WENCK File #0002-0236
October 2018

Technical and Cost Specifications: Clearwater Harbor/ Hidden River NMAP Implementation

Prepared for:

Clearwater River Watershed District

75 Elm St E
PO Box 481
Annandale, MN 55389

Clearwater River
WATERSHED DISTRICT

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Technical And Cost Specifications

For

Clearwater River and Hidden River NMAP Project 0018-01

February 2018
Updated October 2018 Per Board Order

Prepared for:
Clearwater River Watershed District
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Board of Managers:

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Chris Uecker, Vice-Chair
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I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly registered Professional Engineer under the laws of the State of Minnesota.

Rebecca Carlson

Rebecca Carlson, P.E. (MN) Date 2/21/2018
Registration no. 42013

Revised October 3, 2018

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly registered Professional Soil Scientist under the laws of the State of Minnesota.

Patty A. Mills

Peter Miller, PSS, PSC Date: 2/21/2018
Revised October 3, 2018

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1.0 Purpose

The Clearwater River Watershed District (CRWD) owns two large sub-surface treatment systems to treat wastewater for two housing developments. They are located next to each other in Lyden Township, Stearns County, Minnesota. The project area is shown in Figures 1.1 and 1.2. The systems, Clearwater Harbor (CRWD project #02-1) and Hidden River (CRWD Project #99-1), are permitted by the Minnesota Pollution Control Agency (MPCA) as one facility under State Disposal System Permit #MN0065226 and are together classified as a Class C Facility. The current permit will expire on May 31, 2019.

Hidden River was constructed in 2000 and Clearwater Harbor was constructed in 2005. MPCA updated their policy with respect to nitrogen limits for these types of systems in 2010. The current MPCA policy and therefore the permit requires total nitrogen concentrations below 10 mg/L at either:

- end of pipe prior to discharge to the system drain field or
- as measured in groundwater at the downgradient well (in this case GW004).

Monitoring of the downgradient well for these systems, GW004, shows that nitrogen levels in groundwater exceed the permit requirements from time to time. As the result, the MPCA Permit #MN0065226 required a Nitrogen Mitigation and Analysis Plan (NMAP) to be prepared and implemented and a new total nitrogen limit of 10 mg/L to be attained one day prior to permit expiration.

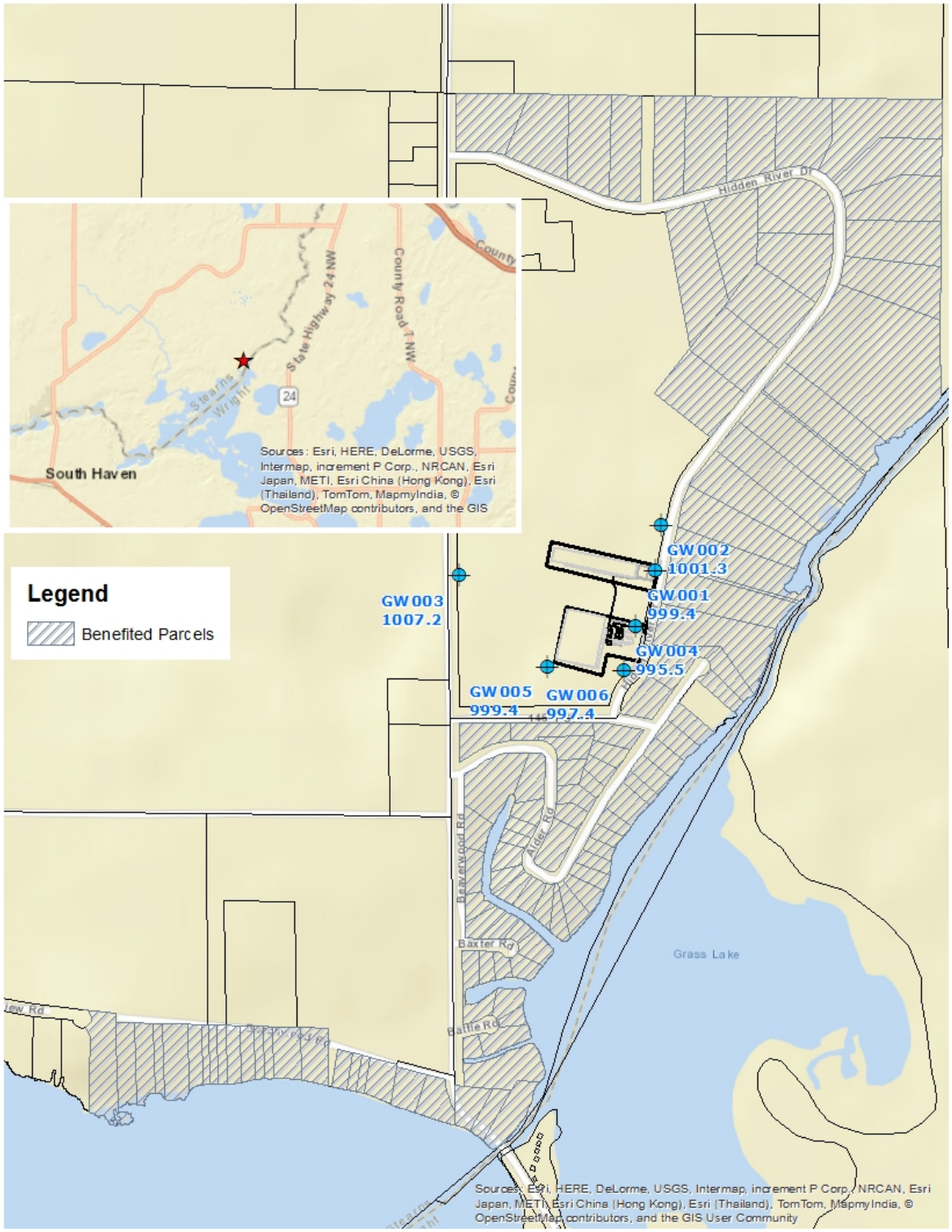
The CRWD prepared an NMAP report which was accepted by the MPCA (Appendix A). The District performed an alternatives analysis as part of the NMAP and a solution was selected based on cost, benefit and stakeholder input to address elevated nitrogen levels detected in groundwater monitoring well GW004.

The findings of the Board of Managers (Board) of the CRWD, by Board motion #16-5-2 on May 11, 2016, are:

- The District Engineer has certified that the systems were originally constructed to meet MPCA permit requirements, and those permit requirements changed with the re-issuance of the permit in 2014 to include the noted nitrogen limit.
- The systems cannot operate without the MPCA permit, and their current state will fall out of permit compliance on May 30, 2019.
- Therefore, the systems must be altered to attain the level of operating efficiency contemplated at the time of original systems construction.

The alternative selected during the NMAP process is an "end of pipe" treatment method. This Technical and Cost Specifications Report details the selected solution as required under MN 103D.635, Repairs and Improvements exceeding Normal Maintenance.

Figure 1.1. Project Location



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2.0 Introduction and Background

2.1 PROJECT LOCATION

The two systems are in Stearns County in the Upper Mississippi River Basin in HUC Code 07010203. The PLS Location is NW Qtr of Sec 32, T122N, R27W. The existing design of the two systems is described below:

2.2 HIDDEN RIVER SYSTEM

The first of the existing treatment systems, Hidden River, was constructed by CRWD in 2000 at the request of the developer of the Hidden River subdivision. The system serves 31 single family lots and consists of the components described below.

Collection System

- Individual septic tank at each home
- Eight inch gravity sewer and four inch forcemain
- One lift station

Treatment Site

- 17,000 gpd permitted Average Wet Weather (AWW) flow
- One 20,000 gallon recirculation tank
- One 3,300 square foot recirculating sand filter
- Drainfield dosing lift station
- 3,600 linear feet of drainfield trenches, gravity fed
- Onsite electrical service is single phase

2.3 CLEARWATER HARBOR SYSTEM

The Clearwater Harbor treatment system was constructed in 2005. The system serves 81 single family lots and consists of the components described below.

Collection System

- Eight inch gravity sewer and four inch forcemain
- Three lift stations

Treatment Site

- 28,000 gpd permitted AWW flow
- Three 15,000 gallon septic tanks in series
- One 30,000 gallon recirculation tank
- One 5,600 square foot recirculating sand filter
- Drainfield dosing lift station
- 6,400 linear feet of drainfield trenches, gravity fed
- Onsite electrical service is single phase

2.4 ALTERNATIVES CONSIDERED

To identify the most cost-effective means by which to meet the new MPCA permit limit, the District identified and evaluated several potential solutions. The following alternatives were evaluated through the NMAP process:

1. Regionalization of wastewater services to Annandale
2. Constructing a new recirculating gravel filter and Post Anoxic Denitrification System
3. Installation of an Orenco Treatment System and Post Anoxic Denitrification System
4. Installation of a Bio Microbics Treatment System and Post Anoxic Denitrification System
5. Use of phytoremediation in wetland

The alternatives that were reviewed, and their sizing assumptions, costs, and discussion, are presented below. The descriptions, sizing, and costs shown in this section reflect the concept designs that were presented to the Board and residents on June 1, 2016. Appendix B contains layouts for each alternative and a more detailed comparison description of construction and operation and maintenance costs associated with each alternative.

2.4.1 Alternative 1 – Regionalization to Annandale

Description

This alternative consisted of the installation of new infrastructure to convey wastewater from the Hidden River and Clearwater Harbor collection systems to the City of Annandale's sewer system. A list of the work required to implement this alternative is presented below.

- Abandonment of sand filters, recirculating tanks, drainfields and dosing lift stations, and control panels at both treatment sites. Septic tanks at Clearwater Harbor site would also be abandoned.
- Extension of 4" forcemain from the Hidden River lift station to the Clearwater Harbor treatment site.
- Construction of 3 lift stations, including installation of pumps, control panels and backup generators.
- Installation of 44,000 feet of 4" pipe from Clearwater Harbor site to the tie-in location with the City of Annandale's collection system near the Annandale Care Center.
- One waterway crossing between Grass Lake and Clearwater Lake
- 8 sections of steel casing for road crossings.
- Installation of 15 air release manholes (assumed one every 3,000 feet) and 25 cleanouts (one every 1,800 feet).

