LAKE POINT IMPROVEMENT DISTRICT

WASTEWATER LAGOON NO. 1 AERATION EXPANSION

DESIGN STUDY REPORT

DRAFT April 2026

WARD ENGINEERING GROUP
Planning • Engineering • Surveying

LAKE POINT
IMPROVEMENT DISTRICT

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LAKE POINT IMPROVEMENT DISTRICT

DESIGN STUDY REPORT

WASTEWATER LAGOON NO. 1 – AERATION EXPANSION

DRAFT APRIL 2026

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LAKE POINT IMPROVEMENT DISTRICT

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INTRODUCTION

BACKGROUND

Lake Point Improvement District (LPID) was formed in 1972, with construction of its initial facultative sewer lagoons by Exxon Mobile, serving the commercial area at Exit 99 off Interstate 80. Today, LPID has expanded its sewer treatment system, adding hydraulic capacity, aeration, pumping capacity, and disinfection, on approximately 26 acres of property owned by LPID.

LPID provides both sewer collection and treatment of domestic wastewater to a mix of customers, including more than 650 residential accounts, and 16 commercial, institutional, and light industrial accounts, contained within its service area comprising 3,967 acres.

SERVICE AREA

LPID is primarily located within the corporate boundary of Lake Point City, situated at the north end of Tooele County, south of Interstate 80, lying both west and east of SR-36. Two exhibits depicting the location and extents of LPID's service area are shown in Figures 3 and 3 of Appendix A.

OBJECTIVES

In 2004, a Design Study Report (DSR) was prepared by Ward Engineering Group, addressing options to expand the biological treatment capacity of the district's existing three facultative lagoons. Refer to Appendix D. LPID acted on the recommendation to install a number of aspirating aerators within its existing primary Treatment Lagoon (Cell No. 1). Six aerators were subsequently installed and are currently in operation. At the time the 2004 DSR was prepared, considerations were made for future expansion, and calculations were made for the eventual installation of up to 24 "like" aeration units.

Since 2004, LPID has experienced both residential, commercial, and light industrial growth. Likewise, the district anticipates ongoing and future growth. As a result, LPID seeks to increase its biological treatment capacity by acting on the 2004 recommendations, to add additional aerator units to its Cell No. 1, as originally planned. The objectives of this 2026 DSR are:

1) to provide an update to the growth projections, and calculate revised design flows,
2) collect and report wastewater constituent loading necessary to confirm and revise the sizing and number of aerator units required for the design period,
3) coordinate with the product manufacture of the selected aerator units, and obtain performance criteria, and treatment capacities, and incorporate such information as part of the DSR, and
4) provide sufficient information to the Division of Water Quality in order to proceed with the design, permitting, and installation of said aerators.

EXISTING CONDITIONS

PAST STUDIES AND APPLICABLE DOCUMENTS

The following documents were prepared for LPID, and were instrumental in the evaluation and preparation of this DSR. A brief summation of each is provided, detailing relevance to this report.

2004 Lagoon Aerators – Cell No. 1 Design Study Report: This report was described in the objectives sections, and is the basis for the biological treatment expansion proposed in this DSR.

Adopted 2018 Sewer Master Plan: This report provided updated growth modeling for both sewer collection and treatment services within the current boundary of LPID. This report provided further finding with respect to LPID's unit of flow (i.e., GPD/ERU), including measured inflow and infiltration (I/I); which together, serves as the basis for this DSR. This report is not included in this DSR.

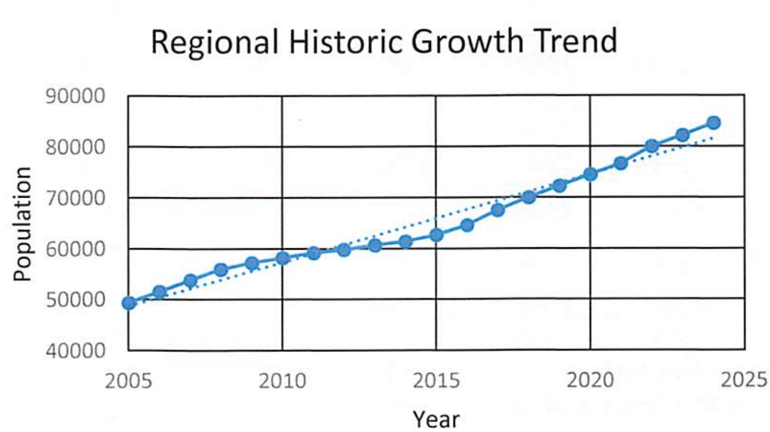
Adopted 2020 Impact Fee Facilities Plan (IFFP): This report adds upon the 2018 Sewer Master Plan by establishing capital improvement projects recommended in the master plan, which have been funded by impact fee revenue. The aeration expansion project proposed by the DSR is programmed in the 2020 IFFP, and it is the intent of the district to fund the project entirely with reserved impact fees. Currently, the district is required to spend its impact fee reserves this year. As such, this expansion project schedule is time sensitive. The IFFP is not included in this DSR.

Adopted 2020 Sewer Impact Fee Analysis: This report was independently prepared in conjunction with the afore described IFFP, and established the recommendation for the maximum allowed impact fee, for which the district has collected impact fee revenue to fund the aeration project at hand. This report is not included in this DSR.

REGIONAL TRENDS IN GROWTH AND POPULATION

	TOOELE COUNTY		
	Year	Population	Growth (%)
	2003	46700	
	2004	47900	2.6%
20-Year Period	2005	49300	2.9%
	2006	51500	4.5%
	2007	53800	4.5%
	2008	55900	3.9%
	2009	57200	2.3%
	2010	58,218	1.8%
	2011	59,190	1.7%
	2012	59,792	1.0%
	2013	60,633	1.4%
	2014	61,442	1.3%
	2015	62,639	1.9%
	2016	64,612	3.1%
	2017	67,486	4.4%
	2018	69,989	3.7%
	2019	72,259	3.2%
	2020	74,500	3.1%
	2021	76,600	2.8%
	2022	80,000	4.4%
	2023	82,100	2.6%
	2024	84,488	2.9%
	20-Year Average Growth		2.9%
	Last 10-Year Average Growth		3.2%
	First 10-Yar Average Growth		2.5%

Data was collected from the U.S. Census Bureau for Tooele County, 2003 through 2024. A summary table of the historic growth within Tooele County at large shows that the past 20-year period yielded a 2.9% growth rate. The last 10 years shows a slightly greater rate of 3.2%. These historic trends can be compared to the growth projections with LIPD, which is situated within North Tooele County.

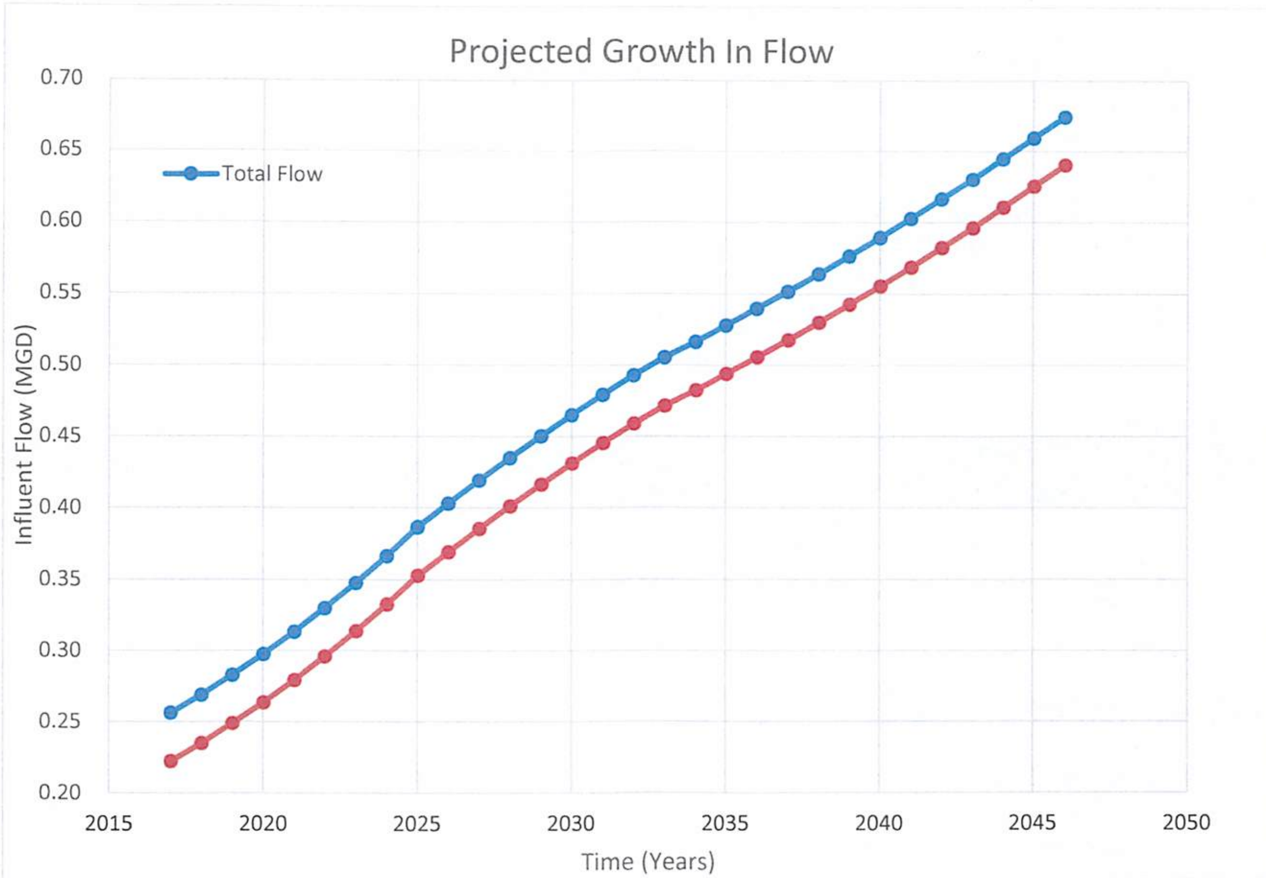


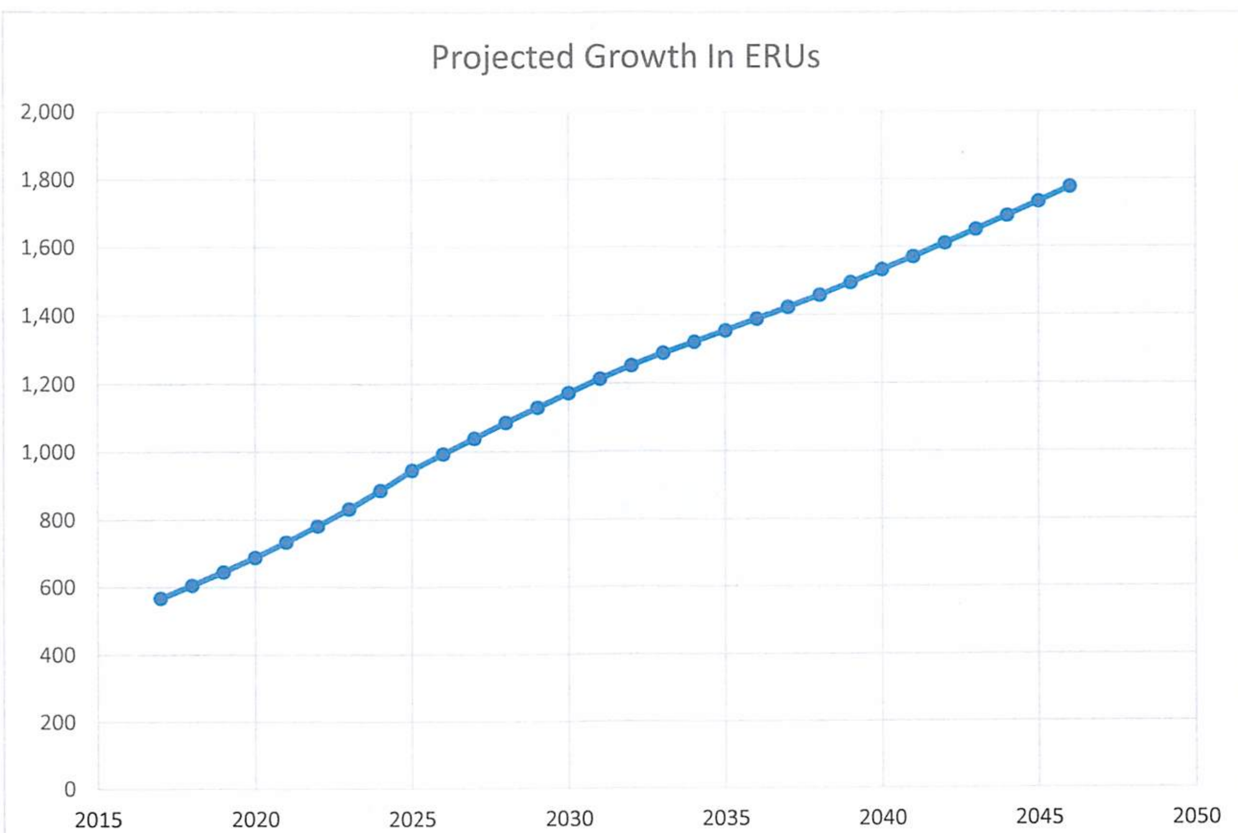
PROJECTED LOCAL GROWTH AND POPULATION

LPID Service Area

20-Year Design Period (2026–2046)

Year	ERUs	Growth (%)	Total Flow (MGD)	Baseline I/I Flow As of Year 2017 (MGD)	Total Flow Less I/I (MGD)
2017	567	-	0.26	0.034	0.222
2018	604	6.6%	0.27	0.034	0.235
2019	644	6.6%	0.28	0.034	0.248
2020	687	6.6%	0.30	0.034	0.263
2021	732	6.6%	0.31	0.034	0.279
2022	780	6.6%	0.33	0.034	0.296
2023	832	6.6%	0.35	0.034	0.313
2024	887	6.6%	0.37	0.034	0.332
2025	945	6.6%	0.39	0.034	0.353
2026	993	5.0%	0.40	0.034	0.369
2027	1,039	4.7%	0.42	0.034	0.385
2028	1,085	4.4%	0.43	0.034	0.401
2029	1,130	4.1%	0.45	0.034	0.416
2030	1,173	3.8%	0.47	0.034	0.431
2031	1,214	3.5%	0.48	0.034	0.445
2032	1,252	3.2%	0.49	0.034	0.459
2033	1,289	2.9%	0.51	0.034	0.471
2034	1,321	2.5%	0.52	0.034	0.483
2035	1,354	2.5%	0.53	0.034	0.494
2036	1,388	2.5%	0.54	0.034	0.506
2037	1,423	2.5%	0.55	0.034	0.518
2038	1,458	2.5%	0.56	0.034	0.530
2039	1,495	2.5%	0.58	0.034	0.543
2040	1,532	2.5%	0.59	0.034	0.556
2041	1,570	2.5%	0.60	0.034	0.569
2042	1,609	2.5%	0.62	0.034	0.582
2043	1,650	2.5%	0.63	0.034	0.596
2044	1,691	2.5%	0.64	0.034	0.611
2045	1,733	2.5%	0.66	0.034	0.625
2046	1,777	2.5%	0.67	0.034	0.640
2047	1,812	2.0%	0.69	0.034	0.653
2048	1,848	2.0%	0.70	0.034	0.665
2049	1,885	2.0%	0.71	0.034	0.678
2050	1,923	2.0%	0.72	0.034	0.691
2051	1,961	2.0%	0.74	0.034	0.704
2052	2,001	2.0%	0.75	0.034	0.718
2053	2,041	2.0%	0.77	0.034	0.732
2054	2,081	2.0%	0.78	0.034	0.746
2055	2,123	2.0%	0.79	0.034	0.760
2056	2,166	2.0%	0.81	0.034	0.775
2057	2,209	2.0%	0.82	0.034	0.790
2058	2,253	2.0%	0.84	0.034	0.805
20-Year Average		**3.0%**			
Next 10-Year Average		**3.4%**			


Projected Growth In Flow
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
Influent Flow (MGD)
Total Flow
2015
2020
2025
2030
2035
2040
2045
2050
Time (Years)


Projected Growth In ERUs
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2015
2020
2025
2030
2035
2040
2045
2050

From 2018 to 2025 it is calculated that LPID has grown at an average rate of approximately 6.6 percent, a little more than twice the average Tooele County rate. Over the next ten-year period, it is anticipated that the district's growth rate will dimmish overt time falling more in line with the County's overall growth trend, at 2.5% by 2034.

