's Intergovernmental Agreement (IGA) with Boulder County (See Figure 1, Section 1). The SWLPA is approximately 740 acres in size, including road ROW, open space, and outlots. Much of the Primary Planning Area (PPA) is located in the 100-year floodplain shown on FIRM numbers 08013C0234J and 08013C0232J, or the interim floodplain depicted on the County Assessor website.

The PPA (see Figure 10) accounts for approximately one-sixth of the SWLPA, with the balance being mostly rural preservation land. Properties in the PPA are located adjacent to County Road 69, Bradford Street, and a portion of Old St. Vrain Road. The SWLPA is bounded on the west, in part, by South St. Vrain Creek. Most of the property along South St. Vrain Creek is owned by Boulder County, as are two 40 acre parcels to the south of the PPA that are part of Heil Valley Ranch.

The developable lots in the SWLPA as currently platted are generally divided between the northern and southern portions of the SWLPA. The PPA makes up the northern portion of the SWLPA and has an approximate area of 120 acres.

The southern portion of the SWLPA is comprised of 620 acres of low-lying areas of very low density, and mountainous terrain with much higher density development. Most of the latter is platted as the Lyons Park Estates subdivision, and is accessed by a network of roads via Jasper Drive. There are three large parcels totaling 123 acres adjacent to the north and west borders of Lyons Park Estates that appear to be a large agricultural operation. These properties, combined with the Heil Valley Ranch property, act as a buffer between the PPA and Lyons Park Estates.

The study area includes two properties adjacent to the west side of South St. Vrain Drive. Sewer service to these lots would require approximately 1,800 feet of sewer and a bore under State Highway 7. This would be prohibitively expensive, and was not explored further as an option.


TOWN OF LYONS
SWLPA: Primary Planning Area & Boulder County Open Space
Figure 10
Proposed Sewer
Alignments
Roads
Streams
Parcels
N
EWALD
PROSPECT
5TH
4TH
ST VRAIN
CR 69
BRADFORD
OLD ST VRAIN
RED GULCH
Primary Planning Area
Lyons Interest Area/Rural Preservation Area
South Saint Vrain Creek
Town of Lyons
Boulder County Open Space
0
250
500
1,000
Feet
J·U·B
THE LANGDON GROUP
GATEWAY MAPPING INC.
OTHER J-U-B COMPANIES

4.1.2 Existing Development Density

The SWLPA has been divided into two services areas as follows (refer to Section 3.1.2 for definitions of buildable lots):

- There are approximately 26 residential lots in the PPA, ranging mostly from 2 to 9 acres in size. South of the PPA, along Old St. Vrain Road, there are two residential properties, each approximately 16 acres in size, and three agricultural lots with a combined area of 123 acres.
- The remaining portion of the SWLPA that contains buildable lots is located in the Lyons Park Estates subdivision. Approximately 72 lots are located on or above Jade Drive, and 7 lots along Red Gulch Road. Most of these lots range from 2 to 7 acres.

4.2 Conceptual Alignments and Service Areas

It is estimated that all of the proposed sewers would have a depth of flow less than 15% of the full depth of the pipe, based on the design criteria in Section 2.6, and assuming that all sewers are 8 inches in diameter. This is due to the low flow conditions we would anticipate. Low flow conditions are a result of the low development densities along the sewer alignments. Solids may build up more quickly in these sewers compared to sewers within the Town limits, due to the limited flushing action. It is typical for sewer utilities to clean sewers every one to three years. Sewers in the SWLPA may need cleaning on an annual basis.

4.2.1 Assumptions

Wastewater flow assumptions are the same for the SWLPA as for the NLPA regarding construction of proposed sewers in road rights-of-way. We assumed that the existing sewer in 4th Avenue would be extended across South St. Vrain Creek to provide a point of connection (see Figure 3, Section 1). We assumed that public lands in the SWLPA would not have large public facilities constructed on them requiring a significant number of sewer services. We therefore divided the SWLPA into two areas; the PPA to the north, and the Lyons Park Estates subdivision and associated areas to the south.

4.2.2 County Road 69 and Old St. Vrain Road

A sewer approximately 4,500 feet in length and aligned in County Road 69 and Old St. Vrain Road to where it reaches the southwest boundary of the PPA would serve approximately 18 buildable lots in the PPA (see Figure 10). This sewer would serve as a trunk line for other sewers constructed in the SWLPA. This proposed alignment is relatively flat, with an average slope of 1.3%.

The maximum flow velocity will likely be less than 1 fps in the upstream end of this sewer, assuming all lots along this alignment are connected to this sewer. Peak velocities would be approximately 2.5 fps should the Lyons Park should sewers in the Estates subdivision be connected to this trunk line.

Alignment	Length (ft)	Slope	No. of Lots
CR 69/Old St. Vrain Road	4,500	1.3%	18

4.2.3 County Road 69 and Bradford Street

A sewer approximately 1,200 feet in length and aligned in the north-south branch of CR 69 could serve 5 homes. This alignment is relatively flat, with an average slope of 1.7%. The maximum flow velocity will likely be less than 1 fps throughout the length of this sewer, and it may require routine flushing to avoid buildup of solids.

Alignment	Length (ft)	Slope	No. of Lots
CR 69/Bradford Street	1,200	1.7%	5

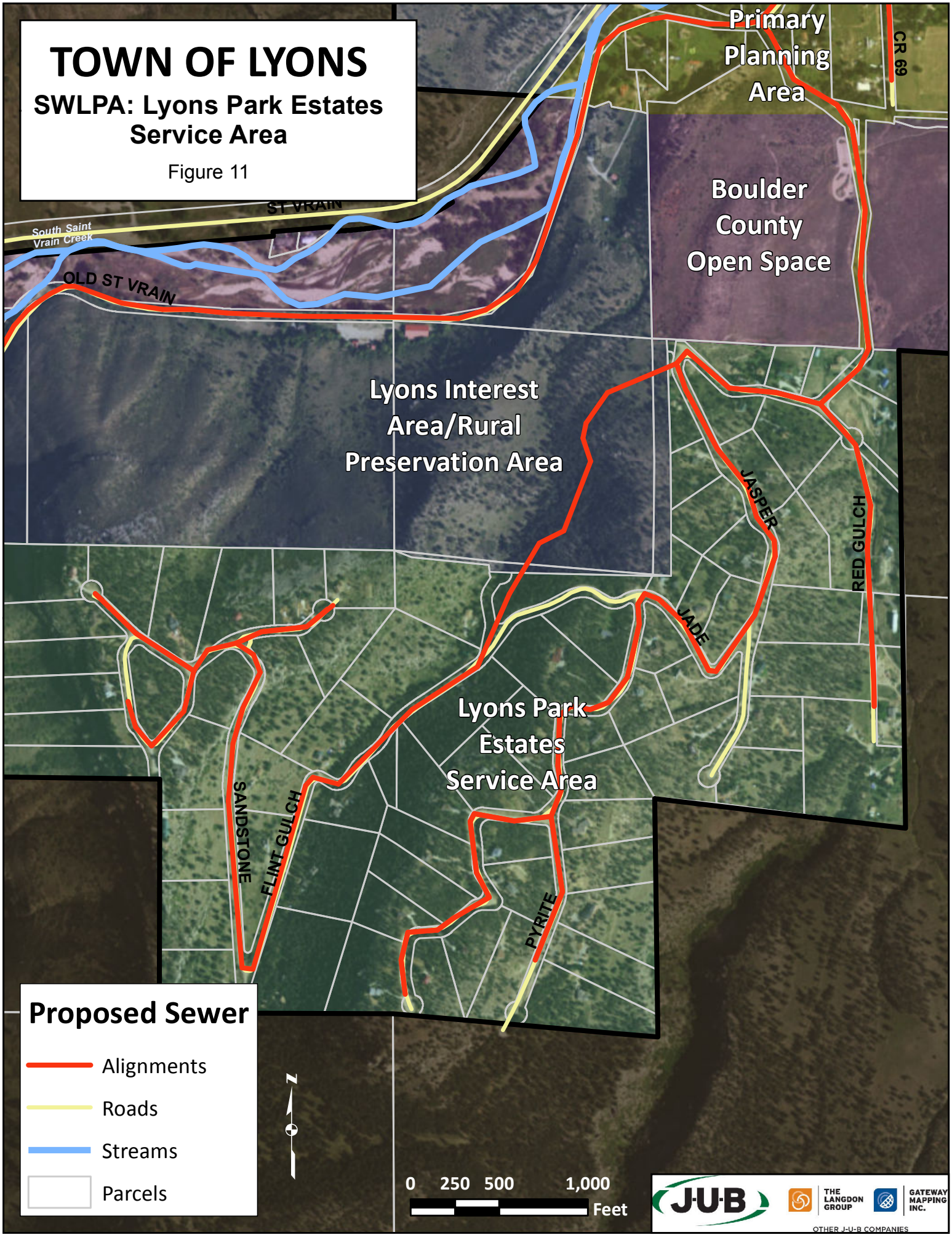
4.2.4 Red Gulch Road

A sewer approximately 4,300 feet in length and aligned in Red Gulch Road could serve 12 to 15 homes, most of which are in Lyons Park Estates (see Figure 11). This alignment has an average slope of 3.0%. Portions of the sewer would lie 15 to 20 feet below grade. The maximum flow velocity would be approximately 1 fps throughout the length of this sewer, and this sewer may require routine flushing to avoid buildup of solids. If the majority of the Lyons Park Estates subdivision were to discharge to the sewer, peak velocities may exceed 2 fps.

