BOARD OF ALDERMEN
Work Session Agenda
CITY OF PARKVILLE, MISSOURI
Tuesday, February 21, 2023 6:00 PM
City Hall Board Room

1. GENERAL AGENDA

A. Riss Lake Low Pressure Sewer System Evaluation Report

2. ADJOURN

Posted Date & Time: 2/17/23; 3:35 p.m. By: MM

CITY OF PARKVILLE
Policy Report

Date: February 10, 2023

Prepared By:
Alysen Abel, Public Works Director

Reviewed By:
Alexa Barton, City Administrator

ISSUE:
Riss Lake Low Pressure Sewer System Evaluation Report

BACKGROUND:
Due to the topography, the Riss Lake subdivision is served by a forcemain sanitary sewer system. Each home has a grinder pump to assist with pumping the wastewater from the home into the forcemain system in lieu of the traditional gravity sewer line.

Over the past four years, there have been several issues related to sewer failures. To be proactive, and in an effort to stay ahead of the emergency repairs, the City will inspect the low pressure sewer system in Riss Lake. North Hills Engineering, the City's on-call engineering services contract, will perform the work.

On August 30, 2022, the Board of Aldermen approved a work authorization for the Riss Lake low pressure sewer system evaluation includes the inspection, evaluation and cataloging of the repairs needed to the manholes in the system.

Since that time, North Hills Engineering has provided the report. The purpose of this work session is to review the findings.

BUDGET IMPACT:
No budget impact: this is a report only. Note: The 2023 Sewer budget includes funding for the first phase of sewer repairs. Budget allocations will be necessary in future years to assist with the priority project areas.

ALTERNATIVES:
1. Receive and file the Riss Lake LPS Report.
2. Provide feedback related to the report.
3. Postpone this item.

STAFF RECOMMENDATION:
This is a work session item and there no action is necessary.

ATTACHMENTS:
1. Riss Lake LPS Evaluation Report

CITY OF PARKVILLE

REPORT ON RISS LAKE L.P. SEWER INSPECTIONS – 2022

J. Norco, P.E. – Contract City Engineer, January 17, 2023

Purpose:

This brief report summarizes the findings of the Riss Lake Low-Pressure (LP) Sewer inspection project completed by the Contract City Engineer in 2022. The objectives of this project were to locate and inspect all 204 valve pits in the Riss Lake system, evaluate the valve pits for defects and repair work needed, and recommend methods of repair. Also, as part of the work the GIS mapping was updated and a new valve pit database was created. Note: This project did not inspect the buried pressure sewer pipes. Pressure sewer pipes cannot be inspected while they remain in service.

Executive Summary:

The inspection work was completed in December, 2022. Overall, 155 (76%) of the manholes were opened, inspected, and evaluated. The remaining 33 could not be opened due to being buried or being covered with landscaping or concrete. Of the 204 total valve pits in the system, 81 are in good shape and require no repair action at this time. The remaining 123 pits require repair work of various types. The total repair cost for all defective/deteriorated pits is estimated to be $800k. The high cost is due to the difficulty of setting up flow bypassing and the difficulty of excavation and restoration in areas with extensive landscaping and multiple utilities. The majority of the repair work involves repairing and testing high priority clean-out pits and air valve pits. Finding and raising buried valve pits is the second largest type of repair work needed, followed by raising to grade pits that have been found but are buried. The author proposes that the City accomplish this work over the next 7 years on a prioritized basis, using the Sewer CIP Program. This study does not make a determination of the impact on sewer rates. That question should be addressed as part of the budget process in the fall of 2023.

