City of Cascade
Preliminary Engineering Report for Aeration and Screen Improvements

Prepared for:

CITY OF
CASCADE, IDAHO

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LIST OF ABBREVIATIONS

Alt.	Alternative
BOD	Five Day Incubated Measurement of Oxygen Required to satisfy Biochemical Oxidation Requirements of Organic Materials
City	City of Cascade
CCTV	Closed-circuit Television
cfs	Cubic Feet per Second
DEQ	Department of Environmental Quality
EDU	Equivalent Dwelling Unit
EID	Environmental Information Document
EPA	Environmental Protection Agency
F	Fahrenheit
FPS	Facility Planning Study
gpcd	Gallons per Capita per Day
gpd	Gallons per Day
gpm	Gallons per minute
Hp	Horse power
IDWR	Idaho Department of Water Resources
kW	Kilowatt
LMI	Low to middle income
mg/L	Milligrams per liter (same as parts per million)
MGD	Million Gallons per Day
Mo	Month
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
ppm	Parts per million (same as mg/L)
psi	Pounds per square inch
PVC	Poly Vinyl Chloride
River	North Fork of the Payette River
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
Wastewater Rules	Idaho Wastewater Rules (IDAPA 58.01.16)
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

1.1 Background

This preliminary engineering report was prepared pursuant to meeting the preliminary engineering report requirements given in Section 411 of IDAPA 58.01.16, better known as the Idaho Wastewater Rules (hereinafter called Wastewater Rules).

The technical portion of the City of Cascade's Sewer Facility Planning Study (Project Engineering Consultants; Schiess & Associates) was completed and approved by DEQ on March 29, 2011. Since that time, the City replaced thousands of feet of old sewer mainline in an effort to eliminate infiltration and reduce the hydraulic loading on the treatment plant. The collection system project included replacement of the final lift station located near the lagoon treatment plant. This is the sum of all of the wastewater improvements that the City has done since the completion of the Sewer Facility Planning Study.

All three lagoon cells were leak tested in 2011 (Strata). The results of these tests showed that the liners of each cell are each within the allowable leakage limit of 1/4 inch per day. It is safe to assume that each of these lagoon cells will continue to test within allowable limits in the future.

The NPDES permit remains administratively extended since January 1, 2009. BOD and TSS discharge requirements are typical of a low impact lagoon system like Cascade with an 85 percent removal requirement and 30 mg/L average monthly discharge concentration limit. Currently phosphorus and ammonia are being monitored as per Table 1 of the City of Cascade NPDES discharge permit.

The City of Cascade now desires to turn their focus to incrementally improving the efficiency and the reliability of treatment at the wastewater treatment plant by adding a minimum amount of aeration and a vertical fine screen.

1.2 Purpose

In visiting with the DEQ Boise Regional Office about the desire of the City to initiate self-funded treatment plant improvements, a discussion ensued about whether the facility plan should be updated or merely writing a preliminary engineering report would be sufficient prior to submitting design plans and specifications. Sound reasoning about this issue resulted in the conclusion that if the City stopped receiving septage as was reported in the approved facility plan, then there was really no need to update the facility plan at this point (Ryan). Subsection 520.01 of the Wastewater Rules states that prior to acceptance of sewage at a wastewater treatment plant, the plan for doing so must be addressed in a facility plan. As a response to this and for many other good and valid reasons, the Cascade City Council in council meeting held on February 27, 2017 voted in favor of permanently ending the acceptance of septage. This is now official City policy.

Much of the collection system improvements identified in the facility plan have been made. But the treatment aspects of the facility plan are not outdated, remain in force and still provide a capital plan for treatment plant improvements. Since the balance of the facility plan remains valid without the consideration of septage, then a preliminary engineering report for treatment plant improvements is a reasonable next step to initiate improvements. This report is intended to meet this requirement.

1.3 Scope

This report is focused on minimum aeration improvements to the three existing facultative lagoon cells. We also touch on the vertical Huber screen that is to be fitted in the final lift station wet well. No other aspect of treatment plant improvements is included such as the removal of nutrients. No attempt is made as part of this report to design for unknown and potentially possible future NPDES nutrient limits.

Since much of the infiltration was removed as a result of the aforementioned collection system and final lift station improvements, it is important to study the reduced treatment plant influent flow, BOD and TSS and nutrient data recorded since commissioning to document changes to the flow stream and its constituents. This will enable more sound aeration improvement recommendations to be made. Thus, Table 3.1 and Table 6.1 of the facility plan will be effectively updated in regards to influent flow, BOD and TSS and nutrients. The need/lack of need for treatment of ammonia and phosphorus will be only lightly addressed.

Lastly, estimates of probable cost will be given for the recommended improvements. These costs will be based on the City using local funds only and working with local contractors. These cost estimates will update the applicable elements of Table 5.4 in the facility plan given on pages 88 and 89 and the associated discussion under subheading 5.1.4 Partial Mix Lagoon with Mechanical Aerators (Alternative 2).

2.0 DESIGN CRITERIA

At City request, we examined the 20 year and buildout conditions in terms of the number of homes added to the City wastewater collection and treatment systems. Using homes makes the projections easier understood. By using the number of homes added, we can set a baseline of flow for current conditions which encompasses homes, businesses and infiltration. Then we incrementally project flow, BOD and TSS into the future based on accepted flowrates and loading rates on a per person basis. We used 0.2 lbs/person/day for BOD and TSS and 100 gpcd for flow. The future conditions of adding 50 homes, 165 homes and 200 homes were considered. This report, like the facility plan, uses an addition of 500 permanent residents as the future design target. This translates to 200 new homes assuming 2.5 people per home.

For the purposes of this report, the build-out condition of 0.72 MGD average daily influent flow in the peak month of the year is too far in the future to warrant consideration in this report. No consideration of buildout would be reasonable without a new NPDES discharge permit that identified nutrient treatment requirements. Refer to Section 3.3 of the facility plan for a discussion of the build-out capacity of the system. No further discussion of the hydraulic design capacity of the WWTP is undertaken.

2.1 Current Wastewater Flow Rates

Current wastewater flow rates are described on the graph given as Figure 1 on the following page. The data were collected from the commissioning of the new lift station in November 2014 to February of 2017. The information given on Figure 1 is numerically expressed in Table 1 below.

Table 1 – Current Influent Flow Rates

			Existing Conditions	
		Unit	Winter	Summer
Population		People	1004	
INFLUENT FLOW				
	Average Day	MGD	0.23	0.14
	Average Month	MGD	0.24	0.14
*	Maximum Month	MGD	0.49	0.19
**	Maximum Day	MGD	1.36	0.24
	Avg/Day Person	Gallons	233	143

*Winter maximum month occurred in 2/17

**Winter maximum day occurred on 2/10/17, Summer maximum occurred on 7/4/16

Comparing Figure 1 with Figure 2-6 in the facility plan illustrates that the baseline flow in October has dropped 0.15 MGD from approximately 0.26 MGD to 0.11 MGD. Comparing Table 6.1 of the facility plan to Table 1 below illustrates that maximum month flow has decreased 0.38 MGD from 0.87 MGD to 0.49 MGD. The maximum day flow remains the same at 1.36 MGD indicating that the maximum day flow is influenced mostly by inflow during spring melt rather than infiltration. Average daily flow has decreased 0.15 MGD from 0.34 MGD to 0.19 MGD (average of winter and summer in Table 1).

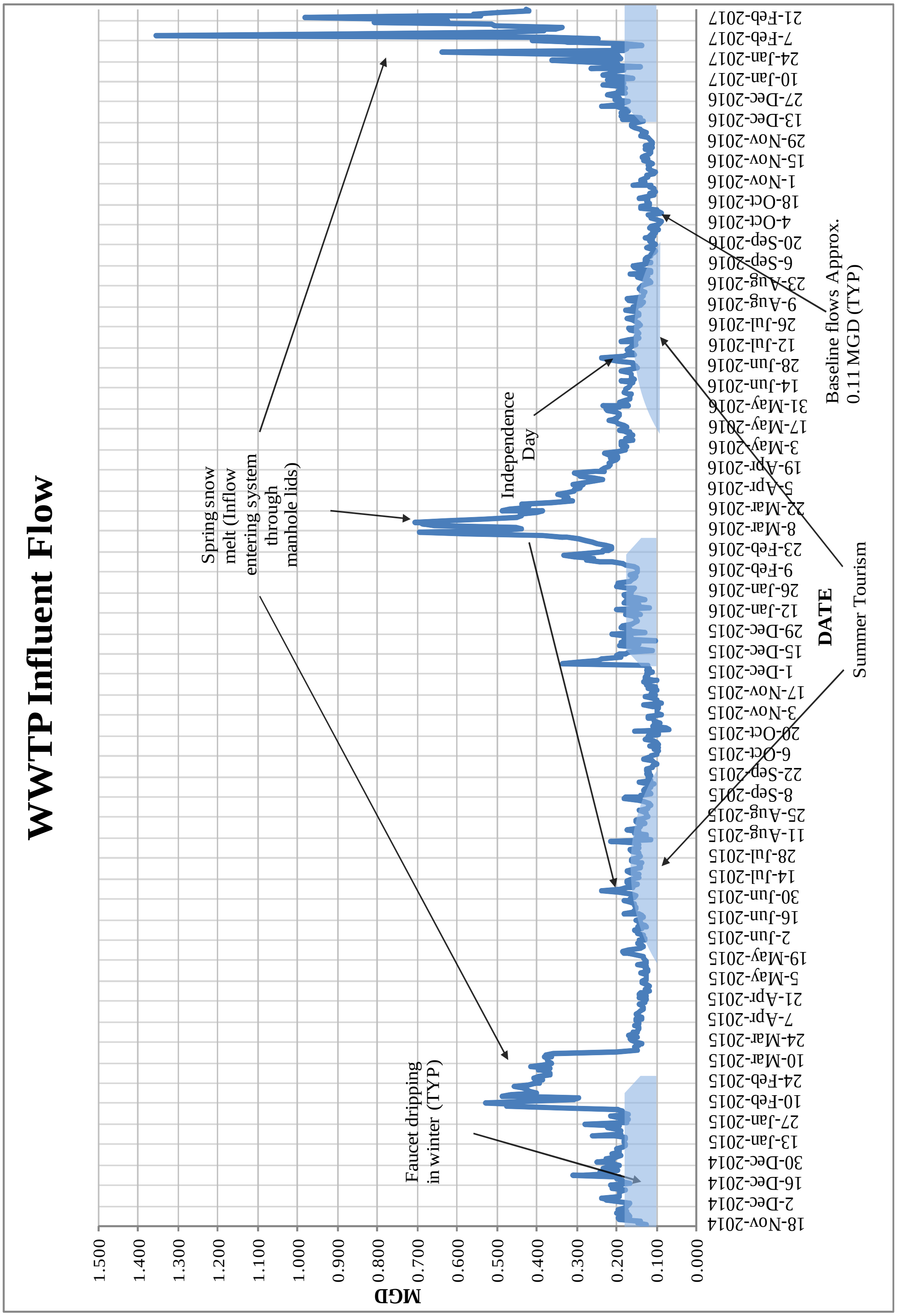

Figure 1 - Recent WWTP Influent Flow History

Inflow is heavy during spring melt. Entry is most likely through the holes around the rims and through the lids of low lying manholes. We believe that there remains approximately 0.01 to 0.03 MGD of infiltration that finds its way into the collection system each day and comprises part of the base flow of 0.11 MGD and all of the flow metrics in Table 1.

Peak hour flow rates are not shown in the table. The peak hour flow rates measured by the lift station flow meter are limited by the capacity of the final lift station pumps acting together drawing water out of the pump station and into Cell 1. This is estimated to be 1,640 gpm or 2.36 MGD. Peak hour flow rates in this case are not used for the design of the aeration system, but are used for the selection of the vertical screen to be installed in the lift station wet well. A pump curve of the final lift pumps with a hand-sketched parallel pump operation curve assuming both pumps are running illustrate the 1,640 gpm maximum flow rate of the system. This pump curve for the lift pumps is provided in Appendix B.

2.2 Estimated Future Flow and Constituent Loading Rates

Figures 2 and 3 give BOD and TSS loading at the WWTP over the same time period as the flow data in Figure 1. Table 2 gives estimated future flow rates and TSS and BOD loading rates.

Table 2 – Estimated Future Influent Flow Rates, TSS and BOD Loading

			Existing Conditions		Add 50 Homes		Add 165 Homes		Add 200 Homes	
		Unit	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
Population		People	1004		1129		1417		1504	
INFLUENT FLOW										
	Average Day	MGD	0.23	0.14	0.25	0.16	0.27	0.18	0.28	0.19
	Average Month	MGD	0.24	0.14	0.25	0.16	0.28	0.18	0.29	0.19
*	Maximum Month	MGD	0.49	0.19	0.51	0.20	0.54	0.23	0.54	0.24
**	Maximum Day	MGD	1.36	0.24	1.37	0.25	1.40	0.28	1.41	0.29
	Avg/Day Person	Gallons	233	143	218	138	194	130	189	128
INFLUENT CONSTITUENTS										
	BOD									
	Average Month	mg/L	137	237	145	238	148	238	151	238
		lbs/day	241	284	266	309	324	366	341	384
	Maximum Month	mg/L	230	333	-	-	-	-	-	-
		lbs/day	518	401	543	426	601	484	618	501
	TSS									
	Average Month	mg/L	98	129	112	152	125	165	128	169
		lbs/day	208	172	233	197	290	254	308	272
	Maximum Month	mg/L	410	300	-	-	-	-	-	-
		lbs/day	924	314	949	339	1006	396	1024	414

*Winter maximum month occurred in 2/17

**Winter maximum day occurred on 2/10/17, Summer maximum occurred on 7/4/16

The BOD and TSS data were taken over a period of time where the City allowed the acceptance of septage into the WWTP. Therefore the estimated amount of BOD and TSS expected at the WWTP, in terms of pounds and concentration, is overestimated in this table, but it is the best information available and conservative when considering future loading to the WWTP.

Septage volumes provided by the City for the period of June 2014 to June 2015 and included in Appendix A indicates, using an assumed standard septage BOD of 7,000 mg/L, that septage was contributing as little as one pound of BOD into the system per day in the winter months to as high as 50 pounds per day in the summer. This amount of BOD loading is equivalent to the loading of 100 homes.

The era of not accepting septage has just begun so there is not available data to consider the loading reduction to the WWTP that does not include septage. The maximum month concentration data for BOD and TSS was not estimated for the future because we believe the existing data are high due in some measure to septage. There seemed to be no good way to estimate the future without using available sampling and testing data as a basis. The next best thing would be to throw out available data and resort to using accepted national loading rates. Nationally accepted BOD and TSS concentrations for a typical city under normal conditions are 220 mg/L for BOD and TSS in literature (Metcalf and Eddy, Inc.). The maximum month pounds of BOD and TSS from the sampling and testing data coupled with adding 0.2 lbs/person per day of BOD and TSS for the impact of new homes were used in the calculations for determining aeration requirements to be conservative. The effect of using existing high BOD and TSS values had minimal impact in determining aeration requirements.

Figures 2 and 3 illustrate that the average monthly pounds of BOD and TSS sent to the WWTP is the highest in the summer time. With or without septage, this is expected because of the tourist impact and the summer dumping of RV waste at Harpo's. The running of water faucets in the coldest months and the inflow that occurs at spring melt increases the winter flow and dilutes the sewage (BOD, TSS and nutrient concentrations) in the winter.

The future average loading rates show a gradual increase from the present. With every new home added, the concentration of BOD and TSS should increase slightly as the diluting impact of remaining infiltration and winter faucet dripping slowly diminish for winter time loading. Summer trends should remain about the same less the periodic shock impact of septage like what appears to have occurred in October of 2015.

A review of Cell 3 effluent testing results reveals that the highest ammonia concentrations from Cell 3 occur in the late winter during spring melt when flows are the highest. This was reported to the City in the WWTP and River Monitoring Results prepared by Schiess & Associates in 2009 (Schiess & Assoicates). The Cell 3 effluent results for ammonia and phosphorus from December 2014 to February 2017 are given in Appendix A. Again, the highest ammonia concentrations occur in the late winter during spring melt when flows are the highest. The later dataset has a high of ammonia of 19.9 mg/L and the earlier dataset has a high of 13.0 mg/L. Both datasets trend similarly. Perhaps the later data set has a higher concentration than the earlier dataset because the maximum month sewage volume is 56 percent of what it once was (.49 MGD/.87 MGD)*100). Similarly, concentration of ammonia in the sewage has increased 53 percent (19.9/13.0 - 1)*100) during the maximum month which corresponds to the spring melt period.

The high influent loadings for BOD and TSS shown on Figures 2 and 3 for the month of October 2015 were thrown out as anomalies related primarily to septage. This month relates to

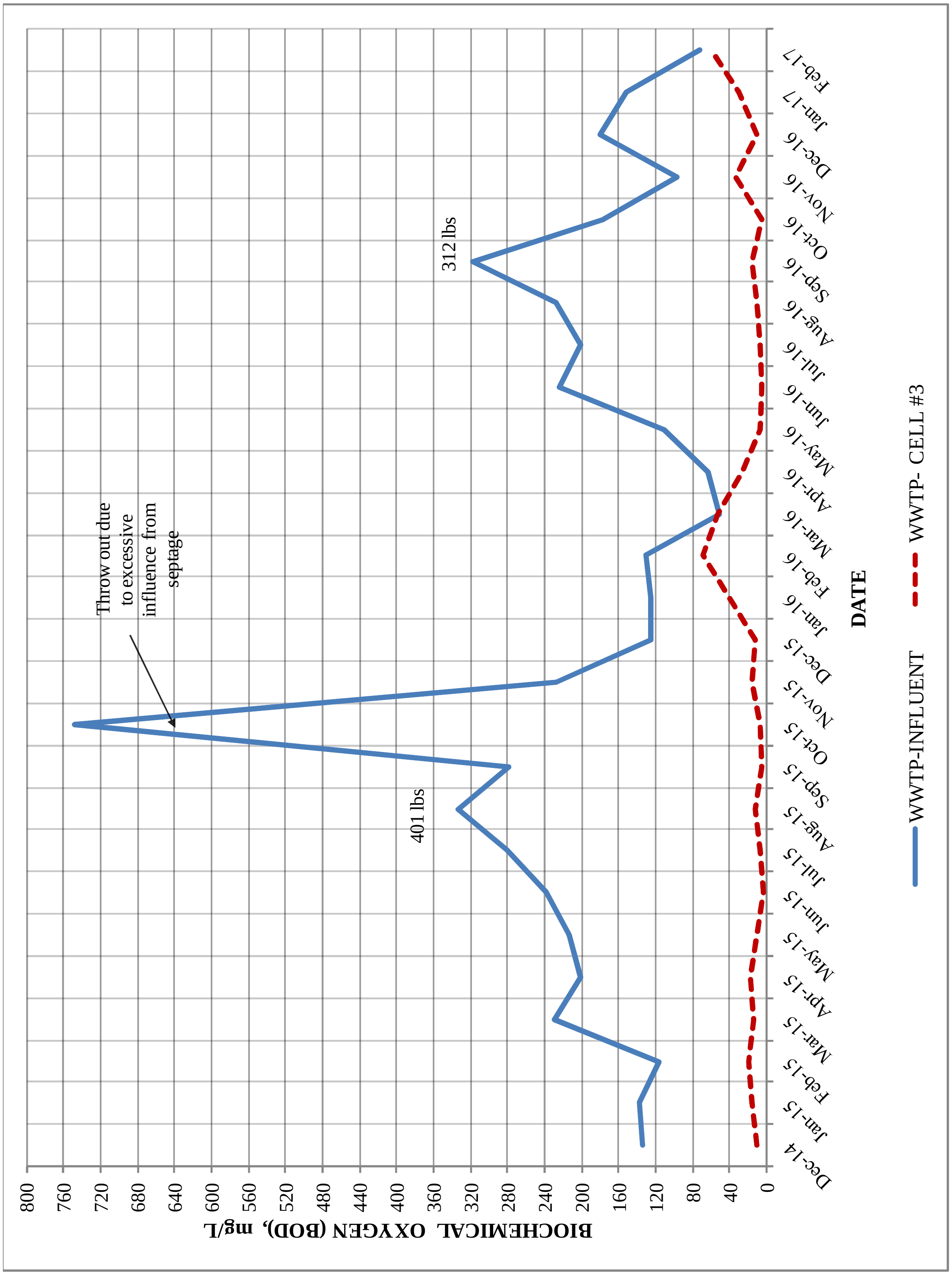

Figure 2 - Monthly BOD Loading at WWTP

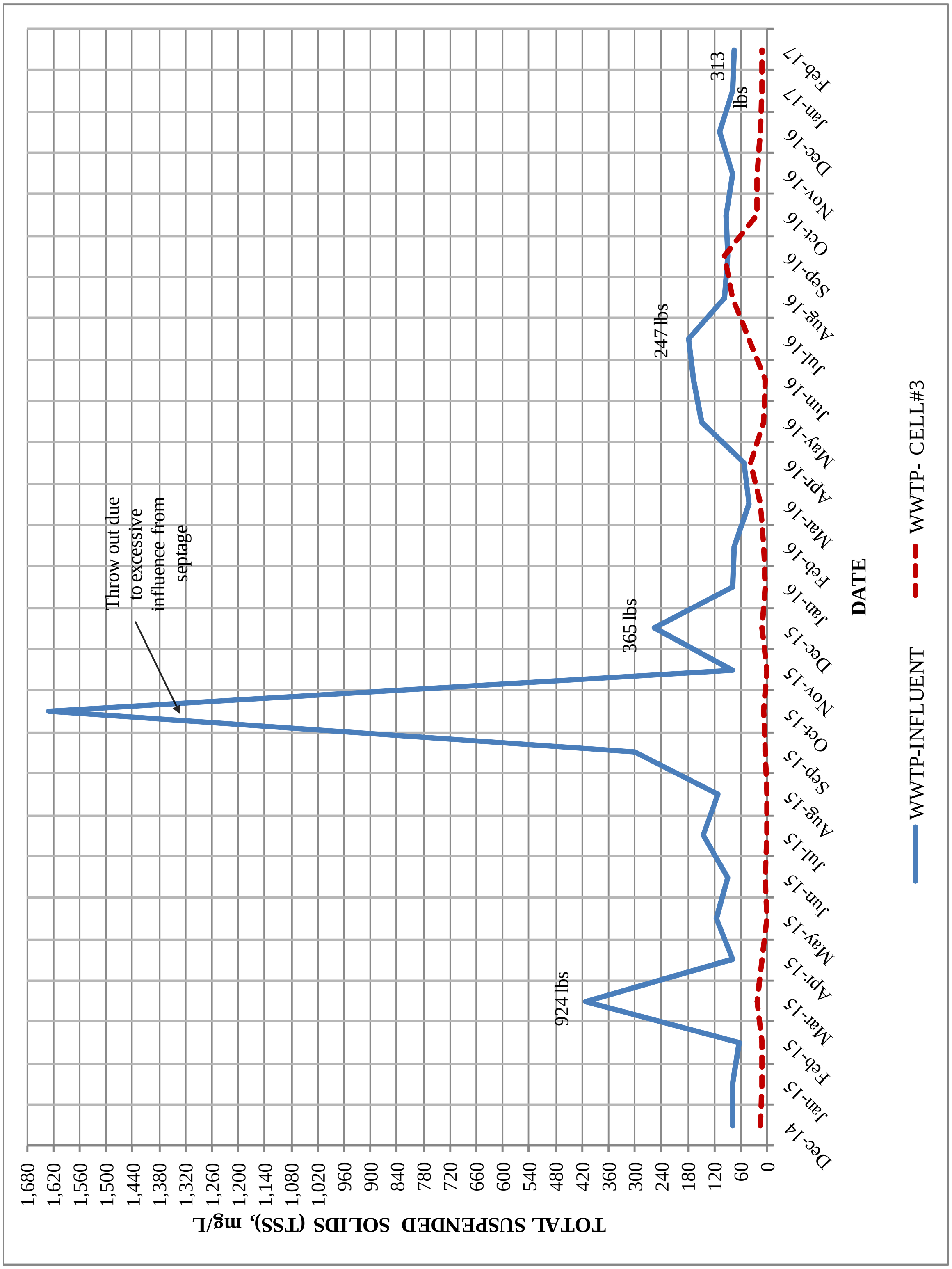

Figure 3 - Monthly TSS Loading at WWTP

a time when forest fires were rampant in the region and significant septage dumping into the WWTP occurred to support the efforts of firefighters.