Alignment	Length (ft)	Slope	No. of Lots
Red Gulch Road	4,300	3.0%	12 to 15

4.2.5 Upper Lyons Park Estates

The 72 lots above the intersection of Jasper Drive and Red Gulch Road could be served by a network of sewers laid in the road ROW, comprised of two main trunk lines and two laterals (see Figure 11). The Flint Gulch trunk sewer would require a single easement approximately 600 feet in length across an agricultural parcel. The table below provides the lengths and slopes of these sewers:


TOWN OF LYONS
SWLPA: Lyons Park Estates Service Area
Figure 11
Primary Planning Area
CR 69
Boulder County Open Space
ST VRAIN
South Saint Vrain Creek
OLD ST VRAIN
Lyons Interest Area/Rural Preservation Area
JASPER
RED GULCH
JADE
Lyons Park Estates Service Area
SANDSTONE
FLINT GULCH
PYRITE
Proposed Sewer
Alignments
Roads
Streams
Parcels
N
0 250 500 1,000
Feet
J-U-B
THE LANGDON GROUP
GATEWAY MAPPING INC.
OTHER J-U-B COMPANIES

Alignment	Length (ft)	Slope	Lots
Jasper Dr./Jade Way/Quartz Way	6,900	10.9%	
Flint Gulch	7,650	8.3%	
Sandstone Drive	600	11.8%	
Sandstone Circle	700	6.7%	
Pyrite Way	850	7.5%	
Total	**16,700**		**72**

Numerous lots in upper Lyons Park Estates would need to pump to the sewer, and construction would likely require substantial amounts of rock excavation.

4.2.6 Old St. Vrain Road

A sewer approximately 4,500 feet in length and aligned in Old St. Vrain Road could serve four (4) buildable lots, assuming homes were built on two agricultural parcels adjacent to the road (see Figure 12). The alignment is relatively flat, with an average slope of 1.4%. This sewer would have negligible flow throughout its length, and would require routine flushing to avoid buildup of solids.

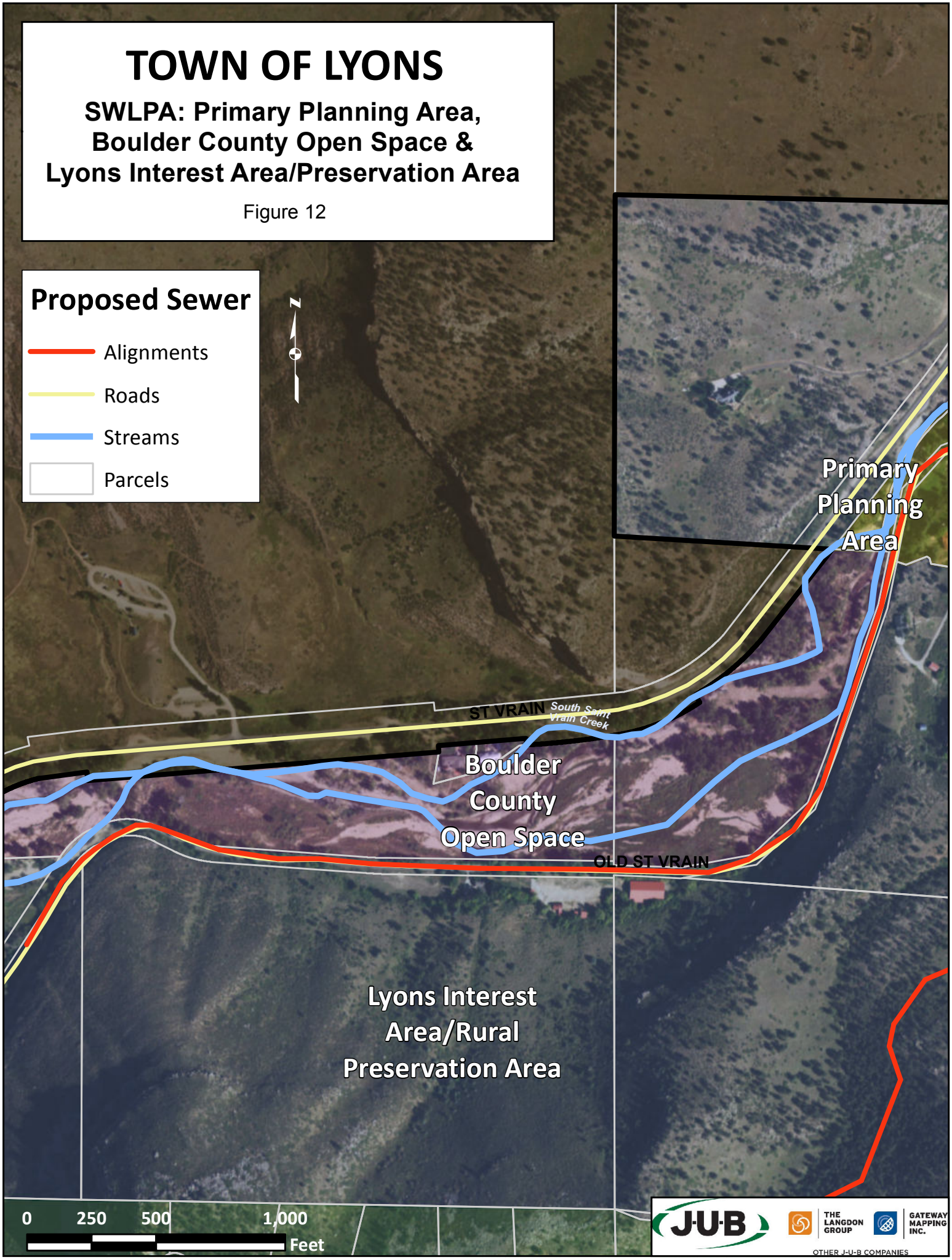
4.3 Potential Points of Connection

The Town has identified one potential point of connection for the SWLPA. Plans provided by the Town indicate that the sewer in 4th Avenue will be extended across South St. Vrain Creek in the future (see Figure 3). This crossing would necessitate an easement across one property on the south side of South St. Vrain Creek to reach the north end of CR 69.

TOWN OF LYONS

SWLPA: Primary Planning Area, Boulder County Open Space & Lyons Interest Area/Preservation Area

Figure 12



Chapter 5

Costs

Chapter 5 – Costs

5.1 Assumptions

Costs provided in this feasibility study represent an order of magnitude (OM). These OM costs were not developed with the detail necessary for inclusion into a capital improvements program. Rather, they are intended to provide guidance to the Town in determining sewer projects on which they may choose to perform preliminary design studies. Such studies would refine and modify alignments, and establish preliminary opinions of cost. The Town's choice of which alignments to study will depend on several factors, the identification of which was beyond the scope of this study. These may include easement acquisitions, utility conflicts, future development, land use planning, planned road improvements, etc. We did not estimate a cost to replace or relocate the Eagle Canyon Lift Station as there are too many variables that would not be defined until a planning study is performed. We have not included costs for bored crossings of streams. We estimate that these costs would represent less than 5% of the total construction cost of a trunk sewer serving the SWLPA, and less than 2% of a trunk sewer serving the NLPA. Cost estimates of this resolution are more appropriate to detailed project studies.

We have developed these OM costs assuming a cost per lineal foot that is intended to include mobilization and demobilization, insurance and bonding, traffic control, dewatering, utility and culvert crossings, erosion control, and other items that could be expected to be included in a typical project. We have accounted for rock excavation separately, as we would expect it to be less in alluvial soils than in areas where shallow rock is apparent. Our assumed unit cost for rock is $24 per lineal foot of trench. This is based on similar work recently bid in the Lyons area, and assumes that rock removed from the trench would be disposed of in the Lyons area. Rock removal is typically bid in increments of depth, and we have assumed the trench depth is 4 feet to 6 feet deep. Detailed information of the geology of the alignments was not available for this study. We have therefore estimated the lineal feet of trench that would require rock excavation based on visits to the proposed alignments. We have not included the cost of easement acquisitions. However, the conceptual alignments we have developed have limited the number of required easements by confining sewers to roadways wherever possible. We have assumed the following unit costs for the purpose of this feasibility study:

Cost per lineal foot of pipe	$	200
Cost per lineal foot of rock excavation	$	24
Cost per manhole	$	6,000

We have assumed that the trunk lines will be constructed prior to construction of laterals. In addition, the Red Gulch Road lateral would need to be constructed prior to construction of the Jasper Drive lateral and the other laterals in Upper Lyons Park Estates.