In addition to construction costs, a one-time sewer access fee would be assessed by the City of Annandale at a rate of $4,100 per household.

Sizing

The size and capacity of the forcemain pipe and lift stations were determined using guidance from Ten States Standards:

- Minimum forcemain diameter for raw wastewater: 4 inches
- Minimum velocity through pipe: 2 feet/second (design based on 5 feet/second)

Costs

The estimated initial capital cost for the construction and installation of treatment systems for this option is $4,850,000.

The estimated yearly operations and maintenance cost for this option is $127,000.

Considerations

The advantages and disadvantages to this alternative are listed below.

Pros

- Wastewater would no longer be treated onsite
- Eliminates the need for the CRWD to hold an SDS permit for the two systems – less compliance risk
- Grant funding available

Cons

- High initial capital cost
- Complex easements and permitting

2.4.2 Alternative 2 – Recirculating Gravel Filter + Denitrification

Description

This alternative consisted of the installation of new infrastructure on the Clearwater Harbor site to treat wastewater from both the Hidden River and Clearwater Harbor collection systems. A new gravel filter would be constructed to replace the two existing sand filters and a post anoxic system would be added for denitrification. A list of the work required to implement this alternative is presented below.

- Abandonment of sand filters, drainfield dosing lift stations, and control panels at both treatment sites. The recirculation tank at Hidden River would also be abandoned.
- Septic tanks and recirculation tank at the Clearwater Harbor site would be reused, as well as both drainfields. Modifications to these components are expected.
- Extension of 4" forcemain from the Hidden River lift station to the Clearwater Harbor treatment site.
- Installation of a new 25,000 gallon recirculation tank, microbubble diffuser, gravel filter dosing pumps, and 3-way flow splitter basin.
- Construction of 81 ft x 130 ft (10,500 sq ft) gravel filter.
- Installation of post anoxic treatment system, including denitrification dose tank and pumps, ABCN clarifier unit, and MicroFAST polishing unit.
- Construction of control building, including installation of electrical/controls and chemical feed equipment.
- Installation of new drainfield dose tank and pumps for dosing both Hidden River and Clearwater Harbor drainfields.

Sizing

The recirculating gravel filter was sized using guidance from the Onsite Wastewater Treatment Systems Manual (US Environmental Protection Agency, 2002. EPA/625/R-00/008):

- Design flow: 26,000 gpd
- Design $CBOD_5$ loading: 25.0 lb/day (115 mg/L $CBOD_5$ x 23,400 gpd)
- Design TN loading: 13.0 lb/day (60 mg/L TN x 23,400 gpd)

Septic tank volume was sized using guidelines outlined in the December 2013 MPCA LSTS design guidance document:

- Design AWW flow: 26,000 gpd
- Peaking factor: 3.0
- Minimum required septic tank volume: 78,000 gal (26,000 gpd x 3.0)

The three existing septic tanks and recirculation tank at the Clearwater Harbor treatment site provide a combined 75,000 gallons of storage, meeting the required storage volume. Note also that this does not account for the volume contributed by individual septic tanks at each of the homes as part of the Hidden River system.

Electrical components included in this alternative are listed below.

- Six x hp gravel filter dosing pumps
- One 2 hp microbubble blower/diffuser in recirculation tank
- Four 0.5 hp denitrification dosing pumps
- Two 0.5 hp denitrification mixing pumps
- Two 0.33 hp chemical feed pumps
- Two 0.5 hp sludge transfer pumps
- One 2.5 hp polishing FAST blower
- Two 2 hp drainfield dosing pumps

Costs

The estimated initial capital cost for the construction and installation of treatment systems for this option is $1,440,000. The estimated yearly operations and maintenance cost for this option is $66,000.

Considerations

The advantages and disadvantages to this alternative are listed below.

Pros

- Added nitrogen removal capability
- Minimal electrical components
- Grant funding available
- Regulatory certainty

Cons

- Similar to existing sand filters, which may be perceived by residents as an ineffective technology
- Gravel filter media replacement more difficult than other treatment alternatives
- Treatment for total nitrogen not as effective during winter

2.4.3 Alternative 3 – Orenco + Denitrification

Description

This alternative consisted of the installation of new infrastructure on the Clearwater Harbor site to treat wastewater from both the Hidden River and Clearwater Harbor collection systems. Vendor-supplied treatment units (Advantex pods containing textile media) would be installed to replace the two existing sand filters and a post anoxic system would be added for denitrification. A list of the work required to implement this alternative is presented below.

- Abandonment of sand filters, drainfield dosing lift stations, and control panels at both treatment sites. The recirculation tank at Hidden River would also be abandoned. A detailed summary of abandonment procedures is provided in Section 4.0.
- Septic tanks and recirculation tank at the Clearwater Harbor site would be reused, as well as both drainfields. Modifications to these components are expected.
- Extension of 4" forcemain from the Hidden River lift station to the Clearwater Harbor treatment site.
- Installation of a 25,000 gallon equalization tank, microbubble diffuser, Advantex dosing pumps, and 3-way flow splitter basin.
- Installation of 10 buried Advantex AX-100 units, including 2 ventilation fans
- Installation of two buried post anoxic AX-MBBR denitrification units.
- Construction of control building, including installation of electrical/controls and chemical feed equipment.
- Installation of new drainfield dose tank and pumps for dosing both Hidden River and Clearwater Harbor drainfields.
- Electrical utility upgrade to three phase power.

Sizing

The size and configuration of the Advantex and denitrification units were proposed by the equipment vendor. The vendor was given the design flows for the existing systems identified in this memo. Below is a summary of the design criteria selected by the vendor and identified in their proposal:

- Design flow: 23,400 gpd
- Design BOD_5 loading: 22.4 lb/day (115 mg/L BOD_5 x 23,400 gpd)
- Design TN loading: 11.7 lb/day (60 mg/L TN x 23,400 gpd)

The manufacturer recommended 98,360 gallons of upstream septic tank volume. The three existing septic tanks and recirculation tank at the Clearwater Harbor treatment site provide a combined 75,000 gallons of storage. An additional equalization tank was sized to provide the total required volume. Sizing of that tank did not rely on volume provided by the individual septic tanks on private lands provided for the Hidden River system. This assumption is conservative.

- Required additional volume: 23,360 gallons
- Provided additional volume: proposed 25,000 gallon equalization tank

Electrical components included in this alternative are listed below.

- Eight 1 hp Advantex unit dosing pumps
- One 2 hp microbubble blower/diffuser in recirculation tank
- One 0.5 hp RNE pump
- Two 0.08 hp ventilation fans
- Two 2 hp denitrification mixers
- Two 0.33 hp chemical feed pumps
- Two 2 hp drainfield dosing pumps

Costs

The estimated initial capital cost for the construction and installation of treatment systems for this option is $1,620,000. The estimated yearly operations and maintenance cost for this option is $68,000.

Considerations

The advantages and disadvantages to this alternative are listed below.

Pros

- Added nitrogen removal capability
- Single vendor responsible for entire aerobic & anoxic treatment system
- Improved ability to replace media due to easy-access hatches
- Grant funding available
- Regulatory certainty

Cons

- Two types of chemical feed required
- Treatment for total nitrogen less effective during winter due to exposure of the top of the treatment pods to cold air

2.4.4 Alternative 4 – Bio Microbics + Denitrification

Description

This alternative consists of the installation of new infrastructure on the Clearwater Harbor site to treat wastewater from both the Hidden River and Clearwater Harbor collection systems. Vendor-supplied treatment units (Bio Microbics FAST units containing plastic media) would be installed to replace the two existing sand filters and a post anoxic system (ABCN clarifier plus a polishing FAST unit) would be added for denitrification. A list of the work that is anticipated is presented below.

- Abandonment of sand filters, drainfield dosing lift stations, control panels, and recirculation tanks at both treatment sites.
- Septic tanks at the Clearwater Harbor site would be reused, as well as both drainfields. Modifications to these components are expected.

- Extension of 4” forcemain from the Hidden River lift station to the Clearwater Harbor treatment site.
- Retrofit of existing recirculation tank at Clearwater Harbor site with FAST dosing pumps.
- Installation of 2 buried MicroFAST/NitriFAST treatment trains, including 4 blowers.
- Installation of post anoxic treatment system, including denitrification dose tank and pumps, ABCN clarifier unit, and MicroFAST polishing unit with blower.
- Construction of control building, including installation of electrical/controls and chemical feed equipment.
- Installation of new drainfield dose tank and pumps for dosing both Hidden River and Clearwater Harbor drainfields.
- Electrical utility upgrade to three phase power.

Sizing

The size and configuration of the Bio Microbics system was proposed by the equipment vendor. The vendor was given the design flows for the existing systems identified in this memo. Below is a summary of the design criteria selected by the vendor and identified in their proposal:

- Design flow: 23,400 gpd
- Design $CBOD_5$ loading: 13.5 lb/day (115 mg/L $CBOD_5$ x 14,000 gpd)
- Design TN loading: 7.0 lb/day (60 mg/L TN x 14,000 gpd)

The manufacturer recommends sizing upstream septic tanks for 24 hours of holding time. The three existing septic tanks and recirculation tank at the Clearwater Harbor treatment site provide a combined 75,000 gallons of storage, which satisfy the required holding time.

Electrical components included in this alternative are listed below.

- Two 0.5 hp FAST train dosing pumps
- Two 7.5 hp MicroFAST blowers
- Two 4 hp NitriFAST blowers
- Four 0.5 hp denitrification dosing pumps
- Two 0.5 hp denitrification mixing pumps
- Two 0.33 hp chemical feed pumps
- Two 0.5 hp sludge transfer pumps
- One 2.5 hp polishing FAST blower
- Two 2 hp drainfield dosing pumps

Costs

The estimated initial capital cost for the construction and installation of treatment systems for this option is $1,160,000. The estimated yearly operations and maintenance cost for this option is $72,000.

