Engineering Report Final

City of Mequon

Lift Station "E" Condition Assessment

January 2021

Applied Technologies
Engineers - Architects

PN6398

CITY OF MEQUON LIFT STATION E CONDITION ASSESSMENT

JANUARY 2021

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PN6398

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CHAPTER 1
EXECUTIVE SUMMARY

The City of Mequon owns and operates Lift Station E (LS), situated on W. Ranch Road. This is Mequon's largest LS serving a large portion of the City of Mequon with the LS averaging 2.485 MGD (1,726 gpm) for 2019. The LS receives flow from the northeast (30-inch diameter), south (10-inch diameter) and west (18-inch diameter) gravity sewers.

The purpose of this portion of the study is to evaluate the condition of the LS and identify deficiencies. In general, the LS is well maintained and in good condition. However, the LS is nearly 55 years of age and requires upgrades to operate safely and reliably into the future. Most of the equipment has exceeded its typical design life, making the acquisition of parts and maintenance challenging. Access to the wet well is limited, due to the exterior door and stairwell, creating a hazardous work environment for City staff due to the confined space entry and the missing bar screen. The size of both the wet well and dry well is very limited resulting in limited storage capacity in the wet well and no space to service and maintain the current pumping equipment.

Based on the hydraulic evaluations completed as part of this study, the LS's firm pumping capacity is 7.56 MGD (5,250 gpm) based on the drawdown testing performed. In addition to the firm capacity, this study evaluated the capacity of the force mains receiving flow from this station along with the capacity of the influent sewers entering the station. As a matter of record, the force main capacity has been calculated as 9,230 GPM and the influent sewer system which includes flow from the north, west and south totals 7,110 GPM. Recent growth in the city and intense wet weather have resulted in increased flows and demands on this LS. Based on the larger and more frequent of occurrence of SSO's the LS no longer appears to be of adequate capacity to meet the present needs of the service area. Given these flow figures, it is apparent that the pumps have the lowest capacity of the system as a whole, whereas the gravity sewer and force mains have greater capacities.

As discussed in this report, numerous upgrades are necessary for the system to function properly in the near term and alleviate the staff's concerns of a station failure due to equipment obsolescence. While numerous items require attention, the most urgent are:

- Flow meter upgrade (installed in September 2020 based on previous authorization by the City not related to this report)
- Pump No. 1 upgrade
- Calibrate level controls to avoid vortexing in wet well
- Electrical and control system upgrades (a new automatic transfer switch ATS was installed in September 2020 as a result of initial drafts of this report)
- Personal Protective Equipment (acquired PPE and participated in Arc Flash Training as a result of initial drafts of this report)

The following chapters detail observations and begin to discuss recommendations for upgrading the various components.

CHAPTER 2
INTRODUCTION

This engineering report evaluates the condition of the existing Lift Station E (LS), identifying deficiencies and recommending needed improvements. The condition assessment consisted of discussions with operating staff, and field inspections. The station was entered, and conditions were observed; however, the wet wells were observed solely from the grating above. Field observations of the building's exterior were made at ground level.

BACKGROUND

The Lift Station is a multi-level cast-in-place concrete wet well and dry well lift station that was constructed in 1965. The wet and dry wells are approximately 26 feet deep. The service area currently includes approximately 3,007 acres and includes the service areas for Stations F, G, H and T which ultimately discharge into the collection system to station E (refer to Figure 2-1). In the future, it will include areas to the north and east described as the East Growth Area (EGA). For the purpose of this report, the operation can be described as follows:

1. Wastewater enters the wet well through a 36-inch RCP gravity sewer north of the station.
2. Four various sized pumps as described in Section 5 are housed in the lower level of the pump room. Pumps 1, 2 and 4 are connected to variable frequency drives (VFD's) whereas pump 3 is a constant speed pump. The firm capacity of the lift station is 5,250 GPM (7.56 MGD) with one pump out of service.
3. The station has no standby power generator but is instead served by two electrical services.
4. The metered discharge from the pumps flows to parallel 16-inch diameter C905 PVC force mains. The westerly (short) force main is approximately 6,200 feet log discharging near the intersection of Sunnydale Lane and Oriole Lane. The easterly (long) force main is approximately 13,500 feet long and discharges near the intersection of Port Washington Road and Zedler Lane. Typically, only one force

main is in service at a time with the shorter force main typically being operated during the day and the longer force main being operated at night, depending on which pumps are operating at that time. During high flow events, both force mains are operated together.

The four pumps operate on a scheduled basis as described in Chapter 5. In summary, Pump 1 operates from 7 AM to 3 PM daily, Pump 2 operates from 3 PM to 11 PM, and Pump 4 operates from 11 PM to 7 AM. Pump 3 does not normally operate, but functions as a standby for Pump 4.

SCOPE OF WORK

This engineering study involved the following evaluations, assessments, testing, analysis and recommendations for Lift Station E.

DATA GATHERING AND BACKGROUND ANALYSIS

- Attend a kickoff meeting with City staff.
- Review existing data, including record drawings, pump maintenance history, SSOs history, lift station runtime records and meter data.
- Review Standard Operating Procedures.
- Review 2011 Sanitary Sewer System Evaluation.
- Review 2018 Forcemain Report.

PERFORM SITE ASSESSMENT OF LIFT STATION E

- Inspect Electrical.
- Inspect Controls.
- Inspect Mechanicals.
- Inspect Wet Well.
- Inspect Structural.
- Inspect Odor Control System.
- Inspect SCADA.

PERFORM DRAWDOWN TESTING

- Provide results in a letter report with attachments.

ATTEND MEETINGS WITH CITY TO REVIEW EACH TASK

EVALUATE OPTIONS TO IMPROVE OPERATIONS AND MAINTENANCE OF LIFT STATION E

- Address Standard Operating Procedures.
- Based on Site Assessment analyze options for on-site improvements and retrofits.
- Present options to optimize and/or improve LS E Electrical, Controls, Mechanicals, Wet Well, Structural, Odor Control System, SCADA.
- Evaluate Electrical System / Power Supply.
    - Address Critical Back-up Power Supply and Redundant Electrical Feeds.
- Evaluate at least three factors on site at the station to mitigate frequency of overflows at LS E. Consider operational improvements, and structural and mechanical upgrades, or others as recommended by consultant.

EVALUATE LS E DEMAND AND ADDRESS CAPACITY ISSUES

- Evaluate hydraulics of contributing areas into LS E that include:
    - Lift Station F area (Basin ME4001) and meter data ME8098
    - Lift Station H area (Basin ME4002) and meter data ME9009
    - Glen Oaks (Basin ME4003) and meter data ME0005
    - Basin ME4004 and meter data ME9054

EVALUATE LS E DEMAND AND ADDRESS CAPACITY ISSUES

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    - Lift Station H area (Basin ME4002) and meter data ME9009
    - Glen Oaks (Basin ME4003) and meter data ME0005
    - Basin ME4004 and meter data ME9054
    - Pump Run time records and meter data to be provided by City and evaluated from 2016 to present.

  - City to provide selected consultant GIS access for mapped basin areas.
- Based on overflow history, address specific conditions that lead to cause of SSOs.
  - Consider Discharge and Forcemain capacity with respect to inflow demand.
  - Evaluate NWS and NOAA river gage/stage information to draw any correlations between pumping rates and river stage that may contribute to SSOs.
  - Identify At Least Three (3) Scenarios to mitigate of SSOs at LS E.
    - Address a fourth scenario that includes feasibility analysis of new lift station in the vicinity of the Port Washington Road Fire Station (to withdraw flow from Basin ME4003 and provide capacity for future growth).
    - Prepare a Cost Benefit Matrix of Options to Improve LS E Performance.
    - Consider I&I Reduction Programmed for Implementation including Lift Station F area (Basin ME4001) and Lift Station H area (Basin ME4002).
- Provide hydraulic analysis report of sewers in LS E contributing area.

Provide Recommendations in Report Format

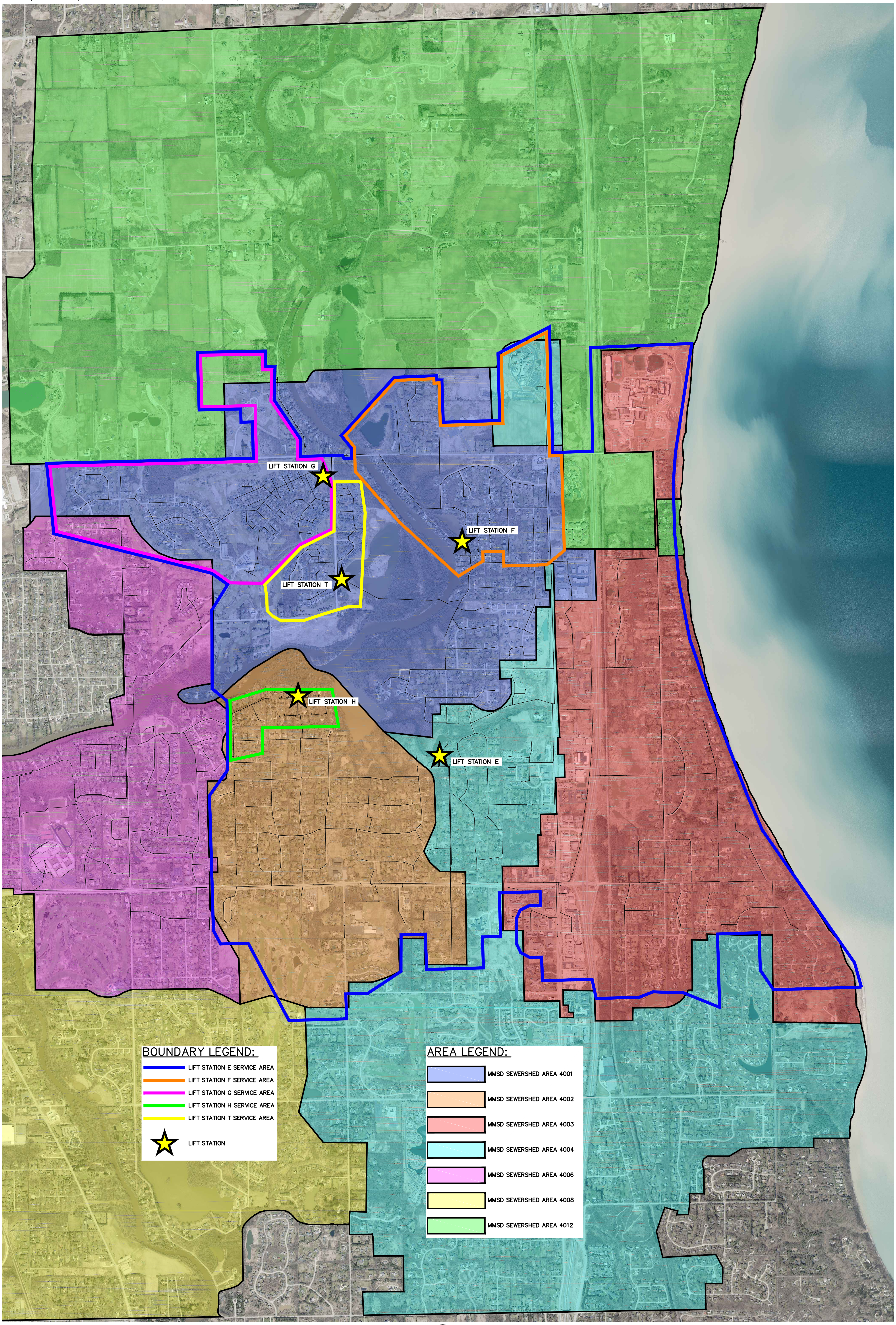
- Provide Near Term recommendations that address deficiencies identified in the condition assessment.
- Include drawdown testing results in the report.
- Provide recommendations that prioritize improvements and/or retrofits to LS E.
  - Address each of the following: LS E Operations and Maintenance, Electrical, Controls, Mechanicals, Wet Well, Structural, Odor Control System, SCADA.
- Include recommendations for Long Range Capital Improvements based Item II.
- Include recommendations for Operational Improvements based on Item V.
- Include recommendations for Collection System Improvements based on Item VI.
- Summarize Evaluation of On-Site Improvements and Retrofits

Prepare a Life Cycle Cost Analysis for Lift Station E

- Prepare LCCA Outline of Costs including but not limited to:
  - Capital, Energy, Operation, Maintenance/Repair, Downtime, Environmental (SSOs)
  - Address Alternatives for Pumps, Piping and Storage.

   - Analysis to Consider 5, 10, 15, 25, 35 and 50 year milestones.
- Provide Scenarios for Upgrade Options
   - Consider Long Term Growth including planning for East Growth Area.
   - Estimate cost for full lift station replacement.
   - Estimate phased replacements of pumps, structures and other features in item #2.
- Provide Draft Report on Life Cycle Cost Analysis.
- Allow for City Review and incorporating comments into Final LCCA Report for LS E

R:\SHARED FOLDERS\PROJECTS\6398 - MEQUON LSE\11.0 GRAPHICS\11.1 FIGURES\FIGURE 2-1.DWG



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N

PLAN

0 1000' 2000' 3000' 4000'
GRAPHIC SCALE

FIGURE 2-1
MMSD SEWERSHED AREAS AND METERS
CITY OF MEQUON, WI

CHAPTER 3

SITE

15-inch culvert beneath the station drive

The station site is located between 2010 and 2028 West Ranch Road, and City staff has identified this location as 2020 West Ranch Road. It is located on an Outlot platted on the recorded 1972 subdivision plat of River Bend in the City of Mequon. Although the Outlot is approximately 18 acres in area, the station is situated within an easement platted on the subdivision plat on a strip of land approximately 50 feet wide with the south face of the building situated approximately 240 feet north of the centerline of W. Ranch Road. To our knowledge, there is not easement declaration language for this property, only a platted easement. The station site is bounded by W. Ranch Road to the south, residential homes to the east and west and ponding water to the north. The land to the north of the station is a backwater area and tributary for the Milwaukee River and subject to periodic flooding.

Two arch culverts beneath W. Ranch Road

In general, for the LS E site, the topography drains from W. Ranch Road to the north toward the station. As it nears the station, there is a swale which intercepts the runoff and ultimately directs it toward the aforesaid backwater area.

At W. Ranch Road, there is what appears to be a 15-inch corrugated metal culvert pipe beneath the driveway to the station.

On the west side of the driveway, there are two elliptical or arch culverts (each approximately 35” X 24” corrugated metal pipes) beneath W. Ranch Road which collect runoff from the south side of W. Ranch Road and convey it north along the driveway and ultimately into the aforesaid backwater area.

Approximately 175 feet north of the W. Ranch Road pavement, there is another elliptical or arch pipe (approximately equivalent to a 15-inch round pipe) beneath the driveway which appears to convey any runoff coming down on the east side of the station driveway beneath the driveway and into the aforesaid backwater area.

Arch culvert beneath drive

Based on visual inspection, the culverts are generally in decent shape and are not a significant concern presently.

A review of the FEMA FIRM maps indicate that the station is located with Zone AE which has established flood elevations for the 1% recurrence storm commonly referred to as the 100-year storm. It appears that the flood elevation described would fall somewhere between elevation 662.6 and 662.5 by interpolation. Using the sewer invert of the influent manhole on the site, we measured the floor elevation for the station at 660.54, which places the building floor below the estimated flood elevation. As recommended, the site was surveyed by Ayres and Associates in September 2020. The survey included the elvations of all site improvements including the berm, the driveway and the culverts (drainage) pipes as shown in Appendix “H.”

The soils in the vicinity of the station consist of silt loam and silty clay loam soils in the Kewaunee and Manawa series. The soils are generally described as Hydrologic Soil Group D soils. These soils have low infiltration rates as a result of their high clay content, and inherent high-water table.

During site visits, it was noted that the north, west and east sides of the site are enclosed with an earthen berm. It appears that if sufficient runoff drains into the aforesaid backwater area, the station site may flood, as the runoff will back up to the driveway and flow toward the station. There is a small diameter pipe thru the berm to the north of the station. In addition to draining runoff from the station site during normal precipitation events, it most likely also acts as a conduit to allow excess runoff to backflow onto the site during high water conditions. Given the floodplain location, drainage is a significant concern. Based on a review of the survey contained in Appendix "H", mitigation of flooding issues has been further discussed in Chapter 7 of this report. Presently, the driveway is approximately 2 feet below the regulatory flood elevation. While the driveway could be raised, to do so would also require raising the building out of the flood plain. This has been further evaluated n Chapter 7 as part of Alternate 1.

Berm on east side of station

Berm on west side of station

The driveway is approximately 12 feet wide and in reasonable shape, and if we were to rate it, we would classify it as good (rating 6) using the Pavement Surface Evaluation and Rating (PASER) system.

12-foot wide dirve

While normally used for public streets, the rating system was used in this instance to quantify the driveway. Given the limited traffic, this would likely be classified as a minor concern. During the field meetings with representatives from the City and our staff, it is evident that parking is limited. While there are no marked parking spaces delineated on the property, the paved area southwest of the building appears capable of storing two vehicles comfortably, but up to four vehicles with an additional vehicle on the north and an additional vehicle on the south for a total of fout to six available parking spaces, if necessary. One option to increase the parking may include widening the driveway, although the ditches along either side will make this difficult. A second option would be the installation of an aggregate shoulder along one or both sides of the paved surface to increase the site accessibility. Alternatively, the ditch could be enclosed using storm sewer piping and parking could be provided. If this is desired, we would recommend enclosing the easterly ditch due to the smaller tributary drainage area.

SITE IMPROVEMENTS

Near W. Ranch Road in the vicinity of the Station, the existing elevation is approximately 666 based on the Ozaukee County GIS site. This elevation is nearly 3.5 feet above the stated regulatory flood elevation. As there is not presently an up to date survey of the property, the information published on the GIS site is the best information available. Due to this, the City commissioned a survey of the station site and the surrounding area to determine what can be done to mitigate flooding at the station site. Upon receipt of detailed survey information of the station site and its immediate surrounding lands, a more thorough discussion of alternatives for mitigating the station flooding can be completed. It is noted that the existing station site is not owned by the City, it is located within an easement located on a platted Outlot. In addition, the easement is configured such that improving or replacing the station on this site will be severely hampered by the lack of available land, and the location of the existing improvements.

The location of the lift station building, and the elevation of the building floor makes this building subject to flooding. Any improvements to existing lift station in excess of 50% of the building's value will require that the building be floodproofed per requirements of NR 116. This requires that the building be constructed at least 2-feet above the 100-year flood elevation and in a manner to prevent the entrance of flood waters into the wet and dry wells of the station among other requirements. This would require either raising the elevation of the current site to an elevation 2-feet above the 100-year flood elevation with building modification to account for grade change or the construction of levees or floodwalls. This would involve modifications to the current berms surrounding the lift station with the raising of berms to a minimum of 3-feet above the 100-year flood elevation and the extension of the berms to a point at least three feet above the regulatory flood elevation. This would also involve removal of any current drains through the existing berms and the installation of a storm water pump station to prevent flooding of the site by storm waters that can enter the site. These improvements would also require the floodproofing of utilities such as power transformers and the influent sewers. Another improvement to the site would be to provide flood proof access to the site to allow servicing and maintenance of the station.

Floodproofing of Sanitary Sewers

River Gage Data

As discussed in Chapter 5, and tabulated in Table 5-2, the City has experienced a series of Sanitary Sewer Overflows (SSO's) dating back to April 2007. The most recent SSO occurring on May 17th of this year resulted in an overflow volume of 1.68 million gallons at Lift Station E. Of the past ten events, the United States Geological Service (USGS) and/or the National Weather Service (NWS) have river gage data available for eight of these SSO events. The data obtained relative to the River Gage data is contained in Appendix E. While the gaging site is located to the north of LS E, on the west side of the Milwaukee River at W. Pioneer Road, comparison of gage heights at the gaging site allows us to evaluate the increase in river stage as a result of the rainfall events associated with the listed SSO's. Using the latest SSO for context, a total rainfall depth of 4.1 inches was reported during the May 17th SSO, which resulted in a crest depth of 11.8 feet and a water surface elevation of 665.15 at the gage site during this event. The crest elevation appears to be significantly below the regulatory flood elevation of 669.1 near the gaging site.

A review of the local rainfall records using the Weather Underground website appears to indicate that while the storm began at approximately 3 AM and ended at approximately 9 PM, the heaviest precipitation rate of approximately 1-inch per hour occurred at approximately 4:30 PM. At the time of this peak rate, it is noted that the storm had dropped approximately 90% of the total reported rainfall. In reviewing the SSO Notification Summary Report for LS E there were three locations where bypass pumping was performed. While each location is different, the maximum duration of pumping occurred from 1:30 PM on the 17th until 3:00 AM on the 18th and totaled 1.098 million gallons. This results in an average bypass of approximately 1,356 GPM for the duration of the bypass.

Sanitary Sewer Recommendations

Being that there are many manholes which could be subject to submergence as a result of high water levels, it is recommended that those immediately adjacent or directly connected to the River be further evaluated for inflow, as the SSO volume of 1.68 million gallons appears to be the result of significant clear water into the system.

CHAPTER 4

BUILDING STRUCTURE

GENERAL

Lift Station E

The original building was constructed in 1965 when the station was originally built. The substructure is a cast in place concrete wall that varies in thickness from 1'-6" at the bottom of the walls to 1'-2" at the top of the foundation. The superstructure is a double wythe brick wall. The north and south elevations had 20" wide brick bump outs that protrude from the face of the building and contain vent piping and roof drain piping. The roof on the original portion of the building was a cast in place concrete deck with rigid insulation and built-up roofing.

In 1999, an addition of approximately 250 square feet was constructed on the north side of the building. The foundation consists of 12" concrete masonry unit (CMU) frost walls on concrete strip footings, as shown on the record drawings. The exterior walls are 9'-0" high, foam-filled 12" CMU which is connected to the existing building with two 10" dowels at every other course, and the joint is sealed with backer rod and sealant. The roof assembly consists of an 8" precast hollowcore plank, rigid insulation and a ballasted ethylene propylene diene monomer (EPDM) membrane. The roof edge is an aluminum gravel stop with aluminum fascia. At the time of the addition, the original roofing was replaced, and the EPDM and roof edge trim were installed over the whole roof.

ROOF

At the time of the inspection, staff was unable to access the roof to conduct a visual inspection. The last record of roof replacement was performed during the 1999 building addition project. Based on typical lifespan of EPDM roof, it could be ready for replacement in the next 5-10 years. There were no reports of known roof leaks, however, on the west interior wall of the Control Room, there was some noticeable discoloration of some bricks near the ceiling. This could be an indication of moisture penetration through the roof or possibly moisture from the Wet Well on the other side of the wall. In speaking with Wayne Bernhardt, there have been some issues with the roof drain in the past.

Recommendation

- Perform a thorough visual inspection of the roof.

EXTERIOR

The original brick and the CMU addition are both in relatively good condition. The main area of repair is the southwest bump out where the roof drain discharges through the brick. The bottom 3 courses are spalling, and the brick has several vertical cracks extending about 3 feet up the wall. Spalling occurs when water inside the brick freezes and expands, popping off the face of the brick. The water can get in the brick any number of ways. Either through prolonged direct contact from rain or possibly a leak from the roof drain leader. The galvanized iron leader will also expand and contract with temperature changes and can cause the brick to crack.


Brick damage at southwest bump out

The movement joints on each side of the building between the original construction and the addition is failing and should be replaced. The sealant joints should also be replaced around each door, louver, and other wall penetrations (est. 150 LF). The doors are beginning to show some rust and the paint on the underside of the roof overhang is deteriorating.


East expansion joint

The inside of the exterior wall above door to the wet well has some unique CMU infill around the original brick. The cracking exhibited here is likely from the differential movement of the clay brick (expands) and the CMU (contracts). The crack is only cosmetic and does not require a repair.

Recommendation

- Replace damaged brick and cut out and tuck point all damaged mortar joints.
- Clean out roof drain and leader.
- Paint doors and underside of roof overhang.
- Replace movement joints between the original construction and the Bldg. addition.

INTERIOR

The interior walls are in good condition. The west interior wall of the Control Room has some indication of moisture penetration as discussed in the roof section above. Investigate further to ensure it is not exterior water penetration.


West expansion joint

Similar to the exterior walls, the interior wall of the Electrical Room connects to the original construction with dowels. However due to settlement of the addition over time the CMU has cracked, and the attempted sealant repair has failed.

Recommendation

- Cut away the cracked CMU to form an appropriate movement joint and install backer rod and sealant.


Interior movement crack

Dry Well

The lift station was constructed with a dry well, a cast in place concrete superstructure that houses the station's four pumps, related piping and valves, and other equipment required to run the station. The current arrangement provides no real space around the equipment to allow the operators to service and maintain the pumping equipment. There is no space in the dry well for an additional pump and even the installation of larger pumps in place of the current pumps will be difficult. The structure is in good condition, appears to be well maintained and requires little or no work at this time.


Corrosion of the concrete structure

Recommendation

- No action necessary at this time.
- Long term recommendations will be finalized and included in the evaluation section of this evaluation.

WET WELL

The LS wet well collects wastewater from the incoming sewer. It is configured with an inlet channel that distributes flow to the north and south end of the wet well. Access to the active wet well is through a small opening at either end of this channel making periodic servicing and maintenance of the wet well difficult and hazardous for Mequon staff. The wet well depth and size is very small for a station of this size resulting in a wet well with limited storage capacity. The storage capacity provided by the wet well directly affects the length of time that wastewater is retained in the station, as well as the frequency of pump starts. The wet well depth limits the active depth of the station. The unconventional arrangement as shown on the following page, of the pump suction with the inlet flush with the wall further limits the active depth of the wet well. Typically, the suction lines would pass through the wall and terminate in a 90° elbow with a flare inlet turned down. To prevent a vortex or a swirling funnel of air from the surface directly into the pump suction line, the location of the pipe in the sump and the actual dimension of the sump are important as well as the depth of liquid above the suction inlet. For the suction pipe as currently configured the minimum submergence is measured from the top of the flange to the required minimum water surface versus the plane of the turned down flare to the water surface. For the current pumps, the minimum submergence recommended to prevent vortexing is 3 feet above the top of the flare inlet putting the minimum wet well level as 58.75 feet with the invert on the sewer inlet at 59.75 feet leaving only one foot of active wet well depth before surcharging the sewer. If designing today, additional depth would be required as this sort of active wet well depth is not adequate.

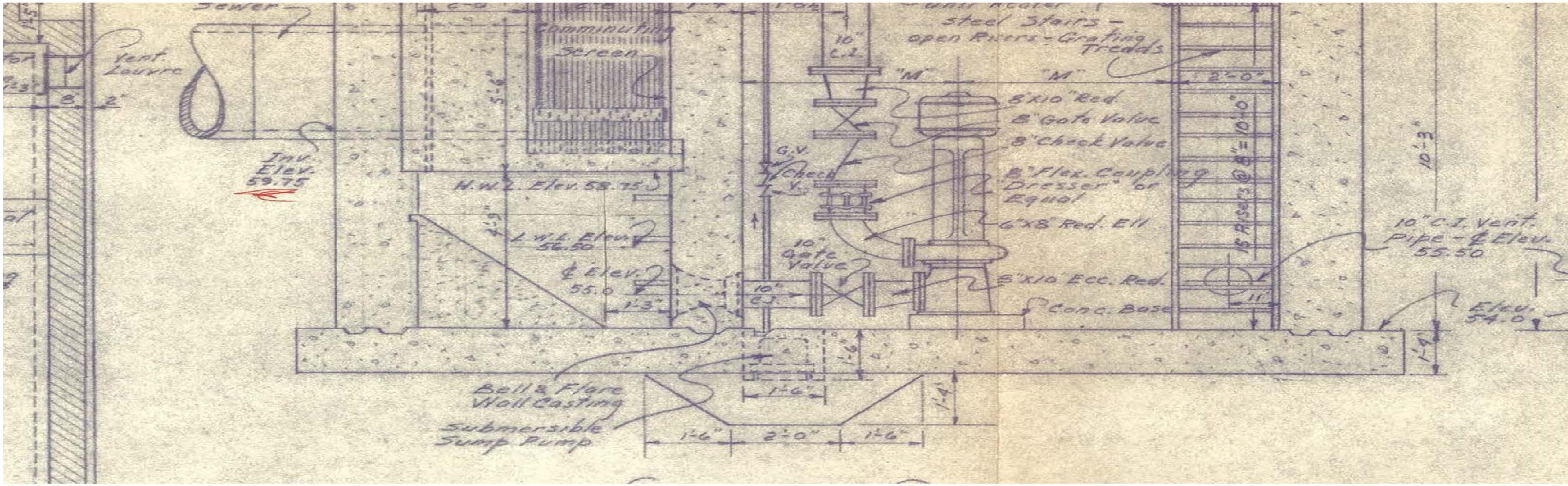
Influent wet well channel

The interior of the wet well appears to be in good condition and Mequon staff noted that it had been recently refinished.

Recommendation

- Review the wet well levels and visually verify that no vortexing is occurring at the pump suctions during pumping.

- Options to be considered following completion of the capacity section of this report include but are not limited to a new wet well, installation of a relief sewer to mitigate the flows to station E, among others.


Sewer
Vent Louvre
Inv. Elev. 59.75
Comminuting Screen
H.W.L. Elev. 58.75
L.W.L. Elev. 56.50
℄ Elev. 55.0
10" C.I.
10" Gate Valve
G.V.
Check V.
Steel Stairs - open Risers - Grating Treads
"M"
8"x10" Red.
8" Gate Valve
8" Check Valve
8" Flex. Coupling "Dresser" or Equal
6"x8" Red. Ell
8"x10" Ecc. Red.
Conc. Base
15 Risers @ 8" = 10'-0"
10'-3"
10" C.I. Vent. Pipe - ℄ Elev. 55.50
Elev. 54.0
Bell & Flare Wall Casting
Submersible Sump Pump
1'-6"
2'-0"
1'-4"
2'-0"

CHAPTER 5

PUMPING FACILITIES

FLOWS

HISTORICAL FLOWS

The City of Mequon has two ultrasonic doppler flow meters to monitor and record the flows pumped from the lift station. Table 5-1 presents the station's historical daily flows for the period of January 1, 2013 through December 31, 2019. A summary of daily reports is contained in Appendix "C".

Table 5-1
Historical Daily LS Flow

Year	Average (gpd)	Median (gpd)	Maximum (gpd)	Max Date	River Stage Ht.[3]
2013[1]	1.283,000	1,089,000	4,278,000	4/11/2013	Not Avail.
2014[2]	1,320,000	1,088,000	5,148,000	6/18/2014	9.95
2015[2]	1,222,000	958,000	4,890,000	4/09/2015	10.91
2016	1,691,000	1,081,000	5,128,000	4/01/2016	Not Avail.
2017	1,875,000	1,147,000	4,844,000	5/01/2017	Not Avail.
2018[2]	1,828,000	1,677,000	4,353,000	9/03/2018	11.40
2019[2]	2,485,000	2,322,000	4,456,000	3/14/2019	15.25

Notes:

1. Data from Sep 13, 2013 through Nov 16, 2013 was not included in the average as it appeared unrepresentative of station flows.
2. Corresponds to overflow event (SSO) reported to the WDNR. (Refer to Appendix "D")
3. Flood stage for this gage is 11, major flood stage is 14. Gage description is provided in Chapter 3.

Over this period, the station's daily flows have averaged from 1.222 MGD (849 gpm) for 2015 to 2.485 MGD (1,726 gpm) for 2019 and appear to have steadily grown. since 2013. Over this period the station experienced a maximum daily flow of 5.148 MGD (3,575 gpm) on April 1, 2016. These flow values are based on the daily flow records for Station E and are a sum of the total flow monitored by the two ultrasonic doppler flow meters with one located on each of the two 16-inch force mains at the Lift Station. It should be noted that Mequon staff was concerned about the performance of the current flow meters and as a result replaced them. Additionally, observations made during the review and summation of the daily flow data led to a discovery that one of the flow meters was repeatedly reporting a daily flow value of 3,276,700 gpd. This was found as the maximum value reported for the period of January 1, 2013 through December 31, 2019 and was reported as a daily flow value 140 times over this period with the earliest occurrence noted as June 18, 2014 and the last being March 15, 2019. It was also observed to have occurred 21 times in the month of May 2020. The 2020 data was not included in table 5-1 because we did not have the entire year of data as we had thru 2019. This was not a random occurrence with it occurring so frequently and indicates some type of problem with metering and or recording of the daily flows from this meter. This discovery causes concern over the reliability and accuracy of the reported daily flow data. The disadvantage of a doppler flow meter is that the liquid stream must have particulates, bubbles or other types of solids to reflect the ultrasonic signal. Furthermore, the accuracy of the meter also depends on particle-size distribution and concentration as well as the relative velocity that may exist between the particulates and the fluid. This meter has trouble with accuracy at very low velocities. Accurate and reliable flow data for this lift station is an important tool when evaluating the adequacy of the current station and in determining the required future design capacity of the lift station. The City received a proposal from Mulcahy Shaw Water and proceeded with the installation of new meters for the station in September 2020. It is recommended that all future work on this and all other stations within the City require the installation of mag meters on the force mains for accurate metering data. Mag meters generally are better performing and more forgiving when recommended pipe lengths cannot be achieved due to field conditions. While mag meter installation requires downtime for the flanged installations and can result in higher cost with bypass potential required, their use is ideal for force main applications.

Sanitary Sewer Overflow

Sanitary Sewer Overflow's (SSO) are defined by Wisconsin Administrative Code NR 210 as "a release of wastewater from a sewage collection system or an interceptor sewer directly into a water of the state or the land surface." These can be caused by severe weather-related conditions such as a large or successive precipitation event, saturated soil and/or heavy snowmelt. They can also occur due to an infrastructure failure such as a line break or an equipment failure. An SSO made as the result of flooding and heavy rains are done to prevent loss of life, personal injury, or severe property damage.

SSO records for lift station E's collection area, (lift station E and all lift stations that discharge to E), over the past seven years were reviewed and summarized in Table 5-2. During this period, nine separate periods of heavy precipitation and/or flooding led to 25 Sanitary Sewer Overflows (SSO's) reported to the DNR. Since 2007, the data seems to show a trend that these events are increasing in size with the most recent event occurred on May 17, 2020 where an estimated volume of 2,140,000 gallons were discharge through six separate SSOs. Based on the frequency and size of SSOs within the LS collection system, lift station E no longer appears to be adequately sized to handle the increasing flows it is receiving. Additionally, this station has experienced extensive flooding of the site as well as the wet well and dry well in 2009. Paint marks in the station appear to indicate the high-water level was approximately 9.5 feet below the floor elevation of the station

RECOMMENDATIONS

- Prioritize the replacement of the flow meters at Lift Station E. During their replacement, verify proper installation and setup of the meters, confirm the scaling of the flow meter output with the current Supervisory Control and Data Acquisition (SCADA) system, base daily totalization of flow off the meter's pulse output, revise SCADA programing and verify that there is not a problem with storing the totalized value.

- Configure SCADA's historical system to periodically store flow rates throughout the day for a period that will allow Mequon staff to recover the data as needed such as for a recent storm event. (This information has been previously provided to the City for the May 17, 2020 SSO event listed in Table 5-2)

- Review Mequon's capacity, management, operation and maintenance program (CMOM) and Compliance Maintenance Annual Report (CMAR) to assure that a sewage system is properly managed, operated and maintained at all times; has adequate capacity to convey peak flows; and all feasible steps are taken to eliminate excessive infiltration and inflow from the system.

Table 5-2
Historical SSO Events

Start Date	End Date	SSO Location	Estimated Volume (gal)	Duration (hr)	Rainfall (inch)	Snow Melt (inch)
3-Apr-07	3-Apr-07	G	51,000	1.42	yes	
10-Apr-08	10-Apr-08	G	38,000	2.17		10-12
13-Jun-08	13-Jun-08	F	90,000	5.00	2.7	
13-Jun-08	13-Jun-08	G	51,000	2.83	2.7	
			141,000[2]			
26-Apr-09	26-Apr-09	G	26,400	6.83	3.8	
26-Apr-11	26-Apr-11	G	160,000	5.00	2.0	
18-Jun-14	18-Jun-14	E	415,800	5.50	4.0	
18-Jun-14	18-Jun-14	F	126,000	3.00	4.0	
18-Jun-14	18-Jun-14	G	58,500	3.00	4.0	
9-Apr-15	9-Apr-15	E	472,500	6.25	4.2	
9-Apr-15	9-Apr-15	E	180,000	2.00	4.2	
9-Apr-15	9-Apr-15	F	168,000	4.00	4.2	
9-Apr-15	9-Apr-15	G	257,400	6.50	4.2	
9-Apr-15	9-Apr-15	H	97,400	5.00	4.2	
			1,175,400[2]			
26-Aug-18	27-Aug-18	E	630,000	7.00	3.3	
26-Aug-18	28-Aug-18	F	247,500	7.00	4.6	
26-Aug-18	27-Aug-18	G	59,400	1.50	3.3	
26-Aug-18	28-Aug-18	H	120,750	5.75	4.6	
			1,057,650[2]			
2-Oct-19	2-Oct-19	E	292,500	2.80	3.5	
17-May-20	18-May-20	E	1,098,000	13.50	4.1	
17-May-20	18-May-20	E	357,000	7.00	4.1	
17-May-20	18-May-20	E	225,000	2.50	4.1	
17-May-20	18-May-20	F	336,600	12.50	4.1	
17-May-20	18-May-20	G	79,200	4.00	4.1	
17-May-20	18-May-20	H	43,875	2.30	4.1	
			2,139,675[2]			

Notes:

2. Total estimated volume of SSO from Lift Station E's service area for the storm event.

INFLUENT SEWER


Influent sewer just west of lift station

Wastewater flows into the station through a 36-inch diameter gravity sewer. Feeding in to this 36-inch sewer, there is a 30-inch diameter from the northeast, an 18-inch from the west and a 10-inch from the south. The capacity of the limiting slope on each of these feeder lines was used to calculate the capacity of the influent sewer. Using the City GIS system, we have reviewed the data provided on each leg of the influent sewer. The 30-inch concrete pipe was installed in 1967 and televised in 2019. Notes on this pipeline appears to indicate spalling and exposed aggregate on portions of this piping. The 18-inch concrete pipe to the west, was installed in 1968, and there were no issues noted on the GIS system for the first several lines beyond the station. The 10-inch concrete pipe from the south and east was also installed in 1967, and there are no condition concerns listed on the GIS system. Cleaning and televising of the influent sewers has recently been completed with no significant defects noted. ATI Staff reviewed the video provided for the 18" and 30" sewers, and found no significant deficiencies. We estimate that the capacity of these influent pipes flowing full at 7,110 gpm. When compared to the meter data for meters ME0005, ME9009 and ME9054 (areas as shown on Figure 2-1) using March 14, 2019 as the benchmark, the highest measured flows during this event totaled approximately 3,500 GPM. This event was selected due to the river stage height and flow values listed in Table 5-1. The condition of the influent sewer was observed from the manhole just west of the lift station, and it appears to be in good condition.


Station Wet Well

SCREENING DEVICES

To protect the pumps from large debris and rags that could potentially clog or damage them, the LS was constructed with a comminutor and a manual trash screen prior to the station's wet well. As is common with many similar stations, the comminutor was removed at some point, likely because it became too difficult and costly to maintain in operation. Mequon continues to utilize the manual bar screen to protect the pumps from large debris. Maintaining the current manual bar screen requires that an operator enters the wet well to manually rake the screen clean. Larger debris is collected and carried out of the station for disposal and smaller debris is broken up and thrown into the wet well.

PUMPS

CAPACITY

The station houses four vertical dry pit pumps of various sizes and types. Pumps 1, 2 and 4 operated on variable frequency drives while pump 3 is constant speed. Pump 1 is a 50 hp Aurora pump rated at 1,400 gpm at 60 feet total dynamic head (TDH) at 875 rpm. This pump is the smallest of the four pumps and is scheduled to operate from 7:00 AM to 3:00 PM daily discharging through the west force main. As currently configured, pump 1 is equipped with 50 hp 1,200 rpm motor, however this motor is undersized for the pump and will overload if operated at full speed. A hydraulic analysis of this pump indicates that this pump is capable of pumping 2,500 gpm at 88 ft TDH, however it would require approximately 70 hp to power the pump which overloads the current 50 hp motor. During the drawdown testing completed as part of this study, an average pumping rate of 2,530 gpm it was measured confirming that the pump is capable of pumping 2,500 gpm at 88 ft TDH. The drawdown test also confirmed that the pump motors is overloading when operated at full speed and that there are no controls to prevent this from

Pumps 2, 3 and 4

occurring. To ensure that this pump is non-overloading, the current 50 hp should be replaced with a 100 hp 1,200 rpm motor. Alternatively the variable speed drive could be programmed to limit the maximum motor speed. Assuming that the pump is 77% efficient and the full motor load of 50 hp is used, this pump should be capable of pumping 1,850 gpm at 68 ft TDH. As such, this pump does not have the needed installed horse power required to develop the head to operate in parallel with Pump 2 or discharge through the longer east force main, but only enough head capacity to operate by itself through the west force main; the shorter of the two 16-inch diameter force mains.

Pump 2 is a 125 hp Smith & Loveless pump rated at 3,000 gpm at 104 feet TDH at 1,200 rpm. This pump is scheduled to operate from 3:00 PM to 11:00 PM daily discharging through the west force main. This pump will also operate between 7:00 AM to 3:00 PM whenever flows are above a predetermined value on the SCADA system. The hydraulic evaluation of this pump discharging through the west force main estimates that it is capable of pumping 3,400 gpm at 98 ft TDH or 3,000 gpm at 104 feet TDH through the east force main. Drawdown testing completed as part of this study for Pump 2 through the west force main had Pump 2 pumping an average rate of 2,810 gpm. This is a 17% reduction in Pump 2’s capacity. Pump 2 is the oldest of the four pumps and the reduced pumping rate from its rated capacity is likely due to pump wear. Other possible causes of reduced flow could be a clogged suction line, debris in the impeller and vortexing.

Pump 3 is a 125 hp Aurora pump rated at 3,400 gpm at 100 feet TDH at 1,200 rpm. This pump is not normally scheduled to operate but would normally operate as a standby unit in place of Pump 4 from 11:00 PM to 7:00 AM daily discharging through the east force main it can also be operated as a standby unit to Pump 2 discharging through the west force main. The hydraulic evaluation of this pump estimates that it is capable of pumping 3,000 gpm at 107 ft TDH discharging through the east force main or 3,400 gpm at 100 feet TDH through the west force main. Drawdown testing completed as part of this study for Pump 3 through the east force main had Pump 3 pumping an average rate of 2,560 gpm. This is a 15% reduction in Pump 3’s capacity. The reduced pumping rate could be caused by the same conditions listed for Pump 2 but could also be attributed to sedimentation in the force main.

Pump 4 is a 125 hp Fairbanks Morse pump rated at 3,000 gpm at 112 feet TDH at 1,170 rpm. This pump is normally scheduled to operate 11:00 PM to 7:00 AM daily discharging through the east force main. The hydraulic evaluation of this pump estimates that it is capable of pumping 3,100 gpm at 108 ft TDH discharging through the east force main. Drawdown testing completed as part of this study for Pump 4 through the east force main had Pump 4 pumping an average rate of 2,440 gpm. This is a 21% reduction in Pump 4's capacity. The reduced pumping rate could be caused by the same conditions listed for Pump 3.

During high flow conditions, multiple pumps can be operated at once and both force mains can be placed in service. With both 16-inch force mains in service and the largest pump out-of-service (Pump 4), the rated capacity of the station is 6,400 gpm (9.22 MGD). This is based on the pumps operating at their rated capacity with Pump 2 pumping 3,400 gpm at 98 ft TDH through the west force main and Pump 3 pumping 3,000 gpm at 107 ft TDH through the east force main. The peak capacity of the station could be achieved with pumps 2, 3 and 4 in service, with pump 1 not being in service due to the reasons discussed above. Operating Pump 3 and Pump 4 in parallel together through the east force main will pump an estimated 3,480 gpm, based on our hydraulic evaluation. This means that the station has a peak capacity of 6,880 gpm (9.91 MGD) with the pumps operating at rated capacity. However the station's firm capacity with its current pumps in their current condition is 5,250 gpm (7.56 MGD) an 18% reduction when compared to the rated capacity. The Sanitary Sewer System Evaluation of January, 2011 prepared by AECOM's listed the firm capacity of the station as 5,195 gpm (7.48 MGD) and its peak capacity as 5,361 gpm (7.72 MGD). Pump curves and hydraulic calculations for each pump and the various conditions are located in Appendix A.

Condition

Pump 1, a replacement pump, has been in service for 7 years, having been installed in 2013. The motor on this pump is believed to have been installed on the previous pump and was reused on the new pump. Station "E" improvements and maintenance shows that Pump 1's motor and a trimmed impeller were installed in 1997. It is believed that this 1200 rpm motor and a new trimmed impeller replaced the 900 rpm motor original pump impeller to increase Pump 1's pumping capacity. Although both the pump and motor appear to be in good condition and should have more service life, the 1200 rpm motor is undersized for the pump and current impeller and the motor overloads if operated at full speed. This pump is normally operated from a variable frequency drive; however, it also has a by-pass starter that can operate the pump. This will likely result in the pump tripping out on overload or high motor temperature. The condition of the current pump, motor and drive arrangement for Pump 1 is concerning and needs to be addressed. Daily records for 2019 indicate that this pump averaged 4.5 hours of run time and two starts per day. Due to the increasing flows to this LS, Pump 1 appears to be operating for fewer hours per day.

Pump 2 was replaced as part of the 2001 improvements and has been in service for 19 years and is reaching the end of its expected service life. The pump seems to be well maintained and the service records do not indicate any problems other than a mechanical seal replacement in 2008, and a report of a pump noise in 2009 during draw down testing to determine the pump's capacity. It was reported as pump cavitation, however it is likely that the wet well level was too low causing air to be drawn into the pump through a vortex that formed at the suction inlet in the wet well. The small wet well size and depth, and the configuration of the suction lines likely led to this issue. Daily records for 2019 indicate that this pump averaged 11.2 hours of run time and two starts per day. This pump has the highest operating time per day and it is required to operate for longer times per day as flows to this station continue to increase and the pump loses capacity. From the draw down testing, the pump appears to have experienced some wear and will require work to restore its rated capacity.

Pump 3 was replaced in 2012 and has been in service for 8 years. It appears to be well maintained and the service records do not indicate any problems. This pump should provide several more years of service. Daily records for 2019 indicate that this pump averaged 8.8 hours of run time and four starts per day.

Pump 4 was replaced in 2009 and has been in service for 11 years. It appears to be well maintained and the service records do not indicate any problems. This pump should provide several more years of service. Daily records for 2019 indicate that this pump averaged 8.8 hours of run time and three starts per day.

Of the four pumps, only Pump 2 is nearing 20 years of service and the end of its expected service life of 15 to 20 years. As the pumps age they become less reliable, require more service, and become more costly to maintain in service. Dependable pumping equipment is mandatory, as the interruption or loss of pumping capacity can lead to messy sewer backups. A summary of the pump maintenance from January 1997 through August 2019 is located in Appendix B.

RECOMMENDATIONS

- Pump 1 should be upgraded by replacing its current motor with a 100 hp 1200 rpm motor and upgrading the pump drive and electrical wiring as needed. This will prevent the motor from overloading under all pumping conditions, will increase the pumping capacity of this pump to approximately 2,400 gpm and will increase the firm capacity of the station.

- Pump 2 should be replaced based on its decreased performance and age to restore its rated capacity and reliability.

- Pumps 3 & 4 should be serviced to restore their rated capacity.

- Based on the historical flow data, flooding of the wet well, and observation of all four LS pumps, the current pumps are not adequately sized for current flows. Recommend replacement pumps rated for projected future flows to the station of 9,000 gpm, or 13.0 MGD. To upgrade the station to have a firm capacity of 9,000 gpm all four pumps would need to be replaced with new 185 hp pumps with a rated capacity of 3,000 gpm at 154 feet TDH. In this configuration both force mains would be open with approximately 3,700 gpm discharging through the east force main and 5,300 gpm discharging through the west force main. At 5,300 gpm, the velocity through the west force main will be 9.2 feet per second As mentioned in Chapter 4, there is limited space available in the dry well for these larger pumps additionally there is limited space for addition electrical equipment on the ground floor. This would require the expansion of building at grade to house the needed electrical equipment for these larger pumps.

FORCE MAINS

Lift station E discharges through two parallel 16-inch diameter C905 DR 18 PVC force mains. The west force main is approximately 6,200 feet long and the east force main is approximately 13,500 feet long. Both force mains were replaced in 2001 from the lift station to Sunnydale Lane to add force main capacity. In addition the east force main was re-configured in 2018 to discharge into the East Relief Trunk Sewer. Prior to this, the east force main was extended from Sunnydale Lane to the intersection of Port Washington Road and West Zedler Lane to relieve the trunk sewer loads. This section is also a 16-inch diameter C905 DR 18 PVC force main. Each force main is used for part of each day, with the west scheduled to be in service from 7:00 AM to 11:00 PM daily and the east scheduled to be in service from 11:00 PM to 7:00 AM. Alternating the force mains is done by the SCADA system and the operation of the pumps connected to the respective force main. The force mains rarely run simultaneously, typically just during high flow events.

CAPACITY

Flow velocity and force main head loss, or major losses, are the primary design constraints. Force mains are generally sized for average velocities of 3 to 5 feet per second (fps), with maximum velocities of 8 fps. Heavier solids, such as grit, will generally not settle out if a minimum velocity of 2 fps is maintained. A velocity of 3.5 fps is required to re-suspend solids that may have settled in a force main. It is also important to keep the velocity below 8 fps to protect the piping from erosion. Table 5-3 shows the flows, velocities, and estimated major losses in the force mains under various conditions, including minimum and maximum velocities.

An existing 16-inch diameter force main provides a capacity of 1,150 gpm (2.0 fps) to 4,610 gpm (8.0 fps), which works well with the current average flow and firm pumping capacities (2 to 5.2 fps velocities). By operating the two 16-inch force mains together the station currently has force main capacity to for up to 9,230 gpm (8.0 fps with both force mains in service).

Table 5-3
Comparison of Force Main Velocities Under Various Flow Conditions

Design Conditions	16-inch West Force Main		16-inch East Force Mains	
	Flow (gpm/fps)	Major Losses[1] (ft)	Flow (gpm)	Major Losses[2] (ft)
Average Flow	1,170 / 2.0	5.7	1,170 / 2.0	12.4
Firm Pumping Capacity	3,400 / 5.9	40.7	3,000 / 5.2	70.8
Min Velocity (2.0 fps)	1,150 / 2.0	5.5	1,150 /2.0	12.1
Suspend Solids (3.5 fps)	2,020 / 3.5	15.5	2,020 /3.5	34.1
Max Velocity (8.0 fps)	4,610 / 8.0	71.5	4,610 / 8.0	156.8

1. Major headlosses based on force main length of 6,200 feet for the west FM and C=140.
2. Major headlosses based on force main length of 13,500 feet for the east FM and C=140.

CONDITION

The force mains have been in service been in service approximately 20 years. Given that the typical life of a force main is 50 plus years, the Lift Station E force mains are expected to be in good condition. Mequon staff did not report any issues and the current pumping rates should be limiting the amount of sedimentation and providing periods under which the sediments can be resuspended, particularly after high flow events such as the high flow period of May 17, 2020 through May 18, 2020.

RECOMMENDATIONS

- Automate the valving between the two force mains to allow the station's controls to utilize the east and west force mains during high flow (wet weather) conditions when the two pumps in service cannot keep up with the influent flow. Utilizing both force mains will reduce the overall system head and increase the capacity of LS E when more than two pumps are operated at rated capacity. This will eliminate the need for operating staff to go to the LS and manually operate the valves.

- Do not operate the wet well level below 58.75 when operating pumps 2, 3 or 4 to prevent forming a vortex at the suction inlet to the pump. (Refer to page 4-7 for figure)

- Clean force mains in accordance with 2018 Superior Engineering Force Main Maintenance Program Report

RECEIVING GRAVITY SEWER

The 16-inch west force main discharges into a manhole located at the intersection of Sunnydale Lane and Oriole Lane. At this location, the gravity sewer is an 18-inch diameter installed at a slope of approximately 1% grade and has a full flow capacity of approximately 4,640 GPM. As part of the capacity assessment portion of this report, evaluation of a sanitary relief sewer from Sunnydale Lane to Stone Creek Drive has been completed. This is further discussed in Chapter 7.

The 16-inch east force main continues to the south and east discharging into a manhole located on Zedler Lane east of Port Washington Road. At this location, the gravity sewer is 27-inch diameter with a full flow capacity of approximately 6,220 GPM. This is also the location of the interconnection with the 48-inch diameter relief sewer installed in 2018.

Overview of Flow Calculations

As mentioned previously in this section and contained in the calculations in Appendix F, summarized below are the limiting factors associated with each aspect of the tributary system for Lift Station E.

- Calculated Firm Capacity of Station=6,400 GPM
- Calculated Capacity of Influent Sewer=7,110 GPM
- Calculated Force Main Capacity=9,230 GPM
- Results of Drawdown Testing
  - Pump #1=2,534 GPM
  - Pump #2=2,808 GPM
  - Pump #3=2,561 GPM
  - Pump #4=2,443 GPM
- Estimated Flow based on Contributing Area=8,963 GPM

STANDARD OPERATING PROCEDURES

Based on a review of the City's current standard operating procedures (SOP), it is recommended that the City develop and include SOP procedures for bypass pumping, and SSO notification, as they were not submitted for review.

Lift Station E relies on utility power from two separate power feeds and does not have an onsite standby generator or provisions to connect to a portable generator. Although the use of dual feeds from a utility provides a fairly reliable source of power for the station, there is a possibility that a storm could disrupt power from both power sources or the occurrence of a reginal power failure. To avoid a complete disruption of pumping at this station and an SSO, an SOP for bypass pumping at Lift Station E needs to be developed. Lift Station E is unique in the respect for the City as it is the City's only station that does not rely on a generator for emergency power but a separate utility feed.

The City has experienced several SSOs in the past few years and has dealt with the reporting of these SSOs, however it currently does not have a SSO for the reporting of these events. It is recommended that the City also develop a SOP for handling SSOs to ensure that they continue to properly report on these events.

CHAPTER 6

ELECTRICAL INSTRUMENTATION & CONTROL (I&C)

A site visit was conducted on February 19th 2020 to review the existing Electrical and I&C systems.

Following the site visit, the City commissioned Switchgear Power Solutions to complete an Arc flash hazard study based on the preliminary observations and recommendation from the ATI project team.

The purpose of this Electrical and I&C condition assessment is to identify deficiencies and items needing repair, replacement or upgrade for Lift Station E.

Lift Station E receives power from two separate service feeds. One is for Normal Service and the other is for Standby Service. We-Energies has two transformers on the Lift Station site to provide the dual feed service to the station.

Normal Service* Transformer *(Facing South)

Normal Service Transformer (Facing North)

Standby Service Transformer (Facing North)

Standby Service Transformer (Facing South)

ELECTRICAL SERVICE

The Normal Service transformer is located south of the Lift Station on the outside of the Station's berm and has some large trees growing near the rear of the transformer.

The Standby transformer is located to the Southwest of the Lift Station building and is inside of the station's berm.

The Lift Station metering cabinets receive power from the two We-Energies owned transformers pictured.

Building Metering Cabinets

The metering cabinets are owned by Mequon with We-Energies metering instrumentation installed in them and We-Energies Meters plugged into the cabinets integral meter sockets.

AUTOMATIC TRANSFER SWITCH

The Automatic Transfer Switch (ATS) receives power from the two We-Energies service feeds which are metered on the outside of the building as pictured above. The right meter is for the NORMAL We-Energies utility service and the left meter is for the STANDBY We-Energies utility service.

The Automatic Transfer Switch is located in the buildings electrical room directly on the opposite side of the wall from the meters shown above.

The Automatic Transfer Switch provides the code required disconnect means for the entire lift station as well as provides the automatic station power transfer from the NORMAL to STANDBY utility service.

Automatic Transfer Switch (Front of Panel)

Automatic Transfer Switch (Door Open)

The Automatic Transfer Switch (ATS) normally transfers power automatically from the NORMAL power source to the STANDBY power source. In some cases, however, the switch failed to operate so the cabinet was then opened and operated manually.

When the NORMAL power source returns, then the automatic transfer switch should automatically transfer the lift station from the STANDBY source back to the NORMAL power source. In some cases, however, the switch failed to operate so the cabinet was then opened and operated manually.

Arc Flash Study

This initial safety concern prompted an earlier recommendation that the City do an arc flash hazard study. In response the City commissioned a comprehensive electrical study which included a short circuit study, a coordination study, and an Arc Flash Hazard Study, which was completed in Spring of 2020 by Switchgear Power Solutions. The results were evaluated and a few questions sent to Switchgear Power Solutions about the study results. We-Energies updated the fault current levels from about 42,000 Available Short Circuit Current (ASCC) down to about 22,000 ASCC. Prior to this update there was a concern that the ATS was underrated but the revised numbers from We-Energies show that the ATS is rated properly at 30,000 ASCC. Even though the ATS was rated properly, the study still showed energy levels to be too high to open the ATS door to manually operate the switch even with Personal Protective Equipment (PPE).

Due to this and other safety issues, these items were acted upon prior to the completion of the final recommendations of this condition assessment. The ATS was replaced by the City in September 2020. The new ATS now functions correctly and automatically transfer power as needed. In the event that the power would need to be transferred manually the new ATS allows this manual operation without opening the ATS doors.

Motor Control Center And Pump Station Electrical Distribution

The Output of the Automatic Transfer Switch feeds the Motor Control Center, which in turn feeds all the equipment and other electrical loads within the Lift Station.

Motor Control Center

The Automatic Transfer Switch and Motor Control Center are the most critical pieces of equipment in the station, since a single failure would cause a major problem. Unlike the pumps, Variable Frequency Drives (VFDs) and starters, there is no electrical redundancy for the ATS and MCC and if a major failure would occur, such as a fault, the Lift Station would not be able to perform its intended purpose.

The Motor Control Center (MCC) powers all the electrical equipment in and outside the lift station including the four lift station pumps. Three of the pumps (1, 2 and 4) have Variable Frequency Drives (VFDs) as well as constant speed starters for use if the VFDs fail. Pumps 1,2 and 4 Variable Frequency Drives (VFDs) are 50, 125 and 125 Horse Power (HP) respectively. Pump 3 is constant speed only and has a Full Voltage Non-Reversing Motor Starter. Pump 3 is 125 HP. During draw down testing it was determined that the motor, VFD, bypass starter on Pump 1 is undersized. Pump 1 can be sized for 75HP instead of 50HP. This condition can be temporarily dealt with by control system software modifications and/or VFD maximum speed programming update to limit the output frequency of the VFD to 51Hz.

Lift Station Pump Variable Frequency Drives and Motor Starters

Pump 1 (50HP VFD)

Pump 2 (125HP VFD)

Pump 3 Constant Speed (125HP in MCC)

Pump 4 (125HP VFD)

From the outside the Lift Stations electrical equipment looks in generally good condition. In many Lift Stations, Hydrogen Sulfide causes corrosion of the bus structures and conductors. Hydrogen Sulfide damage was not evident at Lift Station E; however, it is not possible to tell unless all enclosures are opened and visually inspected. This can be accomplished but the power needs to be turned off to do this safely. (Subsequent discussions with Mequon have confirmed that Hydrogen

Sulfide damage is not a problem in the electrical room. Some electrical corrosion has been observed in the odor control equipment room.)

Record drawings show that the MCC was installed when the lift station was built in the mid-1960s so it is about 55 years old. and past the normal design life, but electrical equipment in good environments can last much longer without problems.

Record drawings show that the Automatic Transfer Switch was installed in the late 1970s along with the installation of the We-Energies STANDBY Feeder so it is at least 40 years old and past the normal design life. The ATS is now replaced so this is no longer a concern.

ELECTRICAL SAFETY DISCUSSION

Safety is the number one concern of the condition assessment. The completed Arc Flash Hazard Assessment has shown that most of the electrical equipment on site have energy levels high enough that it is not safe to work on or open the cabinets to inspect without wearing Personal Protective Equipment (PPE). The PPE tables in the completed study provide information as to what PPE is required at each electrical equipment location. The completed study also shows that the energy levels in the ATS are so high that the doors cannot be opened unless the power from both Utility Feeders are turned off. A copy of the completed study is contained in Appendix "I".

The Electrical Studies also discovered two other electrical problems. First is a broken breaker handle which requires the MCC bucket door to be opened to operate the breaker. The second is a potential code problem with the breaker size feeding the stations lighting panels stepdown transformer. It may be oversized depending on the actual size of the Transformer which drawings show as 10KVA, but this has not yet been verified. In order to look at transformer more closely and safely, the power to the MCC needs to be turned off.

SHORT TERM RECOMMENDATIONS

- Replace Automatic Transfer Switch. (Completed September 2020.)
- Update control system to limit speed of Pump 1 by adjusting control system or VFD maximum output frequency to 51Hz.
- Wear PPE and/or deenergize the electrical equipment in accordance to the study table whenever working on electrical equipment.

- Replace MCC Electric Heater Feed Breaker that has the broken operator.
- Verify the size of the stations lighting panel transformer KVA rating so the MCC Feed Breaker size can be verified for code compliance. (Need size of transformer to provide specific recommendation)
- Remove vegetation from We-Energies Normal Service Transformer.

Other Electrical Discussions

The existing Lift Station electrical systems are generally in good condition, but the age of much of the equipment has most likely already become a problem due to availability of parts with factory service because of equipment model obsolescence. This is especially prevalent for major items such as the Motor Control Center (MCC). The MCC about 40 years old and have been discontinued for some time. These components are also the most important part of the electrical system because there is no redundancy and a failure of the MCC could stop the operation of the Lift Station for an extended period of time, and depending on the failure it could require emergency pumping or temporary generation be implemented.

The VFDs look to be in good condition and appear to be relatively new. This size of VFDs are fairly common so replacement time is not usually a concern. Each of the pumps with VFDs also have bypass motor starters so pumps can still be operated in constant (full) speed mode.

Recommendations

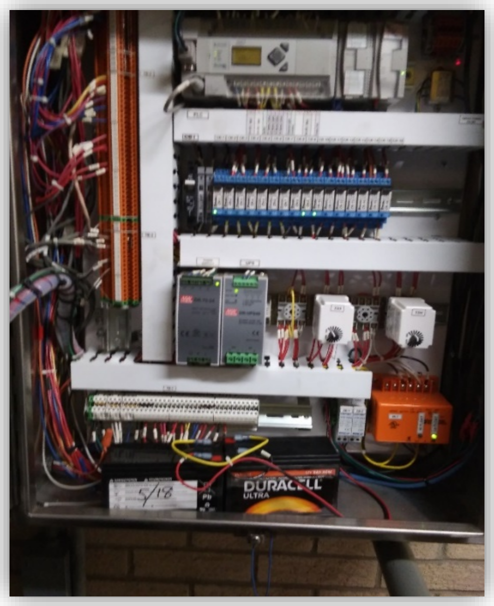
- The MCC should be replaced due to age of equipment and the nature of possible failure. When replaced the Fault Current Rating should be increased to 65,000 ASCC and bus rating may need to be increased to 800 amps or higher depending on future pumping needs. A 480V Power Panel should be considered as an alternate to a new MCC as the VFDs are not part of the MCC and it could save electrical room space depending on how bypass (full speed starters) end up being arranged.
- If it is decided that the pumps need to increase in size, the VFDs will need to be replaced due to capacity. Some of the newer VFDs (Pump 2 and Pump 4) appear to be in good shape so if pumps remain the same HP they may be able to remain in service.

- For future upgrades, especially if pumping capacity of station is increased, addition of Harmonic Filters to input of the VFDs may be needed as required by IEEE-519 "Recommended Practices and Requirements for Harmonic Control in Electric Power Systems"

PUMP CONTROLS AND SCADA

The pump controls are located in the Lift station's electrical equipment room across from the Automatic Transfer Switch. The panel is radio linked to the City's Supervisory Control and Data Acquisition (SCADA) system.

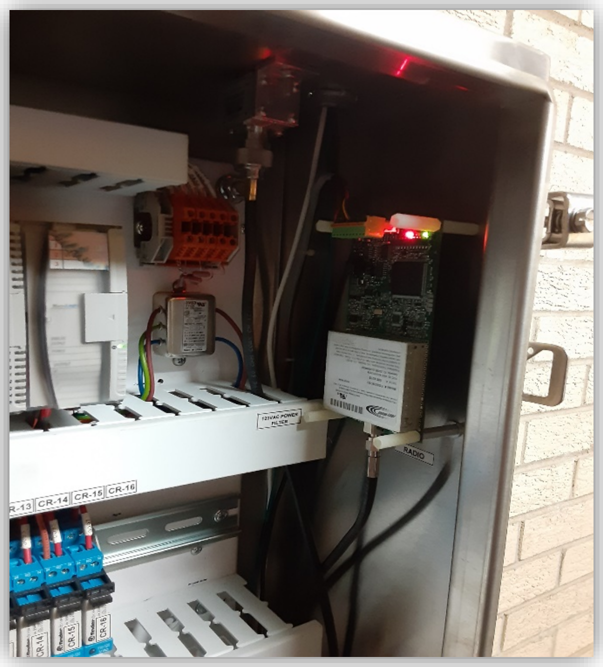
Pump Control Panel (Front of Panel)



Pump Control Panel (Door Open)

The pumps are controlled with an Allen-Bradley MicroLogix 1400 Programmable Logic Controller (PLC) and a local Maple Systems Operator Interface Terminal (OIT) touch screen. This equipment is relatively new and the PLC is a current model. The touch screen operator interface is a Maple Systems HMI-5070NH which is not a current model but can be replaced if necessary, with a similar available model from Maple Systems.

The Pump Controls radio is a Freewave FGR2-C-U model radio. This radio is no longer available, but there is newer model available as a direct replacement and the replacement does not require any other SCADA system upgrades to incorporate. The direct drop-in replacement is a FHR3 per Tony Battaglia of FREEWAVE Technologies Inc. The radios are in good condition and do not need replacement at this time.



Pump Control Panel Radio (Door Open)

The pump system controls provide control of the stations 4 pumps based on two submersible wet well level transmitters. The redundant Level Transmitters are WIKA LS-10 and are a currently available design and model and do not need replacement at this time. The pump controls provide automatic control of the starting and stopping of pumps and the speed of the pumps 1,2,4 via the VFDs.

The pump control system also has two float switches to control the pumps if the wet well level transmitters fails. This control is independent of the PLC, so if it would fail, then the pumps are controlled via the float switches and start delay timers.

The pump control panel sends the pumps station discharge force main flow meter data to the City's SCADA system. The city has recently purchased a new Flow Meter for each force main leaving the Lift Station and replaced the existing flow meters in September 2020 due to inconsistent data.

Pump Control Panel Recommendations

The existing pump control panel is utilizing current technology and would be able to control future process upgrades with minimal changes to the existing control panel.

At this time, no action is recommended for the Lift Station E pump control panel.

Instrumentation Recommendations

At this time, no action is recommended for Lift Station E with the exception of the flow meter recommendations and the automation of the valve controls for the force mains contained in chapter 5 of the report.

CHAPTER 7
LIFT STATION EVALUATION

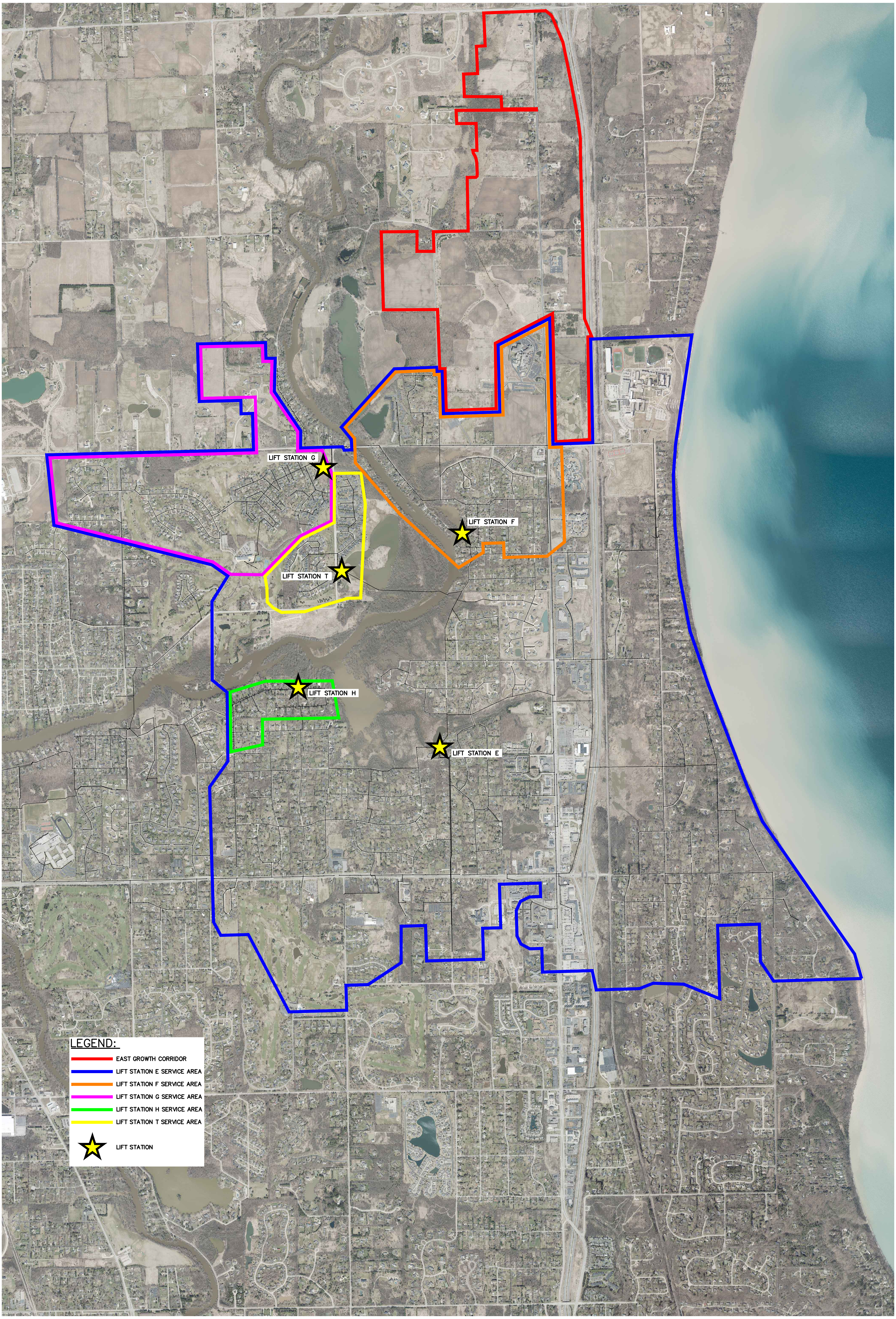
In general, the Lift Station (LS) is well maintained and in good condition. However, the LS is nearly 55 years of age and requires upgrades to operate safely and reliably into the future. Most of the equipment has exceeded its typical design life, making the acquisition of parts and maintenance challenging. Access to the wet well is limited, creating a hazardous work environment for City staff. The size of both the wet well and dry well is very limited resulting in limited storage capacity in the wet well and limited space to service and maintain the current pumping equipment. The LS's firm pumping capacity with its current pumps in their current condition is 5,250 gpm (7.56 MGD). The LS has a history of sanitary sewer overflows (SSO). Based on the frequency and size of SSOs within the LS collection system, Lift Station E no longer appears to be adequately sized to handle the increasing flows it is receiving. Additionally, this station has experienced extensive flooding of the site as well as the wet well and dry well in 2009. The LS site and ground floor of the LS is below the 100-year flood elevation. This LS is a critical asset of the City's wastewater collection system and its reliable operation is critical in preventing sanitary sewer overflows (SSO). The collection area for LS E is depicted on Figure 7-1, which also shows the east growth area (EGA).

To determine the best method to address the issues with LS E, various LS and collection system improvement alternatives were identified for potential evaluation.

PROJECTED FLOWS

In order to estimate the design flows for the future Lift Station E (LSE) service area, contributing portions of the sewer sheds within the existing LSE service area were determined, and the proposed East Growth Area (EGA) land use was summarized. The LSE service area is fully developed and not expected to have significant population increases. The summary of these results are presented in Table 7-1 and Table 7-2, respectively.

R:\SHARED FOLDERS\PROJECTS\6398 - MEQUON LSE\11.0 GRAPHICS\11.1 FIGURES\FIGURE 7-1.DWG



N

PLAN

0 1000' 2000' 3000' 4000'

GRAPHIC SCALE

AppliedTechnologies
Engineers-Architects

FIGURE 7-1
LIFT STATION SERVICE AREAS
CITY OF MEQUON, WI

Table 7-1 LSE Design Average Day and Peak Hour Flows						
Sewershed	Land Information		Average Flow		Peak Hour Flow	
	Total Acres	**Acres within LSE**	**MGD**	**GPM**	**MGD**	**GPM**
ME4001	1,641	1,445	0.214	149	4.713	3,273
ME4002	918	918	0.187	130	2.755	1,913
ME4003	1,488	1,283	0.344	239	4.501	3,126
ME4004	2,516	462	0.853	592	8.179	5,680
ME4012	3,772	144	1.081	751	2.334	1,621
Total	**10,335**	**4,252**	**2.68**	**1,861**	**22.48**	**15,613**

Notes:

1. Data is based on Milwaukee Metropolitan Sewerage District's 2050 Facilities Plan.

Table 7-2 Projected Flows for East Growth Area							
Service Area	**Land Use Type**	**Area (Acres)**	**Rate (gpd/acre)**	**Average Flow**		**Peak Hour Flow[1]**	
				MGD	**GPM**	**MGD**	**GPM**
EGA	Institutional	51	1,500	0.076	53	0.30	212
	Residential	272	1,070	0.29	202	1.2	808
	Office/Commercial	161	1,500	0.24	168	0.97	672
Total	**-**	**484**	**-**	**0.61**	**423**	**2.5**	**1,692**

Notes:

1. Based on a peak hour factor of 4.0.

SELECTED LIFT STATION ALTERNATIVES

Four alternatives were identified to be evaluated for upgrading, offloading, and/or replacing LS E, to address station capacity, station flooding, age of equipment, maintenance and operational issues, and downstream sewer improvements

ALTERNATIVE 1 – UPGRADE EXISTING LS E

This alternative provides for major additions or changes to the existing lift station facility to address station capacity, station flooding, age of equipment, maintenance and operational issues, and downstream sewer improvements. Under this alternative, the firm capacity of the LS will be increased to 7,300 gpm (10.5 MGD) with the ability to expand to 9,000 gpm (13.0 MGD). Figure 7-2 displays the LS site with proposed LS.

Site

To prevent LS flooding in the future, the LS will be floodproofed per NR 116 requirements. This will involve raising the site and access drive to the site 2-feet above flood elevation. Other site work will include raising the site utilities, including sewer manholes, valve operators, the metering vaults as well as the electric service transformers.

Lift Station Building

The building will be expanded and reconstructed from the existing ground floor level, raising the concrete foundation of the building 4'-6" above the current ground floor elevation to flood proof the building. Above grade the walls will be constructed of concrete block with rigid board insulation and finished brick exterior. The building appearance can be made to blend with the architecture of the neighborhood with either a standing seam metal roof or asphalt shingles.

The first floor of the building will be expanded to both the south and west creating more space for the electrical equipment and access to the building. To the south the building will be expanded approximately 14-feet creating additional electrical room space that will house the transfer switch, power distribution equipment, variable speed drives, electrical services, and station controls. Access to the existing electrical space and dry well will be through this space which will have a landing and stairs to bring operators down from the new grade to the existing floor elevation. To the west, the building will be expanded approximately 6' for a second stairway and corridor to the

N

PLAN

0 20' 40' 60' 80'
GRAPHIC SCALE

R:\SHARED FOLDERS\PROJECTS\6398 - MEQUON LSE\11.0 GRAPHICS\11.1 FIGURES\FIGURE 7-2.DWG

Applied Technologies
Engineers - Architects

FIGURE 7-2
ALTERNATIVE 1 - UPGRADE EXISTING LIFT STATION E
CITY OF MEQUON, WI

wet well and room containing the odor removal equipment. The building expansion will require modification to the force main west of the existing building.

These modifications will also address all building interior and exterior recommendations made in Chapter 4.

Wet Well

The LS E current site and station arrangement is very limited, making any improvements to the existing wet well impractical. Based on this, no improvements other than floodproofing will occur to the wet well. The wet well will continue to be undersized increasing the frequency of pump starts and have limited active depth causing control and vertexing issues. Additionally, access to the active wet well will remain limited, causing periodic servicing and maintenance of the wet well to be a difficult and hazardous operation for Mequon staff.

Dry Well

The LS E current site and station arrangement is very limited, making any expansion of the existing dry well impractical. Improvements to the dry will include floodproofing and replacement of the existing piping, valves, and pumps in the dry well. The dry well will continue to be undersized making installation and servicing of the pumps and valves difficult.

Pumps

The City has indicated a preference for Flygt N-Series dry-pit submersible pumps for their new lift stations. The N-pump uses a proprietary hydraulic end design to reduce the risk of clogging while maintaining pump efficiency. Based on this, the current LS pumps will be replaced and updated with four 140 hp Flygt NP 3315 submersible pumps, each with a rated capacity of 3,000 gpm at 110 feet total dynamic head (TDH). With three pumps in service, the LS will have a firm capacity of 7,500 gpm. With two pumps discharging through the west force main and a third pumps discharging through the East force main.

For the ultimate build out with the East Growth Area included, the LS could be updated with four 185 hp Flygt NP 3315 submersible pumps, each with a rated capacity of 3,000 gpm at 155 feet total dynamic head (TDH). With three pumps in service, the LS will have a firm capacity of 9,000 gpm with both force mains. Under this condition the flow will split approximately 5,100 gpm discharging through the West force main and 3,900 gpm discharging through the east force main. This will require the installation of a flow valve between the east and west force mains that will be automatically opened during high flow events.

The pumps will all utilize variable frequency drives to allow a varied pumping rate to match influent flows, and to ease pump startup under standby power. Utilizing the variable frequency drives to ramp up pump speed at startup greatly reduces the starting current as compared to an across the line starter.

Controls and SCADA

The local control panel that houses the controls and SCADA system for the lift station will be replaced and located in the electrical room to allow operators to control the pumps on-site. An uninterruptible power supply will be included with the control panel to maintain PLC operation and SCADA monitoring through power failures.

Control Panel

The primary level control system will be an element such as a submersible pressure transducer located in the wet well that provides continuous level indication and pump control through the PLC. A backup float system will provide full pump control in the event of the pressure transducer or PLC failure.

A flow meter was installed on each of the two force mains in the existing flow vaults. Flow monitoring at lift stations allows for easy monitoring and remote evaluation of the station’s operation.

Standby Power

The station will continue to receive power from two We Energies service feeds. An automatic transfer switch (ATS) will transfer from one service to the other in the event of a power failure from one of the two services.

FORCE MAIN AND SEWERS

Force Main

This alternative does not require any force main improvements.

Sanitary Sewer Improvements

The capacity of the sanitary sewer system receiving the flows from the west force main has been evaluated and the section of sewer directly downstream of the west force main discharge is undersized for current and future flows. The discharge point for the west force main is in Manhole 0430-016 located in Oriole Lane approximately 440 feet north of the intersection with Sunnydale Lane. From this discharge point to a point approximately 1,154 feet to the south at Manhole 0430-106, the existing sanitary sewer piping is 18 inches in diameter. The section of pipe with the limiting slope is located between Manholes 0430-016 to 0430-015 resulting in a full flow capacity of 3,230 GPM. With the improvements to LS E this section will need to be able to handle flows from the LS up to 5,100 gpm in addition to collection area draining into this sewer. Under this alternative, the existing 18-inch diameter sewer will remain and the 24-inch diameter relief sewer will be extended from Stone Creek Drive. It is estimated (assuming similar sanitary sewer slopes) that this new section of sewer will have capacity 6,960 gpm. The estimated costs for this alternative are contained in Table 7-5.

ALTERNATIVE 2 – NEW LS E AT WEST RANCH ROAD

This alternative involves the construction of a new LS on an outlot approximately 300-feet west of the existing LS. Figure 7-3 shows a conceptual layout for the new LS E at West Ranch Road site. The new LS alternative addresses all problems with the existing LS; station capacity, station flooding, age of equipment, maintenance and operational issues, and downstream sewer improvements. Under this alternative, the firm capacity of the LS will be increased to 7,300 gpm (10.5 MGD) with the ability to expand to 9,000 gpm (13.0 MGD).

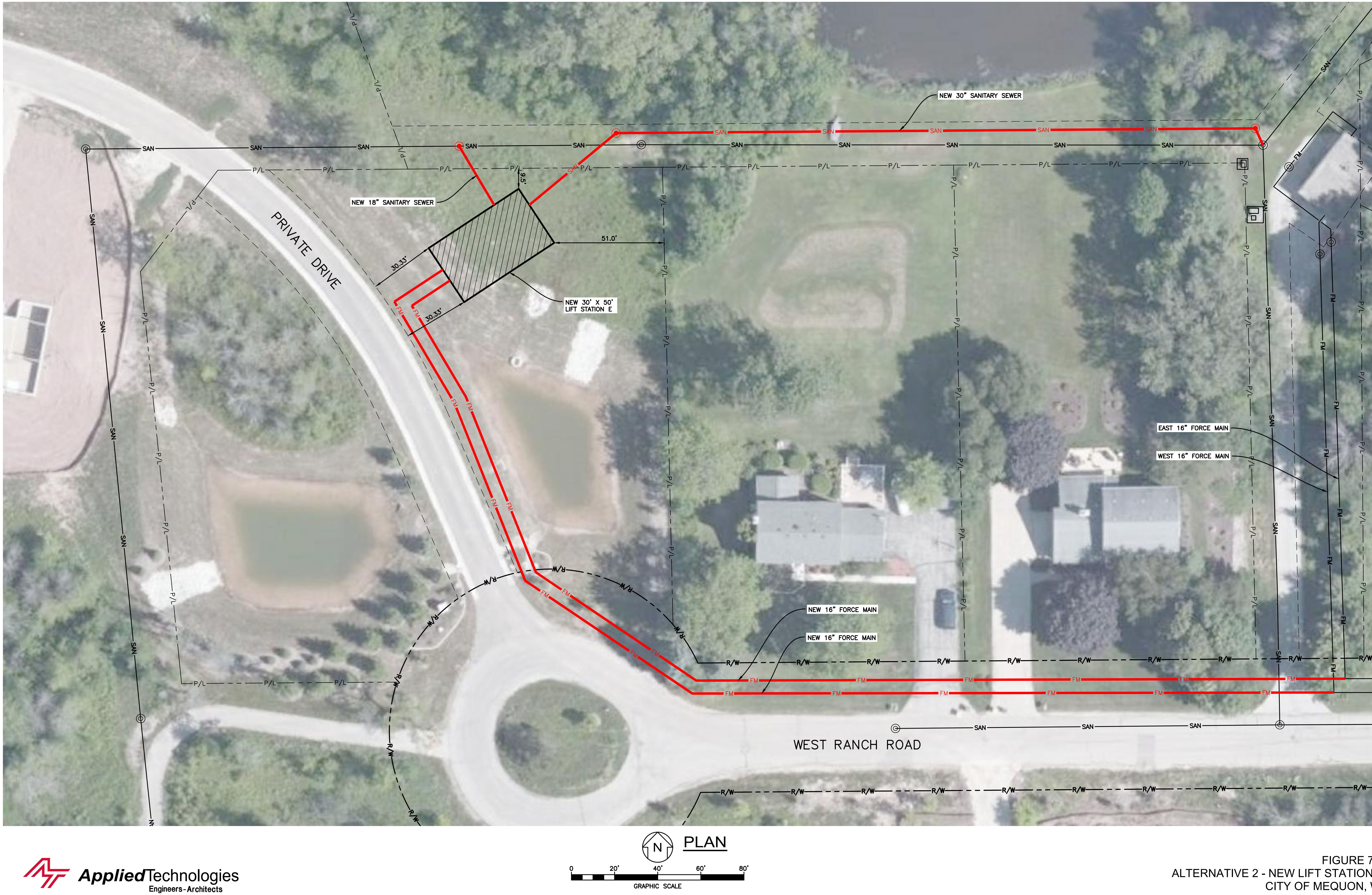


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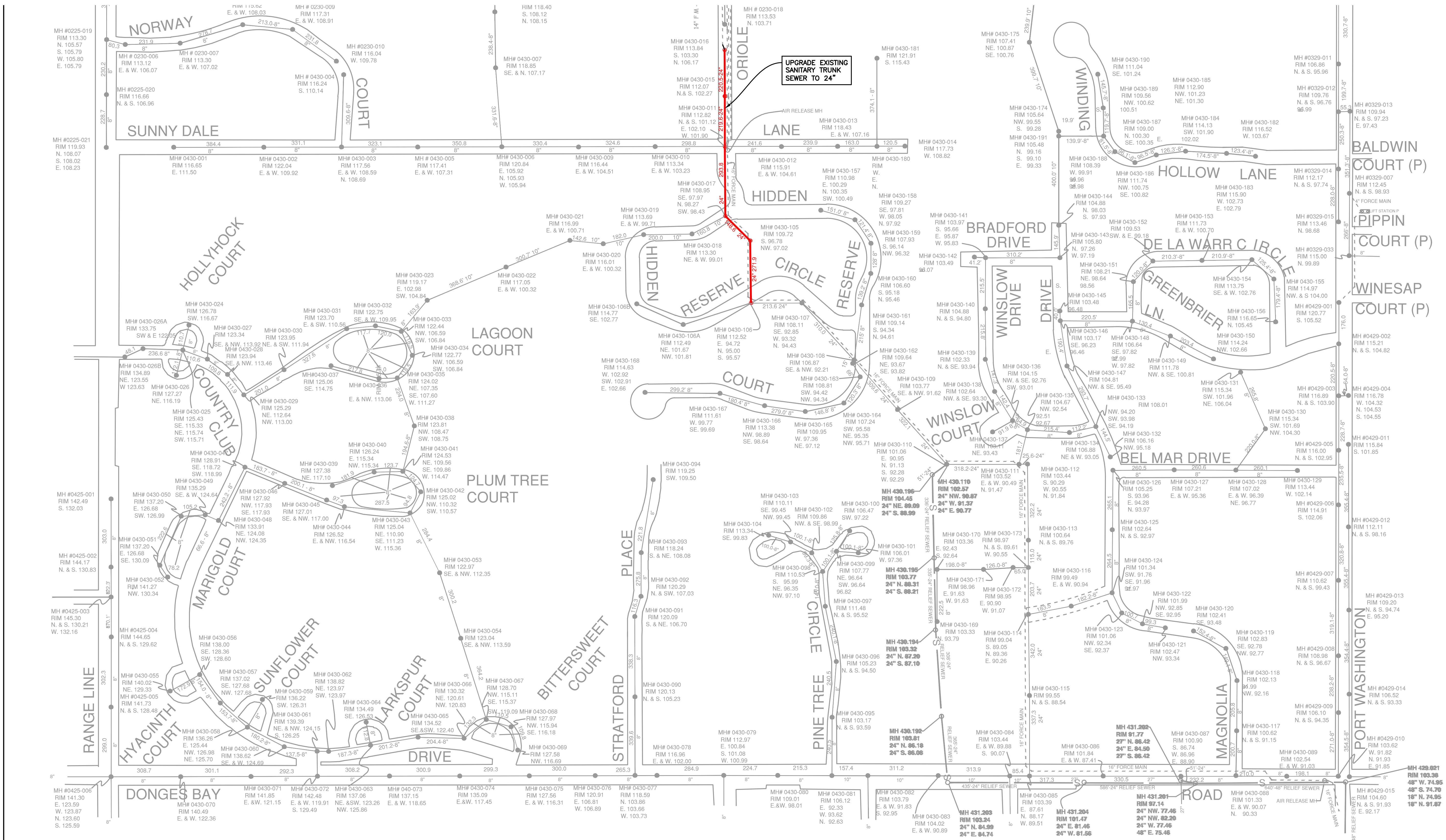
FIGURE 7-3
ALTERNATIVE 2 - NEW LIFT STATION E
CITY OF MEQUON, WI



DRAWN BY: NRS

0 165 330 660 1320 Feet

0 1/32 1/16 1/8 1/4 Miles

N

CITY OF MEQUON
OZAUKEE COUNTY
WISCONSIN

SEWER SYSTEM MAP
SECTION 30 RANGE 22

R:\SHARED FOLDERS\PROJECTS\6398 - MEQUON LSE\11.0 GRAPHICS\11.1 FIGURES\FIGURE 7-6.DWG

Applied Technologies
Engineers - Architects

FIGURE 7-6
SANITARY TRUNK SEWER UPGRADES
CITY OF MEQUON, WI

Site

Located 300 feet to the west of the existing station, on a platted outlot, this alternative is probably the most logical location to provide a new station to replace Station E. While a portion of the property is located within the flood fringe and contains a storm water pond, the conceptual station layout will be located outside the flood area, will be floodproofed in accordance with NR116 of the Wisconsin Administrative Code and will be designed such that it has no impact on the storm water pond. In addition, this station can be completed, tested and brought on-line while Station E is still operating which will minimize the cost of bypass pumping. Easements or fee acquisition will be necessary from the Homeowner's Association (if established) to construct on this outlot site.

Lift Station Building

A new lift station building will be constructed on the proposed site with separate Pump and Generator Rooms. The building will also house the lift station power distribution and control equipment. The new building will be constructed in place and will include a concrete foundation building foundation, concrete block walls with rigid board insulation and finish brick exterior. The building appearance can be made to blend with the architecture of the neighborhood with exterior improvements in accordance with subdivision restrictions.

Example – South Milwaukee Lift Station

The generator room will house the generator and transfer switch, power distribution equipment, and variable frequency drives for the pumps. The pump room will house the discharge piping, check and isolation valves from the pumps, control valves, pumping instrumentation and pump control panel.

Wet Well

The wet well for the lift station will be a cast-in-place concrete structure, and will be sized for the installation of up to five submersible pumps and the depth of the wet well will be approximately 35 feet providing additional wet well depth to increase active wet well volume and control level.

The lift station building will be constructed over part of the wet well, with a section of the wet well extending past the building on the west edge to allow access for cleaning. A 36-inch diameter interceptor sanitary sewer will discharge into the wet well from the east and an 18-inch diameter sewer from the west will discharge into the new LS wet well.

Entrance to the wet well inside the building will be through access doors both from inside the building and from the portion of the wet well that extends outside the LS. Submersible pump removal will be through the access doors located in the pump room. covers sized for each of the four submersible pumps. The multiple access covers will provide safer access to the wet well for cleaning.

Pumps

As in Alternative 1, the pumps evaluated in this alternative are based on Flygt N-Series submersible pumps. To meet the peak flow design requirements of 7,300 gpm, two 140 hp Flgyt NP 3315 submersible pumps, each with a rated capacity of 3,000 gpm at 110 feet total dynamic head (TDH) and two 110 hp Flgyt NP 3231 with a rated capacity of 2,250 gpm at 95 TDH. With three pumps in service, the LS will have a firm capacity of 7,500 gpm. With two pumps discharging through the west force main and a third pumps discharging through the East force main.

For the ultimate build out (which includes the East Growth Area), the LS could be updated to five installed pumps with replacing the two larger pumps with three 160 hp Flgyt NP 3315 submersible pumps, each with a rated capacity of 2,250 gpm at 193 feet TDH. With four pumps in service, the LS will have a firm capacity of 9,000 gpm. Under this condition, the four pumps will be operated with the two pumps discharging into the west force main at 4,500 gpm and two of the three larger pumps discharging at 4,500 gpm through the east force main. The third large pump will be a standby unit that can be valve between either the east of west force main, meeting the requirement for station firm capacity with the largest unit out of service.

As in Alternative 1, the pumps will all utilize variable frequency drives to allow a varied pumping rate to match influent flows, and to ease pump startup under standby power. Utilizing the variable frequency drives to ramp up pump speed at startup greatly reduces the starting current as compared to an across the line starter.

Controls and SCADA

The controls and SCADA will be as described in Alternative 1.

Standby Power

A new 500 kW diesel powered emergency generator will be installed in the new lift station and a new automatic transfer switch (ATS) will be provided to keep the lift station operational if an electrical service outage occurs. Transfer from normal utility power to generator power will be automatic through the use of the ATS. The ATS will continually monitor the utility power source, transferring power should one or more phases drop out. To ensure stability of the utility power, the ATS will include user-adjustable time delays to ignore brief outages and prevent retransfer to utility power.

Example - 230 kW Generator

To expand the firm capacity for the station to 9,000 gpm in the future, the generator will need to be upgraded to a larger 650 kW diesel powered emergency generator with a larger transfer switch. Sufficient space will be provided when designing the building to account for the generator and transfer switch.

Force Main and Sewers

Force Main

This alternative requires the construction of two 16-inch diameter force mains from the new LS to the existing force main in W. Ranch Road where the two new mains to tie into the existing force mains near the east side of the existing driveway to Station E. Preliminary planning would indicate that the logical force main route would be along the north side of W. Ranch Road as shown in Figure 7-3. When reviewing the survey contained in Appendix “H”, it is noted that additional utility location will be necessary within the W. Ranch Road right of way to properly located the new force main without significant utility relocation.

Sanitary Sewer Improvements

This alternative will require construction of both an 18-inch diameter and 30-inch diameter sewer to connect the existing sewers to the new station. The 36-inch diameter sewer will pick up the existing 30-inch diameter and 10-inch diameter sewers the running to the existing site from the northeast and south respectively. Then run due west into the new LS along the existing 20-feet wide easement for the existing 18-inch diameter sewer from the west. (It is recognized that a temporary construction easement will likely be necessary) This alternative will also require this 18-inch diameter sewer to be redirected into the new station. These sewer improvements can be seen on Figure 7-3.

As with Alternative 1, the capacity of the 18-inch diameter sanitary sewer system receiving the flows from the 16-inch diameter west force main near Sunnydale and Oriole Lanes can be optimized with a new 24-inch diameter relief sewer. This can be further evaluated in comparison to the 18-inch diameter concrete sewer pipe constructed in 1967. This is consistent with the improvements described in Alternative 1. The costs associated with this alternative are contained in Table 7-6.

Alternative 3 – New LS E at Wildwood Drive

Similar to Alternative 2, this alternative involves the construction of a new LS on an out lot north of the existing LS. Figure 7-4 displays this Alternative the new LS E at Wildwood Drive site and arrangement. The new LS alternative addresses the problems with the existing LS; station capacity, station flooding, age of equipment, maintenance and operational issues, and downstream sewer improvements. Under this alternative, the firm capacity of the LS will be increased to 7,300 gpm (10.5 MGD) with the ability to expand to 9,000 gpm (13.0 MGD).

Site

Located approximately 800 feet northeast of the existing station, this location provides a second outlot location on which the station could be relocated. This property is located near the southeast corner of N. Oriole Lane and W. Wildwood Drive and is within the flood fringe and is approximately 5.5 feet below the regulatory flood elevation. Flood proofing will necessitate approximately 7.5 feet of fill to elevate the station in accordance with NR code. Given the hydric nature of the soils in the area, it is possible that wetland may also be present offering another challenge for this site. Extensive permitting from the DNR and Army Corps of Engineers is expected along with a letter of map revisions (LOMR) through FEMA. This site could also be completed, tested and brought on-line while Station E is still operating minimizing the cost of bypass pumping. As with Alternative 2, easements or fee acquisition will be necessary from the Homeowner's Association to construct on this site. It is noted that the width of the existing sewer easement is limited in the residential setting of River Bend Court. Construction work associated with this alternative will require acquisition of temporary construction easements. Being adjacent to an environmentally sensitive area will likely warrant the use of higher cost trenchless installation methods in lieu of open cut construction.

Lift Station Building

A new lift station building will be constructed on the proposed site with separate Pump and Generator Rooms as described in Alternative 2.

Wet Well

The wet well for the lift station will be a cast-in-place concrete structure, and will be sized for the installation of up to five submersible pumps and the depth of the wet well will be approximately 40-feet providing additional wet well depth to increase active wet well volume and control level. The lift station building will be constructed over part of the wet well as described in Alternative 2. A 30-inch diameter interceptor sanitary sewer will discharge into the wet well from the north and a 21-inch diameter sewer from the south will discharge into the new LS wet well.

Pumps

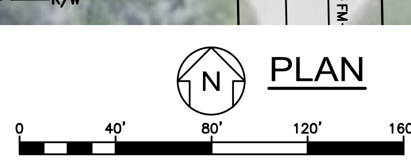
The pumps in this alternative will be arranged, sized and configured in the same manner as Alternative 2. Providing the LS with a firm capacity of 7,500 gpm with a four-pump installation with three pumps in-service, and 9,000 gpm with five pumps installed and four pump in-service as described in Alternative 2.

As in Alternative 1 and 2, the pumps will all utilize variable frequency drives to allow a varied pumping rate to match influent flows, and to ease pump startup under standby power. Utilizing the variable frequency drives to ramp up pump speed at startup greatly reduces the stating current as compared to an across the line starter.

Controls and SCADA

R:\SHARED FOLDERS\PROJECTS\6398 - MEQUON LSE\11.0 GRAPHICS\11.1 FIGURES\FIGURE 7-4.DWG

PLAN



AppliedTechnologies
Engineers-Architects

FIGURE 7-4
ALTERNATIVE 3 - NEW LIFT STATION E
CITY OF MEQUON, WI

The controls and SCADA will be as described in Alternative 1.

Standby Power

As in Alternative 2, a new 500 kW diesel powered emergency generator will be installed in the new lift station and a new automatic transfer switch (ATS) and this generator can be upgraded in the future to a larger 650 kW diesel powered emergency generator and respective transfer switch in the future to handle the larger future pumps for a 9,000 gpm LS firm capacity.

FORCE MAIN AND SEWERS

Force Main

This alternative requires the construction of two 16-inch diameter force mains from the new LS south to the existing force main site where the two new mains to tie into the existing force mains on LS E's existing site. The route for the force main will follow the existing gravity sewer draining into LS E presently, as shown in Figure 7-4.

Sanitary Sewer Improvements

This alternative will require construction of both a 21-inch diameter and 24-inch diameter sewer to connect the existing sewers to the new station. The 21-inch diameter sewer will pick up the existing 18-inch diameter and 10-inch diameter sewer the running to the existing site from the west and south respectively, and runs north into the LS along the easement for the existing 24-inch diameter sewer from the north. This alternative will also require this 24-inch diameter sewer to be redirected into the new station. These sewer improvements can be seen on Figure 7-4.

As with Alternative 1, the capacity of the sanitary sewer system receiving the flows from the new LS will be upgraded as further described in Alternative 1.

ALTERNATIVE 4 – NEW LS AT FIRE HOUSE TO OFFLOAD LS E

This alternative was included to determine the feasibility of constructing a new LS in the vicinity of the Port Washington Road fire house (to withdraw flow from Basin ME4003 and provide capacity for future growth). Three sites were considered along Port Washington Road including locating a LS at the intersection of West Homestead Trail and Port Washington Road, West Eastbrook Drive and Port Washington Road, and the fire house at 11800 North Port Washington Road. The alternatives of locating this LS at either West Homestead Trail and West Eastbrook

Drive were considered. Due to the extensive development in these areas and the limited space available for a LS of the size required for the projected flows in this area, these locations were not pursued any further. It is also noted that development on this property would require the acquisition of easements. As shown in Table 7-1, flows from Basin ME4003 are projected at 272 gpm (0.39 MGD) average day and 2,420 gpm (3.5 MGD) peak hour with the ability to expand to 4,110 gpm (5.9 MGD). Diverting flow from this area will significantly reduce projected flows to LS E from 9,000 gpm to 4,850 gpm (7.0 MGD). Under this alternative, LS E will remain and service and will ultimately be updated in a similar manner to Alternative 1 to floodproof the station and to update the pumping and electrical equipment. These improvements to LS E would no longer be as urgent as the station’s firm capacity with its current pumps in their current condition is 5,250 gpm (7.56 MGD). It is expected that the station can continue to be operated for an additional 5 to 10 years before a major LS upgrade is required to maintain the reliability of the station. If desired by City staff, additional flows from ME4004 could be diverted into the new LS and further reduce the load on LS E during wet weather conditions. This diversion would require additional diversion structures on pipe segments 0119.003 to 0119.004 and 0.119.005 to 0119.006 and new sewers draining from the diversions into the new LS.

Site

Located at 11800 Port Washington Road at the fire house, the conceptual LS can be located at the northeast corner of the site just south of the 24-inch diameter sewer from Basin ME4003 which is running east from under I-43 to Port Washington Road. Figure 7-5 shows the proposed LS site. This location will provide relief to LS E, by re-directing the 24-inch diameter sewer from ME003 into the new LS. The challenge for this site is that it is located on the northern edge of LS E’s collection basin and to divert the flow from LS E a point approximately 1.8 miles to the south at West Donges Bay Road and Port Washington Road. The site location is proximate to the EGA which will allow the station to serve this area. While this site appears to be located outside the Flood Hazard area, floodproofing will be necessary for this station and coordination with the DNR, Army Corps of Engineers and FEMA may be required to construct on this site, as the soils in the area are hydric possibly indicating the location of wetlands.

Lift Station Building

A new lift station building could be constructed on the fire house site with separate pump and generator rooms. The building will also house the lift station power distribution and control equipment. The new building will be constructed in place and will be similar construction to the buildings in Alternative 2 and 3 with generator and pump rooms.

Wet Well

The wet well for the lift station will be a 12 foot inside diameter precast concrete structure with a depth of 25 feet. The lift station building will be constructed over the wet well. A 24-inch diameter sanitary sewer diversion is included and will discharge into the wet well. Entrance to the wet well will be through an access cover sized for the three submersible pumps. The access covers will include fall-through protection, which will allow them to be safely opened for observation of the wet well interior.

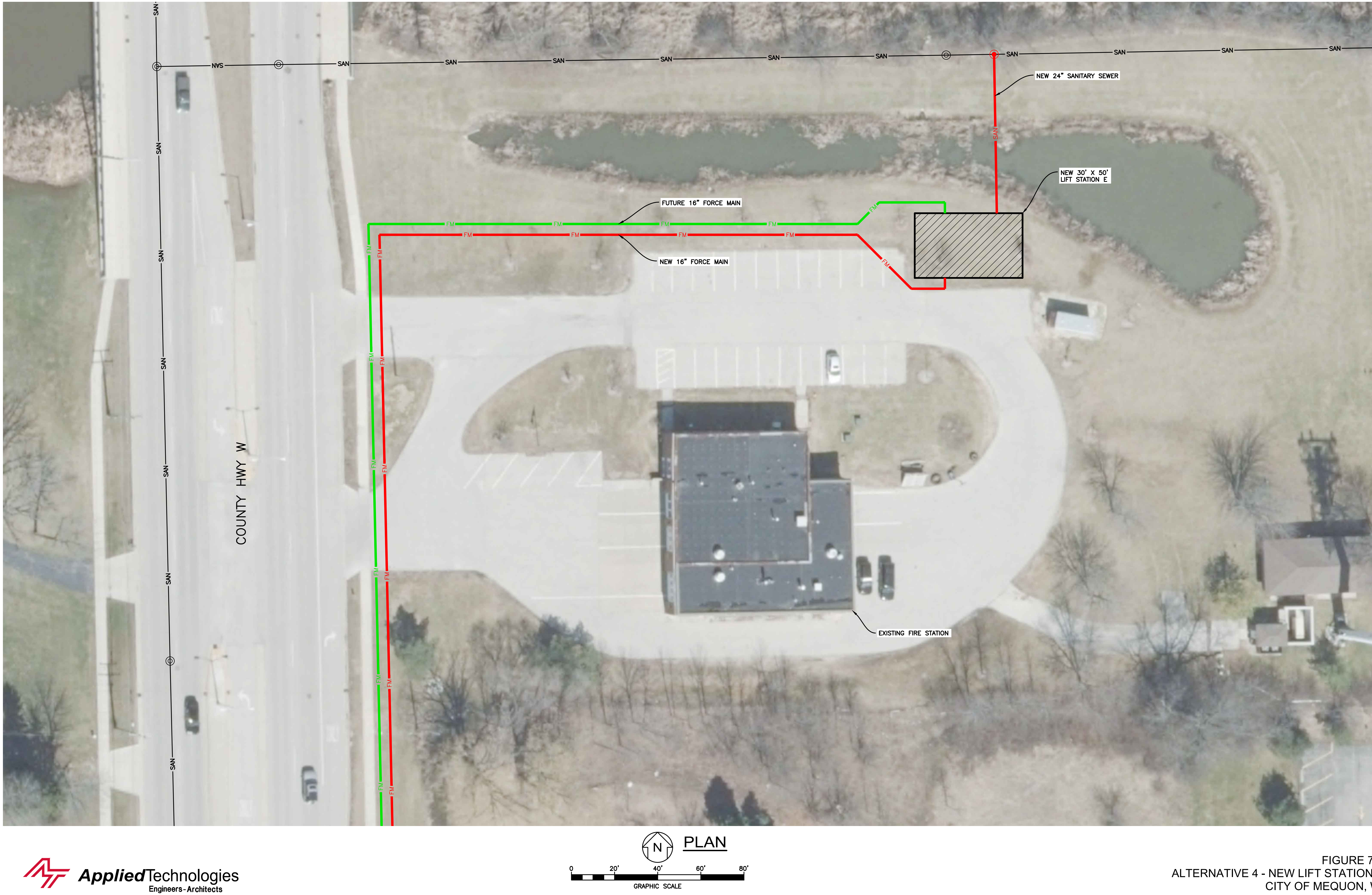
Pumps

As in the other Alternatives, the pumps evaluated in this alternative are based on Flygt N-Series submersible pumps. To meet the peak flow design requirements of 2,420 gpm, three 60 hp Flgyt NP 3202 submersible pumps, each with a rated capacity of 1,210 gpm at 129 feet TDH. With two pumps in service, the LS will have a firm capacity of 2,420 gpm.

For the ultimate build out with the EGA included, the LS could pumps can be replaced with three 160 hp Flgyt NP 3231 submersible pumps, each with a rated capacity of 2,310 gpm at 154 feet TDH. With two pumps in service, the LS will have a firm capacity of 4,620 gpm.

Under this alternative some of the improvements described in Alternative #1 would be implemented. For example, LS E's pumps would be replaced during LS E's upgrades with similar vertical dry pit pumps. To prevent pump 1 motor from overloading, pump 1 will be replaced with a 100 hp motor.

The pumps for Alternative 4 will utilize variable frequency drives to allow a varied pumping rate to match influent flows, and to ease pump startup under standby power. Utilizing the variable frequency drives to ramp up pump speed at startup greatly reduces the stating current as compared to an across the line starter.



R:\SHARED FOLDERS\PROJECTS\6398 - MEQUON LSE\11.0 GRAPHICS\11.1 FIGURES\FIGURE 7-5.DWG

AppliedTechnologies
Engineers - Architects

FIGURE 7-5
ALTERNATIVE 4 - NEW LIFT STATION E
CITY OF MEQUON, WI

Controls and SCADA

The controls and SCADA will be as described in Alternative 1.

Standby Power

A new 200 kW diesel powered emergency generator will be installed in the new lift station and a new automatic transfer switch (ATS) will be provided to keep the lift station operational if an electrical service outage occurs. Transfer from normal utility power to generator power will be automatic through the use of the ATS. The ATS will continually monitor the utility power source, transferring power should one or more phases drop out. To ensure stability of the utility power, the ATS will include user-adjustable time delays to ignore brief outages and prevent retransfer to utility power.

Example - 230 kW Generator

To expand this LS's firm capacity to 4,620 gpm in the future, the generator will need to be upgraded to a larger 500 kW diesel powered emergency generator with a larger transfer switch.

FORCE MAIN AND SEWERS

Force Main

This alternative requires the construction of a 9,800-ft long 12-inch diameter force main from the new LS south in Port Washington Road's right-of-way to the intersection of West Donges Bay Road. In anticipation of the addition of the EGA, this alternative provided a second parallel 12-inch diameter force main to convey the peak flows from the build out of the EGA or the Ulao Creek neighborhood.

Sanitary Sewer Improvements

This alternative will require construction of a 24-inch dia. sewer to redirect the existing 24-inch dia. sewer into the new station. This sewer improvement and the routing of the force main to Port Washington Road can be seen on Figure 7-5. At the time of this report, the potential future connection for the EGA was not defined. As such, it has been assumed that the developer will build and/or contribute consistent with City policy pertaining to the sanitary sewer service area as applied historically in other areas of the City.

COST-EFFECTIVENESS ANALYSIS AND ALTERNATIVE SELECTION

GENERAL

This section presents a life cycle cost analysis of the four lift station alternatives and includes both monetary costs and non-monetary criteria. Table 7-3 lists the general cost estimating criteria used for the monetary cost evaluation.

Monetary costs in this evaluation include operation and maintenance (O&M) costs as well as initial and future capital investments. The costs of the various project components are estimated using current market values prevailing at the time of this analysis. Inflation of prices and wages are not considered in the evaluation.

Total capital investment includes the initial capital construction costs plus professional fees and the capital costs necessary for major equipment replacement during the 50-year planning period. All future costs are discounted to the present year, using a single payment present worth factor computed at 3⅜ percent interest. The result of the present worth analysis is the amount of money that must be theoretically invested at 3⅜ percent interest when the project is initially constructed so that the capital for equipment replacement will be available when such expenditures are necessary.

Salvage value at the end of the planning period is also considered in the monetary cost evaluation. Structures and equipment whose service life extends beyond the planning period are considered to have a salvage value. Straight line depreciation methods are used to determine the salvage value of the components. A single payment present worth factor computed at 3⅜ percent is applied to the total salvage value. The resulting present worth of the salvage value is subtracted from the total capital costs for each alternative.

The total value of all O&M costs occurring during the 50-year planning period must be discounted to a present worth value. This value is obtained by multiplying the projected design condition O&M costs by a uniform series present worth factor computed at 3⅜ percent interest. This yields the amount of money that theoretically must be invested at 3⅜ percent interest when the project is initially constructed so that the annual O&M costs can be paid each year over the life of the facility.

Lift station costs were obtained from similar projects that were recently bid, quotations from local contractors and suppliers, and cost estimating guidelines. O&M costs were assumed to be two (2) percent of the capital cost. It should be noted that cost estimates have been prepared for guidance in alternative evaluation and selection. The final costs of a project will depend on actual labor and material costs, competitive market conditions, final project scope, implementation schedule, and other variable factors. As a result, the final project costs will typically vary from the estimates presented in this study.

ALTERNATIVE COSTS

The capital costs for the four lift station alternatives are provided in Tables 7-5 through 7-9. The costs for the four alternatives, vary from $4,026,000 to $6,051,000, with Alternative 4 having the highest capital cost as well as requiring the highest future capital expenditures.

Table 7-12 presents a summary of the total present worth costs of the alternatives. Based on the analysis performed, Alternative 1 has the lowest life cycle cost with a present worth cost of $6,993,000, closely followed by Alternative 2 with a present worth cost of $7,069,000 with a 1 percent higher life cycle cost. Alternative 1 has slightly lower capital costs than Alternative 2, however Alternative 2 has slightly lower operating and maintenance costs. This is primarily due to projected lower costs to maintain a new facility with better access to the equipment and wet well as well as lower energy requirements for pumping.

