Operations Management Services

2016 Annual Report

Northport Leelanau Township Utility Authority

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Project Description

The Northport Leelanau Township Utility Authority's (NLTUA) wastewater treatment plant (WWTP) is a 0.132 million gallon per day (mgd) facility. The wastewater is collected in the system by gravity sewer and low pressure force mains. Two lift stations help push the water along to the Main Street lift station. From the Main Street lift station, water is pumped to the WWTP. When the wastewater reaches the treatment facility, gravity flows through the treatment processes starting at the fine screen unit. After the fine screens, the waste stream flows to the primary anoxic basin and moving bed biofilm reactor (MBBR). After the MBBR, the water flows to the settling basin where solids are allowed to settle and are then pumped to the solids basin. The settling basin effluent then flows through the polishing filters before final dosage into the rapid infiltration beds (RIBs).

We manage, operate, and maintain the WWTP and collection system in the best interest of the NLTUA.

2016 Project Overview

CH2M has had the privilege of operating and maintaining the NLTUA WWTP, three lift stations, and collection system including residential grinder pumps since 2008. During that time, we have strived to increase treatment efficiency, decrease vulnerabilities, and reduce the likelihood of emergency calls. We are pleased to present the following operations and maintenance (O&M) year in review.

Operations and Maintenance

Residential Grinders

- Assisted with addressing a root issue at one of the residual grinder pumps, and replaced the leaking air release valve (ARV).

Collection System

- Installed a new level transducer at the Main Street lift station.
- Completed the inspections of the ARVs on the collection system and our findings include:

ARV Inspection Summary

1. Dawn Haven Drive ARV was operating correctly, but in need of new fittings and shut off valves.
2. M-22 existing ARV is the wrong kind for the application. It needs to be replaced with the proper ARV and needs a support bracket.
3. Golf course ARC is in good operating condition.
4. Northshore Drive ARV was operating correctly, but shut off valves and fittings were in poor condition. Recommend pulling ARV and replacing fittings. The manhole was also full of water submerging ARV, need to seal manhole.
5. Woolsey Lake Road ARV was operating correctly and in good condition.
6. Northport Point Road ARV was operating correctly, but shut off valves and fittings were in poor condition. Recommend pulling ARV and replacing fittings. The manhole was also full of water submerging ARV, need to seal manhole.
7. West Circle Drive ARV was operating correctly, but shut off valves and fittings were in poor condition. Recommend pulling ARV and replacing fittings.
8. East Circle Drive ARV was operating correctly, but shut off valves and fittings were in poor condition. Recommend pulling ARV and replacing fittings. The manhole was also full of water submerging ARV, need to seal manhole.

Root issue at residual grinder pump.

Collection System ARV.

- We completed the inspections of the manholes in the collections system and our findings include:

  1. The sewer manholes on the north end of North Shore Drive have some hydrogen sulfide corrosion. The manhole closest to where the force main dumps into the gravity sewer exhibits the highest level of deterioration. As you move south towards the Village the corrosion lessens.
  2. Throughout the NLTUA sewer district there are several areas with minor paper or grease build ups. We will remove the minor grease and paper buildups in the Spring.

Preliminary Treatment

- Replaced a failed lip seal on the fine screen gear box. The purpose of the fine screen is to remove rags and debris from the influent to protect downstream equipment.

MBBR

- Completed both 6-month inspections on the Landia mixers in the MBBR. The first 6-month inspection revealed that three of the mixers were in need of repairs. The repairs were completed and at the time of the second 6-month inspection all of the mixers were found to be in good working order.
- Added four stone diffusers to the cavitation air floatation (CAF) structure to take the place of the current mechanical aerator, which repeatedly needed to have the bearings replaced. The procedure to pull this unit and replace the bearings was timely, costly, and presented safety hazards. The design purpose of the CAF aerator was to float solids that had sloughed off the MBBR media to the surface, then capture the solids in the CAF solids pit to be pumped to the biosolids storage basin. The CAF aerator never adequately removed the sloughed solids and basically served to mix the CAF structure. By installing the stone diffusers, we took the CAF aerator out of service, therefore eliminating repair costs, energy consumption, and freezing in the Winter months.
- Cleaned the settling basin with no compliance excursions or safety incidences. The settling basin is where secondary solids are settled out of the system to be pumped to the biosolids storage basin.