5.2 NLPA

5.2.1 Apple Road Trunk Line

Alignment	Length of Sewer Main (ft)	Approx. Length Requiring Rock Removal	No. of Manholes	Approx. Number of Lots Served	Approx. Total Cost of Sewer Main
Apple Valley Road	11,700	3500	59	75	$2,800,000

5.2.2 Apple Valley Laterals

Sewer Alignment	Length of Sewer Main (ft)	Approx. Length Requiring Rock Removal	No. of Manholes	Approx. Number of Lots Served	Approx. Total Cost of Sewer Main
Apple Ridge Road	3,900	1950	27	10	$990,000
JJ Kelly Road	1,660	800	3	3	$370,000
Antelope Drive	2,000	1000	5	12	$460,000
Indian Lookout Road	3,200	1600	20	5	$800,000
North St. Vrain Drive	11,000	5500	31	41	$2,500,000

5.3 SWLPA

5.3.1 County Road 69/Old St. Vrain Road Trunk Line

Alignment	Length of Sewer Main (ft)	Approx. Length Requiring Rock Removal	No. of Manholes	Approx. Number of Lots Served	Approx. Total Cost of Sewer Main
CR 69/Old St. Vrain Road	4,500	0	18	18	$1,000,000

5.3.2 Laterals

Sewer Alignment	Length of Sewer Main (ft)	Approx. Length Requiring Rock Removal	No. of Manholes	Approx. Number of Lots Served	Approx. Total Cost of Sewer Main
County Road 69 (Bradford)	1,600	0	4	5	$350,000
Bradford Street	1,060	0	3	2	$230,000
Red Gulch Road	4,300	2000	15	12	$1,000,000
Jasper Drive	3,600	1800	36	27	$980,000
Flint Gulch	7,650	4000	27	19	$1,800,000
Sandstone Drive	700	350	2	4	$170,000
Sandstone Circle	600	300	3	5	$150,000
Pyrite Way	850	450	2	7	$200,000
Old St. Vrain Drive	4,500	1200	25	2	$1,100,000

Chapter 6

Summary and Recommendations

Chapter 6 – Summary and Recommendations

6.1 Summary

The NLPA and SWLPA are characterized by low density development. A small percentage of the buildable lots are less than one acre in size. Onsite wastewater treatment systems are currently used on all lots, except for those systems that were damaged or destroyed in the September 2013 flood and have not been rebuilt.

The Town identified two connection points for the NLPA and one for the SWLPA for extensions of the Town's sewer infrastructure. The SWLPA connection in 4th Street to the southwest and NWLPA connection at River Bend to the west, were recently built or rebuilt. The third connection point is the Eagle Canyon lift station. This lift station is 23 years old. Although the Town reports no operations or maintenance issues with the station, the planning process lifespan for a lift station is approximately 20 years, and we therefore viewed the Eagle Canyon lift station as a new lift station (either completely rebuilt or relocated).

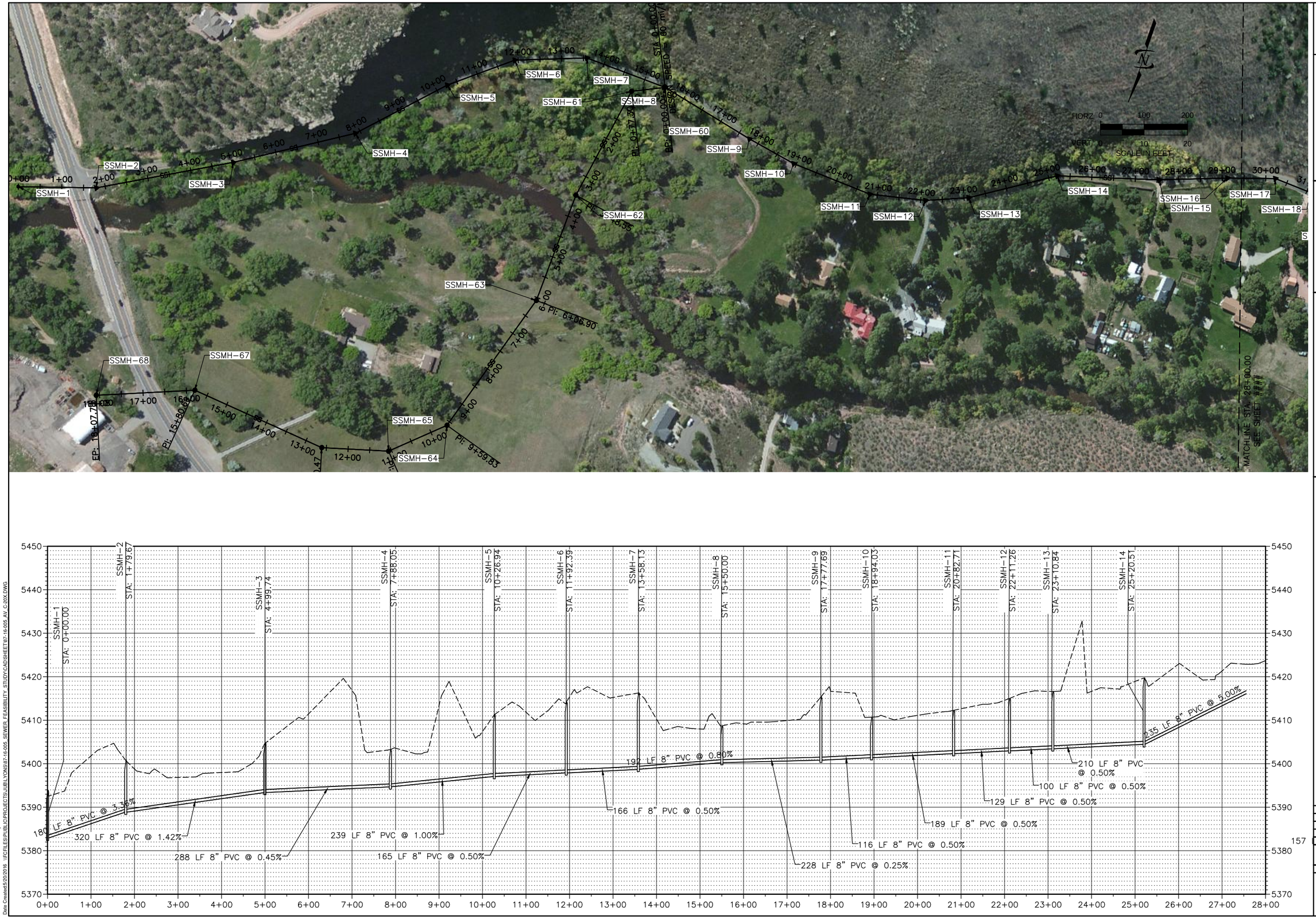
Conceptual alignments for sewers in the NLPA and SWLPA were developed within existing roads wherever possible to minimize the number of easements required. Construction of most sewers would require significant excavation of rock. Maintenance of traffic flow would be a challenge in most cases. Alignment of the Apple Valley sewer along the west bank of North St. Vrain Creek would eliminate most impacts to roads and traffic, but would require a substantial number of easements. A significant percentage of buildable lots served would need household lift stations to discharge to new sewers. It would likely be necessary to construct low pressure sewers parallel to and in a common trench with gravity sewers to serve household lift stations.

6.2 Recommendations

- We recommend that the Town commence a planning study for upgrading or replacing the Eagle Canyon lift station. This study should be incorporated in the Town's overall plan for extension of its sewer system infrastructure into the NLPA once the lift station's location is decided upon. We did not estimate a cost to replace or relocate the Eagle Canyon Lift Station as there are too many variables that would not be defined until a planning study is performed.
- We recommend that should the Town plan for a sewer system in Apple Valley that the connection point be either at the existing Eagle Canyon lift station location, assuming it's rebuilt, or at a new lift station at the west end of Main Street.

Appendices

Appendix 1
Apple Valley Sewer Plan and Profile



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TOWN OF LYONS
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APPLE VALLEY ROAD

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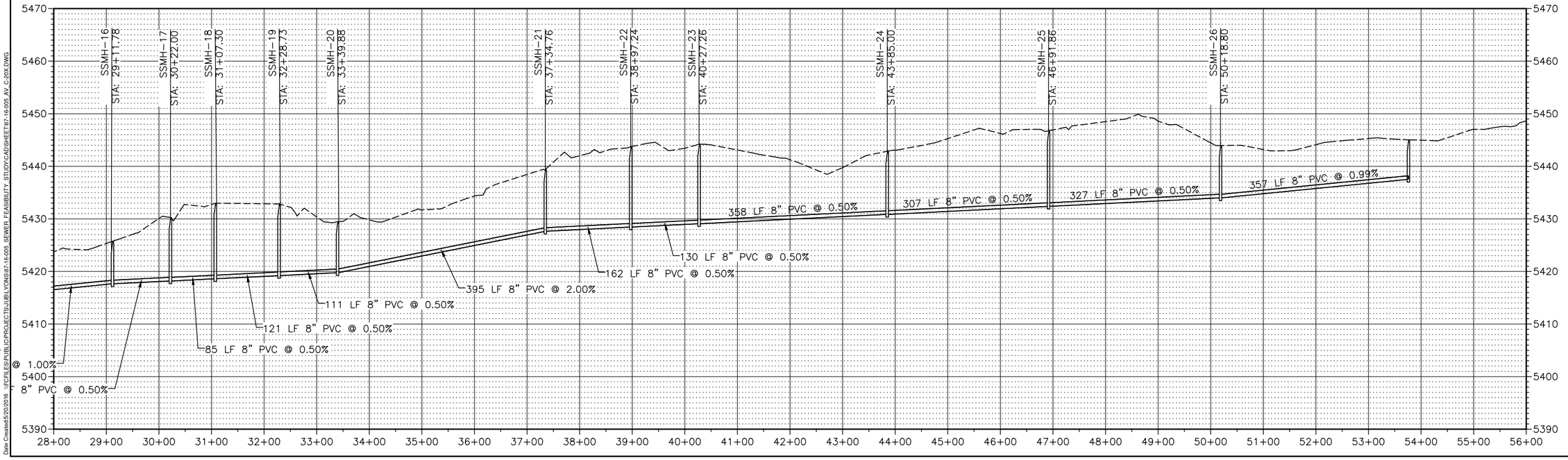