Note also the smaller spikes of BOD and TSS that occur in the late winter and fall for Cell 3. The late winter BOD spikes appear to be related to turnover and the fall TSS spikes are likely related to the presence of algae. We will discuss more of this later in this report.

2.3 Effluent Requirements

Effluent requirements have not changed since the current NPDES permit became effective in 2004. This permit remains active via administrative extension and will remain so until the EPA issues a new permit. Effluent requirements of the permit are given on Table 1 in the permit and on page 17 of the facility plan. These include influent flow, BOD, TSS and effluent BOD, TSS, E. Coli and temperature. The BOD and TSS effluent limits are 30 mg/L and 180 lbs/day average monthly limit and 45 mg/L and 270 lbs/day average weekly limit. Ensuring that the treatment plant has ample room for additional sewage treatment for several decades without extraordinarily high capital improvement costs is our aim.

No permit limit exists for ammonia and phosphorus. Monitoring is required. It remains to be seen what the next permit will require for these nutrients. At worst, it is expected that the limits will be lenient enough to allow the City to keep its lagoons as a viable treatment process, although some alterations may be needed. Disinfection in some form will also certainly be required. Perhaps ultra violet light disinfection could be considered to ensure that the rapid sand filters remain biologically active as designed.

The North Fork of the Payette River (hereinafter called River) has been assigned a Total Maximum Daily Load (TMDL) only for sediment in the North Fork Payette River Subbasin Assessment and TMDL (IDEQ). Phosphorus was delisted at the same time because beneficial uses in the River are not impaired by the low phosphorus levels present in the River. Temperatures exceed the temperature standard primarily from warm water leaving Cascade Reservoir, but canopy cover meets target levels, so a TMDL for temperature was not developed. A TMDL for sediment was developed, but the entire allocation went to non-point sources (IDEQ). Future permit limits expected for the WWTP remain as described in Section 3.3 of the facility plan (Project Engineering Consultants; Schiess & Associates) and herein.

Furthermore, with the sand filter remaining functional and active in the treatment train, the WWTP effluent hardly ever directly discharges into the River. When discharge does occur, the discharge water comes from the sand filter underdrain system. This WWTP filtered effluent water (filtrate) only flows overland out of the sand filter underdrain system when the groundwater surrounding the WWTP rises sufficiently to mix with the sand filter filtrate. The mixture of groundwater and filtrate then flows overland several hundred feet into the River. Direct discharge into the River with the groundwater/filtrate mixture has not occurred since 2006 (Yamamoto).

2.4 Aeration Design Criteria and Calculations

The aim of the floating mechanical aspirators is to add mixing capability to the lagoon system and improve the dissolved oxygen level to a minimum of 1.8 – 2.0 mg/L in all the ponds as per the requirements of Subsection 493.06.d in the Wastewater Rules.

It is apparent by studying the dissolved oxygen (DO) test results from Cell 3 that DO ranges from 0 mg/L to as high as 4 mg/L naturally. This was realized by reviewing test results provided to us by the system operator over the period from November 2014 to February 2017. It is generally accepted that most wastewater treatment lagoons, without some form of aeration, are mixing limited, not oxygen limited. These lagoons tend to be limited about the same with oxygen tending toward being the primary limiter. The addition of mixing and oxygen using mechanical aspirators is a generally accepted improvement technique to raise dissolved oxygen levels to 2 mg/L in each facultative lagoon cell and thus improve treatment of BOD and TSS. The aspirator technology best achieves this in shallow lagoons like the City's three lagoon cells. The action of the aspirator will not have an erosive effect on the clay seal at the bottom of the lagoon cells.

The loading rates for BOD and TSS are given on Table 2 were considered when making the aeration calculations in this report. The aeration calculations are provided in Appendix B. Aeration Industries prepared the calculations based on input from the author. These calculations aid in determining needed equipment to fulfill oxygen and mixing requirements of the wastewater. Theoretical calculations for summer and winter conditions to predict BOD removal are also given. Each indicates that adequate reduction of BOD and TSS should occur with the recommended amount of floating aspirating aeration equipment. Forty horsepower of aspirating aeration equipment divided among the three lagoon cells is recommended.

2.5 Vertical Fine Screen Design Criteria

The important design criterion for this screen is that it can screen the maximum flow rate entering the lift station wet well from the gravity collection system. The maximum flowrate can be assumed to be the same or nearly the same as the capacity of the lift station pumps when both are running. This was calculated to be a maximum of 1,640 gpm or 2.36 MGD by estimating the combined flowrate of both lift station pumps running together. The graphical method of doing this is illustrated with the lift station pump curve given in Appendix B.

3.0 SITE EVALUATION AND LAYOUT

3.1 Currently Proposed Facilities for 20 Years Conditions

As described in Section 2.0, for the purpose of this report, the 20 year design condition is assumed to be the addition of 200 homes from the present condition and the buildout condition is too far into the future to be relevant at this time. The addition of 200 homes yields a non-transient population of 1,500 and a summer population of 2,000 or more. The added amount of tourist influence, although factored into the design and recommendations of this report through heavier summer BOD and TSS loading, do not play a significant role in the aeration recommendations given in this report due to the inherent benefits of lagoon operations coupled with aeration during summer and fall months.

A plan view preliminary drawing showing the recommended improvements is given in Figure 4. No discussion of adding 50 homes or 165 homes is given due to the need to supply minimum aeration to achieve noticeable improvement in treatment, which requires 40 horsepower of the type of recommended aeration equipment. Minimum aeration in these ponds with lots of hydraulic residence time (98 days average in the summer and 43 days in the winter) made available with reduced infiltration and inflow warrant the addition of a minimum of 40 horsepower of aeration.

Aeration and mixing added to each of the three lagoon cells will provide immediate treatment improvement. The operators should see a noticeable effect of reduced BOD effluent results and odor at seasonal turnover (when the ice on the surface of the lagoons melt off and the warmer water near the bottom of the lagoons during the winter changes places with the warming water on the top of the lagoons as winter gives way to spring) in the late winter and in the later fall when cooler lagoon surface temperatures tend to change places with the warmer water at the bottom of the lagoons (See Figure 2). A similar trend should be noticeable with reduced Cell 3 TSS concentrations in the summer and fall when algae blooms historically were the likely culprit for raised concentrations (See Figure 3).

The vertical fine screen is a one-time installation item that will function for current flows all the way to buildout of the capacity of the entire WWTP. No more discussion of this unit is given in this chapter.

3.2 Treatment During Construction

Since the addition of floating mechanical aeration can be added without interfering with the flow stream, there are no harmful effects to treatment during construction. New electrical conductors will be installed in the lagoon berms as necessary to provide power to each floating aerator. Deadman type concrete filled and backfilled steel posts with cable ties will be used to hold the floating aspirators in place. The floating aspirators will be set in place and the cables strung from one side of each lagoon to the other using a rowboat.

To install the fine screen, the lift station will need to be temporarily bypassed. This should be done in late September and October when collection system flows into the lift station are at a minimum. The manhole invert on the downside10 feet upstream from the wet well of the lift station can be plugged with a sewer plug. Bypass pumping equipment can then be installed in the manhole and pumped using a portable hose to the camlock fitting connection inside of the lift station dry well. Refer to the lift station record drawings and O&M manual for additional information. As soon as the fine screen is set, normal flow through the lift station can resume.

The screen can be fitted for easy removal using a slide rail system. Through evaluation of the record drawings it is apparent that there is adequate room for the screen to be installed on a slide rail system. The screen installed on a slide rail system would be much easier to retrieve for maintenance.

4.0 PROCESS UNITS

4.1 Current, Twenty Year and Buildout Conditions

As described in Section 3 of this report, the aeration needed for 200 or fewer homes are given below. Due to the benefit of a limited aeration amount of 40 horsepower, there is no value to consider the amount of aeration for treatment of 50 homes or 165 homes. The size and number of units needed for each lagoon are given.

Cell 1: (4) 5 Hp Aire-O_2 Aspirating Aerator from Aeration Industries or equivalent
Cell 2: (2) 5 Hp Aire-O_2 Aspirating Aerator from Aeration Industries or equivalent
Cell 3: (2) 5 Hp Aire-O_2 Aspirating Aerator from Aeration Industries or equivalent

Once the aeration is functioning, the viability of how many homes can be added over time will begin to be apparent. Perhaps more than 200 homes could be added. There will likely be a continued limited amount of nitrification of ammonia in the summer months since the aerated lagoons will be underloaded and aeration is provided at a minimal level. Very little nitrification is expected in the winter months due to the low temperature of the water. Phosphorus removal of about 10 to 20 percent may occur (EPA).

4.2 Redundancy

As a precautionary measure, it would be desirable for the City to have on hand spare parts. This will limit the loss of a portion of the aeration and mixing to hours or a day for maintenance. A partial loss of aeration seems reasonable since design is based on peak month and it will not be necessary to run all the aerators all of the time. Operator knowledge gained over time will determine how many aerators to run and how often. The controls should include shut-off and timers to regulate the amount of operation of each aerator.

Redundancy is not possible for the Huber vertical fine screen. Furthermore, if screening didn't occur for days or even a few weeks while the unit was down for repairs, the WWTP would continue to operate as it is now with the consequence being less reliable lift station pumps and continued pumping of inorganic solids and wastes into Cell 1 of the treatment plant. This screen comes equipped with an automatic bypass in the event of plugging or loss of power. Maintenance of the screen is usually accomplished by removal since it can be installed on a slide rail system for easy removal. More discussion of this screen was given in Section 3.4 of the Preliminary Engineering Report for Final Lift Station Replacement Including Provision for a Future Vertical Fine Screen submitted and approved by DEQ in May of 2013 in connection with the overall large collection system improvements project (Schiess & Associates).

4.3 Equipment Type, Size, Performance Criteria and Power Requirements

As indicated in Subsection 4.1 above, the type of aeration device recommended is an aspirating mechanical floating aerator. Manufacturer information for these units is provided in Appendix C. These devices are designed for shallow depth lagoons such as the City's lagoons.

These units will not erode the clay seal in the bottom of the lagoons. The lagoon depths taken from the facility plan are as follows:

Cell 1 – 5.5 feet
Cell 2 – 5.8 feet
Cell 3 – 6.2 feet

The aspirating devices should be mounted on a pontoon system that keeps the motor out of the water and the spinning propeller submerged. The movement of the water created by the spinning propeller creates a draft that draws air through the hollow shaft. The air exits the shaft and is broken into very small bubbles by the propeller. The tiny air bubbles are dispersed into the water by the violent mixing action created by the propeller.

Available power at the WWTP is three phase 240 Volt. The floating aspirating aerators should be supplied with this power. It would be best to purchase units equipped with 480 V capabilities in case the City upgrades its lift station and shop power service to 480 V.

4.4 Structure, Equipment and Piping Layout

Figure 4 gives the aerator layout for all the lagoons. This figure supersedes Figure 5-4 in the facility plan. The layout is simple with two five horsepower units suspended from a stainless steel cable that spans the lagoons and is duplicated three additional times.

The wet well at the final lift station was designed around the future addition of a Huber RoK4 500 vertical fine screen. Attached plan sheets C-6 and C-7 from the lift station record drawings illustrate how the screen should be placed in the wet wall. Support systems and access were previously constructed with the wet well. Installation of the screen should not be difficult. Installation of the slide rail system would make maintenance easier for the operators.

4.5 Cold Temperature Operation

The aeration equipment is designed for use in cold temperatures. The aeration aspirators are capable of operating year-round even in ice and snow conditions.

The Huber screen must be purchased with the cold weather package due to freezing issues of the above ground portion of the unit or a building constructed over it. The cold weather package is rated to function to a low of minus 20 degrees F. Huber has vertical screens operating in Wisconsin with the cold weather package. Perhaps it would also work in Cascade. If the vertical screen was installed outside with the winter insulation package, then a worst case scenario would be to cease using it during periods of the year where, through experience, the screen cannot function properly in the extreme cold periods of winter. This would potentially be up to as much as three months a year (December through February).

A building built around the wet well and screen would ensure year-round operation of the vertical screen as described in the facility plan. A means of retrieval out of the roof of the building through a hatch would have to be built into the building. National Fire Protection Association (NFPA) 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities should be followed if the screen is placed inside of a building.

FIGURE 4

MECHANICAL AERATION PLAN

Schiess & Associates
IMPROVING COMMUNITY INFRASTRUCTURE
Idaho Falls, ID Phone 208.522.1244

4.6 Startup Procedures

Startup procedures require initial testing to insure aerators are correctly positioned and that the electrical equipment is operational. Manufacturer also suggests one field day for factory representative to support startup and initial operations.

Startup of the vertical fine screen requires manufacturer field support. Manufacturer suggests two days on site for start-up, installation and training.

5.0 ESTIMATES OF COST

These estimates are budgetary level and prepared assuming that the City advertises for bids for the work and pays for the work with local funds. The bids would include the work of a licensed electrician and someone who is readily available to do trenching and burying of electrical conduits and a water service line. Further refinement may is possible if the City opted to do some of the work themselves on a piecemeal basis with limited professional engineering support.

Table 3 below is an estimate of probable cost for the purchase and installation of the aeration improvements recommended herein. Power for the aeration system would bypass the standby generator.

Table 3 – Estimate of Probable Cost for 40 Horsepower of Lagoon Aeration & Mixing

Item No.	Item	Qty	Unit	Unit Cost	Ext. Cost
1	Aeration equipment- (8) 5 Hp aspirating aerators (includes main panel and control components, mooring cable with end accessories and 1,250' of submersible electrical cable, factory startup and warranty)	1	lump sum	$180,000	$180,000
2	Electrical cables, pull boxes, disconnects, miscellaneous electrical equipment and installation	1	lump sum	$71,000	$71,000
3	Trenching & conduit	1	lump sum	$41,000	$41,000
4	Modify existing service to separate normal power and standby power loads and feed to control panel	1	lump sum	$15,000	$15,000
5	Deadmen for aerator mooring	8	each	$1,500	$12,000
6	Mobilization	1	lump sum	$10,000	$10,000
Subtotal					$329,000
Construction contingency at 10%					$32,900
Engineering @ 10% of construction					$32,900
Total					**$416,800**

This estimate places all buried conductors in conduit and allows isolation for repairs of any of the eight aerators at any time.

Table 4 below is an estimate of probable cost for the purchase and installation of the vertical fine screen.

Table 4 – Estimate of Probable Cost for Vertical Fine Screen

Item No.	Item	Qty	Unit	Unit Cost	Ext. Cost
1	Huber RoK4 500 vertical fine screen (includes cold weather package, slide rail system, control panel and equipment, pressure sensor, startup and warranty). No building included.	1	lump sum	$123,000	$123,000
2	Installation of slide rail system	1	lump sum	$10,000	$10,000
3	Power installation including trenching, conduit and conductor	1	lump sum	$5,000	$5,000
4	Water service connection and line to screen, meter box, yard hydrant and insulation of service line to the screen connection	1	lump sum	$5,000	$5,000
5	Mobilization	1	lump sum	$5,000	$5,000
Subtotal					$148,000
Construction contingency at 10%					$14,800
Engineering @ 10% of construction					$14,800
Total					**$182,600**

The lift station was prepared for this very screen. Power for the screen is readily available at minimal cost as reflected in the estimate.

6.0 CONSTRUCTION SCHEDULE

The construction schedule has not been determined at this time. The City must consider the financial impacts of the recommended improvements contained herein and then budget and schedule accordingly. The City may use this report and estimate of costs to determine budgeting and scheduling according to the 2018 and future budget cycles.

7.0 APPENDICES

Appendix A: Data
Appendix B: Design Calculations
Appendix C: Manufacturer Equipment Information
Appendix D: References

Appendix A: Data

- Flow Data for Period November 2014 to February 2017
- BOD and TSS Data for Period November 2014 to February 2017
- Septage Volumes for Period June 2014 to June 2015
- Concentration of Ammonia and Phosphorus at Cell 3 for Period November 2014 to February 2017

CASCADE CITY INFLUENT FLOWS

DATE	TOTAL GALLONS	MGD	DATE	MONTHLY AVG MGD
11/18/2014	136,512	0.137	Dec-14	0.207
11/19/2014	124,941	0.125	Jan-15	0.199
11/20/2014	146,154	0.146	Feb-15	0.369
11/21/2014	141,680	0.142	Mar-15	0.270
11/22/2014	191,376	0.191	Apr-15	0.138
11/23/2014	197,796	0.198	May-15	0.137
11/24/2014	166,117	0.166	Jun-15	0.147
11/25/2014	168,500	0.169	Jul-15	0.159
11/26/2014	199,360	0.199	Aug-15	0.144
11/27/2014	193,916	0.194	Sep-15	0.125
11/28/2014	174,460	0.174	Oct-15	0.106
11/29/2014	195,018	0.195	Nov-15	0.110
11/30/2014	183,446	0.183	Dec-15	0.171
12/1/2014	172,597	0.173	Jan-16	0.165
12/2/2014	172,068	0.172	Feb-16	0.208
12/3/2014	167,641	0.168	Mar-16	0.456
12/4/2014	197,885	0.198	Apr-16	0.259
12/5/2014	228,620	0.229	May-16	0.188
12/6/2014	218,380	0.218	Jun-16	0.171
12/7/2014	237,590	0.238	Jul-16	0.165
12/8/2014	193,837	0.194	Aug-16	0.142
12/9/2014	192,630	0.193	Sep-16	0.118
12/10/2014	193,011	0.193	Oct-16	0.113
12/11/2014	192,737	0.193	Nov-16	0.120
12/12/2014	176,929	0.177	Dec-16	0.167
12/13/2014	213,507	0.214	Jan-17	0.221
12/14/2014	209,904	0.210	Feb-17	0.494
12/15/2014	189,535	0.190		
12/16/2014	215,811	0.216		
12/17/2014	166,678	0.167		
12/18/2014	186,345	0.186		
12/19/2014	186,737	0.187		
12/20/2014	199,320	0.199		
12/21/2014	193,260	0.193		
12/22/2014	311,171	0.311		
12/23/2014	282,528	0.283		
12/24/2014	211,824	0.212		
12/25/2014	243,067	0.243		
12/26/2014	197,492	0.197		
12/27/2014	232,878	0.233		
12/28/2014	221,279	0.221		
12/29/2014	193,233	0.193		

12/30/2014	210,862	0.211
12/31/2014	221,902	0.222
1/1/2015	248,518	0.249
1/2/2015	207,099	0.207
1/3/2015	226,061	0.226
1/4/2015	200,788	0.201
1/5/2015	188,364	0.188
1/6/2015	210,098	0.210
1/7/2015	193,832	0.194
1/8/2015	192,700	0.193
1/9/2015	192,012	0.192
1/10/2015	201,036	0.201
1/11/2015	185,715	0.186
1/12/2015	176,551	0.177
1/13/2015	178,258	0.178
1/14/2015	180,047	0.180
1/15/2015	181,048	0.181
1/16/2015	178,362	0.178
1/17/2015	177,100	0.177
1/18/2015	203,554	0.204
1/19/2015	262,149	0.262
1/20/2015	190,365	0.190
1/21/2015	196,350	0.196
1/22/2015	189,384	0.189
1/23/2015	202,243	0.202
1/24/2015	224,134	0.224
1/25/2015	192,299	0.192
1/26/2015	280,078	0.280
1/27/2015	185,895	0.186
1/28/2015	175,848	0.176
1/29/2015	188,619	0.189
1/30/2015	170,890	0.171
1/31/2015	197,365	0.197
2/1/2015	213,759	0.214
2/2/2015	170,387	0.170
2/3/2015	185,871	0.186
2/4/2015	186,903	0.187
2/5/2015	199,780	0.200
2/6/2015	195,373	0.195
2/7/2015	352,823	0.353
2/8/2015	476,782	0.477
2/9/2015	438,083	0.438
2/10/2015	530,182	0.530
2/11/2015	416,564	0.417
2/12/2015	305,261	0.305
2/13/2015	294,121	0.294
2/14/2015	458,225	0.458

2/15/2015	486,072	0.486
2/16/2015	465,192	0.465
2/17/2015	401,968	0.402
2/18/2015	420,667	0.421
2/19/2015	425,095	0.425
2/20/2015	434,805	0.435
2/21/2015	455,736	0.456
2/22/2015	420,096	0.420
2/23/2015	402,977	0.403
2/24/2015	394,085	0.394
2/25/2015	405,722	0.406
2/26/2015	386,854	0.387
2/27/2015	407,820	0.408
2/28/2015	397,841	0.398
3/1/2015	366,467	0.366
3/2/2015	367,762	0.368
3/3/2015	372,434	0.372
3/4/2015	389,616	0.390
3/5/2015	397,161	0.397
3/6/2015	367,416	0.367
3/7/2015	416,137	0.416
3/8/2015	387,007	0.387
3/9/2015	364,443	0.364
3/10/2015	369,509	0.370
3/11/2015	373,934	0.374
3/12/2015	375,250	0.375
3/13/2015	380,779	0.381
3/14/2015	363,272	0.363
3/15/2015	378,932	0.379
3/16/2015	360,083	0.360
3/17/2015	199,681	0.200
3/18/2015	146,496	0.146
3/19/2015	151,169	0.151
3/20/2015	154,446	0.154
3/21/2015	144,645	0.145
3/22/2015	151,040	0.151
3/23/2015	136,856	0.137
3/24/2015	151,797	0.152
3/25/2015	161,545	0.162
3/26/2015	166,027	0.166
3/27/2015	147,658	0.148
3/28/2015	168,394	0.168
3/29/2015	160,687	0.161
3/30/2015	157,127	0.157
3/31/2015	146,553	0.147
4/1/2015	147,885	0.148
4/2/2015	144,809	0.145

4/3/2015	144,750	0.145
4/4/2015	156,578	0.157
4/5/2015	142,142	0.142
4/6/2015	142,196	0.142
4/7/2015	149,511	0.150
4/8/2015	149,904	0.150
4/9/2015	138,151	0.138
4/10/2015	135,079	0.135
4/11/2015	146,113	0.146
4/12/2015	150,315	0.150
4/13/2015	143,255	0.143
4/14/2015	138,807	0.139
4/15/2015	133,892	0.134
4/16/2015	134,266	0.134
4/17/2015	136,756	0.137
4/18/2015	137,583	0.138
4/19/2015	145,670	0.146
4/20/2015	129,515	0.130
4/21/2015	127,906	0.128
4/22/2015	126,274	0.126
4/23/2015	143,073	0.143
4/24/2015	125,806	0.126
4/25/2015	142,910	0.143
4/26/2015	139,168	0.139
4/27/2015	128,259	0.128
4/28/2015	116,703	0.117
4/29/2015	127,349	0.127
4/30/2015	121,499	0.121
5/1/2015	117,354	0.117
5/2/2015	125,526	0.126
5/3/2015	135,946	0.136
5/4/2015	134,702	0.135
5/5/2015	130,126	0.130
5/6/2015	126,692	0.127
5/7/2015	126,692	0.127
5/8/2015	125,392	0.125
5/9/2015	123,484	0.123
5/10/2015	139,266	0.139
5/11/2015	121,699	0.122
5/12/2015	119,833	0.120
5/13/2015	128,027	0.128
5/14/2015	123,784	0.124
5/15/2015	124,536	0.125
5/16/2015	146,101	0.146
5/17/2015	123,907	0.124
5/18/2015	125,425	0.125
5/19/2015	128,194	0.128