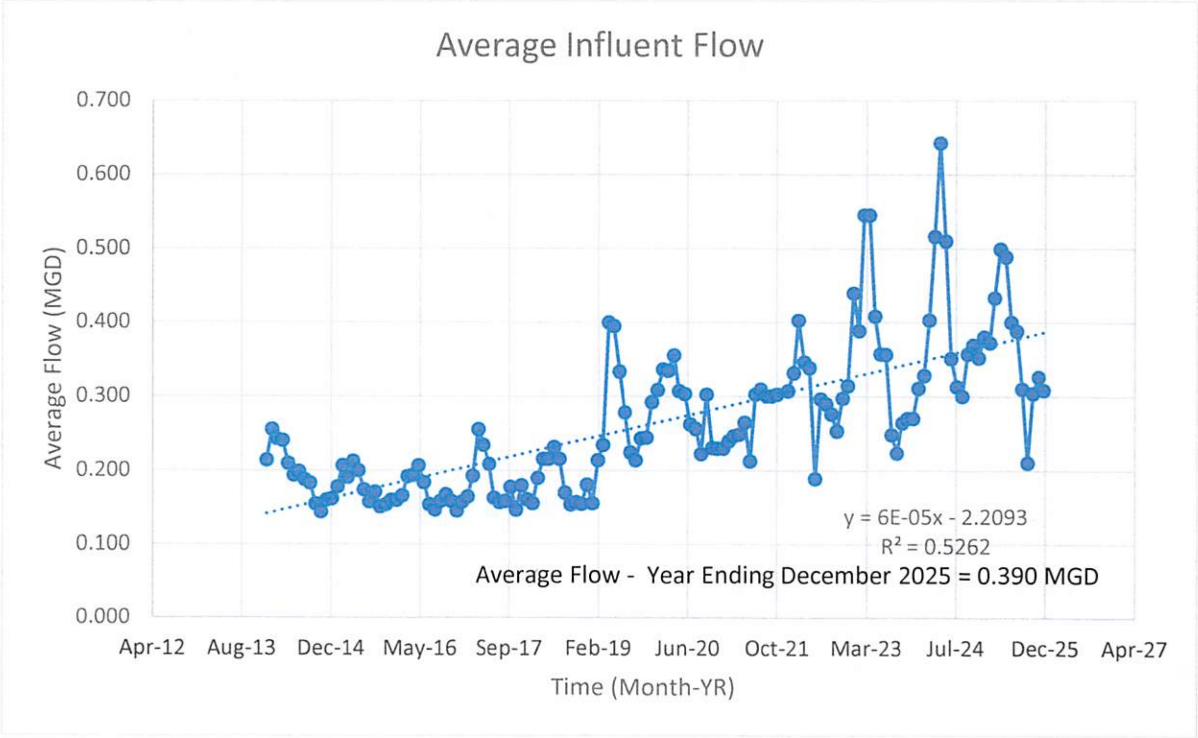
A tabulation and graphical representation of LPID's projected growth are depicted in the preceding table and charts, and are expressed in terms of both flow rate and equivalent residential units (ERUs). From the 2018 Sewer Master Plan, an estimation of baseline I/I was made, in order to more accurately project growth in terms of influent flow per ERU. Additional information is provided in regards to I/I in a subsequent section of this report. A summary of project growth is provided below.

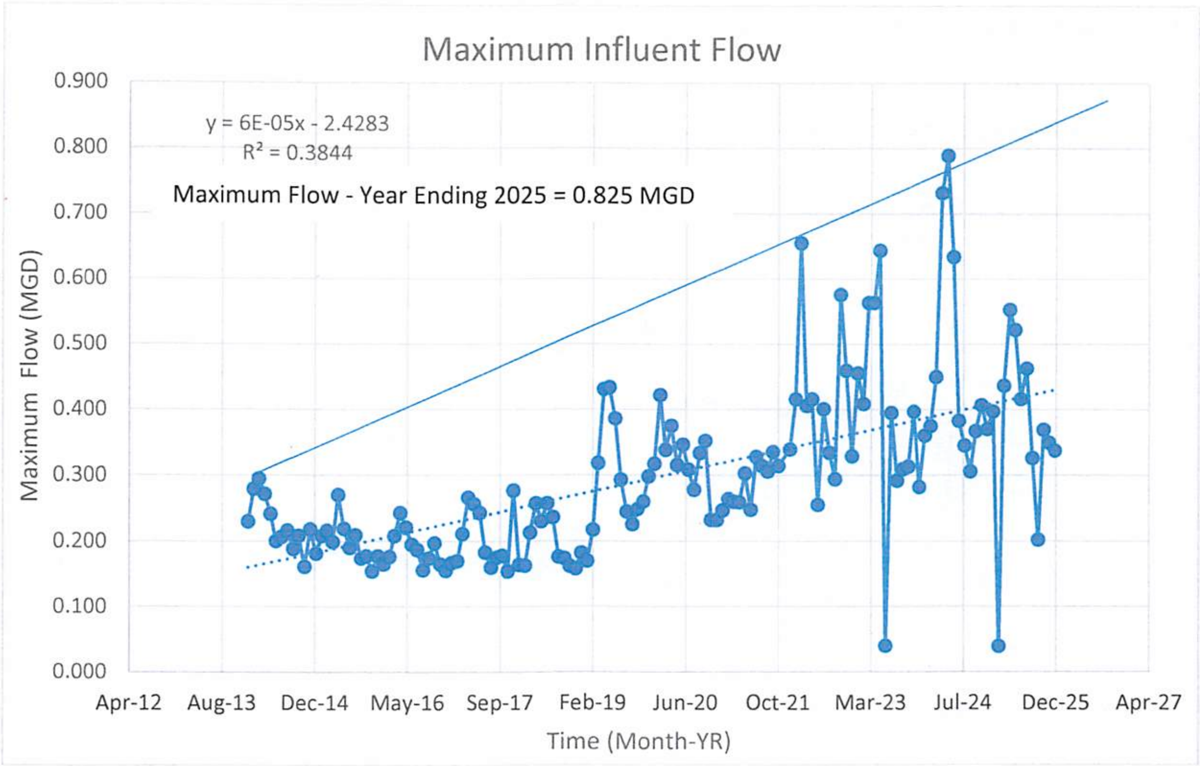
Summary of Growth Projections

Year	Total Influent Flow (MGD)	Basine I/I (MGD)	ERUs
2026	0.40	0.034	993
2036	0.54	0.034	1,388
2046	0.67	0.034	1,777
2051	0.74	0.034	1,961

EXISTING WASTWATER TREATMENT SYSTEM

Domestic Wastewater Generation: The following two charts graphically depict the average daily flow and the maximum daily flow based on the measured influent flow rates collected by the District Manager, from 2014 through 2025.





As mathematically derived from the trendline of the historical average influent flow chart, the average influent flow at the end of 2025 was 0.39 million gallons per day. This was used as the benchmark for the growth projections provided on page 3.

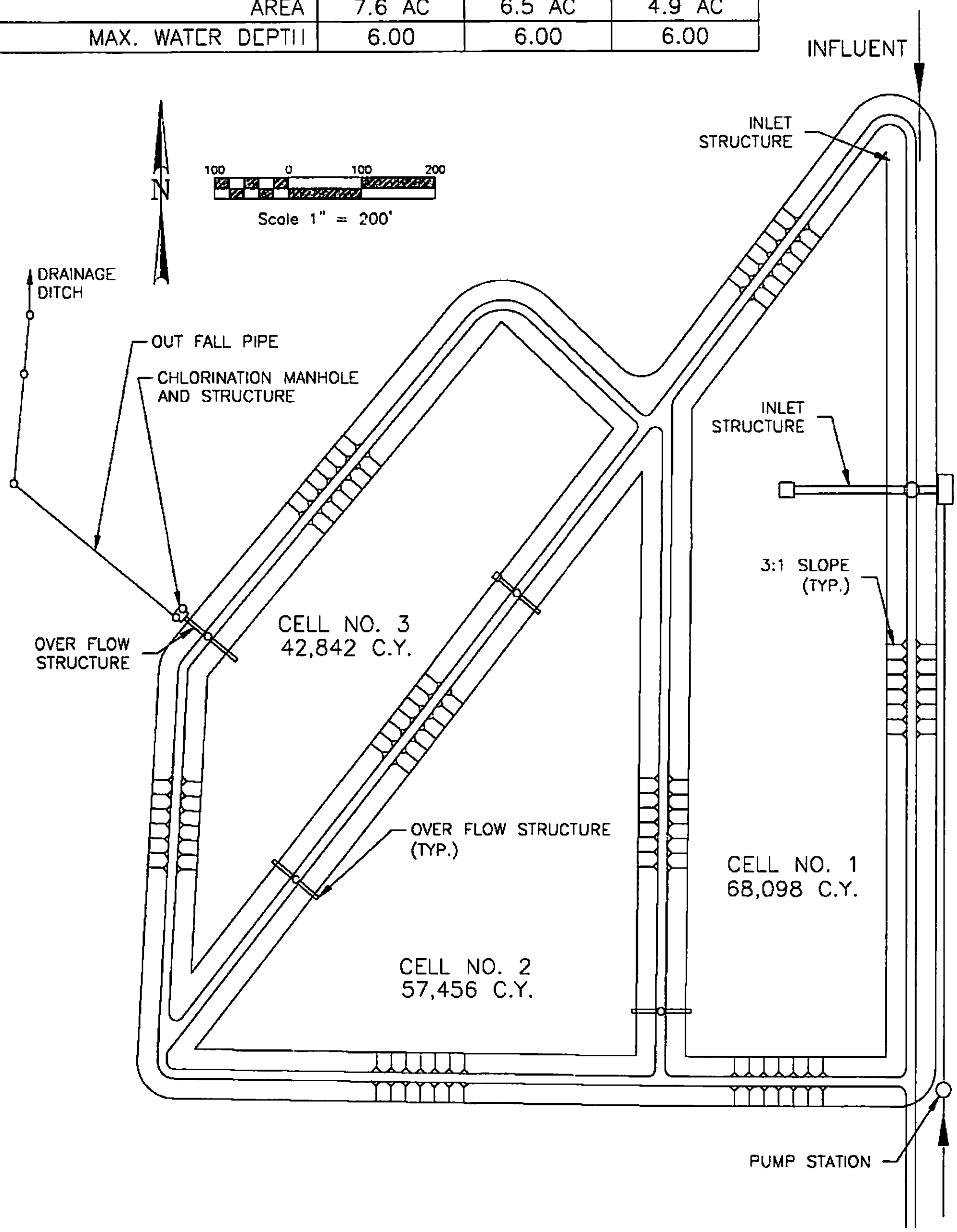
As also mathematically derived from the upper trendline of the historical maximum influent flow chart, the peak flow at the end of 2025 was shown to be 0.83 MGD. Therefore, the maximum peak factor would be 2.1. Refer to Appendix E for reference to a complete set of flow data.

Unit of Demand: It is typical for a sewer district to define a unit of demand as an Equivalent Residential Unit, or ERU. LPID conforms to this conventional approach. The unit flow criteria used for master planning in the DSR is therefore, 346 gallons per day average demand per ERU (2018 Sewer Master Plan, pg. 18), with 3.23 capita per ERU. This excludes I/I as previously indicated. All commercial, institutional, and industrial land uses are converted to ERUs for uniformity and simplification in calculating and reporting user demands and levels of service.

Inflow & Infiltration (I/I): is an important consideration for LPID. During a five-month period at the latter half of 2017, an I/I study was conducted (2018 Sewer Master Plan, pg. 8). It was determined that 60 gallons per day per ERU was attributed to I/I, or 34,000 gallons per day. Furthermore, most of the I/I was observed to originate from the older portion of the sewer collection system, referred to as the Core Area. This was established through additional flow analysis described in the master plan, page 6. As a result, I/I is considered to be a perpetual flow that must be conveyed through the system until such time that the district takes action to reduce the known I/I through pipe lining and manhole rehabilitation. For growth modeling purposes, I/I within the existing Core Area is treated as a constant, which is part of the total measured influent flow. However, it is separated apart from the total flow in order to more accurately calculate future ERU projections.

<u>FACULTATIVE LAGOON – AREA, DEPTH, AND SITE PLAN</u>

	CELL NO. 1	CELL NO. 2	CELL NO. 3
AREA	7.6 AC	6.5 AC	4.9 AC
MAX. WATER DEPTH	6.00	6.00	6.00



FILENAME: W:\LPID\DRT Calculations\Existing Lagoons - Volumes.dwg

Drawn by: Design by: Checked by: Date: JUL 03 UPDATED MAY 2026 Client: LPID Drawing: Existing Lagoons - Volumes Job NO. LPID 23	Lagoon Aerators - Cell No. 1 Figure 1	Ward Engineering Group	Sheet: FIG 1

As illustrated in Figure 1, LPID's treatment system comprises three lagoon cells, for a total estimated surface area of 19 acres, at an average depth of six feet. The district operates the cells in series, with cell 1 as the only aerated portion of the treatment system, having six existing 7.5 horsepower aspirating surface aerator units.