Considerations

The advantages and disadvantages to this alternative are listed below.

Pros

- Added nitrogen removal capability
- Single vendor responsible for entire aerobic & anoxic treatment system
- All treatment units in enclosed, buried tanks – more heat retention helps total nitrogen removal
- Grant funding available
- Regulatory certainty

Cons

- More electrical components and higher electrical O&M costs compared to alternatives
- Media replacement not as easy as Alternative 3 due to buried tanks

2.4.5 Other Alternatives

Two additional alternatives were developed and considered as well, but each was determined to be infeasible. The first was to employ phyto-remediation and evaluate the nitrogen removing capacity of a major wetland complex on site over which the District maintains an easement. However, using a natural system offers far less control over the effluent water quality. Further, the regulators have not permitted a system of this nature making funding of a mitigation system of this nature uncertain. For these reasons, this alternative was not pursued.

The second alternative was to decouple the two systems and for residents connected to the smaller of the two systems (Hidden River) to use private systems on their lots and then proceed with construction of the selected alternative (Alternative 4) but just for Clearwater Harbor. This alternative was not pursued due to a combination of technical infeasibility as well as a lack of documented consensus among Hidden River homeowners and both the legal and practical complications related to decoupling Hidden River from the community system in the absence of that consensus.

2.5 SUMMARY AND SELECTION OF ALTERNATIVES

Results of the feasibility study were presented to the Board and residents on June 1, 2016. A summary of costs presented at the June 1, 2016 meeting is provided in Table 2.1.

Table 2.1. Summary of costs and Operation and Maintenance Costs (as presented at June 1, 2016 meeting).

Alternative	Capital Cost	Yearly O&M Cost*
1 – Regionalization to Annandale	**$4,850,000**	**$127,000**
2 – Recirculating Gravel Filter + Denitrification	**$1,440,000**	**$66,000**
3 – Orenco + Denitrification	**$1,620,000**	**$68,000**
4 – Bio Microbics + Denitrification	**$1,160,000**	**$72,000**

**Note: Actual 2015 Operations and Maintenance costs for the two systems was $69,925*

Based on the combination of the results of the feasibility analysis, additional hydro-geological investigations and stakeholder input, the Board selected alternative 4 for further development at its August 16, 2017 meeting via motions #17-08-2 and 17-08-3. The Board concluded that this alternative offers the lowest risk in terms of meeting permit requirements at the lowest cost.

3.0 Technical Specifications

The basic layout of the proposed system is shown Appendix B, Figure 4 and described as Alternative 4 in the previous section. This section of the report documents the technical considerations for the project. A more detailed Engineering Report, required by the MPCA, contains further technical details, plans and specifications (to be published February 2018).

3.1 ASSUMPTIONS

The assumptions made when determining design criteria and scope of improvements are listed below.

- The existing collection and dispersal infrastructure are appropriately sized for both the existing and original design flows and can be reused. Based on inspections in 2016 and 2017, the drainfields, gravity sewer, forcemains, manholes, and lift stations are in good condition; however, upgrades to system controls and electrical service are anticipated.
- Wet weather flow data for the existing systems do not suggest significant inflow and infiltration (I/I) is occurring that needs to be addressed.
- At the time of concept design, which started in March 2016, the maximum observed 7-day average for the previous three years of was 23,401 gpd, less than twice the then average annual day flow of 13,660 gpd. The maximum observed flow during the three years prior to concept design was 41,808 gpd, or approximately three times the average annual day flow.
- Recent flow data was reviewed prior to final design. Final flow rates used for design are listed in table 3.2.
- It is assumed that all the homes connected to these systems are occupied year-round. No seasonality is assumed.
- The design assumes no additional lots beyond the original plat (82 for Clearwater Harbor and 31 for Hidden River) will be connected to the system.
- The existing gravity drainfield is adequate for system operation.

3.2 INFLUENT FLOWS AND LOADS

Septic Check, the on-site operator, provided treatment system operating data from 2013-2015. This was used to establish the design flows and loads during feasibility evaluations for the proposed modifications. Combined influent design criteria for the two systems are shown in table 3.1 below.

Table 3.1. Feasibility level design flow and loads.

Parameter	Units	Permit Value	Code	Measured	Design Value[7]
Avg. Wet Weather (AWW) Flow	gal/day	45,000[1]	34,000[3]	23,401[4]	26,000 (Treatment) 34,000 (Equalization)
Avg. Annual Day Flow	gal/day			13,660[5]	15,000
Daily Maximum Flow	gal/day	67,000[2]		41,808[5]	46,000

Parameter	Units	Permit Value	Code	Measured	Design Value[7]
Avg. Day $CBOD_5$	mg/L			115 mg/L[6]	115 mg/L
Avg. Day Total Nitrogen	mg/L				60 mg/L[8]
Avg. Day TSS	mg/L			90 mg/L[6]	90 mg/L

1 Permitted AWW Flow for Hidden River is 17,000 gpd; Clearwater Harbor is 28,000 gpd
2 Permitted Daily Maximum Flow for Hidden River is 25,500 gpd; Clearwater Harbor is 42,000 gpd
3 Estimated design AWW flow calculated using guidance from MPCA Design Guidance for Large Subsurface Wastewater Treatment Systems, December 2013, based on number of homes and assumed number of bedrooms connected to system.
4 Based on flow data for both facilities (Jan 2013 – Dec 2015) by adding the daily flow value for each facility, then calculating a 7-day trailing average. Measured AWW flow shown is the highest 7-day average during the 3 year period.
5 Based on flow data for both facilities (Jan 2013 – Dec 2015) by adding the daily flow value for each facility, then calculating the average and maximum over the 3 year period.
6 Based on DMR data for Clearwater Harbor (Jan 2013 – Dec 2015). Average influent $CBOD_5$ strength of wastewater into the septic tanks at treatment site was 115 mg/L and average TSS strength was 90 mg/L. Average strength for Hidden River samples was lower: 104 mg/L and 56 mg/L respectively.
7 10% safety factor applied to design flows.
8 Provided in Metcalf & Eddy for Medium to High Strength Domestic Wastewater (Table 3-15 in Metcalf & Eddy 4th Edition).

The design flow and loads were revisited for the final design using the most recent data. In addition to the data provided for the feasibility study, data from 2016 and 2017 was provided for use by Septic Check. Table 3.2 summarizes the final values used for the design.

Table 3.2. Final design flow and loads.

Parameter	Units	Permit Value	Code	Measured	Design Value[7]
Avg. Wet Weather (AWW) Flow	gal/day	45,000[1]	34,000[3]	22,588[4]	34,000 (Equalization)
Avg. Annual Day Flow	gal/day			12,887[5]	19,500[7]
Daily Maximum Flow	gal/day	67,000[2]		41,808[5]	62,700[7]
Avg. Day $CBOD_5$	mg/L			115 mg/L[6]	115 mg/L
Avg. Day Total Nitrogen	mg/L				60 mg/L[8]
Avg. Day TSS	mg/L			90 mg/L[6]	90 mg/L

1 Permitted AWW Flow for Hidden River is 17,000 gpd; Clearwater Harbor is 28,000 gpd
2 Permitted Daily Maximum Flow for Hidden River is 25,500 gpd; Clearwater Harbor is 42,000 gpd
3 Estimated design AWW flow calculated using guidance from MPCA Design Guidance for Large Subsurface Wastewater Treatment Systems, December 2013, based on number of homes and assumed number of bedrooms connected to system.
4 Based on flow data for both facilities (Jan 2013 – Nov 2017) by adding the daily flow value for each facility, then calculating a 7-day trailing average. Measured AWW flow shown is the highest 7-day average during the 5-year period.
5 Based on flow data for both facilities (Jan 2013 – Nov 217) by adding the daily flow value for each facility, then calculating the average and maximum over the 5-year period.
6 Based on DMR data for Clearwater Harbor (Jan 2013 – Dec 2015). Average influent $CBOD_5$ strength of wastewater into the septic tanks at treatment site was 115 mg/L and average TSS strength was 90 mg/L. Average strength for Hidden River samples was lower: 104 mg/L and 56 mg/L respectively.
7 50% safety factor applied to design flows due to uncertainty about accuracy of flow data from 2015-2017. Based on discussions with the operator, flow data during this time period was likely impacted by miscalibrated dosing pumps.

8 Provided in Metcalf & Eddy for Medium to High Strength Domestic Wastewater (Table 3-15 in Metcalf & Eddy 4th Edition).

3.3 EFFLUENT LIMITS

Because the total daily wastewater flow discharging to the soil is greater than 10,000 gpd, the MPCA recommends the design follow the December 2013 Design Guidance for Large Subsurface Wastewater Treatment Systems (LSTS). The table below lists specific LSTS constituents and limits for soil dispersal. In addition to LSTS guidance, the NPDES permit for the facility includes two alternative limits for Total Nitrogen. $CBOD_5$ and TSS do not have particular limits per se; however, these constituents have direct correlation to nitrogen removal and soil loading rates.

Table 3.3. Effluent Limits.

Parameter	Limit
$CBOD_5$	None, however for system performance this parameter should be low (i.e. less than 30 mg/L)
TSS	None, however for system performance this parameter should be low (i.e. less than 30 mg/L)
Permit Alternative #1: Total Nitrogen	10 mg/L end-of-pipe
Permit Alternative #2: Nitrate Nitrogen	10 mg/L at property boundary
Fecal Coliform	None
Phosphorus	None

3.4 GUIDANCE CRITERIA

In addition to influent and effluent parameters, there are additional requirements for the design and construction of wastewater facilities. The additional criteria is listed below:

- MPCA LSTS design guidance document recommends sizing septic tanks for 3-4 times the AWW flow

These criteria were used in the design of the selected alternative.

3.5 ELECTRIC SERVICE

For the selected alternative, electrical service to the treatment site will need to be upgraded from 1-phase to 3-phase power. Based on discussions with the utility, Wright-Hennepin Cooperative Electric, the estimated capital cost to install this service is $30,000. This is separate from any other construction costs related to the treatment system.