5/20/2015	130,863	0.131
5/21/2015	131,933	0.132
5/22/2015	149,615	0.150
5/23/2015	171,264	0.171
5/24/2015	182,824	0.183
5/25/2015	184,682	0.185
5/26/2015	168,651	0.169
5/27/2015	140,708	0.141
5/28/2015	133,627	0.134
5/29/2015	136,732	0.137
5/30/2015	146,497	0.146
5/31/2015	141,196	0.141
6/1/2015	141,955	0.142
6/2/2015	129,136	0.129
6/3/2015	128,693	0.129
6/4/2015	135,089	0.135
6/5/2015	132,886	0.133
6/6/2015	148,202	0.148
6/7/2015	147,474	0.147
6/8/2015	153,836	0.154
6/9/2015	134,519	0.135
6/10/2015	146,461	0.146
6/11/2015	123,109	0.123
6/12/2015	128,847	0.129
6/13/2015	144,607	0.145
6/14/2015	139,197	0.139
6/15/2015	152,895	0.153
6/16/2015	140,179	0.140
6/17/2015	133,198	0.133
6/18/2015	134,443	0.134
6/19/2015	142,817	0.143
6/20/2015	181,106	0.181
6/21/2015	158,223	0.158
6/22/2015	154,982	0.155
6/23/2015	151,056	0.151
6/24/2015	149,754	0.150
6/25/2015	156,703	0.157
6/26/2015	156,703	0.157
6/27/2015	165,431	0.165
6/28/2015	182,839	0.183
6/29/2015	164,619	0.165
6/30/2015	165,627	0.166
7/1/2015	155,659	0.156
7/2/2015	152,586	0.153
7/3/2015	162,426	0.162
7/4/2015	191,833	0.192
7/5/2015	236,912	0.237

7/6/2015	190,624	0.191
7/7/2015	174,945	0.175
7/8/2015	159,770	0.160
7/9/2015	160,613	0.161
7/10/2015	146,621	0.147
7/11/2015	172,801	0.173
7/12/2015	174,864	0.175
7/13/2015	163,492	0.163
7/14/2015	143,522	0.144
7/15/2015	147,993	0.148
7/16/2015	145,422	0.145
7/17/2015	146,790	0.147
7/18/2015	165,831	0.166
7/19/2015	174,379	0.174
7/20/2015	159,772	0.160
7/21/2015	140,253	0.140
7/22/2015	139,810	0.140
7/23/2015	144,574	0.145
7/24/2015	135,691	0.136
7/25/2015	145,561	0.146
7/26/2015	163,744	0.164
7/27/2015	163,743	0.164
7/28/2015	148,261	0.148
7/29/2015	141,209	0.141
7/30/2015	142,239	0.142
7/31/2015	143,164	0.143
8/1/2015	161,611	0.162
8/2/2015	166,901	0.167
8/3/2015	168,014	0.168
8/4/2015	145,221	0.145
8/5/2015	149,975	0.150
8/6/2015	142,534	0.143
8/7/2015	151,268	0.151
8/8/2015	214,386	0.214
8/9/2015	115,263	0.115
8/10/2015	151,233	0.151
8/11/2015	140,626	0.141
8/12/2015	125,275	0.125
8/13/2015	123,973	0.124
8/14/2015	156,301	0.156
8/15/2015	143,961	0.144
8/16/2015	173,688	0.174
8/17/2015	145,155	0.145
8/18/2015	140,365	0.140
8/19/2015	144,208	0.144
8/20/2015	130,128	0.130
8/21/2015	143,208	0.143

8/22/2015	149,685	0.150
8/23/2015	150,912	0.151
8/24/2015	133,506	0.134
8/25/2015	122,424	0.122
8/26/2015	125,052	0.125
8/27/2015	126,466	0.126
8/28/2015	131,649	0.132
8/29/2015	143,259	0.143
8/30/2015	138,197	0.138
8/31/2015	121,981	0.122
9/1/2015	122,262	0.122
9/2/2015	112,544	0.113
9/3/2015	115,713	0.116
9/4/2015	127,985	0.128
9/5/2015	143,935	0.144
9/6/2015	179,853	0.180
9/7/2015	178,313	0.178
9/8/2015	140,871	0.141
9/9/2015	140,871	0.141
9/10/2015	115,016	0.115
9/11/2015	117,814	0.118
9/12/2015	134,152	0.134
9/13/2015	127,472	0.127
9/14/2015	113,971	0.114
9/15/2015	117,193	0.117
9/16/2015	105,684	0.106
9/17/2015	121,292	0.121
9/18/2015	144,227	0.144
9/19/2015	111,765	0.112
9/20/2015	119,589	0.120
9/21/2015	122,531	0.123
9/22/2015	113,910	0.114
9/23/2015	126,287	0.126
9/24/2015	115,634	0.116
9/25/2015	125,829	0.126
9/26/2015	124,713	0.125
9/27/2015	125,394	0.125
9/28/2015	108,954	0.109
9/29/2015	111,369	0.111
9/30/2015	98,957	0.099
10/1/2015	105,954	0.106
10/2/2015	111,365	0.111
10/3/2015	133,944	0.134
10/4/2015	122,625	0.123
10/5/2015	112,504	0.113
10/6/2015	112,060	0.112
10/7/2015	98,825	0.099

10/8/2015	96,673	0.097
10/9/2015	93,985	0.094
10/10/2015	107,100	0.107
10/11/2015	93,613	0.094
10/12/2015	116,265	0.116
10/13/2015	95,874	0.096
10/14/2015	95,865	0.096
10/15/2015	98,612	0.099
10/16/2015	104,950	0.105
10/17/2015	127,050	0.127
10/18/2015	122,495	0.122
10/19/2015	120,073	0.120
10/20/2015	93,418	0.093
10/21/2015	93,418	0.093
10/22/2015	101,407	0.101
10/23/2015	155,416	0.155
10/24/2015	67,563	0.068
10/25/2015	76,993	0.077
10/26/2015	109,538	0.110
10/27/2015	106,484	0.106
10/28/2015	91,309	0.091
10/29/2015	105,788	0.106
10/30/2015	105,789	0.106
10/31/2015	110,438	0.110
11/1/2015	120,627	0.121
11/2/2015	122,823	0.123
11/3/2015	87,780	0.088
11/4/2015	99,430	0.099
11/5/2015	99,431	0.099
11/6/2015	98,347	0.098
11/7/2015	96,113	0.096
11/8/2015	94,621	0.095
11/9/2015	108,712	0.109
11/10/2015	134,175	0.134
11/11/2015	88,868	0.089
11/12/2015	103,012	0.103
11/13/2015	99,819	0.100
11/14/2015	111,599	0.112
11/15/2015	128,521	0.129
11/16/2015	101,771	0.102
11/17/2015	104,741	0.105
11/18/2015	115,440	0.115
11/19/2015	109,626	0.110
11/20/2015	99,739	0.100
11/21/2015	121,889	0.122
11/22/2015	102,327	0.102
11/23/2015	125,471	0.125

11/24/2015	126,118	0.126
11/25/2015	131,871	0.132
11/26/2015	97,051	0.097
11/27/2015	104,525	0.105
11/28/2015	128,321	0.128
11/29/2015	127,450	0.127
11/30/2015	120,475	0.120
12/1/2015	126,516	0.127
12/2/2015	108,618	0.109
12/3/2015	124,416	0.124
12/4/2015	117,007	0.117
12/5/2015	124,470	0.124
12/6/2015	121,275	0.121
12/7/2015	120,552	0.121
12/8/2015	338,251	0.338
12/9/2015	294,600	0.295
12/10/2015	245,783	0.246
12/11/2015	238,962	0.239
12/12/2015	188,076	0.188
12/13/2015	198,688	0.199
12/14/2015	191,650	0.192
12/15/2015	177,225	0.177
12/16/2015	170,826	0.171
12/17/2015	108,459	0.108
12/18/2015	149,427	0.149
12/19/2015	149,427	0.149
12/20/2015	192,853	0.193
12/21/2015	143,775	0.144
12/22/2015	188,616	0.189
12/23/2015	178,691	0.179
12/24/2015	103,143	0.103
12/25/2015	180,158	0.180
12/26/2015	161,454	0.161
12/27/2015	180,307	0.180
12/28/2015	212,840	0.213
12/29/2015	129,528	0.130
12/30/2015	168,546	0.169
12/31/2015	165,697	0.166
1/1/2016	185,002	0.185
1/2/2016	190,452	0.190
1/3/2016	187,203	0.187
1/4/2016	161,011	0.161
1/5/2016	156,106	0.156
1/6/2016	146,881	0.147
1/7/2016	149,856	0.150
1/8/2016	152,066	0.152
1/9/2016	159,345	0.159

1/10/2016	177,098	0.177
1/11/2016	140,118	0.140
1/12/2016	154,118	0.154
1/13/2016	150,393	0.150
1/14/2016	199,062	0.199
1/15/2016	115,841	0.116
1/16/2016	160,266	0.160
1/17/2016	142,795	0.143
1/18/2016	181,849	0.182
1/19/2016	167,803	0.168
1/20/2016	179,571	0.180
1/21/2016	126,949	0.127
1/22/2016	149,211	0.149
1/23/2016	178,456	0.178
1/24/2016	183,189	0.183
1/25/2016	162,375	0.162
1/26/2016	165,576	0.166
1/27/2016	160,433	0.160
1/28/2016	154,003	0.154
1/29/2016	174,988	0.175
1/30/2016	200,158	0.200
1/31/2016	195,195	0.195
2/1/2016	196,498	0.196
2/2/2016	167,122	0.167
2/3/2016	161,642	0.162
2/4/2016	153,426	0.153
2/5/2016	150,410	0.150
2/6/2016	162,866	0.163
2/7/2016	166,109	0.166
2/8/2016	151,301	0.151
2/9/2016	147,386	0.147
2/10/2016	148,901	0.149
2/11/2016	148,163	0.148
2/12/2016	155,002	0.155
2/13/2016	176,801	0.177
2/14/2016	185,302	0.185
2/15/2016	211,732	0.212
2/16/2016	243,494	0.243
2/17/2016	277,770	0.278
2/18/2016	258,650	0.259
2/19/2016	305,899	0.306
2/20/2016	333,199	0.333
2/21/2016	280,839	0.281
2/22/2016	232,968	0.233
2/23/2016	233,166	0.233
2/24/2016	219,030	0.219
2/25/2016	210,008	0.210

2/26/2016	209,940	0.210
2/27/2016	228,246	0.228
2/28/2016	247,800	0.248
2/29/2016	262,495	0.262
3/1/2016	280,441	0.280
3/2/2016	295,843	0.296
3/3/2016	323,945	0.324
3/4/2016	336,573	0.337
3/5/2016	383,954	0.384
3/6/2016	577,079	0.577
3/7/2016	695,246	0.695
3/8/2016	496,921	0.497
3/9/2016	437,098	0.437
3/10/2016	454,651	0.455
3/11/2016	656,541	0.657
3/12/2016	688,028	0.688
3/13/2016	624,033	0.624
3/14/2016	705,683	0.706
3/15/2016	628,166	0.628
3/16/2016	532,064	0.532
3/17/2016	448,288	0.448
3/18/2016	438,111	0.438
3/19/2016	443,789	0.444
3/20/2016	402,165	0.402
3/21/2016	386,227	0.386
3/22/2016	487,740	0.488
3/23/2016	468,541	0.469
3/24/2016	424,095	0.424
3/25/2016	420,986	0.421
3/26/2016	437,961	0.438
3/27/2016	363,998	0.364
3/28/2016	310,110	0.310
3/29/2016	331,973	0.332
3/30/2016	329,545	0.330
3/31/2016	319,984	0.320
4/1/2016	327,400	0.327
4/2/2016	346,479	0.346
4/3/2016	324,017	0.324
4/4/2016	305,361	0.305
4/5/2016	305,449	0.305
4/6/2016	291,054	0.291
4/7/2016	292,016	0.292
4/8/2016	284,084	0.284
4/9/2016	309,414	0.309
4/12/2016	234,758	0.235
4/13/2016	255,893	0.256
4/14/2016	290,056	0.290

4/15/2016	294,511	0.295
4/16/2016	305,041	0.305
4/17/2016	254,364	0.254
4/18/2016	229,924	0.230
4/19/2016	236,550	0.237
4/20/2016	229,937	0.230
4/21/2016	217,466	0.217
4/22/2016	214,351	0.214
4/23/2016	219,035	0.219
4/24/2016	211,990	0.212
4/25/2016	199,043	0.199
4/26/2016	215,108	0.215
4/27/2016	196,675	0.197
4/28/2016	198,561	0.199
4/29/2016	219,152	0.219
4/30/2016	232,159	0.232
5/1/2016	198,526	0.199
5/2/2016	176,203	0.176
5/3/2016	183,640	0.184
5/4/2016	174,043	0.174
5/5/2016	182,163	0.182
5/6/2016	189,293	0.189
5/7/2016	190,575	0.191
5/8/2016	188,639	0.189
5/9/2016	160,763	0.161
5/10/2016	176,697	0.177
5/11/2016	165,943	0.166
5/12/2016	160,441	0.160
5/13/2016	166,732	0.167
5/14/2016	177,139	0.177
5/15/2016	168,358	0.168
5/16/2016	191,775	0.192
5/17/2016	178,348	0.178
5/18/2016	172,483	0.172
5/19/2016	182,454	0.182
5/20/2016	196,458	0.196
5/21/2016	199,590	0.200
5/22/2016	217,553	0.218
5/23/2016	202,266	0.202
5/24/2016	203,999	0.204
5/25/2016	196,369	0.196
5/26/2016	191,285	0.191
5/27/2016	192,269	0.192
5/28/2016	202,121	0.202
5/29/2016	221,754	0.222
5/30/2016	226,335	0.226
5/31/2016	193,106	0.193

6/1/2016	234,227	0.234
6/2/2016	171,780	0.172
6/3/2016	175,222	0.175
6/4/2016	191,503	0.192
6/5/2016	182,466	0.182
6/6/2016	165,194	0.165
6/7/2016	166,965	0.167
6/8/2016	166,624	0.167
6/9/2016	161,691	0.162
6/10/2016	169,603	0.170
6/11/2016	181,613	0.182
6/12/2016	177,279	0.177
6/13/2016	178,125	0.178
6/14/2016	170,008	0.170
6/15/2016	165,673	0.166
6/16/2016	166,985	0.167
6/17/2016	158,764	0.159
6/18/2016	190,283	0.190
6/19/2016	171,969	0.172
6/20/2016	154,918	0.155
6/21/2016	164,406	0.164
6/22/2016	162,609	0.163
6/23/2016	161,369	0.161
6/24/2016	166,285	0.166
6/25/2016	189,923	0.190
6/26/2016	168,274	0.168
6/27/2016	148,279	0.148
6/28/2016	150,613	0.151
6/29/2016	151,822	0.152
6/30/2016	158,937	0.159
7/1/2016	158,937	0.159
7/2/2016	198,084	0.198
7/3/2016	219,603	0.220
7/4/2016	236,373	0.236
7/5/2016	182,992	0.183
7/6/2016	174,260	0.174
7/7/2016	155,261	0.155
7/8/2016	159,105	0.159
7/9/2016	171,806	0.172
7/10/2016	174,637	0.175
7/11/2016	167,822	0.168
7/12/2016	162,652	0.163
7/13/2016	151,622	0.152
7/14/2016	158,947	0.159
7/15/2016	151,816	0.152
7/16/2016	187,516	0.188
7/17/2016	169,986	0.170

7/18/2016	142,647	0.143
7/19/2016	152,255	0.152
7/20/2016	146,129	0.146
7/21/2016	142,639	0.143
7/22/2016	149,455	0.149
7/23/2016	168,369	0.168
7/24/2016	168,689	0.169
7/25/2016	157,349	0.157
7/26/2016	146,707	0.147
7/27/2016	141,513	0.142
7/28/2016	142,366	0.142
7/29/2016	151,894	0.152
7/30/2016	159,529	0.160
7/31/2016	174,913	0.175
8/1/2016	152,966	0.153
8/2/2016	148,701	0.149
8/3/2016	142,987	0.143
8/4/2016	145,422	0.145
8/5/2016	151,554	0.152
8/6/2016	179,605	0.180
8/7/2016	152,256	0.152
8/8/2016	159,637	0.160
8/9/2016	138,937	0.139
8/10/2016	135,713	0.136
8/11/2016	133,730	0.134
8/12/2016	140,785	0.141
8/13/2016	169,339	0.169
8/14/2016	172,479	0.172
8/15/2016	135,583	0.136
8/16/2016	131,887	0.132
8/17/2016	132,360	0.132
8/18/2016	127,707	0.128
8/19/2016	139,402	0.139
8/20/2016	138,870	0.139
8/21/2016	143,812	0.144
8/22/2016	138,675	0.139
8/23/2016	134,871	0.135
8/24/2016	126,199	0.126
8/25/2016	114,608	0.115
8/26/2016	119,102	0.119
8/27/2016	132,404	0.132
8/28/2016	148,348	0.148
8/29/2016	126,712	0.127
8/30/2016	122,897	0.123
8/31/2016	166,771	0.167
9/1/2016	114,664	0.115
9/2/2016	112,612	0.113

9/3/2016	142,903	0.143
9/4/2016	157,023	0.157
9/5/2016	159,562	0.160
9/6/2016	130,364	0.130
9/7/2016	116,548	0.117
9/8/2016	113,854	0.114
9/9/2016	128,060	0.128
9/10/2016	127,229	0.127
9/11/2016	126,661	0.127
9/12/2016	111,767	0.112
9/13/2016	113,673	0.114
9/14/2016	107,163	0.107
9/15/2016	104,011	0.104
9/16/2016	105,757	0.106
9/17/2016	108,811	0.109
9/18/2016	125,717	0.126
9/19/2016	112,919	0.113
9/20/2016	102,155	0.102
9/21/2016	111,113	0.111
9/22/2016	118,929	0.119
9/23/2016	111,044	0.111
9/24/2016	128,316	0.128
9/25/2016	107,004	0.107
9/26/2016	116,312	0.116
9/27/2016	111,956	0.112
9/28/2016	103,949	0.104
9/29/2016	108,382	0.108
9/30/2016	95,029	0.095
10/1/2016	118,952	0.119
10/2/2016	113,047	0.113
10/3/2016	96,500	0.097
10/4/2016	94,303	0.094
10/5/2016	90,996	0.091
10/6/2016	87,681	0.088
10/7/2016	99,770	0.100
10/8/2016	112,499	0.112
10/9/2016	114,285	0.114
10/10/2016	121,391	0.121
10/11/2016	86,165	0.086
10/12/2016	93,313	0.093
10/13/2016	96,780	0.097
10/14/2016	99,073	0.099
10/15/2016	141,367	0.141
10/16/2016	140,700	0.141
10/17/2016	116,505	0.117
10/18/2016	118,219	0.118
10/19/2016	126,142	0.126

10/20/2016	119,831	0.120
10/21/2016	119,939	0.120
10/22/2016	145,084	0.145
10/23/2016	125,927	0.126
10/24/2016	106,931	0.107
10/25/2016	116,226	0.116
10/26/2016	103,445	0.103
10/27/2016	104,381	0.104
10/28/2016	104,514	0.105
10/29/2016	117,028	0.117
10/30/2016	113,232	0.113
10/31/2016	158,631	0.159
11/1/2016	127,399	0.127
11/2/2016	130,085	0.130
11/3/2016	140,387	0.140
11/5/2016	119,629	0.120
11/6/2016	125,898	0.126
11/7/2016	106,156	0.106
11/8/2016	105,558	0.106
11/9/2016	101,943	0.102
11/10/2016	111,954	0.112
11/11/2016	120,858	0.121
11/12/2016	116,270	0.116
11/13/2016	122,064	0.122
11/14/2016	111,593	0.112
11/15/2016	116,404	0.116
11/16/2016	133,670	0.134
11/17/2016	122,940	0.123
11/18/2016	120,938	0.121
11/19/2016	137,348	0.137
11/20/2016	129,792	0.130
11/21/2016	117,654	0.118
11/22/2016	114,244	0.114
11/23/2016	114,024	0.114
11/24/2016	127,383	0.127
11/25/2016	109,958	0.110
11/26/2016	127,190	0.127
11/27/2016	127,098	0.127
11/28/2016	111,176	0.111
11/29/2016	111,714	0.112
11/30/2016	113,771	0.114
12/1/2016	116,293	0.116
12/2/2016	120,342	0.120
12/3/2016	139,552	0.140
12/4/2016	128,995	0.129
12/5/2016	134,633	0.135
12/6/2016	123,523	0.124

12/7/2016	136,242	0.136
12/8/2016	141,097	0.141
12/9/2016	156,468	0.156
12/10/2016	161,327	0.161
12/11/2016	162,267	0.162
12/12/2016	152,914	0.153
12/13/2016	132,851	0.133
12/14/2016	153,559	0.154
12/15/2016	185,920	0.186
12/16/2016	141,286	0.141
12/17/2016	188,177	0.188
12/18/2016	182,013	0.182
12/19/2016	189,580	0.190
12/20/2016	172,020	0.172
12/21/2016	174,082	0.174
12/22/2016	190,651	0.191
12/23/2016	200,332	0.200
12/24/2016	239,384	0.239
12/25/2016	187,565	0.188
12/26/2016	180,040	0.180
12/27/2016	171,592	0.172
12/28/2016	205,674	0.206
12/29/2016	193,462	0.193
12/30/2016	204,914	0.205
12/31/2016	223,109	0.223
1/1/2017	201,082	0.201
1/2/2017	178,218	0.178
1/3/2017	196,281	0.196
1/4/2017	187,367	0.187
1/5/2017	177,826	0.178
1/6/2017	183,716	0.184
1/7/2017	233,107	0.233
1/8/2017	181,306	0.181
1/9/2017	219,808	0.220
1/10/2017	218,195	0.218
1/11/2017	224,806	0.225
1/12/2017	159,467	0.159
1/13/2017	186,085	0.186
1/14/2017	235,801	0.236
1/15/2017	212,853	0.213
1/16/2017	217,028	0.217
1/17/2017	183,351	0.183
1/18/2017	211,096	0.211
1/19/2017	263,841	0.264
1/20/2017	139,608	0.140
1/21/2017	227,544	0.228
1/22/2017	195,667	0.196

1/24/2017	361,634	0.362
1/25/2017	188,349	0.188
1/26/2017	192,767	0.193
1/27/2017	198,532	0.199
1/30/2017	639,751	0.640
1/31/2017	183,050	0.183
2/1/2017	174,997	0.175
2/2/2017	206,754	0.207
2/3/2017	137,110	0.137
2/4/2017	179,594	0.180
2/5/2017	324,272	0.324
2/6/2017	307,092	0.307
2/7/2017	411,113	0.411
2/8/2017	246,558	0.247
2/9/2017	374,516	0.375
2/10/2017	1,355,989	1.356
2/11/2017	901,045	0.901
2/12/2017	486,604	0.487
2/13/2017	383,152	0.383
2/14/2017	380,038	0.380
2/15/2017	351,170	0.351
2/16/2017	336,790	0.337
2/17/2017	504,458	0.504
2/18/2017	513,183	0.513
2/19/2017	807,562	0.808
2/20/2017	622,910	0.623
2/21/2017	755,174	0.755
2/22/2017	983,766	0.984
2/23/2017	652,091	0.652
2/24/2017	540,328	0.540
2/25/2017	558,672	0.559
2/26/2017	496,940	0.497
2/27/2017	417,700	0.418
2/28/2017	427,533	0.428