EXISTING BIOLOGICAL TREATMENT CAPACITY

From the 2004 DSR (Appendix D), the manufacture of the district's existing Aeromix aerators, provided performance criteria for the calculation of oxygen requirements, and associated power requirements to provide capacity to treat the BOD loading of the district. Based on the manufacture's performance criteria, together with a standard BOD loading rate of 250 mg/l, calculations have been made to determine the status of the existing biological capacity based on the existing six aerator units now in operation in cell 1.

Existing Biological Treatment Capacity Calculations
From 2004 DSR - Manufacture's (Aeromix) unit performance criteria, page 1 and 2

Design Criteria

USER ENTER FLOW =	0.22	MGD
BOD demand =	250	mg/l
TKN Demand =	0	mg/l
TSS =	0	mg/l

Calculations for Oxygen Requirements

Apply 2 lbs of oxygen per lb of BOD and 4.6 lbs of oygen per lbs TKN.
2 mg/l residual oxygen is required at all times.

BOD Demand =	458.7	lbs / day
BOD Oxygen Required =	917.4	lbs O2 / day
TKN Oxygen Required =	0	lbs O2 / day
Total Oxygen Required =	917.4	lbs O2 / day

No. =	1755.7	lbs / day of Standard Total Oxygen Requirement
N =	917.4	lbs / day of Total Oxygen Requirement
Beta =	0.95	Salinity, surface tension factor per manufacture
Cwalt =	7.9	Saturation at given altitude & temperature per manufacture
Cl =	2	mg/l Residudual oxygen required by DWQ
Alpha =	0.85	Oxygen transfer correction factor per manufacture
T =	20	deg C Operating temperature (68 deg F) per manufacture

Calculations for Power

At standard conditions, units transfer up to 2.5 lbs/HP. However, use
an oxygen transfer rate of 1.65 O2 / HP per hour, with 24-hour operation

Required Power =	44.3	HP
Number of Units	5.9	at 7.5 HP per unit

The following calculations are provided to determine the requirements for aeration for the existing treatment plant, based on the measured existing average influent flow of 0.39 MGD, and 933 ERUs.

Existing Biological Treatment Requirement Calculations
From 2004 DSR - Manufacture's (Aeromix) unit performance criteria, page 1 and 2

Design Criteria

USER ENTER FLOW =	0.39	MGD
BOD demand =	250	mg/l
TKN Demand =	0	mg/l
TSS =	0	mg/l

Calculations for Oxygen Requirements

Apply 2 lbs of oxygen per lb of BOD and 4.6 lbs of oygen per lbs TKN.
2 mg/l residual oxygen is required at all times.

BOD Demand =	813.2	lbs / day
BOD Oxygen Required =	1626.3	lbs O2 / day
TKN Oxygen Required =	0	lbs O2 / day
Total Oxygen Required =	1626.3	lbs O2 / day

No. =	3112.4	lbs / day of Standard Total Oxygen Requirement
N =	1626.3	lbs / day of Total Oxygen Requirement
Beta =	0.95	Salinity, surface tension factor per manufacture
Cwalt =	7.9	Saturation at given altitude & temperature per manufacture
Cl =	2	mg/l Residudual oxygen required by DWQ
Alpha =	0.85	Oxygen transfer correction factor per manufacture
T =	20	deg C Operating temperature (68 deg F) per manufacture

Calculations for Power

At standard conditions, units transfer up to 2.5 lbs/HP. However, use
an oxygen transfer rate of 1.65 O2 / HP per hour, with 24-hour operation

Required Power =	78.6	HP
Number of Units	10.5	at 7.5 HP per unit

Based on the preceding two sets of calculations and stated BOD loading, the existing system has a capacity to treat 0.22 million gallons per day as summarized in the following table. It is noted that the treatment capacity should be brought up to the existing demands of 0.39 MGD, requiring a total of 11 aerator units.

Summary of Existing Biological Treatment Capacity

Year Ending	Existing Number of Aerator Units	Capacity (MGD)	Capacity (ERUs)	Needed Number of Aerator Units	Existing Flow (MGD)	Existing Users (ERUs)
2025	6	0.22	635	11	0.39	993

EXISTING HYDRAULIC CAPACITY

The volume of the existing three treatment cells has been estimated based on the surface area take-offs shown on Figure 1, applying an average depth of six feet, with a 3:1 slope at the banks. The resulting total volume of the treatment plant is 186,396 cubic yards (34,011,618 gallons). As required by UAC R317-3-10.F.2, the required hydraulic retention time (HRT) is 30 days.

The following table summarizes the existing HRT.

Summary of HRT

Year Ending	Total Volume (MG)	Influent Average Flow (MGD)	HRT (Days)
2025	34.01	0.39	87.2

PROPOSED CONDITIONS

BASIS OF AERATION EXPANSION

Consideration of Aeration Alternatives: The district evaluated multiple alternatives for its aeration system in 2004, as part of the DSR previously sited; including diffused air, high-speed surface aerators, and aspirating aerators. LPID selected the recommended aspirating-type aerators, consisting of single 7.5 HP units as explained in more detail in the DSR provided for reference in Appendix D.

Product Selection: At the time of the original installation of the 7.5 HP units, provisions were recommended, and made effective, to expand the biological treatment capacity by installing additional 7.5 HP units at the recommended locations to achieve proper zone coverage and depth, according to the manufacture's oxygen profiles. This would allow for the district to continue utilizing the existing aerators, in conjunction with the integration of the recommended "like" units. For these reasons, LPID has selected similar 7.5 aspirating aerator units manufactured by Newterra, for its aeration expansion project.

Project Previously Programmed: As indicated, this proposed aeration expansion project was programmed for construction in the district's 2018 Impact Fee Facilities Plan (IFFP), and the district has collected sufficient revenue to fund this specific project. Furthermore, the district is under obligation to expend said impact fees within a statutory time period, which expires on December 31, 2026. Therefore, the district is working within an expeditious time frame to complete this project. It is also noted that this DSR is written specifically for the aeration expansion project. Other unit processes are not intended to be a part of the analysis provided in this DSR.

DESIGN PERIOD

The design period contemplated with this DSR is a minimum of twenty (20) years. The minimum number of aeration units needed for expansion are on this basis.

PROPOSED LEVELS OF SERVICE

Unit of Demand: As established in the analysis of the existing conditions, 346 gallons per day average demand per ERU, with 3.23 capita per ERU is used to establish the unit demand for the proposed aeration expansion project. I/I, as previously indicated is factored in to the total flow projections as a baseline, perpetual flow. For purposes of projecting influent flow, no distinction of land use types are included in this scope of analysis. Notwithstanding, all land use-wastewater generation is considered "domestic" wastewater.

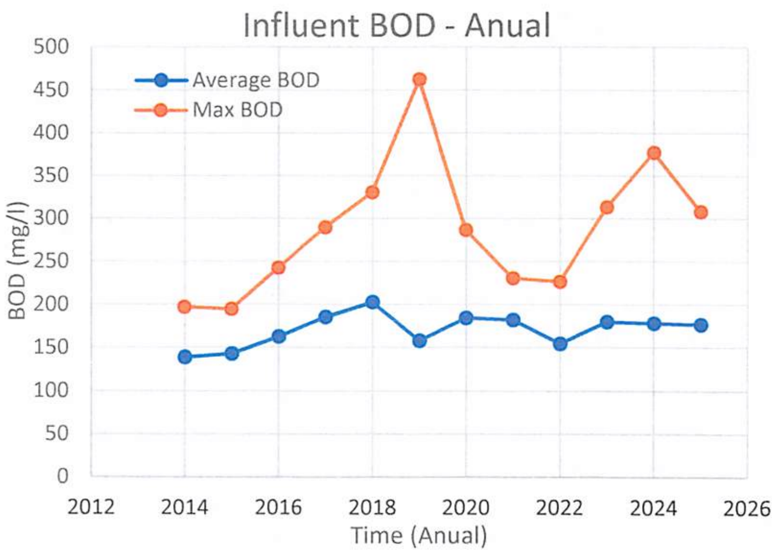
Regulatory Aeration Requirements (UAC R317-4 & R317-3-10): The following parameters are made effective in the calculations for the expansion of aeration capacity.

- BOD Loading is 200 mg/l.
- Design based on 2.0 pounds of oxygen input per pound of BOD_5.
- Aeration equipment must be capable of maintaining 2 mg/l in the lagoon at all times.
- Circle of Influence: that area in which return velocity is greater than 0.15 feet per second as indicated by the manufacture's certified data.
- Suitable protection from weather shall be provided for equipment and electrical controls.

Historical Influent BOD:

The District Manager has collected historic annual average and maximum day influent BOD concentrations from 2014 through 2025.

Year	Average Influent BOD (mg/l)	Maximum Influent BOD (mg/l)
2014	139	197
2015	143	195
2016	162	243
2017	185	290
2018	203	331
2019	158	463
2020	184	287
2021	182	231
2022	155	227
2023	180	314
2024	178	378
2025	177	309



As shown, the historic average annual influent concentrations year over year have not exceeded 200 mg/l. Therefore, the design BOD loading meets the requirement of *UAC R317-4*, and is the level of service for which the aeration expansion project will be designed. It is noted that the previous 2004 DSR used 250 mg/l. However, based on historic data, the treatment plant clearly operates at average concentrations at or below 200 mg/l, while yearly peak day concentrations do exceed that. Appendix E provides a more expanded set of data for reference. It is noted that I/I is inclusive of the measured BOD concentrations. In the future, additional measurements may be warranted as the district mitigates or removes the stated baseline I/I from the influent flow, which may result in slightly higher BOD concentrations.

Biological Treatment Capacity (BOD): Based on the 20-year design period, the following calculations are provided as an estimate for the minimum number of 7.5 HP aerator units that will be required, with an option to expand to the full extent of the system's capability, which is 24 aerator units within cell 1, as planned for in the 2004 DSR.

Summary of Proposed Biological Treatment Capacity

Year Ending	Proposed Minimum Number of Aerator Units	Capacity (MGD)	Capacity (ERUs)	Optional Number of Aerator Units	Future Flow (MGD)	Future Users (ERUs)
2046	15	0.67	1,777	24	1.11	3,032

Note: results based on inclusion of I/I and BOD loading = 200 mg/l.

Figure 2 from the 2004 DSR is provided to show the ultimate location and configuration of the master planned, 24 aerator units in cell 1. It is for conceptual purposes only, and does not necessarily represent the final locations that may be designed, and may not reflect the most current cell data.

Proposed Biological Treatment Requirement Calculations
From 2004 DSR - Manufacture's (Aeromix) unit performance criteria, page 1 and 2

Design Criteria

USER ENTER FLOW =	0.67	MGD
BOD demand =	200	mg/l
TKN Demand =	0	mg/l
TSS =	0	mg/l

Calculations for Oxygen Requirements

Apply 2 lbs of oxygen per lb of BOD and 4.6 lbs of oygen per lbs TKN.
2 mg/l residual oxygen is required at all times.

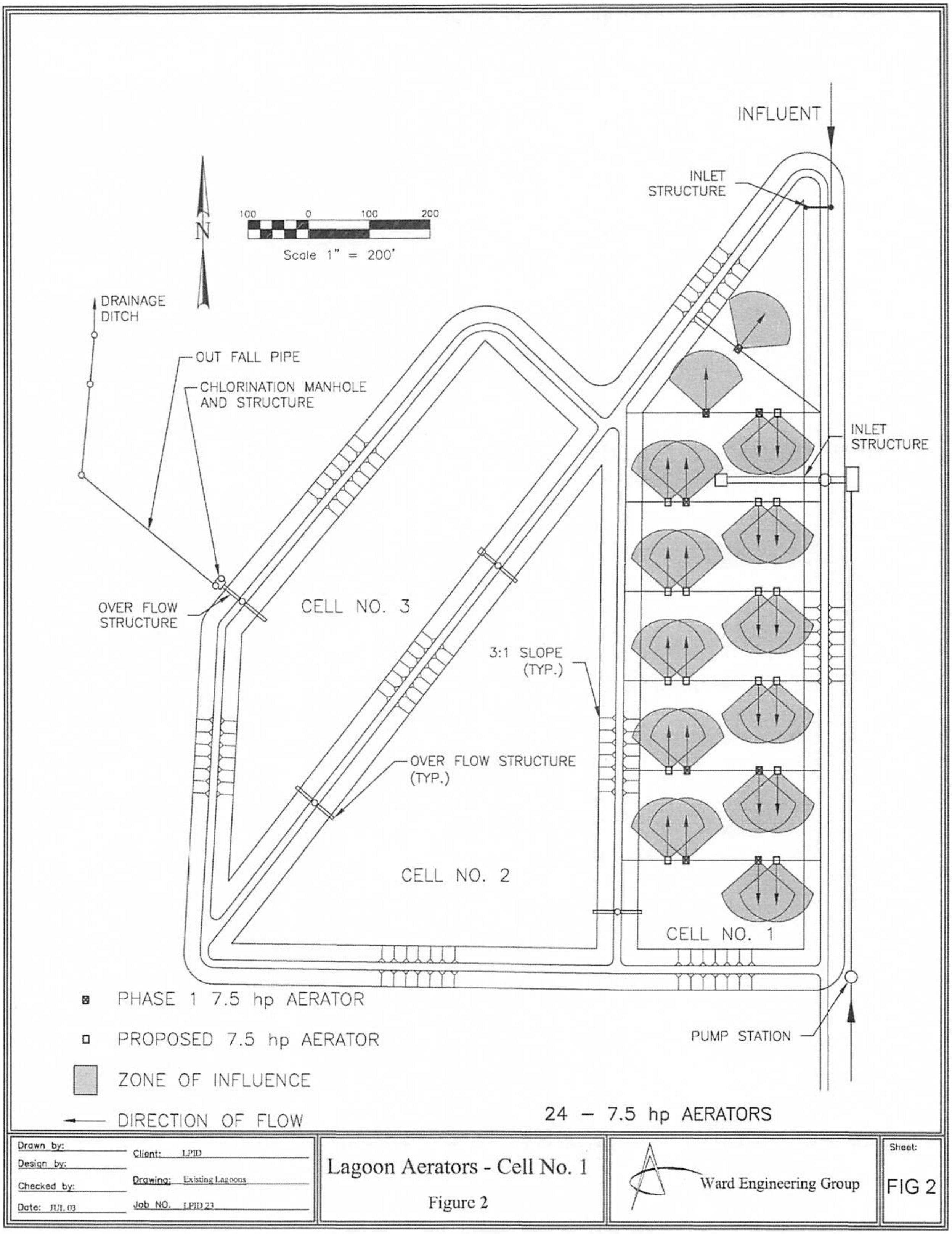
BOD Demand =	1117.6	lbs / day
BOD Oxygen Required =	2235.12	lbs O2 / day
TKN Oxygen Required =	0	lbs O2 / day
Total Oxygen Required =	2235.12	lbs O2 / day