Table 7-3

General Cost Estimating Criteria
Mequon Lift Station E

Item	Criteria
Discount Rate	3.375%
Present Worth Factors	

25 year future sum	0.515
25 year uniform series	14.37
50 year future sum	0.190
50 year uniform series	23.99
Monetary Cost Planning Period	50
Date of Current Cost Estimate	October 2020
Type of Cost Estimate	Between Budget and Order-of Magnitude
Construction Cost Contingencies	15%
General Conditions, Bonds and Insurance	8%
Straight Line Depreciation of Costs over Useful Life of Equipment, Structures, and other Capital Cost Items	
Useful Life	
Land	Permanent
Sewers and Force Mains	50 years
Structures, Piping and Valves	50 years
Process Equipment, Electrical, I&C	25 years

Table 7-5

Capital Costs
Alternative 1 – Upgrade LS E

Item	Initial Cost ($)	Life (Years)	Initial Cost ($)
Bypass Pumping	$630,000		
Sitework (Paving, Grading, Seeding)	$191,000		
Storm Sewer	$25,000	50	
Demolition of above grade building	$40,000		
Lift Station Building	$299,000	50	
Dry Pit Submersible Pumps	$427,000	25	$450,000
Mechanical Piping	$241,000	50	
HVAC	$82,000	25	$82,000
Instrumentation and Control	$198,000	25	$199,000
Electrical	$281,000	25	$283,000
Transfer Switch - 1200 A	$30,000	25	$34,000
Raise Transformers	$20,000		
24-inch dia. Sewer Oriole Lane to Hidden Reserve Circle	$382,000	50	
Subtotal	$2,846,000		$1,048,000
Construction Contingencies (15%)	$427,000		$157,000
General Conditions, Bonds, and Insurance (8%)	$228,000		$84,000
Engineering & Administrative	$525,000		$181,000
TOTAL CAPITAL COST	**$4,026,000**		**$1,048,000**
Present Worth	**$4,026,000**		**$457,000**
Present Worth of Total	**-**		**$4,483,000**

Table 7-6 Capital Costs Alternative 2 – New at West Ranch Road			
Item	**Initial Cost ($)**	**Life (Years)**	**Initial Cost ($)**
Sitework (Paving, Grading, Seeding)	$275,000		
Decommission Existing Lift Station	$48,000		
Concrete Wet Well	$275,000	50	
Lift Station Building	$384,000	50	
Submersible Pumps (West)	$223,000	25	$223,000
Submersible Pumps (East)	$205,000	25	$307,000
Mechanical Piping	$217,000	50	
HVAC	$79,000	25	$79,000
Transfer Switch	$22,000	25	$30,000
Standby Generator 500 kW	$129,000	25	$198,000
Instrumentation and Control	$150,000	25	$167,000
Electrical	$227,000	25	$277,000
36-inch dia. Sewer (365 LF)	$158,000	50	
18-inch dia. Sewer (50 LF)	$16,000	50	
16-inch dia. Force main (1,200 LF)	$184,000	50	
24-inch dia. Sewer Oriole Lane to Hidden Reserve Circle (1,200 LF)	$382,000	50	
Subtotal	$2,974,000		$1,281,000
Construction Contingencies (15%)	$446,000		$192,000
General Conditions, Bonds, and Insurance (8%)	$238,000		$102,000
Engineering & Administrative	$549,000		$221,000
TOTAL CAPITAL COST	**$4,207,000**		**$1,281,000**
Present Worth	**$4,207,000**		**$559,000**
Total Present Worth			**$4,766,000**

Table 7-7

Capital Costs
Alternative 3 – New at Wildwood Drive

Item	Initial Cost ($)	Life (Years)	Initial Cost ($)
Sitework (Paving, Grading, Seeding)	$331,000		
Decommission Existing Lift Station	$48,000		
Concrete Wet Well	$275,000	50	
Lift Station Building	$384,000	50	
Submersible Pumps (West)	$223,000	25	$223,000
Submersible Pumps (East)	$205,000	25	$307,000
Mechanical Piping	$217,000	50	
HVAC	$79,000	25	$79,000
Transfer Switch	$22,000	25	$30,000
Standby Generator 500 kW	$129,000	25	$198,000
Instrumentation and Control	$155,000	25	$172,000
Electrical	$231,000	25	$281,000
21-inch dia. Sewer (900 LF)	$229,000	50	
16-inch dia. Force main (2,100 LF)	$317,000	50	
24-inch dia. Sewer Oriole Lane to Hidden Reserve Circle (1,200 LF)	$382,000	50	
Subtotal	3,227,000		1,290,000
Construction Contingencies (15%)	484,000		194,000
General Conditions, Bonds, and Insurance (8%)	258,000		103,000
Engineering & Administrative	595,000		223,000
TOTAL CAPITAL COST	**4,564,000**		**1,290,000**
Present Worth	**$4,564,000**		**$563,000**
Total Present Worth			**$5,127,000**

Table 7-8 Capital Costs Alternative 4 – New LS at Fire House to Offload E			
Item	**Initial Cost ($)**	**Life (Years)**	**Future Cost ($)**
Sitework (Paving, Grading, Seeding)	$183,000		
Precast Concrete Wet Well	$148,000	50	
Lift Station Building	$312,000	50	
Submersible Pumps	$182,000	25	$307,000
Mechanical Piping	$135,000	50	
HVAC	$79,000	25	$79,000
Transfer Switch	$5,000	25	$5,000
Standby Generator 200 kW	$64,000	25	$64,000
Instrumentation and Control	$89,000	25	$109,000
Electrical	$132,000	25	$182,000
24-inch dia. Influent Sewer (400 LF)	$111,000	50	
12-inch dia. Force Main (9,900 LF)	$2,838,000	50	
Subtotal	$4,278,000		$746,000.00
Construction Contingencies (15%)	$642,000		$112,000.00
General Conditions, Bonds, and Insurance (8%)	$342,000		$60,000.00
Engineering & Administrative	$789,000		$129,000.00
TOTAL CAPITAL COST	**$6,051,000**		**$746,000.00**
Present Worth	**$6,051,000**	**25**	**$325,000.00**
Total Present Worth			**$6,376,000**

Table 7-9

Capital Costs
Alternative 4 – Upgrade LS E

Item	Initial Cost ($)	Life (Years)	Future Cost ($)	Salvage Value ($)
Bypass Pumping	$630,000			
Storm Sewer	$25,000	50		($5,000)
Sitework (Paving, Grading, Seeding)	$176,000			
Storm Sewer	$25,000	50		($5,000)
Demolition of above grade building	$40,000			
Lift Station Building	$299,000	50		($60,000)
Pump Replacement	$41,000	25	$41,000	($16,000)
Pump Replacement	$143,000	25	$143,000	($57,000)
Mechanical Piping	$173,000	50		($35,000)
HVAC	$82,000	25	$82,000	($33,000)
Transfer Switch	$22,000	25	$22,000	($9,000)
Raise Transformers	$20,000			
Instrumentation and Control	$168,000	25	$168,000	($67,000)
Electrical	$228,000	25	$228,000	($91,000)
Subtotal	$2,072,000		$684,000	($378,000)
Construction Contingencies (15%)	$311,000		$103,000	
General Conditions, Bonds, and Insurance (8%)	$166,000		$55,000	
Engineering & Administrative	$382,000		$118,000	
TOTAL CAPITAL COST	**$2,931,000**		**$684,000**	
Present Worth	**$2,103,000**	**35**	**$214,000**	**($72,000)**
Total Present Worth				**$2,245,000**

Table 7-10 Annual O&M Costs First 25 Years of Operation					
Item	**Alt-1**	**Alt-2**	**Alt-3**	**Alt-4**	**Alt-4A**
Annual Maintenance Cost	$80,300	$72,000	$78,200	$105,200	$51,600
Electrical Energy (Incl. Demand Charge)	$18,000	$14,100	$14,100	$4,300	$18,800
Natural Gas	$2,000	$2,300	$2,300	$1,800	$2,000
Diesel Fuel Price		$2,500	$2,500	$1,000	
Total Annual O&M	**$100,300**	**$90,900**	**$97,100**	**$112,300**	**$72,400**
Present Worth Factor (25 years @3 3/8%)	16.71	16.71	16.71	16.71	16.71
Present Worth O&M	**$1,676,000**	**$1,519,000**	**$1,623,000**	**$1,877,000**	**$1,210,000**

Notes:

1. Alt-4 are the annual operational costs for the new lift station at the fire house diverting flow from ME4003.
2.. Alt-4A are the operational costs for the current lift station E.

Table 7-11 Annual O&M Costs Year 26 through 50 of Operation					
Item	**Alt-1**	**Alt-2**	**Alt-3**	**Alt-4**	**Alt-4A**
Annual Maintenance Cost	$81,400	$73,900	$80,700	$110,000	$51,600
Electrical Energy (Incl. Demand Charge)	$31,100	$27,900	$27,900	$15,700	$18,800
Natural Gas	$2,000	$2,300	$2,300	$2,300	$2,000
Diesel Fuel Price		$3,600	$3,600	$2,500	
Total Annual O&M	**$114,500**	**$107,700**	**$114,500**	**$130,500**	**$72,400**
Present Worth Factor (@3 3/8%)[3]	7.28	7.28	7.28	7.28	7.28
Present Worth O&M	**$834,000**	**$784,000**	**$834,000**	**$950,000**	**$527,000**

Notes:

1. Alt-4 are the annual operational costs for the new lift station at the fire house diverting flow from ME4003.
2.. Alt-4A are the operational costs for the current lift station E.
3. The present worth factor for years 26 through 50.

Table 7-12 **Capital Costs** **Alternative 4 – Upgrade LS E**				
Item	**Alt-1 Upgrade**	**Alt-2 New at West Ranch Road**	**Alt-3 New at Wildwood Drive**	**Alt-4 New at Fire House**
Capital Cost	$4,026,000	$4,207,000	$4,564,000	$6,051,000
Capital Cost - Year 10				$1,419,000
Capital Cost - Year 25	$457,000	$559,000	$563,000	$325,000
Capital Cost - Year 35				$208,000
Salvage Value				($69,000)
O&M - Present Worth	$2,510,000	$2,303,000	$2,457,000	$4,564,000
Total Present Worth	$6,993,000	$7,069,000	$7,584,000	$12,498,000

NON-MONETARY COST EVALUATION

Non-monetary costs are grouped into environmental, social, and technical factors. Environmental factors include impacts on water resources and quality, air quality, aesthetics, terrestrial and aquatic ecology, and environmentally sensitive areas. Social impacts include changes in population and land use, effects on archaeological and historic sites, and local activities. Technical considerations include effectiveness in meeting water quality objectives, operability, flexibility, reliability, and compatibility with existing systems.

Non-monetary costs are difficult to adequately measure and assess. First, there is the difference between direct and indirect impacts. Direct impacts arise from actual construction activities such as floodplain or wetland impingement, noise, sedimentation and other problems arising from construction activities. These impacts are measurable. Indirect impacts, such as induced growth, are more difficult to anticipate and evaluate. Second, direct and indirect impacts are often not quantifiable, but instead require qualitative judgment in the evaluation. Finally, the diversity of the criteria being considered precludes the easy generation of a standard set of measurements.

Due to these constraints, the methods of measurement will be qualitative or narrative. Impacts that are common to all alternatives receive only minor discussion. For example, every project will include some noise associated with construction. Aside from informing people that it will occur, the noise mitigation metric is of little use in determining which alternative is the most cost-effective.

Criteria are measured in terms of the other alternatives being evaluated. The intent is to determine not merely that an impact will occur, but also whether the impact is more or less significant among alternatives. Where there are differences among the alternatives, the alternatives are ranked. Ranking for the various categories are presented in Table 7-13.

Environmental Impacts

Water Quality

All of the alternatives will be sized for increased firm pumping capacity than the current facility. The elimination or at a minimum, the reduction in frequency and volume of SSOs should be the end result of the implementation of these alternatives. SSOs impact the water quality of the receiving surface water body, although site specific monitoring has not been collected or analyzed at this time. Based on this, all alternatives are expected to reduce SSOs and improve surface water quality when compared with baseline data.

Flooding

All of the alternatives involve construction on sites in the flood fringe. The existing facilities and new facilities on the existing site will be either constructed outside the floodplain or flood proofed. Alternative 4 may delay the flood proofing of the existing LS E due to the reduction in flow, as such this alternative could be more prone to flooding. There are no significant differences apparent amongst the other alternatives.

Air Quality

All LSs have the potential for odor release. Each alternative will include some dust generation during construction and will include the normal odors associated with wastewater conveyance. The Mequon personnel have noted that they have had some complaints about odors being generated near the discharge of the East force main, which has been addressed through operational changes. Alternative 4 will include the construction of a 9,800 feet long force main. The length and size of this force main is of concern as long detention times in a force main can cause septic conditions that leads to the generation of odors at the point of discharge. Alternatives 1, 2 and 3 are very similar to the current LS which has issues as stated above.

Environmentally Significant Lands

This site for Alternative 3 is located in an environmental corridor. The other three alternatives are located adjacent to an environmental corridor.

Natural Resources

All alternatives involve substantial commitments of natural resources. Fuels and materials will be consumed during construction, as well as over the lifetime of the LS. All are expected to have similar energy demands. Since each of the alternatives will consume similar amounts of material for construction, and consume similar amounts of energy, there are no significant differences apparent amongst the alternatives.

Aesthetics

The proposed LS sites are located in an urban area with nearby homes and commercial buildings. The current site and the planned sites will have landscaped or green buffer zones around the facilities. All existing and proposed buildings will have exterior improvements consistent with subdivision deed restrictions and covenants. The facilities will be maintained by City maintenance Crews. Although the LS buildings are reasonably attractive, in that they will match the architectural requirements of the surrounding area, it will have a visual impact on viewers from around the site. All alternatives are expected to produce similar amounts of truck traffic for maintenance and cleaning. Thus, there are no significant differences apparent among these alternatives.

Social Impacts

Public Health

All of the LS alternatives provide substantial public health benefits. LS capacity will be expanded to ensure adequate pumping and sewer capacity is provided to prevent sewer backups into basements. LS E is currently in the flood fringe and is not currently flood proofed. Alternative 4 does not have the flood proofing of LS E occurring for another several years due to the reduction in flow. During this time, the LS is susceptible to flooding which can result in basement backups and SSO events. In all of the other alternatives, the LS will be flood proofed. Based on this there are no significant differences between alternatives 1, 2 and 3, with alternative 4 more prone to flooding and/or causing a public health problem.

Growth Potential

All alternatives provide sufficient capacity for the expected growth in population over the planning period. There are no significant differences apparent among the alternatives.

Cultural Impacts

The primary cultural impact of any of the alternatives is the possible disruption of an undiscovered archaeological site. All three alternatives involve similar construction on sites with no potential impacts on archaeologically significant lands. There are no significant differences apparent among the alternatives.

Archaeological and Historically Significant Lands

At this time, no archaeological sites have been identified on any of the sites. There are no significant differences apparent among the alternatives.

Technical Considerations

Operation During Construction

Pumping must be maintained throughout construction, with LS E serving a large portion of Mequon, it is Mequon's largest and most critical LS. All of the alternatives involve some modifications to the existing facilities and construction of new facilities on the existing site and, therefore, require careful construction staging. Alternative 1 involves extensive modifications to the current LS, involving structural, mechanical, and electrical changes to the facility. To complete this work, a temporary pumping system will need to be installed and operated to bypass flow around the station for a period during construction. All other Alternatives involve construction of new LSs on new sites. This allows the construction of the new LS while not affecting the operation of the existing LS. Alternative 4 also requires extensive modifications to LS E, at a later date, but this work will be done after the Fire House LS is in service and the amount of flow received at LS E is reduced. Alternatives 2 & 3 will require some sewer and force main connections. However, with two force mains from LS E, one of the force mains and LS E will be able to remain in service during the connection and startup of the new LS. Alternatives 2 and 3 will not affect LS E operation during construction except during the changeover period.

Ease of Operation

All alternatives involve a similar level of complexity. However, Alternative 4 adds an additional LS which will involve additional monitoring and maintenance. Both Alternatives 1 and 4 will continue to operate LS E with its current wet well as configured. This configuration requires periodic cleaning of the bar screen. Based on this, Alternative 4 will be the most difficult alternative to operate followed by Alternative 1. There are no significant differences apparent among the other alternatives..

Process Stability

Process stability is considered synonymous with the ability to maintain pumping. All four alternatives have provisions for emergency power in case utility power is loss. All alternatives except for Alternative 1 will be provided with an on-site back-up diesel generator. Although Alternative 1 utilized a separate electrical service feed from a different portion of the utility grid the station solely relies on utility power. Alternatives 2 & 3 include a backup emergency generator and can maintain pumping with the operation of the generator. Alternative 4 also includes a backup generator at the new Fire House LS, however, existing LS E will remain in service and it will still utilize utility power as a backup power source.

Flexibility

Flexibility refers to the ability to adjust the operation of the lift station to meet changing conditions. This is considered synonymous with the ability to expand the capacity of the LS in the future. All Alternatives have the ability to be expanded in the future. However, Alternatives 2 and 3 will be constructed with additional space for a future pump but are restricted by the current force main capacity. Alternative 4 adds a force main with provisions for a second force main adding capacity to the system in the area of expected future growth.

NON-MONETARY COST SUMMARY

Rankings developed in consideration of non-monetary costs are shown in Table 7-13. In all cases, the least desirable rank was given a numerical value of 1 and the most desirable alternatives were given a value of 4, with a total numerical value of 10 assigned across the four alternatives. There

Table 7-13

Non-Monetary Ranking of Alternatives
Lift Station E Improvements

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Environmental Impacts				
Water Quality	2½	2½	2½	2½
Flooding	1	3	3	3
Air Quality	3	3	3	1
Environmentally Significant Lands	3	3	1	3
Natural Resources	2½	2½	2½	2½
Aesthetics	2	3½	3½	1
Social Impacts				
Public Health	3	3	3	1
Growth Potential	2½	2½	2½	2½
Cultural Impacts	2½	2½	2½	2½
Archaeologically and Historically Significant Lands	2½	2½	2½	2½
Technical Considerations				
Operation During Construction	1	3½	3½	2
Ease of Operation	2	3½	3½	1
Process Stability	1	3½	3½	2
Flexibility	1	2½	2½	4
Total	29½	41	39	30½

Note: Higher value means more desirable

are no standard guidelines established to weight the various evaluation criteria. Thus, “Flexibility” under the technical considerations is considered as important as “Natural Resources” under the environmental considerations. Therefore, the rankings have been simply added together to obtain total point values.

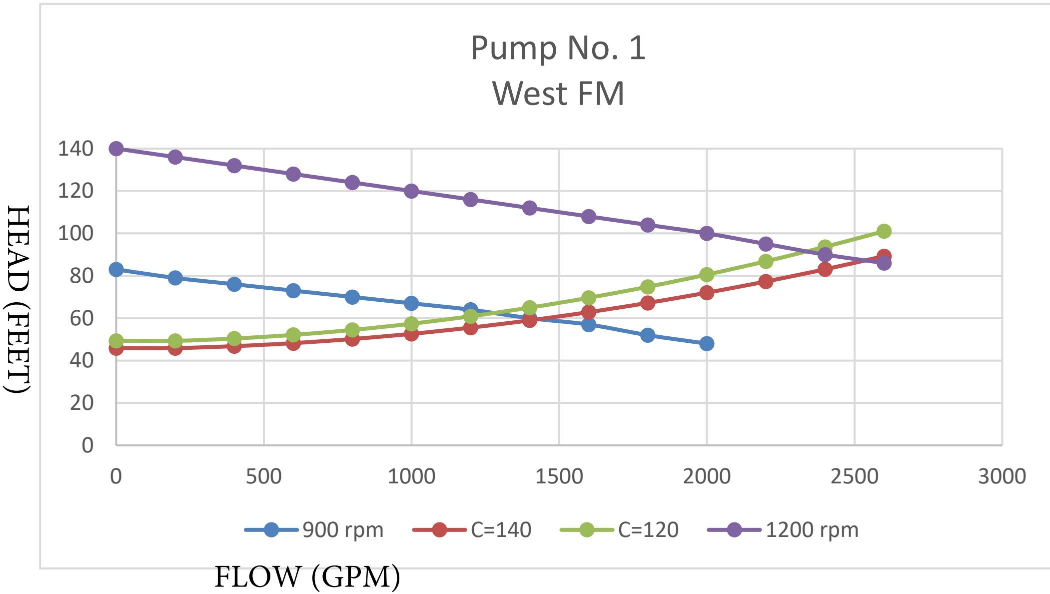
The non-monetary comparison of alternatives suggests that, overall, Alternative 2 is favored over the remaining alternatives, with Alternative 1 being the least desirable.

ALTERNATIVE SELECTION

The analysis presented in this report shows that of the four alternatives, Alternative 1 – Upgrade LS E is the least costly on a cost basis and is the least desirable on a non-economic basis. Alternative 2 – New at West Ranch Road is the second least costly alternative but is the most desirable on a non-economic basis. With the costs of Alternative 2 being only slightly higher than that of Alternative 1 and within the range of our cost estimates, Alternative 2 is the recommended alternative for improving LS E.

Appendix A

Pump Capacity and Hydraulic Calculations


Pump No. 1
West FM
HEAD (FEET)
140
120
100
80
60
40
20
0
0
500
1000
1500
2000
2500
3000
900 rpm
C=140
C=120
1200 rpm
FLOW (GPM)

PROJECT:	*Mequon LS E*	SYSTEM CURVE FLOW POINTS						
PROJECT NO.:	*6398*							
PUMP SYS.:	*West FM Pump # 1*	HEAD LOSSES (ft)						
DESIGN FLOW:	*1400* gpm							
ENGINEER:	*Paul Traeger*	1400	1600	1800	2000	2200	2400	2600
FILE:	***D:\G\Mequon\3.4 Process\[Pump # 1 Capacity - West FM 1200.xlsx]Fittings***							

Table 1
MINOR LOSSES

DIAM. (in.)	ITEM	K	% Q	FLOW THRU FITTING (gpm) q1	q2	q3	q4	q5	q6	q7	VELOCITY (ft/sec) v1	v2	v3	v4	v5	v6	v7	HEAD LOSSES (ft) hl1	hl2	hl3	hl4	hl5	hl6	hl7
10	Inlet	0.05	100	1400	1600	1800	2000	2200	2400	2600	5.7	6.5	7.4	8.2	9.0	9.8	10.6	0.03	0.03	0.04	0.05	0.06	0.07	0.09
10	Gate	0.20	100	1400	1600	1800	2000	2200	2400	2600	5.7	6.5	7.4	8.2	9.0	9.8	10.6	0.10	0.13	0.17	0.21	0.25	0.30	0.35
10	10x8 RDCR	0.19	100	1400	1600	1800	2000	2200	2400	2600	5.7	6.5	7.4	8.2	9.0	9.8	10.6	0.10	0.13	0.16	0.20	0.24	0.28	0.33
8	6x8 Increaser	0.20	100	1400	1600	1800	2000	2200	2400	2600	8.9	10.2	11.5	12.8	14.1	15.3	16.6	0.25	0.32	0.41	0.51	0.61	0.73	0.86
8	Elb 90	0.26	100	1400	1600	1800	2000	2200	2400	2600	8.9	10.2	11.5	12.8	14.1	15.3	16.6	0.32	0.42	0.53	0.66	0.80	0.95	1.11
8	Check	2.00	100	1400	1600	1800	2000	2200	2400	2600	8.9	10.2	11.5	12.8	14.1	15.3	16.6	2.48	3.25	4.11	5.07	6.14	7.30	8.57
8	Gate	0.21	100	1400	1600	1800	2000	2200	2400	2600	8.9	10.2	11.5	12.8	14.1	15.3	16.6	0.26	0.34	0.43	0.53	0.64	0.77	0.90
8	8x10 Increaser	0.18	100	1400	1600	1800	2000	2200	2400	2600	8.9	10.2	11.5	12.8	14.1	15.3	16.6	0.22	0.29	0.37	0.46	0.55	0.66	0.77
8	Tee (branch)	0.57	100	1400	1600	1800	2000	2200	2400	2600	8.9	10.2	11.5	12.8	14.1	15.3	16.6	0.71	0.92	1.17	1.45	1.75	2.08	2.44
8	8x14 Increaser	0.45	100	1400	1600	1800	2000	2200	2400	2600	8.9	10.2	11.5	12.8	14.1	15.3	16.6	0.56	0.73	0.92	1.14	1.38	1.64	1.93
14	14x16 Increase	0.12	100	1400	1600	1800	2000	2200	2400	2600	2.9	3.3	3.8	4.2	4.6	5.0	5.4	0.02	0.02	0.03	0.03	0.04	0.05	0.05
16	Elb 45	0.11	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.01	0.01	0.01	0.02	0.02	0.03	0.03
16	Elb 45	0.11	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.01	0.01	0.01	0.02	0.02	0.03	0.03
16	Elb 11	0.06	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.00	0.01	0.01	0.01	0.01	0.01	0.02
16	Tee (branch)	0.46	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.04	0.05	0.06	0.07	0.09	0.10	0.12
16	Elb 45	0.10	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.01	0.01	0.01	0.02	0.02	0.02	0.03
16	Elb 11	0.06	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.00	0.01	0.01	0.01	0.01	0.01	0.02
16	Elb 90	0.22	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.02	0.02	0.03	0.03	0.04	0.05	0.06
16	Elb 90	0.22	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.02	0.02	0.03	0.03	0.04	0.05	0.06
16	Elb 45	0.11	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.01	0.01	0.01	0.02	0.02	0.03	0.03
16	Elb 45	0.11	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.01	0.01	0.01	0.02	0.02	0.03	0.03
16	Elb 45	0.11	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.01	0.01	0.01	0.02	0.02	0.03	0.03
16	Exit	1.00	100	1400	1600	1800	2000	2200	2400	2600	2.2	2.6	2.9	3.2	3.5	3.8	4.2	0.08	0.10	0.13	0.16	0.19	0.23	0.27
															Total hl (ft) :			5.26	6.86	8.69	10.72	12.98	15.44	18.12
																		1400	1600	1800	2000	2200	2400	2600

PUMP 1

Table 2

PIPE LOSSES

C1 = 120

C2 = 140

SEGMENT NO.	DIAM (in.)	LENGTH (ft.)	% Q	FLOW THRU PIPE (gpm) q1	q2	q3	q4	q5	q6	q7	VELOCITY (fps) v1	v2	v3	v4	v5	v6	v7
1	10	5	100	1400	1600	1800	2000	2200	2400	2600	5.7	6.5	7.4	8.2	9.0	9.8	10.6
1	8	5	100	1400	1600	1800	2000	2200	2400	2600	8.9	10.2	11.5	12.8	14.1	15.3	16.6
1	10	4	100	1400	1600	1800	2000	2200	2400	2600	5.7	6.5	7.4	8.2	9.0	9.8	10.6
1	14	2	100	1400	1600	1800	2000	2200	2400	2600	2.9	3.3	3.8	4.2	4.6	5.0	5.4
1	15.35	6297	100	1400	1600	1800	2000	2200	2400	2600	2.4	2.8	3.1	3.5	3.8	4.2	4.5

SEGMENT NO.	hf1 120	140	hf2 120	140	hf3 120	140	hf4 120	140	hf5 120	140	hf6 120	140	hf7 120	140
1	0.07	0.05	0.09	0.06	0.11	0.08	0.13	0.10	0.15	0.12	0.18	0.14	0.21	0.16
1	0.20	0.15	0.25	0.19	0.32	0.24	0.38	0.29	0.46	0.34	0.54	0.40	0.62	0.47
1	0.05	0.04	0.07	0.05	0.09	0.06	0.10	0.08	0.12	0.09	0.15	0.11	0.17	0.13
1	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01
1	10.49	7.89	13.43	10.09	16.69	12.55	20.29	15.25	24.20	18.20	28.43	21.37	32.96	24.78
SUMMARY -- Total hf (ft) :	10.81	8.13	13.84	10.41	17.21	12.94	20.91	15.73	24.95	18.76	29.3	22.0	34.0	25.6
HEAD LOSSES (ft)	1400		1600		1800		2000		2200		2400		2600	

PUMP 1

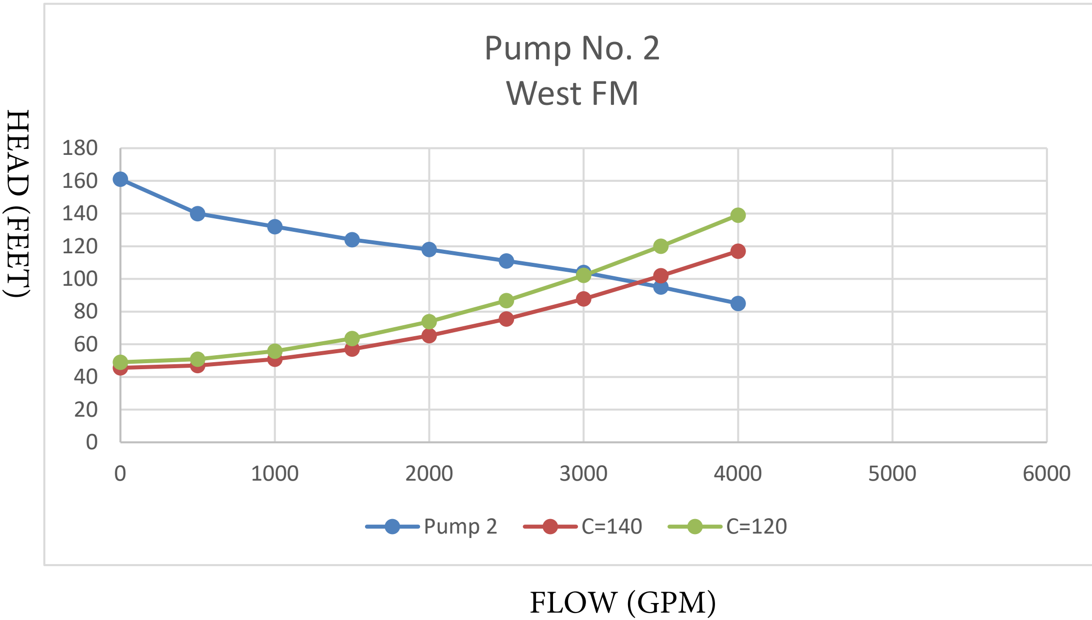
Table 3
STATIC HEAD CONDITIONS

Suction EL		Discharge EL		Hs (ft)	
Min	Max	Min	Max	Min	Max
57.90	59.90	105.48	106.81	45.58	48.91

PUMP 1

Table 4
SYSTEM SUMMARY

	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Minor Losse (ft)	5.26	5.26	6.86	6.86	8.69	8.69	10.72	10.72	12.98	12.98	15.44	15.44	18.12	18.12
Pipe Losses (ft)	8.13	10.81	10.41	13.84	12.94	17.21	15.73	20.91	18.76	24.95	22.03	29.30	25.55	33.98
Static Head (ft)	45.58	48.91	45.58	48.91	45.58	48.91	45.58	48.91	45.58	48.91	45.58	48.91	45.58	48.91
TDH (ft)	58.96	64.98	62.85	69.62	67.21	74.81	72.03	80.55	77.31	86.84	83.06	93.66	89.26	101.02
SYSTEM FLOW (gpm)	1400		1600		1800		2000		2200		2400		2600	



Pump No. 2
West FM
HEAD (FEET)
180
160
140
120
100
80
60
40
20
0
0
1000
2000
3000
4000
5000
6000
Pump 2
C=140
C=120
FLOW (GPM)

PROJECT:	*Mequon LS E*	SYSTEM CURVE FLOW POINTS						
PROJECT NO.:	*6398*							
PUMP SYS.:	*West FM Pump # 2*	HEAD LOSSES (ft)						
DESIGN FLOW:	*3000* gpm							
ENGINEER:	*Paul Traeger*	500	1000	1500	2000	2500	3000	3500
FILE:	***D:\G\Mequon\3.4 Process\[Pump # 2 Capacity - West FM.xlsx]Fittings***							

Table 1

MINOR LOSSES

DIAM. (in.)	ITEM	K	% Q	FLOW THRU FITTING (gpm) q1	q2	q3	q4	q5	q6	q7	VELOCITY (ft/sec) v1	v2	v3	v4	v5	v6	v7	HEAD LOSSES (ft) hl1	hl2	hl3	hl4	hl5	hl6	hl7
12	Inlet	0.05	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.00	0.01	0.01	0.03	0.04	0.06	0.08
12	Gate	0.19	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.01	0.02	0.05	0.10	0.15	0.21	0.29
12	12x10 RDCR	0.18	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.01	0.02	0.05	0.09	0.14	0.20	0.28
10	Elb 90	0.25	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.02	0.06	0.15	0.26	0.41	0.58	0.80
8	8x12 Increaser	0.32	100	500	1000	1500	2000	2500	3000	3500	3.2	6.4	9.6	12.8	16.0	19.2	22.4	0.05	0.20	0.46	0.81	1.27	1.83	2.48
10	Elb 90	0.25	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.02	0.06	0.15	0.26	0.41	0.58	0.80
12	Check	2.00	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.06	0.25	0.56	1.00	1.57	2.25	3.07
12	Plug	1.08	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.03	0.14	0.30	0.54	0.85	1.22	1.66
12	Tee (branch)	0.52	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.02	0.07	0.15	0.26	0.41	0.59	0.80
12	12x14 Increase	0.12	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.00	0.02	0.03	0.06	0.09	0.14	0.18
14	Kife Gate	0.22	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.03	0.06	0.09	0.13	0.18
14	Tee (Flow)	0.08	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.01	0.02	0.03	0.05	0.07
14	14x16 Increase	0.12	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.02	0.03	0.05	0.07	0.10
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 11	0.06	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.01	0.01	0.02	0.03
16	Tee (branch)	0.46	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.22
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 11	0.06	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.01	0.01	0.02	0.03
16	Elb 90	0.22	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.01	0.02	0.03	0.05	0.08	0.11
16	Elb 90	0.22	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.01	0.02	0.03	0.05	0.08	0.11
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Exit	1.00	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.01	0.04	0.09	0.16	0.25	0.36	0.49
																	Total hl (ft) :	0.25	0.99	2.22	3.94	6.16	8.87	12.07
																		500	1000	1500	2000	2500	3000	3500

PUMP 2

Table 2
PIPE LOSSES

C1 = 120
C2 = 140

SEGMENT NO.	DIAM (in.)	LENGTH (ft.)	% Q	FLOW THRU PIPE (gpm) q1	q2	q3	q4	q5	q6	q7	VELOCITY (fps) v1	v2	v3	v4	v5	v6	v7	hf1 120	hf1 140	hf2 120	hf2 140	hf3 120	hf3 140	hf4 120	hf4 140	hf5 120	hf5 140	hf6 120	hf6 140	hf7 120	hf7 140
1	10	5	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.01	0.01	0.04	0.03	0.08	0.06	0.13	0.10	0.20	0.15	0.27	0.21	0.36	0.27
1	8	5	100	500	1000	1500	2000	2500	3000	3500	3.2	6.4	9.6	12.8	16.0	19.2	22.4	0.03	0.02	0.11	0.08	0.23	0.17	0.38	0.29	0.58	0.44	0.81	0.61	1.08	0.81
1	10	4	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.01	0.01	0.03	0.02	0.06	0.05	0.10	0.08	0.16	0.12	0.22	0.17	0.29	0.22
1	14	2	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.02
1	15.35	6297	100	500	1000	1500	2000	2500	3000	3500	0.9	1.7	2.6	3.5	4.3	5.2	6.1	1.56	1.17	5.63	4.23	11.92	8.96	20.29	15.25	30.66	23.05	42.95	32.30	57.13	42.95
SUMMARY -- Total hf (ft) :																		1.61	1.21	5.80	4.36	12.28	9.24	20.91	15.73	31.60	23.76	44.3	33.3	58.9	44.3
HEAD LOSSES (ft)																		500		1000		1500		2000		2500		3000		3500	

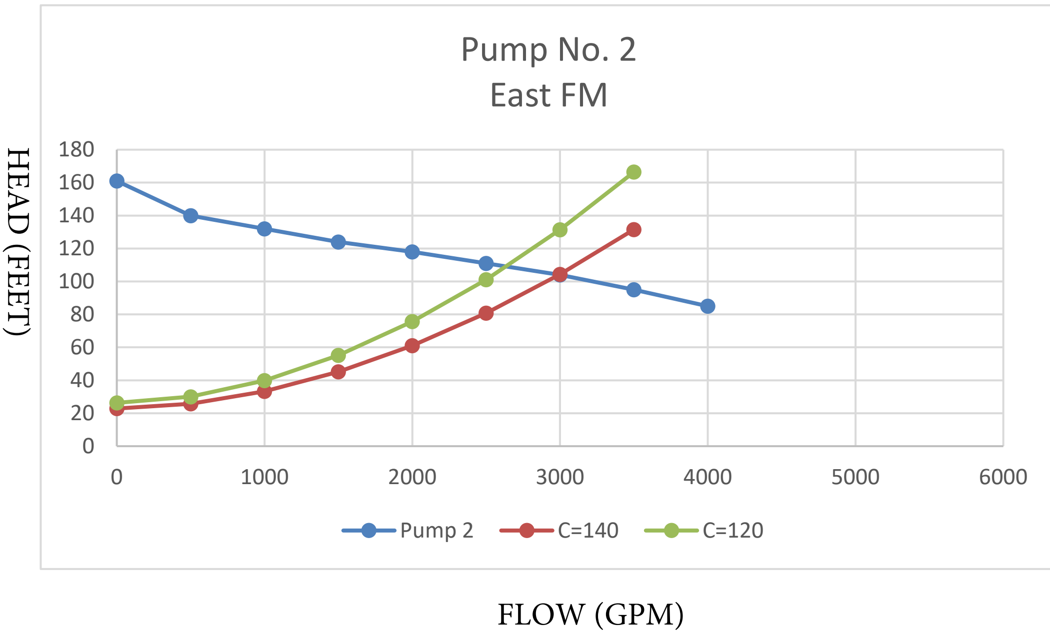
PUMP 2

Table 3 STATIC HEAD CONDITIONS					
Suction EL		Discharge EL		Hs (ft)	
Min	Max	Min	Max	Min	Max
57.79	59.90	105.48	106.81	45.58	49.02

PUMP 2

Table 4
SYSTEM SUMMARY

	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Minor Losse (ft)	0.25	0.25	0.99	0.99	2.22	2.22	3.94	3.94	6.16	6.16	8.87	8.87	12.07	12.07
Pipe Losses (ft)	1.21	1.61	4.36	5.80	9.24	12.28	15.73	20.91	23.76	31.60	33.29	44.28	44.28	58.89
Static Head (ft)	45.58	49.02	45.58	49.02	45.58	49.02	45.58	49.02	45.58	49.02	45.58	49.02	45.58	49.02
TDH (ft)	47.04	50.88	50.93	55.81	57.03	63.52	65.25	73.88	75.50	86.79	87.74	102.18	101.93	119.99
SYSTEM FLOW (gpm)	500		1000		1500		2000		2500		3000		3500	



Pump No. 2
East FM
HEAD (FEET)
180
160
140
120
100
80
60
40
20
0
0
1000
2000
3000
4000
5000
6000
Pump 2
C=140
C=120
FLOW (GPM)

PROJECT:	*Mequon LS E*	SYSTEM CURVE FLOW POINTS						
PROJECT NO.:	*6398*							
PUMP SYS.:	*East FM Pump # 2*	HEAD LOSSES (ft)						
DESIGN FLOW:	*3000* gpm							
ENGINEER:	*Paul Traeger*	500	1000	1500	2000	2500	3000	3500
FILE:	**D:\G\Mequon\3.4 Process\[Pump # 2 Capacity - East FM.xlsx]Curves**							

Table 1
MINOR LOSSES

DIAM.			%	FLOW THRU FITTING (gpm)							VELOCITY (ft/sec)							HEAD LOSSES (ft)						
(in.)	ITEM	K	Q	q1	q2	q3	q4	q5	q6	q7	v1	v2	v3	v4	v5	v6	v7	hl1	hl2	hl3	hl4	hl5	hl6	hl7
12	Inlet	0.05	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.00	0.01	0.01	0.03	0.04	0.06	0.08
12	Gate	0.19	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.01	0.02	0.05	0.10	0.15	0.21	0.29
12	12x10 RDCR	0.18	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.01	0.02	0.05	0.09	0.14	0.20	0.28
10	Elb 90	0.25	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.02	0.06	0.15	0.26	0.41	0.58	0.80
8	8x12 Increaser	0.32	100	500	1000	1500	2000	2500	3000	3500	3.2	6.4	9.6	12.8	16.0	19.2	22.4	0.05	0.20	0.46	0.81	1.27	1.83	2.48
10	Elb 90	0.25	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.02	0.06	0.15	0.26	0.41	0.58	0.80
12	Check	2.00	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.06	0.25	0.56	1.00	1.57	2.25	3.07
12	Plug	1.08	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.03	0.14	0.30	0.54	0.85	1.22	1.66
12	Tee (branch)	0.52	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.02	0.07	0.15	0.26	0.41	0.59	0.80
12	12x14 Increase	0.12	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.00	0.02	0.03	0.06	0.09	0.14	0.18
14	Kife Gate	0.22	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.03	0.06	0.09	0.13	0.18
14	Tee (Flow)	0.08	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.01	0.02	0.03	0.05	0.07
14	Kife Gate	0.22	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.03	0.06	0.09	0.13	0.18
14	Tee (Flow)	0.08	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.01	0.02	0.03	0.05	0.07
16	14x16 Increase	0.12	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.06
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	2 - Elb 90	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	Gate	0.18	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.01	0.02	0.03	0.04	0.06	0.09
16	Tee (branch)	0.46	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.22
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 11	0.06	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.01	0.01	0.02	0.03
16	2 - Elb 90	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	4 - Elb 45	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	4 - Elb 45	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	4 - Elb 45	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	4 - Elb 45	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	4 - Elb 45	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Exit	1.00	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.01	0.04	0.09	0.16	0.25	0.36	0.49
															Total hl (ft) :			0.27	1.10	2.47	4.40	6.87	9.89	13.46
																		500	1000	1500	2000	2500	3000	3500

PUMP 2

Table 2
PIPE LOSSES

C1 = 120
C2 = 140

SEGMENT	DIAM	LENGTH	%	FLOW THRU PIPE (gpm)							VELOCITY (fps)							hf1		hf2		hf3		hf4		hf5		hf6		hf7	
NO.	(in.)	(ft.)	Q	q1	q2	q3	q4	q5	q6	q7	v1	v2	v3	v4	v5	v6	v7	120	140	120	140	120	140	120	140	120	140	120	140	120	140
1	12	5	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.00	0.00	0.01	0.01	0.03	0.02	0.05	0.04	0.08	0.06	0.11	0.08	0.15	0.11
2	8	5	100	500	1000	1500	2000	2500	3000	3500	3.2	6.4	9.6	12.8	16.0	19.2	22.4	0.03	0.02	0.11	0.08	0.23	0.17	0.38	0.29	0.58	0.44	0.81	0.61	1.08	0.81
3	12	4	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.00	0.00	0.01	0.01	0.03	0.02	0.04	0.03	0.06	0.05	0.09	0.07	0.12	0.09
4	14	5	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.00	0.01	0.01	0.01	0.01	0.03	0.02	0.04	0.03	0.05	0.04	0.07	0.05
5	15.35	13805	100	500	1000	1500	2000	2500	3000	3500	0.9	1.7	2.6	3.5	4.3	5.2	6.1	3.42	2.57	12.34	9.28	26.12	19.64	44.48	33.44	67.21	50.53	94.17	70.80	125.24	94.17
SUMMARY -- Total hf (ft) :																		3.46	2.60	12.48	9.38	26.42	19.86	44.98	33.82	67.97	51.11	95.2	71.6	126.7	95.2
HEAD LOSSES (ft)																		500		1000		1500		2000		2500		3000		3500	

PUMP 2

Table 3

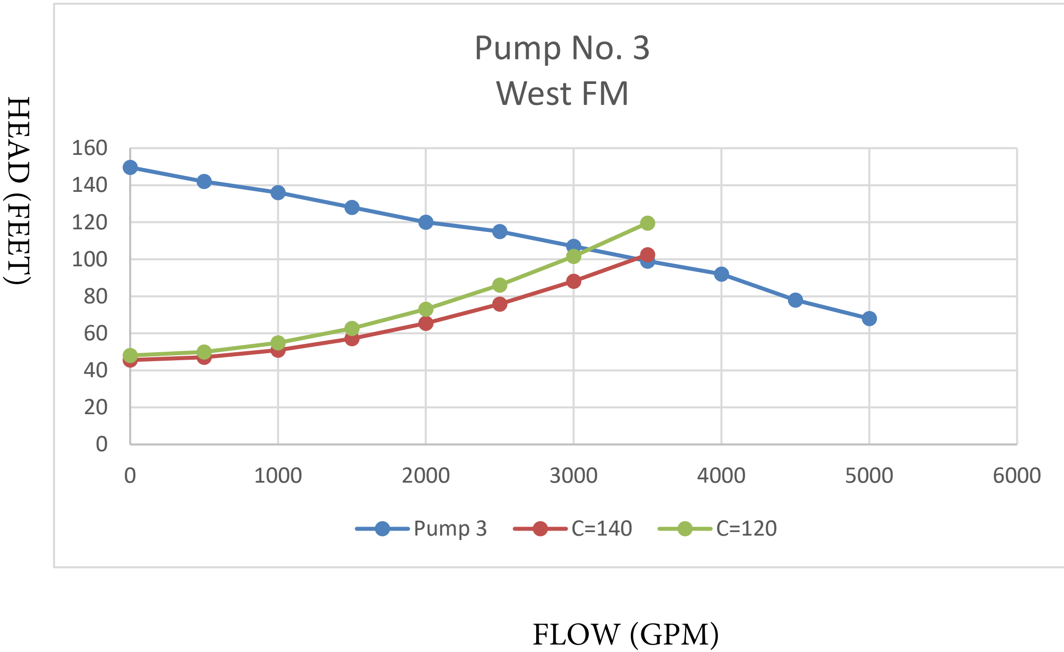
STATIC HEAD CONDITIONS

Suction EL		Discharge EL		Hs (ft)	
Min	Max	Min	Max	Min	Max
57.79	59.90	82.75	84.08	22.85	26.29

PUMP 2

Table 4
SYSTEM SUMMARY

	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Minor Losse (ft)	0.27	0.27	1.10	1.10	2.47	2.47	4.40	4.40	6.87	6.87	9.89	9.89	13.46	13.46
Pipe Losses (ft)	2.60	3.46	9.38	12.48	19.86	26.42	33.82	44.98	51.11	67.97	71.61	95.24	95.24	126.67
Static Head (ft)	22.85	26.29	22.85	26.29	22.85	26.29	22.85	26.29	22.85	26.29	22.85	26.29	22.85	26.29
TDH (ft)	25.73	30.03	33.33	39.87	45.19	55.18	61.07	75.67	80.82	101.13	104.35	131.42	131.55	166.42
SYSTEM FLOW (gpm)	500		1000		1500		2000		2500		3000		3500	


Pump No. 3
West FM
HEAD (FEET)
160
140
120
100
80
60
40
20
0
0
1000
2000
3000
4000
5000
6000
Pump 3
C=140
C=120
FLOW (GPM)

PROJECT:	*Mequon LS E*	SYSTEM CURVE FLOW POINTS	
PROJECT NO.:	*6398*		
PUMP SYS.:	*West FM Pump # 3*	HEAD LOSSES (ft)	
DESIGN FLOW:	*3400* gpm		
ENGINEER:	*Paul Traeger*	500 1000 1500 2000 2500 3000 3500	
FILE:	D:\G\Mequon\3.4 Process\[Pump # 3 Capacity - West FM.xlsx]Curves		

Table 1

MINOR LOSSES

DIAM.			%	FLOW THRU FITTING (gpm)							VELOCITY (ft/sec)							HEAD LOSSES (ft)						
(in.)	ITEM	K	Q	q1	q2	q3	q4	q5	q6	q7	v1	v2	v3	v4	v5	v6	v7	hl1	hl2	hl3	hl4	hl5	hl6	hl7
14	Inlet	0.05	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.00	0.01	0.01	0.02	0.03	0.04
14	Plug	1.13	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.02	0.08	0.17	0.31	0.48	0.69	0.94
14	14x10 RDCR	0.24	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.02	0.04	0.06	0.10	0.15	0.20
10	Elb 90	0.25	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.02	0.06	0.15	0.26	0.41	0.58	0.80
8	8x12 Increaser	0.32	100	500	1000	1500	2000	2500	3000	3500	3.2	6.4	9.6	12.8	16.0	19.2	22.4	0.05	0.20	0.46	0.81	1.27	1.83	2.48
10	Elb 90	0.25	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.02	0.06	0.15	0.26	0.41	0.58	0.80
12	Check	2.00	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.06	0.25	0.56	1.00	1.57	2.25	3.07
12	Plug	1.08	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.03	0.14	0.30	0.54	0.85	1.22	1.66
12	Tee (branch)	0.52	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.02	0.07	0.15	0.26	0.41	0.59	0.80
12	12x14 Increase	0.12	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.00	0.02	0.03	0.06	0.09	0.14	0.18
14	Knife Gate	0.22	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.03	0.06	0.09	0.13	0.18
14	Tee (flow line)	0.08	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.01	0.02	0.03	0.05	0.07
14	Knife Gate	0.22	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.03	0.06	0.09	0.13	0.18
14	Tee (flow line)	0.08	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.01	0.02	0.03	0.05	0.07
14	Kife Gate	0.22	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.03	0.06	0.09	0.13	0.18
14	Tee (Flow)	0.08	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.01	0.02	0.03	0.05	0.07
14	14x16 Increase	0.12	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.01	0.02	0.03	0.05	0.07	0.10
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 11	0.06	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.01	0.01	0.02	0.03
16	Tee (branch)	0.46	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.22
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 11	0.06	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.01	0.01	0.02	0.03
16	Elb 90	0.22	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.01	0.02	0.03	0.05	0.08	0.11
16	Elb 90	0.22	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.01	0.02	0.03	0.05	0.08	0.11
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 45	0.11																						
16	Exit	1.00																						
																	Total hl (ft) :	0.26	1.03	2.31	4.10	6.41	9.23	12.56
																		500	1000	1500	2000	2500	3000	3500

PUMP 3

Table 2
PIPE LOSSES

C1 = 120
C2 = 140

SEGMENT NO.	DIAM (in.)	LENGTH (ft.)	% Q	FLOW THRU PIPE (gpm) q1	q2	q3	q4	q5	q6	q7	VELOCITY (fps) v1	v2	v3	v4	v5	v6	v7	hf1 120	140	hf2 120	140	hf3 120	140	hf4 120	140	hf5 120	140	hf6 120	140	hf7 120	140
1	10	5	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.01	0.01	0.04	0.03	0.08	0.06	0.13	0.10	0.20	0.15	0.27	0.21	0.36	0.27
2	8	5	100	500	1000	1500	2000	2500	3000	3500	3.2	6.4	9.6	12.8	16.0	19.2	22.4	0.03	0.02	0.11	0.08	0.23	0.17	0.38	0.29	0.58	0.44	0.81	0.61	1.08	0.81
3	10	4	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.01	0.01	0.03	0.02	0.06	0.05	0.10	0.08	0.16	0.12	0.22	0.17	0.29	0.22
4	14	5	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.00	0.01	0.01	0.01	0.01	0.03	0.02	0.04	0.03	0.05	0.04	0.07	0.05
5	15.35	6297	100	500	1000	1500	2000	2500	3000	3500	0.9	1.7	2.6	3.5	4.3	5.2	6.1	1.56	1.17	5.63	4.23	11.92	8.96	20.29	15.25	30.66	23.05	42.95	32.30	57.13	42.95
SUMMARY -- Total hf (ft) :																		1.61	1.21	5.81	4.37	12.29	9.24	20.93	15.74	31.63	23.78	44.3	33.3	58.9	44.3
HEAD LOSSES (ft)																		500		1000		1500		2000		2500		3000		3500	

PUMP 3

Table 3

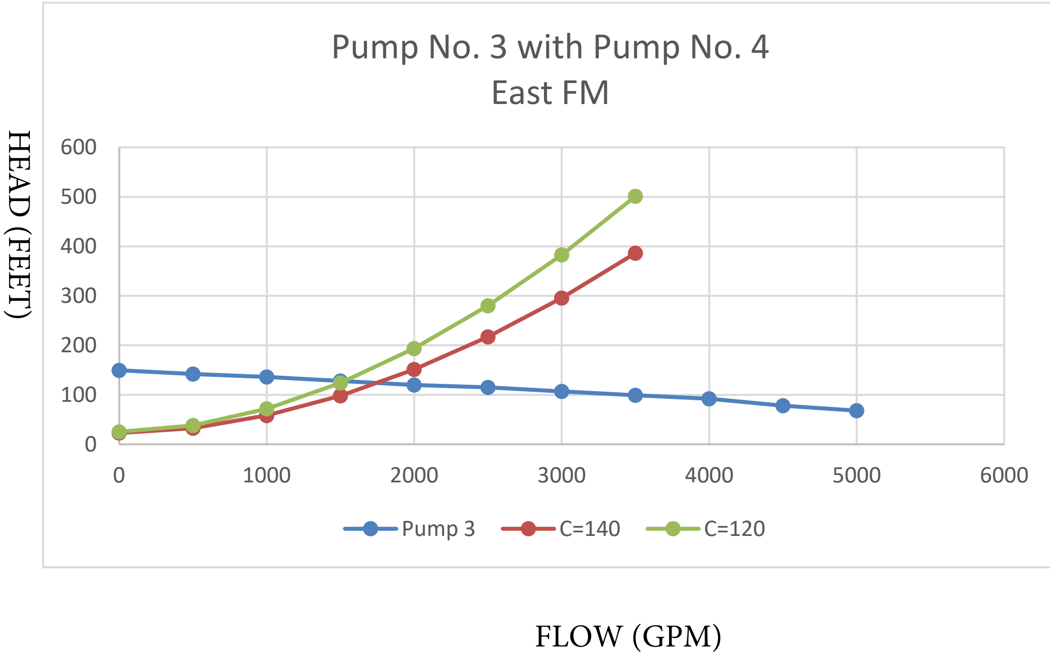
STATIC HEAD CONDITIONS

Suction EL		Discharge EL		Hs (ft)	
Min	Max	Min	Max	Min	Max
58.75	59.90	105.48	106.81	45.58	48.06333

PUMP 3

Table 4
SYSTEM SUMMARY

		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Minor Losse	(ft)	0.26	0.26	1.03	1.03	2.31	2.31	4.10	4.10	6.41	6.41	9.23	9.23	12.56	12.56
Pipe Losses	(ft)	1.21	1.61	4.37	5.81	9.24	12.29	15.74	20.93	23.78	31.63	33.32	44.31	44.31	58.94
Static Head	(ft)	45.58	48.06	45.58	48.06	45.58	48.06	45.58	48.06	45.58	48.06	45.58	48.06	45.58	48.06
TDH	(ft)	47.05	49.93	50.97	54.89	57.13	62.66	65.42	73.10	75.77	86.10	88.13	101.61	102.46	119.56
SYSTEM FLOW	(gpm)	500		1000		1500		2000		2500		3000		3500	



Pump No. 3 with Pump No. 4
East FM
HEAD (FEET)
600
500
400
300
200
100
0
0
1000
2000
3000
4000
5000
6000
Pump 3
C=140
C=120
FLOW (GPM)

PROJECT:	*Mequon LS E*	SYSTEM CURVE FLOW POINTS
PROJECT NO.:	*6398*	
PUMP SYS.:	*East FM Pump # 3 w/ #4*	HEAD LOSSES (ft)
DESIGN FLOW:	*3400* gpm	
ENGINEER:	*Paul Traeger*	500 1000 1500 2000 2500 3000 3500
FILE:	**D:\G\Mequon\3.4 Process\[Pump # 3 Capacity - East FM with Pump #4.xlsx]Curves**	

Table 1

MINOR LOSSES

DIAM.			%	FLOW THRU FITTING (gpm)							VELOCITY (ft/sec)							HEAD LOSSES (ft)						
(in.)	ITEM	K	Q	q1	q2	q3	q4	q5	q6	q7	v1	v2	v3	v4	v5	v6	v7	hl1	hl2	hl3	hl4	hl5	hl6	hl7
14	Inlet	0.05	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.00	0.01	0.01	0.02	0.03	0.04
14	Plug	1.13	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.02	0.08	0.17	0.31	0.48	0.69	0.94
14	14x10 RDCR	0.24	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.02	0.04	0.06	0.10	0.15	0.20
10	Elb 90	0.25	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.02	0.06	0.15	0.26	0.41	0.58	0.80
8	8x12 Increaser	0.32	100	500	1000	1500	2000	2500	3000	3500	3.2	6.4	9.6	12.8	16.0	19.2	22.4	0.05	0.20	0.46	0.81	1.27	1.83	2.48
10	Elb 90	0.25	100	500	1000	1500	2000	2500	3000	3500	2.0	4.1	6.1	8.2	10.2	12.3	14.3	0.02	0.06	0.15	0.26	0.41	0.58	0.80
12	Check	2.00	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.06	0.25	0.56	1.00	1.57	2.25	3.07
12	Plug	1.08	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.03	0.14	0.30	0.54	0.85	1.22	1.66
12	Tee (branch)	0.52	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.02	0.07	0.15	0.26	0.41	0.59	0.80
12	12x14 Increase	0.12	200	1000	2000	3000	4000	5000	6000	7000	2.8	5.7	8.5	11.4	14.2	17.0	19.9	0.02	0.06	0.14	0.24	0.38	0.54	0.74
14	Knife Gate	0.22	200	1000	2000	3000	4000	5000	6000	7000	2.1	4.2	6.3	8.3	10.4	12.5	14.6	0.01	0.06	0.13	0.24	0.37	0.54	0.73
14	Tee (flow line)	0.08	200	1000	2000	3000	4000	5000	6000	7000	2.1	4.2	6.3	8.3	10.4	12.5	14.6	0.01	0.02	0.05	0.09	0.14	0.19	0.26
14	14x16 Increase	0.12	200	1000	2000	3000	4000	5000	6000	7000	2.1	4.2	6.3	8.3	10.4	12.5	14.6	0.01	0.03	0.07	0.13	0.20	0.29	0.40
16	Elb 45	0.11	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	2 - Elb 90	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	Gate	0.18	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.01	0.03	0.06	0.11	0.18	0.26	0.35
16	Tee (branch)	0.46	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.29	0.46	0.66	0.89
16	Elb 45	0.11	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	Elb 11	0.06	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.00	0.01	0.02	0.04	0.06	0.09	0.12
16	2 - Elb 90	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	4 - Elb 45	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	4 - Elb 45	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	4 - Elb 45	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	4 - Elb 45	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	4 - Elb 45	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	Elb 45	0.11	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	Exit	1.00	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.04	0.16	0.36	0.63	0.99	1.43	1.94
																	Total hl (ft) :	0.47	1.86	4.19	7.45	11.64	16.77	22.82
																		500	1000	1500	2000	2500	3000	3500

3 WITH 4

Table 2

PIPE LOSSES

C1 = 120

C2 = 140

SEGMENT NO.	DIAM (in.)	LENGTH (ft.)	% Q	FLOW THRU PIPE (gpm) q1	q2	q3	q4	q5	q6	q7	VELOCITY (fps) v1	v2	v3	v4	v5	v6	v7
1	14	5	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3
2	8	5	100	500	1000	1500	2000	2500	3000	3500	3.2	6.4	9.6	12.8	16.0	19.2	22.4
3	12	4	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9
4	14	5	200	1000	2000	3000	4000	5000	6000	7000	2.1	4.2	6.3	8.3	10.4	12.5	14.6
5	15.35	13805	200	1000	2000	3000	4000	5000	6000	7000	1.7	3.5	5.2	6.9	8.7	10.4	12.1

SEGMENT NO.	hf1 120	hf1 140	hf2 120	hf2 140	hf3 120	hf3 140	hf4 120	hf4 140	hf5 120	hf5 140	hf6 120	hf6 140	hf7 120	hf7 140
1	0.00	0.00	0.01	0.01	0.01	0.01	0.03	0.02	0.04	0.03	0.05	0.04	0.07	0.05
2	0.03	0.02	0.11	0.08	0.23	0.17	0.38	0.29	0.58	0.44	0.81	0.61	1.08	0.81
3	0.00	0.00	0.01	0.01	0.03	0.02	0.04	0.03	0.06	0.05	0.09	0.07	0.12	0.09
4	0.01	0.01	0.03	0.02	0.05	0.04	0.09	0.07	0.14	0.10	0.19	0.14	0.26	0.19
5	12.34	9.28	44.48	33.44	94.17	70.80	#####	#####	242.28	#####	339.48	255.25	451.50	339.48
SUMMARY -- Total hf (ft) :	12.38	9.31	44.63	33.55	94.49	71.04	#####	#####	243.10	#####	340.6	256.1	453.0	340.6
HEAD LOSSES (ft)	500		1000		1500		2000		2500		3000		3500	

3 WITH 4

Table 3

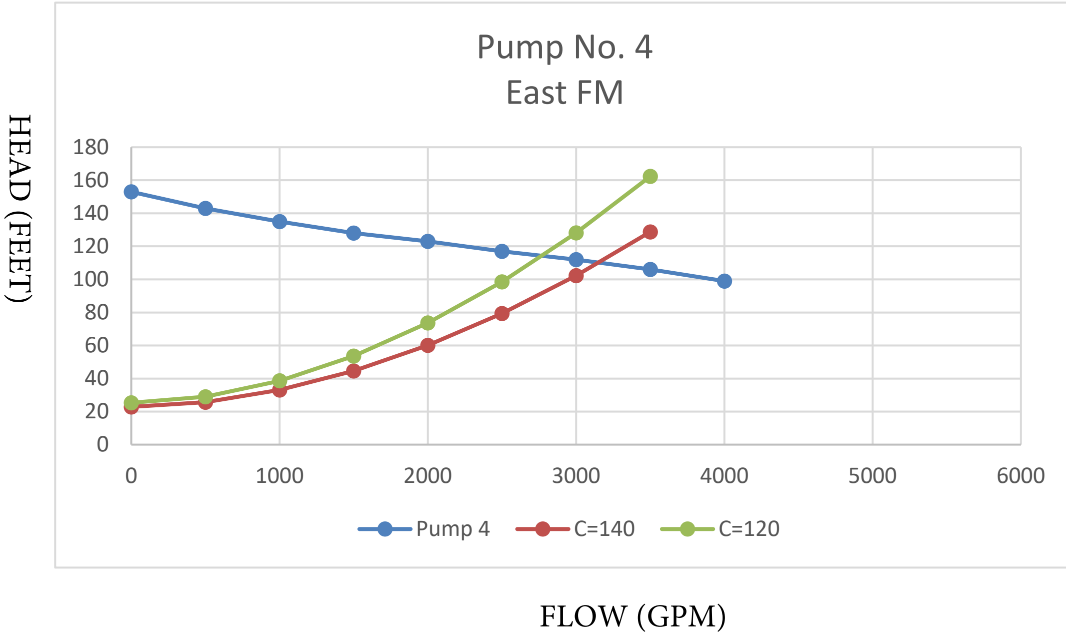
STATIC HEAD CONDITIONS

Suction EL		Discharge EL		Hs (ft)	
Min	Max	Min	Max	Min	Max
58.75	59.90	82.75	84.08	22.85	25.33

3 WITH 4

Table 4
SYSTEM SUMMARY

	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Minor Losse (ft)	0.47	0.47	1.86	1.86	4.19	4.19	7.45	7.45	11.64	11.64	16.77	16.77	22.82	22.82
Pipe Losses (ft)	9.31	12.38	33.55	44.63	71.04	94.49	120.96	160.88	182.78	243.10	256.11	340.63	340.63	453.03
Static Head (ft)	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33
TDH (ft)	32.62	38.18	58.27	71.82	98.08	124.01	151.27	193.66	217.28	280.08	295.72	382.72	386.29	501.18
SYSTEM FLOW (gpm)	500		1000		1500		2000		2500		3000		3500	



Pump No. 4
East FM
HEAD (FEET)
180
160
140
120
100
80
60
40
20
0
0
1000
2000
3000
4000
5000
6000
Pump 4
C=140
C=120
FLOW (GPM)

PROJECT:	*Mequon LS E*	SYSTEM CURVE FLOW POINTS						
PROJECT NO.:	*6398*							
PUMP SYS.:	*East FM Pump # 4*	HEAD LOSSES (ft)						
DESIGN FLOW:	*3400* gpm							
ENGINEER:	*Paul Traeger*	500	1000	1500	2000	2500	3000	3500
FILE:	***D:\G\Mequon\3.4 Process\[Pump # 4 Capacity - East FM.xlsx]Curves***							

Table 1
MINOR LOSSES

DIAM. (in.)	ITEM	K	% Q	FLOW THRU FITTING (gpm) q1	q2	q3	q4	q5	q6	q7	VELOCITY (ft/sec) v1	v2	v3	v4	v5	v6	v7	HEAD LOSSES (ft) hl1	hl2	hl3	hl4	hl5	hl6	hl7
16	Inlet	0.05	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.00	0.01	0.01	0.02	0.02
16	Plug	1.09	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.01	0.04	0.10	0.17	0.27	0.39	0.53
16	16x12 RDCR	0.22	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.01	0.02	0.03	0.05	0.08	0.11
12	Elb 90	0.24	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.01	0.03	0.07	0.12	0.19	0.27	0.37
8	8x12 Increaser	0.32	100	500	1000	1500	2000	2500	3000	3500	3.2	6.4	9.6	12.8	16.0	19.2	22.4	0.05	0.20	0.46	0.81	1.27	1.83	2.48
12	Elb 90	0.25	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.01	0.03	0.07	0.13	0.20	0.28	0.38
12	Check	2.00	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.06	0.25	0.56	1.00	1.57	2.25	3.07
12	Plug	1.08	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.03	0.14	0.30	0.54	0.85	1.22	1.66
14	Tee (branch)	0.52	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.01	0.04	0.08	0.14	0.22	0.32	0.43
16	12x14 Increase	0.12	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.06
16	14x16 Increase	0.12	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.06
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	2 - Elb 90	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	Gate	0.18	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.01	0.02	0.03	0.04	0.06	0.09
16	Tee (branch)	0.46	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.22
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Elb 11	0.06	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.01	0.01	0.02	0.03
16	2 - Elb 90	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	4 - Elb 45	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	4 - Elb 45	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	4 - Elb 45	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	4 - Elb 45	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	4 - Elb 45	0.44	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	Elb 45	0.11	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.01	0.02	0.03	0.04	0.05
16	Exit	1.00	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.01	0.04	0.09	0.16	0.25	0.36	0.49
																	Total hl (ft) :	0.24	0.95	2.14	3.80	5.94	8.56	11.65
																		500	1000	1500	2000	2500	3000	3500

PUMP 4

Table 2
PIPE LOSSES

C1 = 120
C2 = 140

SEGMENT NO.	DIAM (in.)	LENGTH (ft.)	% Q	FLOW THRU PIPE (gpm) q1	q2	q3	q4	q5	q6	q7	VELOCITY (fps) v1	v2	v3	v4	v5	v6	v7	hf1 120	hf1 140	hf2 120	hf2 140	hf3 120	hf3 140	hf4 120	hf4 140	hf5 120	hf5 140	hf6 120	hf6 140	hf7 120	hf7 140
1	20	20	100	500	1000	1500	2000	2500	3000	3500	0.5	1.0	1.5	2.0	2.6	3.1	3.6	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.03	0.02	0.04	0.03	0.05	0.04
1	24	20	100	500	1000	1500	2000	2500	3000	3500	0.4	0.7	1.1	1.4	1.8	2.1	2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02
1	16	5	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.03	0.02	0.04	0.03
1	15.35	13805	100	500	1000	1500	2000	2500	3000	3500	0.9	1.7	2.6	3.5	4.3	5.2	6.1	3.42	2.57	12.34	9.28	26.12	19.64	44.48	33.44	67.21	50.53	94.17	70.80	125.24	94.17
SUMMARY -- Total hf (ft) :																		3.43	2.58	12.35	9.28	26.14	19.66	44.52	33.47	67.27	50.58	94.2	70.9	125.4	94.2
HEAD LOSSES (ft)																		500		1000		1500		2000		2500		3000		3500	

PUMP 4

Table 3

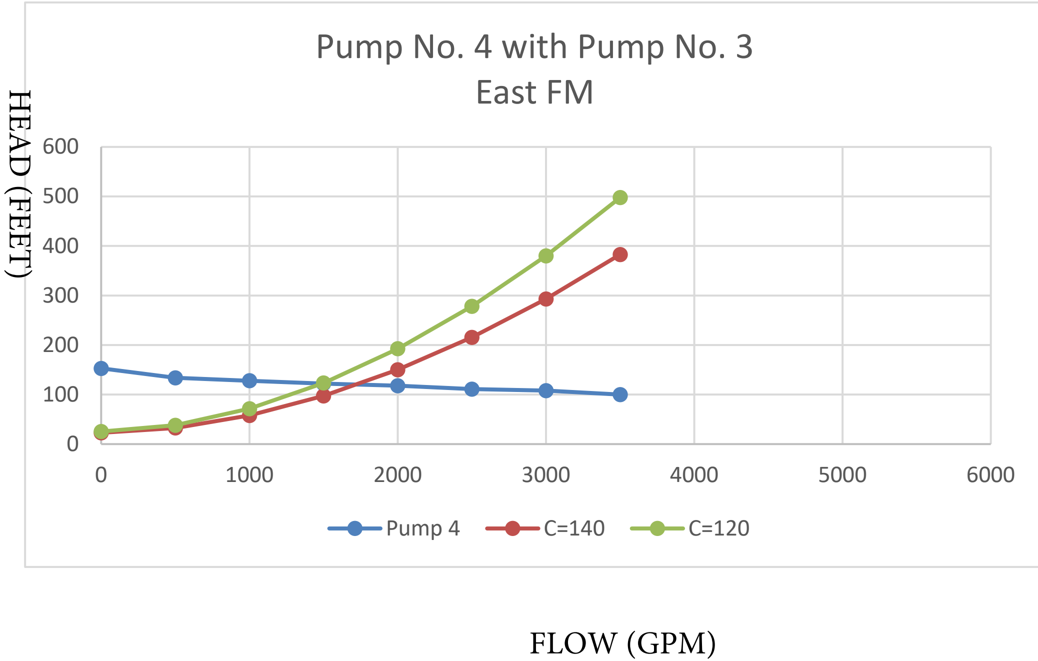
STATIC HEAD CONDITIONS

Suction EL		Discharge EL		Hs (ft)	
Min	Max	Min	Max	Min	Max
58.75	59.90	82.75	84.08	22.85	25.33333

PUMP 4

Table 4
SYSTEM SUMMARY

	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Minor Losse (ft)	0.24	0.24	0.95	0.95	2.14	2.14	3.80	3.80	5.94	5.94	8.56	8.56	11.65	11.65
Pipe Losses (ft)	2.58	3.43	9.28	12.35	19.66	26.14	33.47	44.52	50.58	67.27	70.86	94.25	94.25	125.35
Static Head (ft)	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33
TDH (ft)	25.66	29.00	33.09	38.63	44.65	53.62	60.12	73.65	79.37	98.54	102.27	128.14	128.75	162.33
SYSTEM FLOW (gpm)	500		1000		1500		2000		2500		3000		3500	


Pump No. 4 with Pump No. 3
East FM
HEAD (FEET)
600
500
400
300
200
100
0
0
1000
2000
3000
4000
5000
6000
Pump 4
C=140
C=120
FLOW (GPM)

PROJECT:	*Mequon LS E*	SYSTEM CURVE FLOW POINTS	
PROJECT NO.:	*6398*		
PUMP SYS.:	*East FM Pump # 4 w/ #3*	HEAD LOSSES (ft)	
DESIGN FLOW:	*3400* gpm		
ENGINEER:	*Paul Traeger*	500 1000 1500 2000 2500 3000 3500	
FILE:	D:\G\Mequon\3.4 Process\[Pump # 4 Capacity - East FM with #3.xlsx]Curves		

Table 1

MINOR LOSSES

DIAM.			%	FLOW THRU FITTING (gpm)							VELOCITY (ft/sec)							HEAD LOSSES (ft)						
(in.)	ITEM	K	Q	q1	q2	q3	q4	q5	q6	q7	v1	v2	v3	v4	v5	v6	v7	hl1	hl2	hl3	hl4	hl5	hl6	hl7
16	Inlet	0.05	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.00	0.00	0.01	0.01	0.02	0.02
16	Plug	1.09	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.01	0.04	0.10	0.17	0.27	0.39	0.53
16	16x12 RDCR	0.22	100	500	1000	1500	2000	2500	3000	3500	0.8	1.6	2.4	3.2	4.0	4.8	5.6	0.00	0.01	0.02	0.03	0.05	0.08	0.11
12	Elb 90	0.24	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.01	0.03	0.07	0.12	0.19	0.27	0.37
8	8x12 Increaser	0.32	100	500	1000	1500	2000	2500	3000	3500	3.2	6.4	9.6	12.8	16.0	19.2	22.4	0.05	0.20	0.46	0.81	1.27	1.83	2.48
12	Elb 90	0.25	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.01	0.03	0.07	0.13	0.20	0.28	0.38
12	Check	2.00	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.06	0.25	0.56	1.00	1.57	2.25	3.07
12	Plug	1.08	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.03	0.14	0.30	0.54	0.85	1.22	1.66
14	Tee (branch)	0.52	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.01	0.04	0.08	0.14	0.22	0.32	0.43
12	12x14 Increase	0.12	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.00	0.02	0.03	0.06	0.09	0.14	0.18
16	14x16 Increase	0.12	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.00	0.02	0.04	0.08	0.12	0.17	0.23
16	Elb 45	0.11	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	2 - Elb 90	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	Gate	0.18	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.01	0.03	0.06	0.11	0.18	0.26	0.35
16	Tee (branch)	0.46	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.29	0.46	0.66	0.89
16	Elb 45	0.11	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	Elb 11	0.06	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.00	0.01	0.02	0.04	0.06	0.09	0.12
16	2 - Elb 90	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	4 - Elb 45	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	4 - Elb 45	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	4 - Elb 45	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	4 - Elb 45	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	4 - Elb 45	0.44	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.02	0.07	0.16	0.28	0.44	0.63	0.85
16	Elb 45	0.11	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.00	0.02	0.04	0.07	0.11	0.16	0.21
16	Exit	1.00	200	1000	2000	3000	4000	5000	6000	7000	1.6	3.2	4.8	6.4	8.0	9.6	11.2	0.04	0.16	0.36	0.63	0.99	1.43	1.94
															Total hl (ft) :			0.40	1.58	3.56	6.33	9.89	14.24	19.39
																		500	1000	1500	2000	2500	3000	3500

4 WITH 3

Table 2

PIPE LOSSES

C1 = 120

C2 = 140

SEGMENT	DIAM	LENGTH	%	FLOW THRU PIPE (gpm)							VELOCITY (fps)							hf1		hf2		hf3		hf4		hf5		hf6		hf7	
NO.	(in.)	(ft.)	Q	q1	q2	q3	q4	q5	q6	q7	v1	v2	v3	v4	v5	v6	v7	120	140	120	140	120	140	120	140	120	140	120	140	120	140
1	14	5	100	500	1000	1500	2000	2500	3000	3500	1.0	2.1	3.1	4.2	5.2	6.3	7.3	0.00	0.00	0.01	0.01	0.01	0.01	0.03	0.02	0.04	0.03	0.05	0.04	0.07	0.05
2	8	5	100	500	1000	1500	2000	2500	3000	3500	3.2	6.4	9.6	12.8	16.0	19.2	22.4	0.03	0.02	0.11	0.08	0.23	0.17	0.38	0.29	0.58	0.44	0.81	0.61	1.08	0.81
3	12	4	100	500	1000	1500	2000	2500	3000	3500	1.4	2.8	4.3	5.7	7.1	8.5	9.9	0.00	0.00	0.01	0.01	0.03	0.02	0.04	0.03	0.06	0.05	0.09	0.07	0.12	0.09
4	14	5	200	1000	2000	3000	4000	5000	6000	7000	2.1	4.2	6.3	8.3	10.4	12.5	14.6	0.01	0.01	0.03	0.02	0.05	0.04	0.09	0.07	0.14	0.10	0.19	0.14	0.26	0.19
5	15.35	13805	200	1000	2000	3000	4000	5000	6000	7000	1.7	3.5	5.2	6.9	8.7	10.4	12.1	12.34	9.28	44.48	33.44	94.17	70.80	#####	#####	242.28	#####	339.48	255.25	451.50	339.48
SUMMARY -- Total hf (ft) :																		12.38	9.31	44.63	33.55	94.49	71.04	#####	#####	243.10	#####	340.6	256.1	453.0	340.6
HEAD LOSSES (ft)																		500		1000		1500		2000		2500		3000		3500	

4 WITH 3

Table 3

STATIC HEAD CONDITIONS

Suction EL		Discharge EL		Hs (ft)	
Min	Max	Min	Max	Min	Max
58.75	59.90	82.75	84.08	22.85	25.33

4 WITH 3

Table 4
SYSTEM SUMMARY

	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Minor Losse (ft)	0.40	0.40	1.58	1.58	3.56	3.56	6.33	6.33	9.89	9.89	14.24	14.24	19.39	19.39
Pipe Losses (ft)	9.31	12.38	33.55	44.63	71.04	94.49	120.96	160.88	182.78	243.10	256.11	340.63	340.63	453.03
Static Head (ft)	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33	22.85	25.33
TDH (ft)	32.55	38.11	57.99	71.54	97.45	123.38	150.14	192.54	215.53	278.33	293.20	380.20	382.86	497.75
SYSTEM FLOW (gpm)	500		1000		1500		2000		2500		3000		3500	

Customer : Pump 1 @ 900 rpm
Project name : New Project

Pump Performance Datasheet

Encompass 2.0 - 19.5.6 20.0.4

Item number	: 005	Size	: 610 - 6x8x18
Service	:	Stages	: 1
Quantity	: 1	Based on curve number	: 16-6x8x18-875
Quote number	: 1031591	Date last saved	: 18 Mar 2020 8:28 AM

Operating Conditions

Flow, rated	: 1,400.0 USgpm
Differential head / pressure, rated (requested)	: 60.00 ft
Differential head / pressure, rated (actual)	: 60.23 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Frequency	: 60 Hz

Performance

Speed, rated	: 875 rpm
Impeller diameter, rated	: 16.81 in
Impeller diameter, maximum	: 18.00 in
Impeller diameter, minimum	: 15.00 in
Efficiency	: 75.73 %
NPSH required / margin required	: 10.65 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 30 / 110 Metric units
Minimum Continuous Stable Flow	: 519.9 USgpm
Head, maximum, rated diameter	: 82.92 ft
Head rise to shutoff	: 37.67 %
Flow, best eff. point	: 1,631.8 USgpm
Flow ratio, rated / BEP	: 85.80 %
Diameter ratio (rated / max)	: 93.40 %
Head ratio (rated dia / max dia)	: 78.46 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 3.75 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

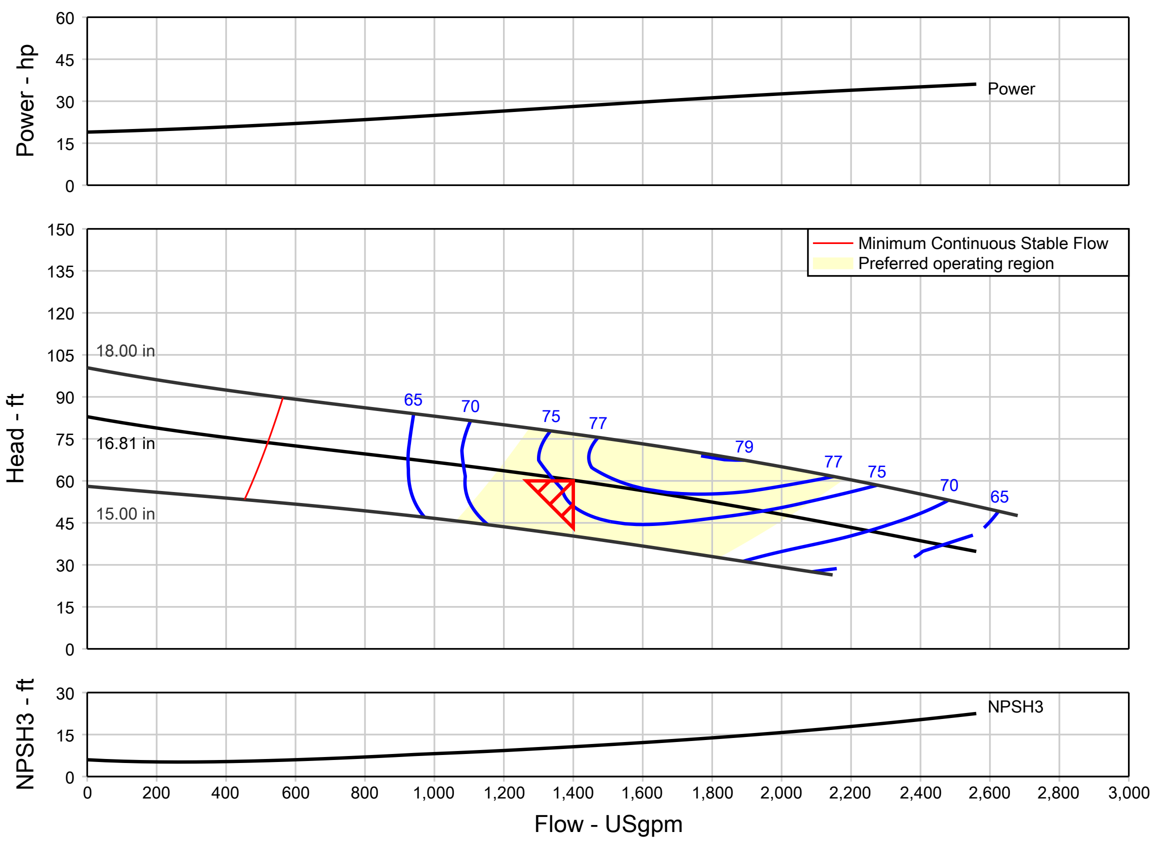
Material selected	: Standard

Pressure Data

Maximum working pressure	: 35.89 psi.g
Maximum allowable working pressure	: 100.0 psi.g
Maximum allowable suction pressure	: 100.0 psi.g
Hydrostatic test pressure	: N/A

Driver & Power Data (@Max density)

Driver sizing specification	: Max Power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 21.29 hp
Power, rated	: 28.11 hp
Power, maximum, rated diameter	: 36.09 hp
Minimum recommended motor rating	: 40.00 hp / 29.83 kW

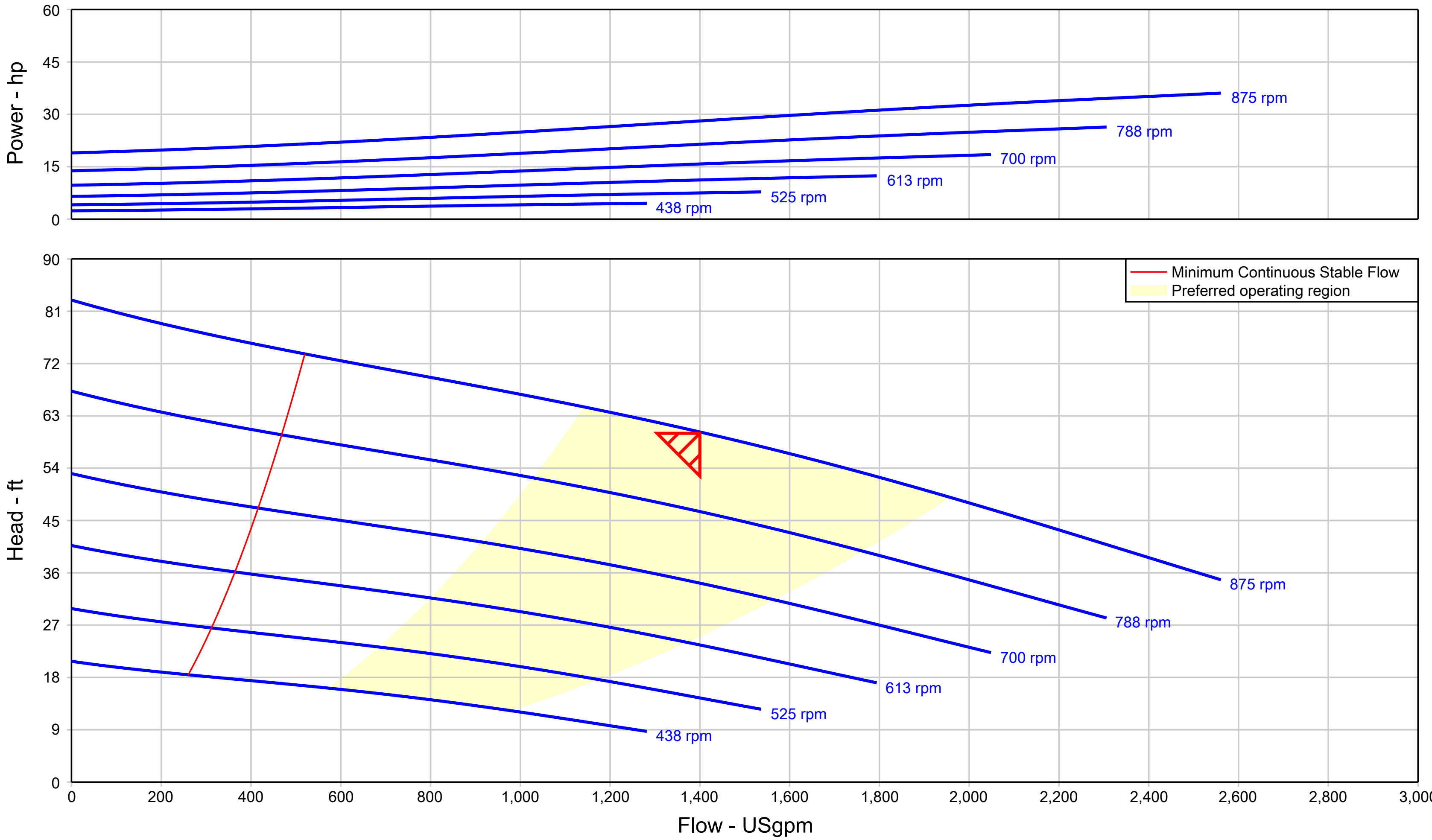


ASC PUMPING EQUIPMENT, INC - RICHFIELD WI
· WEST BEND, WI
PHONE: · FAX:

Customer :
Project name : New Project

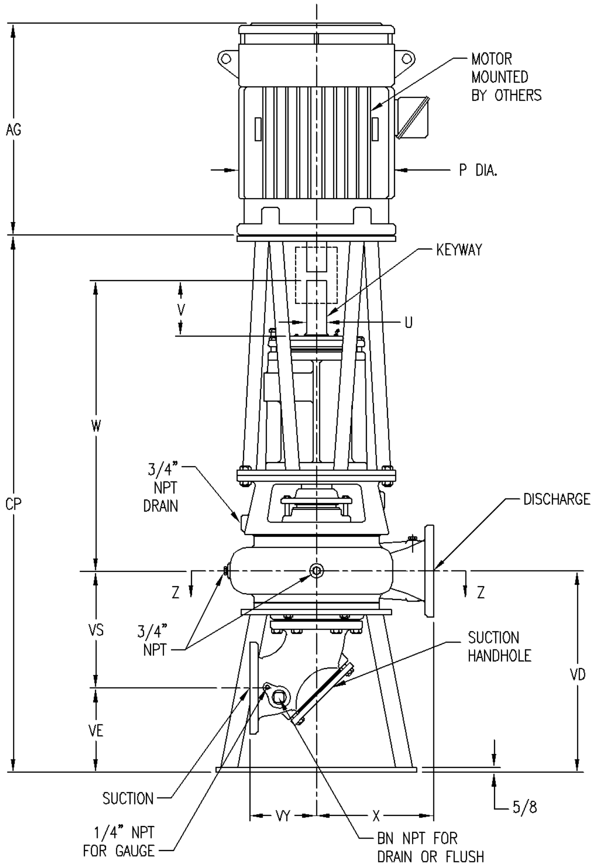
Multi-Speed Performance Curve

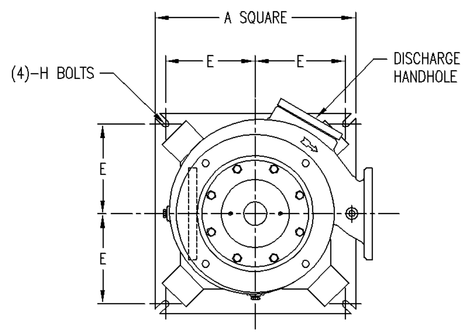
Encompass 2.0 - 19.5.6 20.0.4



Item number	: 005	Size	: 610 - 6x8x18	Flow, rated	: 1,400.0 USgpm
Service	:	Stages	: 1	Differential head / pressure, rated	: 60.00 ft
Quantity	: 1	Efficiency	: 75.73 %	Speed, rated	: 875 rpm
Quote number	: 1031591	Power, rated	: 28.11 hp	Impeller diameter, rated	: 16.81 in
Based on curve number	: 16-6x8x18-875	NPSH required	: 10.65 ft	Fluid density, rated / max	: 1.000 / 1.000 SG
		Frequency	: 60 Hz	Viscosity	: 1.00 cP
Date last saved	: 18 Mar 2020 8:28 AM	Nominal speed	: 875 rpm	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00

General Arrangement Drawing





VIEW Z-Z

A	BN	E	H	VY	W	X	CP	VD	VE	VS	P	AG	U	V	Key (LG)
-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00

Key (WD)	Key (DP)	Handhole Suction
-1.00	-1.00	-1.00

NOTES:
All dimensions are in inches.
Dimensions shown may vary ± 0.5" (13mm) due to normal manufacturing tolerances.
Not for construction, installation, or application purposes unless certified.
Two 0.5" (13mm) NPT connections 180 degrees apart on the stuffing box for lubrication purposes are furnished as standard.
Alemite fitting is provided in one tap and the remaining tap is plugged.
Conduit box is shown in approximate location. Dimensions are not specified as they may vary with each motor manufacturer.
AG and P dimensions of motor will vary based on make and style of motor. Dimensions shown reflect Aurora standard motors.
See individual motor supplier dimensional data sheets for your application.

Pump Data			
Series	610	Liquid Type	Water
Model	613A	Discharge Size	6.00 in
Size	6x8x18	Suction Size	8.00 in
Flow	1400	Case Bore	18.00 in
Head	60	Temperature Rating	20
RPM	875 RPM	Connection Suc/Disch	Flange 125#/125#
Rotation	Right	Baseplate	Not Required
Pump Paint	Standard blue	Coupling	Coupling

Motor Data			
Power	0.00 hp	Frame	-
Phase	0	Efficiency (%)	0
Frequency	60 Hz	Efficiency Rating	-
Volts	-	Enclosure	-
RPM	0	Manufacturer	-

Pump Material Data			
Pump Material	Standard Fitted	PowerFrame	Cast Iron ASTM A48
Casing	Cast Iron ASTM A48	Bearing Covers	Cast Iron ASTM A48
Impeller	Cast Iron ASTM A48	Seal Type	Packing
Shaft	Steel SAE 1045	Seal Material	Graphite Impregnated
Sleeve	SS. ASTM A276	Lantern Ring	Glass Filled Teflon
Glands	AL, ASTM A356-T6		

Estimated Weights	
Pump	1,630.0 lb
Coupling	0.00 lb
Driver	0.00 lb
Total	1,630.0 lb

Additional Options

-
-
-
-
-
-
-
-
-
-

Certification Correct	
Customer	
Customer Quote #	1031591
Job Name	New Project
Market	-

PENTAIR

Quote Item #	005
Quote Date	19 Feb 2020

PENTAIR

Customer : Pump 1 @ 1200 rpm
Project name : New Project

Pump Performance Datasheet

Encompass 2.0 - 20.1.3

Item number	: 005	Size	: 610 - 6x8x18
Service	:	Stages	: 1
Quantity	: 1	Based on curve number	: 16-6x8x18-1150
Quote number	: 1031591	Date last saved	: 02 Jun 2020 7:31 AM

Operating Conditions

Flow, rated	: 2,348.8 USgpm
Head, rated (requested)	: 90.95 ft
Head, rated (actual)	: 90.95 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available	: Ample
Frequency	: 60 Hz

Performance

Speed	: 1150 rpm
Impeller dia.	: 16.81 in
Impeller diameter, maximum	: 18.00 in
Impeller diameter, minimum	: 15.00 in
Efficiency	: 77.74 %
NPSH required / margin required	: 19.87 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 30 / 123 Metric units
Minimum Continuous Stable Flow	: 668.0 USgpm
Head max.	: 139.5 ft
Head rise to shutoff	: 53.39 %
Flow, best eff. point	: 2,185.8 USgpm
Flow ratio, rated / BEP	: 107.46 %
Diameter ratio (rated / max)	: 93.40 %
Head ratio (rated dia / max dia)	: 77.56 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids size limit	: 3.75 in
Solids concentration, by volume	: 0.00 %
Temperature	: 68.00 deg F
Fluid density	: 1.000 / 1.000 SG
Viscosity	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

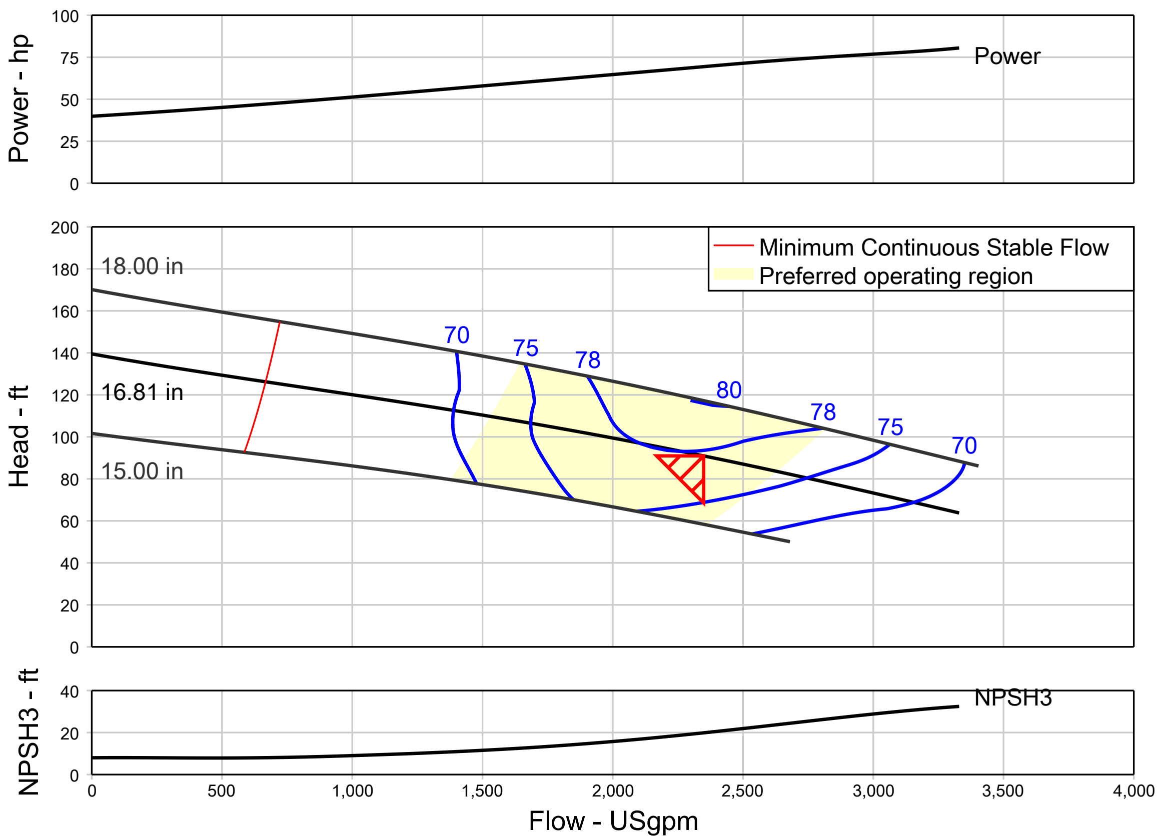
Material selected	: Standard

Pressure Data

Maximum working pressure	: 60.38 psi.g
Maximum allowable working pressure	: 100.0 psi.g
Maximum allowable suction pressure	: 100.0 psi.g
Hydrostatic test pressure	: N/A

Driver & Power Data (@Max density)

Driver sizing specification	: Max Power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 53.93 hp
Power, rated	: 69.38 hp
Power, maximum	: 80.48 hp
Motor rating	: 100 hp / 74.57 kW



PENTAIR

ASC PUMPING EQUIPMENT, INC - RICHFIELD WI
· WEST BEND, WI

PHONE: · FAX:

Pump 1

Close window

BOM History

Serial Number: **13-2344375**

Sold To: **S-P-D INC**

Order#
2578930
Order Type
SC
Branch Plant
1100

Original Order#

Customer PO#
OR28121AUR

Ship To: *ASC PUMPING EQUIPMENT*
145 W PROGRESS DR

WEST BEND
WI
53095

Line#	Parent#	Qty	Work Order#	Order Date	Ship Date	Description
200.000	**X601655**	**1**		**3/16/2013**	**7/22/2013**	**6 X 8 X18 SPHER- FLO 613A PF 5E**

Text

Material Of Construction: SF
Pump Only: NO
Gallons Per Minute: 1400
Total Dynamic Head: 60
RPM: 900
Discharge Position 1
NPSHA:
Solids:
Impeller Diameter: 18.000
Impeller Degree: 13
6T Stainless Steel Imp & Case Rng
Export Boxing: No
Standard Blue Paint
Surface Preparation: Standard
Hydrostatic Test Pressure: 50
Special Pump Testing Required: NO
Suction Pressure: 0
Mount Customer Supplied Motor: No
Motor Ship Direct: No
Motor Frame Size: 365HP
Assemble Seal Box Per: 7210304000
Seal Box Piping Drawing: 0321623000
1B Durametallic CRO Double PF 5
Coupling Guard Assembly: 8420659000
COUPLING FOR 365HP FRAME
* *
* SERIAL NUMBER IS 2344375 *
* *
SPL Special Coupling

Show / Hide Associated Order Information

S.No.	Part Number	Description	B/I	Qty
2.1	**1160495010**	BRAKET (A139) 18" PF5EFGH IRON GR CAST CLASS 30 MED	I	1
2.1	**1680560082**	HHCS .625 X 1.250 LG NC SAE#5 STL	B	4
2.1	**1680562082**	HHCS .625 X 1.500 LG NC	B	10
2.1	**1680564082**	HHCS .625 X 1.750 LG NC	B	4
2.1	**1680632082**	HHCS .750 X 1.500 LG NC	B	8
2.1	**1681009082**	CAPSCR .750 10 NC 3A STEEL FASTENERS SAE #5	I	1

2.1	**1801890010**	CASING (A141) 610 IRON GR CAST CLASS 30 MED	I	1
2.1	**2600657010**	COVER (A016) 600 IRON GR CAST CLASS 30 MED	I	1
2.1	**3641328803**	GASKET .062THK 18.13IDx21.63OD 18"CASE GASKET	I	2
2.1	**3641345803**	GASKET .031THK 11.13IDx12.10OD BOX/BRKT GASKET	I	1
2.1	**3642029803**	GASKET .031THK .75IDx3.31OD IMP/WASHER GASKET	I	1
2.1	**3642039457**	GASKET .125THK 4.88IDx5.88OD HANDHOLE GASKET BUNA N	I	1
2.1	**4432318646**	IMPASY 2079/1911 600 STAIN FTD CONST (440C)	I	1
2.1	**4720391087**	KEY .625 W X 3.000 LG WROUGHT STEEL (4720399104)	B	1
2.1	**5320045114**	NAMEPLATE AURORA CENTRIFUGAL STAIN STL MISC APPL	B	1
2.1	**6000004028**	PIPE PLUG .500 MALLEABLE CAST IRON	B	1
2.1	**6000005028**	PIPE PLUG .750 MALLEABLE CAST IRON	B	2
2.1	**7080013365**		B	2
2.1	**8161148646**	SUCCOV 1117/1911 600 STAIN FTD CONST (440C)	I	1
2.1	**9080458062**	IMPELLER WASHER 3.281 OD CARBON STL WR AISI C1040	I	1
2.1	**9081284999**	IMPELLER SEAL .750 VENDOR STANDARD MATERIAL	I	1
6.1	**1680498082**	HHCS .500 X 2.250 LG NC	B	4
6.1	**3640075803**	GASKET .031THK 4.81IDx5.53OD PF5 GLAND GASKET	I	1
6.1	**3640584457**	GASKET .210THK 3.35IDx3.75OD TETRA SEAL #TS-340 BUNA N	I	1
6.1	**3720520010**	GLAND (A091) PF 5 610A IRON GR CAST CLASS 30 MED	I	1
6.1	**4720010087**	KEYWDF .187 W X .781 LG WROUGHT STEEL MISC APPL	B	1
6.1	**6000002087**	PIPE PLUG .250 WROUGHT STEEL MISC APPL	B	1
6.1	**6000003087**	PIPE PLUG .375 WROUGHT STEEL MISC APPL	B	1
6.1	**6000004028**	PIPE PLUG .500 MALLEABLE CAST IRON	B	3
6.1	**6000205387**	STREET ELBOW .500 GALVANIZED MALLEABLE IRON	B	1
6.1	**6001004387**	REDUCER .500 X .375 GALVANIZED MALLEABLE IRON	B	1
6.1	**6001254387**	NIPPLE .375 X 2.000 LG GALVANIZED MALLEABLE IRON	B	1
6.1	**6760460088**	RNGRET 3.750 .109THKx4.31OD TRUARC # 5100-375	I	1
6.1	**6760471088**	RNGRET 3.250 .105THKx2.938ID SPIROLOX # D-MSB-325	I	1
6.1	**7126426773**	MECH SEAL 3.625ID TYPE CRO DBL BUNA-N,CARBON,DURACHROME,SS	I	1
6.1	**7560412208**	SLEEVE 600A PF 5E,F,G&H LEADED RED BRASS 85-5-5-5	I	1
6.1	**7640022478**	SLINGER .13THK 3.56IDx4.25OD NEOPRENE	I	1
6.1	**8121085010**	STUFBX (A068) 600A PF 5 IRON GR CAST CLASS 30 MED	I	1
15.3	**0601389087**	VERT BASE SUPORT 8&10" SUCT WROUGHT STEEL MISC APPL	I	1
15.3	**1680564082**	HHCS .625 X 1.750 LG NC	B	4
15.3	**1680638082**	HHCS .750 X 2.250 LG NC	B	16
15.3	**2600649010**	COVER (A024) 600 IRON GR CAST CLASS 30 MED	I	1
15.3	**3640610803**	FLANGE GASKET 8.000 125# ARMSTRON S-8091 SYNTHESEAL	I	1
15.3	**3641048478**	GASKET .125THK 6.00IDx7.38OD HANDHOLE GASKET NEOPRENE	I	1
15.3	**6000002087**	PIPE PLUG .250 WROUGHT STEEL MISC APPL	B	1
15.3	**6000008028**	PIPE PLUG 1.500 MALLEABLE CAST IRON	B	1
15.3	**8161207010**	SUCELB (A072) 600 IRON GR CAST CLASS 30 MED	I	1
15.5	**1680568082**	HHCS .625 X 2.250 LG NC	B	4
15.5	**1680640082**	HHCS .750 X 2.500 LG NC	B	4
15.5	**1681000080**	HHCS .312 X .500 LG NC SERRATED FLANGE BOLT	B	4
15.5	**3920623087**	CPLG GUARD VERT PF 5 & 6D EXP METAL ASSY WELDMENT	I	1
15.5	**5440115080**	HEXNUT .625 NC STEEL FASTENERS SAE #2	B	4
15.5	**5440117080**	HEXNUT .750 NC STEEL FASTENERS SAE #2	B	4
15.5	**8201620087**	VERT MOTOR SUPORT(P020)PF 5&6 WROUGHT STEEL MISC APPL	I	1
16.1	**2561837648**	CPLG 2.375 .625X.313KWY SIZE 11S	I	1
16.1	**2561838648**	CPLG 1.625 .375X.188KWY SIZE 11S	I	1
16.1	**4480143650**	COUPLING INSERT 11E COUPLING INSERT	I	1
20.5	**6000329387**	STREET ELBOW .500 X 45 GALVANIZED MALLEABLE IRON	B	2
20.5	**6000723387**	COUPLING .500 GALVANIZED MALLEABLE IRON	B	2
20.5	**6001005387**	REDUCER .500 X .250 GALVANIZED MALLEABLE IRON	B	1

20.5	**6001103387**	NIPPLE .250 X .875 LG GALVANIZED MALLEABLE IRON	B	1
20.5	**6001316387**	NIPPLE .500 X 5.000 LG GALVANIZED MALLEABLE IRON	B	2
30.5	**3550077642**	PWRFRM ASSY NO. 5E 600A ALL IRON CONSTRUCTION	I	1

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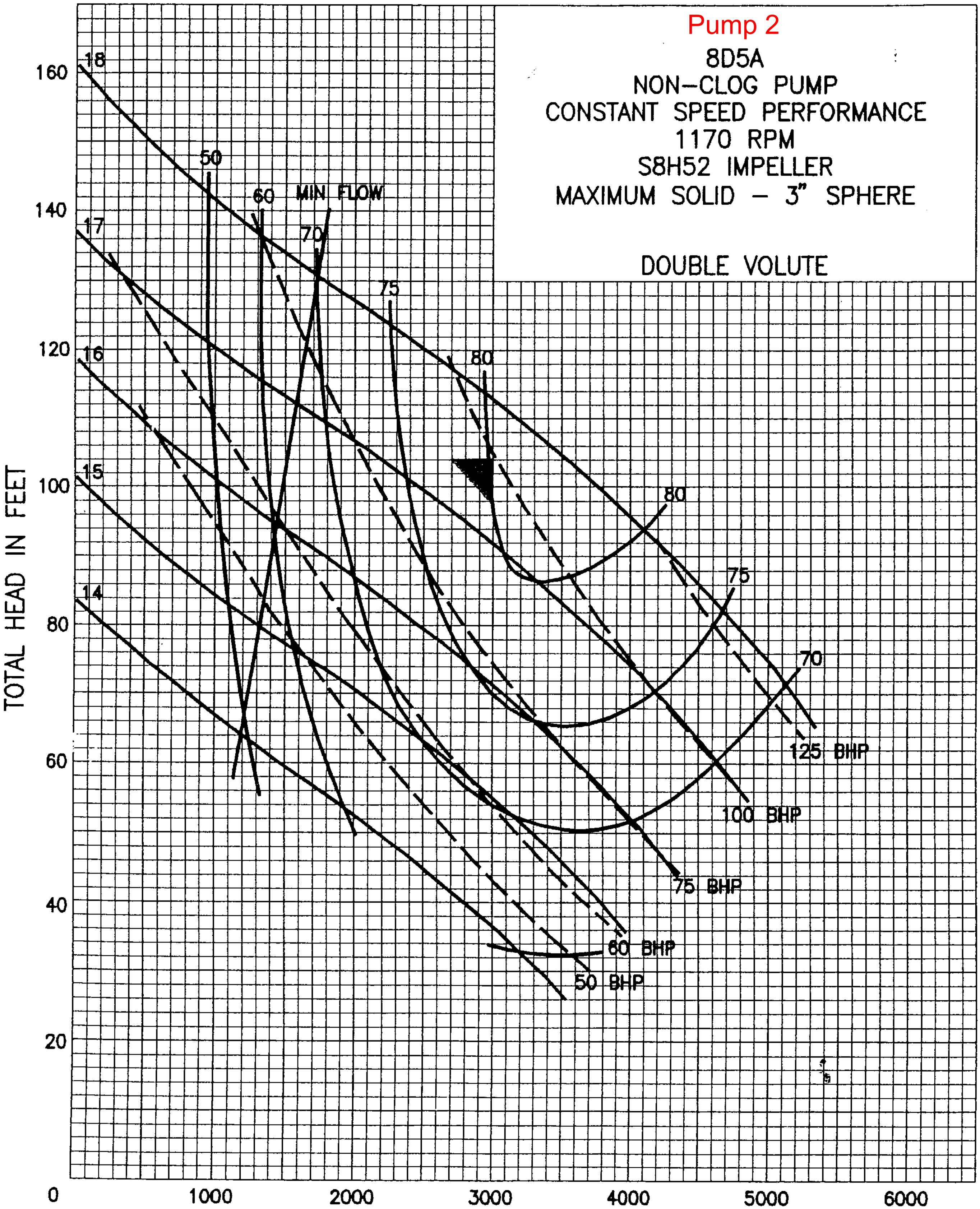
Close window

ENGINEERING DATA

Pump Performance Curves
Constant Speed
8D5A
1170 RPM
May, 1994

Smith & ® Loveless, Inc.
14040 W. Santa Fe Trail Dr.
Lenexa, Kansas 66215



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S/N 19-00866-Q MEQUON, WI 3000GAL @ 104' TDH

Pump 3

Close window

BOM History

Serial Number: **12-2174810**

Sold To: **S-P-D INC**

Order#
2479588
Order Type
SC
Branch Plant
1100

Original Order#

Customer PO#
Q204674994

Ship To: *ASC PUMPING EQUIPMENT*
3064 HELSAN DR

RICHFIELD
WI
53076

Line#	Parent#	Qty	Work Order#	Order Date	Ship Date	Description
1.000	**X601671**	**1**		**12/14/2011**	**4/11/2012**	**8 X10 X18 SPHER- FLO 613A PF 5H**

Text

Material Of Construction: SF
Pump Only: NO
Gallons Per Minute: 3400
Total Dynamic Head: 100
RPM: 1200
Discharge Position 1
4D 316 SS Shaft Sleeve PF 5
Hydrostatic Test Pressure: 65
Suction Pressure: 0
NPSHA:
Solids:
Impeller Diameter: 18.000
Impeller Degree: 0
Horsepower:
1B Durametallic CRO Double PF 5
16D Filtered Pumped Liq Dead End
Export Boxing: No
Standard Blue Paint
Surface Preparation: Standard
Assemble Seal Box Per: 7210304000
Special Pump Testing Required: NO
SPL Special Coupling
Mount Customer Supplied Motor: No
Motor Ship Direct: No
Motor Part Number:
* SERIAL NUMBER IS 2174810 *
Phase:
Hertz:
Voltage:
Enclosure:
Motor Frame Size: 445HP
* *
Seal Box Piping Drawing: 0321673000
Power Frame Size 5H
Wear Rings: *Calculated
Coupling Guard Assembly: 8420659000
* *

