

Devil's Lake Sewer System Evaluation

Devil's Lake State Park

DSF Project No.: 10B30

Prepared For:
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1.0 Introduction & Prioritized Repair Project List

1.1. Introduction

Devil's Lake State Park is located in the Baraboo Range and is 2 miles south of the City of Baraboo and about 40 miles northwest of Madison. Effigy mounds throughout the park testify to the inhabitation of prehistoric indigenous peoples. The Ho-Chunk (Winnebago) Nation had a summer fishing village along the North Shore of Devil's Lake and a winter camp on the southeast shore. Resort hotels operated along the lakeshore from 1866 to 1904. Devil's Lake State Park was established in 1911 and is one of Wisconsin's oldest state parks. There have been many changes over the years. At various times, the land within the present park boundaries included quarries, a golf course, a toboggan slide, and private cabins.

Today, the park encompasses 9,217 acres and is visited by 1.2 to 1.4 million people annually. Portions of the water distribution and sewage collection systems in the park have been installed through the years to accommodate a wide range of activities and development. These systems have been mended and modified to provide an acceptable level of service; however, no significant improvements have been made to the system in over 25 years. The purpose of this report is to evaluate the current state of the sewage collection system and recommend a phased approach to modernize the system to comply with current plumbing codes and allow for expansion (if desired) of facilities in the park.

1.2. Prioritized Repair Project List

The analysis and findings discussed in this report were used to create a list of projects needed to address deficiencies of the sanitary sewer system and needs within the park. Highest priority was given to projects that are needed to correct code violations, prevent failure of the operation of the collection systems and correct deficiencies that may result in a threat to public health. A prioritized list of projects is shown in **Table 1.2** on the next page. A brief discussion of the listed projects follows the table.

Table 1.2 - Prioritized Repair Project List

Priority	Repair Item	Estimated Cost	Reason for Repair Project
1	Replace North Shore Pumping Station Pumps	\$ 36,000	Operational Failures
2	Replace South Shore Pumping Station Pumps	\$ 32,000	Operational Failures
3	North Shore Pumping Station Replacement & Portable Emergency Generator	\$ 323,000	Code Violations, Operational Failures
4	South Shore Pumping Station Replacement & Portable Emergency Generator	\$ 334,000	Code Violations, Operational Failures
5	Nature Center Sewer Lateral	\$ 97,000	Protection of Public Health
6	Replace & Reinforce (with steel I beam) Pipe No. 21 in North Shore System	\$ 6,300	Protection of Public Health
7	Pressure Test South Shore to North Shore Force Main to Determine if Repairs are Required	\$ 5,000	Protection of Public Health
8	North Shore Flood Area Sewer & Manhole Replacements/Repairs (See Tables 4.3.2-1 & 4.3.2-2)	\$ 194,000	Code Violations
9	South Shore Flood Area Sewer & Manhole Replacements/Repairs (See Tables 4.3.4-1 & 4.3.4-2)	\$ 58,000	Code Violations
10	Non-Flood Area Sewer & Manhole Replacements/Repairs (See Tables 4.2.4 & 4.1-1 to 4.1-IV)	\$ 144,000	Code Violations.

Priority 1 – North Shore Pumping Station Pumps Replacement: The current pumps are beyond their expected service life and have frequent failures that require costly emergency repairs by a local plumbing contractor. During the failures sewage is diverted to the septic tank which is in a deteriorated condition. The water-tightness of the septic tank is questionable. It should be noted that the recommended replacement pumps are dry-pit submersibles. This type of pump can be installed in the existing pumping station temporarily and then they can be salvaged and installed in the new pumping station so that their initial capital expense is not wasted.

Priority 2 - South Shore Pumping Station Pumps Replacement: The reasons for replacing these pumps are similar to those for the North Shore Pumping Station. Similar to the North Shore Pumping Station Pump Replacement, the recommended pumps can be re-used in the new, full replacement of the pumping station.

Priority 3 - North Shore Pumping Station Replacement: Replacement of the pumps alone will not be sufficient to address the code violations and deteriorated conditions of other equipment at the pumping station. Full replacement of the pumping station is recommended to ensure reliable, code compliant operation of the pumping station.

Priority 4 - South Shore Pumping Station Replacement: The reasons for complete replacement of the south shore pumping station are similar to those for the North Shore Pumping Station.

Priority 5 - Nature Center Sewer Lateral: The Nature Center is served by a septic field which has potential to contaminate the down-gradient drinking water well.

Priority 6 - Replace & Reinforce (with steel I beam) Pipe No. 21 in North Shore System: During flood conditions this sewer washes out and allows raw sewage to drain into the creek. Historically, park staff has indicated this occurs once every four to five years.

Priority 7 - Pressure Test South Shore to North Shore Force Main: Due to its proximity to the East Shore, leaks in the force main may be allowing raw sewage to drain into the lake. It has been twenty-four years since the last test which revealed several leaks requiring repairs.

Priorities 8 & 9 - Flood Area Sewer & Manhole Replacements/Repairs: In addition to the problem of sewage leaking out of defects in sewer pipes and manholes, the flood prone areas of the sanitary sewer system are more susceptible to groundwater infiltration and stormwater inflow (I/I) than non-flood areas of the sanitary sewer system. I/I increases operational costs and reduces system capacity. Paragraph NR 110.13(1) of the Wisconsin Administrative Code requires storm and clear water to be excluded from sanitary sewer systems.

Priority 10 – Non-Flood Area Sewer & Manhole Replacements/Repairs: Sewage can leak out of defects in sewer pipes and manholes. In addition, sanitary sewer system defects allow groundwater infiltration and stormwater inflow (I/I). As mentioned above, I/I increases operational costs and reduces system capacity. Paragraph NR 110.13(1) of the Wisconsin Administrative Code requires storm and clear water to be excluded from sanitary sewer systems.

Several non-repair park projects are desired including expansion of campgrounds on the North Shore and construction of new facilities, such as a new park entrance station and a nature center, on the South Shore. It is recommended that Repair Projects 1 to 7 in Table 1.2 above are completed prior to any campground expansion or new building construction at the park. Once these repair projects have been completed, the system

will become reliable enough to expand campgrounds and add new buildings. Repair Projects 8, 9 and 10 may be integrated into any expansion plans as development occurs. In addition, the recommended repairs will reduce infiltration and inflow into the sewer system and increase the system capacity to accommodate expansion and new building construction.

2.0 Sanitary Sewer System Overview

2.1. Overall Sanitary Sewer System

Currently, there are two distinct sewage collection systems within Devil's Lake State Park: the "North Shore" and the "South Shore." Each system has a network of gravity sewer piping which conveys wastewater to a pumping station. The pumping station, in turn, pumps the wastewater through a force main to the City of Baraboo's sanitary sewer collection system for ultimate treatment at the City's wastewater treatment facility.

These overall sanitary facilities are shown on the "**Sanitary System Map**" (Sheet 1 of 3) found in the **Appendix**.

2.2. South Shore Sanitary Sewer System

The South Shore has an entrance office and five shelter buildings. Each shelter building has restrooms. The Red Oak shelter restrooms are in service all year, while the other restrooms are summer use only.

A system of gravity sewer piping conveys wastewater from the shelter buildings to the South Shore Pumping Station (see Sheet 3 of 3 in Appendix 1) located a few hundred feet from the South Shore of the lake. The pumping station conveys wastewater through a force main along the east shore of the lake and connects to the common force main at the North Shore pumping station.

Not shown in the map of the South Shore collection system are nine group campsites located east of the South Shore shelters that can accommodate a total of 240 campers. These campsites are served by a flush toilet/shower building and a pit toilet building. The flush toilet/shower building uses a grinder station with positive displacement pumps and small diameter force main to convey wastewater to the South Shore force main and eventually to the City of Baraboo wastewater collection system. With this configuration, these campsites can function somewhat independently from the South Shore system because they are not dependent upon the South Shore Pumping Station to convey wastewater to the treatment facility.

These wastewater facilities are shown on the "**South Shore Sanitary System Map**" (Sheet 3 of 3) found in the **Appendix**.

2.3. North Shore Sanitary Sewer System

The North Shore sanitary sewer system serves the majority of the Park's buildings and campgrounds. This includes the Park Entrance Visitor Station, Park Headquarters,

Chateau, the maintenance garage, and adjoining buildings, two shelter buildings with restrooms, a rest room building near the trail head of the East Bluff Trail and the Quartzite, Northern Lights and Ice Age campgrounds. These campgrounds have a total of 407 sites that each accommodates a family or up to six individuals. There are three shower/flush toilet buildings and one R/V trailer dumping station in the Quartzite Campground; five shower/flush toilet buildings and one R/V trailer dumping station in the Northern Lights Campground, and two shower/flush buildings in the Ice Age Campground.

The Northern Lights and Ice Age campgrounds close in October and re-open in April. Some campsites in the Quartzite Campground are kept open during the winter, but the running water rest rooms and showers are closed. One winterized water tap and pit toilets are available to winter campers. Running water restrooms are open and available in the Park Entrance Visitor Station and Headquarters buildings for winter campers.

There is a system of gravity sewer piping which collects wastewater from the North Shore buildings and campgrounds and conveys it to the North Shore Pumping Station. This pumping station is located east of the Quartzite Campground and west of the rail road tracks, and conveys wastewater through a force main along the railroad tracks to the City of Baraboo sanitary sewer system. A single shower/flush toilet building in the upper Ice Age Campground is served by a grinder station with positive displacement pumps which conveys the wastewater through a force main to a gravity sewer manhole (IA 4) in the west half of the Ice Age Campground.

These wastewater facilities are shown on the "**North Shore Sanitary System Map**" (Sheet 2 of 3) found in the **Appendix**.

3.0 Purpose & Scope of Study

The purpose of this study is to inspect, inventory and evaluate the current conditions and capacities of the Park's sanitary sewer system. In addition, the study is to propose improvements and repairs to address code violations, maintenance problems and the potential for expansion of the sanitary sewage handling facilities at the park.

The scope of the study includes:

- Identifying items that present a life safety hazard or could cause personal injury (the need for entering confined spaces should be eliminated as much as practical).
- Identifying items that are violations under current code.
- Propose repairs or replacements for items that require immediate attention (failure to do so will cause major deterioration or hinder operation of the system) and that will reduce general "housekeeping" and maintenance issues.
- Identify action not required, but modification may improve system functionality.
- Address the system's ability to accommodate emergency situations, such as power failure, surface water flooding, etc.
- Determine the estimated flow rate for the park under "typical" conditions.

4.0 Existing System Evaluation

4.1. Sanitary Manholes

The entire sanitary sewer system includes 80 manholes at the writing of this report. The South Shore system has 15 manholes while the remaining 65 are located in the North Shore system. As part of the surveying completed to create the system map, each manhole was opened (except as noted below), the depth measured and the condition noted. This information is documented on the **Sanitary Manhole Survey Forms** included in the **Appendix**.

The manholes are constructed of various materials. There were 21 constructed of concrete block, 30 were precast concrete, 18 were stone, 5 were block/stone or brick composite, 3 were a precast concrete/block composite. The currently accepted standard material of construction for manholes is precast concrete.

The manhole covers are of varying materials. There were 9 cast covers with concealed pick holes 37 cast covers with open pick holes, 1 cover with a lifting ring, 30 concrete covers, and 1 sheet metal cover. The currently accepted standard material of construction for manholes covers is cast with concealed pick holes.

One manhole (#27) had a concrete lid which could not be removed. The pipe to this dead-end manhole was plugged in the manhole (#26) immediately downstream. Another manhole (#IA 3) was buried under a large pile of gravel and could not be accessed, and a third (IA #4) could not be found, but the approximate is shown on the plans.

The majority of the manholes, including the older stone manholes, were found to be in fair to good structural condition. However, there are 19 manholes that are recommended to be replaced completely. Several manholes (11) were surcharged with standing water/solids. This condition may indicate plugged, collapsed or under-capacity downstream pipes. Several manholes (30) had a buildup of solids which required cleaning. This condition could indicate low flow velocities due to inadequate pipe slopes or just low usage. Other recommended repairs/improvements include adjusting below grade rims to grade, grouting joints, chemical grouting where infiltration is suspected, plugging inactive pipes to prevent infiltration, constructing outside drops were inside inverts are greater than 2 feet above the outlet pipe, and abandoning manholes on inactive lines.

The manhole inventory information and recommended improvements, including unit costs, and designated repair priority are listed in **Table 4.1 – “Sanitary Manhole Inventory & Recommended Improvements”** found in the **Appendix**. **Tables 4.1-1 through Table 4.1-IV** in the **Appendix** provide an Opinion of Probable Construction Costs for prioritized recommended manhole improvements.

4.2. Sanitary Gravity Piping

There are 108 gravity pipes in the entire sanitary sewer system at the writing of this report. The South Shore system has 21 gravity pipes while the remaining 87 are located in the North Shore system. As part of the surveying completed to create the system map, each manhole was opened and the pipe diameter and material was noted. This

information is documented on the **Sanitary Manhole Survey Forms** included in the **Appendix**.

The gravity piping has 4 inch, 6 inch, and 8 inch diameters, and are constructed from a variety of materials including ductile iron, PVC (plastic) and clay. The majority of sewers are clay. A summary of the pipe sizes, materials of construct and total lengths is shown in **Table 4.2.1 – Sanitary Gravity Piping Summary**. The currently accepted standard material of construction for sanitary gravity piping is PVC with a minimum diameter of 8 inches for mains and 4 or 6 inches for building services.

Table 4.2.1 - Sanitary Gravity Piping Summary

Size (inches)	Material	Total Length (ft)
4	Clay	114
6	Clay	13,828
8	Clay	226
4	Ductile Iron	49
6	Ductile Iron	27
4	PVC	37
6	PVC	1,253
8	PVC	1,998
Total =		17,533

Some of the gravity piping was televised in 1987. Of the pipes televised, five contained cracks, six had dips, 4 had segments or the entire length was full of water, 2 had roots growing through the joints and 76 had no damage or repairs noted. It appears that 1 of the cracked pipes, 3 of the dipped pipes and 2 of the underwater pipes have been replaced since 1987. (Current field survey notes indicate that these pipes are now PVC.) Notes for each pipe televised in 1987 can be found in **Table 4.2.2 Sanitary Gravity Piping Inventory & Recommended Improvements** in the **Appendix**.

As the final step in this report and analysis, approximately 2,000 lineal feet of sewer will be televised. This work has not been performed to date, but will be completed in the spring of 2011. This information will be used to prioritize the sanitary sewer replacement and is of importance to the formation of the overall sewage system. However, in comparison with other issues that are discussed hereafter, the condition of these sewers is not the most pressing need of the Park. An amendment to this report will be issued (as an addendum) including repair recommendations based on the televising as well as an opinion of probable construction cost for the recommended repairs.

It is recommended that a regular cleaning and televising program be implemented. This program would assure that cleaning and televising is completed each year over the next several years until all of the clay pipe has been televised. For example, if 2,000 feet of pipe were to be cleaned and televised each year, the 8,083 feet of piping in need of

televising could be completed in four years. A list of pipes to be televised is shown in **Table 4.2.3 – Sanitary Gravity Piping to be Televised** in the **Appendix**.

As part of the surveying for the system map, each manhole cover was removed and the depth of each gravity pipe was measured from the rim of the manhole. Along with the rim elevation, these measurements were used to determine the pipe invert elevations at the manholes, which were in turn used to calculate the slopes of the pipes. These calculations assumed the pipes do not dip between the manholes, which may not always be the case. The estimated capacity of each pipe was calculated by using Manning's Equation which takes into account the pipe diameter, roughness coefficient (based on material), and slope.

The sanitary gravity piping inventory information, estimated pipe capacity, and recommended improvements are listed in **Table 4.2.2- Sanitary Gravity Piping Inventory & Recommended Improvements** in the **Appendix**. Also, a prioritized list of recommended improvements, including opinions of probable construction costs, for the sanitary gravity piping is included in **Table 4.2.4 - Sanitary Gravity Piping Prioritized Recommended Improvements with Opinion of Probable Construction Costs** in the **Appendix**.

4.3. Evaluation of Susceptibility to Flooding

Since the lake has no natural outlet the water surface can raise with significant rainfall events. The ground elevations at the developed areas of the North Shore and South Shore are near the normal lake surface elevation; therefore, when the lake water level rises, these areas are flooded. In addition, low areas near each of the shores frequently flood during significant rainfall events even when the lake water surface elevation does not rise.

4.3.1. North Shore

As reported by Jim Carter, Assistant Manager/Maintenance Supervisor at the park, the area on the North Shore that is most susceptible to flooding is the area immediately north of the beach which includes manholes Nos. 19 through 27. He further reported that in 1993 and 2008 when the lake overflowed, water flowed from manhole 27 towards manhole 21 where it turned and flowed over manholes 20 and 19 and then turned again and went into a culvert system between manhole Nos. 16 and 17 which empties into the creek. The North Shore Pumping Station was also reported to be inundated with flood water in 1993.

Localized flooding occurs on the North Shore during significant rain events. Rain water collects in the area around manhole Nos. 20, 21, 24 and 25 and approximately six times per year after significant rainfall events these manholes are underwater.

Devil's Lake is not mapped or studied in detail under FEMA's Floodplain mapping program. However, according to WDNR floodplain management staff, the flood of record on Devils Lake occurred on June 14, 2008 when the lake reached a stage of 969.33 NAVD88. This elevation is consistent with the flood area described by Park staff. Therefore, it is recommended that flood protection measures be taken for manholes and sewer piping below elevation 969.33. To add a measure of safety, flood protecting

manholes and sewer piping below elevation 971.00 could be considered (2' ± free board).

The North Shore flood prone areas are shown on the “**North Shore Sanitary System Map**” (Sheet 2 of 3) found in the **Appendix**.

Another rainwater related problem is the wash out of sanitary gravity pipe no. 21. This pipe is located east of the North Shore Pumping Station and is suspended over the creek channel to convey wastewater from the Northern Lights and Ice Age campgrounds to the pumping station (between manhole nos. 40 & 41). This pipe has been washed out several times when water levels rise in the creek during flash floods. This allows raw sewage from these campgrounds to discharge directly to the stream.

4.3.2. North Shore Flood Protection Recommendations:

The materials of construction, cover type and conditions of the manholes included in the flood prone areas listed in section 4.3.1 above were reviewed in **Table 4.1 – “Sanitary Manhole Inventory & Recommended Improvements”** found in the **Appendix**. The table indicated that these manholes are constructed of stone or block with a casting with open pick holes. It is recommended that at a minimum the castings be replaced with gasketed, water-tight castings, and that internal chimney seals be installed where possible. Ultimately, all the manholes subject to flooding should be replaced with precast concrete manholes constructed with exterior joint seal (Mac-Wrap), chimney seals, and gasket, water-tight castings. The manhole inventory table notes that manhole nos. 23, 24 & 25 have evidence of infiltration and are in fair to poor condition. Therefore, these manholes should be the first priority for replacement in the flood prone area. Recommended manhole repairs/replacements are listed in **Table 4.3.1.2-1** below. The manhole numbers are listed in the recommended order of repair/replacement priority.

Table 4.3.2-1 – North Shore Flood Prone Area Recommended Sanitary Manhole Replacement/Repairs

Repair/Replacement	Number of Manholes	Manhole Number(s)
Complete Replacement	12	25, 24, 23, 21, 20, 17, 18, 28, 11, 9, 40, 41
New Cover w/ Concealed Pick Holes	5	10, 8, 7, 44, 45
New Cover, Fame & Conc. Flat Top	2	42,43
Internal Chimney Seal	2	16, B
New Cover w/ Concealed Pick Holes & Install Internal Chimney Seal	1	19

Replacement of clay pipe within the flood prone area is recommended because clay pipe has non-gasketed joints at 3 feet intervals. This makes clay pipe systems prone to infiltration in high groundwater areas. The sanitary gravity pipe inventory included in the Appendix (Table 4.2.2) was reviewed and priority was given to replacing clay sewers in

flood prone areas. The pipes constructed of clay are listed in **Table 4.3.2-2** below. These pipes should be replaced with PVC pipe with gasket joints to prevent infiltration.

**Table 4.3.2-2 – North Shore Flood Prone Area
Recommended Sanitary Gravity Piping Replacement**

Pipe Number	Diameter (inches)	Length (ft.)
88	4	81
66	6	344
65	6	311
91	6	161
63	6	58
64	6	185
62	6	223
90	6	393
48	6	268
49	6	137

Flood protection improvements are also indicated in the sanitary manholes and sanitary gravity pipes **Tables 4.1 & 4.2.2** found in the **Appendix**. In addition, an **Opinion of Probable Construction Costs** can be found in **Table 4.3.2-3** found in the **Appendix**.

A potential solution to prevent the wash out of pipe no. 21 would be to install a horizontal steel I-beam between two concrete abutments to protect and reinforce the pipe during high water conditions. Another possibility is to replace the pipe with an inverted siphon. A more detailed hydraulic analysis would be needed to confirm the viability of this option. We have presented an opinion of possible construction for reinforcing the pipe with an I-beam in **Table 4.2.4** found in the **Appendix**.

4.3.3. South Shore

According to records, the area immediately surrounding the South Shore pumping station was also flooded in 1993 and in 2008.

During other times, heavy rains produce stormwater runoff that inundates portions of the South Shore. The runoff flows around the Tamarack shelter, over manhole S2 and then down towards S3 before turning and flowing into the lake (See **Sheet 3 of 3** in the **Appendix**).

As mentioned in discussion of the North Shore stations, it is recommended that flood protection measures be taken for manholes and sewer piping below elevation 969.33. To add a measure of safety, flood protecting manholes and sewer piping below elevation 972.00 could be considered.

The South Shore flood prone areas are shown on the "**South Shore Sanitary System Map**" (Sheet 3 of 3) found in the **Appendix**.

4.3.3.South Shore Flood Protection Recommendations:

The materials of construction, cover type and conditions of the manholes included in the flood prone areas listed in section 4.3.3 above were reviewed in **Table 4.1 – “Sanitary Manhole Inventory & Recommended Improvements”** found in the **Appendix**. The table indicated that these manholes are constructed of stone or block with concrete covers or castings with open pick holes. It is recommended that at a minimum the concrete covers and/or castings be replaced with gasketed, water-tight castings, and internal chimney seals be installed if possible. Ultimately, all the manholes subject to flooding should be replaced with precast concrete manholes constructed with exterior joint seal (Mac-Wrap), chimney seals, and gasket, water-tight castings. The manhole inventory table notes that manhole nos. S5 and S6 have mortar missing between the stones and are in poor condition. Therefore, these manholes should be the first priority for replacement in the flood prone area.

**Table 4.3.4-1 – South Shore Flood Prone Area
Recommended Sanitary Manhole Replacement/Repairs**

Repair/Replacement	Number of Manholes	Manhole Number(s)
Complete Replacement	2	S5, S6
New Cover w/ Concealed Pick Holes	1	S2
New Cover, Frame & Conc. Flat Top	1	S3

The materials of construction and conditions of the sanitary gravity piping included in the flood prone areas listed in section 4.3.3 above were reviewed in **Table 4.2.2- Sanitary Gravity Piping Inventory & Recommended Improvements** in the **Appendix**. The table indicated that pipes 5, 7, 13, 14, 106 & 107 are constructed of clay. Due to the fact that clay pipe has frequent (3 feet intervals) and non-gasket joints; it is recommended that all of these pipes be replaced with PVC pipe with gasket joints.

**Table 4.3.4-2 – South Shore Flood Prone Area
Recommended Sanitary Gravity Piping Replacement**

Pipe Number	Diameter (inches)	Length (ft.)
5	6	181
7	8	125
13	6	186
14	6	244
106	6	10
107	6	10

Flood protection of the pumping station should also be a priority. More complete and higher earthen dikes could be constructed around the station to protect it from flood waters as an interim fix. Ultimately, due to the style of construction, age and condition,

the pumping station should be relocated to an area farther from the lake shore. This concept will be further explored in the pumping station section of this report.

Manhole and gravity piping flood protection improvements are indicated in the sanitary manholes and sanitary gravity pipes **Tables 4.1 & 4.2.2** found in the **Appendix**. In addition, an **Opinion of Probable Construction Costs** is shown in **Table 4.3.4-3** found in the **Appendix**.

4.4. Nature Center Sewer Service Evaluation

The 1987 Devils Lake North Shore Utility Map notes that the Nature Center is served by a septic tank which discharges into a "dry well". However, current park staff suspects that the Nature Center was connected to the gravity sewer system at some point in time. Dye testing was completed on 8/19/10 to determine if the Nature Center connects to the sewer system or if it still remains connected to the septic tank and dry well. The septic tank for the Nature Center was located in the field at the approximate location where it is shown on the 1987 utility map. The tank was intact and full of water to a level even with the outlet pipe. Fluorescent dye and water from a garden hose was poured into the septic tank for one hour while the hill side and sewer system manholes surrounding the Nature Center were monitored. Dye was not detected in any of the sanitary manholes nor it appeared at any location on the hillside where the septic tank is located. No unmapped or previously unknown manholes were found in the vicinity of the Nature Center which could indicate another connection to the sewer system besides through the septic tank. Therefore, it appears that Nature Center septic tank is not connected to the sanitary sewer system and still discharges through the dry well.

There is a water supply well down gradient and northeast of the Nature Center. Therefore, it is recommended that the Nature Center be connected to the sanitary sewer system to reduce the potential of contamination of the water supply well. The **North Shore Sanitary System Map**, found in the **Appendix**, shows a possible route to connect the Nature Center to the sanitary sewer system, and an opinion of probable construction costs is shown in **Table 4.4 – Engineer's Opinion of Probable Cost – Nature Center Sewer Lateral** which can be found in the **Appendix** as well.

5.0 Flow Monitoring Results Summary & Analysis

5.1. Flow Monitoring Methodology

Flow monitoring was performed at six (6) locations throughout the park. Three manholes (MH 8, MH 15, and MH 41) were monitored on the North Shore. Three manholes (MH S3, S7 and MH S14) were monitored on the South Shore. The South Shore manholes were monitored between Wednesday, August 18th and Tuesday, August 24th, 2010. The North Shore manholes were monitored between Thursday, September 2nd and Wednesday, September 8th, 2010, which included Labor Day Weekend.

5.2. Quartzite Campground Flow Monitoring

The flow from the Quartzite Campground was monitored at MH 8 just west of the pumping station. Immediately downstream of MH 8 is Pipe 80 (6" clay @ 0.55%), and immediately upstream of MH 8 is Pipe 15 (6" clay @ 0.70%). A summary of flow data is shown in **Table 5.2 – Quartzite Campground Flow Monitoring**.

Table 5.2 – Quartzite Campground Flow Monitoring

Date	Average Flow (cfs)	Minimum Flow (cfs)	Maximum Flow (cfs)	Heaviest Flow Period	Lowest Flow Period
9/2/10*	0.009	0.003	0.033	Noon-4:00pm	9:00pm-Midnight
9/3/10*	0.009	0.002	0.043	8:00pm-Midnight	1:00am-7:00am
9/4/10	0.021	0.003	0.064	8:00am-10:00pm	Midnight-8:00am
9/5/10*	0.024	0.009	0.066	7:00am-11:00am	Midnight-9:00am
9/6/10	0.016	0.003	0.069	7:00am-11:00am	4:00pm-Midnight
9/7/10	0.006	0.003	0.020	8:00am-9:00am	Majority of day
9/8/10	0.006	0.003	0.018	8:00am-9:30am	Majority of day

*Note: Rain Fall Data – 9/2 = 0.17", 9/3 = 0.08", 9/5 = 0.02"

The minimum flow recorded was 0.002 cfs and the maximum flow was 0.069 cfs. The average flow at this location from 9/2 – 9/8 was 0.013 cfs. There appears to be a fairly consistent base flow of approximately 0.002 – 0.005 cfs (1-2 gpm). On 9/3 – 9/5 there were a few periods of negative flows lasting between 15 minutes and 3 hours which typically would indicate that the manhole was surcharged and downstream pipes may not have adequate capacity.

5.3. Northern Lights and Ice Age Campgrounds Flow Monitoring

The flow from the Northern Lights and Ice Age Campgrounds was monitored at MH 41 east of the pumping station. Pipe 22 (6" clay @ 0.53%) is immediately upstream of MH 41, and Pipe 21 (6" clay @ 1.43%) is immediately downstream of MH 41. A summary of the flow data is shown in Table 5.3 – Northern Lights & Ice Age Campground Flow Monitoring.

Table 5.3 – Northern Lights & Ice Age Campground Flow Monitoring

Date	Average Flow (cfs)	Minimum Flow (cfs)	Maximum Flow (cfs)	Heaviest Flow Period	Lowest Flow Period
9/2/10*	0.005	0.003	0.024	Consistent 1-3gpm	Consistent 1-3gpm
9/3/10*	0.009	0.003	0.030	6:30pm-8:30pm	Midnight-9:00am
9/4/10	0.023	0.004	0.068	8:00am-Noon 5:00pm-8:00pm	Midnight-7:00am
9/5/10*	0.029	0.007	0.096	7:30am-12:30pm 3:00pm-8:00pm	Midnight-7:00am
9/6/10	0.019	0.006	0.084	7:30am-Noon	Midnight-7:00am
9/7/10	0.009	0.007	0.023	Consistent 3-5gpm	Consistent 3-5gpm
9/8/10	0.009	0.007	0.020	Consistent 3-5gpm	Consistent 3-5gpm

*Note: Rain Fall Data – 9/2 = 0.17", 9/3 = 0.08", 9/5 = 0.02"

The minimum flow recorded was 0.003 cfs and the maximum flow was 0.096 cfs. The average flow at this location from 9/2 – 9/8 was 0.0148 cfs. There appears to be a fairly consistent base flow of approximately 0.005 – 0.011 cfs (2-5 gpm). There were no time periods of negative flow.

5.4. North Shore Park Area Flow Monitoring

The flow from the North Shore Park Area (Chateau & Park Shelters on the North Shore) was monitored at MH 15 south of the pumping station. Downstream of MH 15 is Pipe 70 (6" PVC @ 0.84%) and upstream of MH 15 is Pipe 69 (6" PVC @ 0.97%). A summary of the flow data is shown in Table 5.4 – Chateau/Shelter Park Areas Flow Monitoring.

Table 5.4 – North Shore Park Area (Chateau & Park Shelter Buildings) Flow Monitoring

Date	Average Flow (cfs)	Minimum Flow (cfs)	Maximum Flow (cfs)	Heaviest Flow Period	Lowest Flow Period
9/2/10*	0.012	0.009	0.015	Consistent 4-6gpm	Consistent 4-6gpm
9/3/10*	0.012	0.003	0.041	9:00am-10:00am	3:15pm-4:00pm
9/4/10	0.021	0.004	0.186	11:45am-7:00pm	Minight-10:00am
9/5/10*	0.029	0.006	0.240	Noon-6:00pm	Consistent 8gpm
9/6/10	0.023	0.005	0.187	11:30am-4:00pm	4:00pm-6:00pm
9/7/10	0.013	0.010	0.029	Consistent 5gpm	Consistent 5gpm
9/8/10	0.012	0.007	0.016	Consistent 4-5gpm	Consistent 4-5gpm

*Note: Rain Fall Data – 9/2 = 0.17", 9/3 = 0.08", 9/5 = 0.02"

The minimum flow recorded was 0.003 cfs and the maximum flow was 0.240 cfs. The average flow at this location from 9/2 – 9/8 was 0.0174 cfs. There appears to be a fairly consistent base flow of approximately 0.007 – 0.011 cfs (3-5 gpm). There were periods of negative flow on 9/3-9/5, Labor Day Weekend, typically between 9:30am and 11:30am, which again would typically indicate that the manhole was surcharged and downstream pipes did not have adequate capacity.

5.5. South Shore Tamarack Shelter Flow Monitoring

The flow from the Tamarack Shelter on the South Shore was monitored at MH S3 northeast of the pumping station. Downstream of MH S3 is Pipe 13 (6" clay @ 0.41%) and upstream of MH S3 is Pipe 14 (6" PVC @ 2.13%). A summary of the flow data is shown in Table 5.5 – Tamarack Shelter Flow Monitoring.

Table 5.5 – Tamarack Shelter Flow Monitoring

Date	Average Flow (cfs)	Minimum Flow (cfs)	Maximum Flow (cfs)	Heaviest Flow Period	Lowest Flow Period
8/18/10	0.011	0.004	0.033	4:00pm-6:30pm	9:00pm-Midnight
8/19/10	0.007	0.002	0.033	1:30pm-3:30pm	5:00pm-Midnight
8/20/10*	0.005	0.001	0.033	4:15pm-6:45pm	7:30pm-Midnight
8/21/10	0.010	0.002	0.056	11:00am-2:00pm 4:00pm-8:00pm	Midnight-10:00am
8/22/10	0.016	0.003	0.078	Noon-6:00pm	8:00pm-Midnight
8/23/10	0.006	0.001	0.025	3:30pm-6:00pm	Midnight-8:00am
8/24/10	0.006	0.005	0.010	Consistent	Consistent

*Note: Rain Fall Data – 8/20 = 1.17"

The minimum flow recorded was 0.001 cfs and the maximum flow was 0.078 cfs. The average flow at this location from 8/18 – 8/24 was 0.009 cfs. There appears to be a fairly consistent base flow of approximately 0.001 – 0.006 cfs (0.4-2 gpm). There were many time periods of negative flow each lasting an hour or two which typically indicate that the manhole was surcharged and downstream pipes did not have adequate capacity.

5.6. South Shore White Oak Shelter, Concessions & Red Oak Shelter Flow Monitoring

The flow from the White Oak Shelter, Concessions Building and Red Oak Shelter on the South Shore was monitored at MH S14 south of the pumping station. Downstream of MH S14 is Pipe 5 (6" clay @ 02.71%) and upstream of MH S14 is Pipe 4 (6" PVC @ 0.42%). A summary of the flow data is shown in Table 5.6 – White Oak Shelter, Concessions & Red Oak Shelter Flow Monitoring.

Table 5.6 – White Oak Shelter, Concessions & Red Oak Shelter Flow Monitoring

Date	Average Flow (cfs)	Minimum Flow (cfs)	Maximum Flow (cfs)	Heaviest Flow Period	Lowest Flow Period
8/18/10	0.000	0.000	0.001	-	-
8/19/10	0.000	0.000	0.001	-	-
8/20/10*	0.004	0.000	0.157	5:30pm-6:30pm	-
8/21/10	0.002	0.000	0.007	4:30pm-5:30pm	-
8/22/10	0.001	0.000	0.011	2:30pm-5:00pm	-
8/23/10	0.000	0.000	0.003	-	-
8/24/10	0.000	0.000	0.001	-	-

*Note: Rain Fall Data – 8/20 = 1.17"

The minimum flow recorded was 0.000 cfs and the maximum flow was 0.157 cfs. The average flow at this location from 8/18 – 8/24 was 0.001 cfs (0.4 gpm). There were many time periods of no recorded flow, and the only substantial flow occurred on Friday 8/20 when there was 1.17" of rain. This suggests that infiltration/Inflow in the sewer upstream of MH S14 is significant.

5.7. South Shore Shagbark Shelter, White Pine Shelter & Entrance Building Flow Monitoring

The flow from the Shagbark Shelter, White Pine Shelter & Entrance Building on the South Shore was monitored at MH S7 east of the pumping station. Downstream of MH S7 is Pipe 7 (8" clay @ 4.61%) and upstream of MH S7 is Pipe 8 (6" Clay @ 2.24%). A summary of the flow data is shown in Table 5.7 – White Oak Shelter, Concessions & Red Oak Shelter Flow Monitoring.

Table 5.7 – Shagbark Shelter, White Pine Shelter & Entrance Building Flow Monitoring

Date	Average Flow (cfs)	Minimum Flow (cfs)	Maximum Flow (cfs)	Heaviest Flow Period	Lowest Flow Period
8/21/10	0.0116	0.005	0.0828	1:00pm	10:30am

The minimum flow recorded was 0.005 cfs and the maximum flow was 0.083 cfs. The average flow at this location on 8/21/10 was 0.012 cfs (5 gpm).

5.8. Pipe Capacity and Flow Monitoring Comparison

A summary of the peak flow observed during the flow monitoring period and the capacity of pipes upstream and downstream of the monitored manhole is shown in Table 5.8 – Pipe Capacity vs. Monitored Peak Flow.

Table 5.8 – Pipe Capacity vs. Monitored Peak Flow

Location	Monitored Peak Flow (cfs)	Upstream Pipe Capacity (cfs)	Downstream Pipe Capacity (cfs)	Negative Flows Observed
MH 8	0.069	0.44	0.39	Yes
MH 41	0.096	0.38	0.45	No
MH 15	0.240	0.72	0.67	Yes
MH S3	0.078	0.82	0.34	Yes
MH S7	0.0828	1.09	2.59	No
MH S14	0.157*	0.34	0.86	No

*Note: 1.17" of rain occurred during monitoring

Comparison of the monitored peak flows against the pipe capacities shows that all of the monitored pipes had capacities greater than the recorded peak flows. However, the flow monitors detected negative, or backward, flows at MH 8, MH 15 and MH S3.

This condition indicates that there are under capacity, surcharged pipes downstream of the monitored location. Analysis of these manholes is presented in the paragraphs that follow.