No. =	4277.5	lbs / day of Standard Total Oxygen Requirement
N =	2235.12	lbs / day of Total Oxygen Requirement
Beta =	0.95	Salinity, surface tension factor per manufacture
Cwalt =	7.9	Saturation at given altitude & temperature per manufacture
Cl =	2	mg/l Residudual oxygen required by DWQ
Alpha =	0.85	Oxygen transfer correction factor per manufacture
T =	20	deg C Operating temperature (68 deg F) per manufacture

Calculations for Power

At standard conditions, units transfer up to 2.5 lbs/HP. However, use
an oxygen transfer rate of 1.65 O2 / HP per hour, with 24-hour operation

Required Power =	108.0	HP
Number of Units	14.4	at 7.5 HP per unit


INFLUENT
INLET STRUCTURE
100 0 100 200
N
Scale 1" = 200'
DRAINAGE DITCH
OUT FALL PIPE
CHLORINATION MANHOLE AND STRUCTURE
INLET STRUCTURE
OVER FLOW STRUCTURE
CELL NO. 3
3:1 SLOPE (TYP.)
OVER FLOW STRUCTURE (TYP.)
CELL NO. 2
CELL NO. 1
PHASE 1 7.5 hp AERATOR
PROPOSED 7.5 hp AERATOR
ZONE OF INFLUENCE
DIRECTION OF FLOW
PUMP STATION
24 – 7.5 hp AERATORS
Drawn by:
Design by:
Checked by:
Date: JUL 03
Client: LPID
Drawing: Existing Lagoons
Job NO. LPID 23
Lagoon Aerators - Cell No. 1
Figure 2
Ward Engineering Group
Sheet:
FIG 2

Hydraulic Capacity (HRT): By applying the physical parameters previously described under existing conditions, the HRT of the system at the end of the 20-year design period, 2046, is summarized in the table below.

Summary of HRT

Year Ending	Total Volume (MG)	Influent Average Flow (MGD)	HRT (Days)
2046	34.01	0.67	50.8

Other Levels of Service: The treatment plant is, and will be, designed to accept domestic wastewater from residential, commercial, industrial, or similar sources that result primarily from human sanitary uses; and excludes industrial processes, or wastewater in large peak volumes, any stormwater whatsoever, and any excessive ground water resulting from new collection system infiltration (except as previously defined as "baseline" I/I), and illegal storm drain or ground water sump discharge. All customers are required to install pretreatment facilities (prior to any connection to LPID's sewer collection system), if a potential exists during the plan review and permitting process, or if measured or observed in the field; for the generation of wastewaters containing pollutants such as: high organic concentrations, toxic substances, metals, or pH extremes), or any other organic or inorganic constituent that is deemed by LPID to adversely or disproportionally impact LPID's discharge limits established by the Utah Department of Environmental Quality, Division of Water Quality (DWQ).

Other levels of service may apply to other unit processes of LPID's treatment system. However, such other levels of service are beyond the scope of service pertaining to this specific project.

POTENTIAL FOR PHASING

As proposed in the summary table of proposed biological treatment capacity, the minimum proposed number of total aerator units for the 20-year design period is 15, including the existing 6 units in operation today. The current system is programmed for the ultimate installation and operation of 24 total units, including the existing 6 units in operation.

As determined by the Board of Trustees, according to impact fee revenue stored for aeration expansion, LPID may determine that it will install a minimum of 9 additional units (15 total), or up to 18 additional units (24 total). A final determination may be made upon receiving bids for the aeration expansion project.

MANUFACTURE AND SUPPLIER'S TECHNICAL DATA

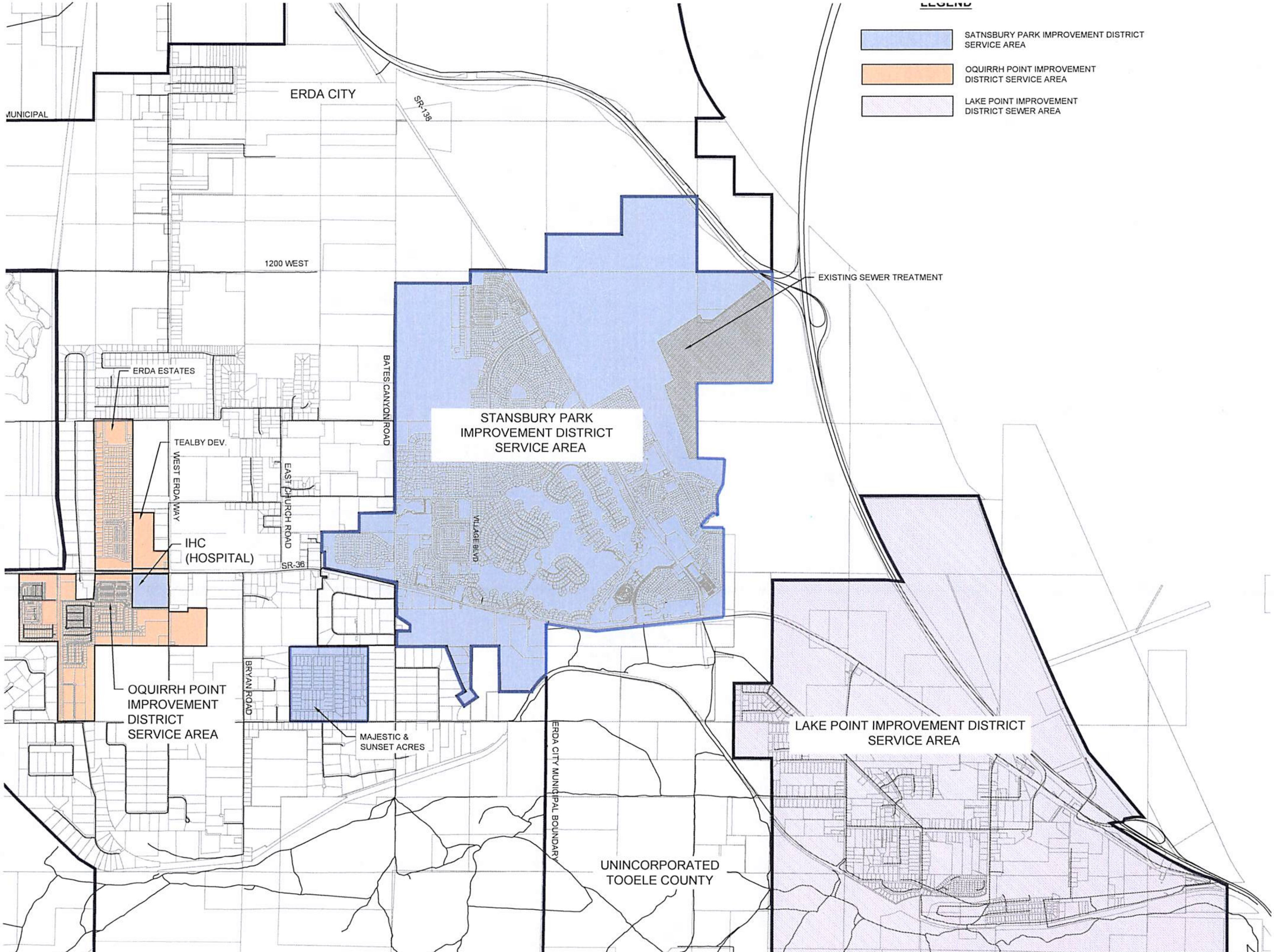
Aeration Industries International (Newterra): LPID has engaged Newterra with the intent to specify its aspirating 7.5 HP surface mounted TORNADO aerator and mixer units, which are similar in operation and performance to the existing Aeromix TORNADO units now in operation. Refer to Appendix B for Newterra's product information.

Calculations and Technical Worksheets: Supporting calculations and conformance to the stipulated minimum levels of service, for the proposed 7.5 HP TORDADO units are provided by Newterra in Appendix C.

APPENDIX A: SERVICE AREA

- Figure 3: Service Area
- Figure 4: Regional Service Area

TO TOOELE CITY
(SEE FIGURE 2)
HYPOCHLORITE DISINFECTION SYSTEM
DISCHARGE
800
0
LAKE POINT IMPROVEMENT
DISTRICT SERVICE AREA
PUMP STATION #4
CELL 3
CELL 2
CELL 1
SR-36
REGIONAL PUMP STATION
PUMP STATION #1
TO I-80


LEGEND
SATNSBURY PARK IMPROVEMENT DISTRICT SERVICE AREA
OQUIRRH POINT IMPROVEMENT DISTRICT SERVICE AREA
LAKE POINT IMPROVEMENT DISTRICT SEWER AREA
MUNICIPAL
ERDA CITY
SR-138
1200 WEST
EXISTING SEWER TREATMENT
ERDA ESTATES
BATES CANYON ROAD
STANSBURY PARK IMPROVEMENT DISTRICT SERVICE AREA
TEALBY DEV.
WEST ERDA WAY
EAST CHURCH ROAD
VILLAGE BLVD
IHC (HOSPITAL)
SR-36
OQUIRRH POINT IMPROVEMENT DISTRICT SERVICE AREA
BRYAN ROAD
MAJESTIC & SUNSET ACRES
ERDA CITY MUNICIPAL BOUNDARY
LAKE POINT IMPROVEMENT DISTRICT SERVICE AREA
UNINCORPORATED TOOELE COUNTY

APPENDIX B: PRODUCT INFORMATION

- Newterra Budgetary Proposal Submittal 5-6-2026

Lake Point Improvement District, UT- TORNADO Aerators

Surface Mounted Aerators and Mixers

Budgetary Proposal QU-2610574.R0

Submitted To: Wards Engineering Group

Attention To: Colin Reynolds, 801-487-8040 ext.220, creynolds@wardeg.com

Submitted By: Newterra Corporation, Inc.
1555 Coraopolis Heights Rd. Suite 4100
Coraopolis, PA 15108

Represented By: WATERFORD SYSTEMS, Mike Sorensen, 801-463-9900, mike.waterford@gmail.com

Presented By: Dina Palumbo, 763-746-9271;ext=271, dpalumbo@newterra.com

newterra

Submitted 2026-05-06

Contents

1 Introduction & Overview

About Newterra

Newterra's approach is simple: we are a single point contractor combining process design, engineering, fabrication, and long-term life cycle support services to all our customers. We are a leading provider of modular, prefabricated water treatment technologies with a core focus of treating water for three primary purposes:

- **To drink**
- **To safely return to the environment or be reused**
- **For industries to use to produce goods and services**

Operating as Newterra since 1992, and headquartered in Coraopolis, PA, USA, Newterra is an industry leader in modular treatment solutions. Servicing a variety of customers in diverse end-markets including municipalities, land developers, military, commercial & institutional and a variety of light and heavy industries. Providing treatment solutions from 100 gallons per day up to several million gallons per day is within our wheelhouse and driven by the type of treatment solution targeted. Our cross functional team brings outstanding expertise in engineering, treatment applications, manufacturing, and service, leveraging a broad portfolio of technologies. We have dependable (largely modular) designs for ease of installation and operation. We employ a flexible business model to address your needs from capital equipment to rental units (water as a service) and full lifecycle support. Newterra provides real solutions to the world's most demanding industrial end-users, including Mining, Oil & Gas and food and beverage, as well as potable and wastewater solutions for Private and Commercial Developments, and Municipalities.

With over 200+ employees worldwide, delivering 100's of systems annually Newterra is more than just an equipment and solutions provider. Newterra forms a long-term partnership with all our customers, providing long-term Life Cycle support and site services. We understand operating a water or wastewater treatment system can be challenging. Oftentimes, the purchaser of the system, and even the operator of the system, cannot maintain the same level of expertise as the original system designer. Newterra is dedicated to the ongoing success of all its clients, and so we offer our engineering and technical capabilities as an ongoing service.

What differentiates Newterra from our competition is:

1) Client Relationships – Our fundamental belief is that knowing our clients and understanding their needs, desires and challenges is the only way to foster and maintain long-lasting relationships where both parties reap the benefits.
2) Flexibility – Newterra understands that not all clients or projects are the same and therefore offer the ability to design the level of systems that is appropriate for your specific project needs.
3) Stature – Newterra is a right sized company to provide a hands-on approach to every project. One of Newterra's greatest strengths is the ability to make decisions quickly and effectively. Our clients appreciate the speed of service and our level of attentiveness, especially in moments of crisis or emergency.
4) Streamlined In-House Services and Capabilities – Being an integrated mid-sized equipment and service provider allows Newterra the flexibility to offer a full spectrum of in-house capabilities to best serve and create value for our clients.

Locations

Newterra is headquartered in Coraopolis, PA, with engineering, fabrication, and field service offices strategically located thought North America to better service our growing client base.

Newterra Corporate Headquarters
1555 Coraopolis Heights Rd. Suite 4100
Coraopolis, PA 15108
USA

Systems Manufacturing
1291 California Ave.
Brockville, ON K6V 5Y6
Canada

Pressure Vessel Manufacturing
250 Bolton Sullivan Dr.
Heber Springs, AR 72543
USA

Surface Aerators & Mixer Manufacturing
1215 Chaska Creek Blvd., Suite 400
Chaska, MN 55318
USA

Systems Manufacturing
1220 Kendall Road
San Luis Obispo, CA 93401
USA

2 Commercial Section

Price Breakdown

18 TORNADO Aerators

Item	Unit Price	Qty.	Total Price
Kit Tornado 7.5/60 For NEMA Motor 1-3/8" Shaft	$ 12,348.00	18	$ 222,264.00
Motor Techtop7.5/3/208-230/460/50-60 C-face 1800RPM IP55	Included	18	Included
Kit 2 Float System For Tornado 2-10HP Stainless Steel	Included	18	Included
Total			$ 222,264.00

12 TORNADO Aerators

Item	Unit Price	Qty.	Total Price
Kit Tornado 7.5/60 For NEMA Motor 1-3/8" Shaft	$ 12,348.00	12	$ 148,176.00
Motor Techtop7.5/3/208-230/460/50-60 C-face 1800RPM IP55	Included	12	Included
Kit 2 Float System For Tornado 2-10HP Stainless Steel	Included	12	Included
Total			$ 148,176.00

Freight Pricing (both options)

Item	Price
Estimated Equipment Freight to Site • System will be shipped DAP (Incoterms 2020) • Freight costs will be prepaid and added to invoice • Customer is responsible for offloading at site • Customer is responsible for final placement of equipment at the site	$ 4,375.00

Commercial Notes

- All prices are quoted in US Dollars (USD)
- This quote is for budgetary purposes only and does not constitute a binding offer of sale. Contact your Newterra representative for a firm priced proposal before placing a purchase order.
- Unless otherwise specified, any sales or value added taxes or duties are not included.
- This is an equipment supply price and does not include onsite technical services.
- This proposal has been prepared with considerations for globally sourcing materials and independent of provisions specific to BABAA.