DATE	WWTP-INFLUENT					WWTP-CELL#1	WWTP-CELL#3	
	Flow Avg MGD	BOD (mg/L)	lbs/day	TSS (mg/L)	lbs/day	BOD (mg/L)	BOD (mg/L)	TSS (mg/L)
Dec-14	0.207	135	234	77	133	26	11	14
Jan-15	0.199	138	229	79	131	51	16	10
Feb-15	0.369	117	360	62	191	67	19	12
Mar-15	0.270	230	518	410	924	28	15	22
Apr-15	0.138	201	232	80	92	31	18	10
May-15	0.137	214	244	115	131	52	10	2
Jun-15	0.147	238	293	88	108	85	4	6
Jul-15	0.159	280	372	144	191	49	7	2
Aug-15	0.144	333	401	112	135	59	13	2
Sep-15	0.125	279	292	300	314	97	6	3
Oct-15	0.106	748	662	1,630	1442	89	7	8
Nov-15	0.110	227	209	80	74	56	16	2
Dec-15	0.171	126	180	256	365	74	13	10
Jan-16	0.165	126	173	80	110	59	41	6
Feb-16	0.208	130	225	75	130	73	69	7
Mar-16	0.456	52	198	42	160	37	54	16
Apr-16	0.259	64	138	54	116	23	26	39
May-16	0.188	111	174	149	234	21	8	7
Jun-16	0.171	224	319	167	238	27	5	6
Jul-16	0.165	201	277	179	247	109	7	40
Aug-16	0.142	228	270	98	116	52	11	77
Sep-16	0.118	318	312	89	87	37	16	97
Oct-16	0.113	177	167	92	87	47	5	22
Nov-16	0.120	98	98	79	79	35	33	22
Dec-16	0.167	180	251	107	149	17	11	14
Jan-17	0.221	152	281	79	146	70	30	11
Feb-17	0.494	72	297	76	313	68	61	10

Conversion Factor = 8.34

Septage at Cascade from June 2014 to June 2015

month	Q gal/mo	BOD mg/L	BOD lbs/mo.	Avg BOD lbs/day
Jun 2014	21600	7000	1261	42
Jul	26600	7000	1553	50
Aug	18200	7000	1063	34
Sept	17000	7000	992	33
Oct	13100	7000	765	25
Nov	3500	7000	204	7
Dec	1900	7000	111	4
Jan 2015	550	7000	32	1
Feb	1200	7000	70	3
Mar	3120	7000	182	6
Apr	5050	7000	295	10
May	15600	7000	911	29
June	11260	7000	657	22

Concentration of Ammonia and Phosphorus at Cell 3

month	Ammonia mg/L	Phosphate as P mg/L
Dec	10	4.64
Jan 2015	12.1	3.7
Feb	12.1	3.07
Mar	8.45	1.87
Apr	4.92	1.43
May	3.81	1.8
June	7.96	2.1
Jul	6.82	2.57
Aug	6.68	3.54
Sept	7.89	4.39
Oct	7.52	4.25
Nov	6.58	4.05
Dec	6.24	5.48
Jan 2016	15.2	4.4
Feb	19.3	3.79
Mar	15.2	2.87
Apr	5.46	1.78
May	0.99	1.18
June	7.44	2.19
Jul	1.61	2.4
Aug	0.04	2.7
Sept	0.94	3.82
Oct	3.42	4.19
Nov	6.67	4.34
Dec	10.4	4.58
Jan 2017	18.1	4.3
Feb	19.9	3.57

Appendix B: Design Calculations

- Preliminary Process Design Report for Cascade, Idaho Prepared by Aeration Industries International (Aeration Calculations for 200 New Homes)
- Aeration Industry’s Comments on the Benefits of the Aire-O2 Lagoon Aeration System
- Pump Curve of Final Lift Station Pumps

PRELIMINARY PROCESS DESIGN REPORT

AERATED LAGOON SYSTEM

Project Name: Cascade, Idaho

Design # 15-7-4748

Option: AIRE-O_2® Aeration System

4/28/2017

Designed by: Alan Rice, EIT, Aeration Industries International, LLC.

1. Design Specifications

1.1 Average Flow Rates

The biological process unit has been designed for a 24 hour / 7 day flow. No peaking factor has been assumed.

The peak hydraulic flow is assumed to represent an increase in hydraulic load only – not organic load.

DESIGN PARAMETER	FLOW	UNITS
Winter Flow (Average Day Max Month)	544,200	gpd
Summer Flow (Average Day Max Month)	238,000	gpd
Peak Hydraulic Flow	720,000	gpd

1.2 Influent Water Quality

The aeration system has been designed around the following influent water quality values provided by the engineer.

PARAMETER	INFLUENT	UNITS
Summer BOD_5	501	ppd
Summer TSS	414	ppd
Winter BOD_5	618	ppd
Winter TSS	1024	ppd

1.3 Effluent Water Quality

Effluent requirements were taken from NPDES permit ID 002316-7

PARAMETER	EFFLUENT	UNITS
BOD_5	30	mg / L
TSS	30	mg / L
TKN	-	mg / L

Note: The lagoon is not designed to achieve nitrification.

2. Design Considerations

2.1 Pre-Biological Unit Process

Neutralization is recommended / required ahead of the biological unit process if the pH is expected to fall outside of 6.5 – 8.5 for significant durations.

1/4" fine screen solids removal / reduction is recommended prior to the biological unit process (by others).

2.2 Biological Unit Process Aeration

The aeration system has been designed to provide 1.8 lbs O_2/lb BOD_5 on a removed basis at the design flow. No wind, surface, or algae effects have been assumed.

The aeration system has been designed to support a maximum process oxygen demand of 80 lb O_2/day.

The lagoon system kinetically designed to achieve sufficient BOD removal. All three cells are designed to supply the minimum amount of mixing required to prevent algae growth and odor.

2.3 Process Conditions

It is assumed there are no significant fluctuations in the operating water level. If significant water fluctuations are expected to occur, Aeration Industries recommends using swing arm assemblies to allow the aeration equipment to fluctuate with the water level.

2.4 Process Description

Aeration Industries recommends installing four (4) 5HP Aspirating Aerators in the first treatment cell and two (2) 5HP Aspirating Aerator in each of the second and third treatment cells.

2.5 Process Calculations

See attached.

Aeration Industries' calculations for determining the aeration equipment required to fulfill the oxygen and/or mixing demand of biological wastewater treatment systems

AIRE-O2®

Note: The methods and data presented here are intended for use by the designer to estimate the power requirement for the oxygen demand using AIRE-O_2 aeration equipment. This method is not intended to cover every application. Questions can be answered by contacting AIII at 1-800-328-8287

Project Name:

Cascade, ID
Winter Flow

Project Number:

15-7-4748

Notes:

The average day, maximum month winter flowrate of 0.5442MGD was provided by the engineer.

Effluent limits were taken from NPDES ID-002316-7.

The winter maximum month organic load of 618lb BOD / day was provided by the engineer. The BOD concentration was then calculated based on this design parameter and the flowrate.

The lagoon is not designed to achieve nitrifciation.

An oxygen to BOD ratio of 1.8 : 1 supplies sufficient oxygen for BOD treatment and complete stabilization of the biomass.

The operating DO concentration is modeled to be 2.0mg/L. This is a conservative design parameter. The actual DO level in the lagoon may not reach 2.0. Aeration efficiency will increase at lower dissolved oxygen concentrations.

Input Data (Blue Cells)

				Description
1	Flowrate =	0.54	MGD	*Input flowrate*
2	Volume =	23.36	MG	*Input volume*
3	BOD in =	136	mg/l	*Influent BOD*
4	BOD out =	30	mg/l	*Design output BOD*
5	NH_4-N Removal =	0	mg/l	*Design ammonia or TKN removal*
6	Other =	0.00	mg/l	
7	BOD total =	618.0	lb/day	*line 7 = (line 1) * (line 3) * 8.34*
8	BOD net =	481.8	lb/day	*line 8 = (line 3 - line 4) x (line 1) x 8.34*
9	NH_4-N net =	0.0	lb/day	*line 9 = (line 5) x (line 1) x 8.34*
10	Other =	0.0	lb/day	*line 10 = (line 6) x (line 1) x 8.34*

ASSUMPTIONS

11	O_2 : BOD =	1.8	lb O_2 / lb BOD	*Typically varies between 1 and 2*
12	O_2 : NH_3-N=	4.6	lb O_2 / lb NH_4-N	*Typical value is 4.6*
13	O_2 : Other =		lb O_2 / lb Other	*Depends on species*

O_2 REQUIREMENT UNDER FIELD CONDITIONS (AOR)

14	O_2 for BOD =	867.3	lb O_2 / day	*line 14 = (line 11) x (line 8)*
15	O_2 for NH_4-N =	0.0	lb O_2 / day	*line 15 = (line 12) x (line 9)*
16	O_2 for Other =	0.0	lb O_2 / day	*line 16 = (line 13) x (line 10)*
17	AOR =	**867.3**	lb O_2 / day	*line 17 = (line 14) + (line 15) + (line 16)*
18	AOR =	**36.1**	lb O_2 / hour	*line 18 = (line 17) / (24)*

CORRECTION FACTORS TO DETERMINE O_2 REQUIREMENT UNDER STANDARD CONDITIONS (SOR)

	Air Temperature =	90	°F	*Input Air temperature*
19	Basin Temperature =	90	°F	*Input Basin temperature*
20	Elevation =	4750	feet above msl	*Input Basin elevation*
21	C_w =	2.0	mg/l	*Operating O_2 conc. of wastewater*
22	α =	0.85		*Correction factor for type of waste*
23	β =	0.95		*Correction factor for salinity, TDS, etc.*
24	C_{s20} =	9.09	mg/l	*O_2 saturation conc. at 68 deg F*
25	τ =	0.78		*Temperature correction factor*
26	Ω =	0.83		*Altitude correction factor*
27	C_s =	5.9	mg/l	*O_2 saturation conc. at field conditions*
28	**(Standardized) SOR =**	**80**	**lb O_2 / hour**	

$$SOR = \frac{(AOR) * (C_{s20})}{(\alpha)*\{\beta * C_s - C_w\} * (1.024)^{T-20}}$$

HP REQUIREMENTS

OXYGEN

30	AIRE-O_2 Aspirator SAE	2.0	lb O_2 / HP hour	
33	AIRE-O_2 Aspirator	**40.0**	**HP**	*line 33 = (line 28) / (line 30)*

MIXING

Process	Triton	Aspirator	
Complete Mix Lagoon	30	60	HP / MG
Partial Mix Lagoon	10	20	HP / MG
Facultative Lagoon	5	10	HP / MG
Minimum Mixing	-	2-3	HP / Acre Surface Area

Chosen Process: Minimum Mixing

First Cell	**12.6**	**HP**	*process (HP/MG) * V*
Second Cell	**7.1**	**HP**	*process (HP/MG) * V*
Third Cell	**7.28**	**HP**	*process (HP/MG) * V*

RECOMMENDATIONS

Based on the information provided, this system is oxygen limited. We recommend installing (8) 5HP AIRE-O_2 Aspirating aerators to supply the oxygen and mixing required for treatment.

Aeration Industries' calculations for determining the aeration equipment required to fulfill the oxygen and/or mixing demand of biological wastewater treatment systems

Note: The methods and data presented here are intended for use by the designer to estimate the power requirement for the oxygen demand using AIRE-O_2 aeration equipment. This method is not intended to cover every application. Questions can be answered by contacting AIII at 1-800-328-8287

Project Name: Cascade, ID Summer Flow

Project Number: 15-7-4748

Notes:

The average day, maximum month summer flowrate of 0.2380MGD was provided by the engineer.

The summer maximum month organic load of 441lb BOD / day was provided by the engineer.

The lagoon is not designed to achieve nitrifciation.

An oxygen to BOD ratio of 1.8 : 1 supplies sufficient oxygen for BOD treatment and complete stabilization of the biomass.

The operating DO concentration is modeled to be 2.0mg/L. This is a conservative design parameter. The actual DO level in the lagoon may not reach 2.0. Aeration efficiency will increase at lower dissolved oxygen concentrations.

	Input Data (Blue Cells)			Description
1	Flowrate =	0.24	MGD	*Input flowrate*
2	Volume =	23.36	MG	*Input volume*
3	BOD in =	252	mg/l	*Influent BOD*
4	BOD out =	30	mg/l	*Design output BOD*
5	NH_4-N Removal =	0	mg/l	*Design ammonia or TKN removal*
6	Other =	0.00	mg/l	
7	BOD total =	501.0	mg/l	*line 7 = (line 1) * (line 3) * 8.34*
8	BOD net =	441.5	lb/day	*line 8 = (line 3 - line 4) x (line 1) x 8.34*
9	NH_4-N net =	0.0	lb/day	*line 9 = (line 5) x (line 1) x 8.34*
10	Other =	0.0	lb/day	*line 10 = (line 6) x (line 1) x 8.34*

ASSUMPTIONS

11	O_2 : BOD =	1.8	lb O_2 / lb BOD	*Typically varies between 1 and 2*
12	O_2 : NH_3-N=	4.6	lb O_2 / lb NH_4-N	*Typical value is 4.6*
13	O_2 : Other =		lb O_2 / lb Other	*Depends on species*

O_2 REQUIREMENT UNDER FIELD CONDITIONS (AOR)

14	O_2 for BOD =	794.6	lb O_2 / day	*line 14 = (line 11) x (line 8)*
15	O_2 for NH_4-N =	0.0	lb O_2 / day	*line 15 = (line 12) x (line 9)*
16	O_2 for Other =	0.0	lb O_2 / day	*line 16 = (line 13) x (line 10)*
17	AOR =	**794.6**	lb O_2 / day	*line 17 = (line 14) + (line 15) + (line 16)*
18	AOR =	**33.1**	lb O_2 / hour	*line 18 = (line 17) / (24)*

CORRECTION FACTORS TO DETERMINE O_2 REQUIREMENT UNDER STANDARD CONDITIONS (SOR)

	Air Temperature =	90	°F	*Input Air temperature*
19	Basin Temperature =	90	°F	*Input Basin temperature*
20	Elevation =	4750	feet above msl	*Input Basin elevation*
21	C_w =	2.0	mg/l	*Operating O_2 conc. of wastewater*
22	α =	0.85		*Correction factor for type of waste*
23	β =	0.95		*Correction factor for salinity, TDS, etc.*
24	C_{s20} =	9.09	mg/l	*O_2 saturation conc. at 68 deg F*
25	τ =	0.78		*Temperature correction factor*
26	Ω =	0.83		*Altitude correction factor*
27	C_s =	5.9	mg/l	*O_2 saturation conc. at field conditions*
28	**(Standardized) SOR =**	**73**	**lb O_2 / hour**	

$$SOR = \frac{(AOR) * (C_{s20})}{(\alpha)*\{\beta * C_s - C_w\} * (1.024)^{T-20}}$$

HP REQUIREMENTS

OXYGEN

30	AIRE-O_2 Aspirator SAE	2.0	lb O_2 / HP hour	
33	AIRE-O_2 Aspirator	**36.7**	**HP**	*line 33 = (line 28) / (line 30)*

MIXING

Process	Triton	Aspirator	
Complete Mix Lagoon	30	60	HP / MG
Partial Mix Lagoon	10	20	HP / MG
Facultative Lagoon	5	10	HP / MG
Minimum Mixing	-	2-3	HP / Acre Surface Area

Chosen Process: Minimum Mixing

First Cell	**12.6**	**HP**	*process (HP/MG) * V*
Second Cell	**7.1**	**HP**	*process (HP/MG) * V*
Third Cell	**7.28**	**HP**	*process (HP/MG) * V*

RECOMMENDATIONS

Based on the information provided, this system is oxygen limited. We recommend installing (8) 5HP AIRE-O_2 Aspirating aerators to supply the oxygen and mixing required for treatment.

Aeration Industries International

Lagoons in Series Design Calculations

Project Name:	City of Cascade, ID	Date	4/28/2017
Project No.:	15-7-4748	Prepared By	APR
		Revision:	0

Design Flow = 237,980 gpd = 900.754 m3/d

Note: Design flowrate is typically the average day max month flow. The flowrate displayed above represents the summer flowrate provided by the engineer.

Lagoon Water Depth = 5.5 ft = 1.7 m

BOD Removal Zone

Total Lagoon Volume = 23.36 MG = 88417.6 m3
Total HRT = 98.16 days

Suspended Growth BOD Removal Calculations

Aerated Lagoon Reactors In Series
(Metcalf & Eddy, 4th Ed., p.271)

$$S = S_o / [1 + (k_T / n) * \tau]^n$$

where
S = effluent BOD concentration, mg/l
S_o = influent BOD concentration, mg/l
τ = total retention time, days
T = wastewater temperature, C
k_T = reaction coefficient, days-1
n = number of reactors

$$k_T = k_{20} (\theta^{T-20})$$

where
k_{20} = reaction coefficient at 20 deg. C = 0.15 days^{-1}

Note: A kinetic rate of 0.15 day^{-1} corresponds to a lagoon approximately 5-6' deep with no mechanical mixing or aeration. The proposed system includes mechanical mixing and aeration, therefore the modeled kinetic rate is an extremely conservative

θ = temperature factor = 1.036

REACTORS IN SERIES

Number of Reactors = 3

Min. Lagoon Temperature			**Max. Lagoon Temperature**		
T =	6	C	T =	20	C
τ =	98.16	days	τ =	98.16	days
So =	238	mg/l	So =	238	mg/l
k_T =	0.09	days^{-1}	k_T =	0.15	days^{-1}
S =	4	mg/l	S =	1	mg/l

Aeration Industries International

Cell 1 Design Calculations

Project Name:	City of Cascade, ID	Date	4/28/2017
Project No.:	15-7-4748	Prepared By	APR
		Revision:	0

Design Flow =	237,980	gpd =	900.754	m3/d
Lagoon Water Depth =	5.5	ft =	1.7	m

1st Cell in Series

Total Lagoon Volume =	23.36	MG =	88417.6	m3
Total Number of Cells in Series =	3			
Cell 1 Volume =	10.65	MG =	40310.3	m3
HRT in Cell 1 =	44.75	days		

Suspended Growth BOD Removal Calculations

Aerated Lagoon Reactors In Series
(Metcalf & Eddy, 4th Ed., p.271)

$$S = S_o / [1 + (k_T / n) * \tau)]^n$$

where
S = effluent BOD concentration, mg/l
S_o = influent BOD concentration, mg/l
τ = total retention time, days
T = wastewater temperature, C
k_T = reaction coefficient, days-1
n = number of reactors

$$k_T = k_{20} (\theta^{T-20})$$

where
k_{20} = reaction coefficient at 20 deg. C = 0.150 $days^{-1}$
θ = temperature factor = 1.036

REACTORS IN SERIES

Number of Reactors = 1

Min. Lagoon Temperature			**Max. Lagoon Temperature**		
T =	6	C	T =	20	C
τ =	44.75	days	τ =	44.75	days
So =	238	mg/l	So =	238	mg/l
k_T =	0.09	$days^{-1}$	k_T =	0.15	$days^{-1}$
S =	47	mg/l	S =	31	mg/l

Aeration Industries International

Cell 2 Design Calculations

AIRE-0$_2$®

Project Name:	City of Cascade, ID	Date	4/28/2017
Project No.:	15-7-4748	Prepared By	APR
		Revision:	0

Design Flow =	237,980	gpd =	900.754	m3/d
Lagoon Water Depth =	5.5	ft =	1.7	m

2nd Cell in Series

Total Lagoon Volume =	23.36	MG =	88417.6	m3
Total Number of Cells in Series =	3			
Cell 2 Volume =	6.05	MG =	22899.3	m3
HRT in Cell 2 =	25.42	days		

Suspended Growth BOD Removal Calculations

Aerated Lagoon Reactors In Series
(Metcalf & Eddy, 4th Ed., p.271)

$$S = S_o / [1 + (k_T / n) * \tau)]^n$$

where
S = effluent BOD concentration, mg/l
S_o = influent BOD concentration, mg/l
τ = total retention time, days
T = wastewater temperature, C
k_T = reaction coefficient, days-1
n = number of reactors

$$k_T = k_{20} (\theta^{T-20})$$

where
k_{20} = reaction coefficient at 20 deg. C = 0.150 days^{-1}
θ = temperature factor = 1.036

REACTORS IN SERIES

Number of Reactors = 1

Min. Lagoon Temperature			**Max. Lagoon Temperature**		
T =	6	C	T =	20	C
τ =	25.42	days	τ =	25.42	days
So =	47	mg/l	So =	31	mg/l
k_T =	0.09	days^{-1}	k_T =	0.15	days^{-1}
S =	14	mg/l	S =	6	mg/l

Aeration Industries International

Cell 3 Design Calculations

Project Name:	City of Cascade, ID	Date	4/28/2017
Project No.:	15-7-4748	Prepared By	APR
		Revision:	0

Design Flow =	237,980	gpd =	900.754	m3/d
Lagoon Water Depth =	5.5	ft =	1.7	m

3rd Cell in Series

Total Lagoon Volume =	23.36	MG =	88417.6	m3
Total Number of Cells in Series =	3			
Cell 3 Volume =	6.66	MG =	25208.1	m3
HRT in Cell 3 =	27.99	days		

Suspended Growth BOD Removal Calculations

Aerated Lagoon Reactors In Series
(Metcalf & Eddy, 4th Ed., p.271)

$$S = S_o / [1 + (k_T / n) * \tau)]^n$$

where
S = effluent BOD concentration, mg/l
S_o = influent BOD concentration, mg/l
τ = total retention time, days
T = wastewater temperature, C
k_T = reaction coefficient, days-1
n = number of reactors

$$k_T = k_{20} (\theta^{T-20})$$

where
k_{20} = reaction coefficient at 20 deg. C = 0.15 $days^{-1}$
θ = temperature factor = 1.036

REACTORS IN SERIES

Number of Reactors = 1

Min. Lagoon Temperature			**Max. Lagoon Temperature**		
T =	6	C	T =	20	C
τ =	27.99	days	τ =	27.99	days
So =	14	mg/l	So =	6	mg/l
k_T =	0.09	$days^{-1}$	k_T =	0.15	$days^{-1}$
S =	4	mg/l	S =	1	mg/l

Aeration Industries International

Lagoons in Series Design Calculations

Project Name:	City of Cascade, ID	Date	4/28/2017
Project No.:	15-7-4748	Prepared By	APR
		Revision:	0

Design Flow = 544,200 gpd = 2059.8 m3/d

Note: Design flowrate is typically the average day max month flow. The flowrate displayed above represents the winter flowrate provided by the engineer.