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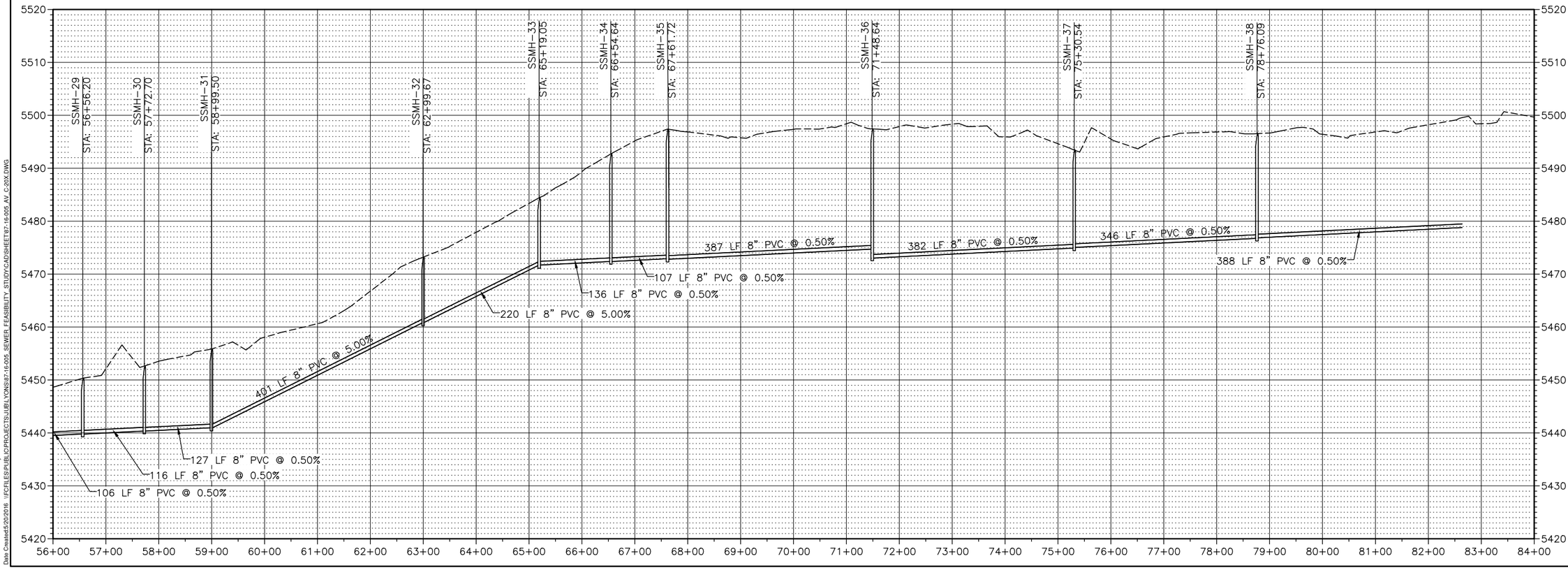

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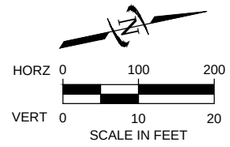

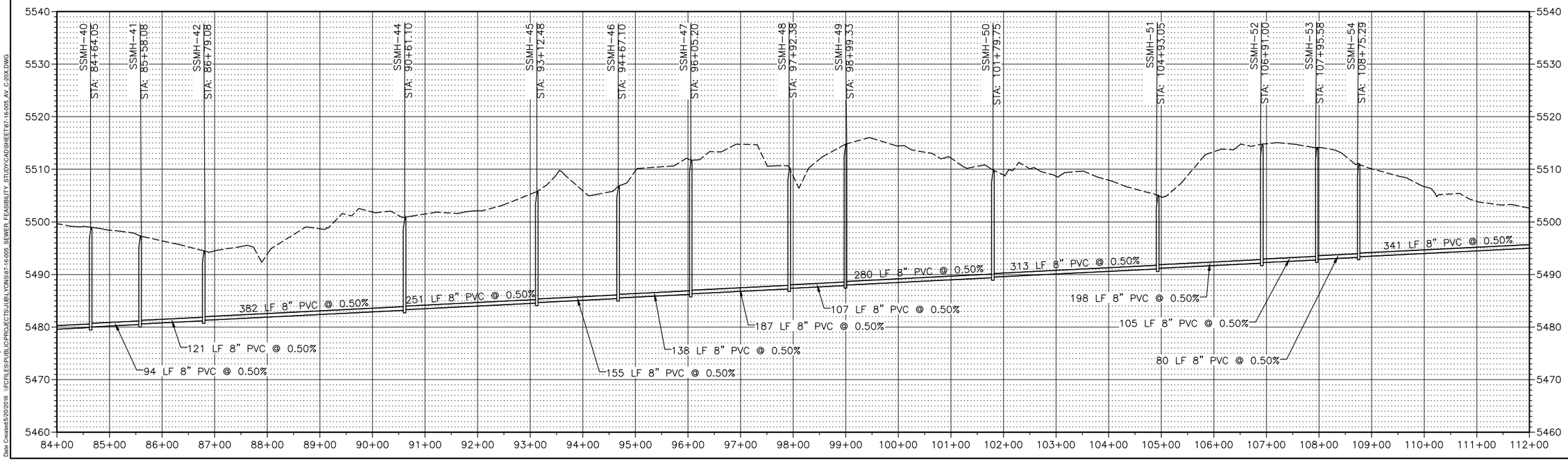

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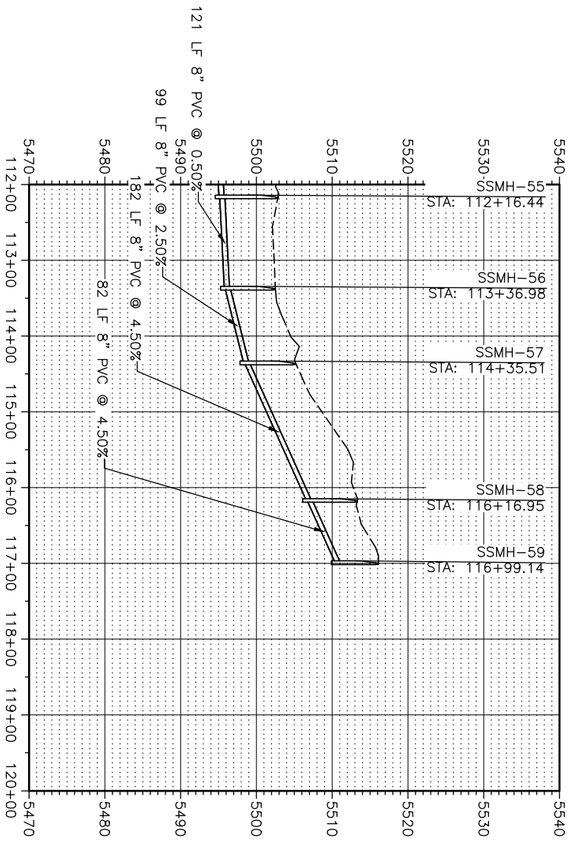

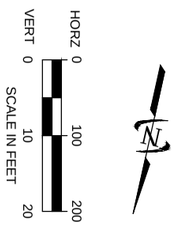

TOWN OF LYONS
SANITARY SEWER FEASIBILITY STUDY

APPLE VALLEY ROAD

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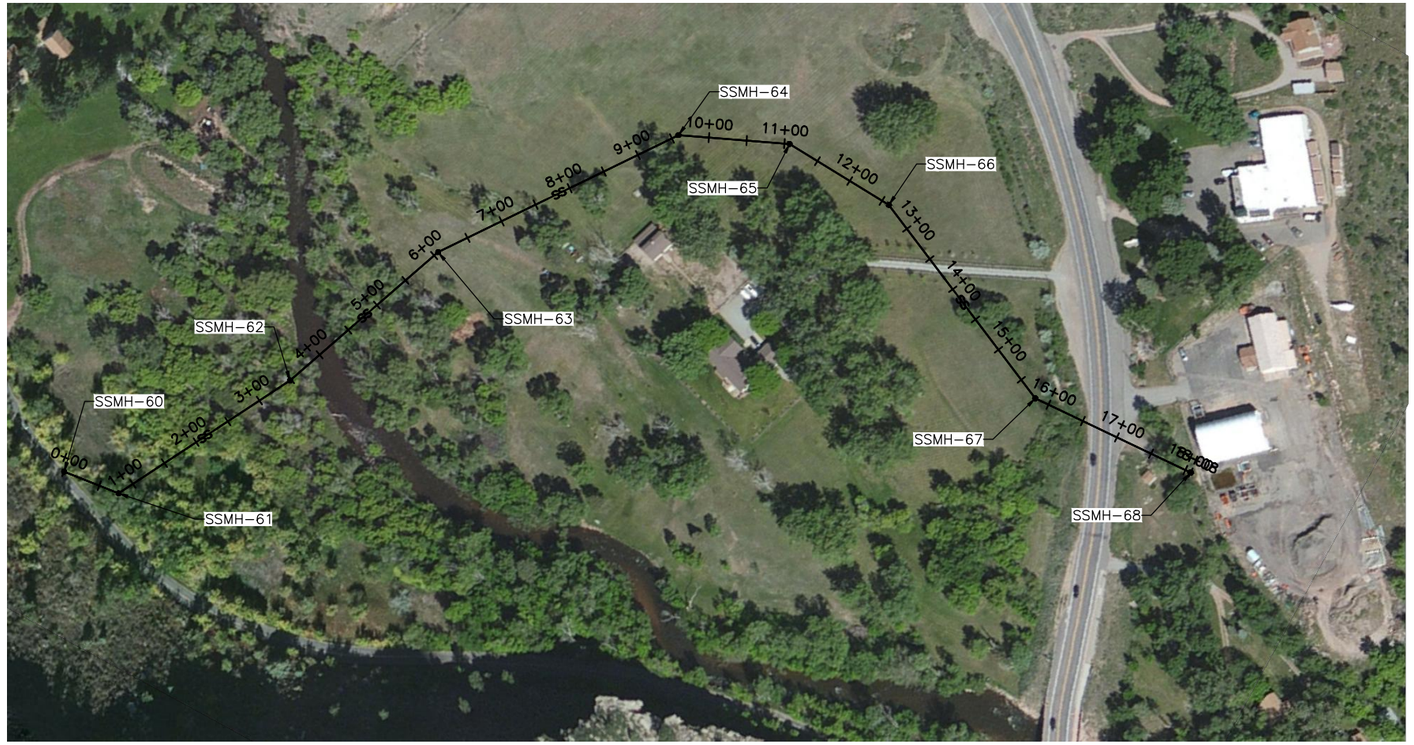