New diffusers at the CAF structure.

Taking settling basin down.

Removing settled sludge.

Almost clean.

2016 Project Overview

Polishing Filters

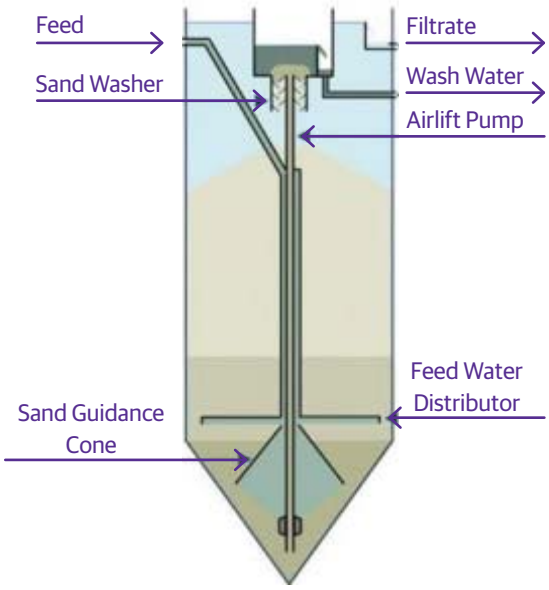
There are two sand filters at the facility, the purpose of which is to further reduce the concentration of total suspended solids (TSS) and Total Phosphorus in the treated water before discharge to the RIBs. In a sand filter, the air lift is used to carry the sand up to the wash box for cleaning. The wash (reject) water flows to a reject chamber and is then pumped to the biosolids storage basin with the use of reject pumps. Exhibit 1 highlights this process.

- Replaced the airlift for the lower sand filter and stored the new airlift for the upper sand filter in the critical spare parts inventory.
- Repaired the damaged lower sand filter air lift at a local welding shop, and stored it in the critical spare parts inventory. This repair cost $160, and will offer emergency backup should the air lift in service ever fail.
- Replaced reject pump #1 and purchased a second pump for spare parts inventory. The reject pumps are used to pump the wash (reject) water from the reject chamber to the biosolids storage basin.
- Rebuilt the reject chamber discharge piping.

Rapid Infiltration Beds

- Facilitated the maintenance of the RIBs.

Exhibit 1
Polishing Filter Process



Getting ready to install new air lift.

New upper and lower sand filter air lifts.

We have strived to increase treatment efficiency, decrease vulnerabilities, and reduce the likelihood of emergency calls.

Failed airlift.

Repaired airlift.

Reject pump replacement.

Reject chamber with new rebuilt piping.

RIBs after annual maintenance was performed.

2016 Project Overview

Compliance

Sampling and Analyses

- Replaced a blown fuse on the ISCO sampler. After the sampler quit working during the effluent meter installation, we suspected that the board may have shorted out. After further investigation, we discovered that the power supply was equipped with a fast blow fuse which had blown. We replaced the fuse and put the sampler back into service. This saved us the cost of a new ISCO 4700 sampler, which can cost around $4,500 dollars.
- Purchased a new pH meter to replace the old unit which needed a new cable. This new unit was similar in price to the old and also has the ability to test for conductivity. This will greatly reduce our contracted laboratory monitoring well fees every quarter.

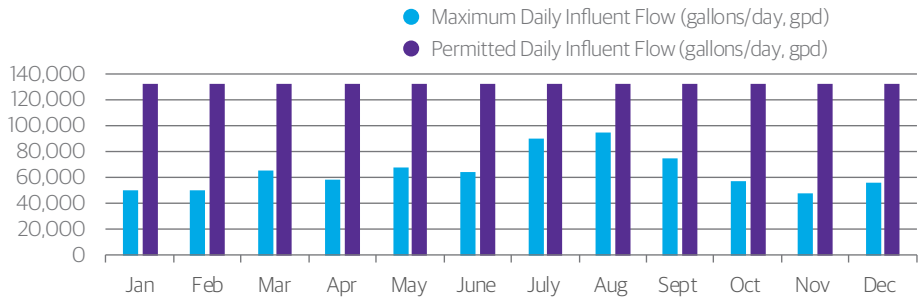
Plant Performance

The NLTUA WWTP operates under a National Pollution Discharge Elimination System (NPDES) Permit issued and regulated by the Michigan Department of Environmental Quality (MDEQ). The following is a summary of the facility's performance in comparison to the requirements of its permit.