Lagoon Water Depth = 5.5 ft = 1.7 m

BOD Removal Zone

Total Lagoon Volume = 23.36 MG = 88417.6 m3

Total HRT = 42.93 days

Suspended Growth BOD Removal Calculations

Aerated Lagoon Reactors In Series

(Metcalf & Eddy, 4th Ed., p.271)

$$S = S_o / [1 + (k_T / n) * \tau]^n$$

where

S = effluent BOD concentration, mg/l

S_o = influent BOD concentration, mg/l

τ = total retention time, days

T = wastewater temperature, C

k_T = reaction coefficient, days-1

n = number of reactors

$$k_T = k_{20} (\theta^{T-20})$$

where

k_{20} = reaction coefficient at 20 deg. C = 0.15 $days^{-1}$

Note: A kinetic rate of 0.15 day^{-1} corresponds to a lagoon approximately 5-6' deep with no mechanical mixing or aeration. The proposed system includes mechanical mixing and aeration, therefore the modeled kinetic rate is an extremely conservative

θ = temperature factor = 1.036

REACTORS IN SERIES

Number of Reactors = 3

Min. Lagoon Temperature			**Max. Lagoon Temperature**		
T =	2	C	T =	10	C
τ =	42.93	days	τ =	42.93	days
So =	151	mg/l	So =	151	mg/l
k_T =	0.08	$days^{-1}$	k_T =	0.11	$days^{-1}$
S =	16	mg/l	S =	10	mg/l

AIRE-O$_2$®

Aeration Industries International

Cell 1 Design Calculations

Project Name:	City of Cascade, ID	Date	4/28/2017
Project No.:	15-7-4748	Prepared By	APR
		Revision:	0

Design Flow =	544,200 gpd =	2059.8 m3/d
Lagoon Water Depth =	5.5 ft =	1.7 m

1st Cell in Series

Total Lagoon Volume =	23.36 MG =	88417.6 m3
Total Number of Cells in Series =	3	
Cell 1 Volume =	10.65 MG =	40310.3 m3
HRT in Cell 1 =	19.57 days	

Suspended Growth BOD Removal Calculations

Aerated Lagoon Reactors In Series
(Metcalf & Eddy, 4th Ed., p.271)

$$S = S_o / [1 + (k_T / n) * \tau)]^n$$

where
S = effluent BOD concentration, mg/l
S_o = influent BOD concentration, mg/l
τ = total retention time, days
T = wastewater temperature, C
k_T = reaction coefficient, days-1
n = number of reactors

$$k_T = k_{20} (\theta^{T-20})$$

where
k_{20} = reaction coefficient at 20 deg. C = 0.150 days^{-1}
θ = temperature factor = 1.036

REACTORS IN SERIES

Number of Reactors = 1

Min. Lagoon Temperature		**Max. Lagoon Temperature**	
T =	2 C	T =	10 C
τ =	19.57 days	τ =	19.57 days
So =	151 mg/l	So =	151 mg/l
k_T =	0.08 days^{-1}	k_T =	0.11 days^{-1}
S =	59 mg/l	S =	49 mg/l

Aeration Industries International

Cell 2 Design Calculations

Project Name:	City of Cascade, ID	Date	4/28/2017
Project No.:	15-7-4748	Prepared By	APR
		Revision:	0

Design Flow =	544,200	gpd =	2059.8	m3/d
Lagoon Water Depth =	5.5	ft =	1.7	m

2nd Cell in Series

Total Lagoon Volume =	23.36	MG =	88417.6	m3
Total Number of Cells in Series =	3			
Cell 2 Volume =	6.05	MG =	22899.3	m3
HRT in Cell 2 =	11.12	days		

Suspended Growth BOD Removal Calculations

Aerated Lagoon Reactors In Series
(Metcalf & Eddy, 4th Ed., p.271)

$$S = S_o / [1 + (k_T / n) * \tau)]^n$$

where
S = effluent BOD concentration, mg/l
S_o = influent BOD concentration, mg/l
τ = total retention time, days
T = wastewater temperature, C
k_T = reaction coefficient, days-1
n = number of reactors

$$k_T = k_{20} (\theta^{T-20})$$

where
k_{20} = reaction coefficient at 20 deg. C = 0.150 $days^{-1}$
θ = temperature factor = 1.036

REACTORS IN SERIES

Number of Reactors = 1

Min. Lagoon Temperature			**Max. Lagoon Temperature**		
T =	2	C	T =	10	C
τ =	11.12	days	τ =	11.12	days
So =	59	mg/l	So =	49	mg/l
k_T =	0.08	$days^{-1}$	k_T =	0.11	$days^{-1}$
S =	31	mg/l	S =	23	mg/l

Aeration Industries International

Cell 3 Design Calculations

Project Name:	City of Cascade, ID	Date	4/28/2017
Project No.:	15-7-4748	Prepared By	APR
		Revision:	0

Design Flow =	544,200	gpd =	2059.8	m3/d
Lagoon Water Depth =	5.5	ft =	1.7	m

3rd Cell in Series

Total Lagoon Volume =	23.36	MG =	88417.6	m3
Total Number of Cells in Series =	3			
Cell 3 Volume =	6.66	MG =	25208.1	m3
HRT in Cell 3 =	12.24	days		

Suspended Growth BOD Removal Calculations

Aerated Lagoon Reactors In Series
(Metcalf & Eddy, 4th Ed., p.271)

$$S = S_o / [1 + (k_T / n) * \tau)]^n$$

where
S = effluent BOD concentration, mg/l
S_o = influent BOD concentration, mg/l
τ = total retention time, days
T = wastewater temperature, C
k_T = reaction coefficient, days-1
n = number of reactors

$$k_T = k_{20} (\theta^{T-20})$$

where
k_{20} = reaction coefficient at 20 deg. C = 0.15 $days^{-1}$
θ = temperature factor = 1.036

REACTORS IN SERIES

Number of Reactors = 1

Min. Lagoon Temperature			**Max. Lagoon Temperature**		
T =	2	C	T =	10	C
τ =	12.24	days	τ =	12.24	days
So =	31	mg/l	So =	23	mg/l
k_T =	0.08	$days^{-1}$	k_T =	0.11	$days^{-1}$
S =	16	mg/l	S =	10	mg/l

AERATION INDUSTRIES' COMMENTS ON THE BENEFITS OF THE AIRE-O2 LAGOON AERATION SYSTEM

FOR THE CITY OF

CASCADE, IDAHO

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April 28, 2017

Authored by Alan Rice, EIT
Applications Engineer
Aeration Industries International

To Paul Scoresby,

The City of Cascade is faced with unique challenges regarding the performance of their wastewater lagoon treatment system, and Aeration Industries believes that the installation and operation of our custom AIRE-O2 system, consisting of eight (8) 5HP aspirating aerators, will not only greatly improve the current performance of the wastewater system, but will also provide the city the confidence they need to ensure that the wastewater treatment infrastructure can handle an increasing population.

Aeration Industries has been recognized as an industry leader in aeration technologies and lagoon treatment systems since it was founded over 40 years ago, with our AIRE-O2 system being used in all 50 U.S. states and over 90 countries around the world. Aeration Industries would like to take a moment to comment on some of the advantages that the AIRE-O2 system has to offer.

Improved Effluent

Based on information provided to Aeration Industries, the existing wastewater lagoon system experiences poor quality effluent during the spring months due to a combination of spring turnover, winter melt, and other factors. The biological oxygen demand and total suspended solids measured in the effluent during this spring period will reach 40mg/L or greater, which is not representative of "clean water."

The proposed AIRE-O2 system is designed to achieve year-round treatment. Operation of the AIRE-O2 system during these spring months will allow the city to achieve a high quality effluent year-round.

Population Expansion

Aeration Industries understands that Cascade is a growing community, and that an increasing population over the design life of the plant is likely to occur. The AIRE-O2 system is designed to treat an increased capacity of wastewater that is estimated to be equivalent to an additional 200 homes.

Algae Control

If left unaerated and unmixed, it is likely the existing treatment lagoon will grow algae – especially during the warm summer months in Cascade. Algae may be harmful to the local ecosystem, and can be toxic to birds or other animals in the area that may come into contact with the treatment lagoon.

The AIRE-O2 system may be intermittently operated during the spring and summer months in order to prevent the likely algae growth. By aerating the water, the surface layer continually turns over and disrupts the photosynthetic process by which algae grows.

Odor Control

The AIRE-O2 system will provide a safety mechanism against offensive odors resultant of future expansion. If the organic load to the lagoon is increased due to population growth, but aeration equipment is not installed, offensive odors in the immediate vicinity of the lagoon may be an issue. These odors may be spread from the treatment lagoons and throughout the town by wind.

However, aerating the lagoon will prevent the growth of bacteria that produce hydrogen sulfide and other odor-causing compounds, thus preventing offensive odors before they are ever created. Similarly, operation of the AIRE-O2 system will reduce odors resultant of spring turnover.

Turndown

Although the AIRE-O2 system consists of eight aerators, it is not necessary to operate all of the aerators constantly. The aerators may be cycled and operated intermittently depending on seasonal variations, environmental conditions, and other factors, in order to reduce electrical consumption.

Examples where turning on/off units in reaction to the process include:

1. Turning on additional aerators when algae growth or odors become a concern.
2. Turning off one or more units during non-peak seasons when there is little tourism.
3. Cycling aerators on/off based on the dissolved oxygen level measured in the field.
4. Turning off aerators after the historically difficult spring months are over.

Every wastewater treatment lagoon has its own unique qualities and intricacies, and the modular nature of the AIRE-O2 system provides the city the maximum amount of flexibility to adjust the process to meet their unique challenges. Although 40HP of equipment is installed, the operational staff may choose to operate as little as 5HP or as much as the entire 40HP, based on his or her previous experience.

Operational Ease

Aeration Industries AIRE-O2 system is designed to be easily operated and require almost no maintenance. The AIRE-O2 system aerators consist of just 5 moving parts, and the recommended maintenance schedule takes just a few hours every year.

Future Limits / Equipment Reuse

The AIRE-O2 system is designed to achieve BOD and TSS reduction. It is not designed to remove ammonia or phosphorous from the system. In the future, if the city of Cascade must comply to strict nutrient limits, the lagoon system may be upgraded further to meet these limits.

Ammonia removal may be achieved through installation of Aeration Industries patented BIO-FFILM system, and phosphorous removal may be achieved through chemical precipitation.

In either scenario, AIRE-O2 aerators will be required in the upgraded system, and the proposed aerators may be reused in the upgraded lagoon.

Conclusion

Aeration Industries believes that the AIRE-O2 system will benefit the city of Cascade, both immediately in the spring months and in the future as the population grows. Aeration Industries looks forward to partnering with both Schiess & Associates and the city of Cascade to identify the most effective path forward to meet the city's unique wastewater challenges.

Sincerely,

Alan Rice, EIT

Applications Engineer

Aeration Industries

Pump Curve of Lift Station Pumps

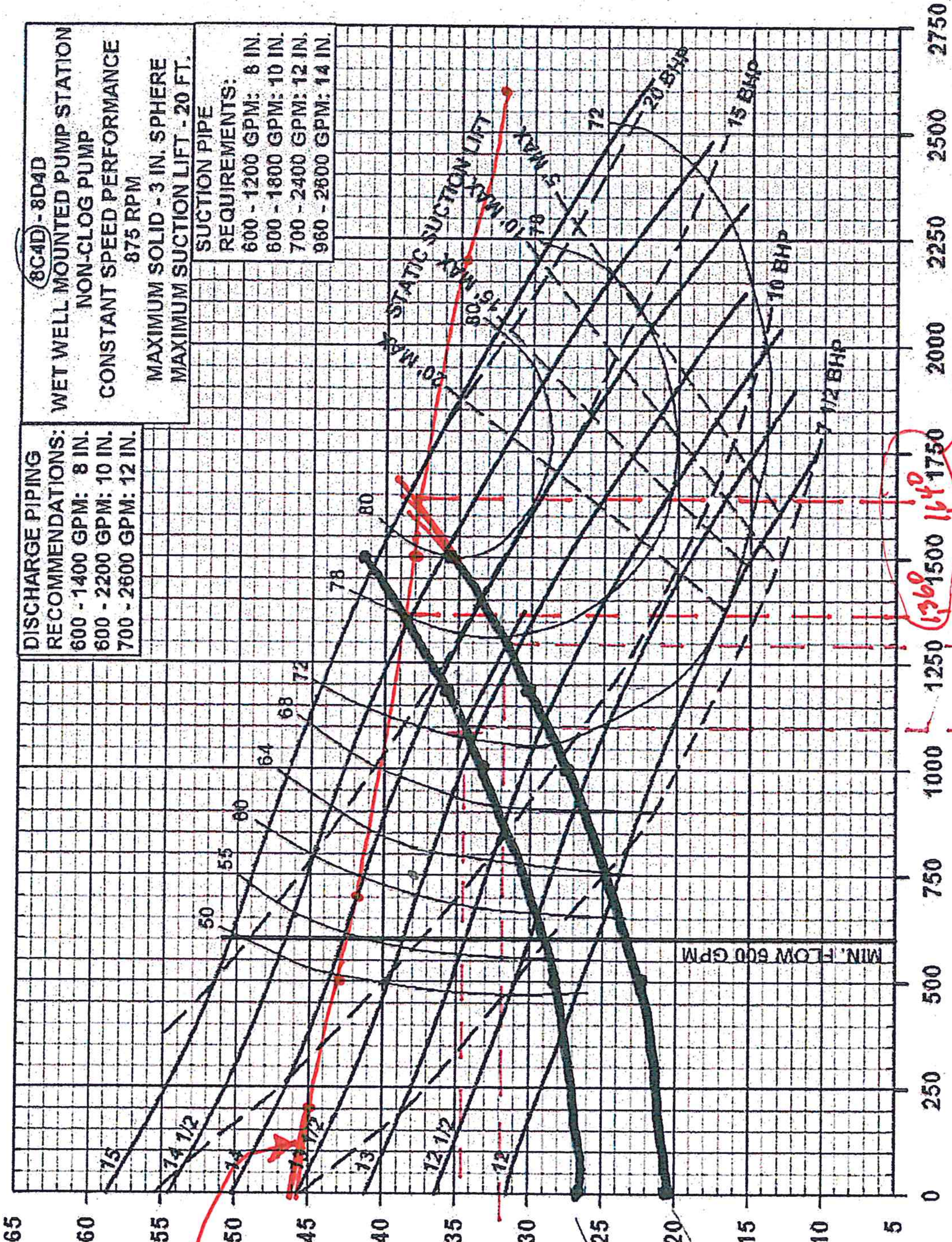
Cascade - Pump Design
Sheet 4 of 12

ENGINEERING DATA

Smith & Loveless, Inc.®

14040 West Santa Fe Trail Drive
Lenexa, Kansas 66215-1284

Vacuum Primed Pump
Performance Curve 62L156
Constant Speed
Non-Clog Pump
8C4D / 8D4D – 875 RPM
July, 2012



13 5/8 Trim
Derate Suction Lift 5.42' @ Elev. 4729.0'

Lift Station Pumps, Both Running in Parallel

One pump running. MAX. 34.6 MIN. 31.9

Pump On
SYSTEM CURVES
Pump Off

One Pump Running.

1100 MIN. 1300 MAX

1640 = 2.4 MGD < 2.7 MGD

Maximum flow that could pass through the screen is limited by the lift station pumps.

Use the 500 Series Rok4

Appendix C: Manufacturer Equipment Information

- Aeration Industries Aire-O2 Aspirator Aerator Sales Brochure
- Aeration Industries Aerator Layout Plan, Aerator Shop Drawings and Deadman Post Detail
- Aeration Industries Equipment Summary, Budgetary Price for Aeration Equipment and General Terms and Conditions
- Huber Vertical Fine Screen ROTAMAT RoK4 Sales Brochure
- RoK4 500 Sample CAD Drawing
- Sheets C-6 and C-7 of Final Lift Station Record Drawings Illustrating Screen Placement
- Manufacturer's Budgetary Price for the Screen

Aeration Industries International

AIRE-O$_2$®

Aire-O$_2$® Aspirator Aerator

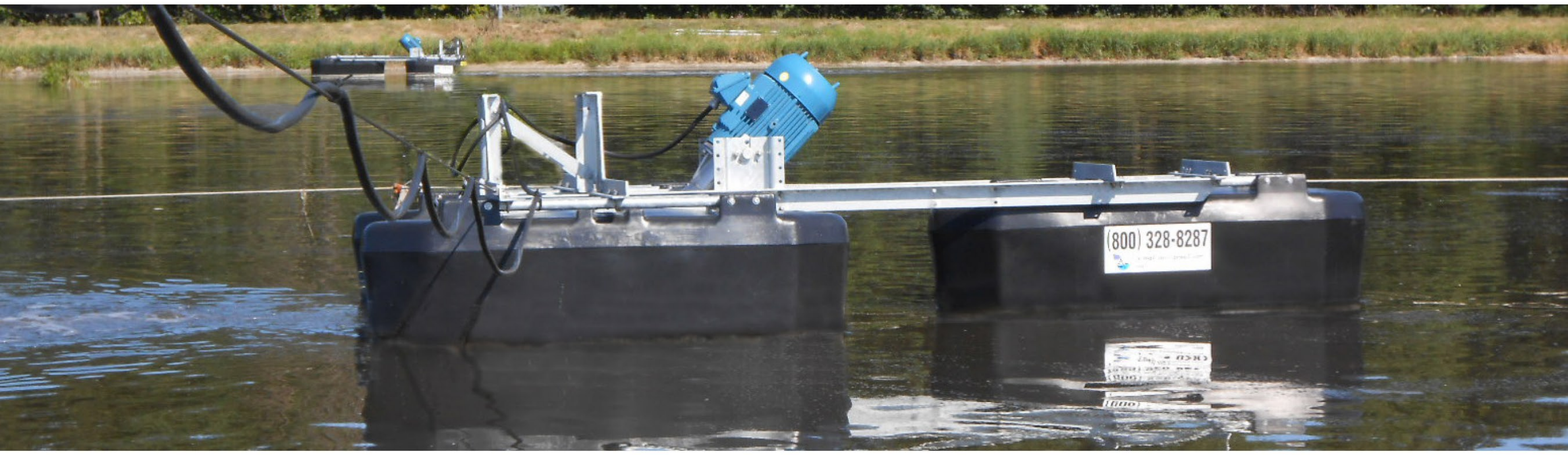
Uniform oxygen dispersion. Complete basin circulation.

The Aire-O$_2$® Aspirator produces a horizontal and circular flow pattern, providing proven whole basin circulation. Improve your wastewater treatment with higher removal rates of Biochemical Oxygen Demand (BOD) and suspended solids.

With the growing use and challenge caused by supposedly flushable wipes and poor screening becoming an increasing issue, we have customized our 10-30hp Aire-O$_2$® Aspirators with a larger stainless steel antifouling propeller and housing for low maintenance operation that excels in heavy debris conditions. The resilient, patented design forces water outward horizontally past the end of the shaft, creating a vacuum that draws atmospheric air down the shaft. The air is then dispersed in a large plume of fine bubbles to maximize oxygen dispersion and mixing. Flexible sizing and mounting options allow for easy installation in a variety of applications and consistent oxygen dispersion throughout the entire basin, regardless of its size or shape.

The Aire-O$_2$ aspirator aerator is simply designed, consisting of only a few moving parts… providing you with easy maintenance and peace of mind.

Aire-O_2® Aspirator Aerator



WHY CHOOSE THE AIRE-O_2® ASPIRATOR?

- Trusted performance in challenging, heavy debris conditions
- Simple to install and portable; ideal for retrofits and upgrades
- Consistent seasonal performance
- No aerosols
- Offering 10-30hp Aire-O_2® Aspirators with larger stainless steel antifouling propeller and housing

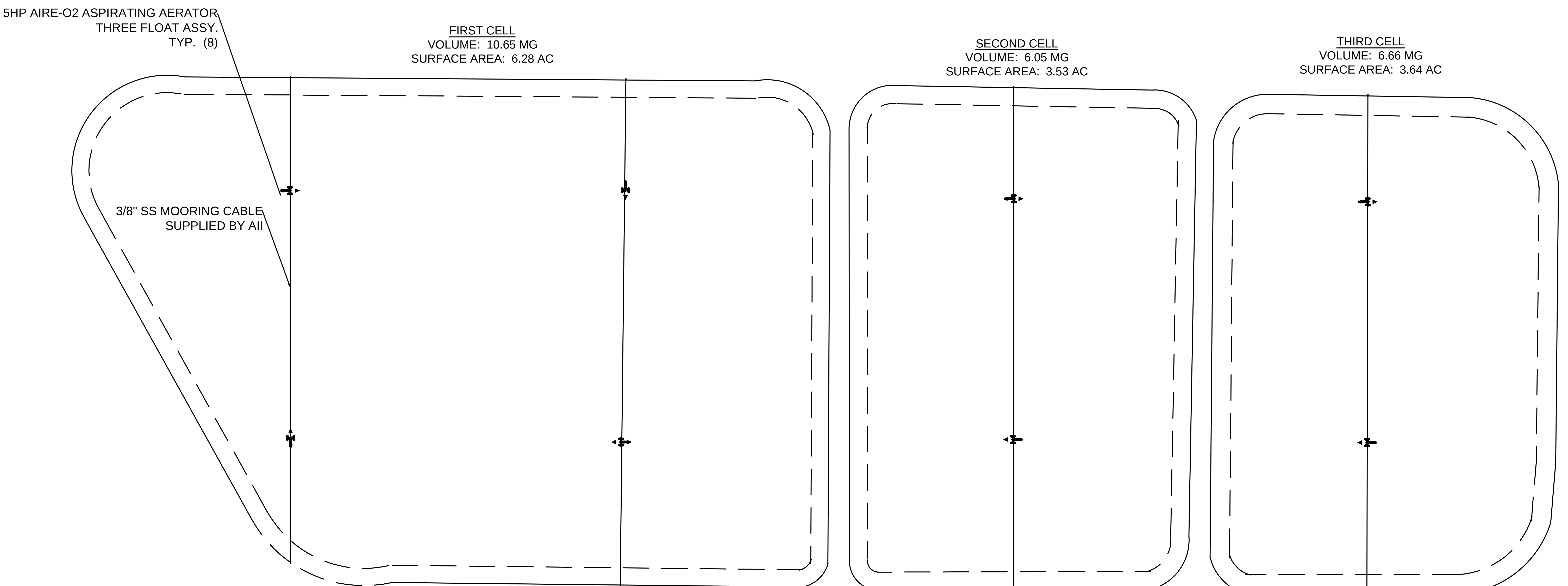
FEATURING

- Mixing and fine bubble aeration
- Variable mounting angle offers flexibility
- Three (3) year warranty for 2-100hp (7.5-22 kW) sizes in worldwide voltage, phase and Hz combinations
- Robust 1450/1800 rpm 4 pole motors allow for high velocity aspiration with extended motor life
- Field replaceable, water lubricated lower bearing with wear-resistant sleeve
- Wall, bridge mount assembly
- Housing mounted vortex shield available upon request

> "It has been a great relief to have dependable equipment that doesn't require babysitting."

DARYL VANDYKE, MANAGER
KALAMAZOO LAKE SEWER AND WATER AUTHORITY

Aeration Industries® International | +1-952-448-6789 | 4100 Peavey Road Chaska, MN 55318, USA | aii@aireo2.com
www.aerationindustries.com |



NOTES:

AII RECOMMENDS INSTALLING EIGHT (8) 5HP AIRE-O2 ASPIRATING AERATORS TO MEET THE OXYGEN AND MIXING REQUIREMENTS FOR TREATMENT.

MINIMAL WATER FLUCTUATION IS ASSUMED. IF WATER FLUCTUATION IS EXPECTED TO BE 2' OR GREATER, SWING ARM ASSEMBLIES ARE REQUIRED.