Show / Hide Associated Order Information

S.No.	Part Number	Description	B/I	Qty

2.1	**1160495010**	BRAKET (A139) 18" PF5EFGH IRON GR CAST CLASS 30 MED	I	1
2.1	**1680560082**	HHCS .625 X 1.250 LG NC SAE#5 STL	B	4
2.1	**1680562082**	HHCS .625 X 1.500 LG NC	B	2
2.1	**1680564082**	HHCS .625 X 1.750 LG NC	B	4
2.1	**1680632082**	HHCS .750 X 1.500 LG NC	B	8
2.1	**1681010082**	CAPSCR 1.00 8 NC 3A	I	1
2.1	**1801892010**	CASING (A143) 610 IRON GR CAST CLASS 30 MED	I	1
2.1	**2600660010**	COVER (A019) 600 IRON GR CAST CLASS 30 MED	I	1
2.1	**3641322457**	GASKET .125THK 6.00X7.06 OVAL HANDHOLE GASKET BUNA N	I	1
2.1	**3641328803**	GASKET .062THK 18.13IDx21.63OD 18"CASE GASKET	I	2
2.1	**3641345803**	GASKET .031THK 11.13IDx12.10OD BOX/BRKT GASKET	I	1
2.1	**3642032803**	GASKET .031THK 1.00IDx3.56OD IMP/WASHER GASKET	I	1
2.1	**4432081010**	IMPTRM (2081)A100 IRON GR CAST CLASS 30 MED	I	1
2.1	**4720408087**	KEY .750 W X 3.500 LG WROUGHT STEEL MISC APPL	I	1
2.1	**5320045114**	NAMEPLATE AURORA CENTRIFUGAL STAIN STL MISC APPL	B	1
2.1	**6000004028**	PIPE PLUG .500 MALLEABLE CAST IRON	B	1
2.1	**6000005028**	PIPE PLUG .750 MALLEABLE CAST IRON	B	2
2.1	**7080013365**		B	2
2.1	**8161119010**	SUCCOV (A041) 600 IRON GR CAST CLASS 30 MED	I	1
2.1	**9080459062**	IMPELLER WASHER 3.500 OD CARBON STL WR AISI C1040	I	1
2.1	**9081286999**	IMPELLER SEAL 1.000 VENDOR STANDARD MATERIAL	I	1
6.1	**1680498082**	HHCS .500 X 2.250 LG NC	B	4
6.1	**3640075803**	GASKET .031THK 4.81IDx5.53OD PF5 GLAND GASKET	I	1
6.1	**3640429457**	O-RING .139D 3.48IDx3.75OD UNIF SIZE 238 BUNA N	B	1
6.1	**3640582457**	GASKET .210THK 3.97IDx4.38OD TETRA SEAL #TS-33-345 BUNA N	I	1
6.1	**3720520010**	GLAND (A091) PF 5 610A IRON GR CAST CLASS 30 MED	I	1
6.1	**4720010087**	KEYWDF .187 W X .781 LG WROUGHT STEEL MISC APPL	B	1
6.1	**6000002087**	PIPE PLUG .250 WROUGHT STEEL MISC APPL	B	1
6.1	**6000003087**	PIPE PLUG .375 WROUGHT STEEL MISC APPL	B	1
6.1	**6000004028**	PIPE PLUG .500 MALLEABLE CAST IRON	B	3
6.1	**6000205387**	STREET ELBOW .500 GALVANIZED MALLEABLE IRON	B	1
6.1	**6001004387**	REDUCER .500 X .375 GALVANIZED MALLEABLE IRON	B	1
6.1	**6001254387**	NIPPLE .375 X 2.000 LG GALVANIZED MALLEABLE IRON	B	1
6.1	**6760471088**	RNGRET 3.250 .105THKx2.938ID SPIROLOX # D-MSB-325	I	1
6.1	**7126426773**	MECH SEAL 3.625ID TYPE CRO DBL BUNA-N,CARBON,DURACHROME,SS	I	1
6.1	**7560412104**	SLEEVE 600A PF 5E,F,G STAIN STL AISI 316 CF8M	I	1
6.1	**7560417104**	COLLAR 600A PF 5G&H STAIN STL AISI 316 CF8M	I	1
6.1	**7640022478**	SLINGER .13THK 3.56IDx4.25OD NEOPRENE	I	1
6.1	**8121085010**	STUFBX (A068) 600A PF 5 IRON GR CAST CLASS 30 MED	I	1
15.3	**0601389087**	VERT BASE SUPORT 8&10" SUCT WROUGHT STEEL MISC APPL	I	1
15.3	**1680562082**	HHCS .625 X 1.500 LG NC	B	4
15.3	**1680638082**	HHCS .750 X 2.250 LG NC	B	8
15.3	**1680676082**	HHCS .875 X 2.500 LG NC	B	12
15.3	**2600649010**	COVER (A024) 600 IRON GR CAST CLASS 30 MED	I	1
15.3	**3640611803**	FLANGE GASKET 10.000 125# ARSTRONG S-8091 SYNTHESEAL	I	1
15.3	**3641048478**	GASKET .125THK 6.00IDx7.38OD HANDHOLE GASKET NEOPRENE	I	1
15.3	**6000002087**	PIPE PLUG .250 WROUGHT STEEL MISC APPL	B	1
15.3	**6000008028**	PIPE PLUG 1.500 MALLEABLE CAST IRON	B	1
15.3	**8160726010**	SUCELB (X775)4449 600 IRON GR CAST CLASS 30 MED	I	1
15.5	**1680568082**	HHCS .625 X 2.250 LG NC	B	4
15.5	**1680640082**	HHCS .750 X 2.500 LG NC	B	4
15.5	**1681000080**	HHCS .312 X .500 LG NC SERRATED FLANGE BOLT	B	4
15.5	**3920623087**	CPLG GUARD VERT PF 5 & 6D EXP METAL ASSY WELDMENT	I	1
15.5	**5440115080**	HEXNUT .625 NC STEEL FASTENERS SAE #2	B	4

15.5	**5440117080**	HEXNUT .750 NC STEEL FASTENERS SAE #2	B	4
15.5	**8201620087**	VERT MOTOR SUPORT(P020)PF 5&6 WROUGHT STEEL MISC APPL	I	1
20.5	**5962851387**	PIPTBE .50 D GALVANIZED MALLEABLE IRON	B	3
20.5	**5962851387**	PIPTBE .50 D GALVANIZED MALLEABLE IRON	B	5
20.5	**5962851387**	PIPTBE .50 D GALVANIZED MALLEABLE IRON	B	18
20.5	**6000004028**	PIPE PLUG .500 MALLEABLE CAST IRON	B	2
20.5	**6000231387**	FEMALE ELBOW .500 GALVANIZED MALLEABLE IRON	B	2
20.5	**6000329387**	STREET ELBOW .500 X 45 GALVANIZED MALLEABLE IRON	B	2
20.5	**6000506387**	TEE .500 GALVANIZED MALLEABLE IRON	B	2
20.5	**6000907387**	RDBUSH .750 X .500 GALVANIZED MALLEABLE IRON	B	2
20.5	**6001005387**	REDUCER .500 X .250 GALVANIZED MALLEABLE IRON	B	1
20.5	**6001103387**	NIPPLE .250 X .875 LG GALVANIZED MALLEABLE IRON	B	1
20.5	**6001304387**	NIPPLE .500 X 2.000 LG GALVANIZED MALLEABLE IRON	B	4
20.5	**6001316387**	NIPPLE .500 X 5.000 LG GALVANIZED MALLEABLE IRON	B	2
20.5	**6004304387**	UNION .500 GALVANIZED MALLEABLE IRON	B	1
20.5	**8560020999**	FILTER VESSEL/FILTER .750	I	1
20.5	**8964278644**	GATE VALVE .500 BRONZE FITTED CONSTR.	I	2
30.5	**3550080642**	PWRFRM ASSY NO. 5H 600A ALL IRON CONSTRUCTION	I	1

Queried on 3/18/2020 8:24:42 AM

Close window

PENTAIR

Customer : Pump 3
Project name : New Project

Pump Performance Datasheet

Encompass 2.0 - 19.5.6 20.0.4

Item number	: 005	Size	: 610 - 8x10x18
Service	:	Stages	: 1
Quantity	: 1	Based on curve number	: 16-8x10x18-1150
Quote number	: 1031591	Date last saved	: 18 Mar 2020 8:31 AM

Operating Conditions

Flow, rated	: 3,400.0 USgpm
Differential head / pressure, rated (requested)	: 100.0 ft
Differential head / pressure, rated (actual)	: 100.0 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Frequency	: 60 Hz

Performance

Speed, rated	: 1150 rpm
Impeller diameter, rated	: 17.88 in
Impeller diameter, maximum	: 18.00 in
Impeller diameter, minimum	: 15.00 in
Efficiency	: 78.67 %
NPSH required / margin required	: 20.84 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 44 / 128 Metric units
Minimum Continuous Stable Flow	: 1,193.2 USgpm
Head, maximum, rated diameter	: 149.6 ft
Head rise to shutoff	: 49.58 %
Flow, best eff. point	: 3,680.8 USgpm
Flow ratio, rated / BEP	: 92.37 %
Diameter ratio (rated / max)	: 99.31 %
Head ratio (rated dia / max dia)	: 99.20 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 4.13 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

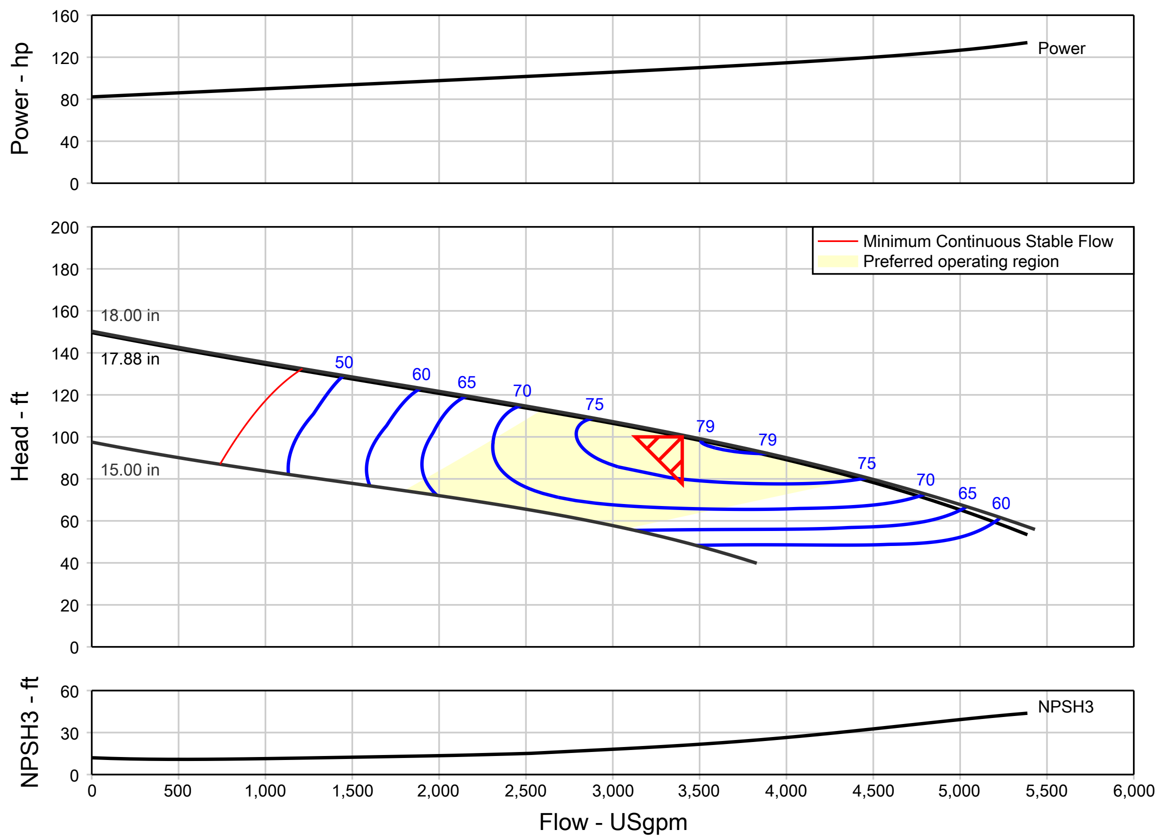
Material selected	: Standard

Pressure Data

Maximum working pressure	: 64.76 psi.g
Maximum allowable working pressure	: 100.0 psi.g
Maximum allowable suction pressure	: 100.0 psi.g
Hydrostatic test pressure	: N/A

Driver & Power Data (@Max density)

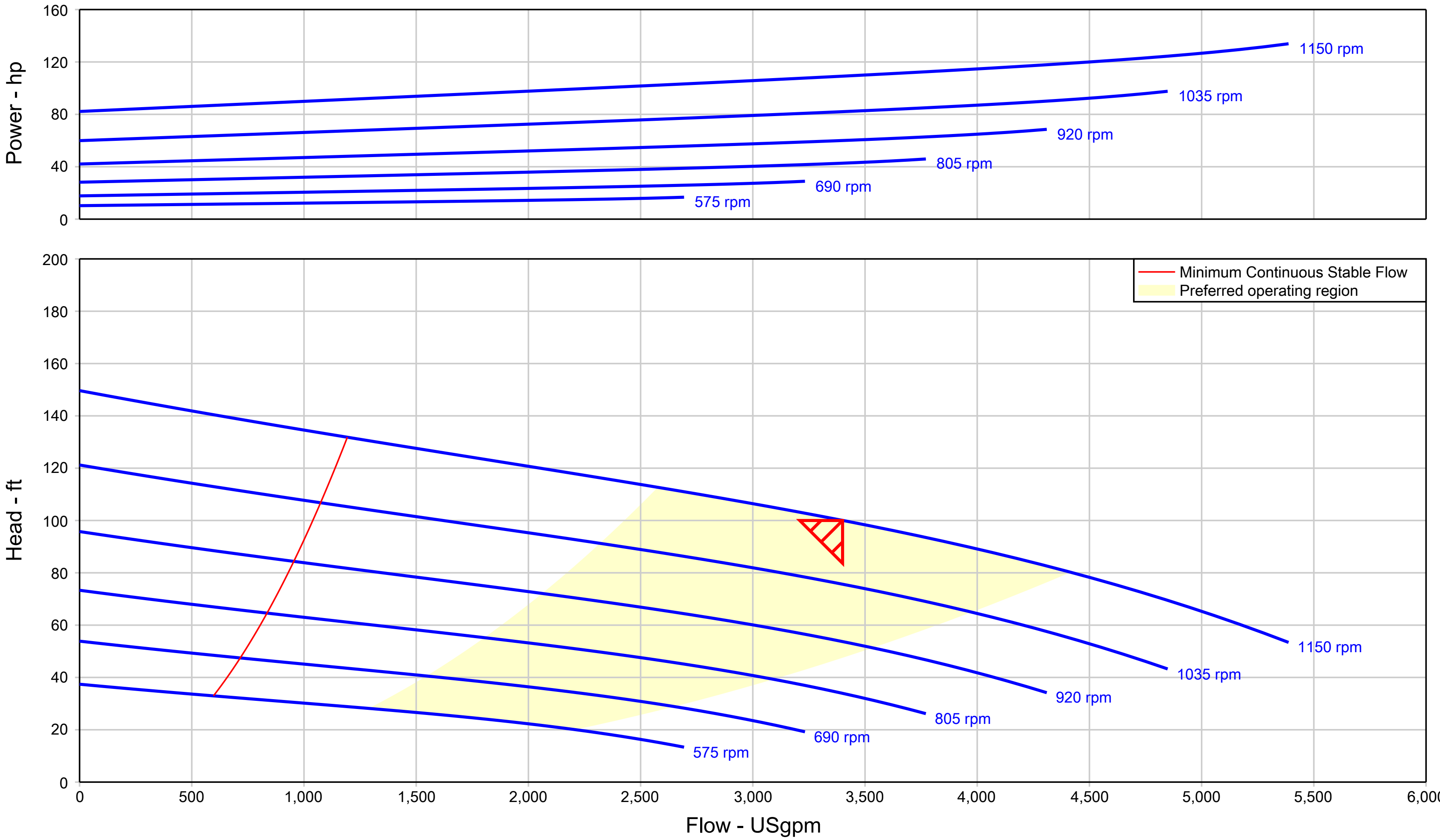
Driver sizing specification	: Max Power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 85.87 hp
Power, rated	: 109 hp
Power, maximum, rated diameter	: 134 hp
Minimum recommended motor rating	: 150 hp / 112 kW



PENTAIR

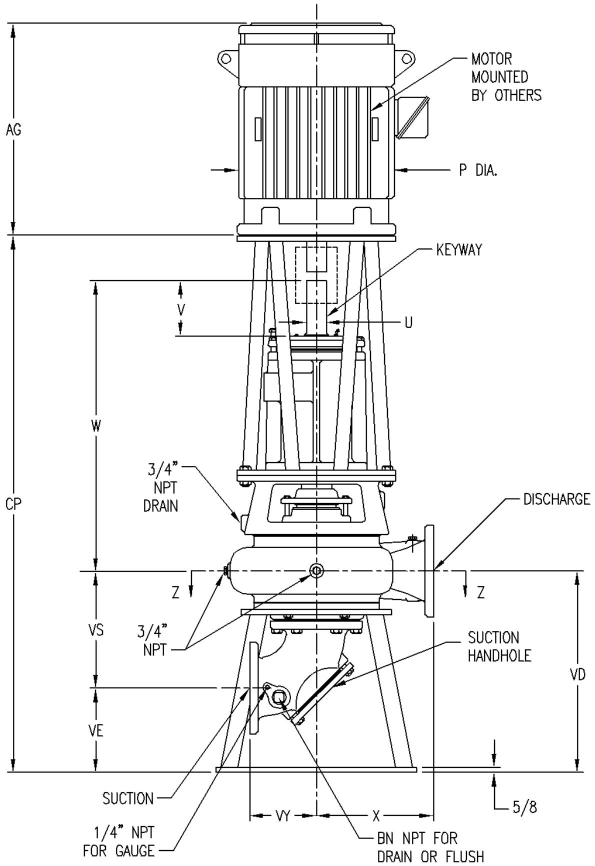
ASC PUMPING EQUIPMENT, INC - RICHFIELD WI
· WEST BEND, WI

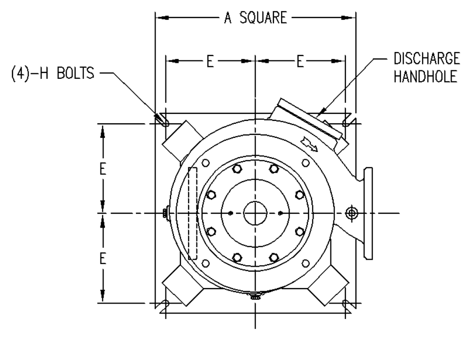
PHONE: · FAX:



Item number	: 005	Size	: 610 - 8x10x18	Flow, rated	: 3,400.0 USgpm
Service	:	Stages	: 1	Differential head / pressure, rated	: 100.0 ft
Quantity	: 1	Efficiency	: 78.67 %	Speed, rated	: 1150 rpm
Quote number	: 1031591	Power, rated	: 109 hp	Impeller diameter, rated	: 17.88 in
Based on curve number	: 16-8x10x18-1150	NPSH required	: 20.84 ft	Fluid density, rated / max	: 1.000 / 1.000 SG
		Frequency	: 60 Hz	Viscosity	: 1.00 cP
Date last saved	: 18 Mar 2020 8:31 AM	Nominal speed	: 1150 rpm	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00

General Arrangement Drawing





VIEW Z-Z

A	BN	E	H	VY	W	X	CP	VD	VE	VS	P	AG	U	V	Key (LG)
30.00	1.50	13.75	0.75	11.00	34.63	19.00	73.19	33.00	15.19	17.81	24.00	32.00	2.38	6.38	4.00

Key (WD)	Key (DP)	Handhole Discharge	Handhole Suction
0.63	0.31	5"x7"	6.00

NOTES:
All dimensions are in inches.
Dimensions shown may vary ± 0.5" (13mm) due to normal manufacturing tolerances.
Not for construction, installation, or application purposes unless certified.
Two 0.5" (13mm) NPT connections 180 degrees apart on the stuffing box for lubrication purposes are furnished as standard.
Alemite fitting is provided in one tap and the remaining tap is plugged.
Conduit box is shown in approximate location. Dimensions are not specified as they may vary with each motor manufacturer.
AG and P dimensions of motor will vary based on make and style of motor. Dimensions shown reflect Aurora standard motors.
See individual motor supplier dimensional data sheets for your application.

Pump Data			
Series	610	Liquid Type	Water
Model	613A	Discharge Size	8.00 in
Size	8x10x18	Suction Size	10.00 in
Flow	3400	Case Bore	18.00 in
Head	100	Temperature Rating	20
RPM	1150 RPM	Connection Suc/Disch	Flange 125#/125#
Rotation	Right	Baseplate	Not Required
Pump Paint	Standard blue	Coupling	-

Motor Data			
Power	150 hp	Frame	445HP
Phase	3	Efficiency (%)	95.4
Frequency	60 Hz	Efficiency Rating	premium
Volts	230/460	Enclosure	ODP
RPM	1200	Manufacturer	US Motors

Pump Material Data			
Pump Material	Standard Fitted	PowerFrame	Cast Iron ASTM A48
Casing	Cast Iron ASTM A48	Bearing Covers	Cast Iron ASTM A48
Impeller	Cast Iron ASTM A48	Seal Type	Packing
Shaft	Steel SAE 1045	Seal Material	Graphite Impregnated
Sleeve	SS. ASTM A276	Lantern Ring	Glass Filled Teflon
Glands	AL, ASTM A356-T6		

Estimated Weights	
Pump	1,820.0 lb
Coupling	-1.00 lb
Driver	1,600.0 lb
Total	3,419.0 lb

Additional Options

-
-
-
-
-
-
-
-
-
-

Certification Correct	
Customer	
Customer Quote #	1031591
Job Name	New Project
Market	-

PENTAIR

Quote Item #	005
Quote Date	19 Feb 2020

Fairbanks Morse
Pump Corporation

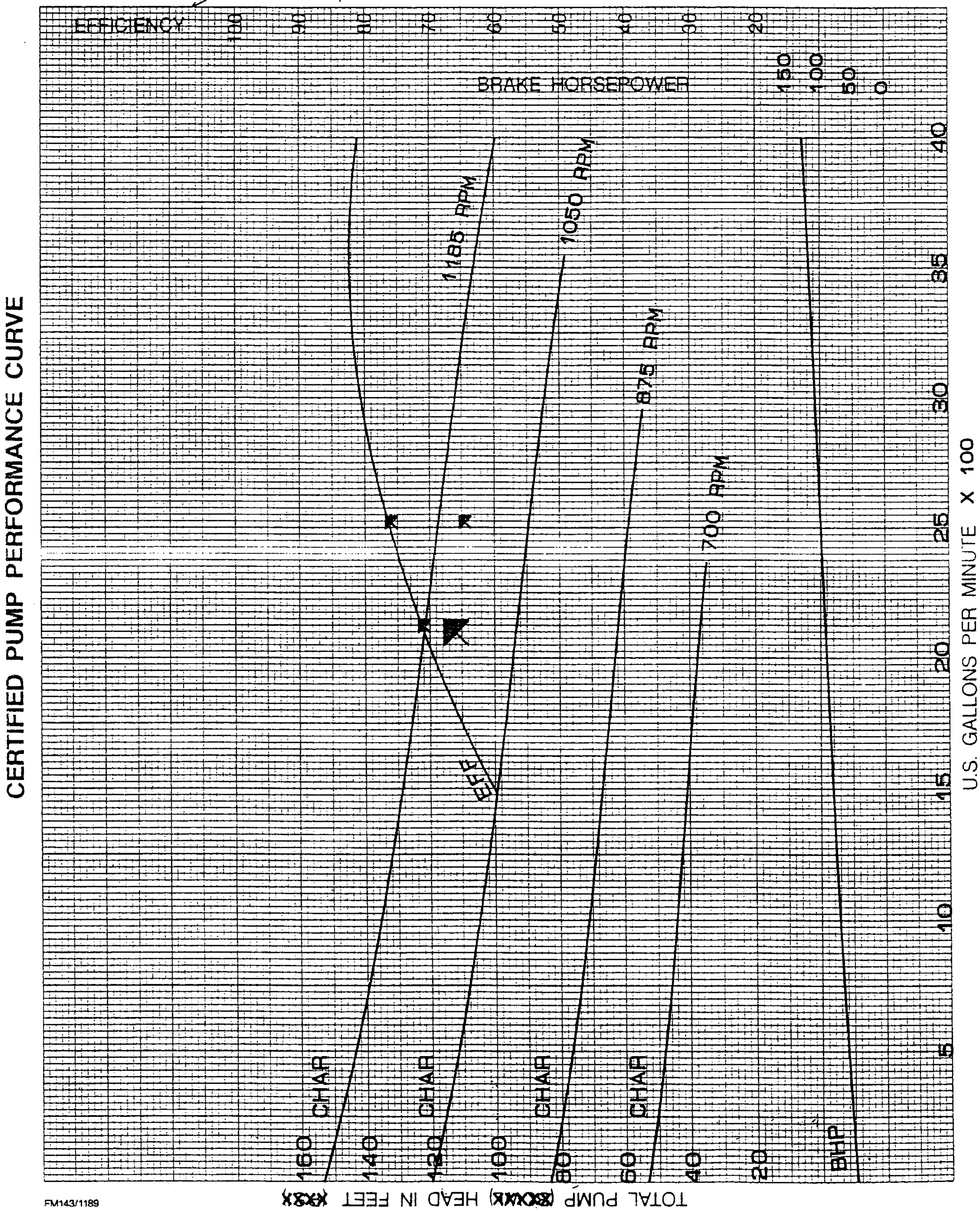
Pump 4

CERTIFIED CURVE

SERIAL NO. K4E1-078057 NO. STAGES ONE
TEST DATE 6/12/97 DRIVER DYNO-125 MTR

SIZE-MODEL 8-C5445
IMPELLER TAKE5HX
IMPELLER DIA. 17.6"
RPM(S) 1185 (AS NOTED)

CERTIFIED CORRECT BY [signature] 6/97
TEST DEPARTMENT DATE



FM143/1189

Appendix B

Pump Maintenance Summary

STATION "E" IMPROVEMENTS & MAINTENANCE

6/20/1968

DATE	NOTES	PRICE
1/00/1997	PUMP REHAB	$110,000.00
02/07/97	24" BARMINUTOR	$1,559.03
07/25/97	NEW #1 50HP MOTOR & TRIMMED IMPELLER	$4,000.00
07/25/97	NEW #1 VFD	$1,220.25
07/25/97	NEW # 4 PUMP & 125 HP MOTOR	$25,000.00
12/16/97	#3 PUMP REBUILT	$12,563.25
01/01/98	NEW VALVE ON FM HEADER PIPE	$4,551.69
01/01/99	NEW #2 PUMP VFD	$3,000.00
02/08/99	#4 PUMP SEAL REPAIR	$6,659.07
04/17/00	NEW KAMP CONTROL PANEL, 2 TRANSD, BACKUP FLOAT	$2,285.78
6/00/2001	2 - 16" FORCEMAINS	$1,000,000.00
06/21/01	IMPROVEMENTS	$165,000.00
10/08/02	H2S CALIBRATION KIT & CONTROLS	$607.09
11/21/02	KAMP - NEW PLC	$1,288.38
12/10/02	ODOR CONTROL PUMP	$310.25
10/24/02	#4 PUMP - MECHANICAL SEAL	$6,659.07
01/06/03	ODOR CONTROL MIXING TANK	$177.69
04/28/03	NEW CHARCOAL ODOR CONTROL SYSTEM	$15,000.00
06/27/03	16" VALVES	$10,950.00
12/15/04	#2 VFD - NEW STARTER	$4,248.00
09/13/05	#1 VFD COOLING FAN REPLACEMENT	$70.00
11/00/07	NEW #2 FLOW METER	$4,447.00
12/00/07	#2 VFD - NEW FAN & TRANSFORMER	$1,968.00
01/14/08	#1 PUMP - FRONT HEAD REPLACEMENT	$3,517.00
03/18/08	#2 PUMP - NEW MECHANICAL SEAL	$910.00
01/29/09	#4 PUMP REPLACEMENT	$31,088.00
07/02/09	#3 PUMP - NEW CHECK VALVE, SS PIPE, SPOOL	$12,541.00
10/26/09	#4 VFD - NEW FAN & TRANSFORMER	$1,615.00
09/09/10	REPAIR #3 PLUG SUCTION VALVE	$5,698.00
11/00/10	ALUMINUM GRATING FOR WETWELL	$503.00
12/06/10	#1 CHECK VALVE REPLACEMENT	$3,191.00
07/25/11	#1 PUMP - MECHANICAL SEALS & BEARINGS	$3,358.00
02/27/12	BAD RESISTOR IN TRANSFER SWITCH	$220.00
04/24/12	#3 -AURORA PUMP RELACEMENT	$26,500.00
02/25/13	NEW CHARCOAL PELLETS EVERY 9-10 YEARS	$6,600.00
3/00/13	3 VFD'S	$26,000.00
5/00/13	NEW PUMP #1	$22,000.00
01/10/14	Contacter added to starter #4 to keep power from shorting out drive	$3,530.00
08/05/14	Installed #2 suction Gate Valve	$6,250.00
10/20/14	Contacter added to starter #4 to keep power from shorting out drive	$4,500.00
11/19/14	New charcoal grate and pellets for odor control room	$5,760.00
02/17/17	New Blower motor in odor control room	$1,720.00
10/17/17	2 new air releases on short force main	$3,250.00
09/19/18	Safety hook installed in wet well	$4,085.00

09/27/18	4 new air releases on long force main	$6,360.00
2015 - 2018	Various indoor and outdoor lights and ballasts	$1,320.00
03/12/19	2 new transducers installed in wet well	$1,850.00
05/24/19	New low level float	$50.00
06/11/19	Crane installed new seal in #1 pump	$5,500.00
08/13/19	New dehumidifier	$180.00
To be done in 2019	Sabel will install new seal in #4 pump	$4,050.00
		$1,573,710.55
	ANNUAL LABOR MAINTENANCE COSTS	**19,038**
Checking station	2 MEN X 1.5HRS/WEEK = 156 HRS/YR X $100/HR = $15600	
Cleaning pellets	CHARCOAL REGEN 2 MEN-10 HRS@$100/HR= $2000	
Grease Pumps/motors	2 MEN x 15MIN/2x/YEAR = 1 HR/YR x $100/HR = $100	
Pipes & Filters	2 MEN x 3HRS/YEAR = 6 HRS/YR x $100/HR = $600	
Cleaning Wetwell	4 MEN x 1HR/YEAR = 4 HRS/YR x $100/HR = $400	
Vehicle	1 TRUCK x 4.5HRS/YEAR = 4.5 HRS/YR x $75/HR = $338	

Appendix C
Summary of Daily Reports

City Of Mequon Daily Report - 2013

Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
1/1/2013	2	960.0	1	75.0	0	4.2	473	4.2	640	195	835,000	
1/2/2013	2	960.0	1	72.0	0	4.2	473	4.2	579	195	774,000	
1/3/2013	3	959.0	1	68.0	0	4.2	473	4.2	609	178	787,000	
1/4/2013	2	960.0	1	70.0	0	4.2	473	4.2	594	177	771,000	
1/5/2013	3	958.0	1	67.0	0	4.2	473	4.2	591	174	765,000	
1/6/2013	2	960.0	1	68.0	0	4.2	473	4.2	581	164	745,000	
1/7/2013	2	960.0	1	66.0	0	4.2	473	4.2	546	170	716,000	
1/8/2013	3	958.0	1	64.0	0	4.2	473	4.2	569	167	736,000	
1/9/2013	2	960.0	1	66.0	0	4.2	473	4.2	568	161	729,000	
1/10/2013	4	938.0	6	147.0	121	138.9	123	138.9	595	172	767,000	
1/11/2013	2	960.0	1	167.0	126	139.4	125	139.4	605	181	786,000	
1/12/2013	3	958.0	3	221.0	237	373.9	238	373.9	1,603	509	2,112,000	
1/13/2013	5	960.0	2	167.0	235	334.6	234	334.6	1,252	543	1,795,000	
1/14/2013	2	960.0	1	126.0	202	265.7	203	265.7	1,016	416	1,432,000	
1/15/2013	3	959.0	1	113.0	174	217.1	175	217.1	881	324	1,205,000	
1/16/2013	2	960.0	1	99.0	165	198.8	164	198.8	797	282	1,079,000	
1/17/2013	5	955.0	2	91.0	154	186.8	156	186.8	748	255	1,003,000	
1/18/2013	2	960.0	1	86.0	150	175.6	149	175.6	709	232	941,000	
1/19/2013	3	955.0	1	85.0	146	171.9	147	171.9	707	215	922,000	
1/20/2013	2	960.0	1	82.0	147	174.3	146	174.3	688	209	897,000	
1/21/2013	2	960.0	1	75.0	141	170.5	142	170.5	644	200	844,000	
1/22/2013	3	954.0	4	73.0	136	159.2	136	159.2	639	189	828,000	
1/23/2013	2	960.0	1	70.0	128	147.7	128	147.7	600	182	782,000	
1/24/2013	3	952.0	3	72.0	126	147.0	126	147.0	603	174	777,000	
1/25/2013	2	960.0	1	69.0	123	141.5	123	141.5	605	181	786,000	
1/26/2013	3	943.0	5	66.0	120	134.0	118	134.0	575	171	746,000	
1/27/2013	2	960.0	1	66.0	124	142.1	124	142.1	575	159	734,000	
1/28/2013	2	960.0	1	65.0	123	139.5	123	139.5	565	163	728,000	
1/29/2013	3	956.0	1	77.0	129	149.6	130	149.6	664	169	833,000	
1/30/2013	2	960.0	2	368.0	219	349.9	219	349.9	1,385	456	1,841,000	
1/31/2013	14	961.0	4	197.0	242	496.3	242	496.3	1,671	909	2,580,000	
2/1/2013	10	956.0	1	137.0	212	284.2	212	284.2	1,066	474	1,540,000	
2/2/2013	3	958.0	2	114.0	178	222.5	178	222.5	898	338	1,236,000	
2/3/2013	2	960.0	1	102.0	166	208.1	167	208.1	799	285	1,084,000	
2/4/2013	2	960.0	1	95.0	158	194.3	157	194.3	738	261	999,000	
2/5/2013	5	956.0	4	93.0	147	176.1	147	176.1	725	238	963,000	
2/6/2013	6	956.0	5	88.0	142	168.0	141	168.0	719	232	951,000	
2/7/2013	4	951.0	5	88.0	137	159.7	137	159.7	696	222	918,000	
2/8/2013	2	960.0	2	84.0	136	159.6	137	159.6	692	218	910,000	
2/9/2013	9	950.0	5	82.0	134	156.1	134	156.1	681	211	892,000	
2/10/2013	2	960.0	1	78.0	139	165.2	139	165.2	651	202	853,000	
2/11/2013	2	960.0	1	202.0	165	215.6	164	215.6	845	233	1,078,000	
2/12/2013	3	958.0	3	145.0	225	327.0	226	327.0	1,181	515	1,696,000	
2/13/2013	2	960.0	1	123.0	184	235.9	183	235.9	959	360	1,319,000	
2/14/2013	3	958.0	1	113.0	169	211.0	169	211.0	868	308	1,176,000	
2/15/2013	2	960.0	1	112.0	162	199.7	161	199.7	845	286	1,131,000	
2/16/2013	4	957.0	4	102.0	156	190.9	156	190.9	833	267	1,100,000	
2/17/2013	2	960.0	1	94.0	155	190.1	156	190.1	772	251	1,023,000	
2/18/2013	2	960.0	1	86.0	152	181.8	151	181.8	723	237	960,000	
2/19/2013	4	957.0	1	183.0	156	192.0	158	192.0	793	255	1,048,000	
2/20/2013	2	960.0	1	119.0	202	261.9	202	261.9	991	427	1,418,000	
2/21/2013	3	957.0	4	97.0	164	195.7	163	195.7	848	292	1,140,000	
2/22/2013	4	941.0	7	97.0	145	181.4	147	181.4	763	250	1,013,000	
2/23/2013	3	957.0	3	85.0	146	175.2	147	175.2	712	232	944,000	
2/24/2013	2	960.0	1	83.0	146	172.2	146	172.2	695	208	903,000	
2/25/2013	2	960.0	1	85.0	142	166.9	142	166.9	676	204	880,000	
2/26/2013	3	957.0	2	82.0	138	157.8	138	157.8	683	209	892,000	
2/27/2013	2	960.0	1	82.0	139	159.0	138	159.0	684	203	887,000	
2/28/2013	2	960.0	1	89.0	139	162.1	139	162.1	694	206	900,000	
3/1/2013	2	960.0	1	97.0	143	168.0	144	168.0	746	224	970,000	
3/2/2013	3	958.0	1	86.0	142	165.0	143	165.0	725	237	962,000	
3/3/2013	2	960.0	2	85.0	142	170.7	143	170.7	703	218	921,000	
3/4/2013	2	960.0	2	84.0	146	172.0	145	172.0	694	213	907,000	
3/5/2013	6	948.0	4	86.0	141	165.2	141	165.2	698	211	909,000	
3/6/2013	2	960.0	1	82.0	139	161.5	139	161.5	682	204	886,000	
3/7/2013	4	936.0	4	86.0	134	155.0	135	155.0	679	207	886,000	
3/8/2013	2	960.0	1	87.0	140	164.0	140	164.0	728	217	945,000	
3/9/2013	4	956.0	3	95.0	152	163.4	140	163.4	749	218	967,000	
3/9/2013	4	956.0	3	95.0	152	163.4	140	163.4	749	218	967,000	
3/11/2013	74	982.0	2	244.0	207	426.5	207	426.5	1,615	404	2,019,000	
3/12/2013	43	964.0	10	148.0	241	492.5	240	492.5	1,834	847	2,681,000	
3/13/2013	2	960.0	2	125.0	241	388.9	241	388.9	1,397	592	1,989,000	
3/14/2013	7	958.0	1	110.0	234	337.6	234	337.6	1,505	482	1,987,000	
3/15/2013	3	960.0	1	98.0	221	302.4	221	302.4	1,213	426	1,639,000	
3/16/2013	10	957.0	3	95.0	214	283.0	212	283.0	1,102	388	1,490,000	
3/17/2013	5	959.0	2	90.0	205	276.9	206	276.9	1,031	364	1,395,000	
3/18/2013	2	960.0	1	81.0	197	257.9	196	257.9	977	342	1,319,000	
3/19/2013	3	958.0	3	83.0	189	244.3	190	244.3	996	319	1,315,000	
3/20/2013	2	960.0	1	73.0	181	227.2	181	227.2	951	323	1,274,000	
3/21/2013	4	955.0	1	71.0	173	213.0	173	213.0	885	289	1,174,000	

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			Rainflow Total (in):
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	
3/22/2013	2	960.0	1	66.0	166	204.6	167	204.6	860	273	1,133,000	
3/23/2013	4	954.0	2	65.0	161	195.9	162	195.9	849	258	1,107,000	
3/24/2013	2	960.0	1	75.0	168	212.9	170	212.9	847	255	1,102,000	
3/25/2013	2	960.0	1	71.0	177	222.6	176	222.6	868	291	1,159,000	
3/26/2013	49	636.0	45	68.0	169	210.1	170	210.1	567	517	1,084,000	
3/27/2013	15	951.0	9	92.0	175	217.4	174	217.4	885	291	1,176,000	
3/28/2013	41	941.0	40	128.0	216	295.6	217	295.6	1,198	400	1,598,000	
3/29/2013	2	960.0	1	136.0	232	340.6	231	340.6	1,385	502	1,887,000	
3/30/2013	4	957.0	3	141.0	237	352.3	239	352.3	1,435	533	1,968,000	
3/31/2013	3	960.0	2	151.0	236	362.1	236	362.1	1,509	552	2,061,000	
4/1/2013	2	960.0	2	150.0	242	422.7	243	422.7	1,712	613	2,325,000	
4/2/2013	5	957.0	4	120.0	238	356.3	236	356.3	1,390	573	1,963,000	
4/3/2013	2	960.0	1	103.0	216	300.8	216	300.8	1,310	462	1,772,000	
4/4/2013	5	944.0	2	99.0	200	272.8	201	272.8	1,130	408	1,538,000	
4/5/2013	2	960.0	1	98.0	194	271.5	194	271.5	1,109	390	1,499,000	
4/6/2013	3	958.0	4	92.0	194	260.9	192	260.9	1,130	380	1,510,000	
4/7/2013	2	960.0	1	98.0	193	256.2	194	256.2	1,076	360	1,436,000	
4/8/2013	2	960.0	1	93.0	198	264.8	197	264.8	1,077	389	1,466,000	
4/9/2013	3	957.0	16	182.0	213	432.1	214	432.1	1,990	413	2,403,000	
4/10/2013	71	1009.0	404	234.0	172	739.5	165	739.5	2,184	860	3,044,000	
4/11/2013	638	1343.0	609	17.0	81	1327.9	27	1327.9	3,005	1,273	4,278,000	
4/12/2013	716	1421.0	934	26.0	16	1438.7	0	1438.7	3,286	343	3,629,000	
4/13/2013	447	1417.0	446	0.0	70	1438.7	0	1438.7	3,311	520	3,831,000	
4/14/2013	511	1439.0	1	0.0	85	1157.2	60	1157.2	2,957	0	2,957,000	
4/15/2013	644	1439.0	1	0.0	247	543.1	248	543.1	2,314	0	2,314,000	
4/16/2013	168	1359.0	2	175.0	249	445.3	247	445.3	2,071	82	2,153,000	
4/17/2013	1	960.0	1	140.0	247	435.1	247	435.1	1,606	676	2,282,000	
4/18/2013	5	951.0	3	237.0	234	467.7	231	467.7	1,812	601	2,413,000	
4/19/2013	321	1183.0	452	245.0	125	1103.5	76	1103.5	2,573	1,015	3,588,000	
4/20/2013	11	961.0	1	169.0	248	533.0	246	533.0	1,844	921	2,765,000	
4/21/2013	2	960.0	2	131.0	245	416.0	246	416.0	1,509	631	2,140,000	
4/22/2013	2	960.0	2	111.0	236	351.8	235	351.8	1,272	498	1,770,000	
4/23/2013	3	956.0	3	101.0	216	294.6	215	294.6	1,147	438	1,585,000	
4/24/2013	2	960.0	1	144.0	215	319.9	216	319.9	1,279	415	1,694,000	
4/25/2013	2	960.0	2	120.0	234	363.9	233	363.9	1,384	559	1,943,000	
4/26/2013	4	957.0	5	101.0	212	310.0	216	310.0	1,188	466	1,654,000	
4/27/2013	2	960.0	1	92.0	196	272.0	196	272.0	1,057	400	1,457,000	
4/28/2013	2	960.0	1	83.0	190	256.9	190	256.9	976	354	1,330,000	
4/29/2013	2	960.0	1	77.0	183	243.1	182	243.1	904	320	1,224,000	
4/30/2013	5	956.0	3	72.0	166	222.6	168	222.6	884	301	1,185,000	
5/1/2013	2	960.0	1	68.0	164	210.0	164	210.0	852	284	1,136,000	
5/2/2013	2	960.0	1	63.0	159	197.9	158	197.9	813	264	1,077,000	
5/3/2013	2	960.0	1	107.0	155	190.6	155	190.6	780	254	1,034,000	
5/4/2013	3	958.0	4	110.0	233	370.4	233	370.4	1,239	470	1,709,000	
5/5/2013	2	960.0	2	93.0	217	323.9	217	323.9	1,087	413	1,500,000	
5/6/2013	2	960.0	1	81.0	197	276.0	197	276.0	975	356	1,331,000	
5/7/2013	5	946.0	5	74.0	181	236.3	180	236.3	912	325	1,237,000	
5/8/2013	2	960.0	1	68.0	169	219.0	169	219.0	854	291	1,145,000	
5/9/2013	3	959.0	1	64.0	163	211.1	164	211.1	799	261	1,060,000	
5/10/2013	2	960.0	1	75.0	164	203.4	163	203.4	798	258	1,056,000	
5/11/2013	3	956.0	2	137.0	226	417.2	227	417.2	1,604	452	2,056,000	
5/12/2013	2	960.0	2	109.0	232	355.9	233	355.9	1,280	517	1,797,000	
5/13/2013	2	960.0	1	93.0	208	297.2	208	297.2	1,092	413	1,505,000	
5/14/2013	7	954.0	5	82.0	192	255.6	193	255.6	1,006	367	1,373,000	
5/15/2013	2	960.0	1	74.0	182	237.2	182	237.2	938	325	1,263,000	
5/16/2013	26	906.0	8	69.0	166	218.9	173	218.9	838	302	1,140,000	
5/17/2013	3	958.0	2	64.0	161	210.5	160	210.5	819	269	1,088,000	
5/18/2013	2	960.0	1	77.0	167	222.6	167	222.6	869	255	1,124,000	
5/19/2013	2	960.0	1	66.0	169	227.5	169	227.5	825	279	1,104,000	
5/20/2013	2	960.0	1	60.0	162	214.2	163	214.2	777	252	1,029,000	
5/21/2013	3	959.0	1	59.0	153	197.6	153	197.6	745	241	986,000	
5/22/2013	2	960.0	1	60.0	153	199.4	154	199.4	762	245	1,007,000	
5/23/2013	3	958.0	1	177.0	171	236.5	171	236.5	1,013	286	1,299,000	
5/24/2013	2	960.0	2	119.0	226	356.2	225	356.2	1,334	679	2,013,000	
5/25/2013	3	957.0	2	95.0	192	271.2	192	271.2	1,135	461	1,596,000	
5/26/2013	2	960.0	1	83.0	179	247.0	179	247.0	964	366	1,330,000	
5/27/2013	2	960.0	1	74.0	166	222.6	167	222.6	872	321	1,193,000	
5/28/2013	2	960.0	1	71.0	165	224.1	164	224.1	872	288	1,160,000	
5/29/2013	3	956.0	3	117.0	206	302.8	208	302.8	1,387	333	1,720,000	
5/30/2013	2	960.0	2	95.0	201	280.6	200	280.6	1,144	450	1,594,000	
5/31/2013	18	892.0	16	96.0	182	248.5	183	248.5	987	398	1,385,000	
6/1/2013	4	958.0	3	95.0	201	281.9	203	281.9	1,147	415	1,562,000	
6/2/2013	2	960.0	1	91.0	184	257.2	184	257.2	975	364	1,339,000	
6/3/2013	2	960.0	1	76.0	179	242.2	178	242.2	955	347	1,302,000	
6/4/2013	3	959.0	2	66.0	166	220.9	167	220.9	899	307	1,206,000	
6/5/2013	2	960.0	2	61.0	155	202.7	155	202.7	828	280	1,108,000	
6/6/2013	7	935.0	9	63.0	150	193.4	149	193.4	768	253	1,021,000	
6/7/2013	8	956.0	3	58.0	146	190.3	147	190.3	753	244	997,000	
6/8/2013	4	956.0	1	54.0	142	181.3	140	181.3	700	229	929,000	
6/9/2013	2	960.0	1	51.0	142	185.8	142	185.8	675	207	882,000	

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
6/10/2013	2	960.0	1	50.0	140	181.2	140	181.2	655	195	850,000	
6/11/2013	2	960.0	1	169.0	140	181.2	140	181.2	655	195	850,000	
6/12/2013	3	1631.0	1	227.0	189	237.2	189	237.2	991	205	1,196,000	
6/13/2013	146	1793.0	101	83.0	215	393.1	214	393.1	1,407	442	1,849,000	
6/14/2013	17	957.0	3	41.0	226	470.1	242	470.1	1,436	765	2,201,000	
6/15/2013	2	960.0	2	30.0	204	292.3	205	292.3	1,106	437	1,543,000	
6/16/2013	71	1027.0	1	49.0	197	319.6	196	319.6	1,211	337	1,548,000	
6/17/2013	206	1030.0	2	44.0	231	523.3	232	523.3	1,645	780	2,425,000	
6/18/2013	6	944.0	3	34.0	222	321.7	221	321.7	1,215	484	1,699,000	
6/19/2013	2	960.0	1	27.0	188	254.5	189	254.5	1,008	365	1,373,000	
6/20/2013	2	932.0	1	69.0	163	212.8	163	212.8	858	278	1,136,000	
6/21/2013	2	960.0	1	64.0	160	206.6	159	206.6	822	267	1,089,000	
6/22/2013	3	958.0	1	92.0	172	229.9	172	229.9	939	254	1,193,000	
6/23/2013	2	960.0	2	96.0	211	321.5	211	321.5	1,136	386	1,522,000	
6/24/2013	2	960.0	1	78.0	188	262.9	189	262.9	926	365	1,291,000	
6/25/2013	5	958.0	3	67.0	164	213.9	165	213.9	831	299	1,130,000	
6/26/2013	2	960.0	2	126.0	213	365.7	213	365.7	1,532	350	1,882,000	
6/27/2013	2	960.0	2	97.0	212	310.8	212	310.8	1,146	484	1,630,000	
6/28/2013	3	956.0	2	83.0	185	262.5	182	262.5	985	380	1,365,000	
6/29/2013	2	960.0	1	79.0	184	254.0	184	254.0	929	368	1,297,000	
6/30/2013	2	960.0	1	72.0	169	223.9	169	223.9	839	305	1,144,000	
7/1/2013	2	960.0	1	63.0	158	207.0	159	207.0	758	267	1,025,000	
7/2/2013	6	956.0	7	61.0	147	185.3	148	185.3	717	246	963,000	
7/3/2013	2	960.0	1	53.0	138	171.7	137	171.7	663	226	889,000	
7/4/2013	2	960.0	2	104.0	177	258.7	178	258.7	1,042	231	1,273,000	
7/5/2013	2	960.0	2	75.0	152	202.4	153	202.4	875	379	1,254,000	
7/6/2013	3	955.0	3	66.0	162	213.8	162	213.8	774	294	1,068,000	
7/7/2013	2	960.0	1	63.0	149	191.7	148	191.7	692	250	942,000	
7/8/2013	2	960.0	1	55.0	145	187.2	146	187.2	657	228	885,000	
7/9/2013	4	951.0	3	53.0	137	166.9	136	166.9	678	209	887,000	
7/10/2013	2	960.0	1	73.0	147	183.7	147	183.7	776	219	995,000	
7/11/2013	2	960.0	1	57.0	150	188.9	151	188.9	753	281	1,034,000	
7/12/2013	2	960.0	1	201.0	142	174.2	140	174.2	753	281	1,034,000	
7/13/2013	8	966.0	24	53.0	132	161.6	132	161.6	657	212	869,000	
7/14/2013	2	960.0	1	46.0	132	159.6	132	159.6	606	192	798,000	
7/15/2013	2	960.0	1	46.0	132	160.6	132	160.6	585	182	767,000	
7/16/2013	3	958.0	1	44.0	123	147.1	124	147.1	589	173	762,000	
7/17/2013	2	960.0	1	46.0	117	137.5	116	137.5	580	163	743,000	
7/18/2013	2	960.0	1	42.0	118	141.1	118	141.1	558	169	727,000	
7/19/2013	3	957.0	2	42.0	118	138.1	118	138.1	549	163	712,000	
7/20/2013	2	960.0	1	39.0	116	135.4	116	135.4	533	162	695,000	
7/21/2013	2	960.0	1	38.0	116	137.4	117	137.4	501	141	642,000	
7/22/2013	2	960.0	1	46.0	121	141.8	120	141.8	538	147	685,000	
7/23/2013	3	955.0	4	41.0	120	141.1	121	141.1	542	181	723,000	
7/24/2013	2	960.0	1	40.0	115	131.0	115	131.0	528	159	687,000	
7/25/2013	2	960.0	1	40.0	111	126.5	111	126.5	507	146	653,000	
7/26/2013	2	960.0	1	37.0	113	128.1	113	128.1	497	145	642,000	
7/27/2013	3	955.0	2	44.0	124	141.9	124	141.9	567	148	715,000	
7/28/2013	2	960.0	1	41.0	129	149.4	130	149.4	522	163	685,000	
7/29/2013	2	960.0	1	37.0	122	140.0	122	140.0	510	153	663,000	
7/30/2013	4	956.0	2	38.0	114	131.7	114	131.7	508	153	661,000	
7/31/2013	2	960.0	1	45.0	110	120.9	109	120.9	497	144	641,000	
8/1/2013	2	960.0	1	51.0	136	159.3	137	159.3	638	225	863,000	
8/2/2013	2	960.0	1	37.0	129	145.1	128	145.1	605	191	796,000	
8/3/2013	4	955.0	2	48.0	135	156.8	135	156.8	636	196	832,000	
8/4/2013	2	960.0	1	43.0	130	150.0	129	150.0	566	178	744,000	
8/5/2013	2	960.0	1	39.0	123	141.0	124	141.0	523	159	682,000	
8/6/2013	3	957.0	1	38.0	114	129.5	114	129.5	540	152	692,000	
8/7/2013	2	960.0	1	41.0	110	125.8	111	125.8	533	154	687,000	
8/8/2013	2	960.0	1	43.0	120	137.9	120	137.9	571	169	740,000	
8/9/2013	2	960.0	1	38.0	115	131.6	115	131.6	542	160	702,000	
8/10/2013	4	957.0	1	37.0	113	125.7	112	125.7	530	145	675,000	
8/11/2013	2	960.0	1	37.0	113	127.7	113	127.7	497	135	632,000	
8/12/2013	2	960.0	1	36.0	113	127.2	113	127.2	493	132	625,000	
8/13/2013	4	947.0	2	38.0	112	130.0	114	130.0	525	147	672,000	
8/14/2013	2	960.0	1	32.0	108	120.7	108	120.7	508	132	640,000	
8/15/2013	2	960.0	1	33.0	106	119.7	106	119.7	488	130	618,000	
8/16/2013	2	960.0	1	32.0	109	120.9	108	120.9	499	126	625,000	
8/17/2013	3	946.0	1	34.0	109	121.0	110	121.0	504	127	631,000	
8/18/2013	2	960.0	1	35.0	111	124.0	112	124.0	487	123	610,000	
8/19/2013	2	960.0	1	35.0	109	118.6	108	118.6	473	121	594,000	
8/20/2013	3	952.0	1	33.0	105	125.0	105	125.0	482	121	603,000	
8/21/2013	2	960.0	1	32.0	105	114.6	105	114.6	481	123	604,000	
8/22/2013	2	960.0	1	31.0	105	115.3	105	115.3	485	127	612,000	
8/23/2013	2	960.0	1	36.0	107	117.9	107	117.9	498	115	613,000	
8/24/2013	3	956.0	1	36.0	106	114.9	105	114.9	500	124	624,000	
8/25/2013	2	960.0	1	11.0	110	121.1	111	121.1	481	125	606,000	
8/26/2013	2	960.0	1	107.0	110	121.1	111	121.1	481	125	606,000	
8/27/2013	4	2392.0	3	37.0	212	235.2	213	235.2	1,125	131	1,256,000	
8/28/2013	2	960.0	1	38.0	108	118.3	107	118.3	504	130	634,000	

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			Rainflow Total (in):
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	
8/29/2013	2	960.0	1	35.0	109	120.2	109	120.2	490	127	617,000	
8/30/2013	4	809.0	103	36.0	108	117.2	109	117.2	424	198	622,000	
8/31/2013	3	943.0	7	37.0	109	116.8	109	116.8	497	121	618,000	
9/1/2013	2	960.0	1	30.0	109	119.2	108	119.2	437	113	550,000	
9/2/2013	2	960.0	1	33.0	110	122.5	111	122.5	426	113	539,000	
9/3/2013	2	960.0	1	32.0	113	127.2	113	127.2	461	120	581,000	
9/4/2013	3	931.0	4	35.0	102	116.2	101	116.2	493	121	614,000	
9/5/2013	2	960.0	1	34.0	100	112.2	100	112.2	506	117	623,000	
9/6/2013	2	960.0	1	31.0	99	111.1	100	111.1	485	115	600,000	
9/7/2013	20	1386.0	28	57.0	95	108.5	95	108.5	1,746	364	2,110,000	
9/8/2013	2	960.0	1	47.0	114	137.9	113	137.9	563	120	683,000	
9/9/2013	2	960.0	1	40.0	116	140.3	117	140.3	540	166	706,000	
9/10/2013	2	960.0	1	39.0	106	122.4	105	122.4	547	146	693,000	
9/11/2013	2	960.0	1	117.0	106	122.4	105	122.4	547	146	693,000	
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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
11/17/2013	0	0.0	2	16.0	0	8.0	1	8.0	568,900	673,400	1,242,300	
1/1/1900	10	4.8	6	15.8	2	2.3	92	2.3	1,195,100	197,800	1,392,900	
11/19/2013	0	0.0	0	0.8	0	0.4	1	0.4	34,000	18,400	1,080,900	
11/20/2013	2	8.8	1	0.0	0	15.1	1	15.1	419,500	585,300	1,004,800	
11/21/2013	1	0.1	1	8.0	0	1.3	1	1.3	342,100	56,400	965,400	
11/22/2013	3	8.0	3	8.0	1	7.9	4	7.9	693,800	246,400	940,200	
11/23/2013	2	8.6	1	0.0	0	15.1	1	15.1	370,000	533,300	903,300	
11/24/2013	0	0.0	1	0.1	0	0.0	1	0.0	1,100	300	894,400	
11/25/2013	3	4.6	1	0.6	1	8.0	2	8.0	310,400	301,000	611,400	
11/26/2013	1	8.0	1	2.5	0	13.4	2	13.4	407,800	535,000	942,800	
11/27/2013	2	14.9	2	1.0	1	8.0	2	8.0	596,200	295,400	891,600	
11/28/2013	1	8.0	1	8.0	0	8.0	1	8.0	549,900	252,300	802,200	
11/29/2013	1	8.0	1	8.0	0	8.0	1	8.0	811,600	269,600	1,081,200	
11/30/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,453,000	277,300	1,730,300	
12/1/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,892,500	285,500	2,178,000	
12/2/2013	3	8.1	2	8.0	1	8.0	2	8.0	1,708,700	278,500	1,987,200	
12/3/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,707,300	359,700	2,067,000	
12/4/2013	5	12.2	5	10.2	0	1.1	2	1.1	1,882,600	47,500	1,930,100	
12/5/2013	3	4.2	4	9.7	1	10.0	5	10.0	1,866,200	398,900	2,265,100	
12/6/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,546,900	264,500	1,811,400	
12/7/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,834,600	241,400	2,076,000	
12/8/2013	1	8.0	1	8.0	0	8.0	1	8.0	2,168,000	229,500	2,397,500	
12/9/2013	1	8.0	1	8.0	0	8.0	1	8.0	2,146,300	229,500	2,375,800	
12/10/2013	2	7.9	2	8.0	1	8.0	2	8.0	2,408,300	218,400	2,626,700	
12/11/2013	1	8.0	1	8.0	0	8.0	1	8.0	2,332,200	211,200	2,543,400	
12/12/2013	1	8.0	1	8.0	0	8.0	1	8.0	2,449,000	207,200	2,656,200	
12/13/2013	6	7.7	4	8.1	1	8.1	4	8.1	1,881,700	197,800	2,079,500	
12/14/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,995,000	183,700	2,178,700	
12/15/2013	1	8.0	1	8.0	0	7.9	1	7.9	2,310,100	179,500	2,489,600	
12/16/2013	3	7.9	2	8.0	1	8.1	2	8.1	2,209,000	180,900	2,389,900	
12/17/2013	1	8.0	1	8.0	0	7.9	1	7.9	2,001,400	181,700	2,183,100	
12/18/2013	14	4.2	5	9.4	4	8.1	7	8.1	2,336,700	182,000	2,518,700	
12/19/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,504,400	174,100	1,678,500	
12/20/2013	2	8.0	1	8.0	0	8.0	1	8.0	1,476,400	171,200	1,647,600	
12/21/2013	1	8.0	1	8.0	0	7.9	1	7.9	1,690,500	171,400	1,861,900	
12/22/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,484,800	180,700	1,665,500	
12/23/2013	3	3.6	3	12.3	1	8.0	2	8.0	1,306,600	174,800	1,481,400	
12/24/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,923,400	175,300	2,098,700	
12/25/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,805,700	176,800	1,982,500	
12/26/2013	2	7.9	2	8.0	1	8.0	2	8.0	1,650,900	170,900	1,821,800	
12/27/2013	2	4.9	1	8.0	0	11.1	2	11.1	1,872,800	292,100	2,164,900	
12/28/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,848,800	179,500	2,028,300	
12/29/2013	1	8.0	1	8.0	0	8.0	1	8.0	1,352,000	200,500	1,552,500	
12/30/2013	6	7.2	3	8.1	0	8.1	9	8.1	1,314,800	213,900	1,528,700	
12/31/2013	1	0.0	1	0.0	0	23.8	1	23.8	1,137,400	738,000	1,875,400	
Total	5011	249466.6	3736	21260.6	39309	59927.4	43510	59927.4	65,028,796	11,413,051	383,572,300	0.00
Ave	17	834.3	12	71.1	131	200.4	146	200.4	217,488	38,171	1,282,851	#DIV/0!
Max	716	2392.0	934	368.0	249	1438.7	473	1438.7	2,449,000	738,000	4,278,000	0.00
Min	0	0.0	0	0.0	0	0.0	0	0.0	424	0	539,000	0.00
Median	2	960.0	1	68.0	142	174.3	146	174.3	852	281	1,089,000	#NUM!

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
1/1/2014	1	2.8	3	14.2	0	7.0	2	7.0	2,838,800	168,600	3,007,400	0.00
1/2/2014	2	3.6	2	8.3	0	12.1	3	12.1	2,352,700	312,700	2,665,400	0.00
1/3/2014	3	7.9	2	8.0	1	8.0	2	8.0	2,130,000	176,600	2,306,600	0.00
1/4/2014	1	8.0	1	8.0	0	8.0	1	8.0	2,035,300	173,700	2,209,000	0.00
1/5/2014	1	8.0	1	8.0	0	8.0	1	8.0	2,361,100	173,600	2,534,700	0.00
1/6/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,833,400	176,000	2,009,400	0.00
1/7/2014	8	7.3	5	8.1	4	8.0	3	8.0	1,965,600	171,000	2,136,600	0.00
1/8/2014	3	7.8	1	8.0	0	8.0	2	8.0	1,537,900	170,600	1,708,500	0.00
1/9/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,076,600	166,300	1,242,900	0.00
1/10/2014	2	8.0	2	8.0	1	8.0	2	8.0	1,103,400	171,500	1,274,900	0.31
1/11/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,240,200	235,800	1,476,000	0.01
1/12/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,149,400	221,400	1,370,800	0.00
1/13/2014	4	7.9	4	8.0	1	8.1	5	8.1	1,359,000	244,500	1,603,500	0.00
1/14/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,381,800	271,200	1,653,000	0.00
1/15/2014	3	7.8	2	8.0	2	8.0	2	8.0	1,265,300	259,800	1,525,100	0.00
1/16/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,130,600	242,600	1,373,200	0.00
1/17/2014	3	8.0	2	8.0	1	8.0	2	8.0	924,000	233,700	1,157,700	0.00
1/18/2014	1	8.0	1	8.0	0	8.0	1	8.0	884,200	217,800	1,102,000	0.00
1/19/2014	1	8.0	1	8.0	0	8.0	1	8.0	866,600	215,700	1,082,300	0.00
1/20/2014	6	7.5	5	8.4	1	8.0	3	8.0	781,400	205,600	987,000	0.00
1/21/2014	10	3.1	7	11.1	5	8.1	11	8.1	687,500	208,900	896,400	0.00
1/22/2014	3	3.9	2	7.6	44	9.8	3	9.8	773,900	262,800	1,036,700	0.00
1/23/2014	1	8.0	1	8.0	0	7.9	1	7.9	806,800	193,800	1,000,600	0.00
1/24/2014	3	4.6	2	11.3	1	8.1	2	8.1	769,200	189,600	958,800	0.00
1/25/2014	1	8.0	1	8.0	0	7.9	1	7.9	963,300	196,000	1,159,300	0.00
1/26/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,112,500	189,100	1,301,600	0.00
1/27/2014	3	8.0	2	8.0	1	8.1	2	8.1	853,700	190,000	1,043,700	0.00
1/28/2014	1	7.9	1	8.0	0	7.9	1	7.9	1,159,000	185,700	1,344,700	0.00
1/29/2014	2	8.0	2	8.0	1	8.1	2	8.1	992,900	181,800	1,174,700	0.00
1/30/2014	1	8.0	1	8.0	0	7.9	1	7.9	1,072,900	180,500	1,253,400	0.00
1/31/2014	3	7.9	2	8.0	1	8.1	2	8.1	1,282,400	176,700	1,459,100	0.00
2/1/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,611,100	173,000	1,784,100	0.00
2/2/2014	1	8.0	1	8.0	0	7.9	1	7.9	1,780,800	170,500	1,951,300	0.00
2/3/2014	2	8.0	2	8.0	1	8.0	2	8.0	1,912,400	172,400	2,084,800	0.00
2/4/2014	2	6.1	6	9.2	0	8.2	8	8.2	2,119,700	180,100	2,299,800	0.00
2/5/2014	3	8.0	2	8.0	1	8.0	2	8.0	730,700	162,400	893,100	0.00
2/6/2014	4	4.6	5	1.1	1	16.6	6	16.6	800,900	450,200	1,251,100	0.00
2/7/2014	3	3.0	2	15.0	1	6.0	3	6.0	524,600	201,900	726,500	0.00
2/8/2014	1	8.0	1	8.0	0	8.0	1	8.0	649,300	156,500	805,800	0.00
2/9/2014	1	7.9	1	8.0	0	8.0	1	8.0	596,700	157,000	753,700	0.00
2/10/2014	2	8.0	2	8.0	1	8.0	2	8.0	587,300	157,600	744,900	0.00
2/11/2014	2	4.3	1	11.7	0	8.0	1	8.0	619,700	158,500	778,200	0.00
2/12/2014	1	8.0	1	8.0	0	8.0	1	8.0	555,100	165,800	720,900	0.00
2/13/2014	1	8.0	1	8.0	0	8.0	1	8.0	435,600	152,300	587,900	0.00
2/14/2014	3	8.0	2	8.0	1	7.9	2	7.9	401,000	156,100	557,100	0.00
2/15/2014	1	8.0	1	8.0	0	8.0	1	8.0	419,200	150,800	570,000	0.00
2/16/2014	1	8.0	1	8.0	0	8.0	1	8.0	460,100	148,700	608,800	0.00
2/17/2014	3	7.9	2	8.0	1	8.0	2	8.0	418,100	155,300	573,400	0.00
2/18/2014	1	8.0	1	8.0	0	8.0	1	8.0	518,100	156,200	674,300	0.14
2/19/2014	4	6.4	4	8.0	21	8.1	3	8.1	528,100	156,000	684,100	0.01
2/20/2014	1	8.0	1	8.0	0	8.0	1	8.0	835,300	212,100	1,047,400	0.42
2/21/2014	4	7.9	3	8.1	1	8.0	3	8.0	1,121,300	412,400	1,533,700	0.00
2/22/2014	1	8.0	1	8.0	0	8.0	1	8.0	782,100	303,400	1,085,500	0.00
2/23/2014	1	8.0	1	8.0	0	8.0	1	8.0	655,100	261,100	916,200	0.00
2/24/2014	5	7.3	3	8.0	6	8.0	3	8.0	652,700	247,200	899,900	0.00
2/25/2014	1	8.0	1	8.0	0	8.0	1	8.0	611,900	230,100	842,000	0.00
2/26/2014	3	3.9	2	11.7	1	8.0	5	8.0	592,600	233,400	826,000	0.00
2/27/2014	1	8.0	1	8.0	0	8.0	1	8.0	568,700	216,300	785,000	0.00
2/28/2014	5	3.8	2	12.2	1	8.0	4	8.0	505,800	207,700	713,500	0.00
3/1/2014	1	8.0	1	8.0	0	8.0	1	8.0	527,600	188,300	715,900	0.00
3/2/2014	1	8.0	1	8.0	0	8.0	1	8.0	548,300	185,700	734,000	0.00
3/3/2014	9	2.0	8	12.1	0	8.0	2	8.0	476,500	198,700	675,200	0.00
3/4/2014	1	7.9	1	8.0	0	8.0	1	8.0	489,200	185,100	674,300	0.00
3/5/2014	5	8.0	2	8.0	1	8.0	2	8.0	489,000	182,000	671,000	0.00
3/6/2014	1	8.0	1	8.0	0	8.0	1	8.0	574,100	181,200	755,300	0.00
3/7/2014	8	7.6	7	8.1	3	8.0	2	8.0	612,800	181,700	794,500	0.00
3/9/2014												0.00
1/1/1900	1	8.0	1	8.0	0	7.0	1	7.0	552,400	168,600	721,000	0.00
3/10/2014	4	7.8	3	8.0	1	8.0	3	8.0	1,053,500	231,900	1,285,400	0.00
3/11/2014	1	0.0	1	16.0	0	8.0	2	8.0	1,500,700	523,500	2,024,200	0.00
3/12/2014	5	3.5	6	9.4	82	8.0	4	8.0	1,629,000	589,200	2,218,200	0.00
3/13/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,516,200	459,200	1,975,400	0.00
3/14/2014	3	3.8	2	8.0	1	12.2	3	12.2	1,348,200	702,700	2,050,900	0.00
3/15/2014	1	0.0	1	16.0	0	8.0	2	8.0	1,399,900	663,500	2,063,400	0.00
3/16/2014	1	8.0	1	8.0	0	7.9	1	7.9	1,446,500	517,800	1,964,300	0.00
3/17/2014	3	3.3	2	12.6	1	8.1	3	8.1	1,243,800	426,200	1,670,000	0.00
3/18/2014	1	8.0	1	8.0	0	7.9	1	7.9	1,405,100	380,800	1,785,900	0.00
3/19/2014	5	4.8	4	8.1	75	8.0	4	8.0	1,292,300	471,800	1,764,100	0.00
3/20/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,481,400	521,500	2,002,900	0.00
3/21/2014	3	7.9	2	8.0	1	8.0	3	8.0	1,368,800	525,800	1,894,600	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
3/22/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,290,500	500,600	1,791,100	0.00
3/23/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,150,700	426,600	1,577,300	0.00
3/24/2014	3	7.8	2	8.0	1	8.0	3	8.0	1,068,700	378,300	1,447,000	0.00
3/25/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,089,600	361,000	1,450,600	0.00
3/26/2014	4	7.9	3	8.1	1	8.0	3	8.0	1,093,000	324,800	1,417,800	0.00
3/27/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,116,100	341,900	1,458,000	0.00
3/28/2014	4	0.1	4	15.9	1	8.1	6	8.1	1,794,300	825,200	2,619,500	0.00
3/29/2014	1	0.0	1	15.9	0	8.0	2	8.0	1,368,500	611,900	1,980,400	0.00
3/30/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,618,300	506,700	2,125,000	0.00
3/31/2014	4	7.9	3	8.0	1	8.0	3	8.0	1,792,500	474,900	2,267,400	0.00
4/1/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,791,100	463,900	2,255,000	0.00
4/2/2014	4	4.2	3	8.1	89	8.0	3	8.0	1,488,600	403,900	1,892,500	0.00
4/3/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,573,000	383,200	1,956,200	0.00
4/4/2014	5	7.7	4	8.0	1	8.0	3	8.0	1,567,900	366,600	1,934,500	0.02
4/5/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,489,000	345,800	1,834,800	0.00
4/6/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,344,900	341,200	1,686,100	0.00
4/7/2014	5	7.7	6	8.2	1	8.0	6	8.0	1,298,700	336,100	1,634,800	0.00
4/8/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,357,500	341,900	1,699,400	0.11
4/9/2014	4	3.5	3	11.4	30	8.0	5	8.0	1,134,700	300,800	1,435,500	0.00
4/10/2014	2	2.4	1	8.0	0	13.7	2	13.7	1,382,400	45,000	1,427,400	0.00
4/11/2014	5	7.7	3	8.1	1	7.6	83	7.6	1,179,300	311,100	1,490,400	0.00
4/12/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,305,700	313,700	1,619,400	0.39
4/13/2014	18	0.3	11	16.3	0	8.7	139	8.7	2,036,300	511,800	2,548,100	1.85
4/14/2014	9	0.1	9	11.6	10	2.1	109	2.1	2,997,000	808,700	3,805,700	0.34
4/15/2014	1	0.0	1	16.0	0	8.0	2	8.0	1,961,300	904,300	2,865,600	0.00
4/16/2014	6	0.0	6	15.9	1	8.0	7	8.0	1,727,900	676,500	2,404,400	0.00
4/17/2014	1	8.0	1	7.9	0	8.0	1	8.0	1,992,600	567,400	2,560,000	0.00
4/18/2014	16	4.1	16	10.5	1	8.8	15	8.8	1,720,900	540,000	2,260,900	0.00
4/19/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,766,500	415,800	2,182,300	0.00
4/20/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,616,600	386,500	2,003,100	0.01
4/21/2014	4	7.9	3	8.0	1	7.9	2	7.9	1,481,900	359,600	1,841,500	0.14
4/22/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,410,300	384,700	1,795,000	0.01
4/23/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,347,800	344,900	1,692,700	0.00
4/24/2014	4	7.9	2	8.0	1	8.0	3	8.0	1,404,900	327,300	1,732,200	0.18
4/25/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,562,800	383,400	1,946,200	0.09
4/26/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,412,200	345,800	1,758,000	0.00
4/27/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,318,200	322,600	1,640,800	0.02
4/28/2014	6	7.9	2	0.0	1	16.0	3	16.0	1,684,200	894,200	2,578,400	0.52
4/29/2014	1	0.0	1	16.0	0	8.0	2	8.0	2,043,100	703,300	2,746,400	0.51
4/30/2014	3	0.0	5	15.8	1	8.1	4	8.1	1,787,200	779,300	2,566,500	0.01
5/1/2014	1	0.0	1	15.9	0	8.0	2	8.0	1,844,000	589,200	2,433,200	0.04
5/2/2014	4	8.0	3	8.1	1	7.9	3	7.9	1,795,100	501,200	2,296,300	0.09
5/3/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,689,300	472,700	2,162,000	0.01
5/4/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,766,300	429,900	2,196,200	0.00
5/5/2014	5	7.9	3	8.0	1	8.0	3	8.0	1,699,700	385,500	2,085,200	0.00
5/6/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,347,900	356,100	1,704,000	0.00
5/7/2014	5	1.7	4	14.2	1	8.1	4	8.1	1,042,900	335,400	1,378,300	0.16
5/8/2014	1	8.0	1	8.0	0	7.9	1	7.9	1,203,500	335,500	1,539,000	0.00
5/9/2014	4	7.8	3	8.1	1	8.1	3	8.1	1,316,000	320,100	1,636,100	0.14
5/10/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,340,100	318,900	1,659,000	0.00
5/11/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,112,400	304,200	1,416,600	0.05
5/12/2014	5	6.6	3	9.3	1	8.0	4	8.0	1,846,600	352,800	2,199,400	0.81
5/13/2014	51	0.5	1	16.0	0	8.0	2	8.0	2,268,100	947,000	3,215,100	0.09
5/14/2014	3	0.1	3	13.9	69	8.0	4	8.0	1,880,200	630,400	2,510,600	0.00
5/15/2014	1	0.0	1	16.0	0	8.0	2	8.0	1,843,900	565,500	2,409,400	0.25
5/16/2014	4	1.3	3	14.6	1	8.0	4	8.0	1,707,900	529,200	2,237,100	0.00
5/17/2014	1	3.6	1	12.4	0	8.0	2	8.0	1,638,500	440,200	2,078,700	0.00
5/18/2014	0	0.0	13	15.8	0	8.1	14	8.1	1,216,500	398,200	1,614,700	0.00
5/19/2014	1	0.0	21	15.6	1	8.1	22	8.1	1,191,800	355,600	1,547,400	0.05
5/20/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,523,900	337,700	1,861,600	0.00
5/21/2014	1	8.0	1	8.0	0	8.0	1	8.0	2,046,400	320,200	2,366,600	0.01
5/22/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,821,500	291,100	2,112,600	0.00
5/23/2014	3	0.9	2	15.1	1	8.0	3	8.0	1,106,000	270,000	1,376,000	0.00
5/24/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,341,000	256,600	1,597,600	0.00
5/25/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,636,500	242,800	1,879,300	0.00
5/26/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,957,800	240,900	2,198,700	0.13
5/27/2014	5	7.9	4	8.0	1	8.0	3	8.0	2,028,300	256,400	2,284,700	0.38
5/28/2014	1	8.0	1	8.0	0	8.0	1	8.0	2,109,400	280,800	2,390,200	0.00
5/29/2014	1	8.0	1	8.0	0	8.0	1	8.0	2,033,800	255,300	2,289,100	0.00
5/30/2014	4	7.9	3	8.0	1	8.0	3	8.0	2,187,400	246,000	2,433,400	0.00
5/31/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,993,700	231,800	2,225,500	0.00
6/1/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,868,400	239,900	2,108,300	0.58
6/2/2014	9	5.8	3	10.1	2	8.0	5	8.0	2,407,500	329,700	2,737,200	0.21
6/3/2014	1	8.0	1	8.0	0	8.0	1	8.0	2,180,400	307,900	2,488,300	0.00
6/4/2014	3	5.4	2	8.0	49	8.0	2	8.0	1,700,700	263,700	1,964,400	0.11
6/5/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,968,200	261,200	2,229,400	0.00
6/6/2014	4	7.9	2	8.0	1	8.0	2	8.0	1,846,200	241,400	2,087,600	0.00
6/7/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,721,300	229,500	1,950,800	0.00
6/8/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,788,100	219,800	2,007,900	0.00
6/9/2014	6	7.9	3	8.0	1	8.0	3	8.0	1,850,700	212,100	2,062,800	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
6/10/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,848,300	203,200	2,051,500	0.07
6/11/2014	3	5.2	2	8.0	67	8.0	5	8.0	2,689,600	266,500	2,956,100	1.18
6/12/2014	1	0.0	1	16.0	0	8.0	2	8.0	2,335,200	526,800	2,862,000	0.00
6/13/2014	3	7.9	2	8.0	1	8.0	2	8.0	2,516,800	358,000	2,874,800	0.00
6/14/2014	1	8.0	1	8.0	0	8.0	1	8.0	2,266,800	297,900	2,564,700	0.00
6/15/2014	1	8.0	1	8.0	0	8.0	1	8.0	2,029,400	269,400	2,298,800	0.00
6/16/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,865,200	259,100	2,124,300	0.00
6/17/2014	4	0.0	5	15.9	2	8.0	7	8.0	2,252,000	408,200	2,660,200	0.74
6/18/2014	146	1.0	151	9.3	6	11.6	304	11.6	3,276,700	1,871,000	5,147,700	2.09
6/19/2014	3	0.1	31	15.8	0	7.3	149	7.3	2,864,800	882,800	3,747,600	0.05
6/20/2014	1	0.0	4	15.9	1	5.4	460	5.4	2,626,800	676,600	3,303,400	0.29
6/21/2014	0	0.0	1	16.0	0	5.4	458	5.4	2,272,100	666,100	2,938,200	0.01
6/22/2014												0.00
6/23/2014	0	0.0	4	15.9	0	4.6	459	4.6	2,430,600	568,700	2,999,300	0.00
6/24/2014	12	1.0	66	14.1	21	8.1	162	8.1	3,089,300	1,149,000	4,238,300	0.33
6/25/2014	1	0.0	5	14.6	1	7.4	398	7.4	2,281,300	954,000	3,235,300	0.00
6/26/2014	0	0.0	3	15.8	0	5.5	399	5.5	1,815,700	609,000	2,424,700	0.00
6/27/2014	2	0.1	4	15.8	1	8.1	4	8.1	1,959,900	472,200	2,432,100	0.00
6/28/2014	0	0.0	1	16.1	0	7.9	1	7.9	1,726,900	400,100	2,127,000	0.02
6/29/2014	0	0.0	1	16.0	0	8.0	1	8.0	1,629,900	374,000	2,003,900	0.05
6/30/2014	1	0.0	3	15.9	1	8.0	3	8.0	1,937,100	448,100	2,385,200	0.95
7/1/2014	0	0.0	1	16.0	0	8.0	2	8.0	2,424,600	746,800	3,171,400	0.03
7/2/2014	0	0.0	1	16.0	0	8.0	1	8.0	2,208,500	484,500	2,693,000	0.02
7/3/2014	1	0.0	4	16.0	1	8.0	3	8.0	1,758,600	406,500	2,165,100	0.00
7/4/2014	0	0.0	1	16.0	0	8.0	1	8.0	1,574,600	338,700	1,913,300	0.00
7/5/2014	0	0.0	1	16.0	0	8.0	1	8.0	1,605,200	307,100	1,912,300	0.00
7/6/2014	0	0.0	1	16.0	0	8.0	1	8.0	1,518,000	287,200	1,805,200	0.04
7/7/2014	4	5.9	6	10.0	3	8.0	3	8.0	1,499,200	281,400	1,780,600	0.00
7/8/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,528,600	291,200	1,819,800	0.29
7/9/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,629,300	281,900	1,911,200	0.00
7/10/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,418,100	257,800	1,675,900	0.00
7/11/2014	4	7.9	3	8.0	1	8.0	4	8.0	1,405,400	249,600	1,655,000	0.00
7/12/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,257,400	226,500	1,483,900	0.07
7/13/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,186,300	231,200	1,417,500	0.00
7/14/2014	4	8.0	3	8.0	1	8.0	3	8.0	1,135,700	212,400	1,348,100	0.00
7/15/2014	3	7.9	1	8.0	0	8.0	2	8.0	1,146,200	271,600	1,417,800	0.14
7/16/2014	4	8.0	2	8.0	1	8.0	2	8.0	862,300	224,900	1,087,200	0.00
7/17/2014	1	8.0	1	8.0	0	8.0	1	8.0	728,000	201,900	929,900	0.00
7/18/2014	3	7.9	2	8.0	1	8.0	2	8.0	680,200	191,900	872,100	0.00
7/19/2014	1	8.0	1	8.0	0	8.0	1	8.0	575,600	174,300	749,900	0.00
7/20/2014	1	8.0	1	8.0	0	8.0	1	8.0	535,600	173,900	709,500	0.00
7/21/2014	4	7.9	2	8.0	1	8.0	6	8.0	567,000	169,200	736,200	0.00
7/22/2014	1	8.0	1	8.0	0	8.0	1	8.0	630,300	164,200	794,500	0.00
7/23/2014	1	8.0	1	8.0	0	8.0	1	8.0	515,100	161,100	676,200	0.00
7/24/2014	3	5.8	3	0.0	1	18.1	4	18.1	720,500	446,300	1,166,800	0.00
7/25/2014	0	0.0	1	7.0	0	17.0	2	17.0	541,900	418,000	959,900	0.01
7/26/2014	1	9.0	1	7.0	0	8.0	1	8.0	318,000	148,900	466,900	0.00
7/27/2014	1	9.0	1	7.0	0	8.0	1	8.0	365,700	150,100	515,800	0.48
7/28/2014	4	8.9	3	7.1	1	8.0	8	8.0	460,600	156,300	616,900	0.00
7/29/2014	1	9.0	1	7.0	0	8.0	1	8.0	330,400	160,900	491,300	0.26
7/30/2014	6	7.7	3	8.0	3	8.0	4	8.0	359,400	174,000	533,400	0.01
7/31/2014	35	6.2	12	9.3	2	8.2	4	8.2	430,700	137,200	567,900	0.00
8/1/2014	197	9.6	3	8.0	2	8.0	5	8.0	559,800	34,900	594,700	0.76
8/2/2014	1	8.0	1	8.0	0	8.0	1	8.0	515,100	222,800	737,900	0.00
8/3/2014	1	7.9	1	8.0	0	8.0	1	8.0	476,100	185,800	661,900	0.13
8/4/2014	7	15.6	0	0.0	0	8.1	7	8.1	575,600	177,000	752,600	0.07
8/5/2014	4	6.0	3	8.0	26	8.0	3	8.0	373,200	227,200	600,400	0.00
8/6/2014	5	7.8	2	8.0	0	8.0	3	8.0	319,500	161,900	481,400	0.00
8/7/2014	1	8.0	1	8.0	0	8.0	1	8.0	173,600	158,100	331,700	0.00
8/8/2014	4	7.9	2	8.0	1	8.0	2	8.0	158,300	149,800	308,100	0.00
8/9/2014	1	8.0	1	8.0	0	8.0	1	8.0	147,000	143,000	290,000	0.00
8/10/2014	1	8.0	1	8.0	0	8.0	1	8.0	171,200	143,400	314,600	0.00
8/11/2014	2	7.9	2	8.0	1	8.0	2	8.0	243,600	211,700	455,300	0.31
8/12/2014	1	8.0	1	8.0	0	8.0	1	8.0	282,800	178,000	460,800	0.25
8/13/2014	4	8.0	2	8.0	1	8.0	2	8.0	265,500	187,500	453,000	0.00
8/14/2014	1	8.0	1	8.0	0	8.0	1	8.0	294,900	168,000	462,900	0.00
8/15/2014	3	7.9	2	8.0	1	8.0	2	8.0	207,400	161,600	369,000	0.00
8/16/2014	1	8.0	1	8.0	0	8.0	1	8.0	156,400	157,700	314,100	0.00
8/17/2014	1	8.0	1	8.0	0	8.0	1	8.0	202,900	183,400	386,300	0.39
8/18/2014	1	8.0	1	8.0	0	8.0	1	8.0	237,000	167,500	404,500	0.00
8/19/2014	6	0.0	6	16.0	1	8.0	5	8.0	493,400	287,400	780,800	1.00
8/20/2014	1	8.0	1	8.0	0	8.0	1	8.0	389,500	234,500	624,000	0.00
8/21/2014	1	8.0	1	8.0	0	8.0	1	8.0	405,500	205,300	610,800	0.25
8/22/2014	3	8.0	2	8.0	1	7.9	2	7.9	361,400	225,600	587,000	0.00
8/23/2014	1	8.0	1	8.0	0	8.0	1	8.0	383,900	200,000	583,900	0.00
8/24/2014	1	8.0	1	8.0	0	8.0	1	8.0	350,200	184,600	534,800	0.04
8/25/2014	2	7.9	2	8.0	0	8.0	2	8.0	363,300	187,600	550,900	0.17
8/26/2014	1	8.0	1	8.0	0	8.0	1	8.0	325,900	204,500	530,400	0.00
8/27/2014	1	8.0	1	8.0	0	8.0	1	8.0	321,700	191,600	513,300	0.00
8/28/2014	1	8.0	1	8.0	0	8.0	1	8.0	348,000	183,000	531,000	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			Rainflow Total (in):
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	
8/29/2014	5	8.0	3	8.0	1	8.0	2	8.0	303,900	176,800	480,700	0.04
8/30/2014	1	8.0	1	8.0	0	8.0	1	8.0	220,800	169,100	389,900	0.05
8/31/2014	1	8.0	1	8.0	0	8.0	1	8.0	258,700	166,500	425,200	0.00
9/1/2014	1	8.0	1	8.0	0	8.0	1	8.0	255,600	165,200	420,800	0.03
9/2/2014	4	7.8	2	8.0	1	8.1	2	8.1	291,100	157,400	448,500	0.00
9/3/2014	1	8.0	1	8.0	0	8.0	1	8.0	292,700	154,300	447,000	0.00
9/4/2014	4	7.9	3	8.1	1	8.0	4	8.0	353,600	158,000	511,600	0.01
9/5/2014	1	8.0	1	8.0	0	8.0	1	8.0	294,400	145,000	439,400	0.00
9/6/2014	1	8.0	1	8.0	0	8.0	1	8.0	290,900	140,300	431,200	0.00
9/7/2014	1	8.0	1	8.0	0	8.0	1	8.0	396,800	152,600	549,400	0.00
9/8/2014	4	7.9	3	8.0	1	8.0	4	8.0	468,100	145,100	613,200	0.00
9/9/2014	1	8.0	1	8.0	0	8.0	1	8.0	454,200	146,700	600,900	0.00
9/10/2014	4	8.0	2	8.0	1	8.0	2	8.0	390,500	143,200	533,700	0.31
9/11/2014	1	8.0	1	8.0	0	8.0	1	8.0	381,200	154,900	536,100	0.00
9/12/2014	4	1.4	2	13.9	0	8.1	5	8.1	307,500	161,300	468,800	0.19
9/13/2014	1	7.9	1	8.0	0	8.0	1	8.0	535,800	163,500	699,300	0.01
9/14/2014	1	8.0	1	7.9	0	8.0	1	8.0	446,500	152,900	599,400	0.00
9/15/2014	4	8.0	2	8.0	1	8.0	2	8.0	478,100	153,700	631,800	0.22
9/16/2014	1	8.0	1	8.0	0	8.0	1	8.0	493,800	167,200	661,000	0.00
9/17/2014	3	7.9	2	8.0	1	8.0	2	8.0	500,900	158,900	659,800	0.00
9/18/2014	1	8.0	1	8.0	0	8.0	1	8.0	498,100	149,100	647,200	0.00
9/19/2014	4	2.4	4	13.6	1	8.0	7	8.0	505,300	149,800	655,100	0.00
9/20/2014	1	8.0	1	8.0	0	8.0	1	8.0	538,200	141,000	679,200	0.16
9/21/2014	1	8.0	1	8.0	0	8.0	1	8.0	548,400	154,900	703,300	0.01
9/22/2014	2	3.1	2	11.8	1	8.1	4	8.1	523,100	164,900	688,000	0.00
9/23/2014	1	8.0	1	8.0	0	8.0	1	8.0	509,200	142,900	652,100	0.00
9/24/2014	1	8.0	1	8.0	0	8.0	1	8.0	522,500	138,800	661,300	0.00
9/25/2014	1	8.0	1	8.0	0	7.9	1	7.9	477,700	136,200	613,900	0.00
9/26/2014	3	7.9	2	8.1	1	8.0	2	8.0	451,300	139,600	590,900	0.00
9/27/2014	1	8.0	1	8.0	0	8.0	1	8.0	441,400	138,700	580,100	0.00
9/28/2014	1	8.0	1	8.0	0	8.0	1	8.0	458,400	133,400	591,800	0.00
9/29/2014	4	7.9	3	8.0	1	8.0	3	8.0	458,100	131,600	589,700	0.12
9/30/2014	1	8.0	1	8.0	0	8.0	1	8.0	417,600	132,900	550,500	0.01
10/1/2014	1	8.0	1	8.0	0	8.0	1	8.0	419,200	127,500	546,700	0.00
10/2/2014	1	8.0	1	8.0	0	8.0	1	8.0	534,400	159,700	694,100	0.54
10/3/2014	4	1.2	3	14.8	1	8.0	5	8.0	799,400	213,200	1,012,600	0.52
10/4/2014	1	8.0	1	8.0	0	8.0	1	8.0	564,000	204,200	768,200	0.01
10/5/2014	1	8.0	1	8.0	0	8.0	1	8.0	532,600	179,500	712,100	0.00
10/6/2014	4	7.8	3	8.0	1	8.0	3	8.0	487,400	169,400	656,800	0.00
10/7/2014	1	8.0	1	8.0	0	8.0	1	8.0	473,400	158,600	632,000	0.00
10/8/2014	2	8.0	1	8.0	0	8.0	1	8.0	472,700	151,400	624,100	0.00
10/9/2014	4	7.9	2	8.0	1	8.0	2	8.0	470,000	152,400	622,400	0.00
10/10/2014	1	8.0	1	8.0	0	8.0	1	8.0	473,200	140,500	613,700	0.00
10/11/2014	1	8.0	1	8.0	0	8.0	1	8.0	402,800	133,200	536,000	0.00
10/12/2014	1	8.0	1	8.0	0	8.0	1	8.0	431,300	134,900	566,200	0.02
10/13/2014	5	7.8	3	8.1	1	8.0	4	8.0	808,500	207,700	1,016,200	1.17
10/14/2014	1	0.0	1	16.0	0	8.0	2	8.0	974,500	524,700	1,499,200	0.20
10/15/2014	1	8.0	1	8.0	0	8.0	1	8.0	874,500	389,500	1,264,000	0.09
10/16/2014	5	7.8	5	8.1	1	8.0	5	8.0	751,600	319,600	1,071,200	0.00
10/17/2014	1	8.0	1	8.0	0	8.0	1	8.0	702,200	271,800	974,000	0.00
10/18/2014	1	8.0	1	8.0	0	8.0	1	8.0	676,300	238,000	914,300	0.05
10/19/2014	1	8.0	1	8.0	0	8.0	1	8.0	621,800	222,200	844,000	0.00
10/20/2014	5	7.7	5	7.8	0	8.2	15	8.2	593,400	213,600	807,000	0.00
10/21/2014	1	8.0	1	8.0	0	8.0	1	8.0	574,500	197,400	771,900	0.00
10/22/2014	2	8.0	2	8.0	1	8.0	2	8.0	562,900	186,900	749,800	0.00
10/23/2014	1	8.0	1	8.0	0	8.0	1	8.0	511,900	173,800	685,700	0.03
10/24/2014	4	7.8	3	8.1	1	8.0	5	8.0	479,300	171,700	651,000	0.00
10/25/2014	1	8.0	1	8.0	0	8.0	1	8.0	465,900	163,200	629,100	0.00
10/26/2014	1	8.0	1	8.0	0	8.0	1	8.0	503,700	151,700	655,400	0.00
10/27/2014	3	8.0	2	8.0	1	8.0	2	8.0	402,500	163,800	566,300	0.01
10/28/2014	1	8.0	1	8.0	0	8.0	1	8.0	363,900	165,800	529,700	0.00
10/29/2014	4	7.8	3	7.9	1	8.0	2	8.0	352,100	159,300	511,400	0.00
10/30/2014	1	8.0	1	8.0	0	8.0	1	8.0	383,800	156,300	540,100	0.00
10/31/2014	5	7.9	3	8.1	1	8.0	3	8.0	388,700	154,100	542,800	0.02
11/1/2014	1	8.0	1	8.0	0	8.0	1	8.0	421,300	143,100	564,400	0.00
11/2/2014	1	8.0	1	8.0	0	9.0	1	9.0	396,500	160,600	557,100	0.00
11/3/2014	2	3.5	3	12.3	1	8.0	3	8.0	426,700	156,100	582,800	0.00
11/4/2014	1	8.0	1	8.0	0	8.0	1	8.0	443,900	152,900	596,800	0.12
11/5/2014	1	8.0	1	8.0	0	8.0	1	8.0	379,000	156,600	535,600	0.00
11/6/2014	5	7.9	4	8.1	1	8.0	4	8.0	557,000	149,900	706,900	0.05
11/7/2014	1	8.0	1	8.0	0	8.0	1	8.0	576,600	145,000	721,600	0.00
11/8/2014	1	8.0	1	8.0	0	8.0	1	8.0	896,000	145,600	1,041,600	0.05
11/9/2014	1	8.0	1	8.0	0	8.0	1	8.0	905,700	146,200	1,051,900	0.02
11/10/2014	4	7.9	3	8.1	1	8.0	4	8.0	970,500	148,000	1,118,500	0.03
11/11/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,047,400	151,900	1,199,300	0.21
11/12/2014	6	7.8	6	8.1	1	8.0	6	8.0	850,500	181,300	1,031,800	0.00
11/13/2014	1	8.0	1	8.0	0	8.0	1	8.0	923,100	165,000	1,088,100	0.00
11/14/2014	4	7.9	4	8.0	1	8.0	5	8.0	853,400	168,700	1,022,100	0.00
11/15/2014	1	8.0	1	8.0	0	8.0	1	8.0	697,600	161,400	859,000	0.00
11/16/2014	1	8.0	1	8.0	0	8.0	1	8.0	742,000	150,900	892,900	0.01

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
11/17/2014	3	7.9	2	8.0	1	8.0	2	8.0	792,800	160,300	953,100	0.00
11/18/2014	1	8.0	1	8.0	0	8.0	1	8.0	731,700	151,400	883,100	0.00
11/19/2014	3	6.3	2	8.0	34	8.0	2	8.0	763,300	196,300	959,600	0.00
11/20/2014	1	8.0	1	8.0	0	8.0	1	8.0	772,900	150,400	923,300	0.00
11/21/2014	4	7.8	3	8.1	1	8.0	4	8.0	738,100	145,500	883,600	0.00
11/22/2014	1	8.0	1	8.0	0	8.0	1	8.0	854,900	135,000	989,900	0.02
11/23/2014	1	8.0	1	8.0	0	8.0	1	8.0	969,100	167,600	1,136,700	0.59
11/24/2014	3	6.6	3	9.3	1	8.0	4	8.0	1,398,000	350,800	1,748,800	0.19
11/25/2014	66	7.2	2	10.6	0	5.5	0	5.5	1,398,000	350,800	1,748,800	0.00
11/26/2014	5	15.8	4	8.0	2	0.0	0	0.0	1,312,400	7,800	1,320,200	0.04
11/27/2014	1	16.0	1	8.0	0	0.0	0	0.0	946,000	0	946,000	0.00
11/28/2014	1	16.0	1	8.0	0	0.0	0	0.0	1,038,100	0	1,038,100	0.00
11/29/2014	1	16.0	1	8.0	0	0.0	0	0.0	1,073,600	0	1,073,600	0.02
11/30/2014	1	16.0	1	8.0	0	0.0	0	0.0	1,003,800	0	1,003,800	0.00
12/1/2014	3	15.9	2	8.0	1	0.0	0	0.0	1,116,600	800	1,117,400	0.00
12/2/2014	1	16.0	1	7.9	0	0.0	0	0.0	1,163,200	0	1,163,200	0.00
12/3/2014	6	14.3	6	8.1	4	1.0	10	1.0	1,119,000	44,300	1,163,300	0.00
12/4/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,196,900	202,300	1,399,200	0.00
12/5/2014	3	7.4	4	8.1	5	8.1	3	8.1	1,067,800	218,000	1,285,800	0.00
12/6/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,068,700	188,800	1,257,500	0.00
12/7/2014	1	8.0	1	8.0	0	8.0	1	8.0	952,400	187,200	1,139,600	0.00
12/8/2014	4	6.3	5	8.1	26	8.0	2	8.0	1,053,100	241,200	1,294,300	0.10
12/9/2014	3	4.4	2	11.5	0	8.0	4	8.0	1,059,200	199,500	1,258,700	0.00
12/10/2014	4	8.0	2	8.0	1	8.0	2	8.0	1,222,900	181,100	1,404,000	0.00
12/11/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,074,700	180,900	1,255,600	0.00
12/12/2014	4	7.9	2	8.1	1	8.0	2	8.0	1,027,700	178,200	1,205,900	0.00
12/13/2014	1	8.0	1	8.0	0	8.0	1	8.0	1,018,800	166,500	1,185,300	0.00
12/14/2014	1	8.0	1	8.0	0	8.0	1	8.0	436,100	169,700	605,800	0.00
12/15/2014	5	7.9	11	7.9	1	7.6	48	7.6	445,500	169,400	614,900	0.05
12/16/2014	7	7.9	1	8.0	0	4.1	351	4.1	455,700	166,000	621,700	0.04
12/17/2014	22	7.7	2	8.0	1	4.6	321	4.6	464,300	185,000	649,300	0.00
12/18/2014	6	6.6	9	9.1	0	6.4	168	6.4	434,200	177,800	612,000	0.00
12/19/2014	5	7.9	2	8.0	1	8.0	2	8.0	489,400	174,100	663,500	0.00
12/20/2014	1	8.0	1	8.0	0	8.0	1	8.0	467,200	175,100	642,300	0.00
12/21/2014	1	8.0	1	8.0	0	8.0	1	8.0	471,600	171,600	643,200	0.00
12/22/2014	4	7.9	2	8.0	1	8.0	2	8.0	518,900	188,600	707,500	0.30
12/23/2014	3	0.1	3	15.8	0	8.0	3	8.0	1,096,700	401,000	1,497,700	0.34
12/24/2014	1	8.0	1	8.0	0	7.9	1	7.9	756,900	369,200	1,126,100	0.00
12/25/2014	1	8.0	1	8.0	0	8.0	1	8.0	617,400	313,600	931,000	0.00
12/26/2014	2	8.0	2	8.0	0	8.1	3	8.1	649,500	282,100	931,600	0.00
12/27/2014	1	8.0	1	8.0	0	8.0	1	8.0	663,300	267,300	930,600	0.02
12/28/2014	1	8.0	1	8.0	0	8.0	1	8.0	583,400	252,000	835,400	0.00
12/29/2014	5	3.8	3	12.1	1	8.0	4	8.0	492,400	240,200	732,600	0.00
12/30/2014	1	8.0	1	8.0	0	8.0	1	8.0	480,200	229,500	709,700	0.00
12/31/2014	2	0.8	3	14.4	2	8.0	3	8.0	523,300	231,200	754,500	0.00
Total	1337	2472.1	995	3288.6	801	2865.4	4751	2865.4	380,693,100	98,522,300	479,215,400	24.72
Ave	4	6.8	3	9.1	2	7.9	13	7.9	1,048,741	271,411	1,320,153	0.07
Max	197	16.0	151	16.3	89	18.1	460	18.1	3,276,700	1,871,000	5,147,700	2.09
Min	0	0.0	0	0.0	0	0.0	0	0.0	147,000	0	290,000	0.00
Median	1	8.0	1	8.0	0	8.0	1	8.0	905,700	204,200	1,088,100	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
1/1/2015	2	0.8	3	14.4	2	8.0	3	8.0	523,300	231,200	754,500	0.00
1/2/2015	3	6.7	3	9.3	1	8.0	5	8.0	599,300	189,800	789,100	0.00
1/3/2015	1	8.0	1	8.0	0	8.0	1	8.0	514,900	187,600	702,500	0.08
1/4/2015	1	8.0	1	8.0	0	8.0	1	8.0	486,700	188,900	675,600	0.00
1/5/2015	3	5.9	2	10.0	1	8.0	3	8.0	498,600	186,000	684,600	0.00
1/6/2015	1	8.0	1	8.0	0	8.0	1	8.0	496,700	179,000	675,700	0.00
1/7/2015	4	3.2	3	12.6	1	8.0	5	8.0	461,300	177,500	638,800	0.00
1/8/2015	1	8.0	1	8.0	0	8.0	1	8.0	493,300	175,600	668,900	0.00
1/9/2015	4	7.9	2	8.0	1	8.0	2	8.0	484,700	173,400	658,100	0.00
1/10/2015	1	8.0	1	8.0	0	8.0	1	8.0	483,800	159,400	643,200	0.00
1/11/2015	1	8.0	1	8.0	0	8.0	1	8.0	487,100	162,400	649,500	0.00
1/12/2015	4	7.9	2	8.0	1	8.0	2	8.0	537,800	156,800	694,600	0.00
1/13/2015	1	8.0	1	8.0	0	8.0	1	8.0	566,900	158,200	725,100	0.00
1/14/2015	2	8.0	2	8.0	1	8.0	2	8.0	520,500	154,100	674,600	0.00
1/15/2015	1	8.0	1	8.0	0	8.0	1	8.0	542,600	154,000	696,600	0.02
1/16/2015	2	8.0	1	8.0	0	8.0	1	8.0	565,300	148,500	713,800	0.00
1/17/2015	1	8.0	1	8.0	0	8.0	1	8.0	600,000	150,700	750,700	0.00
1/18/2015	1	8.0	1	8.0	0	8.0	1	8.0	557,000	158,800	715,800	0.00
1/19/2015	4	7.9	2	8.0	1	8.0	2	8.0	580,400	162,200	742,600	0.00
1/20/2015	1	8.0	1	8.0	0	8.0	1	8.0	592,400	154,800	747,200	0.01
1/21/2015	4	7.9	2	8.0	1	8.0	2	8.0	560,100	157,400	717,500	0.00
1/22/2015	1	8.0	1	8.0	0	8.0	1	8.0	610,800	156,000	766,800	0.00
1/23/2015	3	1.3	3	14.6	1	8.0	5	8.0	611,600	154,200	765,800	0.00
1/24/2015	1	8.0	1	8.0	0	8.0	1	8.0	548,500	152,600	701,100	0.00
1/25/2015	1	8.0	1	8.0	0	8.0	1	8.0	585,000	169,300	754,300	0.00
1/26/2015	4	7.9	3	8.0	1	8.0	4	8.0	1,067,400	170,500	1,237,900	0.00
1/27/2015	1	8.0	1	8.0	0	8.0	1	8.0	904,300	168,600	1,072,900	0.02
1/28/2015	3	7.5	2	8.1	2	8.1	3	8.1	471,500	170,900	642,400	0.00
1/29/2015	3	7.9	1	8.0	0	8.0	3	8.0	534,100	164,200	698,300	0.00
1/30/2015	4	8.0	2	8.0	1	8.0	2	8.0	623,300	157,000	780,300	0.00
1/31/2015	1	8.0	1	8.0	0	8.0	1	8.0	590,500	156,400	746,900	0.00
2/1/2015	1	8.0	1	8.0	0	8.0	1	8.0	546,000	155,300	701,300	0.00
2/2/2015	1	8.0	1	8.0	0	8.0	1	8.0	573,800	156,700	730,500	0.00
2/3/2015	5	7.9	2	8.0	1	8.0	2	8.0	596,400	155,800	752,200	0.00
2/4/2015	6	7.5	3	8.0	2	8.3	4	8.3	423,100	172,700	595,800	0.00
2/5/2015	1	8.0	1	8.0	0	8.0	1	8.0	550,200	149,000	699,200	0.00
2/6/2015	5	7.9	3	8.0	1	8.1	4	8.1	472,300	157,800	630,100	0.03
2/7/2015	1	8.0	1	8.0	0	8.0	1	8.0	445,800	152,600	598,400	0.08
2/8/2015	1	8.0	1	8.0	0	7.9	1	7.9	549,200	187,800	737,000	0.01
2/9/2015	3	8.0	2	8.0	1	8.0	2	8.0	478,700	167,100	645,800	0.00
2/10/2015	1	8.0	1	8.0	0	8.0	1	8.0	510,900	152,700	663,600	0.00
2/11/2015	3	7.9	2	8.0	1	8.0	2	8.0	572,900	150,300	723,200	0.00
2/12/2015	1	8.0	1	8.0	0	8.0	1	8.0	590,100	151,300	741,400	0.00
2/13/2015	4	7.9	2	8.1	1	8.0	2	8.0	528,500	150,400	678,900	0.00
2/14/2015	1	8.0	1	8.0	0	8.0	1	8.0	864,300	142,600	1,006,900	0.00
2/15/2015	1	8.0	1	8.0	0	8.0	1	8.0	787,600	148,300	935,900	0.00
2/16/2015	4	7.9	2	8.0	1	8.0	2	8.0	1,215,400	158,000	1,373,400	0.00
2/17/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,107,400	141,800	1,249,200	0.00
2/18/2015	4	7.9	3	8.0	1	8.0	2	8.0	650,700	146,100	796,800	0.00
2/19/2015	1	8.0	1	8.0	0	8.0	1	8.0	407,700	148,200	555,900	0.00
2/20/2015	3	7.9	2	8.0	1	8.0	2	8.0	420,500	144,500	565,000	0.00
2/21/2015	1	8.0	1	8.0	0	8.0	1	8.0	446,800	141,000	587,800	0.00
2/22/2015	1	8.0	1	8.0	0	8.0	1	8.0	446,600	138,800	585,400	0.00
2/23/2015	4	7.9	2	8.0	1	8.0	2	8.0	461,900	145,600	607,500	0.00
2/24/2015	1	8.0	1	8.0	0	8.0	1	8.0	479,200	140,300	619,500	0.00
2/25/2015	4	7.7	3	8.1	2	8.0	3	8.0	477,300	151,600	628,900	0.00
2/26/2015	1	8.0	1	8.0	0	8.0	1	8.0	514,000	137,500	651,500	0.00
2/27/2015	5	3.5	2	12.5	1	8.1	4	8.1	491,300	142,400	633,700	0.00
2/28/2015	1	8.0	1	8.0	0	8.0	1	8.0	447,300	135,500	582,800	0.00
3/1/2015	1	8.0	1	8.0	0	8.0	1	8.0	466,900	134,600	601,500	0.00
3/2/2015	4	4.4	6	11.1	7	8.0	3	8.0	425,900	140,700	566,600	0.00
3/3/2015	1	8.0	1	8.0	0	7.9	1	7.9	478,200	141,100	619,300	0.00
3/4/2015	3	8.0	2	8.0	1	8.0	2	8.0	533,900	143,400	677,300	0.00
3/5/2015	2	7.9	1	8.0	0	8.0	1	8.0	541,700	139,300	681,000	0.00
3/6/2015	4	7.9	2	8.1	1	8.0	2	8.0	533,400	136,100	669,500	0.00
3/7/2015	1	8.0	1	8.0	0	8.0	1	8.0	557,600	139,900	697,500	0.00
3/8/2015	1	8.0	1	8.0	0	7.0	1	7.0	601,700	136,100	737,800	0.00
3/9/2015	5	8.0	3	8.0	1	8.0	2	8.0	804,700	206,300	1,011,000	0.00
3/10/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,129,400	337,200	1,466,600	0.00
3/11/2015	7	7.4	5	8.1	13	8.2	7	8.2	1,152,200	426,400	1,578,600	0.00
3/12/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,014,900	356,400	1,371,300	0.00
3/13/2015	5	7.9	4	8.0	1	8.0	4	8.0	1,074,100	320,200	1,394,300	0.00
												0.00
1/1/1900	1	8.0	1	8.0	0	8.0	1	8.0	904,500	298,500	1,203,000	0.00
3/16/2015	3	3.9	3	12.0	1	8.0	4	8.0	910,800	284,200	1,195,000	0.00
3/17/2015	1	8.0	1	8.0	0	8.0	1	8.0	745,300	266,600	1,011,900	0.00
3/18/2015	4	4.4	2	11.6	2	8.0	3	8.0	705,500	253,600	959,100	0.00
3/19/2015	1	8.0	1	8.0	0	8.0	1	8.0	675,300	241,200	916,500	0.00
3/20/2015	3	7.9	2	8.0	1	8.0	2	8.0	651,400	231,000	882,400	0.00
3/21/2015	1	8.0	1	8.0	0	8.0	1	8.0	653,200	220,300	873,500	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
3/22/2015	1	8.0	1	8.0	0	8.0	1	8.0	618,300	214,000	832,300	0.00
3/23/2015	4	7.9	3	8.1	1	8.0	4	8.0	665,900	216,300	882,200	0.00
3/24/2015	1	8.0	1	8.0	0	8.0	1	8.0	684,400	203,800	888,200	0.00
3/25/2015	3	7.8	3	8.0	6	8.0	2	8.0	806,700	243,200	1,049,900	0.35
3/26/2015	1	8.0	1	8.0	0	8.0	1	8.0	808,800	259,900	1,068,700	0.00
3/27/2015	3	8.0	2	8.0	1	8.0	2	8.0	783,700	246,700	1,030,400	0.00
3/28/2015	1	8.0	1	8.0	0	8.0	1	8.0	785,000	230,400	1,015,400	0.00
3/29/2015	1	8.0	1	8.0	0	8.0	1	8.0	703,900	223,100	927,000	0.02
3/30/2015	3	7.9	2	8.0	1	8.0	2	8.0	683,600	219,300	902,900	0.03
3/31/2015	1	8.0	1	8.0	0	8.0	1	8.0	717,500	211,200	928,700	0.00
4/1/2015	5	3.2	5	12.6	1	8.0	5	8.0	675,100	210,600	885,700	0.00
4/2/2015	4	7.8	2	8.1	0	8.1	2	8.1	743,500	208,000	951,500	0.12
4/3/2015	5	7.9	4	8.0	1	8.0	4	8.0	687,800	227,400	915,200	0.00
4/4/2015	1	8.0	1	8.0	0	8.0	1	8.0	672,200	217,800	890,000	0.00
4/5/2015	1	8.0	1	8.0	0	8.0	1	8.0	652,500	212,700	865,200	0.00
4/6/2015	5	7.8	3	8.1	2	8.0	4	8.0	694,600	205,400	900,000	0.17
4/7/2015	1	8.0	1	8.0	0	8.0	1	8.0	723,500	240,400	963,900	0.55
4/8/2015	9	2.0	16	16.6	6	11.7	31	11.7	2,350,500	1,034,000	3,384,500	0.77
4/9/2015	12	1.3	4	19.3	0	24.0	3	24.0	3,111,000	1,779,100	4,890,100	2.66
4/10/2015	6	0.1	6	22.8	1	11.8	16	11.8	2,539,800	916,100	3,455,900	0.03
4/11/2015	1	0.0	1	16.0	0	8.0	2	8.0	1,621,000	745,100	2,366,100	0.00
4/12/2015	1	0.0	1	16.0	0	8.0	2	8.0	1,183,000	562,800	1,745,800	0.00
4/13/2015	4	4.7	4	11.3	1	8.0	5	8.0	1,029,900	463,300	1,493,200	0.01
4/14/2015	1	8.0	1	8.0	0	8.0	1	8.0	976,800	393,100	1,369,900	0.00
4/15/2015	6	7.5	4	7.6	3	8.0	6	8.0	836,500	370,000	1,206,500	0.00
4/16/2015	5	1.3	20	13.3	5	8.1	6	8.1	871,600	322,200	1,193,800	0.00
4/17/2015	4	7.9	3	8.0	1	8.0	3	8.0	651,200	297,200	948,400	0.00
4/18/2015	1	8.0	1	8.0	0	8.0	1	8.0	631,400	274,300	905,700	0.00
4/19/2015	1	8.0	1	8.0	0	8.0	1	8.0	885,700	296,500	1,182,200	0.74
4/20/2015	3	0.1	5	16.0	2	8.0	5	8.0	2,284,800	729,800	3,014,600	0.13
4/21/2015	1	0.0	1	16.0	0	8.0	2	8.0	2,118,000	539,800	2,657,800	0.00
4/22/2015	2	3.0	2	12.9	1	8.0	3	8.0	2,234,700	437,700	2,672,400	0.00
4/23/2015	3	1.1	1	14.9	0	8.0	2	8.0	1,017,600	378,600	1,396,200	0.00
4/24/2015	5	7.9	2	8.0	3	8.0	2	8.0	1,060,400	346,800	1,407,200	0.10
4/25/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,060,700	329,800	1,390,500	0.00
4/26/2015	1	8.0	1	8.0	0	8.0	1	8.0	942,700	299,700	1,242,400	0.00
4/27/2015	4	7.8	3	8.0	1	8.1	5	8.1	1,026,000	289,600	1,315,600	0.00
4/28/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,058,700	271,500	1,330,200	0.00
4/29/2015	4	7.4	5	8.1	12	8.0	2	8.0	896,900	282,700	1,179,600	0.00
4/30/2015	1	8.0	1	8.0	0	8.0	1	8.0	967,900	248,700	1,216,600	0.00
5/1/2015	4	4.0	3	11.9	1	8.0	4	8.0	920,300	231,000	1,151,300	0.00
5/2/2015	1	8.0	1	8.0	0	8.0	1	8.0	742,600	220,200	962,800	0.00
5/3/2015	1	8.0	1	8.0	0	8.0	1	8.0	807,900	216,700	1,024,600	0.01
5/4/2015	3	3.7	2	12.3	1	8.0	3	8.0	916,700	220,200	1,136,900	0.03
5/5/2015	1	8.0	1	8.0	0	8.0	1	8.0	839,500	208,100	1,047,600	0.06
5/6/2015	7	7.2	9	8.1	10	8.0	5	8.0	807,600	235,700	1,043,300	0.07
5/7/2015	1	8.0	1	8.0	0	8.0	1	8.0	778,200	226,400	1,004,600	0.00
5/8/2015	4	7.9	2	8.0	1	8.0	3	8.0	943,400	217,100	1,160,500	0.11
5/9/2015	1	8.0	1	7.9	0	8.0	1	8.0	780,400	217,600	998,000	0.10
5/10/2015	1	8.0	1	8.0	0	8.0	1	8.0	691,800	214,500	906,300	0.04
5/11/2015	7	3.0	6	12.9	2	8.0	5	8.0	779,300	222,100	1,001,400	0.11
5/12/2015	1	8.0	1	8.0	0	8.0	1	8.0	760,800	222,300	983,100	0.00
5/13/2015	4	1.4	2	14.6	1	8.0	3	8.0	684,000	213,400	897,400	0.00
5/14/2015	1	8.0	1	8.0	0	8.0	1	8.0	639,600	200,800	840,400	0.08
5/15/2015	4	8.0	3	8.0	1	8.0	3	8.0	2,347,400	230,600	2,578,000	0.16
5/16/2015	1	8.0	1	8.0	0	8.0	1	8.0	3,161,400	215,200	3,376,600	0.00
5/17/2015	1	8.0	1	8.0	0	8.0	1	8.0	2,581,800	209,600	2,791,400	0.14
5/18/2015	3	7.9	2	8.0	1	8.0	2	8.0	2,802,600	206,900	3,009,500	0.00
5/19/2015	1	8.0	1	8.0	0	8.0	1	8.0	2,714,600	194,400	2,909,000	0.00
5/20/2015	1	8.0	1	8.0	0	8.0	1	8.0	702,600	189,900	892,500	0.00
5/21/2015	6	7.9	4	8.1	2	8.0	3	8.0	708,500	188,700	897,200	0.03
5/22/2015	1	8.0	1	8.0	0	8.0	1	8.0	757,300	180,200	937,500	0.00
5/23/2015	1	8.0	1	8.0	0	8.0	1	8.0	757,700	167,700	925,400	0.00
5/24/2015	1	8.0	1	8.0	0	8.0	1	8.0	827,500	170,600	998,100	0.28
5/25/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,110,400	251,400	1,361,800	0.28
5/26/2015	5	7.9	4	8.0	2	8.0	4	8.0	930,200	232,300	1,162,500	0.20
5/27/2015	1	8.0	1	8.0	0	8.0	1	8.0	572,900	255,800	828,700	0.01
5/28/2015	4	7.9	2	8.0	1	8.0	2	8.0	674,400	227,300	901,700	0.00
5/29/2015	1	8.0	1	8.0	0	8.0	1	8.0	2,986,400	210,700	3,197,100	0.26
5/30/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,194,000	243,900	1,437,900	0.42
5/31/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,000,800	317,600	1,318,400	0.00
6/1/2015	4	3.6	1	12.1	1	8.0	2	8.0	1,163,500	267,500	1,431,000	0.00
6/2/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,014,600	234,600	1,249,200	0.00
6/3/2015	3	7.9	2	8.0	2	8.0	3	8.0	970,600	221,300	1,191,900	0.00
6/4/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,359,100	202,900	1,562,000	0.00
6/5/2015	3	7.8	2	8.0	1	8.0	3	8.0	2,995,800	195,000	3,190,800	0.00
6/6/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,421,800	188,500	1,610,300	0.00
6/7/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,092,400	173,700	1,266,100	0.05
6/8/2015	4	7.9	3	8.1	1	8.1	3	8.1	678,000	152,300	830,300	0.00
6/9/2015	1	8.0	1	8.0	0	8.0	1	8.0	595,900	0	595,900	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
6/10/2015	3	7.9	2	8.0	1	8.0	2	8.0	966,800	0	966,800	0.00
6/11/2015	3	6.5	0	0.0	0	17.4	4	17.4	411,000	414,600	825,600	0.91
6/12/2015	3	0.0	3	15.9	1	8.1	4	8.1	2,060,700	612,200	2,672,900	0.72
6/13/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,565,600	401,700	1,967,300	0.26
6/14/2015	1	0.0	1	16.0	0	8.0	2	8.0	2,310,400	490,200	2,800,600	0.16
6/15/2015	5	5.3	3	10.6	2	8.0	4	8.0	1,868,200	426,300	2,294,500	0.00
6/16/2015	1	7.9	1	8.0	0	8.0	1	8.0	1,509,400	363,000	1,872,400	0.00
6/17/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,249,200	298,200	1,547,400	0.00
6/18/2015	5	6.2	3	8.1	36	8.0	4	8.0	1,037,900	353,400	1,391,300	0.97
6/19/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,163,700	242,100	1,405,800	0.00
6/20/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,075,400	226,400	1,301,800	0.00
6/21/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,337,100	215,800	1,552,900	0.00
6/22/2015	5	7.9	4	8.0	1	8.0	4	8.0	1,407,900	215,900	1,623,800	0.45
6/23/2015	1	8.0	1	8.0	0	8.0	1	8.0	744,800	270,800	1,015,600	0.00
6/24/2015	1	7.9	1	8.0	0	8.0	1	8.0	1,186,400	228,400	1,414,800	0.00
6/25/2015	3	6.0	2	8.1	49	8.0	2	8.0	2,119,300	293,500	2,412,800	0.00
6/26/2015	1	7.9	1	8.0	0	8.0	1	8.0	980,100	202,200	1,182,300	0.00
6/27/2015	1	8.0	1	8.0	0	8.0	1	8.0	759,900	182,300	942,200	0.00
6/28/2015	1	8.0	1	8.0	0	8.0	1	8.0	704,000	180,300	884,300	0.00
6/29/2015	4	7.9	3	8.0	1	8.0	3	8.0	715,500	178,500	894,000	0.00
6/30/2015	1	8.0	1	8.0	0	8.0	1	8.0	785,700	171,100	956,800	0.00
7/1/2015	3	7.4	1	7.4	1	8.7	9	8.7	784,100	143,800	927,900	0.00
7/2/2015	4	7.9	2	8.0	1	8.0	2	8.0	476,900	84,000	560,900	0.00
7/3/2015	1	8.0	1	8.0	0	8.0	1	8.0	449,700	158,000	607,700	0.00
7/4/2015	1	8.0	1	8.0	0	8.0	1	8.0	390,400	153,700	544,100	0.00
7/5/2015	1	7.9	1	8.0	0	8.0	1	8.0	353,400	152,200	505,600	0.00
7/6/2015	1	8.0	1	8.0	0	8.0	1	8.0	429,800	156,200	586,000	0.29
7/7/2015	1	8.0	1	8.0	0	8.0	1	8.0	677,200	341,300	1,018,500	0.60
7/8/2015	4	7.9	3	8.1	1	8.0	3	8.0	527,000	225,700	752,700	0.00
7/9/2015	1	8.0	1	8.0	0	8.0	1	8.0	503,900	201,200	705,100	0.00
7/10/2015	6	7.5	3	8.3	4	8.0	3	8.0	490,200	197,200	687,400	0.00
7/11/2015	1	8.0	1	8.0	0	8.0	1	8.0	568,200	173,000	741,200	0.00
7/12/2015	1	8.0	1	8.0	0	8.0	1	8.0	535,900	177,300	713,200	0.00
7/13/2015	4	7.9	3	8.0	1	8.0	3	8.0	705,700	197,400	903,100	0.59
7/14/2015	1	8.0	1	8.0	0	8.0	1	8.0	648,200	264,100	912,300	0.00
7/15/2015	4	7.9	3	8.1	1	8.1	4	8.1	573,000	210,000	783,000	0.00
7/16/2015	1	8.0	1	7.9	0	8.0	1	8.0	627,800	231,700	859,500	1.24
7/17/2015	4	0.1	4	15.9	0	8.0	5	8.0	1,140,500	606,600	1,747,100	0.01
7/18/2015	3	8.0	1	8.0	0	8.0	1	8.0	792,700	325,200	1,117,900	0.21
7/19/2015	1	8.0	1	8.0	0	8.0	1	8.0	717,500	336,400	1,053,900	0.00
7/20/2015	3	7.7	3	8.2	1	8.0	4	8.0	681,000	268,100	949,100	0.00
7/21/2015	1	8.0	1	8.0	0	8.0	1	8.0	623,200	240,500	863,700	0.00
7/22/2015	2	7.9	2	8.0	1	8.0	2	8.0	695,100	219,300	914,400	0.00
7/23/2015	1	8.0	1	8.0	0	8.0	1	8.0	601,100	197,000	798,100	0.00
7/24/2015	4	7.9	3	8.0	1	8.0	4	8.0	563,500	194,100	757,600	0.00
7/25/2015	1	8.0	1	8.0	0	8.0	1	8.0	576,000	174,400	750,400	0.00
7/26/2015	1	8.0	1	8.0	0	8.0	1	8.0	602,800	174,100	776,900	0.00
7/27/2015	5	8.0	2	8.1	1	8.0	2	8.0	604,500	163,400	767,900	0.00
7/28/2015	1	8.0	1	8.0	0	8.0	1	8.0	569,400	165,500	734,900	0.00
7/29/2015	3	4.8	2	8.0	50	8.0	2	8.0	635,300	261,500	896,800	0.01
7/30/2015	1	8.0	1	8.0	0	8.0	1	8.0	531,700	159,800	691,500	0.00
7/31/2015	4	7.8	3	8.0	1	8.0	4	8.0	531,500	153,300	684,800	0.00
8/1/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,064,700	148,400	1,213,100	0.00
8/2/2015	1	8.0	1	8.0	0	8.0	1	8.0	711,800	172,700	884,500	1.02
8/3/2015	4	7.8	3	8.1	1	8.0	4	8.0	1,164,700	294,000	1,458,700	0.00
8/4/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,821,400	218,400	2,039,800	0.00
8/5/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,301,300	195,600	1,496,900	0.00
8/6/2015	5	7.8	3	8.1	2	8.0	4	8.0	657,700	187,700	845,400	0.00
8/7/2015	1	8.0	1	8.0	0	8.0	1	8.0	451,300	167,400	618,700	0.08
8/8/2015	1	8.0	1	8.0	0	7.9	1	7.9	1,901,600	163,500	2,065,100	0.00
8/9/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,045,100	161,700	1,206,800	0.00
8/10/2015	2	3.8	1	12.2	0	8.0	2	8.0	616,400	169,600	786,000	0.82
8/11/2015	2	5.8	2	9.8	0	8.1	6	8.1	771,200	208,200	979,400	0.00
8/12/2015	4	7.9	3	8.0	1	8.0	3	8.0	1,270,500	186,700	1,457,200	0.00
8/13/2015	1	8.0	1	8.0	0	8.0	1	8.0	917,300	180,300	1,097,600	0.00
8/14/2015	4	7.9	3	8.1	1	8.0	4	8.0	1,577,600	181,100	1,758,700	0.46
8/15/2015	1	8.0	1	8.0	0	8.0	1	8.0	413,300	233,000	646,300	0.01
8/16/2015	1	8.0	1	8.0	0	8.0	1	8.0	822,900	189,100	1,012,000	0.00
8/17/2015	4	7.9	2	8.0	1	8.0	2	8.0	438,200	183,100	621,300	0.21
8/18/2015	1	8.0	1	8.0	0	8.0	1	8.0	810,000	207,800	1,017,800	0.42
8/19/2015	4	7.8	2	8.0	2	7.9	2	7.9	780,500	291,500	1,072,000	0.00
8/20/2015	1	8.0	1	8.0	0	8.0	1	8.0	414,500	209,400	623,900	0.00
8/21/2015	2	8.0	2	8.0	1	8.0	3	8.0	369,200	185,700	554,900	0.00
8/22/2015	1	8.0	1	8.0	0	8.0	1	8.0	693,800	179,700	873,500	0.00
8/23/2015	1	8.0	1	8.0	0	8.0	1	8.0	415,200	173,300	588,500	0.08
8/24/2015	3	3.5	1	12.2	1	8.1	3	8.1	856,800	171,800	1,028,600	0.00
8/25/2015	1	8.0	1	8.0	0	8.0	1	8.0	393,600	160,800	554,400	0.00
8/26/2015	2	5.3	1	8.0	42	8.0	1	8.0	480,600	238,000	718,600	0.00
8/27/2015	1	8.0	1	8.0	0	8.0	1	8.0	373,800	156,400	530,200	0.00
8/28/2015	3	1.8	4	14.0	2	8.0	3	8.0	490,300	155,900	646,200	0.26

