PEC
PROJECT ENGINEERING CONSULTANTS

CONDITION ASSESSMENT REPORT
SVSD River Bottom Trunk Line
Condition Assessment - Phase 1

SOUTH VALLEY SEWER DISTRICT

Submitted To:

South Valley Sewer District

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1.0 Project and Report Overview

South Valley Sewer District (District) has contracted with Project Engineering Consultants, Ltd. (PEC) to perform a condition assessment of one of the District's main sewer trunk lines that flows south to north and generally follows the Jordan River to the South Valley Water Reclamation Facility (SVWRF). The River Bottom Trunk Line Condition Assessment project was divided into two phases as follows:

- **Phase 1a**: Quantities include approximately 19,851 linear feet of sewer pipe comprised of 59 segments. These locations consist of pipe sizes ranging from 48-inch through 60-inch and include various pipe materials.
- **Phase 1b**: Quantities include approximately 52,619 linear feet of sewer pipe comprised of 199 segments. These locations consist of pipe sizes ranging from 12-inch through 54-inch and include various pipe materials.
- **Phase 2**: Quantities include approximately 19,457 linear feet of sewer pipe comprised of 80 pipe segments.
- **Phase 3**: Consists of East and West out fall trunk lines, data will be provided by SVSD in the future.

The limits of Phase 1a, 1b and 2 are shown in Figure 1.

Figure 1 also identifies the general location of each pipe segment. Phase 1 of this project extends from SVWRF on the north end to approximately 14600 South on the southern end of the project. Phase 2 extends from approximately 14600 South on the northern end to Camp Williams on the southern end. The Phase 2 portion of the work was not included in this scope of work and is planned to be inspected and assessed at a future date. Sections 1 through 5 of this report describe the pipe condition score description, defect descriptions, rehabilitation options, and project phasing recommendations.

The pipe segments within the scope of this project were inspected by District personnel utilizing Digital Side-scanning Camera (DUC) technology, and GraniteNet software. The inspection files were delivered to PEC to complete the condition assessment. The condition assessment followed the standards set forth in National Association Sewer Service Companies (NASSCO), Pipeline Assessment Certification Programs (PACP) version 7.0.2. Manholes were not inspected or assessed as part of this scope of work.

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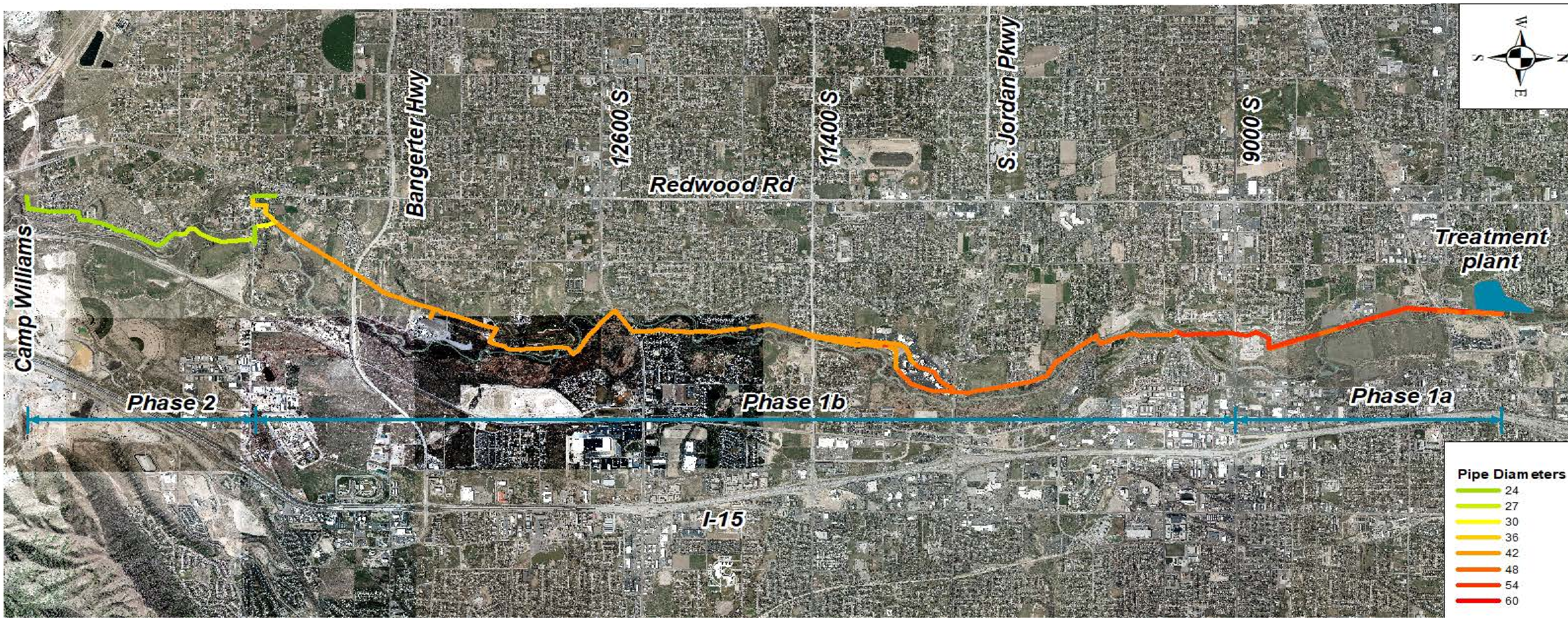

Figure 1 Project Map

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2.0 NASSCO Assessment Protocol

2.1 Pipe Rating Systems/Methodology

Section 2.0 as shown here includes information and descriptions included from Appendix D of the September 2016 version of the NASSCO manual. This information is included here to make the needed reference material readily available to the reader. NASSCO's PACP Quick Rating (QR) condition scoring and reporting methodology was used to determine the condition of the pipelines associated with this project.