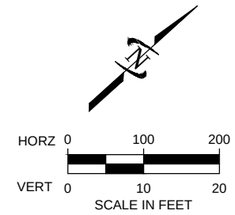

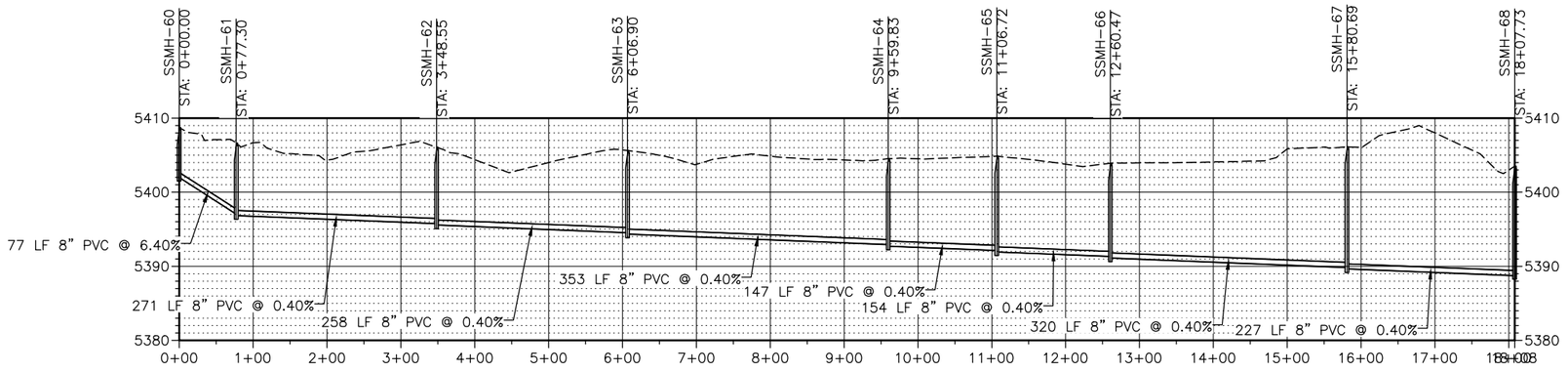

J-U-B ENGINEERS, INC.
J-U-B ENGINEERS, INC.
www.jub.com

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	BY	APP.	DATE
	REVISION			

TOWN OF LYONS
SANITARY SEWER FEASIBILITY STUDY

APPLE VALLEY ROAD

FILE : 87-16-005_AV_C-20X
JUB PROJ. # : ----
DRAWN BY: ##
DESIGN BY: ###
CHECKED BY: ###
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 8/31/2016

SHEET NUMBER:
6

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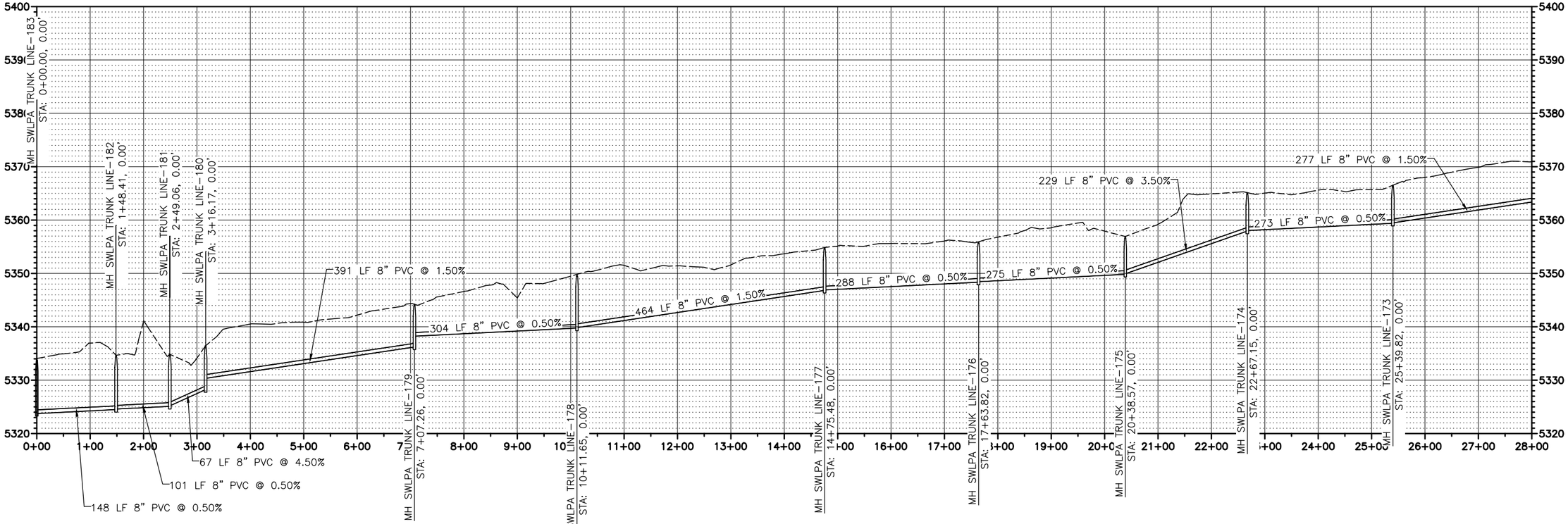
Appendix 2
County Road 69/Old St. Vrain Road
Plan and Profile

MATCHLINE STA. 28+00
SEE SHEET C-207

HORZ 0 100 200
VERT 0 10 20
SCALE IN FEET



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PRELIMINARY PLANS

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	DATE	BY	APP.
	REVISION			

TOWN OF LYONS
SANITARY SEWER FEASIBILITY STUDY

SWLPA TRUNK LINE

FILE : 87-16-005_SWLPA_C-20X
JUB PROJ. # : ----
DRAWN BY: ##
DESIGN BY: ###
CHECKED BY: ###
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 8/23/2016