3.6 COLLECTION SYSTEM UPDATES

Since the concept design was completed, it has been determined that upgrades to the existing collection systems are required. The call-out function for the lift station control panels is currently not operational. Work would consist of replacing control panels at each of the four collection system lift stations, one for the Hidden River development and three for the Clearwater Harbor development. The estimated capital cost to install new control panels

is $25,000 each, or $100,000 total. This item was not included at the time of concept design but has been added to the current design.

3.7 ABANDONMENT OF EXISTING INFRASTRUCTURE

The table below describes the abandonment procedure for the selected alternative for each component of the existing treatment systems. The existing systems must continue to operate until the proposed system is fully functioning and can be put online.

Table 3.4. Abandonment of Existing Infrastructure.

Existing Infrastructure	Selected Alternative
Hidden River Sand Filter	Area will not be needed. Decommission all piping, cap all outlets, and puncture bottom geotextile so it can't hold water. Remove one foot of material, place topsoil, and seed.
Clearwater Harbor Sand Filter	Area will be needed for new treatment units. Remove all piping, liners, geotextile, and filter media and landfill in accordance with Rule 7080.2500. Approved landfill site to be chosen by Contractor.
Hidden River Recirculation Tank	Cap all outlets and inlets, pump empty, remove any pumps and electrical, break bottom and top, and fill with sand.
Clearwater Harbor Recirculation Tank	Will be reused. Pipes to and from new infrastructure will be cored through tank walls as part of switchover. After switchover, existing pumps and electrical will be decommissioned and removed.
Control Panels	Decommission and remove from site for both systems and lift stations. Remove conduit and wiring.
Drainfield Dosing Lift Stations	For both systems, cap all outlets and inlets, pump empty, remove any pumps and electrical, break bottom and top, and fill with sand.
Clearwater Harbor Septic Tanks	Will be reused. Extended forcemain from Hidden River lift station will be cored through tank wall and existing effluent pipe will be tied into new recirculation/equalization tank as part of switchover.
Drainfields	Will be reused. Pipes from new drainfield dose tank will be tied into existing piping/distribution boxes as part of switchover.
Buried Piping	Either dig up and remove or cap ends so piping can't convey water.

3.8 COST

The engineer's estimate of probable construction cost of the selected alternative updated February 2018 is presented in Table 3.5:

Table 3.5. Engineer's Estimate of Probable Construction Cost (June 2018).

Clearwater River Watershed District
Clearwater Harbor Wastewater Treatment Facility
Large Subsurface Sewage Treatment System
MN Permit #MN0065226
MN Public Facilities Authority PSIG Form 4a
Opinion of Probable Construction Costs

By: EMB
Date: 6/5/2018
Date Modified: 6/6/2018, 6/7/2018, 6/8/2018

ITEM No.	ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
1	Remove Fence	1	LS	$5,000.00	$5,000
2	Abandon Hidden River Sand Filter	1	LS	$10,000.00	$10,000
3	Remove Clearwater Harbor Sand Filter	1	LS	$20,000.00	$20,000
4	Abandon Hidden River Recirculation Tank	1	EA	$5,000.00	$5,000
5	Remove Clearwater Harbor Recirculation Tank Pumps	2	EA	$1,000.00	$2,000
6	Abandon Drainfield Lift Stations	2	EA	$5,000.00	$10,000
7	Remove Existing Drainfield Control Panels	2	EA	$2,000.00	$4,000
8	Remove and Replace Lift Station Control Panel	4	EA	$35,000.00	$140,000
9	4" Forcemain Extension	385	LF	$40.00	$15,400
10	Connect to Existing Forcemain	1	LS	$7,500.00	$7,500
11	Connect Forcemain to Existing Septic Tank	2	EA	$2,000.00	$4,000
12	Septic Tank Upgrades	1	LS	$25,000.00	$25,000
13	Septic Tank 6-inch PVC Sanitary	125	LF	$50.00	$6,250
14	Existing Precast Concrete Tank Core-drill	12	EA	$2,500.00	$30,000
15	Septic Tank #3 Fine Bubble Diffusion Aerator	1	EA	$22,500.00	$22,500
16	Flowmeter Manhole	1	LS	$35,000.00	$35,000
17	Receiving Manhole	1	LS	$10,000.00	$10,000
18	Septic Tank Effluent Screen	3	EA	$1,500.00	$4,500
19	Equalization Pumps/Appurtenances/Retrofit	1	LS	$35,000.00	$35,000
20	Aerobic Treatment Unit Tank	75,000	GAL	$3.25	$243,750
21	BioMicrobics MyFAST 1.0	3	EA	$55,000.00	$165,000
22	BioMicrobics MyNitriFAST 1.0	3	EA	$55,000.00	$165,000
23	Denitrification Unit Dose Tank	6,400	GAL	$3.25	$20,800
24	Denitrification Unit Dosing Pumps and Appurtenance	1	LS	$25,000.00	$25,000
25	Denitrification Unit Tank	12,500	GAL	$3.25	$40,625
26	BioMicrobics MyABC-N 1.0	1	EA	$55,000.00	$55,000
27	Chemical Feed Equipment	1	EA	$12,500.00	$12,500
28	Control Building	1	LS	$85,000.00	$85,000
29	Control Building Equipment & Furnishings	1	LS	$7,500.00	$7,500
30	Polishing Tank	12,500	GAL	$3.25	$40,625
31	Polishing Treatment Unit	1	EA	$55,000.00	$55,000
32	Drainfield Dose Tank	12,500	GAL	$3.25	$40,625
33	Effluent Screen	1	GAL	$1,500.00	$1,500
34	Drainfield Dosing Pumps and Appurtenances	1	LS	$35,000.00	$35,000
35	Drainfield Cell Connection	6	LS	$1,500.00	$9,000
36	Drainfield Cell Distribution Box Cover	6	LS	$500.00	$3,000
37	Control Panel	1	LS	$75,000.00	$75,000
38	Yard Piping	2,200	LF	$40.00	$88,000
39	Insulation (4")	800	SY	$10.00	$8,000
40	Gravel Access Drive	130	LF	$35.00	$4,550
41	Gravel Access Walkway	200	LF	$20.00	$4,000
42	Protection Bollard	12	EA	$300.00	$3,600
43	Site Restoration	2.0	ACRE	$10,000.00	$20,000
44	Erosion Control	1	LS	$5,000.00	$5,000
45	Electrical Utility Upgrade	1	LS	$30,000.00	$30,000
46	Electrical Work	1	LS	$125,000.00	$125,000
47	Electrical Generator	1	LS	$55,000.00	$55,000
48	Mobilization & Demobilization	1	LS	$165,000.00	$165,000
				Wastewater Treatment Construction Costs:	$1,979,225
				5% Contingency per MN PFA PSIG Form 4a:	$98,961
				Total Opinion of Probable Construction Costs:	**$2,080,000**

Table 3.6 below shows the total estimated project costs as described on form 4a of Public Facilities Authority's Point Source Implementation Grant (PSIG) application.

Table 3.6. Expected Total Project Costs June 2018*

Minnesota Public Facilities Authority
Point Souce Implementation Grant Program
Form 4a - PSIG Project Costs

Applicant: Clearwater River Watershed District | **Date:** 6/8/2018

Project: Clearwater Harbor/Hidden River Nitrogen Miti | **Project Costs Based on:** Estimated costs

Instructions: *Fill in yellow cells. See notes at bottom.*

	COLUMN A	COLUMN B	COLUMN C	COLUMN D	COLUMN E
	Start Date	**End Date**	**Total Project Costs**	**ESTIMATED PSIG Eligible Costs**	**Estimated PSIG Eligible %**
1. Construction Costs					
Wastewater Treatment	05/01/19	10/31/19	$ 1,979,225	$ 1,979,225	
Sanitary Sewer Collection					
Stormwater Treatment					
Other:					
Subtotal - Construction			*$ 1,979,225*	*$ 1,979,225*	*100.0%*
2. Contingencies (5% of construction)			$ 98,961	$ 98,961	
3. Engineering / Other					
Planning / Pre-design	01/01/15	06/26/17	$ 114,219	$ 114,219	
Design (preparation of plans & specs)	06/26/17	05/01/19	$ 150,000	$ 150,000	
Inspection / Construction Mgmt	05/01/19	10/31/20	$ 200,000	$ 200,000	
Legal / Financing Related Fees	01/01/15	10/31/20	$ 75,000	$ 75,000	
Land Purchase				$ -	
Other:				$ -	
Subtotal - Engineering / Other			*$ 539,219*	*$ 539,219*	
Total Project Costs			**$ 2,617,405**	**$ 2,617,405**	*100.0%*

Total PSIG Eligible Cost $ 2,617,405

Estimated PSIG Grant:
(PSIG Eligible Cost x 80%, $7 million max) **$ 2,093,924**

*This figure does not include operation & maintenance which is generally about $72,000 annually.

4.0 Project Cost Allocation

This section provides project details relevant to Board decisions on benefit and cost allocation.

4.1 PROJECT BENEFIT

Regulatory changes make this project necessary for the full system to function at all. Legally operable sanitary sewer systems are required for habitable homes on platted lots. Original benefits determined for the two systems are discussed in the Administrators project summary.

4.2 ALLOCATION OF PROJECT COSTS

There are no cost elements of the project that are necessitated principally by one subdivision or the other. The potential improvement is to be constructed for the common benefit of the two projects.

4.3 FUTURE OPERATION AND MAINTENANCE OF TWO SYSTEMS

Currently the only common elements shared by the two systems are telemetry and the O&M services retainer with Septic Check. As such, invoices from Septic Check and invoices related to telemetry (principally internet service) are split 50/50 between the two system O&M funds. All other costs associated for the two sewer systems are allocated to each respective fund as they occur (ex. pump repairs, vegetation control at treatment areas, etc.).

Following construction of the nitrogen mitigation system, the only system elements not common to both systems will be the respective collection systems. Wastewater streams will be combined once they reach the treatment system.