This method, along with recommendations made by our project engineers, have been factored into assigning Structural and Operations & Maintenance (O&M) condition scores to the pipe segments and manhole structures assessed as part of this project. The condition scores and definitions are:

5 – Most significant defect grade
4 – Significant defect grade
3 – Moderate defect grade
2 – Minor to moderate defect grade
1 – Minor defect grade

2.1.1 PACP Quick Rating (QR)

The quick rating method is a 4-character score developed by reporting the highest defect grade and the number of occurrences as the 1^{st} and 2^{nd} characters in the score. The 3^{rd} and 4^{th} characters are determined in a similar fashion with the next highest defect grade and its number of occurrences. This rating method is summarized as follows:

1^{st} Character: the highest severity grade occurring in the pipe

2^{nd} Character: the total number of occurrences of the highest severity grade

3^{rd} Character: the second highest severity grade occurring in the pipe

4^{th} Character: the total number of occurrences of the second highest severity grade

For defects that appear more than nine times, letters are substituted for the second and fourth characters according to the following:

A = 10-14 occurrences,

B = 15-19 occurrences,

C = 20-24 occurrences, etc.

Utilizing this methodology, a user can quickly determine the severity of defects that exist within a pipe or structure. In addition, the user can quickly see if serious defects are repeated multiple times. This scoring mechanism does not account for lower grade defects even if they are repeated many times. For example, if a pipe has multiple grade 4 and grade 5 defects, none of the defects lower than the grade 4 defects are reported. This mechanism is only useful when a user wants to identify the assets with the most severe defects.

2.2 Likelihood of Failure (LoF)

Likelihood of Failure (LoF) refers to a calculated numerical representation that denotes the probability of failure based on the physical condition of an asset, typically determined by reviewing PACP survey reports. LoF values can vary between 0 and 6.

The process requires the selection of a rating system that relates directly to the known pipe or manhole condition. The PACP Quick Ratings can be used to establish a value for LoF for pipelines and manholes based on condition assessment data provided by the inspectors. These ratings are preferred among other PACP pipe rating systems (See Appendix C), since their derivations are based on the highest rating structural scores and are not adversely skewed by the presence of multiple low condition grade scores. Use of the PACP Quick Ratings also protect against generating artificially low scores, since the calculations are not affected by line segment length, or manhole depth.

An asset's LoF is determined by dividing the first two numbers of the Structural PACP Quick Rating by 10 and using the following guidelines.

- If no condition assessment data is available, the LoF is 0 (zero).
- If condition assessment data is available and there are no defects, 1.0 is added to the result of the division and the LoF is 1.0.
- If there are no more than 9 occurrences of the highest condition grade, divide the first two numbers of the Structural PACP Quick Rating by 10.
- If the second character is a letter (indicating more than 9 occurrences), that letter is replaced by the number zero, and 1.0 is added to the result of the division.

For example, the following Quick Ratings result in the LoF values listed:

Quick Rating	LoF
0000	1
2365	2.3
5E45	6

2.3 Consequence of Failure (CoF)

Pipe failure may be defined as the inability to convey flow. Consequence of Failure (CoF) is the combination of the direct and indirect impact on the vicinity and community due to a potential asset failure.

In recent decades this type of impact has typically been expressed in the so-called "Triple Bottom Line" (TBL) terms of impacts to people, planet and profit. This concept emerged in the early 1980s as a criterion for measuring economic, ecologic, and societal success. The TBL expands the traditional organization's financial bottom line to view other non-traditional social and environmental factors. Consideration of these factors encourages an organization to also focus on social and environmental aspects, rather than solely on the (more visible) economic aspects of management. This also helps an organization to consider its stakeholders.

TBL concept focuses not only upon direct Economic costs, but also Social costs and Environmental costs. The goal is sustainability of all the assets in a balanced manner.

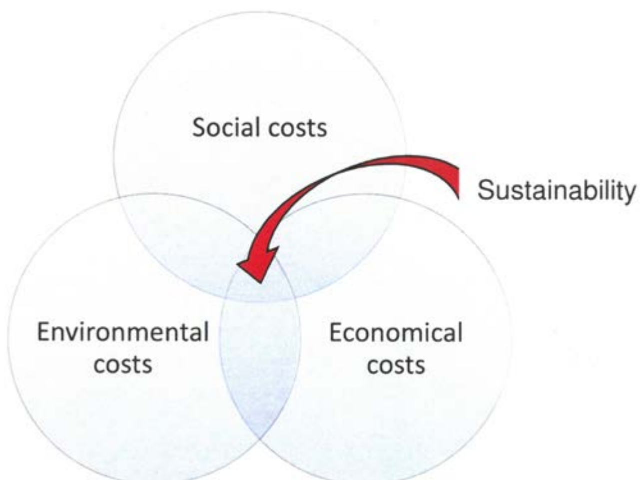

Figure 2 Consequence of Failure Graphic

2.3.1 Economical Costs

The economical consequence of failure encompasses the impacts of direct and indirect economic losses to the affected organization and third parties due to asset failure.