Maximum Daily Influent Flow

The facility is permitted to receive a maximum influent daily flow of 132,000 gallons per day (gpd). As depicted in Exhibit 2, the month with the highest maximum daily influent flow was August when influent flow reached 72 percent of the facility's permitted maximum flow.

Exhibit 2
Maximum Daily Influent Flow



Monthly Average Biochemical Oxygen Demand

Biochemical oxygen demand (BOD) is a measure of the amount of oxygen that will be consumed in the receiving waters by the effluent the facility discharges, or the strength of the effluent. The permitted effluent monthly average for the NLTUA WWTP is 30 milligrams per liter (mg/L). Exhibit 3 depicts the actual monthly average effluent BOD concentrations in comparison to the permitted limit.

The daily maximum limit for the NLTUA WWTP effluent BOD concentration is 45 mg/L. Exhibit 4 is a comparison of the daily maximum effluent BOD concentrations versus the permitted maximum daily BOD concentrations.

Exhibit 3

Average Monthly Effluent BOD Concentrations

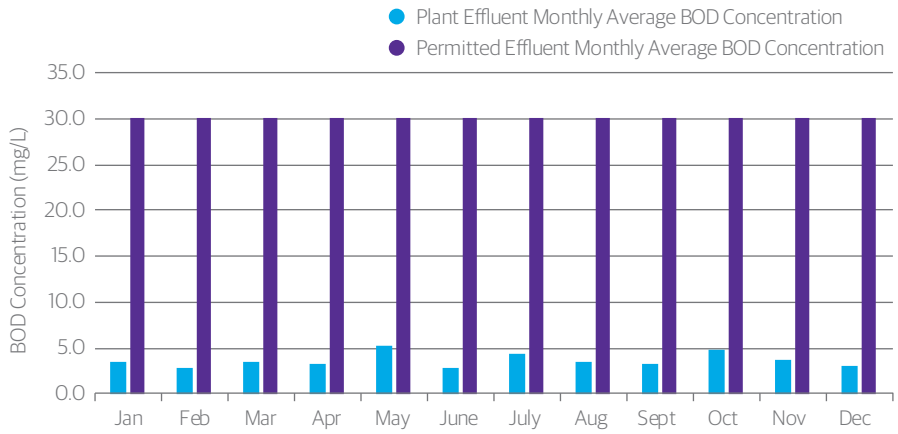
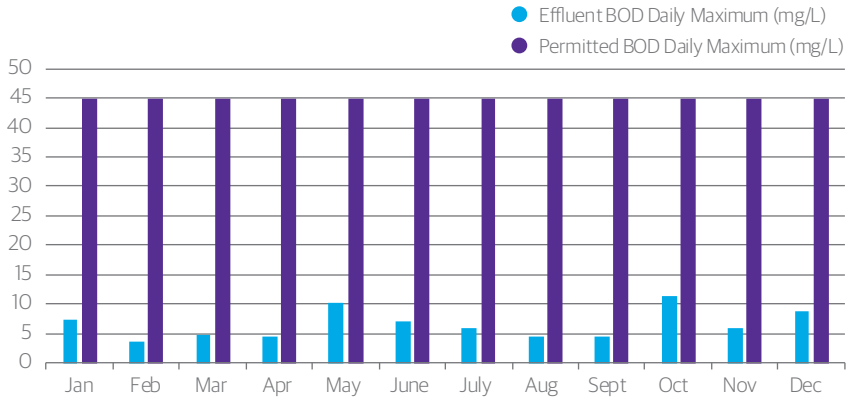


Exhibit 4

Daily Maximum Effluent BOD versus Permitted Daily Maximum BOD Concentrations



2016 Project Overview

Effluent pH

The pH of the effluent is an indication of the intensity of its acidity or alkalinity. A low pH indicates acidity, and a high pH indicates alkalinity. Effluent pH is monitored and regulated for minimal impact on the receiving waters and/or soil it is discharged to. The pH of the NLTUA effluent ranged from 6.91 to 8.05 in 2016. This range is within the permitted pH range of 6.5-9.0. (Refer to Exhibits 5 and 6.)