Background:

The Riss Lake residential developments encompass a large area of the City of Parkville and include about 850 sanitary sewer customers. (See attached map: *Riss Lake LP Sewer System*.) All of Riss Lake is served by a "low pressure sanitary sewer system", or "LP Sewer", meaning that each customer has a grinder pump that discharges to a network of pipes that operate under pressure. Whereas a conventional gravity sewer system has deep pipes and manholes that allow access and inspection of the pipes, an LP sewer system has shallow pipes and a system of valve pits. Note: the term "pit" can also mean "vault", or "manhole", and denotes a small buried structure that allows access to the valves within. These pits consist of four basic types:

- **Air valve pits:** Contain air release valves or combination air release/vacuum release valves. These valves are needed to release gas bubbles from the pipeline, or to admit air into the line to prevent vacuum conditions. Sometimes these pits also contain a main line valve.
- **In-line clean-out pits:** Contain a main line valve and at least one tee and riser, and the riser usually has a removable cap. These pits are used to shut down a section of main to allow repairs, and to provide a point where a pump or a vac/tanker truck can clear the section of pipeline. Also, these pits can be used to insert a water jetter head or a cleaning rod.
- **End-of-line clean-out pits:** Contain a valve valve and a cleanout riser, usually with a removable cap. These are located at the end of a pipe segment, to provide a point where a vac/tanker truck can clear the section of pipeline. These pits can also be used to insert a water jetter head or a cleaning rod.
- **Buried Valves:** Contain only a main line valve, and are used to isolation a section of pipeline. These "pits" are not structures, but have a small PVC pipe riser located above a buried valve, allowing operation of the valve.

Most of the pipes and valves in the system are 15 to 20 years old. The oldest parts are about 35 years old, and the new parts about 10 years old. By design, all valve pits in the LPS system are intended to remain visible and readily accessible so that a repair crew can quickly enter and operate valves.

Inspection Work:

As part of this project, the author visited and inspected every valve pit to inspect condition, to take measurements, to record valve sizes and types, and to photograph the valves. From this information the author developed a repair cost estimate based on the necessary repairs at that location. For stuck iron lids, the author applied penetrating oil and repeated doses of a sledge hammer until the lid opened. For buried pits, the author located the pit and recorded the location and the depth of the lid. For pits that could not be located, the author took photographs of the probable location and made cost estimates for exploratory excavations and grade adjustment work.

The field data were recorded in a valve pit asset database, along with the repair cost estimates.

Another aspect of the work was adjusting the location and type of pits in the GIS model. The author found that many of the old "as-built" drawings were sometimes incorrect, often by a large distance.

This updated information can be used to create new field maps that will increase the accuracy of utility locates performed by City personnel.

General Findings:

Photographs of the types of valve pits and typical defects are presented in the attachment: "*Photos of Typical Valve Pits & Defects*". The overall statistics and cost estimates are presented on the attached sheet: "*2022 Riss Lake LPS Survey – Statistics and Cost Summary."*

In general, the older parts of the system show the greatest signs of deterioration, partly due to age and partly due to material choices. The older phases used only metallic valves (brass and iron) and these are most susceptible to corrosion and to seizing up. The newer phases use PVC valves and these have a much longer service life.

After inspecting the pits and assessing the condition of the valves the author draws the following general observations and conclusions:

- In the oldest sections of Riss Lake (Phase 1, Lakeview Dr, Woodhaven, south section of Spinnaker), the mainline and cleanout valves are made of brass and iron, and are corroded and in-operable. The City needs to replace these valves and some of the pits in the near future. However, this work is costly due to the high flows and the distances required for flow bypassing.
- Recent line breaks (due to utility bores) have revealed that in-operable valves make flow bypassing and repairs much more costly than they need to be. Although 99 percent of the time these valves are not needed, when they are needed they are critical.
- In moderately old sections: (Meadows, north section of Spinnaker, Agron, etc.), valves need to be tested manually, then decisions made on replacement. Valve failure is not always predictable with age. The operational condition of metallic valves (brass and iron gate valves, butterfly valves, and ball valves) cannot be determined based on age and appearance alone. These valves need to be tested and operated by workmen who are qualified and experienced with valve construction and replacement (and also confined space entry). This testing should be done with the material and equipment on hand (or on call nearby) to quickly replace valves that become damaged in the process.
- In newer sections (9th-12th Plats: Parkview, Clearwater, Sunset, Reserves, etc.), that use PVC valves and fittings, corrosion is minimal, valves are generally operable, and these should be tested/exercised periodically.
- Many of the end-of-line cleanout pits have been buried by builders or residents with lot grading over the years, these need to be raised to grade soon. Fortunately, most of these are in turfed areas where restoration will not be very costly.
- A good number of valve pits have been covered over with costly landscaping, making location and raising an expensive undertaking, particularly if the City must pay for replacement of said landscaping.