AERATOR POSITIONING RECOMMENDATION MAY CHANGE DEPENDING ON INFLUENT/EFFLUENT STRUCTURE LOCATIONS

REV.	DATE:	BY:	DESCRIPTION:
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Aeration Industries' International, LLC.
4100 Peavey Rd, Chaska, MN 55318 • USA www.aireo2.com
Phone: +1-952-448-6789 • Fax: +1-952-448-7293
aii@aireo2.com

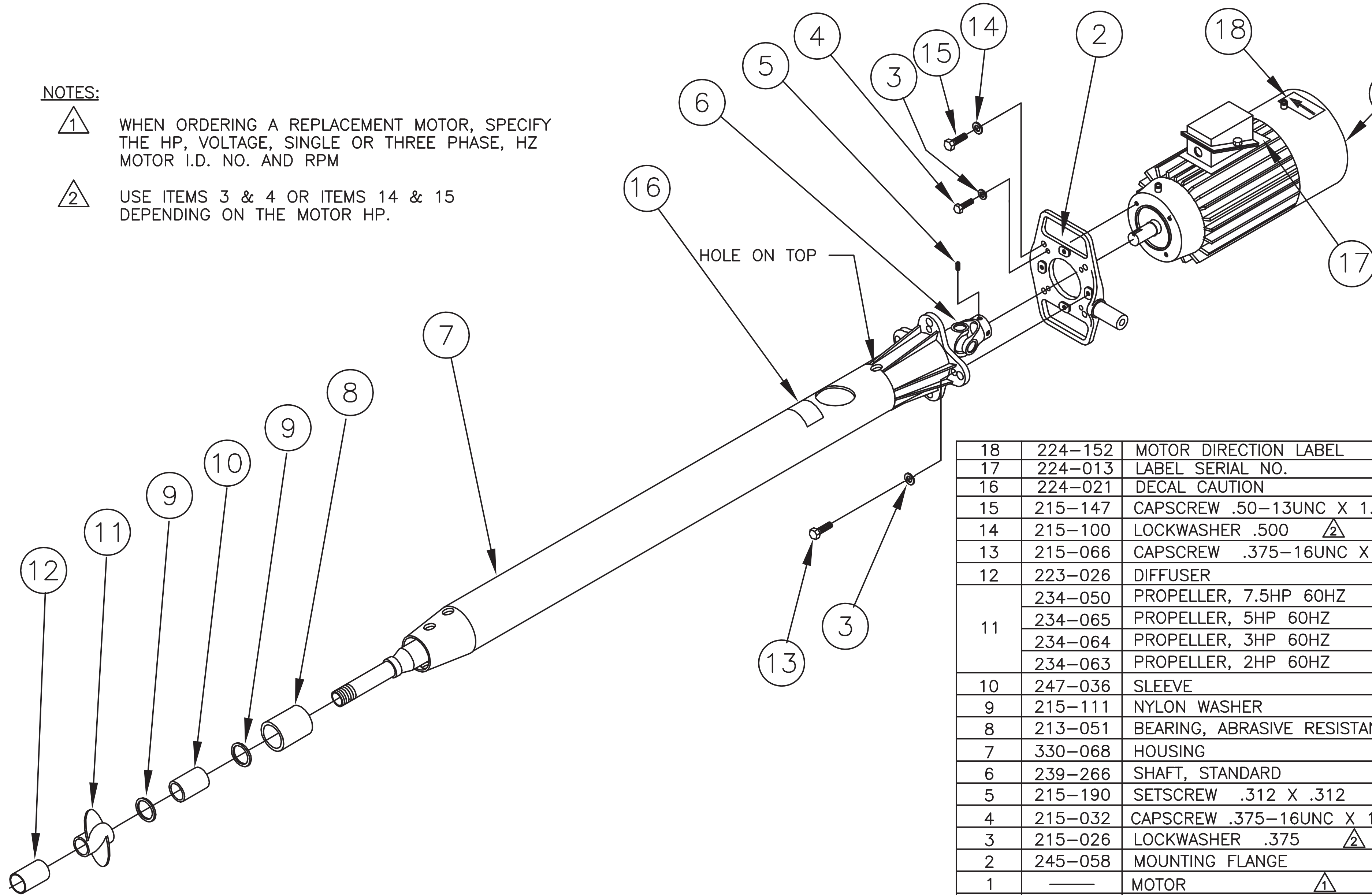
DRAWN BY: APR DATE: 4/20/2017
CHECKED BY: - DATE: -
SCALE: -

DRAWING STATUS:
- ☐ INFORMATION ONLY
- ☒ PRELIMINARY
- ☐ APPROVAL
- ☐ CERTIFIED FOR CONSTRUCTION
- ☐ AS-BUILT

CLIENT: -

TITLE: TOWN OF CASCA, IDAHO
OXIDATION POND
AIRE-O2 LAYOUT

REV: - PROJECT NUMBER: 15-7-4748 SHEET 1 OF 1



NOTES:

1. WHEN ORDERING A REPLACEMENT MOTOR, SPECIFY THE HP, VOLTAGE, SINGLE OR THREE PHASE, HZ MOTOR I.D. NO. AND RPM
2. USE ITEMS 3 & 4 OR ITEMS 14 & 15 DEPENDING ON THE MOTOR HP.

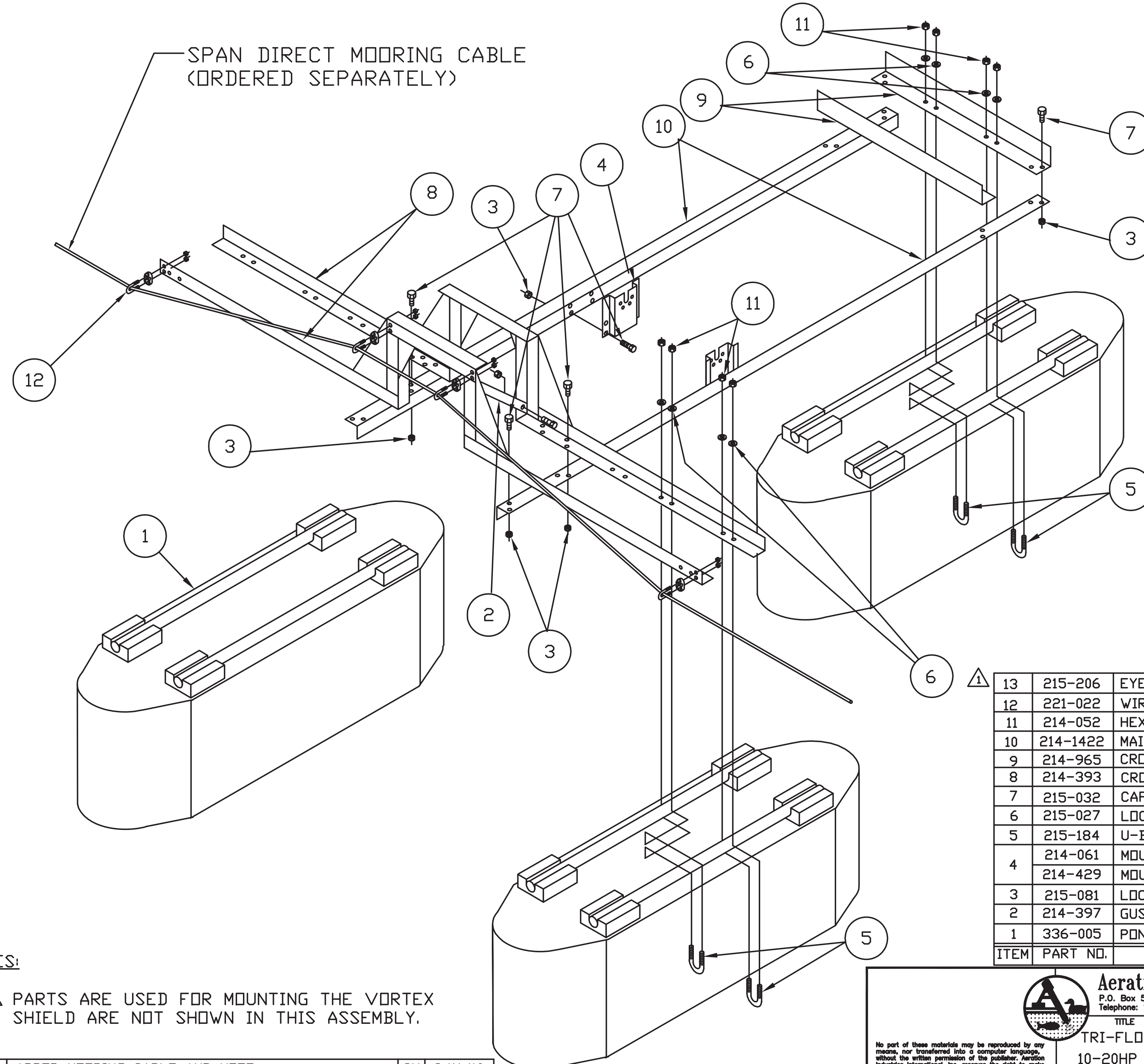
ITEM	PART NO.	DESCRIPTION	QTY
18	224-152	MOTOR DIRECTION LABEL	1
17	224-013	LABEL SERIAL NO.	1
16	224-021	DECAL CAUTION	1
15	215-147	CAPSCREW .50-13UNC X 1.25 (2)	4
14	215-100	LOCKWASHER .500 (2)	4
13	215-066	CAPSCREW .375-16UNC X 1.00	4
12	223-026	DIFFUSER	1
11	234-050	PROPELLER, 7.5HP 60HZ	1
	234-065	PROPELLER, 5HP 60HZ	
	234-064	PROPELLER, 3HP 60HZ	
	234-063	PROPELLER, 2HP 60HZ	
10	247-036	SLEEVE	1
9	215-111	NYLON WASHER	2
8	213-051	BEARING, ABRASIVE RESISTANT	1
7	330-068	HOUSING	1
6	239-266	SHAFT, STANDARD	1
5	215-190	SETSCREW .312 X .312	2
4	215-032	CAPSCREW .375-16UNC X 1.25 (2)	4
3	215-026	LOCKWASHER .375 (2)	8
2	245-058	MOUNTING FLANGE	1
1	———	MOTOR (1)	1

REV.	ECO NO.	CHANGE	BY	DATE
D	07-2032	239-266 WAS 239-125	RH	4-20-07
C	–	CANCELED ECO 03-1610	RH	5-9-05
B	03-1610	245-126 WAS 245-058	SH	12-23-03
A	01-1432	ADDED ITEM #16	RH	7-24-01
–	–	WAS SK92-010	SH	3-28-00

Aeration Industries International
P.O. Box 59144 Minneapolis, MN 55459 USA
Telephone: 1(612)448-6789 Telex: 9105780838 Facsimile: 1(612)448-7293

TITLE: AERATOR ASSEMBLY 2-7.5 HP, 60HZ NEMA

DRAWN: S. HOOF DATE: 3-28-00
APPROVED: DATE:
DRAWING NO.: 360-101 REV.: D
SCALE: – PLOT: 1 = 1 SHEET: 1 OF 1



	ITEM	PART NO.	DESCRIPTION	QTY
△1	13	215-206	EYEBOLT .375	2
	12	221-022	WIRE ROPE CLAMP, SS	4
	11	214-052	HEX NUT .31-18UNC	24
	10	214-1422	MAINFRAME	2
	9	214-965	CROSSMEMBER	2
	8	214-393	CROSSARCH	2
	7	215-032	CAPSCREW .375-16UNC x 1.25	30
	6	215-027	LOCKWASHER .312	24
	5	215-184	U-BOLT	12
	4	214-061	MOUNT BRACKET (10-20 HP)	2
		214-429	MOUNT BRACKET (25-30HP)	
	3	215-081	LOCKNUT .375-16UNC	30
	2	214-397	GUSSET	2
	1	336-005	PONTOON	3

NOTES:

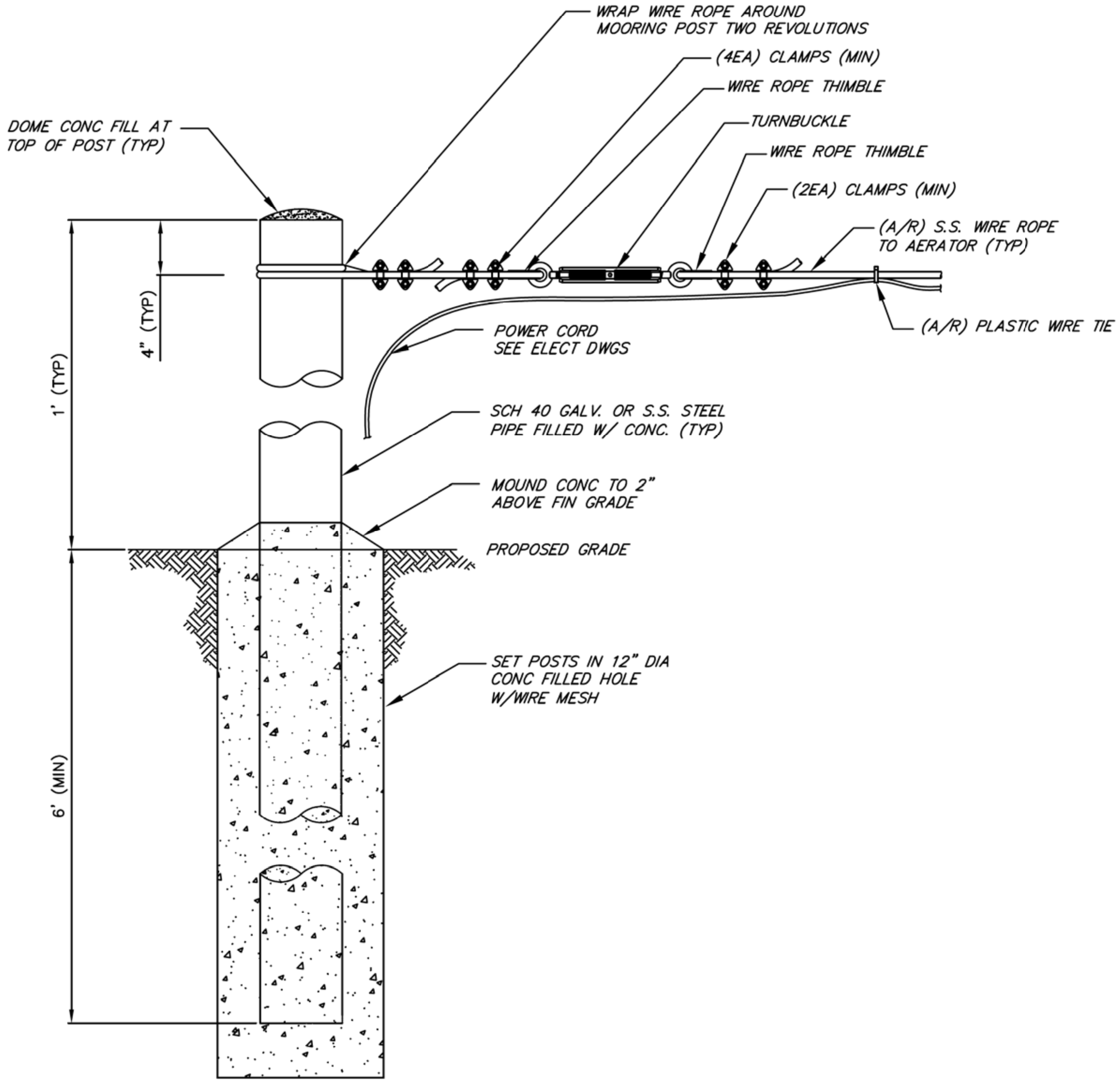
△1 PARTS ARE USED FOR MOUNTING THE VORTEX SHIELD ARE NOT SHOWN IN THIS ASSEMBLY.

REV.	ECO NO.	DESCRIPTION OF CHANGE	BY	DATE
C	10-2374	ADDED MOORING CABLE AND NOTE	CY	8/11/10
B	09-2231	214-1422 WAS 214-062 DELEATED 214-104, 214-064	RH	6-1-09
A	01-1470	ADDED P/N 214-968	RH	8-28-02

Aeration Industries International
P.O. Box 59144 Minneapolis, MN 55459 USA
Telephone: 1(612)448-6789 Telex: 9105780838 Facsimile: 1(612)448-7293

TITLE: TRI-FLOAT ASS'Y, STAINLESS STEEL 10-20HP 60HZ/50HZ & 25-30HP 60HZ

DRAWN: RVH	DATE: 9-14-01	DRAWING NO.: 360-082	PROJECT NO.:	REV.: C
APPROVED:	DATE:	SCALE: NONE	PLOT: FIT	SHEET 1 OF 1



METHOD W/O EYE-BOLT

NOTE:
THIS IS A DESIGN RECOMMENDATION FOR A TYPICAL INSTALLATION ONLY. FINAL DESIGN IS THE RESPONSIBILITY OF THE ONSITE CONTRACTOR/CIVIL ENGINEER AFTER ACTUAL SITE CONDITIONS ARE ANALYZED.

TYPICAL MINIMUM SOIL REQUIREMENTS:
COMPRESSED SATURATED GRANULAR WITH AN ALLOWABLE BEARING PRESSURE OF 1000 PSF. DO NOT PLACE IN ORGANIC SOIL (BLACK DIRT, PEAT, ETC.) OR LOOSE SAND.

Aeration Industries International, LLC.
P.O. Box 59144 Minneapolis, MN 55459 USA
Telephone: 1(952)448-6789 Fax: 1(952)448-7293

TITLE	MOORING POST DETAILS TYPICAL INSTALLATION		
DRAWN NSF	DATE 10-6-10	PROJECT NO. SK11-002	REV. –
REVISED	DATE	SCALE	PLOT
SHEET 1	OF 1		

3. Equipment Summary

Eight (8) 5HP AIRE-O_2® Aspirating Aerators, consisting of:

- 5 HP TEFC, 230/460 volt, 3 phase, 60 Hz, motor with motor heater
- Field replaceable, water lubricated lower bearing
- Field replaceable, wear-resistant sleeve
- 316 stainless steel three-bladed propeller
- 304 stainless steel diffuser and hollow shaft
- 304 stainless steel housing with mounting flange
  Note: Aerators shall arrive fully assembled for immediate mounting on flotation assembly.

Eight (8) Tri-Float Assemblies, consisting of:

- Three (3) molded low-density polyethylene, closed cell pontoon
- Stainless steel mounting hardware
  Note: Flotation devices require minimal field assembly.

One (1) Lagoon Control System, consisting of:

- NEMA rated free standing enclosure
- Main fuse disconnect
- 480/240-120VAC control transformer
- Power distribution box
- Eight (8) IEC contactor with adjustable ambient compensated overload relay
- Eight (8) NEMA 4X outdoor selector switch 3 position Run-Off-Auto
- Eight (8) NEMA 4X outdoor pilot light
- Eight (8) 24 Hour adjustable time clocks
- Underwriters Laboratories U/L 508 serialized label

2250’	**Spool 3/8" Stainless Steel Mooring Cable**
Eight (8)	**3/8" SS Mooring Cable End Assemblies**
Eight (8)	**3/8” SS Mooring Cable Turnbuckles**
1250’	**10/4 SEOOW Electrical Cable**

Freight FOB to Jobsite
Field Service (one trip, one day)
Three (3) Year Warranty (See General T&C’s)

BUDGETARY PRICE: $179,749

EXCLUSIONS:	Installation, duties and taxes are not included. DO controls and instrumentation, cord grips, hand winches, mooring posts, and all items not specifically listed above are excluded.
NOTE:	If required, submittals will be done six weeks from receipt of purchase order. Delivery is ten to twelve weeks from submittal approval. Quotation valid for 30 days. Three year non prorated warranty
TERMS:	General Terms and Conditions Attached (2 pages).

AERATION INDUSTRIES INTERNATIONAL, LLC

General Terms and Conditions

1. **Price.** Published prices are subject to change without notice and shall not be binding on Seller until reduced to writing signed by Seller. All prices are F.O.B. Chaska, MN, and do not include transportation cost or charges relating to transportation, which costs and charges shall be solely the responsibility of Purchaser. Prices quoted include standard packing according to Seller's specifications. Special packing requested by Purchaser, including packing for exports, shall be paid by the Purchaser as an additional charge.

2. **Taxes.** To the extent legally permissible, all present and future taxes, imposed by any Federal, State, Local or foreign authority, which Seller may be required to pay or collect upon or with reference to the sale, purchase, transportation, delivery, storage, use or consumption of goods or services, including taxes upon, or measured by the receipts therefrom, shall be paid by Purchaser. Amounts covered hereby shall be added to the price, or billed as a separate item as the law may require or as the Seller may determine. No offset against or reduction in price shall be allowed Purchaser by reason of taxes owed, paid or payable by Purchaser, or charged by Purchaser's account.

3. **Credit and Payment.** Credit accounts will be opened only with firms or individuals approved by Seller's Credit Department. Unless otherwise provided, in any case where delivery is made on credit, Purchaser shall have thirty (30) days from date of the invoice in which to make payment for the goods. Seller reserves the right at any time upon notice to Purchaser, to alter or suspend credit, or to change the credit terms provided herein, when in its sole opinion the financial condition of the Purchaser so warrants. In addition, the Seller may at any time, with or without notice to Purchaser, and at its option, suspend work and shipment under this contract if, in the Seller's sole opinion, the financial condition of the Purchaser so warrants. In such cases, in addition to any other remedies herein, or by law provided, cash payment or satisfactory security from the Purchaser may be required by the Seller before credit is restored or Seller continues performance. If the Purchaser fails to make payment or fails to furnish security satisfactory to Seller, then Seller shall also have the right to enforce payment of the full contract price of the work completed and in process. Upon default by Purchaser in payment when due, Purchaser shall pay immediately to Seller the entire unpaid amounts for any and all shipments made to purchaser irrespective of the terms of said shipment and whether said shipments are made pursuant to this contract or any other contract of sale between Seller and Purchased, and Seller may withhold all subsequent shipments until the full account is settled. Acceptance by the Seller of less than full payment shall not be a waiver of any or its rights hereunder. The seller reserves the right, at its discretion, to charge up to 1½% per month for amounts not paid within stated terms.

4. **Cancellation.** Cancellation of orders once placed with and accepted by us can only be made by us. Should the Purchaser, due to change in design or other good and sufficient cause, desire to effect cancellation of the order, same will be accepted on the following basis:

Purchaser shall pay in full the costs of all material, dies, tools, patterns and fixtures provided for this order, that are on hand or for which we are obligated, together with all labor and other expense incurred in connection therewith. Invoices covering said costs shall be due and payable immediately upon our acceptance of cancellation.

5. **Patents.** To the best of our knowledge, the articles purchased hereunder do not infringe any Letters Patent granted to others by the United States of America or by any country foreign thereto. We do not assume any responsibility or liability for any claim of infringement brought against the Purchaser, its successors, assigns, customers or udders of its product. The Purchaser agrees to hold us harmless against any claim of infringement which arises out of compliance by us with specifications furnished by Purchaser.

6. **Risk of Loss, Title.** The risk of loss of the goods shall pass to the Purchaser as soon as they are deposited with the carrier for shipment to the Purchaser, but title to the goods shall remain in the seller until the purchase price therefore has been paid.

7. **Shipment.** All shipments shall be F.O.B. Chaska, MN, and the date of shipment shall be contingent upon the date of acceptance of Seller's offer. Seller's obligation with respect to shipments of the goods shall not extend beyond a) putting the goods in the possession of such a carrier and making such a contract for the transportation thereof as may be reasonable having regard to the nature of the good; b) obtaining and delivering within a reasonable time such documents as may be necessary for Purchaser to obtain possession of goods; and c) notifying the Purchaser of the shipment within a reasonable time. Seller shall have the right to ship all of the goods at one time or in portions from time to time within the time of shipment. This contract shall be deemed separable as to the goods sold. Purchaser may not refuse to accept any lot or portion of the goods shipped hereunder on the grounds that there has been a failure to ship any other lot or that goods in any other lot were nonconforming. Any such default by Seller will not substantially impair the value of this contract as a whole and will not constitute a breach of the contract as a whole. The goods shall be deemed to have been tendered to Purchaser when they have been deposited with the carrier.

8. **Inspection and Acceptance.** Purchaser shall have the right to inspect the goods upon receipt of them and shall have the opportunity, at that time, to run adequate tests to determine whether the goods shipped conform to the specification of this contract.

Purchaser shall recompense Seller, at the contract price, for all goods used in testing and Purchaser shall bear any expense incurred in the inspection of the goods used in testing, whether or not the goods are non-conforming. Failure to inspect the goods or failure to notify the Seller in writing that the goods are nonconforming with ten (10) days of the receipt of the goods by Purchaser, shall constitute a waiver of Purchaser's rights of inspection and rejection for nonconformity and shall be equivalent to an irrevocable acceptance of the goods by Purchaser. Acceptance – Unless we receive notification to the contrary promptly from you, we will consider the foregoing conditions as been acceptable to you.