Exhibit 5

Effluent Maximum pH versus Permitted Maximum pH

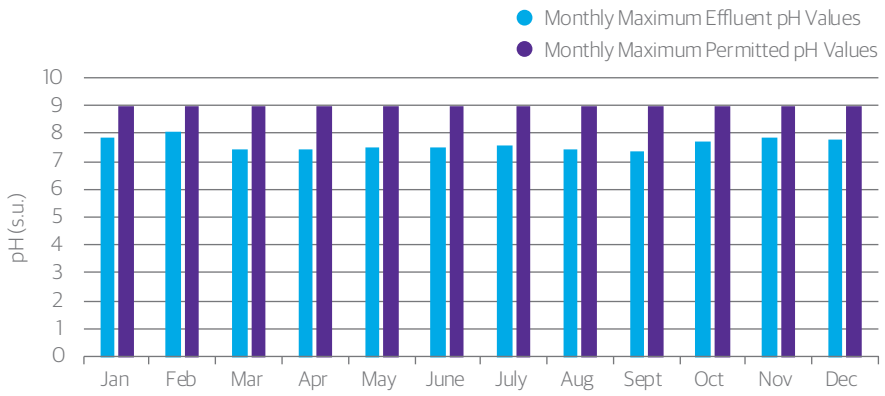
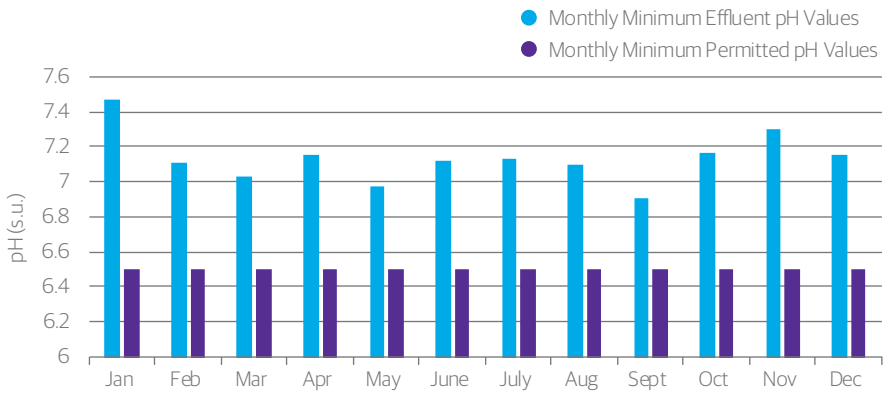


Exhibit 6

Effluent Minimum pH versus Permitted Minimum pH



Total Phosphorus

Phosphorus is a nutrient that aids in the growth of microorganisms and plant life, however, if present in the effluent discharged from the facility in too high of concentrations, it could lead to algae blooms, plant overgrowth, and decreased dissolved oxygen concentrations in the receiving waters and/or soil. Exhibits 7 and 8 compare the effluent Total Phosphorus concentrations to the permitted Total Phosphorus concentrations.

As depicted in Exhibit 8, which compares daily maximum Total Phosphorus concentrations to permitted daily maximum Total Phosphorus concentration, plant effluent daily maximum Total Phosphorus concentrations exceeded the permitted limit in October of 2016. We performed a root cause analysis to identify the reason of this exceedance. We concluded that because we had altered the frequency at which we rotate the RIBs in order to remove the present vegetation in the manner approved by the MDEQ, the solids in the wet well discharging to these beds built up. When we rotated the beds, according to our standard operating procedure, the solids in the wet well were stirred up, increasing the solids concentration in the plant effluent, resulting in the increased effluent Total Phosphorus concentration. We have created a routine task for cleaning this wet well to prevent a future reoccurrence. The daily maximum Total Phosphorus concentration exceedance was reported to the MDEQ per regulatory reporting requirements.

In addition to the parameters discussed above, we monitor and report Dissolved Oxygen, Ammonia Nitrogen, Nitrate Nitrogen, Nitrite Nitrogen, Total Inorganic Nitrogen, Chloride and Sodium concentrations in the effluent. The permit contains no limits for these parameters.