Economic factors are typically expressed in dollars and include property damage, repair cost and production loss, among others. Regarding utilities, economical cost considerations may include those related to pipe material, diameter, depth and length of the pipe segments; direct or indirect interaction with other infrastructure elements, such as roads and bridges in the repair vicinity; effects of local topography on required access, and possible access restriction created by such barriers as walls and fences.

Direct consequences of failures include such costs as those for asset repairs, legal fees and fines. Indirect consequences include environmental cleanup costs and loss of business revenue to the community. In addition, consideration must be given to other external costs that are not directly measurable but result from the failure - such as loss in property value, utility credibility and increased insurance rates.

Both direct and indirect costs are considered when measuring the Economical Consequence of Failure.

2.3.2 Social Costs

The social consequences of failure represent the impact on society due to asset failure. These considerations may include the number of affected properties; the type of affected properties such as: hospitals, schools, parks, businesses or critical services as defined by the owner; the duration of the failure, and public image. In addition, there must be consideration for health and safety issues that may directly or indirectly create the possibility for public exposure to health-threatening problems, injuries or even fatalities.

Finally, public image and utility's credibility is extremely important due to the magnitude of its effect on the negative public exposure, criticism and legal actions the organization may face due to the failure

2.3.3 Environmental Costs

The environmental consequence of failure considers the impact to ecological conditions occurring as a result of asset failure. Examples are contamination of soil, groundwater and surface water. Environmental cost considerations may include proximity to wetlands and waterways, proximity to Federal Emergency Management Agency (FEMA) flood zones, possible contamination of potable water sources and the sensitivity of nearby soils. The main consequence is the Sanitary Sewer Overflow (SSO) resulting from a failure. Also fines from consent decrees and from federal and state agencies may also result in Economic and Social costs.

2.3.4 Rating Methodology

Consequence of Failure is determined by considering the location and demographics of an asset. For example, a 56-inch combined trunk sewer, 100 feet downstream of a Combined Sewer Overflow (CSO) that crosses a body of water, has a higher consequence of failure, than an 8-inch sanitary sewer at the upstream end of the system that only serves one resident. Likewise, a different 56-inch sewer would have a lower consequence of failure, than another 56-inch combined trunk sewer that is installed deeper, has a higher dry weather flow and crosses under a high traffic roadway.

In order to present this concept in a useful format, these considerations should be broken into separate scoring parameters using a similar (maximum of 6) scoring system as Likelihood of Failure, so that the two components equally contribute to risk. This can be done by several methods; however, the method selected must be a result of consultation with the utility. This should include a consideration of how each of the three cost structures should be weighted, and to what extend the various components of these costs are present and important to the community.

When assigning weighting factors, one should consider how much the parameter contributes to the economic, social and environmental impacts in the event of a failure. Some parameters may impact just one of the three TBL categories, while some may have varying degrees of impacts. An example of this would be a sewer line that crosses a waterway. This clearly can impact the environmental aspect of the TBL, considering the likelihood for contamination of the stream. There may also be some social impacts with respect to an interruption in recreational use of the waterway, and economic impacts that result from penalties and fines. All of this must be thoroughly discussed with the system owner.

As part of this project, PEC and the District determined which CoF factors would be considered as part of this assessment project (see Appendix A). Tables 1 through 4 summarize the consequence of failure factors that will be utilized in this assessment.

Table 1 Relative Network Position (Pipes)

Economic				Social	
Diameter (in)	CoF Factor	Depth (ft)	CoF Factor	Q_{avg} (MGD)	CoF Factor
Less than 8"	1	Less than 6	1	<= 1.5	1
>= 8" - < 10"	2	>= 6 - < 10	2	1.6 <= 3.0	2
>= 10" - < 15"	3	>= 10 - < 14	3	3.1 <= 4.5	3
>= 15" - < 21"	4	>= 14 - < 18	4	4.6 <= 6.0	4
>= 21" - < 30"	5	>= 18 - < 24	5	6.1 <= 7.5	5
>= 30"	6	>= 24	6	> 7.5	6

Table 2 Location (Pipes)

Economic		Social	
Road Classification	CoF Factor	Disruption of traffic	CoF Factor
Unpaved	1	Unpaved	1
Minor local	2	Minor local	2
Major local	3	Major local	3
Collector	4	Collector	4
Arterial/Building/Pool	5	Arterial/Building/Pool	5
Highway/Waterway	6	Highway/Waterway	6

Table 3 Proximity to Environmentally Sensitive Features

Environmental	
Distance between Pipe or Manhole and Sensitive Features (ft)	CoF Factor
150 LF or more	1
100 – 150 LF	2
75 – 100 LF	3
50 – 75 LF	4
25 – 50 LF	5
Less than 25 LF	6

Table 4 Accessibility for Maintenance and Inspection

Economic	
Accessibility of Pipe or Manhole	CoF Factor
Accessible	1
Not Accessible	6

2.4 Risk Management

Asset management relates the combination of both Likelihood of Failure and Consequence of Failure to risk. Risks consider the physical condition of the asset, as well as the impact that its failure would have on system performance, the environment and affected stakeholders. Once the LoF and CoF values are calculated for each asset, a "risk" analysis can be performed to determine which assets are exposing the utility to the most risk.