9. **Excuse in Seller's Performance.** This contract is subject to an the Seller shall not be responsible or liable for any delay directly or indirectly resulting from or contributed limitations on Seller's production, capabilities, prompt settlement of all details relating to the materials covered by this proposal, and to delays due to fires, explosions, acts of God, strikes or other differences with workmen, shortage of utility, facility, components or labor, delay in transportation, breakdown or accident, war and acts of war, compliance with or other action taken to carry out the intent of purposes of any law or regulation, changes, or revisions, accidents or any other causes or contingencies not caused by Seller or other which Seller had no reasonable control. In the event that any one or more deliveries hereunder is suspended or delayed by reason of any one or more of the occurrences or contingencies aforesaid, any and all deliveries so suspended or delayed shall be made after such disabilities have ceased to exist, and nothing herein contained shall be construed as lessening in any event the full amount of goods herein purchased and sold, but only as deferring delivery and payment in the events and to the extent herein provided for. Neither shall any delay in shipment be considered as a default under this contract or give rise to any liability on the part of Seller for items of incidental, special consequential damage unless such delay was directly and proximately caused by the willful and wanton act of gross negligence of Seller. Acceptance of material on delivery shall constitute a waiver of any claims against seller for damages on accounts of delay.

10. **Warranty.** Seller warrants that it will, at its option, repair or replace the goods, or return the purchase price thereof, which are found to be defective in material or workmanship or not in conformity with the contract requirements provided that, within three (3) year of shipment thereof, Purchaser gives written notice of such defect to Seller, the Purchaser returns the goods to Seller at point of original manufacture, with transportation charges prepaid by Purchaser, and an examination by Seller discloses to its satisfaction the existence of such defect or nonconformity with the contract requirements. In no event shall Seller be liable for any incidentals, special or consequential damages resulting from said effects or nonconformity. This warranty specifically excludes all labor charges that could be incurred.

THE FOREGOING DOES NOT APPLY TO COMPONENTS WHERE WERE NOT MANUFACTURED BY SELLER, AND IS EXPRESSLY IN LIEU OF OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE OR USE. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE FOREGOING, NO AGENT, EMPLOYEE OR REPRESENTATIVE OF THE SELLER HAS ANY AUTHORITY TO BIND THE SELLER TO ANY AFFIRMATION, REPRESENTATION OR WARRANTY CONCERNING THE GOODS SOLD UNDER THIS SALES CONTRACT, AND UNLESS AN AFFIRMATION, REPRESENTATION OR WARRANTY MADE BY AN AGENT EMPLOYEE OR REPRESENTATIVE IS SPECIFICALLY INCLUDED WITHIN THIS WRITTEN AGREEMENT, IT SHALL NOT BE ENFORCEABLE TY THE PURCHASER.

11. **Remedies of Purchaser.** If goods are tendered which do not conform with the specifications under the sales contract and these goods are rejected by Purchaser, Seller shall have the right to cure the tender by either correcting the goods or substituting conforming goods. In the event that such substituted goods fail to conform to the contract or in the event of any other breach or repudiation of this contract by Seller, Purchaser shall not be entitled to recover any incidental or consequential damages as those terms are defined in Section 2-715 of the Minnesota Uniform Commercial Code and Purchaser's right to damages shall be limited to the difference between the contract and the market price of the goods as provided in Section 2-713 of the Minnesota Uniform Commercial Code. Purchaser shall not have the right to "cover" as provided in Section 2-712 of the Minnesota Uniform commercial code nor any rights to recover damages for any loss resulting in the ordinary course of events from nonconformity of tender as contained in Section 2-714(1) of the Minnesota Uniform Commercial Code.

12. **Assignments.** No right to interest in this contract shall be assigned by Purchaser, without the written permission of Seller, and no delegation of any obligation owned by Purchaser shall be made without permission of the Seller. Any attempted assignment of delegation shall be wholly void and totally ineffective for all purposed.

13. **Alterations, Interpretations and Definitions.** This contract shall be governed by the laws of Minnesota and is intended also as a complete and exclusive statement of the terms of their agreement. No course of prior dealings between the parties, and no usage of the trade shall be relevant to supplement or explain any term used in this contract. Acceptance or acquiescence to a course of performance rendered under this contract shall not be relevant to determine the meaning of this contract, even though the accepting or acquiescing party has knowledge of the nature of the performance and an opportunity for objection. Waiver by Seller of a breach by Purchaser of any provision of this contract shall not be deemed a waiver of future compliance therewith, and such provision shall remain in full force and effect. Any term used in this contract which is not defined herein shall have the same definition as that contained in the Minnesota Uniform Commercial Code.

Vertical Fine Screen ROTAMAT® RoK 4

Fine Screen with vertical lifting, dewatering and compaction of screenings

– Compact unit, easy to fit into confined spaces
– Prevents clogging of sewers and pumps
– Optional guide rails for easy and safe maintenance

Challenge

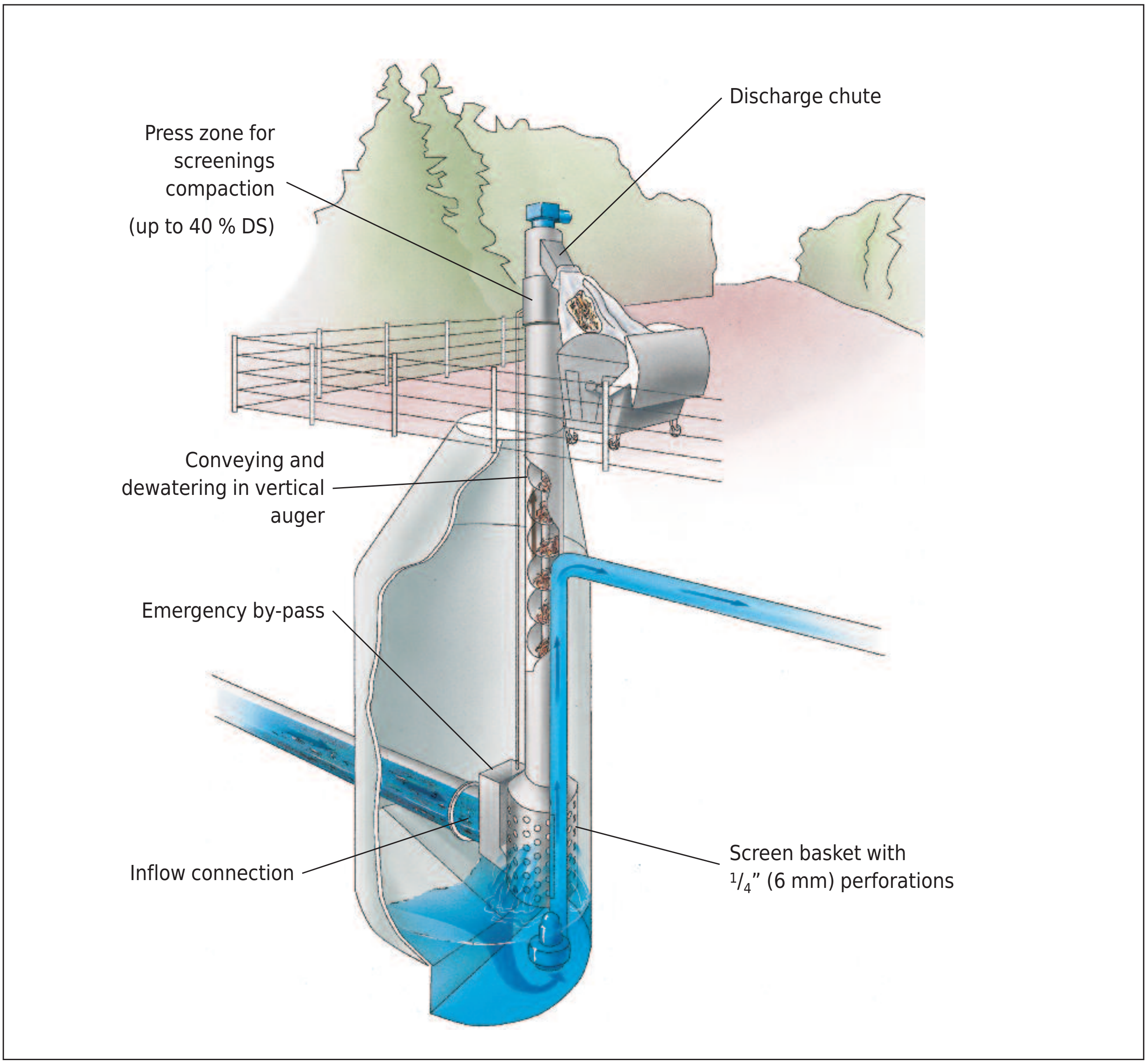
Pumps in lift stations require a lot of maintenance. Pumps with a large clear passage are used to prevent frequent clogging. However, those pumps have poor efficiency, particularly where the flow is low. Grinder pumps are subject to high wear, thus also requiring frequent maintenance in a narrow and dangerous environment.

Pump failure can lead to back-flooding in sewer systems, sometimes causing substantial damage.

Solution

Upstream screening protects pumps from clogging and permits use of high-efficiency pumps. In addition, removal of coarse solids protects sewers by preventing deposits and reducing septicity, odor and concrete corrosion.

Our RoK 4 is the ideal screen for such applications. It is extremely compact and fits easily into confined spaces, such as wet wells and manholes. It vertically lifts the screenings, and dewaters and compacts them at the same time.



Installation in a confined pump station

Capacity

Size	Flow	
	[l/s]	[MGD]
300	46	1.05
500	120	2.7
700	180	4.1

Features

The RoK 4 consists of a vertical screen basket and a shafted auger in a vertical tube. Wastewater flows through an inflow connection and a chamber into the screen basket. The top of this chamber is open and serves as an emergency bypass, e.g. in case of power failure. The inflow drops into the screen basket thus generating turbulence for the removal of fecal matter from solids (washing action). The drop also prevents back-flooding and solids deposits in the incoming sewer.

The screen is provided with 1/4” (6 mm) perforations; other sizes are available on request. When the water level in the screen basket rises above the invert level of the inflow connection, the auger revolves for a short time period. Within the screen basket the flights of the auger are equipped with a wear-resistant brush for effective cleaning of the screen.

As the screenings are gradually elevated by the auger, they are dewatered by gravity drainage. A screenings compaction zone is provided near the upper end of the auger. Water is pressed out of the screenings through perforations in the vertical tube. Filtrate drains through a hose back into the inlet chamber. The compacted screenings are discharged through a chute into a container or endless bagger for odor control.

Benefits

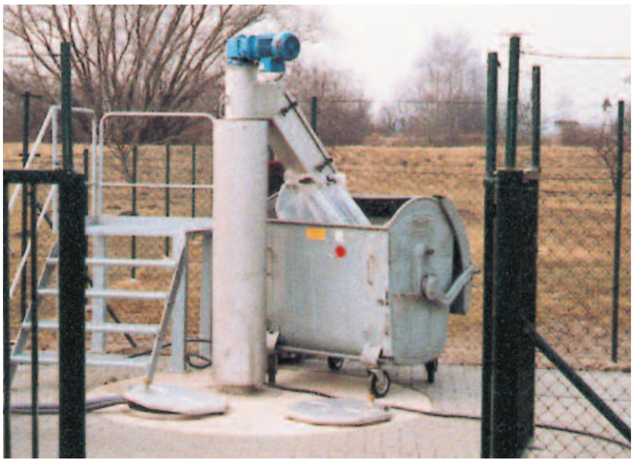
- Prevents pump clogging and failure
- Screening, lifting, dewatering, compaction and bagging in a single and compact unit
- Single, easily accessible drive
- Excellent washing of fecals due to turbulent flow
- Optional frost-protection for outdoor installation
- Quick and easy installation into confined structures
- Easy retrofitting with little need for construction work
- Integrated bypass for power failure
- Sturdy design, reliable operation
- Optional guide rail for easy and safe maintenance
- Made of stainless steel, pickled in an acid bath
- Over a hundred installations

Applications

- Headworks of small to medium size wastewater treatment plants
- Pump or lift stations
- Sewer manholes or other sewer structures

Examples

A few examples, selected from overone hundred RoK 4 installations.



Thermally insulated and heat-traced unit

Outdoor-installation with frost-protection

Screenings discharge into a bagger

Another indoor-installation

HUBER TECHNOLOGY, Inc.

9735 NorthCross Center Court STE A · Huntersville, NC 28078
Phone: (704) 949 - 1010 · Fax: (704) 949 - 1020
huber@hhusa.net · http://www.huber-technology.com

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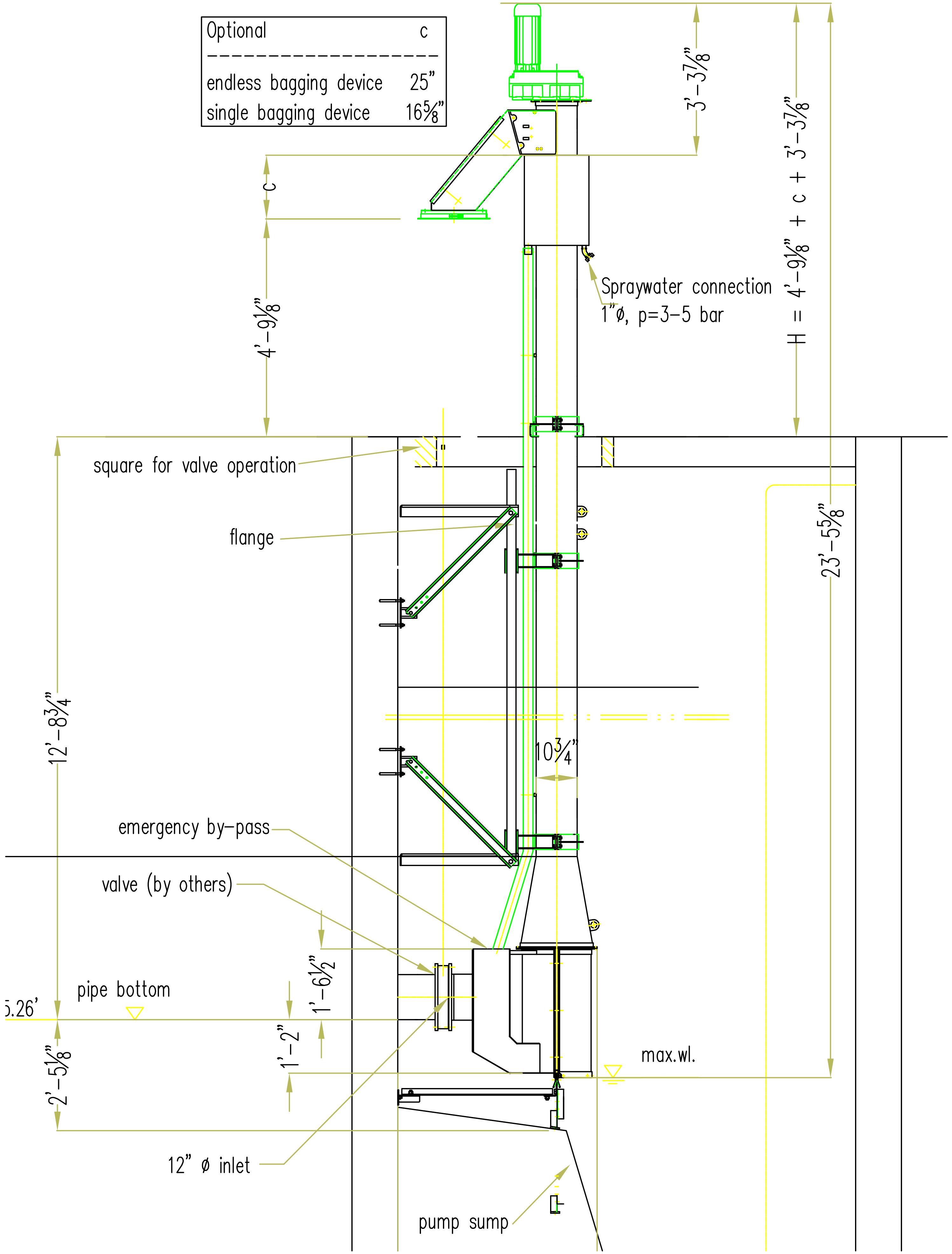
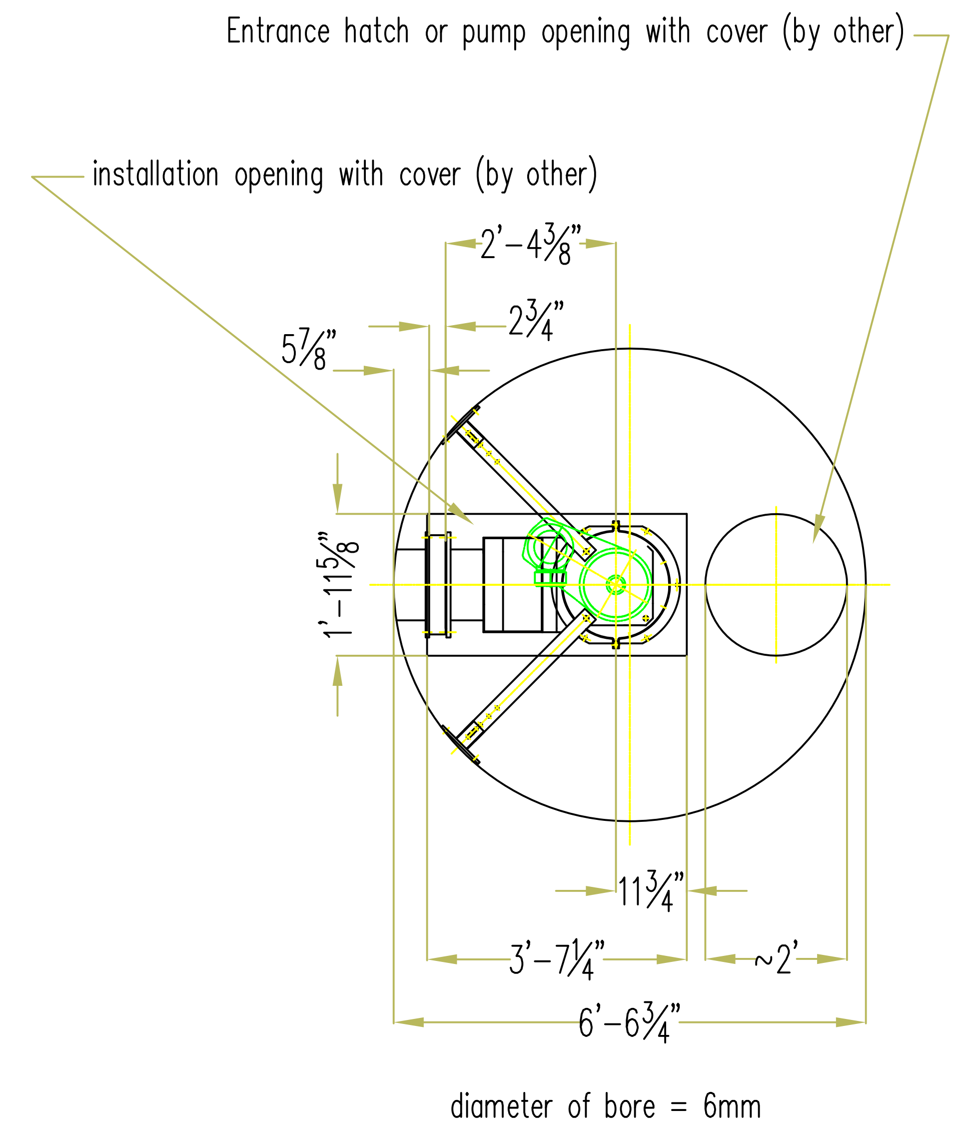




HUBER TECHNOLOGY

9735 NorthCross Center Court, Suite A
Huntersville, NC 28078
Tel. 704-949-1010
info@huber-technology.com

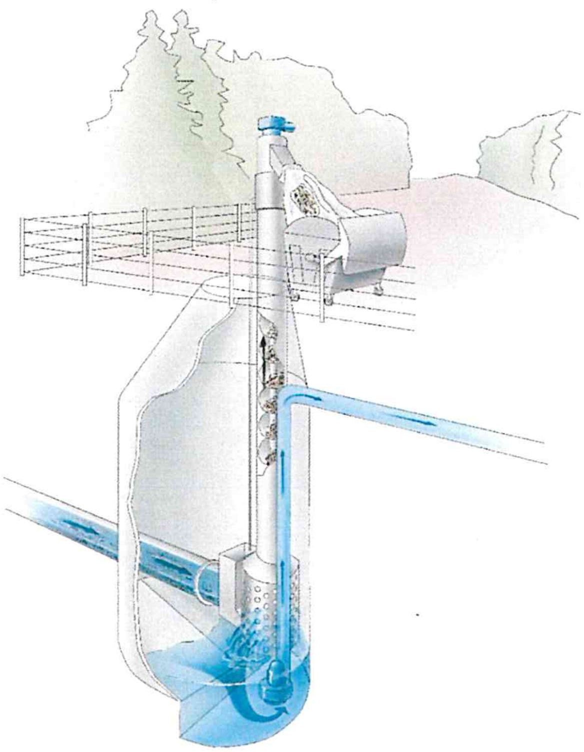
RoK4 size 500		
Fig No. 1/1	Dimensional Sheet	Scale: 3/8" = 1'-0"
Project No.	Drawing No. Rok4_500_2010.dwg	

BUDGET PROPOSAL

Project Name: Cascade, ID

Equipment Type: RoK4 500/6

Date: April 27, 2017



Huber Contact:
John Lewis
Regional Sales Director - West
John@hhusa.net 704-995-5451

Represented by:
Ryan Spanton
Goble Sampson
801) 268-8790

HUBER TECHNOLOGY
WASTE WATER Solutions

Huber Technology, Inc.
9735 NorthCross Center Court
Suite A
Huntersville, NC 28078

Phone: (704) 949-1010
Fax: (704) 949-1020

DESCRIPTION

ROTAMAT® RoK4 Fine Screen for Confined Spaces
Model: One (1) x RoK4 500/6

Design Clarifications:
Maximum Flow: 2.74 MGD Wastewater
Plant Specific Flow: 1.75 MGD Wastewater
Top of Well to Invert: ~~11~~ ft (estimated) 14.7'
Total Length: ~~22.64~~ ft (6900 mm) 26.34'

Including:

- 304L Stainless Steel construction; pickled and passivated in acid bath
- Vertical screen basket
- Basket perforation: 1/4 in. (6 mm)
- Flights of screw equipped with wear resistant brush for effective cleaning of screen
- Shafted auger in vertical tube
- Integrated screening press
- Automatic Press Zone Washing System with one (1) 1 in., Brass, C1D1 Solenoid Valve
- Class 1 / Division 1 Motor, 2 hp
- Closed Discharge Chute
- Bagging Unit
- 12 in. ANSI Flange Inlet Connection

RoK4 Main Control Panel
Including:

- NEMA 4X, 304 Stainless Steel Enclosure
- Main disconnect, non-fused with door handle
- FVR, IEC starter w/CB branch circuit [screen]
- PLC, Allen-Bradley MicroLogix 1400 w/required IO
- OIU, Allen-Bradley PanelView 300 Micro
- UL label
- Pressure sensor, 0-2 PSI with cable

Manufacturer's Services
Including:

- One (1) trip, two (2) days on site for start-up, installation, training, etc.
- Additional services are available on a per diem rate upon request
- Freight to site included

Price: ~~$95,000~~ $99,000

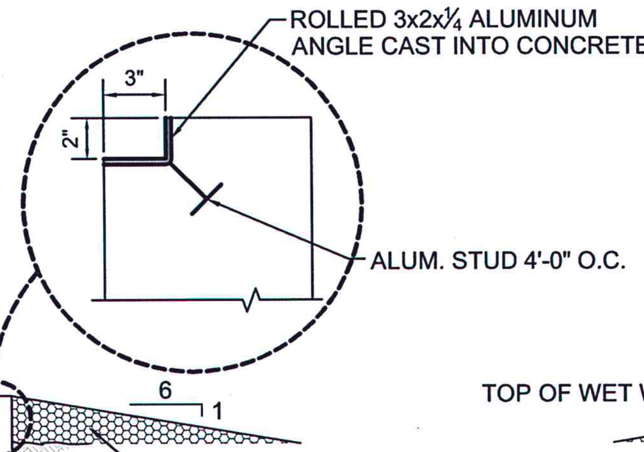
Optional: Lift In / Lift Out Device and Structure: +$10,000 ADDER
Optional: Cold Weather Package Protection (to -20F): +$14,000 ADDER