Table 4.1. System Elements post-project construction

Element	Common to both Hidden River and Clearwater Harbor (fund to-be created)	Hidden River (existing O&M fund 610)	Clearwater Harbor (existing O&M fund 630)
Treatment components (ex. NMS, drain fields, treatment septic tanks, telemetry, treatment controls, etc.)	X		
Hidden River Collection components (ex. gravity lines, force-mains to treatment area, lift stations)		X	
Clearwater Harbor Collection components (ex. gravity lines, force-mains to treatment area, lift stations)			X

5.0 Project Requirements

The project can be constructed within existing CRWD easements. No additional lands or property rights are required to construct the project. There are no damages for the project.

6.0 Funding and Financing

The State of Minnesota offers Point Source Implementation Grant (PSIG) funding for projects of this nature. The program is competitive in nature and the State maintains a ranked list of projects eligible for funding based on the amount of funding provided by the legislature.

Currently, the legislature has authorized funding of 80% of project costs. In addition to construction costs, funding also covers costs for design and feasibility incurred prior to award for projects that qualify. Funds are available based on project ranking relative to other projects on the list and the total amount available.

The District submitted this project for consideration of PSIG funding. The project is on the list, though funding is not available in the current biennium. However, projects currently slated for funding can stall, and others can move up the list. The District is proceeding with full design of the project to improve the project ranking and accelerate funding and construction.

The remainder of the project costs not covered by PSIG will be covered by the benefited property owners, which include the landowners of the two communities served by both systems.

These funds are proposed to be levied through special assessment over a period of 10 years. Via MN State statutes 103D.901, Stearns County will provide the proceeds to cover these costs up front to ensure there is cash on hand to complete the project. The county may issue bonds to finance its provision of funding or it may use other means to do so, in its judgment.

7.0 Project Schedule

The proposed project schedule is listed in table 7.1 below.

Table 7.1. Proposed Project Schedule.

Task	2018												2019											
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Submit Plans & Specs to MPCA		x																						
Final Tech & Cost Spec. Report		x																						
Public Hearing				x																				
MPCA Certifies Project						x																		
2019 PSIG Funding Apl.							x																	
PSIG Funding Announcement								x																
Steps Below Contingent on PSIG Funding																								
Advertise for Bids									x															
Award Bids												x												
Submit Certified Bids to MPCA												x												
Construction													x	x	x	x	x	x	x	x	x	x		

8.0 Recommendation and Certification

This report was prepared in accordance with Minnesota State Statute 103D.635. The Engineer previously has certified that, due to a change in the MPCA policy, the Clearwater Harbor (District Project 02-01) and Hidden River (District Project 99-1) waste water treatment systems must be improved to attain the level of operating efficiency contemplated at the time of the original construction. Because of the change in permit requirements, and the necessity of the permit for operation of the two systems, construction, operation and maintenance of a nitrogen mitigation system is required.

Appendix A

NMAP

Wenck
Engineers • Scientists
Business Professionals

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TECHNICAL MEMORANDUM

TO: Dennis Loewen, District Administrator
Clearwater River Watershed District

FROM: Rebecca Kluckhohn, P.E. Wenck Associates, Inc.

DATE: June 6, 2014

SUBJECT: Clearwater Harbor & Hidden River Nitrogen Mitigation and Analysis Plan MPCA SDS Permit No. MN0065226

At their May 2014 meeting, the Clearwater River Watershed District Board of Managers directed the Engineer to provide two items:

1. Historical and background ground water quality data for the surficial aquifer which Clearwater Harbor and Hidden River systems may impact.
2. A scope of work for the MPCA-required Nitrogen Mitigation and Analysis Plan & to evaluate operational future of the sand filters.

These two items are presented below.

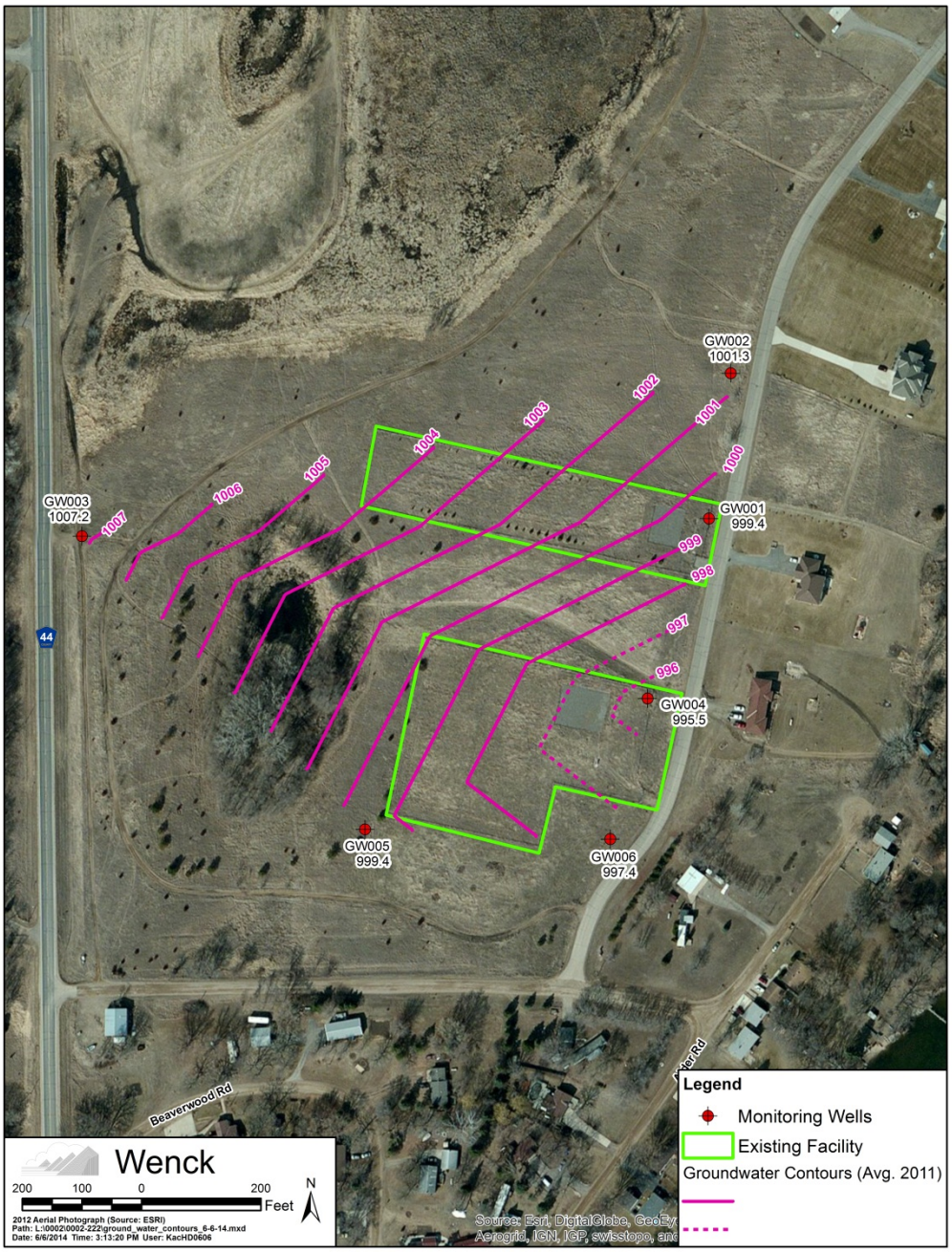
1. Groundwater Flow & Water Quality

The Hidden River waste water treatment system was installed in 2000; Clearwater Harbor was installed in 2005. At the time the groundwater monitoring wells were installed, shallow groundwater flowed towards the Clearwater River from west to east and GW004 was used at the down gradient well. The system and monitoring wells are located in the Anoka Sand Plain, a shallow aquifer with high transmissivity.

Since system installation, homes, and presumably wells have been installed in the area. Withdrawals at these wells may be influencing the direction of shallow groundwater flow in the area of the systems. Groundwater elevation data collected between 2005 and 2009 showed that the location of GW006 may be a better representation of down gradient conditions than GW004. GW006 was installed in spring of 2010 to respond to the data which showed that GW004 may not be a down gradient well.

For this report, all historical data was reviewed. Recent data show a potential cone of depression surrounding GW004. Groundwater flow direction is shown in Figure 1.

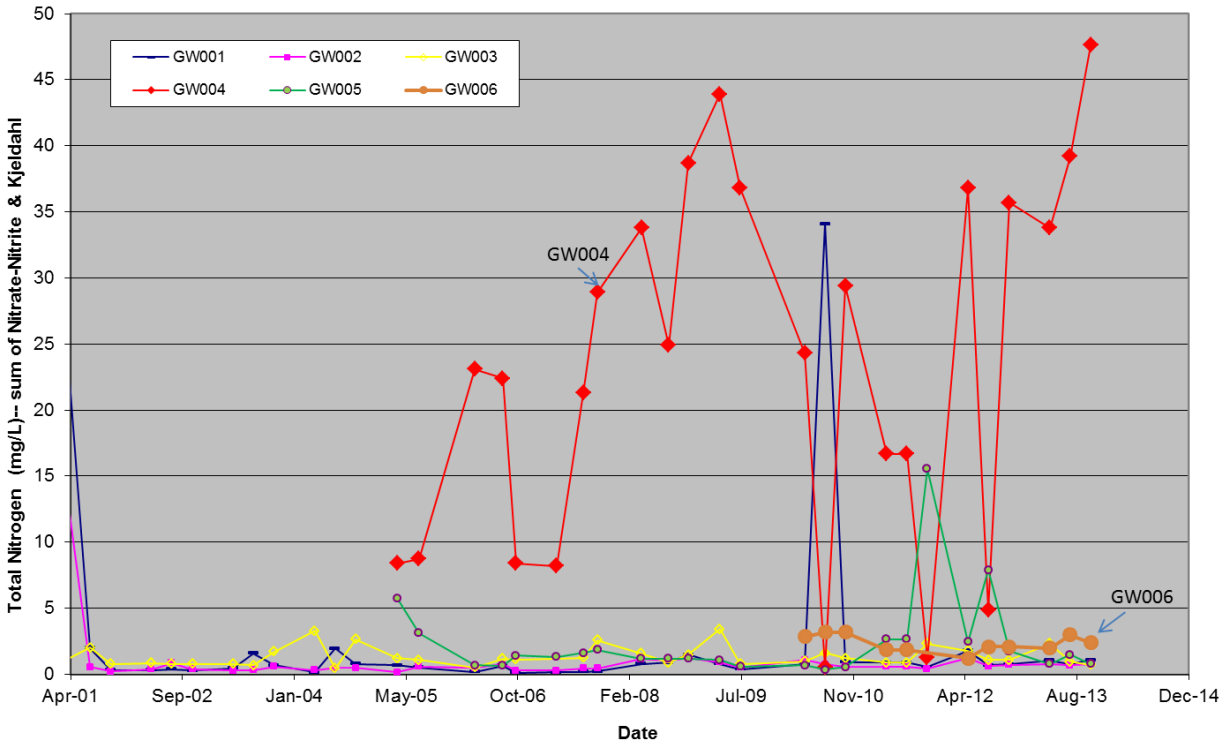
Figure 1: Average groundwater flow direction, 2011