SHEET NUMBER:
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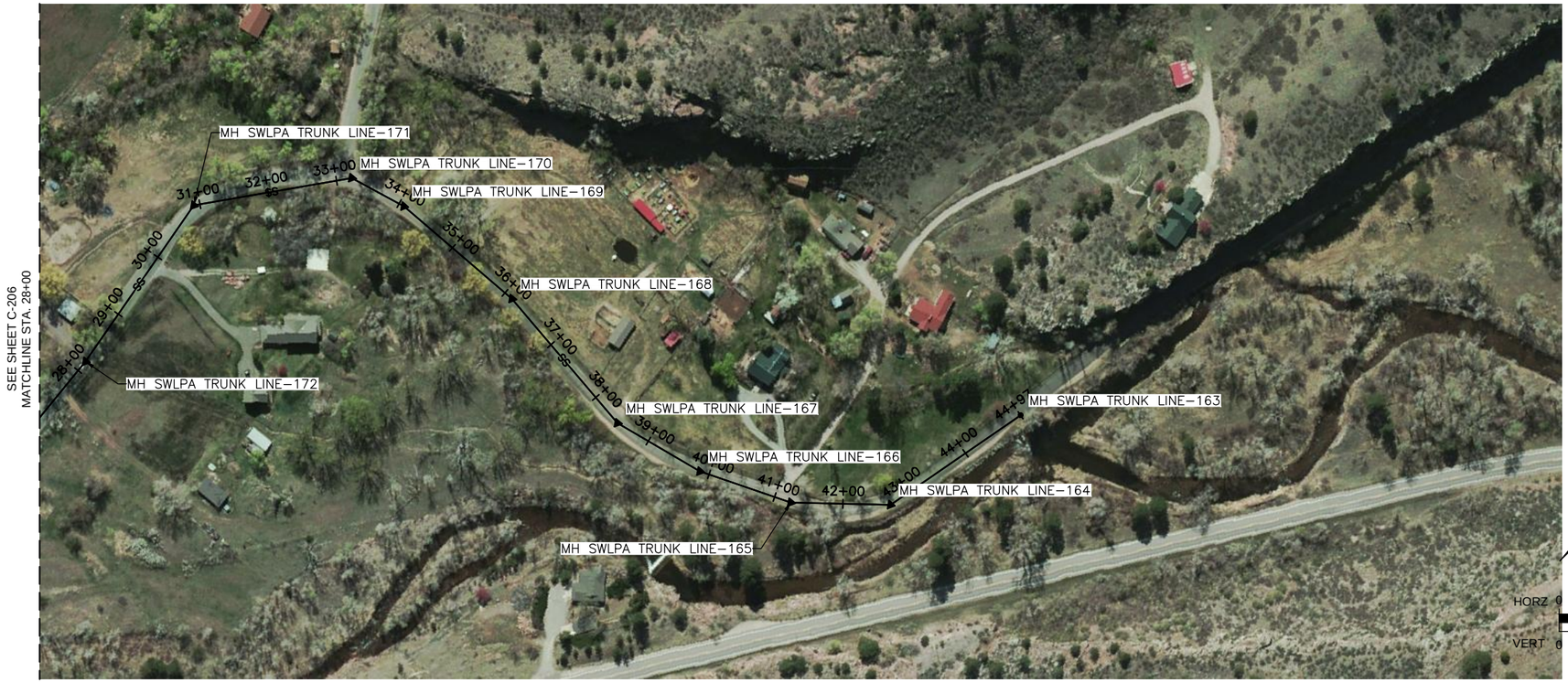
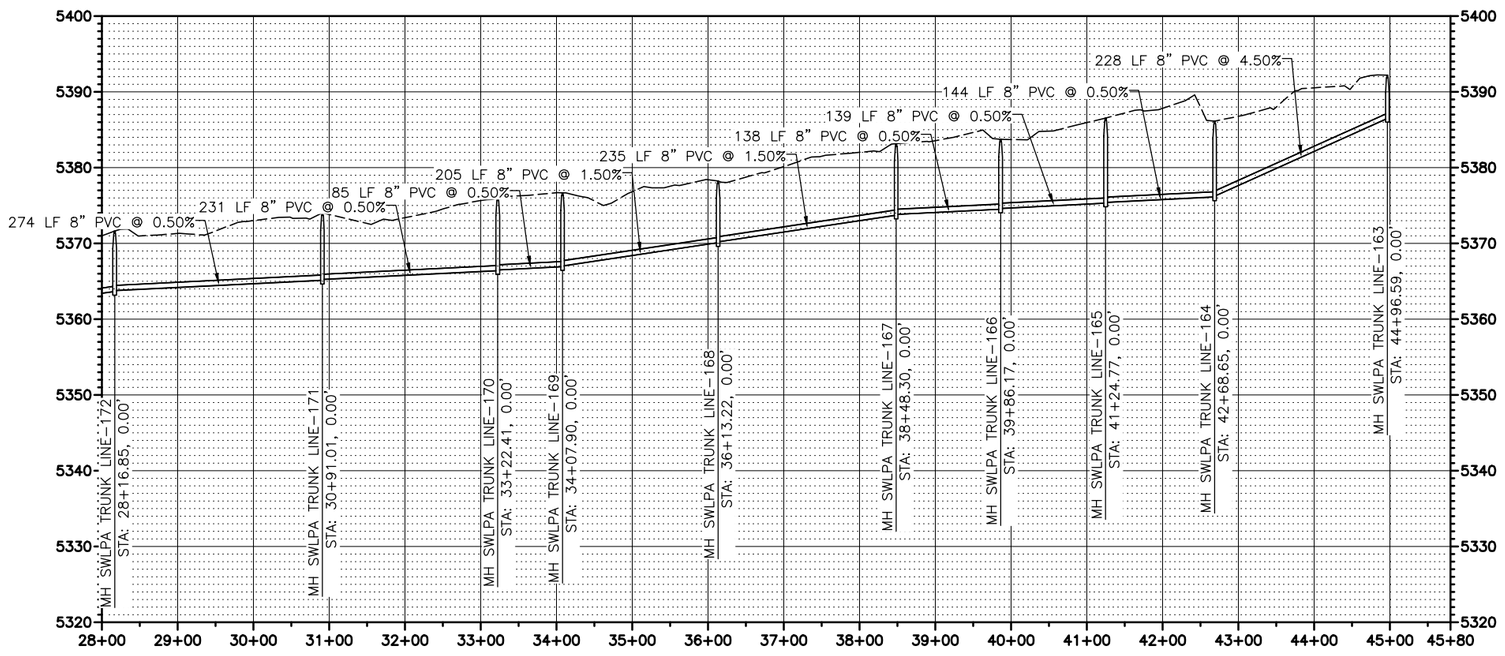
Date Created:7/11/2016 \\FCFILES\PUBLIC\PROJECTS\JUBL\LYONS\87-16-005_SEWER_FEASIBILITY_STUDY\CAD\SHEET\87-16-005_SWLPA_C-20X.DWG





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NO.	DESCRIPTION	BY	APP.	DATE
	REVISION			

TOWN OF LYONS
SANITARY SEWER FEASIBILITY STUDY

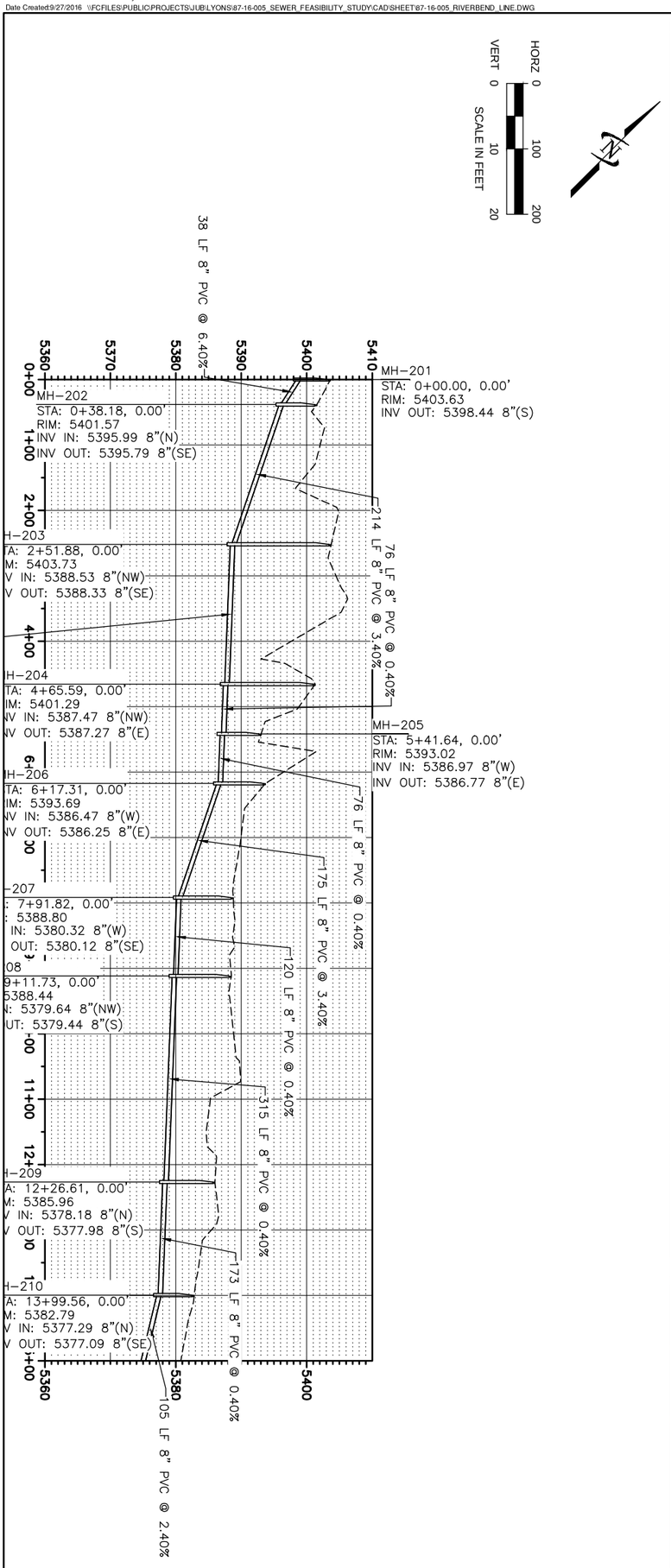
SWLPA TRUNK LINE

FILE: 87-16-005_SWLPA_C-20X
JUB PROJ. #: ---
DRAWN BY: ##
DESIGN BY: ###
CHECKED BY: ###
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 8/23/2016

SHEET NUMBER:
2

Appendix 3
Riverbend Plan and Profile

Plot Date:10/6/2016 1:01 PM Plotted By: Brian Klatt
Date Created:9/27/2016 \\FC\FILES\PUBLIC\PROJECTS\JUB\LYONS\87-16-005_SEWER_FEASIBILITY_STUDY\CAD\SHEET\87-16-005_RIVERBEND_LINE.DWG



TOWN OF LYONS
SANITARY SEWER FEASIBILITY STUDY

RIVERBEND

FILE: 87-16-005_RIVERBEND_LINE
JUB PROJ. # ----
DRAWN BY: ##
CHECKED BY: ##
DESIGNED BY: ##
ONE INCH
AT FULL SIZE IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 10/6/2016
SHEET NUMBER: 1

REVISION			
NO.	DESCRIPTION	BY	APR. DATE

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

J-U-B ENGINEERS, INC.
4745 Boardwalk Drive
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Fax: 970.377.3935
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	REVISION			

TOWN OF LYONS
SANITARY SEWER FEASIBILITY STUDY

RIVERBEND

FILE : 87-16-005_RIVERBEND_LINE
JUB PROJ. # : ----
DRAWN BY: ##
DESIGN BY: ###
CHECKED BY: ###

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AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

LAST UPDATED: 10/6/2016

SHEET NUMBER:
2

Plot Date:10/6/2016 1:01 PM Plotted By: Brian Kidd
Date Created:9/27/2016 \\FCFILES\PUBLIC\PROJECTS\JUBILYONS\87-16-005_SEWER FEASIBILITY_STUDY\CAD\SHEET\87-16-005_RIVERBEND_LINE.DWG

Appendix 4
Draft Comments and Responses

J-U-B ENGINEERS, INC.