As seen in Figure 3, the LoF values should be plotted on the horizontal axis and the CoF values plotted on the vertical axis. Each set of points (LoF, CoF) will plot a single point on the graph. As the points move up and to the right, the risk values increase (red shaded area), likewise, as the points move down and to the left, the risk values decrease (green shaded area). As plotted points move from the lower left region of the graph, to the upper right region of the graph, rehabilitation aggressiveness should increase also. This approach will utilize agency resources to address the locations or system assets that expose the agency to the highest degree of risk first. This also maximizes the effectiveness of every dollar spent to eliminate the most risk possible.

Three example data points are show on Figure 3, to graphically show that an asset can move 2 to 3 regions depending on the level of deterioration in the pipe or the consequences of the pipe failing.

Mathematically, the risk from a system failure may also be expressed as the product of likelihood and consequence of failure (ranging from 0 to 36) as quantified in equation 1:

Equation 1: $Risk = Likelihood\ of\ Failure\ (LoF)\ \times Consequence\ of\ Failure\ (CoF)$

Once all the risk values of LoF and CoF are calculated and plotted, regions should be identified to define the level of action required by the risk associated with each asset. Lines can be drawn at a -45 degree slope and regions created (as seen in Figure 3) to identify recommended rehabilitation or replacement actions (as seen in Table 5).

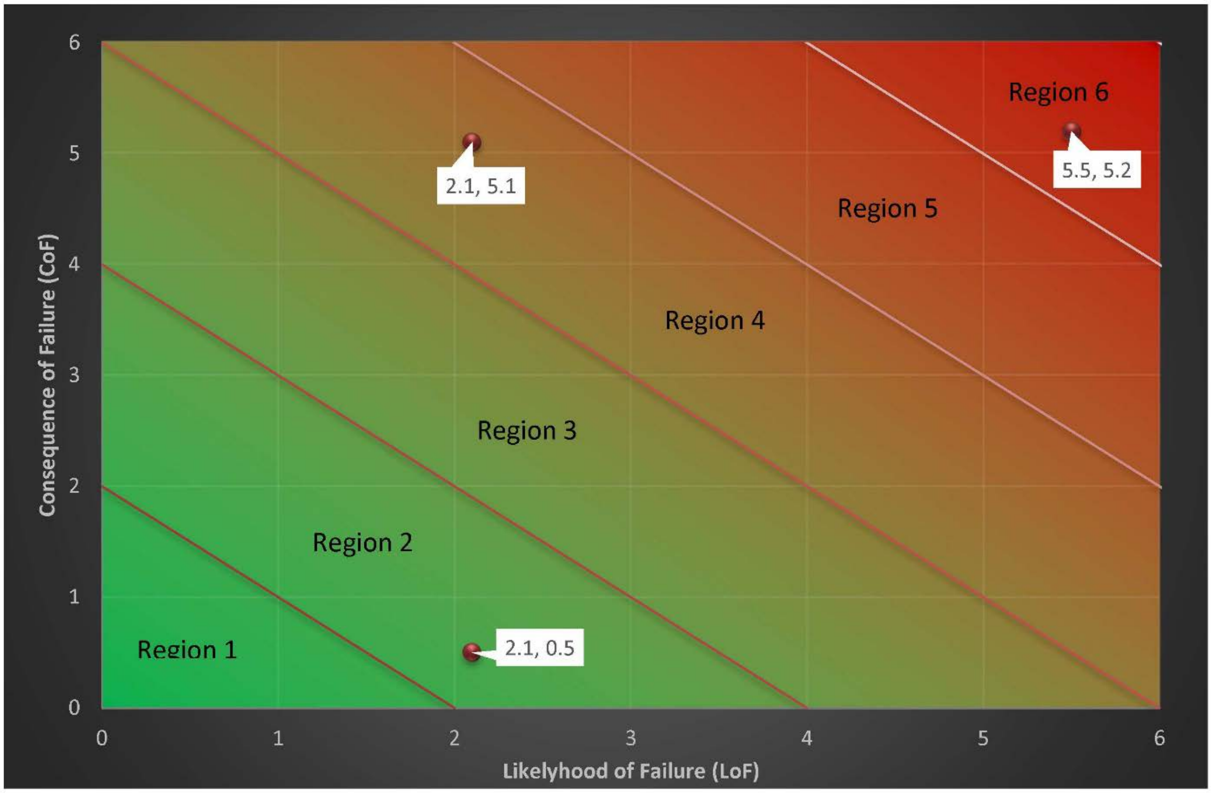

Figure 3 Risk Analysis Graphic

Table 5 Risk Management

Region	Recommended Action
1	No Action
2	Reassess in 5-10 years
3	Reassess in 0-5 years
4	Replace/Rehabilitate in 5-10 years
5	Replace/Rehabilitate in 0-5 years
6	Immediate Action

3.0 Defect Descriptions

Sections 3.1 and 3.2 provide Structural and Operations & Maintenance defect descriptions applicable to defects found within the inspected pipelines. Each pipe segment that was inspected has an associated inspection report in which the defects and their locations are identified for future reference or if repairs are required. These pipe inspection reports are attached hereto in Appendix C. The NASSCO quick reference guide is also included in Appendix G for the reader's reference.