Total nitrogen concentrations in the monitoring well GW004 have varied between 8.4 mg/L at the time of its installation in 2005, and 47.6 mg/L in 2013. The nitrogen standard is 10 mg/L. The average concentration for GW004 is 21.7 mg/L. Background / pre-system operation concentrations at GW004 were not measured directly, though low concentrations in the up gradient wells suggest that background concentrations of total nitrogen in the local surficial aquifer are low (0-2 mg/L).

A technical paper called *Groundwater Quality in Agricultural Areas, Anoka Sand Plan Aquifer, East-Central Minnesota, 1984-1990* (Landon and Delin, 1995) was reviewed to further determine background concentrations in the shallow aquifer. This paper shows that concentrations of nitrate plus nitrite-nitrogen from samples in this aquifer ranged from 0.1 to 21 mg/ L during the study period with a median concentration of 10 mg/L. This study encompasses the area of interest, the closest wells in this study are within 5 miles of the area of interest.

Figure 2. Total nitrogen in monitoring wells (sum of Nitrate+ Nitrite as N and Total Kjeldahl Nitrogen)



2. Scope of Work for Nitrogen Mitigation & Analysis Plan

The scope of work will include an evaluation of the local shallow aquifer and an evaluation of the feasibility of alternatives to provide nitrogen mitigation. Alternative costs and benefits will be presented in the report. The report will also review alternatives to address the existing function of the sand filters. The Nitrogen Mitigation and Analysis Plan shall be prepared in accordance with Section 1.1 of the draft permit and shall evaluate methods to reduce the amounts of nitrogen in the discharge and/ or increase the distribution of effluent to the groundwater.

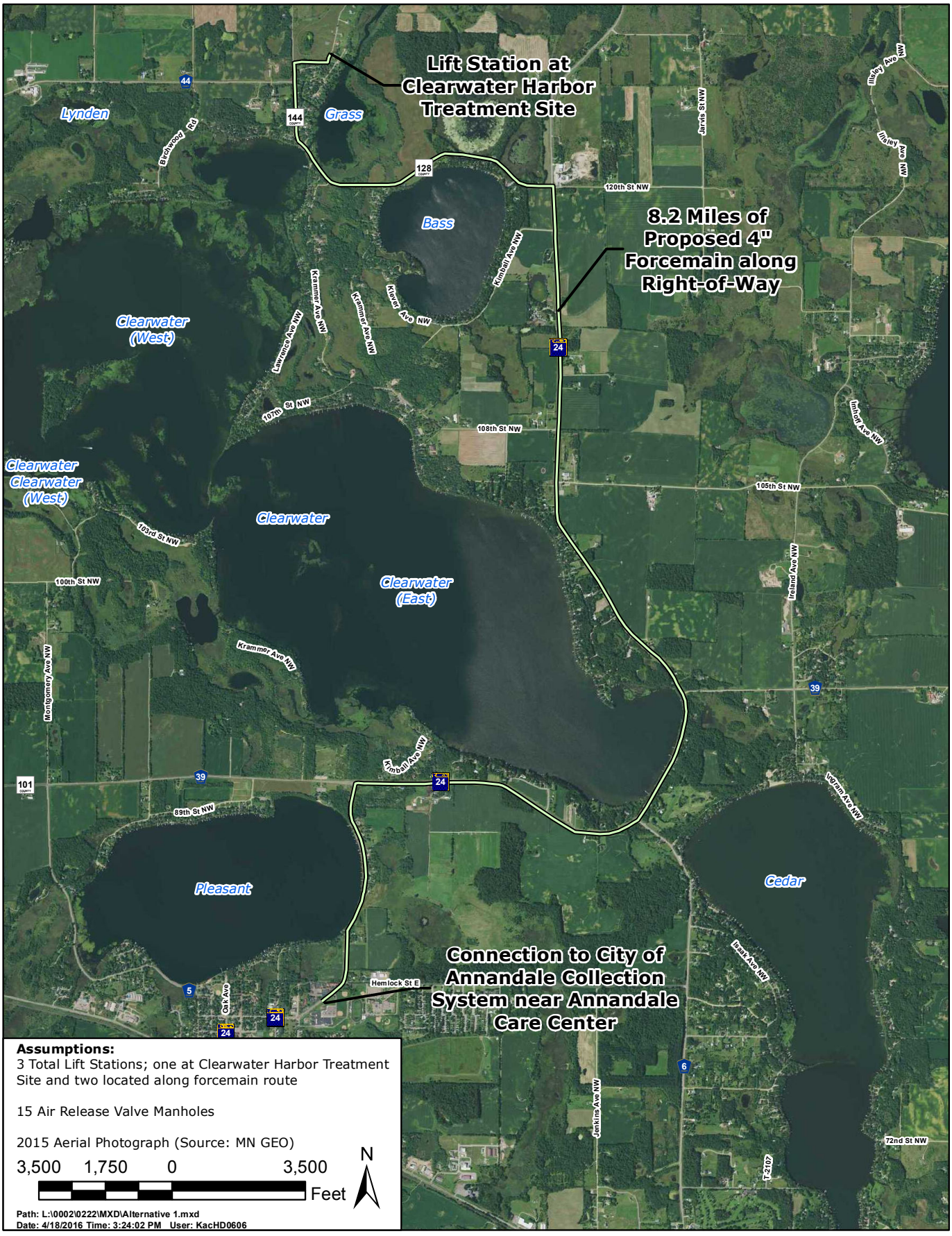
A table of tasks and associated level of effort is listed below (Table 1). The report can be submitted thereafter in accordance with the permit requirement (within 90 days of permit issuance). Draft and final findings will be presented at the regular CRWD board meeting.

Table 1. Level of Effort

		Rebecca Kluckhohn	Shane Waterman	Eric Blaising	Brian Koski (Septic Check)	Expenses	Total
Task	Description	$160	$160	$136	$125		
1	Evaluate installation of additional treatment units to remove nitrogen in wastewater			24			$3,264
2	Evaluate installation of additional disposal area to reduce nitrogen loading rate			4	2		$794
3	Evaluate groundwater monitoring well network to determine if the current wells are adequately placed and whether additional wells are necessary. Evaluate sources and historical data.	2	8				$1,600
4	Analyze the operation and maintenance of the system which includes application rates, seasonal loading and resting procedures, distribution effectiveness to maximize the area used and solids removal. This will include review of operational data and an interview with the operator.	2		4	4	$100	$1,464
5	Provide a schedule outlining completion dates for proposed activities.			2			$272
6	Prepare draft & final report.	4		20			$3,360
		8	8	54	6	100	$10,754

Appendix B

Alternatives Considered



CLEARWATER RIVER WATERSHED DISTRICT

Alternative 1 - Regionalization to Annandale

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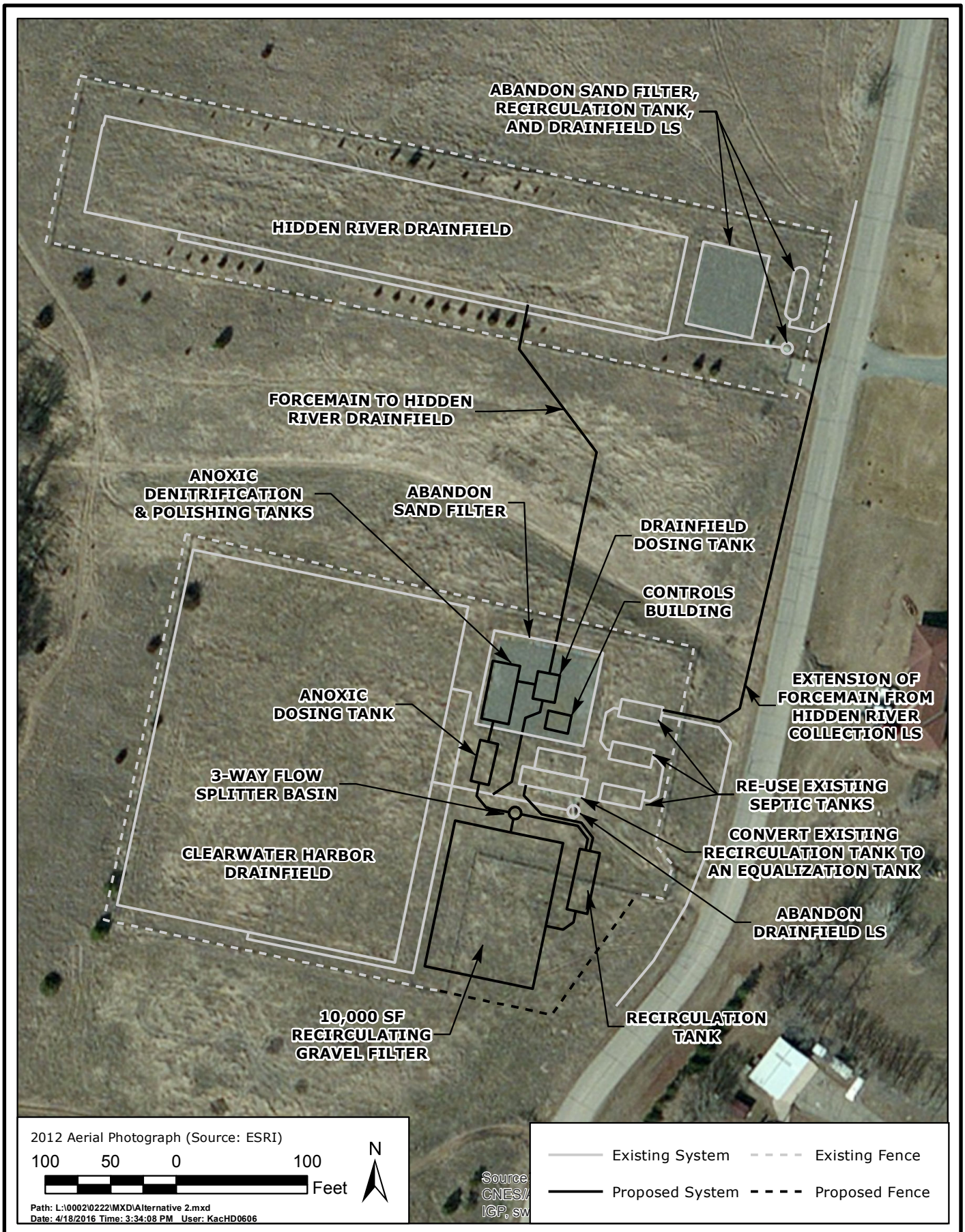
Figure 2