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
8/29/2015	1	0.0	1	16.0	0	8.0	2	8.0	881,100	328,300	1,209,400	1.04
8/30/2015	1	8.0	1	8.0	0	8.0	1	8.0	658,000	299,500	957,500	0.00
8/31/2015	2	8.0	3	8.0	1	8.0	2	8.0	556,400	245,600	802,000	0.00
9/1/2015	1	8.0	1	8.0	0	8.0	1	8.0	626,900	218,600	845,500	0.00
9/2/2015	5	7.9	3	8.0	1	8.0	4	8.0	606,200	204,700	810,900	0.00
9/3/2015	1	8.0	1	8.0	0	8.0	1	8.0	596,300	186,900	783,200	0.00
9/4/2015	5	7.9	2	8.0	7	8.0	2	8.0	585,800	183,200	769,000	0.00
9/5/2015	1	8.0	1	8.0	0	8.0	1	8.0	450,000	168,700	618,700	0.00
9/6/2015	1	8.0	1	8.0	0	8.0	1	8.0	466,600	165,300	631,900	0.00
9/7/2015	1	8.0	1	8.0	0	8.0	1	8.0	509,700	164,800	674,500	0.03
9/8/2015	13	1.9	9	14.1	1	8.0	15	8.0	1,196,100	204,700	1,400,800	1.42
9/9/2015	1	7.9	1	8.0	0	8.0	1	8.0	837,600	394,300	1,231,900	0.00
9/10/2015	6	7.9	5	8.0	1	8.1	5	8.1	815,400	278,600	1,094,000	0.16
9/11/2015	1	8.0	1	8.0	0	8.0	1	8.0	688,300	259,000	947,300	0.00
9/12/2015	1	8.0	1	8.0	0	8.0	1	8.0	577,600	222,400	800,000	0.00
9/13/2015	15	7.9	2	8.0	0	7.1	149	7.1	645,900	210,400	856,300	0.00
9/14/2015	2	2.5	4	8.1	116	8.0	1	8.0	416,700	406,300	823,000	0.00
9/15/2015	1	8.0	1	8.0	0	8.0	1	8.0	565,900	185,400	751,300	0.00
9/16/2015	1	8.0	1	8.0	0	8.0	1	8.0	526,600	179,900	706,500	0.00
9/17/2015	3	0.4	8	8.1	119	8.0	2	8.0	268,700	435,700	704,400	0.22
9/18/2015	12	1.5	2	15.9	0	8.0	2	8.0	1,479,300	480,400	1,959,700	1.59
9/19/2015	1	0.0	1	16.0	0	8.0	2	8.0	1,291,200	581,300	1,872,500	0.28
9/20/2015	1	8.0	1	8.0	0	8.0	1	8.0	883,600	396,100	1,279,700	0.00
9/21/2015	2	8.0	2	8.0	1	8.0	2	8.0	835,000	320,200	1,155,200	0.00
9/22/2015	1	8.0	1	8.0	0	8.0	1	8.0	695,600	274,800	970,400	0.00
9/23/2015	1	8.0	1	8.0	0	8.0	1	8.0	612,700	248,700	861,400	0.00
9/24/2015	1	8.0	1	8.0	0	8.0	1	8.0	599,100	232,500	831,600	0.00
9/25/2015	2	2.0	2	14.0	0	8.0	4	8.0	572,800	217,700	790,500	0.00
9/26/2015	1	8.0	1	8.0	0	8.0	1	8.0	548,400	208,700	757,100	0.00
9/27/2015	1	8.0	1	8.0	0	8.0	1	8.0	571,800	195,400	767,200	0.00
9/28/2015	4	5.8	2	8.0	39	8.0	2	8.0	494,000	283,000	777,000	0.00
9/29/2015	1	0.0	1	15.9	0	8.0	2	8.0	1,597,900	329,200	1,927,100	1.18
9/30/2015	6	2.2	5	13.7	1	8.0	7	8.0	969,200	459,100	1,428,300	0.00
10/1/2015	1	8.0	1	8.0	0	8.0	1	8.0	813,000	330,300	1,143,300	0.00
10/2/2015	4	7.9	3	8.0	1	8.0	4	8.0	748,800	278,900	1,027,700	0.00
10/3/2015	1	8.0	1	8.0	0	8.0	1	8.0	629,200	244,200	873,400	0.00
10/4/2015	1	8.0	1	8.0	0	8.0	1	8.0	609,500	237,500	847,000	0.00
10/5/2015	1	0.8	1	14.8	0	8.1	6	8.1	625,800	228,900	854,700	0.00
10/6/2015	1	8.0	1	8.0	0	8.0	1	8.0	611,100	208,200	819,300	0.00
10/7/2015	1	8.0	1	8.0	0	8.0	1	8.0	592,600	202,000	794,600	0.00
10/8/2015	3	7.8	2	8.1	1	8.0	2	8.0	514,400	201,000	715,400	0.04
10/9/2015	1	8.0	1	8.0	0	8.0	1	8.0	574,900	187,100	762,000	0.00
10/10/2015	1	8.0	1	7.9	0	8.0	1	8.0	662,200	181,000	843,200	0.00
10/11/2015	1	8.0	1	8.0	0	8.0	1	8.0	428,300	177,600	605,900	0.00
10/12/2015	1	8.0	1	8.0	0	8.0	1	8.0	467,900	175,100	643,000	0.00
10/13/2015	1	8.0	1	8.0	0	8.0	1	8.0	463,300	171,500	634,800	0.00
10/14/2015	1	8.0	1	8.0	0	8.0	1	8.0	493,700	165,800	659,500	0.00
10/15/2015	2	3.3	1	8.6	72	8.0	2	8.0	474,400	312,300	786,700	0.00
10/16/2015	1	8.0	1	8.0	0	8.0	1	8.0	588,900	169,000	757,900	0.00
10/17/2015	1	8.0	1	8.0	0	8.0	1	8.0	912,200	158,700	1,070,900	0.00
10/18/2015	1	8.0	1	8.0	0	8.0	1	8.0	665,500	159,200	824,700	0.00
10/19/2015	5	7.8	4	8.1	1	8.0	5	8.0	1,063,400	164,300	1,227,700	0.00
10/20/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,382,700	160,700	1,543,400	0.25
10/21/2015	6	8.0	3	8.0	1	8.0	4	8.0	1,797,100	193,100	1,990,200	0.17
10/22/2015	1	8.0	1	8.0	0	8.0	1	8.0	409,300	169,100	578,400	0.00
10/23/2015	4	7.9	3	8.0	1	8.0	4	8.0	1,215,600	173,800	1,389,400	0.35
10/24/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,125,800	236,800	1,362,600	0.02
10/25/2015	1	7.9	1	8.0	0	8.0	1	8.0	1,032,400	193,600	1,226,000	0.00
10/26/2015	4	8.0	2	8.0	1	8.0	2	8.0	1,740,800	184,900	1,925,700	0.00
10/27/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,926,300	194,100	2,120,400	0.22
10/28/2015	3	0.0	4	16.0	1	8.0	6	8.0	2,627,300	455,100	3,082,400	0.39
10/29/2015	1	8.0	1	8.0	0	8.0	1	8.0	832,500	360,900	1,193,400	0.01
10/30/2015	4	7.9	3	8.0	1	8.0	3	8.0	889,100	285,600	1,174,700	0.00
10/31/2015	1	8.0	1	8.0	0	8.0	1	8.0	911,700	283,400	1,195,100	0.43
11/1/2015	1	8.0	1	8.0	0	9.0	1	9.0	947,100	470,900	1,418,000	0.00
11/2/2015	3	8.0	2	8.0	1	8.0	2	8.0	838,800	328,300	1,167,100	0.00
11/3/2015	1	8.0	1	8.0	0	8.0	1	8.0	745,400	290,100	1,035,500	0.00
11/4/2015	1	8.0	1	8.0	0	8.0	1	8.0	736,900	264,500	1,001,400	0.00
11/5/2015	1	8.0	1	8.0	0	8.0	1	8.0	701,600	258,300	959,900	0.07
11/6/2015	4	3.9	3	12.1	0	8.0	5	8.0	1,033,200	308,300	1,341,500	0.18
11/7/2015	1	8.0	1	8.0	0	8.0	1	8.0	746,900	267,100	1,014,000	0.00
11/8/2015	1	8.0	1	8.0	0	8.0	1	8.0	654,100	252,600	906,700	0.00
11/9/2015	5	7.9	3	8.0	1	8.0	3	8.0	604,200	239,800	844,000	0.00
11/10/2015	1	8.0	1	8.0	0	8.0	1	8.0	629,300	231,900	861,200	0.00
11/11/2015	1	8.0	1	8.0	0	8.0	1	8.0	679,200	237,400	916,600	0.09
11/12/2015	1	8.0	1	8.0	0	8.0	1	8.0	913,500	326,500	1,240,000	0.01
11/13/2015	4	7.9	3	8.0	1	8.0	3	8.0	612,200	276,600	888,800	0.00
11/14/2015	1	8.0	1	8.0	0	8.0	1	8.0	750,000	251,300	1,001,300	0.00
11/15/2015	1	8.0	1	8.0	0	8.0	1	8.0	610,000	255,400	865,400	0.00
11/16/2015	5	1.8	2	13.8	2	8.0	5	8.0	705,900	241,500	947,400	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
11/17/2015	13	8.1	2	8.0	0	8.0	2	8.0	1,157,200	322,000	1,479,200	0.76
11/18/2015	1	0.0	1	16.0	0	8.0	2	8.0	1,909,100	824,600	2,733,700	0.07
11/19/2015	1	0.0	1	16.0	0	8.0	2	8.0	1,247,100	526,300	1,773,400	0.00
11/20/2015	1	3.3	1	12.7	0	8.0	2	8.0	1,024,100	406,500	1,430,600	0.00
11/21/2015	1	8.0	1	8.0	0	8.0	1	8.0	833,600	357,600	1,191,200	0.00
11/22/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,068,700	349,300	1,418,000	0.00
11/23/2015	3	8.0	2	8.0	1	8.0	2	8.0	1,067,100	330,700	1,397,800	0.02
11/24/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,067,500	317,200	1,384,700	0.00
11/25/2015	3	4.0	3	11.9	1	8.0	4	8.0	1,090,600	330,600	1,421,200	0.00
11/26/2015	3	9.0	2	8.0	0	8.0	1	8.0	1,390,100	354,400	1,744,500	1.01
11/27/2015	0	2.9	1	20.2	0	9.2	13	9.2	2,433,300	844,600	3,277,900	0.28
11/28/2015	1	0.0	1	16.0	0	8.0	2	8.0	1,192,100	660,600	1,852,700	0.00
11/29/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,080,000	498,700	1,578,700	0.00
11/30/2015	4	7.9	4	8.0	2	8.0	5	8.0	1,131,700	484,100	1,615,800	0.64
12/1/2015	27	0.2	1	16.0	0	8.0	2	8.0	1,781,600	939,300	2,720,900	0.16
12/2/2015	5	1.7	6	14.2	3	8.1	6	8.1	1,159,100	682,300	1,841,400	0.00
12/3/2015	1	0.0	1	16.0	0	8.0	2	8.0	1,096,900	523,400	1,620,300	0.00
12/4/2015	4	4.2	3	11.8	1	8.0	5	8.0	1,077,900	463,900	1,541,800	0.00
12/5/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,050,000	407,000	1,457,000	0.00
12/6/2015	1	8.0	1	8.0	0	8.0	1	8.0	847,400	391,300	1,238,700	0.00
12/7/2015	5	7.9	4	8.0	2	8.0	4	8.0	888,700	368,400	1,257,100	0.00
12/8/2015	1	8.0	1	8.0	0	8.0	1	8.0	851,000	340,300	1,191,300	0.00
12/9/2015	1	8.0	1	8.0	0	8.0	1	8.0	810,200	328,700	1,138,900	0.00
12/10/2015	1	8.0	1	8.0	0	8.0	1	8.0	758,700	306,600	1,065,300	0.00
12/11/2015	4	7.9	3	8.1	1	8.0	4	8.0	660,800	292,500	953,300	0.00
12/12/2015	1	8.0	1	8.0	0	8.0	1	8.0	694,900	283,600	978,500	0.08
12/13/2015	6	4.0	4	11.8	0	8.1	7	8.1	1,405,300	379,900	1,785,200	0.95
12/14/2015	1	2.3	1	20.8	0	14.7	5	14.7	2,277,200	1,361,300	3,638,500	0.53
12/15/2015	1	0.0	1	16.0	0	8.0	2	8.0	1,297,700	767,000	2,064,700	0.00
12/16/2015	1	1.0	1	14.9	0	8.0	2	8.0	1,434,700	570,900	2,005,600	0.05
12/17/2015	6	6.1	7	9.8	3	8.0	8	8.0	948,900	500,800	1,449,700	0.00
12/18/2015	1	8.0	1	8.0	0	8.0	1	8.0	1,674,200	428,100	2,102,300	0.00
12/19/2015	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	378,800	3,655,500	0.00
12/20/2015	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	349,200	3,625,900	0.00
12/21/2015	2	3.3	3	12.7	1	8.1	4	8.1	3,276,700	379,900	3,656,600	0.58
12/22/2015	7	0.1	1	16.0	0	8.0	2	8.0	2,461,300	560,400	3,021,700	0.00
12/23/2015	4	0.0	4	15.9	1	10.0	316	10.0	3,276,700	722,200	3,998,900	0.37
12/24/2015	1	0.0	1	16.0	0	8.0	2	8.0	3,276,700	691,300	3,968,000	0.00
12/25/2015	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	513,500	3,790,200	0.00
12/26/2015	1	7.7	1	8.3	0	8.0	2	8.0	3,276,700	458,800	3,735,500	0.19
12/27/2015	2	3.5	2	12.5	0	8.0	5	8.0	3,276,700	526,400	3,803,100	0.00
12/28/2015	3	4.2	3	11.8	1	8.0	6	8.0	3,276,700	457,400	3,734,100	0.00
12/29/2015	1	8.0	1	8.0	0	8.0	1	8.0	2,449,400	434,700	2,884,100	0.00
12/30/2015	3	7.8	3	8.1	2	8.0	5	8.0	1,196,600	445,800	1,642,400	0.00
12/31/2015	2	3.7	2	12.3	0	8.0	3	8.0	1,189,000	442,900	1,631,900	0.00
Total	875	2477.5	676	3320.5	734	2956.3	1265	2956.3	346,144,200	98,615,200	444,759,400	31.99
Ave	2	6.8	2	9.1	2	8.1	3	8.1	950,946	270,921	1,221,866	0.09
Max	27	9.0	20	22.8	119	24.0	316	24.0	3,276,700	1,779,100	4,890,100	2.66
Min	0	0.0	0	0.0	0	7.0	1	7.0	268,700	0	505,600	0.00
Median	1	8.0	1	8.0	0	8.0	1	8.0	730,200	217,750	958,300	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			Rainflow Total (in):
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	
1/1/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,848,600	432,800	2,281,400	0.00
1/2/2016	1	7.9	1	8.0	0	8.0	1	8.0	1,952,400	401,900	2,354,300	0.05
1/3/2016	1	8.0	1	8.0	0	8.0	1	8.0	2,193,900	384,100	2,578,000	0.00
1/4/2016	4	1.5	5	14.5	1	8.1	6	8.1	1,830,300	358,400	2,188,700	0.00
1/5/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,601,500	337,400	1,938,900	0.00
1/6/2016	4	7.9	2	8.0	4	8.0	2	8.0	1,407,700	335,700	1,743,400	0.03
1/7/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,033,600	318,600	1,352,200	0.17
1/8/2016	3	0.6	3	12.4	64	8.0	5	8.0	2,578,200	554,600	3,132,800	0.12
1/9/2016	1	0.0	1	16.0	0	8.0	2	8.0	1,769,400	648,700	2,418,100	0.04
1/10/2016	1	0.0	1	16.0	0	8.0	2	8.0	2,230,100	646,000	2,876,100	0.00
1/11/2016	7	0.0	6	15.9	1	8.0	8	8.0	2,044,200	509,100	2,553,300	0.00
1/12/2016	1	0.0	1	15.9	0	8.0	2	8.0	1,943,600	428,200	2,371,800	0.00
1/13/2016	2	5.5	1	8.0	71	8.0	1	8.0	1,166,600	522,200	1,688,800	0.00
1/14/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,731,600	347,200	2,078,800	0.04
1/15/2016	7	7.9	5	8.1	2	8.1	5	8.1	1,529,700	327,800	1,857,500	0.00
1/16/2016	1	7.9	1	8.0	0	8.0	1	8.0	1,868,000	305,200	2,173,200	0.00
1/17/2016	1	8.0	1	8.0	0	8.0	1	8.0	787,400	298,000	1,085,400	0.00
1/18/2016	2	8.0	2	8.0	1	8.0	2	8.0	695,800	278,400	974,200	0.00
1/19/2016	1	8.0	1	8.0	0	8.0	1	8.0	934,700	270,200	1,204,900	0.00
1/20/2016	2	8.0	2	8.0	1	8.0	2	8.0	982,300	261,700	1,244,000	0.00
1/21/2016	3	6.5	2	8.9	2	8.4	3	8.4	1,215,200	266,300	1,481,500	0.00
1/22/2016	4	7.9	3	8.0	1	8.0	3	8.0	2,324,500	236,600	2,561,100	0.00
1/23/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	230,300	3,507,000	0.00
1/24/2016	1	8.0	1	8.0	0	8.0	1	8.0	2,924,800	234,900	3,159,700	0.00
1/25/2016	4	7.9	3	8.1	1	8.0	4	8.0	3,276,700	240,300	3,517,000	0.06
1/26/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	233,100	3,509,800	0.00
1/27/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	214,900	3,491,600	0.00
1/28/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,074,300	221,000	1,295,300	0.00
1/29/2016	4	7.9	2	8.0	1	8.0	2	8.0	738,300	217,400	955,700	0.00
1/30/2016	1	8.0	1	8.0	0	8.0	1	8.0	597,200	205,800	803,000	0.00
1/31/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,086,400	235,700	1,322,100	0.19
2/1/2016	5	7.9	4	8.0	2	8.0	4	8.0	903,900	326,600	1,230,500	0.00
2/2/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,763,000	351,900	2,114,900	0.29
2/3/2016	6	4.0	5	8.7	74	8.1	4	8.1	1,557,500	819,300	2,376,800	0.04
2/4/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	444,300	3,721,000	0.00
2/5/2016	8	7.9	7	8.1	1	8.0	7	8.0	3,276,700	393,300	3,670,000	0.00
2/6/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	352,600	3,629,300	0.00
2/7/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	352,800	3,629,500	0.00
2/8/2016	4	7.9	3	8.1	1	8.0	4	8.0	3,265,100	398,000	3,663,100	0.00
2/9/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	358,700	3,635,400	0.00
2/10/2016	3	0.8	2	11.9	72	8.0	3	8.0	3,276,700	503,900	3,780,600	0.00
2/11/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	294,600	3,571,300	0.00
2/12/2016	4	8.0	3	8.0	1	8.0	4	8.0	3,206,200	275,100	3,481,300	0.00
2/13/2016	1	8.0	1	8.0	0	8.0	1	8.0	833,700	269,400	1,103,100	0.00
2/14/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,182,300	252,600	1,434,900	0.00
2/15/2016	2	7.9	2	8.0	1	8.0	2	8.0	3,276,700	252,900	3,529,600	0.00
2/16/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	238,200	3,514,900	0.00
2/17/2016	2	1.0	2	11.6	79	8.0	2	8.0	3,276,700	391,200	3,667,900	0.00
2/18/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	226,500	3,503,200	0.00
2/19/2016	10	3.6	12	11.7	7	8.1	9	8.1	3,276,700	278,900	3,555,600	0.00
2/20/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,096,000	411,900	3,507,900	0.00
2/21/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	469,700	3,746,400	0.00
2/22/2016	4	7.9	2	8.1	1	8.0	3	8.0	3,276,700	422,500	3,699,200	0.00
2/23/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	357,900	3,634,600	0.00
2/24/2016	3	5.9	2	8.0	50	8.0	2	8.0	3,276,700	437,400	3,714,100	0.00
2/25/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	319,100	3,595,800	0.00
2/26/2016	2	8.0	2	7.9	1	8.0	2	8.0	3,276,700	296,800	3,573,500	0.00
2/27/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	294,800	3,571,500	0.00
2/28/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	332,000	3,608,700	0.04
2/29/2016	4	7.9	3	8.1	1	8.0	3	8.0	1,233,300	368,500	1,601,800	0.00
3/1/2016	1	8.0	1	8.0	0	8.0	1	8.0	2,887,700	345,200	3,232,900	0.00
3/2/2016	5	7.9	2	8.0	1	8.0	3	8.0	2,581,800	331,400	2,913,200	0.05
3/3/2016	1	8.0	1	8.0	0	8.0	1	8.0	970,600	312,500	1,283,100	0.01
3/4/2016	5	7.8	3	8.0	2	8.1	4	8.1	2,758,500	303,600	3,062,100	0.01
3/5/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	298,100	3,574,800	0.06
3/6/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	328,100	3,604,800	0.00
3/7/2016	8	3.1	7	12.9	4	8.1	10	8.1	3,276,700	433,400	3,710,100	0.01
3/8/2016	1	0.0	1	15.9	0	8.0	2	8.0	3,276,700	450,100	3,726,800	0.01
3/9/2016	1	1.3	1	14.8	0	8.0	2	8.0	3,276,700	455,100	3,731,800	0.06
3/10/2016	3	2.0	1	14.0	0	8.0	4	8.0	3,276,700	446,500	3,723,200	0.00
3/11/2016	2	3.0	2	12.9	0	8.0	3	8.0	3,276,700	407,900	3,684,600	0.00
3/13/2016												0.00
1/1/1900	1	8.0	1	8.0	0	7.0	1	7.0	3,276,700	336,300	3,613,000	0.34
3/14/2016	4	0.9	4	15.1	2	8.0	6	8.0	3,276,700	559,900	3,836,600	0.01
3/15/2016	1	0.0	1	16.0	0	8.0	2	8.0	3,276,700	472,600	3,749,300	0.37
3/16/2016	2	0.0	2	16.0	1	8.0	3	8.0	3,276,700	792,700	4,069,400	0.17
3/17/2016	1	0.0	1	16.0	0	8.1	2	8.1	3,276,700	658,400	3,935,100	0.00
3/18/2016	4	0.7	4	15.3	2	8.0	6	8.0	1,493,500	547,300	2,040,800	0.21
3/19/2016	1	0.0	1	15.9	0	8.0	2	8.0	3,276,700	496,900	3,773,600	0.00
3/20/2016	1	0.0	1	16.0	0	8.0	2	8.0	2,986,600	457,900	3,444,500	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			Rainflow Total (in):
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	
3/21/2016	10	0.1	3	15.9	1	8.0	6	8.0	3,276,700	424,100	3,700,800	0.00
3/22/2016	1	0.0	1	16.0	0	8.0	2	8.0	2,695,900	404,700	3,100,600	0.00
3/23/2016	10	3.9	3	8.6	78	8.0	4	8.0	3,276,700	622,400	3,899,100	0.51
3/24/2016	6	5.3	9	11.6	1	18.9	28	18.9	3,276,700	1,711,100	4,987,800	0.51
3/25/2016	3	13.1	3	6.0	1	18.0	4	18.0	2,153,400	1,655,100	3,808,500	0.11
3/26/2016	1	3.3	1	6.0	0	18.0	2	18.0	1,043,800	1,688,300	2,732,100	0.00
3/27/2016	1	0.0	1	6.0	0	18.0	2	18.0	1,997,900	1,527,100	3,525,000	0.20
3/28/2016	7	0.0	5	5.9	1	18.1	7	18.1	3,276,700	1,478,200	4,754,900	0.00
3/29/2016	1	0.0	1	6.0	0	18.0	2	18.0	3,276,700	1,292,800	4,569,500	0.00
3/30/2016	3	3.0	4	2.9	1	17.9	4	17.9	3,276,700	1,187,500	4,464,200	0.32
3/31/2016	99	1.6	4	11.8	1	18.5	60	18.5	3,276,700	1,779,400	5,056,100	0.58
4/1/2016	3	0.0	4	5.9	1	18.1	6	18.1	3,276,700	1,851,800	5,128,500	0.02
4/2/2016	1	3.0	1	3.0	0	18.0	1	18.0	3,276,700	1,565,600	4,842,300	0.04
4/3/2016	1	3.0	1	3.0	0	18.0	1	18.0	2,669,600	1,444,400	4,114,000	0.00
4/4/2016	4	0.0	4	6.0	1	18.0	4	18.0	2,121,600	1,267,300	3,388,900	0.00
4/5/2016	1	3.0	1	3.0	0	18.0	1	18.0	2,816,800	1,148,700	3,965,500	0.03
4/6/2016	3	0.0	5	5.9	2	18.0	5	18.0	2,600,300	1,439,300	4,039,600	0.33
4/7/2016	1	0.0	1	6.0	0	18.1	2	18.1	3,224,600	1,360,400	4,585,000	0.01
4/8/2016	3	3.0	2	2.9	2	18.0	3	18.0	2,297,000	1,336,700	3,633,700	0.08
4/9/2016	1	0.0	1	5.9	0	18.0	2	18.0	2,760,200	1,317,200	4,077,400	0.01
4/10/2016	1	3.0	1	3.0	0	18.0	1	18.0	2,617,100	1,259,800	3,876,900	0.03
4/11/2016	4	0.1	2	5.9	1	18.0	5	18.0	1,766,200	1,184,600	2,950,800	0.00
4/12/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	433,700	3,710,400	0.00
4/13/2016	4	7.9	2	8.0	4	8.0	4	8.0	2,356,900	412,000	2,768,900	0.00
4/14/2016	4	7.4	2	8.0	13	8.0	1	8.0	1,647,800	435,300	2,083,100	0.00
4/15/2016	5	7.9	4	8.0	1	8.0	5	8.0	1,035,300	366,000	1,401,300	0.00
4/16/2016	1	8.0	1	8.0	0	8.0	1	8.0	812,600	337,700	1,150,300	0.00
4/17/2016	1	8.0	1	8.0	0	8.0	1	8.0	737,100	326,400	1,063,500	0.00
4/18/2016	4	7.9	2	8.0	1	8.0	2	8.0	813,300	316,800	1,130,100	0.00
4/19/2016	1	8.0	1	8.0	0	8.0	1	8.0	822,000	305,200	1,127,200	0.00
4/20/2016	3	4.6	2	8.0	78	8.0	2	8.0	635,200	473,800	1,109,000	0.08
4/21/2016	9	0.3	11	13.8	20	8.1	12	8.1	1,824,600	476,900	2,301,500	0.42
4/22/2016	2	8.0	2	8.0	1	8.0	2	8.0	1,289,500	384,200	1,673,700	0.00
4/23/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,346,600	348,200	1,694,800	0.00
4/24/2016	1	8.0	1	8.0	0	8.0	1	8.0	2,955,800	320,200	3,276,000	0.03
4/25/2016	3	7.9	2	8.0	1	8.0	2	8.0	2,944,600	324,300	3,268,900	0.09
4/26/2016	7	3.0	4	12.6	2	8.0	6	8.0	750,700	330,300	1,081,000	0.00
4/27/2016	1	8.0	1	8.0	0	8.0	1	8.0	743,100	306,900	1,050,000	0.04
4/28/2016	2	5.3	2	8.0	68	8.0	2	8.0	580,500	431,600	1,012,100	0.00
4/29/2016	1	8.0	1	8.0	0	8.0	1	8.0	693,100	283,400	976,500	0.03
4/30/2016	1	8.0	1	8.0	0	8.0	1	8.0	731,300	294,100	1,025,400	0.37
5/1/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,013,200	374,700	1,387,900	0.02
5/2/2016	4	7.9	2	8.0	1	8.0	2	8.0	1,053,200	344,600	1,397,800	0.00
5/3/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,276,700	323,600	1,600,300	0.00
5/4/2016	3	4.5	3	8.1	83	8.0	2	8.0	1,032,800	495,600	1,528,400	0.02
5/5/2016	1	8.0	1	8.0	0	8.0	1	8.0	2,559,200	290,200	2,849,400	0.00
5/6/2016	2	1.8	2	14.1	1	8.1	3	8.1	3,276,700	268,000	3,544,700	0.00
5/7/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	266,500	3,543,200	0.00
5/8/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	253,000	3,529,700	0.00
5/9/2016	3	7.9	2	8.0	1	8.0	2	8.0	3,276,700	257,100	3,533,800	0.00
5/10/2016	16	6.9	4	9.5	3	8.0	7	8.0	3,276,700	304,900	3,581,600	1.32
5/11/2016	6	1.5	4	15.9	3	8.1	7	8.1	3,276,700	793,500	4,070,200	0.03
5/12/2016	1	0.0	1	16.0	0	8.0	2	8.0	3,276,700	583,000	3,859,700	0.01
5/13/2016	5	0.1	2	16.0	1	7.9	5	7.9	2,463,300	471,900	2,935,200	0.22
5/14/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,054,700	484,300	3,539,000	0.00
5/15/2016	1	8.0	1	7.9	0	8.0	1	8.0	2,863,500	400,500	3,264,000	0.00
5/16/2016	4	7.9	2	8.0	2	8.0	7	8.0	995,100	367,900	1,363,000	0.04
5/17/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,679,200	344,400	2,023,600	0.00
5/18/2016	2	0.2	1	10.8	114	8.0	3	8.0	3,276,700	589,000	3,865,700	0.00
												0.00
5/20/2016	5	15.9	4	16.1	1	16.1	4	16.1	3,276,700	586,000	3,862,700	0.00
5/21/2016	1	8.0	1	8.0	0	8.0	1	8.0	2,568,400	267,300	2,835,700	0.00
5/22/2016	1	8.0	1	8.0	0	8.0	1	8.0	2,495,200	261,100	2,756,300	0.00
5/23/2016	6	7.8	5	8.0	2	8.0	5	8.0	3,276,700	257,800	3,534,500	0.00
5/24/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	245,000	3,521,700	0.10
5/25/2016	2	2.5	1	8.0	89	8.0	1	8.0	3,276,700	489,000	3,765,700	0.25
5/26/2016	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	257,000	3,533,700	0.01
5/27/2016	4	7.9	2	8.0	1	7.9	2	7.9	2,413,700	241,500	2,655,200	0.23
5/28/2016	2	8.0	1	8.0	0	8.0	1	8.0	1,993,000	255,200	2,248,200	0.41
5/29/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,037,400	332,300	1,369,700	0.02
5/30/2016	1	8.0	1	8.0	0	8.0	1	8.0	932,100	274,100	1,206,200	0.00
5/31/2016	4	7.9	3	8.1	1	8.0	4	8.0	554,600	258,400	813,000	0.04
6/1/2016	1	8.0	1	8.0	0	8.0	1	8.0	518,600	240,800	759,400	0.06
6/2/2016	3	8.0	2	8.0	1	8.0	2	8.0	547,000	222,600	769,600	0.00
6/3/2016	1	8.0	1	8.0	0	8.0	1	8.0	584,200	206,700	790,900	0.00
6/4/2016	1	8.0	1	8.0	0	8.0	1	8.0	533,800	215,100	748,900	0.13
6/5/2016	1	7.9	1	8.0	0	8.0	1	8.0	550,200	208,400	758,600	0.02
6/6/2016	4	8.0	2	8.0	1	8.0	2	8.0	474,300	200,800	675,100	0.12
6/7/2016	1	7.9	1	8.0	0	8.0	1	8.0	580,700	195,700	776,400	0.00
6/8/2016	5	0.4	1	11.9	50	8.1	2	8.1	352,400	329,700	682,100	0.02

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
6/9/2016	1	8.0	1	8.0	0	8.0	1	8.0	417,900	189,900	607,800	0.00
6/10/2016	4	7.9	2	8.0	1	8.0	2	8.0	510,000	189,300	699,300	0.25
6/11/2016	1	8.0	1	8.0	0	8.0	1	8.0	489,000	190,500	679,500	0.00
6/12/2016	1	8.0	1	8.0	0	8.0	1	8.0	505,600	185,600	691,200	0.00
6/13/2016	6	8.0	2	8.0	1	8.0	2	8.0	575,500	179,100	754,600	0.00
6/14/2016	1	7.9	1	8.0	0	8.0	1	8.0	646,600	178,700	825,300	0.61
6/15/2016	11	4.0	5	10.7	32	8.0	6	8.0	1,229,100	702,000	1,931,100	1.31
6/16/2016	1	0.0	1	17.0	0	7.0	1	7.0	1,194,300	449,000	1,643,300	0.00
6/17/2016	2	7.9	1	15.0	0	1.1	3	1.1	1,128,900	49,900	1,178,800	0.00
6/18/2016	1	7.9	1	8.0	0	8.0	1	8.0	648,900	292,000	940,900	0.00
6/19/2016	1	8.0	1	8.0	0	8.0	1	8.0	628,700	266,500	895,200	0.00
6/20/2016	4	7.9	3	8.0	1	8.0	3	8.0	594,800	242,700	837,500	0.00
6/21/2016	1	8.0	1	8.0	0	8.0	1	8.0	535,400	218,500	753,900	0.00
6/22/2016	5	4.0	2	8.0	60	8.0	2	8.0	370,300	363,300	733,600	0.00
6/23/2016	1	8.0	1	8.0	0	8.0	1	8.0	517,800	199,000	716,800	0.10
6/24/2016	3	8.0	2	8.0	1	8.0	2	8.0	496,600	198,000	694,600	0.00
6/25/2016	1	8.0	1	8.0	0	8.0	1	8.0	452,400	186,300	638,700	0.00
6/26/2016	1	8.0	1	8.0	0	8.0	2	8.0	591,000	202,900	793,900	0.47
6/27/2016	4	7.9	2	8.0	2	8.0	2	8.0	541,300	230,200	771,500	0.00
6/28/2016	1	8.0	1	8.0	0	8.0	1	8.0	507,000	206,100	713,100	0.00
6/29/2016	1	8.0	1	8.0	0	8.0	1	8.0	463,500	194,000	657,500	0.00
6/30/2016	4	8.0	2	8.1	0	8.0	4	8.0	463,200	184,500	647,700	0.09
7/1/2016	1	7.9	1	8.0	0	8.0	1	8.0	499,000	175,600	674,600	0.00
7/2/2016	1	8.0	1	8.0	0	8.0	1	8.0	485,800	170,100	655,900	0.00
7/3/2016	1	8.0	1	8.0	0	8.0	1	8.0	417,000	163,700	580,700	0.00
7/4/2016	1	8.0	1	8.0	0	8.0	1	8.0	415,700	155,900	571,600	0.00
7/5/2016	4	8.0	2	8.0	1	8.0	2	8.0	460,700	157,300	618,000	0.00
7/6/2016	3	8.0	3	8.0	0	8.0	3	8.0	478,600	182,500	661,100	0.11
7/7/2016	1	8.0	1	8.0	0	8.0	1	8.0	472,300	162,000	634,300	0.02
7/8/2016	3	7.9	2	8.0	1	8.0	3	8.0	405,900	163,700	569,600	0.00
7/9/2016	1	8.0	1	8.0	0	8.0	1	8.0	432,800	154,200	587,000	0.00
7/10/2016	1	8.0	1	8.0	0	8.0	1	8.0	421,100	149,600	570,700	0.00
7/11/2016	4	7.9	2	8.0	1	8.0	2	8.0	466,600	155,600	622,200	0.17
7/12/2016	3	8.0	1	8.0	0	8.0	1	8.0	416,400	167,700	584,100	0.00
7/13/2016	5	7.8	2	8.0	2	8.0	2	8.0	433,300	160,700	594,000	0.00
7/14/2016	4	3.9	2	12.1	0	8.0	5	8.0	413,100	155,900	569,000	0.00
7/15/2016	4	7.8	3	8.1	1	8.0	4	8.0	403,300	146,200	549,500	0.05
7/16/2016	1	8.0	1	8.0	0	8.0	1	8.0	397,700	132,200	529,900	0.00
7/17/2016	1	8.0	1	8.0	0	8.0	1	8.0	439,600	140,900	580,500	0.17
7/18/2016	4	8.0	2	8.0	1	8.0	2	8.0	334,200	152,900	487,100	0.00
												0.00
7/20/2016	10	11.8	7	23.7	50	8.3	56	8.3	815,700	268,400	1,084,100	0.00
7/21/2016	2	8.0	2	8.0	0	8.0	1	8.0	468,700	147,600	616,300	0.63
7/22/2016	5	7.8	3	8.1	1	8.1	4	8.1	490,300	192,400	682,700	0.00
7/23/2016	16	7.9	2	8.0	0	8.0	1	8.0	492,300	185,700	678,000	0.36
7/24/2016	3	5.0	2	10.9	0	7.8	34	7.8	486,000	225,100	711,100	0.01
7/25/2016	6	7.9	2	8.0	1	8.0	2	8.0	445,600	184,400	630,000	0.00
7/26/2016	1	8.0	1	8.0	0	7.9	9	7.9	410,100	178,600	588,700	0.00
7/27/2016	1	8.0	1	8.0	0	8.0	1	8.0	426,100	158,400	584,500	0.00
7/28/2016	5	7.9	5	8.1	1	8.0	6	8.0	471,000	169,200	640,200	0.32
7/29/2016	2	8.0	2	8.0	0	7.7	52	7.7	418,800	172,200	591,000	0.17
7/30/2016	5	7.9	2	8.0	0	7.6	71	7.6	402,500	185,500	588,000	0.00
7/31/2016	1	8.0	1	8.0	0	8.0	1	8.0	453,900	168,300	622,200	0.00
8/1/2016	5	5.6	1	10.3	0	8.0	2	8.0	413,000	162,300	575,300	0.00
8/2/2016	1	8.0	1	8.0	0	8.0	1	8.0	467,600	153,100	620,700	0.00
8/3/2016	14	0.8	12	8.2	85	8.1	7	8.1	259,900	350,200	610,100	0.00
8/4/2016	12	0.0	8	1.4	10	21.2	12	21.2	251,300	554,300	805,600	0.11
8/5/2016	8	0.1	13	13.7	13	9.0	6	9.0	508,400	200,000	708,400	0.02
8/6/2016	0	0.0	1	15.9	0	8.0	1	8.0	395,400	146,100	541,500	0.00
8/7/2016	0	0.0	1	16.0	0	8.0	1	8.0	419,300	141,600	560,900	0.00
8/8/2016	6	0.5	5	14.2	9	8.5	8	8.5	366,000	171,000	537,000	0.00
8/9/2016	2	8.0	1	8.0	0	8.0	1	8.0	383,000	136,900	519,900	0.00
8/10/2016	1	8.0	1	8.0	0	8.0	1	8.0	451,400	140,800	592,200	0.00
8/11/2016	10	6.2	3	8.0	10	8.0	2	8.0	423,300	157,000	580,300	0.00
8/12/2016	2	7.9	2	8.0	1	8.0	2	8.0	459,500	144,300	603,800	0.87
8/13/2016	1	8.0	1	8.0	0	8.0	1	8.0	481,600	230,900	712,500	0.04
8/14/2016	1	8.0	1	8.0	0	8.0	1	8.0	385,900	186,700	572,600	0.00
8/15/2016	4	7.9	2	8.0	1	8.0	2	8.0	432,100	168,300	600,400	0.00
8/16/2016	1	8.0	1	8.0	0	8.0	1	8.0	433,500	160,700	594,200	0.00
8/17/2016	1	7.9	1	8.0	0	8.0	1	8.0	380,100	155,700	535,800	0.18
8/18/2016	3	7.9	2	8.0	1	8.0	2	8.0	380,500	157,700	538,200	0.00
8/19/2016	1	8.0	1	8.0	0	8.0	1	8.0	502,500	159,800	662,300	0.68
8/20/2016	1	8.0	1	8.0	0	8.0	1	8.0	705,600	277,100	982,700	0.16
8/21/2016	1	8.0	1	8.0	0	8.0	1	8.0	561,000	224,900	785,900	0.00
8/22/2016	5	7.9	2	8.1	1	8.0	4	8.0	604,400	199,500	803,900	0.00
8/23/2016	1	8.0	1	8.0	0	8.0	1	8.0	539,600	179,900	719,500	0.00
8/24/2016	1	8.0	1	8.0	0	8.0	1	8.0	541,000	173,900	714,900	0.20
8/25/2016	1	8.0	1	8.0	0	8.0	1	8.0	532,700	188,500	721,200	0.00
8/26/2016	3	7.9	2	8.0	1	8.0	3	8.0	456,500	189,300	645,800	0.00
8/27/2016	1	8.0	1	8.0	0	8.0	1	8.0	659,700	230,400	890,100	0.89

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
8/28/2016	1	8.0	1	8.0	0	8.0	1	8.0	511,000	227,400	738,400	0.00
8/29/2016	3	7.8	2	8.1	2	8.0	4	8.0	514,300	202,800	717,100	0.00
8/30/2016	1	8.0	1	8.0	0	8.0	1	8.0	563,900	195,900	759,800	0.73
8/31/2016	1	8.0	1	8.0	0	8.0	1	8.0	524,600	224,300	748,900	0.00
9/1/2016	4	8.0	2	8.0	1	8.0	2	8.0	473,300	199,300	672,600	0.00
9/2/2016	1	8.0	1	8.0	0	8.0	1	8.0	450,100	174,300	624,400	0.00
9/3/2016	1	8.0	1	8.0	0	8.0	1	8.0	414,000	163,400	577,400	0.00
9/4/2016	1	8.0	1	8.0	0	8.0	1	8.0	393,600	161,900	555,500	0.00
9/5/2016	1	8.0	1	8.0	0	8.0	1	8.0	447,900	157,600	605,500	0.00
9/6/2016	2	3.8	1	7.9	0	12.2	2	12.2	375,500	314,800	690,300	0.52
9/7/2016	3	0.5	2	8.0	0	15.4	3	15.4	737,400	807,400	1,544,800	1.47
9/8/2016	4	0.2	3	12.2	0	11.7	5	11.7	726,100	739,100	1,465,200	0.00
9/9/2016	6	7.6	1	8.0	1	8.0	2	8.0	657,200	301,000	958,200	0.00
9/10/2016	1	8.0	1	8.0	0	8.0	1	8.0	634,400	253,500	887,900	0.06
9/11/2016	1	8.0	1	8.0	0	8.0	1	8.0	622,100	248,100	870,200	0.00
9/12/2016	4	7.9	3	8.0	1	8.0	5	8.0	598,700	224,800	823,500	0.00
9/13/2016	1	8.0	1	8.0	0	8.0	1	8.0	565,600	207,600	773,200	0.04
9/14/2016	1	8.0	1	8.0	0	8.0	1	8.0	542,100	195,800	737,900	0.01
9/15/2016	9	7.8	4	8.1	2	8.0	3	8.0	530,900	185,400	716,300	0.00
9/16/2016	3	7.5	1	8.0	0	8.0	1	8.0	501,100	175,500	676,600	0.24
9/17/2016	1	8.0	1	8.0	0	8.0	1	8.0	473,400	177,600	651,000	0.02
9/18/2016	1	8.0	1	8.0	0	8.0	1	8.0	429,500	166,400	595,900	0.00
9/19/2016	5	7.7	4	8.1	1	8.1	5	8.1	561,800	224,500	786,300	0.64
9/20/2016	1	0.0	1	16.0	0	8.0	2	8.0	855,100	482,000	1,337,100	0.53
9/21/2016	1	5.3	1	10.7	0	8.0	2	8.0	1,285,300	313,800	1,599,100	0.25
9/22/2016	4	2.1	2	13.9	1	8.0	4	8.0	905,800	420,100	1,325,900	0.06
9/23/2016	1	8.0	1	8.0	0	8.0	1	8.0	713,400	311,500	1,024,900	0.00
9/24/2016	1	8.0	1	8.0	0	8.0	1	8.0	627,900	263,800	891,700	0.00
9/25/2016	1	7.9	1	8.0	0	8.0	1	8.0	616,900	244,400	861,300	0.19
9/26/2016	6	3.4	7	10.9	4	9.6	10	9.6	580,000	338,300	918,300	0.00
9/27/2016	2	4.1	1	8.0	0	11.9	2	11.9	438,600	385,200	823,800	0.05
9/28/2016	1	8.0	1	8.0	0	8.0	1	8.0	577,100	213,900	791,000	0.07
9/29/2016	6	5.3	4	10.6	2	8.0	2	8.0	540,900	216,700	757,600	0.00
9/30/2016	1	8.0	1	8.0	0	8.0	1	8.0	550,700	205,300	756,000	0.40
10/1/2016	1	8.0	1	7.9	0	8.0	1	8.0	809,000	359,600	1,168,600	0.43
10/2/2016	1	8.0	1	8.0	0	8.0	1	8.0	814,900	347,800	1,162,700	0.12
10/3/2016	1	8.0	1	8.0	0	8.0	1	8.0	716,900	332,500	1,049,400	0.00
10/4/2016	1	8.0	1	8.0	0	8.0	1	8.0	637,900	276,900	914,800	0.00
10/5/2016	1	8.0	1	8.0	0	8.0	1	8.0	569,700	256,000	825,700	0.03
10/6/2016	1	8.0	1	8.0	0	8.0	1	8.0	568,100	236,300	804,400	0.03
10/7/2016	5	7.9	3	8.0	1	8.0	5	8.0	559,000	232,500	791,500	0.03
10/8/2016	1	8.0	1	8.0	0	8.0	1	8.0	554,200	215,900	770,100	0.00
10/9/2016	1	8.0	1	8.0	0	8.0	1	8.0	510,500	207,100	717,600	0.00
10/10/2016	4	7.9	3	8.1	2	8.0	3	8.0	552,600	210,400	763,000	0.00
10/11/2016	1	8.0	1	8.0	0	8.0	1	8.0	530,800	193,200	724,000	0.05
10/12/2016	1	8.0	1	8.0	0	8.0	1	8.0	558,800	194,300	753,100	0.22
10/13/2016	2	4.1	1	8.0	67	8.0	1	8.0	405,900	380,300	786,200	0.00
10/14/2016	1	8.0	1	8.0	0	8.0	1	8.0	549,500	210,000	759,500	0.00
10/15/2016	1	8.0	1	8.0	0	8.0	1	8.0	443,800	196,000	639,800	0.03
10/16/2016	5	2.9	1	16.0	0	8.0	2	8.0	1,817,600	314,100	2,131,700	1.40
10/17/2016	1	0.1	1	16.0	0	8.0	2	8.0	986,800	481,400	1,468,200	0.01
10/18/2016	3	5.8	2	8.0	76	8.0	2	8.0	685,400	488,300	1,173,700	0.00
10/19/2016	1	8.0	1	8.0	0	8.0	1	8.0	709,600	299,200	1,008,800	0.00
10/20/2016	1	8.0	1	8.0	0	8.0	1	8.0	604,100	270,000	874,100	0.00
10/21/2016	2	8.0	2	8.0	1	8.0	2	8.0	622,500	243,100	865,600	0.00
10/22/2016	1	8.0	1	8.0	0	8.0	1	8.0	593,800	226,700	820,500	0.00
10/23/2016	1	8.0	1	8.0	0	8.0	1	8.0	495,300	211,400	706,700	0.00
10/24/2016	5	7.8	4	8.0	3	8.0	4	8.0	528,500	212,500	741,000	0.00
10/25/2016	2	6.7	1	8.0	23	8.0	1	8.0	543,500	245,300	788,800	0.00
10/26/2016	2	3.1	1	13.9	0	16.3	149	16.3	2,086,100	935,900	3,022,000	1.55
10/27/2016	3	4.1	4	15.9	2	8.0	5	8.0	1,959,700	750,200	2,709,900	0.00
10/28/2016	1	0.0	1	16.0	0	8.0	2	8.0	1,114,500	544,700	1,659,200	0.00
10/29/2016	1	8.0	1	8.0	0	8.0	1	8.0	906,000	427,200	1,333,200	0.00
10/30/2016	1	8.0	1	8.0	0	8.0	1	8.0	773,800	362,200	1,136,000	0.01
10/31/2016	3	8.0	2	8.0	2	8.0	2	8.0	822,700	323,700	1,146,400	0.00
11/1/2016	1	8.0	1	8.0	0	8.0	1	8.0	713,600	298,000	1,011,600	0.00
11/2/2016	1	3.9	1	12.1	0	8.0	2	8.0	1,313,400	310,300	1,623,700	0.63
11/3/2016	1	0.0	1	16.0	0	8.1	2	8.1	1,072,400	519,500	1,591,900	0.01
11/4/2016	4	2.2	3	13.7	5	8.0	3	8.0	929,800	414,900	1,344,700	0.00
11/5/2016	1	8.0	1	8.0	0	8.0	1	8.0	778,300	355,000	1,133,300	0.00
11/6/2016	1	8.0	1	8.0	0	9.0	1	9.0	901,200	351,400	1,252,600	0.00
11/7/2016	2	2.9	2	13.1	1	8.0	3	8.0	949,700	301,000	1,250,700	0.00
11/8/2016	1	8.0	1	8.0	0	8.0	1	8.0	778,000	278,100	1,056,100	0.00
11/9/2016	4	7.9	3	8.0	1	8.0	3	8.0	791,400	271,100	1,062,500	0.00
11/10/2016	1	8.0	1	8.0	0	8.0	1	8.0	655,000	257,600	912,600	0.00
11/11/2016	6	7.8	4	8.0	2	8.0	2	8.0	608,100	241,000	849,100	0.00
11/12/2016	1	8.0	1	8.0	0	8.0	1	8.0	731,300	226,100	957,400	0.00
11/13/2016	1	8.0	1	8.1	0	8.0	1	8.0	585,700	217,200	802,900	0.00
11/14/2016	4	7.8	4	8.0	1	8.0	5	8.0	544,000	211,200	755,200	0.00
11/15/2016	1	8.0	1	8.0	0	8.0	1	8.0	492,200	210,600	702,800	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
11/16/2016	5	0.8	2	8.6	116	8.0	3	8.0	323,800	467,900	791,700	0.00
11/17/2016	1	8.0	1	8.0	0	8.0	1	8.0	454,900	200,500	655,400	0.00
11/18/2016	4	7.9	2	8.0	1	8.0	2	8.0	465,700	194,600	660,300	0.17
11/19/2016	1	8.0	1	8.0	0	8.0	1	8.0	478,000	185,900	663,900	0.00
11/20/2016	1	8.0	1	8.0	0	8.0	1	8.0	610,200	188,100	798,300	0.00
11/21/2016	4	7.9	2	8.0	1	8.0	2	8.0	469,200	199,700	668,900	0.00
11/22/2016	1	8.0	1	8.0	0	8.0	1	8.0	443,800	191,200	635,000	0.00
11/23/2016	4	7.9	3	8.1	1	8.0	3	8.0	398,000	186,000	584,000	0.07
11/24/2016	1	8.0	1	8.0	0	8.0	1	8.0	313,900	182,400	496,300	0.00
11/25/2016	1	8.0	1	8.0	0	8.0	1	8.0	482,200	177,800	660,000	0.00
11/26/2016	1	8.0	1	7.9	0	8.0	1	8.0	496,300	182,100	678,400	0.00
11/27/2016	1	8.0	1	8.0	0	8.0	1	8.0	614,600	174,900	789,500	0.00
11/28/2016	5	7.9	3	8.1	1	8.1	4	8.1	797,700	319,700	1,117,400	0.83
11/29/2016	1	0.0	1	16.0	0	8.0	2	8.0	967,200	623,600	1,590,800	0.02
11/30/2016	1	8.0	1	8.0	0	8.0	1	8.0	1,028,100	417,900	1,446,000	0.00
12/1/2016	3	7.4	1	8.0	9	8.0	1	8.0	820,800	384,700	1,205,500	0.00
12/2/2016	2	2.1	1	13.9	0	8.0	3	8.0	796,200	318,800	1,115,000	0.00
12/3/2016	1	7.9	1	8.0	0	8.0	1	8.0	839,100	283,600	1,122,700	0.00
12/4/2016	1	8.0	1	8.0	0	8.0	1	8.0	524,600	280,900	805,500	0.01
12/5/2016	4	4.6	4	11.4	1	8.0	4	8.0	917,400	312,400	1,229,800	0.24
12/6/2016	1	8.0	1	8.0	0	8.0	1	8.0	763,800	353,000	1,116,800	0.00
12/7/2016	2	4.5	1	8.0	78	8.0	1	8.0	580,900	526,100	1,107,000	0.00
12/8/2016	1	8.0	1	8.0	0	8.0	1	8.0	750,300	299,000	1,049,300	0.00
12/9/2016	3	7.8	2	8.0	1	8.0	2	8.0	555,200	280,900	836,100	0.00
12/10/2016	1	8.0	1	8.0	0	8.0	1	8.0	705,500	260,100	965,600	0.00
12/11/2016	1	8.0	1	8.0	0	8.0	1	8.0	667,600	256,400	924,000	0.00
12/12/2016	2	8.0	1	8.0	0	8.0	1	8.0	615,500	249,000	864,500	0.00
12/13/2016	1	8.0	1	8.0	0	8.0	1	8.0	518,500	246,000	764,500	0.00
12/14/2016	3	8.0	2	8.0	1	8.0	2	8.0	548,800	241,100	789,900	0.00
12/15/2016	1	8.0	1	8.0	0	8.0	1	8.0	525,300	227,200	752,500	0.00
12/16/2016	1	8.0	1	8.0	0	8.0	1	8.0	520,100	222,400	742,500	0.00
12/17/2016	1	8.0	1	8.0	0	8.0	1	8.0	554,000	211,600	765,600	0.00
12/18/2016	1	8.0	1	8.0	0	8.0	1	8.0	530,000	202,900	732,900	0.00
12/19/2016	1	8.0	1	8.0	0	8.0	1	8.0	508,100	207,900	716,000	0.00
12/20/2016	1	8.0	1	8.0	0	8.0	1	8.0	519,100	207,100	726,200	0.00
12/21/2016	1	8.0	1	8.0	0	8.0	1	8.0	518,700	207,200	725,900	0.00
12/22/2016	7	4.9	7	10.9	1	8.0	4	8.0	556,300	204,900	761,200	0.04
12/23/2016	1	8.0	1	8.0	0	8.0	1	8.0	519,500	211,000	730,500	0.00
12/24/2016	1	8.0	1	8.0	0	8.0	1	8.0	493,300	222,200	715,500	0.16
12/25/2016	1	8.0	1	8.0	0	8.0	1	8.0	659,400	260,700	920,100	0.24
12/26/2016	1	0.0	1	16.0	0	8.0	2	8.0	1,861,200	708,200	2,569,400	0.18
12/27/2016	5	0.1	3	15.9	1	8.0	4	8.0	1,236,100	747,500	1,983,600	0.00
12/28/2016	1	8.0	1	8.0	0	8.0	1	8.0	932,700	500,100	1,432,800	0.00
12/29/2016	2	4.2	3	11.7	1	8.0	3	8.0	841,000	424,200	1,265,200	0.00
12/30/2016	1	8.0	1	7.9	0	8.0	1	8.0	773,100	369,700	1,142,800	0.00
12/31/2016	1	8.0	1	8.0	0	8.0	1	8.0	738,800	345,900	1,084,700	0.00
Total	995	2310.4	674	3266.1	1793	3140.7	1214	3140.7	482,549,900	131,396,000	613,945,900	29.07
Ave	3	6.4	2	9.0	5	8.7	3	8.7	1,329,339	361,972	1,691,311	0.08
Max	99	15.9	13	23.7	116	21.2	149	21.2	3,276,700	1,851,800	5,128,500	1.55
Min	0	0.0	1	1.4	0	1.1	1	1.1	251,300	49,900	487,100	0.00
Median	1	8.0	1	8.0	0	8.0	1	8.0	738,300	270,200	1,081,000	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
1/1/2017	1	8.0	1	8.0	0	8.0	1	8.0	626,900	315,300	942,200	0.00
1/2/2017	1	8.0	1	8.0	0	8.0	1	8.0	671,700	305,900	977,600	0.02
1/3/2017	3	7.8	2	8.0	5	8.0	3	8.0	747,400	346,700	1,094,100	0.01
1/4/2017	1	8.0	1	8.0	0	8.0	1	8.0	674,300	364,800	1,039,100	0.00
1/5/2017	1	8.0	1	8.0	0	8.0	1	8.0	663,500	312,800	976,300	0.00
1/6/2017	3	8.0	2	8.0	1	8.0	2	8.0	629,700	286,700	916,400	0.00
1/7/2017	1	8.0	1	8.0	0	8.0	1	8.0	613,800	262,300	876,100	0.00
1/8/2017	1	8.0	1	8.0	0	8.0	1	8.0	566,100	253,500	819,600	0.00
1/9/2017	3	3.6	2	12.3	1	8.1	4	8.1	559,500	247,700	807,200	0.00
1/10/2017	4	8.0	1	8.0	0	8.0	1	8.0	929,500	263,800	1,193,300	0.34
1/11/2017	1	7.9	1	8.0	0	8.0	1	8.0	731,000	403,600	1,134,600	0.00
1/12/2017	3	4.2	2	11.9	0	8.0	3	8.0	626,200	294,200	920,400	0.00
1/13/2017	1	8.0	1	8.0	0	8.0	1	8.0	580,000	261,000	841,000	0.00
1/14/2017	1	8.0	1	8.0	0	8.0	1	8.0	563,900	248,800	812,700	0.00
1/15/2017	1	8.0	1	8.0	0	8.0	1	8.0	545,100	233,200	778,300	0.01
1/16/2017	4	7.9	3	8.0	1	8.0	2	8.0	600,700	257,100	857,800	0.46
1/17/2017	1	8.0	1	8.0	0	8.0	1	8.0	822,700	392,100	1,214,800	0.14
1/18/2017	6	6.9	5	8.2	2	8.7	7	8.7	714,500	394,700	1,109,200	0.00
1/19/2017	1	8.0	1	8.0	0	8.0	1	8.0	645,400	321,100	966,500	0.02
1/20/2017	2	3.2	2	11.8	24	8.0	2	8.0	940,300	499,400	1,439,700	0.38
1/21/2017	1	8.0	1	8.0	0	8.0	1	8.0	942,700	428,400	1,371,100	0.07
1/22/2017	1	8.0	1	7.9	0	8.0	1	8.0	924,400	436,400	1,360,800	0.00
1/23/2017	4	7.9	3	8.1	2	8.0	3	8.0	927,000	423,300	1,350,300	0.00
1/24/2017	1	8.0	1	8.0	0	8.0	1	8.0	870,400	404,300	1,274,700	0.02
1/25/2017	3	8.0	2	8.0	1	8.0	2	8.0	1,236,900	416,600	1,653,500	0.34
1/26/2017	1	0.0	1	16.0	0	8.1	2	8.1	1,300,400	544,200	1,844,600	0.07
1/27/2017	3	8.0	3	8.0	2	8.0	3	8.0	1,312,000	491,400	1,803,400	0.00
1/28/2017	1	7.9	1	8.0	0	8.0	1	8.0	1,269,100	399,100	1,668,200	0.00
1/29/2017	1	8.0	1	8.0	0	8.0	1	8.0	901,300	364,100	1,265,400	0.00
1/30/2017	3	7.9	2	8.0	1	8.1	5	8.1	745,100	341,600	1,086,700	0.00
1/31/2017	1	7.9	1	8.0	0	8.0	1	8.0	703,400	313,600	1,017,000	0.00
2/1/2017	1	8.0	1	8.0	0	8.0	1	8.0	694,400	294,800	989,200	0.00
2/2/2017	1	8.0	1	8.0	0	8.0	1	8.0	674,600	286,600	961,200	0.00
2/3/2017	3	8.0	2	8.0	1	8.0	2	8.0	639,000	273,300	912,300	0.00
2/4/2017	1	8.0	1	8.0	0	8.0	1	8.0	602,100	256,100	858,200	0.00
2/5/2017	1	8.0	1	8.0	0	8.0	1	8.0	607,300	251,700	859,000	0.01
2/6/2017	2	7.4	2	8.0	12	8.0	2	8.0	612,300	269,700	882,000	0.00
2/7/2017	1	8.0	1	8.0	0	8.0	1	8.0	911,600	248,600	1,160,200	0.10
2/8/2017	4	8.0	2	8.0	1	8.0	2	8.0	933,300	284,200	1,217,500	0.00
2/9/2017	1	8.0	1	8.0	0	8.0	1	8.0	815,300	251,600	1,066,900	0.00
2/10/2017	3	6.7	2	8.0	23	8.0	2	8.0	680,500	304,700	985,200	0.00
2/11/2017	1	8.0	1	8.0	0	8.0	1	8.0	771,400	220,400	991,800	0.00
2/12/2017	1	8.0	1	8.0	0	8.0	1	8.0	765,100	224,900	990,000	0.03
2/13/2017	6	7.9	3	8.0	1	8.0	3	8.0	741,900	238,800	980,700	0.00
2/14/2017	3	7.9	1	8.0	2	8.0	2	8.0	784,800	238,500	1,023,300	0.00
2/15/2017	4	7.0	4	8.0	2	8.8	4	8.8	714,100	278,100	992,200	0.00
2/16/2017	2	8.0	1	8.0	0	8.0	1	8.0	746,000	232,100	978,100	0.00
2/17/2017	2	7.9	2	8.0	1	8.0	2	8.0	756,900	233,800	990,700	0.00
2/18/2017	1	8.0	1	8.0	0	8.0	1	8.0	767,900	230,300	998,200	0.00
2/19/2017	1	8.0	1	8.0	0	8.0	1	8.0	804,900	253,400	1,058,300	0.00
2/20/2017	4	7.4	2	8.0	18	8.0	2	8.0	1,372,600	299,700	1,672,300	0.00
2/21/2017	1	7.9	1	8.0	0	8.0	1	8.0	2,562,800	301,000	2,863,800	0.09
2/22/2017	1	1.3	1	8.5	132	8.0	3	8.0	1,546,300	691,100	2,237,400	0.00
2/23/2017	1	8.0	1	8.0	0	8.0	1	8.0	2,276,900	357,900	2,634,800	0.38
2/24/2017	46	3.3	1	12.1	0	19.7	15	19.7	3,257,000	1,485,000	4,742,000	0.82
2/25/2017	0	0.0	1	11.9	0	12.0	2	12.0	2,693,600	1,201,100	3,894,700	0.00
2/26/2017	0	0.0	1	12.0	0	12.0	1	12.0	2,648,200	920,200	3,568,400	0.00
2/27/2017	0	0.0	2	9.0	74	12.0	1	12.0	2,708,900	1,029,300	3,738,200	0.00
2/28/2017	0	0.0	1	9.0	8	14.7	2	14.7	3,276,700	1,007,100	4,283,800	0.22
3/1/2017	1	0.0	3	9.0	4	14.7	3	14.7	3,276,700	1,292,800	4,569,500	0.09
3/2/2017	0	0.0	1	12.0	0	12.0	1	12.0	2,729,200	988,000	3,717,200	0.01
3/3/2017	1	0.0	2	12.0	0	12.0	3	12.0	2,969,600	843,800	3,813,400	0.00
3/4/2017	0	0.0	1	12.0	0	12.0	1	12.0	3,009,800	738,700	3,748,500	0.00
3/5/2017	0	0.0	1	12.0	0	12.0	1	12.0	2,792,100	719,800	3,511,900	0.01
3/6/2017	1	0.0	2	11.8	2	12.0	3	12.0	1,974,400	755,600	2,730,000	0.00
3/7/2017	0	0.0	1	12.0	0	12.0	2	12.0	2,992,000	1,047,000	4,039,000	0.25
3/8/2017	9	0.4	4	11.6	0	12.1	12	12.1	2,594,600	882,700	3,477,300	0.00
3/9/2017	0	0.0	1	12.0	0	12.0	1	12.0	1,957,600	753,200	2,710,800	0.00
3/10/2017	0	0.0	1	12.0	0	12.0	1	12.0	2,452,500	655,900	3,108,400	0.00
3/12/2017												
1/1/1900	0	0.0	1	12.0	0	11.0	1	11.0	1,354,500	507,000	1,861,500	0.00
3/13/2017	3	3.7	3	12.0	3	8.0	3	8.0	1,471,100	333,100	1,804,200	0.00
3/14/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,274,000	321,200	1,595,200	0.00
3/15/2017	4	7.8	2	8.1	4	8.0	2	8.0	1,463,500	334,000	1,797,500	0.00
3/16/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,375,900	320,100	1,696,000	0.03
3/17/2017	2	8.0	2	8.0	1	8.0	2	8.0	1,576,700	352,900	1,929,600	0.15
3/18/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,818,100	461,700	2,279,800	0.01
3/19/2017	1	0.0	1	16.0	0	8.0	2	8.0	1,794,200	592,000	2,386,200	0.00
3/20/2017	1	0.0	2	13.6	47	8.0	3	8.0	1,491,200	814,000	2,305,200	0.00
3/21/2017	1	0.0	1	16.0	0	8.0	2	8.0	1,666,000	537,700	2,203,700	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
3/22/2017	3	8.0	2	8.0	1	8.0	3	8.0	1,662,700	455,200	2,117,900	0.00
3/23/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,605,000	416,500	2,021,500	0.08
3/24/2017	3	7.7	2	8.0	5	8.0	2	8.0	1,740,600	427,200	2,167,800	0.00
3/25/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,294,900	388,000	1,682,900	0.06
3/26/2017	2	5.9	1	10.1	0	8.0	2	8.0	1,738,100	448,900	2,187,000	0.00
3/27/2017	6	0.1	4	15.8	1	8.1	9	8.1	1,797,400	754,000	2,551,400	0.50
3/28/2017	1	0.0	1	16.0	0	8.0	2	8.0	1,678,400	581,400	2,259,800	0.02
3/29/2017	5	1.4	4	14.5	1	8.1	7	8.1	1,563,500	507,500	2,071,000	0.07
3/30/2017	29	4.3	9	4.2	0	23.8	6	23.8	2,303,700	2,034,100	4,337,800	0.63
3/31/2017	70	0.7	2	12.6	1	12.0	7	12.0	2,100,900	1,233,400	3,334,300	0.00
4/1/2017	0	0.0	1	12.0	0	12.0	1	12.0	1,925,300	987,000	2,912,300	0.00
4/2/2017	0	0.0	1	12.0	0	12.0	1	12.0	1,831,200	870,400	2,701,600	0.03
4/3/2017	1	0.0	3	12.3	58	9.0	2	9.0	1,354,000	996,400	2,350,400	0.41
4/4/2017	189	2.5	4	1.3	2	22.5	6	22.5	1,535,900	2,552,200	4,088,100	0.22
4/5/2017	2	0.0	2	11.9	1	12.0	3	12.0	1,768,600	1,288,000	3,056,600	0.27
4/6/2017	1	0.0	1	20.0	0	4.0	3	4.0	1,821,300	375,400	2,196,700	0.00
4/7/2017	3	3.3	3	12.7	1	8.0	3	8.0	1,543,800	581,000	2,124,800	0.00
4/8/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,512,600	493,700	2,006,300	0.00
4/9/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,367,400	436,400	1,803,800	0.00
4/10/2017	3	5.6	2	8.0	52	8.0	2	8.0	1,209,400	592,500	1,801,900	0.57
4/11/2017	1	0.0	1	16.0	0	8.0	2	8.0	1,512,800	654,400	2,167,200	0.00
4/12/2017	2	0.0	3	15.8	5	8.0	3	8.0	1,348,700	532,500	1,881,200	0.00
4/13/2017	1	0.0	1	16.0	0	8.0	2	8.0	1,664,500	558,300	2,222,800	0.43
4/14/2017	18	5.3	10	10.0	0	8.1	4	8.1	1,438,300	593,500	2,031,800	0.01
4/15/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,481,000	552,600	2,033,600	0.14
4/16/2017	1	0.0	1	16.0	0	8.0	2	8.0	1,596,500	788,000	2,384,500	0.40
4/17/2017	5	6.0	4	10.0	2	8.0	4	8.0	1,379,700	622,400	2,002,100	0.00
4/18/2017	5	6.2	5	9.6	0	8.1	5	8.1	1,620,700	512,500	2,133,200	0.00
4/19/2017	1	8.0	1	8.0	0	8.0	1	8.0	2,935,800	451,500	3,387,300	0.01
4/20/2017	1	0.0	1	16.0	0	8.0	3	8.0	3,107,100	615,900	3,723,000	0.47
4/21/2017	3	3.8	2	12.2	1	8.0	3	8.0	3,231,000	581,300	3,812,300	0.00
4/22/2017	1	8.0	1	8.0	0	7.9	1	7.9	3,276,700	481,400	3,758,100	0.00
4/23/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	435,200	3,711,900	0.00
4/24/2017	2	8.0	2	8.0	1	8.0	2	8.0	3,276,700	385,400	3,662,100	0.00
4/25/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,171,200	363,400	3,534,600	0.00
4/26/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,123,000	350,000	3,473,000	0.24
4/27/2017	79	1.0	2	13.0	0	11.0	3	11.0	3,098,300	802,500	3,900,800	0.55
4/28/2017	8	0.2	3	13.0	3	10.9	7	10.9	3,199,100	907,200	4,106,300	0.02
4/29/2017	1	0.0	1	13.0	0	11.0	2	11.0	3,189,300	733,900	3,923,200	0.27
4/30/2017	3	0.0	1	8.0	0	16.0	2	16.0	3,276,700	1,522,700	4,799,400	0.47
5/1/2017	144	1.6	8	16.5	1	16.2	4	16.2	3,229,400	1,615,100	4,844,500	0.58
5/2/2017	0	0.0	1	8.0	0	16.0	2	16.0	3,055,700	1,682,100	4,737,800	0.01
5/3/2017	2	0.0	3	13.2	58	8.0	5	8.0	2,636,400	877,600	3,514,000	0.00
5/4/2017	1	0.0	1	16.0	0	8.0	2	8.0	2,666,800	527,100	3,193,900	0.00
5/5/2017	2	7.9	2	8.1	1	8.0	3	8.0	3,229,800	458,500	3,688,300	0.00
5/6/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,130,400	403,500	3,533,900	0.00
5/7/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,102,400	367,900	3,470,300	0.00
5/8/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,164,500	347,700	3,512,200	0.00
5/9/2017	3	7.9	2	8.0	2	8.0	2	8.0	3,109,800	323,200	3,433,000	0.00
5/10/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,088,600	303,800	3,392,400	0.14
5/11/2017	5	7.8	4	8.0	1	8.0	5	8.0	2,996,100	309,800	3,305,900	0.00
5/12/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,176,300	293,200	3,469,500	0.00
5/13/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,043,700	268,000	3,311,700	0.00
5/14/2017	1	8.0	1	8.0	0	8.0	1	8.0	2,953,000	262,300	3,215,300	0.00
5/15/2017	1	8.0	1	8.0	0	8.0	1	8.0	2,790,100	254,900	3,045,000	0.72
5/16/2017	2	1.9	1	9.1	128	8.0	1	8.0	2,240,300	762,300	3,002,600	0.02
5/17/2017	1	8.0	1	8.0	0	8.0	1	8.0	2,597,600	342,200	2,939,800	0.46
5/18/2017	3	2.1	3	13.9	1	8.0	3	8.0	2,652,800	551,000	3,203,800	0.00
5/19/2017	1	8.0	1	8.0	0	8.0	1	8.0	2,994,600	395,300	3,389,900	0.00
5/20/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,102,300	361,600	3,463,900	0.41
5/21/2017	2	3.4	2	12.5	0	8.0	3	8.0	2,986,700	503,400	3,490,100	0.03
5/22/2017	2	7.6	1	8.0	9	8.0	1	8.0	3,067,900	452,600	3,520,500	0.08
5/23/2017	1	8.0	1	8.0	0	8.0	1	8.0	2,938,400	445,200	3,383,600	0.39
5/24/2017	1	0.0	1	16.0	0	8.1	2	8.1	2,763,400	724,100	3,487,500	0.12
5/25/2017	3	0.1	3	13.9	40	8.0	3	8.0	2,664,100	784,900	3,449,000	0.00
5/26/2017	2	2.1	2	13.8	0	8.0	2	8.0	2,989,600	475,200	3,464,800	0.03
5/27/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	410,200	3,686,900	0.00
5/28/2017	1	3.0	1	13.0	0	8.0	2	8.0	3,276,700	412,200	3,688,900	0.90
5/29/2017	1	0.0	1	16.0	0	8.0	2	8.0	2,967,400	615,600	3,583,000	0.00
5/30/2017	4	2.9	5	12.9	3	8.0	4	8.0	3,166,300	470,400	3,636,700	0.00
5/31/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	405,000	3,681,700	0.00
6/1/2017	3	7.9	2	8.0	2	8.0	2	8.0	3,162,900	355,800	3,518,700	0.00
6/2/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,147,700	308,900	3,456,600	0.00
6/3/2017	1	4.5	1	11.6	0	8.0	2	8.0	2,878,600	299,500	3,178,100	0.40
6/4/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,208,900	365,800	3,574,700	0.00
6/5/2017	4	7.7	2	8.0	1	8.1	5	8.1	3,273,900	317,600	3,591,500	0.00
6/6/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	276,300	3,553,000	0.00
6/7/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	259,200	3,535,900	0.00
6/8/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	245,000	3,521,700	0.00
6/9/2017	3	7.5	2	8.0	2	8.5	6	8.5	3,276,700	264,000	3,540,700	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
6/10/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,097,800	227,800	3,325,600	0.00
6/11/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	216,000	3,492,700	0.00
6/12/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	216,800	3,493,500	0.47
6/13/2017	4	7.6	3	8.0	7	8.0	2	8.0	3,276,700	241,700	3,518,400	0.21
6/14/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	221,900	3,498,600	0.08
6/15/2017	3	7.6	2	8.0	1	8.3	5	8.3	3,276,700	238,300	3,515,000	0.00
6/16/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	214,100	3,490,800	0.00
6/17/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	240,900	3,517,600	0.42
6/18/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	229,600	3,506,300	0.00
6/19/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	216,500	3,493,200	0.25
6/20/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,232,400	220,700	3,453,100	0.24
6/21/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,254,300	228,500	3,482,800	0.00
6/22/2017	4	6.7	3	9.1	2	8.0	3	8.0	3,159,200	222,400	3,381,600	0.46
6/23/2017	15	2.9	1	16.0	0	8.1	2	8.1	2,366,400	545,600	2,912,000	1.60
6/24/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,182,800	471,600	3,654,400	0.00
6/25/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	345,800	3,622,500	0.00
6/26/2017	7	7.7	2	8.0	4	8.0	5	8.0	3,179,500	295,300	3,474,800	0.00
6/27/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,199,000	267,600	3,466,600	0.00
6/28/2017	4	8.5	2	6.6	7	8.0	6	8.0	3,085,200	399,100	3,484,300	2.31
6/29/2017	2	0.1	4	22.3	8	7.7	10	7.7	2,314,600	651,900	2,966,500	0.11
6/30/2017	1	0.0	1	16.0	0	8.0	2	8.0	2,402,700	600,000	3,002,700	0.00
7/1/2017	1	0.0	1	16.0	0	8.0	2	8.0	2,640,000	433,400	3,073,400	0.00
7/2/2017	1	0.0	1	16.0	0	8.0	2	8.0	2,383,500	358,200	2,741,700	0.28
7/3/2017	5	0.0	4	15.7	6	8.0	3	8.0	2,548,400	375,600	2,924,000	0.00
7/4/2017	1	0.1	1	16.0	0	8.0	2	8.0	2,538,800	308,200	2,847,000	0.00
7/5/2017	21	1.6	5	14.1	6	8.0	5	8.0	2,540,900	300,500	2,841,400	0.00
7/6/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,028,000	265,600	3,293,600	0.00
7/7/2017	3	7.8	2	8.0	3	8.0	2	8.0	3,043,900	272,500	3,316,400	0.05
7/8/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,110,000	312,100	3,422,100	0.05
7/9/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,169,100	262,600	3,431,700	0.00
7/10/2017	3	6.4	2	8.0	36	8.0	3	8.0	3,276,700	430,800	3,707,500	0.75
7/11/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	318,300	3,595,000	0.00
7/12/2017	2	2.5	1	12.7	16	8.0	2	8.0	2,565,900	406,800	2,972,700	0.00
7/13/2017	5	3.0	2	12.2	20	8.0	2	8.0	2,644,100	504,200	3,148,300	0.25
7/14/2017	2	7.9	2	8.0	1	8.0	2	8.0	3,214,200	348,100	3,562,300	0.00
7/15/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,191,100	301,100	3,492,200	0.00
7/16/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,233,500	276,400	3,509,900	0.00
7/17/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,260,000	256,500	3,516,500	0.00
7/18/2017	1	8.0	1	8.0	0	8.0	1	8.0	3,026,400	239,000	3,265,400	0.00
7/19/2017	1	8.0	1	8.0	0	8.0	1	8.0	2,941,000	240,000	3,181,000	0.15
7/20/2017	3	7.5	2	8.0	16	8.1	2	8.1	956,900	264,700	1,221,600	0.47
7/21/2017	1	7.9	1	8.0	0	8.0	1	8.0	890,800	246,500	1,137,300	0.00
7/22/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,089,000	304,700	1,393,700	0.40
7/23/2017	1	8.0	1	8.0	0	8.0	1	8.0	924,800	244,300	1,169,100	0.00
7/24/2017	3	7.7	2	8.0	8	8.0	2	8.0	855,200	244,000	1,099,200	0.10
7/25/2017	1	7.9	1	8.0	0	8.0	1	8.0	811,100	209,000	1,020,100	0.00
7/26/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,158,900	244,400	1,403,300	0.00
7/27/2017	3	2.4	2	8.0	121	8.0	3	8.0	959,000	776,000	1,735,000	1.33
7/28/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,071,800	310,200	1,382,000	0.00
7/29/2017	1	8.0	1	8.0	0	8.0	1	8.0	871,800	255,300	1,127,100	0.00
7/30/2017	1	8.0	1	8.0	0	8.0	1	8.0	920,000	237,900	1,157,900	0.00
7/31/2017	1	8.0	1	8.0	0	8.0	1	8.0	937,000	222,300	1,159,300	0.00
8/1/2017	3	3.7	2	8.0	66	8.0	2	8.0	662,400	365,600	1,028,000	0.00
8/2/2017	1	8.0	1	8.0	0	8.0	1	8.0	641,900	195,300	837,200	0.00
8/3/2017	4	4.7	3	11.3	1	8.1	22	8.1	1,645,600	271,200	1,916,800	1.54
8/4/2017	1	0.0	1	16.0	0	8.0	2	8.0	1,201,200	584,300	1,785,500	0.01
8/5/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,067,200	366,600	1,433,800	0.00
8/6/2017	1	8.0	1	8.0	0	8.0	1	8.0	899,200	295,200	1,194,400	0.00
8/7/2017	1	8.0	1	8.0	0	8.0	1	8.0	901,700	258,100	1,159,800	0.00
8/8/2017	4	7.7	2	8.0	5	8.0	3	8.0	822,800	250,400	1,073,200	0.00
8/9/2017	1	8.0	1	8.0	0	8.0	1	8.0	822,000	226,400	1,048,400	0.00
8/10/2017	1	8.0	1	8.0	0	8.0	1	8.0	848,100	214,800	1,062,900	0.01
8/11/2017	2	5.3	1	8.0	39	8.0	1	8.0	665,400	305,100	970,500	0.00
8/12/2017	1	8.0	1	8.0	0	8.0	1	8.0	718,000	196,600	914,600	0.00
8/13/2017	1	8.0	1	8.0	0	8.0	1	8.0	780,500	190,100	970,600	0.00
8/14/2017	4	7.8	2	8.0	4	8.0	2	8.0	785,900	194,400	980,300	0.00
8/15/2017	1	8.0	1	8.0	0	8.0	1	8.0	757,300	172,300	929,600	0.00
8/16/2017	1	8.0	1	8.0	0	8.0	1	8.0	729,700	172,500	902,200	0.12
8/17/2017	5	6.7	2	8.0	21	8.0	2	8.0	839,900	266,200	1,106,100	0.28
8/18/2017	1	8.0	1	8.0	0	8.0	1	8.0	772,900	198,300	971,200	0.00
8/19/2017	1	8.0	1	8.0	0	8.0	1	8.0	866,100	182,400	1,048,500	0.00
8/20/2017	1	7.9	1	8.0	0	8.0	1	8.0	853,400	176,200	1,029,600	0.00
8/21/2017	3	4.0	2	8.0	56	8.0	2	8.0	671,600	310,800	982,400	0.00
8/22/2017	1	8.0	1	8.0	0	8.0	1	8.0	680,100	162,800	842,900	0.00
8/23/2017	1	8.0	1	8.0	0	8.0	1	8.0	741,400	160,000	901,400	0.00
8/24/2017	6	7.8	4	8.1	1	8.1	4	8.1	834,600	166,100	1,000,700	0.00
8/25/2017	1	8.0	1	8.0	0	8.0	1	8.0	674,800	157,200	832,000	0.00
8/26/2017	1	8.0	1	8.0	0	8.0	1	8.0	675,800	148,000	823,800	0.00
8/27/2017	1	8.0	1	8.0	0	8.0	1	8.0	771,400	159,000	930,400	0.07
8/28/2017	2	6.3	2	8.4	26	8.0	3	8.0	950,800	249,100	1,199,900	1.09

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
8/29/2017	1	8.0	1	8.0	0	8.0	1	8.0	732,400	214,600	947,000	0.00
8/30/2017	1	8.0	1	8.0	0	8.0	1	8.0	740,200	196,400	936,600	0.06
8/31/2017	3	5.6	2	8.0	38	8.0	2	8.0	676,800	284,400	961,200	0.00
9/1/2017	1	8.0	1	8.0	0	8.0	1	8.0	623,000	187,500	810,500	0.00
9/2/2017	1	8.0	1	8.0	0	8.0	1	8.0	564,800	174,400	739,200	0.21
9/3/2017	1	7.9	1	8.0	0	8.0	1	8.0	717,100	164,600	881,700	0.01
9/4/2017	1	8.0	1	8.0	0	8.0	1	8.0	780,400	164,500	944,900	0.00
9/5/2017	3	6.7	2	8.0	18	8.0	2	8.0	739,800	211,300	951,100	0.00
9/6/2017	1	8.0	1	8.0	0	8.0	1	8.0	725,300	157,100	882,400	0.00
9/7/2017	3	7.3	2	8.0	8	8.0	2	8.0	602,100	181,800	783,900	0.01
9/8/2017	1	8.0	1	8.0	0	8.0	1	8.0	722,700	161,500	884,200	0.05
9/9/2017	1	8.0	1	8.0	0	8.0	1	8.0	600,000	148,000	748,000	0.00
9/10/2017	1	8.0	1	8.0	0	8.0	1	8.0	746,500	150,300	896,800	0.00
9/11/2017	3	7.8	2	8.0	2	8.0	2	8.0	744,200	158,800	903,000	0.00
9/12/2017	1	8.0	1	8.0	0	8.0	1	8.0	856,600	151,200	1,007,800	0.00
9/13/2017	1	8.0	1	8.0	0	8.0	1	8.0	852,600	149,300	1,001,900	0.00
9/14/2017	1	8.0	1	8.0	0	8.0	1	8.0	847,100	150,400	997,500	0.00
9/15/2017	4	7.9	2	8.0	1	8.0	3	8.0	912,100	144,500	1,056,600	0.00
9/16/2017	1	8.0	1	8.0	0	8.0	1	8.0	817,800	144,700	962,500	0.00
9/17/2017	1	8.0	1	8.0	0	8.0	1	8.0	880,100	147,600	1,027,700	0.00
9/18/2017	1	8.0	1	8.0	0	8.0	1	8.0	805,700	139,800	945,500	0.00
9/19/2017	2	7.1	1	8.0	13	8.0	1	8.0	791,800	186,800	978,600	0.00
9/20/2017	4	7.7	3	8.1	2	8.0	3	8.0	830,100	147,800	977,900	0.07
9/21/2017	1	8.0	1	8.0	0	8.0	1	8.0	818,900	139,600	958,500	0.00
9/22/2017	1	8.0	1	8.0	0	8.0	1	8.0	649,600	141,300	790,900	0.00
9/23/2017	1	8.0	1	8.0	0	8.0	1	8.0	678,400	142,400	820,800	0.00
9/24/2017	1	8.0	1	8.0	0	8.0	1	8.0	832,800	134,500	967,300	0.00
9/25/2017	3	6.2	2	8.0	25	8.0	2	8.0	843,900	199,500	1,043,400	0.00
9/26/2017	1	8.0	1	8.0	0	8.0	1	8.0	742,200	146,000	888,200	0.00
9/27/2017	1	8.0	1	8.0	0	8.0	1	8.0	694,200	136,200	830,400	0.00
9/28/2017	4	7.7	2	8.0	3	8.0	2	8.0	699,700	140,600	840,300	0.00
9/29/2017	1	8.0	1	8.0	0	8.0	1	8.0	700,400	136,100	836,500	0.00
9/30/2017	1	8.0	1	8.0	0	8.0	1	8.0	742,100	132,800	874,900	0.00
10/1/2017	1	8.0	1	8.0	0	8.0	1	8.0	781,600	136,200	917,800	0.00
10/2/2017	3	7.5	3	8.0	9	8.0	2	8.0	911,500	152,000	1,063,500	0.00
10/3/2017	1	7.9	1	8.0	0	8.0	1	8.0	758,400	134,600	893,000	0.00
10/4/2017	1	8.0	1	8.0	0	8.0	1	8.0	608,100	139,200	747,300	0.03
10/5/2017	3	7.5	2	8.0	7	8.0	2	8.0	584,400	161,800	746,200	0.19
10/6/2017	1	8.0	1	8.0	0	8.0	1	8.0	694,800	136,100	830,900	0.07
10/7/2017	1	7.9	1	8.0	0	8.0	1	8.0	704,300	145,700	850,000	0.09
10/8/2017	1	8.0	1	8.0	0	8.0	1	8.0	728,600	138,800	867,400	0.00
10/9/2017	8	4.6	3	11.2	1	8.0	3	8.0	762,700	140,100	902,800	0.00
10/10/2017	1	8.0	1	8.0	0	8.0	1	8.0	739,000	139,500	878,500	0.38
10/11/2017	1	8.0	1	8.0	0	8.0	1	8.0	754,100	234,400	988,500	0.56
10/12/2017	2	3.8	2	8.7	48	8.0	3	8.0	594,400	311,300	905,700	0.00
10/13/2017	2	7.8	2	8.1	0	8.0	2	8.0	762,400	183,500	945,900	0.45
10/14/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,063,000	289,900	1,352,900	0.73
10/15/2017	1	8.0	1	8.0	0	8.0	1	8.0	1,024,800	356,000	1,380,800	0.01
10/16/2017	4	6.3	2	8.0	31	8.1	3	8.1	656,300	306,500	962,800	0.00
10/17/2017	4	0.1	1	11.0	0	12.9	2	12.9	885,200	418,600	1,303,800	0.00
10/18/2017	6	5.9	3	8.1	31	8.1	3	8.1	659,000	260,900	919,900	0.00
10/19/2017	2	6.8	1	8.0	14	8.0	1	8.0	580,300	210,900	791,200	0.00
10/20/2017	3	7.9	2	8.0	2	8.0	2	8.0	621,000	162,000	783,000	0.00
10/21/2017	1	8.0	1	8.0	0	8.0	1	8.0	582,100	152,600	734,700	0.00
10/22/2017	1	8.0	1	8.0	0	8.0	1	8.0	803,600	160,900	964,500	0.46
10/23/2017	3	6.9	3	8.0	17	8.0	3	8.0	719,000	265,100	984,100	0.03
10/24/2017	1	8.0	1	8.0	0	8.0	1	8.0	807,600	202,900	1,010,500	0.19
10/25/2017	3	8.0	2	8.0	1	8.0	2	8.0	839,100	213,300	1,052,400	0.00
10/26/2017	1	8.0	1	8.0	0	8.0	1	8.0	782,200	194,700	976,900	0.00
10/27/2017	3	2.4	2	8.0	93	8.0	2	8.0	590,000	386,300	976,300	0.00
10/28/2017	1	8.0	1	8.0	0	8.0	1	8.0	817,800	171,400	989,200	0.00
10/29/2017	1	8.0	1	8.0	0	8.0	1	8.0	764,100	158,000	922,100	0.00
10/30/2017	3	6.9	2	8.0	17	8.0	2	8.0	667,100	204,500	871,600	0.00
10/31/2017	1	8.0	1	8.0	0	8.0	1	8.0	618,800	163,500	782,300	0.00
11/1/2017	1	8.0	1	8.0	0	8.0	1	8.0	605,300	160,700	766,000	0.23
11/2/2017	1	8.0	1	8.0	0	8.0	1	8.0	748,400	186,900	935,300	0.01
11/3/2017	3	7.8	2	8.0	3	8.0	2	8.0	642,800	173,600	816,400	0.00
11/4/2017	1	8.0	1	8.0	0	8.0	1	8.0	639,400	163,900	803,300	0.09
11/5/2017	1	8.0	1	8.0	0	9.0	1	9.0	858,800	183,800	1,042,600	0.01
11/6/2017	3	7.2	4	8.0	10	8.0	2	8.0	653,800	189,200	843,000	0.00
11/7/2017	1	8.0	1	8.0	0	8.0	1	8.0	677,400	163,200	840,600	0.00
11/8/2017	3	7.8	2	8.0	2	8.0	2	8.0	585,300	168,300	753,600	0.00
11/9/2017	1	8.0	1	8.0	0	8.0	1	8.0	668,700	161,500	830,200	0.00
11/10/2017	5	7.0	2	8.0	14	8.0	2	8.0	499,400	197,900	697,300	0.00
11/11/2017	1	8.0	1	8.0	0	8.0	1	8.0	573,500	150,500	724,000	0.00
11/12/2017	1	8.0	1	8.0	0	8.0	1	8.0	546,900	159,600	706,500	0.00
11/13/2017	1	8.0	1	8.0	0	8.0	1	8.0	736,000	151,700	887,700	0.00
11/14/2017	1	8.0	1	8.0	0	8.0	1	8.0	591,000	155,300	746,300	0.00
11/15/2017	3	7.7	2	8.0	5	8.0	2	8.0	781,000	169,200	950,200	0.29
11/16/2017	1	8.0	1	8.0	0	8.0	1	8.0	647,100	173,600	820,700	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
11/17/2017	3	7.8	2	8.0	2	8.0	3	8.0	834,500	191,900	1,026,400	0.85
11/18/2017	1	8.0	1	8.0	0	8.0	1	8.0	979,900	333,200	1,313,100	0.17
11/19/2017	1	8.0	1	8.0	0	8.0	1	8.0	868,400	288,500	1,156,900	0.00
11/20/2017	4	7.8	4	8.0	3	8.0	2	8.0	777,800	253,600	1,031,400	0.00
11/21/2017	1	8.0	1	8.0	0	8.0	1	8.0	541,500	222,000	763,500	0.00
11/22/2017	4	7.9	3	8.0	2	8.0	4	8.0	745,900	218,400	964,300	0.00
11/23/2017	1	8.0	1	8.0	0	8.0	1	8.0	666,800	196,100	862,900	0.00
11/24/2017	1	8.0	1	8.0	0	8.0	1	8.0	540,800	196,600	737,400	0.00
11/25/2017	1	8.0	1	8.0	0	8.0	1	8.0	499,600	175,100	674,700	0.00
11/26/2017	1	8.0	1	8.0	0	8.0	1	8.0	634,400	176,700	811,100	0.00
11/27/2017	3	7.8	2	8.0	2	8.0	2	8.0	572,900	180,200	753,100	0.00
11/28/2017	1	8.0	1	8.0	0	8.0	1	8.0	626,600	176,600	803,200	0.00
11/29/2017	3	8.0	2	8.0	1	8.0	2	8.0	544,300	172,700	717,000	0.00
11/30/2017	1	8.0	1	8.0	0	8.0	1	8.0	623,300	174,300	797,600	0.01
12/1/2017	3	6.6	2	8.0	20	8.0	2	8.0	770,200	209,600	979,800	0.00
12/2/2017	1	8.0	1	8.0	0	8.0	1	8.0	567,800	163,500	731,300	0.00
12/3/2017	1	7.9	1	8.0	0	8.0	1	8.0	431,400	165,200	596,600	0.00
12/4/2017	1	8.0	1	8.0	0	8.0	1	8.0	503,700	168,700	672,400	0.24
12/5/2017	3	8.0	2	8.0	1	8.0	2	8.0	590,000	187,400	777,400	0.07
12/6/2017	1	8.0	1	8.0	0	8.0	1	8.0	717,100	179,900	897,000	0.00
12/7/2017	1	8.0	1	8.0	0	7.9	1	7.9	729,000	182,600	911,600	0.00
12/8/2017	3	7.9	3	8.0	1	8.0	2	8.0	666,200	171,700	837,900	0.00
12/9/2017	1	8.0	1	8.0	0	8.0	1	8.0	522,700	161,600	684,300	0.00
12/10/2017	1	8.0	1	8.0	0	8.0	1	8.0	614,500	161,900	776,400	0.00
12/11/2017	3	7.4	2	8.0	9	8.0	2	8.0	705,200	185,600	890,800	0.01
12/12/2017	1	8.0	1	8.0	0	8.0	1	8.0	559,600	157,600	717,200	0.00
12/13/2017	2	7.2	1	8.0	11	8.0	1	8.0	599,300	184,400	783,700	0.00
12/14/2017	1	8.0	1	8.0	0	8.0	1	8.0	627,800	157,600	785,400	0.00
12/15/2017	1	8.0	1	8.0	0	8.0	1	8.0	796,000	149,500	945,500	0.00
12/16/2017	1	8.0	1	8.0	0	8.0	1	8.0	724,200	152,400	876,600	0.12
12/17/2017	1	8.0	1	8.0	0	8.0	1	8.0	743,900	158,700	902,600	0.00
12/18/2017	3	7.7	4	8.0	4	8.0	2	8.0	751,500	164,500	916,000	0.07
12/19/2017	1	8.0	1	8.0	0	8.0	1	8.0	819,200	164,200	983,400	0.00
12/20/2017	1	8.0	1	8.0	0	8.0	1	8.0	680,000	167,100	847,100	0.00
12/21/2017	4	7.7	3	8.1	7	8.0	2	8.0	639,800	174,900	814,700	0.00
12/22/2017	1	8.0	1	8.0	0	8.0	1	8.0	719,000	166,700	885,700	0.01
12/23/2017	1	8.0	1	8.0	0	8.0	1	8.0	812,200	168,700	980,900	0.00
12/24/2017	1	8.0	1	8.0	0	8.0	1	8.0	797,300	175,800	973,100	0.00
12/25/2017	1	8.0	1	8.0	0	8.0	1	8.0	740,100	172,300	912,400	0.00
12/26/2017	4	6.6	3	8.0	23	8.0	2	8.0	803,800	211,800	1,015,600	0.00
12/27/2017	1	8.0	1	8.0	0	8.0	1	8.0	903,500	159,000	1,062,500	0.00
12/28/2017	3	2.9	2	8.0	77	8.0	2	8.0	752,000	310,400	1,062,400	0.00
12/29/2017	2	7.9	2	8.0	0	8.0	2	8.0	809,700	148,300	958,000	0.00
12/30/2017	1	8.0	1	8.0	0	8.0	1	8.0	827,300	145,600	972,900	0.00
12/31/2017	1	8.0	1	8.0	0	8.0	1	8.0	921,800	150,800	1,072,600	0.00
Total	1245	2306.0	570	3299.1	1819	3073.8	688	3073.8	552,591,900	129,921,300	682,513,200	33.12
Ave	3	6.3	2	9.1	5	8.4	2	8.4	1,518,110	356,927	1,875,036	0.09
Max	189	8.5	10	22.3	132	23.8	22	23.8	3,276,700	2,552,200	4,844,500	2.31
Min	0	0.0	1	1.3	0	4.0	1	4.0	431,400	132,800	596,600	0.00
Median	1	8.0	1	8.0	0	8.0	1	8.0	895,000	263,200	1,147,100	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
1/1/2018	1	8.0	1	8.0	0	8.0	1	8.0	878,400	149,900	1,028,300	0.00
1/2/2018	3	6.3	3	8.0	23	8.0	2	8.0	885,500	201,600	1,087,100	0.00
1/3/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,045,400	162,400	1,207,800	0.00
1/4/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,104,500	153,500	1,258,000	0.00
1/5/2018	2	7.0	2	8.0	14	8.0	2	8.0	1,020,500	180,400	1,200,900	0.00
1/6/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,133,800	150,000	1,283,800	0.00
1/7/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,240,500	148,000	1,388,500	0.00
1/8/2018	3	7.2	2	8.0	10	8.0	1	8.0	1,168,800	172,300	1,341,100	0.00
1/9/2018	1	8.0	1	7.9	0	8.0	1	8.0	1,144,500	147,600	1,292,100	0.00
1/10/2018	3	8.0	2	8.1	1	8.0	2	8.0	1,075,200	143,400	1,218,600	0.00
1/11/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,165,100	146,200	1,311,300	0.00
1/12/2018	3	6.6	2	8.0	18	8.0	2	8.0	1,077,400	188,600	1,266,000	0.00
1/13/2018	3	6.7	2	9.2	0	8.0	3	8.0	1,141,700	137,200	1,278,900	0.00
1/14/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,143,700	143,700	1,287,400	0.00
1/15/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,094,400	142,500	1,236,900	0.03
1/16/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,152,700	142,300	1,295,000	0.01
1/17/2018	4	7.9	2	8.0	1	8.0	2	8.0	1,177,300	137,600	1,314,900	0.00
1/18/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,196,700	137,300	1,334,000	0.00
1/19/2018	9	4.4	12	7.9	50	8.1	11	8.1	1,062,700	244,400	1,307,100	0.01
1/20/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,285,400	133,600	1,419,000	0.01
1/21/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,120,900	136,400	1,257,300	0.00
1/22/2018	8	1.5	5	8.1	146	8.3	6	8.3	1,331,700	658,900	1,990,600	1.18
1/23/2018	4	7.9	1	8.0	4	8.0	1	8.0	1,996,000	483,300	2,479,300	0.00
1/24/2018	36	7.2	2	8.9	3	8.1	5	8.1	1,554,800	250,000	1,804,800	0.00
1/25/2018	229	9.5	5	8.7	1	8.2	7	8.2	1,420,000	42,500	1,462,500	0.15
1/26/2018	5	7.7	3	8.0	6	8.0	5	8.0	1,289,600	242,700	1,532,300	0.00
1/27/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,565,400	319,000	1,884,400	0.00
1/28/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,289,800	277,500	1,567,300	0.00
1/29/2018	5	6.8	4	8.8	7	8.0	2	8.0	1,208,700	248,900	1,457,600	0.00
1/30/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,196,200	213,900	1,410,100	0.00
1/31/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,229,700	200,700	1,430,400	0.04
2/1/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,146,800	196,300	1,343,100	0.00
2/2/2018	5	7.7	2	8.0	4	8.0	2	8.0	1,129,600	193,400	1,323,000	0.00
2/3/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,053,100	176,700	1,229,800	0.00
2/4/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,117,300	177,900	1,295,200	0.00
2/5/2018	3	7.9	2	8.0	2	8.0	2	8.0	1,221,900	174,900	1,396,800	0.00
2/6/2018	4	6.6	3	8.0	19	8.0	3	8.0	1,123,500	219,800	1,343,300	0.00
2/7/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,111,300	165,800	1,277,100	0.00
2/8/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,176,300	168,000	1,344,300	0.00
2/9/2018	4	7.8	4	8.1	1	8.0	3	8.0	1,183,600	165,000	1,348,600	0.00
2/10/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,162,700	155,200	1,317,900	0.00
2/11/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,171,600	158,900	1,330,500	0.00
2/12/2018	3	6.6	3	8.0	18	8.0	2	8.0	1,225,700	198,200	1,423,900	0.00
2/13/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,211,100	154,700	1,365,800	0.00
2/14/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,294,900	164,200	1,459,100	0.34
2/15/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,759,200	247,600	2,006,800	0.00
2/16/2018	6	5.7	3	8.0	50	8.0	2	8.0	1,416,600	412,900	1,829,500	0.00
2/17/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,383,900	240,700	1,624,600	0.00
2/18/2018	1	7.9	1	8.0	0	8.0	1	8.0	1,268,900	207,700	1,476,600	0.00
2/19/2018	3	4.7	2	8.0	51	8.0	2	8.0	1,278,400	383,300	1,661,700	0.60
2/20/2018	2	0.0	2	16.0	1	8.0	4	8.0	2,613,900	536,400	3,150,300	0.78
2/21/2018	3	5.2	2	8.0	63	8.0	2	8.0	1,808,100	681,800	2,489,900	0.00
2/22/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,516,300	344,000	1,860,300	0.00
2/23/2018	4	7.9	3	8.0	4	8.0	2	8.0	1,666,200	331,500	1,997,700	0.07
2/24/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,634,300	374,400	2,008,700	0.36
2/25/2018	1	0.0	1	16.0	0	8.0	2	8.0	1,969,300	676,200	2,645,500	0.07
2/26/2018	3	5.7	2	8.0	51	8.0	2	8.0	1,810,700	570,300	2,381,000	0.00
2/27/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,675,100	372,300	2,047,400	0.00
2/28/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,600,700	382,000	1,982,700	0.00
3/1/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,479,300	345,000	1,824,300	0.00
3/2/2018	3	6.2	2	8.0	45	8.0	2	8.0	1,222,500	403,600	1,626,100	0.00
3/3/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,312,000	284,600	1,596,600	0.00
3/4/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,195,600	269,700	1,465,300	0.00
3/5/2018	3	7.9	5	7.2	2	8.1	5	8.1	1,197,300	277,100	1,474,400	0.00
3/6/2018	1	8.0	1	8.1	0	8.0	1	8.0	1,270,500	270,600	1,541,100	0.15
3/7/2018	3	7.5	2	8.0	9	8.0	2	8.0	1,280,100	330,200	1,610,300	0.00
3/8/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,284,300	282,800	1,567,100	0.00
3/9/2018	2	5.2	1	8.0	49	8.0	1	8.0	1,213,200	396,300	1,609,500	0.00
3/11/2018												
1/1/1900	1	8.0	1	8.0	0	7.0	1	7.0	1,013,600	221,700	1,235,300	0.00
3/12/2018	3	6.4	2	8.0	30	8.0	2	8.0	1,037,600	313,700	1,351,300	0.00
3/13/2018	1	8.0	1	8.0	0	8.0	1	8.0	997,900	224,900	1,222,800	0.00
3/14/2018	3	5.8	2	8.0	31	8.0	2	8.0	939,300	310,500	1,249,800	0.00
3/15/2018	1	8.0	1	8.0	0	8.0	1	8.0	964,100	219,700	1,183,800	0.00
3/16/2018	3	7.4	2	8.0	10	8.0	2	8.0	1,108,300	241,000	1,349,300	0.00
3/17/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,053,600	206,700	1,260,300	0.00
3/18/2018	1	7.9	1	8.0	0	8.0	1	8.0	1,122,800	208,900	1,331,700	0.00
3/19/2018	1	8.0	1	8.0	0	8.0	1	8.0	985,100	203,300	1,188,400	0.00
3/20/2018	2	8.0	2	8.0	1	8.0	2	8.0	982,300	208,800	1,191,100	0.00
3/21/2018	1	8.0	1	8.0	0	8.0	1	8.0	935,500	212,900	1,148,400	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
3/22/2018	1	7.9	1	8.0	0	8.0	1	8.0	1,007,500	197,300	1,204,800	0.00
3/23/2018	3	8.0	3	8.0	1	8.0	2	8.0	1,053,200	194,300	1,247,500	0.00
3/24/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,097,900	191,900	1,289,800	0.00
3/25/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,105,800	194,500	1,300,300	0.00
3/26/2018	3	5.3	2	8.0	37	8.0	2	8.0	1,094,800	306,200	1,401,000	0.30
3/27/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,246,800	275,900	1,522,700	0.15
3/28/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,258,300	267,800	1,526,100	0.00
3/29/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,129,900	247,600	1,377,500	0.00
3/30/2018	3	4.6	3	8.0	52	8.0	2	8.0	900,700	381,800	1,282,500	0.00
3/31/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,079,300	225,900	1,305,200	0.10
4/1/2018	1	8.0	1	8.0	0	8.0	1	8.0	989,900	231,200	1,221,100	0.00
4/2/2018	3	7.2	2	8.0	13	8.0	2	8.0	971,600	259,000	1,230,600	0.00
4/3/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,200,100	229,900	1,430,000	0.23
4/4/2018	3	3.7	2	8.0	75	8.0	2	8.0	1,220,500	515,200	1,735,700	0.11
4/5/2018	3	7.8	2	8.1	3	8.1	2	8.1	1,260,600	306,000	1,566,600	0.00
4/6/2018	3	5.7	2	8.0	41	8.0	2	8.0	1,299,000	412,000	1,711,000	0.00
4/7/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,344,100	273,000	1,617,100	0.00
4/8/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,152,700	263,100	1,415,800	0.00
4/9/2018	3	7.8	2	7.9	3	8.0	2	8.0	1,124,800	262,100	1,386,900	0.01
4/10/2018	2	6.9	1	8.0	0	9.0	2	9.0	1,301,200	287,600	1,588,800	0.00
4/11/2018	3	8.0	2	8.0	1	8.0	2	8.0	1,097,500	244,800	1,342,300	0.06
4/12/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,165,600	258,600	1,424,200	0.06
4/13/2018	6	7.9	2	7.8	6	8.1	3	8.1	1,157,500	262,300	1,419,800	0.39
4/14/2018	0	0.0	0	0.0	0	0.0	0	0.0	2,560,900	618,700		0.54
4/15/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,560,900	618,700	3,179,600	0.12
4/16/2018	4	0.7	4	9.8	132	8.0	5	8.0	1,555,600	989,600	2,545,200	0.12
4/17/2018	1	0.0	1	16.0	0	8.0	2	8.0	2,080,800	534,000	2,614,800	0.43
4/18/2018	1	0.0	1	16.0	0	8.0	2	8.0	2,122,600	558,700	2,681,300	0.01
4/19/2018	7	0.4	2	16.0	0	8.0	2	8.0	2,612,200	598,300	3,210,500	0.42
4/20/2018	38	0.6	4	12.6	30	13.7	8	13.7	2,378,300	1,839,200	4,217,500	0.00
4/21/2018	18	0.2	1	16.0	0	8.0	2	8.0	2,424,400	987,900	3,412,300	0.00
4/22/2018	1	0.0	1	16.0	0	8.0	2	8.0	2,443,000	812,500	3,255,500	0.00
4/23/2018	4	0.2	4	15.6	10	8.1	5	8.1	2,212,300	709,100	2,921,400	0.00
4/24/2018	1	0.0	1	15.9	0	8.0	2	8.0	2,434,200	587,200	3,021,400	0.00
4/25/2018	4	2.9	3	13.1	0	8.0	3	8.0	1,947,600	503,700	2,451,300	0.00
4/26/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,001,300	438,000	2,439,300	0.00
4/27/2018	2	1.8	2	8.0	130	8.0	2	8.0	1,135,800	785,000	1,920,800	0.03
4/28/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,602,100	357,100	1,959,200	0.00
4/29/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,525,600	330,500	1,856,100	0.00
4/30/2018	4	6.4	3	8.0	33	8.0	2	8.0	1,373,700	403,900	1,777,600	0.00
5/1/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,456,500	295,700	1,752,200	0.00
5/2/2018	3	7.9	2	8.0	3	8.0	2	8.0	1,465,100	322,000	1,787,100	0.60
5/3/2018	9	0.7	2	16.0	0	8.0	2	8.0	2,096,700	606,200	2,702,900	0.86
5/4/2018	24	2.2	1	16.0	0	8.0	2	8.0	2,002,400	898,200	2,900,600	0.03
5/5/2018	1	0.0	1	16.0	0	8.0	2	8.0	1,806,400	682,000	2,488,400	0.00
5/6/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,073,800	521,100	2,594,900	0.01
5/7/2018	3	7.8	2	8.0	4	8.0	2	8.0	2,225,500	444,300	2,669,800	0.00
5/8/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,905,500	379,200	2,284,700	0.00
5/9/2018	3	6.0	2	8.1	46	8.0	2	8.0	2,075,400	572,500	2,647,900	0.88
5/10/2018	1	0.0	1	16.0	0	8.0	2	8.0	2,163,500	717,100	2,880,600	0.00
5/11/2018	5	0.1	1	16.0	0	8.0	3	8.0	2,183,900	588,300	2,772,200	0.81
5/12/2018	2	0.0	1	16.0	0	8.0	2	8.0	1,691,000	941,600	2,632,600	0.32
5/13/2018	1	0.0	1	16.0	0	8.0	2	8.0	2,064,300	910,400	2,974,700	0.00
5/14/2018	2	0.0	4	14.7	26	8.1	4	8.1	2,296,800	807,200	3,104,000	0.20
5/15/2018	1	0.0	1	16.0	0	8.0	2	8.0	2,138,400	589,900	2,728,300	0.00
5/16/2018	1	0.0	1	16.0	0	8.0	2	8.0	2,015,200	496,200	2,511,400	0.00
5/17/2018	4	4.7	2	9.4	65	8.0	5	8.0	1,875,800	545,900	2,421,700	0.00
5/18/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,134,500	373,000	2,507,500	0.00
5/19/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,052,500	348,700	2,401,200	0.11
5/20/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,770,000	324,100	2,094,100	0.04
5/21/2018	3	4.7	2	8.0	68	8.0	2	8.0	1,987,200	541,400	2,528,600	0.49
5/22/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,368,600	462,400	2,831,000	0.01
5/23/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,924,900	397,700	2,322,600	0.00
5/24/2018	3	7.8	2	8.0	3	8.0	2	8.0	2,086,600	369,200	2,455,800	0.00
5/25/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,810,700	318,200	2,128,900	0.00
5/26/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,590,500	294,500	1,885,000	0.00
5/27/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,366,300	267,400	1,633,700	0.00
5/28/2018	1	7.9	1	8.0	0	8.0	1	8.0	1,260,100	258,100	1,518,200	0.00
5/29/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,306,700	243,700	1,550,400	0.00
5/30/2018	3	4.1	2	8.0	64	8.0	2	8.0	1,256,200	404,300	1,660,500	0.23
5/31/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,184,400	277,300	1,461,700	0.00
6/1/2018	3	6.7	2	8.0	22	8.0	2	8.0	1,469,100	300,100	1,769,200	0.00
6/2/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,220,600	221,900	1,442,500	0.19
6/3/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,296,400	259,200	1,555,600	0.14
6/4/2018	3	7.4	2	8.0	10	8.0	2	8.0	1,010,000	249,800	1,259,800	0.00
6/5/2018	1	8.0	1	8.0	0	8.0	1	8.0	872,400	223,500	1,095,900	0.05
6/6/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,312,600	213,400	1,526,000	0.02
6/7/2018	3	6.3	2	8.0	24	8.0	2	8.0	691,000	271,800	962,800	0.00
6/8/2018	1	8.0	1	7.9	0	8.0	1	8.0	804,400	192,200	996,600	0.18
6/9/2018	1	8.0	1	8.0	0	8.0	1	8.0	618,700	238,200	856,900	0.19