3.1 Structural Defect Descriptions

This section provides a description of the structural defects found in the project. The language and explanations are based on the September 2016 version 7.0.2 of the NASSCO manual.

3.1.1 Hole (H)

The Hole (H) Code is used when the pipe material is missing. Unless the hole is relatively small, the surrounding soil is exposed. This occurs where the pipe pieces have completely dislodged from the wall. If a portion of the material is missing and has not been patched, either the surrounding soil or a void is likely to be visible beyond the defect.

3.1.1.1 Hole Soil Visible (HSV)

If the soil is visible beyond the hole, it is described as Hole Soil Visible. This means that the outside of the structure is visible, and the soil can be seen.

3.1.2 Crack (C)

The Crack (C) Code is used where a break line is visible on the surface but is not visibly open. No gap is visible between the edges of a crack.

3.1.2.1 Crack Longitudinal (CL)

A crack that runs lengthwise along the axis of the pipe (parallel to the centerline of the pipeline).

3.1.2.2 Crack Spiral (CS)

This condition is defined as where individual cracks change clock position as they travel along the pipe. A spiral crack may start down the pipe longitudinally and then turn in a circumferential direction, or it may start at a joint and then turn and come back to the same joint.

3.1.2.3 Crack Multiple (CM)

Multiple cracks are defined as a combination of longitudinal and circumferential cracks that are observed with the pipe video.

3.1.3 Deformed (D)

This condition relates to pipe damage, where the original cross section or geometry of the pipe is noticeably changed.

3.1.3.1 Deformed Flexible Bulging Round (DFBR)

Deformed Flexible Bulging Round is the condition where one or more rounded projections occur in the pipe. This condition can be local or continuous. This is measured as a percentage of the cross-sectional area lost as a result of this DFBR.

3.1.4 Lining Features (LF)

The Lining Features group code is used to describe features in pipes that have been manufactured or rehabilitated with a lining system. This coding family includes blemishes, defects or other observations which may affect the proper operation of the pipeline.

3.1.5 Miscellaneous Features (M)

The Miscellaneous Features family of the PACP Code includes general features and defects that are not described by or included in other categories. This group of codes is used to record features or special observations.

3.1.6. Miscellaneous Water Level (MWL)

At the beginning of each pipe survey, the depth of water at the observed point in the pipe (includes flowing and stagnant water, i.e. depth from water surface to invert of pipe) is recorded. The level entered represents the percentage of the diameter of a circular pipe (or height in the case of not circular pipes) and is presented to the nearest 5 percent.

3.1.6.1 Miscellaneous Water Level Sag (MWLS)

The Miscellaneous Water Level Sag description is used to indicate the presence of a sag, dip or low spot in the pipe. Sag is defined as a condition where the grade of the pipe is poor and results in water being "trapped" by a reverse grade downstream. MWLS is opened at the footage where a significant change in water level indicates the beginning of the sag. The depth is recorded as a percent of the height at the deepest part of the sag. It is closed at the footage where the water returns to the original level.

3.1.7 Point Repair Patch Defective (RPPD)

A patch was installed to repair a hole or other defect. Part of the original material remains in place, and the defect is patched, but the effort left a defect at the point of repair.

3.1.8 Surface Damage Surface Spalling (SSS)

Surface Damage Surface Spalling is where surface damage occurs by spalling or splintering. Spalling is the spontaneous separation or fragmentation of the pipe surface often as a result of internal stresses, or the result of defective, damaged or improperly stored pipe material.

3.1.8.1 Surface Damage Aggregate Projecting (SAP)

Surface damage is where some of the aggregate in the concrete pipe is visible and is projecting above the surface of the remaining concrete matrix.

3.1.8.2 Surface Damage Reinforcement Visible (SRV)

Surface reinforcement visible is where sufficient concrete is missing to enable the reinforcement to be visible. This type of defect is usually associated with H_2S damage.

3.2 Non-Structural Defects Descriptions

This section provides a description of the operational and maintenance (O&M) defects found in the project. The language and explanation are based on the September 2016 version 7.0.2 of the NASSCO manual.

3.2.1 Deposits (DA/DS/DN)

This group is used to report a wide range of deposits that may be found in pipe systems. Deposits can cause flow turbulence and partial blockages that result in a reduction of hydraulic capacity.

3.2.2 Infiltration Dripper (ID)

This is similar to the Infiltration Runner (see below), except that water entering the pipe is seen as a slow but steady drip or seeping down the pipe wall.

3.2.3 Infiltration Gusher (IG)

This infiltration is when the water enters the sewer pipe under pressure through a defect or joint.

3.2.3.1 Infiltration Gusher Joint (IGJ)

This type of infiltration gusher shows water entering the sewer pipe through a joint.

3.2.4 Infiltration Runner (IR)

This defect is defined as the situation where water enters the pipe through a defect or porous area of the pipe wall, pipe connection, pipe joint or service lateral and there is a continuous water flow into the pipe.

3.2.4.1 Infiltration Runner Joint (IRJ)

This type of infiltration runner shows water entering into the sewer pipe through a faulty joint. Usually, a continuous flow will be visible.