J-U-B COMPANIES | THE LANGDON GROUP | GATEWAY MAPPING INC.

MEMORANDUM

DATE: November 7, 2016

TO: Jim Blankenship, Town of Lyons

CC: Eric Garner, J-U-B Engineers

FROM: Doug Paull, J-U-B Engineers

SUBJECT: Response to comments, September 1 draft submittal of the Sanitary Sewer System Expansion Feasibility Study

Jim,

We appreciate the comments you forwarded to us from Town staff and the Utilities and Engineering Board. We value the input, and we trust we've addressed the Town's concerns to its satisfaction. We offer below a restatement of each comment along with our responses. Where noted we have made changes to the report address the comments.

Changes and Updates to Feasibility Study

Apple Valley Road – Alignment length has been corrected, along with the estimated cost of construction.

Costs – All costs have been updated to reflect refined cost data for rock removal.

Utility and Engineering Board Questions and Comments:

Comment: If we remove some of the hardest areas to reach would we likely reduce the estimated average cost of $200 per foot of pipe? And by how much? Could we reduce the depth from 6' to 3' in some areas? *(Note: Town Staff is reluctant to allow a line shallower than 4.5' due to freezing and low flow in this pipe, the 4.5' should be the minimum depth unless that depth is occurring at a drainage crossing point. If at a drainage crossing point, the depth can be 3', however include cost for sleeve for pipe protection.)*

Response: The costs used in the Sewer Feasibility Study Report (Report) were derived from a number of comparable projects, including bid results provided by the Town for the Confluence area project. We revised costs for rock removal in response to the Town's comments, and revised our assumptions of the extent of rock removal. We derived a cost of approximately $200 per lineal foot for a sewer in Apple Valley Road using the Confluence project bid tabulations, deleting items not applicable and adjusting quantities as appropriate. This is the same cost that we derived from other sources. This included no quantities and costs for rock removal or dewatering. This cost is useful for comparison only.

Staff Comments:

Comment: Please include signature blocks for those who prepared and supervised the report (if different) and an acceptance block for the Town of Lyons. The Acceptance block should note "This Report and Accompanying Tables, Charts, Maps and Data were reviewed by Town Staff and the Utility and Engineering Board".

Response:

Completed

Comment: Update the discussion regarding capacity of existing systems to address additional information and verifications provided and determined through provisions for supplemental information and data collection.

Response: The addendum to the RFP included an exhibit indicating that the Town could provide as-built plans for approximately 3,000 feet of the sewer trunk line from the wastewater treatment plant (WWTP) upstream to the 4th Avenue and Evans Street intersection. The Town was able to only provide information for approximately 1,000 feet of this. J-U-B submitted a proposal to survey the manhole invert elevations for the trunk sewers where information was unavailable, but the Town chose to fund other projects.

Comment: Provide an exhibit showing the potential, or lack there-of, for a gravity sewer from 501 Main (Riverbend) that is routed from the gravity point of connection in the southwest side of this parcel, under US36 and along the alignment of the existing force main, under N St Vrain Creek on the east side of US36, then splitting north to the lift station and west to Apple Valley. The report identifies a portion of this routing through the escarpment, however this suggested routing would be out and around the escarpment to the east in the location (horizontal) of the existing force main, but vertically deeper as allowed by the new POC in Riverbend.

Response: This has been investigated. Discussion and exhibits are included in the revised report.

Comments:

- Provide a section/commentary about existing conditions and assumptions regarding bedrock depths and rock excavation. Please include any references used for determining/assuming depth to bedrock and any maps that may be available to support this analysis. Reference may include published soil studies from SCS or other local geotechnical data.
- There are reaches of the system where bedrock may be quite a bit deeper than anticipated, such as the SWLPA Primary Planning Area. Within this area, the South St Vrain Creek channel has varied within the last 100-years from its current location to the south edge of the planning area as it's shown in maps. This area is a depositional alluvium and just downstream has been found to have deeper bedrock. The project may need to consider two unit prices to apply for pipe and appurtenances installed if data supports less bedrock excavation. We are including geotechnical reports from Bohn Park (at the downstream side of SWLPA) and the Confluence area near the point of connection for reference. Each of these studies suggest this area has deeper bedrock and is alluvium, also confirming groundwater will be of issue during the installations in these areas.

- Per the above considerations of deeper bedrock, it seems to be appropriate to include a unit price for sewer installation that does not include bedrock and to perhaps split out a portion of the project accordingly when addressing the trunk lines. For example, it is also expected that the alluvium conditions exist for the Apple Valley area from the lift station upstream to Apple Valley Road, in addition to the S St Vrain area near CR69 and Bradford.

Response: Actual depths of bedrock within sewer lateral alignments can be determined only through physical investigations. Our estimates for the extent of subsurface rock at higher elevations is based on prior experience with construction of waterlines and sewers in mountainous terrain, and our visits to the study sites. We have removed most costs for rock excavation for the trunk sewers in Apple Valley Road and the SWLPA per information provided with the Town's comments.

Comment: For Groover area only, include map and discussion about connecting to the Eagle Canyon gravity sewer system on the north side of US36. The outfall is located near the southeast corner of the Eagle Canyon subdivision as shown on the referenced drawings for this area and included with this response. This option would only serve the Groover area, not the rest of the N St Vrain Drive lots that would remain separate as per the discussion and information provided.

Response: This has been investigated. Discussion and exhibits are included in the revised report.

Attachments:

Markup of NLPA Map RE: Groover - This has been investigated. Discussion is included in the revised report.

Markup of P/P Sheet (including comments and notes RE: Sheet 6) – discussion of an alignment from the existing lift station to Riverbend has been added to the report, along with an exhibit. Although other permutations are possible, a sewer aligned from the lift station to Riverbend would serve all of Apple Valley by gravity, including the Eagle Canyon subdivision and Groover Drive. Alignment 2 could be investigated as part of a design study for a sewer in Apple Valley. Alignment 3 would not work, due to adverse grade. The alternative alignment we show crossing this property on our exhibit was chosen to maintain grade to the lift station while avoiding excessive trench depths.

Exhibit of Sewer from Riverbend through Planet Bluegrass – This has been investigated and an exhibit and discussion have been included in the report. It appears feasible to serve Apple Valley by gravity via a sewer connecting to the existing sewer at Riverbend.

Comments from Town of Lyons
September 19, 2016

RE: Draft - September 1, 2016, **Sanitary Sewer System Expansion Feasibility Study**, Town of Lyons, prepared by JUB Engineers, Inc., Fort Collins, Co

In regards to the subject report and contents and in accordance with the Contract for services with the Town of Lyons, we offer the following comments and questions regarding the subject report:

Utility and Engineering Board Questions and Comments:

- If we remove some of the hardest areas to reach would we likely reduce the estimated average cost of $200 per foot of pipe? And by how much? Could we reduce the depth from 6' to 3' in some areas? *(Note: Town Staff is reluctant to allow a line shallower than 4.5' due to freezing and low flow in this pipe, the 4.5' should be the minimum depth unless that depth is occurring at a drainage crossing point. If at a drainage crossing point, the depth can be 3', however include cost for sleeve for pipe protection.)*

Staff Comments

- Please include signature blocks for those who prepared and supervised the report (if different) and an acceptance block for the Town of Lyons. The Acceptance block should note "This Report and Accompanying Tables, Charts, Maps and Data were reviewed by Town Staff and the Utility and Engineering Board".
- Update the discussion regarding capacity of existing systems to address additional information and verifications provided and determined through provisions for supplemental information and data collection.
- Provide an exhibit showing the potential, or lack there-of, for a gravity sewer from 501 Main (Riverbend) that is routed from the gravity point of connection in the southwest side of this parcel, under US36 and along the alignment of the existing force main, under N St Vrain Creek on the east side of US36, then splitting north to the lift station and west to Apple Valley. The report identifies a portion of this routing through the escarpment, however this suggested routing would be out and around the escarpment to the east in the location (horizontal) of the existing force main, but vertically deeper as allowed by the new POC in Riverbend.
- Provide a section/commentary about existing conditions and assumptions regarding bedrock depths and rock excavation. Please include any references used for determining/assuming depth to bedrock and any maps that may be available to support this analysis. Reference may include published soil studies from SCS or other local geotechnical data.
- There are reaches of the system where bedrock may be quite a bit deeper than anticipated, such as the SWLPA Primary Planning Area. Within this area, the South St Vrain Creek channel has varied within the last 100-years from its current location to the south edge of the planning area as it's shown in maps. This area is a depositional alluvium and just downstream has been found to have deeper bedrock. The project may need to consider two unit prices to apply for pipe and appurtenances installed if data supports less bedrock excavation. We are including geotechnical reports from Bohn Park (at the downstream side of SWLPA) and the Confluence area near the point of connection for reference. Each of these studies suggest this area has deeper bedrock and is alluvium, also confirming groundwater will be of issue during the installations in these areas.

- Per the above considerations of deeper bedrock, it seems to be appropriate to include a unit price for sewer installation that does not include bedrock and to perhaps split out a portion of the project accordingly when addressing the trunk lines. For example, it is also expected that the alluvium conditions exist for the Apple Valley area from the lift station upstream to Apple Valley Road, in addition to the S St Vrain area near CR69 and Bradford.
- For Groover area only, include map and discussion about connecting to the Eagle Canyon gravity sewer system on the north side of US36. The outfall is located near the southeast corner of the Eagle Canyon subdivision as shown on the referenced drawings for this area and included with this response. This option would only serve the Groover area, not the rest of the N St Vrain Drive lots that would remain separate as per the discussion and information provided.