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
6/10/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,431,800	238,400	1,670,200	0.59
6/11/2018	3	7.8	2	8.0	5	8.0	2	8.0	1,417,200	327,600	1,744,800	0.00
6/12/2018	3	7.1	3	8.1	18	8.0	2	8.0	1,088,300	292,300	1,380,600	0.00
6/13/2018	1	8.0	1	8.0	0	8.0	1	8.0	650,200	244,400	894,600	0.00
6/14/2018	3	4.4	2	8.0	60	8.0	2	8.0	1,035,900	365,600	1,401,500	0.00
6/15/2018	1	8.0	1	8.0	0	8.0	1	8.0	647,000	209,400	856,400	0.24
6/16/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,066,500	275,700	1,342,200	0.05
6/17/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,262,000	231,000	1,493,000	0.00
6/18/2018	4	4.9	2	8.0	45	11.0	22	11.0	1,736,900	643,800	2,380,700	2.65
6/19/2018	9	4.1	2	16.1	0	8.0	5	8.0	2,539,000	757,600	3,296,600	0.74
6/20/2018	3	0.1	3	11.9	82	8.0	3	8.0	1,675,200	1,105,100	2,780,300	0.00
6/21/2018	1	0.0	1	16.0	0	8.0	2	8.0	1,832,700	515,700	2,348,400	0.01
6/22/2018	3	6.1	2	8.0	45	8.0	2	8.0	1,607,000	536,100	2,143,100	0.01
6/23/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,273,600	352,300	1,625,900	0.00
6/24/2018	1	8.0	1	8.0	0	8.0	1	8.0	922,200	303,300	1,225,500	0.00
6/25/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,087,800	278,300	1,366,100	0.00
6/26/2018	2	5.0	1	8.0	51	8.0	1	8.0	1,086,200	410,100	1,496,300	0.57
6/27/2018	1	0.1	1	16.0	0	8.0	2	8.0	1,734,300	447,000	2,181,300	0.28
6/28/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,446,300	394,700	1,841,000	0.00
6/29/2018	3	7.0	2	8.0	27	8.0	3	8.0	1,198,000	368,000	1,566,000	0.00
6/30/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,060,800	294,800	1,355,600	0.04
7/1/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,005,700	281,300	1,287,000	0.54
7/2/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,334,500	350,200	1,684,700	0.00
7/3/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,147,400	271,500	1,418,900	0.00
7/4/2018	4	9.0	3	8.0	0	10.8	7	10.8	1,315,900	508,700	1,824,600	1.20
7/5/2018	35	1.1	1	16.0	0	8.0	2	8.0	1,498,700	812,700	2,311,400	0.01
7/6/2018	3	7.9	2	8.0	2	8.0	3	8.0	1,407,100	490,800	1,897,900	0.00
7/7/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,069,100	359,600	1,428,700	0.00
7/8/2018	1	8.0	1	8.0	0	8.0	1	8.0	892,200	297,800	1,190,000	0.00
7/9/2018	2	4.7	1	8.0	56	8.0	1	8.0	762,200	428,700	1,190,900	0.00
7/10/2018	1	8.0	1	8.0	0	8.0	1	8.0	998,400	248,700	1,247,100	0.00
7/11/2018	1	8.0	1	8.0	0	8.0	1	8.0	859,500	233,400	1,092,900	0.00
7/12/2018	3	7.9	2	7.9	2	8.0	2	8.0	705,100	229,200	934,300	0.09
7/13/2018	1	8.0	1	8.0	0	8.0	1	8.0	702,300	222,500	924,800	0.03
7/14/2018	1	8.0	1	8.0	0	8.0	1	8.0	853,000	203,200	1,056,200	0.20
7/15/2018	1	8.0	1	8.0	0	8.0	1	8.0	785,100	244,800	1,029,900	0.00
7/16/2018	3	6.3	2	8.0	29	8.0	2	8.0	828,900	288,600	1,117,500	0.00
7/17/2018	1	7.9	1	8.0	0	8.0	1	8.0	707,200	200,400	907,600	0.00
7/18/2018	1	8.0	1	8.0	0	8.0	1	8.0	869,900	191,500	1,061,400	0.00
7/19/2018	1	8.0	1	8.0	0	8.0	1	8.0	788,800	186,300	975,100	0.00
7/20/2018	1	8.0	1	8.0	0	8.0	1	8.0	835,800	215,700	1,051,500	1.00
7/21/2018	1	8.0	1	8.0	0	8.0	1	8.0	758,400	231,100	989,500	0.01
7/22/2018	1	8.0	1	8.0	0	8.0	1	8.0	895,800	213,600	1,109,400	0.09
7/23/2018	3	8.0	2	8.0	1	8.0	2	8.0	686,900	208,600	895,500	0.00
7/24/2018	1	8.0	1	8.0	0	7.9	1	7.9	755,300	193,500	948,800	0.00
7/25/2018	1	8.0	1	8.0	0	8.0	1	8.0	707,200	188,500	895,700	0.00
7/26/2018	4	2.9	3	8.0	73	8.0	2	8.0	606,600	354,000	960,600	0.00
7/27/2018	1	8.0	1	8.0	0	8.0	1	8.0	793,200	172,700	965,900	0.00
7/28/2018	1	7.9	1	8.1	0	8.0	1	8.0	732,100	167,700	899,800	0.00
7/29/2018	1	8.0	1	8.0	0	8.0	1	8.0	624,300	164,500	788,800	0.00
7/30/2018	3	5.6	2	8.0	34	8.0	2	8.0	660,900	240,000	900,900	0.00
7/31/2018	1	8.0	1	8.0	0	8.0	1	8.0	746,900	159,000	905,900	0.00
8/1/2018	1	8.0	1	8.0	0	8.0	1	8.0	915,600	153,800	1,069,400	0.04
8/2/2018	3	5.1	2	8.0	38	8.1	2	8.1	630,200	246,900	877,100	0.13
8/3/2018	1	8.0	1	8.0	0	8.0	1	8.0	654,400	159,200	813,600	0.00
8/4/2018	1	8.0	1	8.0	0	7.9	1	7.9	803,400	153,900	957,300	0.00
8/5/2018	1	8.0	1	8.0	0	8.0	1	8.0	836,800	149,700	986,500	0.09
8/6/2018	1	8.0	1	8.0	0	8.0	1	8.0	900,900	182,300	1,083,200	0.48
8/7/2018	5	4.9	2	8.0	39	8.0	2	8.0	714,100	279,900	994,000	0.00
8/8/2018	1	8.0	1	8.0	0	8.0	1	8.0	754,400	175,600	930,000	0.00
8/9/2018	3	4.4	2	8.0	48	8.0	2	8.0	844,500	280,700	1,125,200	0.05
8/10/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,008,300	150,500	1,158,800	0.00
8/11/2018	1	8.0	1	8.0	0	8.0	1	8.0	802,100	146,400	948,500	0.00
8/12/2018	1	8.0	1	8.0	0	8.0	1	8.0	834,300	146,600	980,900	0.00
8/13/2018	3	6.1	2	8.0	27	8.0	2	8.0	994,900	206,200	1,201,100	0.00
8/14/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,419,700	139,500	1,559,200	0.00
8/15/2018	1	8.0	1	8.0	0	8.0	1	8.0	946,100	136,600	1,082,700	0.00
8/16/2018	3	7.6	2	8.0	5	8.0	2	8.0	1,090,600	153,800	1,244,400	0.00
8/17/2018	1	2.4	1	13.6	0	8.0	2	8.0	1,901,100	177,900	2,079,000	1.53
8/18/2018	1	0.0	1	16.0	0	8.0	2	8.0	1,711,700	383,300	2,095,000	0.00
8/19/2018	1	0.0	1	16.0	0	8.0	2	8.0	1,064,700	262,100	1,326,800	0.00
8/20/2018	7	0.0	6	13.9	32	8.0	3	8.0	1,064,400	312,400	1,376,800	1.84
8/21/2018	24	4.2	17	17.7	0	8.1	2	8.1	1,701,500	807,500	2,509,000	0.16
8/22/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,020,300	457,100	2,477,400	0.00
8/23/2018	3	6.5	2	8.0	32	8.0	2	8.0	1,444,300	414,500	1,858,800	0.00
8/24/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,450,300	275,900	1,726,200	0.00
8/25/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,236,200	250,000	1,486,200	0.00
8/26/2018	3	8.6	2	8.3	0	7.7	3	7.7	1,597,600	244,200	1,841,800	2.61
8/27/2018	5	0.9	9	12.6	85	4.8	4	4.8	3,036,800	1,196,900	4,233,700	0.51
8/28/2018	0	0.0	10	20.3	0	20.5	2	20.5	2,963,400	804,000	3,767,400	1.81

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			Rainflow Total (in):
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	
8/29/2018	0	0.0	4	23.3	1	21.5	4	21.5	3,183,800	398,200	3,582,000	0.19
8/30/2018	0	0.0	2	16.1	0	8.0	2	8.0	2,100,300	838,400	2,938,700	0.00
8/31/2018	1	0.0	5	15.9	2	8.1	7	8.1	1,582,800	638,900	2,221,700	0.00
9/1/2018	0	0.0	1	16.0	0	8.0	1	8.0	1,877,300	498,400	2,375,700	0.30
9/2/2018	0	0.0	3	19.2	0	17.2	27	17.2	2,643,700	1,141,100	3,784,800	1.33
9/3/2018	0	0.0	1	24.0	0	24.0	2	24.0	2,885,800	1,467,600	4,353,400	0.47
9/4/2018	1	0.0	14	22.2	1	8.1	13	8.1	2,583,000	572,000	3,155,000	0.00
9/5/2018	0	0.0	2	17.0	0	15.2	8	15.2	2,607,600	953,600	3,561,200	0.92
9/6/2018	1	0.0	26	20.9	7	8.1	6	8.1	2,773,500	652,500	3,426,000	0.01
9/7/2018	1	0.0	2	16.0	1	8.0	5	8.0	1,853,000	641,700	2,494,700	0.00
9/8/2018	0	0.0	1	16.0	0	8.0	1	8.0	1,830,100	487,200	2,317,300	0.00
9/9/2018	0	0.0	1	16.0	0	8.0	1	8.0	1,758,100	401,800	2,159,900	0.00
9/10/2018	2	1.5	3	14.5	1	8.0	2	8.0	1,340,400	356,700	1,697,100	0.00
9/11/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,616,400	315,200	1,931,600	0.00
9/12/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,491,200	288,400	1,779,600	0.00
9/13/2018	6	4.4	3	8.1	59	8.1	6	8.1	1,289,300	430,700	1,720,000	0.00
9/14/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,441,300	253,100	1,694,400	0.00
9/15/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,507,600	230,600	1,738,200	0.00
9/16/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,537,200	229,500	1,766,700	0.00
9/17/2018	2	4.8	1	8.0	46	8.0	1	8.0	1,262,700	346,500	1,609,200	0.00
9/18/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,302,900	209,200	1,512,100	0.22
9/19/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,290,100	208,200	1,498,300	0.02
9/20/2018	6	5.2	3	8.0	57	8.0	3	8.0	1,204,600	361,100	1,565,700	0.59
9/21/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,457,100	273,000	1,730,100	0.09
9/22/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,468,900	233,300	1,702,200	0.00
9/23/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,301,200	226,300	1,527,500	0.00
9/24/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,507,800	216,100	1,723,900	0.00
9/25/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,520,900	220,300	1,741,200	0.31
9/26/2018	4	7.7	2	8.0	8	8.0	2	8.0	1,555,800	274,500	1,830,300	0.00
9/27/2018	4	7.7	1	8.0	0	8.3	3	8.3	1,585,400	233,400	1,818,800	0.00
9/28/2018	3	8.0	2	8.0	1	8.0	2	8.0	1,427,100	205,600	1,632,700	0.00
9/29/2018	1	7.9	1	8.0	0	8.0	1	8.0	1,230,600	195,200	1,425,800	0.22
9/30/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,510,400	297,400	1,807,800	0.77
10/1/2018	5	1.0	3	16.0	1	10.1	18	10.1	1,826,000	821,100	2,647,100	1.30
10/2/2018	12	5.0	4	15.9	1	8.0	6	8.0	1,661,300	637,000	2,298,300	0.02
10/3/2018	1	0.0	1	16.0	0	8.0	2	8.0	1,374,200	598,900	1,973,100	0.00
10/4/2018	1	0.0	1	16.0	0	8.0	4	8.0	1,603,600	462,900	2,066,500	0.00
10/5/2018	5	7.9	4	8.1	1	8.0	7	8.0	1,710,800	393,100	2,103,900	0.34
10/6/2018	8	2.6	2	16.0	0	13.9	3	13.9	1,952,900	972,100	2,925,000	0.91
10/7/2018	4	0.1	4	15.9	0	8.0	5	8.0	1,942,200	693,700	2,635,900	0.21
10/8/2018	3	0.0	3	15.0	27	8.0	3	8.0	1,364,800	723,100	2,087,900	0.04
10/9/2018	1	0.0	1	16.0	0	8.0	2	8.0	1,503,200	540,200	2,043,400	0.16
10/10/2018	1	0.0	1	15.9	0	8.0	2	8.0	1,415,600	527,900	1,943,500	0.24
10/11/2018	1	0.0	1	16.0	0	8.0	2	8.0	1,392,900	557,600	1,950,500	0.00
10/12/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,682,800	443,100	2,125,900	0.00
10/13/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,956,800	385,300	2,342,100	0.00
10/14/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,802,800	344,900	2,147,700	0.00
10/15/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,990,200	334,800	2,325,000	0.03
10/16/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,023,800	315,500	2,339,300	0.00
10/17/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,792,400	292,200	2,084,600	0.00
10/18/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,546,600	258,700	1,805,300	0.00
10/19/2018	3	7.7	2	8.0	8	8.0	2	8.0	1,518,800	269,100	1,787,900	0.07
10/20/2018	2	7.0	2	8.4	0	8.0	1	8.0	1,682,900	252,300	1,935,200	0.00
10/21/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,210,400	239,800	1,450,200	0.00
10/22/2018	3	6.7	2	8.0	21	8.0	2	8.0	1,229,000	300,600	1,529,600	0.00
10/23/2018	1	7.9	1	8.0	0	8.0	1	8.0	1,601,900	228,600	1,830,500	0.00
10/24/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,513,000	226,000	1,739,000	0.00
10/25/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,502,800	219,300	1,722,100	0.00
10/26/2018	3	6.7	2	8.0	21	8.1	2	8.1	1,513,700	260,000	1,773,700	0.00
10/27/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,518,200	206,800	1,725,000	0.00
10/28/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,296,700	201,500	1,498,200	0.11
10/29/2018	2	6.4	2	8.0	23	8.0	2	8.0	1,131,000	276,000	1,407,000	0.01
10/30/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,369,400	221,800	1,591,200	0.54
10/31/2018	3	6.7	2	8.0	29	8.0	2	8.0	1,633,500	426,300	2,059,800	0.01
11/1/2018	1	8.0	1	7.9	0	8.0	1	8.0	1,527,400	290,600	1,818,000	0.00
11/2/2018	3	4.8	2	8.0	50	8.0	1	8.0	1,239,500	413,200	1,652,700	0.00
11/3/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,378,400	242,200	1,620,600	0.00
11/4/2018	4	7.2	2	8.0	1	9.0	2	9.0	1,524,800	358,900	1,883,700	1.07
11/5/2018	2	5.1	2	10.9	3	8.0	2	8.0	1,786,500	702,400	2,488,900	0.20
11/6/2018	6	0.5	1	16.0	0	8.0	2	8.0	1,746,800	757,800	2,504,600	0.29
11/7/2018	3	0.0	3	10.8	102	8.0	3	8.0	1,326,300	1,096,400	2,422,700	0.00
11/8/2018	1	0.0	1	16.0	0	8.0	2	8.0	1,577,800	495,200	2,073,000	0.00
11/9/2018	3	7.8	3	8.0	4	8.0	3	8.0	1,760,100	454,100	2,214,200	0.05
11/10/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,524,300	421,600	1,945,900	0.02
11/11/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,488,400	388,600	1,877,000	0.02
11/12/2018	2	8.0	2	8.0	1	8.0	2	8.0	1,747,600	380,200	2,127,800	0.00
11/13/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,230,200	354,700	1,584,900	0.00
11/14/2018	3	7.8	2	8.0	7	8.0	2	8.0	1,211,200	346,700	1,557,900	0.00
11/15/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,217,300	318,600	1,535,900	0.00
11/16/2018	3	8.0	2	8.0	1	8.0	2	8.0	1,307,300	310,100	1,617,400	0.02

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
11/17/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,333,000	298,300	1,631,300	0.01
11/18/2018	1	7.9	1	8.0	0	8.0	1	8.0	1,331,300	294,300	1,625,600	0.00
11/19/2018	3	7.6	2	8.0	10	8.0	2	8.0	1,491,800	318,800	1,810,600	0.00
11/20/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,513,000	283,400	1,796,400	0.01
11/21/2018	3	5.7	2	8.0	40	8.0	2	8.0	1,028,800	396,100	1,424,900	0.00
11/22/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,218,900	259,500	1,478,400	0.00
11/23/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,357,400	255,400	1,612,800	0.00
11/24/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,142,800	269,300	1,412,100	0.18
11/25/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,206,400	279,100	1,485,500	0.01
11/26/2018	4	7.9	3	8.1	1	8.0	4	8.0	2,433,500	278,100	2,711,600	0.00
11/27/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,881,900	267,100	2,149,000	0.00
11/28/2018	2	7.5	1	8.0	9	8.0	1	8.0	2,115,200	286,000	2,401,200	0.00
11/29/2018	1	8.0	1	8.0	0	8.0	1	8.0	3,117,600	247,500	3,365,100	0.00
11/30/2018	9	4.3	5	8.0	55	8.0	3	8.0	1,875,700	411,600	2,287,300	0.04
12/1/2018	4	8.8	2	8.0	0	8.0	2	8.0	3,000,300	268,500	3,268,800	1.14
12/2/2018	6	6.0	1	16.0	0	8.0	2	8.0	1,285,900	492,900	1,778,800	0.14
12/3/2018	5	3.9	3	12.1	3	8.0	4	8.0	1,400,900	651,500	2,052,400	0.01
12/4/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,968,500	512,700	2,481,200	0.00
12/5/2018	3	4.3	3	11.4	8	8.0	3	8.0	2,105,000	459,200	2,564,200	0.00
12/6/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,270,600	408,800	2,679,400	0.00
12/7/2018	2	6.8	1	8.0	26	8.0	1	8.0	2,276,500	430,400	2,706,900	0.00
12/8/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,192,500	331,100	2,523,600	0.00
12/9/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,406,100	311,200	2,717,300	0.00
12/10/2018	2	6.2	2	8.0	29	8.0	2	8.0	1,979,700	387,400	2,367,100	0.00
12/11/2018	3	8.0	2	8.0	0	8.0	3	8.0	2,168,300	278,700	2,447,000	0.00
12/12/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,875,500	266,500	2,142,000	0.08
12/13/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,126,600	259,100	2,385,700	0.00
12/14/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,247,000	253,200	2,500,200	0.00
12/15/2018	1	7.9	1	8.0	0	8.0	1	8.0	2,231,400	245,900	2,477,300	0.00
12/16/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,187,300	248,500	2,435,800	0.00
12/17/2018	3	7.3	2	8.0	16	8.0	3	8.0	2,082,300	267,600	2,349,900	0.00
12/18/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,251,900	227,500	2,479,400	0.00
12/19/2018	3	8.0	2	8.0	1	8.0	2	8.0	2,238,600	227,200	2,465,800	0.00
12/20/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,071,500	231,300	2,302,800	0.10
12/21/2018	4	7.9	2	8.1	1	8.0	3	8.0	2,216,700	244,700	2,461,400	0.00
12/22/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,161,900	241,600	2,403,500	0.00
12/23/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,074,800	233,900	2,308,700	0.00
12/24/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,282,500	240,200	2,522,700	0.00
12/25/2018	1	8.0	1	8.0	0	8.0	1	8.0	1,909,500	228,800	2,138,300	0.02
12/26/2018	3	6.6	4	8.0	21	8.0	2	8.0	1,928,500	284,500	2,213,000	0.00
12/27/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,413,800	243,000	2,656,800	0.42
12/28/2018	3	6.4	2	8.0	30	8.0	2	8.0	2,125,900	467,700	2,593,600	0.02
12/29/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,370,600	350,400	2,721,000	0.00
12/30/2018	1	8.0	1	8.0	0	8.0	1	8.0	2,462,100	327,900	2,790,000	0.01
Total	1104	2280.6	637	3402.1	3198	2973.4	715	2973.4	536,106,000	128,847,400	661,773,800	43.13
Ave	3	6.3	2	9.4	9	8.2	2	8.2	1,476,876	354,952	1,828,104	0.12
Max	229	9.5	26	24.0	146	24.0	27	24.0	3,183,800	1,839,200	4,353,400	2.65
Min	0	0.0	0	0.0	0	0.0	0	0.0	606,600	42,500	788,800	0.00
Median	1	8.0	1	8.0	0	8.0	1	8.0	1,344,100	278,700	1,677,450	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
1/2/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,462,100	327,900	2,790,000	0.00
1/2/2019	5	55.3	3	8.0	11	8.0	4	8.0	3,276,700	355,700	3,632,400	0.00
1/3/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,657,700	390,400	3,048,100	0.21
1/4/2019	3	7.6	2	8.0	9	8.0	2	8.0	2,570,500	395,200	2,965,700	0.00
1/5/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,670,700	368,500	3,039,200	0.00
1/6/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,751,400	359,800	3,111,200	0.02
1/7/2019	4	0.8	2	15.8	4	8.4	51	8.4	2,417,500	441,900	2,859,400	0.80
1/8/2019	3	1.1	1	16.0	0	8.0	2	8.0	2,205,500	725,200	2,930,700	0.00
1/9/2019	2	0.0	3	15.9	3	8.1	3	8.1	2,356,800	589,900	2,946,700	0.00
1/10/2019	1	0.1	1	16.0	0	8.0	2	8.0	2,227,200	453,500	2,680,700	0.00
1/11/2019	4	3.3	4	12.6	1	8.0	5	8.0	2,186,900	388,600	2,575,500	0.00
1/12/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,587,700	352,400	2,940,100	0.00
1/13/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,353,200	329,500	2,682,700	0.00
1/14/2019	3	6.4	2	8.0	26	8.0	2	8.0	2,179,900	410,100	2,590,000	0.00
1/15/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,246,900	296,200	2,543,100	0.00
1/16/2019	3	7.0	3	8.0	17	8.0	2	8.0	2,203,700	336,900	2,540,600	0.00
1/17/2019	1	7.9	1	8.0	0	8.0	1	8.0	2,478,600	279,100	2,757,700	0.00
1/18/2019	3	6.8	2	8.0	18	8.0	2	8.0	2,202,000	323,200	2,525,200	0.00
1/19/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	258,300	3,535,000	0.00
1/20/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,633,900	251,900	2,885,800	0.00
1/21/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,780,900	252,500	3,033,400	0.00
1/22/2019	2	5.2	1	8.0	38	8.0	1	8.0	3,004,900	364,000	3,368,900	0.00
1/23/2019	1	8.0	1	8.0	0	7.9	1	7.9	3,276,700	234,600	3,511,300	0.00
1/24/2019	4	6.9	2	8.0	2	9.1	3	9.1	3,276,700	282,900	3,559,600	0.00
1/25/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	224,200	3,500,900	0.00
1/26/2019	1	7.9	1	8.0	0	8.0	1	8.0	3,276,700	216,000	3,492,700	0.00
1/27/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,209,800	216,600	3,426,400	0.00
1/28/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	218,200	3,494,900	0.00
1/29/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	215,600	3,492,300	0.00
1/30/2019	3	6.0	7	8.1	24	8.1	2	8.1	2,998,800	292,200	3,291,000	0.00
1/31/2019	2	8.0	2	8.0	0	8.0	1	8.0	3,276,700	214,900	3,491,600	0.00
2/1/2019	2	7.9	2	8.0	1	8.0	2	8.0	3,276,700	215,200	3,491,900	0.00
2/2/2019												
2/3/2019												
2/4/2019	5	0.1	6	15.3	17	8.0	7	8.0	3,276,700	531,100	3,807,800	0.03
2/5/2019	1	0.0	1	16.0	0	8.0	2	8.0	3,276,700	659,400	3,936,100	0.01
2/6/2019	5	0.0	3	15.9	3	8.0	4	8.0	3,276,700	571,200	3,847,900	0.00
2/7/2019	3	0.8	2	16.0	0	12.9	20	12.9	3,276,700	845,500	4,122,200	0.01
2/8/2019	1	3.9	1	16.0	0	8.0	3	8.0	3,276,700	566,000	3,842,700	0.00
2/9/2019	1	0.0	1	16.0	0	8.0	2	8.0	3,276,700	502,700	3,779,400	0.00
2/10/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	409,200	3,685,900	0.00
2/11/2019	4	6.1	2	9.6	8	8.0	3	8.0	3,276,700	376,000	3,652,700	0.00
2/12/2019	1	8.0	1	8.0	0	8.0	2	8.0	3,276,700	335,400	3,612,100	0.00
2/13/2019	6	7.8	2	8.0	2	8.2	6	8.2	3,276,700	323,300	3,600,000	0.00
2/14/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	312,200	3,588,900	0.04
2/15/2019	15	7.2	8	8.4	5	8.0	10	8.0	3,276,700	332,000	3,608,700	0.00
2/16/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	289,000	3,565,700	0.00
2/17/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	284,200	3,560,900	0.00
2/18/2019	6	7.5	3	8.4	1	8.1	6	8.1	3,276,700	278,300	3,555,000	0.22
2/19/2019	2	7.2	2	8.0	17	8.0	1	8.0	3,276,700	299,500	3,576,200	0.00
2/20/2019	6	7.9	2	8.0	2	8.0	3	8.0	3,276,700	284,800	3,561,500	0.22
2/21/2019	2	8.0	2	8.0	1	8.0	2	8.0	3,276,700	299,300	3,576,000	0.00
2/22/2019	5	5.0	1	8.0	46	8.0	1	8.0	3,079,000	443,200	3,522,200	0.00
2/23/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	319,900	3,596,600	0.52
2/24/2019	1	0.0	1	16.0	0	8.0	2	8.0	3,276,700	626,000	3,902,700	0.02
2/25/2019	4	4.1	4	12.0	1	8.0	4	8.0	3,276,700	520,500	3,797,200	0.00
2/26/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	422,300	3,699,000	0.00
2/27/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	387,500	3,664,200	0.00
2/28/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	354,600	3,631,300	0.00
3/1/2019	3	7.8	2	8.0	4	8.0	2	8.0	3,276,700	356,400	3,633,100	0.01
3/2/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	320,700	3,597,400	0.00
3/3/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	314,600	3,591,300	0.00
3/4/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	312,700	3,589,400	0.00
3/5/2019	5	7.7	4	8.0	7	8.0	3	8.0	3,276,700	313,000	3,589,700	0.00
3/6/2019	1	8.0	1	8.0	0	8.0	1	8.0	3,276,700	279,100	3,555,800	0.00
3/7/2019	6	6.2	2	9.9	0	8.0	3	8.0	3,276,700	276,000	3,552,700	0.00
3/8/2019	15	7.8	11	7.9	7	8.0	15	8.0	3,276,700	272,600	3,549,300	0.01
3/10/2019												
1/1/1900	1	8.0	1	8.0	0	7.0	1	7.0	3,276,700	463,500	3,740,200	0.26
3/11/2019	7	4.7	5	11.1	5	8.0	7	8.0	3,276,700	523,200	3,799,900	0.00
3/12/2019	12	6.2	9	9.6	0	8.2	12	8.2	3,085,300	474,200	3,559,500	0.00
3/13/2019	12	0.9	9	15.9	1	8.1	11	8.1	2,437,200	516,500	2,953,700	0.23
3/14/2019	1	5.3	2	18.7	0	24.0	1	24.0	3,276,700	1,179,300	4,456,000	0.09
3/15/2019	2	0.9	1	23.0	0	22.9	2	22.9	3,276,700	958,300	4,235,000	0.01
3/16/2019	4	7.9	3	16.0	0	8.4	37	8.4	2,464,600	458,400	2,923,000	0.00
3/17/2019	3	7.9	3	16.0	0	8.0	3	8.0	2,772,000	402,700	3,174,700	0.00
3/18/2019	8	8.0	5	15.9	2	8.1	10	8.1	3,215,700	370,600	3,586,300	0.00
3/19/2019	15	2.0	1	16.0	0	8.0	2	8.0	2,726,700	645,500	3,372,200	0.00
3/20/2019	2	0.0	3	14.3	21	8.0	3	8.0	2,472,600	798,200	3,270,800	0.00
3/21/2019	2	0.0	2	16.0	0	8.1	3	8.1	2,784,800	620,700	3,405,500	0.01

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
3/22/2019	3	0.1	4	14.2	29	8.0	4	8.0	2,199,300	718,200	2,917,500	0.00
3/23/2019	2	0.0	1	20.0	0	4.0	3	4.0	2,240,100	263,800	2,503,900	0.00
3/24/2019	1	0.0	1	20.0	0	4.0	2	4.0	2,476,700	243,700	2,720,400	0.00
3/25/2019	5	5.6	5	15.3	0	3.0	0	3.0	2,405,800	174,200	2,580,000	0.00
3/26/2019	2	6.9	1	15.1	0	2.0	3	2.0	2,319,200	123,000	2,442,200	0.00
3/27/2019	4	4.5	4	11.4	3	8.1	5	8.1	2,528,100	400,000	2,928,100	0.00
3/28/2019	1	8.0	1	8.0	0	7.9	1	7.9	2,522,100	394,400	2,916,500	0.00
3/29/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,387,800	384,500	2,772,300	0.00
3/30/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,541,000	363,400	2,904,400	0.00
3/31/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,514,800	345,800	2,860,600	0.00
4/1/2019	5	7.8	2	8.0	4	8.0	3	8.0	2,365,700	328,200	2,693,900	0.00
4/2/2019	7	7.6	3	8.4	0	8.1	6	8.1	2,594,000	314,400	2,908,400	0.10
4/3/2019	2	8.0	2	7.9	0	8.0	2	8.0	2,423,300	308,600	2,731,900	0.01
4/4/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,374,300	293,300	2,667,600	0.00
4/5/2019	5	7.9	2	8.1	1	8.0	4	8.0	2,401,900	286,700	2,688,600	0.00
4/6/2019	1	8.0	1	8.0	0	8.0	2	8.0	2,319,300	280,200	2,599,500	0.00
4/7/2019	1	8.0	1	8.0	0	8.0	4	8.0	2,504,600	293,200	2,797,800	0.38
4/8/2019	5	7.9	3	7.9	0	8.0	4	8.0	2,550,700	360,600	2,911,300	0.00
4/9/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,783,800	331,400	2,115,200	0.00
4/10/2019	7	8.0	3	8.0	2	8.0	3	8.0	1,214,000	314,400	1,528,400	0.00
4/11/2019	2	8.9	1	8.0	0	8.4	14	8.4	1,298,400	405,800	1,704,200	1.09
4/12/2019	17	5.6	2	16.0	1	8.0	3	8.0	1,250,500	477,700	1,728,200	0.01
4/13/2019	1	0.1	1	16.0	0	8.0	2	8.0	1,090,700	535,300	1,626,000	0.00
4/14/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,371,600	441,300	1,812,900	0.00
4/15/2019	2	0.0	3	16.0	1	8.1	4	8.1	966,500	490,100	1,456,600	0.41
4/16/2019	1	0.0	1	16.0	0	8.0	2	8.0	1,009,900	619,800	1,629,700	0.14
4/17/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,227,300	544,800	1,772,100	0.01
4/18/2019	1	7.0	1	8.0	0	9.0	1	9.0	1,176,400	546,700	1,723,100	0.05
4/19/2019	0	0.0	0	0.0	9	23.6	28	23.6	1,427,000	1,433,500	2,860,500	0.01
4/20/2019	0	0.0	0	0.0	0	23.9	1	23.9	1,788,900	1,295,600	3,084,500	0.00
4/21/2019	0	0.0	0	0.0	0	24.0	1	24.0	1,378,800	1,173,300	2,552,100	0.00
4/22/2019	4	5.5	3	8.0	1	10.4	4	10.4	1,089,000	465,500	1,554,500	0.66
4/23/2019	17	0.2	1	16.0	0	8.1	2	8.1	1,001,700	689,400	1,691,100	0.24
4/24/2019	4	0.1	4	15.8	3	8.0	5	8.0	983,500	548,000	1,531,500	0.00
4/25/2019	1	0.0	1	16.0	0	8.0	2	8.0	1,107,100	459,000	1,566,100	0.33
4/26/2019	2	0.0	2	16.0	1	8.0	3	8.0	897,200	535,500	1,432,700	0.01
4/27/2019	2	8.0	1	8.0	0	8.0	4	8.0	1,361,600	436,700	1,798,300	0.01
4/28/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,376,000	396,900	1,772,900	0.04
4/29/2019	5	5.8	2	9.9	5	8.0	3	8.0	1,243,700	414,500	1,658,200	0.52
4/30/2019	19	8.1	11	8.0	0	8.1	12	8.1	1,393,100	564,900	1,958,000	0.29
5/1/2019	16	0.4	8	15.9	1	8.1	9	8.1	1,071,900	680,400	1,752,300	0.22
5/2/2019	2	0.1	2	16.0	0	8.0	3	8.0	1,112,500	613,900	1,726,400	0.09
5/3/2019	4	0.0	4	15.8	5	8.0	5	8.0	1,199,300	563,600	1,762,900	0.00
5/4/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,439,600	469,100	1,908,700	0.00
5/5/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,513,300	419,700	1,933,000	0.18
5/6/2019	3	7.8	3	8.0	3	8.0	3	8.0	1,475,600	437,300	1,912,900	0.07
5/7/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,411,600	393,100	1,804,700	0.00
5/8/2019	4	7.7	3	8.0	8	8.1	3	8.1	1,465,900	381,300	1,847,200	0.08
5/9/2019	14	2.6	4	16.0	0	11.4	7	11.4	1,286,900	715,400	2,002,300	0.78
5/10/2019	4	4.7	3	11.0	8	8.1	4	8.1	1,307,900	608,500	1,916,400	0.00
5/11/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,403,200	465,800	1,869,000	0.00
5/12/2019	1	7.9	1	8.0	0	8.0	1	8.0	1,533,100	409,500	1,942,600	0.00
5/13/2019	4	7.9	2	8.0	5	8.0	2	8.0	1,600,500	388,200	1,988,700	0.00
5/14/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,472,600	348,200	1,820,800	0.00
5/15/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,495,000	320,700	1,815,700	0.00
5/16/2019	3	5.9	2	8.0	1	10.0	2	10.0	1,488,200	405,100	1,893,300	0.25
5/17/2019	1	0.0	1	14.0	0	10.0	2	10.0	1,438,000	412,900	1,850,900	0.00
5/18/2019	1	0.0	1	14.0	0	10.0	2	10.0	1,262,500	503,600	1,766,100	0.42
5/19/2019	1	0.1	1	14.0	0	10.0	2	10.0	1,400,000	522,700	1,922,700	0.26
5/20/2019	2	6.0	2	8.0	3	9.9	2	9.9	1,536,600	546,500	2,083,100	0.00
5/21/2019	1	0.0	1	14.0	0	10.0	2	10.0	1,405,000	477,600	1,882,600	0.00
5/22/2019	1	0.0	1	14.0	0	10.0	2	10.0	1,309,300	623,500	1,932,800	0.66
5/23/2019	10	0.7	4	12.7	7	10.0	3	10.0	1,141,900	769,100	1,911,000	0.02
5/24/2019	4	0.1	1	14.0	0	9.8	8	9.8	1,068,300	591,600	1,659,900	0.45
5/25/2019	1	0.0	1	14.0	0	10.0	2	10.0	1,018,700	751,700	1,770,400	0.21
5/26/2019	1	0.0	1	14.0	0	10.0	2	10.0	1,239,700	628,000	1,867,700	0.00
5/27/2019	9	6.0	6	8.0	0	10.1	7	10.1	1,538,100	561,800	2,099,900	0.47
5/28/2019	5	3.8	5	10.2	2	10.0	5	10.0	1,429,800	768,700	2,198,500	0.00
5/29/2019	1	0.0	1	14.0	0	10.0	2	10.0	1,248,000	614,000	1,862,000	0.00
5/30/2019	3	3.4	3	9.5	24	10.0	3	10.0	2,016,700	604,700	2,621,400	0.00
5/31/2019	0	0.0	0	0.0	0	24.0	1	24.0	2,746,600	1,241,300	3,987,900	0.00
6/1/2019	0	0.0	0	0.0	0	24.0	1	24.0	2,547,900	1,143,100	3,691,000	0.15
6/2/2019	0	0.0	0	0.0	0	24.0	1	24.0	2,900,100	1,103,400	4,003,500	0.00
6/3/2019	0	0.0	0	0.0	12	23.4	2	23.4	2,979,900	1,030,000	4,009,900	0.00
6/4/2019	0	0.0	0	0.0	0	24.0	1	24.0	2,847,900	969,700	3,817,600	0.00
6/5/2019	0	0.0	0	0.0	0	24.1	1	24.1	3,054,300	975,900	4,030,200	0.10
6/6/2019	0	0.0	0	0.0	13	23.4	3	23.4	3,046,600	929,800	3,976,400	0.00
6/7/2019	2	6.0	2	8.0	0	10.0	2	10.0	2,700,000	327,300	3,027,300	0.00
6/8/2019	1	6.0	1	8.0	0	10.0	1	10.0	2,639,800	296,800	2,936,600	0.00
6/9/2019	1	6.0	1	8.0	0	10.0	1	10.0	2,762,200	284,800	3,047,000	0.04

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			Rainflow Total
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	(in):
6/10/2019	3	5.9	2	8.1	5	10.0	2	10.0	2,752,000	302,500	3,054,500	0.00
6/11/2019	1	0.6	1	15.3	0	8.0	1	8.0	2,549,800	219,500	2,769,300	0.00
6/12/2019	0	0.0	2	16.0	0	8.0	3	8.0	2,502,900	248,100	2,751,000	0.77
6/13/2019	0	0.0	3	15.9	3	8.0	3	8.0	1,586,700	651,500	2,238,200	0.31
6/14/2019	0	0.0	2	16.0	0	8.0	2	8.0	1,621,100	393,100	2,014,200	0.00
6/15/2019	0	0.0	1	16.0	0	7.9	1	7.9	1,611,200	327,400	1,938,600	0.00
6/16/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,697,200	289,400	1,986,600	0.04
6/17/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,344,200	270,800	1,615,000	0.00
6/18/2019	0	0.0	4	14.1	38	8.1	3	8.1	1,330,800	329,400	1,660,200	0.00
6/19/2019	0	0.0	2	14.2	37	8.0	1	8.0	1,464,600	310,600	1,775,200	0.33
6/20/2019	0	0.0	2	16.0	0	8.1	5	8.1	1,484,700	282,400	1,767,100	0.05
6/21/2019	0	0.0	6	15.6	10	8.0	5	8.0	1,382,200	273,000	1,655,200	0.00
6/22/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,137,400	229,400	1,366,800	0.00
6/23/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,233,500	221,700	1,455,200	0.04
6/24/2019	0	0.0	4	15.8	5	8.0	4	8.0	1,334,300	249,700	1,584,000	1.08
6/25/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,175,500	398,600	1,574,100	0.03
6/26/2019	0	0.0	1	15.9	0	8.0	1	8.0	1,396,500	298,100	1,694,600	0.00
6/27/2019	0	0.0	4	15.2	19	8.0	4	8.0	1,259,000	313,200	1,572,200	0.46
6/28/2019	0	0.0	4	16.0	0	8.4	42	8.4	1,386,100	430,900	1,817,000	0.73
6/29/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,521,200	533,200	2,054,400	0.00
6/30/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,389,100	401,200	1,790,300	0.21
7/1/2019	0	0.0	6	15.3	18	8.0	2	8.0	1,174,600	401,300	1,575,900	0.00
7/2/2019	0	0.0	18	16.4	0	13.7	5	13.7	1,610,000	613,900	2,223,900	0.68
7/3/2019	0	0.0	14	15.1	15	8.0	4	8.0	1,498,900	756,300	2,255,200	0.00
7/4/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,661,100	454,800	2,115,900	0.00
7/5/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,615,400	365,700	1,981,100	0.01
7/6/2019	0	0.0	1	16.0	0	8.0	2	8.0	1,723,400	314,500	2,037,900	0.05
7/7/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,679,000	285,400	1,964,400	0.00
7/8/2019	0	0.0	3	12.0	86	8.0	2	8.0	1,410,500	436,000	1,846,500	0.00
7/9/2019	0	0.0	1	16.1	0	8.0	1	8.0	1,695,600	247,000	1,942,600	0.00
7/10/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,325,000	253,600	1,578,600	0.13
7/11/2019	0	0.0	3	14.1	39	8.0	2	8.0	1,664,600	308,400	1,973,000	0.00
7/12/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,637,500	216,500	1,854,000	0.00
7/13/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,622,200	205,900	1,828,100	0.00
7/14/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,903,600	200,400	2,104,000	0.00
7/15/2019	0	0.0	3	13.9	51	8.1	2	8.1	1,447,200	266,400	1,713,600	0.00
7/16/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,515,100	189,600	1,704,700	0.00
7/17/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,558,700	187,700	1,746,400	0.00
7/18/2019	0	0.0	7	15.2	16	8.0	6	8.0	1,343,500	215,300	1,558,800	0.56
7/19/2019	0	0.0	1	16.0	0	7.9	1	7.9	1,193,100	208,200	1,401,300	0.01
7/20/2019	0	0.0	7	16.0	0	8.1	12	8.1	1,502,800	389,700	1,892,500	1.91
7/21/2019	0	0.0	3	16.0	0	8.0	5	8.0	1,533,700	438,700	1,972,400	0.00
7/22/2019	0	0.0	4	14.8	52	7.0	1	7.0	1,476,200	372,700	1,848,900	0.00
7/23/2019	0	0.0	0	23.0	0	1.0	1	1.0	988,200	32,700	1,020,900	0.00
7/24/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,684,800	227,400	1,912,200	0.00
7/25/2019	0	0.0	3	15.8	6	8.0	2	8.0	1,659,000	221,300	1,880,300	0.00
7/26/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,623,200	205,100	1,828,300	0.01
7/27/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,598,900	191,200	1,790,100	0.07
7/28/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,641,700	194,300	1,836,000	0.01
7/29/2019	0	0.0	3	15.8	5	8.0	2	8.0	1,685,900	195,200	1,881,100	0.03
7/30/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,852,500	177,600	2,030,100	0.00
7/31/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,744,600	169,300	1,913,900	0.00
8/1/2019	0	0.0	3	15.4	8	8.0	4	8.0	2,017,600	174,700	2,192,300	0.00
8/2/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,103,800	163,700	2,267,500	0.00
8/3/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,040,900	154,500	2,195,400	0.07
8/4/2019	0	0.0	1	16.0	0	8.0	2	8.0	1,725,500	157,600	1,883,100	0.00
8/5/2019	0	0.0	3	16.0	0	8.0	3	8.0	1,765,100	166,700	1,931,800	0.64
8/6/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,054,000	276,100	2,330,100	0.00
8/7/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,207,700	225,000	2,432,700	0.84
8/8/2019	0	0.0	3	15.8	4	8.0	2	8.0	1,785,000	410,600	2,195,600	0.00
8/9/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,817,300	242,000	2,059,300	0.00
8/10/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,247,800	212,300	2,460,100	0.00
8/11/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,310,600	194,300	2,504,900	0.04
8/12/2019	0	0.0	6	15.9	3	8.0	4	8.0	2,357,000	195,200	2,552,200	0.00
8/13/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,532,900	182,900	2,715,800	0.01
8/14/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,278,100	173,800	2,451,900	0.00
8/15/2019	0	0.0	2	15.7	4	8.0	2	8.0	1,905,500	168,100	2,073,600	0.00
8/16/2019	0	0.0	1	13.6	0	10.4	1	10.4	2,647,100	226,600	2,873,700	0.03
8/17/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,073,500	151,200	2,224,700	0.00
8/18/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,121,000	155,900	2,276,900	0.19
8/19/2019	0	0.0	3	15.0	18	8.1	3	8.1	1,907,500	186,300	2,093,800	0.00
8/20/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,439,100	149,300	2,588,400	0.00
8/21/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,336,100	148,800	2,484,900	0.00
8/22/2019	0	0.0	3	15.6	8	8.0	3	8.0	2,282,400	159,700	2,442,100	0.00
8/23/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,139,400	144,400	2,283,800	0.00
8/24/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,597,400	135,700	2,733,100	0.00
8/25/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,601,800	144,600	2,746,400	0.00
8/26/2019	0	0.0	4	15.9	3	8.0	3	8.0	1,866,000	167,700	2,033,700	1.11
8/27/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,623,400	279,200	1,902,600	0.00
8/28/2019	0	0.0	1	16.0	0	8.0	4	8.0	1,660,500	211,600	1,872,100	0.00

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Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
8/29/2019	0	0.0	8	15.8	0	8.0	10	8.0	1,768,700	184,900	1,953,600	0.00
8/30/2019	0	0.0	1	16.0	0	8.0	1	8.0	1,622,900	167,200	1,790,100	0.00
8/31/2019	0	0.0	4	16.0	0	8.0	4	8.0	1,963,000	163,400	2,126,400	0.00
9/1/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,147,400	148,600	2,296,000	0.00
9/2/2019	0	0.0	1	16.0	0	8.0	1	8.0	2,264,800	146,500	2,411,300	0.00
9/3/2019	0	0.0	4	15.8	5	8.0	2	8.0	1,628,600	164,800	1,793,400	0.27
9/4/2019	1	5.2	3	10.7	0	8.0	1	8.0	1,780,000	162,500	1,942,500	0.00
9/5/2019	3	7.9	2	8.0	1	8.0	3	8.0	1,906,800	155,900	2,062,700	0.00
9/6/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,668,700	156,700	1,825,400	0.00
9/7/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,948,800	150,700	2,099,500	0.00
9/8/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,774,900	146,400	1,921,300	0.00
9/9/2019	4	7.7	2	8.0	6	8.0	4	8.0	1,677,300	156,000	1,833,300	0.00
9/10/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,613,100	174,200	1,787,300	0.50
9/11/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,604,100	217,300	1,821,400	0.66
9/12/2019	3	7.7	4	8.0	10	8.0	2	8.0	1,547,200	337,400	1,884,600	0.42
9/13/2019	10	2.8	4	18.6	2	12.3	6	12.3	2,113,200	569,000	2,682,200	1.43
9/14/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,551,800	415,000	1,966,800	0.00
9/15/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,934,500	324,000	2,258,500	0.04
9/16/2019	12	3.5	4	8.2	29	11.2	6	11.2	1,662,000	522,400	2,184,400	0.00
9/17/2019	3	7.5	3	8.5	2	8.0	1	8.0	1,584,900	257,100	1,842,000	0.00
9/18/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,598,600	242,900	1,841,500	0.00
9/20/2019	4	14.7	4	25.1	3	8.0	2	8.0	2,820,800	224,100	3,044,900	0.00
9/21/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,761,300	198,300	1,959,600	0.01
9/22/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,912,800	205,300	2,118,100	0.38
9/23/2019	4	7.8	3	8.0	1	8.0	3	8.0	1,649,900	246,600	1,896,500	0.01
9/24/2019	3	7.5	4	8.0	13	8.0	2	8.0	1,517,700	252,900	1,770,600	0.00
9/25/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,565,700	215,800	1,781,500	0.00
9/26/2019	2	7.4	1	8.0	14	8.0	1	8.0	1,465,400	225,300	1,690,700	0.00
9/27/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,637,000	204,100	1,841,100	0.45
9/28/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,860,100	236,000	2,096,100	0.00
9/29/2019	6	3.4	15	12.6	1	8.1	26	8.1	1,787,600	290,700	2,078,300	1.27
9/30/2019	2	3.7	6	12.1	4	8.1	6	8.1	2,022,700	599,200	2,621,900	0.01
10/1/2019	7	6.9	6	9.5	5	7.7	9	7.7	1,842,600	450,000	2,292,600	1.79
10/2/2019	2	0.0	6	20.1	3	20.1	4	20.1	2,487,000	720,300	3,207,300	1.19
10/3/2019	0	0.0	58	22.5	1	13.0	16	13.0	1,734,900	638,900	2,373,800	0.02
10/4/2019	4	0.0	69	17.4	3	8.1	10	8.1	2,282,300	722,700	3,005,000	0.00
10/5/2019	4	0.0	4	15.9	0	8.0	7	8.0	2,003,900	650,700	2,654,600	0.21
10/6/2019	1	0.0	1	16.0	0	8.0	2	8.0	2,499,700	602,500	3,102,200	0.00
10/7/2019	2	8.0	4	8.0	2	8.0	3	8.0	2,233,500	485,300	2,718,800	0.00
10/8/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,328,500	396,100	2,724,600	0.00
10/9/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,294,300	347,500	2,641,800	0.00
10/10/2019	3	7.9	2	8.0	2	8.0	2	8.0	2,520,100	315,800	2,835,900	0.06
10/11/2019	21	5.0	19	10.9	1	8.2	19	8.2	2,242,200	338,500	2,580,700	0.65
10/12/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,365,500	481,000	2,846,500	0.01
10/13/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,326,100	396,700	2,722,800	0.04
10/14/2019	3	7.9	3	8.0	5	8.0	2	8.0	2,331,200	358,300	2,689,500	0.00
10/15/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,247,800	311,900	2,559,700	0.02
10/16/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,218,900	295,800	2,514,700	0.00
10/17/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,999,600	269,400	2,269,000	0.00
10/18/2019	3	7.8	2	8.0	4	8.0	2	8.0	1,966,300	271,100	2,237,400	0.00
10/19/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,012,600	244,100	2,256,700	0.00
10/20/2019	1	7.9	1	8.0	0	8.0	1	8.0	1,761,200	236,000	1,997,200	0.00
10/21/2019	4	7.9	2	8.0	3	8.0	2	8.0	2,181,000	243,400	2,424,400	0.29
10/22/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,427,300	266,500	2,693,800	0.04
10/23/2019	3	7.1	2	8.0	17	8.0	2	8.0	2,343,800	293,800	2,637,600	0.16
10/24/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,093,000	278,300	2,371,300	0.00
10/25/2019	2	7.1	1	8.0	19	8.0	1	8.0	2,023,800	286,700	2,310,500	0.00
10/26/2019	5	8.9	2	8.0	0	8.0	2	8.0	2,063,600	252,200	2,315,800	1.05
10/27/2019	1	7.0	2	16.0	0	8.0	3	8.0	2,136,100	427,800	2,563,900	0.29
10/28/2019	3	4.9	3	10.7	11	8.0	3	8.0	1,791,000	575,600	2,366,600	0.00
10/29/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,448,200	435,600	2,883,800	0.09
10/30/2019	3	7.6	4	8.0	9	8.1	4	8.1	1,677,000	425,800	2,102,800	0.00
10/31/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,918,600	388,800	2,307,400	0.00
11/1/2019	2	0.0	2	16.0	2	8.0	3	8.0	1,583,600	409,200	1,992,800	0.26
11/2/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,821,300	439,200	2,260,500	0.00
11/3/2019	1	8.0	1	8.0	0	9.0	1	9.0	1,984,500	490,600	2,475,100	0.05
11/4/2019	3	5.2	3	10.0	18	8.0	3	8.0	1,561,800	472,800	2,034,600	0.09
11/5/2019	2	7.9	1	8.0	2	8.0	3	8.0	1,920,100	401,800	2,321,900	0.00
11/6/2019	2	7.6	1	8.0	10	8.0	1	8.0	1,664,800	387,300	2,052,100	0.00
11/7/2019	1	7.9	1	8.0	0	8.0	1	8.0	1,605,600	363,200	1,968,800	0.00
11/8/2019	2	8.0	2	8.0	1	8.0	2	8.0	1,862,700	348,600	2,211,300	0.00
11/9/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,770,400	334,800	2,105,200	0.12
11/10/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,944,800	351,500	2,296,300	0.00
11/11/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,011,000	355,800	2,366,800	0.00
11/12/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,739,200	335,300	2,074,500	0.01
11/13/2019	3	7.7	2	8.0	8	8.0	2	8.0	1,864,500	337,200	2,201,700	0.00
11/14/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,836,100	303,900	2,140,000	0.00
11/15/2019	2	7.8	2	8.0	6	8.1	2	8.1	1,776,600	300,700	2,077,300	0.03
11/16/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,764,600	289,000	2,053,600	0.00

City Of Mequon Daily Report - 2019

Date	Pump #1		Pump #2		Pump #3		Pump #4		Flow			
	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	Cycles	Runtime	East FM	West FM	Station Flow	Rainflow Total (in):
11/17/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,910,900	305,500	2,216,400	0.12
11/18/2019	2	7.9	2	8.0	1	8.0	2	8.0	1,934,600	351,400	2,286,000	0.01
11/19/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,986,800	360,200	2,347,000	0.00
11/20/2019	9	7.1	5	8.0	2	8.7	5	8.7	1,734,600	384,800	2,119,400	0.00
11/21/2019	1	0.0	1	16.0	0	8.0	2	8.0	1,747,200	379,700	2,126,900	0.45
11/22/2019	3	4.5	3	11.5	2	8.1	3	8.1	1,798,800	500,800	2,299,600	0.00
11/23/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,420,800	428,300	2,849,100	0.00
11/24/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,204,000	380,200	2,584,200	0.01
11/25/2019	4	8.0	3	8.0	2	8.0	3	8.0	1,751,500	365,000	2,116,500	0.01
11/26/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,647,000	342,500	1,989,500	0.21
11/27/2019	18	0.2	5	15.9	2	8.0	7	8.0	801,400	581,500	1,382,900	0.48
11/28/2019	1	0.0	1	16.0	0	8.0	2	8.0	867,800	527,000	1,394,800	0.01
11/29/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,703,200	450,900	2,154,100	0.01
11/30/2019	8	8.1	1	8.0	0	8.0	1	8.0	1,641,400	436,000	2,077,400	0.07
12/1/2019	14	6.8	1	16.0	0	14.5	2	14.5	1,520,300	854,900	2,375,200	0.09
12/2/2019	9	0.1	2	9.4	66	8.0	2	8.0	1,227,200	1,274,800	2,502,000	0.01
12/3/2019	1	0.0	1	16.0	0	8.0	2	8.0	1,210,200	526,800	1,737,000	0.06
12/4/2019	1	2.7	1	8.0	115	8.0	1	8.0	1,716,000	800,000	2,516,000	0.00
12/5/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,970,300	405,400	2,375,700	0.00
12/6/2019	3	7.8	2	8.0	5	8.1	3	8.1	1,985,600	387,400	2,373,000	0.00
12/7/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,955,100	348,200	2,303,300	0.00
12/8/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,987,800	335,400	2,323,200	0.00
12/9/2019	3	7.9	2	8.0	5	8.0	2	8.0	1,899,700	330,800	2,230,500	0.09
12/10/2019	1	8.0	1	8.0	0	8.0	1	8.0	1,985,900	322,800	2,308,700	0.00
12/11/2019	2	7.9	2	8.0	0	7.9	2	7.9	2,218,000	299,000	2,517,000	0.00
12/12/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,167,800	285,700	2,453,500	0.00
12/13/2019	3	7.9	2	8.0	4	8.0	2	8.0	1,961,400	278,200	2,239,600	0.00
12/14/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,040,900	268,000	2,308,900	0.00
12/15/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,233,400	257,700	2,491,100	0.00
12/16/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,225,700	242,200	2,467,900	0.00
12/17/2019	1	7.9	1	8.0	0	8.0	1	8.0	2,581,100	241,700	2,822,800	0.00
12/18/2019	3	8.0	2	8.0	1	8.0	3	8.0	2,939,900	232,600	3,172,500	0.00
12/19/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,887,300	224,500	3,111,800	0.00
12/20/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,640,700	213,700	2,854,400	0.00
12/21/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,427,600	208,300	2,635,900	0.00
12/22/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,446,200	206,900	2,653,100	0.00
12/23/2019	5	5.4	6	8.2	48	8.0	2	8.0	2,301,900	297,300	2,599,200	0.00
12/24/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,091,200	201,900	2,293,100	0.00
12/25/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,322,800	198,200	2,521,000	0.00
12/26/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,349,100	197,600	2,546,700	0.00
12/27/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,230,100	198,800	2,428,900	0.00
12/28/2019	1	8.0	1	8.0	0	8.0	1	8.0	2,541,200	196,600	2,737,800	0.27
12/29/2019	1	0.0	1	16.0	0	16.2	9	16.2	2,647,200	942,200	3,589,400	0.98
12/30/2019	9	5.7	2	16.0	0	17.5	53	17.5	1,998,300	1,105,000	3,103,300	0.19
12/31/2019	1	0.0	1	16.0	0	8.1	2	8.1	2,537,900	578,300	3,116,200	0.00
Total	790	1641.0	884	4053.3	1385	3162.6	1111	3162.6	756,960,900	140,023,200	896,984,100	36.92
Ave	2	4.5	2	11.2	4	8.8	3	8.8	2,096,845	387,876	2,484,720	0.10
Max	21	55.3	69	25.1	115	24.1	53	24.1	3,276,700	1,433,500	4,456,000	1.91
Min	0	0.0	0	0.0	0	1.0	0	1.0	801,400	32,700	1,020,900	0.00
Median	1	6.0	1	8.0	0	8.0	2	8.0	1,987,800	334,800	2,321,900	0.00

Appendix D

SSO Records

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, all permittees shall provide the following notices if an **unscheduled** sanitary sewer overflow or bypass occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow or bypass, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office.

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **unscheduled sanitary sewer overflow or bypass occurrences**. Attach additional information as necessary to explain or document the overflow or bypass. For the purpose of this report, an overflow or bypass is defined as the discharge of untreated sewage from the sanitary sewer collection system to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow or bypass details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name)	Overflow or Bypass Reported To DNR	
City of Mequon	Date: April 3, 2007	Time: 12:40 [X] am [ ] pm
Person Representing Permittee Who Contacted DNR: Jon Garms	DNR Office and Person Contacted: Ted Bosch	

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for **each occurrence**)

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
April 3, 2007	9:50 [X] am [ ] pm	April 3, 2007	11:15 [X] am [ ] pm

Duration of the overflow or bypass (hours and minutes): 1 hour 25 minutes.

Estimated Volume of Wastewater Discharged (gallons): 51,000

Location of the Overflow or Bypass (complete a separate form for **each discharge location**)

Lift Station G - Fieldwood Dr. @ HIghland Road

Circumstances Causing the Overflow or Bypass (check all that apply)

- [X] Rain
- [ ] Rain and Snow Melt
- [ ] Snow Melt
- [ ] Power Outage
- [ ] Plugged Sewer
- [ ] Broken Sewer
- [ ] Equipment Failure
- [ ] Widespread Flooding
- [X] Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Excess rainfall/saturated ground conditions combined to cause a high wet well alarm and sewer levels approaching critical basement elevations. Visual observation upstream of the lift station had a 3 foot surcharge and bypassing was done for 1 hr. 25 min. to protect basements. This area is also within 500 feet of the Milwaukee River which was at bank full stage.

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, all permittees shall provide the following notices if an **unscheduled** sanitary sewer overflow or bypass occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow or bypass, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office.

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **unscheduled sanitary sewer overflow or bypass occurrences**. Attach additional information as necessary to explain or document the overflow or bypass. For the purpose of this report, an overflow or bypass is defined as the discharge of untreated sewage from the sanitary sewer collection system to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow or bypass details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name)	Overflow or Bypass Reported To DNR	
CITY OF MEQUON	Date: APRIL 11, 2008	Time: 7:45 [X] am [ ] pm
Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted	
JON GARMS	TED Bosch	

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for **each occurrence**)

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
APRIL 10, 2008	9:50 [ ] am [X] pm	APRIL 10, 2008	11:59 [ ] am [X] pm
Duration of the overflow or bypass (hours and minutes)		Estimated Volume of Wastewater Discharged (gallons)	
2 HRS 10 MIN.		38,000	

Location of the Overflow or Bypass (complete a separate form for **each discharge location**)

LIFT STATION G - Highland ROAD @ FIELDWOOD ROAD

Circumstances Causing the Overflow or Bypass (check all that apply)

- [ ] Rain
- [X] Rain and Snow Melt
- [ ] Snow Melt
- [ ] Power Outage
- [ ] Plugged Sewer
- [ ] Broken Sewer
- [ ] Equipment Failure
- [ ] Widespread Flooding
- [ ] Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

PORTIONS OF MEQUON'S SEWER SYSTEM EXPERIENCED A SURCHARGED CONDITION STARTING LATE EVENING APRIL 10, 2008 (BETWEEN APPROX. 7:45 PM & MIDNIGHT) APPROX. 3.58 INCHES OF RAIN OVER 58 HOURS W/ 10"-12" OF SNOW MELT WAS THE PRIMARY CAUSE.

Wet Weather Data (if applicable)

Document the weather conditions if it contributed to the cause of the overflow or bypass. An overflow or bypass may be caused by a series of short rain storms or in combination with a snow melt. The wet weather data should include the cumulative amount of precipitation that caused the overflow or bypass.

Date(s) and Duration of Rainfall			
Start Date: APRIL 8, 2008	Time (to nearest 15 minutes): 1:20 ☐ am ☒ pm	End Date: APRIL 10, 2008	Time (to nearest 15 minutes): 11:59 ☐ am ☒ pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy): 3.58 INCHES

Amount of Snow Melt (estimated inches melted): 10"

Contributing Soil Conditions (saturated, frozen, soil type): SATURATED, CLAY

Where Did the Discharge from the Overflow or Bypass Go? (check all that apply)

Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water.

☐ Runs on ground and absorbs into the soil.

☒ Ditch. Name of surface water it drains to: 1300 ft. UPSTREAM OF MILWAUKEE RIVER

☐ Storm sewer. Name of surface water it drains to:

☐ Surface water direct discharge:

☐ Other, describe:

Actions to Correct This Occurrence and Prevent Future Overflows or Bypasses

Describe what actions were taken to minimize the volume of wastewater discharged from the overflow or bypass reported on this form. Also describe what actions are planned to prevent or minimize future overflows or bypasses. The WPDES permit prohibits overflows or bypasses, unless certain specified conditions are met. If the permittee fails to operate and maintain the sewage collection system to prevent overflows and bypasses, they will be subject to enforcement action.

BYPASS PUMPING ONLY OCCURRED TO PREVENT BASEMENT BACKUPS UNTIL LEVELS OBSERVED IN MANHOLES RETURNED TO NORMAL LEVELS. NO BASEMENT BACKUPS WERE REPORTED.

PRIVATE LIFT STATION, MANHOLES AND LATERALS IN THIS BASIN WILL BE CHECKED FOR I/I CONDITIONS. LIFT STATION PUMP CAPACITY SHOULD ALSO BE VARIFIED.

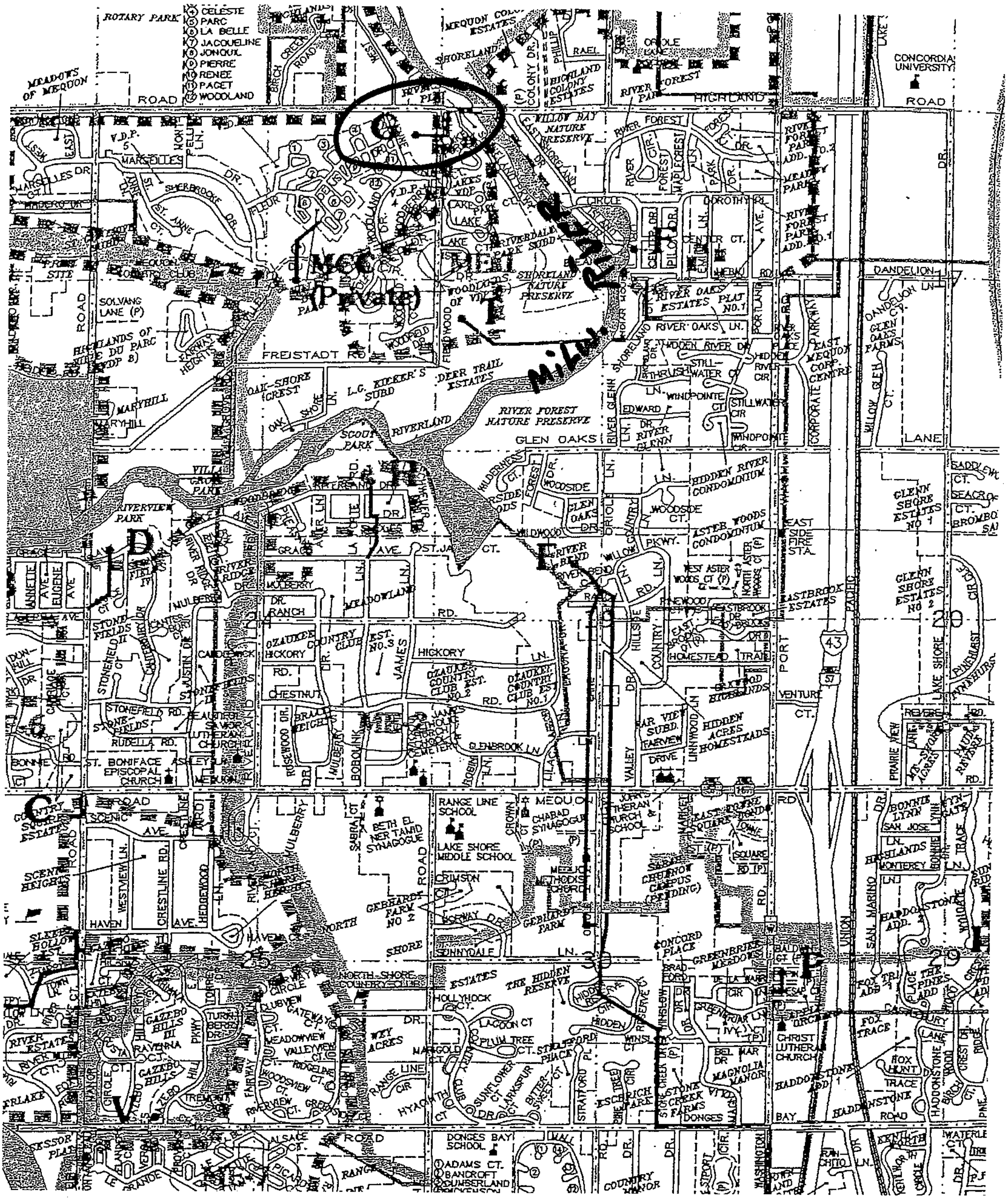
Report Completed By

Authorized Representative Name (Print): JON J. GARMS

Title: Director Public Works

Authorized Representative Signature: [signature]

Date: 4-15-08



ROTARY PARK
CELESTE
PARC
LA BELLE
JACQUELINE
JONQUIL
PIERRE
RENEE
PAGET
WOODLAND
MEADOWS OF MEQUON
MEQUON COLONY ESTATES
HIGHLAND COLONY ESTATES
RIVER FOREST PARK
HIGHLAND
ROAD
CONCORDIA UNIVERSITY
WILLOW BAY NATURE PRESERVE
RIVER FOREST
V.D.P. 5
MARSEILLES DR.
SHERBROOKE
ST. ANNE
FLEUR
V.D.P. 4
LAKES VDP
RIVER FOREST PARK ADD. NO. 2
MEADOW PARK
RIVER FOREST PARK ADD. NO. 1
DOROTHY
CENTER CT.
MCC
(Private)
MEQUON COUNTRY CLUB
SOLVANG LANE (P)
RIVERDALE PARK SUBD.
SHORELAND NATURE PRESERVE
RIVER OAKS ESTATES PLAT NO. 1
RIVER OAKS LN.
DANDELION
DANDELION CT.
GLEN OAKS FARMS
EAST MEQUON CORP. CENTRE
CORPORATE PARKWAY
HIGHLANDS OF VILLE DU PARC (VDP 8)
FREISTADT RD.
HIDDEN RIVER DR.
STILLWATER CT.
WINDPOINTE CT.
MARYHILL
OAK-SHORE CREST
L.C. KIEKER'S SUBD
DEER TRAIL ESTATES
RIVER FOREST NATURE PRESERVE
RIVERLAND
SCOUT PARK
GLEN OAKS
RIVER GLENN
HIDDEN RIVER CONDOMINIUM
GLENN SHORE ESTATES NO 1
RIVERVIEW PARK
WOODSIDE
ASTER WOODS CONDOMINIUM
EAST SIDE FIRE STA.
RIVER BEND
RIVER RIDGE
MULBERRY
MEADOWLANE
RANCH
RD.
EASTBROOK ESTATES
GLENN SHORE ESTATES NO 2
STONE FIELDS
OZAUKEE COUNTRY CLUB EST. NO. 3
HICKORY
JAMES
HOMESTEAD TRAIL
PORT
43
57
OZAUKEE COUNTRY CLUB EST. NO. 2
OZAUKEE COUNTRY CLUB EST. NO. 1
CHESTNUT
VENTURE
STONEFIELD RD.
BEAUTIFUL SAVIOR LUTHERAN CHURCH
RUDELLA RD.
GLENBROOK LN.
HIDDEN ACRES HOMESTEADS
PRAIRIE VIEW
BONNIE
ST. BONIFACE EPISCOPAL CHURCH
ASHLEY
MEQUON
COUNTRY SQUIRE ESTATES
SCENIC
AVE.
BETH EL NER TAMID SYNAGOGUE
RANGE LINE SCHOOL
CHABAD SYNAGOGUE
LAKE SHORE MIDDLE SCHOOL
BONNIE LYNN
SAN JOSE
MONTEREY
SCENIC HEIGHTS
WESTVIEW LN.
CRESTLINE RD.
HEDGEWOOD
CRIMSON
MEQUON METHODIST CHURCH
CONCORDIA
SAN MARINO
HADDONSTONE ADD. 2
HAVEN
GEBHARDT FARM NO 2
GEBHARDT FARM
NORTH SHORE
SUNNYDALE
CONCORD PLACE
GREENBRIER MEADOWS
UNION
PACIFIC
NORTH SHORE COUNTRY CLUB
ESTATES
THE HIDDEN RESERVE
HOLLYHOCK CT.
LAGOON CT
PLUM TREE
STRATFORD PLACE
CHRIST LUTHERAN CHURCH
FOX TRACE
FOX HUNT
GAZEBO HILLS III
RAVENNA
MEADOWVIEW CT.
VALLEYVIEW CT.
RIDGELINE CT.
WOODSVIEW CT.
RIVERVIEW CT.
RANGE LINE CIR
HYACINTH CT.
SUNFLOWER DR.
LARKSPUR
BITTERSWEET CT.
ESCHRICH PARK
STONE CREEK FARMS
MAGNOLIA MANOR
BEL MAR DR
HADDONSTONE ADD. 1
HADDONSTONE
TRACE
BAY
ROAD
DONGES
DONGES BAY SCHOOL
ADAMS CT.
BANCROFT
CUMBERLAND
ALSACE CT.
WASHINGTON
KENTWORTH
COUNTRY MANOR
MILW. RIVER

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, all permittees shall provide the following notices if an **unscheduled** sanitary sewer overflow or bypass occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow or bypass, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office.

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **unscheduled sanitary sewer overflow or bypass occurrences**. Attach additional information as necessary to explain or document the overflow or bypass. For the purpose of this report, an overflow or bypass is defined as the discharge of untreated sewage from the sanitary sewer collection system to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow or bypass details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name)	Overflow or Bypass Reported To DNR	
CITY OF MEQUON	Date JUNE 13, 2008	Time 9:30 [X] am [ ] pm
Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted	
MARK J. LLOYD	TED BOSCH - WDNR/MILWAUKEE	

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for **each occurrence**)

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
JUNE 13, 2008	12:45 [X] am [ ] pm	JUNE 13, 2008	5:45 [X] am [ ] pm

Duration of the overflow or bypass (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
5 HOURS	90,000

Location of the Overflow or Bypass (complete a separate form for **each discharge location**)

MH # 0118-063 INTERSECTION OF N. CIRCLE DR & N. ISLAND DR. (LIFT STA. "F")

Circumstances Causing the Overflow or Bypass (check all that apply)

- [X] Rain
- [ ] Rain and Snow Melt
- [ ] Snow Melt
- [ ] Power Outage
- [ ] Plugged Sewer
- [ ] Broken Sewer
- [ ] Equipment Failure
- [X] Widespread Flooding
- [ ] Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

PORTIONS OF MEQUON'S SYSTEM EXPERIENCED SURCHARGED CONDITIONS EARLY MORNING OF JUNE 13th AS A RESULT OF HEAVY RAINS (APPROX. 2.68 inches IN A 15.5 HOUR PERIOD). BYPASS PUMPED TO MILWAUKEE RIVER FROM 12:45 AM TO 5:45 AM, JUNE 13, 2008.

Wet Weather Data (if applicable)

Document the weather conditions if it contributed to the cause of the overflow or bypass. An overflow or bypass may be caused by a series of short rain storms or in combination with a snow melt. The wet weather data should include the cumulative amount of precipitation that caused the overflow or bypass.

Date(s) and Duration of Rainfall			
Start Date JUNE 12, 2008	Time (to nearest 15 minutes) 4:00 ☐ am ☒ pm	End Date JUNE 13, 2008	Time (to nearest 15 minutes) 7:30 ☒ am ☐ pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy): 2.68 inches

Amount of Snow Melt (estimated inches melted):

Contributing Soil Conditions (saturated, frozen, soil type): SATURATED, CLAY

Where Did the Discharge from the Overflow or Bypass Go? (check all that apply)

Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water.

☐ Runs on ground and absorbs into the soil.

☒ Ditch. Name of surface water it drains to: MILWAUKEE RIVER

☐ Storm sewer. Name of surface water it drains to:

☐ Surface water direct discharge:

☐ Other, describe:

Actions to Correct This Occurrence and Prevent Future Overflows or Bypasses

Describe what actions were taken to minimize the volume of wastewater discharged from the overflow or bypass reported on this form. Also describe what actions are planned to prevent or minimize future overflows or bypasses. The WPDES permit prohibits overflows or bypasses, unless certain specified conditions are met. If the permittee fails to operate and maintain the sewage collection system to prevent overflows and bypasses, they will be subject to enforcement action.

BYPASS PUMPING ONLY TO PREVENT BASEMENT BACK-UPS UNTIL LEVELS OBSERVED IN MANHOLES RETURNED TO NORMAL LEVELS. NO BASEMENT BACK-UPS IN THIS AREA REPORTED. A MASTER PLAN UPDATE OF THE CITY'S SANITARY SYSTEM, SCHEDULED FOR 2008-2009, SHOULD IDENTIFY SOLUTIONS TO REDUCE I/I & BYPASSING.

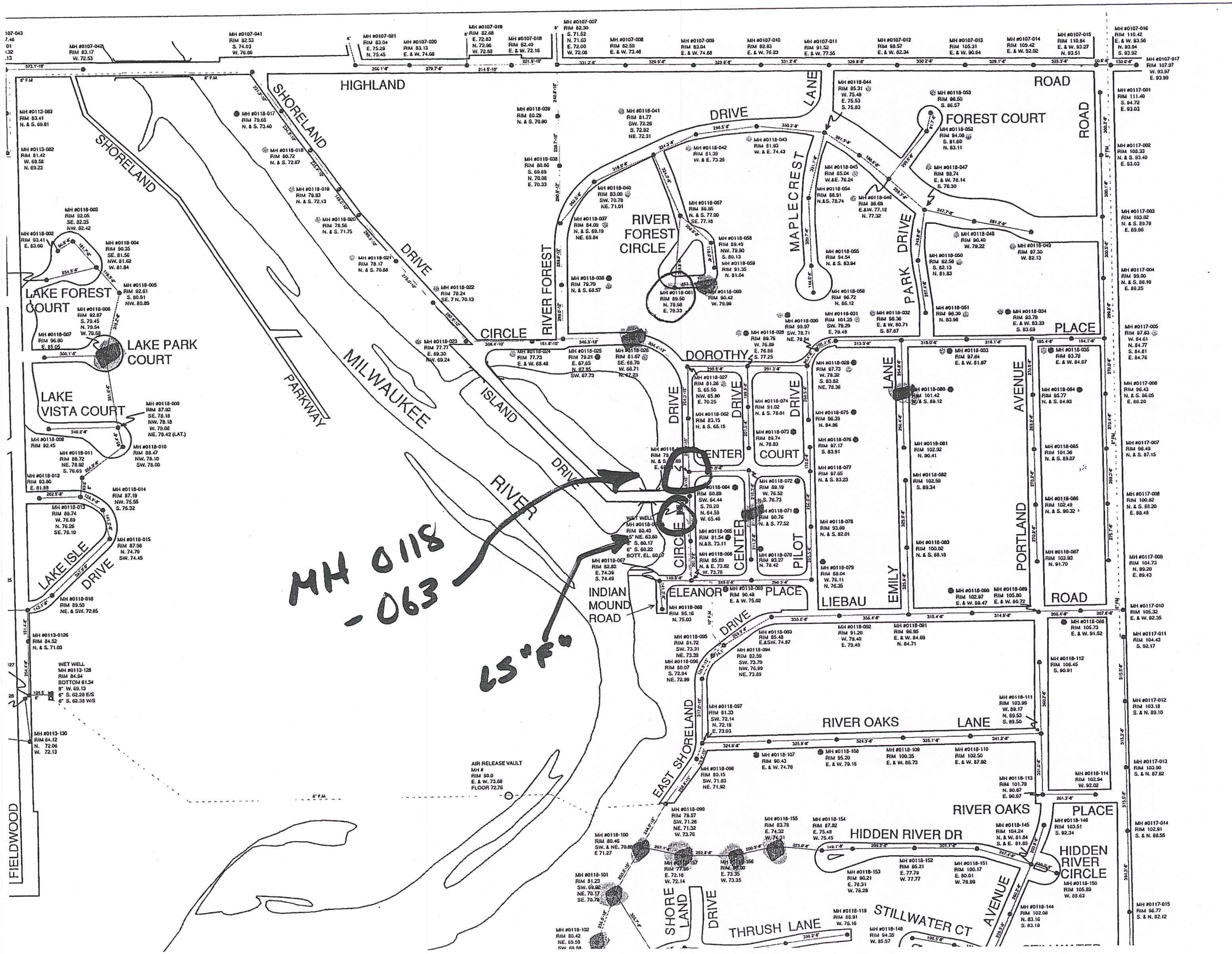
Report Completed By

Authorized Representative Name (Print): MARK J. LLOYD

Title: ASSISTANT CITY ENGINEER

Authorized Representative Signature:

Date: 6-17-08


HIGHLAND
SHORELAND DRIVE
SHORELAND
DRIVE
LANE
MAPLECREST
PARK DRIVE
FOREST COURT
ROAD
RIVER FOREST CIRCLE
RIVER FOREST
CIRCLE
DOROTHY
DRIVE
CENTER
COURT
CENTER
PILOT
CIRCLE
ELEANOR PLACE
INDIAN MOUND ROAD
LIEBAU
EMILY LANE
PORTLAND AVENUE
PLACE
ROAD
MILWAUKEE RIVER
ISLAND DRIVE
PARKWAY
LAKE FOREST COURT
LAKE PARK COURT
LAKE VISTA COURT
LAKE ISLE DRIVE
FIELDWOOD
EAST SHORELAND DRIVE
RIVER OAKS LANE
RIVER OAKS PLACE
HIDDEN RIVER DR
HIDDEN RIVER CIRCLE
AVENUE
STILLWATER CT
THRUSH LANE
SHORE LAND DRIVE
AIR RELEASE VAULT
WET WELL
MH 0118 -063
LS "F"

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, all permittees shall provide the following notices if an **unscheduled** sanitary sewer overflow or bypass occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow or bypass, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office.

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **unscheduled sanitary sewer overflow or bypass occurrences**. Attach additional information as necessary to explain or document the overflow or bypass. For the purpose of this report, an overflow or bypass is defined as the discharge of untreated sewage from the sanitary sewer collection system to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow or bypass details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name)	Overflow or Bypass Reported To DNR	
CITY OF MEQUON	Date: JUNE 13, 2008	Time: 9:30 [X] am [ ] pm
Person Representing Permittee Who Contacted DNR: MARK J. LLOYD	DNR Office and Person Contacted: TED BOSCH - WDNR/MILWAUKEE	

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for **each occurrence**)			
Start Date: JUNE 13, 2008	Time (to nearest 15 minutes): 2:00 [X] am [ ] pm	End Date: JUNE 13, 2008	Time (to nearest 15 minutes): 4:50 [X] am [ ] pm
Duration of the overflow or bypass (hours and minutes): 2 HOURS, 50 MINUTES		Estimated Volume of Wastewater Discharged (gallons): 51,000	

Location of the Overflow or Bypass (complete a separate form for **each discharge location**)
LIFT STATION "G" - HIGHLAND ROAD @ FIELDWOOD ROAD

Circumstances Causing the Overflow or Bypass (check all that apply)

[X] Rain	[ ] Power Outage	[ ] Equipment Failure
[ ] Rain and Snow Melt	[ ] Plugged Sewer	[X] Widespread Flooding
[ ] Snow Melt	[ ] Broken Sewer	[ ] Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

PORTIONS OF MEQUON'S SYSTEM EXPERIENCED SURCHARGED CONDITIONS EARLY MORNING OF JUNE 13th AS A RESULT OF HEAVY RAINS (APPROX. 2.68 inches IN A 15.5 HOUR PERIOD). BYPASS PUMPED TO DITCH (INTO MILWAUKEE RIVER) FROM 2:00 AM TO 4:50 AM, JUNE 13, 2008.

Wet Weather Data (if applicable)

Document the weather conditions if it contributed to the cause of the overflow or bypass. An overflow or bypass may be caused by a series of short rain storms or in combination with a snow melt. The wet weather data should include the cumulative amount of precipitation that caused the overflow or bypass.

Date(s) and Duration of Rainfall			
Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
JUNE 12, 2008	4:00 ☐ am ☒ pm	JUNE 13, 2008	7:30 ☒ am ☐ pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy): 2.68 inches

Amount of Snow Melt (estimated inches melted):

Contributing Soil Conditions (saturated, frozen, soil type): SATURATED, CLAY

Where Did the Discharge from the Overflow or Bypass Go? (check all that apply)

Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water.

☐ Runs on ground and absorbs into the soil.

☒ Ditch. Name of surface water it drains to: MILWAUKEE RIVER (DITCH ≈ 1300 ft TO RIVER)

☐ Storm sewer. Name of surface water it drains to:

☐ Surface water direct discharge:

☐ Other, describe:

Actions to Correct This Occurrence and Prevent Future Overflows or Bypasses

Describe what actions were taken to minimize the volume of wastewater discharged from the overflow or bypass reported on this form. Also describe what actions are planned to prevent or minimize future overflows or bypasses. The WPDES permit prohibits overflows or bypasses, unless certain specified conditions are met. If the permittee fails to operate and maintain the sewage collection system to prevent overflows and bypasses, they will be subject to enforcement action.

BYPASS PUMPING ONLY TO PREVENT BASEMENT BACK-UPS UNTIL LEVELS OBSERVED IN MANHOLES RETURNED TO NORMAL LEVELS. NO BASEMENT BACK-UPS IN THIS AREA REPORTED. A MASTER PLAN UPDATE OF THE CITY'S SANITARY SYSTEM, SCHEDULED FOR 2008-2009, SHOULD IDENTIFY SOLUTIONS TO REDUCE I/I & BYPASSING.

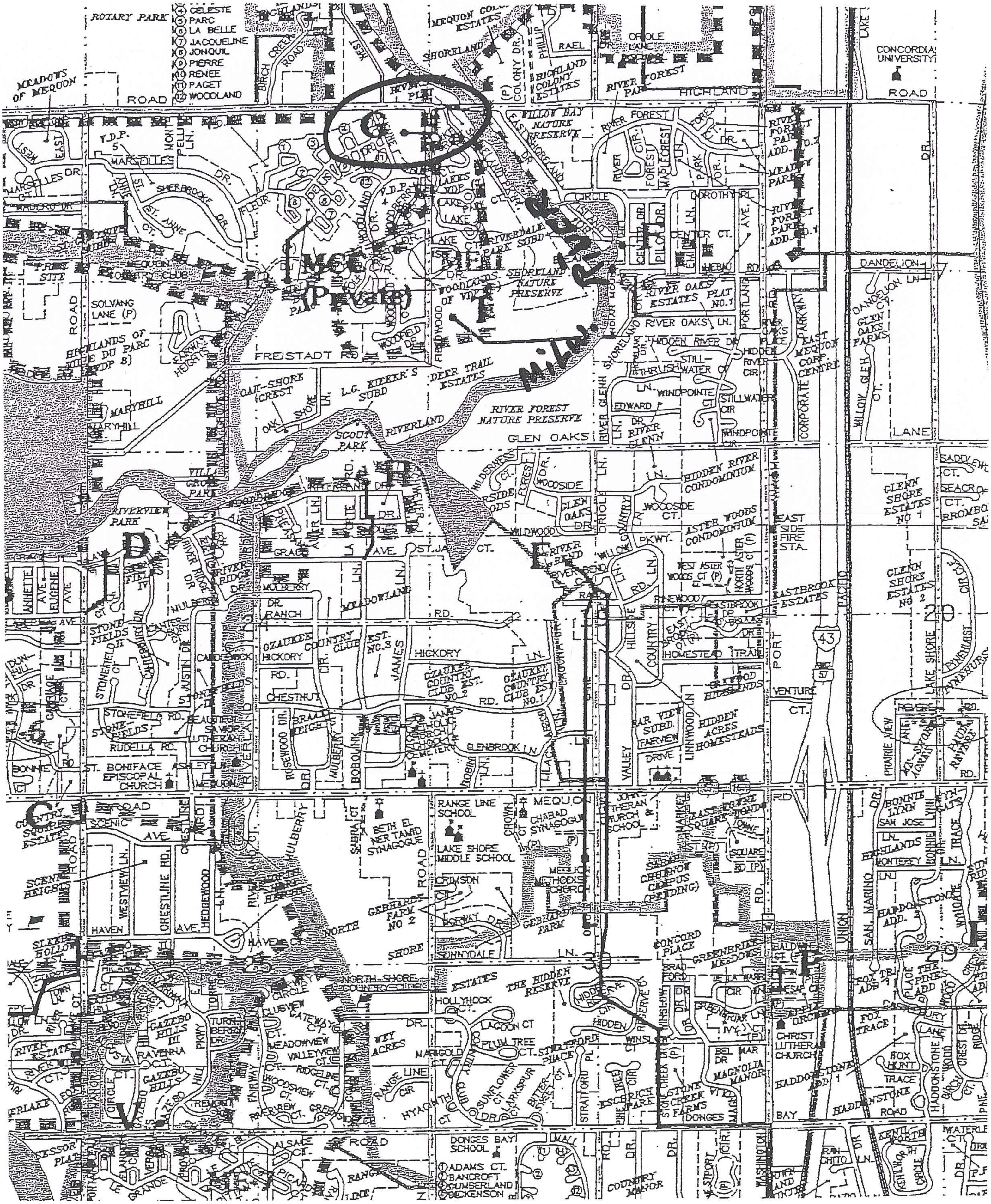
Report Completed By

Authorized Representative Name (Print): MARK J. LLOYD

Title: ASSISTANT CITY ENGINEER

Authorized Representative Signature:

Date: 6-17-08



ROTARY PARK
CELESTE
PARC
LA BELLE
JACQUELINE
JONQUIL
PIERRE
RENEE
PAGET
WOODLAND
MEADOWS OF MEQUON
MEQUON COLONY ESTATES
HIGHLAND COLONY ESTATES
RIVER FOREST
HIGHLAND
ROAD
CONCORDIA UNIVERSITY
WILLOW BAY NATURE PRESERVE
MARSEILLES
SHERBROOKE
ST. ANNE
MEQUON COUNTRY CLUB
SOLVANG LANE (P)
HIGHLANDS OF RIVE DU PARC
FREISTADT RD.
SHORELAND NATURE PRESERVE
WOODLANDS OF VDP
RIVER OAKS ESTATES PLAT NO. 1
RIVER OAKS LN.
DANDELION LN.
GLEN OAKS FARMS
EAST MEQUON CORP. CENTRE
CORPORATE PKWY.
OAK-SHORE CREST
MARYHILL
L.C. KIEKER'S SUBD
DEER TRAIL ESTATES
RIVER FOREST NATURE PRESERVE
GLEN OAKS
SCOUT PARK
RIVERLAND
RIVERVIEW PARK
HIDDEN RIVER CONDOMINIUM
ASTER WOODS CONDOMINIUM
EAST SIDE FIRE STA.
GLENN SHORE ESTATES NO 1
GLENN SHORE ESTATES NO 2
EASTBROOK ESTATES
OZAUKEE COUNTRY CLUB EST. NO. 3
OZAUKEE COUNTRY CLUB EST. NO. 2
OZAUKEE COUNTRY CLUB EST. NO. 1
HICKORY
CHESTNUT
STONEFIELDS
ST. BONIFACE EPISCOPAL CHURCH
BEAUTIFUL SAVIOR LUTHERAN CHURCH
RUDELLA RD.
GLENBROOK LN.
BAY VIEW SUBD.
HIDDEN ACRES HOMESTEADS
HOMESTEAD TRAIL
VENTURE CT.
PORT
43
57
LAKE SHORE
RANGE LINE SCHOOL
CHABAD SYNAGOGUE
BETH EL NER TAMID SYNAGOGUE
LAKE SHORE MIDDLE SCHOOL
MEQUON METHODIST CHURCH
GEBHARDT FARM NO 2
GEBHARDT FARM
SCENIC HEIGHTS
WESTVIEW LN.
CRESTLINE RD.
HEDGEWOOD
HAVEN AVE.
NORTH SHORE
SUNNYDALE
THE HIDDEN RESERVE
CONCORD PLACE
GREENBRIAR MEADOWS
SAN MARINO
HADDONSTONE ADD.
NORTH SHORE COUNTRY CLUB
ESTATES
HOLLYHOCK CT.
LAGOON CT
PLUM TREE CT.
MEADOWVIEW
VALLEYVIEW
RIDGELINE CT.
WOODSVIEW CT.
RAVENNA
GAZEBO HILLS III
GAZEBO HILLS
RIVER ESTATES
MARIGOLD CT.
RANGE LINE CIR
HYACINTH CT
SUNFLOWER CT
LARKSPUR
STRATFORD
ESCHRICH PARK
STONE CREEK FARMS
MAGNOLIA MANOR
CHRIST LUTHERAN CHURCH
HADDONSTONE ADD. 1
FOX TRACE
FOX HUNT TRACE
HADDONSTONE ROAD
DONGES
BAY
DONGES BAY SCHOOL
ADAMS CT.
BANCROFT
CUMBERLAND
DICKENSON
COUNTRY MANOR
WASHINGTON
KENILWORTH CIRCLE
LAKE
MILW. RIVER
MCC
(Private)
20
29
30

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, all permittees shall provide the following notices if an **unscheduled** sanitary sewer overflow or bypass occurs:

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Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name)	Overflow or Bypass Reported To DNR	
CITY OF MEQUON	Date 4-27-09	Time 9:14 ☒ am ☐ pm
Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted	
JON J. GARMS	TED BOSCH	

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for **each occurrence**)

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
4-26-09	4:00 ☐ am ☒ pm	4-26-09	10:50 ☐ am ☒ pm

Duration of the overflow or bypass (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
6 HR - 50 MIN	26,400 gallons

Location of the Overflow or Bypass (complete a separate form for **each discharge location**)

LIFT STATION "G" - HighLAND ROAD @ FIELDWood Rd.

Circumstances Causing the Overflow or Bypass (check all that apply)

- ☒ Rain
- ☐ Rain and Snow Melt
- ☐ Snow Melt
- ☐ Power Outage
- ☐ Plugged Sewer
- ☐ Broken Sewer
- ☐ Equipment Failure
- ☐ Widespread Flooding
- ☐ Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Portions of Mequon's system experienced surcharging Conditions on Sunday afternoon/evening, 4-26-09, as a result of heavy rain on Sat. 4-25-09 & Sun 4-26-09, a total of approximately 3.75" of rain.

State of Wisconsin
Department of Natural Resources

Sanitary Sewer Overflow or Bypass Notification Summary Report

Form 3400-184 (4/02)

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- Within **5 days** of the occurrence, provide a written report describing the overflow or bypass, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office.

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__Use one form per occurrence.__ A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Municipality or Facility Name)	Overflow or Bypass Reported To DNR	
CITY OF MEQUON	Date 4-26-11	Time 4:20 ☐ am ☒ pm
Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted	
MARK LLOYD	TED BOSCH / WDNR (email)	

Overflow or Bypass Details

Date(s) and Duration of Overflow or Bypass Occurrence (complete a separate form for **each occurrence**)

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
4-26-11	7:00 ☒ am ☐ pm	4-26-11	1:00 ☐ am ☒ pm

Duration of the overflow or bypass (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
5 - HOURS	≈ 160,000 GALLONS

Location of the Overflow or Bypass (complete a separate form for **each discharge location**)

LIFT STATION "G" - FIELDWOOD RD SOUTH OF HIGHLAND RD.

Circumstances Causing the Overflow or Bypass (check all that apply)

☒ Rain ☐ Power Outage ☐ Equipment Failure
☐ Rain and Snow Melt ☐ Plugged Sewer ☒ Widespread Flooding
☐ Snow Melt ☐ Broken Sewer ☐ Other (explain below)

Provide a narrative description to further explain why the overflow or bypass occurred. For example, describe what equipment failed, what caused the power outage, or what plugged the sewer. Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

HEAVY RAINS (1.72 - 2.04 inches) OVER A 9.5 HOUR PERIOD WITH SATURATED SOILS CAUSED SURCHARGING IN PORTIONS OF MEQUON'S SYSTEM. LIFT STATION "G" WAS IN THE PROCESS OF PUMP UPGRADES. A 4" PUMP INTO DRY HYDRANT/FORCE MAIN WAS BEING USED AND BECAME OVERWHELMED.

Wet Weather Data (if applicable)

Document the weather conditions if it contributed to the cause of the overflow or bypass. An overflow or bypass may be caused by a series of short rain storms or in combination with a snow melt. The wet weather data should include the cumulative amount of precipitation that caused the overflow or bypass.

Date(s) and Duration of Rainfall			
Start Date: 4-26-11	Time (to nearest 15 minutes): 12:15 ☒ am ☐ pm	End Date: 4-26-11	Time (to nearest 15 minutes): 9:30 ☒ am ☐ pm
Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy): 1.72 - 2.04 see attached info		Amount of Snow Melt (estimated inches melted): N/A	

Contributing Soil Conditions (saturated, frozen, soil type)
SATURATED

Where Did the Discharge from the Overflow or Bypass Go? (check all that apply)

Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water.

☐ Runs on ground and absorbs into the soil.

☒ Ditch. Name of surface water it drains to: MILWAUKEE RIVER / FISH CREEK

☐ Storm sewer. Name of surface water it drains to:

☐ Surface water direct discharge:

☐ Other, describe:

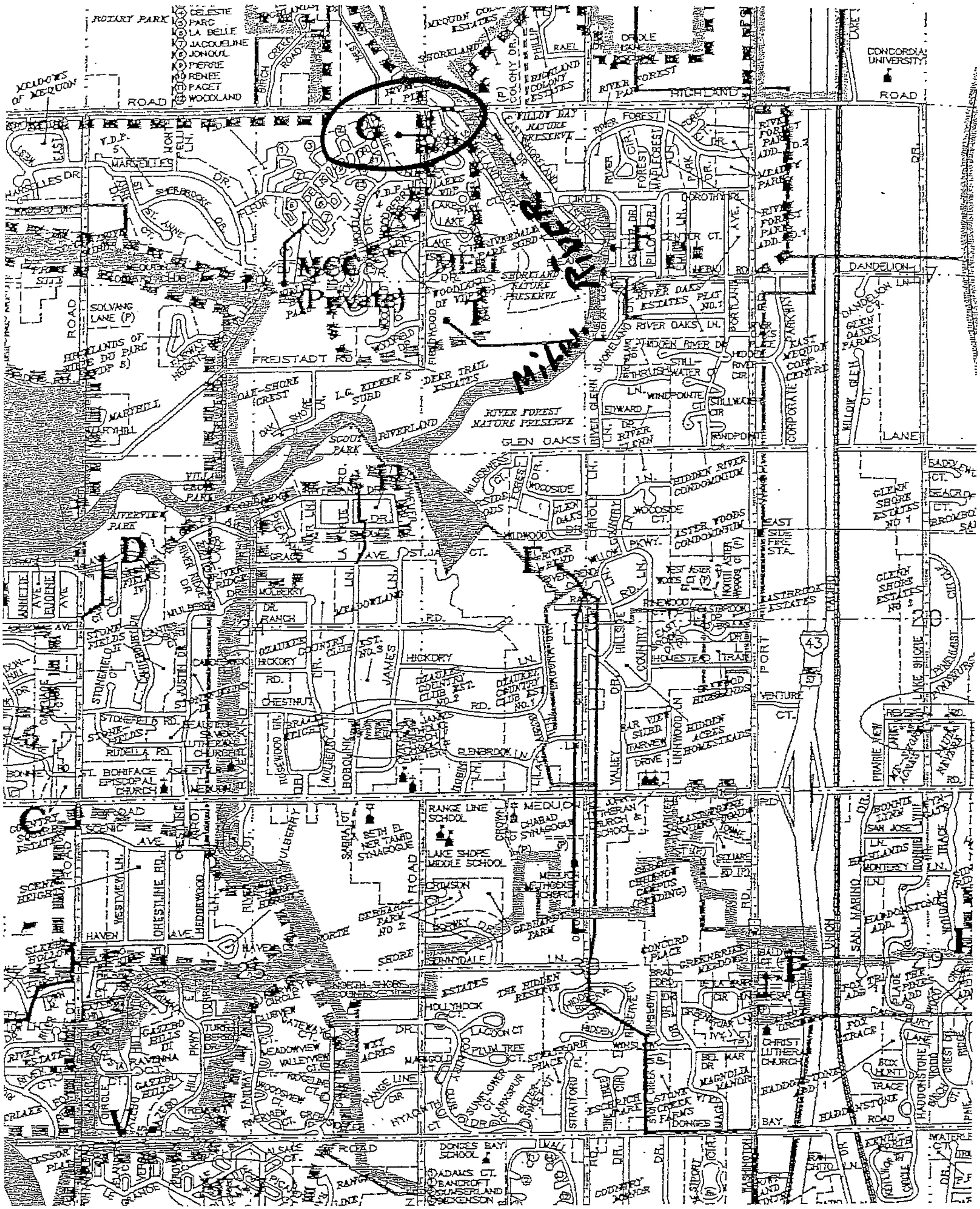
Actions to Correct This Occurrence and Prevent Future Overflows or Bypasses

Describe what actions were taken to minimize the volume of wastewater discharged from the overflow or bypass reported on this form. Also describe what actions are planned to prevent or minimize future overflows or bypasses. The WPDES permit prohibits overflows or bypasses, unless certain specified conditions are met. If the permittee fails to operate and maintain the sewage collection system to prevent overflows and bypasses, they will be subject to enforcement action.

BYPASSED TO PREVENT BASEMENT BACKUPS UNTIL OBSERVED ELEVATIONS IN MANHOLES AND WET WELLS DROPPED BELOW CRITICAL ELEVATIONS. NO BACKUPS WERE REPORTED. BYPASSED AT LIFT STATION "G" AFTER TEMPORARY PUMP COULD NOT KEEP UP. PUMPS AND MOTORS AT LIFT STATION "G" WERE BEING REPLACED.