3.2.5 Infiltration Stain (IS)

Where no moisture is present during the inspection, but a discoloration indicates water has entered in the past.

3.2.6 Tap (T)

This group is used to describe the various kinds of sewer laterals connecting the service pipe from buildings to the main sewer. These are typically referred to as service connections, sewer lateral connections or wyes. Drop connections are also coded under this group.

3.2.6.1 Tap Break-In Intruding (TBI)

The break-in tap or a portion of this sewer lateral connection intrudes into the sewer main. This type of defect is more commonly found in break-in sewer lateral connections (taps) than in the factory taps.

3.3 Pipe Evaluations

There was a total of 72,768-feet of sewer pipe inspected as part of Phase 1. Each pipe segment was inspected and assessed. Maps showing the structural and O&M grades for each pipe segment are attached in Appendix B. Figures 3 through 6 are representative images of the pipe segments inspected as part of this project. The caption labels indicate the type of defect found and the location where the defect was found in the system.

Figure 4 Surface Damage Aggregate Visible (SAV)
Pipe Segment: SL2477 at 0.3 ft

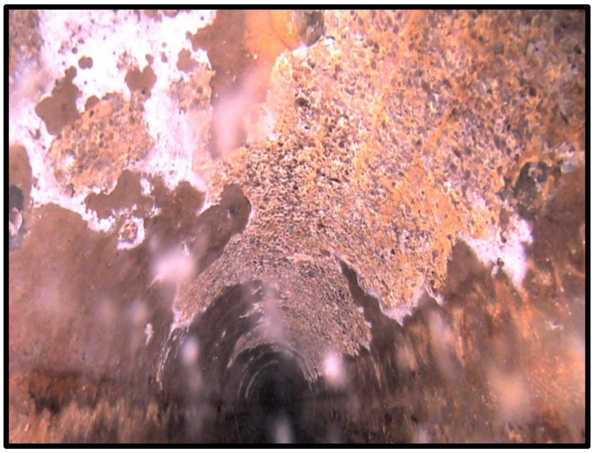

Figure 5 Surface Damage Aggregate Projecting (SAP)
Pipe Segment: SL11054 at 271.4 ft

Figure 6 Surface Damage Reinforcement Visible (SRV)
Pipe Segment: SL7660 at 6.6 ft

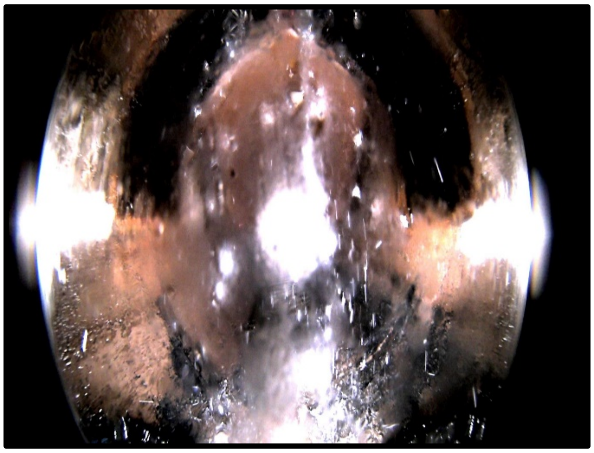

Figure 7 Infiltration Gusher Joint (IGJ)
Pipe Segment: SL8043 at 84.0 ft

Pipe sizes in Phase 1 ranged from 15-inch to 60-inch diameter pipe. Pipe materials included Reinforced Concrete Pipe (RCP) and Fiber Reinforced Pipe (FRP) pipe materials.

Most of the pipes in Phase 1 consist of RCP pipe materials. As such, the most common pipe defect was SAV in the existing RCP pipe material. Pipe defects are listed in Appendix C in the individual inspection reports for each pipe segment. Figure 8 shows the risk analysis for the pipe segments within the project. Each data point show and represents a pipe segment (manhole to manhole).