MH 8: During field surveying of the collection system, standing water was observed in MH 9 which is immediately downstream of MH 8. This condition along with negative flows observed in Pipe 80 at MH 8 would indicate that Pipe 108 and Pipe 80 are under capacity or blocked with debris. It is recommended that these pipes be replaced with pipes of larger diameter and/or steeper slopes to increase their capacities. However, these replacements should be coordinated with replacement or upgrade of the pumping station.

MH 15: Negative flow was observed in Pipe 70 during the flow monitoring period which could indicate that this pipe and pipes downstream could be under capacity. There are plug valves installed on Pipes 71 & 73 immediately downstream of MH 12. Pipe 71 is the beginning of a deeper sewer which includes Pipes 71, 72 & 79. Pipe 79 includes a plug valve just upstream of the North Pumping Station Wet Well. Pipe 73 is the beginning of the original sewer system which includes Pipes 73, 74, 75 & 108. If the plug valves are not fully open they could be restricting flow through these pipes. It is recommended that the valves be checked to make sure they are fully open. If the valves are set such that only one of the sewers is being used, it is recommended that all the valves be opened to allow use of both the shallow sewer and deeper sewer to take advantage of their combined capacities.

MH S3: The initial monitoring plan proposed monitoring MH's S5 & S6 immediately adjacent to the South Shore Pumping Station. However, both manholes were found to be full of sewage when opened to install the flow meters. Also, it was noticed that the water levels in MH's S5 & S6 dropped to almost the bottom of the manholes when the pumping station operated. They were observed to fill again after the pumping station had stopped operating. Based on these observations, and negative flow observed in MH S3 during flow monitoring, it appears that piping in the vicinity of the pumping station is surcharged due to the current setting of the "pump on" level in the pumping station wet well. It is recommended that, if possible, the "pump on" level in the wet well be lowered to reduce as much of the surcharging as possible. Replacement of these surcharged pipes should be coordinated with replacement of the pumping station.

All recommended pipe improvements can be found in **Table 4.2.2- Sanitary Gravity Piping Inventory & Recommended Improvements** in the **Appendix**.

6.0 Estimation of Wastewater Flows

6.1. Estimated Wastewater Flows Based on Park Usage & Typical Wastewater Generation Factors

Currently, the Quartzite Campground has 100 sites, the Northern Lights Campground has 122 sites, and the Ice Age Campground has 186 sites. All these campgrounds are located in the North Shore area and have a maximum capacity of six campers per site. There are 9 group sites with a total capacity of 240 campers in the South Shore area. Both the North and South Shore areas include shelters and recreation areas for day uses as well as campers. There are approximately 45 acres and 51 acres of park area for

day use in the South Shore and North Shore areas of the park respectively. Using Table A-83.43-1 Public Facility Wastewater Flows, from the Wisconsin Administrative Code Chapter COMM 83, the estimated wastewater flow for the park areas is shown in **Table 6.1 – Estimated Wastewater Flows Based on Park Usage & Typical Wastewater Generation Factors.**

Table 6.1 – Estimated Wastewater Flows Based on Park Usage & Typical Wastewater Generation Factors

Park Area	Units	Number of Units	Average Daily Flow Rate (gpd)	Peak Flow Rate (gpm)	Peak Flow Rate (cfs)
Quartzite Campground = 100 sites	Patron ¹	600	3,900	11	0.024
Northern Lights Campground = 122 sites	Patron ¹	732	4,758	13	0.029
Ice Age Campground = 186 sites	Patron ¹	1,116	7,254	20	0.045
Total NL + IA = 308 sites	Patron ¹	1,848	12,012	33	0.074
North Shore Park Area	Day User ²	3,825	24,863	69	0.154
Total North Shore Campgrounds + Park Area =			40,775	113	0.252
South Shore Park Area	Day User ³	3,375	11,813	33	0.073
South Shore Group Campground	Patron ⁴	240	1,560	4	0.010
Total Devils Lake Park =			54,147		

- Footnotes:**
- (1) Maximum of 6 patrons per campsite.
 - (2) 51 acres x 75 day users/acre. 75 day users/acre per Table A-83.43-1 Wisconsin Admin. Code.
 - (3) 45 acres x 75 day users/acre . 75 day users / acre per Table A-83.43-1 Wisconsin Admin. Code.
 - (4) Nine group sites with maximum 240 Patron capacity.

Factors:

- Per Campsite Patron ¹ = 6.5 gals./patron*day
- North Shore Park Area Day User (toilets & showers) ¹ = 6.5 gals./day*person
- South Shore Day User (toilets only) ¹ = 3.5 gals./day*person
- Peaking Factor = 4.0

Footnotes: (1) Per Table A-83.43-1 Wisconsin Administrative Code

As shown in Table 6.1 above, the total estimated average daily wastewater flow based on typical wastewater generation factors is 54,200 gallons per day when the park is fully utilized. The table also shows that the estimated average daily flow and peak flow to the North Shore Pumping station is 40,800 gpd and 115 gpm respectively while the average daily and peak flow estimated for the South Shore is 11,900 gpd and 35 gpm respectively.

6.2. Estimated Wastewater Flows Based on Historic Flow Records

Devil's Lake State Park discharges wastewater from the north and South Shore park areas and campgrounds to the City of Baraboo's collection system via a 6" PVC force main from the north and south pumping stations. Historical sanitary flow records from 1987 – 2007 were provided by park staff that show the total number of gallons pumped from the park during the periods of December to February, March to May, June to August, and September to November. Since a majority of park visitors come during the summer, the anticipated peak usage and flows would be expected during the period of June to August.

The flow records along with minimums, maximums and average flow rates during the June to August period is shown in **Table 6.2 – Total Wastewater Flow Historic Data.**

Table 6.2 – Total Wastewater Flow Historic Data

Year	December - February (gallons)	March - May (gallons)	June - August (gallons)	September - November (gallons)	Year Total (gallons)
1987				781,200	781,200
1988	409,000	919,600	3,215,200	889,100	5,432,900
1989		762,900	2,825,000	868,000	4,455,900
1990	21,000	855,700	3,371,000	1,031,300	5,279,000
1991	7,000	1,006,900	4,555,200	896,700	6,465,800
1992	52,000	772,300	3,015,100	946,300	4,785,700
1993	106,000	2,571,300	6,300,500	1,623,300	10,601,100
1994	798,000	966,200	3,358,400	968,500	6,091,100
1995	30,000	956,300	3,927,500	1,031,400	5,945,200
1996	58,000	767,100	4,154,300	1,075,300	6,054,700
1997	131,000	967,200	3,433,500	877,500	5,409,200
1998	93,000	1,040,800	4,234,800	1,348,300	6,716,900
1999	125,000	1,115,000	4,399,400	1,104,300	6,743,700
2000	93,000	902,300	5,748,300	1,640,900	8,384,500
2001	53,000	2,156,900	5,163,300	816,100	8,189,300
2002	229,000	2,569,700	3,780,200	974,400	7,553,300
2003	59,000	1,750,100	3,007,100	754,400	5,570,600
2004	74,200	1,106,100	3,771,100	431,000	5,382,400
2005	18,000	780,700	2,610,600	305,000	3,714,300
2006	70,000	825,000	3,358,700	416,000	4,669,700
2007	91,000	860,500	2,093,200	566,000	3,610,700
Average =		3,816,120 gallons			
Average Daily Flow =		41,480 gpd (based on Aver.)			
Min. Average Daily Flow =		22,752 gpd (based on Min. Year)			
Max. Average Daily Flow =		68,484 gpd (based on Max. Year)			
Max. Average Daily Flow =		56,123 gpd (Max. Non-Flood Years)			

As can be seen in the table above, the average daily flow during the non-flood years ranged from approximately 22,800 gpm to 56,200 gpm.

6.3. Estimated Wastewater Flows Based On Flow Monitoring

Flow monitoring was performed at six (6) locations throughout the park from Wednesday, August 18th to Tuesday, August 24th, 2010 (South Shore), and from Thursday, September 2nd to Wednesday, September 8th, 2010, which included Labor Day

Weekend (North Shore). The total estimated average daily and peak flows are shown in **Table 6.3 – Estimated Wastewater Flow Based on Flow Monitoring** below.

Table 6.3 – Estimated Wastewater Flow Based on Flow Monitoring

Location	Avg Flow (cfs)	Avg Flow (gpd)	Total Flow (gallons)	Peak Flow (cfs)	Peak Flow (gpm)
Quartzite Campgrounds	0.013	8,402	772,995	0.069	31
Northern Lights / Ice Age Campgrounds	0.015	9,565	880,025	0.096	43
North Park Area (Chateau, Rock Elm, Sugar Maple, etc.)	0.017	11,246	1,034,624	0.240	108
Total Flow North Shore =			2,687,644		
Average Daily Flow North Shore =			29,214 gpd		
Total Peak Flow North Shore =				0.405	182
South Tamarack Shelter	0.009	5,817	535,150	0.078	35
South White Oak, Concessions, & Red Oak Shelter	0.001	646	59,461	0.157	70
South Shagbark, White Pines & Entrance Bldg.	0.012	7,497	689,749	0.083	37
South Red Oak Shelter Rest Rooms ^{1,3}	0.014	8,997	827,699	0.056	25
South Group Campground ^{2,3}	0.002	1,560	143,519	0.010	4
Total Flow South Shore =			2,255,580		
Average Daily Flow South Shore =			24,517 gpd		
Total Peak Flow South Shore =				0.383	172
Total North + South Shores =			4,943,224		
Average Daily Flow Total North + South Shore =			53,731 gpd		

Footnotes: (1) Red Oak Restrooms not monitored anticipate = Chateau
(2) Group Campgrounds not monitored. Estimate based on Typical WW Factors.
(3) Peak Factor = 4.0

In summary, the first method of estimating the average daily wastewater flows was based on typical wastewater generation factors from Table A-83.43-1 of the Wisconsin Administrative Code (plumbing code) and known maximum capacities of the park facilities (such as total number of camp sites, etc.) This method should predict the maximum average daily waste water flow from the park at full utilization and provided an estimated average daily wastewater flow rate of approximately 54,200 gpd as shown in Table 6.1.

The second method to estimate the wastewater flow rate analyzed the historic wastewater pumping rates from the parks pumping stations over the last twenty years. This analysis showed the average daily wastewater flow rate ranged from

approximately 22,800 gpd to 57,200 gpd during the non-flood years with an average of 41,500 gpd as shown in Table 6.2.

The third method used to estimate wastewater flow rates utilized data from the flow monitoring performed in August and September of 2010. This method estimated approximately 53,800 gpd as shown in Table 6.3.

Comparing the flow monitoring based estimate (53,800 gpd) to the average daily flow rates from historic pumping, it can be noted that it falls between the average (41,500 gpd) and the maximum average daily flow (57,200 gpd). One would expect this estimated daily flow rate (53,800 gpd) to be between the historic average and maximum average as the monitoring period included the Labor Day Weekend which is one of the busiest weekends for the park. Therefore, this comparison confirms the validity of the flow monitoring data.

Comparing the flow monitoring based average daily flow rate estimate (53,800 gpd) to the estimate based on typical wastewater generation factors (54,200 gpd) shows that the two estimates are 400 gpd different. This comparison shows the two methods to be comparable and validates the typical wastewater generation factors for use in predicting future flows that is required for planning future park expansion.

In Table 6.3 includes the total peak flow rate for the North (185 gpm) and South Shore (175 gpm) systems based on flow monitoring. These peak flow rates are important to know because the wastewater pumping station capacities must meet these peak flow rates.

7.0 Pumping Stations

7.1. North Shore Pumping Station Equipment & Conditions

The North Shore Pumping Station is located approximately 1,800 feet north of the North Shore of Devils Lake and adjacent to the creek which parallels the railroad. Over the history of the Park this facility has been upgraded several times. The history of the upgrades is not relevant to this study; however, structural remnants of the upgrades are still present and, to varying degrees, still used today. The location of the North Shore Pumping Station is shown on the **North Shore Sanitary System Map** found in the **Appendix**.

The present configuration of the pumping station is composed of head works, a concrete wet well, a concrete sub-grade dry well housing two dry pit centrifugal pumps. A control room above the dry well houses the pump motors and controls. The control room is enclosed in a wood framed structure with wood siding and a shingled roof that extends over the headworks and wetwell (see pictures following). The pumping station is located adjacent to a concrete septic tank that is currently used as an overflow tank for pumping station wetwell.



North Shore Wastewater Pumping Station Exterior

Two gravity pipes discharge into the pumping station. There are two horizontally parallel sewer lines between SMH #12 and the pumping station. The "upper" sewer line (Pipes 73, 74, 75 & 108 on the System Map) has 6-inch piping and shallow cover with as little as one to two feet in some locations,. This sewer line was intended to provide summer sewer service only and was probably installed at the same time as the pumping station and septic holding tank. The other "deep" sewer line has 8-inch piping and was installed in 1989 (Pipes 71, 72, & 79 on the System Map). This second sewer line was installed to facilitate winter sewer service to the North Shore area. There are plug valves just north of SMH #12 on both the shallow and deep lines (Pipes 71 & 73). These valves allow diversion of flow through the shallower or deeper sewer line between SMH #12 and the pumping station. Pipe 108 connects the shallower sewer line to the pumping station and has an invert at the bottom of the headworks channel. Pipe 79 connects the deeper sewer line directly to the pumping station wet well at an invert approximately 7' feet below the top of the wet well, thereby bypassing the headworks (comminutor and bar screen). This pipe contains a plug valve ten feet south of the pumping station which should be closed when the deeper line is not in use.

The head works of the North Shore Pumping Station are enclosed with a chain link fence and are exposed to the elements. The head works include a comminutor and stationary bypass bar screen above a concrete wet well. The comminutor is operated by a 1/3 hp 230 volt single phase motor manufactured by General Electric. Almost all of the paint on comminutor and motor has peeled away leaving a rusting metal exterior. The intended function of the comminutor is to grind and shred solids in the wastewater so that they may pass through the pumps. However, the comminutor clogs on a regular basis and a grabbing tool is used to remove solids that are stuck in the open top of the comminutor. A thick layer of solids, debris and algae was observed in the channel upstream of the comminutor and on bypass bar screen which impeded flow through the head works. Below the head works is a 9' x 4' x 12' deep concrete wet well.



Head Works Channel (Comminutor & Bar Screen)



Comminutor

Inside the wetwell there is an overflow pipe (Pipe 109 on the System Map) with an invert three feet below the top of the wet well which diverts flow into the adjacent concrete septic holding tank. There is a valve located in a concrete vault on the overflow pipe immediately west of the wet well to shut off this overflow pipe. Two float switches in the wet well control pump operation. Based on sketches provided by park staff, the off float is 8 feet below the top of the wet well and the on float is 5'-6" below the top of the wet well resulting in a 2.5' operating range for the pumps. This operating range provides a 673 gallon operating volume. The exposed top portions of the wet well concrete appeared to be in good condition. The interior of the wet well was not observed as it was not dewatered for observation at the time of the site visit.



Wetwell



Wetwell Overflow Pipe Valve Vault

The dry well adjacent to the wet well contains two vertical line shaft driven centrifugal pumps. Per the original 1978 sales records on file at L.W. Allen, the pumps' supplier, the pumps are 4-inch non-clog sewage pumps Model # 5413B32 manufactured by Fairbanks-Morse with 4-inch intake and discharge connections. At the time of the sale, the pumps were rated to provide 200 gpm at a total dynamic head of 128 feet with an 11.25-inch diameter, 2-vane impeller. Per LW Allen, these pumps are capable of passing a 3-inch diameter sphere as required by paragraph NR 110.14(3)(g) of the Wisconsin Administrative Code. Files at LW Allen did not include record of any repairs or replaced parts since the original sale of the pumps in 1978. The expected service life of sewage pumps is 15 to 20 years. Therefore, the 33 year old pumps are 13 to 18 years beyond their expected service life. Based on discussions with Gary Kowalke of Terrytown Plumbing whose company frequently unplugs the pumps, the impellers are worn such that solids accumulate between the impeller and the volute (impeller housing) leading to frequent plugging.

Piping between the wet well, pumps and force main is 4" ductile iron which complies with the minimum pipe diameter (4 inches) required by Paragraph NR110.14(3)(g) of the

Wisconsin Administrative Code. There are shut off valves (plug valves) on the suction piping and shut-off (plug valves) and check valves downstream of each pump. The finish of most of the piping and valves is deteriorated and rust is visible. It appears that the valves date back to construction of the pump station based on records provided by park staff, LW Allen and Terrytown Plumbing. Therefore, they are well beyond their expected 15-20 year service life.

There is a magnetic flow meter adjacent to the east wall of the dry well. Per LW Allen sales records, the flow meter was installed in 1987. There are no service records at LW Allen showing the flow meter has been calibrated since it's installation in 1987.

An aluminum access ladder is used to enter the dry well. The floor of the dry well was moist, and wastewater appeared to be leaking from the seal of Pump #2. There is a ventilation fan in the control room with an intake in the dry well and exhaust duct through the side wall of the control room. However, there was a noticeable sewage smell coming through the access opening to the dry well. A rope is connected to the lever of the check valve on Pump #1 to back flush the pump when clogging occurs. The dry well was lacking an automatic heater, dehumidifier and sump pump as required by paragraph NR110.14(3)(b) & (d) of the Wisconsin Administrative Code.



Drywell (west side)



Drywell (east side)

The control room houses the pump motors and pump controls. Each pump is driven by a 20 hp, 1750 rpm, 230/460 volt, 3-phase motor manufactured by Lincoln Motors. The motors are each controlled by a variable frequency drive (VFD) which ramps the pump up to full speed when the "on" float switch is activated and then ramps them down to shut off when the "off" float switch is activated. There is a control enclosure with a "hand" – "off" - "auto" switch and a run time meter for each pump. The pumping flow rate is indicated by an instantaneous flow digital display and totalized flow indicator connected to the flow meter. The controls are in good condition. The VFDs and magnetic flow meter are the current preferred technologies for pump control and flow measurement respectively.



Pump Motor



Controls & Electrical Distribution Panel



VFDs



Flow Meter

The concrete septic holding tank is located west of the pumping station. The overflow pipe in the pumping station wet well (Pipe 109 on the System Map) discharges into this holding tank. There is a pipe from the holding tank connected to the suction piping of Pump #1 (Pipe 110 on the System Map) to facilitate emptying of this tank. The tank is divided into two compartments. The main/south compartment is 15' wide x 46' long x 13' deep. The suction pipe to Pump #1 is 1' above the bottom of the tank floor. Therefore, the main compartment of this tank has a 61,934 gallon capacity. The second/north compartment of the tank is 20' wide x 23' long x 4' deep. This compartment acts as an overflow chamber and has a 6" overflow pipe which discharges into a ditch north of the tank. The roof of the holding tank is constructed of precast concrete planks with four openings covered by steel plates. The steel frames of the openings and the plates covering them are severely corroded. Vegetation has grown between the joints in the planks, the surface of the planks has deteriorated, and there is a noticeable deflection of the planks when walked upon. There is a steel plate at the southeast corner of the roof approximately 4' x 8' which covers an area where the concrete planking collapsed. Debris was noted in the tank as viewed through one of the hatches. The condition of the tank walls and floor was not noted as the interior of the tank was not accessed at the time of the site visit. However, if they are of the same age as the roof or older, it is reasonable to assume they are likewise deteriorated and in need of repair or replacement.



Septic Holding Tank (looking south)



Septic Holding Tank (looking north)



Septic Tank Overflow Pipe



Access Hatch



Access Hatch

7.2. North Shore Pumping Station Capacity

On August 19, 2010, the flow rates, as shown on the flow meter, produced by each pump were observed over the duration of a pumping cycle. Pumping rates will decline over the duration of a pumping cycle as the static head that the pump must overcome increases as the liquid level in the wet well decreases. Information provided park staff from 1987 when the force main to the City of Baraboo was first installed indicated maximum pumping rates of 770 gpm and 835 gpm for Pump Nos. 1 & 2 respectively. The pumping rates provided by the pumps as observed on 8-19-10 and compared to the 1987 maximums are shown in Table 7.2.

**Table 7.2 – North Pumping Station Average Pumping Rates
(Per 8-19-2010 & 1987 Flow Meter Observations)**

Pump No.	Average Flow Rate (gpm)	Minimum Flow Rate (gpm)	Maximum Flow Rate (gpm)	1987 Maximum Flow Rate (gpm)
1	308	150	450	770
2	207	138	295	835

Comparison of the 1987 maximum flow rates to those observed on August 19, 2010 shows a noticeable decrease in pumping capacity. This decreased pumping capacity may indicate excessive wear has occurred in the pumps, and possibly solids build up in the force main.

7.3. North Shore Pumping Station Recommended Improvements

Recommended improvements for the North Shore Pumping Station should address the deteriorated and nonfunctioning comminutor and bar screen, the deteriorated valves and piping in the dry well, leaking seal of Pump #2, frequent plugging of the pumps which are 13-18 years beyond their expected service life, lack of an automatic heater, dehumidifier and sump pump in the dry well as required by paragraph NR110.14(3)(b) & (d) of the Wisconsin Administrative Code, and the deteriorated and hazardous condition of the septic holding tank. Also, the improvements should address flood proofing the pumping station as required by Subchapters NR 116.16 & 116.17 of the Wisconsin Administrative Code.

Improvement Alternative I – Equipment Replacement in the Existing Pumping Station:

Pumps:

The first alternative for improvements includes replacement of the existing pumps with new solids handling pumps capable of passing spheres at least 3 inches in diameter per the requirements of NR 110.14(3)(g). The same model as the original pumps are still actively manufactured by Fairbanks-Morse and new pumps with new impellers may eliminate the frequent clogging of the existing pumps.

Alternatively, new pumps capable of cutting and passing any materials encountered by the pumps could be installed. Any pump not capable of passing spheres at least 3 inches in diameter is required per NR 110.14(3)(g) to be approved by the Wastewater Section of the WDNR. The N-impeller series pumps manufactured by ITT Flygt feature an impeller with a hardened and sharpened leading edge. These pumps have been used successfully at many prisons, sports stadiums and other facilities where numerous and frequent solids are encountered. The use of N-Impeller pumps has been approved by the Wastewater Section of the Division of Watershed Management at the WDNR. Another option is a C-series chopper pump as manufactured by Tsurumi. However, this pump has not yet been approved by the DNR Wastewater Section for use as a solids handling pump. Similar chopper pumps from local vendors may be available for usage.

New pumps designed to be non-clog, or capable of cutting and passing any materials encountered, would allow the comminutor and by-pass bar screen to be removed. The septic holding tank could be abandoned as well.

Controls, Access and Safety Improvements to Meet Current Code Requirements:

The improvements should also include replacement of the deteriorated piping and valves with a recommended minimum diameter of six inches. The dry well access ladder should be replaced with one that is compliant with current OSHA standards for fixed ladders. An automatic heater, dehumidifier and sump pump should be added to the dry well per paragraph NR 110.14(3)(b) & (d) of the Wisconsin Administrative Code.

A automatic telephone dialer, radio conveyed system, or telemetry system should be added to the controls to convey power failure, pump failure and high water level alarm conditions to comply with the requirements of paragraph NR 110.14(3)(i) of the Wisconsin Administrative Code.

A water-tight hatch could be added to the dry well, and a concrete top slab with inverted "j" tube for ventilation, water-tight hatch and caution sign per NR 110.14(3)(b)4. could be added to the wet well to flood-proof these structures. However, the current wood construction of the above ground control room would require building a berm around the facility above the local flood elevation to provide flood protection for the pumping station.

The **Opinion of Probable Construction Cost** for this improvement alternative is shown in **Table 7.3-I** found in the **Appendix**.

Improvement Alternative II – New Submersible Pump Station

This option includes demolition of the existing wastewater pumping station and septic holding tank and replacing them with a new submersible pump station complying with all requirements of Subchapter NR 110.14 of the Wisconsin Administrative Code. The new

station would include a circular concrete wet well manhole, a separate adjacent concrete valve vault and a free standing stainless steel control panel.

The wet well would contain two submersible solids handling sewage pumps each capable of pumping at the anticipated peak hourly flow rate. Flow monitoring completed as part of this study indicated a peak flow rate of 185 gpm (See Table 6.3 above). Therefore, it is recommended that the new pumps match the rated capacity of the original pumps (200 gpm @128' TDH). The pumps would be capable of passing spheres at least 3 inches in diameter per the requirements of NR 110.14(3)(g), or they should be a pump capable of cutting and passing any materials encountered by the pumps. These pumps should be similar to those recommended in Improvement Alternative I above. Pump lifting cables and a lift rail system would enable removal of the pumps from the wet well without entry into the wet well.

Plug valves and check valves on the discharge pipes from the pumps would be contained in a separate below grade concrete valve vault. Piping in the valve vault would include by-pass piping with a quick disconnect coupling to facilitate connection of a portable pump if required in an emergency.

The controls would be housed in a stainless steel free-standing enclosure. Control components would include automatic level controller with alternation of the pumps, external alarm light and audible horn, automatic telephone dialer or radio conveyed alarm system, and interlocked utility and emergency power circuit breakers with an external receptacle for connection of a portable emergency power generator.

Both the wet well and valve vault would be constructed with water-tight hatches to flood—proof the structures.

The new pump station could be constructed west of the existing station and septic holding tank and the gravity sewer from manholes A, 40, and 8 could be rerouted to the new wet well. The shallow gravity line (Pipes 73, 74, 75 & 108) could then be abandoned as well as manhole #9.

The **Opinion of Probable Construction Cost** for this improvement alternative is shown in **Table 7.3-II** found in the **Appendix**.

RECOMMENDATIONS:

Immediate Recommendation:

If an immediate solution to the current pump plugging problem is desired, it is recommended that submersible pumps capable of running under a dry-pit condition be obtained (dry-pit submersibles). These types of pumps can be installed in the dry-well of the current lift station and operated as dry-pit pumps. These pumps could then be relocated to the new submersible pump station once it has been constructed and be operated as submersible pumps.

Long Term Recommended Improvement Alternative:

Considering that Improvement Alternative I does not provide complete flood-proofing of the pumping station and that additional service life would be realized with a completely new pumping station, **Improvement Alternative II – New Submersible Pump Station** is recommended for the long term reliability of the North Pump Station.

A portable emergency electrical generator sized to operate the North Shore pumping station be procured to provide emergency operation as required by paragraph NR 110.14(12)(b) of the Wisconsin Administrative Code.

7.4. South Shore Pumping Station Equipment & Conditions

The South Shore Pumping Station is located approximately 100 feet east of the South Shore of Devils Lake and 150 feet northeast of the Red Oak Shelter building. This area, and the pumping station, was inundated with flood water in 2008 and 1993. The location of the South Shore Pumping Station is shown on the **South Shore Sanitary System Map** found in the **Appendix**.

The South Shore Pumping Station is composed of head works, a concrete wet well, a concrete sub-grade dry well housing two dry pit centrifugal pumps. A control room is located above the dry well housing the pump motors and controls. The control room is enclosed in a wood framed structure with wood siding and a shingled roof.



South Shore Wastewater Pumping Station Exterior

The head works of the South Shore Pumping Station are enclosed in a room adjacent to the control room and are 6 feet lower than the floor of the control room. The head works include a comminutor and stationary bypass bar screen above a concrete wet well. The comminutor is operated by a 1/3 hp 230 volt single phase motor manufactured by General Electric. Almost all of the paint on comminutor and motor has peeled away leaving a rusting metal exterior. The function of the comminutor is to grind and shred solids in the wastewater so that they may pass through the pumps. However, a large amount of debris was observed in the head works channel and bypass screen. There is a door frame, without a door, in the wall between the control room and the head works room. No caution sign, as required by Paragraph NR110.14(3)(b)4. of the Wisconsin Administrative Code, near the entrance to the head works room. The ceiling over the head works room, and the adjacent control room, is open to the roof trusses. Since the head works room (and entire structure) is open to the wet well below, hazardous and potentially explosive gases could be present in the head works room. Current code requires the wet well to be completely separated from the control room, common walls to be a gas tight, and a separate exterior entrance for the head works and/or wet well.



Head Works Room/Comminutor



Head Works



Head Works Comminutor & Bar Screen

Below the head works is a 20' x 11' x 11' deep concrete wet well. The head works channel, comminutor and bypass screen sit 6 feet below the top of the wet well. Two gravity pipes (Pipe 106 & Pipe 107 on the **South Shore Sanitary System Map** found in the **Appendix**) discharge into the head works channel. One pipe is from the west and one from the east. There is a 4' tall wall in the wet well which vertically aligns with the outside edge of the head works room. This wall separates the part of the wet well below the head works room from the part that is buried outside. Based on sketches provided by Park staff, normal operating pump on liquid level is set at of 3.95' which provides an approximate wet well operating volume of 6,500 gallons. This operating volume provides a detention time in excess of 30 minutes which is the maximum allowed by current code. There is a ventilation fan in the head works room with an intake in the wet well and exhaust duct through the side wall of the head works room. The exposed top portions of the wet well concrete appeared to be pitted and crumbling. There was a deteriorated permanent fixed ladder into the wet well from the head works room which is not currently allowed per Paragraph NR 110.14((3)(b)3. of the Wisconsin Administrative Code. The interior of the wet well beyond the head works room was not observed as it was not dewatered for observation at the time of the site visit. However, based on conditions of the portions of the wet well visible in the head works room, it is reasonable to assume that the rest of the wet well may be of the same deteriorating condition also in need of repair or replacement.



Wetwell (below wood framing)



Wetwell/Access Ladder



Septic Holding Tank/Access Hatch

The dry well adjacent to the wet well contains two vertical line shaft driven centrifugal pumps. Per sales records on file at L.W. Allen, the pumps' supplier, the current pumps were sold and installed in 2001. These pumps are 3-inch sewage pumps Model # B5423K-T30 manufactured by Fairbanks-Morse with 3-inch intake and discharge connections. At the time of the sale, the pumps were rated to provide 200 gpm at a total dynamic head of 90 feet with a 10.34-inch diameter, 1-vane impeller. Per LW Allen, these pumps are not capable of passing a 3-inch diameter sphere as required by paragraph NR 110.14(3) (g) of the

Wisconsin Administrative Code. Files at LW Allen did not include record of any repairs or replaced parts since the original sale of the pumps in 2001. The expected service life of sewage pumps is 15 to 20 years. Therefore, the 10 year old pumps are within their expected service life. Based on discussions with park staff and Gary Kowalke of Terrytown Plumbing who frequently unplugs the pumps, the 3-size size of the pumps leads to solids becoming stuck in the passages of the pump causing frequent plugging.

Piping between the wet well, pumps and force main appears to be 4" ductile iron which complies with the minimum pipe diameter (4 inches) required by Paragraph NR110.14 (3)(g) of the Wisconsin Administrative Code. There are shut off valves (plug valves) on the suction piping and shut-off (plug valves) and check valves downstream of each pump. The finish of most of the piping and valves is deteriorated and rust is visible. It appears that the shut-off valves (plug valves) date back to construction of the pump station. However, the check valves were replaced in 2001 by Terrytown Plumbing. Therefore, the check valves are within their 15-20 year service life, while the shut-off (plug) valves are beyond their expected 15-20 year service life.

There is a magnetic flow meter in the vertical pipe connected to the horizontal pump discharge manifold. Per LW Allen sales records, the flow meter was installed in 1987. There are no service records at LW Allen showing the flow meter has been calibrated since it's installation in 1987.

An aluminum ladder is used for access into the dry well, is not secured to the wall, and has one bent side rail. The floor of the dry well was moist, and there appeared to be a thin mat of rust. The dry well is lacking an automatic heater and dehumidifier as required by paragraph NR110.14(3)(d) of the Wisconsin Administrative Code.



Drywell

The control room houses the motors for the two pumps as well as the controls. Each pump is driven by a 10 hp, 1740 rpm, 208-230/460 volt, 3-phase motor. The motor for Pump 1 was installed in 1983 while the Pump #2 motor was replaced in 1991 and is a high efficiency motor manufactured by Marathon Electric. The motors are each controlled by a variable frequency drive (VFD) which ramps the pump up to full speed when the "on" float switch is activated and then ramps them down to shut off when the "off" float switch is activated. There are "on" and "off" switch and a run time meter for each pump. There is an instantaneous flow digital display along with a totalized flow indicator connected to the flow meter. Although it is an unconventional arrangement to have the pump switches in

separate boxes instead of one common enclosure, the controls are in good condition. The VFDs and magnetic flow meter are the current preferred technologies for pump control and flow measurement respectively.



Control Room/Pump Motors



Controls



VFDs

7.5. South Shore Pumping Station Capacity

On August 19, 2010, the flow rates, as shown on the flow meter, produced by each pump were observed over the duration of a pumping cycle. Pumping rates will decline over the duration of a pumping cycle as the static lift that the pump must overcome increases as the liquid level in the wet well decreases. Information provided park staff from 1987 when the force main to the City of Baraboo was first installed indicated maximum pumping rates of 301 gpm and 294 gpm for Pump Nos. 1 & 2 respectively. The pumping rates provided by the pumps as observed on 8-19-10 and compared to the 1987 maximums are shown in Table 7.5 below.

**Table 7.5 – South Pumping Station Average Pumping Rates
(Per 8-19-2010 & 1987 Flow Meter Observations)**

Pump No.	Average Flow Rate (gpm)	Minimum Flow Rate (gpm)	Maximum Flow Rate (gpm)	1987 Maximum Flow Rate (gpm)
1	236	225	250	301
2	280	270	290	294

Comparison of the 1987 maximum flow rates to those observed on August 19, 2010 shows a noticeable decrease in pumping capacity for Pump #1. This decreased pumping capacity may indicate excessive wear has occurred in the pump.

7.6. South Shore Pumping Station Recommended Improvements

Recommended improvements for the South Shore Pumping Station should address the deteriorated and nonfunctioning comminutor and bar screen, lack of gas-tight separation between the head works/wet well and control room as required by Paragraph NR 110.04(3)(b) of the Wisconsin Administrative Code, lack of separate entrance to the wet well

as required by Paragraph NR 110.04(3)(b), deteriorated valves and piping in the dry well, frequent plugging of both pumps, and flood proofing the pumping station as required by NR 116.16 & 116.17.

Immediate Recommendation:

If an immediate solution to the current pump plugging problem is desired, it is recommended that submersible pumps capable of running under a dry-pit condition be obtained (dry-pit submersibles). These types of pumps could be installed in the dry-well of the current lift station and operated as dry-pit pumps. Then they could be relocated to the new submersible pump station once it has been constructed and be operated as submersible pumps.

Long Term Recommendation:

Due to the deteriorated conditions of the equipment and wet well structure, lack of separation between the wet well/head works and control room and frequent past flooding, complete replacement of this pumping station is recommended. This includes demolition of the existing wastewater pumping station and wet well/septic holding tank and replacing them with a new submersible pump station complying with all requirements of Subchapter NR 110.14 of the Wisconsin Administrative Code. The new station would include a circular concrete wet well manhole, a separate adjacent concrete valve vault and a free standing stainless steel control panel.

The wet well would contain two submersible solids handling sewage pumps each capable of pumping at the anticipated peak hourly flow rate. Flow monitoring completed as part of this study indicated a peak flow rate of 175 gpm (See Table 6.3 above). Therefore, it is recommended that the new pumps match the rated capacity of the original pumps (200 gpm @ 90' TDH). Similar to the recommendations made for the North Shore Pumping Station, the pumps would be capable of passing spheres at least 3 inches in diameter per the requirements of NR 110.14(3)(g), or they should be capable of cutting and passing any materials encountered by the pumps. Pump lifting cables and a lift rail system would enable removal of the pumps from the wet well without entry into the wet well.

Plug valves and check valves on the discharge pipes from the pumps would be contained in a separate below grade concrete valve vault. Piping in the valve vault would include by-pass piping with a quick disconnect coupling to facilitate connection of a portable pump if required in an emergency.

The controls would be housed in a stainless steel free-standing enclosure. Control components would include automatic level controller with alternation of the pumps, external alarm light and audible horn, automatic telephone dialer or radio conveyed alarm system, and interlocked utility and emergency power circuit breakers with an external receptacle for connection of a portable emergency power generator.

Both the wet well and valve vault could be constructed with water-tight hatches to flood—proof the structures.

The new pumping station could be constructed approximately 50 feet west of SMH S7 with the station's wet well constructed over Pipe 7 and the valve vault just northeast of the wet well. This location would move the pumping station out of the frequently flooded area.

Pipes 5, 6 and 13 could be reconstructed to drain to the new stations wet well and Pipes 106 and 107 could be abandoned along with Manholes S5, S6 and the existing pumping station.

It is recommended that a portable emergency electrical generator sized to operate the South Shore pumping station be procured to provide emergency operation as required by paragraph NR 110.14(12)(b) of the Wisconsin Administrative Code.

The **Opinion of Probable Construction Cost** for this improvement alternative is shown in **Table 7.6-I** found in the **Appendix**.

8.0 Wastewater Force Main

8.1. Force Main Background

In 1970, the North Shore and South Shore wastewater pumping stations conveyed wastewater through a six-inch ductile iron pipe force main to Sewage Treatment Lagoons east of the South Shore pumping station and north of the railway. The force main piping between the North Shore and the South Shore (approximately 10,200 LF) was placed parallel to the Chicago & Northwestern Railway along the east shore of Devil's Lake. There are many locations where the pipe was buried less than 2 ft and in some places only 6 inches below the ground surface because of dense rock.