Attachments:

1. Markup of NLPA Map RE: Groover
2. Markup of P/P Sheet 1 (including comments and notes RE: Sheet 6)
3. Exhibit of Sewer from Riverbend through Planet Bluegrass

Please provide a written response to these comments. We are available to answer questions as needed.

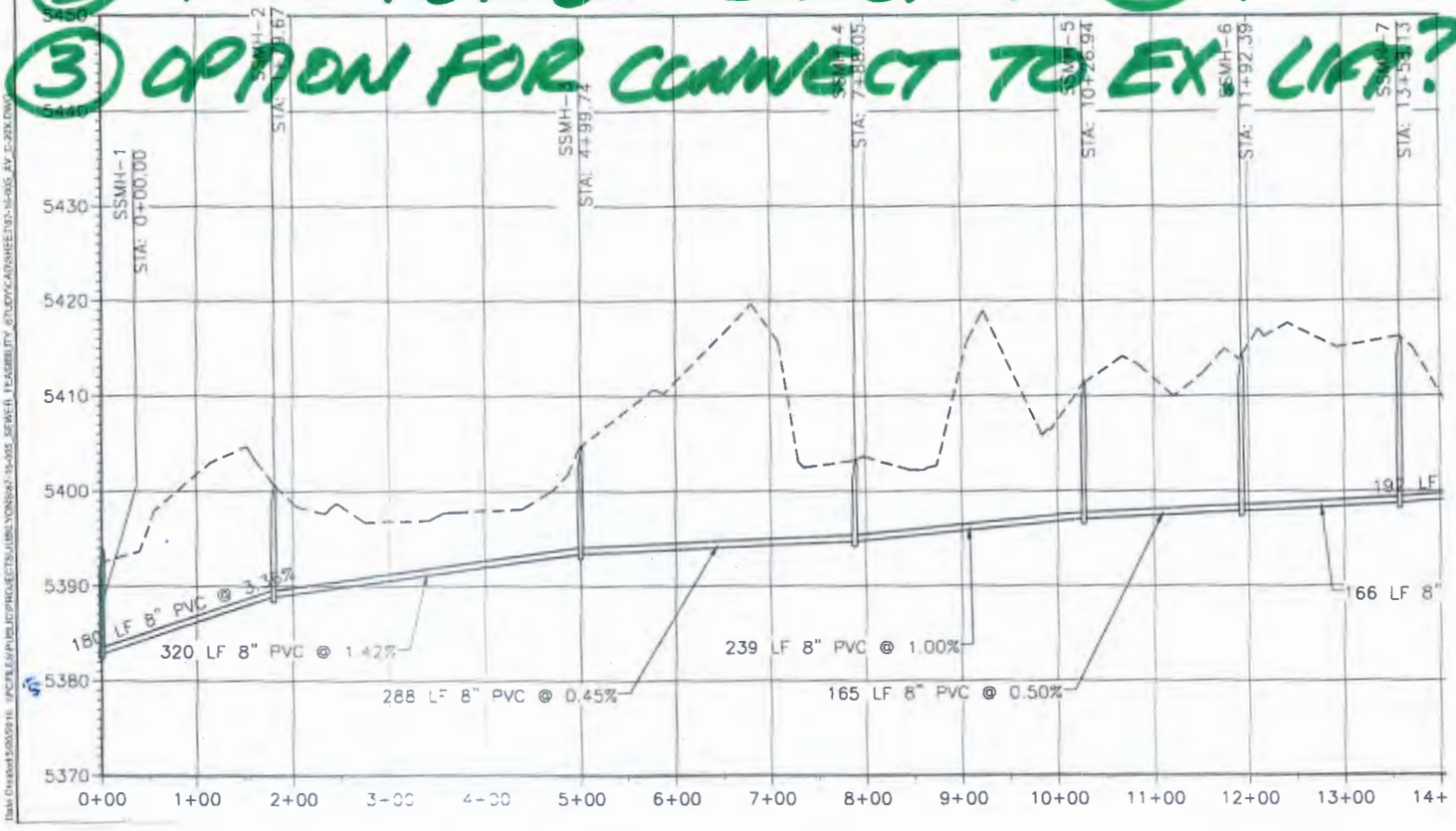
END OF COMMENTS AND MEMORANDUM

RE: SHTS 1 & 6

1 CONTINUE FROM RIVERBEND

2 OPTION FOR CONNECTION TO 1 ?

3 OPTION FOR CONNECT TO EX LIFT?



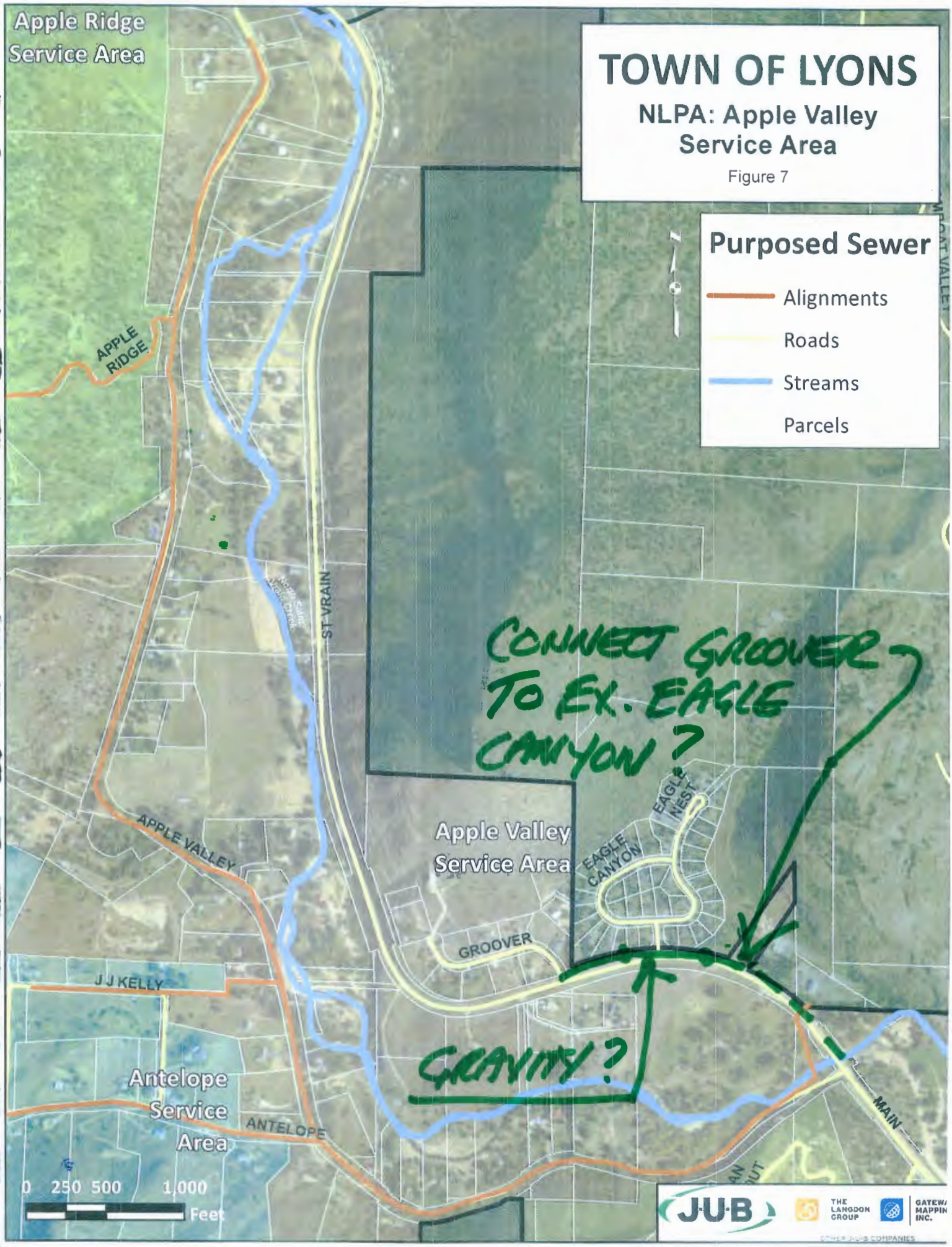

TOWN OF LYONS
NLPA: Apple Valley Service Area
Figure 7
Purposed Sewer
Alignments
Roads
Streams
Parcels
Apple Ridge Service Area
APPLE RIDGE
ST VRAIN
APPLE VALLEY
Apple Valley Service Area
EAGLE NEST
EAGLE CANYON
GROOVER
J J KELLY
Antelope Service Area
ANTELOPE
MAIN
CONNECT GROOVER TO EX. EAGLE CANYON ?
GRAVITY ?
0 250 500 1,000
Feet
JUB
THE LANGDON GROUP


Exhibit of Sewer Alignment
Riverbend through Plant Bluegrass
Align in approximate location of existing 4" force main
Gravity connection to eliminate lift station
Need easement along shared property line
Sewer crossing in casing
Existing sewer under creek to Riverbend
Apple Valley Rd
McCall Alley
Reese St
Seward Ave
Stickney Ave
Upper 5th Ave
High St
Main St
Lyons
3000 ft
N
Google earth
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J·U·B ENGINEERS, INC.