Exhibit 7

Effluent Monthly Average Total Phosphorus versus Permitted Monthly Average Total Phosphorus

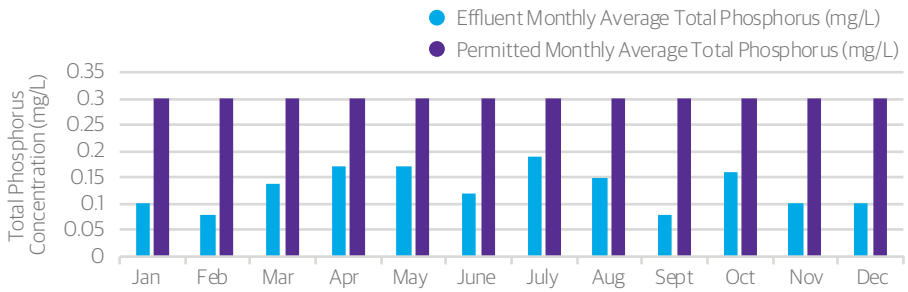
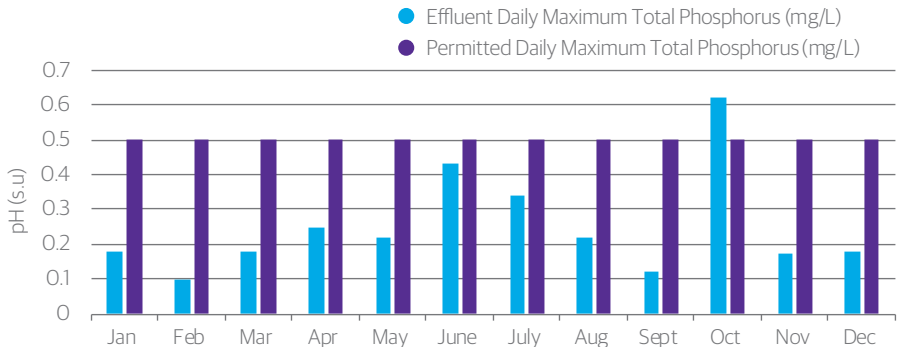


Exhibit 8

Effluent Daily Maximum Total Phosphorus Concentration versus Permitted Daily Maximum Total Phosphorus Concentrations



2016 Project Overview

Monitoring Wells

On a quarterly basis, the permit requires that monitoring wells up gradient and down gradient of the facility's effluent discharge are sampled and monitored for various parameters. The pH values of the samples taken at the down gradient monitor wells are the only monitoring well parameters with regulated limits. Exhibits 9 and 10 compare the permitted maximum, and minimum pH values, with the maximum and minimum pH values from each down gradient monitoring well in 2016.

Modified Monitoring Requirements

Included in the new NPDES permit, was an annual Bray 1 Phosphorus soil sampling requirement. CH2M inquired with the MDEQ as to whether or not this soil sampling requirement was necessary at this type of facility. The MDEQ looked into the matter, and concluded that the requirement was mistakenly added to the permit, and was not required.

2016 MDEQ Reporting

In accordance with MDEQ reporting requirements for the NLTUA WWTP, CH2M completed and submitted the following reports:

- Monthly Monitoring Report
- Annual Residual Management Report
- Sara TIER II Reporting

Exhibit 9

Monitoring Well Maximum pH Values versus Permitted Maximum pH Values

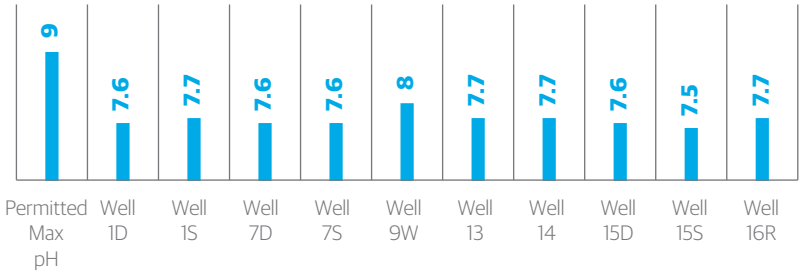
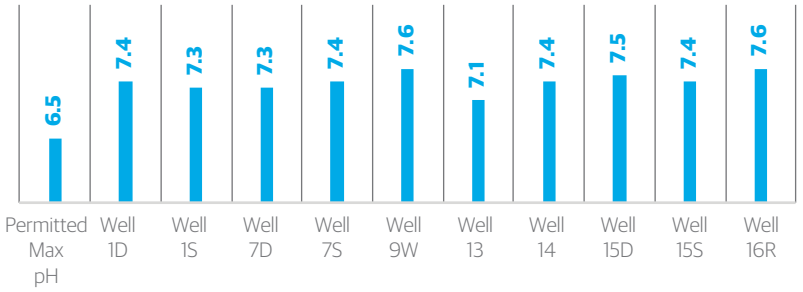