Report Completed By

Authorized Representative Name (Print)	Title
MARK LLOYD	DEPUTY DIRECTOR PUBLIC WORKS
Authorized Representative Signature: Mark Lloyd	Date: 5-2-11


ROTARY PARK
CELESTE
PARC
LA BELLE
JACQUELINE
JONQUIL
PIERRE
RENEE
PAGET
WOODLAND
MEADOWS OF MEQUON
ROAD
HIGHLAND
ROAD
CONCORDIA UNIVERSITY
RIVER FOREST
HIGHLAND COLONY ESTATES
WILLOW BAY NATURE PRESERVE
MARSEILLES
SHERBROOKE DR.
ST. ANNE
FLEUR
SHORELAND NATURE PRESERVE
WOODLANDS OF V.D.P.
RIVER OAKS ESTATES PLAT NO. 1
RIVER OAKS LN.
PORTLAND
DANDELION
DANDELION LN.
GLEN OAKS FARMS
EAST MEQUON CORP. CENTRE
CORPORATE
SOLVANG LANE (P)
HIGHLANDS OF RIDGE DU PARC
FREISTADT RD.
FIELDWOOD
DEER TRAIL ESTATES
OAK-SHORE CREST
L.G. KIEFER'S SUBD
RIVER FOREST NATURE PRESERVE
GLEN OAKS
HIDDEN RIVER DR.
STILLWATER CT.
WINDPOINTE
EDWARD
MARYHILL
SCOUT PARK
RIVERLAND
VILLA GRACE PARK
RIVERVIEW PARK
WOODSIDE
HIDDEN RIVER CONDOMINIUM
WOODSIDE CT.
ASTER WOODS CONDOMINIUM
EAST SIDE FIRE STA.
GLENN SHORE ESTATES NO 1
GLENN SHORE ESTATES NO 2
MEADOWLAND
MULBERRY
RANCH
EASTBROOK ESTATES
OZAUKEE COUNTRY CLUB EST. NO. 3
OZAUKEE COUNTRY CLUB EST. NO. 2
OZAUKEE COUNTRY CLUB EST. NO. 1
HICKORY
JAMES
CHESTNUT
COUNTRY
HOMESTEAD TRAIL
PORT
43
VENTURE CT.
LAKE SHORE
STONEFIELD RD.
RUDELLA RD.
ST. BONIFACE EPISCOPAL CHURCH
GLENBROOK LN.
HIDDEN ACRES HOMESTEADS
LINNWOOD LN.
DRIVE
VALLEY
PRAIRIE VIEW
MEQUON
RANGE LINE SCHOOL
LAKE SHORE MIDDLE SCHOOL
CHABAD SYNAGOGUE
SCENIC AVE.
SCENIC HEIGHTS
HAVEN
WESTVIEW LN.
CRESTLINE RD.
HEDGEWOOD
GEBHARD PARK NO 2
GEBHARD PARK
SUNNYDALE
SHORE
NORTH SHORE COUNTRY ESTATES
THE HIDDEN RESERVE
CONCORD PLACE
GREENBRIAR MEADOWS
SAN MARINO
HADDONSTONE
UNION
HOLLYHOCK CT.
LAGOON CT
PLUM TREE CT.
GAZEBO HILLS
RAVENNA
FAIRWAY
MEADOWVIEW
WEST ACRES
MARIGOLD
RANGE LINE
HYACINTH CT.
STRATFORD PL.
BEL MAR DR
MAGNOLIA MANOR
CHRIST LUTHERAN CHURCH
FOX TRACE
FOX HUNT
BAY
ROAD
DONGES BAY SCHOOL
ADAMS CT.
BANCROFT
COUNTRY MANOR
WASHINGTON
RIVER
MILW.
NCC
(Private)

State of Wisconsin
Department of Natural Resources

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 11/13)

Sanitary Sewage Overflow Type:

- (●) Collection System SSO
- ( ) Treatment Facility TFO

Permit Number:

- (●) GP WI-0047341-05
- ( ) Other WI-

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, permittees shall provide the following notices if a sanitary sewer overflow or treatment facility overflow occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office (Refer to GP WI-0047341-05 sections 3.2, 3.4, and 3.5.)
- Public notification. Date 06/23/2014 How? City of Mequon eNews
- Regional wastewater treatment facility notification. Date 06/18/2014 ☐ Not applicable
- Drinking water intake owner notification. Date 06/18/2014 ☐ Not applicable

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **SSO, or TFO occurrences**. Attach additional information as necessary to explain or document the overflow. For the purpose of this report, an overflow is defined as the discharge of sewage from the collection system or at the treatment facility other than from the permitted outfall to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Facility Name)	Overflow Reported to DNR – Date	Overflow Reported to DNR – Time
City of Mequon	06/18/2014	4:05 ( ) am (●) pm

Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted
Kristen Lundeen, Director of Public Works/City Engineer	Theera Ratarasarn, Southeastern District Office

Overflow Details (Refer to GP WI-0047341-05 section 3.2 and NR210.21(4)(b), Wis. Adm. Code.)

1. Location of the Overflow (complete a separate form for **each discharge location**)

MH #0119-057 (Lift Station E)

2. Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water. (check all that apply)

- ☒ Runs on ground and absorbs into the soil.
- ☒ Ditch. Name of surface water it drains to: Milwaukee River
- ☐ Storm sewer. Name of surface water it drains to:
- ☐ Surface water direct discharge:
- ☐ Other, describe:

3. Duration of the Overflow (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
5 hours 30 minutes	415800

Note: The duration of the overflow equals the estimated time when the overflow began and stopped when sewage may have discharged, and is not the same as the length of time precipitation occurred. The volume of all overflow discharges shall be reported as a numerical value (do not report "unknown"). The potential overflow volume may be calculated knowing the flow capacity of the sewer and the overflow duration.

4. Identify the sewer system or treatment facility component from which the discharge occurred. Check all that apply and explain in number 11.

- ☐ Manhole
- ☐ Permanent overflow structure
- ☐ Other (describe below)
- ☒ Lift station
- ☐ Broken pipe

5. The estimated date and time when the overflow began and stopped or will be stopped:

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
06/18/2014	12:00 ( ) am (●) pm	06/18/2014	5:30 ( ) am (●) pm

6. The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information. Circumstances causing the overflow: (check all that apply)

- [x] Rain
- [x] Soil Moisture
- [ ] Snow Melt
- [ ] Power Outage
- [ ] Plugged Sewer
- [ ] Broken Sewer
- [ ] Equipment Failure
- [ ] Widespread Flooding
- [ ] Other (explain in number 11)

Note: Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Document the weather conditions if it contributed to the cause of the overflow. The wet weather data should include the cumulative amount of precipitation that caused the overflow.

Date and Duration of Rainfall

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
06/17/2014	12:00 (●) am ( ) pm	06/20/2014	12:15 ( ) am (●) pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy)	Amount of Snow Melt (estimated inches melted)
4	0

Contributing Soil Conditions (saturated, frozen, soil type)
Saturated

7. Steps taken or planned to reduce, eliminate and prevent reoccurrence of the overflow and a schedule of major milestones for those steps.

Heavy rains over a short period of time on previously saturated soil caused surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is at set level to bypass at critical elevation to avoid basement backups. For this event, we were not able to eliminate all basement backups.

8. A description of the actual or potential for human exposure and contact with the wastewater from the overflow.

Exposure to those to received sewage in the basement, as well as the exposure to the runoff in the ditch.

9. Steps taken or planned to mitigate the impacts of the overflow and a schedule of major milestones for those steps.

-City has a program in place to line sanitary sewer and seal manholes to remove I/I from the public system
-City is undergoing analysis for the establishment of a PP/II program to remove I/I from the public system - goal of implementation in early 2015
-Capacity analysis as a part of the East Trunk Sewer Study - STATUS: Flow monitoring to recalibrate model and reassess potential alternates for solution - goal of design in 2015

10. To the extent known at the time of reporting, the number and location of building backups caused by excessive flow or other hydraulic constraints in the sewage collection system that occurred concurrently with the SSO and were within the same area of the sewage collection system as the SSO.

Number: 24 Location: None reported in LS K area; Others: Stone Creek Drive, Revere Road, W. River Oaks Lane, N. Winslow Drive, Concord Place Condominium (Greenbriar west of Pt. Wash. Rd), W. Donges Bay Rd., Westport Cir.

11. The reason the overflow occurred or explanation of other contributing circumstances that resulted in the overflow event including whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow. (Refer to GP WI-0047341-05 section 2.2)

Downstream and MMSD sanitary sewers were at capacity and already bypassing or overflowing, leaving little room for relief for the City's increased flow. The alarms on the lift stations went off at 10:00 am and while our sewer crews provided an immediate response, most locations were at or beyond the critical elevation by 10:30 am. Bypass pumping was required to minimize sever property damage and we had no feasible alternatives to an overflow.

Report Completed By

Authorized Representative Name (Print)	Title
Kristen B. Lundeen	Director of Public Works/City Engineer

Signature of Authorized Representative	Date

State of Wisconsin
Department of Natural Resources

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 11/13)

Sanitary Sewage Overflow Type:

- (●) Collection System SSO
- ( ) Treatment Facility TFO

Permit Number:

- (●) GP WI-0047341-05
- ( ) Other WI- ______

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, permittees shall provide the following notices if a sanitary sewer overflow or treatment facility overflow occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office (Refer to GP WI-0047341-05 sections 3.2, 3.4, and 3.5.)
- Public notification. Date 06/23/2014 How? City of Mequon eNews
- Regional wastewater treatment facility notification. Date 06/18/2014 ☐ Not applicable
- Drinking water intake owner notification. Date 06/18/2014 ☐ Not applicable

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **SSO, or TFO occurrences**. Attach additional information as necessary to explain or document the overflow. For the purpose of this report, an overflow is defined as the discharge of sewage from the collection system or at the treatment facility other than from the permitted outfall to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Facility Name)	Overflow Reported to DNR – Date	Overflow Reported to DNR – Time
City of Mequon	06/18/2014	4:05 ( ) am (●) pm

Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted
Kristen Lundeen, Director of Public Works/City Engineer	Theera Ratarasarn, Southeastern District Office

Overflow Details (Refer to GP WI-0047341-05 section 3.2 and NR210.21(4)(b), Wis. Adm. Code.)

1. Location of the Overflow (complete a separate form for **each discharge location**)

Lift Station F - 12439 N. Circle Dr.

2. Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water. (check all that apply)

- ☒ Runs on ground and absorbs into the soil.
- ☒ Ditch. Name of surface water it drains to: Milwaukee River
- ☐ Storm sewer. Name of surface water it drains to:
- ☐ Surface water direct discharge:
- ☐ Other, describe:

3. Duration of the Overflow (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
3 hours 0 minutes	126000

Note: The duration of the overflow equals the estimated time when the overflow began and stopped when sewage may have discharged, and is not the same as the length of time precipitation occurred. The volume of all overflow discharges shall be reported as a numerical value (do not report "unknown"). The potential overflow volume may be calculated knowing the flow capacity of the sewer and the overflow duration.

4. Identify the sewer system or treatment facility component from which the discharge occurred. Check all that apply and explain in number 11.

- ☐ Manhole
- ☐ Permanent overflow structure
- ☐ Other (describe below)
- ☒ Lift station
- ☐ Broken pipe

5. The estimated date and time when the overflow began and stopped or will be stopped:

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
06/18/2014	11:00 (●) am ( ) pm	06/18/2014	2:00 ( ) am (●) pm

6. The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information. Circumstances causing the overflow: (check all that apply)

☒ Rain	☐ Power Outage	☐ Equipment Failure
☒ Soil Moisture	☐ Plugged Sewer	☐ Widespread Flooding
☐ Snow Melt	☐ Broken Sewer	☐ Other (explain in number 11)

Note: Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Document the weather conditions if it contributed to the cause of the overflow. The wet weather data should include the cumulative amount of precipitation that caused the overflow.

Date and Duration of Rainfall

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
06/17/2014	12:00 ◉ am ○ pm	06/20/2014	12:15 ○ am ◉ pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy)	Amount of Snow Melt (estimated inches melted)
4	0

Contributing Soil Conditions (saturated, frozen, soil type)
Saturated

7. Steps taken or planned to reduce, eliminate and prevent reoccurrence of the overflow and a schedule of major milestones for those steps.

Heavy rains over a short period of time on previously saturated soil caused surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is at set level to bypass at critical elevation to avoid basement backups. For this event, we were not able to eliminate all basement backupts.

8. A description of the actual or potential for human exposure and contact with the wastewater from the overflow.

Exposure to those to received sewage in the basement, as well as the exposure to the runoff in the ditch.

9. Steps taken or planned to mitigate the impacts of the overflow and a schedule of major milestones for those steps.

-City has a program in place to line sanitary sewer and seal manholes to remove I/I from the public system
-City is undergoing analysis for the establishment of a PP/II program to remove I/I from the public system - goal of implementation in early 2015
-Capacity analysis as a part of the East Trunk Sewer Study - STATUS: Flow monitoring to recalibrate model and reassess potential alternates for solution - goal of design in 2015

10. To the extent known at the time of reporting, the number and location of building backups caused by excessive flow or other hydraulic constraints in the sewage collection system that occurred concurrently with the SSO and were within the same area of the sewage collection system as the SSO.

Number: 24 Location: None reported in LS K area; Others: Stone Creek Drive, Revere Road, W. River Oaks Lane, N. Winslow Drive, Concord Place Condominium (Greenbriar west of Pt. Wash. Rd), W. Donges Bay Rd., Westport Cir.

11. The reason the overflow occurred or explanation of other contributing circumstances that resulted in the overflow event including whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow. (Refer to GP WI-0047341-05 section 2.2)

Downstream and MMSD sanitary sewers were at capacity and already bypassing or overflowing, leaving little room for relief for the City's increased flow. The alarms on the lift stations went off at 10:00 am and while our sewer crews provided an immediate response, most locations were at or beyond the critical elevation by 10:30 am. Bypass pumping was required to minimize sever property damage and we had no feasible alternatives to an overflow.

Report Completed By

Authorized Representative Name (Print)	Title
Kristen B. Lundeen	Director of Public Works/City Engineer

Signature of Authorized Representative	Date

State of Wisconsin
Department of Natural Resources

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 11/13)

Sanitary Sewage Overflow Type:

- (●) Collection System SSO
- ( ) Treatment Facility TFO

Permit Number:

- (●) GP WI-0047341-05
- ( ) Other WI- ________

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, permittees shall provide the following notices if a sanitary sewer overflow or treatment facility overflow occurs:

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- Public notification. Date 06/23/2014 How? City of Mequon eNews
- Regional wastewater treatment facility notification. Date 06/18/2014 ☐ Not applicable
- Drinking water intake owner notification. Date 06/18/2014 ☐ Not applicable

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Notification Information

Permittee (Facility Name)	Overflow Reported to DNR – Date	Overflow Reported to DNR – Time
City of Mequon	06/18/2014	4:05 ( ) am (●) pm

Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted
Kristen Lundeen, Director of Public Works/City Engineer	Theera Ratarasarn, Southeastern District Office

Overflow Details (Refer to GP WI-0047341-05 section 3.2 and NR210.21(4)(b), Wis. Adm. Code.)

1. Location of the Overflow (complete a separate form for **each discharge location**)

Lift Station G - 12735 N. Fieldwood Rd.

2. Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water. (check all that apply)

- ☒ Runs on ground and absorbs into the soil.
- ☒ Ditch. Name of surface water it drains to: Milwaukee River
- ☐ Storm sewer. Name of surface water it drains to:
- ☐ Surface water direct discharge:
- ☐ Other, describe:

3. Duration of the Overflow (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
3 hours 0 minutes	58500

Note: The duration of the overflow equals the estimated time when the overflow began and stopped when sewage may have discharged, and is not the same as the length of time precipitation occurred. The volume of all overflow discharges shall be reported as a numerical value (do not report "unknown"). The potential overflow volume may be calculated knowing the flow capacity of the sewer and the overflow duration.

4. Identify the sewer system or treatment facility component from which the discharge occurred. Check all that apply and explain in number 11.

- ☐ Manhole ☐ Permanent overflow structure ☐ Other (describe below)
- ☒ Lift station ☐ Broken pipe

5. The estimated date and time when the overflow began and stopped or will be stopped:

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
06/18/2014	11:00 (●) am ( ) pm	06/18/2014	2:00 ( ) am (●) pm

6. The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information. Circumstances causing the overflow: (check all that apply)

☒ Rain	☐ Power Outage	☐ Equipment Failure
☒ Soil Moisture	☐ Plugged Sewer	☐ Widespread Flooding
☐ Snow Melt	☐ Broken Sewer	☐ Other (explain in number 11)

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Date and Duration of Rainfall

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
06/17/2014	12:00 ◉ am ○ pm	06/20/2014	12:15 ○ am ◉ pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy)	Amount of Snow Melt (estimated inches melted)
4	0

Contributing Soil Conditions (saturated, frozen, soil type)
Saturated

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Number: 24
Location: None reported in LS K area; Others: Stone Creek Drive, Revere Road, W. River Oaks Lane, N. Winslow Drive, Concord Place Condominium (Greenbriar west of Pt. Wash. Rd), W. Donges Bay Rd., Westport Cir.

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Report Completed By

Authorized Representative Name (Print)	Title
Kristen B. Lundeen	Director of Public Works/City Engineer

Signature of Authorized Representative	Date

State of Wisconsin
Department of Natural Resources

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 11/13)

Sanitary Sewage Overflow Type:

- (•) Collection System SSO
- ( ) Treatment Facility TFO

Permit Number:

- (•) GP WI-0047341-05
- ( ) Other WI-

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- Public notification. Date 04/09/2015 How? Milwaukee Journal Sentinel (WDNR notification via Theera Ratarasan)
- Regional wastewater treatment facility notification. Date 04/09/2015 ☐ Not applicable
- Drinking water intake owner notification. Date 04/09/2015 ☐ Not applicable

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **SSO, or TFO occurrences**. Attach additional information as necessary to explain or document the overflow. For the purpose of this report, an overflow is defined as the discharge of sewage from the collection system or at the treatment facility other than from the permitted outfall to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Facility Name)	Overflow Reported to DNR – Date	Overflow Reported to DNR – Time
City of Mequon	04/09/2015	10:14 (•) am ( ) pm

Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted
Kristen Lundeen, Director of Public Works/City Engineer	Theera Ratarasarn, Southeastern District Office

Overflow Details (Refer to GP WI-0047341-05 section 3.2 and NR210.21(4)(b), Wis. Adm. Code.)

1. Location of the Overflow (complete a separate form for **each discharge location**)

MH #0119-038 (Lift Station E)

2. Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water. (check all that apply)

- ☒ Runs on ground and absorbs into the soil.
- ☒ Ditch. Name of surface water it drains to: Milwaukee River
- ☐ Storm sewer. Name of surface water it drains to:
- ☐ Surface water direct discharge:
- ☐ Other, describe:

3. Duration of the Overflow (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
6 hours 15 minutes	472,500

Note: The duration of the overflow equals the estimated time when the overflow began and stopped when sewage may have discharged, and is not the same as the length of time precipitation occurred. The volume of all overflow discharges shall be reported as a numerical value (do not report "unknown"). The potential overflow volume may be calculated knowing the flow capacity of the sewer and the overflow duration.

4. Identify the sewer system or treatment facility component from which the discharge occurred. Check all that apply and explain in number 11.

- ☐ Manhole
- ☐ Permanent overflow structure
- ☐ Other (describe below)
- ☒ Lift station
- ☐ Broken pipe

5. The estimated date and time when the overflow began and stopped or will be stopped:

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
04/09/2015	9:45 (•) am ( ) pm	04/09/2015	3:00 ( ) am (•) pm

6. The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information. Circumstances causing the overflow: (check all that apply)

- [x] Rain
- [x] Soil Moisture
- [ ] Snow Melt
- [ ] Power Outage
- [ ] Plugged Sewer
- [ ] Broken Sewer
- [ ] Equipment Failure
- [ ] Widespread Flooding
- [ ] Other (explain in number 11)

Note: Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Document the weather conditions if it contributed to the cause of the overflow. The wet weather data should include the cumulative amount of precipitation that caused the overflow.

Date and Duration of Rainfall

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
04/07/2015	9:45 (●) am ( ) pm	04/09/2015	2:45 ( ) am (●) pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy)	Amount of Snow Melt (estimated inches melted)
4.2	0

Contributing Soil Conditions (saturated, frozen, soil type)
Saturated

7. Steps taken or planned to reduce, eliminate and prevent reoccurrence of the overflow and a schedule of major milestones for those steps.

Heavy rains over a short period of time on previously saturated soil caused surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is at set level to bypass at critical elevation to avoid basement backups. For this event, we were not able to eliminate all basement backups.

8. A description of the actual or potential for human exposure and contact with the wastewater from the overflow.

Exposure to those to received sewage in the basement, as well as the exposure to the runoff in the ditch.

9. Steps taken or planned to mitigate the impacts of the overflow and a schedule of major milestones for those steps.

-City has a program in place to line sanitary sewer and seal manholes to remove I/I from the public system
-City is undergoing analysis for the establishment of a PP/II program to remove I/I from the public system - goal of implementation in early 2016
-Capacity analysis as a part of the East Trunk Sewer Study - STATUS: Flow monitoring to recalibrate model and reassess potential alternates for solution - goal of design in 2015-2016

10. To the extent known at the time of reporting, the number and location of building backups caused by excessive flow or other hydraulic constraints in the sewage collection system that occurred concurrently with the SSO and were within the same area of the sewage collection system as the SSO.

Number: 18 Location: None reported in LS K area; Others: Stone Creek Drive, Revere Road, W. River Oaks Lane, N. Winslow Drive, Concord Place Condominium (Greenbriar west of Pt. Wash. Rd), W. Donges Bay Rd., Westport Cir.

11. The reason the overflow occurred or explanation of other contributing circumstances that resulted in the overflow event including whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow. (Refer to GP WI-0047341-05 section 2.2)

Downstream and MMSD sanitary sewers were at capacity and already bypassing or overflowing, leaving little room for relief for the City's increased flow. Rainfall on 4/8/15 had already increased pumping at the lift stations towards capacity. Crews were on site at 6:00 am 4/9/15 preparing for the inflow into the system. At 9:00 am crews were bypass pumping the overall system in three locations and by 2:00 pm pumping at eight locations. Bypass pumping was required to minimize sever property damage and we had no feasible alternatives to an overflow.

Report Completed By

Authorized Representative Name (Print)	Title
Kristen B. Lundeen	Director of Public Works/City Engineer

Signature of Authorized Representative	Date

State of Wisconsin
Department of Natural Resources

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 11/13)

Sanitary Sewage Overflow Type:

- (•) Collection System SSO
- ( ) Treatment Facility TFO

Permit Number:

- (•) GP WI-0047341-05
- ( ) Other WI- ________

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, permittees shall provide the following notices if a sanitary sewer overflow or treatment facility overflow occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office (Refer to GP WI-0047341-05 sections 3.2, 3.4, and 3.5.)
- Public notification. Date 04/09/2015 How? Milwaukee Journal Sentinel (WDNR notification via Theera Ratarasan)
- Regional wastewater treatment facility notification. Date 04/09/2015 ☐ Not applicable
- Drinking water intake owner notification. Date 04/09/2015 ☐ Not applicable

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **SSO, or TFO occurrences**. Attach additional information as necessary to explain or document the overflow. For the purpose of this report, an overflow is defined as the discharge of sewage from the collection system or at the treatment facility other than from the permitted outfall to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Facility Name)	Overflow Reported to DNR: Date	Time
City of Mequon	04/09/2015	10:14 (•) am ( ) pm

Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted
Kristen Lundeen, Director of Public Works/City Engineer	Theera Ratarasarn, Southeastern District Office

Overflow Details (Refer to GP WI-0047341-05 section 3.2 and NR210.21(4)(b), Wis. Adm. Code.)

1. Location of the Overflow (complete a separate form for **each discharge location**)

MH #0119-058 (Lift Station E)

2. Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water. (check all that apply)

- ☒ Runs on ground and absorbs into the soil.
- ☒ Ditch. Name of surface water it drains to: Milwaukee River
- ☐ Storm sewer. Name of surface water it drains to:
- ☐ Surface water direct discharge:
- ☐ Other, describe:

3. Duration of the Overflow (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
2 hours 0 minutes	180,000

Note: The duration of the overflow equals the estimated time when the overflow began and stopped when sewage may have discharged, and is not the same as the length of time precipitation occurred. The volume of all overflow discharges shall be reported as a numerical value (do not report "unknown"). The potential overflow volume may be calculated knowing the flow capacity of the sewer and the overflow duration.

4. Identify the sewer system or treatment facility component from which the discharge occurred. Check all that apply and explain in number 11.

- ☒ Manhole
- ☐ Permanent overflow structure
- ☐ Other (describe below)
- ☐ Lift station
- ☐ Broken pipe

5. The estimated date and time when the overflow began and stopped or will be stopped:

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
04/09/2015	12:30 ( ) am (•) pm	04/09/2015	2:30 ( ) am (•) pm

6. The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information. Circumstances causing the overflow: (check all that apply)

- [x] Rain
- [x] Soil Moisture
- [ ] Snow Melt
- [ ] Power Outage
- [ ] Plugged Sewer
- [ ] Broken Sewer
- [ ] Equipment Failure
- [ ] Widespread Flooding
- [ ] Other (explain in number 11)

Note: Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Document the weather conditions if it contributed to the cause of the overflow. The wet weather data should include the cumulative amount of precipitation that caused the overflow.

Date and Duration of Rainfall

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
04/07/2015	9:45 (●) am ( ) pm	04/09/2015	2:45 ( ) am (●) pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy)	Amount of Snow Melt (estimated inches melted)
4.2	0

Contributing Soil Conditions (saturated, frozen, soil type)
Saturated

7. Steps taken or planned to reduce, eliminate and prevent reoccurrence of the overflow and a schedule of major milestones for those steps.

Heavy rains over a short period of time on previously saturated soil caused surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is at set level to bypass at critical elevation to avoid basement backups. For this event, we were not able to eliminate all basement backups.

8. A description of the actual or potential for human exposure and contact with the wastewater from the overflow.

Exposure to those to received sewage in the basement, as well as the exposure to the runoff in the ditch.

9. Steps taken or planned to mitigate the impacts of the overflow and a schedule of major milestones for those steps.

-City has a program in place to line sanitary sewer and seal manholes to remove I/I from the public system
-City is undergoing analysis for the establishment of a PP/II program to remove I/I from the public system - goal of implementation in early 2016
-Capacity analysis as a part of the East Trunk Sewer Study - STATUS: Flow monitoring to recalibrate model and reassess potential alternates for solution - goal of design in 2015-2016

10. To the extent known at the time of reporting, the number and location of building backups caused by excessive flow or other hydraulic constraints in the sewage collection system that occurred concurrently with the SSO and were within the same area of the sewage collection system as the SSO.

Number: 18
Location: None reported in LS K area; Others: Stone Creek Drive, Revere Road, W. River Oaks Lane, N. Winslow Drive, Concord Place Condominium (Greenbriar west of Pt. Wash. Rd), W. Donges Bay Rd., Westport Cir.

11. The reason the overflow occurred or explanation of other contributing circumstances that resulted in the overflow event including whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow. (Refer to GP WI-0047341-05 section 2.2)

Downstream and MMSD sanitary sewers were at capacity and already bypassing or overflowing, leaving little room for relief for the City's increased flow. Rainfall on 4/8/15 had already increased pumping at the lift stations towards capacity. Crews were on site at 6:00 am 4/9/15 preparing for the inflow into the system. At 9:00 am crews were bypass pumping the overall system in three locations and by 2:00 pm pumping at eight locations. Bypass pumping was required to minimize sever property damage and we had no feasible alternatives to an overflow.

Report Completed By

Authorized Representative Name (Print)	Title
Kristen B. Lundeen	Director of Public Works/City Engineer

Signature of Authorized Representative	Date

State of Wisconsin
Department of Natural Resources

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 11/13)

Sanitary Sewage Overflow Type:

- (•) Collection System SSO
- ( ) Treatment Facility TFO

Permit Number:

- (•) GP WI-0047341-05
- ( ) Other WI- ________

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, permittees shall provide the following notices if a sanitary sewer overflow or treatment facility overflow occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office (Refer to GP WI-0047341-05 sections 3.2, 3.4, and 3.5.)
- Public notification. Date 04/09/2015 How? Milwaukee Journal Sentinel (WDNR notification via Theera Ratarasan)
- Regional wastewater treatment facility notification. Date 04/09/2015 ☐ Not applicable
- Drinking water intake owner notification. Date 04/09/2015 ☐ Not applicable

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **SSO, or TFO occurrences**. Attach additional information as necessary to explain or document the overflow. For the purpose of this report, an overflow is defined as the discharge of sewage from the collection system or at the treatment facility other than from the permitted outfall to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Facility Name)	Overflow Reported to DNR: Date	Time
City of Mequon	04/09/2015	10:14 (•) am ( ) pm

Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted
Kristen Lundeen, Director of Public Works/City Engineer	Theera Ratarasarn, Southeastern District Office

Overflow Details (Refer to GP WI-0047341-05 section 3.2 and NR210.21(4)(b), Wis. Adm. Code.)

1. Location of the Overflow (complete a separate form for **each discharge location**)

Lift Station F - 12439 N. Circle Dr.

2. Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water. (check all that apply)

- ☒ Runs on ground and absorbs into the soil.
- ☒ Ditch. Name of surface water it drains to: Milwaukee River
- ☐ Storm sewer. Name of surface water it drains to:
- ☐ Surface water direct discharge:
- ☐ Other, describe:

3. Duration of the Overflow (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
4 hours 0 minutes	168,000

Note: The duration of the overflow equals the estimated time when the overflow began and stopped when sewage may have discharged, and is not the same as the length of time precipitation occurred. The volume of all overflow discharges shall be reported as a numerical value (do not report "unknown"). The potential overflow volume may be calculated knowing the flow capacity of the sewer and the overflow duration.

4. Identify the sewer system or treatment facility component from which the discharge occurred. Check all that apply and explain in number 11.

- ☐ Manhole ☐ Permanent overflow structure ☐ Other (describe below)
- ☒ Lift station ☐ Broken pipe

5. The estimated date and time when the overflow began and stopped or will be stopped:

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
04/09/2015	11:00 (•) am ( ) pm	04/09/2015	3:00 ( ) am (•) pm

6. The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information. Circumstances causing the overflow: (check all that apply)

☒ Rain	☐ Power Outage	☐ Equipment Failure
☒ Soil Moisture	☐ Plugged Sewer	☐ Widespread Flooding
☐ Snow Melt	☐ Broken Sewer	☐ Other (explain in number 11)

Note: Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Document the weather conditions if it contributed to the cause of the overflow. The wet weather data should include the cumulative amount of precipitation that caused the overflow.

Date and Duration of Rainfall

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
04/07/2015	9:45 ◉ am ◯ pm	04/09/2015	2:45 ◯ am ◉ pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy)	Amount of Snow Melt (estimated inches melted)
4.2	0

Contributing Soil Conditions (saturated, frozen, soil type)
Saturated

7. Steps taken or planned to reduce, eliminate and prevent reoccurrence of the overflow and a schedule of major milestones for those steps.

Heavy rains over a short period of time on previously saturated soil caused surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is at set level to bypass at critical elevation to avoid basement backups. For this event, we were not able to eliminate all basement backups.

8. A description of the actual or potential for human exposure and contact with the wastewater from the overflow.

Exposure to those to received sewage in the basement, as well as the exposure to the runoff in the ditch.

9. Steps taken or planned to mitigate the impacts of the overflow and a schedule of major milestones for those steps.

-City has a program in place to line sanitary sewer and seal manholes to remove I/I from the public system
-City is undergoing analysis for the establishment of a PP/II program to remove I/I from the public system - goal of implementation in early 2016
-Capacity analysis as a part of the East Trunk Sewer Study - STATUS: Flow monitoring to recalibrate model and reassess potential alternates for solution - goal of design in 2015-2016

10. To the extent known at the time of reporting, the number and location of building backups caused by excessive flow or other hydraulic constraints in the sewage collection system that occurred concurrently with the SSO and were within the same area of the sewage collection system as the SSO.

Number: 18 Location: Stone Creek Drive, Revere Road, W. River Oaks Lane, N. Winslow Drive, Concord Place Condominium (Greenbriar west of Pt. Wash. Rd), W. Donges Bay Rd., Westport Cir., Pine Tree Circle, W. Bradford Dr.

11. The reason the overflow occurred or explanation of other contributing circumstances that resulted in the overflow event including whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow. (Refer to GP WI-0047341-05 section 2.2)

Downstream and MMSD sanitary sewers were at capacity and already bypassing or overflowing, leaving little room for relief for the City's increased flow. Rainfall on 4/8/15 had already increased pumping at the lift stations towards capacity. Crews were on site at 6:00 am 4/9/15 preparing for the inflow into the system. At 9:00 am crews were bypass pumping the overall system in three locations and by 2:00 pm pumping at eight locations. Bypass pumping was required to minimize sever property damage and we had no feasible alternatives to an overflow.

Report Completed By

Authorized Representative Name (Print)	Title
Kristen B. Lundeen	Director of Public Works/City Engineer

Signature of Authorized Representative	Date

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 11/13)

Sanitary Sewage Overflow Type:

- (●) Collection System SSO
- ( ) Treatment Facility TFO

Permit Number:

- (●) GP WI-0047341-05
- ( ) Other WI-

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, permittees shall provide the following notices if a sanitary sewer overflow or treatment facility overflow occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office (Refer to GP WI-0047341-05 sections 3.2, 3.4, and 3.5.)
- Public notification. Date 04/09/2015 How? Milwaukee Journal Sentinel (WDNR notification via Theera Ratarasan)
- Regional wastewater treatment facility notification. Date 04/09/2015 ☐ Not applicable
- Drinking water intake owner notification. Date 04/09/2015 ☐ Not applicable

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **SSO, or TFO occurrences**. Attach additional information as necessary to explain or document the overflow. For the purpose of this report, an overflow is defined as the discharge of sewage from the collection system or at the treatment facility other than from the permitted outfall to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Facility Name)	Overflow Reported to DNR – Date	Time
City of Mequon	04/09/2015	10:14 (●) am ( ) pm

Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted
Kristen Lundeen, Director of Public Works/City Engineer	Theera Ratarasarn, Southeastern District Office

Overflow Details (Refer to GP WI-0047341-05 section 3.2 and NR210.21(4)(b), Wis. Adm. Code.)

1. Location of the Overflow (complete a separate form for **each discharge location**)

Lift Station G - 12735 N. Fieldwood Rd.

2. Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water. (check all that apply)

- ☒ Runs on ground and absorbs into the soil.
- ☒ Ditch. Name of surface water it drains to: Milwaukee River
- ☐ Storm sewer. Name of surface water it drains to:
- ☐ Surface water direct discharge:
- ☐ Other, describe:

3. Duration of the Overflow (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
6 hours 30 minutes	257,400

Note: The duration of the overflow equals the estimated time when the overflow began and stopped when sewage may have discharged, and is not the same as the length of time precipitation occurred. The volume of all overflow discharges shall be reported as a numerical value (do not report "unknown"). The potential overflow volume may be calculated knowing the flow capacity of the sewer and the overflow duration.

4. Identify the sewer system or treatment facility component from which the discharge occurred. Check all that apply and explain in number 11.

- ☐ Manhole
- ☐ Permanent overflow structure
- ☐ Other (describe below)
- ☒ Lift station
- ☐ Broken pipe

5. The estimated date and time when the overflow began and stopped or will be stopped:

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
04/09/2015	8:45 (●) am ( ) pm	04/09/2015	3:15 ( ) am (●) pm

6. The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information. Circumstances causing the overflow: (check all that apply)

- [x] Rain
- [x] Soil Moisture
- [ ] Snow Melt
- [ ] Power Outage
- [ ] Plugged Sewer
- [ ] Broken Sewer
- [ ] Equipment Failure
- [ ] Widespread Flooding
- [ ] Other (explain in number 11)

Note: Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Document the weather conditions if it contributed to the cause of the overflow. The wet weather data should include the cumulative amount of precipitation that caused the overflow.

Date and Duration of Rainfall

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
04/07/2015	9:45 (●) am ( ) pm	04/09/2015	2:45 ( ) am (●) pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy)	Amount of Snow Melt (estimated inches melted)
4.2	0

Contributing Soil Conditions (saturated, frozen, soil type)
Saturated

7. Steps taken or planned to reduce, eliminate and prevent reoccurrence of the overflow and a schedule of major milestones for those steps.

Heavy rains over a short period of time on previously saturated soil caused surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is at set level to bypass at critical elevation to avoid basement backups. For this event, we were not able to eliminate all basement backups.

8. A description of the actual or potential for human exposure and contact with the wastewater from the overflow.

Exposure to those to received sewage in the basement, as well as the exposure to the runoff in the ditch.

9. Steps taken or planned to mitigate the impacts of the overflow and a schedule of major milestones for those steps.

-City has a program in place to line sanitary sewer and seal manholes to remove I/I from the public system
-City is undergoing analysis for the establishment of a PP/II program to remove I/I from the public system - goal of implementation in early 2016
-Capacity analysis as a part of the East Trunk Sewer Study - STATUS: Flow monitoring to recalibrate model and reassess potential alternates for solution - goal of design in 2015-2016

10. To the extent known at the time of reporting, the number and location of building backups caused by excessive flow or other hydraulic constraints in the sewage collection system that occurred concurrently with the SSO and were within the same area of the sewage collection system as the SSO.

Number: 18
Location: Stone Creek Drive, Revere Road, W. River Oaks Lane, N. Winslow Drive, Concord Place Condominium (Greenbriar west of Pt. Wash. Rd), W. Donges Bay Rd., Westport Cir., Pine Tree Circle, W. Bradford Dr.

11. The reason the overflow occurred or explanation of other contributing circumstances that resulted in the overflow event including whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow. (Refer to GP WI-0047341-05 section 2.2)

Downstream and MMSD sanitary sewers were at capacity and already bypassing or overflowing, leaving little room for relief for the City's increased flow. Rainfall on 4/8/15 had already increased pumping at the lift stations towards capacity. Crews were on site at 6:00 am 4/9/15 preparing for the inflow into the system. At 9:00 am crews were bypass pumping the overall system in three locations and by 2:00 pm pumping at eight locations. Bypass pumping was required to minimize sever property damage and we had no feasible alternatives to an overflow.

Report Completed By

Authorized Representative Name (Print)	Title
Kristen B. Lundeen	Director of Public Works/City Engineer

Signature of Authorized Representative	Date

State of Wisconsin
Department of Natural Resources

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 11/13)

Sanitary Sewage Overflow Type:

- (●) Collection System SSO
- ( ) Treatment Facility TFO

Permit Number:

- (●) GP WI-0047341-05
- ( ) Other WI-

Notice: Under s.283.55 (1)(dm), Wis. Stats., and in accordance with reporting requirements in your WPDES permit, permittees shall provide the following notices if a sanitary sewer overflow or treatment facility overflow occurs:

- Within **24 hours** of the occurrence, notify the DNR regional wastewater staff by telephone (FAX, email or voice mail, if staff are unavailable).
- Within **5 days** of the occurrence, provide a written report describing the overflow, including all information requested on this form. The permittee is required to submit this form or other equivalent written notification to the DNR Regional Office (Refer to GP WI-0047341-05 sections 3.2, 3.4, and 3.5.)
- Public notification. Date 04/09/2015 How? Milwaukee Journal Sentinel (WDNR notification via Theera Ratarasan)
- Regional wastewater treatment facility notification. Date 04/09/2015 ☐ Not applicable
- Drinking water intake owner notification. Date 04/09/2015 ☐ Not applicable

Failure to notify the Department as specified may result in fines up to $10,000 for each day of violation [s. 283.91(2), Wis. Stats.].

Personally identifiable information will be used for program administration and will also be made available to requesters as required under Wisconsin Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Instructions: Use this form to report all **SSO, or TFO occurrences**. Attach additional information as necessary to explain or document the overflow. For the purpose of this report, an overflow is defined as the discharge of sewage from the collection system or at the treatment facility other than from the permitted outfall to a surface water and/or ground due to circumstances such as those identified by the check boxes in the overflow details section of this form.

Use one form per occurrence. A single occurrence may be more than one day if the circumstance causing the overflow or bypass results in a discharge duration more than 24-hours. If there is a stop and restart of the overflow or bypass within 24-hours, but it's caused by the same circumstances, report it as one occurrence. If the discharges are separated by more than 24 hours, they should be reported as separate occurrences.

Notification Information

Permittee (Facility Name)	Overflow Reported to DNR – Date	Overflow Reported to DNR – Time
City of Mequon	04/09/2015	10:14 (●) am ( ) pm

Person Representing Permittee Who Contacted DNR	DNR Office and Person Contacted
Kristen Lundeen, Director of Public Works/City Engineer	Theera Ratarasarn, Southeastern District Office

Overflow Details (Refer to GP WI-0047341-05 section 3.2 and NR210.21(4)(b), Wis. Adm. Code.)

1. Location of the Overflow (complete a separate form for **each discharge location**)

Lift Station H (2932 W. Riverland Dr.)

2. Provide the name of the local receiving water that the wastewater enters, which could be a nearby stream, river, lake, or wetland. If discharge does not enter directly into a surface water, but indirectly by way of a ditch or storm sewer, trace the path of the ditch or storm sewer to find the receiving water. (check all that apply)

- ☒ Runs on ground and absorbs into the soil.
- ☒ Ditch. Name of surface water it drains to: Milwaukee River
- ☐ Storm sewer. Name of surface water it drains to:
- ☐ Surface water direct discharge:
- ☐ Other, describe:

3. Duration of the Overflow (hours and minutes)	Estimated Volume of Wastewater Discharged (gallons)
5 hours 0 minutes	97,500

Note: The duration of the overflow equals the estimated time when the overflow began and stopped when sewage may have discharged, and is not the same as the length of time precipitation occurred. The volume of all overflow discharges shall be reported as a numerical value (do not report "unknown"). The potential overflow volume may be calculated knowing the flow capacity of the sewer and the overflow duration.

4. Identify the sewer system or treatment facility component from which the discharge occurred. Check all that apply and explain in number 11.

- ☐ Manhole
- ☐ Permanent overflow structure
- ☐ Other (describe below)
- ☒ Lift station
- ☐ Broken pipe

5. The estimated date and time when the overflow began and stopped or will be stopped:

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
04/09/2015	10:00 (●) am ( ) pm	04/09/2015	3:00 ( ) am (●) pm

6. The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information. Circumstances causing the overflow: (check all that apply)

- [x] Rain
- [x] Soil Moisture
- [ ] Snow Melt
- [ ] Power Outage
- [ ] Plugged Sewer
- [ ] Broken Sewer
- [ ] Equipment Failure
- [ ] Widespread Flooding
- [ ] Other (explain in number 11)

Note: Flooding should only be indicated as a cause if there is significant flooding that is caused by high river, stream, or lake water levels, not just localized high water in the street.

Document the weather conditions if it contributed to the cause of the overflow. The wet weather data should include the cumulative amount of precipitation that caused the overflow.

Date and Duration of Rainfall

Start Date	Time (to nearest 15 minutes)	End Date	Time (to nearest 15 minutes)
04/07/2015	9:45 (●) am ( ) pm	04/09/2015	2:45 ( ) am (●) pm

Amount of Rainfall (nearest rain gauge to 0.1 inch accuracy)	Amount of Snow Melt (estimated inches melted)
4.2	0

Contributing Soil Conditions (saturated, frozen, soil type)
Saturated

7. Steps taken or planned to reduce, eliminate and prevent reoccurrence of the overflow and a schedule of major milestones for those steps.

Heavy rains over a short period of time on previously saturated soil caused surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is at set level to bypass at critical elevation to avoid basement backups. For this event, we were not able to eliminate all basement backups.

8. A description of the actual or potential for human exposure and contact with the wastewater from the overflow.

Exposure to those to received sewage in the basement, as well as the exposure to the runoff in the ditch.

9. Steps taken or planned to mitigate the impacts of the overflow and a schedule of major milestones for those steps.

-City has a program in place to line sanitary sewer and seal manholes to remove I/I from the public system
-City is undergoing analysis for the establishment of a PP/II program to remove I/I from the public system - goal of implementation in early 2016
-Capacity analysis as a part of the East Trunk Sewer Study - STATUS: Flow monitoring to recalibrate model and reassess potential alternates for solution - goal of design in 2015-2016

10. To the extent known at the time of reporting, the number and location of building backups caused by excessive flow or other hydraulic constraints in the sewage collection system that occurred concurrently with the SSO and were within the same area of the sewage collection system as the SSO.

Number: 18 Location: Stone Creek Drive, Revere Road, W. River Oaks Lane, N. Winslow Drive, Concord Place Condominium (Greenbriar west of Pt. Wash. Rd), W. Donges Bay Rd., Westport Cir., Pine Tree Circle, W. Bradford Dr.

11. The reason the overflow occurred or explanation of other contributing circumstances that resulted in the overflow event including whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow. (Refer to GP WI-0047341-05 section 2.2)

Downstream and MMSD sanitary sewers were at capacity and already bypassing or overflowing, leaving little room for relief for the City's increased flow. Rainfall on 4/8/15 had already increased pumping at the lift stations towards capacity. Crews were on site at 6:00 am 4/9/15 preparing for the inflow into the system. At 9:00 am crews were bypass pumping the overall system in three locations and by 2:00 pm pumping at eight locations. Bypass pumping was required to minimize sever property damage and we had no feasible alternatives to an overflow.

Report Completed By

Authorized Representative Name (Print)	Title
Kristen B. Lundeen	Director of Public Works/City Engineer

Signature of Authorized Representative	Date

State of Wisconsin
Department of Natural Resources
dnr.wi.gov

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 7/17)

(●) **Sanitary Sewer Overflow (SSO)**
( ) **Treatment Facility Overflow (TFO)**

Notice: An overflow is defined as a release of wastewater from a sewage collection system (SSO) or from a location within a sewage treatment facility (TFO) other than a permitted outfall structure, directly to a water of the state or land surface. Pursuant to s. 283.55(1)(dm), Wis. Stats., s. NR 210.21(4)(5)(6) Wis. Adm. Code and in accordance with reporting requirements in your WPDES permit, permittees shall submit a written report form for each overflow. This record is used to administer the water quality program, and any personally identifiable information may be provided to requesters as required under the Wisconsin Open Records law (ss. 19.31–19.39, Wis. Stats.)."

__Use one form per SSO location.__ Submit within five calendar days to your Department wastewater representative. Attach additional information as necessary to explain or document each overflow occurrence. A single SSO may be more than one day if the circumstance causing the overflow results in discharge duration more than 24 hours. If there is a stop and restart of the overflow within 24 hours, but it's caused by the same circumstances, report it as one SSO. If the discharges are separated by more than 24 hours, they should be reported as separate SSOs.

Notifications

Department Notification

Permittee (Municipality or Facility Name)	Permit No.
City of Mequon	GP WI-0047341-05

Person Who Contacted the DNR
Kevin Driscoll

DNR Person Contacted	Date (mm/dd/yyyy)	Time of Day	Within 24 hours?
Geisa Thielen	08/27/2018	9:30 (●) am ( ) pm	(●) Yes ( ) No

Public Notification

Date (mm/dd/yyyy)	How the Public was Notified
08/27/2018	Mequon eNews and City's website

Describe the actual or potential for human exposure or contact with overflowing wastewater
Overflow pumped into drainage swale

Other Notifications (if applicable)		Date (mm/dd/yyyy)
	Drinking Water Intake Owner: NSWC, MWW, South Milwaukee, Cudahy, Oak Creek	08/27/2018
	Regional Wastewater Treatment Facility: MMSD	08/27/2018

(Satellite collection permittees are required to submit a copy of this report to the regional plant to which they discharge.)

Wet Weather Information (if applicable)

Was this overflow wet weather related? (●) Yes ( ) No (skip this section)

Rainfall Start: 08/26/2018 Date (mm/dd/yyyy) 9:00 Start Time ( ) am (●) pm — 3.3 inches Rainfall Amount

Rainfall End: 08/27/2018 Date (mm/dd/yyyy) 6:00 End Time (●) am ( ) pm

Contributing Soil or Other Conditions (saturated, frozen, soil type, snowmelt, etc.): ______

Overflow Details

Location (Street Address)
Intersection of W. Wildwood Drive and N. Oriole Lane (MH#119.038)

Location (GPS coordinates, WGS84 standard coordinate system) Latitude: 43.2324 (e.g. 43.075350) Longitude: -87.934 (e.g. -89.379770)

Overflow Start: 08/27/2018 Date (mm/dd/yyyy) 12:00 Start Time (●) am ( ) pm

Overflow End: 08/27/2018 Date (mm/dd/yyyy) 7:00 End Time (●) am ( ) pm

Duration: 7 hours — Volume: 630,000 gallons

Cause: (select all that apply)

- [x] Rain
- [ ] Snow Melt
- [ ] Flooding
- [ ] Power Outage
- [ ] Plugged Pipe
- [ ] Broken Pipe
- [ ] Equipment Failure
- [ ] Contractor Related
- [ ] Other–Explain: ______

Overflow Occurred From: (select only one)

( ) Lift Station – Name: ______
(●) Manhole – MH#: 119.038
( ) Gravity Sewer Pipe
( ) Pressure Sewer Pipe (Forcemain)
( ) River or Stream Crossing – Select one: ( ) Forcemain ( ) Siphon
( ) Permanent Overflow Structure
( ) Treatment Plant Unit or Pipe: ______
( ) Other: ______

Sanitary Sewage Overflow Notification Summary Report

Destination: (select all that apply)

- [x] Ditch – Name of surface water it drains to: drains to unnamed tributary into Milwaukee River
- [ ] Storm sewer – Name of surface water it goes to:
- [ ] Surface water – Name of waterbody:
- [ ] Ground – Seeps into soil:
- [ ] Other – Describe:

Overflow Explanation (This includes any information, whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow.)

Heavy rains over a short period of time caused surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is set at levels to bypass at critical elevation to avoid basement backups.

Immediate Corrective Action and Steps Taken to Reduce this Overflow Volume and Impacts

Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is set at levels to bypass at critical elevation to avoid basement backups.
In addition, the City of Mequon is constructing a wet weather relief sewer for this area. This project is called the East Trunk Sewer.

Long Term Plan to Reduce, Eliminate, Prevent Reoccurrence of this Overflow

- The City has an annual program to install cured-in-place lining in the sanitary mainlines and to seal manholes to remove I/I from the public system.
- The City has completed a pilot PPII project to remove I/I from the public system.
- The East Trunk Sewer project, nearly two miles of wet weather relief sewer, had design finalized in 2017 and construction began in 2018.

Building Backups

Number of building backups occurring during this time in Area of Overflow: 0

Locations of Building Backups: (list each one)

Certification

Authorized Representative Name	Authorized Representative Title
Kevin Driscoll	Deputy Director of Utilities

Email Address	Phone Number
kdriscoll@ci.mequon.wi.us	(262) 236-2937

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Kevin Driscoll — Signature of Authorized Representative

8/29/2018 — Signed Date (mm/dd/yyyy)

Note: Submit this form to your DNR wastewater representative. Permittees who are required to submit monthly Discharge Monitoring Reports (DMRs) shall report this overflow on the DMR.

DNR Follow-Up Action (DNR Use Only)	

State of Wisconsin
Department of Natural Resources
dnr.wi.gov

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 7/17)

(●) Sanitary Sewer Overflow (SSO)
( ) Treatment Facility Overflow (TFO)

Notice: An overflow is defined as a release of wastewater from a sewage collection system (SSO) or from a location within a sewage treatment facility (TFO) other than a permitted outfall structure, directly to a water of the state or land surface. Pursuant to s. 283.55(1)(dm), Wis. Stats., s. NR 210.21(4)(5)(6) Wis. Adm. Code and in accordance with reporting requirements in your WPDES permit, permittees shall submit a written report form for each overflow. This record is used to administer the water quality program, and any personally identifiable information may be provided to requesters as required under the Wisconsin Open Records law (ss. 19.31–19.39, Wis. Stats.)."

Use one form per SSO location. Submit within five calendar days to your Department wastewater representative. Attach additional information as necessary to explain or document each overflow occurrence. A single SSO may be more than one day if the circumstance causing the overflow results in discharge duration more than 24 hours. If there is a stop and restart of the overflow within 24 hours, but it's caused by the same circumstances, report it as one SSO. If the discharges are separated by more than 24 hours, they should be reported as separate SSOs.

Notifications

Department Notification

Permittee (Municipality or Facility Name): City of Mequon
Permit No.: GP WI-0047341-05

Person Who Contacted the DNR: Kevin Driscoll

DNR Person Contacted: Geisa Thielen
Date (mm/dd/yyyy): 08/27/2018
Time of Day: 9:30 (●) am ( ) pm
Within 24 hours? (●) Yes ( ) No

Public Notification

Date (mm/dd/yyyy): 08/27/2018
How the Public was Notified: Mequon eNews and City's website

Describe the actual or potential for human exposure or contact with overflowing wastewater

Overflow pumped into drainage swale on 8/26 to 8/27 for 5.5 hours due to 3.3 inches of rain, then again on 8/28 for another 1.5 hours following 1.3 inches of rainfall.

Other Notifications (if applicable)

Drinking Water Intake Owner: NSWC, MWW, South Milwaukee, Cudahy, Oak Creek — Date (mm/dd/yyyy): 08/27/2018

Regional Wastewater Treatment Facility: MMSD — Date (mm/dd/yyyy): 08/27/2018

(Satellite collection permittees are required to submit a copy of this report to the regional plant to which they discharge.)

Wet Weather Information (if applicable)

Was this overflow wet weather related? (●) Yes ( ) No (skip this section)

Rainfall Start: 08/26/2018 Date (mm/dd/yyyy) 9:00 Start Time ( ) am (●) pm — Rainfall Amount: 4.6 inches

Rainfall End: 08/28/2018 Date (mm/dd/yyyy) 9:00 End Time (●) am ( ) pm

Contributing Soil or Other Conditions (saturated, frozen, soil type, snowmelt, etc.): ____________

Overflow Details

Location (Street Address): 12439 N. Circle Drive

Location (GPS coordinates, WGS84 standard coordinate system): Latitude: 43.2446 (e.g. 43.075350) Longitude: -87.9319 (e.g. -89.379770)

Overflow Start: 08/26/2018 Date (mm/dd/yyyy) 11:30 Start Time ( ) am (●) pm

Overflow End: 08/28/2018 Date (mm/dd/yyyy) 9:30 End Time (●) am ( ) pm

Duration: 7 hours
Volume: 247,500 gallons

Cause: (select all that apply)

- [x] Rain
- [ ] Snow Melt
- [ ] Flooding
- [ ] Power Outage
- [ ] Plugged Pipe
- [ ] Broken Pipe
- [ ] Equipment Failure
- [ ] Contractor Related
- [ ] Other–Explain: ____________

Overflow Occurred From: (select only one)

- (●) Lift Station – Name: Lift Station "F"
- ( ) Manhole – MH#: ______
- ( ) Gravity Sewer Pipe
- ( ) Pressure Sewer Pipe (Forcemain)
- ( ) River or Stream Crossing – Select one: ( ) Forcemain ( ) Siphon
- ( ) Permanent Overflow Structure
- ( ) Treatment Plant Unit or Pipe: ____________
- ( ) Other: ____________

Sanitary Sewage Overflow Notification Summary Report

Destination: (select all that apply)

- [x] Ditch – Name of surface water it drains to: ditch drains to Milwaukee River
- [ ] Storm sewer – Name of surface water it goes to:
- [ ] Surface water – Name of waterbody:
- [ ] Ground – Seeps into soil:
- [ ] Other – Describe:

Overflow Explanation (This includes any information, whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow.)

Heavy rains over a short period of time caused surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is set at levels to bypass at critical elevation to avoid basement backups.

Immediate Corrective Action and Steps Taken to Reduce this Overflow Volume and Impacts

Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is set at levels to bypass at critical elevation to avoid basement backups.
In addition, the City of Mequon is constructing a wet weather relief sewer for this area. This project is called the East Trunk Sewer.

Long Term Plan to Reduce, Eliminate, Prevent Reoccurrence of this Overflow

- The City has an annual program to install cured-in-place lining in the sanitary mainlines and to seal manholes to remove I/I from the public system.
- The City has completed a pilot PPII project to remove I/I from the public system.
- The East Trunk Sewer project, nearly two miles of wet weather relief sewer, had design finalized in 2017 and construction began in 2018.

Building Backups

Number of building backups occurring during this time in Area of Overflow: 0

Locations of Building Backups:
(list each one)

Certification

Authorized Representative Name	Authorized Representative Title
Kevin Driscoll	Deputy Director of Utilities

Email Address	Phone Number
kdriscoll@ci.mequon.wi.us	(262) 236-2937

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Kevin Driscoll
Signature of Authorized Representative

8/29/2018
Signed Date (mm/dd/yyyy)

Note: Submit this form to your DNR wastewater representative. Permittees who are required to submit monthly Discharge Monitoring Reports (DMRs) shall report this overflow on the DMR.

DNR Follow-Up Action (DNR Use Only)	

State of Wisconsin
Department of Natural Resources
dnr.wi.gov

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 7/17)

(●) Sanitary Sewer Overflow (SSO)
( ) Treatment Facility Overflow (TFO)

Notice: An overflow is defined as a release of wastewater from a sewage collection system (SSO) or from a location within a sewage treatment facility (TFO) other than a permitted outfall structure, directly to a water of the state or land surface. Pursuant to s. 283.55(1)(dm), Wis. Stats., s. NR 210.21(4)(5)(6) Wis. Adm. Code and in accordance with reporting requirements in your WPDES permit, permittees shall submit a written report form for each overflow. This record is used to administer the water quality program, and any personally identifiable information may be provided to requesters as required under the Wisconsin Open Records law (ss. 19.31–19.39, Wis. Stats.)."

Use one form per SSO location. Submit within five calendar days to your Department wastewater representative. Attach additional information as necessary to explain or document each overflow occurrence. A single SSO may be more than one day if the circumstance causing the overflow results in discharge duration more than 24 hours. If there is a stop and restart of the overflow within 24 hours, but it's caused by the same circumstances, report it as one SSO. If the discharges are separated by more than 24 hours, they should be reported as separate SSOs.

Notifications

Department Notification

Permittee (Municipality or Facility Name)	Permit No.
City of Mequon	GP WI-0047341-05

Person Who Contacted the DNR: Kevin Driscoll

DNR Person Contacted	Date (mm/dd/yyyy)	Time of Day	Within 24 hours?
Geisa Thielen	08/27/2018	9:30 (●) am ( ) pm	(●) Yes ( ) No

Public Notification

Date (mm/dd/yyyy)	How the Public was Notified
08/27/2018	Mequon eNews and City's website

Describe the actual or potential for human exposure or contact with overflowing wastewater

Overflow pumped into drainage swale

Other Notifications (if applicable)		Date (mm/dd/yyyy)
	Drinking Water Intake Owner: NSWC, MWW, South Milwaukee, Cudahy, Oak Creek	08/27/2018
	Regional Wastewater Treatment Facility: MMSD	08/27/2018

(Satellite collection permittees are required to submit a copy of this report to the regional plant to which they discharge.)

Wet Weather Information (if applicable)

Was this overflow wet weather related? (●) Yes ( ) No (skip this section)

Rainfall Start: 08/26/2018 (Date (mm/dd/yyyy)) 9:00 (Start Time) ( ) am (●) pm — 3.3 inches (Rainfall Amount)

Rainfall End: 08/27/2018 (Date (mm/dd/yyyy)) 6:00 (End Time) (●) am ( ) pm

Contributing Soil or Other Conditions (saturated, frozen, soil type, snowmelt, etc.): ____________

Overflow Details

Location (Street Address)

12735 N. Fieldwood Drive

Location (GPS coordinates, WGS84 standard coordinate system) Latitude: 43.2495 (e.g. 43.075350) Longitude: -87.945 (e.g. -89.379770)

Overflow Start: 08/27/2018 (Date (mm/dd/yyyy)) 1:30 (Start Time) (●) am ( ) pm

Overflow End: 08/27/2018 (Date (mm/dd/yyyy)) 3:00 (End Time) (●) am ( ) pm

1.5 hours (Duration) 59,400 gallons (Volume)

Cause: (select all that apply)

- [x] Rain
- [ ] Snow Melt
- [ ] Flooding
- [ ] Power Outage
- [ ] Plugged Pipe
- [ ] Broken Pipe
- [ ] Equipment Failure
- [ ] Contractor Related
- [ ] Other–Explain: ____________

Overflow Occurred From: (select only one)

- (●) Lift Station – Name: Lift Station "G"
- ( ) Manhole – MH#: ____________
- ( ) Gravity Sewer Pipe
- ( ) Pressure Sewer Pipe (Forcemain)
- ( ) River or Stream Crossing – Select one: ( ) Forcemain ( ) Siphon
- ( ) Permanent Overflow Structure
- ( ) Treatment Plant Unit or Pipe: ____________
- ( ) Other: ____________

Sanitary Sewage Overflow Notification Summary Report

Destination: (select all that apply)

- [X] Ditch – Name of surface water it drains to: unnamed tributary to Milwaukee River
- [ ] Storm sewer – Name of surface water it goes to:
- [ ] Surface water – Name of waterbody:
- [ ] Ground – Seeps into soil:
- [ ] Other – Describe:

Overflow Explanation (This includes any information, whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow.)

Heavy rains over a short period of time caused surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is set at levels to bypass at critical elevation to avoid basement backups.

Immediate Corrective Action and Steps Taken to Reduce this Overflow Volume and Impacts

Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is set at levels to bypass at critical elevation to avoid basement backups.
In addition, the City of Mequon is constructing a wet weather relief sewer for this area. This project is called the East Trunk Sewer.

Long Term Plan to Reduce, Eliminate, Prevent Reoccurrence of this Overflow

- The City has an annual program to install cured-in-place lining in the sanitary mainlines and to seal manholes to remove I/I from the public system.
- The City has completed a pilot PPII project to remove I/I from the public system.
- The East Trunk Sewer project, nearly two miles of wet weather relief sewer, had design finalized in 2017 and construction began in 2018.

Building Backups

Number of building backups occurring during this time in Area of Overflow: 0

Locations of Building Backups:
(list each one)

Certification

Authorized Representative Name	Authorized Representative Title
Kevin Driscoll	Deputy Director of Utilities

Email Address	Phone Number
kdriscoll@ci.mequon.wi.us	(262) 236-2937

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Kevin Driscoll
Signature of Authorized Representative

8/29/2018
Signed Date (mm/dd/yyyy)

Note: Submit this form to your DNR wastewater representative. Permittees who are required to submit monthly Discharge Monitoring Reports (DMRs) shall report this overflow on the DMR.

DNR Follow-Up Action (DNR Use Only)	

State of Wisconsin
Department of Natural Resources
dnr.wi.gov

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 7/17)

(◉) Sanitary Sewer Overflow (SSO)
( ) Treatment Facility Overflow (TFO)

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Notifications

Department Notification

Permittee (Municipality or Facility Name): City of Mequon
Permit No.: GP WI-0047341-05

Person Who Contacted the DNR: Kevin Driscoll

DNR Person Contacted: Geisa Thielen
Date (mm/dd/yyyy): 08/27/2018
Time of Day: 9:30 (◉) am ( ) pm
Within 24 hours? (◉) Yes ( ) No

Public Notification

Date (mm/dd/yyyy): 08/27/2018
How the Public was Notified: Mequon eNews and City's website

Describe the actual or potential for human exposure or contact with overflowing wastewater

Overflow pumped into drainage swale for 4.75 hours on 8/26 and 8/27 due to 3.3 inches of rain, then again on 8/28 for another hour following an additional 1.3 inches of rainfall.

Other Notifications (if applicable)

Drinking Water Intake Owner	NSWC, MWW, South Milwaukee, Cudahy, Oak Creek	Date (mm/dd/yyyy): 08/27/2018
Regional Wastewater Treatment Facility	MMSD	Date (mm/dd/yyyy): 08/27/2018

(Satellite collection permittees are required to submit a copy of this report to the regional plant to which they discharge.)

Wet Weather Information (if applicable)

Was this overflow wet weather related? (◉) Yes ( ) No (skip this section)

Rainfall Start: 08/26/2018 Date (mm/dd/yyyy) 9:00 Start Time ( ) am (◉) pm — 4.6 inches Rainfall Amount

Rainfall End: 08/28/2018 Date (mm/dd/yyyy) 9:00 End Time (◉) am ( ) pm

Contributing Soil or Other Conditions (saturated, frozen, soil type, snowmelt, etc.): ____________

Overflow Details

Location (Street Address): 2932 W. Riverland Drive

Location (GPS coordinates, WGS84 standard coordinate system) Latitude: 43.2349 (e.g. 43.075350) Longitude: -87.9478 (e.g. -89.379770)

Overflow Start: 08/26/2018 Date (mm/dd/yyyy) 11:15 Start Time ( ) am (◉) pm

Overflow End: 08/28/2018 Date (mm/dd/yyyy) 6:20 End Time (◉) am ( ) pm

5.75 hours Duration — 120,750 gallons Volume

Cause: (select all that apply)

- [x] Rain
- [ ] Snow Melt
- [ ] Flooding
- [ ] Power Outage
- [ ] Plugged Pipe
- [ ] Broken Pipe
- [ ] Equipment Failure
- [ ] Contractor Related
- [ ] Other–Explain: ____________

Overflow Occurred From: (select only one)

- (◉) Lift Station – Name: Lift Station "H"
- ( ) Manhole – MH#: ____________
- ( ) Gravity Sewer Pipe
- ( ) Pressure Sewer Pipe (Forcemain)
- ( ) River or Stream Crossing – Select one: ( ) Forcemain ( ) Siphon
- ( ) Permanent Overflow Structure
- ( ) Treatment Plant Unit or Pipe: ____________
- ( ) Other: ____________

Sanitary Sewage Overflow Notification Summary Report

Destination: (select all that apply)

- [X] Ditch – Name of surface water it drains to: roadside ditch drains to Milwaukee River
- [ ] Storm sewer – Name of surface water it goes to:
- [ ] Surface water – Name of waterbody:
- [ ] Ground – Seeps into soil:
- [ ] Other – Describe:

Overflow Explanation (This includes any information, whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow.)

Heavy rains over a short period of time caused surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is set at levels to bypass at critical elevation to avoid basement backups.

Immediate Corrective Action and Steps Taken to Reduce this Overflow Volume and Impacts

Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is set at levels to bypass at critical elevation to avoid basement backups.
In addition, the City of Mequon is constructing a wet weather relief sewer for this area. This project is called the East Trunk Sewer.

Long Term Plan to Reduce, Eliminate, Prevent Reoccurrence of this Overflow

- The City has an annual program to install cured-in-place lining in the sanitary mainlines and to seal manholes to remove I/I from the public system.
- The City has completed a pilot PPII project to remove I/I from the public system.
- The East Trunk Sewer project, nearly two miles of wet weather relief sewer, had design finalized in 2017 and construction began in 2018.

Building Backups

Number of building backups occurring during this time in Area of Overflow: 0

Locations of Building Backups: (list each one)

Certification

Authorized Representative Name	Authorized Representative Title
Kevin Driscoll	Deputy Director of Utilities
Email Address	**Phone Number**
kdriscoll@ci.mequon.wi.us	(262) 236-2937

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Kevin Driscoll — Signature of Authorized Representative

8/29/2018 — Signed Date (mm/dd/yyyy)

Note: Submit this form to your DNR wastewater representative. Permittees who are required to submit monthly Discharge Monitoring Reports (DMRs) shall report this overflow on the DMR.

DNR Follow-Up Action (DNR Use Only)	

City of Mequon

11333 N. Cedarburg Rd 60W
Mequon, WI 53092-1930
Phone (262) 236-2937
Fax (262) 242-9655
kdriscoll@ci.mequon.wi.us

www.ci.mequon.wi.us

PUBLIC WORKS/ENGINEERING

October 2, 2019

JACOB WEDESKY
WISCONSIN DEPARTMENT OF NATURAL RESOURCES
2300 NORTH DR. MARTIN LUTHER KING JR. DRIVE
MILWAUKEE, WI 53212

Subject: Sanitary Sewer Overflow Notification Summary Report

Mr. Wedesky:

Please find the enclosed Sanitary Sewer Overflow Notification Summary Report for the City of October 2, 2019 event.

Please email kdriscoll@ci.mequon.wi.us or call (262) 236-2937 with any questions.

Sincerely,

Kevin Driscoll, P.E.
Deputy Director of Utilities

Cc: Kristen Lundeen – Director of Public Works / City Engineer

State of Wisconsin
Department of Natural Resources
dnr.wi.gov

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 7/17)

(●) **Sanitary Sewer Overflow (SSO)**
( ) **Treatment Facility Overflow (TFO)**

Notice: An overflow is defined as a release of wastewater from a sewage collection system (SSO) or from a location within a sewage treatment facility (TFO) other than a permitted outfall structure, directly to a water of the state or land surface. Pursuant to s. 283.55(1)(dm), Wis. Stats., s. NR 210.21(4)(5)(6) Wis. Adm. Code and in accordance with reporting requirements in your WPDES permit, permittees shall submit a written report form for each overflow. This record is used to administer the water quality program, and any personally identifiable information may be provided to requesters as required under the Wisconsin Open Records law (ss. 19.31–19.39, Wis. Stats.)."

Use one form per SSO location. Submit within five calendar days to your Department wastewater representative. Attach additional information as necessary to explain or document each overflow occurrence. A single SSO may be more than one day if the circumstance causing the overflow results in discharge duration more than 24 hours. If there is a stop and restart of the overflow within 24 hours, but it's caused by the same circumstances, report it as one SSO. If the discharges are separated by more than 24 hours, they should be reported as separate SSOs.

Notifications

Department Notification

Permittee (Municipality or Facility Name): City of Mequon
Permit No.: GP WI-0047341-05

Person Who Contacted the DNR: Kevin Driscoll

DNR Person Contacted	Date (mm/dd/yyyy)	Time of Day	Within 24 hours?
Bryan Hartsook	10/02/2019	8:45 (●) am ( ) pm	(●) Yes ( ) No

Public Notification

Date (mm/dd/yyyy)	How the Public was Notified
10/02/2019	Mequon eNews and City's Website

Describe the actual or potential for human exposure or contact with overflowing wastewater

Overflow pumped into drainage swale

Other Notifications (if applicable)

		Date (mm/dd/yyyy)
Drinking Water Intake Owner	Milwaukee Water Works, South Milwaukee, Cudahy, Oak Creek	10/02/2019
Regional Wastewater Treatment Facility	Milwaukee Metropolitan Sewerage District	10/02/2019

(Satellite collection permittees are required to submit a copy of this report to the regional plant to which they discharge.)

Wet Weather Information (if applicable)

Was this overflow wet weather related? (●) Yes ( ) No (skip this section)

Rainfall Start: 10/01/2019 (Date (mm/dd/yyyy)) 3:00 (Start Time) ( ) am (●) pm — 2.8 inches (Rainfall Amount)

Rainfall End: 10/02/2019 (Date (mm/dd/yyyy)) 8:00 (End Time) (●) am ( ) pm

Contributing Soil or Other Conditions (saturated, frozen, soil type, snowmelt, etc.): Saturated conditions

Overflow Details

Location (Street Address)
Lift Station "E" 2020 Ranch Road, Mequon

Location (GPS coordinates, WGS84 standard coordinate system) Latitude: 43.231 (e.g. 43.075350) Longitude: -87.935 (e.g. -89.379770)

Overflow Start: 10/02/2019 (Date (mm/dd/yyyy)) 12:10 (Start Time) (●) am ( ) pm

Overflow End: 10/02/2019 (Date (mm/dd/yyyy)) 3:40 (End Time) (●) am ( ) pm

Duration: 3.5 hours
Volume: 292,500 gallons

Cause: (select all that apply)

- [x] Rain
- [ ] Plugged Pipe
- [ ] Snow Melt
- [ ] Broken Pipe
- [ ] Flooding
- [ ] Equipment Failure
- [ ] Power Outage
- [ ] Contractor Related
- [ ] Other–Explain: ______

Overflow Occurred From: (select only one)

- ( ) Lift Station – Name: ______
- (●) Manhole – MH#: 119.034
- ( ) Gravity Sewer Pipe
- ( ) Pressure Sewer Pipe (Forcemain)
- ( ) River or Stream Crossing – Select one: ( ) Forcemain ( ) Siphon
- ( ) Permanent Overflow Structure
- ( ) Treatment Plant Unit or Pipe: ______
- ( ) Other: ______

Sanitary Sewage Overflow Notification Summary Report

Form 3400-184 (R 7/17)

Destination: (select all that apply)

- [x] Ditch – Name of surface water it drains to: Milwaukee River
- [ ] Storm sewer – Name of surface water it goes to:
- [ ] Surface water – Name of waterbody:
- [ ] Ground – Seeps into soil:
- [ ] Other – Describe:

Overflow Explanation (This includes any information, whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow.)

Heavy rains over a short period of time caused high alarms at lift stations and surcharging in the system. Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is set at levels to bypass critical elevations to avoid basement back-ups

Immediate Corrective Action and Steps Taken to Reduce this Overflow Volume and Impacts

Bypass pumping is set up when critical elevations in the manholes or wet wells are exceeded. Suction is set at levels to bypass critical elevations to avoid basement back-ups

Long Term Plan to Reduce, Eliminate, Prevent Reoccurrence of this Overflow

- The City has an annual program to rehabilitate sanitary sewers with the installation of cured-in-place pipe lining in the mainlines and to seal manholes to remove infiltration.
- The City has completed a pilot project to reduce private property inflow and infiltration from entering the sanitary sewer system, and is in the process of prioritizing target areas for additional workplans to implement.
- The East Trunk Relief Sewer was brought online in March 2019 and completed in July 2019. It added inline storage capacity to the sanitary sewer system to alleviate future surcharging in wet weather events.
- A condition assessment for the Ranch Road Lift Station "E" is programmed for 2020 to evaluate upgrades and improvements.

Building Backups

Number of building backups occurring during this time in Area of Overflow: 0

Locations of Building Backups: n/a
(list each one)

Certification

Authorized Representative Name	Authorized Representative Title
Kevin Driscoll	Deputy Director of Utilities

Email Address	Phone Number
kdriscoll@ci.mequon.wi.us	(262) 236-2937

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Kevin Driscoll — 10/2/2019

Signature of Authorized Representative — Signed Date (mm/dd/yyyy)

Note: Submit this form to your DNR wastewater representative. Permittees who are required to submit monthly Discharge Monitoring Reports (DMRs) shall report this overflow on the DMR.

DNR Follow-Up Action (DNR Use Only)	

414-263-8512 Jacob Wedesky
Bryan Hartsook

BYPASS PUMPING RECORD

Date: 10/2/19 Manhole: # 0119.034 -87.935, 43.230

Station: "E" 2020 Ranch Rd

WETWELL LEVEL NOTES

TIME	GAUGE READING	OR	RUNGS FROM TOP
1. 12:10 am	11.5'		
2. 12:40 am	10.9'		
3. 3:40 am	4.6'		

TIME Over Flow Started ______ TIME Over Flow Stopped ______

Total Hours ______ Cycles/Hour ______ Gals/Cycle ______ Estimated Gals ______

BYPASS PUMPING

PUMP 2" 3" 4" 6"

TIME Started	THROTTLE FULL	HALF	QUARTER	IDLE	TIME Stopped	HOURS	Inflow Wet Well	GPM
12:10 am		√			12:40 am	.5		750
12:40 am	√				3:40 am	3		1500

TIME PUMPING STARTED 12:10am TIME PUMPING STOPPED 12:40am

GPM PUMPED X MINUTES RUN + INFLOW = TOTAL GALLONS PUMPED
750 X 30 + ______ = 22,500

TIME PUMPING STARTED 12:40 am TIME PUMPING STOPPED 3:40am

GPM PUMPED X MINUTES RUN + INFLOW = TOTAL GALLONS PUMPED
1500 X 180 + ______ = 270,000

TIME PUMPING STARTED ______ TIME PUMPING STOPPED ______

GPM PUMPED X MINUTES RUN + INFLOW = TOTAL GALLONS PUMPED
______ X ______ + ______ = ______

TOTAL GALLONS PUMPED 292,500

From:	Kevin Driscoll	Mequon Deputy Director of Utilities	kdriscoll@ci.mequon.wi.us

TO	Eric Kiefer	North Shore Water Commission	Ekiefer@northshorewc.com
	Karen Dettmer	Milwaukee Water Works	Dettmer, Karen <Karen.Dettmer@milwaukee.gov>
	Daniel Welk	Milwaukee Water Works	Daniel.P.Welk@milwaukee.gov
	Lucas Beversdorf	Milwaukee Water Works	lbevers@milwaukee.gov
	Frank Miller	Cudahy Water Utility	Millerf@ci.cudahy.wi.us
	Douglas Fischer	South Milwaukee Water Utility	FischerD@smwi.org
	Mike Robe	Oak Creek Water Utility	mrobe@water.oak-creek.wi.us
	Micki Klappa-Sullivan	MMSD	MKlappaSullivan@mmsd.com
	Jacob Wedesky	DNR	jacob.wedesky@wisconsin.gov

Kevin Driscoll

From:	Kevin Driscoll
Sent:	Wednesday, October 02, 2019 9:22 AM
To:	'Ekiefer@northshorewc.com'; 'jennifer.gonda@milwaukee.gov'; 'Millerf@ci.cudahy.wi.us'; 'FischerD@smwi.org'; 'FrancisP@water.oak-creek.wi.us'; 'MKlappaSullivan@mmsd.com'; 'lbevers@milwaukee.gov'; 'Daniel.P.Welk@milwaukee.gov'
Cc:	'jacob.wedesky@wisconsin.gov'; Kristen Lundeen
Subject:	SSO Occurence: City of Mequon

From:	**Kevin Driscoll**	**Mequon Deputy Director of Utilities**	kdriscoll@ci.mequon.wi.us

TO	**Eric Kiefer**	**North Shore Water Commission**	Ekiefer@northshorewc.cor
	Jennifer Gonda	**Milwaukee Water Works**	jennifer.gonda@milwauke
	Daniel Welk	**Milwaukee Water Works**	Daniel.P.Welk@milwaukee
	Lucas Beversdorf	**Milwaukee Water Works**	lbevers@milwaukee.gov
	Frank Miller	**Cudahy Water Utility**	Millerf@ci.cudahy.wi.us
	Douglas Fischer	**South Milwaukee Water Utility**	FischerD@smwi.org
	Mike Robe	**Oak Creek Water Utility**	mrobe@water.oak-creek.w
	Micki Klappa-Sullivan	**MMSD**	MKlappaSullivan@mmsd.c
	Jacob Wedesky	**DNR**	jacob.wedesky@wisconsin

Be advised:

This notification sent to all water intake owners as required by WPDES permit in the event of a SSO occurrence.

The Sanitary Sewer System was by-passed at one location due to additional wet weather following saturated conditions.
The SSO occurred this morning Wednesday, October 2 from 12:10am to 3:40am from a manhole near the City lift station located at 2020 River Road (LS E).

Kevin R. Driscoll, P.E.
Deputy Director of Utilities
City of Mequon
11333 N. Cedarburg Road
Mequon, WI 53092
kdriscoll@ci.mequon.wi.us
262-236-2937

Kevin Driscoll

From: Wayne Bernhardt
Sent: Wednesday, October 02, 2019 10:22 AM
To: Kevin Driscoll
Subject: rain gauge readings

Kevin,

According to our rain gauge, yesterday's rain was 1.79" and today was 1.02"
The 48" (ETS project) is taking on water from Diversion Structure 3 and Diversion Structure 1 like it is supposed do.
This is great news. We looked at a manhole in the median on Port Washington Rd and the 48" line looks to be about 12"-18" full of water.
On Stonecreek Dr. by diversion structure 3, there is standing water 1/3 across the road. The ground needs to be lowered at that point for water to drain towards the creek.
I believe this to be a contractor issue.

Wayne Bernhardt
Wastewater Superintendent
City of Mequon
wbernhardt@ci.mequon.wi.us
Office:262-236-2919
Mobile:414-807-3089

Appendix E
River Gage Data

weather.gov

National Weather Service
Advanced Hydrologic Prediction Service

Home News Organization Search for: NWS All NOAA Go

BOOKMARK

National Observations | WFO Observations | Hydrograph

Local weather forecast by "City, ST"
City, ST Go

Weather Forecast Office Milwaukee/Sullivan, WI | North Central River Forecast Center

National Conditions
Rivers
Satellite
Climate
Observed Precip

Local Conditions
Warnings
Weather
Forecast
Radar

AHPS Documentation
User Guide
User Brochure

What is AHPS?
Facts
Our Partners

Feedback/Questions
Provide Feedback
Ask Questions

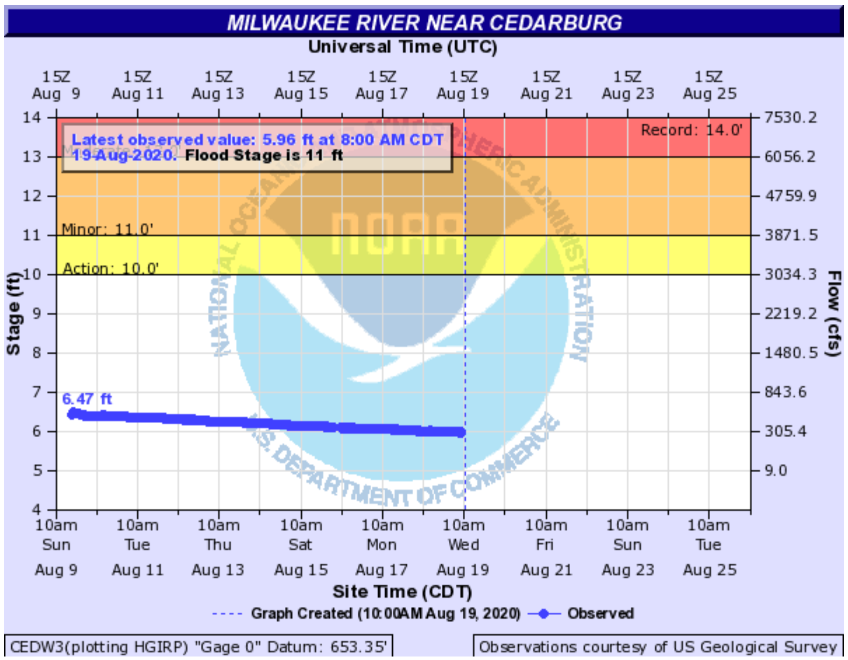
WHEN FLOODED TURN AROUND DON'T DROWN

FLOODSMART.GOV

USA.gov

Hydrograph | River at a Glance | Download | Inundation Mapping | Probability Information

Auto Refresh: OFF



Printable Image
About this graph
Tabular Data (UTC)
Tabular Data (CDT)
XML
RSS
Datum: Not Available
Metadata

NOTE: River forecasts for this location take into account past precipitation and the precipitation amounts expected approximately 24 hours into the future from the forecast issuance time.

Reliability of the Forecast: Based on current and forecast river, weather and reservoir conditions

NOTE: Forecasts for the Milwaukee River near Cedarburg are issued as needed during times of high water, but are not routinely available.

Default Hydrograph

Return to Area Map

Upstream Gauge Downstream Gauge

Flood Categories (in feet)

Major Flood Stage:	14
Moderate Flood Stage:	13
Flood Stage:	11
Action Stage:	10

Historic Crests
(1) 15.25 ft on 03/16/2019 **(P)**
(2) 13.98 ft on 06/13/2008
(3) 13.11 ft on 05/24/2004
(4) 12.99 ft on 10/03/2019 **(P)**
(5) 12.88 ft on 06/18/1996
Show More Historic Crests

(P): Preliminary values subject to further review.

Recent Crests
(1) 11.80 ft on 05/19/2020 **(P)**
(2) 12.99 ft on 10/03/2019 **(P)**
(3) 15.25 ft on 03/16/2019 **(P)**
(4) 11.40 ft on 09/03/2018 **(P)**
(5) 12.20 ft on 08/29/2018 **(P)**
Show More Recent Crests

(P): Preliminary values subject to further review.

Low Water Records
(1) 5.20 ft on 07/09/1999
(2) 5.20 ft on 11/27/2012
(3) 5.34 ft on 10/07/2005
(4) 5.44 ft on 08/25/2015
(5) 5.45 ft on 07/01/2012
Show More Low Water Records

FEMA

For more information on your flood risk go to www.floodsmart.gov.

☐ Show FEMA's National Flood Hazard Layers

Zoom Level:16

Gauge Location Disclaimer

Latitude/Longitude Disclaimer: The gauge location shown in the above map is the approximate location based on the latitude/longitude coordinates provided to the NWS by the gauge owner.

Flood Impacts & Photos Collapse

If you notice any errors in the below information, please contact our Webmaster

13.31 Floodwaters affect Island Drive and Shoreland Parkway in the Mequon area. Water is over Elm St, Green Bay Rd, North Cedarburg Rd in Thiensville. The following roads and intersections are flooded and closed: Highway Y and Hawthorne Drive in the Town of Saukville, Highway W between Highway 33 and Highway 57 in the Village of Saukville. This level is the 1 percent chance flood meaning there is a 1 percent chance of the river reaching this level in any given year.

13 Floodwaters affect Island Drive and Shoreland Parkway in the Mequon area. Water is over Elm St, Green Bay Rd, N Cedarburg Rd in Thiensville and into Thiensville village Park. The following roads and intersections are flooded and closed: Highway Y and Hawthorne Drive in the Town of Saukville, Blueberry Drive and Hawthorne Drive in the Town of Saukville, Highway W between Highway 33 and Highway 57 in the Village and Town of Saukville.

12.93 Floodwaters affect Island Drive and Shoreland Parkway in the Mequon area. Water is over Elm St, Green Bay Rd, North Cedarburg Rd in Thiensville. The following roads and intersections may be flooded: Highway Y and Hawthorne Drive in the Town of Saukville, Highway W between Highway 33 and Highway 57 in the Village and Town of Saukville.

12.53 Floodwaters are into the back yards of homes in the Thiensville area. Water is into Thiensville Village Park. The following roads and intersections may be flooded: Highway Y and Hawthorne Drive, Blueberry Drive and Hawthorne Drive in the Town of Saukville, Highway W between Highway 33 and Highway 57 in the Village of Saukville. This level is the 4 percent flood meaning there is a 4 percent chance of the river reaching this level in any given year.

12 Floodwaters spread into the back yards of homes in the Thiensville area. Water is over Elm St, Green Bay Rd, and N Cedarburg Rd, and into Thiensville Village Park. The following roads and intersections are flooded and closed: Highway Y and Hawthorne Drive in the Town of Saukville, Blueberry Drive and Hawthorne Drive in the Town of Saukville, Highway W between Highway 33 and Highway 57 in the Village and Town of Saukville. Water is near some homes along Island Drive and Shoreland Parkway in the Mequon area.

11.86 The following roads and intersections may be flooded: Highway Y and Hawthorne Drive in the Town of Saukville, Blueberry Drive and Hawthorne Drive in the Town of Saukville, Highway W between Highway 33 and Highway 57 in the Village and Town of Saukville. Water is near some homes along Island Drive and Shoreland Parkway in the Mequon area. This level is the 10 percent flood meaning there is a 10 percent chance of the river reaching this level in any given year.

11.3 The following roads and intersections may be flooded: Highway Y and Hawthorne Drive in the Town of Saukville, Blueberry Drive and Hawthorne Drive in the Town of Saukville, Highway W between Highway 33 and Highway 57 in the Village and Town of Saukville. Water approaches some homes along Klug Lane just south of Highway C in Thiensville. Water is near some homes along Island Drive and Shoreland Parkway in the Mequon area.

11.13 Floodwaters approach some homes along Klug Lane and just south of Highway C. About 2 1/2 miles downstream, water approaches some homes along Island Drive and Shoreland Parkway in the Mequon area. This level is the 20 percent chance flood meaning that there is a 20 percent chance of the river reaching this level in any given year.

11 Water approaches some homes along Klug Lane just south of Highway C. At equivalent stage 2 1/2 miles downstream, water approaches homes along Island Drive and Shoreland Parkway in the Mequon area.

10.5 There is minor lowland flooding.

10 Minor lowland flooding occurs.

9.88 There is minor lowland flooding in the Cedarburg and Thiensville area. This level is the 50 percent flood meaning that there is a 50 percent chance of the river reaching this level in any given year.

Photos
(1) Aerial photo looking east-Milwaukee R. near Cedarburg, WI
(2) Aerial photo looking south-Milwaukee R. near Cedarburg, WI

About This Location Collapse

Latitude: 43.279850° N, Longitude: 87.942970° W, Horizontal Datum: NAD83/WGS84

River Stage Reference Frame	Gauge Height	Flood Stage	Uses
NWS stage	0 ft	11 ft	Interpreting hydrographs and NWS watch, warnings, and forecasts, and inundation maps
Vertical Datum	Elevation **(gauge height = 0)**	Elevation **(gauge height = flood stage)**	Elevation information source
NAVD88	653.35	664.35	Survey grade GPS equipment, FEMA flood plain maps, newer USGS

			topographic maps
NGVD 29	653.558 ft	664.558 ft	Older USGS topographic maps, NGVD29 benchmarks
MSL	Not Available	Not Available	Older USGS topographic maps, MSL benchmarks
Other	Not Available	Not Available	

Current/Historical Observations:

- U.S. Geological Survey (USGS) Data and Site Info for Cedarburg

Additional Information Collapse

How low could the river get?

Resources Collapse

Hydrologic Resources

- Text Products
- Past Precipitation
- Forecast Precipitation
- River Forecast Centers
- River Stage Summary
- Inundation Mapping Locations

Additional Resources

- Area Hydrographs
- NWS Precipitation and River Forecasting
- AHPS Iframes for Developers
- Mobile iNWS for emergency management
- Long Term Palmer Drought Severity Index
- Snow Information
- USGS WI Water Science
- High Water Mark Signs
- Levee Safety Information
- June 2008 National Flood Assessment
- How to Estimate River Ice Thickness
- Flood Resiliency at Wastewater Plants
- Manure Management Advisory System
- Historic Flooding Events For Southern Wisconsin
- Ice Jam Potential-4 sites in SE Wis.

Collaborative Agencies Collapse

The National Weather Service prepares its forecasts and other services in collaboration with agencies like the US Geological Survey, US Bureau of Reclamation, US Army Corps of Engineers, Natural Resource Conservation Service, National Park Service, ALERT Users Group, Bureau of Indian Affairs, and many state and local emergency managers across the country. For details, please click here.

NWS Information

National Weather Service
Milwaukee/Sullivan Weather Forecast Office
N3533 Hardscrabble Road
Dousman, WI 53118
(262) 965-2074
Ask Questions/Webmaster
Page last modified: 1-Mar-2019 12:34 AM

Recent Crests

(1) 11.80 ft on 05/19/2020 **(P)**
(2) 12.99 ft on 10/03/2019 **(P)**
(3) 15.25 ft on 03/16/2019 **(P)**
(4) 11.40 ft on 09/03/2018 **(P)**
(5) 12.20 ft on 08/29/2018 **(P)**
(6) 12.24 ft on 01/23/2017
(7) 8.34 ft on 12/16/2015
(8) 10.91 ft on 04/10/2015 **(P)**
(9) 9.95 ft on 06/21/2014
(10) 11.40 ft on 04/15/2014 **(P)**
(11) 12.22 ft on 03/13/2013
(12) 10.77 ft on 03/23/2011
(13) 8.57 ft on 02/20/2011
(14) 8.71 ft on 07/24/2010
(15) 9.07 ft on 07/16/2010
(16) 9.87 ft on 03/13/2010
(17) 10.25 ft on 04/27/2009
(18) 11.95 ft on 03/09/2009
(19) 9.96 ft on 02/13/2009
(20) 13.98 ft on 06/13/2008
(21) 10.36 ft on 04/11/2008
(22) 9.53 ft on 03/15/2008
(23) 11.12 ft on 03/15/2007
(24) 11.80 ft on 03/13/2007

Meas. Number | Date Time | Time Datum | Measurement Used? | Who | Measuring Agency | Stream flow (ft³/s) | Gage Height (ft) | GH Change (ft) | Meas. Duration (hr) | Meas. Rated

National Water Information System: Web Interface

USGS Water Resources

Data Category: Surface Water
Geographic Area: United States
GO

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- Introducing The Next Generation of USGS Water Data for the Nation
- Full News

Streamflow Measurements for the Nation

USGS 04086600 MILWAUKEE RIVER NEAR CEDARBURG, WI

Available data for this site Surface-water: Field measurements GO

Ozaukee County, Wisconsin
Hydrologic Unit Code 04040003
Latitude 43°16'49", Longitude 87°56'33" NAD83
Drainage area 607 square miles
Gage datum 653.35 feet above NAVD88

Output formats

HTML table with channel data
HTML table without channel data
Tab-separated data with channel data
Tab-separated data without channel data
Graph of data
Reselect output format

Meas. Number	Date Time	Time Datum	Measurement Used?	Who	Measuring Agency	Stream flow (ft^3/s)	Gage Height (ft)	GH Change (ft)	Meas. Duration (hr)	Meas. Rated	Control	Flow Adjust. Code
331	2020-08-06 11:11:45	CDT	Yes	BRH	USGS	795	6.94	0.00	0.50	Good	VegetationLight	NONE
330	2020-07-09 13:20:30	CDT	Yes	BRH	USGS	598	6.65	0.00	1.20	Fair	VegetationModerate	NONE
329	2020-05-18 17:27:24	CDT	Yes	BRH	USGS	4260	11.44	0.01	0.50	Good	Clear	NONE
328	2020-04-16 11:55:58	CDT	Yes	BRH	USGS	727	6.80	-0.01	0.50	Fair	Clear	NONE
327	2020-03-05 12:43:41	CST	Yes	BRH	USGS	875	6.94	0.00	0.50	Good	Clear	NONE
326	2019-12-30 14:45:35	CST	Yes	BRH	USGS	1730	8.22	0.01	0.50	Good	Clear	NONE
325	2019-11-19 13:10:44	CST	Yes	BME	USGS	829	7.02	0.01	0.20	Good	Clear	NONE

Meas. Number	Date Time	Time Datum	Measurement Used?	Who	Measuring Agency	Stream flow (ft³/s)	Gage Height (ft)	GH Change (ft)	Meas. Duration (hr)	Meas. Rated	(	
324	2019-10-03 16:39:03	CDT	Yes	BRH	USGS	5930	12.98	0.02	1.00	Good	Clear	NONE
323	2019-10-01 13:46:48	CDT	Yes	BME/BRH	USGS	1040	7.34	0.04	0.20	Good	VegetationLight	NONE
322	2019-08-28 14:18:08	CDT	Yes	BME/GCW	USGS	513	6.59	0.01	0.25	Poor	VegetationLight	NONE
321	2019-07-10 14:30:50	CDT	Yes	BME/JMW	USGS	505	6.51	0.02	0.20	Good	VegetationModerate	NONE
320	2019-05-07 16:55:06	CDT	Yes	KTM	USGS	998	7.30	0.00	0.50	Good	VegetationLight	NONE
319	2019-03-18 16:00:56	CDT	Yes	KTM	USGS	4600	12.04	0.12	0.75	Fair	Clear	NONE
318	2019-02-28 10:04	CST	Yes	KTM/RPE	USGS	386	8.23	0.04	1.25	Poor	IceCover	NONE
317	2018-11-27 15:44:58	CST	Yes	KTM	USGS	581	6.46	0.01	0.75	Fair	Clear	NONE
316	2018-10-04 15:04:34	CDT	Yes	KTM	USGS	1660	8.11	0.00	0.25	Good	Clear	NONE
315	2018-08-28 15:32:23	CDT	Yes	KTM	USGS	4400	11.81	0.00	0.20	Good	Clear	NONE
314	2018-08-07 16:48:30	CDT	Yes	KTM	USGS	124	5.74	0.00	0.60	Fair	VegetationModerate	NONE
313	2018-07-06 12:05:30	CDT	Yes	KTM	USGS	275	5.94	-0.01	0.90	Good	VegetationLight	NONE
312	2018-06-07 16:12:53	CDT	Yes	KTM/RPE	USGS	270	5.94	0.00	0.24	Good	VegetationLight	NONE
311	2018-05-10 16:13:02	CDT	Yes	KTM	USGS	1600	8.02	0.00	0.30	Good	Clear	NONE
310	2018-04-26 16:53:50	CDT	Yes	KTM	USGS	1210	7.31	0.00	0.25	Good	Clear	NONE
309	2018-03-09 14:00:14	CST	Yes	KTM	USGS	450	6.14	0.00	0.30	Good	DebrisLight	NONE
308	2018-01-11 11:00:30	CST	Yes	BCT/KTM	USGS	163	6.66			Poor	IceCover	NONE
307	2017-12-06 09:14:30	CST	Yes	KTM	USGS	284	5.86	0.00	0.56	Fair	DebrisLight	NONE
306	2017-10-04 14:29:30	CDT	Yes	KTM	USGS	225	5.72	0.00	0.80	Fair	VegetationModerate	NONE
305	2017-09-08 08:42:24	CDT	Yes	KTM	USGS	238	6.20	0.00	0.40	Fair	VegetationHeavy	NONE
304	2017-08-09 12:09:14	CDT	Yes	KTM	USGS	456	6.63	0.00	0.30	Good	DebrisModerate	NONE
303	2017-06-22 09:17:02	CDT	Yes	KTM	USGS	458	6.35	0.00	0.30	Good	VegetationLight	NONE
302	2017-04-17 15:52:52	CDT	Yes	KTM	USGS	1600	8.09	0.00	0.30	Good	DebrisLight	NONE
301	2017-02-23 08:54:16	CST	Yes	KTM	USGS	1540	7.83	0.00	0.20	Good	Clear	NONE
300	2017-01-06 11:07	CST	Yes	KTM	USGS	224	6.86	0.00	0.80	Poor	IceCover	NONE
299	2016-11-30 13:06:30	CST	Yes	KTM	USGS	1060	7.15	0.00	0.50	Good	Clear	NONE
298	2016-10-13 12:30:16	CDT	Yes	BME	USGS	463	6.31	0.01	0.20	Good	VegetationLight	NONE
297	2016-08-23 14:26:30	CDT	Yes	BME	USGS	295	6.19	0.00	0.20	Good	VegetationLight	NONE
296	2016-07-26 11:31:30	CDT	Yes	APM	USGS	332	6.23	0.00	0.90	Fair	VegetationModerate	NONE
295	2016-07-26 11:24:28	CDT	Yes	APM	USGS	366	6.23	0.00	0.30	Fair	VegetationModerate	NONE
294	2016-06-22 14:15:30	CDT	Yes	BME	USGS	326	5.99	0.00	0.20	Good	Clear	NONE
293	2016-05-03 12:52:30	CDT	Yes	BME	USGS	549	6.33	0.00	0.20	Good	Clear	NONE
292	2016-03-22 13:41:27	CDT	Yes	BME	USGS	1050	7.11	0.00	0.20	Good	Clear	NONE
291	2016-02-19 15:00:30	CST	Yes	BME	USGS	405	8.73	-0.02	0.50	Poor	IceCover	NONE
290	2015-12-16 14:32:30	CST	Yes	BME	USGS	1710	8.20	0.00	0.20	Good	Clear	NONE
289	2015-11-20 12:05	CST	Yes	BME	USGS	595	6.45	0.01	0.20	Good	Clear	NONE

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288	2015-10-14 13:36:30	CDT	Yes	BME	USGS	135	5.52	0.01	0.50	Fair	DebrisLight	NONE
287	2015-09-19 12:52	CDT	Yes	APM	USGS	490	6.42	0.00	0.40	Good	DebrisModerate	NONE
286	2015-07-31 13:15	CDT	Yes	BME	USGS	122	5.56	-0.01	0.70	Good	DebrisModerate	NONE
285	2015-06-04 12:16:30	CDT	Yes	BME	USGS	637	6.53	-0.01	0.20	Good	DebrisLight	NONE
284	2015-04-15 10:52	CDT	Yes	BME	USGS	1600	7.89	0.00	0.30	Good	Clear	NONE
283	2015-04-10 14:39	CDT	Yes	BME	USGS	3790	10.88	0.01	0.20	Good	Clear	NONE
282	2015-03-31 13:13	CDT	Yes	BME	USGS	353	5.90	-0.01	0.20	Good	Clear	NONE
281	2015-01-27 13:23:30	CST	Yes	bme/cru	USGS	227	6.42	0.01	0.60	Poor	IceCover	NONE
280	2014-12-03 12:05:30	CST	Yes	BME/CRU	USGS	435	6.60	0.00	0.30	Good	IceCover	NONE
279	2014-10-02 13:44:30	CDT	Yes	BME	USGS	234	5.74	-0.01	0.20	Good	Clear	NONE
278	2014-09-16 14:29	CDT	Yes	BME	USGS	240	5.82	0.00	0.20	Good	DebrisLight	NONE
277	2014-08-20 11:58:30	CDT	Yes	BME	USGS	688	6.47	0.00	0.20	Good	Clear	NONE
276	2014-07-10 11:49	CDT	Yes	BME	USGS	781	6.57	0.00	0.70	Good	Clear	NONE
275	2014-05-13 13:07	CDT	Yes	BME	USGS	1670	7.93	0.03	0.20	Good	Clear	NONE
274	2014-04-15 13:34:30	CDT	Yes	BME	USGS	4170	11.26	-0.01	0.20	Good	Clear	NONE
273	2014-04-02 12:39	CDT	Yes	BME	USGS	1040	7.02	0.00	0.30	Good	Clear	NONE
272	2014-03-11 12:44	CDT	Yes	BME/KRR	USGS	304	7.28	0.02	0.70	Fair	IceCover	NONE
271	2014-01-24 12:58	CST	Yes	BME/KRR	USGS	173	6.61	0.01	0.90	Fair	IceCover	NONE
270	2013-12-05 14:00	CST	Yes	BME	USGS	446	6.13	0.00	0.20	Good	Clear	NONE
269	2013-10-21 13:55:30	CDT	Yes	BME	USGS	233	5.77	0.01	0.20	Good	DebrisLight	NONE
268	2013-09-17 14:32	CDT	Yes	BME	USGS	166	5.82	0.00	0.20	Fair	VegetationModerate	NONE
267	2013-08-27 14:18	CDT	Yes	BME	USGS	116	5.66	0.00	0.50	Fair	VegetationModerate	NONE
266	2013-08-02 14:03	CDT	Yes	BME	USGS	242	5.83	-0.01	0.50	Fair	VegetationModerate	NONE
265	2013-07-11 12:01	CDT	Yes	BME	USGS	320	5.89	0.00	0.20	Good	VegetationLight	NONE
264	2013-05-30 12:40	CDT	Yes	bme	USGS	1080	7.10	-0.01	0.20	Good	Clear	NONE
263	2013-04-12 13:11	CDT	Yes	bme	USGS	5480	12.21	0.00	0.20	Good	Clear	NONE
262	2013-04-01 14:07:30	CDT	Yes	bme	USGS	2660	9.28	-0.01	0.20	Good	Clear	NONE
261	2013-03-27 12:05:30	CDT	Yes	bme	USGS	727	6.57	0.00	0.20	Good	Clear	NONE
260	2013-01-10 12:50:30	CST	Yes	BME	USGS	214	6.18	0.00	0.20	Good	IceCover	NONE
259	2012-11-19 13:02	CST	Yes	BME	USGS	138	5.49	0.00	0.50	Fair	Clear	NONE
258	2012-10-09 13:10	CDT	Yes	BME	USGS	60.1	5.26	0.00	0.40	Good	Clear	NONE
257	2012-09-14 13:56	CDT	Yes	BME	USGS	60.5	5.44	0.00	0.50	Good	VegetationModerate	NONE
256	2012-08-07 13:13:30	CDT	Yes	BME	USGS	71.6	5.58	0.00	0.50	Fair	VegetationModerate	NONE
255	2012-07-10 12:12	CDT	Yes	BME	USGS	66.8	5.51	0.00	0.50	Good	VegetationModerate	NONE
254	2012-06-19 13:19	CDT	Yes	BME	USGS	113	5.53	0.00	0.50	Good	VegetationModerate	NONE
253	2012-05-08 12:48	CDT	Yes	BME	USGS	1430	7.54	0.00	0.20	Good	Clear	NONE

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252	2012-03-26 13:36:30	CDT	Yes	BME	USGS	926	6.83	0.00	0.20	Good	Clear	NONE
251	2012-02-21 12:53:30	CST	Yes	BME	USGS	323	5.86	0.00	0.30	Good	Clear	NONE
250	2012-01-06 13:38:30	CST	Yes	BME	USGS	346	6.10	-0.01	0.30	Fair	IceShore	NONE
249	2011-11-21 14:42:30	CST	Yes	BME	USGS	412	6.03	0.00	0.20	Good	Clear	NONE
248	2011-10-06 12:35	CDT	Yes	BME	USGS	313	5.96	0.00	0.30	Good	DebrisLight	NONE
247	2011-09-20 13:34	CDT	Yes	BME	USGS	188	5.80	0.00	0.60	Good	DebrisLight	NONE
246	2011-08-25 12:17	CDT	Yes	BME	USGS	142	5.84	0.00	0.50	Fair	DebrisModerate	NONE
245	2011-08-09 13:19	CDT	Yes	BME	USGS	171	5.85	0.00	0.50	Good	DebrisModerate	NONE
244	2011-07-19 13:26:30	CDT	Yes	BME	USGS	123	5.63	0.01	0.70	Good	DebrisLight	NONE
243	2011-06-02 15:35:30	CDT	Yes	BME/CLU	USGS	424	6.09	0.00	0.10	Good	Clear	NONE
242	2011-05-04 14:01	CDT	Yes	BME	USGS	1270	7.32	-0.01	0.30	Good	Clear	NONE
241	2011-03-23 13:09:30	CDT	Yes	BME	USGS	3800	10.72	-0.03	0.60	Good	Clear	NONE
240	2011-03-17 13:56:30	CDT	Yes	BME	USGS	1410	7.55	0.03	0.30	Good	Clear	NONE
239	2011-02-04 14:10:30	CST	Yes	BME	USGS	191	6.86	0.01	0.60	Fair	IceCover	NONE
238	2010-11-29 13:00	CST	Yes	BME	USGS	269	5.82	-0.01	0.30	Good	Clear	NONE
237	2010-10-15 15:26	CDT	Yes	BME	USGS	140	5.63	0.00	0.40	Good	DebrisLight	NONE
236	2010-09-09 13:49	CDT	Yes	ZTS	USGS	304	6.17	0.01	0.40	Good	VegetationModerate	NONE
235	2010-07-27 13:46	CDT	Yes	BME	USGS	1380	7.70	-0.02	0.20	Good	DebrisLight	NONE
234	2010-07-01 11:16:30	CDT	Yes	BME	USGS	355	6.13	0.00	0.30	Good	DebrisLight	NONE
233	2010-06-14 15:25:30	CDT	Yes	BME	USGS	334	5.99	0.00	0.40	Good	Clear	NONE
232	2010-05-03 12:51:30	CDT	Yes	BME	USGS	1110	7.11	0.00	0.30	Good	Clear	NONE
231	2010-03-16 12:38	CDT	Yes	BME	USGS	2310	8.88	0.00	0.30	Good	Clear	NONE
230	2010-02-25 13:46	CST	Yes	BME	USGS	307	6.98	-0.06	0.30	Fair	IceShore	NONE
229	2010-01-14 11:55:30	CST	Yes	BME/ZTS	USGS	380	8.24	0.03	1.10	Poor	IceCover	NONE
228	2009-12-04 13:12	CST	Yes	BME	USGS	286	5.89	0.01	0.30	Good	Clear	NONE
227	2009-10-14 11:36	CDT	Yes	BME	USGS	170	5.63	0.01	0.50	Good	DebrisLight	NONE
226	2009-08-19 13:16:30	CDT	Yes	TLH	USGS	172	5.85	0.00	0.70	Good	VegetationModerate	NONE
225	2009-07-14 10:44	CDT	Yes	TLH	USGS	149	5.59	0.00	0.50	Good	Clear	NONE
224	2009-06-10 11:57	CDT	Yes	TLH	USGS	1330	7.55	-0.01	0.20	Good	Clear	NONE
223	2009-04-29 10:24	CDT	Yes	TLH	USGS	2600	9.42	0.00	0.20	Good	Clear	NONE
222	2009-03-19 13:42	CDT	Yes	TLH	USGS	1750	8.18	-0.01	0.20	Fair	Clear	NONE
221	2009-03-09 12:41	CDT	Yes	TLH	USGS	2900	11.44	-0.04	0.20	Good	IceShore	NONE
220	2009-02-05 13:15	CST	Yes	TLH	USGS	199	6.79	-0.05	0.50	Poor	IceCover	NONE
219	2008-12-12 15:08	CST	Yes	TLH	USGS	288	7.19	-0.05	1.10	Poor	IceCover	NONE
218	2008-10-16 14:36	CDT	Yes	TLH	USGS	210	5.79	0.00	0.70	Good	DebrisLight	NONE
217	2008-09-18 13:02	CDT	Yes	TLH	USGS	259	5.86	0.00	0.70	Good	DebrisLight	NONE

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216	2008-08-12 11:31	CDT	Yes	TLH	USGS	233	5.76	0.00	0.90	Good	Clear	NONE
215	2008-07-17 15:01	CDT	Yes	TLH	USGS	564	6.35	0.00	0.20	Good	Clear	NONE
214	2008-06-09 14:10	CDT	Yes	HLH/TLH	USGS	6180	13.12	0.01	0.30	Good	Clear	NONE
213	2008-05-12 12:40	CDT	Yes	TLH	USGS	571	6.36	0.00	0.80	Good	Clear	NONE
212	2008-03-28 11:07	CDT	Yes	TLH	USGS	1880	8.31	0.01	0.20	Good	Clear	NONE
211	2008-02-29 11:28	CST	Yes	TLH	USGS	515	8.25	0.01	0.80	Poor	IceCover	NONE
210	2008-01-16 10:26	CST	Yes	TLH/KDR	USGS	831	7.41			Fair	IceShore	NONE
209	2007-11-28 12:18	CST	Yes	TLH	USGS	104	5.42	0.01	0.60	Good	IceShore	NONE
208	2007-10-10 11:43	CDT	Yes	BME	USGS	137	5.57	-0.01	0.50	Good	DebrisLight	NONE
207	2007-08-23 13:09	CDT	Yes	TLH	USGS	2350	9.49	-0.03	0.20	Good	DebrisModerate	NONE
206	2007-06-21 13:43	CDT	Yes	BME	USGS	142	5.69	0.00	0.40	Good	DebrisModerate	NONE
205	2007-05-04 12:03	CDT	Yes	BME/BJS	USGS	1010	7.11	0.00	0.40	Good	Clear	NONE
204	2007-03-16 13:24	CDT	Yes	BME	USGS	3180	10.01	-0.04	0.40	Good	Clear	NONE
203	2007-02-23 14:04	CST	Yes	BME	USGS	223	6.84			Fair	IceCover	NONE
202	2006-12-04 14:00	CST	Yes	BME	USGS	353	6.24	0.09	0.50	Good	IceShore	NONE
201	2006-10-11 15:41	CDT	Yes	BME	USGS	163	5.63	0.00	0.50	Good	DebrisLight	NONE
200	2006-08-21 16:44	CDT	Yes	RTJ/BJS	USGS	78.7	5.67	-0.01	0.80	Fair	DebrisHeavy	NONE
199	2006-06-29 09:39	CDT	Yes	RTJ	USGS	128	5.57	0.01	0.60	Good	DebrisLight	NONE
198	2006-04-24 13:00	CDT	Yes	RTJ	USGS	360	6.02	0.01	0.60	Good	Clear	NONE
197	2006-03-20 13:11	CST	Yes	RTJ/TLH	USGS	885	6.87	0.00	0.20	Good	Clear	NONE
196	2006-01-19 15:37	CST	Yes	TLH	USGS	189	5.66	0.01	0.30	Fair	Clear	NONE
195	2005-12-22 14:30	CST	Yes	DEH/TLH	USGS	103	6.17	0.01	0.80	Poor	IceCover	NONE
194	2005-10-04 12:26	CDT	Yes	TLH	USGS	81.9	5.43	0.00	0.40	Good	Clear	NONE
193	2005-09-13 13:55	CDT	Yes	TLH	USGS	58.4	5.53	0.01	0.60	Good	VegetationLight	NONE
192	2005-08-22 14:21	CDT	Yes	TLH	USGS	58.8	5.58	0.00	0.60	Good	VegetationLight	NONE
191	2005-06-30 10:59	CDT	Yes	TLH	USGS	97.9	5.72	0.02	0.70	Good	VegetationLight	NONE
190	2005-05-24 12:03	CDT	Yes	TLH	USGS	398	6.09	0.00	0.80	Good	Clear	NONE
189	2005-03-31 10:41	CST	Yes	TLH	USGS	1990	8.40	0.00	0.30	Fair	Clear	NONE
188	2005-01-20 11:57	CST	Yes	HLH/TLH	USGS	223	7.22	-0.01	0.50	Poor	IceCover	NONE
187	2004-11-11 13:01	CST	Yes	HLH/TLH	USGS	216	5.77	0.00	0.80	Good	Clear	NONE
186	2004-09-27 12:45	CDT	Yes	TLH	USGS	142	5.68	0.00	0.80	Good	DebrisHeavy	NONE
185	2004-08-31 09:50	CDT	Yes	HLH/TLH	USGS	263	5.91	0.00	0.60	Good	VegetationLight	NONE
184	2004-07-26 10:50	CDT	Yes	TLH	USGS	301	5.88	0.00	1.00	Good	Clear	NONE
183	2004-06-16 10:57	CDT	Yes	TLH/DLO	USGS	4320	11.42	-0.01	0.20	Good	Clear	NONE
182	2004-05-25 12:50	CDT	Yes	HLH/TLH	USGS	5230	12.17	0.00	0.70	Fair	Clear	NONE
181	2004-05-18 12:35	CDT	Yes	HLH/TLH	USGS	1520	7.96	-0.01	0.80	Fair	Clear	NONE