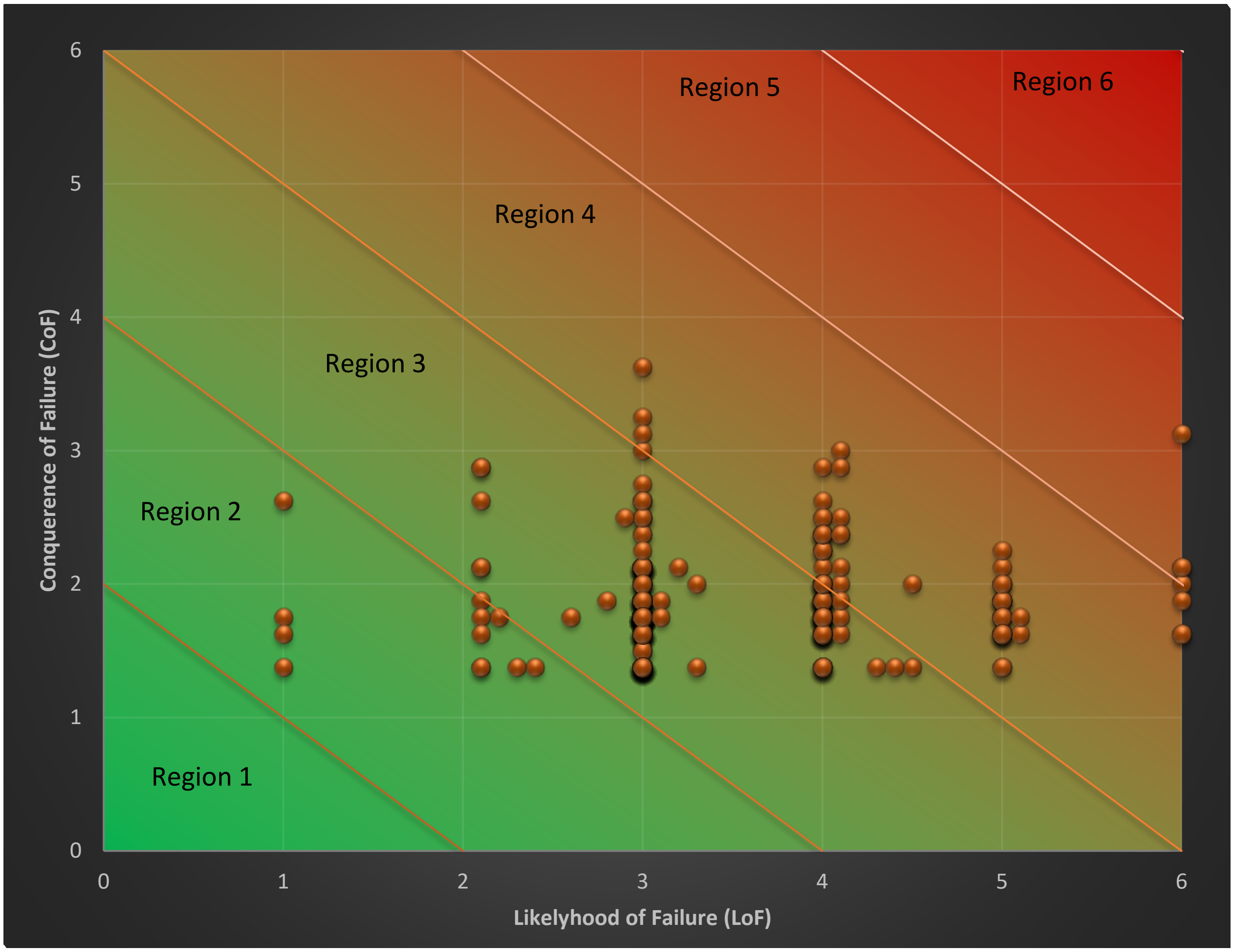

Figure 8 Risk Analysis (Pipe)

The results shown in Figure 8 indicate that the majority of the inspected pipe segments fall in regions 3 and 4 with a few outliers in regions 2 and 5. No pipe segments fall in regions 1 and 6. The following sections provide recommendations based on the strategy that pipe segments in Region 5 should be addressed first, then moving down to the left through the graph addressing pipe segments according to the region (highest first). Table 6 Segment Summary provides a tabulated summary of the region that pipe segments are categorized in based on their condition scores.

Table 6 Segment Summary

Region	# of Segments	Recommended Action
1	0	No Action
2	13	Reassess in 5-10 years
3	182	Reassess in 0-5 years
4	63	Replace/Rehabilitate in 5-10 years
5	4	Replace/Rehabilitate in 0-5 years
6	0	Immediate Action
Total # of Segments	262	

4.0 Recommendations

4.1 Structural

Appendix A includes the risk assessment data spreadsheet developed as part of this scope of work. The structural defects were considered when recommending rehabilitation work and methods of repair. As seen in Table 6, there are more than 60 segments in regions 4 and 5. This section includes those pipe segments that fit within the projects allowed by the District's budget. Further consideration can also be given to additional segments if proposed budgets are modified. Table 7 shows the diameter of the pipe, connecting manholes, pipe diameter, pipe material, and the recommended action based on the guidelines established in section 2.4 of this report. Table 7 also identifies the recommended rehabilitation or replacement method for each of the main line sewer pipes.

Table 7 also includes 9 pipe segments that are in region 3. The recommended action for segments in this region is to "Reassess in 0-5 years" indicating that there are defects, but serious issues are not anticipated in the near future. These segments were included due to other factors such as the segment crosses a major roadway or the Jordan River. The District has requested that segments in these cases be moved up the priority list so that they are lined in the near future to reduce the risk of serious collapse or overflow issues that may have a large impact to the environment or the traveling public.

Table 7 Pipe Segments Recommended for Structural Rehabilitation

IDSL	Up Stream MH	Down Stream MH	Dia. (in)	Material	Recommended Action	Rehab Method
MAP 1						
SL19393	MH210	MH209	30	RCP	Replace in 5-10 Yr	CIPP
SL19391	MH52732	MH207	30	RCP	Replace in 0-5 Yr	CIPP
*SL19387	MH19290	MH204	42	RCP	Replace in 5-10 Yr	CIPP
*SL19386	MH204	MH203	42	RCP	Replace in 5-10 Yr	CIPP
SL19398	MH5520	MH201	42	RCP	Reassess in 0-5 Yr	CIPP