Schedule

The information provided below is a projected estimate only and should not be assumed to represent a binding schedule.

- Submittal of drawings for approval (if required): Estimated to be 1-2 weeks after Order Acceptance[1]
- Customer review and approval of drawings (if required): In a timely fashion, not longer than 2 weeks
- Notice of readiness to ship: Estimated to be 8-10 weeks[2] after Receipt of Submittal Approval or Order Acceptance (if submittals are not required)

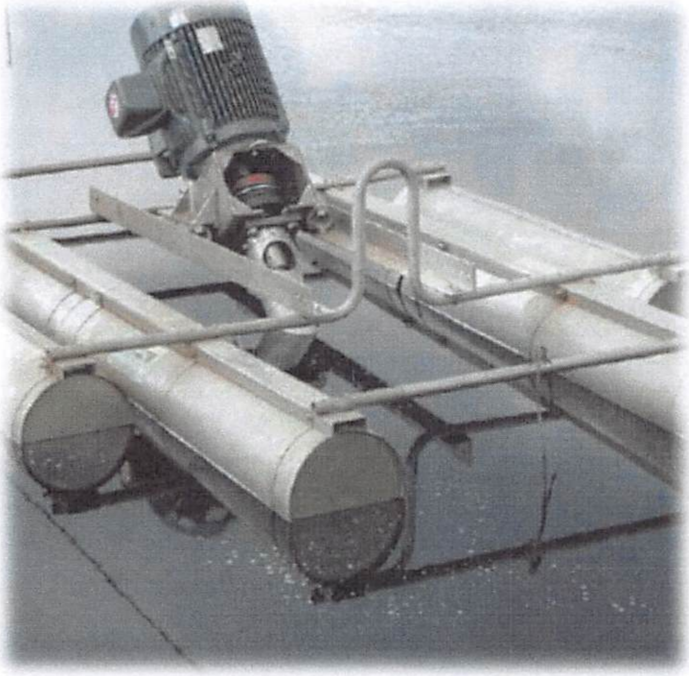
Notes:

1) *Order Acceptance will occur once all required fully executed order documents have been received (signed purchase order, mutually agreed upon terms and conditions) and acknowledged in writing by Newterra.*
2) *Readiness to Ship date will be contingent on payment milestones being met (payment received and confirmed by Newterra in writing). Delays on any payments will postpone the ship date.*

3 Technical Section

TORNADO® Surface Aspirating Aerator/Mixer

The TORNADO® Aerator provides high oxygen transfer and intensive mixing capabilities. The TORNADO® aerator's turbulent directional mixing and jet propulsion discharge assures that oxygen is quickly blended with the wastewater for unmatched oxygen transfer. The intense action of the jet propulsion shears wastewater solids to increase treatment performance and provide better contact for the oxygen and wastewater bacteria.



Scope of Supply

Newterra's scope of supply for this project consists of the following items:

Option 1:

- Eighteen (18) 7.5HP TORNADO® Surface Aspirating Aerator/Mixers, consisting of:
    - One (1) 230/460V, 60Hz, 3PH, 1800RPM NEMA Motor
    - One (1) 304SS 2-Pontoon Float System
    - One (1) 1-Year Non-Prorated Warranty

Note: Aerators shall arrive fully assembled for immediate mounting

Option 2:

- Twelve (12) 7.5HP TORNADO® Surface Aspirating Aerator/Mixers, consisting of:
    - One (1) 230/460V, 60Hz, 3PH, 1800RPM NEMA Motor
    - One (1) 304SS 2-Pontoon Float System
    - One (1) 1-Year Non-Prorated Warranty

Note: Aerators shall arrive fully assembled for immediate mounting

Scope of Supply by Others

All items below are EXCLUDED from this proposal and are the responsibility of the CUSTOMER. These are to be completed by others or specifically agreed to in writing by Newterra and included in the pricing section of the final version of the proposal.

- Our records show that Newterra was not involved in the sizing or selection of the aeration/mixing equipment on this project. We supplied what was defined by the end user and the end user takes responsibility for the adequacy of the aerators for the application.
- All aspects of final assembly and installation of the equipment at the project site, including field mounting of the equipment, electrical wiring and power connections, start-up and commissioning, filling of the tanks, and checking and testing of the components and systems. Float systems are delivered unassembled and field assembly is required. Assembly and installation are to be supplied by others.
- Control accessories such as electrical disconnects, motor starters or run timers are not included and are to be supplied by others.
- Electrical accessories such as electrical cable, electrical cable hangers, motor cable grips or strain reliefs are not included and are to be supplied by others.
- Soft starts and VFDs are highly recommended for any unit over 10 horsepower. Soft starts and VFDs are not included in proposal and are to be supplied by others.
- Mooring accessories such as mooring cable, mooring clips and thimbles, and mooring posts are not included and are to be supplied by others.
- The CUSTOMER will be responsible for supplying the design and equipment for the mooring posts for soil site conditions. Newterra can provide typical installations along with aerator forces being applied to the mooring posts.
- The CUSTOMER assumes responsibility for any alterations to the proposal, in design, materials, manufacture, or otherwise, as such alterations may affect the contract price, the delivery schedule, and the performance of components and the entire plant.
- Additional aerator accessories may be needed (not included in price) in the event the water level will fluctuate more than three (3) feet, these include but are not limited to: swing arms, low level legs, anti-erosion shields and anti-vortex shields. This equipment is available upon request.

4 Newterra Lifecycle Solutions

Robust Support and Complete Lifecycle Solutions: Call us at 1-800-420-4056

Newterra Lifecycle offerings are here to assist with maintaining your water treatment equipment every step of the way by offering OEM Spare Parts & Consumables customized to suit your needs, alongside a team of support staff dedicated to providing top level services for the life of your system. Not Just Technologies. Lifecycle Solutions.

Newterra Parts and Consumables Support

Our Newterra Parts Team ensures seamless replacement and maintenance parts support, with a detailed list of OEM critical spares, maintenance, and consumable parts provided in your Operations & Maintenance Manual. We're dedicated to meeting your parts requirements to ensure long-lasting equipment solutions. Whether your system needs regular maintenance or requires consumable parts for optimal performance, we have you covered. Our Customer Experience Team is here to assist you in identifying the right components based on your specific challenges. Let us connect you with one of our specialists to find the perfect solution tailored to your needs.

Technical Service Support

Our dedicated OEM Trained Service Team is here to help support you and your equipment needs. We offer a range of water treatment services including: 1) Operations Consultations, 2) Equipment Audits, 3) On-site Training, 4) 24/7 Digital Monitoring Services, 5) Equipment Maintenance/Repair, 6) Real-time Technical Support and 7) System Upgrades. Our Technical Services Teams are here to ensure your water treatment equipment is operating optimally, maximum uptime is achieved, and costly repairs are avoided. Reach out for expert guidance and a customized solution to your specific technical service needs today.

Newterra Digital Service

Newterra Digital Services offers the integration of 24/7 web-based remote monitoring to help you increase system runtime and track performance. It provides real-time data and notifications to you and our technical support team on how your system is running or if there are any issues. The technology also provides the ability to quickly analyze the root cause and assist in determining a proper solution. Newterra Digital Services web-based remote monitoring can consist of two levels of access; read-only and system control. With control, you can have the ability to restart components from remote locations saving you time and money. The advanced digital services support will help you get the most out of your water treatment equipment and stay ahead of potential problems.

Media & Media Services

Proper media selection is crucial for efficiency, sustainability, and cost-effectiveness. Newterra leads this sector, providing a range of media solutions from bulk supplies to specialized drums, including Granular Activated Carbon (GAC) and Resin media. When your media has lost its ability to reduce contaminants, our trained professionals, backed by Newterra's experience in the design and implementation of liquid and vapor phase treatment systems, provide complete on-site services. Our trained technicians will arrive on-site and safely clean and remove vapor phase and liquid phase media or even the vessels themselves. We embrace the entire lifecycle of your system.

Rentals Solutions

For just about any water problem, Newterra has you covered. If you're looking for medium or short-term water or wastewater treatment solutions, Newterra has a large, in-stock inventory of solutions that are available to rent. From supplemental aeration to remediation systems, pressure vessels, and complete wastewater treatment systems, our temporary ownership and rental solutions can save precious capital while solving a critical need. Newterra offers flexible terms and conditions to suit any customer.

5 Appendices

TORNADO Surface Aspirating Aerator

Powerful and reliable, self-aspirating surface TORNADO aerators are used to upgrade lagoon systems and expand the treatment capacity of mechanical wastewater treatment plants

Achieve Improved Aeration and Mixing With TORNADO Surface Aspirating Aerators

The TORNADO® Aerator by Newterra is an innovative aeration system designed for wastewater treatment applications. It features a unique, high-efficiency impeller design that creates a powerful tornado-like flow pattern, enhancing oxygen transfer and mixing in water treatment processes.

This aerator is known for its ability to effectively oxygenate and mix wastewater, promoting biological treatment processes and improving overall treatment efficiency. It is often used in aeration basins, lagoons, and other wastewater treatment systems to optimize oxygenation and mixing while minimizing energy consumption. TORNADO provides in a wide range of applications.

The TORNADO aerator's turbulent directional mixing and jet propulsion discharge assures that oxygen is quickly blended with the wastewater for unmatched oxygen transfer. The intense action of the jet propulsion shears wastewater solids to increase treatment performance and provide better contact for the oxygen and wastewater bacteria.

in the water
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The solid
teel propeller.
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stationary
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e aerators
ts of solids,
two tapered
shaft,
eller thrust
ip to 100,000
g bearing
cold climates

Stainless Steel Components

Durable stainless steel floats are unmatched in the industry and ensure the aerator remains buoyant for its full life, even in the harshest of environments. Proprietary engineering ensures that the aerator runs properly throughout its service life, without time consuming maintenance.

Reduced Energy Costs

Every TORNADO aerator is equipped with premium efficiency motor to operate more economically over time. Larger motors are designed to work with soft start or Variable Frequency Drive *(VFD)* controllers to eliminate power surge penalties and reduce energy costs.

Key Technical Features

- Available horsepower range: 2-100 hp *(1.5 kW-75 kW)*
- Operational speed: 1800 rpm at 60 Hz *(1500 rpm at 50 Hz)*
- Premium efficiency *(TEFC)* motors
- 304 stainless steel (standard) or 316 stainless steel (optional) construction
- Grease-lubricated bearings and a solid shaft ensure a vibration-free design

Markets and Industries

- Municipal Wastewater Treatme
- Aquaculture
- Wineries & Breweries
- Chemical Processing
- Pulp & Paper Mills
- Textile • Oil & Gas
- Mining
- Dairies
- Food & Beverage Processing

TORNADO Specifications

hp	kW	60 Hz Motor rpm	Motor FLA 460V	50 Hz Motor rpm	Motor FLA 380 V	Ship Weight lb (kg)
2	1.5	1730	3.1	1425	3.7	118 (54)
3	2	1745	4.0	1450	4.8	161 (73)
5	4	1750	6.5	1445	7.9	169 (76)
7.5	5.5	1750	9.4	1445	11.6	225 (102)
10	7.5	1750	12.4	1445	15	248 (113)
15	11	1760	18.6	1450	22.6	407 (185)
20	15	1760	23.5	1450	31.4	492 (223)
25	18.5	1770	29.6	1460	35.2	539 (244)
30	22	1770	35.5	1460	42	541 (245)
40	30	1770	47.1	1460	55	730 (331)
50	37	1770	59.2	1460	68	914 (415)
60	45	1775	69.4	1465	83	1146 (520)
75	56	1775	86.2	1465	103.5	1219 (553)
100	74.5	1780	114	1480	135	1353 (1353)

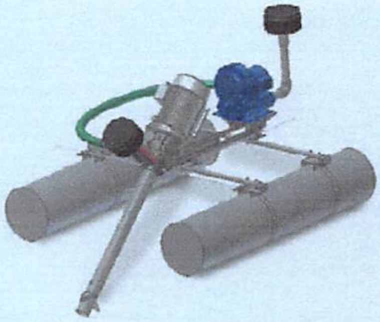
TORNADO® Surface Aspirating Aerator

Available Accessories

- Anti-erosion shields to prevent erosion in shallow *(clay or earthen)* basins
- Anti-vortex shield if vortexing occurs or if an aerator is operated below the standard 45 degree angle of operation
- Low-level legs to prevent damage to basin or equipment when water levels drop below three feet
- Walls and bridge mounts for mounting flexibility
- Swing arms to accommodate up to 15 feet of fluctuations in water elevation
- Maintenance decks built on pontoon platforms for easy servicing access
- Automatic grease lubrication equipment to reduce maintenance
- Blower add-on kit accessory to convert to blower-assisted operation
- **Rental units also available**

Enhanced Oxygenation for Advanced Wastewater Treatment

The Blower-Assisted TORNADO Aerator is used for wastewater treatment applications that require a higher level of oxygenation. A blower is added to the self-aspirating aerator to force additional air down the inlet hole. The blower uses a small motor, typically from 2 to 10 HP *(1.5kW to 7.5 kW)*, that inputs more oxygen as compared to a standard TORNADO aerator. The TORNADO Blower-assist aerator mounts at an angle on floats or can be wall-mounted. The motor and air intake is above the surface and the propeller is submerged beneath the water.