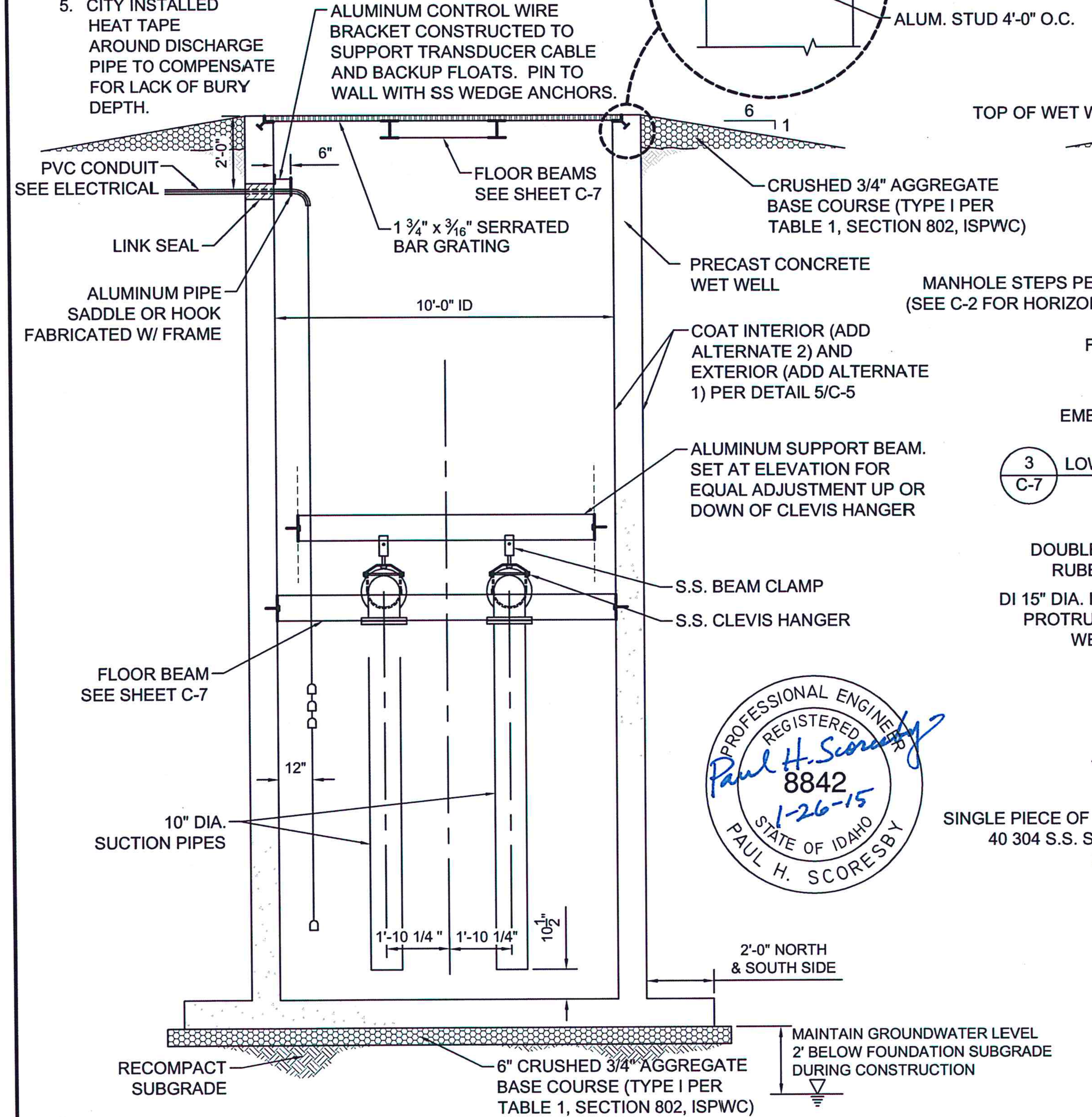
Notes:

1. Budget Proposal is quoted in US$ unless otherwise stated.
2. Detailed Equipment Specification, Drawing, and Formalized Proposal are available upon request.
3. Huber recommends the lift in lift out device to facilitate removing the screen for any required maintenance
4. Machines made from 316L stainless steel or Duplex are available for a price adder for extremely harsh operating environments.
5. Proposal estimate is based upon Huber Technology's Standard Design, Terms, and Conditions. Any deviation from these standards may result in a price adder.
6. If there are site-specific hydraulic constraints that must be applied, please consult Huber Technology's representative to ensure compatibility with the proposed system.
7. Huber's Cold Weather package list above includes heated motor windings, cold weather gearbox, heat tracing and insulation of the screens rising pipe and discharge chute. This can be had in C1D1 configuration
8. All of Huber's standard machines and systems are manufactured from 304L stainless steel. Huber makes no representation or warranties concerning the service life of the equipment against such abrasion or corrosion. The concentration of chloride and hydrogen sulfide (H_2S) in the equipment operating environment shall be kept below the following values:
   a. Chloride < 200 mg/l
   b. Hydrogen sulfide (H_2S) < 6 ppm

NOTES:

1. THE BASE OF THE PRECAST CONCRETE FLOOR OF THE WET WELL SHALL BE DESIGNED BY THE PRECAST CONCRETE SUPPLIER TO WITHSTAND UPLIFT FORCES DUE TO BUOYANCY. SEE ALSO NOTE 1, SHEET C-1.
2. COORDINATE ALL ELECTRICAL PENETRATIONS THROUGH PRECAST VAULTS AND PUMP STATION CONTAINER WITH ELECTRICAL DRAWINGS.
3. FINISH ALL PRECAST CONCRETE JOINTS PER DETAIL 5/C5.
4. BACKFILL WET WELL WITH APPROVED FILL.
5. CITY INSTALLED HEAT TAPE AROUND DISCHARGE PIPE TO COMPENSATE FOR LACK OF BURY DEPTH.

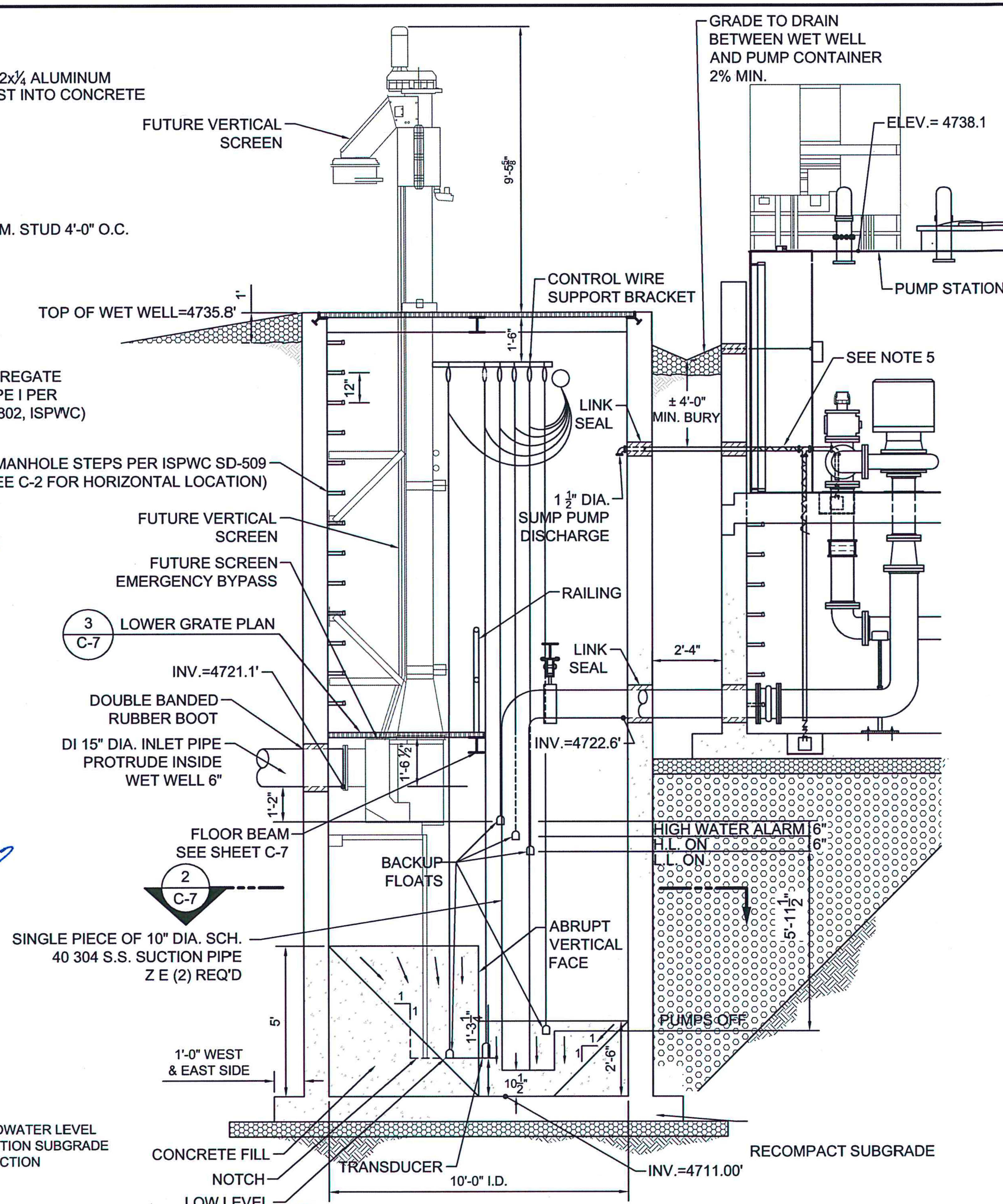




A C-6 **WET WELL ELEVATION 1**

SCALE: 1/4" = 1'-0"

PROFESSIONAL ENGINEER REGISTERED 8842 1-26-15 STATE OF IDAHO PAUL H. SCORESBY



B C-6 **WET WELL ELEVATION 2**

SCALE: 1/4" = 1'-0"

NO.	DESCRIPTION	REV. BY	CKD. BY	DATE

REVISIONS TO DRAWINGS

Schiess & Associates
ENGINEERING • PLANNING • LAND SURVEYING
Idaho Falls 522-1244 Rexburg 356-6092

PROJECT NO.	12021
DATE:	MAY 2013
DRAWN BY:	L. LUSK
DESIGNED BY:	P. SCORESBY
HORIZONTAL SCALE:	AS NOTED
VERTICAL SCALE:	N/A

CITY OF CASCADE

CITY SHOP LIFT STATION

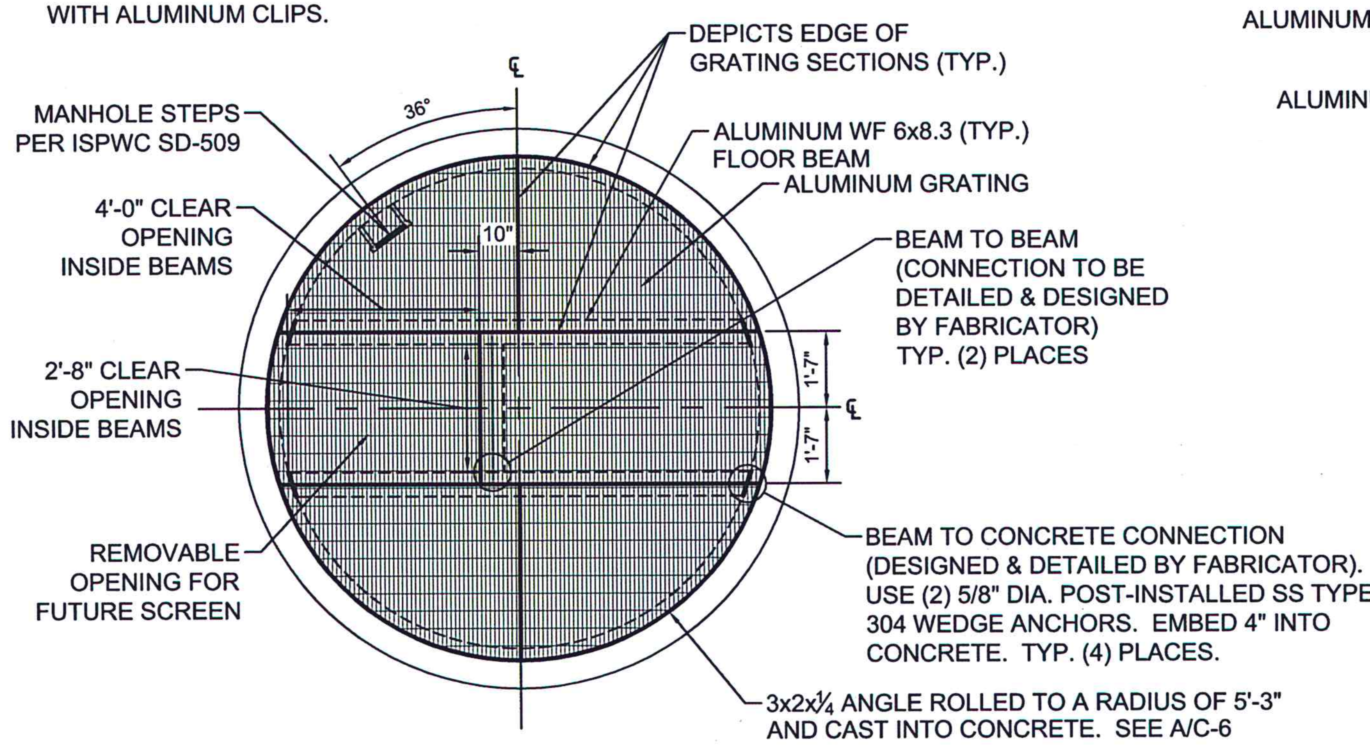
WET WELL DETAILS

SHEET: C-6

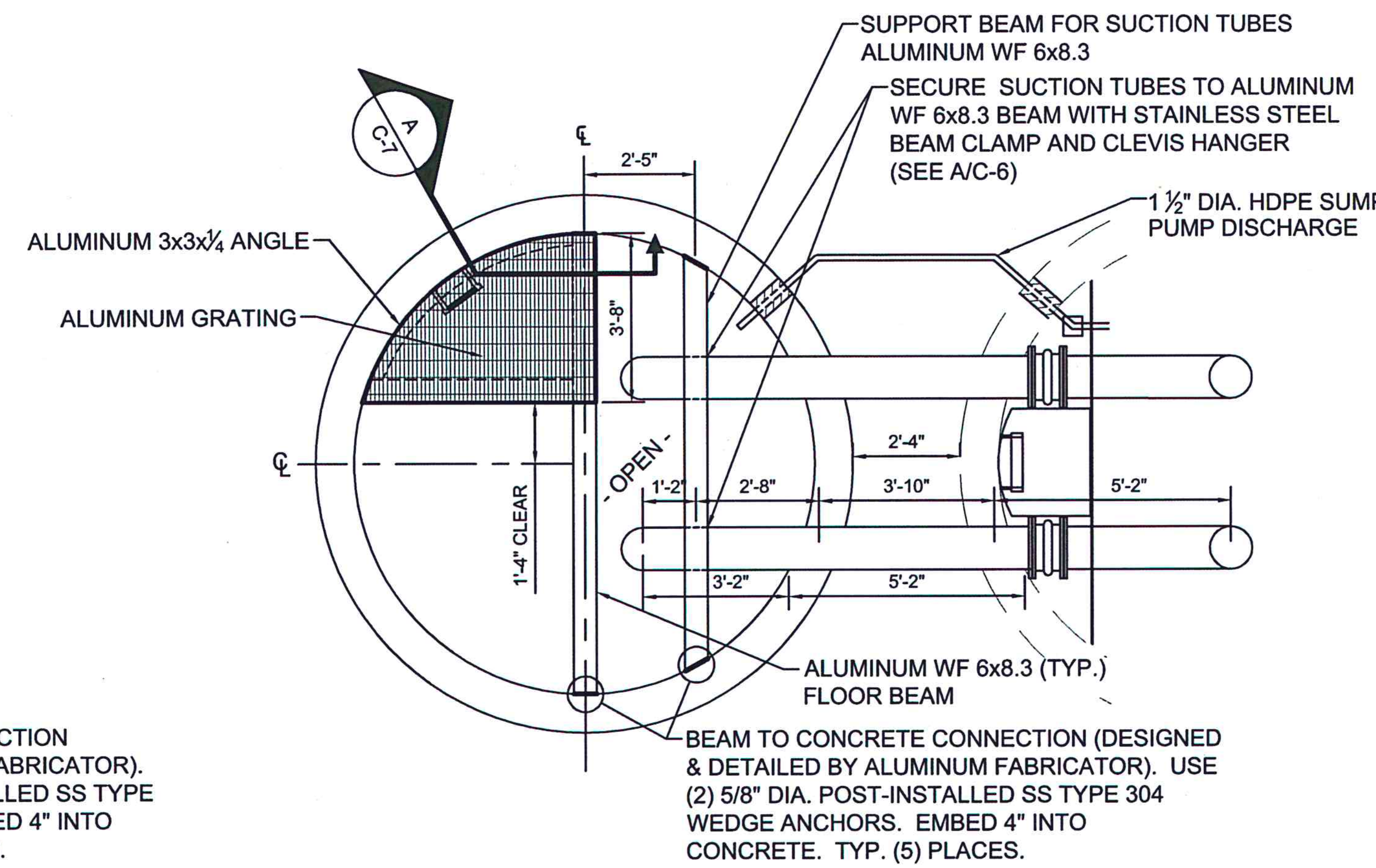
NO. OF

NOTES:

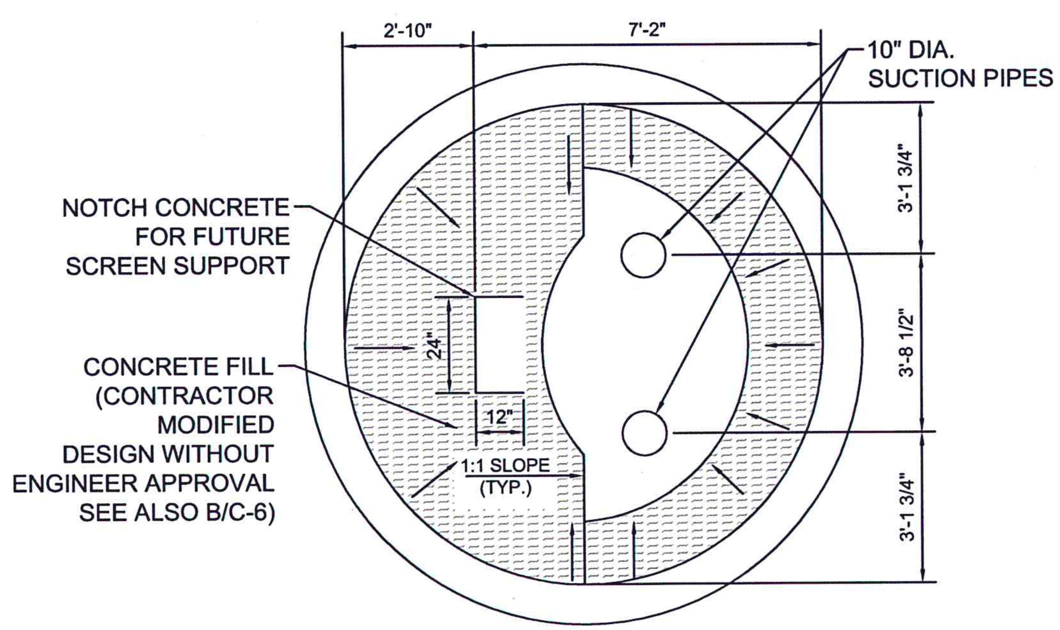
1. TO REDUCE ODORS, IF NECESSARY, CITY WILL COVER WET WELL GRATING WITH HORSE TRAILER RUBBER MAT. SECURE LOOSELY SO THAT VENTILATION EQUALING AN UPSIDE DOWN "J" PIPE WILL STILL OCCUR.
2. CONTRACTOR SHALL SECURE GRATING IN PLACE WITH ALUMINUM CLIPS.



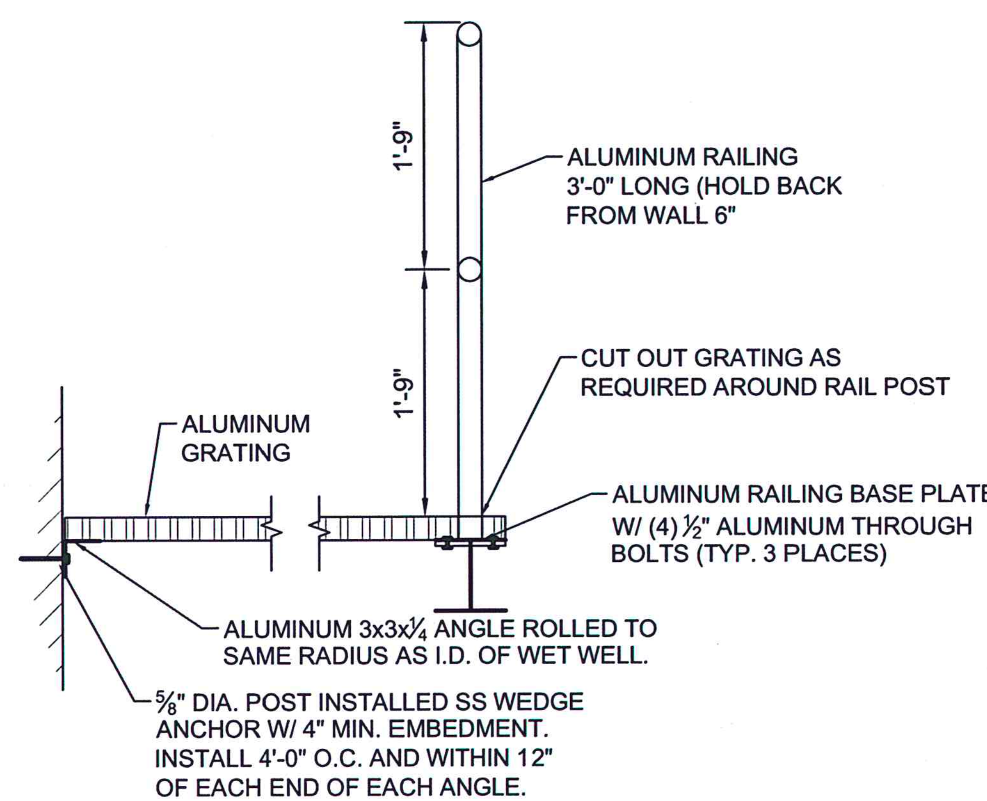
1/C-7 **WET WELL GRATE PLAN**
SCALE: 1/4" = 1'-0"



3/C-7 **LOWER GRATE PLAN**
SCALE: 1/4" = 1'-0"



2/C-7 **BOTTOM OF WET WELL PLAN**
SCALE: 1/4" = 1'-0"



A/C-7 **LOWER GRATING/RAILING SECTION**
SCALE: 3/4" = 1'-0"

PROFESSIONAL ENGINEER REGISTERED 8842 STATE OF IDAHO PAUL H. SCORESBY
Paul H. Scoresby 1-26-15

NO. | DESCRIPTION | REV. BY | CKD. BY | DATE
REVISIONS TO DRAWINGS

Schiess & Associates
ENGINEERING • PLANNING • LAND SURVEYING
Idaho Falls 522-1244 Rexburg 356-6092

PROJECT NO.: 12021
DATE: MAY 2013
DRAWN BY: L. LUSK
DESIGNED BY: P. SCORESBY
HORIZONTAL SCALE: AS NOTED
VERTICAL SCALE: N/A

CITY OF CASCADE

CITY SHOP LIFT STATION
WET WELL GRATING & RAILING DETAILS

SHEET: C-7

Appendix D: References

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