*SL19400	MH200	MH199	42	RCP	Replace in 5-10 Yr	CIPP
SL19383	MH198	MH197	42	RCP	Reassess in 0-5 Yr	CIPP
*SL19382	MH197	MH196	42	RCP	Replace in 5-10 Yr	CIPP
SL19378	MH193	MH15915	42	RCP	Replace in 5-10 Yr	CIPP
SL19379	MH15915	MH192	42	RCP	Reassess in 0-5 Yr	CIPP
MAP 2						
SL9252	MH182	MH181	42	RCP	Replace in 5-10 Yr	CIPP
SL9013	MH173	MH172	42	RCP	Replace in 5-10 Yr	CIPP
SL9011	MH170	MH169	42	RCP	Replace in 5-10 Yr	CIPP
SL9923	MH168	MH167	42	RCP	Replace in 5-10 Yr	CIPP
MAP 3						
*SL8969	MH5828	MH7273	42	RCP	Reassess in 0-5 Yr	CIPP
SL8970	MH7273	MH7274	42	RCP	Reassess in 0-5 Yr	CIPP
SL8971	MH7274	MH7275	42	RCP	Reassess in 0-5 Yr	CIPP
SL8972	MH7275	MH7276	42	RCP	Reassess in 5-10 Yr	CIPP
SL5780	MH7276	MH159	42	RCP	Replace in 5-10 Yr	CIPP
SL9204	MH155	MH154	42	RCP	Replace in 5-10 Yr	CIPP
*SL9208	MH151	MH150	42	RCP	Replace in 5-10 Yr	CIPP
*SL4004	MH18279	MH5515	42	RCP	Replace in 5-10 Yr	CIPP
SL4003	MH18279	MH18278	42	RCP	Replace in 5-10 Yr	CIPP
SL4005	MH18278	MH111	42	RCP	Replace in 5-10 Yr	CIPP
SL12541	MH111	MH110	42	RCP	Reassess in 0-5 Yr	CIPP
MAP 4						
*SL8043	MH5514	MH5513	42	RCP	Replace in 0-5 Yr	CIPP
*SL8042	MH5513	MH47919	42	RCP	Replace in 0-5 Yr	CIPP
SL14634	MH87	MH45691	42	RCP	Reassess in 0-5 Yr	CIPP
SL11054	MH83	MH82	48	RCP	Replace in 5-10 Yr	CIPP
MAP 5						
SL41331-1	MH69	MH68	12	DIP	Replace in 5-10 Yr	CIPP
SL41331-2	MH69	MH68	12	DIP	Replace in 5-10 Yr	CIPP
SL41331-3	MH69	MH68	12	DIP	Replace in 5-10 Yr	CIPP
SL41331-4	MH69	MH68	12	DIP	Reassess in 0-5 Yr	CIPP
SL41331-5	MH69	MH68	12	DIP	Replace in 5-10 Yr	CIPP
MAP 6						
SL12503	MH49	MH50	54	RCP	Replace in 5-10 Yr	CIPP
SL12500	MH49	MH48	54	RCP	Replace in 5-10 Yr	CIPP
SL12493	MH22	MH21	54	RCP	Replace in 5-10 Yr	CIPP
SL12488	MH39	MH38	48	RCP	Replace in 5-10 Yr	CIPP
MAP 7						
SL12476	MH34	MH33	48	RCP	Replace in 5-10 Yr	CIPP
*SL12470	MH31	MH30	48	RCP	Replace in 5-10 Yr	CIPP
SL7665	MH27	MH9771	48	RCP	Reassess in 0-5 Yr	CIPP
*SL7666	MH9771	MH26	48	RCP	Replace in 5-10 Yr	CIPP

*SL7667	MH26	MH25	48	RCP	Replace in 5-10 Yr	CIPP
SL12465	MH7	MH47917	54	RCP	Replace in 5-10 Yr	CIPP
SL7660	MH6	MH5	54	RCP	Replace in 5-10 Yr	CIPP
*SL7661	MH5	MH4	54	RCP	Replace in 5-10 Yr	CIPP
SL7662	MH4	MH3	60	RCP	Replace in 5-10 Yr	CIPP

*Segments also appear in Table 8

4.2 Non-structural

Table 8 is a summary of all the non-structural defects found in Phase 1. Detailed information related to each individual defect is given in the pipe inspection reports. In each of the cases shown in Table 8, the defect can be repaired by performing the recommended rehabilitations in Table 7. Each of the segments in Table 8 appear in Table 7.

Table 8 Non-Structural Defect Summary

IDSL	Up Stream MH	Down Stream MH	Dia. (in)	Material	Defect
MAP 1					
SL19387	MH19290	MH204	42	RCP	IRJ
SL19386	MH204	MH203	42	RCP	IRJ
SL19400	MH200	MH199	42	RCP	IGJ
SL19382	MH197	MH196	42	RCP	IR
MAP 3					
SL8969	MH5828	MH7273	42	RCP	IS
SL9208	MH151	MH150	42	RCP	IRJ
SL4004	MH18279	MH5515	42	RCP	IGJ
MAP 4					
SL8043	MH5514	MH5513	42	RCP	IGJ
SL8042	MH5513	MH47919	42	RCP	IGJ
MAP 7					
SL12470	MH31	MH30	48	RCP	IG
SL7666	MH9771	MH26	48	RCP	IR
SL7667	MH26	MH25	48	RCP	IRJ, IDJ
SL7661	MH5	MH4	54	RCP	IR, ID