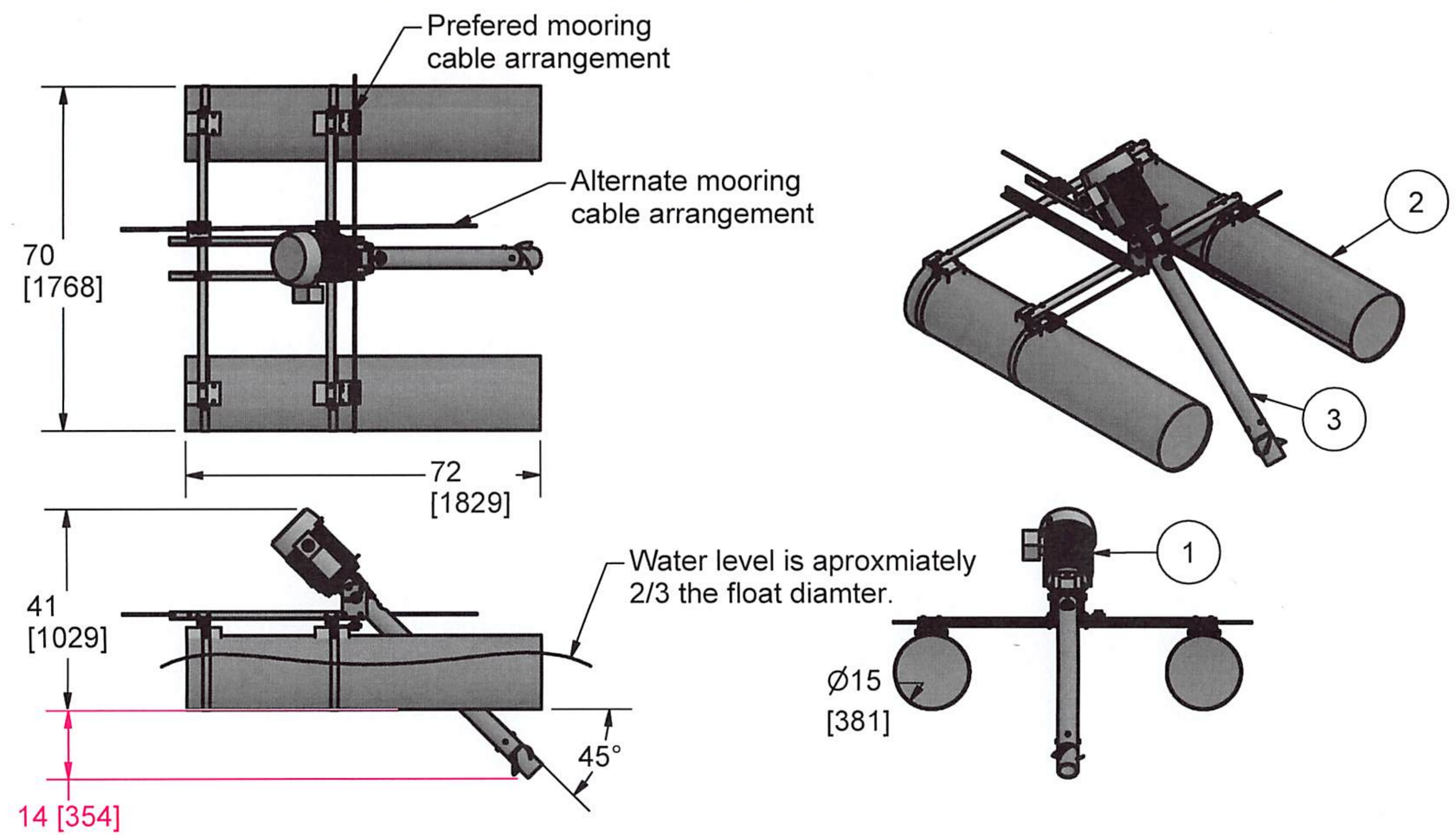


What's Your Unique Water Question?

With thousands of installed units around the world, Newterra is your expert provider for wastewater treatment solutions. We offer all major wastewater aeration technologies and the expertise to help you select and apply the equipment best suited for your application. Our technical experts are ready to assist you with the proper sizing, layout, and operation of your aeration system.

For just about any water problem, Newterra has you covered. Our temporary ownership and rental solutions can save precious capital while solving a critical need. Newterra offers flexible terms and conditions to suit any customer.

Contact us today at **+1 800.420.4056** or visit us online at **newterra.com**



NOTES:
1) FLOATS SHIPPED UNASSEMBLED, ASSEMBLY BY OTHERS.
2) MOORING PLATES CABLE & CABLE CLIPS NOT INCLUDED, AVAILABLE IN A KIT
3) NORMAL USEAGE IS FROM 45° TO 60°. AT ANGLES APPROCHING 30° A VORTEX SHIELD WILL BE NEEDED.
4) USE LOW LEVEL LEGS IF USED IN LESS THAN 3.5FT OF WATER.
5) Inch [mm]

PARTS LIST

ITE	QT	PART NO	DESCRIPTION	MASS [LBS]
1	1	37030	7.5HP/5.6KW MOTOR	45.866 lbmass
2	1	72152K	Kit: 2 Float System	157.359 lbmass
3	1	84907K	Kit Tornado 7.5/60 For NEMA Motor 1-3/8" Shaft	66.319 lbmass

DRAWN

DATE

CHECKED

SIZE
A

newterra

MATERIAL

MANUFACTURING NOTES (WHERE APPLICABLE):
-BREAK CORNERS AND SHARP EDGES
-REMOVE BURRS
-CLEAN AND PASSIVATE WELDS

DEFAULT TOLERANCES

FRACTIONAL	DECIMAL	ANGULAR
+/- 1/64	X.X +/- 0.1 X.XX +/- 0.03 X.XXX +/- 0.005	+/- 1°

TITLE
Kit 2 Float System With 7.5Hp TORNADO

THIRD ANGLE PROJECTION
SCALE: VIEW LEVEL

SHEET 1 of 1

DRAWING/PART NUMBER

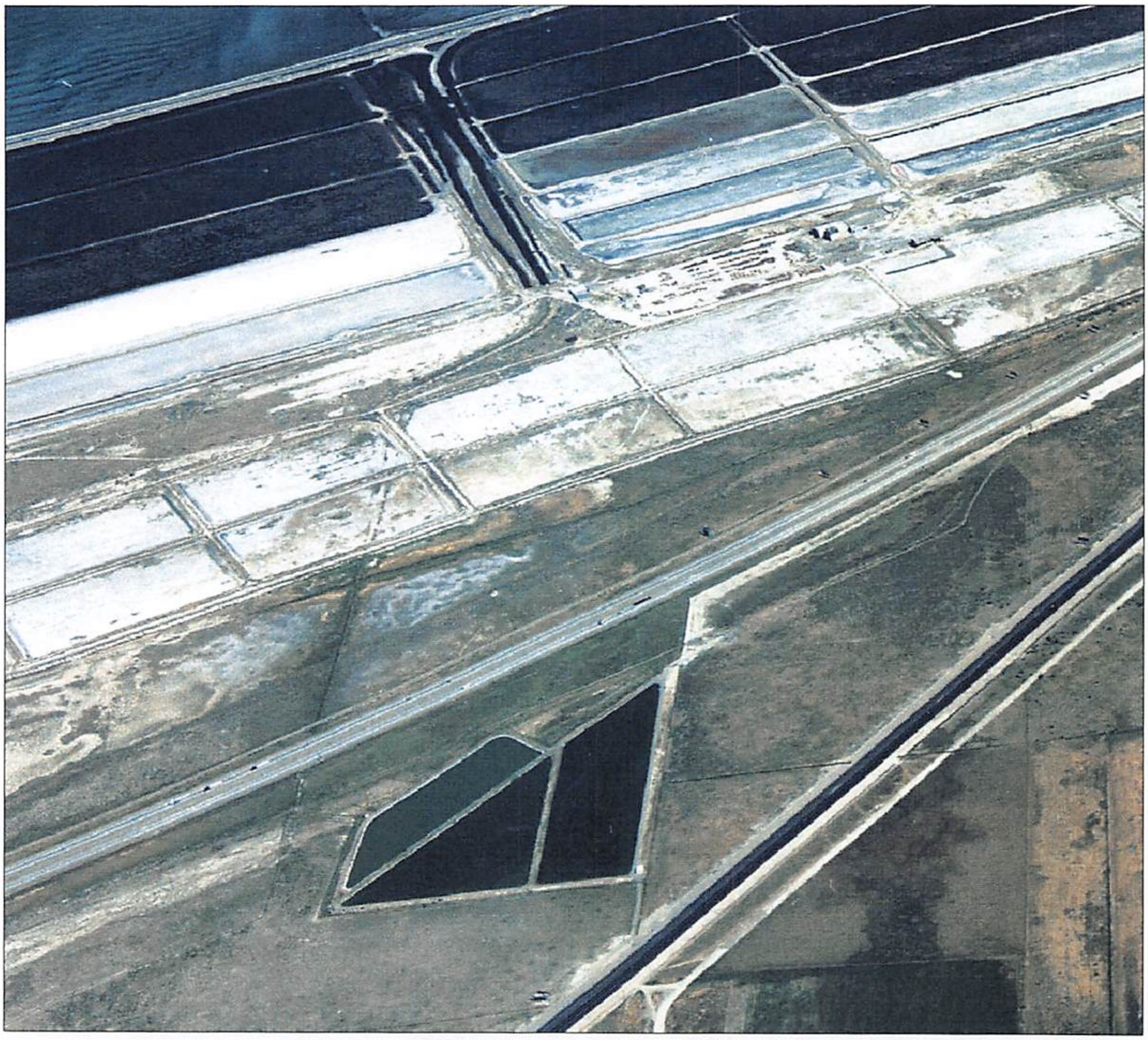
APPENDIX C: NEWTERRA SUPPORTING CALCULATIONS AND CONFORMANCE TO THE STIPULATED MINIMUM LEVELS OF SERVICE

- Calculations and Manufacture's Worksheets

APPENDIX D: 2004 DESIGN STUDY REPORT (DSR)

- Report Prepared by Ward Engineering Group for Cell 1

LAKE POINT IMPROVEMENT DISTRICT
LAGOON AERATORS – CELL NO. 1
DESIGN STUDY REPORT



Ward Engineering Group
1370 South West Temple
Salt Lake City, Utah 84115
(801)487–8040
APRIL 2004

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EXECUTIVE SUMMARY

Background

In June 2001, the Lake Point Improvement District (LPID) was presented with a *Preliminary Engineering Report for Wastewater Treatment* prepared by Ward Engineering Group (WEG). In that report WEG addressed the potential future growth of LPID and the surrounding area, and presented various options for a municipal wastewater treatment plant. Also in the report WEG recommended an interim solution of the installation of mechanical aerators in the existing lagoon system prior to the construction of a mechanical wastewater treatment plant. The installation of mechanical aerators would eliminate odors problems and increase the existing capacity of the lagoons, thus extending the life of the existing lagoon system.

Purpose of This Report

In May 2003, LPID contracted WEG to develop a Design Study Report (DSR) to evaluate various aerator options and to recommend the type of aerator that would best meet LPID's needs.

Existing Conditions

Lake Point is currently treating approximately 0.174 million gallons per day (MGD) of wastewater from 498 paid active equivalent residential units (ERUs). In addition to the 498 paid active connections there are 274 paid inactive ERUs that the District has received impact fees from. This brings the total number of ERUs that the lagoons should have capacity to treat to 772.

Wastewater from the District is treated in a system of three facultative lagoons with a hydraulic capacity of 0.293 MGD and a BOD capacity of 315 pound per day. Effluent from the treatment lagoons is discharged on an as-needed basis to an unnamed drainage ditch that flows into the Great Salt Lake.

Based upon the total number of paid active ERUs the BOD capacities of the lagoons is being exceeded by 15%.

Regulatory Requirements

The Utah Department of Environmental Quality (DEQ), Division of Water Quality (DWQ) regulates wastewater treatment facilities. The rules governing requirements for wastewater treatment facilities can be found in *Utah Administrative Code (UAC) Rule R317-3.*

All wastewater treatment facilities proposing improvements must submit construction drawings and specifications to DWQ and receive a construction permit and approval prior to beginning construction of the proposed improvements.

Population and Flow Projections

Population and flow projections for the LPID service area for the next twenty years have been taken into account for this study. The population and flow projections of future developments have not been taken into account. This is due to the uncertain time frame of these future developments.

Based upon an average of 3.5 people per ERU and 350 gallons per day (gpd) per ERU flow projections for the planning period were calculated. By the end of the planning period it is estimated that LPID may need to treat approximately 0.599 million gallons per day of wastewater.

Treatment Alternatives

Several treatment alternatives for LPID were explored to determine the most viable and economic alternative for supplying oxygen to wastewater. The alternatives considered are Diffusion Aeration, High Speed Surface and Aspirating Aeration.

Recommendation

Considering effectiveness and cost, the recommended aeration alternative is Aspirating Aerators. Based upon the depth of the lagoons and the current BOD loading it recommended that eight - 7.5 horsepower (hp) Tornado aspirating aerators as manufactured by Aeromix by installed at this time. The eight aerators are to be operated continuously to ensure adequate dissolved oxygen level is maintained. If the aerators are not operated continuously additional aerators will be required to maintain the dissolved oxygen level for treatment.

Prior to beginning construction of the project the design of the plans and technical specifications must be reviewed by the DWQ and a construction permit issued.

Estimated Cost of Construction

The Preliminary Estimated Cost of Construction for installation of eight aerators and infrastructure for 24 aerators is approximately $141,934. This includes a 20% contingency, engineering design, and construction management services.

INTRODUCTION

1.1. Background

In June 2001 the Lake Point Improvement District (LPID) was presented with a *Preliminary Engineering Report for Wastewater Treatment* prepared by Ward Engineering Group (WEG). In that report WEG addressed the potential future growth of LPID and the surrounding area, and presented various options for a mechanical wastewater treatment plant. Also in the report WEG recommended an interim solution of the installation of mechanical aerators in the existing lagoon system prior to the construction of a mechanical wastewater treatment plant. The installation of mechanical aerators would both eliminate odors problems and increase the existing capacity of the lagoons, thus extending the life of the existing lagoon system.

1.2. Purpose of This Report

In May 2003 LPID contracted WEG to develop a Design Study Report (DSR) to evaluate the various aerator options and to make a recommendation as to the type of aerator that would best suit LPID's needs.

This DSR has three main goals:

- Determine the current and future design parameters used in the design of the chosen aerator alternative.
- Evaluate the various aeration alternatives and recommend a chosen alternative.
- Provide preliminary engineering data for the chosen alternative.

2. EXISTING CONDITIONS

2.1. Planning Area

The planning area only included the LPID service area. Due to the uncertain time frame of development, the population and flow projections for future developments have not been taken into account. However, it should be noted that when development begins, the existing lagoon system with aerators could reach capacity in a relatively short period of time.

2.2. Planning Period

Population and flow projections for the LPID service area for the next twenty years are taken into account. As with the Planning Area, the population and flow projections for future developments have not been taken into account. This is due to the uncertain time frame of these developments.