Exhibit 10

Monitoring Well Minimum pH Values versus Permitted Minimum pH Values



Financial Summary

General Overview

Our contract includes 300 repair labor hours. In 2016, CH2M accumulated 287 repair labor hours amounting to 13 hours under the repair labor hours' limit or $0.00 to be included in your annual reconciliation invoice. Exhibit 11 is a general comparison of your 2014-2016 repair expenses, repair labor expenses, and direct costs.

Exhibit 11

2014 to 2016 Repair Expenses, Repair Labor Expenses, and Direct Costs Comparison

Expense Category	2014	2015	2016	2014 Reconciliation	2015 Reconciliation	2016 Reconciliation
Direct cost (including repairs labor limit)	$111,205.49	$95,143.41	$107,285.00			
Direct cost over limit (including repairs labor limit) – 50% invoiceable	$13,790.49	NA	$2,618.11	$6,895.24		$1,309.05
Direct cost under limit (including repairs labor limit) – 50% refundable	NA	$6,817.59	NA	$0.00	-$3,408.81	$0.00
Repairs equipment – over $8,000 100% invoiceable	$11,478.72	$11,644.23	$20,150.19	$3,478.72	$3,644.23	$12,150.19
Repairs labor over limit – Over 3000 hours 100% invoiceable	$11,500.00	$2,790.00	$0.00	$11,500.00	$2,790.00	$0.00
Reconciliation invoice total				**$21,873.96**	**$3,025.42**	**$13,459.24**
Base fee (includes direct cost and margin)				**$137,936.00**	**$145,451.00**	**$147,545.00**
Total cost				**$159,809.96**	**$148,476.42**	**$161,004.24**

Financial Summary

Repairs Budget

Included in CH2M's monthly O&M invoice is an annual repairs limit of $8,000. In 2016, expenses related to repairs at the WWTP, in the collection system, and of residential grinder systems amounted to $20,150.19. Exhibit 12 summarizes repair expenses greater than $200. Exhibit 13 illustrates the overall portion of the repair expenses resulting from plant repairs, collection system repairs, and residential grinder pump repairs.

Repairs Labor

Total repair hours for 2016 amounted to 287 hours, 13 hours under the repairs labor limit. Exhibit 14 summarizes the percentage of repair hours attributable to residential grinder systems, the collection system, and the WWTP.

Exhibit 12
Repair Expenses Greater than $200

Residential Grinder Pumps	**Expense**
Replacement Floats for Grinder Pump Systems	$633.90
Grinder Pump Repairs	$4,952.31
Collection System Repairs	**Expense**
Main Street Lift Station Level Transducer	$853.36
Main Street Lift Station Level Transducer Calibration	$380.00
Multitrode Repair-Northport Point Lift Station	$1,266.29
Plant Repairs	**Expense**
NLTUA WWTP troubleshooting and fuse replacement (Includes spare fuse purchase for spare parts inventory)	$600.08
Install of air diffuser in CAF	$317.30
Replacement cable for pulling Landia mixers out of basin	$241.40
Landia Mixer Repair #1	$2,378.42
Landia Mixer Repair #2	$1,392.40
Landia Mixer Repair #3	$1,601.50
Replacement pH Probe	$282.77
Two new check valves for the reject chamber	$240.06
Two new reject pumps	$2,485.20