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180	2004-03-16 11:40	CST	Yes	TLH	USGS	665	6.60	0.00	0.90	Good	Clear	NONE
179	2004-02-02 12:30	CST	Yes	HLH/TLH	USGS	117	6.28			Poor	IceCover	NONE
178	2003-10-15 12:50	CDT	Yes	DEH	USGS	81.0	5.42	0.00	0.40	Good	DebrisLight	NONE
177	2003-08-12 12:40	CDT	Yes	DEH	USGS	144	5.96	0.00	0.50	Good	DebrisHeavy	NONE
176	2003-06-16 10:07	CDT	Yes	DEH	USGS	234	5.79	0.00	1.50	Good	DebrisLight	NONE
175	2003-04-02 12:15	CST	Yes	DEH	USGS	319	5.93	-0.01	0.40	Good	Clear	NONE
174	2003-03-07 10:53	CST	Yes	HLH/DEH	USGS	107	6.44	0.00	0.50	Poor	IceCover	NONE
173	2003-01-30 11:37	CST	Yes	DEH/HLH	USGS	53.4	6.20	0.00	0.40	Poor	IceCover	NONE
172	2002-12-19 12:36	CST	Yes	DEH	USGS	236	5.88	0.00	0.40	Fair	Unspecifed	NONE
171a	2002-10-16 19:00	CDT	Yes	AAA	USGS	51.0				Fair		NONE
171	2002-09-30 10:49	CDT	Yes	DEH	USGS	141	5.78	0.00	0.50	Fair	DebrisModerate	NONE
170a	2002-09-18 19:00	CDT	Yes	AAA	USGS	122				Fair		NONE
170	2002-08-29 11:53	CDT	Yes	DEH	USGS	168	6.03	0.01	1.00	Fair	DebrisHeavy	NONE
169a	2002-08-20 19:00	CDT	Yes	AAA	USGS	109				Fair		NONE
169	2002-07-30 10:20	CDT	Yes	DEH	USGS	141	5.95	-0.01	1.00	Fair	DebrisHeavy	NONE
168b	2002-07-16 19:00	CDT	Yes	AAA	USGS	271				Fair		NONE
168a	2002-06-18 19:00	CDT	Yes	AAA	USGS	312				Fair		NONE
168	2002-06-06 11:30	CDT	Yes	DEH	USGS	847	6.98	0.00	1.00	Fair	Clear	NONE
167a	2002-05-22 19:00	CDT	Yes	AAA	USGS	249				Fair		NONE
167	2002-04-01 14:22	CST	Yes	DEH	USGS	471	6.26	0.00	1.00	Fair	Clear	NONE
166	2001-11-28 12:05	CST	Yes	DEH	USGS	399	6.16	0.00	1.00	Fair	DebrisLight	NONE
165	2001-10-04 13:55	CDT	Yes	DEH	USGS	236	5.94	0.00	1.00	Fair	DebrisModerate	NONE
164	2001-07-26 12:53	CDT	Yes	DEH	USGS	180	5.95	-0.01	0.50	Fair	DebrisModerate	NONE
163	2001-05-02 15:01	CDT	Yes	DEH	USGS	423	6.15	0.00	0.50	Fair	DebrisLight	NONE
162	2001-01-09 13:45	CST	Yes	DEH/HLH	USGS	217	7.02	-0.01	1.00	Poor	IceCover	NONE
161	2000-11-14 13:24	CST	Yes	DEH	USGS	324	6.11	0.00	0.60	Fair	DebrisLight	NONE
160	2000-09-19 12:38	CDT	Yes	DEH	USGS	340	6.33	0.00	0.50	Poor	DebrisHeavy	NONE
159	2000-07-14 11:52	CDT	Yes	DEH	USGS	353	6.18	-0.01	0.50	Fair	DebrisModerate	NONE
158	2000-05-25 14:05	CDT	Yes	DEH	USGS	680	6.66	-0.02	0.60	Fair	DebrisLight	NONE
157	2000-03-21 10:45	CST	Yes	DEH	USGS	395	6.15	0.00	0.60	Good	Clear	NONE
156	2000-01-19 12:10	CST	Yes	DEH/DLO	USGS	198	6.60	0.00	0.80	Poor	IceCover	NONE
155	1999-11-04 09:05	CST	Yes	KRK	USGS	138	5.57	0.00	0.40	Fair	DebrisLight	NONE
154	1999-09-07 13:55	CDT	Yes	DEH	USGS	132	5.76	0.00	0.60	Fair	DebrisHeavy	NONE
153	1999-07-08 11:58	CDT	Yes	DEH	USGS	219	5.82	-0.01	0.50	Fair	DebrisModerate	NONE
152	1999-05-07 12:00	CDT	Yes	DEH	USGS	800	6.82	0.02	0.50	Good	Clear	NONE
151	1999-03-16 11:56	CST	Yes	DEH	USGS	338	5.98	0.00	0.60	Good	Clear	NONE

Meas. Number	Date	Time	Time Datum	Measurement Used?	Who	Measuring Agency	Stream flow (ft³/s)	Gage Height (ft)	GH Change (ft)	Meas. Duration (hr)	Meas. Rated	(	
150	1999-01-19	12:15	CST	Yes	DEH/DLO	USGS	218	6.80	0.00	0.70	Poor	IceCover	NONE
149	1998-11-18	14:10	CST	Yes	DEH	USGS	238	5.81	0.00	0.60	Good	Clear	NONE
148	1998-09-21	14:00	CDT	Yes	DEH	USGS	120	5.62	0.00	0.60	Poor	DebrisModerate	NONE
147	1998-07-07	14:47	CDT	Yes	DEH	USGS	192	5.80	0.00	0.60	Fair	DebrisModerate	NONE
146	1998-04-23	12:26	CDT	Yes	DEH	USGS	1150	7.64	0.00	1.00	Fair		NONE
145	1998-01-27	11:15	CST	Yes	DEH/DLO	USGS	242	7.38			Poor	IceCover	NONE
144	1997-11-13	12:25	CST	Yes	DEH	USGS	146	5.62	0.00	0.80	Fair	DebrisModerate	NONE
143	1997-08-21	10:57	CDT	Yes	DEH	USGS	403	6.34			Good	DebrisHeavy	NONE
142	1997-06-04	14:07	CDT	Yes	DEH	USGS	241	5.92	0.00		Good	DebrisModerate	NONE
141	1997-04-08	13:55	CDT	Yes	DEH	USGS	754	6.83			Fair	Clear	NONE
140	1997-01-15	10:20	CST	Yes	DLO/DEH	USGS	292	8.70			Poor	IceCover	NONE
139	1996-12-04	13:36	CST	Yes	DEH	USGS	332	5.90	-0.01	0.80	Good	Unspecifed	NONE
138	1996-10-08	11:19	CDT	Yes	DEH	USGS	176	5.73	0.00	1.00	Good	DebrisModerate	NONE
137	1996-08-07	12:18	CDT	Yes	DEH	USGS	343	6.04	0.00	1.00	Good	DebrisLight	NONE
136	1996-06-18	11:00	CDT	Yes	DLO	USGS	4060	11.56	0.17	1.80	Fair	Unspecifed	NONE
135	1996-06-12	12:15	CDT	Yes	DEH	USGS	1710	8.15	-0.06	1.00	Fair	Unspecifed	NONE
134	1996-04-22	14:14	CDT	Yes	DEH	USGS	1160	7.22	-0.05	2.00	Fair	Unspecifed	NONE
133	1996-02-20	-- --	--	Yes	DEH/HLH	USGS	274	7.06	0.00	0.40	Poor	IceCover	NONE
132	1996-01-11	-- --	--	Yes	DLO/HLH	USGS	113	6.48	0.00	0.60	Poor	IceCover	NONE
131	1995-11-01	11:40	CST	Yes	DLO	USGS	513	6.43	-0.01	0.80	Good	DebrisModerate	NONE
130	1995-09-19	12:35	CDT	Yes	DLO	USGS	131	5.77	0.00	0.80	Poor	DebrisHeavy	NONE
129	1995-07-13	10:55	CDT	Yes	DLO/KDL	USGS	69.3	5.52	0.00	0.60	Poor	DebrisHeavy	NONE
128	1995-05-10	11:50	CDT	Yes	DLO	USGS	564	6.47	0.01	0.70	Good	DebrisLight	NONE
127	1995-03-28	11:45	CST	Yes	DLO	USGS	379	6.04	0.00	0.70	Good	Clear	NONE
126	1995-03-03	10:45	CST	Yes	DLO/BS	USGS	141	6.63	0.10	0.70	Poor	IceCover	NONE
125	1995-01-11	11:10	CST	Yes	DLO	USGS	98.3	6.01	0.00	0.60	Poor	IceCover	NONE
124	1994-11-30	-- --	--	Yes	DLO	USGS	234	5.78	-0.02	0.70	Good	Clear	NONE
123	1994-10-18	11:20	CDT	Yes	DLO	USGS	112	5.53	0.00	0.70	Fair	DebrisModerate	NONE
122	1994-08-31	08:30	CDT	Yes	DLO	USGS	150	5.72	0.00	0.70	Fair	DebrisModerate	NONE
121	1994-07-15	13:50	CDT	Yes	DLO/TEG	USGS	686	6.70	0.00	0.50	Good	DebrisModerate	NONE
120	1994-05-18	11:30	CDT	Yes	DLO	USGS	224	5.85	0.00	0.50	Poor	VegetationLight	NONE
119	1994-04-01	13:05	CST	Yes	DLO	USGS	693	6.65	0.00	0.70	Good	Clear	NONE
118	1994-02-16	07:55	CST	Yes	DLO/MD	USGS	110	6.99	0.00	0.60	Poor	IceCover	NONE
117	1994-01-13	08:45	CST	Yes	DLO/MD	USGS	122	6.51	0.00	0.80	Poor	IceCover	NONE
116	1993-11-16	09:50	CST	Yes	DLO	USGS	335	5.96	0.00	0.80	Fair	Clear	NONE
115	1993-09-15	12:15	CDT	Yes	DLO	USGS	903	7.02	0.00	1.00	Fair	Unspecifed	NONE

Meas. Number	Date Time	Time Datum	Measurement Used?	Who	Measuring Agency	Stream flow (ft³/s)	Gage Height (ft)	GH Change (ft)	Meas. Duration (hr)	Meas. Rated	(	
114	1993-08-05 11:25	CDT	Yes	DLO/PJO	USGS	260	5.91	0.00	0.70	Fair	DebrisModerate	NONE
113	1993-05-27 11:45	CDT	Yes	DLO	USGS	613	6.58	-0.01	0.80	Good	DebrisModerate	NONE
112	1993-03-31 11:45	CST	Yes	DLO	USGS	2250	9.17	0.03	0.80	Fair	Unspecifed	NONE
111	1993-02-23 12:15	CST	Yes	DLO/HLH	USGS	233	7.54	0.02	0.70	Poor	IceCover	NONE
110	1992-11-17 11:15	CST	Yes	DLO	USGS	311	5.94	0.00	0.80	Good	Clear	NONE
109	1992-10-14 11:30	CDT	Yes	DLO	USGS	121	5.53	0.00	0.80	Fair	DebrisModerate	NONE
108	1992-08-13 11:55	CDT	Yes	DLO	USGS	117	5.52	0.00	0.80	Poor	DebrisModerate	NONE
107	1992-06-19 11:50	CDT	Yes	DLO	USGS	170	5.68	0.00	0.80	Fair	DebrisLight	NONE
106	1992-05-06 11:35	CDT	Yes	DLO	USGS	424	6.16	0.01	0.60	Fair		NONE
105	1992-03-27 11:50	CST	Yes	DLO	USGS	1050	7.20	0.00	0.50	Fair	Clear	NONE
104	1992-02-26 11:30	CST	Yes	DLO	USGS	282	5.94	-0.01	0.80	Fair	IceShore	NONE
103	1992-01-14 10:55	CST	Yes	DLO/TS	USGS	516	6.40	-0.08	0.50	Fair	IceShore	NONE
102	1991-10-09 12:45	CDT	Yes	DLO	USGS	256	5.85	0.00	0.70	Fair	DebrisModerate	NONE
101	1991-08-28 10:25	CDT	Yes	DLO	USGS	99.8	5.51	0.00	0.80	Fair	DebrisModerate	NONE
100	1991-06-27 11:10	CDT	Yes	DLO/SS	USGS	252	5.86	0.00	0.70	Fair	DebrisModerate	NONE
99	1991-05-16 10:30	CDT	Yes	DLO	USGS	261	5.89	0.00	0.80	Fair	Clear	NONE
98	1991-03-25 12:15	CST	Yes	DLO	USGS	1290	7.48	-0.01	1.10	Fair	Unspecifed	NONE
97	1991-02-21 11:00	CST	Yes	DLO	USGS	279	6.85	0.02	1.00	Poor	IceCover	NONE
96	1991-01-16 10:45	CST	Yes	DLO/TS	USGS	189	6.58	0.00	0.70	Poor	IceCover	NONE
95	1990-12-14 10:10	CST	Yes	DLO	USGS	314	6.07	-0.12	0.70	Fair		NONE
94	1990-10-31 10:15	CST	Yes	DLO	USGS	177	5.64	0.01	0.80	Fair	DebrisLight	NONE
93	1990-09-20 10:20	CDT	Yes	DLO	USGS	258	5.86	0.00	0.80	Fair	DebrisModerate	NONE
92	1990-08-09 11:50	CDT	Yes	DLO	USGS	121	5.56	0.00	0.80	Fair	DebrisModerate	NONE
91	1990-06-28 13:15	CDT	Yes	DLO/DJS	USGS	428	6.21	0.01	0.70	Fair	DebrisLight	NONE
90	1990-05-23 12:10	CDT	Yes	DLO	USGS	913	6.76	0.00	0.80	Fair	Unspecifed	NONE
89	1990-04-18 10:40	CDT	Yes	DLO	USGS	470	6.20	0.00	0.70	Fair	VegetationLight	NONE
88	1990-03-14 10:35	CST	Yes	DLO	USGS	2780	9.72	0.04	1.50	Fair	Unspecifed	NONE
87	1990-03-13 10:45	CST	Yes	DLO	USGS	2410	9.45	0.00	1.10	Fair	Unspecifed	NONE
86	1990-01-29 11:25	CST	Yes	DLO	USGS	321	7.31			Poor	IceCover	NONE
85	1989-10-23 11:40	CDT	Yes	DLO	USGS	212	5.75	0.00	0.80	Fair	DebrisLight	NONE
84	1989-08-29 11:55	CDT	Yes	DLO	USGS	202	5.76	0.00	0.70	Fair	DebrisLight	NONE
83	1989-07-06 12:00	CDT	Yes	DLO	USGS	132	5.53	0.01	0.70	Fair	DebrisModerate	NONE
82	1989-05-17 10:40	CDT	Yes	DLO	USGS	190	5.77	0.01	0.70	Fair	DebrisLight	NONE
81	1989-04-05 12:10	CDT	Yes	DLO	USGS	1010	7.08	-0.01	1.10	Fair	Clear	NONE
80	1989-02-23 10:55	CST	Yes	DLO/RJW	USGS	110				Poor	IceCover	NONE
79	1989-01-11 10:25	CST	Yes	DLO/RJW	USGS	298	8.77			Poor	IceCover	NONE

Meas. Number	Date Time	Time Datum	Measurement Used?	Who	Measuring Agency	Stream flow (ft^3/s)	Gage Height (ft)	GH Change (ft)	Meas. Duration (hr)	Meas. Rated		
78	1988-12-02 -- --	--	Yes	DLO	USGS	408	6.16	-0.01	0.80	Fair	Clear	NONE
77	1988-10-27 10:10	CDT	Yes	DLO	USGS	257	5.82	0.00	0.80	Fair	Clear	NONE
76	1988-09-15 12:05	CDT	Yes	DLO	USGS	65.1	5.37	0.00	0.80	Fair	Clear	NONE
75	1988-08-04 -- --	--	Yes	DLO	USGS	50.0	5.30	0.00	0.90	Fair		NONE
74	1988-06-23 -- --	--	Yes	JI	USGS	91.5	5.56	0.00	1.70	Good		NONE
73	1988-05-13 -- --	--	Yes	DLO	USGS	247	5.93	0.00	0.90	Fair		NONE
72	1988-03-23 -- --	--	Yes	DLO	USGS	413	6.11	0.00	0.80	Fair		NONE
71	1988-02-18 -- --	--	Yes	DLO/HLH	USGS	232	7.78	0.04	0.90	Poor	IceCover	NONE
70	1987-12-17 -- --	--	Yes	HLH	USGS	380	6.08	-0.04	0.80	Good		NONE
69	1987-11-09 -- --	--	Yes	HLH	USGS	283	5.88	0.00	0.80	Good		NONE
68	1987-10-01 -- --	--	Yes	HLH	USGS	284	5.86	-0.01	0.80	Good		NONE
67	1987-08-09 -- --	--	Yes	HLH	USGS	887	6.96	-0.03	0.80	Good		NONE
66	1987-07-01 -- --	--	Yes	HLH	USGS	85.6	5.46			Unspecified		NONE
65	1987-05-21 -- --	--	Yes	HLH	USGS	336	6.07			Unspecified		NONE
64	1987-04-07 -- --	--	Yes	KRK	USGS	525	6.23			Unspecified		NONE
63	1987-02-23 -- --	--	Yes	HLH	USGS	286	5.99			Unspecified		NONE
62	1987-01-09 -- --	--	Yes	HLH	USGS	196	5.83			Unspecified		NONE
61	1986-12-01 -- --	--	Yes	HLH	USGS	496	6.21			Unspecified		NONE
60	1986-11-06 -- --	--	Yes	HLH	USGS	493	6.17			Unspecified		NONE
59	1986-10-20 -- --	--	Yes	HLH	USGS	756	6.68			Unspecified		NONE
58	1986-09-12 -- --	--	Yes	KRK/JH	USGS	3970	11.22			Good	Clear	NONE
57	1986-09-11 -- --	--	Yes	KRK/JH	USGS	4720	11.94			Good	Clear	NONE
56	1986-09-09 -- --	--	Yes	KK	USGS	137	5.54			Good	Clear	NONE
55	1986-07-28 -- --	--	Yes	KRK	USGS	207	5.79			Unspecified	Clear	NONE
54	1986-06-03 -- --	--	Yes	KK	USGS	214	5.85	0.00		Fair		NONE
53	1986-04-04 -- --	--	Yes	HLH	USGS	1240	7.38			Good	Clear	NONE
52	1986-02-25 -- --	--	Yes	HLH/JH	USGS	447	7.56			Good	IceCover	NONE
51	1986-02-04 -- --	--	Yes	HLH/JH	USGS	415	7.53			Good	IceCover	NONE
50	1986-01-23 -- --	--	Yes	HLH/JH	USGS	495	7.66			Good	IceCover	NONE
49	1985-12-16 -- --	--	Yes	HLH/JH	USGS	570	9.52			Fair	IceCover	NONE
48	1985-11-19 -- --	--	Yes	HLH/JH	USGS	2490	9.63			Good	Clear	NONE
47	1985-10-01 -- --	--	Yes	BKH	USGS	227	5.76			Good	Clear	NONE
42	1985-01-24 -- --	--	Yes	Han War	USGS	421	9.22			Poor	IceCover	NONE
41	1984-11-29 -- --	--	Yes	Goddard	USGS	833	6.82			Good	Clear	NONE
29	1983-12-05 -- --	--	Yes	Boetcher	USGS	585	6.37			Good	Clear	NONE
23	1983-05-05 -- --	--	Yes	Boetcher	USGS	563	6.32			Good	Clear	NONE

Meas. Number	Date Time	Time Datum	Measurement Used?	Who	Measuring Agency	Stream flow (ft^3/s)	Gage Height (ft)	GH Change (ft)	Meas. Duration (hr)	Meas. Rated	(	
22	1983-04-25 -- --	--	Yes	Boetcher	USGS	695	6.70			Good	Clear	NONE
21	1983-04-04 -- --	--	Yes	Boet McF	USGS	2950	9.64			Good	Clear	NONE
20	1983-03-01 -- --	--	Yes	Boetcher	USGS	837	6.82			Good	Clear	NONE
16	1982-12-08 -- --	--	Yes	Boet McF	USGS	1470	7.93			Good	Clear	NONE
12	1982-04-23 -- --	--	Yes	McFarlan	USGS	975	7.09			Good	Clear	NONE
7	1977-06-14 -- --	--	Yes	McFarlan	USGS	495	12.63			Good	Unspecifed	NONE
6	1977-06-06 19:00	CDT	Yes	AAA	USGS	252				Fair		NONE
5	1977-04-25 19:00	CDT	Yes	AAA	USGS	279				Fair		NONE
4	1977-03-30 -- --	--	Yes	McFarlan	USGS	1010	13.22			Fair	Unspecifed	NONE
3	1976-11-11 18:00	CST	Yes	RDM	USGS	60.8	11.81			Good		NONE
2	1976-10-05 19:00	CDT	Yes	EEZ	USGS	112	12.05			Good		NONE
1	1968-10-02 19:00	CDT	Yes	ZUE	USGS	82.2	14.96			Good		NONE

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Appendix F
Flow Calculations

DESIGN MEMORANDUM

LIFT STATION E & EAST GROWTH AREA FLOWS

City of Mequon

DATE: September 11, 2020

TO: City of Mequon

- Kevin Driscall, P.E. / Deputy Director of Utilities
- Wayne Bernhardt / Wastewater Superintendent

FROM: Applied Technologies, Inc.

- Will Hein, P.E.
- Paul Traeger, P.E.
- Julian Velazquez

This memorandum presents a summary of the existing and projected flows within the Lift Station E (LSE) sewer service shed and the proposed East Growth Area (EGA).

BACKGROUND

The City of Mequon is anticipating additional development in the northeastern edge of the City. The EGA is composed of a mix of rural and agricultural lands, and residential land use where wells and POTWs are required due to the absence of sewer and water utilities. As part of this memorandum the design flow for the EGA were projected in order to determine what capacity a new lift station would need to have in order to service the EGA. Additionally, contributing flows from lift stations within the LSE service area were calculated in order to determine how much capacity could be rerouted from LSE.

SERVICE AREA

The service area for LSE is presented in Figure 1. The service area is fully developed and not expected to have significant population increases. However, infill has continued along the Port Washington Road corridor. Similarly, the EGA planning area is presented in Figure 2. A summary of the existing sewersheds and land uses within the LSE service area and the EGA are presented in Table 1 and Table 2, respectively.

Table 1
Sewershed Summary for LSE

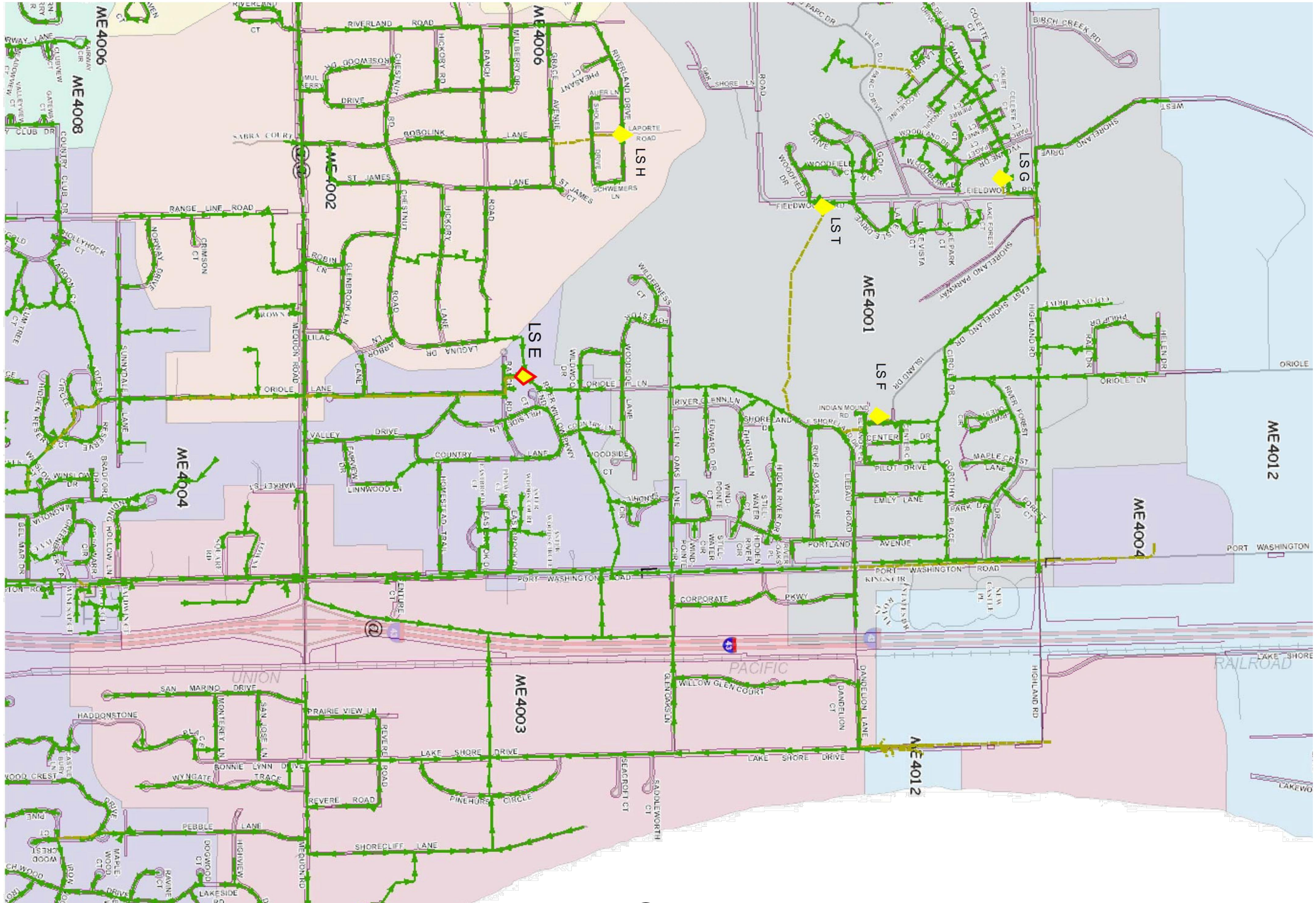
Sewershed	Service Area LSE	
	Total Acres	Acres within LSE
ME4001	1,661	1,445
ME4002	918	918
ME4003	1,433	1,283
ME4004	2,498	462
ME4012	3,852	144
Total	10,362	4,252

Table 2
Existing Land Use Summary for the EGA

Land Use	Service Area East Growth Area Acres
Park	-
Institutional	51
Office/Commercial	161
Residential	272
Total	**484**

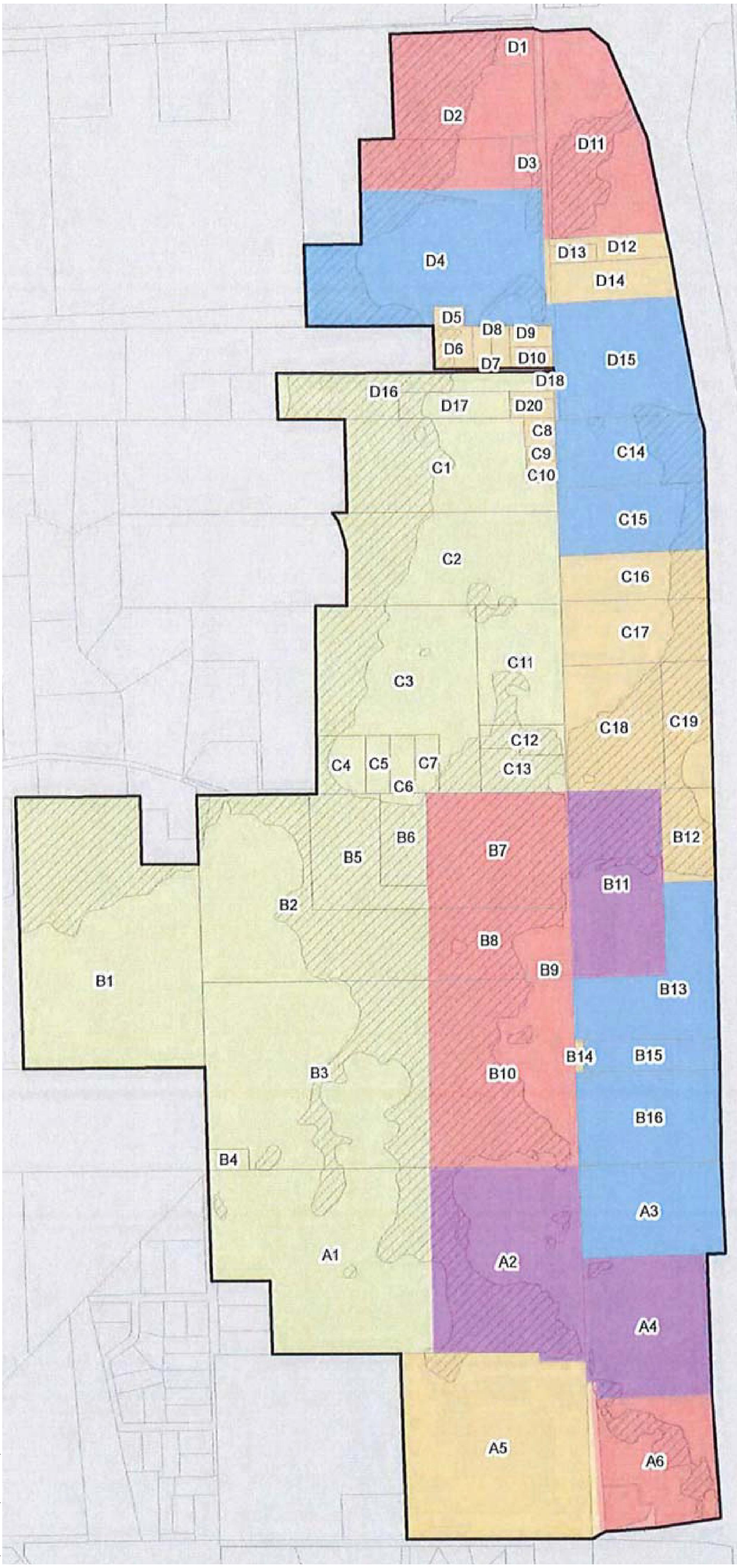
DESIGN FLOWS

Records are available for Lift Station E and its tributary lift stations. However, during 2020 condition assessments of LSE it was established that the values in the records are not reliable. For this reason, estimates for the EGA planning area are undeveloped at this time and design flows must be projected.



AppliedTechnologies
Engineers-Architects

FIGURE 1
LSA SERVICE AREA
MEQUON - LSE



Parcel #	Land Use	Total Area (Acres)	Total Wetland (Acres)	Developable Area (Acres)
D1	4	1.5	0.1	1.4
D2	4	25.6	16.4	9.2
D3	4	1.6	0.4	1.2
D4	3	33.3	11.9	21.4
D5	2	0.8	0.0	0.8
D6	2	2.0	1.0	1.0
D7	2	0.9		0.9
D8	2	0.9		0.9
D9	2	1.1		1.1
D10	2	1.1		1.1
D11	4	22.4	7.0	15.4
D12	2	2.5		2.5
D13	2	1.0		1.0
D14	2	5.7		5.7
D15	3	18.1	0.5	17.6
D16	5	10.0	7.2	2.8
D17	5	3.5	0.8	2.7
D18	2	0.3		0.3
D19	2	0.4		0.4
D20	2	1.0		1.0
	Total Area:	133.5	45.3	88.2

Parcel #	Land Use	Total Area (Acres)	Total Wetland (Acres)	Developable Area (Acres)
C1	5	20.7	10.0	10.8
C2	5	23.6	7.6	16.0
C3	5	27.3	10.1	17.2
C4	5	3.3	1.2	2.1
C5	5	1.7		1.7
C6	5	1.7		1.7
C7	5	1.7	0.1	1.6
C8	2	1.0		1.0
C9	2	0.5		0.5
C10	2	0.8		0.8
C11	5	12.0	1.9	10.1
C12	5	2.6	2.1	0.6
C13	5	4.0	3.6	0.4
C14	3	11.7	4.6	7.1
C15	3	11.6	2.0	9.6
C16	2	8.2	2.1	6.1
C17	2	10.8	2.9	7.9
C18	2	14.4	9.7	4.7
C19	2	7.1	5.6	1.6
	Total Area:	164.8	63.5	101.3

Parcel #	Land Use	Total Area (Acres)	Total Wetland (Acres)	Developable Area (Acres)
B1	5	52.7	18.3	34.5
B2	5	34.1	15.9	18.2
B3	5	47.8	13.7	34.1
B4	5	1.0		1.0
B5	5	10.6	10.6	0.0
B6	5	5.0	4.5	0.5
B7	4	19.3	18.9	0.3
B8	4	11.0	8.4	2.6
B9	4	1.0		1.0
B10	4	32.3	20.9	11.4
B11	1	20.3	8.4	11.9
B12	2	5.8	4.6	1.2
B13	3	16.2		16.2
B14	2	0.3		0.3
B15	3	5.0		5.0
B16	3	15.4		15.4
	Total Area:	278.0	124.3	153.7

Parcel #	Land Use	Total Area (Acres)	Total Wetland (Acres)	Developable Area (Acres)
A1	5	42.6	5.9	36.7
A2	1	33.5	14.1	19.4
A3	3	15.5		15.5
A4	1	20.1	0.9	19.3
A5	2	40.0	1.0	39.0
A6	4	15.1	4.4	10.7
	Total Area:	166.8	26.2	140.6

LEGEND

- Institutional (1)
- Mixed Residential (2)
- Office/Flex (3)
- Retail/Hospitality/Entertainment (4)
- Single-Family Residential (5)
- East Growth Area
- Wetland and Floodplain Extents
- Mequon Parcel

R:\SHARED FOLDERS\PROJECTS\6398 – MEQUON LSE\11.0 GRAPHICS\11.1 FIGURES\FIGURE 2.DWG

AppliedTechnologies
Engineers - Architects

FIGURE 2
EAST GROWTH AREA LAND USE MAKEUP
MEQUON LSE

Parks and Recreation

Several parks and nature reserves are in the service area of Lift Station E. It was assumed that these types of lands do not contribute any significant sanitary flows to the lift station as no collection is known to exist there.

Office/Commercial and Institutional

A 2011 evaluation conducted by AECOM recommended an institutional flow rate of 1,500 gallons/acre-day should be used for commercial and institutional land uses. This value was also used by the Milwaukee Metropolitan Sewerage District in the 2020 Facilities Plan for the City. Office land use is assumed to have the same water generation rates as commercial land use. For the purpose of this report, the water generation rates values stated in the 2011 evaluation will be used.

Residential

A 2012 memo completed by AECOM estimated a residential flow rate of 1,070 gallons/acre-day (Average). This value was determined by dividing the projected average flows by the amount of acreage for predetermined sections of land.

Existing Flows

Existing average and maximum flow values for the LSE and its contributing lift stations were based on the Milwaukee Metropolitan Sewerage District's 2020 Facilities Plan. Table 3 presents the existing flows. It was assumed that the LSE service area was fully developed and therefore any increase in future flows would be insignificant.

Table 3
Existing Flows for Lift Station E Service Area

Sewershed	Sewershed Area (Acres)	Sewershed Area within LSE (Acres)	Average Base Flow (MGD)	Average Dry Weather Infiltration (MGD)	Average Dry Weather Flow (MGD)	Peak RDII (MGD)	Peak Total I/I (MGD)	Peak I/I Rate per Unit Area (MGD)	Peak Hourly Flow (MGD)
ME4001	1,661	1,445	0.20	0.099	0.30	2.7	2.8	1,661	3.0
ME4002	918	918	0.15	0.13	0.28	2.2	2.3	2,517	2.5
ME4003	1,433	1,283	0.31	0.086	0.39	3.1	3.2	2,218	3.5
ME4004	2,498	462	0.12	0.070	0.19	1.4	1.4	572	1.5
ME4012	3,852	144	0.0039	0.0010	0.0049	0.015	0.016	4.1	0.020
Total	10,362	4,252	0.78	0.39	1.17	9.3	9.7	6,972	10.5

13400 Bishop's Lane, Suite 270 • Brookfield, Wisconsin 53005 • Phone (262) 784-7690 • Fax (262) 784-6847

East Growth Area Flows

Average and peak design flow values were developed based upon the expected development in the EGA and the flow criteria developed above. Table 4 presents a summary of the developed proposed flows and expected land use shown in Figure 2 for the EGA.

Table 4
Projected Flow for East Growth Area

Service Area	Type	Area (Acres)	Rate (gpd/acre)	Average Flow (Acreage)		Peak Hour Flow[1]	
				MGD	GPM	MGD	GPM
EGA	Institutional	51	1,500	0.076	53	0.30	212
	Residential	272	1,070	0.29	202	1.2	808
	Office/Commercial	161	1,500	0.24	168	0.97	672
Total	**-**	**484**	**-**	**0.61**	**423**	**2.5**	**1,692**

Notes: 1. Based on a peak hour factor of 4.0.

Projected Flows

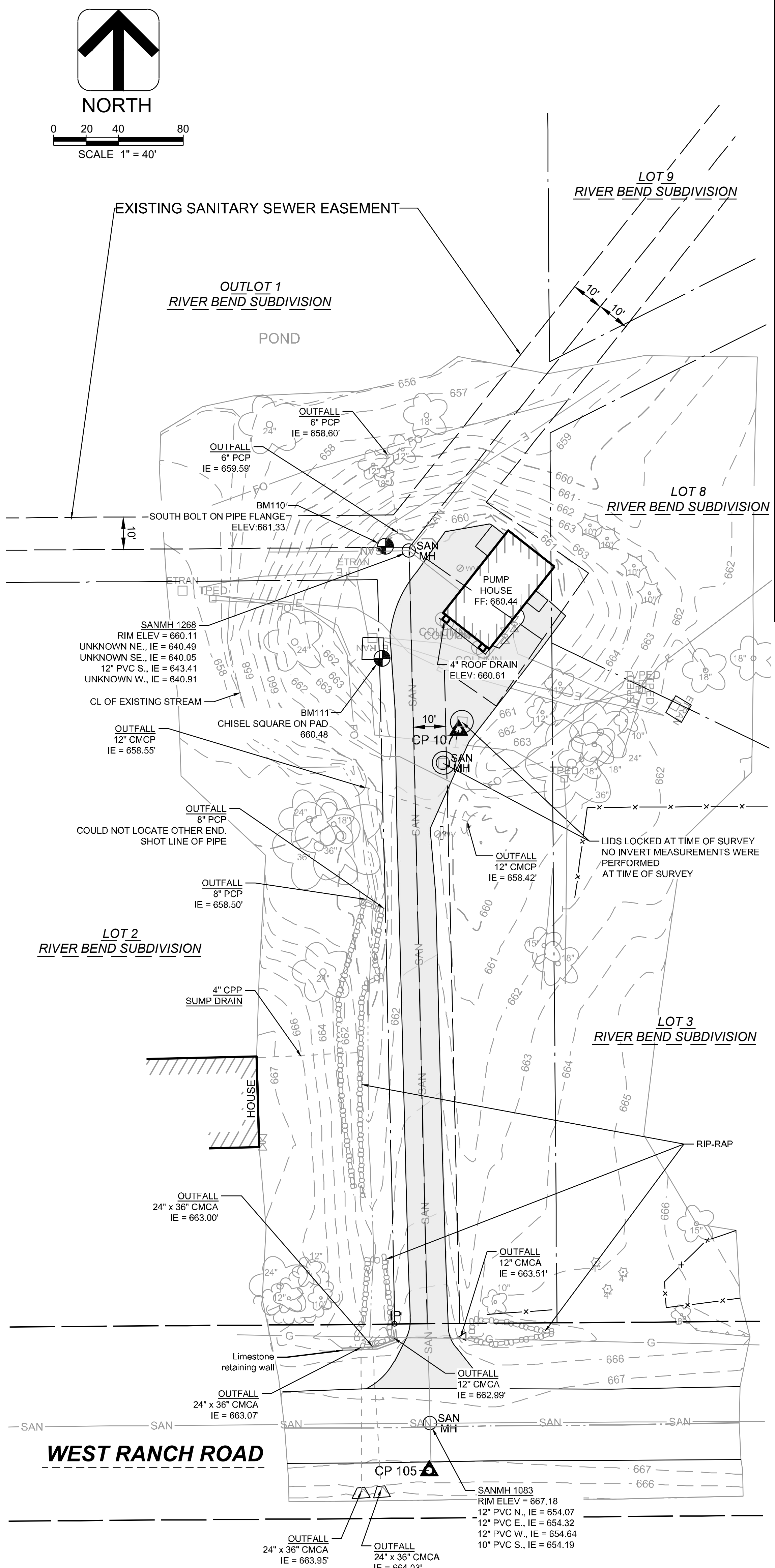
Projected average day and peak hourly flows for the LSE and the EGA are summarized in Table 5.

Table 5
Projected Flows

Service Area	Area (Acres)	Average Flow (Acreage)		Peak Hour Flow	
		MGD	GPM	MGD	GPM
LSE	4,252	1.17	810	10.5	7,280
EGA	484	0.61	423	2.5	1,692
Total	**4,736**	**1.78**	**1,233**	**13.0**	**8,972**

Appendix H

Site Survey



Diggers Hotline, Inc. (Wisconsin)		Locate Request for AUTOEMAIL	
Ticket #:	20203806055 Seq # : 4	Previous Ticket:	
Ticket Type:	Planning-Prints	Start Date:	09/25/2020 06:00:00 AM
Call Date:	09/14/2020 06:00:32 PM		
Contact Information			
Caller:	Nick Schramer	Phone:	(262) 522-4912
Company:	Ayres	Cell:	(262) 522-4912
Address:	N17W24222 Riverwood Dr Suite 310		
	Waukesha		
	WI 53188	Working For:	AYRES
Email:	SchramerN@ayresassociates.com		
Field Rep:	Nick Schramer	Phone:	(262) 409-1654 Ext
Work Information			
County:	OZAUKEE		
Place:	MEQUON CITY		
Address:			
Street:	RANCH RD		
Intersection 1:	N ORIOLE LN		
On the side of the road approximately 250 FT EAST OF INTERSECTION of N ORIOLE LN			
Type of Work:	SURVEY WORK		
Explosives: N	Overhead: N	Boring Equipment: N	Pre-Marked: N
Marking Instructions			
SHOW A 200 FT WIDE PATH ALONG THE PRIVATE DRIVE OF LIFT STATION GOING NORTH FOR 400 FT.			
Remarks			
CALL NICK SCHRAMER FOR QUESTION ON MARKING INSTRUCTIONS.			
Members Notified			
NOWGB	WE ENERGIES-ELE AND WG GAS-NOWGB		(262) 446-9821
SBC01	AT&T DISTRIBUTION SBC01		(262) 446-9821
TWC30	TIME WARNER CABLE - TWC30		(262) 446-9821
Work Site Polygon (NE/SW)			
Latitude:	43.229389	Longitude:	-87.935216
Secondary Latitude:	43.230503	Secondary Longitude:	-87.934417

Diggers Hotline, Inc. (Wisconsin)		Locate Request for AUTOEMAIL	
Ticket #:	20203806054 Seq # : 3	Previous Ticket:	
Ticket Type:	Standard	Start Date:	09/18/2020 06:00:00 PM
Call Date:	09/14/2020 06:00:11 PM		
Contact Information			
Caller:	Nick Schramer	Phone:	(262) 522-4912
Company:	Ayres	Cell:	(262) 522-4912
Address:	N17W24222 Riverwood Dr Suite 310		
	Waukesha		
	WI 53188	Working For:	AYRES
Email:	SchramerN@ayresassociates.com		
Field Rep:	Nick Schramer	Phone:	(262) 409-1654 Ext
Work Information			
County:	OZAUKEE		
Place:	MEQUON CITY		
Address:			
Street:	RANCH RD		
Intersection 1:	N ORIOLE LN		
On the side of the road approximately 250 FT EAST OF INTERSECTION of N ORIOLE LN			
Type of Work:	SURVEY WORK		
Explosives: N	Overhead: N	Boring Equipment: N	Pre-Marked: N
Marking Instructions			
MARK A 200 FT WIDE PATH ALONG THE PRIVATE DRIVE OF LIFT STATION GOING NORTH FOR 400 FT.			
Remarks			
CALL NICK SCHRAMER FOR QUESTION ON MARKING INSTRUCTIONS.			
Members Notified			
NOWGB	WE ENERGIES-ELE AND WG GAS-NOWGB		(262) 446-9821
SBC01	AT&T DISTRIBUTION SBC01		(262) 446-9821
TWC30	TIME WARNER CABLE - TWC30		(262) 446-9821
Work Site Polygon (NE/SW)			
Latitude:	43.229389	Longitude:	-87.935216
Secondary Latitude:	43.230503	Secondary Longitude:	-87.934417

CONTROL / BENCHMARK POINT DATA

POINT NO.	FEATURE	NORTHING	EASTING	ELEVATION	DESCRIPTION
105	CP	454876.933	2518816.712	666.83	REBAR W/CAP
107	CP	455105.625	2518825.772	660.96	X IN CONC. MH LID
101	CP	454640.005	2519052.794	674.007'	SEC CORNER, BRASS MON
110	BM	455162.429	2518803.225	661.34	SOUTH BOLT ON PIPE FLANGE
111	BM	455127.791	2518802.156	660.49	CHISELED SQUARE ON PAD

GENERAL NOTES:

1.) Survey was completed on 09-18-2020

2.) Survey was performed in NAD83, State Plane Coodinate System, Wisconsin South Zone

3.) Elevations are referenced to NAVD 88 Vertical Datum in which the Center of Section 19, T9N, R22E, (point 101), has an elevation of 674.007'

4.) Due to the heavy flow at San MH 1268 unable to determine pipe diameters in field.

5.) Trees locations are center of tree at ground elevations.

LEGEND

SANITARY MANHOLE	FIBER OPTICS MANHOLE
STORM/SAN. MANHOLE	ELECTRIC MANHOLE
INLET	GENERAL MANHOLE
CATCH BASIN	UTILITY POLE
WATER VALVE	ELECTRIC PEDESTAL
GAS VALVE	TELEPHONE PED
FIRE HYDRANT	CABLE TV PED
FLAG POLE	ELECTRIC METER/ GAS METER
GUY WIRE	ELECTRIC PULLBOX
BOLLARD	LIGHT POLE
(100.00') RECORDED AS	SIGN
	YARD LIGHT

PROPERTY LINE
R/W LINE
R/W CENTERLINE
CHAINLINK FENCE
UNDERGROUND TELEPHONE
UNDERGROUND ELECTRIC
UNDERGROUND SANITARY
UNDERGROUND GAS
UNDERGROUND STORM SEWER
WATERMAIN
LANDSCAPED AREA
CONCRETE
ASPHALT
FOUND MONUMENT (TYPE/SIZE NOTED)

MEQUON LIFT STATION E

MEQUON, WI

AYRES

N17 W24222 Riverwood Drive
Waukesha, WI 53188
(262) 523-4488
AyresAssociates.com

Appendix I

Electrical Study

Electrical Power System Study

Customer:

City of Mequon

Project

Lift Station E

2020 W. Ranch Road

Mequon, WI 53092

Date of Report: 05/26/2020
Report Updated on: 06/10/2020
Job Number: 1517

Table of Contents

SECTION 1

SUMMARY REPORT

SWITCHGEAR POWER SOLUTIONS

Switchgear Power Solutions
901 Forest Ave.
Sheboygan Falls, WI 53085
www.switchgearpowersolutions.com
(920)-234-2500

Electrical Power System Study Summary Report

This report contains the results of the coordination, short circuit, and arc flash study that was conducted for the City of Mequon – Lift Station E located in Mequon, WI. The electrical system study was performed using SKM version 9.0.0.6. The following results were found using data that was collected on site by SPS. We Energies was contacted and was able to provide the both the maximum future available fault current and the minimum fault current at both their normal feed and aux feed to this lift station.

Objective

This electrical system study was performed using applicable standards and accepted software practice. The incoming maximum available fault currents were provided by We Energies. The study starts at the utility service entrances that feed normal and aux power to the transfer switch at the site. Power is then fed downstream to the MCC where it feeds out to the different loads at the site including the pumps, unit heaters, and ventilators. The final goal of this study is to make sure that the facility's equipment is coordinated properly, that all of the equipment can withstand the available fault currents at that point in the system, and that the arc flash hazard incident energy level is known for all equipment.

Results and Conclusions

The Short Circuit Study was run under two scenarios, one while the system was on normal minimum Utility Power as the system is designed/configured today and a second using We Energies Maximum Aux. Design Fault Current based on a Maximum Service size. The minimum normal available fault current provided by We Energies and the Maximum Aux. Design Fault Current were both used to calculate the available fault currents in the system. While analyzing the short circuit study with the system being fed by the maximum available fault current it was found that many of the breakers installed in the MCC other than the breakers feeding the pumps and charcoal ventilator were under-rated for the available fault current. The detailed short circuit report can be seen in Section 2 of this report.

While analyzing the Coordination Study a few breakers had overlapping time current curves, but none of these overlaps need to be fixed as selective coordination is not required in these areas. All of the points in the system where there are overlapping time current curves are discussed in detail in Section 3 of the report.

The Arc Flash Hazard Risk Assessment was run under four scenarios, one with the system on the minimum NORMAL installed fault current as the system is designed today provided by the utility, a second with the system on the maximum NORMAL future design fault current provided by the utility, a third with the system on the minimum AUX. installed fault current as the system is designed today provided by the utility, and a fourth with the system on the maximum AUX. future design fault current provided by the utility. The Arc Flash Hazard Risk Assessment indicates that most of the equipment has an incident energy level of 8cal/cm^2 or below. The full details from the Arc Flash Hazard Risk Assessment can be seen in Section 4 of this report. The worst-case results are used for the Arc Flash Labels.

The rest of the study is laid out per the specifications that were provided. Section 1 is this Overview of the report, Section 2 the Short Circuit Study, Section 3 the Coordination Study, Section 4 the Arc Flash Study, Section 5 Prioritized Recommendations and Conclusions, and Section 6 all of the Appendices. Sections 7 and 8 also provide some reference data to help select proper PPE and to ensure proper use of Work Permits.

Switchgear Power Solutions
901 Forest Ave.
Sheboygan Falls, WI 53085
www.switchgearpowersolutions.com
(920)-234-2500

It is important to point out that some of these arc flash values are calculated for a max of 2 seconds. This is assuming that anybody exposed to an arc flash will be able to get away from the arc flash within 2 seconds. If not, more precautions should be taken as the person will be exposed to a higher cals/cm^2 than what is on the label. Arc flash equations and calculations are constantly changing as more accurate tests are performed in labs, it is recommended to re-run that calculations every 5 years to make sure the system is accurate with the up to date equations. In addition to this it is important to watch the labels and replace them when they get old, faded, or fall off. If this should happen feel free to contact SPS for new labels or replacements. Lastly, if any of the protective devices in the system are changed or large loads are added this will change the arc flash values and the study should be updated. In closing these arc flash values are only valid if the equipment is maintained and functioning properly. If the main breaker for each distribution panel does not open, the arc flash could be a lot greater than what is on the label. It is important to maintain the protective devices to ensure they will work when they are needed.

We appreciate this opportunity to be of service for you. If you have any questions regarding this report feel free to contact me.

Sincerely,

Ryan Fecteau
Electrical Engineer
Switchgear Power Solutions
(920) 470-0415
Ryan@switchgearpowersolutions.com

SECTION 2

SHORT CIRCUIT STUDY

Switchgear Power Solutions
901 Forest Ave.
Sheboygan Falls, WI 53085
www.switchgearpowersolutions.com
(920)-234-2500

Short Circuit Study

Purpose

A Short Circuit Study is critical for the safe, efficient, and economical operation of any electrical distribution system. A Short Circuit Study will compare the calculated maximum fault currents with the interrupting ratings of the overcurrent devices. When a protective device is installed in an area where it could see a fault larger than what it is rated for it could explode possibly injuring personnel and damaging equipment. These events often lead to down time while the equipment is repaired or replaced. It is important to make sure that all of the electrical equipment in the facility is properly rated for the area where it is installed.

Explanation of Data

Switchgear Power Solutions visited the site to collect the protective device information, cable lengths, and equipment identifications. The incoming minimum available fault current as the system is configured today and maximum future design fault current were both provided by We Energies for both the Normal side and Aux side of the Transfer Switch. The fault currents that were provided can be seen below. A copy of the letters can also be found after this write up.

NORMAL FEED DATA

***Minimum* Installed 3-phase Available Short Circuit Current –**
Symmetrical: three phase = 7,400 Amps RMS; X/R = 3.5

***Guaranteed 3-phase Available Short Circuit Current*:**
Symmetrical = 25,500 Amps RMS; X/R = 4.2

AUX FEED DATA

***Minimum* Installed 3-phase Available Short Circuit Current –**
Symmetrical: three phase = 7,500 Amps RMS; X/R = 3.5

***Guaranteed 3-phase Available Short Circuit Current*:**
Symmetrical = 25,800 Amps RMS; X/R = 4.3

Assumptions

A few assumptions were made while analyzing the short circuit study. One assumption was that all of the motors shown in the study were running to maximize the amount of fault current on the system to make sure all of the devices in the system were properly rated for the area that they are installed in. It should also be noted that all of the cable lengths were estimated using a walking wheel to get lengths that were reasonably close to the actual lengths of the cables.

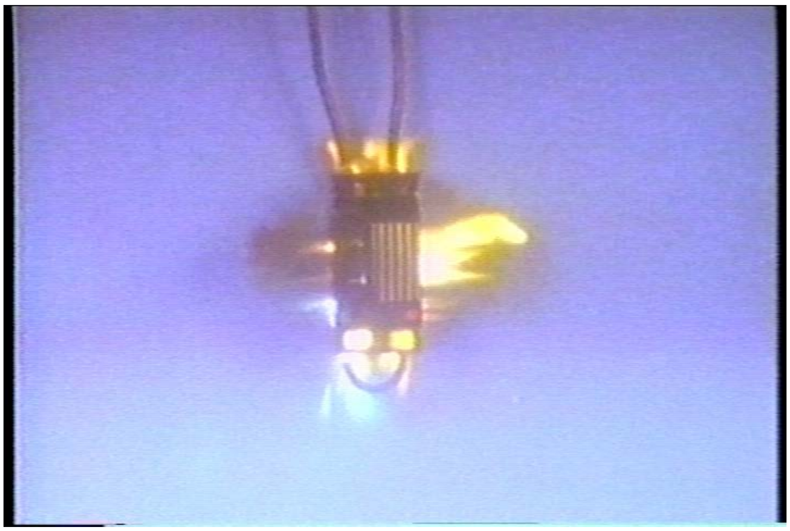
Analysis of Results and Recommendations

The Short Circuit Study was run under two scenarios, one while the system was on normal minimum Utility Power as the system is designed/configured today and a second using We Energies Maximum Design Fault Current based on a Maximum Service size for the Aux side of the transfer switch (This is the worst-case scenario). The minimum available fault current provided by We Energies and the Maximum Design Fault Current were used to calculate the available fault currents in the system. While analyzing the short circuit study using the maximum future design fault current, most of the electrical protective devices installed at Lift Station E were found to be under-rated for the area they are installed.

Utilizing the data provided by We Energies it was found that all of the equipment was rated properly when doing the calculations under the minimum available fault current scenario. However, as stated in the letter, the fault current during a fault scenario will be between the minimum and the maximum futured design fault current. They do not provide a way to calculate the maximum actual fault current as the system is designed today.

While using the worst-case fault current of the maximum future design while the site transfer switch is being fed from the Aux feed there is about 26kA of fault current at the transfer switch and the MCC. Most of the breakers in the MCC other than the breakers feeding the 4 pumps and the charcoal ventilator are under-rated for this fault current. This means that the breaker is not rated to handle this fault current and has the risk of exploding rather than just tripping. This can cause damage to both equipment and can possibly injure personnel in the immediate area when a maximum fault would happen on this equipment.

In order to be properly rated for the maximum fault current at the MCC the breakers would need to be upgraded to breakers that are rated for more than 26kA. Most manufactures provide a 65kA rated line of breakers that should be direct swaps for what are already in place. A picture of what happens to a breaker that is not rated for the fault current can be seen below.



Switchgear Power Solutions
901 Forest Ave.
Sheboygan Falls, WI 53085
www.switchgearpowersolutions.com
(920)-234-2500

Normal Feed – Utility Data

Hi Ryan.

Here is the Arc Flash information you requested:

Request for Short Circuit Current information
City of Mequon Lift Station 'E', served at Secondary Voltage
2020 W. Ranch Rd., Mequon, WI
3-Phase Service
May 19, 2020

Please note that We Energies customers and electrical contractors are always encouraged to request a Hold-Off Clearance or a de-energized service when performing work on any electrical equipment. Performing work on de-energized equipment is the safest condition and does not require an Arc Flash Hazard Analysis for work on or near that equipment. We understand that is not always possible and are providing the following information. ***Due to the dynamic nature of the We energies electric distribution system, this information may be imprecise or inaccurate, and all information provided must be used with extreme care.***

Attached is the short circuit information requested. These values are applicable where We Energies connects to the electrical facilities located at **2020 W. Ranch Rd., Mequon, WI – meter PBZT102097.**
More specifically, this termination point is on the line side of the customer's secondary main breaker, normally in the meter socket, transocket, or secondary switchgear. The values provided below for the 3-phase service include:

- *Minimum Fault Current –*The minimum bolted fault current and associated X/R ratio is based on the maximum impedance of the actual distribution transformer and secondary conductors used to supply the customer's service equipment at the time of the request
- *Guaranteed Available Short Circuit Current* (Design Maximum)- The maximum guaranteed bolted fault current (GASCC) and associated X/R ratio is based on the minimum impedance of the largest future distribution transformer along with the secondary conductors required to supply the maximum capacity of the customer's service equipment.

We Energies recommends that you consider both of these short circuit values when performing an Arc Flash Hazard evaluation. The actual three-phase bolted fault for your facility may be between, or below, the values provided based on actual transformer impedance and future system changes. It should also be recognized that in some instances, depending on clearing times, a calculation using a design maximum fault current level or the lower value provided may not provide the worst case arc flash condition. Rather, a value in between or below these values may provide the worst case arc flash condition. Therefore, we also recommend that short circuit values between, along with values below these values, be considered.

The *Guaranteed Available Short Circuit Current* values represent a worst case maximum three-phase fault current which could exist for any future design or operational change. Therefore, We Energies recommends that you consider the guaranteed available short circuit current values when sizing your equipment.

***Minimum* Installed 3-phase Available Short Circuit Current –**
Symmetrical: three phase = 7,400 Amps RMS; X/R = 3.5

***Guaranteed 3-phase Available Short Circuit Current*:**
Symmetrical = 25,500 Amps RMS; X/R = 4.2

Please let me know if you have any questions. Thank you.

Sarah Mullen
Energy Services Representative
We Energies
262-268-3652
Sarah.mullen@we-energies.com

Aux Feed – Utility Data

Hi Ryan.

Here is the Arc Flash information you requested. I will send the information for the second meter in a separate email.

Request for Short Circuit Current information
City of Mequon Lift Station 'E', served at Secondary Voltage
2020 W. Ranch Rd., Mequon, WI
3-Phase Service
May 19, 2020

Please note that We Energies customers and electrical contractors are always encouraged to request a Hold-Off Clearance or a de-energized service when performing work on any electrical equipment. Performing work on de-energized equipment is the safest condition and does not require an Arc Flash Hazard Analysis for work on or near that equipment. We understand that is not always possible and are providing the following information. ***Due to the dynamic nature of the We energies electric distribution system, this information may be imprecise or inaccurate, and all information provided must be used with extreme care.***

Attached is the short circuit information requested. These values are applicable where We Energies connects to the electrical facilities located at **2020 W. Ranch Rd., Mequon, WI – meter PBZT102025.**
More specifically, this termination point is on the line side of the customer's secondary main breaker, normally in the meter socket, transocket, or secondary switchgear. The values provided below for the 3-phase service include:

- *Minimum Fault Current –*The minimum bolted fault current and associated X/R ratio is based on the maximum impedance of the actual distribution transformer and secondary conductors used to supply the customer's service equipment at the time of the request
- *Guaranteed Available Short Circuit Current* (Design Maximum)- The maximum guaranteed bolted fault current (GASCC) and associated X/R ratio is based on the minimum impedance of the largest future distribution transformer along with the secondary conductors required to supply the maximum capacity of the customer's service equipment.

We Energies recommends that you consider both of these short circuit values when performing an Arc Flash Hazard evaluation. The actual three-phase bolted fault for your facility may be between, or below, the values provided based on actual transformer impedance and future system changes. It should also be recognized that in some instances, depending on clearing times, a calculation using a design maximum fault current level or the lower value provided may not provide the worst case arc flash condition. Rather, a value in between or below these values may provide the worst case arc flash condition. Therefore, we also recommend that short circuit values between, along with values below these values, be considered.

The *Guaranteed Available Short Circuit Current* values represent a worst case maximum three-phase fault current which could exist for any future design or operational change. Therefore, We Energies recommends that you consider the guaranteed available short circuit current values when sizing your equipment.

Minimum **Installed 3-phase Available Short Circuit Current –**
Symmetrical: three phase = 7,500 Amps RMS; X/R = 3.5

***Guaranteed 3-phase Available Short Circuit Current*:**
Symmetrical = 25,800 Amps RMS; X/R = 4.3

Please let me know if you have any questions. Thank you.

Sarah Mullen
Energy Services Representative
We Energies
262-268-3652
Sarah.mullen@we-energies.com

SHORT CIRCUIT STUDY

DATA INPUT
MINIMUM INSTALLED

Project: City of Mequon - Lift Station E - SKM Base Project

City of Mequon for
Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

DAPPER Fault Analysis Input Report (English)

Utilities

Contribution From Name	Bus Name	In/Out Service	Nominal Voltage		-------- Contribution Data -------- Duty	Units	X/R		PU (100 MVA Base) R PU	X PU
We Energies 00-U-4679	CT Cabinet 59 106 102	In	480	3P:	7,500	Amps	3.50	Pos:	4.406	15.420
				SLG:	7,500	Amps	3.50	Zero:	4.406	15.420
We Energies 75-U-0876	CT Cabinet 59 106 174	In	480	3P:	7,400	Amps	3.50	Pos:	4.465	15.629
				SLG:	7,400	Amps	3.50	Zero:	4.465	15.629

Motors

Contribution From Name	# of Motors	Bus Name	In/Out Service	Nominal Voltage	--------- Contribution Data -------- Base kVA	Xd"	X/R	PU (100 MVA Base) R PU	X PU
125hp Pump #2	1	Pump #2	In	480	125.34	0.1507	4.90	24.549	120.267
125hp Pump #3	1	Pump #3	In	480	125.34	0.1507	4.90	24.549	120.267
125hp Pump #4	1	Pump #4	In	480	125.34	0.1507	4.90	24.549	120.267
50hp Pump #1	1	Pump #1	In	480	50.13	0.1507	4.90	61.373	300.668
7.5hp Charcoal Ventilator	1	Charcoal Ventilator	In	480	7.52	0.1507	4.90	409.155	2,004.450

Cables

Cable Name	From Bus / To Bus	In/Out Service	Qty /Ph	Length Feet	Size	Cond. Type	Duct Type	Insul		R pu	jX pu
					------ Cable Description ------				Per Unit (100 MVA Base)		
CBL-0003	CT Cabinet 59 106 174 MTS Normal Breaker	In	2	6	350	Copper	Magnetic	PVC	Pos: Zero:	0.0492 0.1551	0.0486 0.1195
CBL-0004	CT Cabinet 59 106 102 MTS Emer. Breaker	In	2	6	350	Copper	Magnetic	PVC	Pos: Zero:	0.0492 0.1551	0.0486 0.1195
CBL-0005	MTS Load MCC	In	2	12	350	Copper	Magnetic	PVC	Pos: Zero:	0.0984 0.3102	0.0971 0.2391
CBL-0006	MCC VFD Pump #4 Input	In	1	15	3/0	Copper	Magnetic	PVC	Pos: Zero:	0.5241 1.6517	0.2585 0.6367
CBL-0007	VFD Pump #4 Output Pump #4	In	1	50	3/0	Copper	Magnetic	PVC	Pos: Zero:	1.7470 5.5056	0.8615 2.1224
CBL-0008	MCC Upper Unit Heater	In	1	30	10	Copper	Magnetic	PVC	Pos: Zero:	15.3646 48.4219	0.8516 2.0964
CBL-0009	MCC Lower Unit Heater	In	1	60	10	Copper	Magnetic	PVC	Pos: Zero:	30.7292 96.8438	1.7031 4.1927

Cable Name	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	Size	Cond. Type	Duct Type	Insul	Per Unit (100 MVA Base)	R pu	jX pu
CBL-0010	MCC Pump #2 Disc.	In	1	35	4/0	Copper	Magnetic	PVC	Pos: Zero:	0.9722 3.0640	0.5788 1.4249
CBL-0011	VFD Pump #2 Output Pump #2	In	1	50	4/0	Copper	Magnetic	PVC	Pos: Zero:	1.3889 4.3772	0.8268 2.0356
CBL-0012	Pump #2 Disc. VFD Pump #2 Input	In	1	2	4/0	Copper	Magnetic	PVC	Pos: Zero:	0.0556 0.1751	0.0331 0.0814
CBL-0013	MCC West Ventilator	In	1	25	12	Copper	Magnetic	PVC	Pos: Zero:	20.2908 63.9475	0.7552 1.8598
CBL-0014	MCC East Ventilator	In	1	75	12	Copper	Magnetic	PVC	Pos: Zero:	60.8724 91.8425	2.2656 5.5794
CBL-0015	MCC Wet Well Ventilator	In	1	125	12	Copper	Magnetic	PVC	Pos: Zero:	101.4540 19.7374	3.7760 9.2990
CBL-0016	MCC Pump #3 Breaker	In	2	20	350	Copper	Magnetic	PVC	Pos: Zero:	0.1641 0.5169	0.1619 0.3984

Cable Name	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	Size	Cond. Type	Duct Type	Insul		R pu	jX pu
					------ Cable Description ------				Per Unit (100 MVA Base)		
CBL-0017	Pump #3 Breaker Pump #3	In	1	50	3/0	Copper	Magnetic	PVC	Pos: Zero:	1.7470 5.5056	0.8615 2.1224
CBL-0018	MCC Charcoal Vent. Disc.	In	1	60	10	Copper	Magnetic	PVC	Pos: Zero:	30.7292 96.8438	1.7031 4.1927
CBL-0019	Charcoal Vent. Disc. Charcoal Ventilator	In	1	10	12	Copper	Magnetic	PVC	Pos: Zero:	8.1163 25.5790	0.3021 0.7439
CBL-0020	MCC Pump #1 Disc.	In	1	10	4	Copper	Magnetic	PVC	Pos: Zero:	1.3932 4.3906	0.2096 0.5161
CBL-0021	VFD Pump #1 Output Pump #1	In	1	50	4	Copper	Magnetic	PVC	Pos: Zero:	6.9661 21.9531	1.0482 2.5803
CBL-0022	Pump #1 Disc. VFD Pump #1 Input	In	1	2	4	Copper	Magnetic	PVC	Pos: Zero:	0.2786 0.8781	0.0419 0.1032
CBL-0023	MCC XFMR Primary	In	1	3	8	Copper	Magnetic	PVC	Pos: Zero:	1.0560 3.3280	0.0751 0.1849

Cable Name	From Bus / To Bus	In/Out Service	Qty /Ph	Length Feet	Size	Cond. Type	Duct Type	Insul		Per Unit (100 MVA Base) R pu	jX pu
CBL-0024	XFMR Secondary	In	1	3	6	Copper	Magnetic	PVC	Pos:	2.6563	0.2734
									Zero:	8.3708	0.6734
	Terminal Strip										
CBL-0025	Terminal Strip	In	1	25	6	Copper	Magnetic	PVC	Pos:	22.1354	2.2786
									Zero:	69.7570	5.6120
	Entrance Panel										
CBL-0026	Terminal Strip	In	1	15	6	Copper	Magnetic	PVC	Pos:	13.2813	1.3672
									Zero:	41.8542	3.3672
	Old Panel Mounted in Wall										
CBL-0027	MCC	In	1	80	10	Copper	Magnetic	PVC	Pos:	40.9722	2.2708
									Zero:	29.1250	5.5903
	480V Unit Heater										

2-Winding Transformers

Xformer Name	In/Out Service	Primary & Secondary Bus	Conn.	Volts	FLA	Nominal kVA		Z PU (100 MVA Base) R pu	jX pu
XFMR	In	XFMR Primary	D	480	12	10.0	Pos:	192.4600	450.6200
			WG	240	24		Zero:	192.4600	450.6200
		XFMR Secondary							

Pi Impedances

Pi Name	In/Out Service	From Bus	To Bus		Per Unit (100 MVA Base) G/2 pu	B/2 pu		Per Unit (100 MVA Base) R pu	jX pu
PI-0001	In	MTS Normal Breaker	MTS Load	Pos	0.0000	0.000000	Pos	0.0001	0.0001
				Zero	0.0000	0.000000	Zero	0.0001	0.0001

Pi Name	In/Out Service	From Bus	To Bus	Per Unit (100 MVA Base)	G/2 pu	B/2 pu	Per Unit (100 MVA Base)	R pu	jX pu
PI-0002	In	MTS Emer. Breaker	MTS Load	Pos	0.0000	0.000000	Pos	0.0001	0.0001
				Zero	0.0000	0.000000	Zero	0.0001	0.0001

SHORT CIRCUIT STUDY

NORMAL OPERATION
MINIMUM INSTALLED

Project: City of Mequon - Lift Station E - SKM Base Project

City of Mequon for
Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

DAPPER Fault Contribution Complete Report

Comprehensive Short Circuit Study Settings

Three Phase Fault	Yes	**Faulted Bus**	All Buses
Single Line to Ground	Yes	**Bus Voltages**	First Bus From Fault
Line to Line Fault	No	**Branch Currents**	First Branch From Fault
Line to Line to Ground	No	**Phase or Sequence**	Report phase quantities
Motor Contribution	Yes	**Fault Current Calculation**	Asymmetrical RMS (with DC offset and Decay)
Transformer Tap	Yes	**Asym Fault Current at Time**	0.50 **Cycles**
Xformer Phase Shift	Yes		

			-------------Initial Symmetrical Amps-----------				----------------Asymmetrical Amps----------------				---Init Sym Neutral Amps--	
Bus Name	---------Contributions---------		**3 Phase**	**SLG**	**LLG**	**LL**	**3 Phase**	**SLG**	**LLG**	**LL**	**SLG**	**LLG**
CT Cabinet 59 106 174			**8,424**	**8,053**	**0**	**0**	**9,787**	**9,333**	**0**	**0**		
CBL-0003	CABLE	In	1,026	654	0	0	1,192	758	0	0		
We Energies 75-U-0876	UTILITY	In	7,400	7,400	0	0	8,597	8,577	0	0	8,053	
CT Cabinet 59 106 102			**7,500**	**7,500**	**0**	**0**	**8,657**	**8,657**	**0**	**0**		
CBL-0004	CABLE	In	0	0	0	0	0	0	0	0		
We Energies 00-U-4679	UTILITY	In	7,500	7,500	0	0	8,657	8,657	0	0	7,500	

Bus Name	---------Contributions---------		-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
MTS Normal Breaker			**8,397**	**8,008**	**0**	**0**	**9,741**	**9,252**	**0**	**0**		
CBL-0003	CABLE	In	7,373	7,357	0	0	8,552	8,499	0	0	8,008	
PI-0001	PI-EQUI	In	1,026	653	0	0	1,191	754	0	0		
MTS Emer. Breaker			**7,472**	**7,457**	**0**	**0**	**8,609**	**8,579**	**0**	**0**		
CBL-0004	CABLE	In	7,472	7,457	0	0	8,609	8,579	0	0	7,457	
PI-0002	PI-EQUI	In	0	0	0	0	0	0	0	0		
MTS Load			**8,397**	**8,008**	**0**	**0**	**9,740**	**9,252**	**0**	**0**		
CBL-0005	CABLE	In	1,026	653	0	0	1,191	754	0	0		
PI-0001	PI-EQUI	In	7,373	7,357	0	0	8,552	8,499	0	0	8,008	
PI-0002	PI-EQUI	In	0	0	0	0	0	0	0	0		
MCC			**8,344**	**7,920**	**0**	**0**	**9,650**	**9,095**	**0**	**0**		
CBL-0005	CABLE	In	7,318	7,271	0	0	8,464	8,349	0	0	7,920	
CBL-0006	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0008	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0009	CABLE	In	0	0	0	0	0	0	0	0		

Bus Name	---------Contributions---------		-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
CBL-0010	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0013	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0014	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0015	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0016	CABLE	In	969	613	0	0	1,121	704	0	0		
CBL-0018	CABLE	In	59	37	0	0	68	43	0	0		
CBL-0020	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0023	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0027	CABLE	In	0	0	0	0	0	0	0	0		
VFD Pump #4 Input			**8,120**	**7,600**	**0**	**0**	**9,173**	**8,425**	**0**	**0**		
CBL-0006	CABLE	In	8,120	7,600	0	0	9,173	8,425	0	0	7,600	
VFD Pump #4		In	0	0	0	0	0	0	0	0		
VFD Pump #4 Output			**9,086**	**8,142**	**0**	**0**	**10,342**	**9,049**	**0**	**0**		
CBL-0007	CABLE	In	970	580	0	0	1,104	644	0	0		
VFD Pump #4		In	8,120	7,564	0	0	9,241	8,407	0	0	8,142	

Bus Name	---------Contributions---------		-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
Pump #4			**8,379**	**7,109**	**0**	**0**	**9,082**	**7,422**	**0**	**0**		
CBL-0007	CABLE	In	7,415	6,563	0	0	8,037	6,852	0	0	7,109	
125hp Pump #4	IND-MTR	In	980	554	0	0	1,062	579	0	0		
Upper Unit Heater			**4,956**	**3,487**	**0**	**0**	**4,958**	**3,487**	**0**	**0**		
CBL-0008	CABLE	In	4,956	3,487	0	0	4,958	3,487	0	0	3,487	
Lower Unit Heater			**3,166**	**2,020**	**0**	**0**	**3,166**	**2,020**	**0**	**0**		
CBL-0009	CABLE	In	3,166	2,020	0	0	3,166	2,020	0	0	2,020	
VFD Pump #2 Input			**7,858**	**7,238**	**0**	**0**	**8,726**	**7,841**	**0**	**0**		
CBL-0012	CABLE	In	7,858	7,238	0	0	8,726	7,841	0	0	7,238	
VFD Pump #2		In	0	0	0	0	0	0	0	0		
VFD Pump #2 Output			**8,823**	**7,762**	**0**	**0**	**9,885**	**8,429**	**0**	**0**		
CBL-0011	CABLE	In	971	570	0	0	1,088	619	0	0		
VFD Pump #2		In	7,858	7,196	0	0	8,804	7,814	0	0	7,762	
Pump #2			**8,222**	**6,912**	**0**	**0**	**8,911**	**7,215**	**0**	**0**		
CBL-0011	CABLE	In	7,258	6,371	0	0	7,866	6,650	0	0	6,912	

Bus Name	---------Contributions---------			-------------Initial Symmetrical Amps-----------				----------------Asymmetrical Amps----------------				---Init Sym Neutral Amps--	
				3 Phase	SLG	LLG	LL	3 Phase	SLG	LLG	LL	SLG	LLG
125hp Pump #2		IND-MTR	In	980	549	0	0	1,062	573	0	0		
Pump #2 Disc.				**7,883**	**7,273**	**0**	**0**	**8,770**	**7,897**	**0**	**0**		
CBL-0010		CABLE	In	7,883	7,273	0	0	8,770	7,897	0	0	7,273	
CBL-0012		CABLE	In	0	0	0	0	0	0	0	0		
West Ventilator				**4,251**	**2,854**	**0**	**0**	**4,252**	**2,854**	**0**	**0**		
CBL-0013		CABLE	In	4,251	2,854	0	0	4,252	2,854	0	0	2,854	
East Ventilator				**1,801**	**1,091**	**0**	**0**	**1,801**	**1,091**	**0**	**0**		
CBL-0014		CABLE	In	1,801	1,091	0	0	1,801	1,091	0	0	1,091	
Wet Well Ventilator				**1,126**	**670**	**0**	**0**	**1,126**	**670**	**0**	**0**		
CBL-0015		CABLE	In	1,126	670	0	0	1,126	670	0	0	670	
Pump #3 Breaker				**8,255**	**7,776**	**0**	**0**	**9,500**	**8,845**	**0**	**0**		
CBL-0016		CABLE	In	7,287	7,168	0	0	8,386	8,153	0	0	7,776	
CBL-0017		CABLE	In	970	609	0	0	1,117	693	0	0		
Pump #3				**7,691**	**6,864**	**0**	**0**	**8,436**	**7,254**	**0**	**0**		
CBL-0017		CABLE	In	6,723	6,288	0	0	7,374	6,645	0	0	6,864	

Bus Name	---------Contributions---------		-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
125hp Pump #3	IND-MTR	In	980	583	0	0	1,075	616	0	0		
Charcoal Vent. Disc.			**3,195**	**2,030**	**0**	**0**	**3,195**	**2,030**	**0**	**0**		
CBL-0018	CABLE	In	3,160	2,015	0	0	3,160	2,015	0	0	2,030	
CBL-0019	CABLE	In	59	25	0	0	59	25	0	0		
Charcoal Ventilator			**2,664**	**1,654**	**0**	**0**	**2,664**	**1,654**	**0**	**0**		
CBL-0019	CABLE	In	2,633	1,641	0	0	2,633	1,641	0	0	1,654	
7.5hp Charcoal Ventilator	IND-MTR	In	59	24	0	0	59	24	0	0		
VFD Pump #1 Input			**7,918**	**7,261**	**0**	**0**	**8,548**	**7,615**	**0**	**0**		
CBL-0022	CABLE	In	7,918	7,261	0	0	8,548	7,615	0	0	7,261	
VFD Pump #1		In	0	0	0	0	0	0	0	0		
VFD Pump #1 Output			**8,302**	**7,475**	**0**	**0**	**8,997**	**7,845**	**0**	**0**		
CBL-0021	CABLE	In	389	233	0	0	421	245	0	0		
VFD Pump #1		In	7,918	7,244	0	0	8,581	7,603	0	0	7,475	
Pump #1			**6,454**	**4,913**	**0**	**0**	**6,502**	**4,917**	**0**	**0**		
CBL-0021	CABLE	In	6,106	4,736	0	0	6,151	4,740	0	0	4,913	

Bus Name	---------Contributions---------			-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
50hp Pump #1		IND-MTR	In	392	199	0	0	395	199	0	0		
Pump #1 Disc.				**7,991**	**7,376**	**0**	**0**	**8,703**	**7,808**	**0**	**0**		
CBL-0020		CABLE	In	7,991	7,376	0	0	8,703	7,808	0	0	7,376	
CBL-0022		CABLE	In	0	0	0	0	0	0	0	0		
XFMR Primary				**8,122**	**7,567**	**0**	**0**	**8,941**	**8,110**	**0**	**0**		
CBL-0023		CABLE	In	8,122	7,567	0	0	8,941	8,110	0	0	7,567	
XFMR		2W-XFMR	In	0	0	0	0	0	0	0	0		
XFMR Secondary				**477**	**481**	**0**	**0**	**508**	**513**	**0**	**0**		
CBL-0024		CABLE	In	0	0	0	0	0	0	0	0		
XFMR		2W-XFMR	In	477	481	0	0	508	513	0	0	481	
Terminal Strip				**475**	**479**	**0**	**0**	**506**	**509**	**0**	**0**		
CBL-0024		CABLE	In	475	479	0	0	506	509	0	0	479	
CBL-0025		CABLE	In	0	0	0	0	0	0	0	0		
CBL-0026		CABLE	In	0	0	0	0	0	0	0	0		
Entrance Panel				**465**	**461**	**0**	**0**	**488**	**479**	**0**	**0**		

Bus Name	---------Contributions---------		-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
CBL-0025	CABLE	In	465	461	0	0	488	479	0	0	461	
Old Panel Mounted in Wall			**469**	**469**	**0**	**0**	**495**	**491**	**0**	**0**		
CBL-0026	CABLE	In	469	469	0	0	495	491	0	0	469	
480V Unit Heater			**2,521**	**1,567**	**0**	**0**	**2,521**	**1,567**	**0**	**0**		
CBL-0027	CABLE	In	2,521	1,567	0	0	2,521	1,567	0	0	1,567	

SHORT CIRCUIT STUDY

DATA INPUT

MAXIMUM FUTURE DESIGN FAULT CURRENT

Project: City of Mequon - Lift Station E - SKM Base Project

City of Mequon for
Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

DAPPER Fault Analysis Input Report (English)

Utilities

Contribution From Name	Bus Name	In/Out Service	Nominal Voltage		-------- Contribution Data -------- Duty	Units	X/R		PU (100 MVA Base) R PU	X PU
We Energies 00-U-4679	CT Cabinet 59 106 102	In	480	**3P:**	25,800	Amps	4.30	**Pos:**	1.056	4.541
				SLG:	25,800	Amps	4.30	**Zero:**	1.056	4.541
We Energies 75-U-0876	CT Cabinet 59 106 174	In	480	**3P:**	25,500	Amps	4.20	**Pos:**	1.093	4.589
				SLG:	25,500	Amps	4.20	**Zero:**	1.093	4.589

Motors

Contribution From Name	# of Motors	Bus Name	In/Out Service	Nominal Voltage	--------- Contribution Data -------- Base kVA	Xd"	X/R	PU (100 MVA Base) R PU	X PU
125hp Pump #2	1	Pump #2	In	480	125.34	0.1507	4.90	24.549	120.267
125hp Pump #3	1	Pump #3	In	480	125.34	0.1507	4.90	24.549	120.267
125hp Pump #4	1	Pump #4	In	480	125.34	0.1507	4.90	24.549	120.267
50hp Pump #1	1	Pump #1	In	480	50.13	0.1507	4.90	61.373	300.668
7.5hp Charcoal Ventilator	1	Charcoal Ventilator	In	480	7.52	0.1507	4.90	409.155	2,004.450

Cables

Cable Name	From Bus / To Bus	In/Out Service	Qty /Ph	Length Feet	Size	Cond. Type	Duct Type	Insul		R pu	jX pu
					------ Cable Description ------				Per Unit (100 MVA Base)		
CBL-0003	CT Cabinet 59 106 174 MTS Normal Breaker	In	2	6	350	Copper	Magnetic	PVC	Pos: Zero:	0.0492 0.1551	0.0486 0.1195
CBL-0004	CT Cabinet 59 106 102 MTS Emer. Breaker	In	2	6	350	Copper	Magnetic	PVC	Pos: Zero:	0.0492 0.1551	0.0486 0.1195
CBL-0005	MTS Load MCC	In	2	12	350	Copper	Magnetic	PVC	Pos: Zero:	0.0984 0.3102	0.0971 0.2391
CBL-0006	MCC VFD Pump #4 Input	In	1	15	3/0	Copper	Magnetic	PVC	Pos: Zero:	0.5241 1.6517	0.2585 0.6367
CBL-0007	VFD Pump #4 Output Pump #4	In	1	50	3/0	Copper	Magnetic	PVC	Pos: Zero:	1.7470 5.5056	0.8615 2.1224
CBL-0008	MCC Upper Unit Heater	In	1	30	10	Copper	Magnetic	PVC	Pos: Zero:	15.3646 48.4219	0.8516 2.0964
CBL-0009	MCC Lower Unit Heater	In	1	60	10	Copper	Magnetic	PVC	Pos: Zero:	30.7292 96.8438	1.7031 4.1927

Cable Name	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	Size	Cond. Type	Duct Type	Insul		Per Unit (100 MVA Base) R pu	jX pu
CBL-0010	MCC Pump #2 Disc.	In	1	35	4/0	Copper	Magnetic	PVC	Pos: Zero:	0.9722 3.0640	0.5788 1.4249
CBL-0011	VFD Pump #2 Output Pump #2	In	1	50	4/0	Copper	Magnetic	PVC	Pos: Zero:	1.3889 4.3772	0.8268 2.0356
CBL-0012	Pump #2 Disc. VFD Pump #2 Input	In	1	2	4/0	Copper	Magnetic	PVC	Pos: Zero:	0.0556 0.1751	0.0331 0.0814
CBL-0013	MCC West Ventilator	In	1	25	12	Copper	Magnetic	PVC	Pos: Zero:	20.2908 63.9475	0.7552 1.8598
CBL-0014	MCC East Ventilator	In	1	75	12	Copper	Magnetic	PVC	Pos: Zero:	60.8724 91.8425	2.2656 5.5794
CBL-0015	MCC Wet Well Ventilator	In	1	125	12	Copper	Magnetic	PVC	Pos: Zero:	101.4540 19.7374	3.7760 9.2990
CBL-0016	MCC Pump #3 Breaker	In	2	20	350	Copper	Magnetic	PVC	Pos: Zero:	0.1641 0.5169	0.1619 0.3984

Cable Name	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	Size	Cond. Type	Duct Type	Insul		R pu	jX pu
					------ Cable Description ------				Per Unit (100 MVA Base)		
CBL-0017	Pump #3 Breaker Pump #3	In	1	50	3/0	Copper	Magnetic	PVC	Pos: Zero:	1.7470 5.5056	0.8615 2.1224
CBL-0018	MCC Charcoal Vent. Disc.	In	1	60	10	Copper	Magnetic	PVC	Pos: Zero:	30.7292 96.8438	1.7031 4.1927
CBL-0019	Charcoal Vent. Disc. Charcoal Ventilator	In	1	10	12	Copper	Magnetic	PVC	Pos: Zero:	8.1163 25.5790	0.3021 0.7439
CBL-0020	MCC Pump #1 Disc.	In	1	10	4	Copper	Magnetic	PVC	Pos: Zero:	1.3932 4.3906	0.2096 0.5161
CBL-0021	VFD Pump #1 Output Pump #1	In	1	50	4	Copper	Magnetic	PVC	Pos: Zero:	6.9661 21.9531	1.0482 2.5803
CBL-0022	Pump #1 Disc. VFD Pump #1 Input	In	1	2	4	Copper	Magnetic	PVC	Pos: Zero:	0.2786 0.8781	0.0419 0.1032
CBL-0023	MCC XFMR Primary	In	1	3	8	Copper	Magnetic	PVC	Pos: Zero:	1.0560 3.3280	0.0751 0.1849

Cable Name	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	Size	Cond. Type	Duct Type	Insul		R pu	jX pu
					------ Cable Description ------				Per Unit (100 MVA Base)		
CBL-0024	XFMR Secondary Terminal Strip	In	1	3	6	Copper	Magnetic	PVC	Pos: Zero:	2.6563 8.3708	0.2734 0.6734
CBL-0025	Terminal Strip Entrance Panel	In	1	25	6	Copper	Magnetic	PVC	Pos: Zero:	22.1354 69.7570	2.2786 5.6120
CBL-0026	Terminal Strip Old Panel Mounted in Wall	In	1	15	6	Copper	Magnetic	PVC	Pos: Zero:	13.2813 41.8542	1.3672 3.3672
CBL-0027	MCC 480V Unit Heater	In	1	80	10	Copper	Magnetic	PVC	Pos: Zero:	40.9722 29.1250	2.2708 5.5903

2-Winding Transformers

Xformer Name	In/Out Service	Bus	Conn.	Volts	FLA	Nominal kVA		R pu	jX pu
		------------------Primary & Secondary---------------					Z PU (100 MVA Base)		
XFMR	In	XFMR Primary	D	480	12	10.0	Pos:	192.4600	450.6200
			WG	240	24		Zero:	192.4600	450.6200
		XFMR Secondary							

Pi Impedances

Pi Name	In/Out Service	From Bus	To Bus		G/2 pu	B/2 pu		R pu	jX pu
				Per Unit (100 MVA Base)			Per Unit (100 MVA Base)		
PI-0001	In	MTS Normal Breaker	MTS Load	Pos	0.0000	0.000000	Pos	0.0001	0.0001
				Zero	0.0000	0.000000	Zero	0.0001	0.0001

Pi Name	In/Out Service	From Bus	To Bus	Per Unit (100 MVA Base)	G/2 pu	B/2 pu	Per Unit (100 MVA Base)	R pu	jX pu
PI-0002	In	MTS Emer. Breaker	MTS Load	Pos	0.0000	0.000000	Pos	0.0001	0.0001
				Zero	0.0000	0.000000	Zero	0.0001	0.0001

SHORT CIRCUIT STUDY

NORMAL OPERATION

MAXIMUM FUTURE DESIGN FAULT CURRENT

Project: City of Mequon - Lift Station E - SKM Base Project

City of Mequon for
Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

DAPPER Fault Contribution Complete Report

Comprehensive Short Circuit Study Settings

Three Phase Fault	Yes	**Faulted Bus**	All Buses
Single Line to Ground	Yes	**Bus Voltages**	First Bus From Fault
Line to Line Fault	No	**Branch Currents**	First Branch From Fault
Line to Line to Ground	No	**Phase or Sequence**	Report phase quantities
Motor Contribution	Yes	**Fault Current Calculation**	Asymmetrical RMS (with DC offset and Decay)
Transformer Tap	Yes	**Asym Fault Current at Time**	0.50 **Cycles**
Xformer Phase Shift	Yes		

			-------------Initial Symmetrical Amps-----------				----------------Asymmetrical Amps----------------				---Init Sym Neutral Amps--	
Bus Name	---------Contributions---------		**3 Phase**	**SLG**	**LLG**	**LL**	**3 Phase**	**SLG**	**LLG**	**LL**	**SLG**	**LLG**
CT Cabinet 59 106 174			**25,500**	**25,500**	**0**	**0**	**30,685**	**30,685**	**0**	**0**		
CBL-0003	CABLE	In	0	0	0	0	0	0	0	0		
We Energies 75-U-0876	UTILITY	In	25,500	25,500	0	0	30,685	30,685	0	0	25,500	
CT Cabinet 59 106 102			**26,826**	**26,475**	**0**	**0**	**32,473**	**32,043**	**0**	**0**		
CBL-0004	CABLE	In	1,026	675	0	0	1,242	817	0	0		
We Energies 00-U-4679	UTILITY	In	25,800	25,800	0	0	31,232	31,226	0	0	26,475	

Bus Name	---------Contributions---------		-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
MTS Normal Breaker			**25,186**	**25,021**	**0**	**0**	**30,074**	**29,702**	**0**	**0**		
CBL-0003	CABLE	In	25,186	25,021	0	0	30,074	29,702	0	0	25,021	
PI-0001	PI-EQUI	In	0	0	0	0	0	0	0	0		
MTS Emer. Breaker			**26,506**	**25,978**	**0**	**0**	**31,838**	**31,000**	**0**	**0**		
CBL-0004	CABLE	In	25,480	25,307	0	0	30,605	30,200	0	0	25,978	
PI-0002	PI-EQUI	In	1,026	671	0	0	1,233	800	0	0		
MTS Load			**26,505**	**25,977**	**0**	**0**	**31,837**	**30,999**	**0**	**0**		
CBL-0005	CABLE	In	1,026	671	0	0	1,233	800	0	0		
PI-0001	PI-EQUI	In	0	0	0	0	0	0	0	0		
PI-0002	PI-EQUI	In	25,479	25,307	0	0	30,604	30,199	0	0	25,977	
MCC			**25,884**	**25,024**	**0**	**0**	**30,650**	**29,138**	**0**	**0**		
CBL-0005	CABLE	In	24,858	24,362	0	0	29,434	28,368	0	0	25,024	
CBL-0006	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0008	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0009	CABLE	In	0	0	0	0	0	0	0	0		

Bus Name	---------Contributions---------		-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
CBL-0010	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0013	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0014	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0015	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0016	CABLE	In	969	624	0	0	1,147	727	0	0		
CBL-0018	CABLE	In	59	38	0	0	69	44	0	0		
CBL-0020	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0023	CABLE	In	0	0	0	0	0	0	0	0		
CBL-0027	CABLE	In	0	0	0	0	0	0	0	0		
VFD Pump #4 Input			**23,835**	**21,990**	**0**	**0**	**26,323**	**23,393**	**0**	**0**		
CBL-0006	CABLE	In	23,835	21,990	0	0	26,323	23,393	0	0	21,990	
VFD Pump #4		In	0	0	0	0	0	0	0	0		
VFD Pump #4 Output			**24,798**	**22,532**	**0**	**0**	**27,472**	**23,982**	**0**	**0**		
CBL-0007	CABLE	In	970	588	0	0	1,075	626	0	0		
VFD Pump #4		In	23,835	21,949	0	0	26,405	23,361	0	0	22,532	

Bus Name	---------Contributions---------		-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
Pump #4			**19,201**	**15,162**	**0**	**0**	**19,682**	**15,254**	**0**	**0**		
CBL-0007	CABLE	In	18,276	14,675	0	0	18,734	14,764	0	0	15,162	
125hp Pump #4	IND-MTR	In	980	516	0	0	1,004	519	0	0		
Upper Unit Heater			**6,929**	**4,253**	**0**	**0**	**6,929**	**4,253**	**0**	**0**		
CBL-0008	CABLE	In	6,929	4,253	0	0	6,929	4,253	0	0	4,253	
Lower Unit Heater			**3,704**	**2,206**	**0**	**0**	**3,704**	**2,206**	**0**	**0**		
CBL-0009	CABLE	In	3,704	2,206	0	0	3,704	2,206	0	0	2,206	
VFD Pump #2 Input			**21,639**	**19,024**	**0**	**0**	**23,082**	**19,622**	**0**	**0**		
CBL-0012	CABLE	In	21,639	19,024	0	0	23,082	19,622	0	0	19,024	
VFD Pump #2		In	0	0	0	0	0	0	0	0		
VFD Pump #2 Output			**22,593**	**19,513**	**0**	**0**	**24,191**	**20,139**	**0**	**0**		
CBL-0011	CABLE	In	971	559	0	0	1,040	577	0	0		
VFD Pump #2		In	21,639	18,964	0	0	23,169	19,571	0	0	19,513	
Pump #2			**18,285**	**14,260**	**0**	**0**	**18,768**	**14,358**	**0**	**0**		
CBL-0011	CABLE	In	17,358	13,778	0	0	17,817	13,873	0	0	14,260	

Bus Name	---------Contributions---------			-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
125hp Pump #2		IND-MTR	In	980	509	0	0	1,006	513	0	0		
Pump #2 Disc.				**21,844**	**19,294**	**0**	**0**	**23,375**	**19,950**	**0**	**0**		
CBL-0010		CABLE	In	21,844	19,294	0	0	23,375	19,950	0	0	19,294	
CBL-0012		CABLE	In	0	0	0	0	0	0	0	0		
West Ventilator				**5,449**	**3,289**	**0**	**0**	**5,449**	**3,289**	**0**	**0**		
CBL-0013		CABLE	In	5,449	3,289	0	0	5,449	3,289	0	0	3,289	
East Ventilator				**1,928**	**1,134**	**0**	**0**	**1,928**	**1,134**	**0**	**0**		
CBL-0014		CABLE	In	1,928	1,134	0	0	1,928	1,134	0	0	1,134	
Wet Well Ventilator				**1,168**	**684**	**0**	**0**	**1,168**	**684**	**0**	**0**		
CBL-0015		CABLE	In	1,168	684	0	0	1,169	684	0	0	684	
Pump #3 Breaker				**24,898**	**23,550**	**0**	**0**	**28,879**	**26,558**	**0**	**0**		
CBL-0016		CABLE	In	23,930	22,939	0	0	27,756	25,869	0	0	23,550	
CBL-0017		CABLE	In	970	612	0	0	1,126	690	0	0		
Pump #3				**19,463**	**15,917**	**0**	**0**	**20,160**	**16,083**	**0**	**0**		
CBL-0017		CABLE	In	18,524	15,404	0	0	19,188	15,566	0	0	15,917	

Bus Name	---------Contributions---------			------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	---------------Asymmetrical Amps--------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
125hp Pump #3	IND-MTR	In		980	534	0	0	1,015	540	0	0		
Charcoal Vent. Disc.				**3,726**	**2,213**	**0**	**0**	**3,726**	**2,213**	**0**	**0**		
CBL-0018	CABLE	In		3,703	2,203	0	0	3,703	2,203	0	0	2,213	
CBL-0019	CABLE	In		59	23	0	0	59	23	0	0		
Charcoal Ventilator				**2,989**	**1,764**	**0**	**0**	**2,989**	**1,764**	**0**	**0**		
CBL-0019	CABLE	In		2,968	1,756	0	0	2,968	1,756	0	0	1,764	
7.5hp Charcoal Ventilator	IND-MTR	In		59	23	0	0	59	23	0	0		
VFD Pump #1 Input				**21,758**	**18,502**	**0**	**0**	**22,274**	**18,603**	**0**	**0**		
CBL-0022	CABLE	In		21,758	18,502	0	0	22,274	18,603	0	0	18,502	
VFD Pump #1		In		0	0	0	0	0	0	0	0		
VFD Pump #1 Output				**22,128**	**18,686**	**0**	**0**	**22,678**	**18,790**	**0**	**0**		
CBL-0021	CABLE	In		389	219	0	0	398	220	0	0		
VFD Pump #1		In		21,758	18,477	0	0	22,298	18,580	0	0	18,686	
Pump #1				**10,838**	**7,002**	**0**	**0**	**10,839**	**7,002**	**0**	**0**		
CBL-0021	CABLE	In		10,571	6,887	0	0	10,572	6,887	0	0	7,002	

Bus Name	---------Contributions---------			-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
50hp Pump #1		IND-MTR	In	392	169	0	0	392	169	0	0		
Pump #1 Disc.				**22,464**	**19,536**	**0**	**0**	**23,209**	**19,721**	**0**	**0**		
CBL-0020		CABLE	In	22,464	19,536	0	0	23,209	19,721	0	0	19,536	
CBL-0022		CABLE	In	0	0	0	0	0	0	0	0		
XFMR Primary				**23,672**	**21,244**	**0**	**0**	**24,792**	**21,598**	**0**	**0**		
CBL-0023		CABLE	In	23,672	21,244	0	0	24,792	21,598	0	0	21,244	
XFMR		2W-XFMR	In	0	0	0	0	0	0	0	0		
XFMR Secondary				**486**	**488**	**0**	**0**	**518**	**520**	**0**	**0**		
CBL-0024		CABLE	In	0	0	0	0	0	0	0	0		
XFMR		2W-XFMR	In	486	488	0	0	518	520	0	0	488	
Terminal Strip				**485**	**485**	**0**	**0**	**516**	**516**	**0**	**0**		
CBL-0024		CABLE	In	485	485	0	0	516	516	0	0	485	
CBL-0025		CABLE	In	0	0	0	0	0	0	0	0		
CBL-0026		CABLE	In	0	0	0	0	0	0	0	0		
Entrance Panel				**474**	**467**	**0**	**0**	**497**	**485**	**0**	**0**		

Bus Name	---------Contributions---------		-------------Initial Symmetrical Amps----------- 3 Phase	SLG	LLG	LL	----------------Asymmetrical Amps---------------- 3 Phase	SLG	LLG	LL	---Init Sym Neutral Amps-- SLG	LLG
CBL-0025	CABLE	In	474	467	0	0	497	485	0	0	467	
Old Panel Mounted in Wall			**478**	**475**	**0**	**0**	**504**	**497**	**0**	**0**		
CBL-0026	CABLE	In	478	475	0	0	504	497	0	0	475	
480V Unit Heater			**2,819**	**1,669**	**0**	**0**	**2,819**	**1,669**	**0**	**0**		
CBL-0027	CABLE	In	2,819	1,669	0	0	2,819	1,669	0	0	1,669	

SECTION 3

COORDINATION STUDY

Switchgear Power Solutions
901 Forest Ave.
Sheboygan Falls, WI 53085
www.switchgearpowersolutions.com
(920)-234-2500

Protective Device Coordination Study

Purpose

Proper coordination is a very important issue that is affecting every building and facility. Reliability and minimizing the amount of equipment that goes down during a fault starts with having a system that coordinates properly. All of the devices in the system must be coordinated properly starting with the utility and working all the way down in the system to protect the equipment and personnel. A Coordination Study is critical for the safe, efficient, and economical operation of any electrical distribution system. A Coordination Study isolates electrical faults to the nearest protective device, in addition to avoiding nuisance trips due to current inrush from transformers and motor starting.

Explanation of Data

Switchgear Power Solutions visited the site to collect the protective device information, cable lengths, and equipment identifications. The incoming minimum available fault current as the system is configured today and maximum future design fault current were both provided by We Energies for both the Normal side and Aux side of the Transfer Switch. The maximum available fault current was used to analyze the time current curves of the protective devices on site.

Assumptions

While collecting the data in order to do the coordination study some of the cable sizes could not be seen or read on the cable insulation. Reasonable assumptions were made to figure out what the cable size was for the study.

Analysis of Results and Recommendations

While analyzing the coordination of the protective devices at this facility, some issues and overlapping time current curves between over current protective devices (OCPDs) were found and are detailed below.

1. In general, downstream branch breakers have overlapping time current characteristic curves with the upstream feeder breakers at the upper instantaneous portion end of their curves. This is typical for molded case circuit breakers (MCCB) and is the best coordination that can be achieved. Since breakers are sized for the required load, **no changes are recommended at this time**. The overlap may not be as bad as indicated, as the downstream breaker opening may add impedance limiting the amount of let-thru energy seen by the upstream breaker. However, since manufacturers do not normally test for series breaker coordination, improved coordination cannot be assured nor quantified.
2. The breakers in the transfer switch are already set at maximum and still overlap with the distribution breakers in the MCC. This is the best coordination that can be achieved with the breakers that are in place. There is a small chance that a large fault would cause the breaker in the MCC to trip at the same time or before the breaker in the MCC feeding that specific load.
3. The 240V Panel mounted on the wall across from the MCC does not have a main breaker in it which is required when on the secondary side of the transformer.
4. The handle on the front of the molded case breaker feeding the 480V unit heater is snapped off. It is unlikely that the handle on the front of the bucket door will be able to operate the breaker. This is currently a 30A Cutler-Hammer type EHD breaker rated at 14kA at 480V. This breaker is under-rated for the maximum available fault current and should be replaced.
5. The nameplate on the MCC door says there is a 10kVA XFMR feeding the panels on site. The transformer nameplate could not safely be seen with the power on to the site. If the transformer is verified to be a 10kVA transformer the 70A fuse feeding primary power to the transformer is oversized to properly protect the transformer. The transformer would be damaged before the fuses blow. In order to properly fix this issue

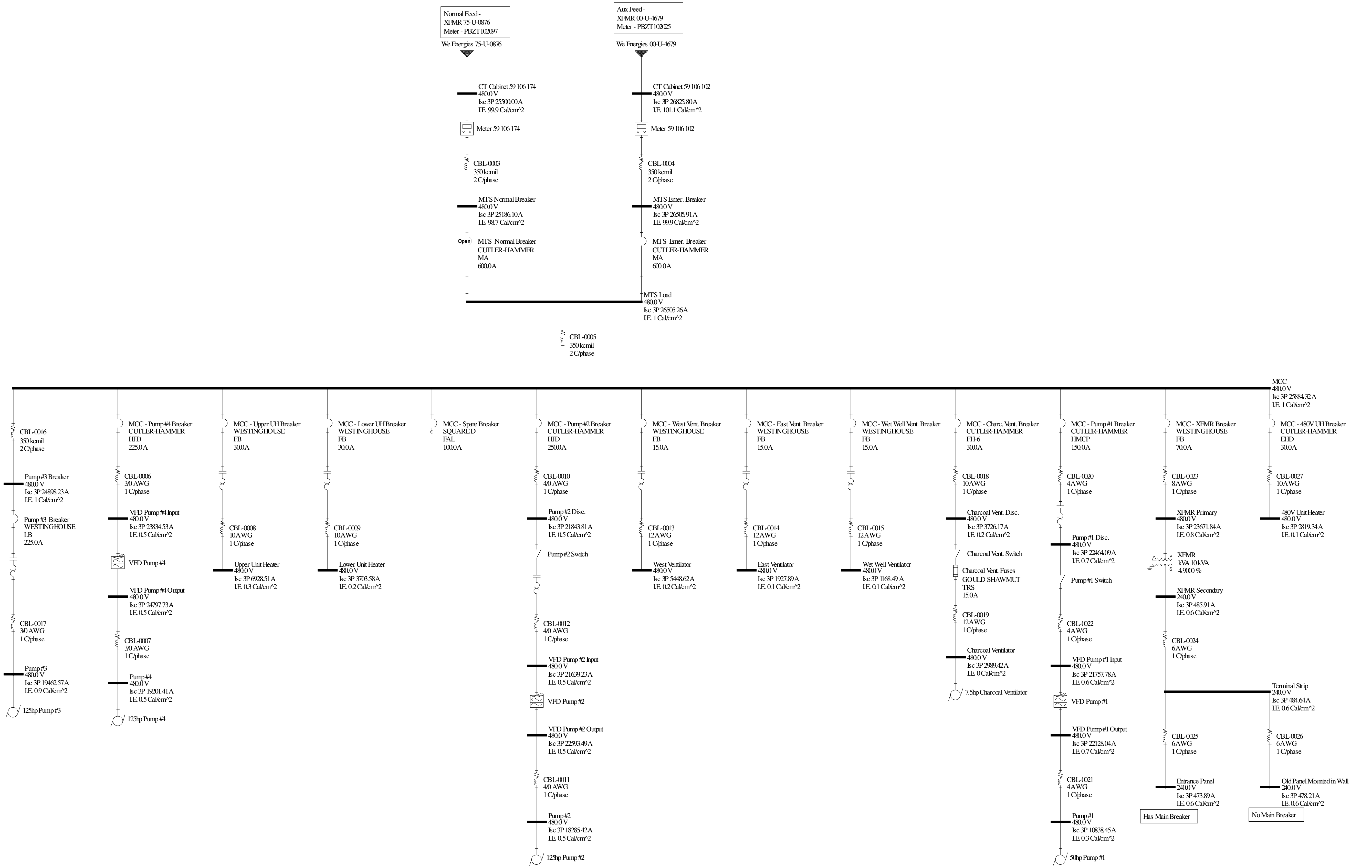
power to the transformer would need to be shut down and the nameplate read. The primary protection should be verified to be properly sized to protect the transformer.

Refer to the over current device rating and settings reports that are included in Section 6 for a detailed list of over current protective devices and setting recommendations. Also refer to the TCC curves that are included for specific TCC curve results. All of the breaker settings on site were already found to be properly adjusted for optimal coordination so no changes are required.