Clearwater Harbor/Hidden River
Clearwater River Watershed District
Opinion of Probable Construction Costs
Alternative 1 - Regionalization to Annandale

ITEM No.	ITEM		QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
1	Abandon Sand Filters		2	EA	$10,000.00	$20,000
2	Abandon Recirculating Tank		2	EA	$20,000.00	$40,000
3	Abandon Drainfield Lift Stations		2	EA	$15,000.00	$30,000
4	Remove Existing Control Panels		2	EA	$5,000.00	$10,000
5	Abandon Drainfields		2	EA	$10,000.00	$20,000
6	Abandon Septic Tanks		3	EA	$12,000.00	$36,000
7	Connect Existing Forcemains to Clearwater Harbo		2	EA	$10,000.00	$20,000
8	4" HDPE Forcemain		44,000	LF	$25.00	$1,100,000
9	Waterway Crossing (Grass & Clearwater Lake)		200	LF	$200.00	$40,000
10	Steel Casing for Road Crossings (Assume 8)		650	LF	$500.00	$325,000
11	Lift Station & Controls (w/ Generator)		3	EA	$250,000.00	$750,000
12	Air Release Manhole		15	EA	$16,000.00	$240,000
13	Cleanouts (One per 1800 Feet)		25	EA	$8,000.00	$200,000
14	Dewatering		1	LS	$50,000.00	$50,000
15	Site Restoration		1	LS	$100,000.00	$100,000
16	Erosion Control		1	LS	$50,000.00	$50,000
17	Mobilizaton (10% of Items 1-16)		1	LS	$286,000.00	$286,000
				Construction Subtotal:		$3,317,000
				10% Contingency:		$332,000
	20% Engineering Design, Grant Assistance, Permitting & Construction Services:					$664,000
			2% Legal, Admin, Permit Fees:			$67,000
	One-Time Sewer Access Fee ($4,100/connection, 113 connections):					$464,000
	Total Opinion of Probable Construction Costs:					**$ 4,850,000**



CLEARWATER RIVER WATERSHED DISTRICT

Alternative 2 - Gravel Filter + Denitrification

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Figure 3

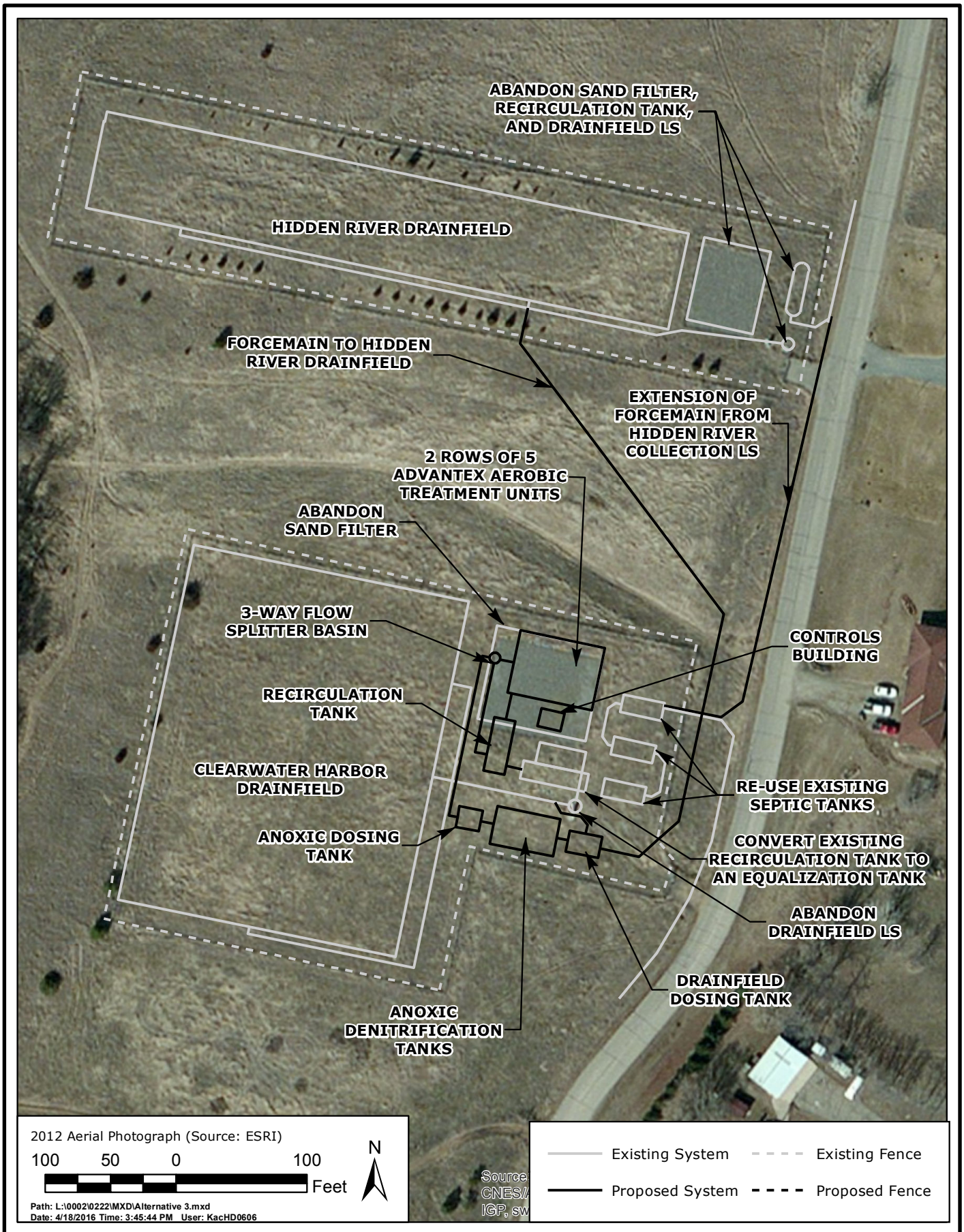
Clearwater Harbor/Hidden River

Clearwater River Watershed District

Opinion of Probable Construction Costs

Alternative 2 - Recirculating Gravel Filter + Denitrification

ITEM No.	ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
Removals					
1	Remove Fence	1	LS	$5,000.00	$5,000
2	Abandon Hidden River Sand Filter	1	LS	$10,000.00	$10,000
3	Abandon Clearwater Harbor Sand Filter	1	LS	$20,000.00	$20,000
4	Abandon Hidden River Recirculation Tank	1	EA	$5,000.00	$5,000
5	Abandon Drainfield Lift Stations	2	EA	$5,000.00	$10,000
6	Remove Existing Control Panels	2	EA	$2,000.00	$4,000
Connecting Hidden River Collection System to Treatment Site					
7	4" Forcemain Extension	350	LF	$40.00	$14,000
8	Connect to Existing Forcemain	1	LS	$5,000.00	$5,000
9	Connect Forcemain to Existing Septic Tank	1	LS	$2,500.00	$2,500
Recirculating Gravel Filter					
10	Septic Tank Effluent Screen	2	EA	$1,500.00	$3,000
11	Recirculation Tank	25,000	GAL	$3.25	$81,250
12	Microbubble Diffuser in Equalization Tank	1	EA	$20,000.00	$20,000
13	Recirculation Pumps and Appurtenances	1	LS	$75,000.00	$75,000
14	Recirculating Gravel Filter (10,500 sf)	1	LS	$235,000.00	$235,000
15	Water Balance Test	1	LS	$25,000.00	$25,000
16	3-Way Splitter Basin w/ Valve and Actuator	1	EA	$10,000.00	$10,000
Anoxic Denitrification					
17	Denitrification Dose Tank	20,000	GAL	$3.25	$65,000
18	Denitrification Dosing Pumps and Appurtenances	1	LS	$20,000.00	$20,000
19	Denitrification Tank	12,000	GAL	$3.25	$39,000
20	Denitrification Unit	1	EA	$30,000.00	$30,000
21	Chemical Feed Equipment	1	EA	$10,000.00	$10,000
22	Chemical Feed Control Building	1	LS	$50,000.00	$50,000
23	Polishing ATU Tank	6,000	GAL	$3.25	$19,500
24	Polishing Treatment Unit	1	EA	$25,000.00	$25,000
Drainfield Dosing					
25	Drainfield Dose Tank	6,000	GAL	$3.25	$19,500
26	Drainfield Dosing Pumps and Appurtenances	1	LS	$20,000.00	$20,000
27	Control Panel	1	LS	$55,000.00	$55,000
General Site Work					
28	Yard Piping	1,500	LF	$15.00	$22,500
29	Insulation (4")	1,000	SY	$5.00	$5,000
30	Tensile Wire Fence	200	LF	$15.00	$3,000
31	Site Restoration	1.5	ACRE	$7,500.00	$11,250
32	Erosion Control	1	LS	$2,500.00	$2,500
33	Electrical Utility Upgrade	1	LS	$30,000.00	$30,000
34	Electrical	1	LS	$50,000.00	$50,000
35	Mobilizaton (10% of Items 1-30)	1	LS	$101,000.00	$101,000
			Construction Subtotal:		$1,103,000
			10% Contingency:		$111,000
	20% Engineering Design, Grant Assistance, Permitting & Construction Services:				$221,000
	Total Opinion of Probable Construction Costs:				**$1,440,000**