Exhibit 13
2016 Repair Expenses

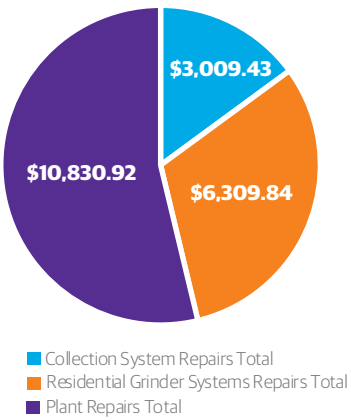
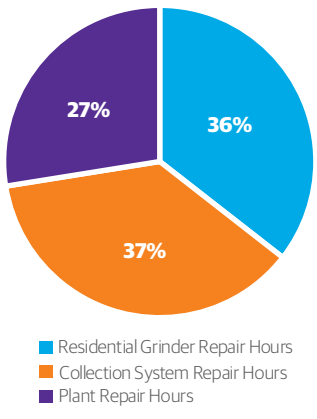


Exhibit 14
2016 Repair Labor Hours



Project Staff

The NLTUA WWTP Project Manager is Elizabeth Hart. She is supported by a staff of 16 technical and non-technical employees. Employee changes in the past 12 months include Marcus Evans leaving CH2M, Mark Huggard becoming Assistant Project Manager, Holly Thompson supporting operations at the facility, and Rick Shaw supporting maintenance at the facility. Highlighted in Exhibit 15 is the CH2M organizational chart.

NLTUA WWTP on-call personnel include:

- Nathan Callison
- Kerry Gensler
- Holly Thompson
- Shane Wyatt

All employees in the organizational chart play a part in serving the NLTUA project. CH2M employees are highly-qualified and licensed and certified to operate and maintain the facility, lift station, and collection system. An overview of their licenses and certifications is located in Exhibit 16.

In addition to our onsite employees, the project has support from numerous CH2M regional and corporate personnel, including Regional Business Manager Andy Appleton; Regional Director of Operations Kevin Dahl; Technical Specialists Maribeth Wintercorn, Scott Blair, and Denny Tulenson; Maintenance Specialist Harry Sellers and Paul Horigan; and Regional Accountants Shelly Campbell and Carolyn Cryer.