- The majority of the original iron-body air/vac combination valves have been replaced with modern plastic (A.R.I. brand) valves. Only six of the old cast iron valves remain, and these should be replaced soon.
- In some sections (Reserves, West Shore Estates, the requisite mainline valves, clean-out valves, and air/vac valves were omitted (never installed per plans). Surprisingly, the system has functioned. However, a line break without isolation valves would be very messy and costly.
- For pits that use air/vac valves, and pits that have been buried a long time, the old cast iron frames and lids are severely corroded. These should be replaced with non-metallic castings.
- Most of the valve pits are small, being made of 4-foot diameter pre-cast concrete manhole sections. These pits are barely large enough to enter to turn valves, but are not large enough to permit replacement of fittings and valves, and this is particularly true in the large pipe sizes. The pits will need to be partially dismantled to allow extensive work within.
- A regular valve exercise program will be needed to turn valves, after we have repaired failed or inoperable valves. This will involve considerable maintenance effort, as there are approximately 90 in-line cleanout pits and 100 end-of-line pits.
- We have learned that the long-term cost of ownership of pressure sewers is higher than a conventional gravity sewer system, even if conventional sewage pumping stations are involved.

Comments on Buried Valve Pits

It is noteworthy that about 25 percent of the pits are either buried or covered with landscaping. The City will need to approach this work carefully.

Of the 33 buried pits that the author was able to find and determine depth to the lid, these are relatively straightforward to raise to grade. The cost should be about $3,000 - $5000 each, depending on location and difficulties involved. The high cost is due to the dispersed mobilizations required, the presence of other utilities, the risks of damage to sidewalks, driveways, and curbs, and the cost of restoration. Another consideration is resistance from residents. Even though these pits are an essential part of the sewer utility and were installed within utility easements and road rights-of-way, the author expects a number of complaints from residents. The author fielded some hostility and unhappiness when telling residents that the City will have a crew come out and raise the iron lids to grade. Possibly a public announcement or an informational notice would have some benefit.

Of greater concern are the 16 pits that could not be located because they lie under driveways or costly landscaping. The author used “as-built drawings”, a probe rod, and a magnetic locator. The author could not locate these pits because of metallic objects in the soil, greater depth, or the presence of nearby utilities. Exploratory excavations will be needed to locate the existing pits. This type of exploratory work is slow and costly. For the pits that have been covered with trees, bushes, and costly landscaping, the costs of restoration will be high. The Board of Aldermen will need to decide if the City will pay to restore landscaping within a utility easement or road rights-of-way. In some cases, it might be advisable to leave a buried valve pit undisturbed until an emergency (translated “sewer line break” or “service line blockage”) occurs.

For these lost pits, the author suggests that a modest expenditure be made to hire a locating contractor to attempt to locate the pits using tracer wire, sonic locators, and other means. This way the number of lost pits can be reduced and hopefully the cost of exploratory excavations reduced. This work could be bundled with other sewer repair work.

Recommendations:

The author prepared a budgetary cost estimate of the repairs needed to address the defects found in the 2022 LPS valve pit inspections. (Refer to the attached document: "*2022 Riss Lake LPS Survey – Statistics and Cost Summary".*)

The estimated total repair cost is about $800,000, including soft project costs. The work is proposed in five phases from 2023 to 2029. The years of some phases may overlap.