In 1986, the Sewage Treatment Lagoons were abandoned, and the force main was reconfigured such that the South Shore pumping station conveys its wastewater toward the North Shore pumping station. In addition, 6" C-900 PVC pipe was installed from the North Shore pumping station to the City of Baraboo wastewater collection system to the north such that the South Shore and North Shore pumping stations convey their wastewater in this common force main to the City of Baraboo collection system.

8.2. Force Main Velocity

Using flow rates from the North Shore and South Shore pumping stations, shown in Table 7.2 and Table 7.5, the force main flow velocities were determined and are shown in Table 8.2.

Table 8.2 – North Pumping Station Average Pumping Rates

Pump No.	Average Velocity (fps)	Minimum Velocity (fps)	Current Maximum Velocity (fps)	1987 Maximum Velocity (fps)
North 1	3.4	1.7	5.0	8.5
North 2	2.3	1.5	3.2	9.2
South 1	2.4	2.3	2.6	3.1
South 2	2.9	2.8	3.0	3.0

Note that the South Shore Pumps pump through 6" Class 52 Ductile Iron to the 6" C-900 PVC common force main through which both the north and south pump station pump to the Baraboo system.

Chapter NR 110.14 of the Wisconsin Administrative Code requires forcemain flow velocity of at least 2 feet per second. Typically, pump manufacturers recommend

limiting the pumping rate such that resulting flow velocity rates do not exceed 10 fps to prevent scouring at the face of the pump impeller. In addition, engineering practice has shown that limiting force main velocities to 7 fps or less keeps piping head loss from being excessive. As seen in the table above, current maximum and average velocities fall within this range. However, the North Shore pumps have significantly reduced their pumping capacity since 1987 and replacement of these pumps should be considered.

8.3. Force Main Repair History and Recommendations

During the summer of 1987, Mid-State Associates tested approximately 10,200 LF of existing ductile iron force main from the South Shore pumping station to the North Shore pumping station. Pressure testing was completed and the results indicated that greater than allowable leakage was occurring from the pipe. Thus, six valves were installed and individual sections of the force main were tested to help isolate the leaks. The leaks found at the pipe joints were then sealed using stainless steel couplings.

In 1998, the North Pumping Station ductile iron force main crossing the intermittent stream was replaced in kind and lowered 2 feet.

Since it has been 24 years since the South Shore Pumping Station Force Main was pressure tested to find leaks, it is recommended that it be tested again. Individual section of the force main should be tested by isolated it into sections using the six existing isolation valves installed along its length in 1987. Any leaks should be repaired with stainless steel repair sleeves and the repaired section retested to verify integrity of the repair.

8.4. Winterize South Pumping Station Force Main

In order to winterize the force main between the South Shore pumping station and the North Shore pumping station, the piping would need to be placed below the frost line. Since the pipe is parallel to the railway, it is in areas of stone ballast used for the railway base sub grade. The frost line in these areas may reach 5' or more below the surface. Thus, in order to winterize the South Shore pumping station the force main pipe should be at least 6.5' below the surface.

The existing ductile iron force main between the South Shore and the North Shore, which parallels the railway, is buried very shallow, in some cases approximately 6 inches below the surface. This shallow depth is most likely due to the presence of rock as indicated in the test pit profiles on the 1970 as-built drawings for the force main.

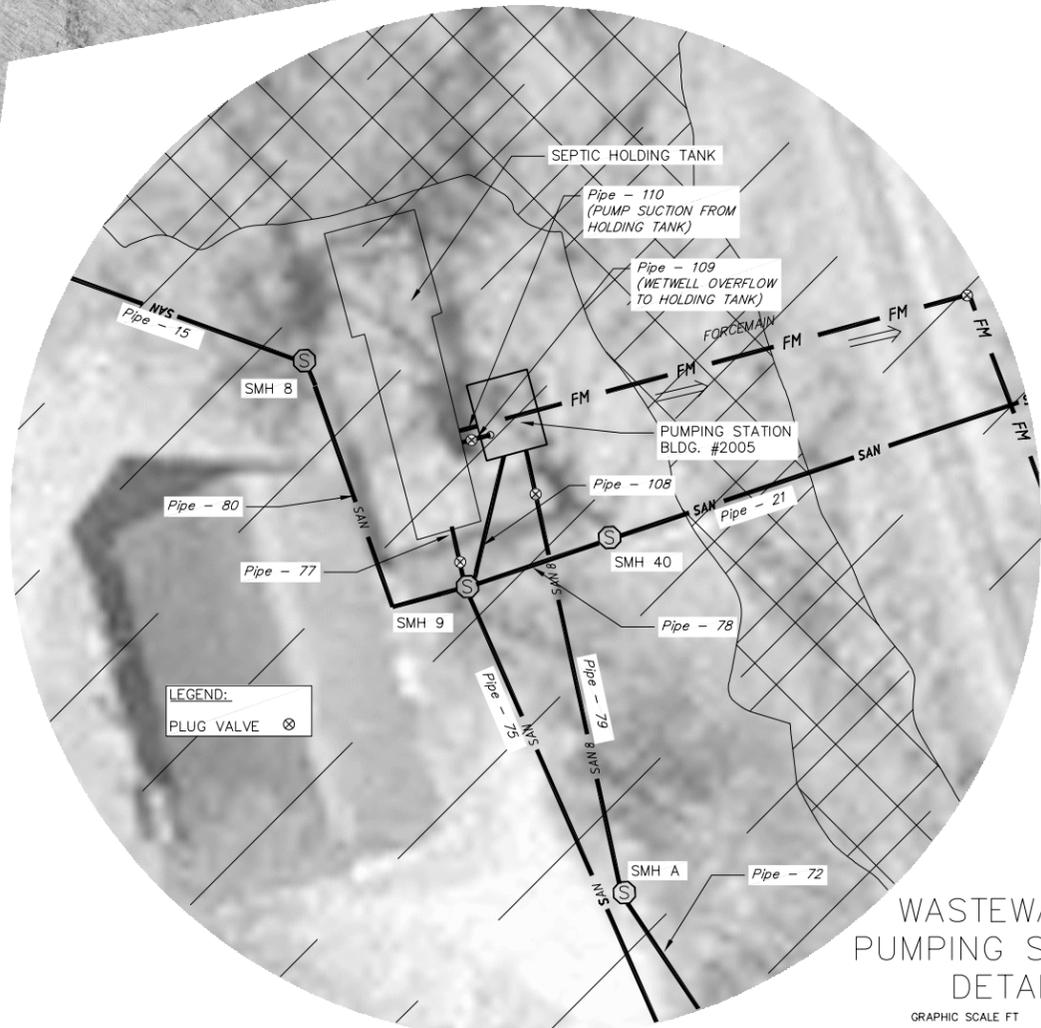
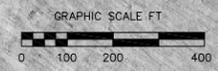
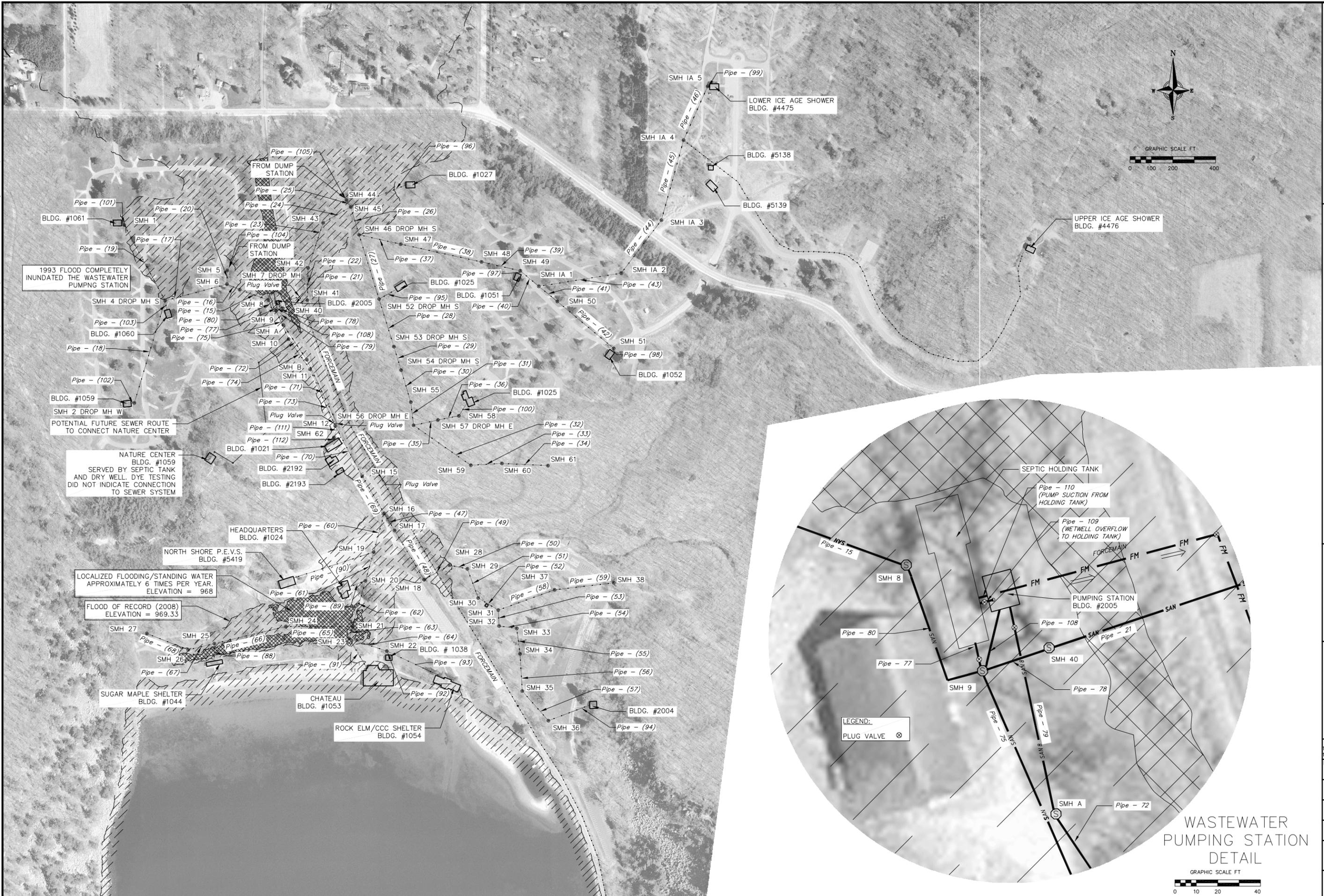
In order to winterize this force main, it would need to be lowered to a minimum of 6.5' below the surface, which would require considerable rock removal. The test pits on the 1970 as-built drawings show the rock surface within a foot of the ground surface; however, the plans only show test pits along a 1,400 feet long section of the 10,100 feet long force main. Therefore, additional test pits/soil borings are required to obtain a more accurate understanding of the amount of rock that would have to be removed to lower the force main. The replacement of the existing 6-inch

ductile iron pipe has been prone to numerous breaks; therefore it would be advisable to replace it with new 6-inch HDPE pipe, no matter the installed depth.

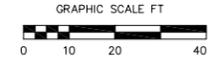
Due to the uncertain amount of rock that would have to be removed, the preliminary Opinion of Probable Construction Cost associated with winterizing the South Shore pumping station force main is given as a range. The lower end of the range assumes half of the route would require rock removal by blasting, while the upper end of the range anticipates the entire length of the route would require rock removal by blasting. The **Opinions of Probable Construction Cost** for winterizing the force main, as well as replacing it at the same vertical location, is shown in **Tables 8.4-1 to 8.4-3** found in the **Appendix**.

APPENDICES

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WASTEWATER PUMPING STATION DETAIL



vierbicher | engineers | advisors
 planners | architects | interior designers
 REEDSBURG - MADISON - FRAIRIE DU CHIEN
 999 Frontier Drive, Suite 201 - Madison, Wisconsin 53717
 Phone: (608) 626-6552 Fax: (608) 626-6550

NORTH SHORE SANITARY SYSTEM MAP
 STATE OF WISCONSIN - DSF/WDRN
 DEVILS LAKE STATE PARK
 Baraboo, Wisconsin

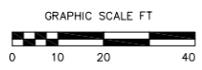
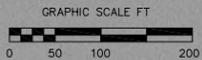
NO.	DATE	REVISIONS	REMARKS

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PROJECT NO.	53107320.00
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WASTEWATER PUMPING STATION DETAIL



SOUTH SHORE SANITARY SYSTEM MAP
STATE OF WISCONSIN - DSF/WDRN
DEVILS LAKE STATE PARK
Baraboo, Wisconsin

REVISIONS	NO.	DATE	REMARKS

SCALE	1" = 100' - 22"x34"
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CHECKED	DPOP
PROJECT NO.	53107320.00
SHEET	3 OF 3
DWG. NO.	

Table 4.1 - Sanitary Manhole Inventory & Recommended Improvements

Structure Name	Diameter / Rim Elevation	Depth	Pipes In	Pipes Out	Material	Condition	Cover	Existing Conditions Comments	Recommended Improvements											Improvements Details					
									Surcharged	Remove Solids Build Up	New Cover (w/ Concealed Pick Holes) & Frame	New Cover, Frame & Conc. Flat Top	Adjust to Grade	Mortar/ Cement Grout Joints	Chemical Grout	Plug Inactive Pipes	Construct Outside Drop	Replace Manhole	Abandon Manhole		Internal Chimney Seal				
1	48" Dia Rim = 969.23	3.98	Pipe 101 - 6" IE = 965.88	Pipe 19 - 6" IE = 964.80	Precast	Fair	Casting w/ Open Pick Holes	6" Casting, 1x4" ring, 1x2" ring			1														
2 Drop MH W	48" Dia Rim = 1000.93	7.5	Pipe 102 - 6" IE = 997.58	Pipe 18 - 6" IE = 993.08	Precast	Good	Casting w/ Open Pick Holes	6" Casting, no rings West invert 4.5' above outlet			1														
4 Drop MH S	48" Dia Rim = 970.01	7.44	Pipe 18 - 6" IE = 966.07 Pipe 19 - 6" IE = 963.01 Pipe 103 - 6" IE = 965.71	Pipe 17 - 6" IE = 962.57	Precast	Fair	Casting w/ Open Pick Holes	6" Casting, no rings & solids build up. S-SW Invert 3.5' above outlet		1	1														
5	48" Dia Rim = 971.86	3.1	Pipe 104 - 4" IE = 968.68	Pipe 20 - 8" IE = 968.06	Precast	Fair	Casting w/ Open Pick Holes	9" Casting (loose), no rings			1											Reset existing casting if new casting is not installed			
6	48" Dia Rim = 974.64	13.5	Pipe 17 - 6" IE = 961.17 Pipe 20 - 8" IE = 963.43	Pipe 16 - 6" IE = 961.13	Precast	Good	Casting w/ Open Pick Holes	6" Casting, 2x4" rings			1														
7 Drop MH	48" Dia Rim = 965.12	14.75	Pipe 16 - 6" IE = 959.87	Pipe 15 - 6" IE = 950.37	Precast	Fair	Casting w/ Open Pick Holes	9" Casting, no rings. NW Invert 9' above outlet			1														
8	48" Dia Rim = 952.72	2.75	Pipe 15 - 6" IE = 949.37	Pipe 80 - 6" IE = 949.34	Precast	Poor	Casting w/ Open Pick Holes	9" Casting, no rings & very low flow, solids build up		1	1														
9	48" Dia Rim = 952.29	2.65	Pipe 75 - 6" IE = 948.59 Pipe 78 - 6" IE = 948.94 Pipe 80 - 6" IE = 948.94	Pipe 77 - 6" IE = 948.49 Pipe 108 - 8" IE = 948.49	Block	Poor	Sheet Metal	No Casting, no rings & very low flow, solid build up, Walls have multiple cracks, Surcharged	1	1												1	Replace. Investigate possible plugged, collapsed or under capacity pipe down stream.		
A	48" Dia Rim = 951.15	7.06	Pipe 72 - 8" IE = 944.15	Pipe 79 - 8" IE = 944.15	Precast	Good	Casting w/ Concealed Pick Holes	9" Casting, 1x4" ring, casting offset, dirt in MH, no flow														1	Clean out dirt in MH. Re-align casting. Install internal chimney seal due to located in flood prone area.		
10	48" Dia Rim = 953.50	2.38	Pipe 74 - 6" IE = 950.15	Pipe 75 - 6" IE = 950.05	Block	Fair	Casting w/ Open Pick Holes	3" Dia Casting, no rings, 2 conc. blocks on bottom, solid build up		1	1												Remove blocks.		
B	48" Dia Rim = 952.30	7.08	Pipe 71 - 8" IE = 945.26	Pipe 72 - 8" IE = 945.18	Precast	Good	Casting w/ Concealed Pick Holes	9" Casting, 1x3" ring, 3" below gravel and no flow					1										1	Add 4" adjusting ring to match grade. Install internal chimney seal due to located in flood prone area.	
11	48" Dia Rim = 953.82	3.2	Pipe 73 - 6" IE = 950.47	Pipe 74 - 6" IE = 950.45	CMP / Block	Poor	Casting w/ Open Pick Hole	4" Casting, no rings & gravel and solids build up, 2 conc. blocks on bottom, Deteriorating CMP		1														1	Replace Manhole
12	48" Dia Rim = 957.40	4.42	Pipe 71 - 8" IE = 952.98 Pipe 73 - 6" IE = 952.98	Pipe 71 - 8" IE = 952.98 Pipe 73 - 6" IE = 952.98	Precast	Fair	Casting w/ Concealed Pick Holes	9" Casting, 3x2" rings & low flow, 4" deep water and solid build up		1															
15	48" Dia Rim = 965.01	9.76	Pipe 69 - 6" IE = 955.35	Pipe 70 - 6" IE = 955.25	Precast	Good	Casting w/ Concealed Pick Holes & Bolts	9" Casting, 5x2" rings																	
16	48" Dia Rim = 966.23	8.93	Pipe 47 - 6" IE = 960.43 Pipe 60 - 6" IE = 957.40	Pipe 69 - 6" IE = 957.30	Precast	Good	Casting w/ Concealed Pick Holes & Bolts	9" Casting, 3x2" rings & structure is 2" below finish grade. South invert 3.13' above outlet.					1											1	Add 2" adjusting ring. Install internal chimney seal due to located in flood prone area.
17	48" Dia Rim = 947.36	5.34	Pipe 48 - 6" IE = 962.08	Pipe 47 - 6" IE = 962.02	Stone	Fair	Casting w/ Concealed Pick Holes	9" Casting, no rings & RIM is 9" above finish grade																	
18	48" Dia Rim = 968.34	4.46	Pipe 49 - 6" IE = 963.41	Pipe 48 - 6" IE = 963.39	Stone	Fair	Concrete	No Casting, no rings. SW Invert 4.62' above outlet																	
19	48" Dia Rim = 966.45	8.42	Pipe 61 - 6" IE = 958.15 Pipe 90 - 6" IE = 959.33	Pipe 60 - 6" IE = 958.03	Block	Fair	Casting w/ Open Pick Hole	9" Casting, 1x2" ring & solid build up		1	1													1	Install internal chimney seal or consider complete replacement due located in flood prone area.
20	48" Dia Rim = 968.38	9	Pipe 62 - 6" IE = 959.50 Pipe 89 - 6" IE = 959.60	Pipe 61 - 6" IE = 959.38	Stone	Fair	Casting w/ Lift Ring	9" Casting, no rings																	
21	48" Dia Rim = 966.63	6.72	Pipe 63 - 6" IE = 960.57 Pipe 65 - 6" IE = 960.29	Pipe 62 - 6" IE = 959.91	Stone	Fair	Casting w/ Open Pick Holes	9" Casting, no rings																	
22	48" Dia Rim = 970.50	6.62	Pipe 92 - 4" IE = 967.32 Pipe 93 - 6" IE = 962.44	Pipe 64 - 6" IE = 962.40	Brick Stone	Poor	Casting w/ Open Pick Holes	9" Casting, no rings. South invert 4.92' above outlet. Casting Offset. Missing mortar between bricks																	
23	48" Dia Rim = 966.81	5.8	Pipe 64 - 6" IE = 961.13 Pipe 91 - 6" IE = 961.06	Pipe 63 - 6" IE = 961.01	Block Stone	Fair	Casting w/ Open Pick Holes	9" Casting, no rings & RIM 3" below finish grade Evidence of infiltration																	
24	48" Dia Rim = 968.55	6.6	Pipe 66 - 6" IE = 961.95	Pipe 65 - 6" IE = 961.95	Block Stone	Fair to Poor	Casting w/ Open Pick Holes	9" Casting, 2x2" rings, solid build up, Evidence of infiltration		1															
25	48" Dia Rim = 967.94	5.28	Pipe 67 - 6" IE = 962.70 Pipe 88 - 4" IE = 962.98	Pipe 66 - 6" IE = 962.66	Block	Fair	Casting w/ Open Pick Holes	Infiltration from 2', and solid build up		1															
26	48" Dia Rim = 967.53	3.85	Pipe 68 - 6" IE = 963.70	Pipe 67 - 6" IE = 963.68	Block	Fair	Casting w/ Open Pick Holes	9" Casting, no rings, RIM 6" below surface, infiltration, sand, plugged 6' upstream																	
27	48" Dia Rim = 968.51			Pipe 68 - 6" IE = 965.16			Concrete	Cover could not be removed																	
28	48" Dia Rim = 967.79	3.5	Pipe 50 - 6" IE = 964.03	Pipe 49 - 6" IE = 964.01	Stone	Fair	Concrete	No casting, no rings, gravel in pipes and no flow.																	
29	48" Dia Rim = 970.72	6.2	Pipe 51 - 6" IE = 964.54	Pipe 50 - 6" IE = 964.52	Stone	Fair	Casting w/ Open Pick Holes	9" Casting, 1 row of conc. blocks as adjusting ring, dirt in SE pipe			1														
30	48" Dia Rim = 969.87	3.98	Pipe 52 - 6" IE = 965.57	Pipe 51 - 6" IE = 965.57	Stone	Fair	Concrete	No Casting, no rings, no flow and gravel in East pipe																	
31	48" Dia Rim = 974.05	3.34	Pipe 53 - 6" IE = 970.61 Pipe 58 - 6" IE = 970.65	Pipe 52 - 6" IE = 970.41	Stone	Fair	Concrete	No Casting, no rings and no flow																	
32	48" Dia Rim = 975.76	3.66	Pipe 54 - 6" IE = 971.64	Pipe 53 - 6" IE = 971.52	Stone	Fair	Concrete	No Casting, no rings, no flow and solid build up			1														
33	48" Dia Rim = 976.77	3.84	Pipe 55 - 6" IE = 972.46	Pipe 54 - 6" IE = 972.46	Stone	Fair	Concrete	No Casting, no rings and no flow																	
34	48" Dia Rim = 977.08	2.16	Pipe 56 - 6" IE = 973.73	Pipe 55 - 6" IE = 973.61	Stone	Fair	Concrete	No Casting, no rings, cracked lid, no flow and solid build up in SE																	
35	48" Dia Rim = 978.22	2.42	Pipe 57 - 6" IE = 974.87	Pipe 56 - 6" IE = 974.85	Stone	Fair	Concrete	No Casting, no rings and no flow																	
36	48" Dia Rim = 979.21	3.15	Pipe 94 - 6" IE = 975.86	Pipe 57 - 6" IE = 975.59	Block	Poor	Casting w/ Open Pick Holes	9" Casting, no rings and full of debris, Surcharged	1	1															
37	48" Dia Rim = 978.24	5.35	Pipe 59 - 6" IE = 972.53	Pipe 58 - 6" IE = 972.55	Stone	Fair	Concrete	No Casting, no rings and debris in pipes																	
38	48" Dia Rim = 985.13	3.08		Pipe 59 - 6" IE = 981.65			Concrete	No Casting, no rings, cracked lie, no flow and gravel in pipes																	
40	48" Dia Rim = 952.35	?	Pipe 21 - 6" IE = 949.00	Pipe 78 - 6" IE = 948.95	Precast	Poor	Concrete - 2 piece	No Casting, no rings, cracked structure and full of solids. Surcharged	1	1															
41	48" Dia Rim = 955.69	5.5	Pipe 22 - 6" IE = 949.93	Pipe 21 - 6" IE = 949.89	Block	Fair	Concrete	No Casting, no rings and solid build up																	
42	48" Dia Rim = 957.70	6.68	Pipe 23 - 6" IE = 950.93	Pipe 22 - 6" IE = 950.73	Precast / Block	Fair	Concrete	Block Cone, No Casting, no rings and solids build up		1															
43	48" Dia Rim = 957.50	2.4	Pipe 24 - 6" IE = 954.15	Pipe 23 - 6" IE = 954.11	Precast	Fair	Concrete	No Casting, no rings and debris in structure																	
44	48" Dia Rim = 961.88	3.26	Pipe 105 - 4" IE = 958.70	Pipe 25 - 8" IE = 958.18	Precast	Fair	Casting w/ Open Pick Holes	6" Casting, no rings and solids build up			1														
45	48" Dia Rim = 963.82	6.5	Pipe 25 - 8" IE = 957.00 Pipe 26 - 6" IE = 957.32 Pipe 96 - 6" IE = 957.36	Pipe 24 - 6" IE = 957.32	Precast/Block	Fair	Casting w/ Open Pick Holes	Precast bottom, block top, 9" Casting, no rings and solids build up		1	1														
46 Drop MH S	48" Dia Rim = 970.09	4.94	Pipe 27 - 6" IE = 966.74 Pipe 37 - 6" IE = 964.31	Pipe 26 - 6" IE = 964.25	Block	Fair	Concrete	No Casting, no rings, cracked lid, SE invert 2.49' above outlet with outside drop																	

Table 4.1 - Sanitary Manhole Inventory & Recommended Improvements

Structure Name	Diameter / Rim Elevation	Depth	Pipes In	Pipes Out	Material	Condition	Cover	Existing Conditions Comments	Recommended Improvements											Improvements Details		
									Surcharged	Remove Solids Build Up	New Cover (w/ Concealed Pick Holes) & Frame	New Cover, Frame & Conc. Flat Top	Adjust to Grade	Mortar/ Cement Grout Joints	Chemical Grout	Plug Inactive Pipes	Construct Outside Drop	Replace Manhole	Abandon Manhole		Internal Chimney Seal	
47	48" Dia Rim = 976.93	7.02	Pipe 38 - 6" IE = 970.05	Pipe 37 - 6" IE = 969.91	Precast	Fair	Casting w/ Concealed Pick Holes	Roots growing between MH sections														Remove roots and chemical grout.
48	48" Dia Rim = 1007.29	5.61	Pipe 39 - 6" IE = 1001.71	Pipe 38 - 6" IE = 1001.68	Precast	Fair	Casting w/ Open Pick Holes	9" Casting, no rings			1											
49	48" Dia Rim = 1014.64	5.96	Pipe 40 - 6" IE = 1008.70 Pipe 97 - 6" IE = 1008.78	Pipe 39 - 6" IE = 1008.68	Precast	Good	Casting w/ Open Pick Holes	N/A			1											
50	48" Dia Rim = 1026.85	5.94	Pipe 42 - 6" IE = 1020.99	Pipe 41 - 6" IE = 1020.91	Precast	Good	Casting w/ Open Pick Holes	9" Casting, no rings, RIM offset and dirt on bench			1											Clean out dirt in MH. Re-align casting if new one not installed.
51	48" Dia Rim = 1034.72	5.48	Pipe 98 - 6" IE = 1029.30	Pipe 42 - 6" IE = 1029.24	Precast	Good	Casting w/ Open Pick Holes	9" Casting, no rings, SE pipe plugged			1											
52 Drop MH S	48" Dia Rim = 991.87	8.73	Pipe 28 - 6" IE = 987.82 Pipe 95 - 6" IE = 988.52	Pipe 27 - 6" IE = 981.79	Block	Fair	Concrete	No Casting, no rings, and solids build up. S & E Outside drops		1		1										
53 Drop MH S	48" Dia Rim = 1017.03	7.72	Pipe 29 - 6" IE = 1013.68	Pipe 28 - 6" IE = 1007.61	Block	Fair	Concrete	No Casting, no rings				1										
54 Drop MH S	48" Dia Rim = 1029.97	9.3	Pipe 30 - 6" IE = 1026.09	Pipe 29 - 6" IE = 1020.37	Block	Fair	Concrete	No Casting, no rings, and solids build up. Significant effervescence / staining of walls = infiltration		1		1			1							Chemical grout to stop infiltration.
55	48" Dia Rim = 1031.11	3.34	Pipe 31 - 6" IE = 1027.50	Pipe 30 - 6" IE = 1027.40	Block	Fair	Concrete	No Casting, no rings, and solids build up Surcharged	1	1		1										Investigate possible plugged, collapsed or under capacity pipe down stream.
56 Drop MH E	48" Dia Rim = 1033.55	5.22	Pipe 32 - 6" IE = 1027.64 Pipe 35 - 6" IE = 1030.20	Pipe 31 - 6" IE = 1027.60	Block	Fair	Concrete	No Casting, no rings		1		1			1							Plug inactive pipe to southeast.
57 Drop MH E	48" Dia Rim = 1044.07	6.3	Pipe 36 - 6" IE = 1040.72	Pipe 35 - 6" IE = 1036.18	Block	Fair	Concrete	No Casting, no rings and cracked cover				1										
58	48" Dia Rim = 1052.01	6.6	Pipe 100 - 6" IE = 1045.51	Pipe 36 - 6" IE = 1045.41	Block	Fair	Casting w/ Open Pick Hole	4" Casting, no rings, old conc. rim broken in bottom, and solids build up. Surcharged	1	1	1											Investigate possible plugged, collapsed or under capacity pipe down stream.
59	48" Dia Rim = 1038.35		Pipe 33 - 6" IE = 1029.55	Pipe 32 - 6" IE = 1029.50	Block	Fair	Concrete (missing)	No Casting, no rings, garbage in MH could not measure inverts												1		Clean garbage out. Abandon due to upstream pipes no longer serving any buildings. Abandon by removing cover, plugging pipes, fracturing bottom & fill with gravel.
60	48" Dia Rim = 1036.82	6.42	Pipe - 34 - 6" IE = 1030.48	Pipe 33 - 6" IE = 1030.40	Block	Fair	Concrete	None.												1		Abandon due to upstream pipes no longer serving any buildings. Abandon by removing cover, plugging pipes, fracturing bottom & fill with gravel.
61	48" Dia Rim = 1035.84	4.32	-	Pipe 34 - 6" IE = 1031.52	Block	Fair	Concrete	No Casting, no rings, clean water from 2' pipe, 1.2' standing water												1		Abandon due to upstream pipes no longer serving any buildings. Abandon by removing cover, plugging pipes, fracturing bottom & fill with gravel.
62	48" Dia.		Pipe - 112	Pipe - 111	Precast	Good	Casting w/ Concealed Pick Holes	None.														
IA 1	48" Dia Rim = 1018.47	3.7	Pipe 41 - 6" IE = 1014.75 Pipe 43 - 8" IE = 1014.95	Pipe 40 - 6" IE = 1014.65	Precast	Fair	Casting w/ Open Pick Hole	6" Casting, no rings, 1" below gravel at Site 148, solids build up on east side		1	1		1									Add 2" adjusting ring.
IA 2	48" Dia Rim = 1026.35	7.98	Pipe 44 - 8" IE = 1018.45	Pipe 43 - 8" IE = 1018.37	Precast	Good	Casting w/ Open Pick Hole	9" Casting, no rings, debris in MH			1											Clean out debris in MH.
IA 3	48" Dia Rim = 1030.00		Pipe 45 - 8" IE = 1022.55	Pipe 44 - 8" IE = 1022.50				buried under a large pile of gravel														Move gravel pile to obtain access to manhole.
IA 4	48" Dia Rim = 1030.20		Pipe 46 - 8" IE = 1023.35	Pipe 45 - 8" IE = 1024.20				Could not be found														Further Site Investigation needed to locate manhole
IA 5	48" Dia Rim = 1028.57	4.12	Pipe 99 - 6" IE = 1024.47	Pipe 46 - 8" IE = 1024.45	Precast	Good	Casting w/ Open Pick Hole	9" Casting, no rings, debris in MH			1											Clean out debris in MH.
S2	48" Dia Rim = 972.02	4.68	Pipe 87 - 6" IE = 967.42	Pipe 14 - 6" IE = 967.34	Block	Fair	Casting w/o Pick Holes	4" Casting, no rings			1											Consider complete replacement due to located in flood prone area.
S3	48" Dia Rim = 968.26	5.76	Pipe 14 - 6" IE = 962.16	Pipe 13 - 6" IE = 962.10	Block	Fair	Concrete	No Casting, no rings, concrete bell section, and solids build up. Surcharged	1	1		1										Consider complete replacement due to located in flood prone area. Investigate possible plugged, collapsed or under capacity pipe down stream.
S5	48" Dia Rim = 967.57	6.36	Pipe 13 - 6" IE = 961.33	Pipe 107 - 6" IE = 961.21	Stone	Poor	Concrete	No Casting, no rings, and solids build up Missing Mortar b/w Stones. Surcharged	1	1										1		Replace due condition & located in flood prone area. Investigate possible plugged, collapsed or under capacity pipe down stream.
S6	48" Dia Rim = 967.81	6.07	Pipe 5 - 6" IE = 961.74 Pipe 6 - 6" IE = 961.74 Pipe 7 - 8" IE = 961.69	Pipe 106 - 6" IE = 962.11	Stone	Poor	Concrete	No Casting, no rings, Missing Mortar b/w Stones, Surcharged	1			1								1		Replace due condition & located in flood prone area. Investigate possible plugged, collapsed or under capacity pipe down stream.
S7	48" Dia Rim = 972.24	5.18	Pipe 7 - 8" IE = 967.06	Pipe 8 - 6" IE = 967.10	Precast	Fair	Casting w/ Open Pick Holes	9" Casting, 1x4" ring, solids build up		1	1											
S8	48" Dia Rim = 980.64	5.02	Pipe 8 - 6" IE = 975.62	Pipe 9 - 6" IE = 975.62	Precast/Block	Fair	Casting w/ Open Pick Hole	9" Casting, 1x4" ring, solids build up, dirt on bench		1	1								1			Clean out dirt from MH.
S9	48" Dia Rim = 984.52	5.18	Pipe 9 - 6" IE = 979.34 Pipe 10 - 6" IE = 979.62	Pipe 11 - 6" IE = 979.50	Precast	Good	Casting w/ Open Pick Hole	9" Casting, 1x4" ring, standing water and solids build up, Surcharged	1	1	1											Investigate possible plugged, collapsed or under capacity pipe downstream.
S10	48" Dia Rim = 987.25	6.1	Pipe 11 - 6" IE = 981.15	Pipe 12 - 6" IE = 981.25 Pipe 86 - 6" IE = 981.60	Precast	Good	Casting w/ Open Pick Holes	9" Casting, 6x2" rings, solids build up		1												No need to replace casting since under shelter roof.
S11	48" Dia Rim = 990.88	3.7	-	Pipe 10 - 6" IE = 987.18	Precast	Good	Casting w/ Open Pick Hole	9" Casting, no rings, 1.2' below finish grade, offset casting, dirt in bottom				1		1								Clean dirt out of MH. Add adjusting rings to match grade. Re-align casting
S13	48" Dia Rim = 991.03	4.6	Pipe 12 - 6" IE = 986.43	Pipe 85 - 6" IE = 986.99	Precast	Good	Casting w/ Open Pick Hole	9" Casting, 2x2" rings, full of water and solids, Surcharged	1	1												Investigate possible plugged, collapsed or under capacity pipe downstream. No need to replace casting since under shelter roof.
S14	48" Dia Rim = 972.61	5.98	Pipe 4 - 6" IE = 966.65	Pipe 5 - 6" IE = 966.63 Pipe 82 - 6" IE = 967.11	Stone	Poor	Concrete	No Casting, no rings, stone cracking near top, solids build up		1										1		Replace cracking stone with block or replace with precast barrel section.
S15	48" Dia Rim = 973.82	6.34	Pipe 3 - 6" IE = 967.50	Pipe 4 - 6" IE = 967.48	Stone	Good	Concrete	No Casting, no rings				1										
S16	48" Dia Rim = 976.68	6.98	Pipe 2 - 6" IE = 969.98	Pipe 3 - 6" IE = 969.70	Block / Brick	Fair	Casting w/ Open Pick Holes	9" Casting, no rings, gaps in mortar b/w blocks at top			1			1								Mortar blocks at top of MH.
S17	48" Dia Rim = 974.20	2.32	Pipe 83 - 6" IE = 971.90	Pipe 2 - 6" IE = 971.88	Block	Fair	Casting w/ Open Pick Holes	3" Casting, no rings, buried 1.0' below finish grade, dirt in bottom, gaps between blocks			1		1	1								Clean out dirt in MH. Ad 2 - 6" adjusting rings to match grade. Mortar b/w blocks.
S18	48" Dia Rim = 972.61	4.38	Pipe 81 - 4" IE = 968.43	Pipe 6 - 6" IE = 968.23	Precast	Poor	Casting w/ Concealed Pick Holes & Bolts	4" Casting, 2x2" rings, full of water, Surcharged	1	1												Investigate possible plugged, collapsed or under capacity pipe downstream.
									Totals	11	30	27	18	5	3	2	10	4	17	7	4	
									Improvement Unit Cost (EA)	\$200	\$1,500	\$1,800	\$325	\$500	\$3,500	\$125	\$1,400	\$3,500	\$500	\$425		
									Estimated Total	\$6,000	\$40,500	\$32,400	\$1,625	\$1,500	\$7,000	\$1,250	\$5,600	\$59,500	\$3,500	\$1,700		
									Total Opinion of Probable Construction Costs											\$160,575		