CLEARWATER RIVER WATERSHED DISTRICT

Alternative 3 - Orenco + Denitrification

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Figure 4

Clearwater Harbor/Hidden River
Clearwater River Watershed District
Opinion of Probable Construction Costs
Alternative 3 - Orenco + Denitrification

ITEM No.	ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
Removals					
1	Remove Fence	1	LS	$5,000.00	$5,000
2	Abandon Hidden River Sand Filter	1	LS	$10,000.00	$10,000
3	Abandon Clearwater Harbor Sand Filter	1	LS	$20,000.00	$20,000
4	Abandon Hidden River Recirculation Tank	1	EA	$5,000.00	$5,000
5	Abandon Drainfield Lift Stations	2	EA	$5,000.00	$10,000
6	Remove Existing Control Panels	2	EA	$2,000.00	$4,000
Connecting Hidden River Collection System to Treatment Site					
7	4" Forcemain Extension	350	LF	$40.00	$14,000
8	Connect to Existing Forcemain	1	LS	$5,000.00	$5,000
9	Connect Forcemain to Existing Septic Tank	1	LS	$2,500.00	$2,500
Advantex Treatment Units					
10	Septic Tank Effluent Screen	2	EA	$1,500.00	$3,000
11	Equalization Pumps and Appurtenances	1	LS	$15,000.00	$15,000
12	Microbubble Diffuser in Equalization Tank	1	EA	$20,000.00	$20,000
13	Recirculation Tank	25,000	GAL	$3.25	$81,250
14	Recirculation Tank Pumps & Appurtenances	1	LS	$50,000.00	$50,000
15	Advantex Treatment Units	10	EA	$30,000.00	$300,000
16	Ventilation Fans	2	EA	$7,500.00	$15,000
17	3-Way Splitter Basin w/ Valve and Actuator	1	EA	$10,000.00	$10,000
Anoxic Denitrification					
18	MBBR Unit	2	EA	$125,000.00	$250,000
19	MBBR Dose Tank	6,000	GAL	$3.25	$19,500
20	MBBR Dosing Pumps and Appurtenances	1	LS	$20,000.00	$20,000
21	Chemical Feed Equipment	1	LS	$10,000.00	$10,000
22	Chemical Feed Control Building	1	LS	$50,000.00	$50,000
Drainfield Dosing					
23	Drainfield Dose Tank	6,000	GAL	$3.25	$19,500
24	Drainfield Dosing Pumps and Appurtenances	1	LS	$20,000.00	$20,000
25	Control Panel	1	LS	$55,000.00	$55,000
General Site Work					
26	Yard Piping	1,000	LF	$15.00	$15,000
27	Insulation (4")	800	SY	$5.00	$4,000
28	Site Restoration	1.5	ACRE	$7,500.00	$11,250
29	Erosion Control	1	LS	$2,500.00	$2,500
30	Electrical Utility Upgrade	1	LS	$30,000.00	$30,000
30	Electrical	1	LS	$50,000.00	$50,000
31	Mobilizaton (10% of Items 1-25)	1	LS	$113,000.00	$113,000
				Construction Subtotal:	$1,240,000
				10% Contingency:	$124,000
	20% Engineering Design, Grant Assistance, Permitting & Construction Services:				$248,000
	Total Opinion of Probable Construction Costs:				**$1,620,000**

CLEARWATER RIVER WATERSHED DISTRICT

Alternative 4 - Bio Microbics + Denitrification

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Figure 5

Clearwater Harbor/Hidden River

Clearwater River Watershed District

Opinion of Probable Construction Costs

Alternative 4 - Bio Microbics + Denitrification

Updated March 6, 2017

ITEM No.	ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
Removals					
1	Remove Fence	1	LS	$5,000.00	$5,000
2	Abandon Hidden River Sand Filter	1	LS	$10,000.00	$10,000
3	Abandon Clearwater Harbor Sand Filter	1	LS	$20,000.00	$20,000
4	Abandon Hidden River Recirculation Tank	1	EA	$5,000.00	$5,000
5	Abandon Drainfield Lift Stations	2	EA	$5,000.00	$10,000
6	Remove Existing Control Panels	2	EA	$2,000.00	$4,000
Collection System Improvements					
7	Remove and Replace Lift Station Control Panel	4	EA	$25,000.00	$100,000
Connecting Hidden River Collection System to Treatment Site					
8	4" Forcemain Extension	350	LF	$40.00	$14,000
9	Connect to Existing Forcemain	1	LS	$5,000.00	$5,000
10	Connect Forcemain to Existing Septic Tank	1	LS	$2,500.00	$2,500
BioMicrobics Treatment Units					
11	Septic Tank Effluent Screen	2	EA	$1,500.00	$3,000
12	Equalization Pumps and Appurtenances	1	LS	$20,000.00	$20,000
13	Recirculation/Equalization Tank Retrofit	1	LS	$10,000.00	$10,000
14	Treatment Tanks (2)	40,000	GAL	$3.25	$130,000
15	BioMicrobics Aeration Units	2	EA	$40,000.00	$80,000
16	BioMicrobics Nitrification Units	2	EA	$40,000.00	$80,000
Anoxic Denitrification					
17	Denitrification Dose Tank	6,000	GAL	$3.25	$19,500
18	Denitrification Dosing Pumps and Appurtenances	1	LS	$20,000.00	$20,000
19	Denitrification Tank	12,000	GAL	$3.25	$39,000
20	Denitrification Unit	1	EA	$30,000.00	$30,000
21	Chemical Feed Equipment	1	EA	$10,000.00	$10,000
22	Chemical Feed Control Building	1	LS	$50,000.00	$50,000
23	Polishing Tank	6,000	GAL	$3.25	$19,500
24	Polishing Treatment Unit	1	EA	$25,000.00	$25,000
Drainfield Dosing					
25	Drainfield Dose Tank	6,000	GAL	$3.25	$19,500
26	Drainfield Dosing Pumps and Appurtenances	1	LS	$15,000.00	$15,000
27	Control Panel	1	LS	$45,000.00	$45,000
General Site Work					
28	Yard Piping	1,000	LF	$15.00	$15,000
29	Insulation (4")	800	SY	$5.00	$4,000
30	Site Restoration	1.5	ACRE	$7,500.00	$11,250
31	Erosion Control	1	LS	$2,500.00	$2,500
32	Electrical Utility Upgrade	1	LS	$30,000.00	$30,000
33	Electrical	1	LS	$50,000.00	$50,000
34	Mobilizaton (10% of Items 1-31)	1	LS	$91,000.00	$91,000
				Construction Subtotal:	$995,000
				10% Contingency:	$100,000
	20% Engineering Design, Grant Assistance, Permitting & Construction Services:				$199,000
	Total Opinion of Probable Construction Costs:				**$1,300,000**

Clearwater Harbor/Hidden River

Clearwater River Watershed District

Estimated Annual O&M Costs for Evaluated Alternatives

ANNUAL O&M COSTS	2015 Hidden River	2015 Clearwater Harbor	2015 Total	Regionalization to Annandale	Recirculating Gravel Filter + Anoxic	Orenco + Anoxic	Bio Microbics + Anoxic
Repair and Maintenance Supplies	$0	$0	$0	$1,000	$500	$500	$500
Communication	$565	$609	$1,174	$2,000	$1,500	$1,500	$1,500
Property Tax	$0	$180	$180	$200	$180	$180	$180
Legal Notices	$20	$20	$40	$0	$0	$0	$0
Professional Services							
Accounting	$912	$1,275	$2,187	$2,500	$2,500	$2,500	$2,500
Engineering	$103	$3,928	$4,030	$5,000	$3,000	$3,000	$3,000
Legal	$739	$1,931	$2,669	$0	$0	$0	$0
Other Professional Services	$345	$796	$1,141	$0	$0	$0	$0
Transportation	$3	$31	$34	$100	$40	$40	$40
Rentals	$50	$50	$100	$0	$0	$0	$0
Dues & Subscriptions	$51	$50	$101	$100	$100	$100	$100
Management (Loewen)	$554	$1,061	$1,615	$3,000	$2,000	$2,000	$2,000
Insurance	$1,625	$1,952	$3,577	$7,000	$4,000	$4,000	$4,000
Permits	$398	$398	$795	$0	$800	$800	$800
Repair/Maintenance Contract	$14,455	$22,539	$36,994				
Septic Check				$18,000	$20,700	$20,700	$19,200
Tank pumping				$5,000	$3,000	$3,000	$3,000
Other				$0	$10,000	$10,000	$10,000
Miscellaneous Equipment	$0	$12,576	$12,576	$0	$0	$0	$0
Annandale Sewer Fees	$0	$0	$0	$67,362	$0	$0	$0
Chemical feed							
Carbon	$0	$0	$0	$0	$7,300	$7,300	$7,300
Alkalinity	$0	$0	$0	$0	$2,190	$2,190	$2,190
Utilities	$642	$2,069	$2,710				
Electricity							
Conveyance				$14,998	$1,764	$1,764	$1,764
Treatment System				$0	$5,968	$8,009	$13,761
TOTAL ANNUAL O&M COSTS	**$20,460**	**$49,465**	**$69,925**	**$127,000**	**$66,000**	**$68,000**	**$72,000**

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