- Phase 1: Raise Buried Pits (2023)
- Phase 2: Locate and Raise Lost Pits (2024-2025)
- Phase 3: Repair and Test High Priority In-line Clean-Out Pits (2025-2027)
- Phase 4: Repair and Test High Priority Air Valve Pits (2027-2028)
- Phase 5: Repair and Test End-of-Line Clean-Out Pits (2029)

The phasing reflects the overall priorities of work. The author proposes to fund the work from the Sewer CIP Program with an average annual impact of about $115k per year. The first phase of $134,000 can be funded out of the $250,000 planned project for 2023 sanitary sewer repairs. In the opinion of the author this LPS system work should be prioritized. Beginning in 2024, a line item for Riss Lake LPS system repairs should be included in the Sewer CIP project list.

END OF REPORT

Attachments:

Map: Riss Lake LP Sewer System

Photos of Typical Valve Pits & Defects

Statistics and Cost Summary

MO Hwy 45

MO Hwy 45

N

1 inch = 600 feet

Pinecrest PS

MO Hwy 9

Hwy 9

Bell Rd.

Riss Lake

Manor Dr.

Manor Ln

Trail Ridge

Walnut St.

Legend

- Exist-Grav-San-Sewer

Exist Air/Valve Pit

Type

- ARV
- CHV
- ELCO
- INCO
- VLV
- Pit-CNL-Bur
- Riss-Main-6
- Riss-Main-5
- Riss-Main-4
- Presmain-3
- Presmain-2
- Presmain-2.5
- Presmain-1.5

PARKVILLE, MO SAN SEWER MAP
RISS LAKE L.P. SEWER SYSTEM

PHOTOS OF TYPICAL VALVE PITS & DEFECTS – 2022 RISS LAKE LPS INSPECTIONS

VARIOUS TYPES OF PITS:

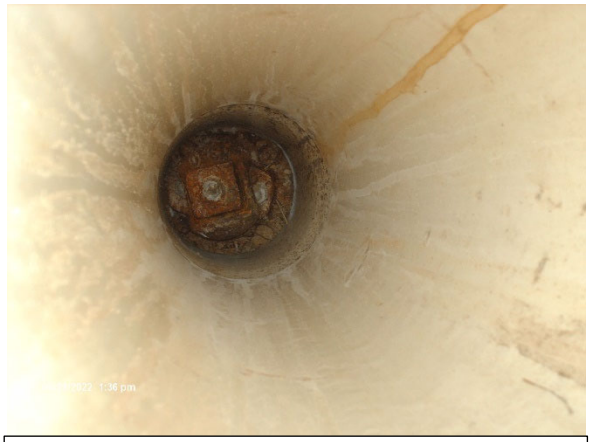
In-line clean-out pit, with mainline valve and riser valves, larger diameter, metal valves.

Air valve pit., with A.R.I. type air/vac valve and isolation valve below.

In-line clean-out pit, with mainline valve and riser valves, smaller diameter, newer PVC.

Air valve pit, with old cast-iron air/vac valve. These corrode badly.

Older end-of-line clean-out pit, with brass valve and steel strut.



Buried isolation valve (no pit), the system has about 11 of these. Can see operating nut.

1 of 4

SAMPLE OF DEFECTS IN VALVE PITS:

Corrosion to concrete, from gases released from air/vac valve. Needs to be lined.

Valve bodies and handles rust away. These from early 1990's.

Broken chimney, admits mud and gravel.

Holes in chimney, from concrete crews.

Casting shoved over on cone – makes access impossible.

Mud fills bottom, accelerates corrosion and makes operation difficult.

MORE TYPES OF DEFECTS:

Valves seized up and coated with corrosion. Needs total replacement.

Leak in pipe fitting, sewage seeping out.

Utility pipe or conduit bored through pit. Needs to be relocated.

Some pits fill with groundwater. Hard to prevent. Makes access more difficult.