 = First Priority Improvement
 = Second Priority Improvement

 = Third Priority Improvement
 = Fourth Priority Improvement

Table 4.1-I - Sanitary Manhole Recommended First Priority Improvements Opinion of Probable Construction Costs

Structure Name	Depth	Material	Condition	Cover	Existing Conditions Comments	Surcharged	Recommended Improvements										Improvements Details	
							Remove Solids Build Up	New Cover (w/ Concealed Pick Holes) & Frame	New Cover, Fame & Conc. Flat Top	Adjust to Grade	Mortar/ Cement Grout Joints	Chemical Grout	Plug Inactive Pipes	Construct Outside Drop	Replace Manhole	Abandon Manhole		Internal Chimney Seal
7 Drop MH	14.75	Precast	Fair	Casting w/ Open Pick Holes	9" Casting, no rings. NW Invert 9' above outlet			1						1				Located in flood prone area.
8	2.75	Precast	Poor	Casting w/ Open Pick Holes	9" Casting, no rings & very low flow, solids build up		1	1										Located in flood prone area.
10	2.38	Block	Fair	Casting w/ Open Pick Holes	3' Dia Casting, no rings, 2 conc. blocks on bottom, solid build up		1	1										Remove blocks. Located in flood prone area.
8	7.08	Precast	Good	Casting w/ Concealed Pick Holes	9" Casting, 1x3" ring, 3" below gravel and no flow				1								1	Add 4" adjusting ring to match grade. Install internal chimney seal due to located in flood prone area.
16	8.93	Precast	Good	Casting w/ Concealed Pick Holes & Bolts	9" Casting, 3x2" rings & structure is 2" below finish grade. South invert 3.13' above outlet				1				1				1	Add 2" adjusting ring. Install internal chimney seal due to located in flood prone area.
17	5.34	Stone	Fair	Casting w/ Concealed Pick Holes	9" Casting, no rings & RIM is 9" above finish grade									1				Replace due to located in flood prone area.
18	4.46	Stone	Fair	Concrete	No Casting, no rings. SW Invert 4.62' above outlet									1				Replace due to located in flood prone area.
19	8.42	Block	Fair	Casting w/ Open Pick Hole	9" Casting, 1x2" ring & solid build up		1	1									1	Install internal chimney seal or consider complete replacement due located in flood prone area.
20	9	Stone	Fair	Casting w/ Lift Ring	9" Casting, no rings									1				Replace due to located in flood prone area.
21	6.72	Stone	Fair	Casting w/ Open Pick Holes	9" Casting, no rings									1				Replace due to located in flood prone area.
23	5.8	Block Stone	Fair	Casting w/ Open Pick Holes	9" Casting, no rings & RIM 3" below finish grade Evidence of infiltration									1				Replace due to located in flood prone area.
24	6.6	Block Stone	Fair to Poor	Casting w/ Open Pick Holes	9" Casting, 2x2" rings, solid build up, Evidence of Infiltration		1							1				Replace due to located in flood prone area.
25	5.28	Block	Fair	Casting w/ Open Pick Holes	Infiltration from 2", and solid build up		1					1		1				Replace due to located in flood prone area. Plug inactive west pipe.
28	3.5	Stone	Fair	Concrete	No casting, no rings, gravel in pipes and no flow.							1		1				Replace due to located in flood prone area. Gravel in flow line may indicated collapsed pipes connecting to manhole. Plug inactive NE pipe.
40	?	Precast	Poor	Concrete - 2 piece	No Casting, no rings, cracked structure and full of solids. Surcharged	1	1							1				Replace due to significant crack and located in flood prone area.. Investigate possible plugged, collapsed or under capacity pipe down stream.
41	5.5	Block	Fair	Concrete	No Casting, no rings and solid build up									1				Replace due to located in flood prone area.
42	6.68	Precast / Block	Fair	Concrete	Block Cone, No Casting, no rings and solids build up		1		1									Located in flood prone area.
43	2.4	Precast	Fair	Concrete	No Casting, no rings and debris in structure		1		1									Located in flood prone area.
44	3.26	Precast	Fair	Casting w/ Open Pick Holes	6" Casting, no rings and solids build up			1										Located in flood prone area.
45	6.5	Precast/Block	Fair	Casting w/ Open Pick Holes	Precast bottom, block top, 9" Casting, no rings and solids build up		1	1										Located in flood prone area.
54 Drop MH S	9.3	Block	Fair	Concrete	No Casting, no rings, and solids build up. Significant effervescence / staining of walls = infiltration		1		1		1							Chemical grout to stop infiltration.
S2	4.68	Block	Fair	Casting w/o Pick Holes	4" Casting, no rings			1										Consider complete replacement due to located in flood prone area.
S3	5.76	Block	Fair	Concrete	No Casting, no rings, concrete bell section, and solids build up. Surcharged	1	1		1									Consider complete replacement due to located in flood prone area. Investigate possible plugged, collapsed or under capacity pipe down stream.
S5	6.36	Stone	Poor	Concrete	No Casting, no rings, and solids build up Missing Mortar b/w Stones, Surcharged	1	1							1				Replace due condition & located in flood prone area. Investigate possible plugged, collapsed or under capacity pipe down stream.
S6	6.07	Stone	Poor	Concrete	No Casting, no rings, Missing Mortar b/w Stones, Surcharged	1			1	1				1				Replace due condition & located in flood prone area. Investigate possible plugged, collapsed or under capacity pipe down stream.
Totals						4	12	7	5	2	1	1	2	2	12	0	3	
Improvement Unit Cost (EA)							\$200	\$1,500	\$1,800	\$325	\$500	\$3,500	\$125	\$1,400	\$3,500	\$500	\$425	Total Opinion of Probable Construction Costs
Estimated Total							\$2,400	\$10,500	\$9,000	\$650	\$500	\$3,500	\$250	\$2,800	\$42,000	\$0	\$1,275	\$72,875

Table 4.1-II - Sanitary Manhole Recommended Second Priority Improvements Opinion of Probable Construction Costs

Structure Name	Depth	Material	Condition	Cover	Existing Conditions Comments	Surcharged	Recommended Improvements										Improvements Details	
							Remove Solids Build Up	New Cover (w/ Concealed Pick Holes) & Frame	New Cover, Fame & Conc. Flat Top	Adjust to Grade	Mortar/ Cement Grout Joints	Chemical Grout	Plug Inactive Pipes	Construct Outside Drop	Replace Manhole	Abandon Manhole		Internal Chimney Seal
9	2.65	Block	Poor	Sheet Metal	No Casting, no rings & very low flow, solid build up. Walls have multiple cracks, Surcharged	1	1									1		Replace. Investigate possible plugged, collapsed or under capacity pipe down stream.
11	3.2	CMP / Block	Poor	Casting w/ Open Pick Hole	4" Casting, no rings & gravel and solids build up, 2 conc. blocks on bottom, Deteriorating CMP		1									1		Replace Manhole
22	6.62	Brick Stone	Poor	Casting w/ Open Pick Holes	9" Casting, no rings. South invert 4.92' above outlet. Casting Offset. Missing mortar between bricks											1		Replace Manhole
36	3.15	Block	Poor	Casting w/ Open Pick Holes	9" Casting, no rings and full of debris. Surcharged	1	1									1		Investigate possible plugged, collapsed or under capacity pipe down stream.
47	7.02	Precast	Fair	Casting w/ Concealed Pick Holes	Roots growing between MH sections						1							Remove roots and chemical grout.
S14	5.98	Stone	Poor	Concrete	No Casting, no rings, stone cracking near top, solids build up		1									1		Replace cracking stone with block or replace with precast barrel section.
S16	6.98	Block / Brick	Fair	Casting w/ Open Pick Holes	9" Casting, no rings, gaps in mortar b/w blocks at top			1				1						Mortar blocks at top of MH.
S17	2.32	Block	Fair	Casting w/ Open Pick Holes	3" Casting, no rings, buried 1.0' below finish grade, dirt in bottom, gaps between blocks				1	1								Clean out dirt in MH. Ad 2 - 6" adjusting rings to match grade. Mortar b/w blocks.
Totals						2	4	2	0	1	2	1	0	0	5	0	0	
Improvement Unit Cost (EA)							\$200	\$1,500	\$1,800	\$325	\$500	\$3,500	\$125	\$1,400	\$3,500	\$500	\$425	Total Opinion of Probable Construction Costs
Estimated Total							\$800	\$3,000	\$0	\$325	\$1,000	\$3,500	\$0	\$0	\$17,500	\$0	\$0	\$26,125

Table 4.1-III - Sanitary Manhole Recommended Third Priority Improvements Opinion of Probable Construction Cost

Structure Name	Depth	Material	Condition	Cover	Existing Conditions Comments	Surcharged	Recommended Improvements										Improvements Details		
							Remove Solids Build Up	New Cover (w/ Concealed Pick Holes) & Frame	New Cover, Fame & Conc. Flat Top	Adjust to Grade	Mortar/ Cement Grout Joints	Chemical Grout	Plug Inactive Pipes	Construct Outside Drop	Replace Manhole	Abandon Manhole		Internal Chimney Seal	
1	3.98	Precast	Fair	Casting w/ Open Pick Holes	6" Casting, 1x4" ring, 1x2" ring			1											
2 Drop MH W	7.5	Precast	Good	Casting w/ Open Pick Holes	6" Casting, no rings West invert 4.5' above outlet			1					1						
4 Drop MH S	7.44	Precast	Fair	Casting w/ Open Pick Holes	6" Casting, no rings & solids build up. S-SW Invert 3.5' above outlet		1	1					1						
5	3.1	Precast	Fair	Casting w/ Open Pick Holes	9" Casting (loose), no rings			1										Reset existing casting if new casting is not installed	
6	13.5	Precast	Good	Casting w/ Open Pick Holes	6" Casting, 2x4" rings			1											
26	3.85	Block	Fair	Casting w/ Open Pick Holes	9" Casting, no rings, RIM 6" below surface, infiltration, sand, plugged 6" upstream											1		Plug pipes if not in use & abandon manhole by removing casting, fracturing bottom & filling with gravel. Replace if in use.	
27				Concrete	Cover could not be removed											1		Abandon due to upstream pipes no longer serving any buildings. Abandon by removing cover, plugging pipes, fracturing bottom & fill with gravel.	
29	6.2	Stone	Fair	Casting w/ Open Pick Holes	9" Casting, 1 row of conc. blocks as adjusting ring, dirt in SE pipe			1				1						Plug inactive SE pipe.	
30	3.98	Stone	Fair	Concrete	No Casting, no rings, no flow and gravel in East pipe				1			1						Plug inactive E pipe.	
31	3.34	Stone	Fair	Concrete	No Casting, no rings and no flow				1			1						Plug inactive E pipe.	
32	3.66	Stone	Fair	Concrete	No Casting, no rings, no flow and solid build up		1		1			1						Plug inactive SW pipe.	
33	3.84	Stone	Fair	Concrete	No Casting, no rings and no flow				1			1						Plug inactive SW pipe.	
34	2.16	Stone	Fair	Concrete	No Casting, no rings, cracked lid, no flow and solid build up in SE				1			1						Plug inactive W & SW pipes	
35	2.42	Stone	Fair	Concrete	No Casting, no rings and no flow				1									Clean out gravel in flow line.	
37	5.35	Stone	Fair	Concrete	No Casting, no rings and debris in pipes											1		Abandon due to upstream pipes no longer serving any buildings. Abandon by removing cover, plugging pipes, fracturing bottom & fill with gravel.	
38	3.08	Stone	Fair	Concrete	No Casting, no rings, cracked lie, no flow and gravel in pipes											1		Abandon due to upstream pipes no longer serving any buildings. Abandon by removing cover, plugging pipes, fracturing bottom & fill with gravel.	
46 Drop MH S	4.94	Block	Fair	Concrete	No Casting, no rings, cracked lid, SE invert 2.49' above outlet with outside drop				1										
48	5.61	Precast	Fair	Casting w/ Open Pick Holes	9" Casting, no rings			1											
49	5.96	Precast	Good	Casting w/ Open Pick Holes	N/A			1											
50	5.94	Precast	Good	Casting w/ Open Pick Holes	9" Casting, no rings, RIM offset and dirt on bench			1										Clean out dirt in MH. Re-align casting if new one not installed.	
51	5.48	Precast	Good	Casting w/ Open Pick Holes	9" Casting, no rings, SE pipe plugged			1											
52 Drop MH S	8.73	Block	Fair	Concrete	No Casting, no rings, and solids build up. S & E Outside drops		1		1										
53 Drop MH S	7.72	Block	Fair	Concrete	No Casting, no rings				1										
55	3.34	Block	Fair	Concrete	No Casting, no rings, and solids build up Surcharged	1	1		1									Investigate possible plugged, collapsed or under capacity pipe down stream.	
56 Drop MH E	5.22	Block	Fair	Concrete	No Casting, no rings		1		1			1						Plug inactive pipe to southeast.	
57 Drop MH E	6.3	Block	Fair	Concrete	No Casting, no rings and cracked cover				1										
58	6.6	Block	Fair	Casting w/ Open Pick Hole	4" Casting, no rings, old conc. rim broken in bottom, and solids build up. Surcharged	1	1	1										Investigate possible plugged, collapsed or under capacity pipe down stream.	
59		Block	Fair	Concrete (missing)	No Casting, no rings, garbage in MH could not measure inverts											1		Clean garbage out. Abandon due to upstream pipes no longer serving any buildings. Abandon by removing cover, plugging pipes, fracturing bottom & fill with gravel.	
60	6.42	Block	Fair	Concrete	None.											1		Abandon due to upstream pipes no longer serving any buildings. Abandon by removing cover, plugging pipes, fracturing bottom & fill with gravel.	
61	4.32	Block	Fair	Concrete	No Casting, no rings, clean water from 2' pipe, 1.2' standing water											1		Abandon due to upstream pipes no longer serving any buildings. Abandon by removing cover, plugging pipes, fracturing bottom & fill with gravel.	
62		Precast	Good	Casting w/ Concealed Pick Holes	None.														
IA 1	3.7	Precast	Fair	Casting w/ Open Pick Hole	6" Casting, no rings, 1" below gravel at Site 148, solids build up on east side		1	1		1								Add 2" adjusting ring.	
IA 2	7.98	Precast	Good	Casting w/ Open Pick Hole	9" Casting, no rings, debris in MH			1										Clean out debris in MH.	
IA 5	4.12	Precast	Good	Casting w/ Open Pick Hole	9" Casting, no rings, debris in MH			1										Clean out debris in MH.	
S7	5.18	Precast	Fair	Casting w/ Open Pick Holes	9" Casting, 1x4" ring, solids build up		1	1											
S8	5.02	Precast/Block	Fair	Casting w/ Open Pick Hole	9" Casting, 1x4" ring, solids build up, dirt on bench		1	1				1						Clean out dirt from MH.	
S9	5.18	Precast	Good	Casting w/ Open Pick Hole	9" Casting, 1x4" ring, standing water and solids build up, Surcharged	1	1	1										Investigate possible plugged, collapsed or under capacity pipe downstream.	
S11	3.7	Precast	Good	Casting w/ Open Pick Hole	9" Casting, no rings, 1.2' below finish grade, offset casting, dirt in bottom			1		1								Clean dirt out of MH. Add adjusting rings to match grade. Re-align casting	
S15	6.34	Stone	Good	Concrete	No Casting, no rings				1										
Totals						3	10	18	13	2	0	0	8	2	0	7	0		
Improvement Unit Cost (EA)							\$200	\$1,500	\$1,800	\$325	\$500	\$3,500	\$125	\$1,400	\$3,500	\$500	\$425		
Estimated Total							\$2,000	\$27,000	\$23,400	\$650	\$0	\$0	\$1,000	\$2,800	\$0	\$3,500	\$0		Total Opinion of Probable Construction Costs
																		\$60,350	

Table 4.1-IV - Sanitary Manhole Recommended Fourth Priority Improvements Opinion of Probable Construction Cost

Structure Name	Depth	Material	Condition	Cover	Existing Conditions Comments	Surcharged	Recommended Improvements										Improvements Details	
							Remove Solids Build Up	New Cover (w/ Concealed Pick Holes) & Frame	New Cover, Frame & Conc. Flat Top	Adjust to Grade	Mortar/ Cement Grout Joints	Chemical Grout	Plug Inactive Pipes	Construct Outside Drop	Replace Manhole	Abandon Manhole		Internal Chimney Seal
A	7.06	Precast	Good	Casting w/ Concealed Pick Holes	9" Casting, 1x4" ring, casting offset, dirt in MH, no flow												1	Clean out dirt in MH. Re-align casting. Install internal chimney seal due to located in flood prone area.
12	4.42	Precast	Fair	Casting w/ Concealed Pick Holes	9" Casting, 3x2" rings & low flow, 4" deep water and solid build up		1											
IA 3					buried under a large pile of gravel													Move gravel pile to obtain access to manhole.
IA 4					Could not be found													Further Site Investigation needed to locate manhole
S10	6.1	Precast	Good	Casting w/ Open Pick Holes	9" Casting, 6x2" rings, solids build up		1											No need to replace casting since under shelter roof.
S13	4.6	Precast	Good	Casting w/ Open Pick Hole	9" Casting, 2x2" rings, full of water and solids, Surcharged	1	1											Investigate possible plugged, collapsed or under capacity pipe downstream. No need to replace casting since under shelter roof
S18	4.38	Precast	Poor	Casting w/ Concealed Pick Holes & Bolts	4" Casting, 2x2" rings, full of water, Surcharged	1	1											Investigate possible plugged, collapsed or under capacity pipe downstream.
Totals						2	4	0	0	0	0	0	0	0	0	0	1	
Improvement Unit Cost (EA)							\$200	\$1,500	\$1,800	\$325	\$500	\$3,500	\$125	\$1,400	\$3,500	\$500	\$425	
Estimated Total							\$800	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$425	
													Total Opinion of Probable Construction Costs		\$1,225			

Table 4.2.2- Sanitary Gravity Piping Inventory & Recommended Improvements

Pipe Number	System	From MH	To MH	Length (ft)	Size (inches)	Material	Slope (%)	Capacity (cfs)	Conditions per 1987 Televising	Comments /Recommended Improvements
2	South	S17	S16	58.1	6	Clay	3.27%	1.02	No damage or repairs noted	Clean pipe and televise.
3	South	S16	S15	450.6	6	Clay	0.49%	0.36	Cracked pipe 130' downstream MH S16 Dips in pipe 270' downstream MH S16	Replace Pipe due to cracks and dips.
4	South	S15	S14	198.6	6	Clay	0.42%	0.34	No damage or repairs noted	Clean pipe and televise.
5	South	S14	S6	180.8	6	Clay	2.71%	0.86	Dips in pipe for 50' starting at MH S14	Replace with PVC. In South Shore Flood Prone Area.
6	South	S18	S6	128.0	6	PVC	5.07%	1.17	No records	
7	South	S7	S6	125.2	8	Clay	4.61%	2.41	No damage or repairs noted	Replace with PVC. In South Shore Flood Prone Area.
8	South	S8	S7	379.7	6	Clay	2.24%	1.09	No damage or repairs noted	Clean pipe and televise.
9	South	S9	S8	240.7	6	Clay	1.55%	0.65	No damage or repairs noted	Clean pipe and televise.
10	South	S11	S9	370.9	6	Clay	2.04%	0.74	Cracked pipe at MH S9	Replace pipe at MH S9 due to crack.
11	South	S10	S9	101.1	6	Clay	1.63%	0.67	Roots	Roto-clean pipe to remove roots.
12	South	S13	S10	359.9	6	Clay	1.44%	0.63	Roots entire length of pipe Cracked pipe 130' downstream MH S13	Roto-clean pipe to remove roots.
13	South	S3	S5	185.9	6	Clay	0.41%	0.34	No damage or repairs noted	Replace with PVC. In South Shore Flood Prone Area.
14	South	S2	S3	243.7	6	Clay	2.13%	0.82	No damage or repairs noted	Replace with PVC. In South Shore Flood Prone Area.
15	North	7 Drop	8	143.1	6	Clay	0.70%	0.44	No damage or repairs noted	Clean pipe and televise.
16	North	6	7 Drop	64.7	6	Clay	1.95%	0.73	No damage or repairs noted	Clean pipe and televise.
17	North	4 Drop	6	299.6	6	Clay	0.47%	0.36	No damage or repairs noted	Clean pipe and televise.
18	North	2 Drop	4 Drop	497.7	6	Clay	5.43%	1.21	No damage or repairs noted	Clean pipe and televise.
19	North	1	4 Drop	400.7	6	Clay	0.45%	0.35	No damage or repairs noted	Clean pipe and televise.
20	North	5	6	63.8	8	Clay	7.25%	3.02	No damage or repairs noted	Clean pipe and televise.
21	North	41	40	120.8	6	Clay/PVC	0.74%	0.45	No damage or repairs noted	Over creek & frequently washes out. Reinforce with steel I Beam
22	North	42	41	150.6	6	Clay	0.53%	0.38	No damage or repairs noted	Clean pipe and televise.
23	North	43	42	221.7	6	Clay	1.43%	0.62	No damage or repairs noted	Clean pipe and televise.
24	North	45	43	148.2	6	Clay	2.14%	0.76	No damage or repairs noted	Clean pipe and televise.
25	North	44	45	37.4	8	Clay	3.16%	1.99	No damage or repairs noted	Clean pipe and televise.
26	North	46 Drop	45	135.8	6	Clay	5.11%	1.18	No damage or repairs noted	Clean pipe and televise.
27	North	52 Drop	46 Drop	314.2	6	Clay	4.79%	1.14	No damage or repairs noted	Clean pipe and televise.
28	North	53 Drop	52 Drop	232.4	6	Clay	8.51%	1.52	No damage or repairs noted	Clean pipe and televise.
29	North	54 Drop	53 Drop	114.2	6	Clay	5.86%	1.26	No damage or repairs noted	Clean pipe and televise.
30	North	55	54 Drop	156.0	6	Clay	0.84%	0.48	No damage or repairs noted	Clean pipe and televise.
31	North	56 Drop	55	109.0	6	Clay	0.09%	0.16	No damage or repairs noted	Clean pipe and televise.
32	North	59	56 Drop	325.9	6	Clay	0.57%	0.39	No damage or repairs noted	Abandon. No longer used.
33	North	60	59	145.9	6	Clay	0.58%	0.40	No damage or repairs noted	Abandon. No longer used.
34	North	61	60	215.4	6	Clay	0.48%	0.36	No damage or repairs noted	Abandon. No longer used.
35	North	57 Drop	56 Drop	116.3	6	Clay	5.14%	1.18	No damage or repairs noted	Clean pipe and televise.
36	North	58	57 Drop	99.8	6	Clay	4.70%	1.13	No damage or repairs noted	Clean pipe and televise.
37	North	47	46 Drop	199.2	6	Clay	2.81%	0.87	No damage or repairs noted	Clean pipe and televise.
38	North	48	47	386.7	6	Clay	8.18%	1.49	No damage or repairs noted	Clean pipe and televise.
39	North	49	48	186.2	6	Clay	3.74%	1.01	No damage or repairs noted	Clean pipe and televise.
40	North	IA 1	49	112.8	6	Clay	5.27%	1.20	No damage or repairs noted	Clean pipe and televise.
41	North	50	IA 1	111.6	6	Clay	5.52%	1.22	No damage or repairs noted	Clean pipe and televise.
42	North	51	50	342.6	6	Clay	2.41%	0.81	No damage or repairs noted	Clean pipe and televise.

Table 4.2.2- Sanitary Gravity Piping Inventory & Recommended Improvements

Pipe Number	System	From MH	To MH	Length (ft)	Size (inches)	Material	Slope (%)	Capacity (cfs)	Conditions per 1987 Televising	Comments /Recommended Improvements
43	North	IA 2	IA 1	390.6	8	PVC	0.88%	1.47	New since 1987	
44	North	IA 3	IA 2	310.0	8	PVC	1.31%	1.80	New since 1987	
45	North	IA 4	IA 3	387.4	8	PVC	0.43%	0.74	New since 1987	
46	North	IA 5	IA 4	275.0	8	PVC	0.40%	0.99	New since 1987	
47	North	17	16	93.2	6	PVC	1.71%	0.95	No damage or repairs noted	
48	North	18	17	267.6	6	Clay	0.49%	0.36	No damage or repairs noted	Replace with PVC. In North Shore Flood Prone Area.
49	North	28	18	136.7	6	Clay	0.44%	0.35	No damage or repairs noted	Replace with PVC. In North Shore Flood Prone Area.
50	North	29	28	84.9	6	Clay	0.58%	0.40	No damage or repairs noted	Clean pipe and televise.
51	North	30	29	145.1	6	Clay	0.71%	0.44	No damage or repairs noted	Clean pipe and televise.
52	North	31	30	109.4	6	Clay	4.42%	1.10	No damage or repairs noted	Clean pipe and televise.
53	North	32	31	74.4	6	Clay	1.22%	0.58	No damage or repairs noted	Clean pipe and televise.
54	North	33	32	83.3	6	Clay	0.99%	0.52	No damage or repairs noted	Clean pipe and televise.
55	North	34	33	119.9	6	Clay	0.96%	0.51	No damage or repairs noted	Clean pipe and televise.
56	North	35	34	174.2	6	Clay	0.64%	0.42	No damage or repairs noted	Clean pipe and televise.
57	North	36	35	184.5	6	Clay	0.39%	0.33	No damage or repairs noted	Clean pipe and televise.
58	North	37	31	280.0	6	Clay	0.68%	0.43	No damage or repairs noted	Abandon. No longer used.
59	North	38	37	278.5	6	Clay	3.27%	0.94	No damage or repairs noted	Abandon. No longer used.
60	North	19	16	186.9	6	PVC	0.34%	0.43	Under water - entire pipe Dips in pipe just upstream MH 16	Likely replaced since 1987. Current MH inventory = PVC. 1987 infor. = Clay.
61	North	20	19	138.9	6	PVC	0.89%	0.69	Under water near pipe midpoint	Likely replaced since 1987. Current MH inventory = PVC. 1987 infor. = Clay.
62	North	21	20	222.9	6	Clay	0.18%	0.22	Dips in pipe entire length	Replace with PVC. In North Shore Flood Prone Area.
63	North	23	21	57.8	6	Clay	0.76%	0.45	No damage or repairs noted	Replace with PVC. In North Shore Flood Prone Area.
64	North	22	23	185.0	6	Clay	0.69%	0.43	No damage or repairs noted	Replace with PVC. In North Shore Flood Prone Area.
65	North	24	21	311.2	6	Clay	0.53%	0.38	No damage or repairs noted	Replace with PVC. In North Shore Flood Prone Area.
66	North	25	24	344.3	6	Clay	0.21%	0.24	Under water 50' upstream of MH 24	Replace with PVC. In North Shore Flood Prone Area.
67	North	26	25	125.2	6	Clay	0.78%	0.46	No damage or repairs noted	Abandon. No longer used.
68	North	27	26	208.1	6	Clay	0.70%	0.44	No damage or repairs noted	Abandon. No longer used.
69	North	16	15	200.9	6	PVC	0.97%	0.72	Dips in pipe just downstream MH 16	Likely replaced since 1987. Current MH inventory = PVC. 1987 infor. = Clay.
70	North	15	12	266.9	6	PVC	0.84%	0.67	Cracks and dips near midpoint	Likely replaced since 1987. Current MH inventory = PVC. 1987 infor. = Clay.
71	North	12	B	336.4	8	PVC	2.30%	1.70	No records	
72	North	B	A	195.5	8	PVC	0.53%	1.14	No records	
73	North	12	11	288.9	6	Clay	0.87%	0.49	Under water just upstream of MH 11	Clean pipe and re-televise. Replace if cracks or dips found.
74	North	11	10	173.4	6	Clay	0.17%	0.21	No damage or repairs noted	Clean pipe and televise.
75	North	10	9	145.2	6	Clay	1.01%	0.52	No damage or repairs noted	Clean pipe and televise.

Table 4.2.2- Sanitary Gravity Piping Inventory & Recommended Improvements

Pipe Number	System	From MH	To MH	Length (ft)	Size (inches)	Material	Slope (%)	Capacity (cfs)	Conditions per 1987 Televising	Comments /Recommended Improvements
77	North	9	Septic Tank	13.7	6	Ductile Iron	*	*	No damage or repairs noted	
78	North	40	9	33.2	6	Clay	0.03%	0.09	No damage or repairs noted	Clean pipe and televise.
79	North	A	Pump Station	103.1	8	PVC	0.40%	0.99	No damage or repairs noted	
80	North	8	9	73.0	6	Clay	0.55%	0.39	No damage or repairs noted	Replace due to surcharging noted during year 2010 flow monitoring. Replace at time of Pumping Station replacement.
81	South	Red Oak Shelter	S18	11.5	4	Ductile Iron	*	*	No records	
82	South	Red Oak Shelter	S14	11.8	6	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
83	South	White Oak Shelter	S17	43.5	6	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
85	South	Shagbark Shelter	S13	18.8	6	Clay	*	*	No records	Clean pipe and televise.
86	South	White Pine Shelter	S10	27.6	6	PVC	*	*	No records	
87	South	Tamarack Shelter	S2	13.1	6	Ductile Iron	*	*	No records	
88	North	Bathhouse	25	81.2	4	Clay	*	*	No damage or repairs noted	Replace with PVC. In North Shore Flood Prone Area.
89	North	Office	20	80.8	6	PVC	*	*	No damage or repairs noted	Likely replaced since 1987. Current MH inventory = PVC. 1987 infor. = Clay.
90	North	Visitor Center	19	392.8	6	Clay	*	*	No damage or repairs noted	Replace with PVC. In North Shore Flood Prone Area.
91	North	Chalet	23	160.7	6	Clay	*	*	4" Clay leaves Chalet, then 6"	Replace with PVC. In North Shore Flood Prone Area.
92	North	Bldg. 1038	22	20.8	4	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
93	North	Bathhouse	22	297.0	6	Clay	*	*	Cracks in pipe 30' downstream bathhouse Dips in pipe 150' downstream bathhouse	Replace at least 150' of pipe due to dips & cracks.
94	North	Toilet Building	36	206.7	6	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
95	North	Toilet Building	52 Drop	91.9	6	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
96	North	Toilet Building	45	277.7	6	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
97	North	Toilet Building	49	15.7	6	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
98	North	Toilet Building	51	13.9	6	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
99	North	Toilet Building	IA 5	9.3	6	PVC	*	*	New since 1987	
100	North	Toilet Building	58	69.6	6	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
101	North	Toilet Building	1	16.4	6	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
102	North	Toilet Building	2 Drop	15.3	6	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
103	North	Toilet Building	4 Drop	44.0	6	Clay	*	*	No damage or repairs noted	Clean pipe and televise.
104	North	Dump Station	5	15.0	4	Ductile Iron			No damage or repairs noted	
105	North	Dump Station	44	11.9	4	Ductile Iron			No damage or repairs noted	
106	South	S6	Pump Station	10.0	6	Clay		0.00	No damage or repairs noted	Replace with PVC. In South Shore Flood Prone Area.
107	South	S5	Pump Station	10.0	6	Clay		0.00	No damage or repairs noted	Replace with PVC. In South Shore Flood Prone Area.

Table 4.2.2- Sanitary Gravity Piping Inventory & Recommended Improvements

Pipe Number	System	From MH	To MH	Length (ft)	Size (inches)	Material	Slope (%)	Capacity (cfs)	Conditions per 1987 Televising	Comments /Recommended Improvements
108	North	9	North Pump Station	25.9	6	Clay	*	*	No damage or repairs noted	Replace due to surcharging noted during year 2010 flow monitoring. Replace at time of Pumping Station replacement.
109	North	Pump Station	Septic Tank	6.5	4	Ductile Iron	*	*	No damage or repairs noted	Overflow pipe from North Pump Station Wetwell
110	North	Septic Tank	North Pump Station	4.1	4	Ductile Iron	*	*	No damage or repairs noted	Suction Pipe from Septic Tank to North Pump Station
111	North	62	Pipe 70	36.8	4	PVC	*	*	No damage or repairs noted	Lateral from Stone Maintenance Garage
112	North	62	Stone Maint. Garage	12.0	4	Clay	*	*	No damage or repairs noted	

 = First Priority Improvement
 = Second Priority Improvement
 = Pipe to be cleaned and televised to determine if improvements required.

Table 4.2.3- Sanitary Gravity Piping to be Televised

Pipe Number	System	Length (ft)	Size (inches)	From MH	To MH	Material
15	North	143.1	6	7 Drop	8	Clay
16	North	64.7	6	6	7 Drop	Clay
17	North	299.6	6	4 Drop	6	Clay
18	North	497.7	6	2 Drop	4 Drop	Clay
19	North	400.7	6	1	4 Drop	Clay
20	North	63.8	8	5	6	Clay
22	North	150.6	6	42	41	Clay
23	North	221.7	6	43	42	Clay
24	North	148.2	6	45	43	Clay
25	North	37.4	8	44	45	Clay
26	North	135.8	6	46 Drop	45	Clay
27	North	314.2	6	52 Drop	46 Drop	Clay
28	North	232.4	6	53 Drop	52 Drop	Clay
29	North	114.2	6	54 Drop	53 Drop	Clay
30	North	156.0	6	55	54 Drop	Clay
31	North	109.0	6	56 Drop	55	Clay
35	North	116.3	6	57 Drop	56 Drop	Clay
36	North	99.8	6	58	57 Drop	Clay
37	North	199.2	6	47	46 Drop	Clay
38	North	386.7	6	48	47	Clay
39	North	186.2	6	49	48	Clay
40	North	112.8	6	IA 1	49	Clay
41	North	111.6	6	50	IA 1	Clay
42	North	342.6	6	51	50	Clay
50	North	84.9	6	29	28	Clay
51	North	145.1	6	30	29	Clay
52	North	109.4	6	31	30	Clay
53	North	74.4	6	32	31	Clay
54	North	83.3	6	33	32	Clay
55	North	119.9	6	34	33	Clay
56	North	174.2	6	35	34	Clay
57	North	184.5	6	36	35	Clay
73	North	288.9	6	12	11	Clay
74	North	173.4	6	11	10	Clay
75	North	145.2	6	10	9	Clay
78	North	33.2	6	40	9	Clay
80	North	73.0	6	8	9	Clay
92	North	20.8	4	Bldg. 1038	22	Clay
94	North	206.7	6	Toilet Building	36	Clay
95	North	91.9	6	Toilet Building	52 Drop	Clay
96	North	277.7	6	Toilet Building	45	Clay
97	North	15.7	6	Toilet Building	49	Clay
98	North	13.9	6	Toilet Building	51	Clay
100	North	69.6	6	Toilet Building	58	Clay
101	North	16.4	6	Toilet Building	1	Clay
102	North	15.3	6	Toilet Building	2 Drop	Clay
103	North	44.0	6	Toilet Building	4 Drop	Clay

Table 4.2.3- Sanitary Gravity Piping to be Televised

Pipe Number	System	Length (ft)	Size (inches)	From MH	To MH	Material
108	North	25.9	6	9	North Pump Station	Clay
2	South	58.1	6	S17	S16	Clay
4	South	198.6	6	S15	S14	Clay
8	South	379.7	6	S8	S7	Clay
9	South	240.7	6	S9	S8	Clay
82	South	11.8	6	Red Oak Shelter	S14	Clay
83	South	43.5	6	White Oak Shelter	S17	Clay
85	South	18.8	6	Shagbark Shelter	S13	Clay
Total =		8,083				

Table 4.2.4- Sanitary Gravity Piping Prioritized Recommended Improvements

Pipe Number	System	Priority	From MH	To MH	Length (ft)	Size (inches)	Material	Recommended Improvements
66	North	1	25	24	344.3	6	Clay	Replace with PVC. In North Shore Flood Prone Area.
65	North	2	24	21	311.2	6	Clay	Replace with PVC. In North Shore Flood Prone Area.
62	North	3	21	20	222.9	6	Clay	Replace with PVC. In North Shore Flood Prone Area.
63	North	4	23	21	57.8	6	Clay	Replace with PVC. In North Shore Flood Prone Area.
64	North	5	22	23	185.0	6	Clay	Replace with PVC. In North Shore Flood Prone Area.
91	North	6	Chalet	23	160.7	6	Clay	Replace with PVC. In North Shore Flood Prone Area.
90	North	7	Visitor Center	19	392.8	6	Clay	Replace with PVC. In North Shore Flood Prone Area.
48	North	8	18	17	267.6	6	Clay	Replace with PVC. In North Shore Flood Prone Area.
88	North	9	Bathhouse	25	81.2	4	Clay	Replace with PVC. In North Shore Flood Prone Area.
49	North	10	28	18	136.7	6	Clay	Replace with PVC. In North Shore Flood Prone Area.
21	North	11	41	40	120.8	6	Clay/PVC	Over creek & frequently washes out. Reinforce with steel I Beam
93	North	12	Bathhouse	22	297.0	6	Clay	Replace at least 150' of pipe due to dips & cracks.
14	South	1	S2	S3	243.7	6	Clay	Replace with PVC. In South Shore Flood Prone Area.
13	South	2	S3	S5	185.9	6	Clay	Replace with PVC. In South Shore Flood Prone Area.
5	South	3	S14	S6	180.8	6	Clay	Replace with PVC. In South Shore Flood Prone Area.
7	South	4	S7	S6	125.2	8	Clay	Replace with PVC. In South Shore Flood Prone Area.
106	South	5	S6	Pump Station	10.0	6	Clay	Replace with PVC. In South Shore Flood Prone Area.
107	South	6	S5	Pump Station	10.0	6	Clay	Replace with PVC. In South Shore Flood Prone Area.
3	South	7	S16	S15	450.6	6	Clay	Replace Pipe due to cracks and dips.
10	South	8	S11	S9	370.9	6	Clay	Replace pipe at MH S9 due to crack.
11	South	9	S10	S9	101.1	6	Clay	Roto-clean pipe to remove roots.
12	South	10	S13	S10	359.9	6	Clay	Roto-clean pipe to remove roots.