2.3. Existing Facultative Lagoon System

LPID currently operates a facultative lagoon system, which consists of three aerobic/facultative lagoons operating in series, as shown in *Figure 1.*

Table 2.3A contains the hydraulic characteristics of the existing lagoon system.

Table 2.3A – Lagoon Hydraulic Characteristics

Cell	Function	Area (Acre)	Depth (feet)	Capacity (Million Gallons)
1	Primary	9.0	4.5	12.4
2	Secondary	7.4	6.0	13.6
3	Tertiary	5.0	6.0	9.2
TOTAL		21.4		35.2

The capacity of each cell is based upon 94% of the total volume of the cell. This is to account for the side slopes of each of the lagoons.

For complete mix calculations the full depth of primary cell is to be used. This equates to a total volume of 16.5 Million Gallons (MG) (2,205,730 cubic feet).

For odor control calculations the effective depth of Cell No.1 of 4.5-feet (12.4 MG or 1,657,640 cubic feet) will be used. This is to account for the depth of the sludge blanket. The sludge blanket is not to be disturbed by the aerators.

The existing lagoon system has an overall hydraulic capacity of 0.293 million gallons per day (MGD) or approximately 837 ERUs based upon 350 gallons per day (gpd) per ERU and a hydraulic retention time of 120 days. This hydraulic capacity does not include inflow and infiltration (I/I).

Additionally the lagoons have the capacity to treat 315 pounds of BOD based upon a maximum BOD loading rate of 35 pounds per day (ppd) per Acre (*UAC R317-3-10.3.A.1.*) and the 9-acre area of the primary cell. This equates to 431 ERUs based upon 0.73 ppd of BOD per ERU.

Currently LPID serves 498 Equivalent Residential Units (ERUs), with an additional 274 ERUs that are inactive. *Table 2.3B* contains a summary of the paid active and inactive ERUs.

Table 2.3B – Summary Of Paid Active And Inactive ERUs

Connection	Paid Active	Paid Inactive	Total
Commercial	286	0	286
Residential	212	274	486
TOTAL	498	274	772

Table 2.3C contains a summary of the paid active and total paid ERUs as compared to lagoon capacities.

Table 2.3C – Remaining Lagoon Capacity

Parameter	Active ERUs	Total ERUs
Hydraulic Loading (MGD)	0.174	0.270
BOD Loading (ppd)	363	563
Hydraulic Capacity Remaining	41%	**8%**
BOD Capacity Remaining	**-15%**	**-79%**

Based upon these figures the lagoons are at their BOD loading capacity and measures should be taken as soon as possible to increase the treatment capacity of the lagoons.

2.4. Wastewater Constituents

Historic sampling data collected by the LPID for January 2000 through March 2003 is contained in *Appendix C* along with graphical representations of the sampling data. *Table 2.4* contains the average BOD and Total Suspended Solids (TSS).

Table 2.4 – Historic Influent Sampling Data

Average BOD (Mg/l)	Average TSS (Mg/l)
161	197

The historic sampling data indicate that the average BOD and TSS concentrations are not increasing even though there are wide variations in the data.

For this study the District standard of an average BOD concentration of 250 mg/L will be used in all calculations.

3. POPULATION AND FLOW PROJECTIONS

3.1. Population Projections

Population projections for the LPID service area from the *Preliminary Engineering Report for Wastewater Treatment* have been revised and used in this study. The projections have been extended to 2023. Due to the uncertain time frame of development, the population and flow projections for future developments have not been taken into account. Therefore, only the paid active ERUs have been used as a base line for projects. The population projections from the *Preliminary Engineering Report for Wastewater Treatment* were determined based upon a flat residential and commercial growth rate of 6% per year and are related in terms of ERUs.

An ERU is defined as being the equivalent flow of one residential unit or home. Based upon District standards, this is assumed to be approximately 350 gallons per day or 3.5 persons per ERU and 100 gallons per day per capita, as prescribed in *Utah Administrative Code (UAC) R317-3.*

Table 3.1 contains a summary of the calculated number of residential and commercial ERUs for the LPID service area.

Table 3.1 – Population Projections

Year	Residential ERUs	Commercial ERUs	Total
2008	284	383	667
2013	380	467	847
2023	680	731	1411

Appendix C contains more detailed information for population and flow projections.

3.2. Flow Projections

Flow projections for the planning period have been calculated based upon an average flow of 350-gallons per day per ERU as shown in *Table 3.2.* Due to the well-maintained sewer collection system, the system experiences little Inflow and Infiltration (I/I), therefore I/I flows have not been taken into account in these flow projections.

Table 3.2 – Flow Projections

Year	Residential Flow (MGD)	Commercial Flow (MGD)	Total
2008	0.145	0.134	0.279
2013	0.179	0.164	0.342
2023	0.284	0.256	0.540

Appendix C contains more detailed information for population and flow projections.

4. REGULATORY REQUIREMENTS

4.1. General

The Utah Department of Environmental Quality (DEQ), Division of Water Quality (DWQ) regulates wastewater treatment facilities. The rules governing requirements for wastewater treatment facilities can be found in *Utah Administrative Code (UAC) Rule R317-3.*

All wastewater treatment facilities proposing improvements must submit construction drawings and specifications to DWQ and receive a construction permit and approval prior to beginning construction of the proposed improvements.

These requirements must be followed for the design of complete mix aerated lagoons.

4.2. Lagoon Requirements

The following is a summary of lagoon requirements as described in *UAC Rule R317-3-10.*

- The minimum detention time for discharging lagoons with chlorination is 120 days. The detention time is calculated using the entire lagoon volume less 18-inches of sludge build-up in the primary cell.
- The minimum detention time for aerated lagoons is 30 days.
- The maximum BOD loading for facultative lagoons is 15 to 35 pounds per acre per day.

4.3. Aeration Requirements

The following excerpts from *UAC Rule R317-3-10* describe the regulatory requirements for complete mix aerated lagoons.

- "...[the design parameters for the aerated lagoon] should be based on two pounds of oxygen input per pound of BOD applied..."
- "Aeration equipment shall be capable of maintaining a minimum dissolved oxygen level of 2 milligrams per liter in the lagoon at all times such that their circles of influence meet. The circle or zone of influence is the area in which return velocity is greater than 0.15 feet per second as indicated by the manufacturer's certified data."
- "Freezing. Suitable protection from weather shall be provided for aerators and electrical controls."

5. LAGOON AERATION DESIGN STANDARDS

5.1. General

The following design standards are based upon state regulations and accepted engineering standards and existing lagoon parameters.

Table 5.1 – Complete Mix Lagoon Design Parameters

Description	Existing	Future
Cell No. 1 Area (Ac)	9.0	9.0
Cell No. 1 Depth (ft)	6.0	6.0
Cell No. 1 Volume (mg)	16.5	16.5
ERUs	772	2,425
Flow (MGD)	0.270	0.849
BOD (mg/l)	250	250
BOD (lb/d)*	563	1,770
Average Water Temperature (^oF)	52.9	52.9
Maximum Water Surface Elevation (ft)	4,242.5	4,242.5

* Based upon 250 mg/L x 8.34 x Flow (MGD)

The following assumptions were made when determining the design parameters:

- Neither the geometry nor the size of Cell No. 1 will change.
- The more conservative recommended state standards for BOD of 250 mg/l or 0.73 ppd per ERU are to be used (*UAC R-317-3-4.3.C*).
- A BOD loading rate of 35 ppd per acre to the primary cell is to be used (*UAC R-317-3-10.3.A.1*).
- For complete mix lagoons, an effective depth of 6 feet is used.

5.2. Cold Weather Conditions

During the months in which lagoon temperatures are typically below 40 degrees, typically November through March, biological activity is extremely low. Because of the decrease temperatures and biologic activity during this time period the effectiveness of the aerators will drop. During this time it may be difficult to meet the discharge requirements and may be necessary to retain wastewater until warmer weather and increased biological activity.

Table 5.2 – Lagoon Average Cold Weather Temperature

Month	Average Temperature (°F)
December-01	33.1
January-01	33.3
February-01	33.5
March-01	40.3
December-02	40.2
January-02	40.2
February-02	40.8
March-02	49.8

5.3. Odor Control Standards

There is not a quantitative standard used in the sizing of aerators for the control of odor. General engineering standards suggest that 20% of total horsepower required for complete mix is adequate for neutralization of odors.

5.4. Oxygen Requirement Standards

Oxygen requirements for aerated lagoons are based upon on "two pounds of oxygen input per pound of BOD applied" and "a minimum dissolved oxygen level of 2 milligrams per liter in the lagoon at all times" as specified in *UAC Rule R317-3-10.3-G.*

5.5. Mixing Requirement Standards

Mixing requirements for complete mix are based upon the general engineering standard of 0.08 horsepower (hp) of mixing per 1,000 cubic feet of lagoon volume.

6. LAGOON AERATION ALTERNATIVES

6.1. General

The main purpose of aeration is to supply oxygen to the wastewater to enhance the aerobic digestion of BOD as well as for the control of odor.

There are two basic methods of aerating wastewater 1) to introduce air into the wastewater with submerged diffusers and 2) to agitate the wastewater mechanically to promote the transfer of air from the atmosphere to the wastewater.

This report will evaluate three different types of aeration:

- Diffused Air
- High Speed Surface Aerators
- Aspirating Aerators

Each of these will be covered separately in the following sections.

6.2. Diffused Air

A diffused air system consists of diffusers submerged in the wastewater, header pipes, air mains, blowers, and appurtenances through which the air passes.

With a diffused air system, blowers force air through a series of air pipes to a series of diffusers that are submerged. The air bubbles up through the water causing mixing as well as oxygen transfer.

A diffused air system provides a high oxygen transfer rate. However due to the high initial cost and maintenance issues this option will not be evaluated further.

6.3. High-Speed Surface Aerators

High-speed surface aerators typically mounted on floats so that they can move vertically with changes in the water surface elevation. The aerators are then anchored to the lagoon banks using mooring cables.

High-speed surface aerators serve dual purposes of oxygenation and mixing. They oxygenate the water by pulling water up from the bottom of the lagoon and throwing it into the air where contact with the oxygen in the air is transferred to the water. Secondly they provide mixing. By pulling water up from the bottom of the lagoon they also provide mixing.

High-speed surface aerators create a high aerosol environment that can lead to odor problems. Additionally they have a limited zone of mixing influence. The limited mixing potential can lead to freezing problems in winter months.

6.4. Aspirating Aerators

Aspirating aerators provide both mixing and aeration and are typically mounted on floats so that they can move vertically with changes in the water surface elevation. The aerators are then anchored to the lagoon banks using mooring cables.

As with high-speed surface aerators, aspirating aerators provide both oxygenation and mixing of wastewater. Moreover, aspirating aerators inject air into water by use of a submerged impeller connected to a solid shaft inside a hollow tube. As the impeller rotates air is pulled through the hollow shaft by the creation of a vacuum that is caused by the rotation of the impeller. The rotation of the impeller also causes mixing.

By injecting air, aspirating aerators have more efficient O_2 transfer, have no aerosol (less odors) and cost less than diffusers. Because of this design, they are not affected by freeze and are easier to maintain.

7. RECOMMENDED ALTERNATIVE

7.1. Recommended Aerator

Based upon the alternative types of aeration considered, the recommended alternative is an aspirating aerator. The aspirating type aerator will supply adequate mixing and oxygen transfer to increase the existing lagoon capacity and possibly reduce the odor associated with the lagoons.

There are two main manufacturers of aspirating aerators, Aeromix which produces the Tornado and Aeration Industries International, Inc., which produces the Aire-O2. Both the Tornado and the Aire-O2 are similar in design and function. The main difference is that the Tornado cost about $200 less and is of better construction. The manufacturer has designed the Tornado for ease of maintenance with the majority of the components being readily available at most retail hardware stores.

Therefore it is recommended that the 7.5 hp Tornado aerator manufactured by Aeromix be used. The remaining sections of this report will be based upon the Tornado. Refer to *Appendix E* for drawings relating to the Tornado.

7.2. Horsepower Requirements

Based upon the regulatory requirements and horsepower design parameters discussed in Sections 4 and 5 of this report, the horsepower requirements for mixing are summarized in *Table 7.2A*.

Table 7.2A – Mixing Horsepower Requirements

Parameter	Required Horsepower*
Complete Mix	176
Partial Mix	88
Odor Control	26

* - Based upon continuous operation.

A total of 24-7.5 hp aerators will be required in Cell No. 1. At the present time, it is not necessary for LPID to install all of the aerators that will be required at build out. Therefore a phasing plan has been developed based upon the calculated BOD loading rate. *Table 7.2B* contains a summery of aeration phasing.

Table 7.2B – Aeration Phasing

#ERU	Flow (MGD)	BOD (ppd)**	Horsepower*	7.5 hp Aerators
772	0.270	563	56	8
1,000	0.350	730	72	10
1,250	0.438	912	91	12
1,500	0.525	1,095	109	15
1,750	0.6123	1,277	126	17
2,000	0.700	1,460	144	20
2,250	0.788	1,642	163	22
2,425	0.849	1,770	176	24

* - Based upon continuous operation.
** - Based upon 250 mg/L x 8.34 x Flow (MGD)

As the number of ERUs increases thus increasing the flow and BOD loading additional aerator can be installed.

It is feasible to install aerators into all three lagoons. With aerators in all three lagoons the hydraulic retention time can be reduced to 30 days (*UAC R317-3-10.3.F.2.a(1)*). This equates to a hydraulic capacity of 1.31 MGD or 3,743 ERUs. Cell No. 2 would require 20-7.5 hp aerators and Cell No. 3 would require 13-7.5 hp aerators operating continuously to provide complete mix. <u>However at this point a mechanical wastewater treatment plant may be more economically viable.</u>

7.3. Construction Recommendation

Based upon the current total number of active and inactive ERUs it is recommended that eight – 7.5 hp aerators be installed at this time and ran continuously. *Figure 1* contained in illustrates the proposed layout of the initial eight aerators.

At the time the initial eight aerators are installed, infrastructure for the maximum number of aerators to be installed in Cell No. 1 should also be installed. The infrastructure includes running PVC duct for future electrical wiring, mooring posts with cables, and a control panel with adequate capacity for the 24 aerators. By installing the mooring posts with cables the operator can then have the flexibility to change the layout of the aerators as operation of the lagoons dictate, only the electrical wiring will need to be altered. Additionally when future aerators are required they can be easily installed without having to first install the mooring posts with cables, only the electrical wiring and controls will need to be installed. Prior to installation and shipping of the aerators from the manufacturer, the manufacturer should check the aerators to ensure that the oxygen transfer rate prescribed can be obtained.