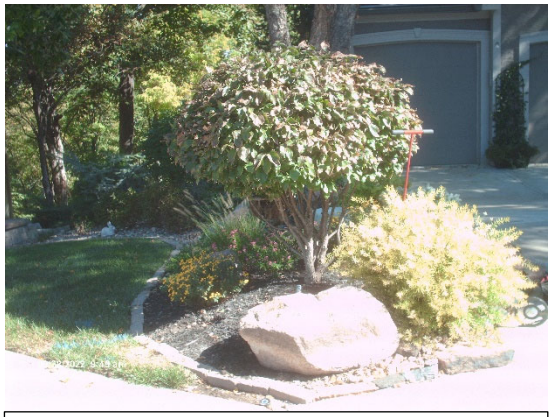
Severe corrosion on casting, from gases. Lid welds to frame. Needs non-metallic.

Valves are missing! Were never installed. West Shore Estates. Several like this….

BURIED AND MSSING PITS (COMMON PROBLEM):

Clean-out pit buried below turf. Usually 6 to 8 inches deep.

Pine tree planted on top of valve pit lid, will require tree removal.



Pit covered with extensive landscaping. Finding and raising could be costly…

Pit covered with landscaping and boulder.

Large bush planted over lid.

Pit buried below mulch and shrubs.

END OF PHOTOS

CITY OF PARKVILLE - 2022 RISS LAKE LPS SURVEY:
STATISTICS AND COST SUMMARY

J. Norco, P.E.

Total number of structures surveyed:			
Total of all types:	204		
Number of pits opened:	155	76%	
Number of buried, but located:	33	Most of these are end-of-line clean-outs	
Number of pit lost, could not locate:	16	Most of these are end-of-line clean-outs, in-line clean-outs.	
Structures by Type:			
Air valve pits:	35	total	
In-line Clean-out Pits:	89	total	
End-of-Line Clean-out Pits:	69	total	
Buried valves (no manhole structure):	11	total	
Structures Needing Repair			
Structures needed no repairs at this time	81	total	
Structures needing repairs of some type:	123	total	60%

Recommended Phasing of Repair Work:

Phase 1:	Raise Buried Pits (2023):			
	Total cost for raising all 33 pits:		$	116,000
	(Also includes: selected valve testing and casting replacement, surface restoration.)			
	Contingency, engineering, project management, observation:	15%	$	17,400
			$	**133,400**
Phase 2:	Locate and Raise lost Pits (2024-2025):			
	Total cost for locating and raising all 16 pits:		$	108,000
	(Also includes: exploration, selected valve testing and casting replacement, surface restoration.)			
	Contingency, engineering, project management, observation:	20%	$	21,600
			$	**129,600**
Phase 3:	Repair and Test High Priority In-line Clean-Out Pits (2025-2027):			
	Total cost for repairing all 35 pits.		$	194,000
	(Includes: grade adjustments, casting replacements, valve testing, valve replacements, lining for corrosion, structural repairs, replacing fittings, flow bypassing, etc.)			
	Repair on a prioritized basis, starting with most severe and most critical locations.			
	Contingency, engineering, project management, observation:	25%	$	48,500
			$	**242,500**
Phase 4:	Repair and Test High Priority Air Valve Pits (2027-2028):			
	Total cost for repairing all 16 pits.		$	156,000
	(Includes: grade adjustments, casting replacements, valve testing, valve replacements, lining for corrosion, structural repairs, replacing fittings, flow bypassing, etc.)			
	Repair on a prioritized basis, starting with most severe and most critical locations.			
	Contingency, engineering, project management, observation:	25%	$	39,000
			$	**195,000**
	Note: Phases 3 and 4 pits may need to be co-mingled, based on locations and flow bypass set-ups required. This is particularly true in the downstream reaches of the sytem.			
Phase 5:	Repair and Test End-of-Line Clean-Out Pits (2029):			
	Total cost for repairing all 25 pits.		$	73,000
	(Includes: grade adjustments, casting replacements, valve testing, valve replacements, lining for corrosion, structural repairs, replacing fittings, flow bypassing, etc.)			
	Repair on a prioritized basis, starting with most severe and most critical locations.			
	Contingency, engineering, project management, observation:	25%	$	18,250
			$	**91,250**
ESTIMATED TOTAL REPAIR COST IN 2022 DOLLARS:			**$**	**792,000**