COORDINATION STUDY

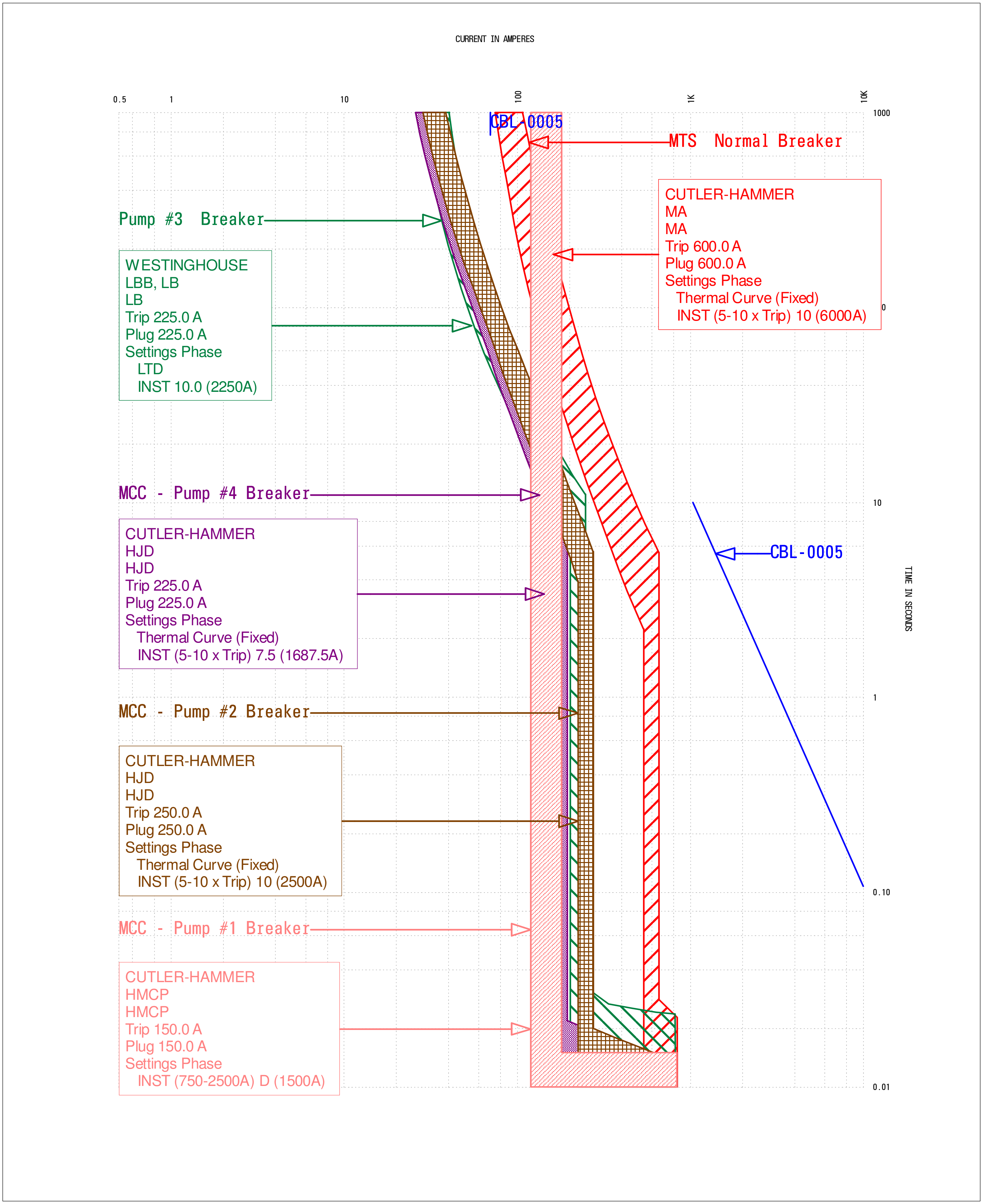
SKM ONE-LINES AND

TIME CURRENT CURVES

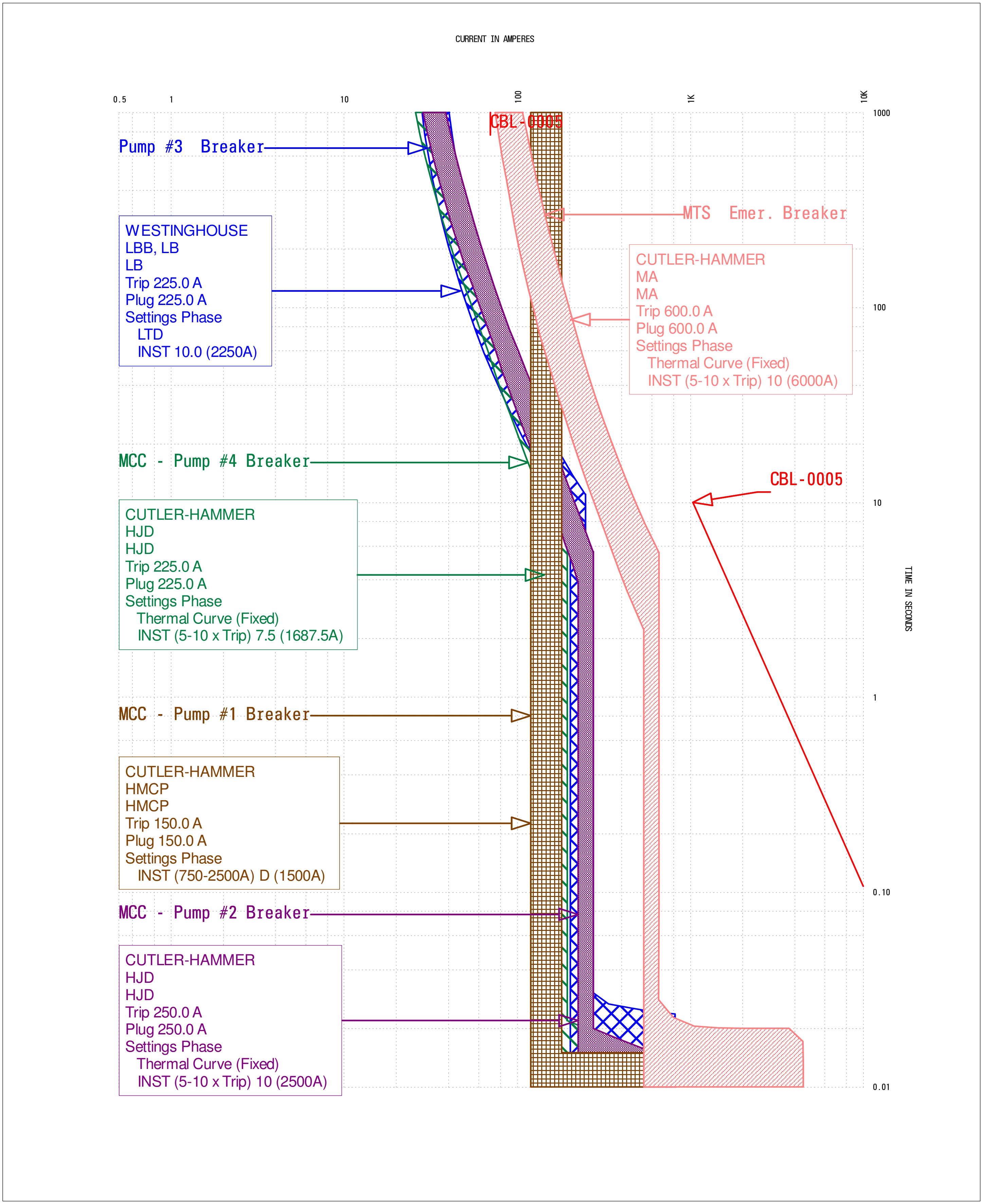


City of Mequon for
Lift Station E
2020 W. Ranch Rd. Mequon, WI 53092
June 10, 2020

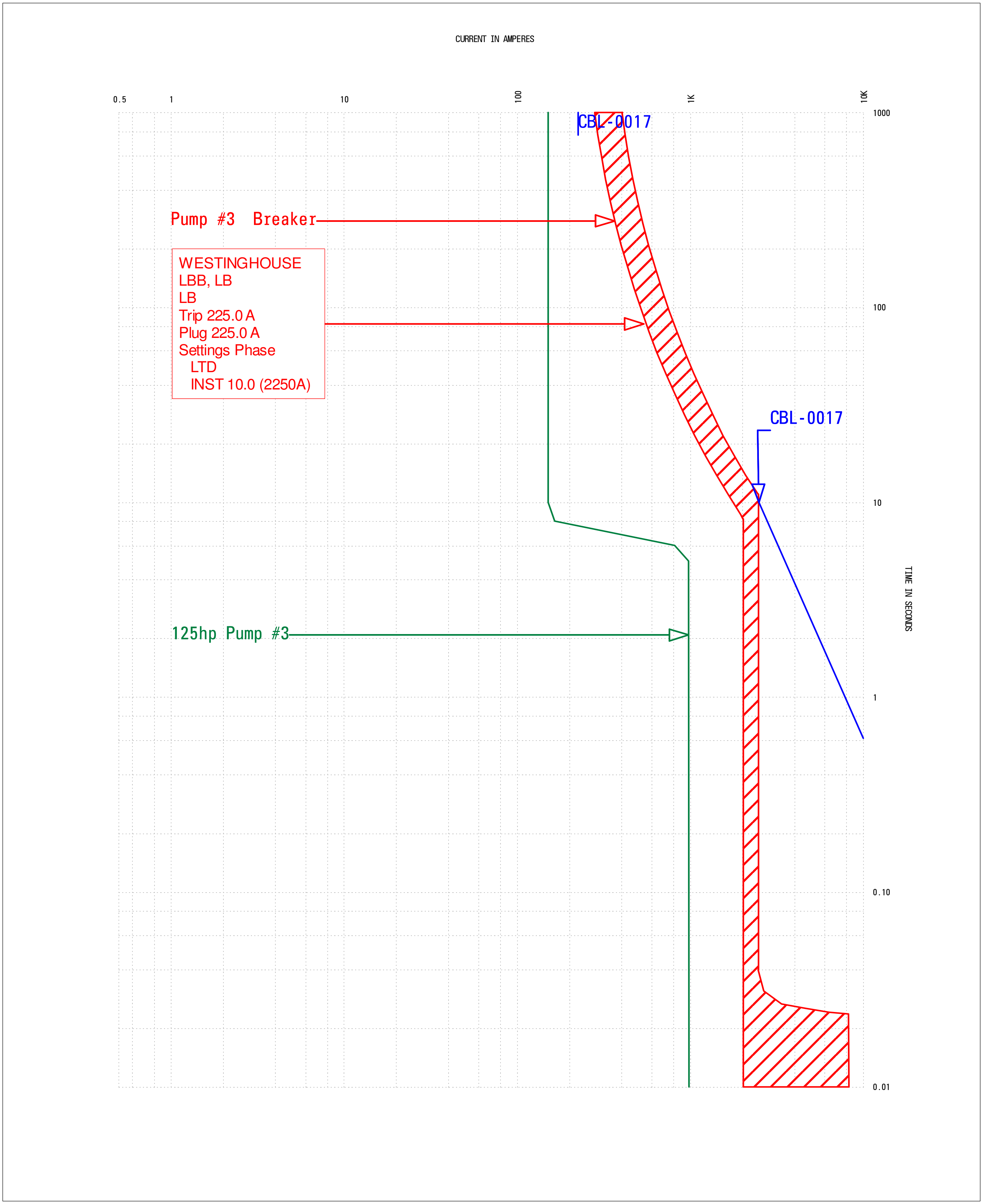
City of Mequon - Lift Station E - One-Line



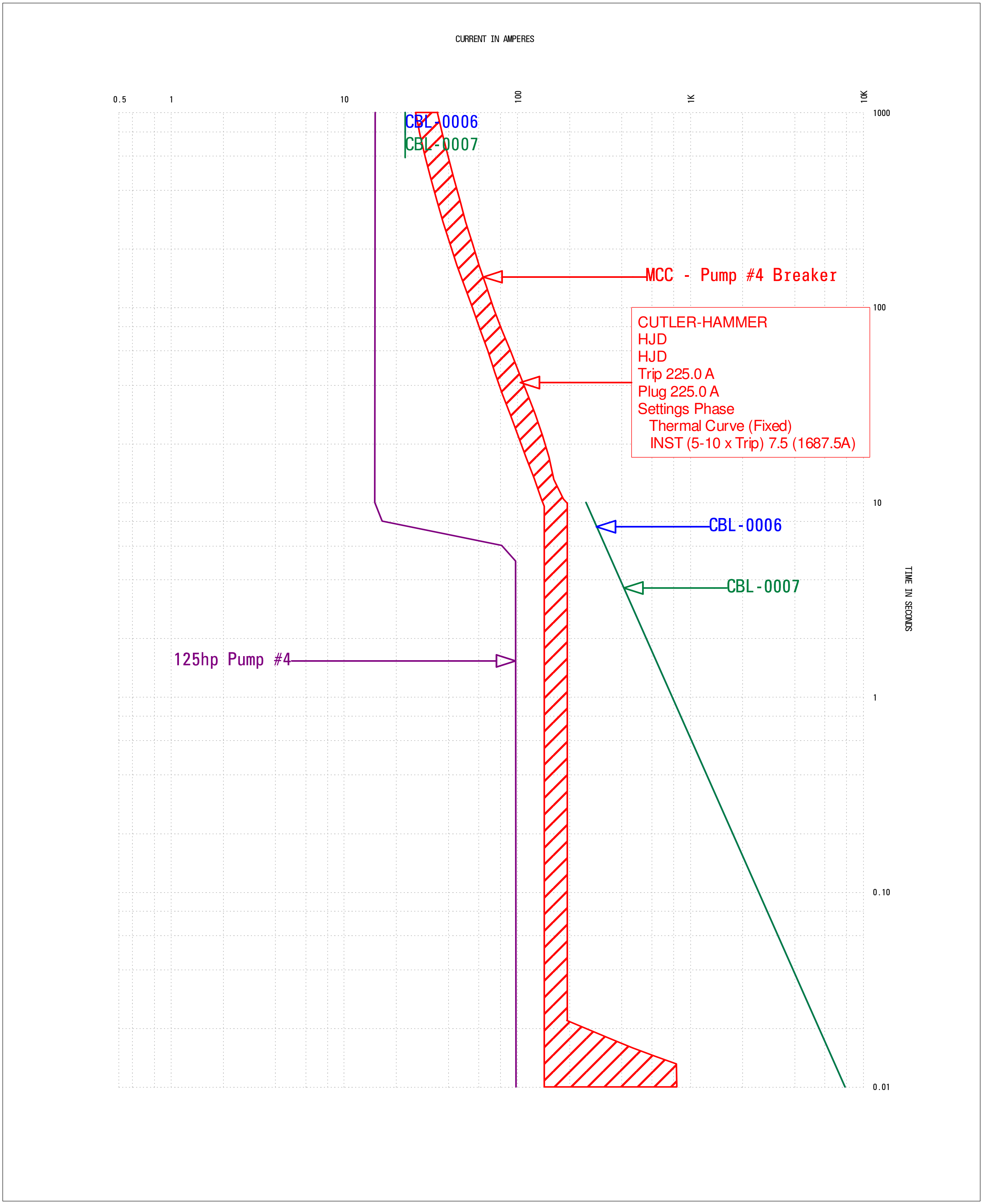
City of Mequon for	Lift Station E 2020 W. Ranch Rd. Mequon, WI 53092	TCC Name: MCC - Normal Reference Voltage: 480 Current in Amps x 10
May 26, 2020		



City of Mequon for	Lift Station E	TCC Name: MCC - Aux
	2020 W. Ranch Rd.	Reference Voltage: 480
May 26, 2020	Mequon, WI 53092	Current in Amps x 10



City of Mequon for	Lift Station E	TCC Name: Pump #3
	2020 W. Ranch Rd.	Reference Voltage: 480
May 26, 2020	Mequon, WI 53092	Current in Amps x 1



City of Mequon for

May 26, 2020

Lift Station E
2020 W. Ranch Rd.
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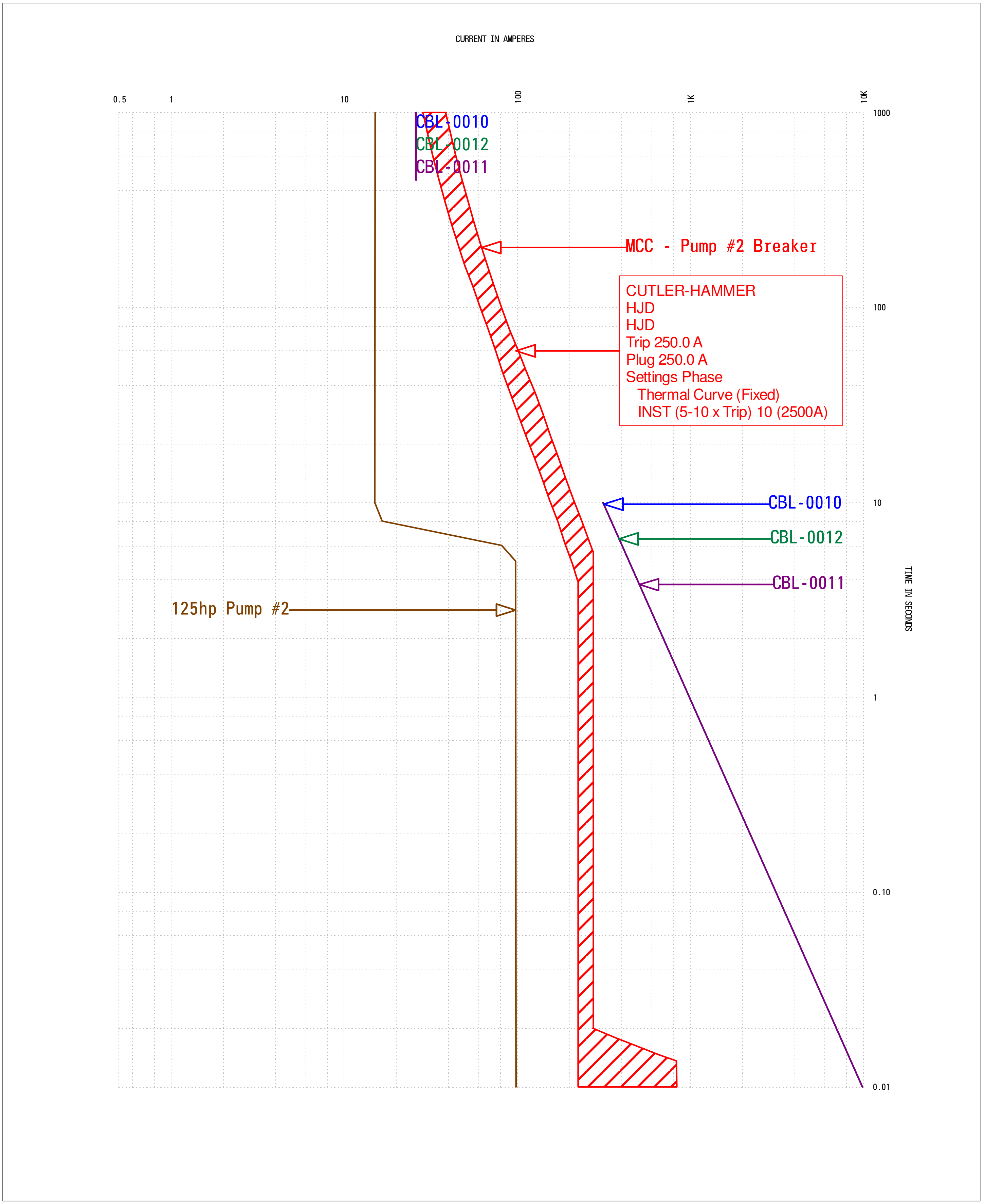
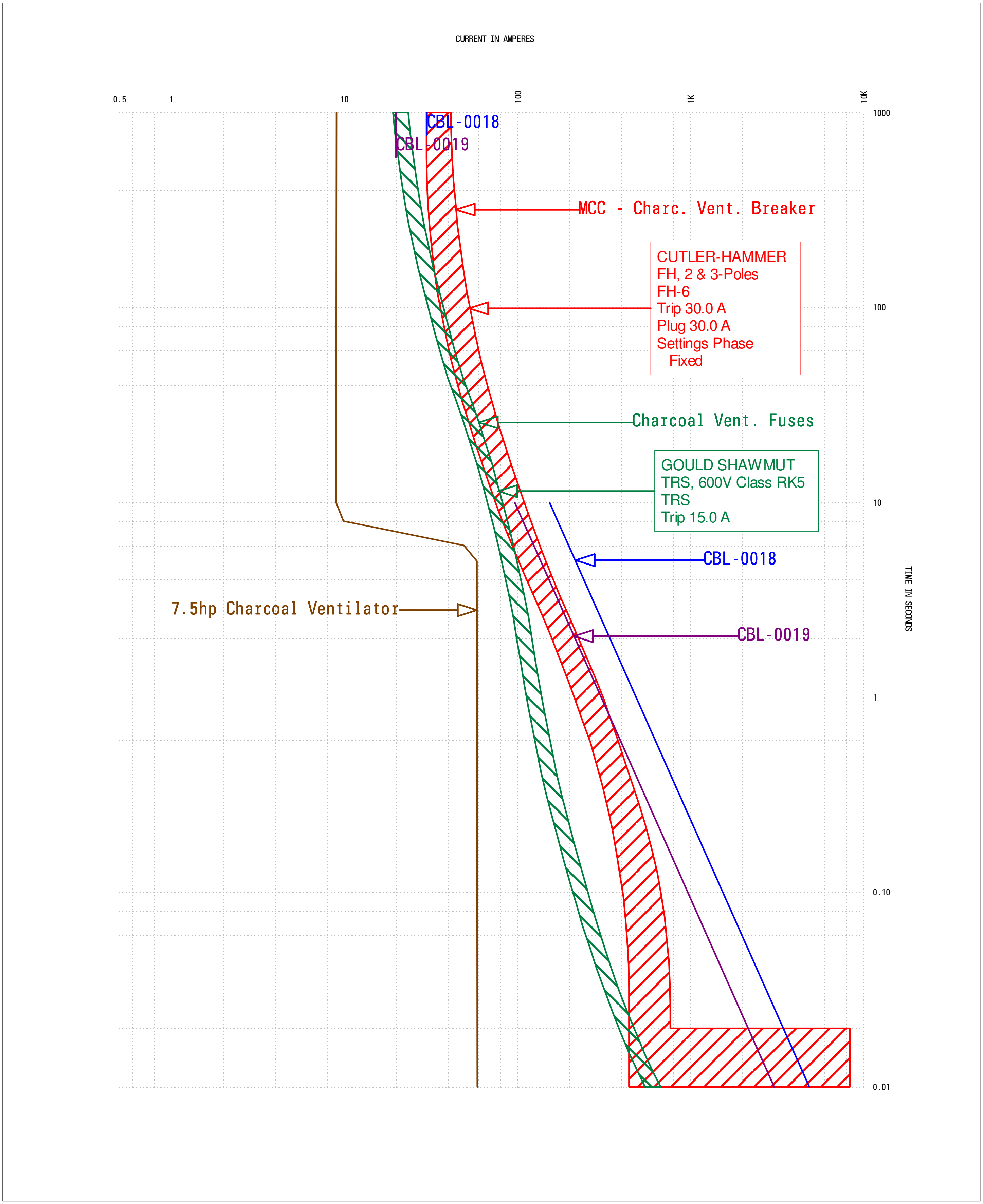
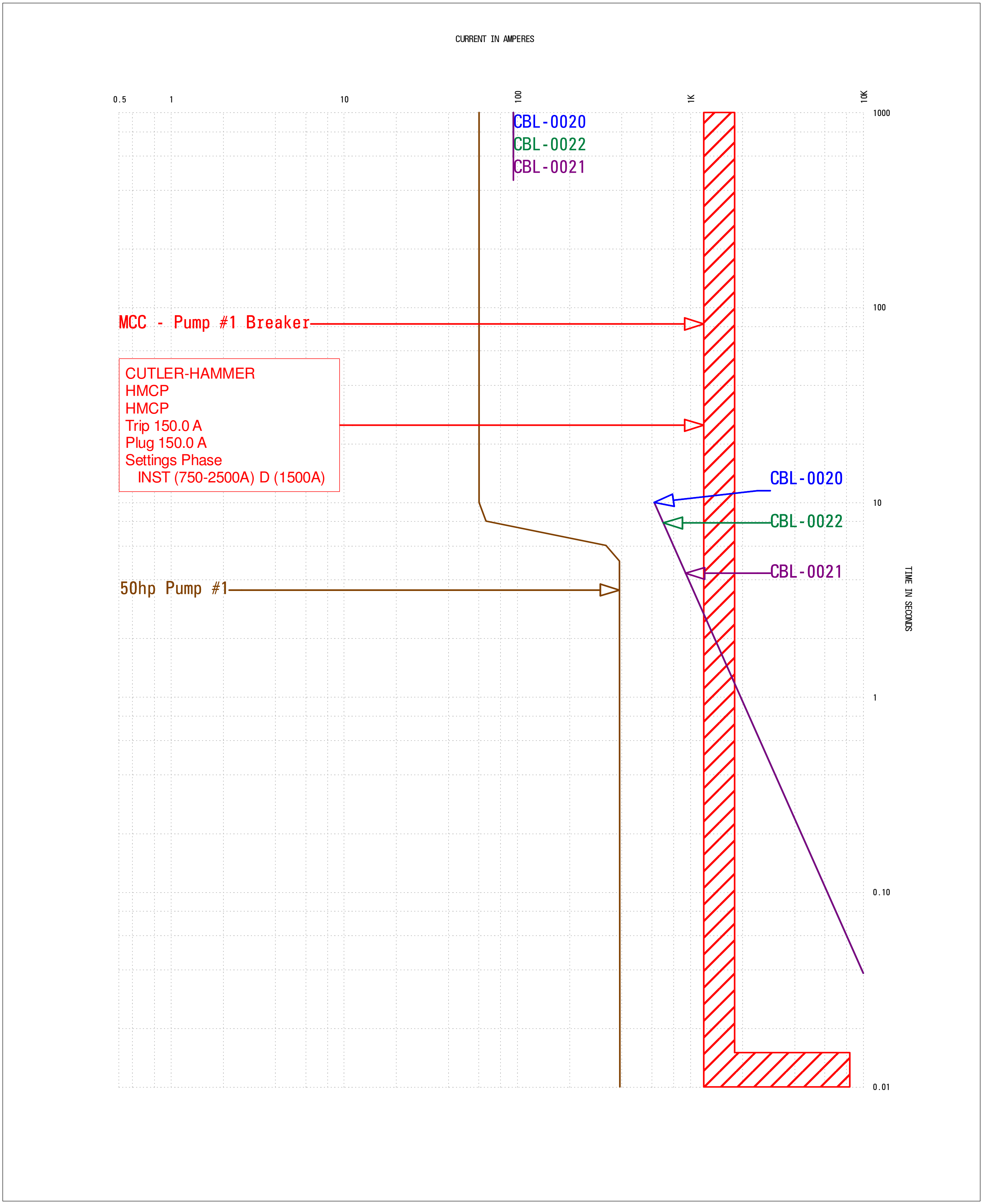
TCC Name: Pump #4
Reference Voltage: 480
Current in Amps x 10



City of Mequon for May 26, 2020	Lift Station E 2020 W. Ranch Rd. Mequon, WI 53092	TCC Name: Pump #2 Reference Voltage: 480 Current in Amps x 10



City of Mequon for May 26, 2020	Lift Station E 2020 W. Ranch Rd. Mequon, WI 53092	TCC Name: Charcoal Ventilator Reference Voltage: 480 Current in Amps x 1

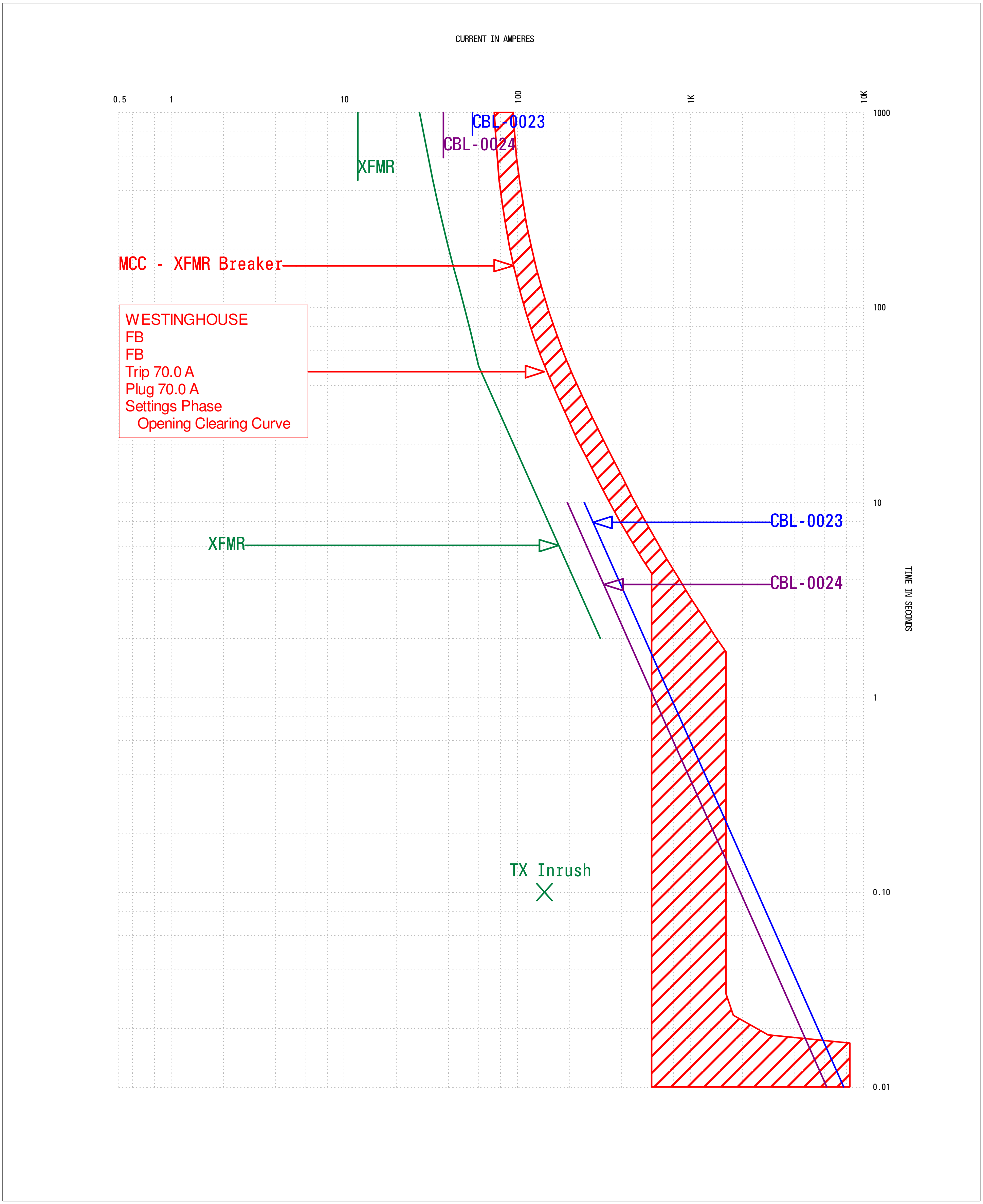


City of Mequon for

May 26, 2020

Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

TCC Name: Pump #1
Reference Voltage: 480
Current in Amps x 1



City of Mequon for

May 26, 2020

Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

TCC Name: XFMR
Reference Voltage: 480
Current in Amps x 1

SECTION 4

ARC FLASH
RISK ASSESSMENT

Switchgear Power Solutions
901 Forest Ave.
Sheboygan Falls, WI 53085
www.switchgearpowersolutions.com
(920)-234-2500

Arc Flash Risk Assessment

Purpose of an Arc Flash Risk Assessment

It is important to have an arc flash risk assessment done to ensure that personnel are safe while operating or interacting with the electrical equipment. Having the risk assessment done and labeling the equipment accordingly helps personnel select the proper personal protective equipment while working on the electrical distribution equipment. After the risk assessment is complete, the incident energy can be analyzed at each point in the system to determine if measures need to be taken to lower the hazard. The hazards are only present while the equipment is energized, it is always better when possible to put the equipment in an electrically safe work condition.

Procedure for determining results

This study starts at the secondary side of the Normal Meter and Aux Meter where the available fault currents were provided by, We Energies. Using the available fault currents the short circuit fault current was calculated at each point in the system. After verifying that the equipment was rated to be installed in that part of the system the protective device settings were analyzed to find the best settings to achieve coordination between the protective devices. These settings were used in combination with the fault currents in the short circuit study to determine the fault duration times.

The arc flash risk assessment is based on equations from both NFPA 70E and IEEE 1584 along with the methods provided in IEEE 1584.1. The calculations presented in this report are based on the IEEE 1584 calculation procedure. The software used for this study calculates the three-phase arcing fault current at each bus in the system based on the available three-phase bolted fault current determined during the short circuit analysis. Once the arcing fault current and fault duration are known, equations from IEEE 1584 are used to calculate the incident energy and arc flash boundary for each location under study.

IEEE 1584 has stated that for low voltage buses, less than 1000V, a second arcing fault current value is calculated to be equal to 85% of the arcing fault value originally calculated. Using this second calculation a second device operating time is determined. Analyzing the two values the worst-case result is reported for the incident energy and arc flash boundary.

It should be noted that over current protection devices cannot protect themselves. Because of this fact, the incoming line lugs at panels with a main circuit breaker are used as the location for determining the incident energy. If the main is mounted in a separate section or a stand-alone enclosure upstream from the distribution panel, the higher incident energy will be posted on the main and the lower at the distribution panel. The incoming line lugs represents the worst-case condition. These line lugs remain energized even when the MCB is turned off to de-energize the panel.

Assumptions

No assumptions were made for the City of Mequon - Lift Station E - Arc Flash Risk Assessment.

Results

The Arc Flash Hazard Risk Assessment was run under four scenarios, one with the system on the minimum NORMAL installed fault current as the system is designed today provided by the utility, a second with the system on the maximum NORMAL future design fault current provided by the utility, a third with the system on the minimum AUX. installed fault current as the system is designed today provided by the utility, and a fourth with the system on the maximum AUX. future design fault current provided by the utility. See the Arc Flash Evaluation Reports in this section for results. The worst-case results are used for the Arc Flash Labels and not all of the worst case labels come from the same scenario.

It is important to point out that some of these arc flash values are calculated for a maximum duration of 2 seconds per NFPA 70E. This is assuming that a person exposed to an arc flash will be able to get away from the arc flash within 2 seconds. If this is not possible, more precautions should be taken since the person will be exposed to a higher amount of incident energy that is listed on the arc flash label. NEC section 110.16 and 70E section 130.6(D) state the minimum requirements for arc flash labeling are switchboards, panel boards, MCC's, industrial control panels, and meter socket enclosures. In addition, it is important to watch the labels and replace them when they get old, faded, or fall off. If this should happen feel free to contact SPS for new labels or replacements.

The Arc Flash Risk Assessment indicates that most of the equipment has an incident energy level below 8cal/cm2. The areas that had incident energies higher than this were the Transfer Switch and MCC. The Transfer Switch is a dangerous area because it is fed directly off the utility power with no upstream protection taken into account. The MCC has a higher incident energy because when the system is operating at a minimum amount of fault current there is not enough fault current to trip the transfer switch breakers in the instantaneous part of the curve. Because of this, the fault is sustained for a longer period of time. The arc flash hazard at the MCC can be lowered by adjusting the settings on the transfer switch breakers to minimum, but then the transfer switch breakers would possibly trip before the breakers feeding the pumps if there was a fault on one of the pumps. To keep proper coordination the settings on the transfer switch breakers were left as found and it is recommended if any maintenance is going to be done on the MCC while it is energized that these settings should be lowered to a minimum setting which will lower the incident energy at the MCC. The rest of the equipment was found to be rated at 8cal/cm^2 or less which requires minimal PPE while working on the equipment. PPE tables will need to be referenced to verify what PPE should be worn at each location in the system.

Recommendations

Training
NFPA 70E requires training to be done once every 3 years because a new 70E electrical safety standard comes out once every 3 years. This training can be in the form of classroom, hands-on field training, or a combination of the two. This is determined by the job requirements and the hazards that personnel will be exposed to. This training will also go over arc flash labels and how to select the proper PPE for the incident energy one will be working around. Additional requirements and guidance on selecting PPE can be found in NFPA 70E article 130.7 and Annex H. [See Section #7 on Work Safety for additional information and guidance on selecting appropriate PPE.]

Updates to the Study
In the future, the Arc Flash Hazard Risk Assessment should be reviewed and updated as required every five (5) years per NFPA 70E or whenever major changes or additions are made to the electrical system. If any of the protective devices in the system are changed or large loads are added this will change the arc flash values and the study should be updated.

Maintaining Equipment
Arc flash incident energy values are only valid if the equipment is maintained and functioning properly. It is important to maintain the protective devices on a regular basis to ensure they will work when they are needed. If the upstream breaker clearing the fault does not open as predicted, the arc flash could be a lot greater than what is on the label. Regularly scheduled breaker testing is recommended to ensure that the breakers are functioning properly.

ARC FLASH RISK ASSESSMENT

NORMAL OPERATION

MINIMUM INSTALLED

Project: City of Mequon - Lift Station E - SKM
Base Project

City of Mequon for
Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

Arc Flash Evaluation Report

Arc Flash Evaluation Study Options

Standard:	IEEE 1584	**Max Arcing Duration:**	2.0 seconds
Unit:	English	**Include Transformer Phase Shift:**	No
Clear Fault Threshold:	80 %	**Define Grounded as SLG/3P Fault >= :**	5.0 %
Check Upstream Miscoordination:	No		

-- Flash Boundary Calculation Adjustment Option --

-- Incident Energy Report Option for Equipment Below 240 V --

Report calculated incident energy from equation

-- Generator and Synchronous Motor Decay Option --

-- Induction Motor Decay Option --

Include induction motors for 5 cycles.

-- Fuse Current Limiting Option --

Specify fuses as current limiting in the protective device library, manufacturer's equipment-specific Incident Energy equations will be used if available.

-- Report Option --

Report Bus Results

Report last trip device

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
480V Unit Heater	0.480	MCC - 480V UH Breaker	2.52	2.02	2.52	2.02	0.018	0.000	PNL	25	4.14	18.00	0.11	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Charcoal Vent. Disc.	0.480	MCC - Charc. Vent. Breaker	3.19	2.47	3.16	2.45	0.020	0.000	PNL	25	5.01	18.00	0.15	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Charcoal Ventilator	0.480	Charcoal Vent. Fuses	2.66	2.12	2.63	2.09	0.004	0.000	PNL	25	1.74	18.00	0.03	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
CT Cabinet 59 106 102	0.480	MaxTripTime @2.0s	7.50	5.13	0.00	0.00	2.000	0.000	PNL	25	134.10	18.00	32.26	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
CT Cabinet 59 106 174	0.480	MaxTripTime @2.0s	8.43	5.67	7.40	5.07	2.000	0.000	PNL	25	133.53	18.00	32.03	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
East Ventilator	0.480	MCC - East Vent. Breaker	1.80	1.52	1.80	1.52	0.019	0.000	PNL	25	3.52	18.00	0.08	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Entrance Panel	0.240	MCC - XFMR Breaker	0.47	0.47	0.47	0.47	2.000	0.000	PNL	25	12.15	18.00	0.54	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Lower Unit Heater	0.480	MCC - Lower UH Breaker	3.17	2.45	3.17	2.45	0.019	0.000	PNL	25	4.83	18.00	0.14	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
MCC	0.480	MTS Normal Breaker	8.35	5.62	7.32	4.93	2.000	0.000	PNL	25	132.70	18.00	31.70	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
MTS Emer. Breaker	0.480	MaxTripTime @2.0s	7.47	5.11	0.00	0.00	2.000	0.000	PNL	25	133.82	18.00	32.14	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
MTS Load	0.480	MTS Normal Breaker	8.40	5.65	7.37	4.96	2.000	0.000	PNL	25	133.25	18.00	31.92	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
MTS Normal Breaker	0.480	MaxTripTime @2.0s	8.40	5.65	7.37	5.05	2.000	0.000	PNL	25	133.25	18.00	31.92	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
Old Panel Mounted in Wall	0.240	MCC - XFMR Breaker	0.47	0.47	0.47	0.47	2.000	0.000	PNL	25	12.20	18.00	0.55	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #1	0.480	MCC - Pump #1 Breaker	6.45	4.51	6.11	4.27	0.015	0.000	PNL	25	6.25	18.00	0.21	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #1 Disc.	0.480	MCC - Pump #1 Breaker	7.99	5.42	7.99	5.41	0.015	0.000	PNL	25	7.05	18.00	0.26	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #2	0.480	MCC - Pump #2 Breaker	8.22	5.55	7.26	4.90	0.016	0.000	PNL	25	7.48	18.00	0.28	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #2 Disc.	0.480	MCC - Pump #2 Breaker	7.89	5.35	7.88	5.35	0.016	0.000	PNL	25	7.18	18.00	0.26	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #3	0.480	Pump #3 Breaker	7.69	5.24	6.73	4.58	0.025	0.000	PNL	25	9.47	18.00	0.42	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #3 Breaker	0.480	MTS Normal Breaker	8.26	5.57	7.23	4.87	2.000	0.000	PNL	25	131.80	18.00	31.35	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
Pump #4	0.480	MCC - Pump #4 Breaker	8.38	5.64	7.42	4.99	0.015	0.000	PNL	25	7.37	18.00	0.28	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Terminal Strip	0.240	MCC - XFMR Breaker	0.48	0.48	0.48	0.48	2.000	0.000	PNL	25	12.28	18.00	0.56	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Upper Unit Heater	0.480	MCC - Upper UH Breaker	4.96	3.60	4.96	3.60	0.019	0.000	PNL	25	6.15	18.00	0.21	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #1 Input	0.480	MCC - Pump #1 Breaker	7.92	5.37	7.92	5.37	0.015	0.000	PNL	25	7.01	18.00	0.25	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #1 Output	0.480	MCC - Pump #1 Breaker	8.30	5.59	7.92	5.34	0.015	0.000	PNL	25	7.20	18.00	0.27	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
VFD Pump #2 Input	0.480	MCC - Pump #2 Breaker	7.86	5.34	7.86	5.34	0.016	0.000	PNL	25	7.17	18.00	0.26	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #2 Output	0.480	MCC - Pump #2 Breaker	8.82	5.89	7.86	5.25	0.016	0.000	PNL	25	7.68	18.00	0.30	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #4 Input	0.480	MCC - Pump #4 Breaker	8.12	5.49	8.12	5.49	0.015	0.000	PNL	25	7.11	18.00	0.26	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #4 Output	0.480	MCC - Pump #4 Breaker	9.09	6.04	8.12	5.40	0.015	0.000	PNL	25	7.60	18.00	0.29	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
West Ventilator	0.480	MCC - West Vent. Breaker	4.25	3.16	4.25	3.16	0.018	0.000	PNL	25	5.45	18.00	0.17	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Wet Well Ventilator	0.480	MCC - Wet Well Vent. Breaker	1.13	1.01	1.13	1.01	0.020	0.000	PNL	25	2.78	18.00	0.06	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
XFMR Primary	0.480	MCC - XFMR Breaker	8.12	5.49	8.12	5.49	0.017	0.000	PNL	25	7.80	18.00	0.30	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
XFMR Secondary	0.240	MCC - XFMR Breaker	0.48	0.48	0.48	0.48	2.000	0.000	PNL	25	12.30	18.00	0.56	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and

ARC FLASH RISK ASSESSMENT

NORMAL OPERATION

MAXIMUM FUTURE DESIGN

Project: City of Mequon - Lift Station E - SKM
Base Project

City of Mequon for
Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

Arc Flash Evaluation Report

Arc Flash Evaluation Study Options

Standard:	IEEE 1584	**Max Arcing Duration:**	2.0 seconds
Unit:	English	**Include Transformer Phase Shift:**	No
Clear Fault Threshold:	80 %	**Define Grounded as SLG/3P Fault >= :**	5.0 %
Check Upstream Miscoordination:	No		

-- Flash Boundary Calculation Adjustment Option --

-- Incident Energy Report Option for Equipment Below 240 V --

Report calculated incident energy from equation

-- Generator and Synchronous Motor Decay Option --

-- Induction Motor Decay Option --

Include induction motors for 5 cycles.

-- Fuse Current Limiting Option --

Specify fuses as current limiting in the protective device library, manufacturer’s equipment-specific Incident Energy equations will be used if available.

-- Report Option --

Report Bus Results

Report last trip device

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
480V Unit Heater	0.480	MCC - 480V UH Breaker	2.82	2.22	2.82	2.22	0.018	0.000	PNL	25	4.36	18.00	0.12	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Charcoal Vent. Disc.	0.480	MCC - Charc. Vent. Breaker	3.72	2.82	3.70	2.80	0.020	0.000	PNL	25	5.46	18.00	0.17	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Charcoal Ventilator	0.480	Charcoal Vent. Fuses	2.99	2.34	2.97	2.32	0.004	0.000	PNL	25	1.86	18.00	0.03	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
CT Cabinet 59 106 102	0.480	MaxTripTime @2.0s	25.80	14.74	0.00	0.00	2.000	0.000	PNL	25	268.77	18.00	100.94	DO NOT WORK ON LIVE!
CT Cabinet 59 106 174	0.480	MaxTripTime @2.0s	26.53	15.09	25.50	14.59	2.000	0.000	PNL	25	267.25	18.00	100.01	DO NOT WORK ON LIVE!
East Ventilator	0.480	MCC - East Vent. Breaker	1.93	1.61	1.93	1.61	0.019	0.000	PNL	25	3.64	18.00	0.09	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Entrance Panel	0.240	MCC - XFMR Breaker	0.47	0.47	0.47	0.47	2.000	0.000	PNL	25	12.29	18.00	0.56	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Lower Unit Heater	0.480	MCC - Lower UH Breaker	3.70	2.80	3.70	2.80	0.019	0.000	PNL	25	5.28	18.00	0.16	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
MCC	0.480	MTS Normal Breaker	25.61	14.64	24.58	14.05	0.020	0.000	PNL	25	16.25	18.00	1.01	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
MTS Emer. Breaker	0.480	MaxTripTime @2.0s	25.48	14.58	0.00	0.00	2.000	0.000	PNL	25	266.88	18.00	99.79	DO NOT WORK ON LIVE!
MTS Load	0.480	MTS Normal Breaker	26.21	14.94	25.19	14.35	0.020	0.000	PNL	25	16.47	18.00	1.03	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
MTS Normal Breaker	0.480	MaxTripTime @2.0s	26.21	14.94	25.19	14.44	2.000	0.000	PNL	25	265.40	18.00	98.88	DO NOT WORK ON LIVE!

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
Old Panel Mounted in Wall	0.240	MCC - XFMR Breaker	0.48	0.48	0.48	0.48	2.000	0.000	PNL	25	12.34	18.00	0.56	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #1	0.480	MCC - Pump #1 Breaker	10.79	7.00	10.52	6.82	0.015	0.000	PNL	25	8.35	18.00	0.34	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #1 Disc.	0.480	MCC - Pump #1 Breaker	22.24	12.98	22.24	12.98	0.015	0.000	PNL	25	12.54	18.00	0.66	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #2	0.480	MCC - Pump #2 Breaker	18.15	10.91	17.22	10.35	0.013	0.000	PNL	25	10.10	18.00	0.46	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #2 Disc.	0.480	MCC - Pump #2 Breaker	21.63	12.68	21.63	12.68	0.012	0.000	PNL	25	10.74	18.00	0.51	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #3	0.480	Pump #3 Breaker	19.30	11.50	18.36	10.94	0.023	0.000	PNL	25	14.99	18.00	0.89	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #3 Breaker	0.480	MTS Normal Breaker	24.64	14.17	23.61	13.58	0.020	0.000	PNL	25	15.91	18.00	0.98	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #4	0.480	MCC - Pump #4 Breaker	19.05	11.37	18.13	10.82	0.012	0.000	PNL	25	10.10	18.00	0.46	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Terminal Strip	0.240	MCC - XFMR Breaker	0.48	0.48	0.48	0.48	2.000	0.000	PNL	25	12.42	18.00	0.57	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Upper Unit Heater	0.480	MCC - Upper UH Breaker	6.91	4.78	6.91	4.78	0.018	0.000	PNL	25	7.28	18.00	0.27	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #1 Input	0.480	MCC - Pump #1 Breaker	21.54	12.63	21.54	12.63	0.015	0.000	PNL	25	12.31	18.00	0.64	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #1 Output	0.480	MCC - Pump #1 Breaker	21.91	12.82	21.54	12.60	0.015	0.000	PNL	25	12.43	18.00	0.65	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
VFD Pump #2 Input	0.480	MCC - Pump #2 Breaker	21.43	12.58	21.43	12.58	0.012	0.000	PNL	25	10.70	18.00	0.51	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #2 Output	0.480	MCC - Pump #2 Breaker	22.39	13.05	21.43	12.50	0.012	0.000	PNL	25	10.98	18.00	0.53	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #4 Input	0.480	MCC - Pump #4 Breaker	23.59	13.65	23.59	13.65	0.011	0.000	PNL	25	10.83	18.00	0.52	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #4 Output	0.480	MCC - Pump #4 Breaker	24.55	14.12	23.59	13.57	0.011	0.000	PNL	25	11.09	18.00	0.54	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
West Ventilator	0.480	MCC - West Vent. Breaker	5.44	3.90	5.44	3.90	0.017	0.000	PNL	25	6.17	18.00	0.21	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Wet Well Ventilator	0.480	MCC - Wet Well Vent. Breaker	1.17	1.05	1.17	1.05	0.020	0.000	PNL	25	2.81	18.00	0.06	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
XFMR Primary	0.480	MCC - XFMR Breaker	23.42	13.57	23.42	13.57	0.016	0.000	PNL	25	13.50	18.00	0.74	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
XFMR Secondary	0.240	MCC - XFMR Breaker	0.49	0.49	0.49	0.49	2.000	0.000	PNL	25	12.44	18.00	0.57	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and

ARC FLASH RISK ASSESSMENT

AUX OPEATION
MINIMUM INSTALLED

Project: City of Mequon - Lift Station E - SKM
Base Project

City of Mequon for
Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

Arc Flash Evaluation Report

Arc Flash Evaluation Study Options

Standard:	IEEE 1584	**Max Arcing Duration:**	2.0 seconds
Unit:	English	**Include Transformer Phase Shift:**	No
Clear Fault Threshold:	80 %	**Define Grounded as SLG/3P Fault >= :**	5.0 %
Check Upstream Miscoordination:	No		

-- Flash Boundary Calculation Adjustment Option --

-- Incident Energy Report Option for Equipment Below 240 V --

Report calculated incident energy from equation

-- Generator and Synchronous Motor Decay Option --

-- Induction Motor Decay Option --

Include induction motors for 5 cycles.

-- Fuse Current Limiting Option --

Specify fuses as current limiting in the protective device library, manufacturer’s equipment-specific Incident Energy equations will be used if available.

-- Report Option --

Report Bus Results

Report last trip device

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
480V Unit Heater	0.480	MCC - 480V UH Breaker	2.53	2.02	2.53	2.02	0.018	0.000	PNL	25	4.14	18.00	0.11	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Charcoal Vent. Disc.	0.480	MCC - Charc. Vent. Breaker	3.20	2.48	3.17	2.45	0.020	0.000	PNL	25	5.02	18.00	0.15	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Charcoal Ventilator	0.480	Charcoal Vent. Fuses	2.67	2.12	2.64	2.10	0.004	0.000	PNL	25	1.74	18.00	0.03	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
CT Cabinet 59 106 102	0.480	MaxTripTime @2.0s	8.53	5.72	7.50	5.13	2.000	0.000	PNL	25	134.53	18.00	32.43	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
CT Cabinet 59 106 174	0.480	MaxTripTime @2.0s	7.40	5.07	0.00	0.00	2.000	0.000	PNL	25	133.10	18.00	31.86	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
East Ventilator	0.480	MCC - East Vent. Breaker	1.80	1.52	1.80	1.52	0.019	0.000	PNL	25	3.52	18.00	0.08	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Entrance Panel	0.240	MCC - XFMR Breaker	0.47	0.47	0.47	0.47	2.000	0.000	PNL	25	12.15	18.00	0.54	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Lower Unit Heater	0.480	MCC - Lower UH Breaker	3.17	2.46	3.17	2.46	0.019	0.000	PNL	25	4.84	18.00	0.14	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
MCC	0.480	MTS Emer. Breaker	8.44	5.68	7.42	4.98	2.000	0.000	PNL	25	133.69	18.00	32.09	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
MTS Emer. Breaker	0.480	MaxTripTime @2.0s	8.50	5.71	7.47	5.11	2.000	0.000	PNL	25	134.25	18.00	32.31	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
MTS Load	0.480	MTS Emer. Breaker	8.50	5.71	7.47	5.02	2.000	0.000	PNL	25	134.25	18.00	32.31	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
MTS Normal Breaker	0.480	MaxTripTime @2.0s	7.37	5.05	0.00	0.00	2.000	0.000	PNL	25	132.82	18.00	31.75	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
Old Panel Mounted in Wall	0.240	MCC - XFMR Breaker	0.47	0.47	0.47	0.47	2.000	0.000	PNL	25	12.20	18.00	0.55	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #1	0.480	MCC - Pump #1 Breaker	6.50	4.54	6.15	4.30	0.015	0.000	PNL	25	6.28	18.00	0.21	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #1 Disc.	0.480	MCC - Pump #1 Breaker	8.08	5.47	8.08	5.47	0.015	0.000	PNL	25	7.09	18.00	0.26	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #2	0.480	MCC - Pump #2 Breaker	8.30	5.59	7.33	4.94	0.016	0.000	PNL	25	7.51	18.00	0.28	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #2 Disc.	0.480	MCC - Pump #2 Breaker	7.97	5.40	7.97	5.40	0.016	0.000	PNL	25	7.21	18.00	0.27	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #3	0.480	Pump #3 Breaker	7.77	5.29	6.81	4.63	0.025	0.000	PNL	25	9.52	18.00	0.42	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #3 Breaker	0.480	MTS Emer. Breaker	8.35	5.62	7.32	4.93	2.000	0.000	PNL	25	132.77	18.00	31.73	PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing
Pump #4	0.480	MCC - Pump #4 Breaker	8.46	5.68	7.49	5.03	0.015	0.000	PNL	25	7.40	18.00	0.28	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Terminal Strip	0.240	MCC - XFMR Breaker	0.48	0.48	0.48	0.48	2.000	0.000	PNL	25	12.28	18.00	0.56	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Upper Unit Heater	0.480	MCC - Upper UH Breaker	4.98	3.62	4.98	3.62	0.019	0.000	PNL	25	6.17	18.00	0.21	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #1 Input	0.480	MCC - Pump #1 Breaker	8.01	5.42	8.01	5.42	0.015	0.000	PNL	25	7.06	18.00	0.26	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #1 Output	0.480	MCC - Pump #1 Breaker	8.39	5.64	8.01	5.39	0.015	0.000	PNL	25	7.24	18.00	0.27	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
VFD Pump #2 Input	0.480	MCC - Pump #2 Breaker	7.95	5.39	7.95	5.39	0.016	0.000	PNL	25	7.20	18.00	0.27	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #2 Output	0.480	MCC - Pump #2 Breaker	8.91	5.94	7.95	5.30	0.016	0.000	PNL	25	7.70	18.00	0.30	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #4 Input	0.480	MCC - Pump #4 Breaker	8.21	5.54	8.21	5.54	0.015	0.000	PNL	25	7.14	18.00	0.26	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #4 Output	0.480	MCC - Pump #4 Breaker	9.18	6.10	8.21	5.45	0.015	0.000	PNL	25	7.63	18.00	0.29	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
West Ventilator	0.480	MCC - West Vent. Breaker	4.27	3.17	4.27	3.17	0.018	0.000	PNL	25	5.46	18.00	0.17	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Wet Well Ventilator	0.480	MCC - Wet Well Vent. Breaker	1.13	1.02	1.13	1.02	0.020	0.000	PNL	25	2.78	18.00	0.06	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
XFMR Primary	0.480	MCC - XFMR Breaker	8.22	5.54	8.22	5.54	0.017	0.000	PNL	25	7.85	18.00	0.31	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
XFMR Secondary	0.240	MCC - XFMR Breaker	0.48	0.48	0.48	0.48	2.000	0.000	PNL	25	12.30	18.00	0.56	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and

ARC FLASH RISK ASSESSMENT

AUX OPERATION
MAXIMUM FUTURE DESIGN

Project: City of Mequon - Lift Station E - SKM
Base Project

City of Mequon for
Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

Arc Flash Evaluation Report

Arc Flash Evaluation Study Options

Standard:	IEEE 1584	**Max Arcing Duration:**	2.0 seconds
Unit:	English	**Include Transformer Phase Shift:**	No
Clear Fault Threshold:	80 %	**Define Grounded as SLG/3P Fault >= :**	5.0 %
Check Upstream Miscoordination:	No		

-- Flash Boundary Calculation Adjustment Option --

-- Incident Energy Report Option for Equipment Below 240 V --

Report calculated incident energy from equation

-- Generator and Synchronous Motor Decay Option --

-- Induction Motor Decay Option --

Include induction motors for 5 cycles.

-- Fuse Current Limiting Option --

Specify fuses as current limiting in the protective device library, manufacturer’s equipment-specific Incident Energy equations will be used if available.

-- Report Option --

Report Bus Results

Report last trip device

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
480V Unit Heater	0.480	MCC - 480V UH Breaker	2.82	2.22	2.82	2.22	0.018	0.000	PNL	25	4.36	18.00	0.12	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Charcoal Vent. Disc.	0.480	MCC - Charc. Vent. Breaker	3.73	2.82	3.70	2.80	0.020	0.000	PNL	25	5.47	18.00	0.17	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Charcoal Ventilator	0.480	Charcoal Vent. Fuses	2.99	2.34	2.97	2.32	0.004	0.000	PNL	25	1.86	18.00	0.03	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
CT Cabinet 59 106 102	0.480	MaxTripTime @2.0s	26.83	15.24	25.80	14.74	2.000	0.000	PNL	25	269.02	18.00	101.10	DO NOT WORK ON LIVE!
CT Cabinet 59 106 174	0.480	MaxTripTime @2.0s	25.50	14.59	0.00	0.00	2.000	0.000	PNL	25	267.00	18.00	99.86	DO NOT WORK ON LIVE!
East Ventilator	0.480	MCC - East Vent. Breaker	1.93	1.61	1.93	1.61	0.019	0.000	PNL	25	3.64	18.00	0.09	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Entrance Panel	0.240	MCC - XFMR Breaker	0.47	0.47	0.47	0.47	2.000	0.000	PNL	25	12.29	18.00	0.56	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Lower Unit Heater	0.480	MCC - Lower UH Breaker	3.70	2.81	3.70	2.81	0.019	0.000	PNL	25	5.28	18.00	0.16	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
MCC	0.480	MTS Emer. Breaker	25.89	14.78	24.86	14.19	0.020	0.000	PNL	25	16.35	18.00	1.02	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
MTS Emer. Breaker	0.480	MaxTripTime @2.0s	26.51	15.08	25.48	14.58	2.000	0.000	PNL	25	267.13	18.00	99.94	DO NOT WORK ON LIVE!
MTS Load	0.480	MTS Emer. Breaker	26.51	15.08	25.48	14.49	0.020	0.000	PNL	25	16.57	18.00	1.04	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
MTS Normal Breaker	0.480	MaxTripTime @2.0s	25.19	14.44	0.00	0.00	2.000	0.000	PNL	25	265.15	18.00	98.72	DO NOT WORK ON LIVE!

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
Old Panel Mounted in Wall	0.240	MCC - XFMR Breaker	0.48	0.48	0.48	0.48	2.000	0.000	PNL	25	12.34	18.00	0.56	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #1	0.480	MCC - Pump #1 Breaker	10.84	7.02	10.57	6.85	0.015	0.000	PNL	25	8.37	18.00	0.34	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #1 Disc.	0.480	MCC - Pump #1 Breaker	22.47	13.09	22.47	13.09	0.015	0.000	PNL	25	12.61	18.00	0.67	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #2	0.480	MCC - Pump #2 Breaker	18.29	10.98	17.36	10.42	0.013	0.000	PNL	25	10.13	18.00	0.47	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #2 Disc.	0.480	MCC - Pump #2 Breaker	21.85	12.78	21.84	12.78	0.012	0.000	PNL	25	10.78	18.00	0.52	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #3	0.480	Pump #3 Breaker	19.46	11.58	18.52	11.02	0.023	0.000	PNL	25	15.06	18.00	0.89	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #3 Breaker	0.480	MTS Emer. Breaker	24.90	14.30	23.87	13.71	0.020	0.000	PNL	25	16.01	18.00	0.99	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Pump #4	0.480	MCC - Pump #4 Breaker	19.20	11.45	18.28	10.90	0.012	0.000	PNL	25	10.13	18.00	0.47	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Terminal Strip	0.240	MCC - XFMR Breaker	0.48	0.48	0.48	0.48	2.000	0.000	PNL	25	12.42	18.00	0.57	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Upper Unit Heater	0.480	MCC - Upper UH Breaker	6.93	4.79	6.93	4.79	0.018	0.000	PNL	25	7.29	18.00	0.27	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #1 Input	0.480	MCC - Pump #1 Breaker	21.76	12.74	21.76	12.74	0.015	0.000	PNL	25	12.38	18.00	0.65	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #1 Output	0.480	MCC - Pump #1 Breaker	22.13	12.92	21.76	12.71	0.015	0.000	PNL	25	12.50	18.00	0.66	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and

Bus Name	Bus kV	Protective Device Name	Bus Bolted Fault (kA)	Bus Arcing Fault (kA)	Prot Bolted Fault (kA)	Prot Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Equip Type	Gap (mm)	ArcFlash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	PPE
VFD Pump #2 Input	0.480	MCC - Pump #2 Breaker	21.64	12.68	21.64	12.68	0.012	0.000	PNL	25	10.74	18.00	0.51	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #2 Output	0.480	MCC - Pump #2 Breaker	22.59	13.16	21.64	12.60	0.012	0.000	PNL	25	11.02	18.00	0.53	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #4 Input	0.480	MCC - Pump #4 Breaker	23.84	13.77	23.84	13.77	0.011	0.000	PNL	25	10.87	18.00	0.52	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
VFD Pump #4 Output	0.480	MCC - Pump #4 Breaker	24.80	14.25	23.84	13.69	0.011	0.000	PNL	25	11.13	18.00	0.54	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
West Ventilator	0.480	MCC - West Vent. Breaker	5.45	3.90	5.45	3.90	0.017	0.000	PNL	25	6.18	18.00	0.21	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
Wet Well Ventilator	0.480	MCC - Wet Well Vent. Breaker	1.17	1.05	1.17	1.05	0.020	0.000	PNL	25	2.81	18.00	0.06	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
XFMR Primary	0.480	MCC - XFMR Breaker	23.67	13.69	23.67	13.69	0.016	0.000	PNL	25	13.57	18.00	0.75	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and
XFMR Secondary	0.240	MCC - XFMR Breaker	0.49	0.49	0.49	0.49	2.000	0.000	PNL	25	12.44	18.00	0.57	PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and

SECTION 5

RECOMMENDATIONS & CONCLUSIONS

Switchgear Power Solutions
901 Forest Ave.
Sheboygan Falls, WI 53085
www.switchgearpowersolutions.com
(920)-234-2500

Recommendations

The Short Circuit Study was run under two scenarios, one while the system was on normal minimum Utility Power as the system is designed/configured today and a second using We Energies Maximum Design Fault Current based on a Maximum Service size for the Aux side of the transfer switch (This is the worst-case scenario). The minimum available fault current provided by We Energies and the Maximum Design Fault Current were used to calculate the available fault currents in the system. While analyzing the short circuit study using the maximum future design fault current, most of the electrical protective devices installed at Lift Station E were found to be under-rated for the area they are installed.

Utilizing the data provided by We Energies it was found that all of the equipment was rated properly when doing the calculations under the minimum available fault current scenario. However, as stated in the letter the fault current during a fault scenario will be between the minimum and the maximum futured design fault current. They do not provide a way to calculate the maximum actual fault current as the system is designed today.

While using the worst-case fault current of the maximum future design while the site transfer switch is being fed from the Aux feed there is about 26.5kA of fault current at the transfer switch and the MCC. All of the breakers in the MCC other than the breakers feeding the 4 pumps and the charcoal ventilator are under-rated for this fault current. This means that the breaker is not rated to handle this fault current and has the risk of exploding rather than just tripping. This can cause damage to both equipment and can possibly injure personnel in the immediate area when a maximum fault would happen on this equipment.

In order to be properly rated for the maximum fault current at the MCC the breakers would need to be upgraded to breakers that are rated for more than 27kA. Most manufactures provide a 65kA rated line of breakers that should be direct swaps for what are already in place.

The 240V Panel mounted on the wall across from the MCC does not have a main breaker in it which is required when on the secondary side of the transformer.

The handle on the front of the molded case breaker feeding the 480V unit heater is snapped off. It is unlikely that the handle on the front of the bucket door will be able to operate the breaker. This is currently a 30A Cutler-Hammer type EHD breaker rated at 14kA at 480V. This breaker is under-rated for the maximum available fault current and should be replaced.

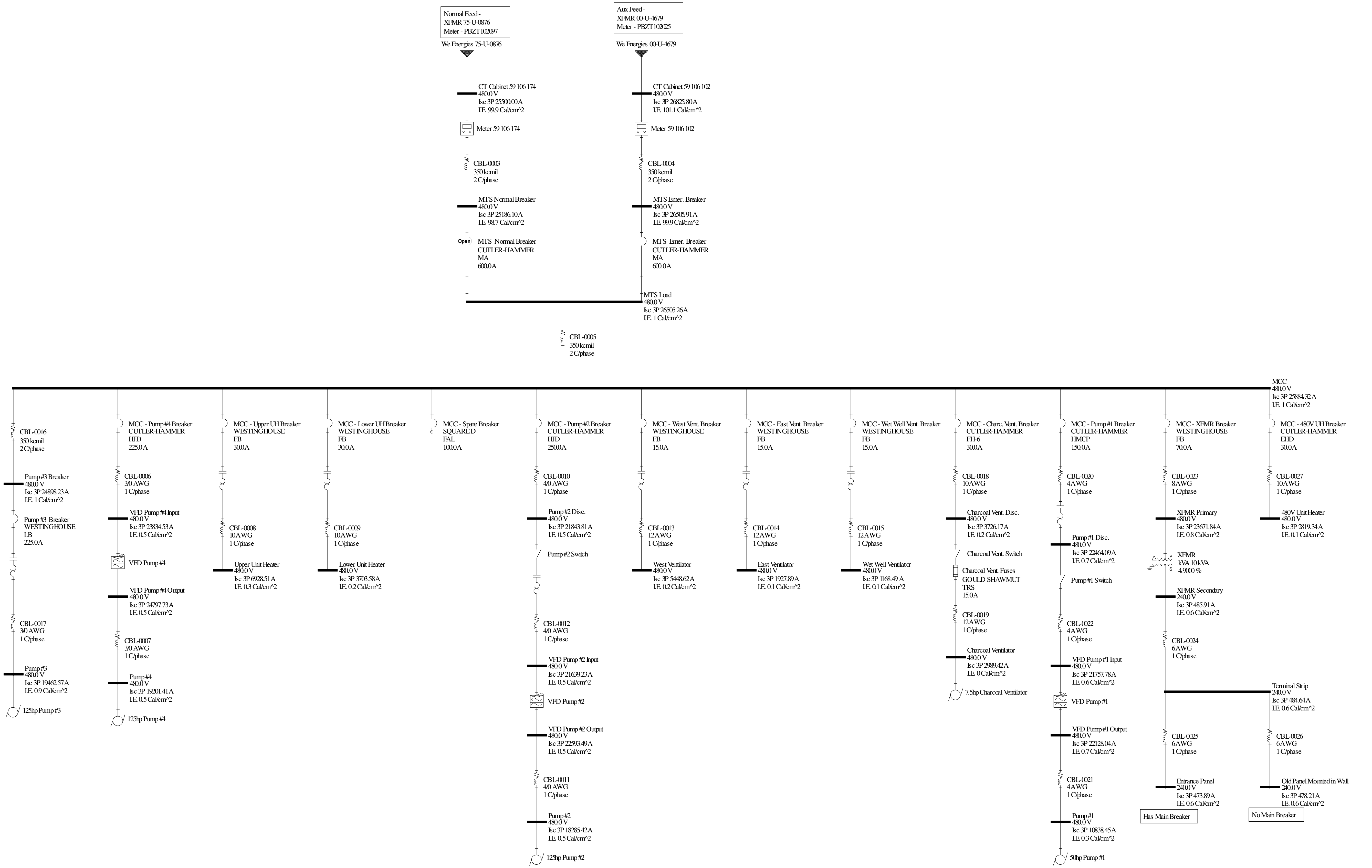
The nameplate on the MCC door says there is a 10kVA XFMR feeding the panels on site. The transformer nameplate could not safely be seen with the power on to the site. If the transformer is verified to be a 10kVA transformer the 70A fuse feeding primary power to the transformer is oversized to properly protect the transformer. The transformer would be damaged before the fuses blow. In order to properly fix this issue power to the transformer would need to be shut down and the nameplate read. The primary protection should be verified to be properly sized to protect the transformer.

Conclusion

Whenever a change is made to the system, this study should also be updated to ensure that all equipment is still properly rated, the system is properly coordinated, and the Arc Flash Hazard Categories are accurate.

SECTION 6

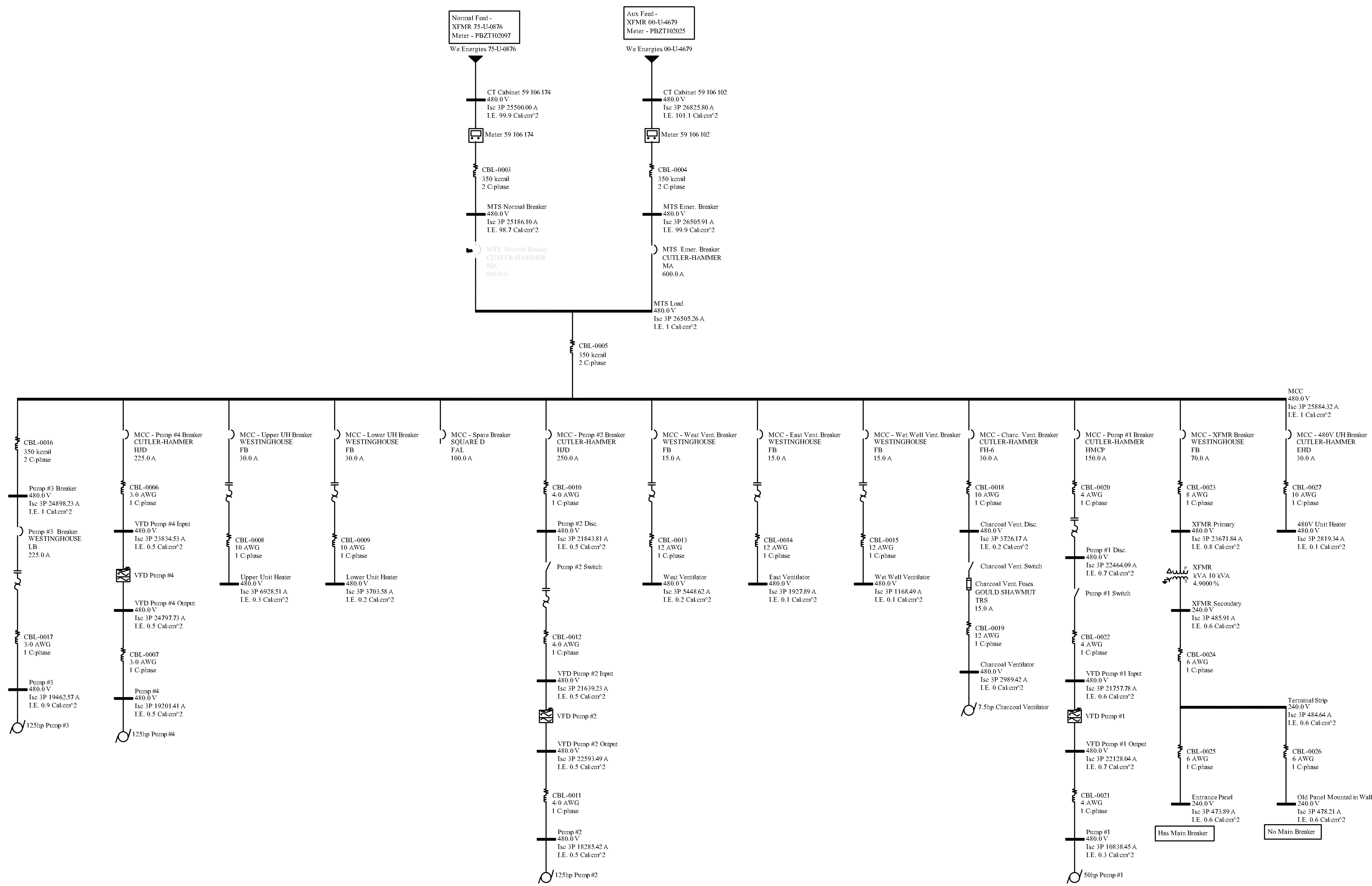
APPENDICES



City of Mequon for
Lift Station E
2020 W. Ranch Rd. Mequon, WI 53092
June 10, 2020

City of Mequon - Lift Station E - One-Line

SWITCHGEAR POWER SOLUTIONS



SWITCHGEAR POWER SOLUTIONS
901 FOREST AVENUE
SHEBOYGAN FALLS, WISCONSIN 53085
PHONE 920-234-2500
E-MAIL SWITCHGEARPOWERSOLUTIONS.COM

CUSTOMER:
City of Mequon
11333 N. Cedarburg Rd. 60W
Mequon, WI 53092-2937
One-Line Diagram
For Lift Station E

ISSUED

DATE: June 10, 2020

REV. #	DATE	DESCRIPTION
# 1		
# 2		
# 3		

City of MEQUON WISCONSIN Mek-wahn

PROJECT:
City of Mequon
Lift Station E
Arc Flash Risk Assessment
One-Line

SHEET TITLE
Electrical One-Line
SHEET 1 OF 1

ISSUED	RF	CREATED BY	RF
SCALE	No Scale		

DRAWING NAME/NO.
Lift Station E

CONTINUED ON DRAWING NO.

Project: City of Mequon - Lift Station E - SKM Base Project

City of Mequon for
Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

LOW VOLTAGE THERMAL MAGNETIC MOLDED CASE BREAKERS SETTINGS

DESIGNATION		FRAME		TRIP UNIT					
Location/Name	Amps Frame	MFR	TYPE MODEL	Amps Sensor/Plug		Description	TYPE/MODEL	LT SETTING	INST SETTING
MCC MCC - 480V UH Breaker	30	CUTLER-HAMMER	EHD	30	30	15-100A	EHD	Fixed	
MCC MCC - Charc. Vent. Breaker	40	CUTLER-HAMMER	FH-6	30	30	15-150A	FH, 2 & 3-Poles	Fixed	
MCC MCC - East Vent. Breaker	40	WESTINGHOUSE	FB	15	15	15-150A	FB	Opening Clearing Curve	
MCC MCC - Lower UH Breaker	40	WESTINGHOUSE	FB	30	30	15-150A	FB	Opening Clearing Curve	
MCC MCC - Pump #2 Breaker	250	CUTLER-HAMMER	HJD	250	250	70-250A	HJD	Thermal Curve (Fixed)	INST (5-10 x Trip) 10
MCC MCC - Pump #4 Breaker	225	CUTLER-HAMMER	HJD	225	225	70-250A	HJD	Thermal Curve (Fixed)	INST (5-10 x Trip) 7.50
MCC MCC - Upper UH Breaker	40	WESTINGHOUSE	FB	30	30	15-150A	FB	Opening Clearing Curve	
MCC MCC - West Vent. Breaker	40	WESTINGHOUSE	FB	15	15	15-150A	FB	Opening Clearing Curve	
MCC MCC - Wet Well Vent. Breaker	40	WESTINGHOUSE	FB	15	15	15-150A	FB	Opening Clearing Curve	
MCC MCC - XFMR Breaker	70	WESTINGHOUSE	FB	70	70	15-150A	FB	Opening Clearing Curve	
MTS Emer. Breaker MTS Emer. Breaker	600	CUTLER-HAMMER	MA	600	600	125-800A	MA	Thermal Curve (Fixed)	INST (5-10 x Trip) 10
MTS Normal Breaker MTS Normal Breaker	600	CUTLER-HAMMER	MA	600	600	125-800A	MA	Thermal Curve (Fixed)	INST (5-10 x Trip) 10

DESIGNATION		FRAME		TRIP UNIT				
Location/Name	Amps Frame	MFR	TYPE MODEL	Amps Sensor/Plug	Description	TYPE/MODEL	LT SETTING	INST SETTING
Pump #3 Breaker Pump #3 Breaker	400	WESTINGHOUSE	LB	225 225	70-400A	LBB, LB	LTD	INST 10.0

Project: City of Mequon - Lift Station E - SKM Base Project

City of Mequon for
Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

Low Voltage Fuses

Prot Dev	Func Name	Connected Bus	Voltage	Manufacturer	Type	Description	Cartridge	Cartridge Size	Trip
Charcoal Vent. Fuses	Phase	Charcoal Vent. Disc.	480	GOULD SHAWMUT	TRS, 600V Class RK5	15-600A	TRS	18	15

Project: City of Mequon - Lift Station E - SKM
Base Project

City of Mequon for
Lift Station E
2020 W. Ranch Rd.
Mequon, WI 53092

Motor Circuit Protectors

Prot Dev	Func Name	Connected Bus	Voltage	Manufacturer	Type	Description	Frame	Segments
MCC - Pump #	Phase	MCC	480	CUTLER-HAMMER	HMCP	150A (750-2500A Inst)	HMCP	INST (750-2500A) D
MCC - Spare E	Phase	MCC	480	SQUARE D	FAL Mag-Gard	100A	FAL	16M (150-580A) 150

ENERGIZED ELECTRICAL WORK PERMIT

PART I: TO BE COMPLETED BY THE REQUESTER:

Job/Work Order Number: ____________

(1) Description of circuit/equipment/job location:
MCC

(2) Description of work to be done:

(3) Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next scheduled outage:

Requester/Title

Date

PART II: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS DOING THE WORK:

Check When Complete

☐

(1) Detailed job description procedure to be used in performing the above detailed work:

☐

(2) Description of the Safe Work Practices to be employed:

Arc Flash Boundary	134"	Incident Energy	32 cal/cm^2	Working Distance	18"
Shock Hazard	480 VAC	Limited Approach Restricted Approach	42" 12"	Glove Class	00
Required PPE		PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing			

(3) Means employed to restrict the access of unqualified persons from the work area:

☐

(4) Evidence of completion of a Job Briefing including discussion of any job-related hazards:

(5) Do you agree the above described work can be done safely? ☐ Yes ☐ No (If no, return to requester)

Electrically Qualified Person(s)

Date

Electrically Qualified Person(s)

Date

PART III: APPROVAL(S) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:

Maintenance/Engineering Manager

Manufacturing Manager

Safety Manager

Electrically Knowledgeable Person

General Manager

Date

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

4 in	Flash Hazard Boundary
0.12 cal/cm^2	Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location: 480V Unit Heater

Protection: MCC - 480V UH Breaker

920-234-2500
June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

2 in	Flash Hazard Boundary
0.03 cal/cm^2	Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location: Charcoal Ventilator

Protection: Charcoal Vent. Fuses

920-234-2500
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WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

5 in	Flash Hazard Boundary
0.17 cal/cm^2	Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location: Charcoal Vent. Disc.

Protection: MCC - Charc. Vent. Breaker

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WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

4 in	Flash Hazard Boundary
0.09 cal/cm^2	Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location: East Ventilator

Protection: MCC - East Vent. Breaker

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WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

12 in Flash Hazard Boundary

0.56 cal/cm^2 Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

240 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: Entrance Panel

Protection: MCC - XFMR Breaker

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DANGER

NO SAFE PPE EXISTS

ENERGIZED WORK PROHIBITED

267 in Flash Hazard Boundary

100 cal/cm^2 Incident Energy at 18 in

DO NOT WORK ON LIVE!

480 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: MTS Emer. Breaker

Protection: MaxTripTime @2.0s

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WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

5 in Flash Hazard Boundary

0.16 cal/cm^2 Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: Lower Unit Heater

Protection: MCC - Lower UH Breaker

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WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

12 in Flash Hazard Boundary

0.56 cal/cm^2 Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

240 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: Old Panel Mounted in Wall

Protection: MCC - XFMR Breaker

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June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

8 in Flash Hazard Boundary

0.34 cal/cm^2 Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: Pump #1

Protection: MCC - Pump #1 Breaker

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WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

10 in Flash Hazard Boundary

0.47 cal/cm^2 Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: Pump #2

Protection: MCC - Pump #2 Breaker

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June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

13 in Flash Hazard Boundary

0.67 cal/cm^2 Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: Pump #1 Disc.

Protection: MCC - Pump #1 Breaker

920-234-2500

June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

11 in Flash Hazard Boundary

0.52 cal/cm^2 Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: Pump #2 Disc.

Protection: MCC - Pump #2 Breaker

920-234-2500

June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

15 in	Flash Hazard Boundary
0.89 cal/cm^2	Incident Energy at18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location: Pump #3 920-234-2500

Protection: Pump #3 Breaker June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

7 in	Flash Hazard Boundary
0.27 cal/cm^2	Incident Energy at18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location: Upper Unit Heater 920-234-2500

Protection: MCC - Upper UH Breaker June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

10 in	Flash Hazard Boundary
0.47 cal/cm^2	Incident Energy at18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location: Pump #4 920-234-2500

Protection: MCC - Pump #4 Breaker June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

12 in	Flash Hazard Boundary
0.65 cal/cm^2	Incident Energy at18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location: VFD Pump #1 Input 920-234-2500

Protection: MCC - Pump #1 Breaker June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

11 in	Flash Hazard Boundary
0.51 cal/cm^2	Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

SWITCHGEAR POWER SOLUTIONS

Location: VFD Pump #2 Input

Protection: MCC - Pump #2 Breaker

920-234-2500

June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

6 in	Flash Hazard Boundary
0.21 cal/cm^2	Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

SWITCHGEAR POWER SOLUTIONS

Location: West Ventilator

Protection: MCC - West Vent. Breaker

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June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

11 in	Flash Hazard Boundary
0.52 cal/cm^2	Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

SWITCHGEAR POWER SOLUTIONS

Location: VFD Pump #4 Input

Protection: MCC - Pump #4 Breaker

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June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

3 in	Flash Hazard Boundary
0.06 cal/cm^2	Incident Energy at 18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

SWITCHGEAR POWER SOLUTIONS

Location: Wet Well Ventilator

Protection: MCC - Wet Well Vent. Breaker

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June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

14 in	Flash Hazard Boundary
0.75 cal/cm^2	Incident Energy at18 in

PPE Required - Arc-rated shirt, pants, face shield, safety glasses, hard hat, hearing protection, and gloves are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

Location: XFMR Primary

Protection: MCC - XFMR Breaker

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June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

134 in Flash Hazard Boundary

32 cal/cm^2 Incident Energy at18 in

PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing protection are required.

480 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: MCC

Protection: MTS Emer. Breaker

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June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

134 in Flash Hazard Boundary

32 cal/cm^2 Incident Energy at18 in

PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing protection are required.

480 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: MCC

Protection: MTS Emer. Breaker

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June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

134 in Flash Hazard Boundary

32 cal/cm^2 Incident Energy at18 in

PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing protection are required.

480 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: MCC

Protection: MTS Emer. Breaker

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WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

134 in Flash Hazard Boundary

32 cal/cm^2 Incident Energy at18 in

PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing protection are required.

480 VAC Shock Hazard when cover is removed

00 Glove Class

42 in Limited Approach

12 in Restricted Approach

Location: MCC

Protection: MTS Emer. Breaker

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WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

134 in	Flash Hazard Boundary
32 cal/cm^2	Incident Energy at18 in

PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing protection are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

SWITCHGEAR POWER SOLUTIONS

Location: MCC

Protection: MTS Emer. Breaker

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June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

133 in	Flash Hazard Boundary
32 cal/cm^2	Incident Energy at18 in

PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing protection are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

SWITCHGEAR POWER SOLUTIONS

Location: Pump #3 Breaker

Protection: MTS Emer. Breaker

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June 10, 2020

WARNING

Arc Flash and Shock Risk

Appropriate PPE Required

134 in	Flash Hazard Boundary
32 cal/cm^2	Incident Energy at18 in

PPE Required - Arc-rated flash suit jacket, pants, hood, gloves, safety glasses, hard hat, and hearing protection are required.

480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 in	Limited Approach
12 in	Restricted Approach

SWITCHGEAR POWER SOLUTIONS

Location: MCC

Protection: MTS Emer. Breaker

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SECTION 7

PPE TABLE

Table 130.7(C)(15)(c) Personal Protective Equipment (PPE)

Arc-Flash PPE Category	PPE
1	**Arc-Rated Clothing, Minimum Arc Rating of 4 cal/cm² (16.75 J/cm²)[a]** Arc-rated long-sleeve shirt and pants or arc-rated coverall Arc-rated face shield[b] or arc flash suit hood Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts)[c] Heavy-duty leather gloves[d] Leather footwear (AN)
2	**Arc-Rated Clothing, Minimum Arc Rating of 8 cal/cm² (33.5 J/cm²)[a]** Arc-rated long-sleeve shirt and pants or arc-rated coverall Arc-rated flash suit hood or arc-rated face shield[b] and arc-rated balaclava Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts)[c] Heavy-duty leather gloves[d] Leather footwear
3	**Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 25 cal/cm² (104.7 J/cm²)[a]** Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR) Arc-rated arc flash suit hood Arc-rated gloves[d] Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts)[c] Leather footwear
4	**Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 40 cal/cm² (167.5 J/cm²)[a]** Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR) Arc-rated arc flash suit hood Arc-rated gloves[c] Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts)[c] Leather footwear

AN: As needed (optional). AR: As required. SR: Selection required.

[a]*Arc rating* is defined in Article 100.

[b]Face shields are to have wrap-around guarding to protect not only the face but also the forehead, ears, and neck, or, alternatively, an arc-rated arc flash suit hood is required to be worn.

[c]Other types of hearing protection are permitted to be used in lieu of or in addition to ear canal inserts provided they are worn under an arc-rated arc flash suit hood.

[d]If rubber insulating gloves with leather protectors are used, additional leather or arc-rated gloves are not required. The combination of rubber insulating gloves with leather protectors satisfies the arc flash protection requirement.

Informative Annex H Guidance on Selection of Protective Clothing and Other Personal Protective Equipment (PPE)

This informative annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

Δ **H.1 Arc-Rated Clothing and Other Personal Protective Equipment (PPE) for Use with Arc Flash PPE Categories.** Table 130.5(C), Table 130.7(C)(15)(a), Table 130.7(C)(15)(b), and Table 130.7(C)(15)(c) provide guidance for the selection and use of PPE when using arc flash PPE categories.

Δ **H.2 Simplified Two-Category Clothing Approach for Use with Table 130.7(C)(15)(a), Table 130.7(C)(15)(b), and Table 130.7(C)(15)(c).** The use of Table H.2 is a simplified approach to provide minimum PPE for electrical workers within facilities with large and diverse electrical systems. The clothing listed in Table H.2 fulfills the minimum arc-rated clothing requirements of Table 130.7(C)(15)(a), Table 130.7(C)(15)(b), and Table 130.7(C)(15)(c). The clothing systems listed in this table should be used with the other PPE appropriate for the arc flash PPE category *[see Table 130.7(C)(15)(c)]*. The notes to Table 130.7(C)(15)(a), Table 130.7(C)(15)(b), and Table 130.7(C)(15)(c) must apply as shown in those tables.

Δ **H.3 Arc-Rated Clothing and Other Personal Protective Equipment (PPE) for Use with Risk Assessment of Electrical Hazards.** Table H.3 provides a summary of specific sections within the NFPA *70E* standard describing PPE for electrical hazards.

N **H.4 Conformity Assessment of Personal Protective Equipment (PPE).**

N **H.4.1 Introduction.** Section 130.7(C)(14) requires personal protective equipment (PPE) provided by a supplier or manufacturer to conform to appropriate product standards by one of three methods. Additional information for these conformity assessment methods can be found within ANSI/ISEA 125, *American National Standard for Conformity Assessment of Safety and Personal Protective Equipment*. ANSI/ISEA 125 establishes criteria for conformity assessment of safety and PPE that is sold with claims of compliance with product performance standards. ANSI/ISEA 125 contains provisions for data collection, product verification, conformation of quality and manufacturing production control, and roles and responsibilities of suppliers, testing organizations, and third-party certification organizations.

N **H.4.2 Level of Conformity.** ANSI/ISEA 125 provides for three different levels of conformity assessment: Level 1, Level 2, and Level 3.

Level 1 conformity is where the supplier or manufacturer is making a self-declaration that a product meets all of the requirements of the standard(s) to which conformance is claimed. A supplier Declaration of Conformity for each product is required to be made available for examination upon request.

Level 2 conformity is where the supplier or manufacturer is making a self-declaration that a product meets all of the requirements of the standard(s) to which conformance is claimed, the supplier or manufacturer has a registered ISO 9001 Quality Management System or equivalent quality management system, and all testing has been carried out by an ISO 17025 accredited testing laboratory. A supplier Declaration of Conformity for each product is required to be made available for examination upon request.

Level 3 conformity is where the products are certified by an ISO 17065 accredited independent third-party certification organization (CO). All product testing is directed by the CO,

Δ **Table H.2 Simplified Two-Category, Arc-Rated Clothing System**

Clothing[a]	Applicable Situations
Everyday Work Clothing Arc-rated long-sleeve shirt with arc-rated pants (minimum arc rating of 8) *or* Arc-rated coveralls (minimum arc rating of 8)	Situations where a risk assessment indicates that PPE is required and where Table 130.7(C)(15)(a) and Table 130.7(C)(15)(b) specify arc flash PPE category 1 or 2[b]
Arc Flash Suit A total clothing system consisting of arc-rated shirt and pants and/or arc-rated coveralls and/or arc flash coat and pants (clothing system minimum arc rating of 40)	Situations where a risk assessment indicates that PPE is required and where Table 130.7(C)(15)(a) and Table 130.7(C)(15)(b) specify arc flash PPE category 3 or 4[b]

[a]Note that other PPE listed in Table 130.7(C)(15)(c), which include arc-rated face shields or arc flash suit hoods, arc-rated hard hat liners, safety glasses or safety goggles, hard hats, hearing protection, heavy-duty leather gloves, rubber insulating gloves, and leather protectors, could be required. The arc rating for a garment is expressed in cal/cm^2.

[b]The estimated available fault current capacities and fault clearing times or arcing durations are listed in the text of Table 130.7(C)(15)(a) and Table 130.7(C)(15)(b). For power systems with greater than the estimated available fault current capacity or with longer than the assumed fault clearing times, Table H.2 cannot be used and arc flash PPE must be determined and selected by means of an incident energy analysis in accordance with 130.5(G).

Δ Table H.3 Summary of Specific Sections Describing PPE for Electrical Hazards

Shock Hazard PPE	Applicable Section(s)
Rubber insulating gloves and leather protectors, unless the requirements of ASTM F496 are met	130.7(C)(7)(a)
Rubber insulating sleeves as needed	130.7(C)(7)(a)
Class G or E hard hat as needed	130.7(C)(3)
Safety glasses or goggles as needed	130.7(C)(4)
Dielectric overshoes as needed	130.7(C)(8)
Incident Energy Exposures Greater than or Equal to 1.2 cal/cm² (5 J/cm²)	
Clothing: Arc-rated clothing system with an arc rating appropriate to the anticipated incident energy exposure	130.7(C)(1), 130.7(C)(2), 130.7(C)(6), 130.7(C)(9)(d)
Clothing underlayers (when used): Arc-rated or nonmelting untreated natural fiber	130.7(C)(9)(c), 130.7(C)(11), 130.7(C)(12)
Gloves: Exposures greater than or equal to 1.2 cal/cm²(5 J/cm²) and less than or equal to 8 cal/cm² (33.5 J/cm²): heavy-duty leather gloves Exposures greater than 8 cal/cm² (33.5 J/cm²): rubber insulating gloves with their leather protectors or arc-rated gloves	130.7(C)(7)(b), 130.7(C)(10)(d)
Hard hat: Class G or E	130.7(C)(1), 130.7(C)(3)
Face shield: Exposures greater than or equal to 1.2 cal/cm²(5 J/cm²) and less than or equal to 12 cal/cm² (50.2 J/cm²): Arc-rated face shield that covers the face, neck, and chin and an arc-rated balaclava or an arc-rated arc flash suit hood Exposures greater than 12 cal/cm² (50.2 J/cm²): arc-rated arc flash suit hood	130.7(C)(1), 130.7(C)(3), 130.7(C)(10)(a), 130.7(C)(10)(b), 130.7(C)(10)(c)
Safety glasses or goggles	130.7(C)(4), 130.7(C)(10)(c)
Hearing protection	130.7(C)(5)
Footwear: Exposures less than or equal to 4 cal/cm² (16.75 J/cm²): Heavy-duty leather footwear (as needed) Exposures greater than 4 cal/cm² (16.75 J/cm²): Heavy-duty leather footwear	130.7(C)(10)(e)

and all changes to the product must be reviewed and retested if necessary. Compliant products are issued a Declaration of Conformity by the CO and products are marked with the CO's mark or label.

N **H.4.3 Equivalence.** While there are three levels of conformity assessment described in ANSI/ISEA 125, the levels are not to be considered as equivalent. Users are cautioned that the level of rigor required to demonstrate conformity should be based on the potential safety and health consequence of using a product that does not meet a stated performance standard. A higher potential safety and health consequence associated with the use of a noncompliant product should necessitate a higher level of conformity assessment.

N **H.4.4 Supplier's Declaration of Conformity.** A Declaration of Conformity should be issued by the supplier and made available for examination upon request from a customer, user, or relevant authority. The Declaration of Conformity should, at a minimum:

(1) List the supplier name and address.
(2) Include a product model number or other identification details.
(3) List the product performance standard or standards (designation and year) to which conformance is claimed.
(4) Include a statement of attestation.
(5) Be dated, written on supplier letterhead, and signed by an authorized representative. The name and title of the authorized representative should also be printed.

Additional information should include:

(1) The level of conformity followed
(2) Whether the ISO 17025 testing facility is an independent or in-house laboratory (owned or partially owned by an entity within the supplier's corporate structure or within the manufacturing stream for the applicable product, including subcontractors and sub-suppliers)
(3) Reference to the test report (title, number, date, etc.) that serves as the basis of determining conformity

For an example of a Supplier's Declaration of Conformity see Figure H.4.4.

N **H.4.5 References.** ANSI/ISEA contains detailed information and guidance on the application of the different conformity assessment levels. Copies of ANSI/ISEA 125 are available free of charge by e-mailing the International Safety Equipment Association at: ISEA@Safetyequipment.org and requesting a complimentary copy.

Informative Annex I Job Briefing and Planning Checklist

This informative annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

I.1 Job Briefing and Planning Checklist. Figure I.1 illustrates considerations for a job briefing and planning checklist.

Identify

- ❑ Hazards
- ❑ Voltage levels involved
- ❑ Skills required
- ❑ Any "foreign" (secondary source) voltage source
- ❑ Any unusual work conditions
- ❑ Number of people needed to do the job
- ❑ Shock protection boundaries
- ❑ Available incident energy
- ❑ Potential for arc flash (Conduct an arc flash risk assessment.)
- ❑ Arc flash boundary
- ❑ Any evidence of impending failure?

Ask

- ❑ Can the equipment be de-energized?
- ❑ Are backfeeds of the circuits to be worked on possible?
- ❑ Is an energized electrical work permit required?
- ❑ Is a standby person required?
- ❑ Is the equipment properly installed and maintained?

Check

- ❑ Job plans
- ❑ Single-line diagrams and vendor prints
- ❑ Status board
- ❑ Information on plant and vendor resources is up to date
- ❑ Safety procedures
- ❑ Vendor information
- ❑ Individuals are familiar with the facility

Know

- ❑ What the job is
- ❑ Who else needs to know — Communicate!
- ❑ Who is in charge

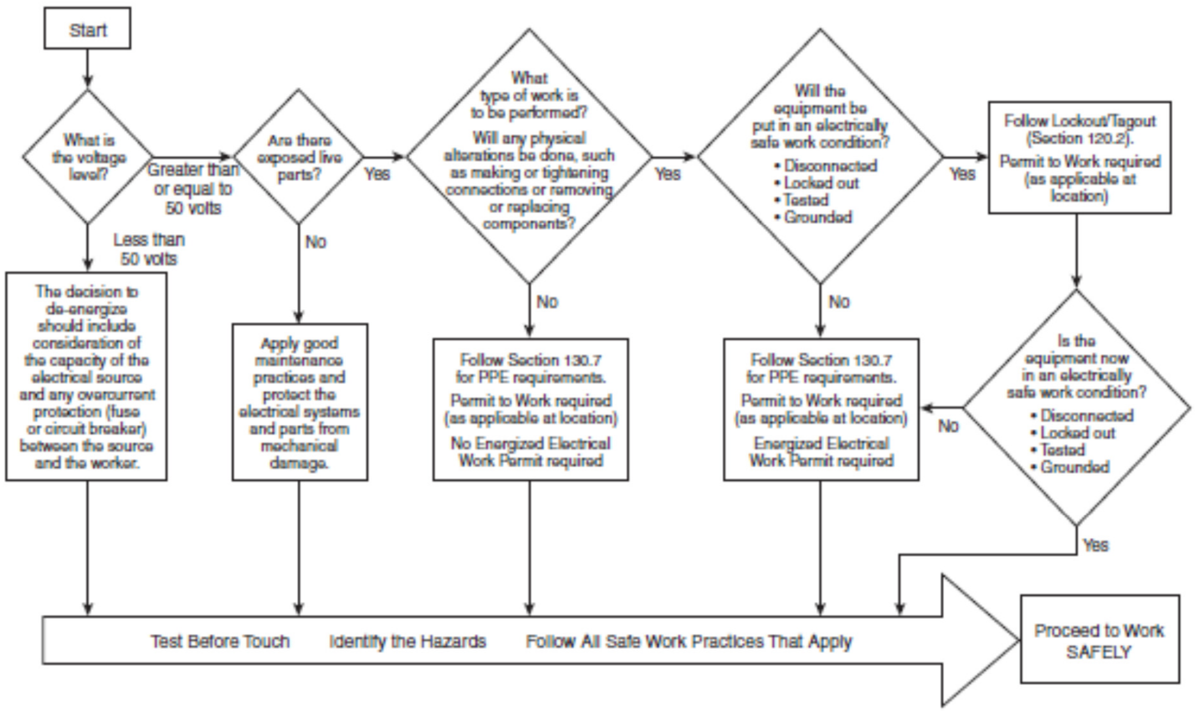
Think

- ❑ About the unexpected event . . . What if?
- ❑ Lock — Tag — Test — Try
- ❑ Test for voltage — FIRST
- ❑ Use the right tools and equipment, including PPE
- ❑ Install and remove temporary protective grounding equipment
- ❑ Install barriers and barricades
- ❑ What else . . . ?

Prepare for an emergency

- ❑ Is the standby person CPR/AED trained?
- ❑ Is the required emergency equipment available? Where is it?
- ❑ Where is the nearest telephone?
- ❑ Where is the fire alarm?
- ❑ Is confined space rescue available?
- ❑ What is the exact work location?
- ❑ How is the equipment shut off in an emergency?
- ❑ Are the emergency telephone numbers known?
- ❑ Where is the fire extinguisher?
- ❑ Are radio communications available?
- ❑ Is an AED available?

Δ **FIGURE I.1 Sample Job Briefing and Planning Checklist.**



Δ **FIGURE J.2 Energized Electrical Work Permit Flow Chart.**

Informative Annex P Aligning Implementation of This Standard with Occupational Health and Safety Management Standards

This informative annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

P.1 General. Injuries from electrical energy are a significant cause of occupational fatalities in the workplace in the United States. This standard specifies requirements unique to the hazards of electrical energy. By itself, however, this standard does not constitute a comprehensive and effective electrical safety program. The most effective application of the requirements of this standard can be achieved within the framework of a recognized health and safety management system standard. ANSI/AIHA Z10, *American National Standard for Occupational Health and Safety Management Systems*, provides comprehensive guidance on the elements of an effective health and safety management system and is one recognized standard. ANSI/AIHA Z10 is harmonized with other internationally recognized standards, including CAN/CSA Z1000, *Occupational Health and Safety Management*; ANSI/ISO 14001, *Environmental Management Systems - Requirements with Guidance for Use*; and BS OSHAS 18001, *Occupational Health and Safety Management Systems*. Some companies and other organizations have proprietary health and safety management systems that are aligned with the key elements of ANSI/AIHA Z10.

The most effective design and implementation of an electrical safety program can be achieved through a joint effort involving electrical subject matter experts and safety professionals knowledgeable about safety management systems.

Such collaboration can help ensure that proven safety management principles and practices applicable to any hazard in the workplace are appropriately incorporated into the electrical safety program.

This informative annex provides guidance on implementing this standard within the framework of ANSI/AIHA Z10 and other recognized or proprietary comprehensive occupational health and safety management system standards.

N **Table Q.5 Error Precursor Identification and Human Performance Tool Selection** *(see Q.5 and Q.6.1)*

Error Precursors	Optimal Tool(s)	Human Performance Tools
Task Demands		**1 Pre-job briefing**
Time pressure (in a hurry)		Identify hazards, assess risk and select and implement risk controls from a hierarchy of methods
High workload (memory requirements)		
Simultaneous or multiple tasks		**2 Job site review**
Repetitive actions or monotony		Increased situational awareness
Critical steps or irreversible acts		**3 Post-job review**
Interpretation requirements		Identify ways to improve and best practices
Unclear goals, roles, or responsibilities		Peer check
Lack of or unclear standards		**4 Procedure use and adherence**
Work Environment		Step-by-step procedure read, outcome understood
Distractions/interruptions		Circle the task to be performed, check off each task as it is completed
Changes/departures from routine		
Confusing displays or controls		**5 Self-check with verbalization**
Workarounds/out of service instrumentation		Stop, Think, Act, Review (STAR)
Obscure electrical supplies or configurations		Verbalize intent before, during, and after each task
Unexpected equipment conditions		**6 Three-way communication**
Lack of alternative indication		Directives are repeated by receiver back to sender; receiver is acknowledged by sender
Personality conflicts		
Individual Capabilities		Use of the phonetic alphabet for clarity
Unfamiliar with, or first time performing task		**7 Stop when unsure**
Lack of knowledge (faulty mental model)		Stop and obtain further direction when unable to follow a procedure or process step or if something unexpected occurs
New technique not used before		
Imprecise communication habits		
Lack of proficiency or experience		Maintain a questioning attitude
Indistinct problem-solving skills		**8 Flagging and blocking**
Unsafe attitudes for critical task		Identify (flag) equipment and controls that will be operated
Inappropriate values		Prevent access (block) equipment and controls that should not be operated
Human Nature		
Stress (limits attention)		
Habit patterns		
Assumptions		
Complacency/overconfidence		
Mind-set		
Inaccurate risk perception		
Mental shortcuts (biases) or limited short-term memory		

Notes:

This table may be utilized when identifying workplace hazards. Identify the error precursors in the left-hand column. Select the optimal human performance tool or combination of tools from the right-hand column. List the selected tool(s) in the centre column beside the associated error. This table does not include all possible human performance tools; however, all tools listed can be applied to each error precursor.

Information Sheet
Electrical Protective Equipment Testing & Inspection

I. Testing time frames (Laboratory) – Minimum requirements by OSHA

1. **Rubber Insulating Gloves - 6 months**
2. **Rubber Insulating Sleeves - 1 year**
3. **Rubber Insulating Blankets - 1 year**
4. **Live Line Tools - 2 years**

II. Other testing done at E.P.E Laboratory

1. **Rubber Insulating Line Hose**
2. **Rubber Insulating Covers**
3. **By-Pass Jumpers**

III. Rubber Protective Gloves

1. **Color Coding of Labels on Gloves. (Type I = Natural Rubber, Type II = Synthetic)**

Class	Color Code (Label)	Maximum Use	Proof Test Voltage
00	Beige	500 Volts	2500 Volts
0	Red	1000 Volts	5000 Volts
1	White	7500 Volts	10000 Volts
2	Yellow	17000 Volts	20000 Volts
3	Green	26500 Volts	30000 Volts
4	Orange	36000 Volts	40000 Volts

2. **What to look for when inspecting gloves – Do not use gloves showing these problems!**
   a. **Ozone deterioration**
   b. **Physical damage (cuts, tears, punctures, pinches, abrasions) – two-color gloves are helpful**
   c. **Chemical damage (swelling, softness, hardening, stickiness)**
   d. **Other obvious damage**

3. **Care of Gloves**
   a. **Visually inspect and air test gloves before use each day and immediately after any incident that is suspect of having caused damage.**
   b. **Keep off dashboard out of sun when not in use.**
   c. **If gloves get wet allow to air dry, *but not in the sun.***
   d. **Take the protectors off and let them air dry.**
   e. **Keep gloves away from artificial heat – can break down rubber.**
   f. **Keep gloves free of any chemicals, oils, solvents and damaging vapors or fumes.**
   g. **Never store gloves or sleeves inside out – puts stress on rubber and will cause them to ozone check in time.**
   h. **Never use tape to put your rubber goods together.**
   i. **Do not wear rings, watches, or other sharp objects that may damage your rubber goods.**

IV. Rubber Insulating Sleeves & Blankets

1. **Care and inspection of sleeves and blankets is identical to gloves (except no air test is given to sleeves in the field).**
2. **Sleeves should be laid on a flat surface and rolled inside and out to expose any ozone damage, cuts, and abrasions. Blankets should also be inspected by lying on a flat surface and rolling (top and bottom), inspecting for any ozone damage, cuts, and abrasions.**

V. Glove Protectors

1. **Leather protectors shall not be used alone for protection against electrical shock. Always use in conjunction with rubber gloves of the proper voltage class.**
2. **Clearance from protector end to roll on end of glove.**
    a. **Class 00 & 0 – ½"**
    b. **All others – 1" per 10kv**
3. **Protectors shall not be used if they have holes, tears, or other defects that affect their ability to give mechanical protection to the insulating gloves.**
4. **Leather protectors must be inspected for metal particles, imbedded wire, and other abrasive material that may damage the rubber gloves.**
5. **Care should be exercised to keep the protector gloves as free as possible from oils, greases, chemicals and other materials that may injure the insulating gloves.**

VI. Rubber Insulating Line Hose, Hoods & Covers

1. **Line hose, hoods & covers should be given a full visual inspection over the entire surface before each use.**
2. **Care and inspection of line hose, hoods and covers is identical to rubber gloves.**
3. **Line hose should be rolled lengthwise, exposing the center of the hose, inspecting for ozone damage, cuts, and abrasions. Insulating covers should be rolled on all sides checking for ozone damage, cuts, and abrasions.**

VII. Live Line Tools

1. **Each live line tool shall be wiped clean and visually inspected for defects before use each day. Silicon wipes work well for this.**
2. **Common defects to look for are any cracks, wear marks, and contamination.**
3. **Live line tools should be thoroughly cleaned and waxed on a periodic basis to maintain their insulating qualities. (Make sure the cleaner and wax is approved by the manufacturer of the equipment.)**

VIII. By-Pass Jumpers

1. **Wiper jumpers clean of any contaminants and check for defects before use.**
2. **Common defects are ozone checking, wear marks, cuts, abrasions, and contamination.**
3. **All rubber products are susceptible to oils and solvents. Oils and solvents should be wiped clean of the equipment immediately.**

****Always store electrical protective equipment in canvas bags or other storage containers designated for that use only. This will keep your equipment in good condition for when it is needed for use. Always work safely.**

SECTION 8

SAMPLE WORK PERMITS

ENERGIZED ELECTRICAL WORK PERMIT

PART I: TO BE COMPLETED BY THE REQUESTER:

Job/Work Order Number

(1) Description of circuit/equipment/job location:

(2) Description of work to be done:

(3) Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next scheduled outage:

Requester/title | Date

PART II: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS *DOING* THE WORK:

Check when complete

(1) Detailed job description procedure to be used in performing the above detailed work: ☐

(2) Description of the safe work practices to be employed: ☐

(3) Results of the shock risk assessment:
- (a) Voltage to which personnel will be exposed ☐
- (b) Limited approach boundary ☐
- (c) Restricted approach boundary ☐
- (d) Necessary shock, personal, and other protective equipment to safely perform assigned task ☐

(4) Results of the arc flash risk assessment:
- (a) Available incident energy at the working distance or arc flash PPE category ☐
- (b) Necessary arc flash personal and other protective equipment to safely perform the assigned task ☐
- (c) Arc flash boundary ☐

(5) Means employed to restrict the access of unqualified persons from the work area: ☐

(6) Evidence of completion of a job briefing, including discussion of any job-related hazards: ☐

(7) Do you agree the above-described work can be done safely? ☐ Yes ☐ No (If *no,* return to requester.)

Electrically Qualified Person(s) | Date

Electrically Qualified Person(s) | Date

PART III: APPROVAL(S) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:

Manufacturing Manager | Maintenance/Engineering Manager

Safety Manager | Electrically Knowledgeable Person

General Manager | Date

Note: Once the work is complete, forward this form to the site Safety Department for review and retention.

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Figure J.1 Sample Permit for Energized Electrical Work.

ENERGIZED ELECTRICAL WORK PERMIT DEMO

PART I: TO BE COMPLETED BY THE REQUESTER:

Job Work Order Number:________________

1. Description of circuit/equipment/job location: **MAIN SWG**
   Switchgear
2. Description of work to be done:
   Work on live parts of utilization equipment (e.g. motor, transformer, conductor) fed directly by feeder circuit of the switchgear
3. Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next scheduled outage:

______________________________ ______________________________
Requester/Title Date

PART II: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS *DOING* THE WORK:

1. Detailed job description procedure to be used in performing the above described work:

2. Description of the Safe Work Practices to be employed:

THIS IS A SAMPLE ONLY

Shock hazard: **13.8 kV**	Shock Boundary: **2' - 2"**	V-rated Gloves: **Yes**
Flash Hazard: **2.8 cal/cm2**	Flash Boundary: **3' - 7"**	V-rated Tools: **Yes**
HCR: **0**	Required PPE: **#1**	Work Distance: **1' - 6"**
FR shirt and FR pants or FR coverall		

3. Means employed to restrict the access of unqualified persons from the work areas:

4. Evidence of completion of a Job Briefing including discussion of any job-specific hazards:
   See Attached Job Briefing Report

5. Do you agree the above-described work can be done safely?
   Yes No (If no, return to requester)

______________________________ ______________________________
Electrically Qualified Person(s) Date

______________________________ ______________________________
Electrically Qualified Person(s) Date

PART III: APPROVAL(S) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:

______________________________ ______________________________
Manufacturing Manager Maintenance/Engineering Manager

______________________________ ______________________________
Safety Manager Electrically Knowledgeable Person

______________________________ ______________________________
General Manager Date

Note: Once the work is complete, forward this form to the site Safety Department for review and retention.

Job Briefing and Planning Checklist

Job Briefing and Planning Checklist

Identify

- What are the hazards?
- Potential for arc flash
- What voltage levels are involved?
- Unusual work conditions
- What skills are required?
- Is this a multiple-person job?
- "Foreign" voltage source present?

Ask

- Can the equipment be de-energized?
- Is a "standby person" required?
- Are there possible backfeeds of the circuits to be worked on?

Check

- Job Plans
- Safety procedures
- One lines and vendor prints
- Vendor Information
- Status Board
- Individuals familiar with facility?
- For up-to-date information on plant and vendor resources

Know

- What is the job?
- EasyPower one-line has been printed, reviewed, and attached to energized work permit?
- Who is in charge?
- Who else needs to know?…..Communicate!

Think

- About the extra event…What if?
- Use the right tools and equipment, including PPE
- Lock-Tag-Test-Try
- Install barriers and barricades
- Test for voltage – FIRST
- What else…?
- Install and remove grounds

Prepare for an emergency

- Standby person CPR trained
- What is the exact work location?
- Telephone location?
- How is the equipment shut off in an emergency?
- Fire alarm locations?
- Where is the emergency equipment?
- Confined space rescue available if required?
- Is the required emergency equipment available?
- Emergency phone numbers?
- Radio communications available?
- Extinguisher?

ENERGIZED ELECTRICAL WORK PERMIT

PART I: TO BE COMPLETED BY THE REQUESTER:

Job Work Order Number:________________

1. Description of circuit/equipment/job location: **<<::BUS**______________________________
   <<::EQP________________
2. Description of work to be done:
   <<::TASK____
   ____
3. Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next scheduled outage:

______________________________ ______________________________

Requester/Title Date

PART II: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS *DOING* THE WORK:

1. Detailed job description procedure to be used in performing the above described work:
   <<::JOB____
   ____
2. Description of the Safe Work Practices to be employed:
   <<::SAFE_WORK____
   ____

Shock hazard: **<<::SH**________________	Shock Boundary: **<<::SB**____________	V-rated Gloves: **<<::VGL**_______
Flash Hazard: **<<::FH**_______________	Flash Boundary: **<<::FB**____________	V-rated Tools: **<<::VTL**
HC Reduction: **<<::HCR**__	Required PPE: **<<::CCL**__________	Work Distance: **<<::WK**____
<<::PPE____ **<<::#2X**____		

3. Means employed to restrict the access of unqualified persons from the work areas:
4. Evidence of completion of a Job Briefing including discussion of any job-specific hazards:
   See Attached Job Briefing Report
5. Do you agree the above-described work can be done safely?
   Yes No (If no, return to requester)

______________________________ ______________________

Electrically Qualified Person(s) Date

______________________________ ______________________

Electrically Qualified Person(s) Date

PART III: APPROVAL(S) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:

______________________________ ______________________________

Manufacturing Manager Maintenance/Engineering Manager

______________________________ ______________________________

Safety Manager Electrically Knowledgeable Person

______________________________ ______________________________

General Manager Date

Note: Once the work is complete, forward this form to the site Safety Department for review and retention.

Job Briefing and Planning Checklist

Job Briefing and Planning Checklist

Identify

What are the hazards?

Potential for arc flash

What voltage levels are involved?

Unusual work conditions

What skills are required?

Is this a multiple-person job?

“Foreign” voltage source present?

Ask

Can the equipment be de-energized?

Is a “standby person” required?

Are there possible backfeeds of the circuits to be worked on?

Check

Job Plans

Safety procedures

One lines and vendor prints

Vendor Information

Status Board

Individuals familiar with facility?

For up-to-date information on plant and vendor resources

Know

What is the job?

Who is in charge?

Who else needs to know?…..Communicate!

EasyPower one-line has been printed, reviewed, and attached to energized work permit?

Think

About the extra event…What if?

Use the right tools and equipment, including PPE

Lock-Tag-Test-Try

Install barriers and barricades

Test for voltage – FIRST

What else…?

Install and remove grounds

Prepare for an emergency

Standby person CPR trained

What is the exact work location?

Telephone location?

How is the equipment shut off in an emergency?

Fire alarm locations?

Where is the emergency equipment?

Confined space rescue available if required?

Is the required emergency equipment available?

Emergency phone numbers?

Radio communications available?

Extinguisher?

ENERGIZED ELECTRICAL WORK PERMIT

PART I: TO BE COMPLETED BY THE REQUESTER:

Job/Work Order Number ______________________

1) Description of circuit/equipment/job location: ______________________

2) Description of work to be done: ______________________

3) Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next scheduled outage: ______________________

______________________ Requester/Title

______________________ Date

PART II: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS DOING THE WORK:

	Check when Complete
1) Detailed job description procedure to be used in performing the above described work:	☐
2) Description of the Safe Work Practices to be employed:	☐
3) Results of the Shock Hazard Analysis:	☐
4) Determination of the Shock Protection Boundaries:	☐
5) Results of the Flash Hazard Analysis:	☐
6) Determination of the Flash Protection Boundary:	☐
7) Necessary personal protective equipment to safely perform the assigned task:	☐
8) Means employed to restrict the access of unqualified persons from the work area:	☐
9) Evidence of completion of a Job Briefing including discussion of any job-specific hazards:	☐

10) Do you agree the above described work can be done safely? ☐ Yes ☐ No (If no, return to requester)

______________________ Electrically Qualified person(s)

______________________ Date

______________________ Electrically Qualified person(s)

______________________ Date

PART III: APPROVAL(s) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:

______________________ Manufacturing Manager

______________________ Maintenance/Engineering Manager

______________________ Safety Manager

______________________ Electrically Knowledgeable Person

______________________ General Manager

______________________ Date

Note: Once the work is complete, forward this form to the site Safety Department for review and retention.