Table 4.3.2-3
ENGINEER'S OPINION OF PROBABLE COST
NORTH SHORE FLOOD AREA SEWER REPLACEMENT
DSF - DEVIL'S LAKE SANITARY SYSTEM STUDY
BARABOO, WISCONSIN
March 3, 2011

Item #	Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	4" PVC Sanitary Sewer	LF	81	\$40.00	\$3,240
2	6" PVC Sanitary Sewer	LF	2,080	\$50.00	\$104,000
3	48" Sanitary Manhole w/ Casting and Waterproof Lid	EA	12	\$3,500.00	\$42,000
4	New Cover w/ Concealed Pick Holes	EA	5	\$1,500.00	\$7,500
5	New Cover, Fame & Conc. Flat Top	EA	2	\$1,800.00	\$3,600
6	Internal Chimney Seal	EA	2	\$425.00	\$850
7	New Cover w/ Concealed Pick Holes & Install Internal Chimney Seal	EA	1	\$1,925.00	\$1,925
8	Abandon Existing Sanitary Manhole	EA	2	\$500.00	\$1,000
9	Abandon Existing Sanitary Sewer	LS	1	\$500.00	\$500
10	Restoration - Seed and Fertilize	SY	4,802	\$0.75	\$3,602
SUBTOTAL =					\$168,217
Contingency (15% +/-) =					\$25,283
TOTAL =					\$193,500

SUBTOTAL =	\$168,217
Contingency (20% +/-) =	\$33,683
TOTAL =	\$201,900

Notes:

1. It is assumed that Sanitary Manholes and Sanitary Sewer will be replaced in the same location as existing.
2. Unit Costs for Sanitary Sewer and Sanitary Manholes include removal of existing structures & pipe.
3. Resotoration is assumed as 20' wide area over length of sanitary pipe being replaced.



Table 4.3.4-3
ENGINEER'S OPINION OF PROBABLE COST
SOUTH SHORE FLOOD AREA SEWER REPLACEMENT
DSF - DEVIL'S LAKE SANITARY SYSTEM STUDY
BARABOO, WISCONSIN
March 3, 2011

Item #	Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	6" PVC Sanitary Sewer	LF	631	\$50.00	\$31,550
2	8" PVC Sanitary Sewer	LF	125	\$55.00	\$6,875
3	48" Sanitary Manhole w/ Casting and Waterproof Lid	EA	2	\$3,500.00	\$7,000
4	New Cover w/ Concealed Pick Holes	EA	1	\$1,500.00	\$1,500
5	New Cover, Fame & Conc. Flat Top	EA	1	\$1,800.00	\$1,800
6	Restoration - Seed and Fertilize	SY	1,680	\$0.75	\$1,260
SUBTOTAL =					\$49,985
Contingency (15% +/-) =					\$7,515
TOTAL =					\$57,500

SUBTOTAL =	\$49,985
Contingency (20% +/-) =	\$10,015
TOTAL =	\$60,000

Notes:

1. It is assumed that Sanitary Manholes and Sanitary Sewer will be replaced in the same location as existing.
2. Unit Costs for Sanitary Sewer and Sanitary Manholes include removal of existing structures & pipe.
3. Resotoration is assumed as 20' wide area over length of sanitary pipe being replaced.

Table 4.4
ENGINEER'S OPINION OF PROBABLE COST
NATURE CENTER SEWER LATERAL
DSF - DEVIL'S LAKE SANITARY SYSTEM STUDY
BARABOO, WISCONSIN
March 7, 2011

Item #	Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	4" PVC Sanitary Sewer	LF	817	\$30.00	\$24,510
2	4" Sanitary Sewer Clean Out	EA	4	\$750.00	\$3,000
3	Rock Blasting - Utility Trench	LF	410	\$50.00	\$20,500
4	Rock Removal - Utility Trench	CY	718	\$8.00	\$5,740
5	Imported Backfill	Ton	1,875	\$10.00	\$18,750
6	Tree & Vegetation Removal	LS	1	\$10,000.00	\$10,000
7	Restoration - Seed and Fertilize	SY	1,815	\$0.75	\$1,361
SUBTOTAL =					\$83,861
Contingency (15% +/-) =					\$12,639
TOTAL =					\$96,500

SUBTOTAL =	\$83,861
Contingency (20% +/-) =	\$16,839
TOTAL =	\$100,700

Notes:

1. Assume 50% of pipe length will require rock blasting
2. Resotoration is assumed as 20' wide area over length of sanitary pipe being replaced.

Table 7.3.-I
ENGINEER'S OPINION OF PROBABLE COST
NORTH SHORE PUMP STATION - EQUIPMENT REPLACEMENT
DSF - DEVIL'S LAKE SANITARY SYSTEM STUDY
BARABOO, WISCONSIN
March 3, 2011

Item #	Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	Pumps	EA	2	\$18,000.00	\$36,000
2	Dry-Pit Check Valves, Plug Valves & Piping	LS	1	\$3,000.00	\$3,000
3	Installation Labor Pumps, Valves & Piping	LS	1	\$3,000.00	\$3,000
4	Access Ladder	LS	1	\$2,000.00	\$2,000
5	Heater	LS	1	\$200.00	\$200
6	Dehumidifier	LS	1	\$300.00	\$300
7	Sump Pump, Piping, Sump	LS	1	\$5,000.00	\$5,000
8	Auto-Dialer	LS	1	\$4,800.00	\$4,800
9	Dry-Pit Hatch	LS	1	\$2,500.00	\$2,500
10	Wetwell Conc. Roof & Hatch	LS	1	\$8,000.00	\$8,000
11	Remove Cominutor & By-pass Screen	LS	1	\$3,000.00	\$3,000
12	Abandon Septic Tank	LS	1	\$12,000.00	\$12,000
13	Portable Emergency Generator (60 kW, trailered, diesel)	LS	1	\$50,000.00	\$50,000
				SUBTOTAL =	\$129,800
				Contingency (15% +/-) =	\$19,500
				TOTAL =	\$149,300

SUBTOTAL =	\$79,800
Contingency (20% +/-) =	\$16,000
TOTAL =	\$95,800

Table 7.3.-II
ENGINEER'S OPINION OF PROBABLE COST
NORTH SHORE PUMP STATION - NEW SUBMERSIBLE PUMP STATION
DSF - DEVIL'S LAKE SANITARY SYSTEM STUDY
BARABOO, WISCONSIN
March 3, 2011

Item #	Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	New Submersible Pump Station	LS	1	\$200,000.00	\$200,000
2	8" PVC Sanitary Sewer (SMH A to Pump Station)	LF	88	\$55.00	\$4,840
3	8" PVC Sanitary Sewer (SMH 40 to Pump Station)	LF	65	\$55.00	\$3,575
4	8" PVC Sanitary Sewer (SMH 8 to Pump Station)	LF	58	\$55.00	\$3,190
5	Abandon SMH #9	EA	1	\$500.00	\$500
6	Abandon Septic Tank	LS	1	\$12,000.00	\$12,000
7	Abandon Existing Pumping Station	LS	1	\$6,000.00	\$6,000
8	Restoration - Seed and Fertilize	SY	900	\$0.75	\$675
9	Portable Emergency Generator (60 kW, trailered, diesel)	LS	1	\$50,000.00	\$50,000
SUBTOTAL =					\$280,780
Contingency (15% +/-) =					\$42,120
TOTAL =					\$322,900

SUBTOTAL =	\$230,780
Contingency (20% +/-) =	\$46,220
TOTAL =	\$277,000

Table 7.6.-I
ENGINEER'S OPINION OF PROBABLE COST
SOUTH SHORE PUMP STATION - NEW SUBMERSIBLE PUMP STATION
DSF - DEVIL'S LAKE SANITARY SYSTEM STUDY
BARABOO, WISCONSIN
March 3, 2011

Item #	Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	New Submersible Pump Station	LS	1	\$200,000.00	\$200,000
2	8" PVC Sanitary Sewer (SMH S3 to Pump Station)	LF	210	\$55.00	\$11,550
3	8" PVC Sanitary Sewer (SMH S18 to Pump Station)	LF	100	\$55.00	\$5,500
4	8" PVC Sanitary Sewer (SMH S14 to Pump Station)	LF	185	\$55.00	\$10,175
5	Abandon SMH #S5 & # S6	EA	2	\$500.00	\$1,000
6	Abandon Septic Tank	LS	1	\$8,000.00	\$8,000
7	Abandon Existing Pumping Station	LS	1	\$6,000.00	\$6,000
8	Restoration - Seed and Fertilize	SY	3,900	\$0.75	\$2,925
9	Portable Emergency Generator (40 kW, trailered, diesel)	LS	1	\$45,000.00	\$45,000
SUBTOTAL =					\$290,150
Contingency (15% +/-) =					\$43,550
TOTAL =					\$333,700

SUBTOTAL =	\$245,150
Contingency (20% +/-) =	\$49,050
TOTAL =	\$294,200

**Table 8.4-1
ENGINEER'S OPINION OF PROBABLE COST
SOUTH SHORE FORCE MAIN WINTERIZATION
ROCK REMOVAL HALF OF THE ROUTE
DSF - DEVIL'S LAKE SANITARY SYSTEM STUDY
BARABOO, WISCONSIN
March 3, 2011**

Item #	Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	Existing Force Main Removal	LF	10,100	\$10.00	\$101,000
2	Rock Blasting - Utility Trench	LF	5,050	\$50.00	\$252,500
3	Rock Removal - Utility Trench	CY	8,838	\$8.00	\$70,700
4	6" HDPE Force Main Pipe	LF	10,100	\$30.00	\$303,000
5	Imported Backfill	Ton	22,210	\$10.00	\$222,100
6	Restoration - Seed and Fertilize	SY	22,444	\$0.75	\$16,833
SUBTOTAL =					\$966,133
Contingency (15% +/-) =					\$144,967
TOTAL =					\$1,111,100

SUBTOTAL =	\$966,133
Contingency (20% +/-) =	\$193,267
TOTAL =	\$1,159,400

Notes:

1. It is anticipated that the new force main be in the same horizontal location as the existing force main.
2. It is anticipated that the force main replacement will be completed during late fall when south shore facilities are closed.
3. Resotation is assumed as 20' wide area over the entire length of the force main.
4. Unit prices verified with Peter Schraufnagle of SX Blasting (262) 252-3200.

Table 8.4-2
ENGINEER'S OPINION OF PROBABLE COST
SOUTH SHORE FORCE MAIN WINTERIZATION
ROCK REMOVAL ENTIRE ROUTE
DSF - DEVIL'S LAKE SANITARY SYSTEM STUDY
BARABOO, WISCONSIN
March 3, 2011

Item #	Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	Existing Force Main Removal	LF	10,100	\$10.00	\$101,000
2	Rock Blasting - Utility Trench	LF	10,100	\$50.00	\$505,000
3	Rock Removal - Utility Trench	CY	17,675	\$8.00	\$141,400
4	6" HDPE Force Main Pipe	LF	10,100	\$30.00	\$303,000
5	Imported Backfill	Ton	22,210	\$10.00	\$222,100
6	Restoration - Seed and Fertilize	SY	22,444	\$0.75	\$16,833
SUBTOTAL =					\$1,289,333
Contingency (15% +/-) =					\$193,467
TOTAL =					\$1,482,800

SUBTOTAL =	\$1,289,333
Contingency (20% +/-) =	\$257,867
TOTAL =	\$1,547,200

Notes:

1. It is anticipated that the new force main be in the same horizontal location as the existing force main.
2. It is anticipated that the force main replacement will be completed during late fall when south shore facilities are closed.
3. Resotation is assumed as 20' wide area over the entire length of the force main.
4. Unit prices verified with Peter Schraufnagle of SX Blasting (262) 252-3200.

Table 8.4-3
ENGINEER'S OPINION OF PROBABLE COST
SOUTH SHORE FORCE MAIN REPLACEMENT
REPLACEMENT AT SAME HORIZONTAL & VERTICAL LOCATION
DSF - DEVIL'S LAKE SANITARY SYSTEM STUDY
BARABOO, WISCONSIN
March 3, 2011

Item #	Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
1	Existing Force Main Removal	LF	10,100	\$10.00	\$101,000
4	6" HDPE Force Main Pipe	LF	10,100	\$30.00	\$303,000
5	Imported Backfill	Ton	6,450	\$10.00	\$64,500
6	Restoration - Seed and Fertilize	SY	22,444	\$0.75	\$16,833
SUBTOTAL =					\$485,333
Contingency (20% +/-) =					\$97,067
TOTAL =					\$582,400

SUBTOTAL =	\$485,333
Contingency (20% +/-) =	\$97,067
TOTAL =	\$582,400

Notes:

1. It is anticipated that the new force main be in the same horizontal and vertical location as the existing force main.
2. It is anticipated that the force main replacement will be completed during late fall when south shore facilities are closed.
3. Resotoration is assumed as 20' wide area over the entire length of the force main.

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 1 Street Name: _____ Nearest Address #: _____

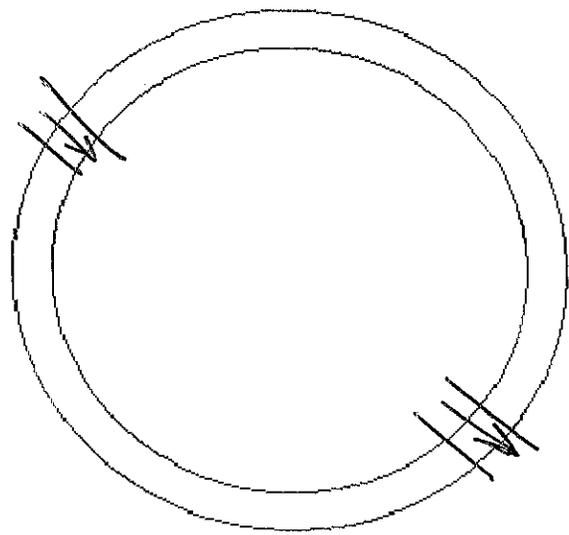
INDICATE ONE:

MANHOLE TYPE: Precast Block Brick
 CONE TYPE: Eccentric Concentric Flat Top
 GENERAL CONDITION: Good Fair Poor
 COVER TYPE: Concealed Open Pic Holes Locking Non-Locking
 CASTING: Depth: 6"
 CONCRETE RINGS: Depth: 1 x 4", 1 x 2" Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	NW	2.90		6"		CLAY
IN OUT	SE	3.98		8"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 2 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 6"

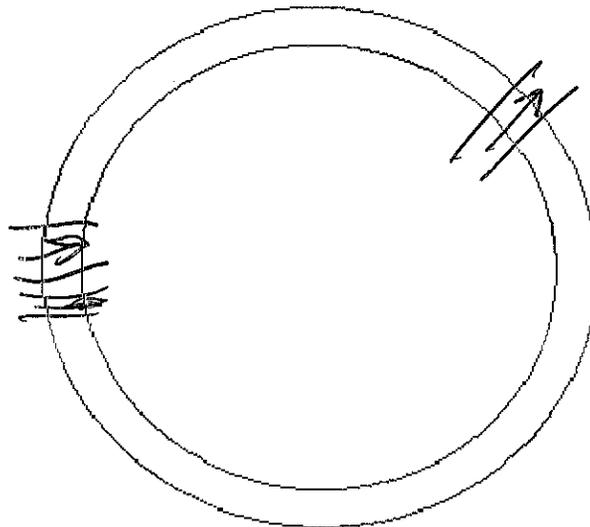
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
(IN) OUT	W	3.0		6"		ORANGE PVC? CLAY
(IN) OUT	W	7.40		6"		PVC
IN (OUT)	NE	7.50		6"		CLAY
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

DROP MH?

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 4 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 6"

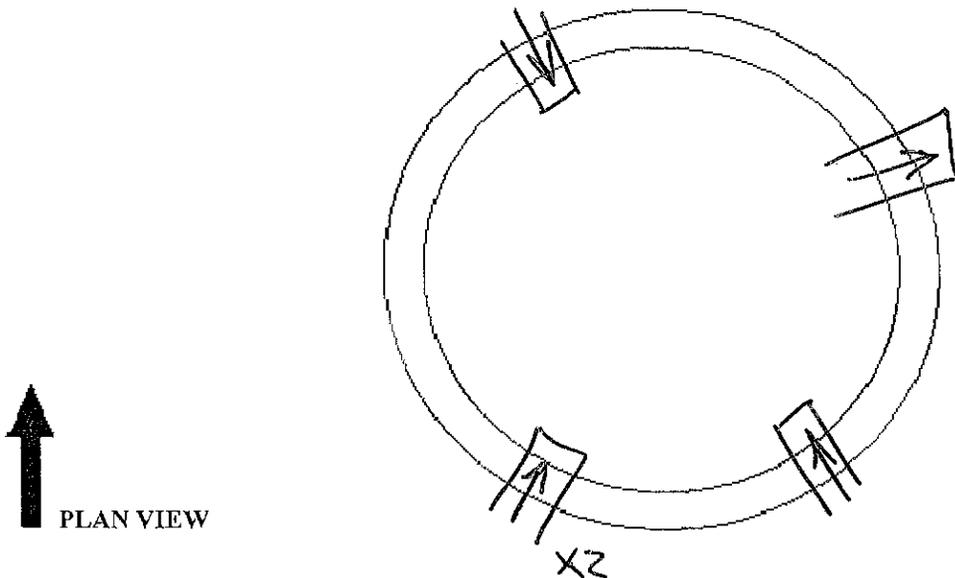
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
(IN) OUT	N	7.00		6"		CLAY
(IN) OUT	SSW	3.94		6"		GRADE PVC
(IN) OUT	SSW	7.28		6"		CLAY
(IN) OUT	S	4.30		6"		CLAY
(OUT)	E	7.44		6"		CLAY

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 5 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

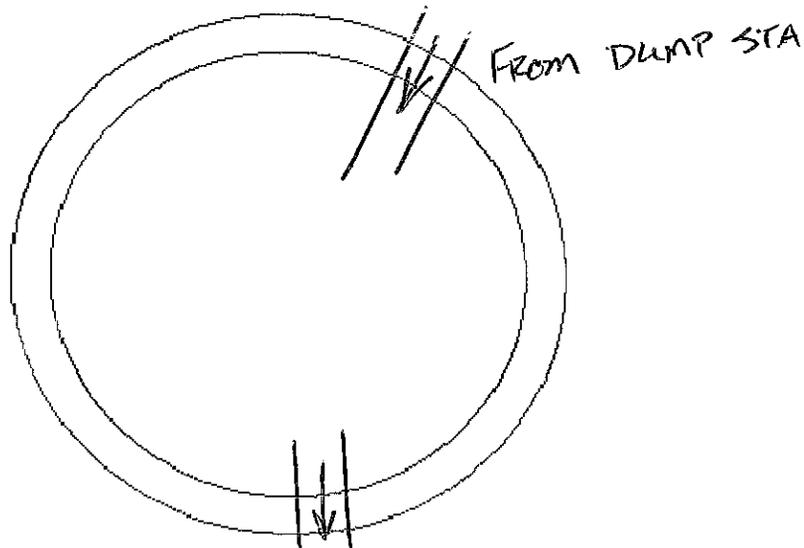
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	NE	2.9		4' 8"		?
IN <u>OUT</u>	S	3.1		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

CASTING LOOSE

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 6 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 6"

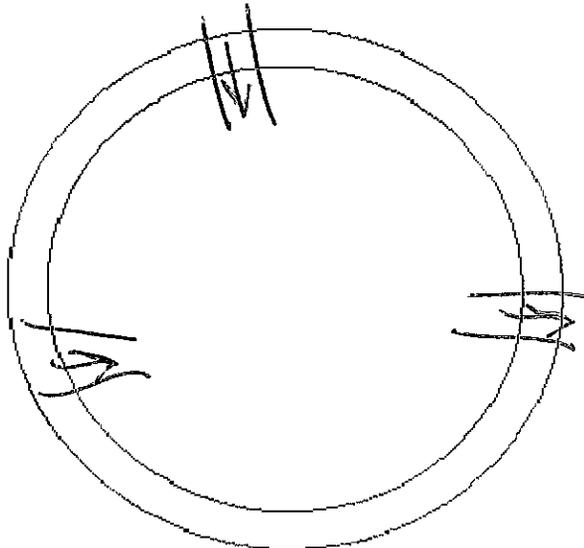
CONCRETE RINGS: Depth: 2x4" Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT		11.20				
<input checked="" type="radio"/> IN <input type="radio"/> OUT	N	11.20		6"		CLAY
<input checked="" type="radio"/> IN <input type="radio"/> OUT	W	13.46		6"		
IN <input checked="" type="radio"/> OUT	E	13.50		6"		

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.

↑
PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 7 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: *GA* Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<u>IN</u> OUT	<u>NW</u>	<u>5.25</u>		<u>6"</u>		<u>CLAY</u>
IN <u>OUT</u>	<u>SE</u>	<u>14.75</u>		<u>6"</u>		<u>CLAY</u>
IN OUT						
IN OUT						

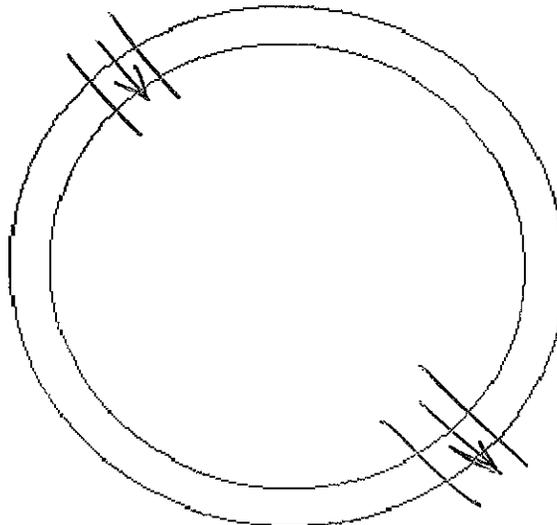
COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

DROP MH?

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 8 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

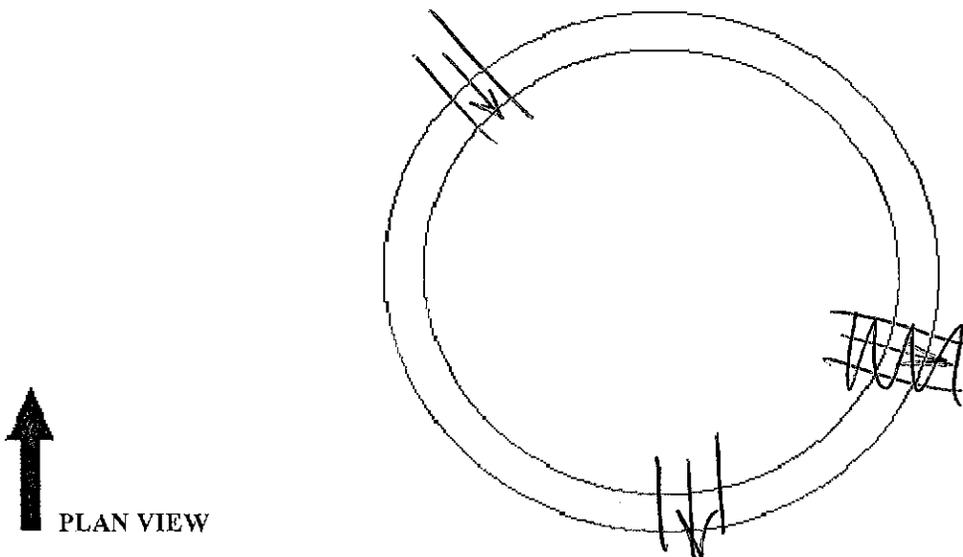
MANHOLE TYPE: Precast Block Brick
 CONE TYPE: Eccentric Concentric Flat Top
 GENERAL CONDITION: Good Fair Poor
 COVER TYPE: Concealed Open Pic Holes Locking Non-Locking
 CASTING: Depth: 9"
 CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	E	2.75		6"		CLAY
IN OUT	NW	2.72		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

VERY LOW FLOW

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 9 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **METAL PLATE**

CASTING: Depth: NONE

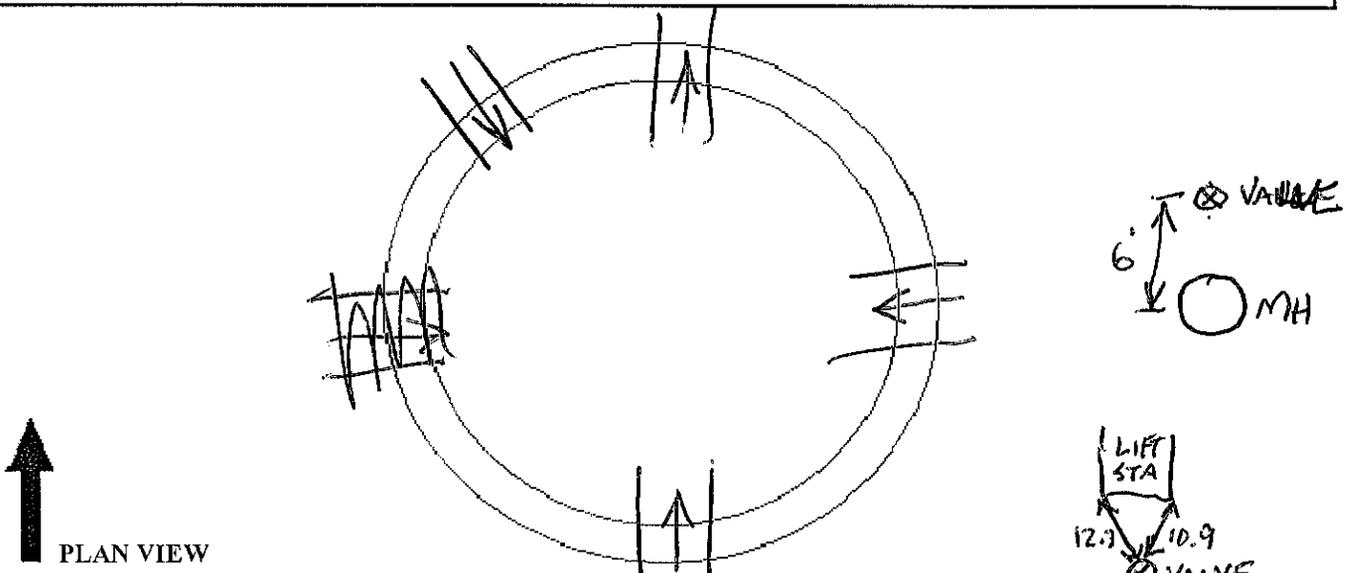
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="radio"/> IN <input type="radio"/> OUT	W S	2.55				
IN <input checked="" type="radio"/> OUT	W N	2.65				
<input checked="" type="radio"/> IN <input type="radio"/> OUT	W E	2.20				
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

NASTY
VERY SLOW FLOW
WATER + SOLID BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

~~CHANGE
OLD 10 TO A~~

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 10 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: 3' DIA Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: NONE

CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	<u>N</u>	<u>2.38</u>		<u>6"</u>		<u>CLAY</u>
IN OUT	<u>S</u>	<u>2.28</u>		<u>6"</u>		<u>CLAY</u>
IN OUT						
IN OUT						

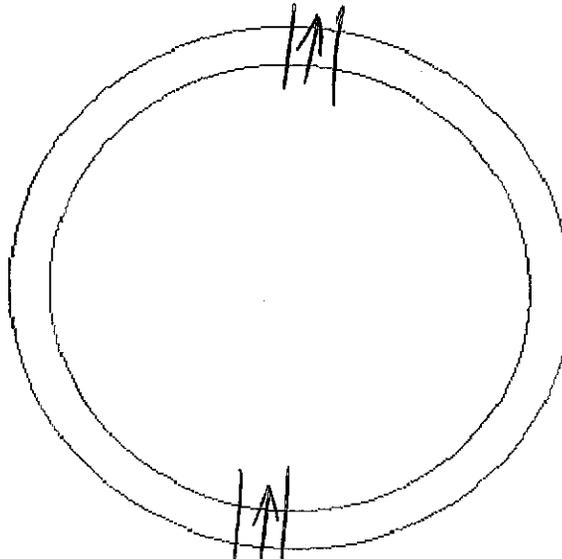
COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

BLOCKS IN BOTTOM
SOLIDS BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

*Sketch old
H to B*

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

*Need
to
be
shot*

Manhole #: 11 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Rings Brick CMP

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Hole Locking Non-Locking

CASTING: Depth: 4"

CONCRETE RINGS: Depth: NONE Other: _____

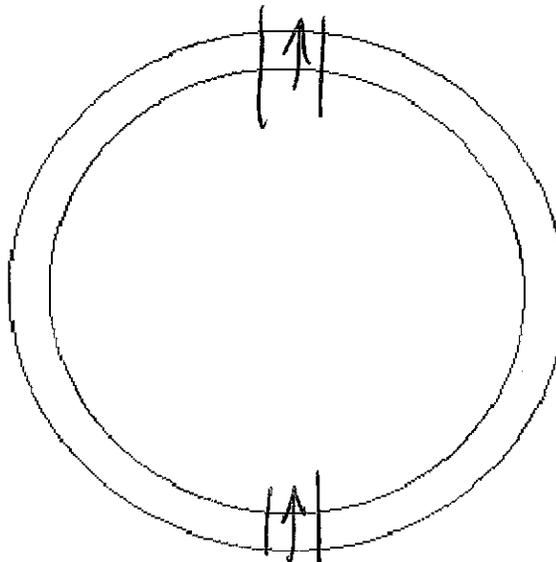
FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	S	3.18		6"		CLAY
IN OUT	N	3.20		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

*GRAVEL IN BOTTOM
SOLID BUILDUP*

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.

PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation

PROJECT NO.: 043107309

Manhole #: 12

Street Name: _____

Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

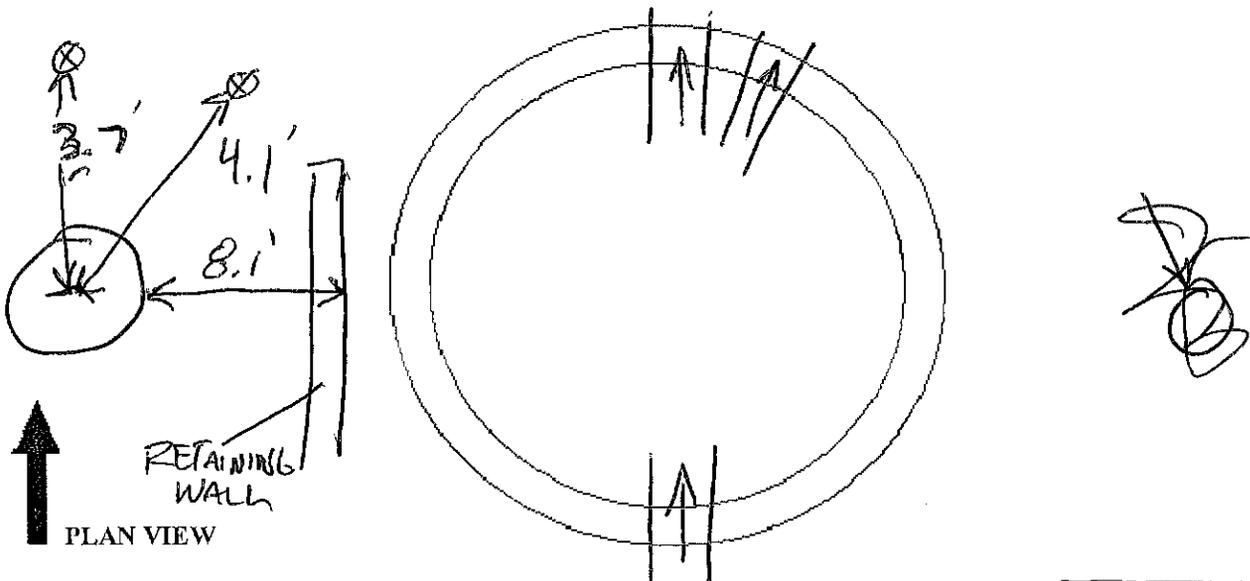
CONCRETE RINGS: Depth: 3 x 2" Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	S	4.40		8"		PVC
IN OUT	N	4.42		6"		CLAY ?
IN OUT	NNE	4.42		6"		CLAY ?
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

VERY SLOW FLOW
WATER 4" DEEP
SOLID BUILD UP ON BENCH

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 15 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking BOLTED DOWN

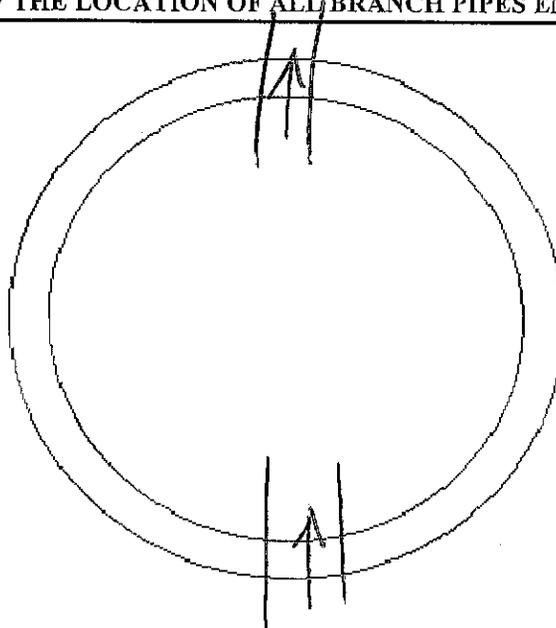
CASTING: Depth: 9"

CONCRETE RINGS: Depth: 5 x 2" Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
(IN) OUT	S	9.76		8"		PVC
IN (OUT)	N	9.76		8"		PVC
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 16 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE:	<input checked="" type="checkbox"/> Precast	<input type="checkbox"/> Block	<input type="checkbox"/> Brick
CONE TYPE:	<input type="checkbox"/> Eccentric	<input checked="" type="checkbox"/> Concentric	<input type="checkbox"/> Flat Top
GENERAL CONDITION:	<input checked="" type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
COVER TYPE:	<input checked="" type="checkbox"/> Concealed	<input type="checkbox"/> Open Pic Holes	<input type="checkbox"/> Locking <input type="checkbox"/> Non-Locking <input checked="" type="checkbox"/> Bolted Down
CASTING:	Depth: <u>9"</u>		
CONCRETE RINGS:	Depth: <u>3 x 2"</u> Other: _____		

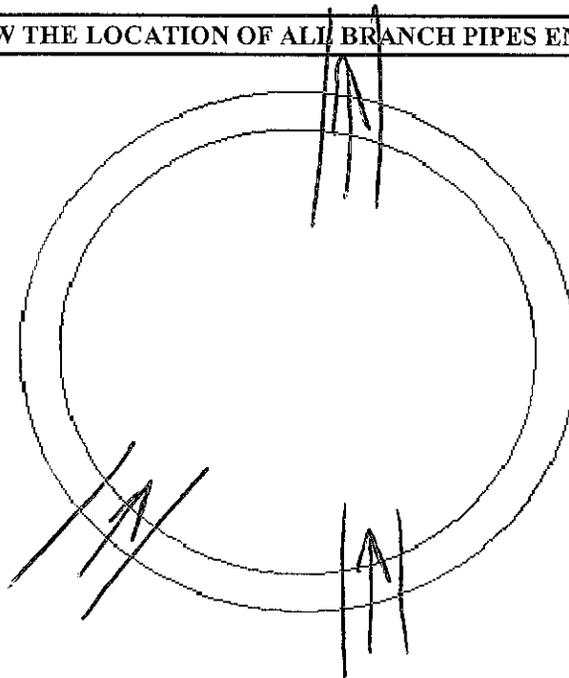
FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	S	5.80		8"		PVC
IN OUT	SW	8.83		8		PVC
IN OUT	N	8.93		8		PVC
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

2" BELOW SURFACE

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.