Exhibit 15
Organizational Chart

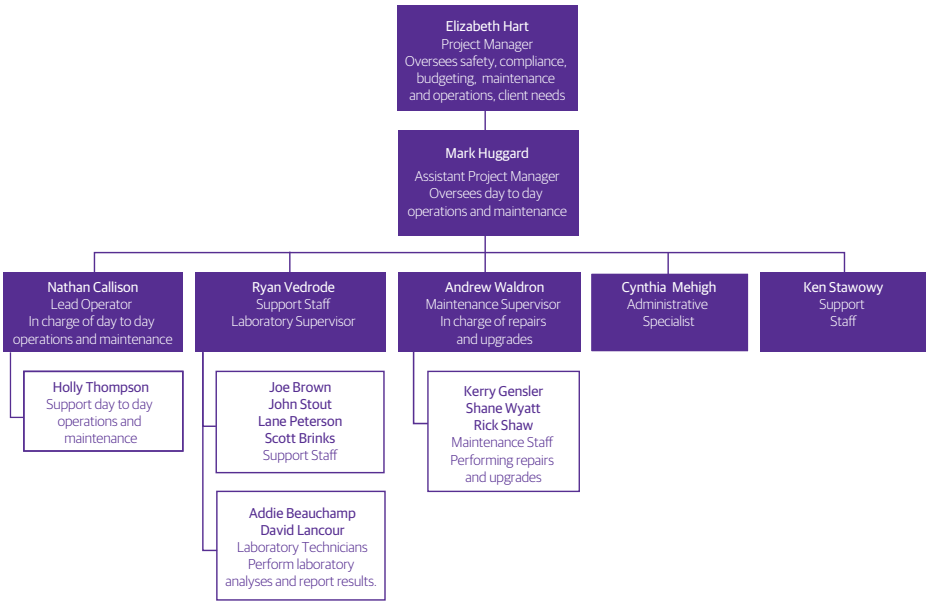


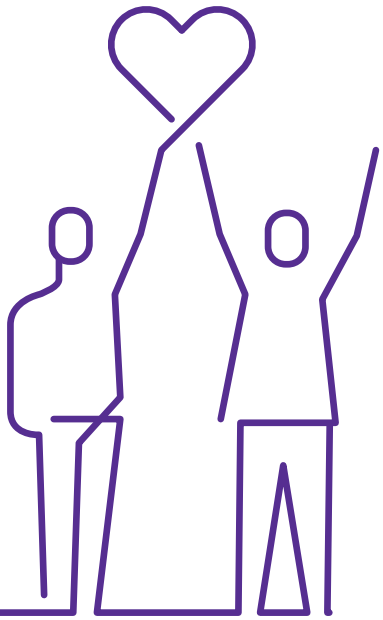
Exhibit 16
CH2M Employee Licenses and Certifications

Name	License/Certification
Addie Beauchamp	MDEQ Industrial A-1b, A-2c, B-2a, C-3s, and Wastewater C, D
Joe Brown	MDEQ Wastewater B, C, and D
Nathan Callison	MDEQ Wastewater C, D
Elizabeth Hart	MDEQ Wastewater A, B, C, D, L1, L2, Stormwater and Water F-4
Mark Huggard	MDEQ Wastewater A, B, C, D, L2, Water F-4, and S-4
Lane Peterson	MDEQ Wastewater C, D, Water F-4, and S-4
Ken Stawowy	MDEQ Wastewater A, B, C, D, L1, L2, and Stormwater
John Stout	MDEQ Wastewater B, C, and D
Ryan Vedrode	MDEQ Wastewater A, B, C, D, L1, L2, and Stormwater
Holly Thompson	MDEQ Wastewater D
Shane Wyatt	MDEQ Wastewater L2, L1, Water D-3, and S-3
Andrew Waldron	SMRP-Certified Maintenance and Reliability Technician

Community Involvement

As members of the community, we continue to provide tours for local residents, MDEQ, community leaders, members of the Michigan Rural Water Association, and many others.

In October, we provided two tours to students. They were taken through the plant as we described how each process works and how important it is to understand the scientific and mathematical concepts they are being taught, because we use those same concepts to make sure the facility is operating optimally every day. The students asked questions regarding regulating the facility's discharge, how they could become a wastewater professional, and what staff liked most about their occupation.



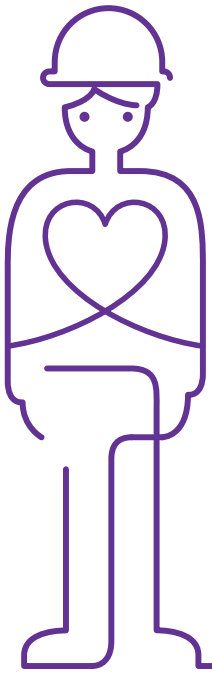
On the Horizon

CH2M's plans for 2017 include:

- Assist with the effluent flow meter install/modification.
- Estimate cost of ARV repairs.
- CH2M recommends a condition assessment be performed on manholes including recommendations for rehabilitation.
- Flush the sewer line in the Spring of 2017 before flows pick up.
- The WWTP needs to excavate and repair the recycle line valve. Due to the cost of excavation ($9,000, not including repair), we are exploring alternative solutions. In the meantime, we have adopted a plan to abandon the recycle valve and use other more accessible valves for recycle flow. In addition, the sludge valve may fail in the future. One option is to install an alternate PVC valve on the sludge line in the settling basin. We will continue to explore this option and find the cost to fix this valve.
- The fine screen auger needs to be pulled and coated with protective epoxy (H2S rated). We also need to change any corroded/ compromised brush brackets, nuts, or bolts.
- Look into different options for the maintenance of the RIBs.
- Facilitate the upgrade of the control panel at Northport Point.
- Continue to look into ventilation options in the blower room.
- Obtain a biosolids measurement in the spring and update the Village on a future biosolids haul date.

Conclusion

CH2M remains committed to providing the same level and expectation of service we have provided NLTUA for the past 8 years. We will continue to manage, operate, and maintain the WWTP and collection system in the best interest of the NLTUA, as outlined in the contract. We will continue to monitor process performance and look for ways to reduce energy consumption for the betterment of the community. CH2M looks forward to working with the NLTUA for many years to come.



CH2M remains committed to providing the same level and expectation of service we have provided NLTUA for the past 8 years.

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