↑
PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 17 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **STONE**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

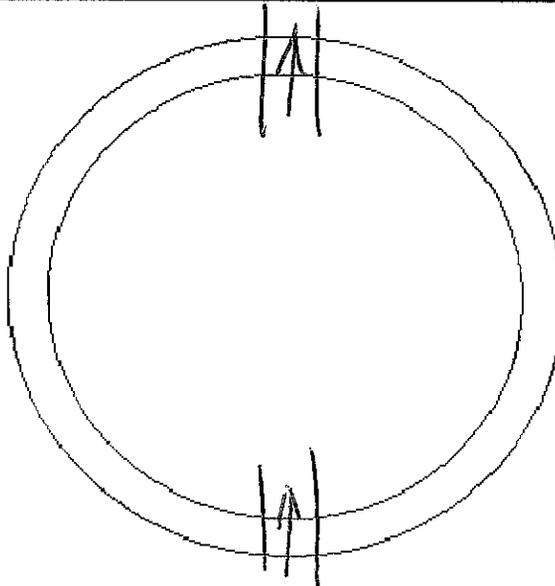
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	<u>N</u>	<u>5.34</u>		<u>6"</u>		<u>CLAY</u>
IN OUT	<u>S</u>	<u>5.28</u>		<u>6"</u>		<u>CLAY</u>
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

9" ABOVE SURFACE
DIRT

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 18 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **STONE**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **CONC**

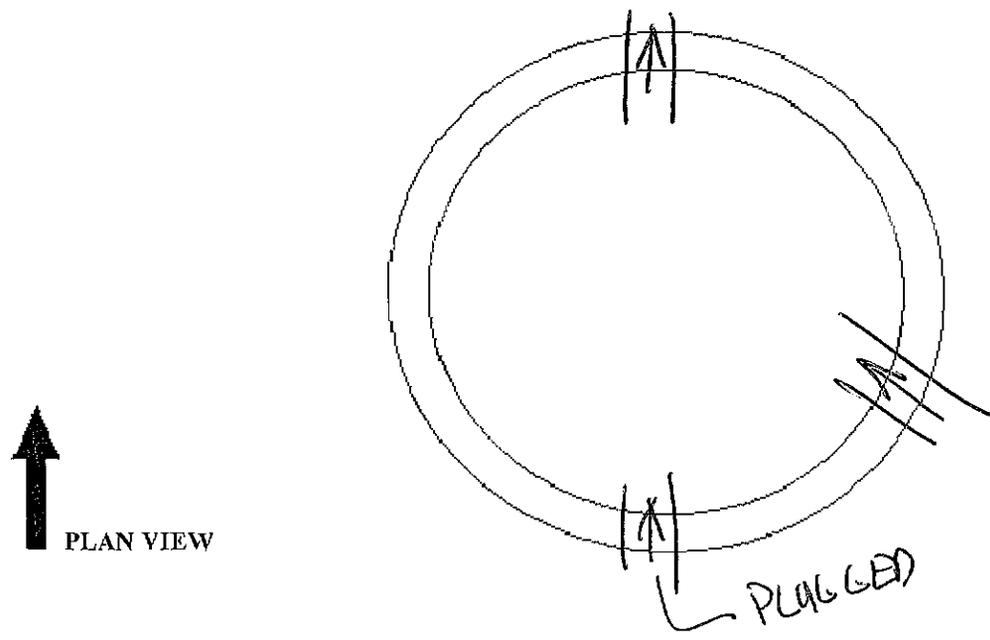
CASTING: Depth: NONE

CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN (OUT)		<u>4.46</u>		<u>6"</u>		<u>CLAY</u>
(IN) OUT		<u>4.44</u>		<u>6"</u>		<u>CLAY</u>
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 19 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

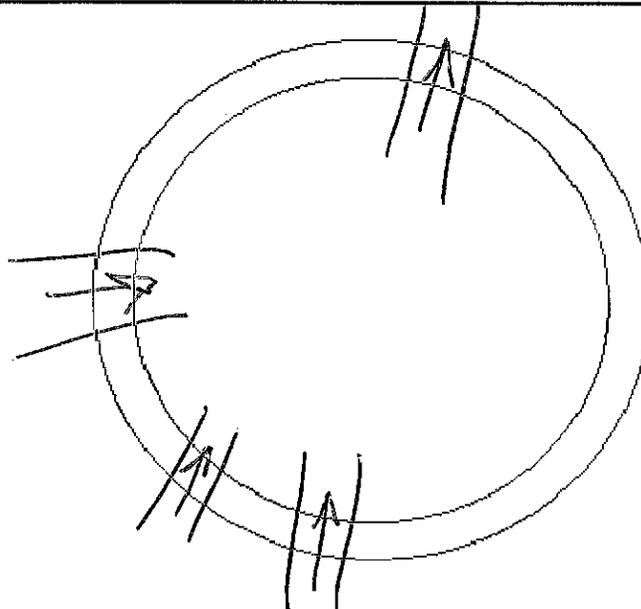
MANHOLE TYPE:	<input type="checkbox"/> Precast	<input checked="" type="checkbox"/> Block	<input type="checkbox"/> Brick
CONE TYPE:	<input type="checkbox"/> Eccentric	<input checked="" type="checkbox"/> Concentric	<input type="checkbox"/> Flat Top
GENERAL CONDITION:	<input type="checkbox"/> Good	<input checked="" type="checkbox"/> Fair	<input type="checkbox"/> Poor
COVER TYPE:	<input type="checkbox"/> Concealed	<input checked="" type="checkbox"/> Open Pic Hole	<input type="checkbox"/> Locking <input type="checkbox"/> Non-Locking <i>1 - WANTED</i>
CASTING:	Depth: <u>9"</u>		
CONCRETE RINGS:	Depth: <u>1 x 2"</u> Other: _____		

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
(IN) OUT	S	8.30		8"		PVC
(IN) OUT	W	7.12		6"		CLAY
IN (OUT)	N	8.42		8"		PVC
(IN) OUT	SW	3.80		4"		D.I.

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 20 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick STONE

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking NO PICK HOLES

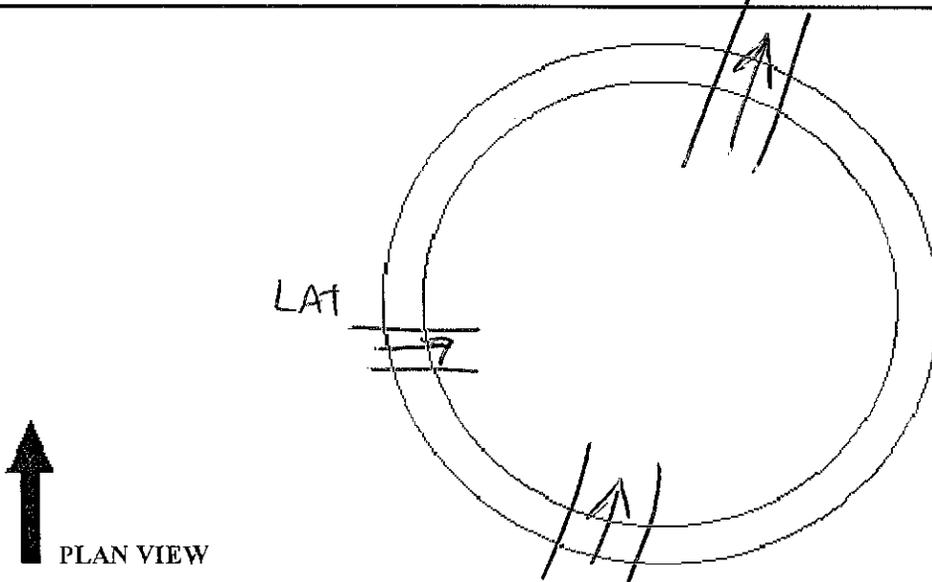
CASTING: Depth: 9"

CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="radio"/> IN <input type="radio"/> OUT	<u>S</u>	<u>8.88</u>		<u>8"</u>		<u>PVC</u>
<input checked="" type="radio"/> IN <input type="radio"/> OUT	<u>W</u>	<u>8.98</u>		<u>6"</u>		<u>CLAY</u>
IN <input checked="" type="radio"/> OUT	<u>N</u>	<u>9.00</u>		<u>8"</u>		<u>PVC</u>
IN <input type="radio"/> OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 21 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick STONE

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

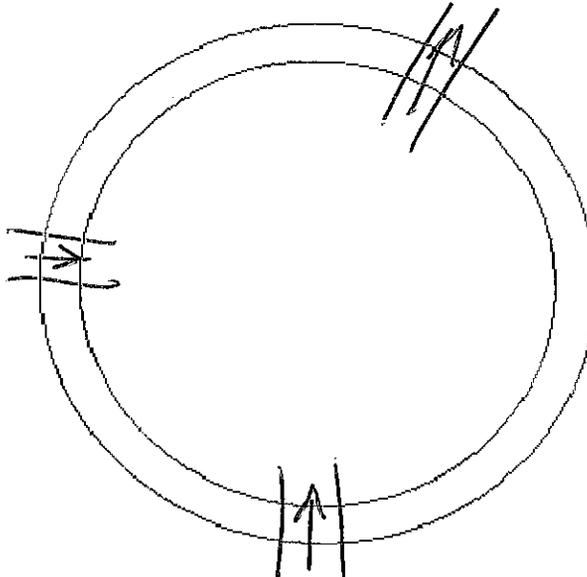
CASTING: Depth: 9" ^{WELDED}

CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<u>(IN)</u> OUT	<u>S</u>	<u>6.06</u>		<u>6"</u>		<u>CLAY</u>
<u>(IN)</u> OUT	<u>W</u>	<u>6.34</u>		<u>6"</u>		<u>CLAY</u>
IN <u>(OUT)</u>	<u>NE</u>	<u>6.72</u>		<u>8"</u>		<u>PVC</u>
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation

PROJECT NO.: 043107309

Manhole #: 22

Street Name: _____

Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick STONE

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

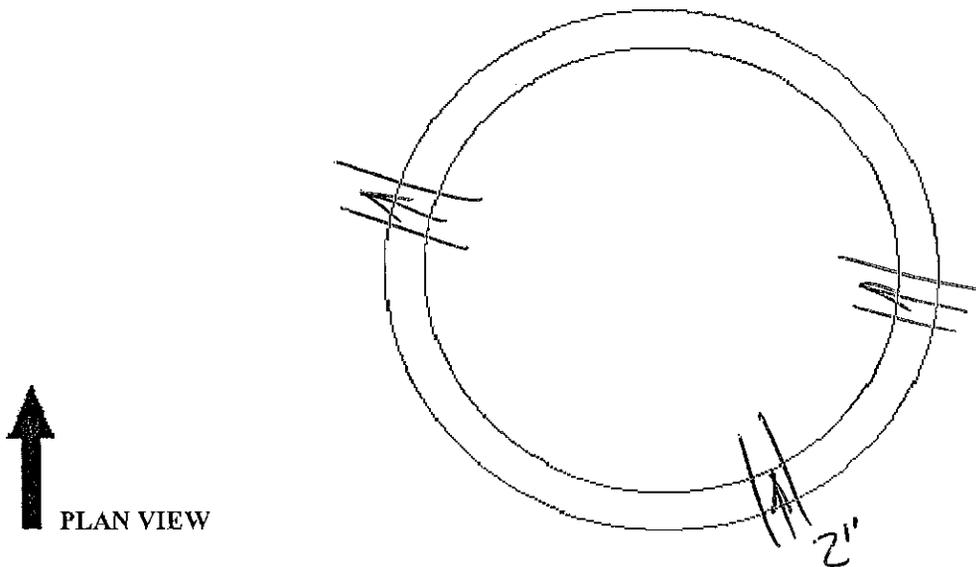
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<u>(IN)</u> OUT	<u>E</u>	<u>6.58</u>		<u>6"</u>		<u>CLAY</u>
IN <u>(OUT)</u>	<u>W</u>	<u>6.62</u>		<u>6"</u>		<u>CLAY</u>
<u>(IN)</u> OUT	<u>S</u>	<u>1.70</u>		<u>2"</u>		<u>D.I.</u>
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

CASTING OFFSET

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: ~~22~~ 23 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block STONE Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Hole WELDED Locking Non-Locking

CASTING: Depth: 9"

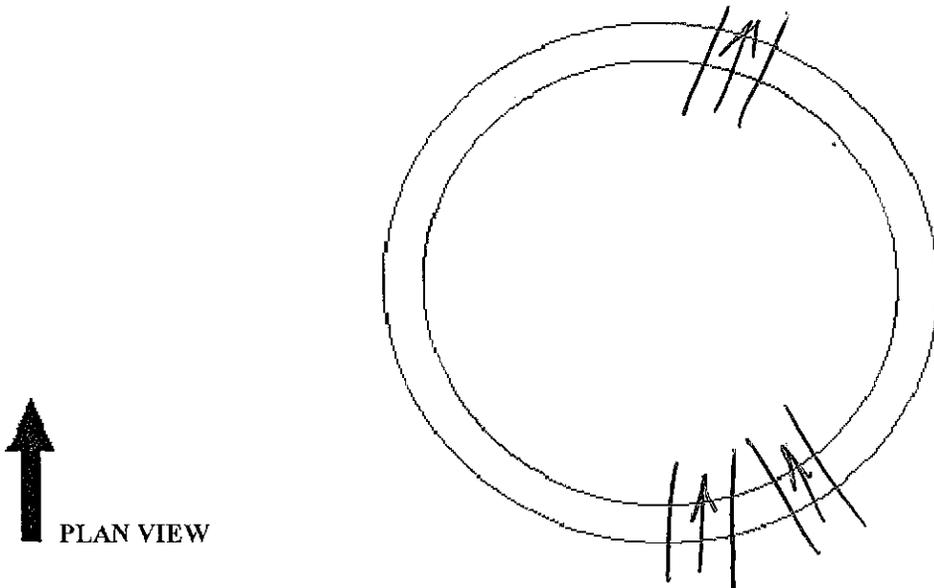
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<u>(IN)</u> OUT	<u>SE</u>	<u>5.68</u>		<u>6"</u>		<u>CLAY</u>
IN <u>(OUT)</u>	<u>N</u>	<u>5.80</u>		<u>6"</u>		<u>CLAY</u>
<u>(IN)</u> OUT	<u>S</u>	<u>5.75</u>		<u>6"</u>		<u>CLAY</u>
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

3" BELOW SURFACE
INFILTRATION

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation

PROJECT NO.: 043107309

Manhole #: 24

Street Name: _____

Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block STONE Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair TO Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9" WELDED

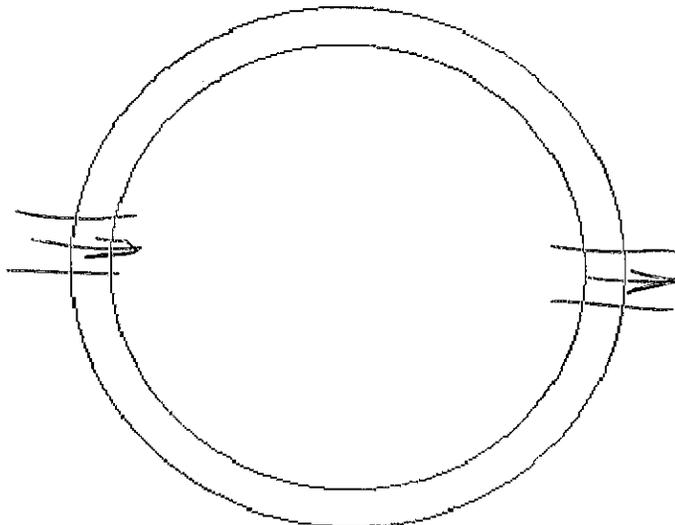
CONCRETE RINGS: Depth: 2 x 2" Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	W	6.60		6"		CLAY
IN OUT	E	6.60		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INFILTRATION
SOLIDS BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation

PROJECT NO.: 043107309

Manhole #: 25

Street Name: _____

Nearest Address #: _____

INDICATE ONE:

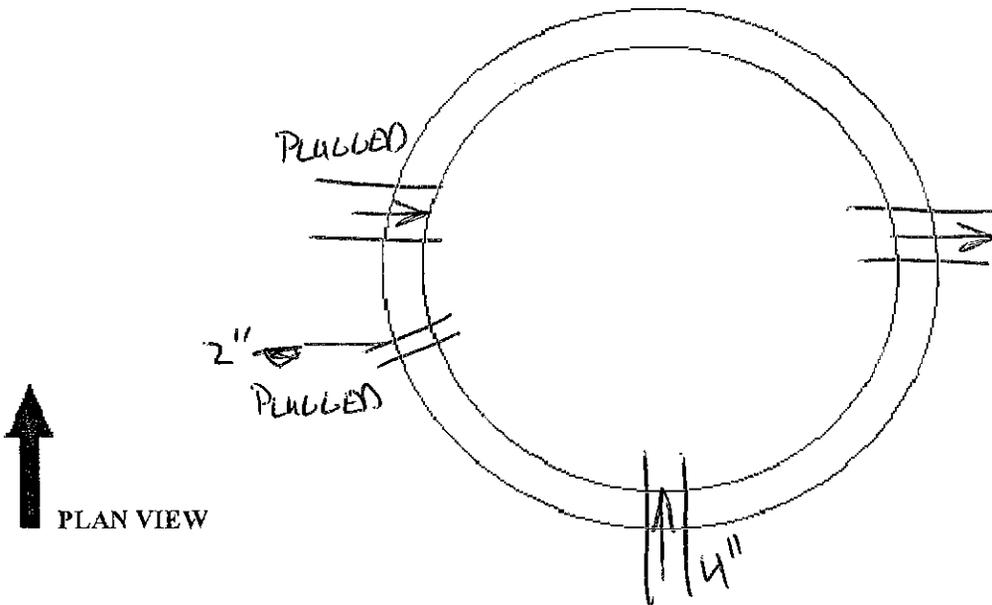
- MANHOLE TYPE: Precast Block Brick
- CONE TYPE: Eccentric Concentric Flat Top
- GENERAL CONDITION: Good Fair Poor
- COVER TYPE: Concealed Open Pic Holes Locking Non-Locking
- CASTING: Depth: _____
- CONCRETE RINGS: Depth: _____ Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
(IN) OUT	W	5.24		6"		
IN (OUT)	E	5.28		6"		
(IN) OUT	S	4.96		4"		
IN OUT				2"		

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INFILTRATION FROM 2"
SOLID BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 26 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

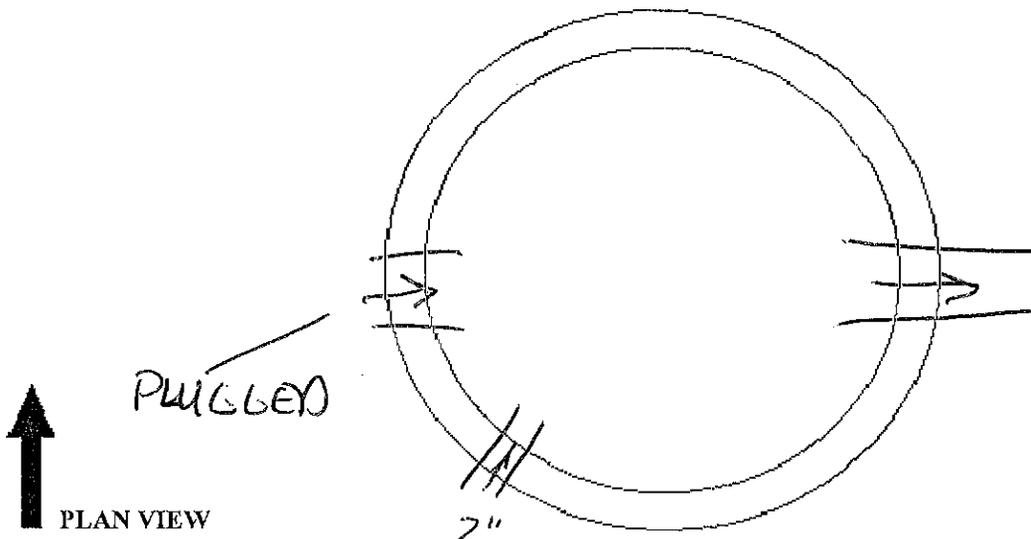
MANHOLE TYPE:	<input type="checkbox"/> Precast	<input checked="" type="checkbox"/> Block	<input type="checkbox"/> Brick
CONE TYPE:	<input type="checkbox"/> Eccentric	<input checked="" type="checkbox"/> Concentric	<input type="checkbox"/> Flat Top
GENERAL CONDITION:	<input type="checkbox"/> Good	<input checked="" type="checkbox"/> Fair	<input type="checkbox"/> Poor
COVER TYPE:	<input type="checkbox"/> Concealed	<input checked="" type="checkbox"/> Open Pic Holes	<input type="checkbox"/> Locking <input type="checkbox"/> Non-Locking
CASTING:	Depth: <u>9"</u>		
CONCRETE RINGS:	Depth: <u>NONE</u>		Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>		<u>3.85</u>		<u>6"</u>		
<u>IN</u> OUT		<u>1.10</u>		<u>2"</u>		
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

6" BELOW SURFACE
INFILTRATION
SAND

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 28 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **STONE**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **CONC**

CASTING: Depth: NONE

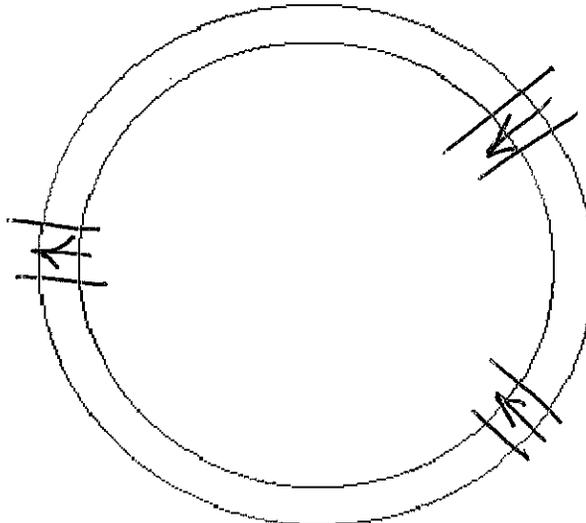
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN (OUT)	W	3.50		6"		CLAY
(IN) OUT	NE	3.34		6"		CLAY
(IN) OUT	E	3.48		6"		CLAY
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

**GRAVEL IN PIPES
NO FLOW**

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation

PROJECT NO.: 043107309

Manhole #: 29

Street Name: _____

Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick STONE

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

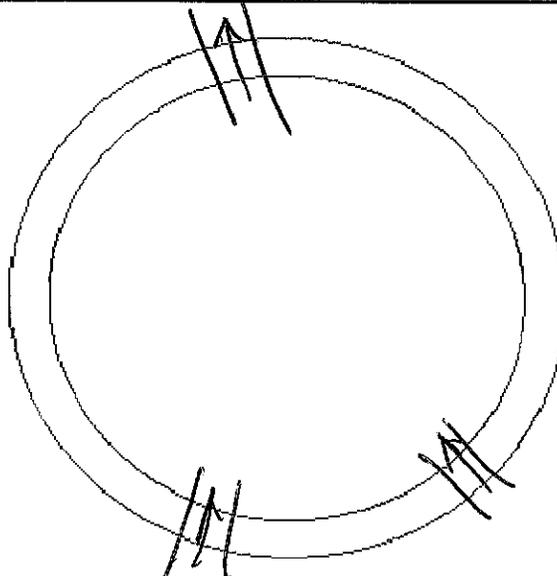
CONCRETE RINGS: Depth: 1 ROW OF CONC BRICKS Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="radio"/> IN <input type="radio"/> OUT	<u>S</u>	<u>6.14</u>		<u>6"</u>		<input checked="" type="radio"/> <u>CLAY</u>
<input checked="" type="radio"/> IN <input type="radio"/> OUT	<u>SE</u>	<u>6.18</u>		<u>6"</u>		<u>CLAY</u>
IN <input checked="" type="radio"/> OUT	<u>NW</u>	<u>6.20</u>		<u>6"</u>		<u>CLAY</u>
IN <input type="radio"/> OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

~~SE~~ GRAVEL + DIRT SE PIPE

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 30 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick STONE

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONC

CASTING: Depth: NONE

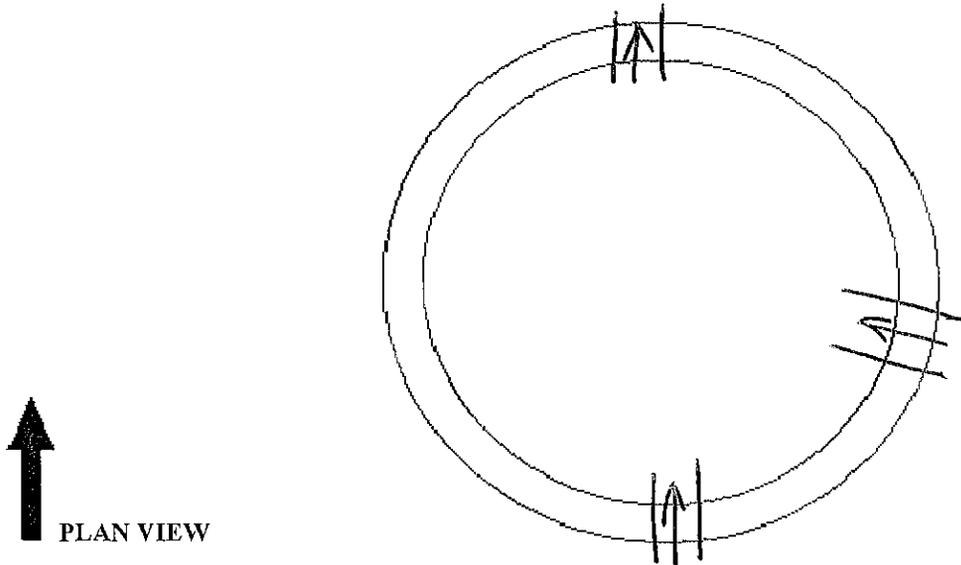
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="checkbox"/> IN OUT	S	3.98		6"		CLAY
<input checked="" type="checkbox"/> IN OUT	SE E	3.96		6"		CLAY
IN <input checked="" type="checkbox"/> OUT	N	3.96		6"		CLAY
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

GRAVEL EAST PIPE
NO FLOW

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 31 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

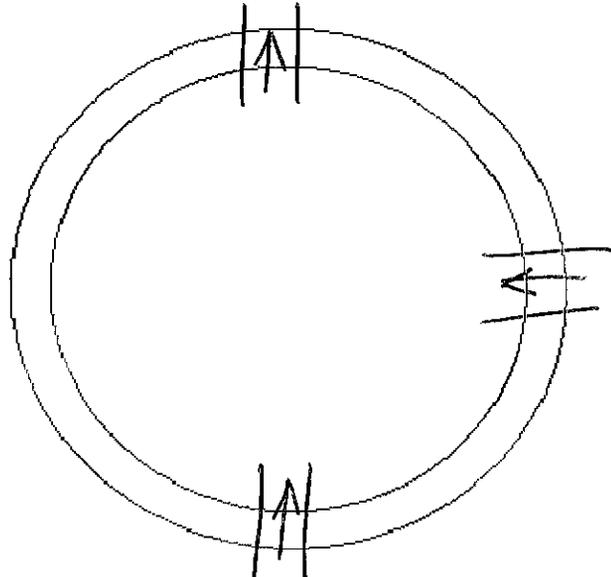
MANHOLE TYPE:	<input type="checkbox"/> Precast	<input type="checkbox"/> Block	<input type="checkbox"/> Brick	<input checked="" type="checkbox"/> STONE
CONE TYPE:	<input type="checkbox"/> Eccentric	<input checked="" type="checkbox"/> Concentric	<input type="checkbox"/> Flat Top	
GENERAL CONDITION:	<input type="checkbox"/> Good	<input checked="" type="checkbox"/> Fair	<input type="checkbox"/> Poor	
COVER TYPE:	<input type="checkbox"/> Concealed	<input type="checkbox"/> Open Pic Holes	<input type="checkbox"/> Locking	<input type="checkbox"/> Non-Locking <input checked="" type="checkbox"/> CONC
CASTING:	Depth: <u>NONE</u>			
CONCRETE RINGS:	Depth: <u>NONE</u> Other: _____			

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	N	3.34				CLAY
IN OUT	E	3.10				CLAY
IN OUT	S	3.14				CLAY
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

NO FLOW

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



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PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 32 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **STONE**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **CONC**

CASTING: Depth: NONE

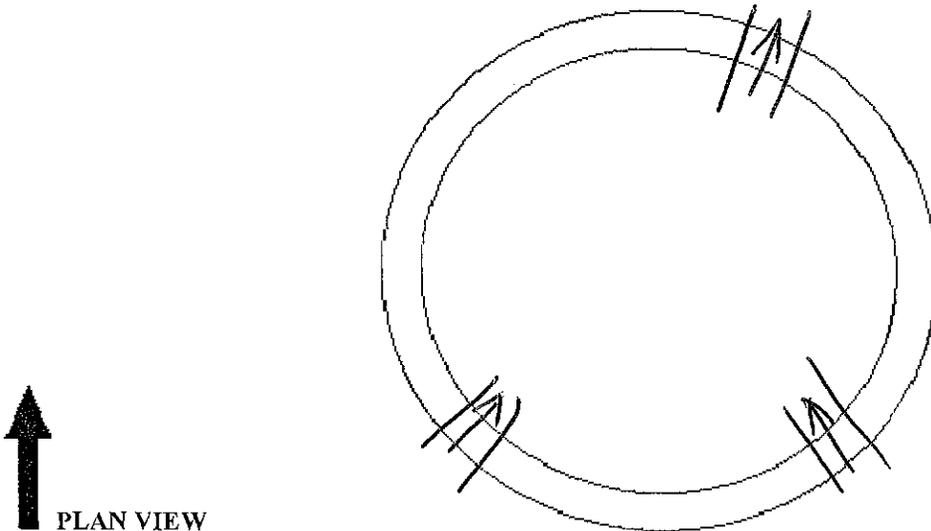
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="checkbox"/> IN OUT	SW	3.62		6"		CLAY
<input checked="" type="checkbox"/> IN OUT	SE	3.54		6"		CLAY
IN <input checked="" type="checkbox"/> OUT	N	3.66		6"		CLAY
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP
NO FLOW

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 33 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **STONE**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **CONC**

CASTING: Depth: NONE

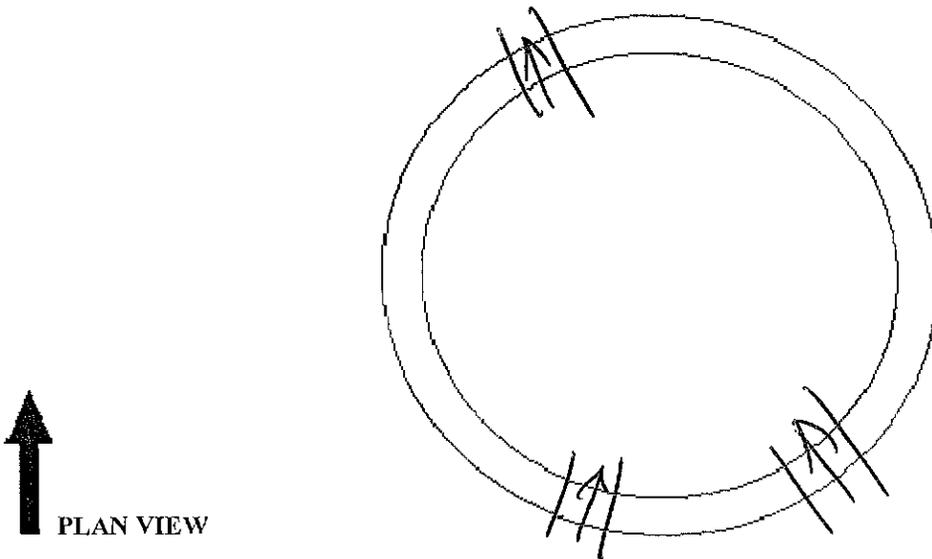
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	NW		3.84	6"		CLAY
IN OUT	SW		3.84	6"		CLAY
IN OUT	SE		3.62	6"		CLAY
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

NO FLOW

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 34 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick STONE

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONC

CASTING: Depth: NONE

CONCRETE RINGS: Depth: NONE Other: _____

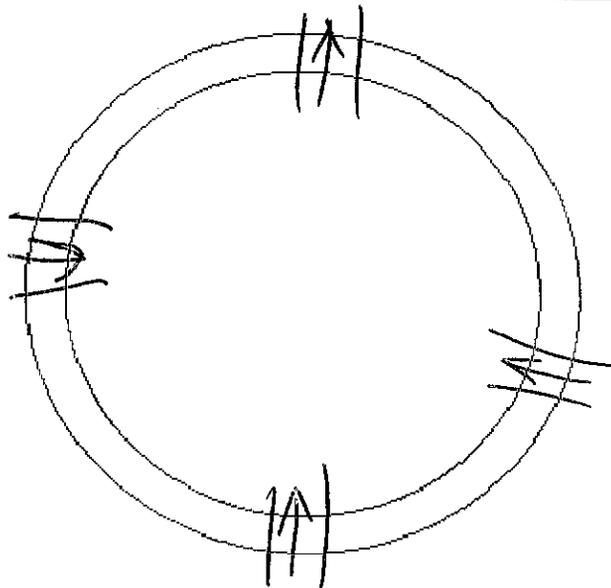
FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="radio"/> IN <input type="radio"/> OUT	W	1.48		4"		D.I.
<input type="radio"/> IN <input checked="" type="radio"/> OUT	NE	2.16		6"		CLAY
<input checked="" type="radio"/> IN <input type="radio"/> OUT	SE	2.04		6"		"
<input checked="" type="radio"/> IN <input type="radio"/> OUT	SW	2.14		6"		"

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

CRACKED LID
NO FLOW
SOLIDS BUILD UP SE

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.

PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 35 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **STONE**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **conc**

CASTING: Depth: NONE

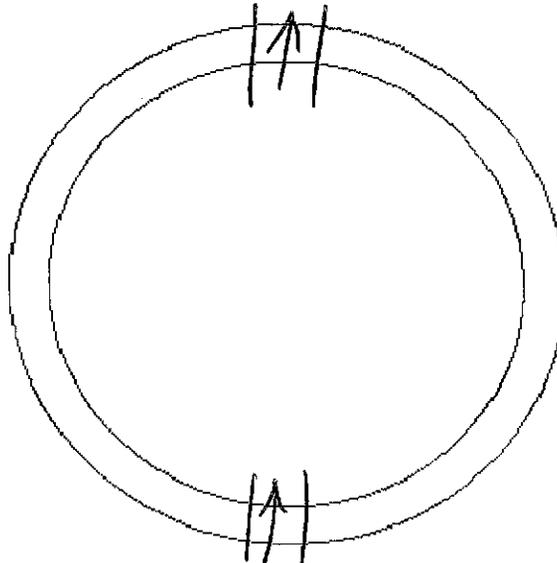
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	S	2.40		6"		CLAY
IN OUT	N	2.42		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

NO FLOW

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



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PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 36 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

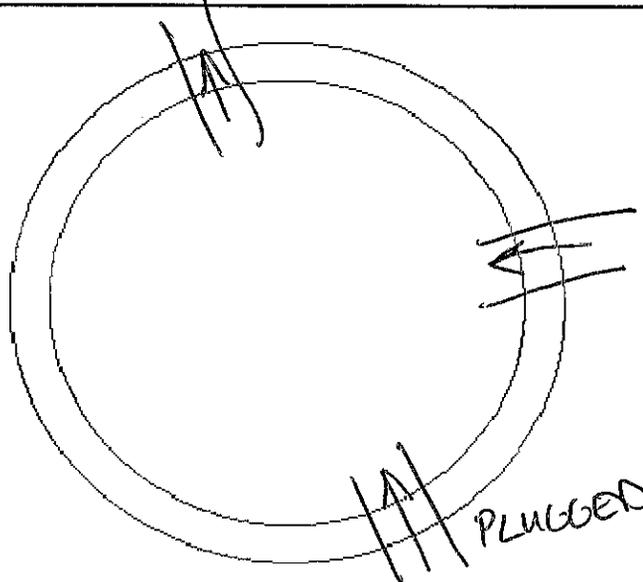
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	NW	3.15		6"		CLAY
IN OUT	E	3.08		6"		CLAY
IN OUT	SE	3.10		6"		CLAY
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

FULL OF DEBRIS

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



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PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 37 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **STONE**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **CONC**

CASTING: Depth: NONE

CONCRETE RINGS: Depth: NONE Other: _____

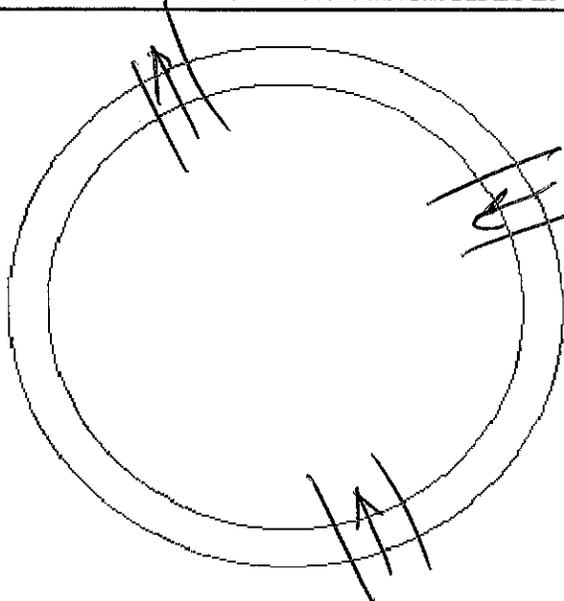
FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	NW	5.32				CLAY
IN OUT	E	5.35				"
IN OUT	S	5.34				"
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

DEBRIS IN PIPES

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.


 PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 38 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **STONE**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **CONC**

CASTING: Depth: NONE

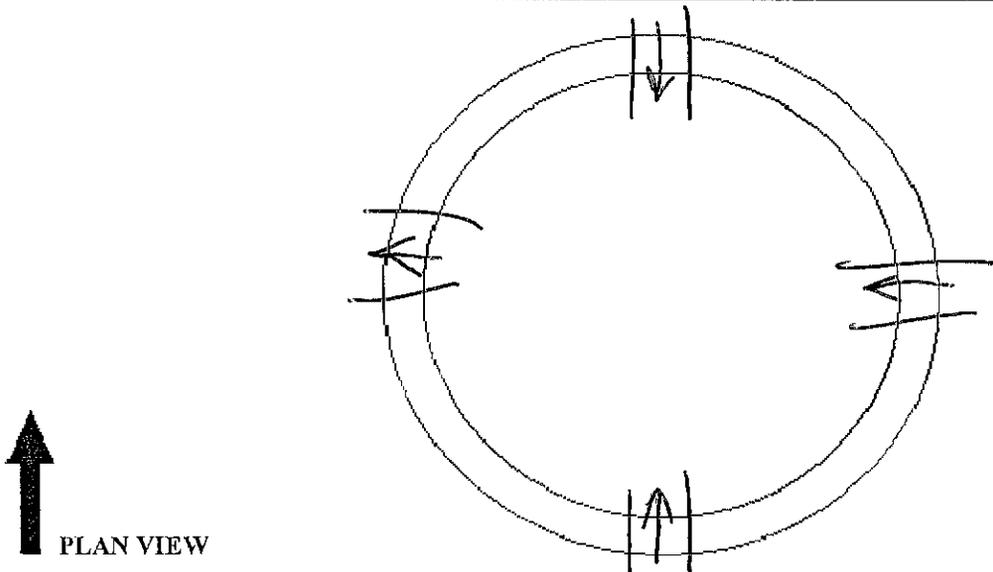
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	N	2.92		6"		CLAY
IN OUT	E	2.92		6"		"
IN OUT	S	2.90		6"		"
IN OUT	W	3.08		6"		"

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

CRACKED LID
 ROCK & GRAVEL IN PIPES
 NO FLOW

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 40 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE:	<input checked="" type="checkbox"/> Precast	<input type="checkbox"/> Block	<input type="checkbox"/> Brick
CONE TYPE:	<input type="checkbox"/> Eccentric	<input checked="" type="checkbox"/> Concentric	<input type="checkbox"/> Flat Top
GENERAL CONDITION:	<input type="checkbox"/> Good	<input checked="" type="checkbox"/> Fair	<input type="checkbox"/> Poor
COVER TYPE:	<input type="checkbox"/> Concealed	<input type="checkbox"/> Open Pic Holes	<input type="checkbox"/> Locking <input type="checkbox"/> Non-Locking
CASTING:	Depth: <u>NONE</u>		
CONCRETE RINGS:	Depth: <u>NONE</u> Other: _____		

2 PIECE
 CONC
COVER

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT						
IN OUT						
IN OUT						
IN OUT						

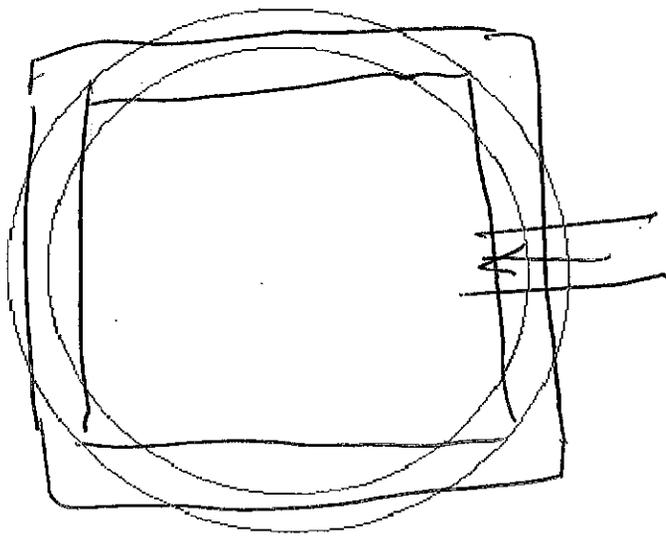
COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

BOX CRACKED
FULL OF SOLIDS

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 41 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONE

CASTING: Depth: NONE

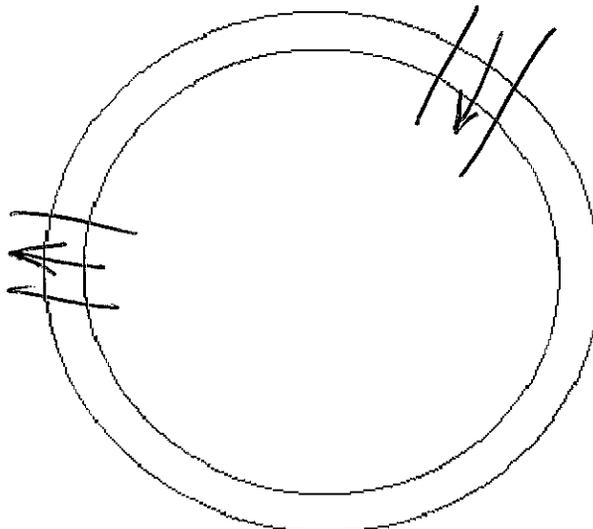
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	W	5.50		6"		CLAY
IN OUT	NE	5.46		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILDUP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 42 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block CONC Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONC

CASTING: Depth: NONE

CONCRETE RINGS: Depth: NONE Other: _____

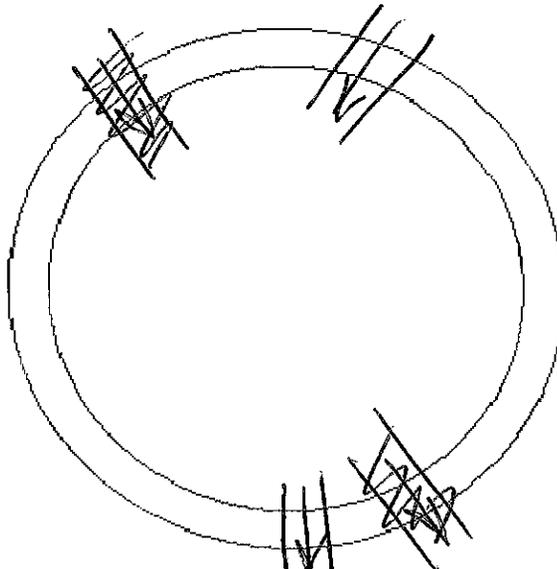
FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
	<u>WEST</u>	<u>6.68</u>		<u>6"</u>		<u>CLAY</u>
	<u>NE</u>	<u>6.48</u>		<u>6"</u>		<u>CLAY</u>
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.

↑
PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 43 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONC

CASTING: Depth: NONE

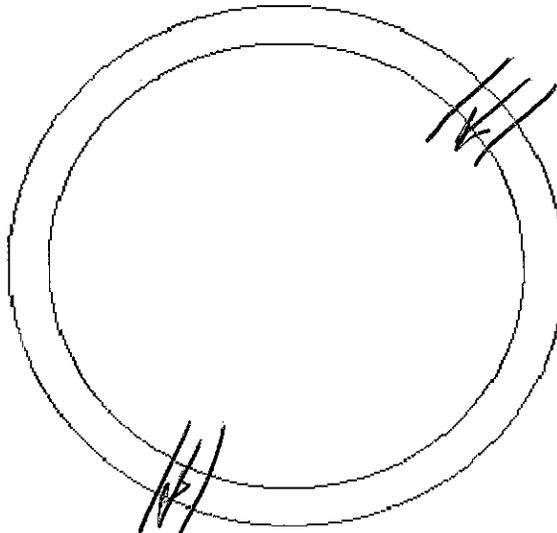
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="radio"/> IN <input type="radio"/> OUT	NE	2.36		6"		CLAY
<input type="radio"/> IN <input checked="" type="radio"/> OUT	SW	2.40		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

DEBRIS

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 44 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 6"

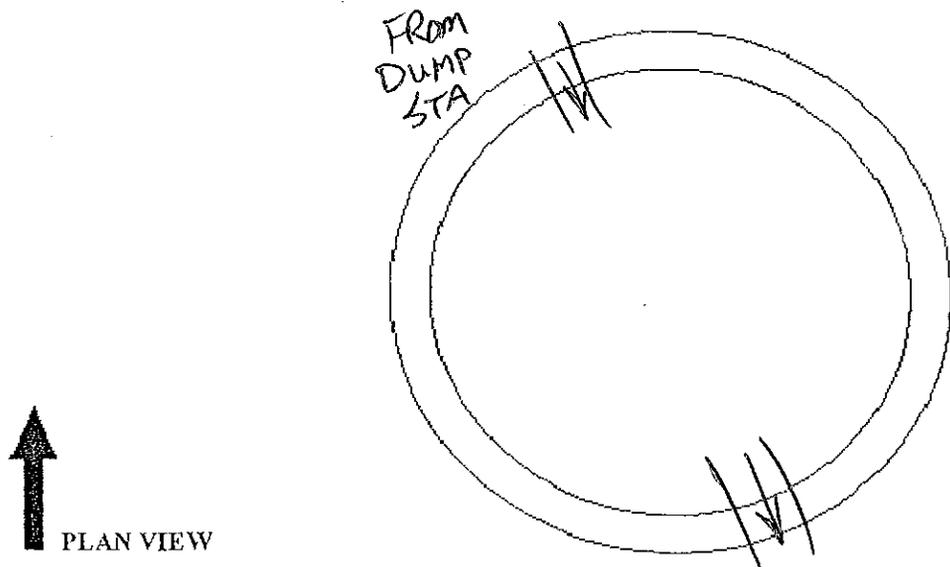
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>		<u>3.26</u>		<u>8"</u>		<u>CLAY</u>
<u>IN</u> OUT		<u>3</u>		<u>4"</u>		<u>D.I.</u>
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 45 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Bottom Block Top Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

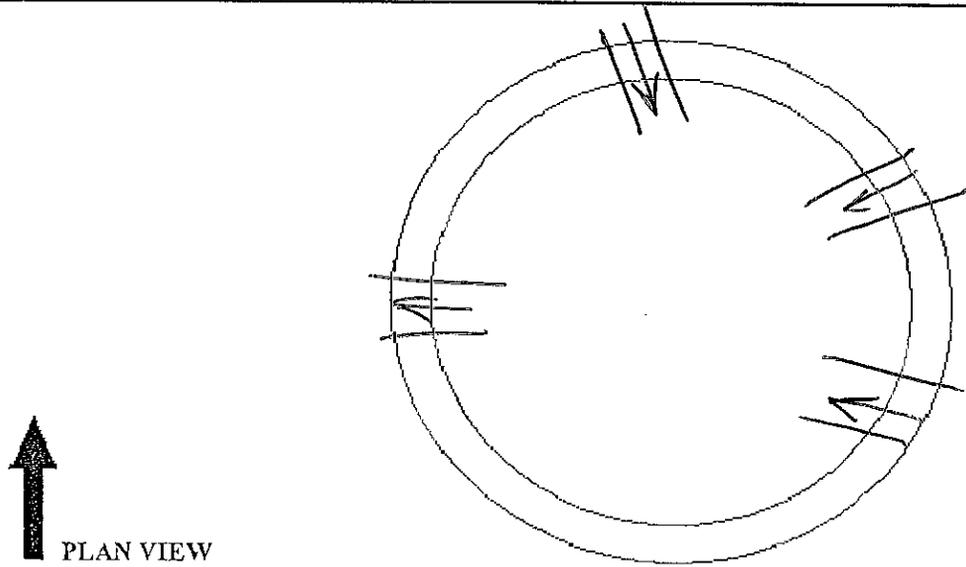
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	N	6.48		8"		CLAY
IN OUT	NE NE	6.46		6"		"
IN OUT	ESE	6.50		6"		"
IN OUT	W	6.50		6"		"

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



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PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 46 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONC

CASTING: Depth: NONE

CONCRETE RINGS: Depth: NONE Other: _____

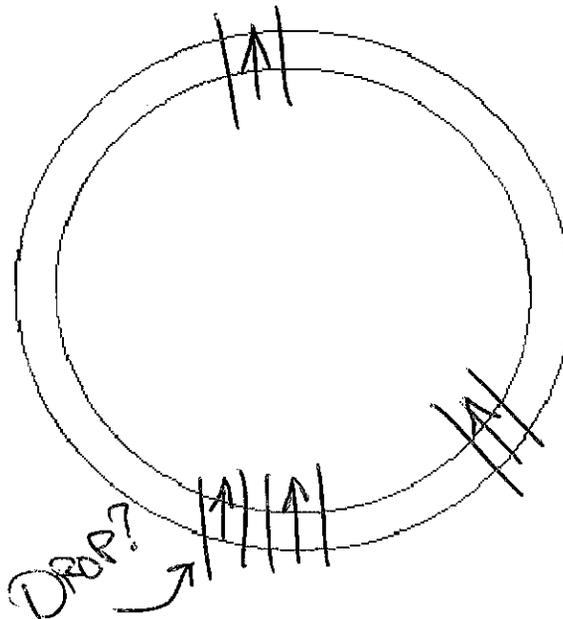
FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>	NW	4.94		6"		CLAY
<u>IN</u> OUT	E	4.88		6"		CLAY
<u>IN</u> OUT	SE	4.92		6"		CLAY
<u>IN</u> OUT	SE	2.45		6"		CLAY

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

CRACKED LID

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.

↑
PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 47 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: _____

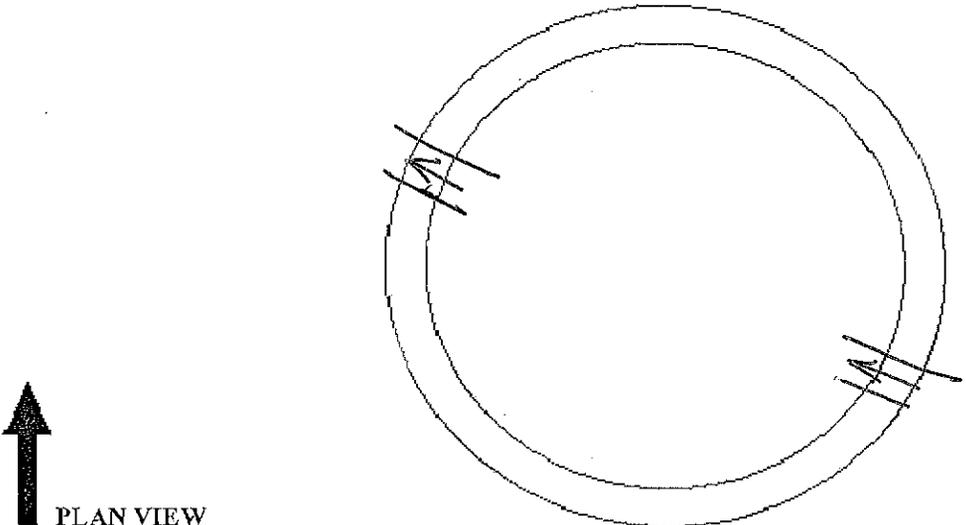
CONCRETE RINGS: Depth: _____ Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	SE	6.88		6"		CLAY
IN OUT	NW	7.02		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOME ROOTS GROWING IN BETWEEN
MH SECTIONS

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



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PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 48 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

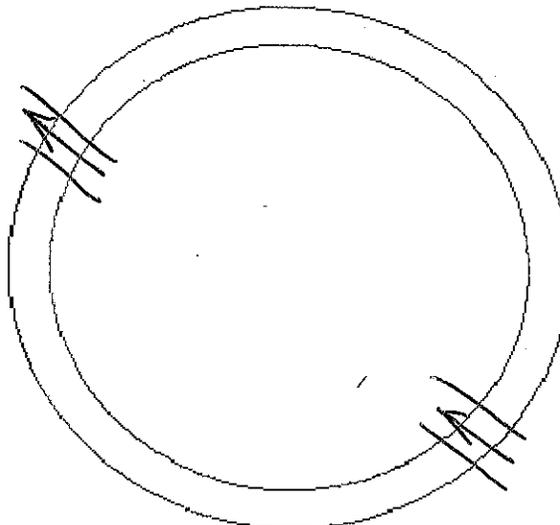
CASTING: Depth: 9"

CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>	<u>NW</u>	<u>5.61</u>		<u>6"</u>		<u>CLAY</u>
<u>IN</u> OUT	<u>SE</u>	<u>5.58</u>		<u>6"</u>		<u>CLAY</u>
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 49 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

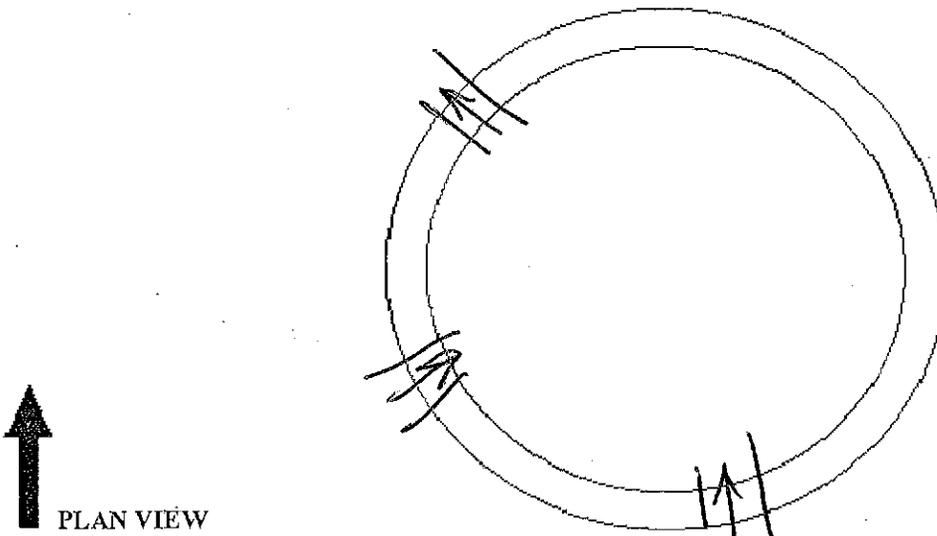
CASTING: Depth: _____

CONCRETE RINGS: Depth: _____ Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<u>IN</u> OUT	SE	5.94		6"		CLAY
<u>IN</u> OUT	SW	5.86		6"		CLAY
IN <u>OUT</u>	NW	5.96		6"		CLAY
IN - OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 50 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

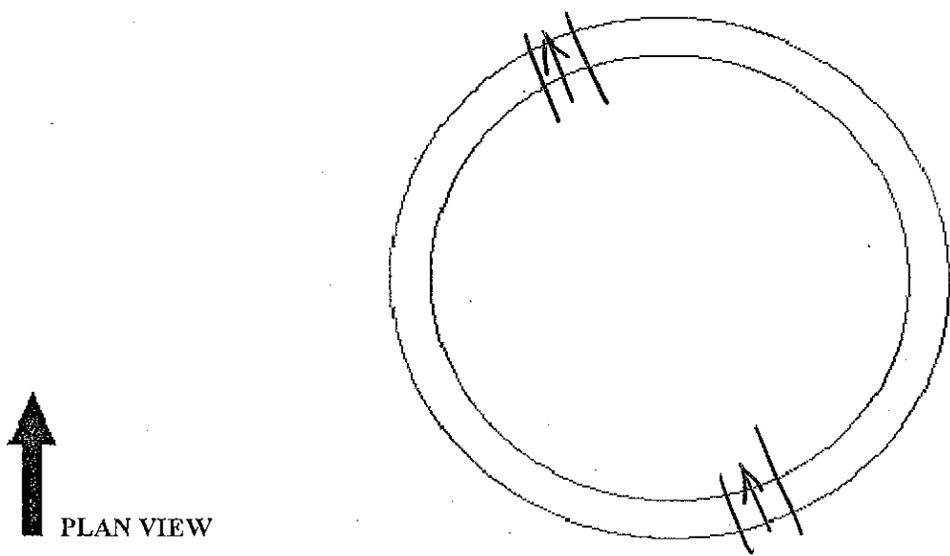
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>	NW	<u>5.94</u>		<u>6"</u>		<u>CLAY</u>
<u>IN</u> OUT	<u>SE</u>	<u>5.86</u>		<u>6"</u>		<u>CLAY</u>
IN OUT						
IN · OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

RIM OFFSET
DIRT ON BENCH

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 51 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

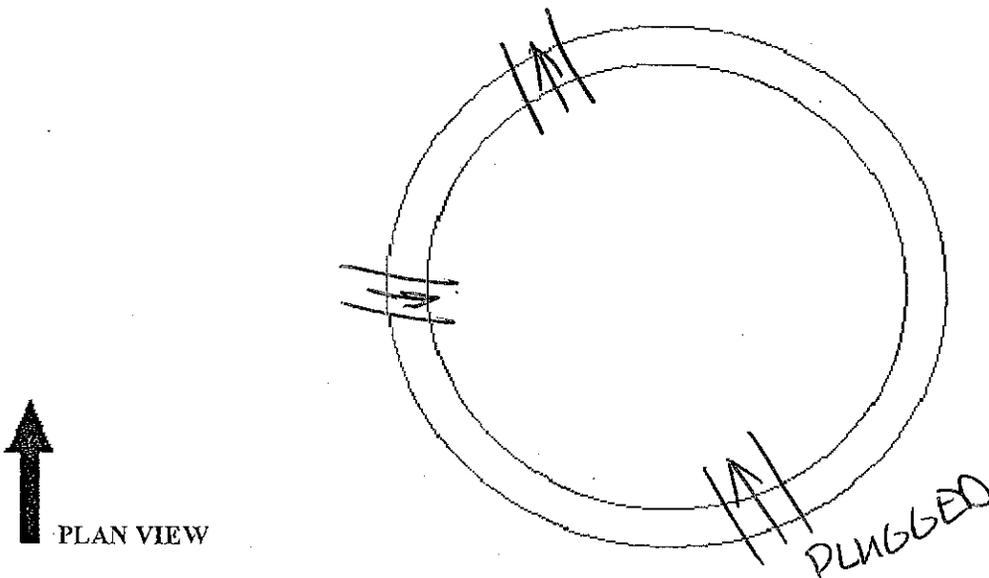
MANHOLE TYPE: Precast Block Brick
 CONE TYPE: Eccentric Concentric Flat Top
 GENERAL CONDITION: Good Fair Poor
 COVER TYPE: Concealed Open Pic Holes Locking Non-Locking
 CASTING: Depth: 9"
 CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	W	5.42		6"		CLAY
IN OUT	NW	5.48		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SE PLUGGED

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

~~NEEDS TO BE SHT?~~

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 52 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

- MANHOLE TYPE: Precast Block Brick
- CONE TYPE: Eccentric Concentric Flat Top
- GENERAL CONDITION: Good Fair Poor
- COVER TYPE: Concealed Open Pic Holes Locking Non-Locking ~~Other~~
- CASTING: Depth: NONE
- CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="radio"/> IN <input type="radio"/> OUT	S	8.64		6"		CLAY
<input type="radio"/> IN <input checked="" type="radio"/> OUT	NE	8.73		6"		CLAY
<input checked="" type="radio"/> IN <input type="radio"/> OUT	E	8.64		6"		CLAY
<input checked="" type="radio"/> IN <input type="radio"/> OUT	E	2.65		6"		"
<input checked="" type="radio"/> IN <input type="radio"/> OUT	S	2.70		6"		"

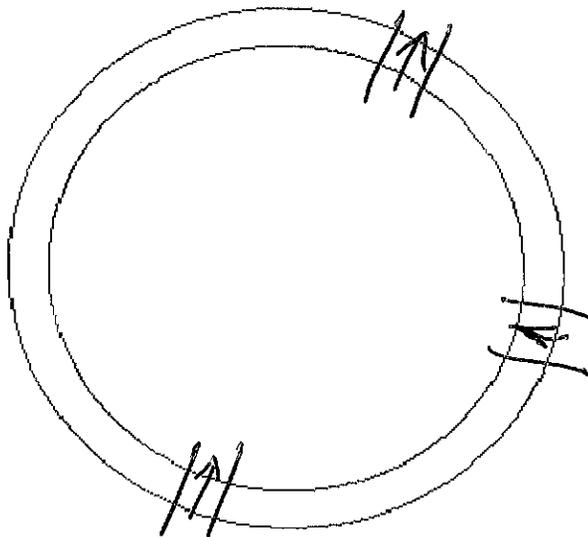
COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP
DROP MH?

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 53 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONC

CASTING: Depth: NONE

CONCRETE RINGS: Depth: NONE Other: _____

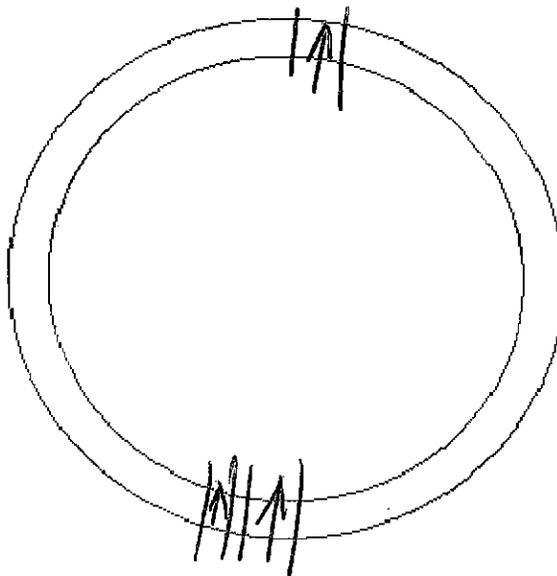
FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
(IN) OUT	S	7.68		6"		CLAY
IN (OUT)	N	7.72		6"		CLAY
(IN) OUT	S	1.65		6"		
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

DROP MH.?

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.

PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 54 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

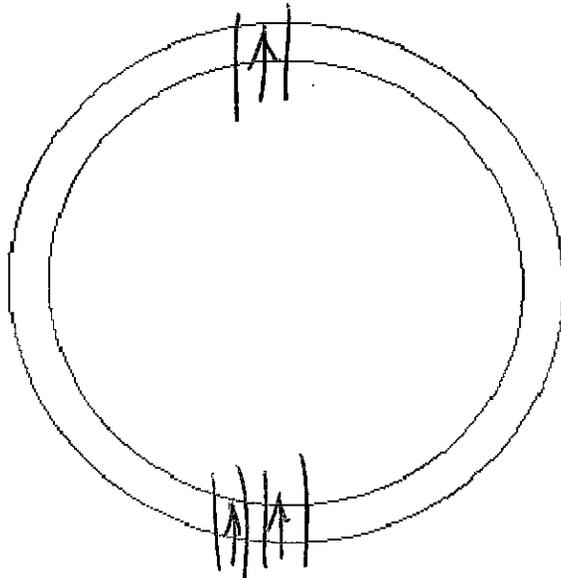
- MANHOLE TYPE: Precast Block Brick
- CONE TYPE: Eccentric Concentric Flat Top
- GENERAL CONDITION: Good Fair Poor
- COVER TYPE: Concealed Open Pic Holes Locking Non-Locking *COSE*
- CASTING: Depth: NONE
- CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="checkbox"/> IN <input type="checkbox"/> OUT	<u>S</u>	<u>3.58</u>		<u>6"</u>		<u>CLAY</u>
<input checked="" type="checkbox"/> IN <input type="checkbox"/> OUT	<u>S</u>	<u>9.26</u>		<u>6"</u>		<u>CLAY</u>
<input type="checkbox"/> IN <input checked="" type="checkbox"/> OUT	<u>N</u>	<u>9.30</u>		<u>6"</u>		<u>CLAY</u>
<input type="checkbox"/> IN <input type="checkbox"/> OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

DROP MA
SOLIDS BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



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PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 55 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONC

CASTING: Depth: NONE

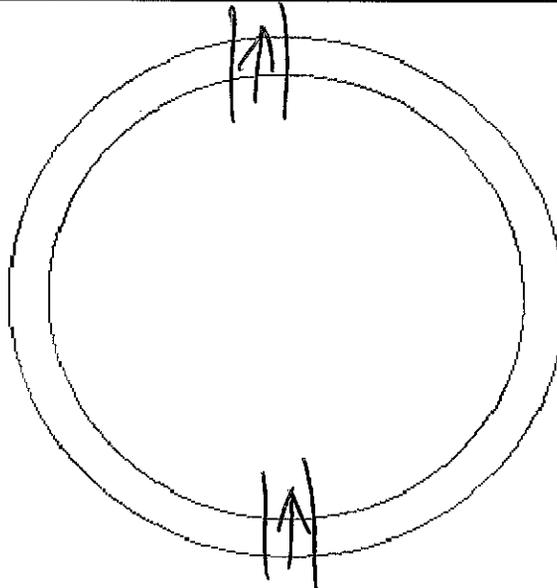
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>		3.34		6"		
<u>IN</u> OUT		3.24		6"		
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 56 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONC

CASTING: Depth: NONE

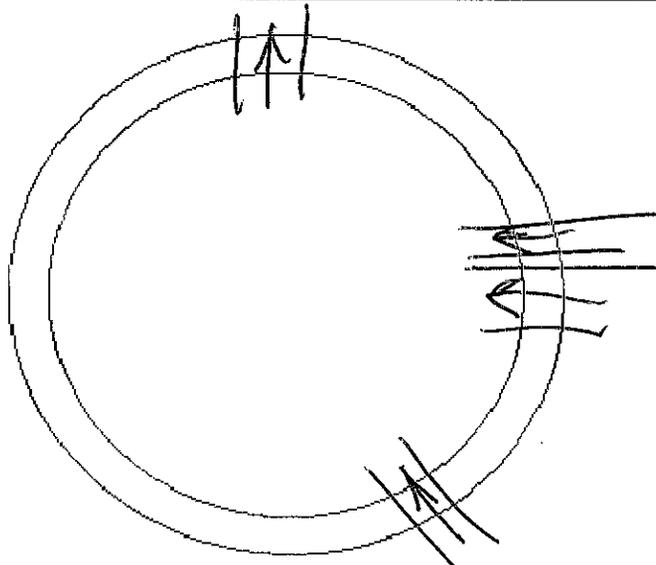
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
(N) OUT	E	2.62		6"		CLAY
(IN) OUT	SE	5.18		6"		CLAY
IN (OUT)	N	5.22		6"		CLAY
(IN) OUT	E	5.20		6"		CLAY

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

Drop mit

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



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PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 57 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONC

CASTING: Depth: NONE

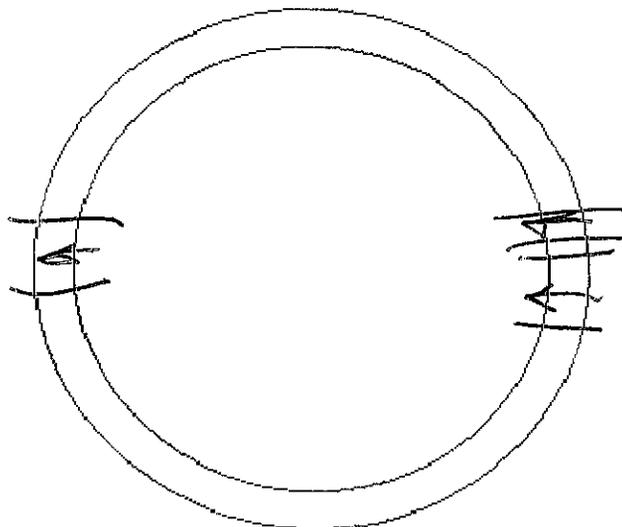
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
(IN) OUT	E	1.76		6"		CLAY
(IN) OUT	E	6.30		6"		CLAY
IN (OUT)	W	6.30		6"		CLAY
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

CRACKED LID
DROP MH

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 58 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **CONCRETE**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: 3' DIA Concealed Open Pic Hole Locking Non-Locking

CASTING: Depth: 4"

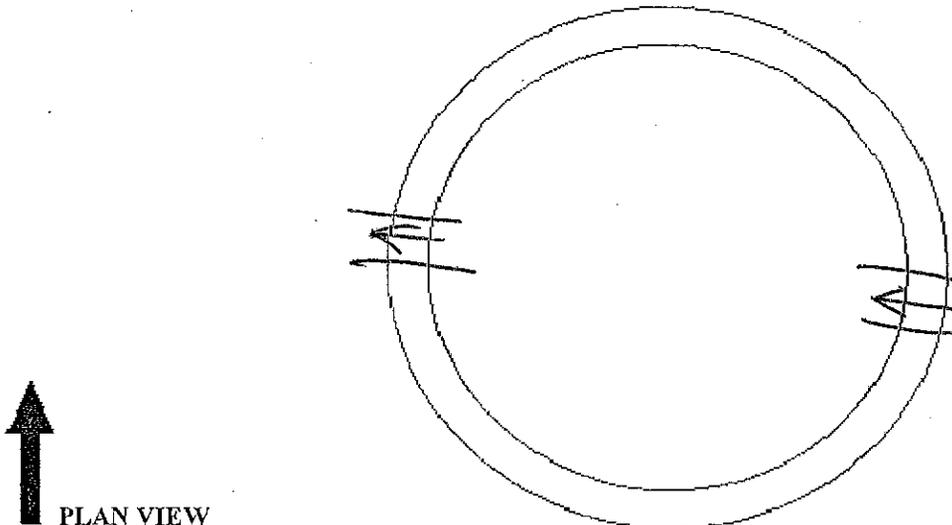
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>	W	6.60		6"		CLAY
<u>IN</u> OUT	E	6.50		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP
OLD CONCRETE RIM BROKEN IN BOTTOM

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 59 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **NO LID**

CASTING: Depth: NONE

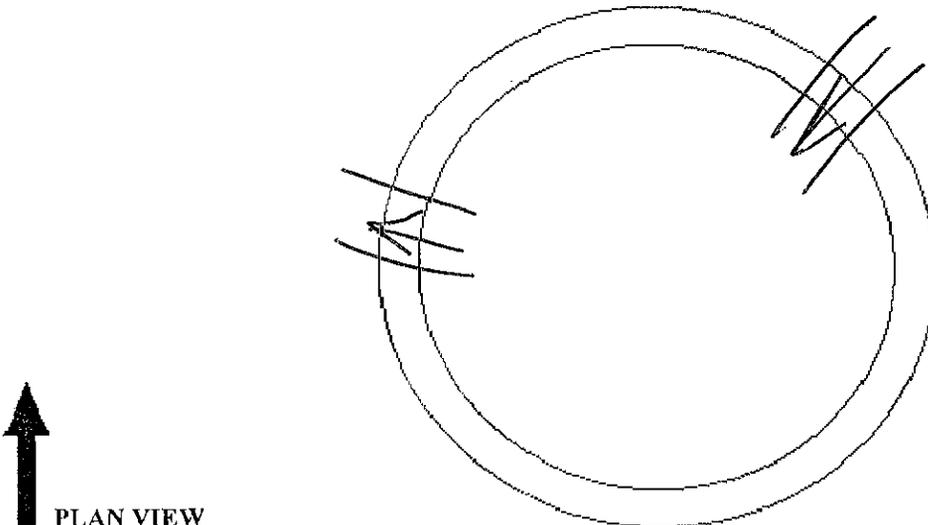
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT						
IN OUT						
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

GARBAGE IN MH

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 60 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONC

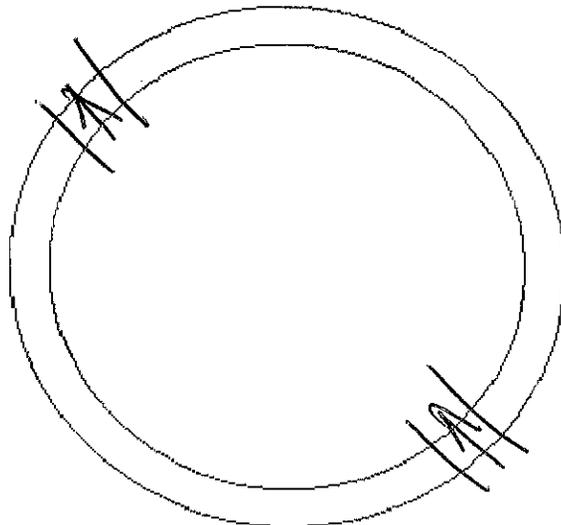
CASTING: Depth: _____

CONCRETE RINGS: Depth: _____ Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>	NW	6.42		6"		CLAY
<u>IN</u> OUT	SE	6.34		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 61 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking CONC

CASTING: Depth: NONE

CONCRETE RINGS: Depth: NONE Other: _____

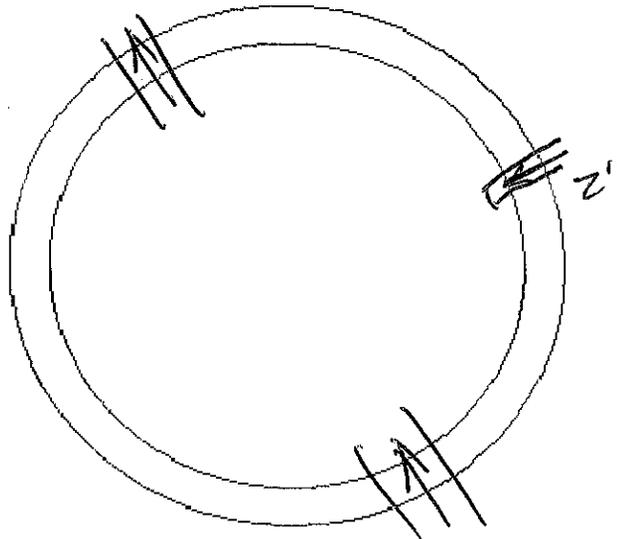
FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>	NW	4.32		6"		CLAY
<u>IN</u> OUT	SE	4.28		6"		CLAY
<u>IN</u> OUT	E	3.16		2"		CLAY
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

CLEAN CLEAR WATER FROM 2" PIPE
1.2' OF WATER IN MH

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.

↑
PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 52 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking *NO PICK HOLES*

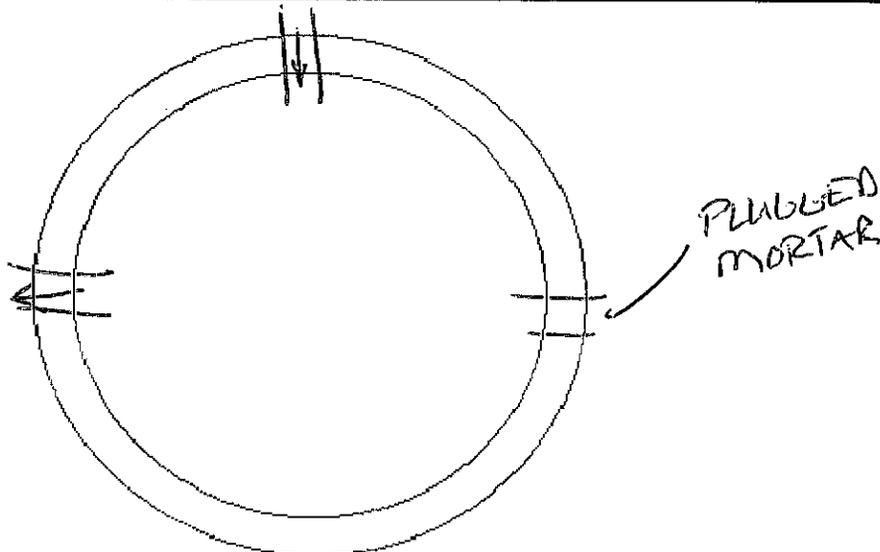
CASTING: Depth: 4"

CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	NW	3.6		4"		D.I.
IN OUT	W	4.68		6"		D.I.
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation

PROJECT NO.: 043107309

Manhole #: 53

Street Name: _____

Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **+ CONC BELL SECTION**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **CONC**

CASTING: Depth: NONE

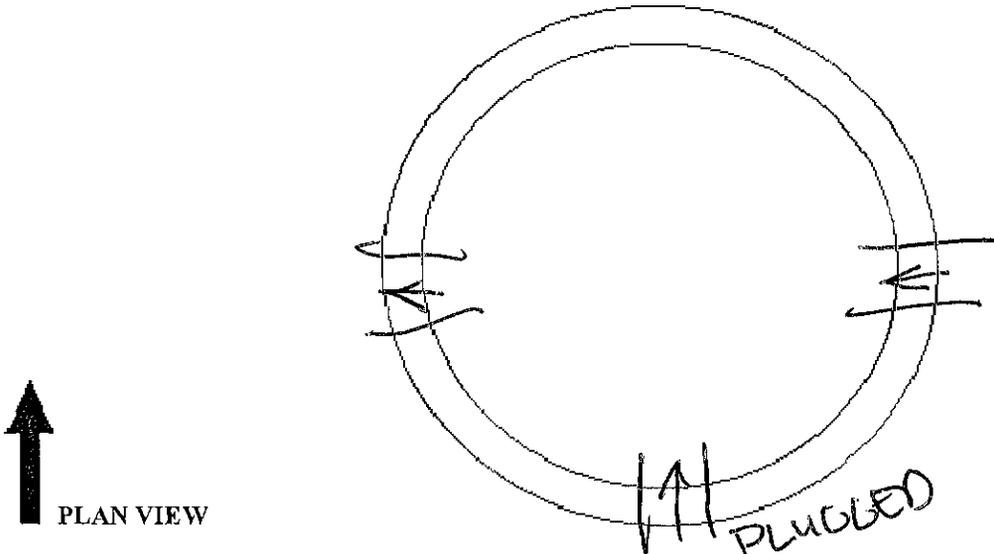
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	E E	5.70		6"		CLAY
IN OUT	W W	5.76		6"		PVC
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILDUP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 55 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick STONE

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking E/CONE

CASTING: Depth: NONE

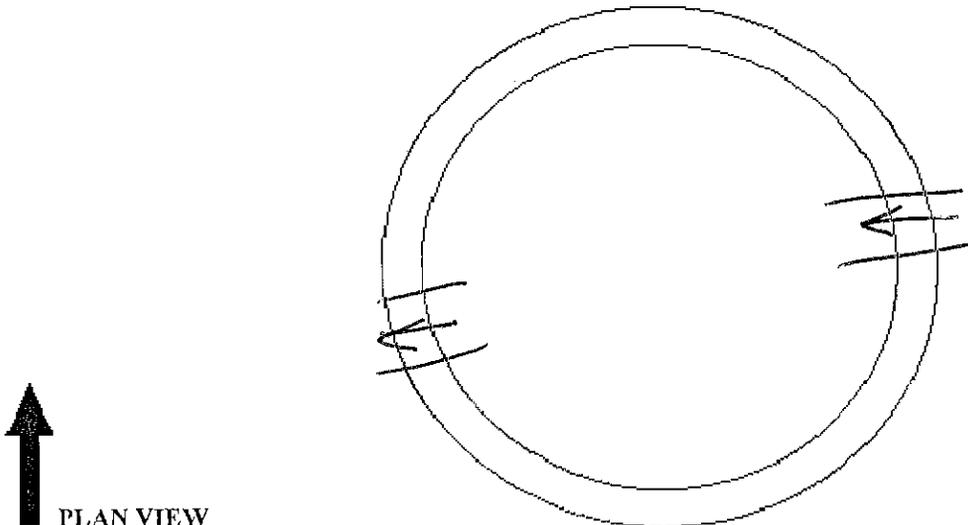
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	E	6.24		6"		CLAY
IN OUT	W	6.30		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 56 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **STONE**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **STONE**

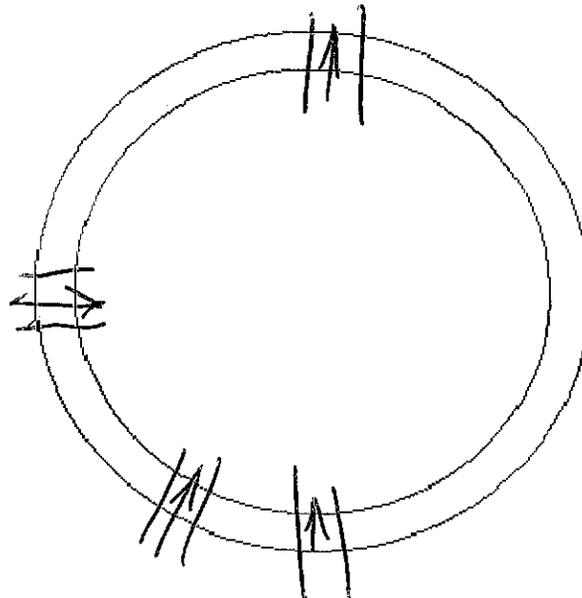
CASTING: Depth: NONE

CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	SN		5.70			CLAY
IN OUT	SE		6.12			CLAY
IN OUT	SW		6.07			
IN OUT	W		6.07			

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 57 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

CONCRETE RINGS: Depth: 1 x 4" Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	NW SE	5.14		8 6"		CLAY
IN OUT		5.18		8"		PVC
IN OUT						
IN OUT						

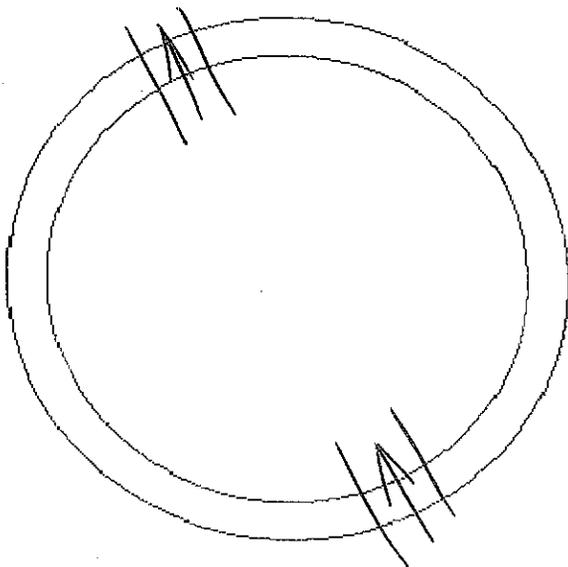
COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 58 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Hole Locking Non-Locking *1 - WELDED SHUT*

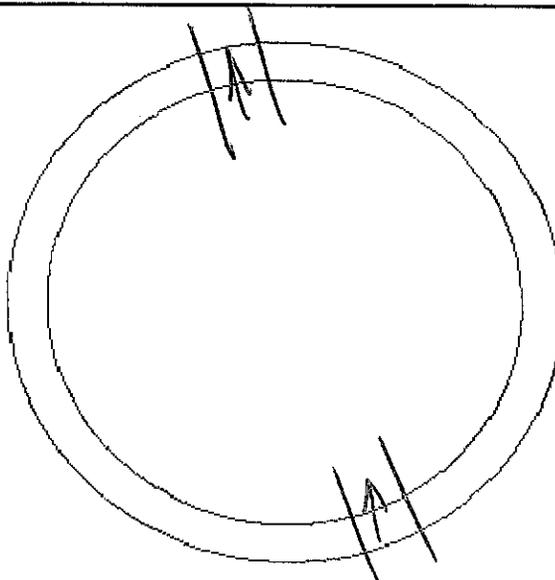
CASTING: Depth: 9"

CONCRETE RINGS: Depth: 1 x 4" Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	SE	5.02				CLAY
IN OUT	NW	5.02				CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 59 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Hole Locking Non-Locking *1 WELDED SHUT*

CASTING: Depth: 9"

CONCRETE RINGS: Depth: 1 x 4" Other: _____

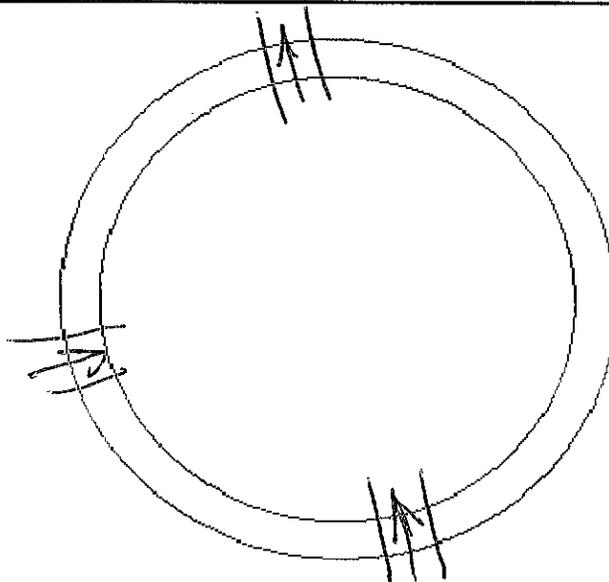
FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>	SE	4.90		6"		CLAY
<u>IN</u> OUT	W.	5.02		6"		CLAY
<u>IN</u> OUT	NW	5.18		6"		CLAY
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

WATER + SOLID BUILD UP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.

PLAN VIEW



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation

PROJECT NO.: 043107309

Manhole #: 310

Street Name: _____

Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE:

Precast

Block

Brick

CONE TYPE:

Eccentric

Concentric

Flat Top

GENERAL CONDITION:

Good

Fair

Poor

COVER TYPE:

Concealed

Open Pic Holes

Locking

Non-Locking

WELDED COVER

CASTING:

Depth: 9'

CONCRETE RINGS:

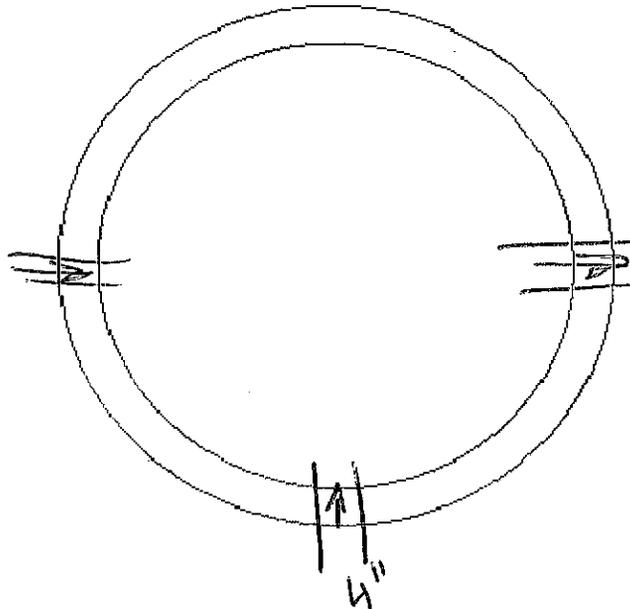
Depth: 6 x 2"

Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="radio"/> IN <input type="radio"/> OUT	<u>S</u>	<u>5.65</u>		<u>4"</u>		<u>PVC</u>
<input type="radio"/> IN <input checked="" type="radio"/> OUT	<u>E</u>	<u>6.10</u>		<u>6"</u>		<u>CLAY</u>
<input checked="" type="radio"/> IN <input type="radio"/> OUT	<u>W</u>	<u>6.00</u>		<u>6"</u>		<u>CLAY</u>
<input type="radio"/> IN <input type="radio"/> OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 511 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Hole ~~X~~ Locking Non-Locking *1 - WELDED*

CASTING: Depth: 9"

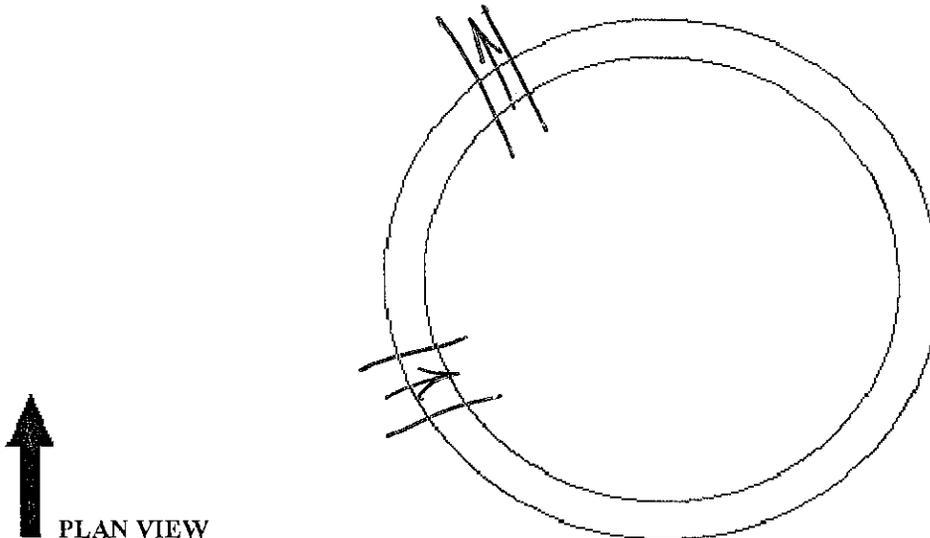
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>	NW	3.70		6"		CLAY
<u>IN</u> OUT	W	3.65		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

1.2' BELOW SURFACE
CASTING OFFSET
DIRT IN BOTTOM

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 213 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

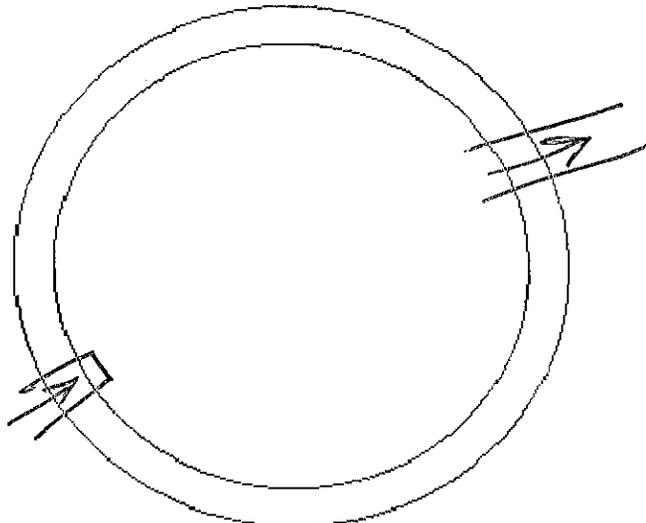
CONCRETE RINGS: Depth: 2 x 2" Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	W	4.04		4"		
IN OUT	E	4.60		6"		
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

FULL OF WATER + SOLIDS

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑

PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 514 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick **STONE**

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **CONC**

CASTING: Depth: NONE

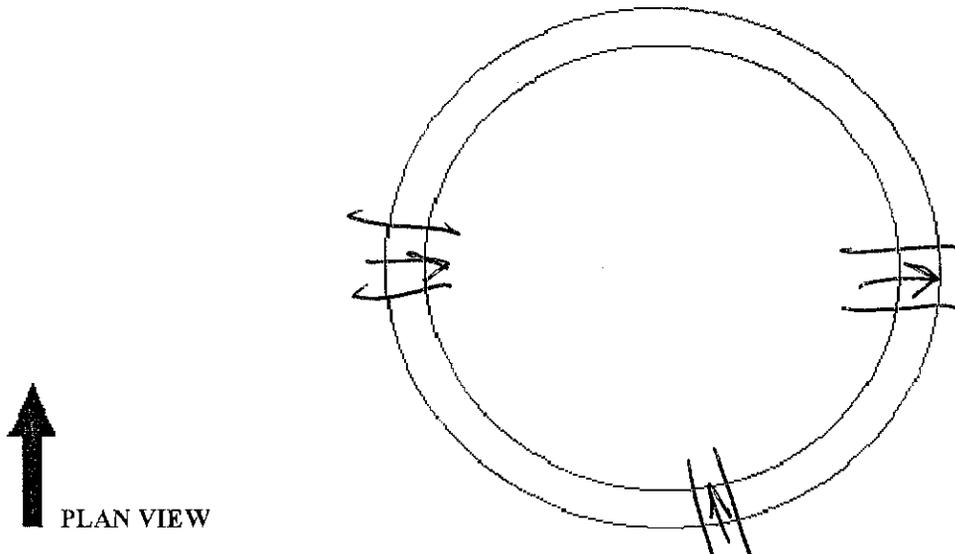
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="checkbox"/> IN OUT	W	5.96		6"		CLAY
IN <input checked="" type="checkbox"/> OUT	E	5.98		6"		"
<input checked="" type="checkbox"/> IN OUT	N	5.50		4"		"
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP
CRACKING OF STONE NEAR TOP

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation

PROJECT NO.: 043107309

Manhole #: 515

Street Name: _____

Nearest Address #: _____

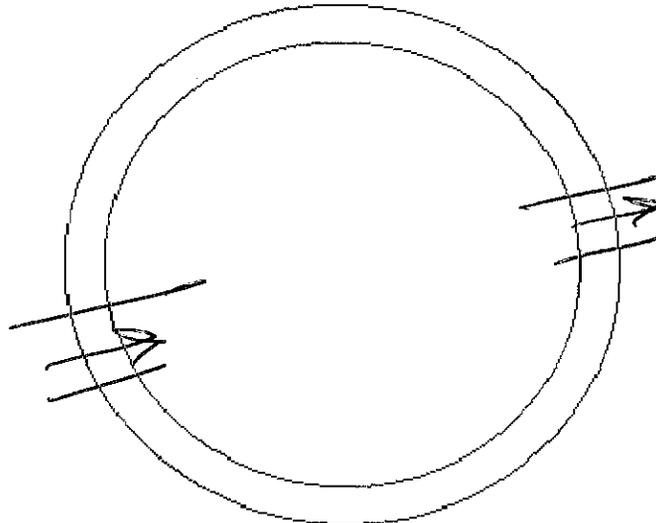
INDICATE ONE:

- MANHOLE TYPE: Precast Block Brick **STONE**
- CONE TYPE: Eccentric Concentric Flat Top
- GENERAL CONDITION: Good Fair Poor
- COVER TYPE: Concealed Open Pic Holes Locking Non-Locking **CONC**
- CASTING: Depth: NONE
- CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	<u>W</u>	<u>6.32</u>		<u>6"</u>		<u>CLAY</u>
IN OUT	<u>E</u>	<u>6.34</u>		<u>6"</u>		<u>CLAY</u>
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 5 16 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

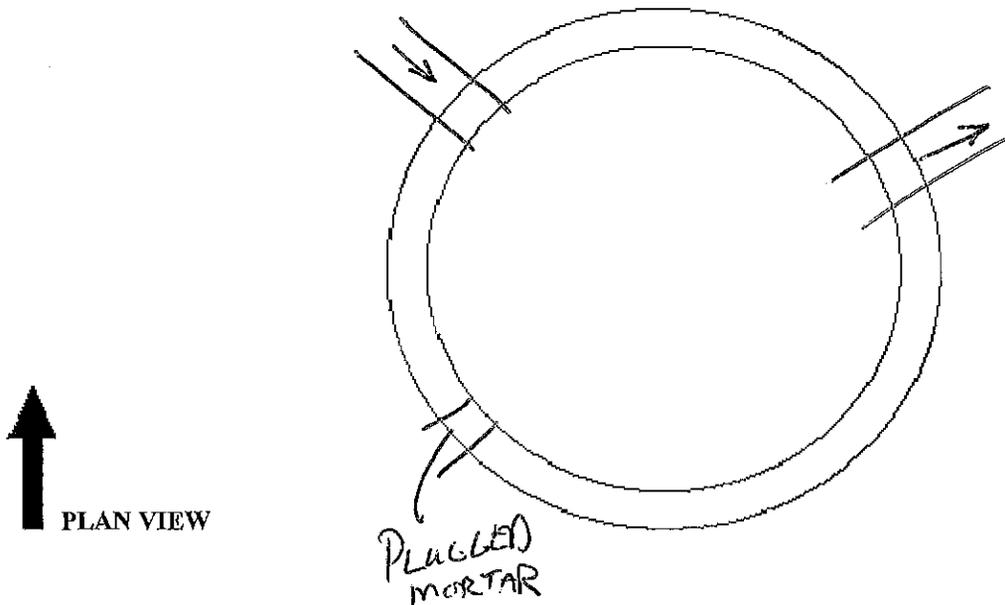
CASTING: Depth: 9"

CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>	NW	6.70 6.70				Di.
<u>IN</u> OUT	NE	6.98				D.I.
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 617 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: 3' DIA Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 3"

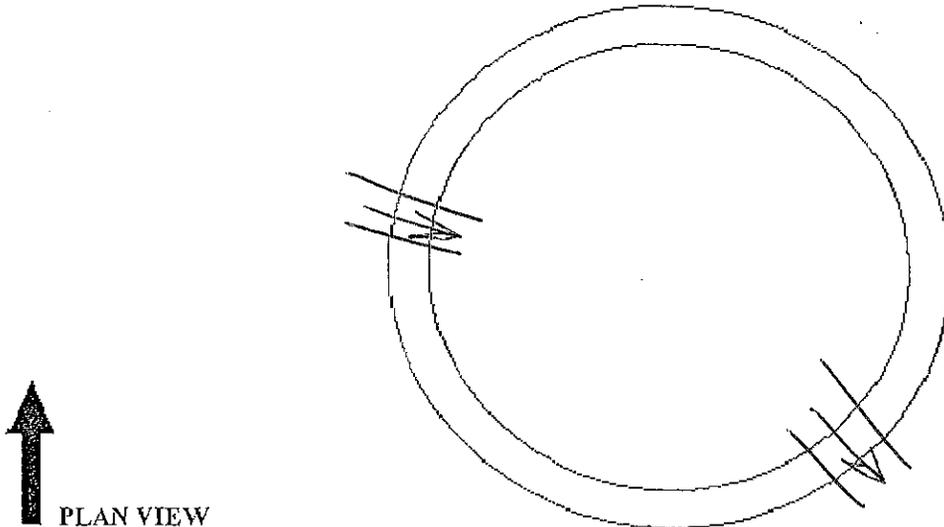
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>		2.32		6"		CLAY
<u>IN</u> OUT		2.30		6"		CLAY
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

DEBRIS IN BOTTOM
BURIED 1 FOOT BELOW SURFACE

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: 518 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking Bolted

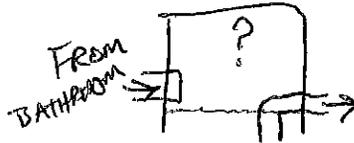
CASTING: Depth: 4"

CONCRETE RINGS: Depth: 2 x 2" Other: FLAT TOP

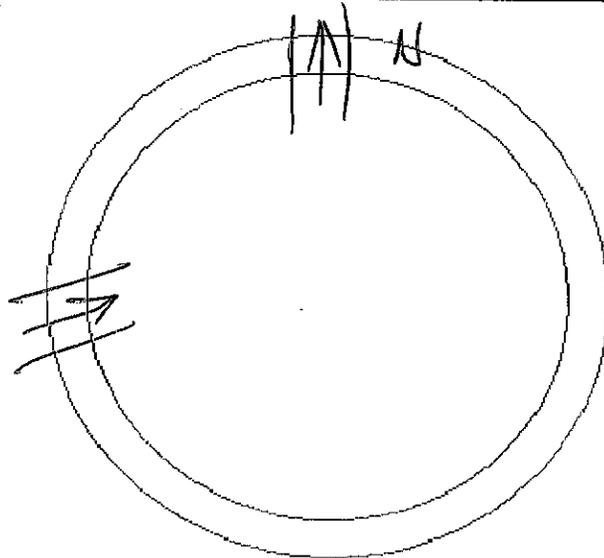
FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<input checked="" type="radio"/> IN <input type="radio"/> OUT	W	4.18		6" 6"		PVC
<input type="radio"/> IN <input checked="" type="radio"/> OUT	N	4.38		4" 4"		P
<input type="radio"/> IN <input type="radio"/> OUT						
<input type="radio"/> IN <input type="radio"/> OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

FULL OF WATER



INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: XA Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

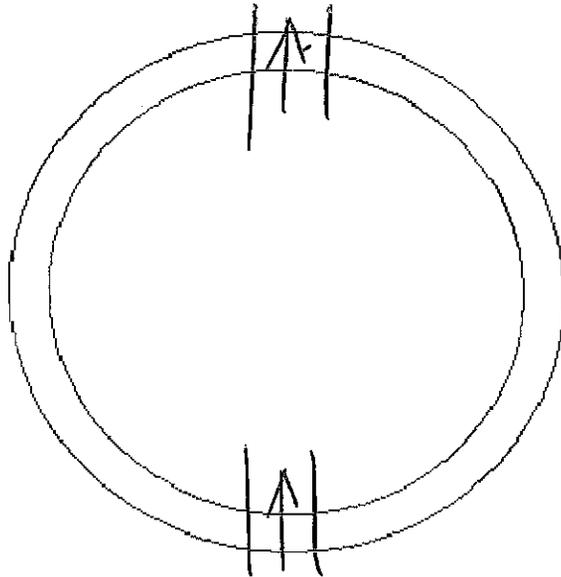
CONCRETE RINGS: Depth: 1 x 4" Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
<u>(IN)</u> OUT	<u>S</u>	<u>7.00</u>		<u>6"</u>		<u>PVC</u>
IN <u>(OUT)</u>	<u>N</u>	<u>7.06</u>		<u>6"</u>		<u>PVC</u>
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

CASTING OFFSET
DIRT IN MH
NO FLOW

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑

PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: XB Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

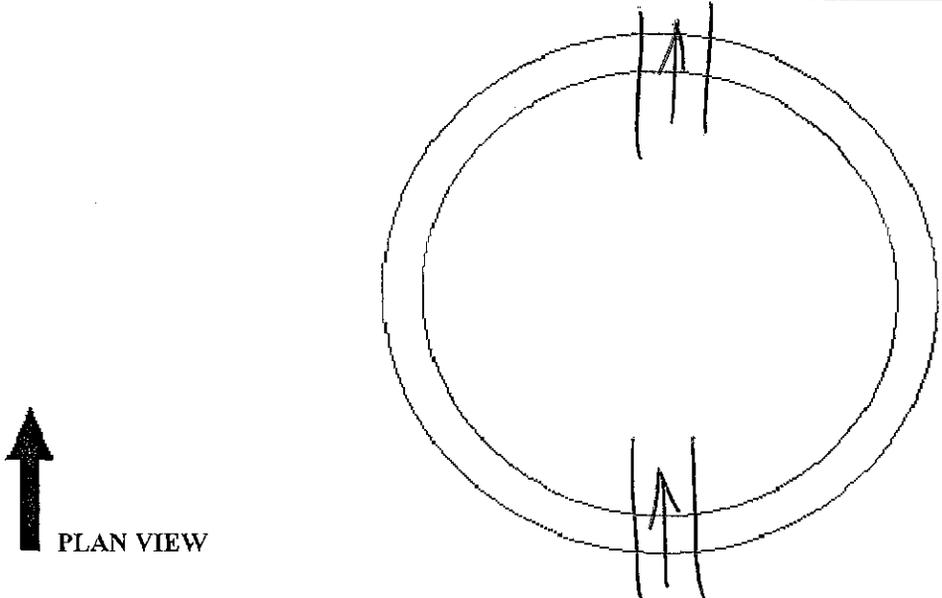
CONCRETE RINGS: Depth: 1 x 3" Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	N	7.08		6"		PVC
IN OUT	S	7.04		6"		PVC
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

**3" BELOW GRAVEL
NO FLOW**

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



↑
PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: JA 1 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 6"

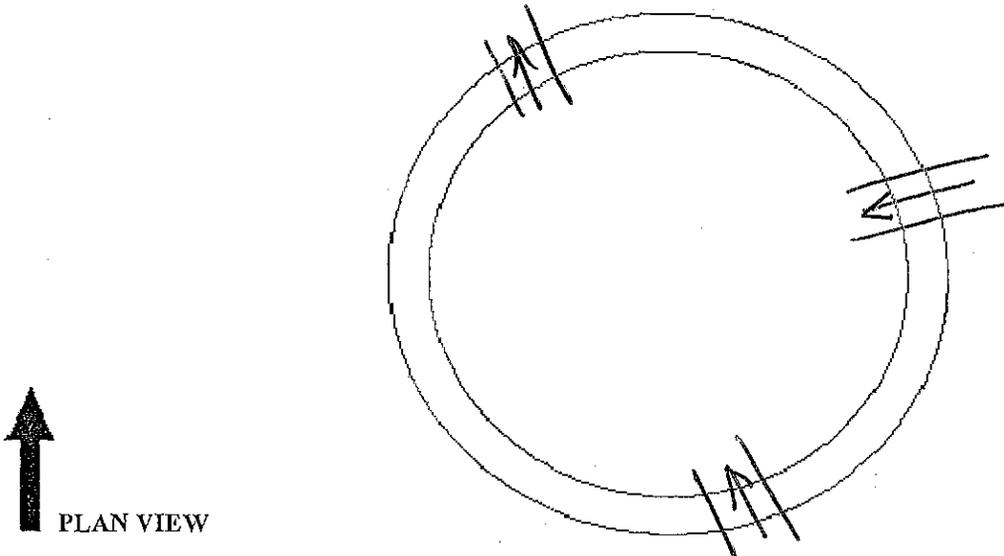
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN <u>OUT</u>	NW	3.70		6"		CLAY
<u>IN</u> OUT	E	3.40		8"		PVC
<u>IN</u> OUT	SE	3.60		6"		PVC CLAY
IN · OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

SOLIDS BUILD UP E
1" BELOW GRAVEL DRIVE SITE 148

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: IAZ Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Hole Locking Non-Locking

CASTING: Depth: 9"

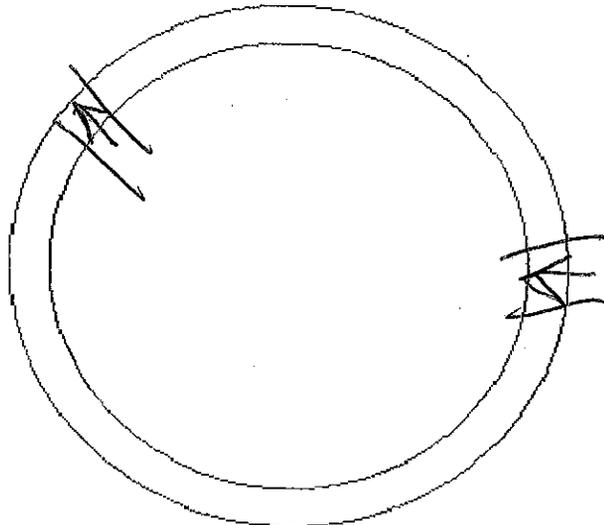
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
(IN) OUT	E	7.90		8"		PVC
IN (OUT)	W	7.98		8"		PVC
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

DEBRIS IN MH

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



PLAN VIEW

SANITARY/STORM MANHOLE SURVEY

PROJECT NAME: Devil's Lake Sewer System Evaluation PROJECT NO.: 043107309

Manhole #: IA5 Street Name: _____ Nearest Address #: _____

INDICATE ONE:

MANHOLE TYPE: Precast Block Brick

CONE TYPE: Eccentric Concentric Flat Top

GENERAL CONDITION: Good Fair Poor

COVER TYPE: Concealed Open Pic Holes Locking Non-Locking

CASTING: Depth: 9"

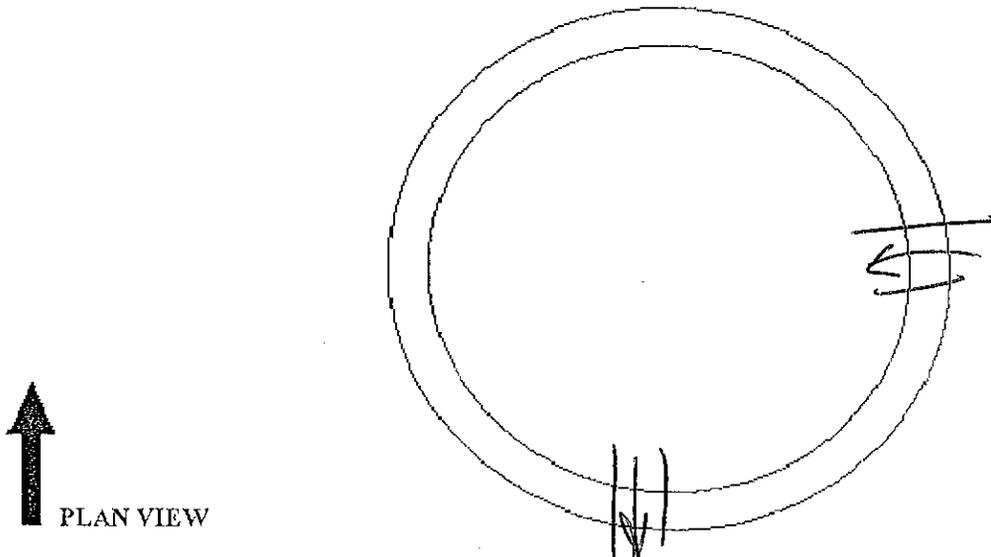
CONCRETE RINGS: Depth: NONE Other: _____

FLOW	DIRECTION N/NE, Etc.	DEPTH TO INVERT	INVERT ELEVATION	DEPTH TO PIPE DIAMETER	FLOW DEPTH	PIPE MATERIAL
IN OUT	E	4.10		4"		PVC
IN OUT	S	4.12		8"		PVC
IN OUT						
IN OUT						

COMMENTS: Note general conditions, solids buildup, leaks, infiltration, and any other items that exist.

DEBRIS

INDICATE ON PLAN VIEW THE LOCATION OF ALL BRANCH PIPES ENTERING THE MANHOLE.



Devils Lake State Park Sanitary Sewer Manhole Inventory Photos























































































































