It is also recommended that a dissolved-oxygen (DO) monitoring meter be included. The DO meter could be either a portable unit or a fixed meter stationed at the outfall between lagoons 1 and 2. A portable DO meter would be more applicable and allow for greater flexibility in monitoring DO levels through out the cell.

At the point when the flow and BOD loading reach a point of 0.849 MGD or 1,770 ppd, respectively, additional aerators will need to be installed into Cell No. 2 to maintain treatment capacity. It is recommended that prior to installation of aerators in Cell No. 2 that the District re-evaluates the option of a mechanical wastewater treatment facility.

8. Estimated Cost of Construction

The Preliminary Estimated Cost of Construction for installation of eight aerators and infrastructure for 24 aerators is approximately $141,934. This includes a 20% contingency, engineering design, and construction management services. See *Appendix B* for Engineer's Estimate of Probable Cost.

9. Conclusion

At this time the lagoons are at their BOD loading capacity and measures must be taken to ensure adequate treatment of wastewater. Therefore it is recommended that aerators be installed in Cell No.1.

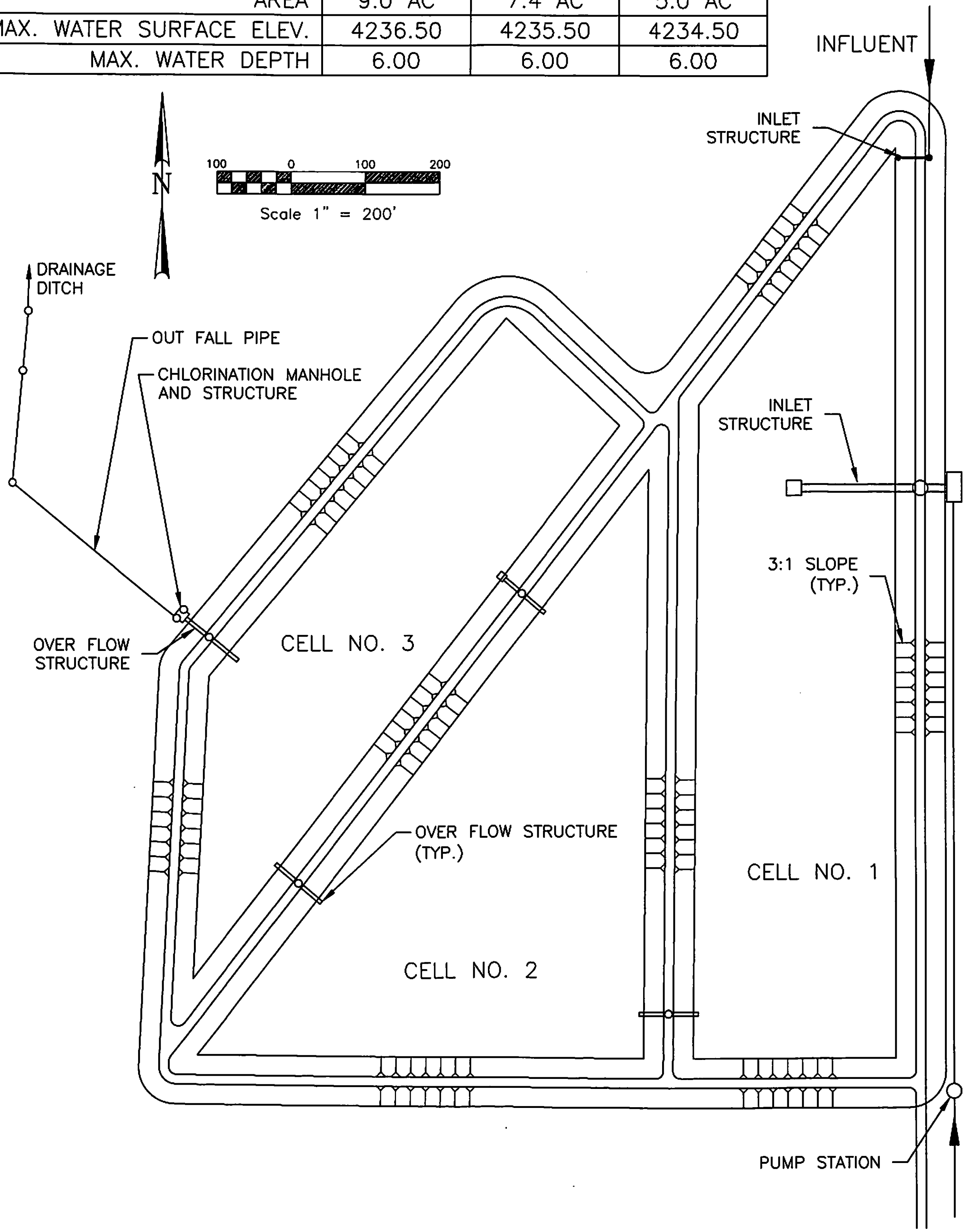
Of the aerator options reviewed, it is recommended that an aspirating type aerator be used. An aspirating aerator will allow a greater degree of flexibility in operating and provide both mixing and aeration. Of the two aspirating aerators available, the Tornado manufactured by Areomix is recommended.

To meet the present paid ERUs demand eight – 7.5 horsepower aerators will be required to meet all of the regulatory and treatment requirements. Preliminary cost estimate indicates that the $141,934 including engineering.

Prior to beginning construction of the project the design of the plans and technical specifications must be reviewed by the DWQ and a construction permit issued.

FIGURES

	CELL NO. 1	CELL NO. 2	CELL NO. 3
AREA	9.0 AC	7.4 AC	5.0 AC
MAX. WATER SURFACE ELEV.	4236.50	4235.50	4234.50
MAX. WATER DEPTH	6.00	6.00	6.00



Drawn by:	Client: LPID
Design by:	Drawing: Existing Lagoons
Checked by:	Job NO. LPID 23
Date: JUL 03	

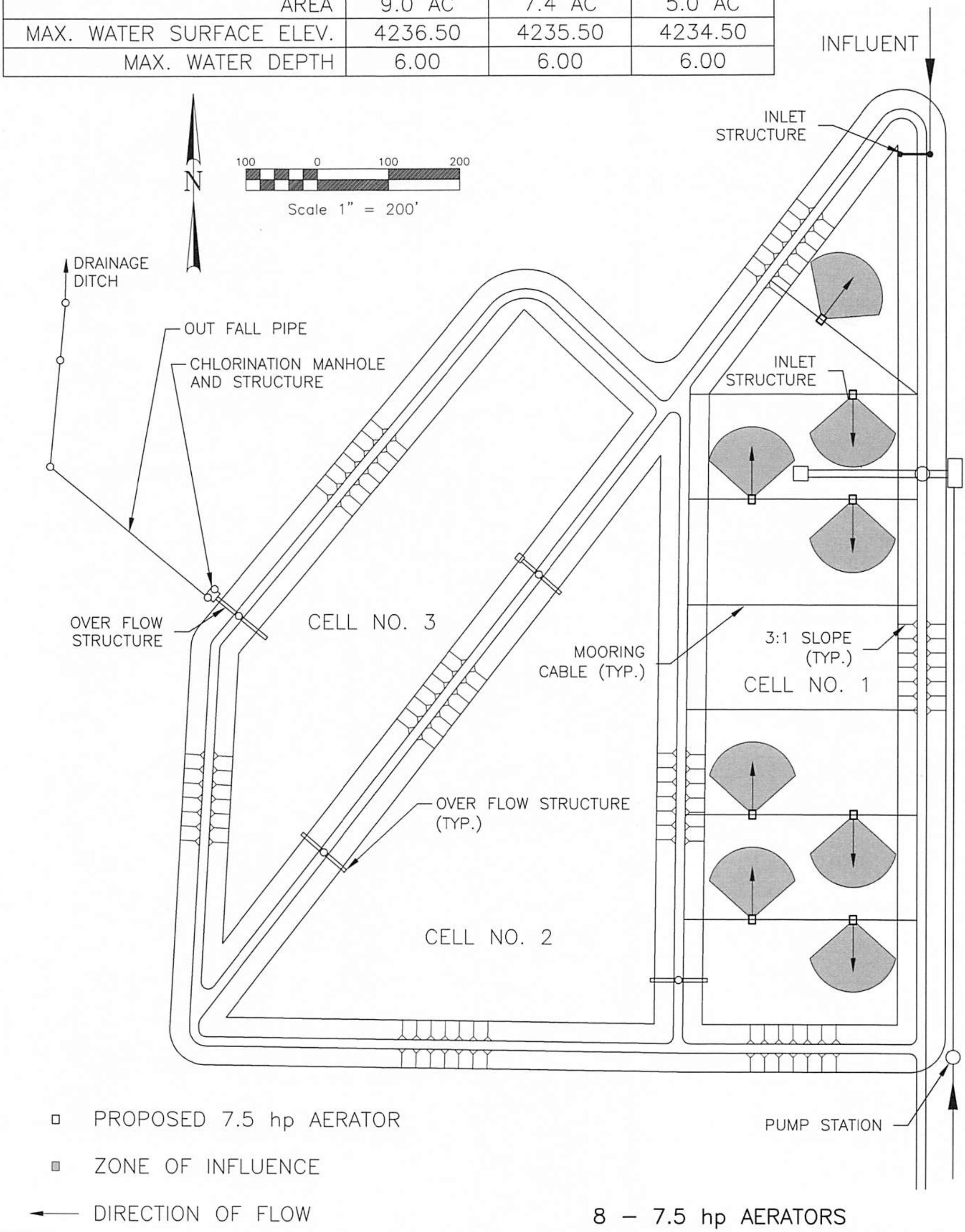
Lagoon Aerators - Cell No. 1

Figure 1

Ward Engineering Group

Sheet:

	CELL NO. 1	CELL NO. 2	CELL NO. 3
AREA	9.0 AC	7.4 AC	5.0 AC
MAX. WATER SURFACE ELEV.	4236.50	4235.50	4234.50
MAX. WATER DEPTH	6.00	6.00	6.00



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Design by:
Checked by:
Date: JUL 03

Client: LPID
Drawing: Existing Lagoons
Job NO. LPID 23

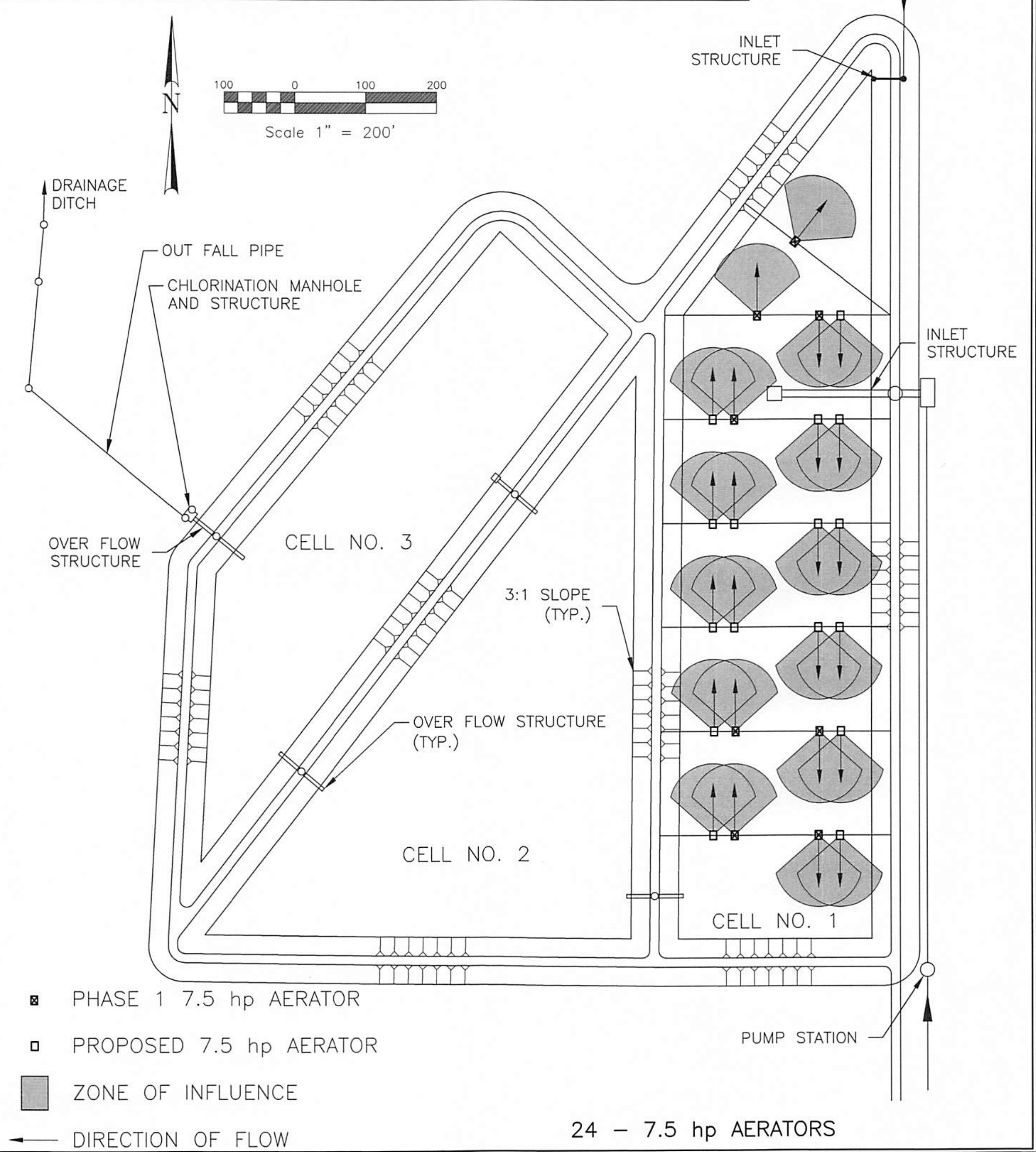
Lagoon Aerators - Cell No. 1

Figure 2

Ward Engineering Group

Sheet:

	CELL NO. 1	CELL NO. 2	CELL NO. 3
AREA	9.0 AC	7.4 AC	5.0 AC
MAX. WATER SURFACE ELEV.	4236.50	4235.50	4234.50
MAX. WATER DEPTH	6.00	6.00	6.00



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APPENDIX A
ABBREVIATIONS AND DEFINITIONS

Abbreviations

BOD: Biochemical Oxygen Demand
DO: Dissolved Oxygen
ERU(s): Equivalent Residential Unit
gpcd: gallons per capita per day
gpd: gallons per day
hp: horsepower
LPID: Lake Point Improvement District
mgd: million gallons per day
NPDES: National Pollutant Discharge Elimination Standards
O&M: Operations and Maintenance
ppd: pounds per day
TSS: Total Suspended Solids
UAC: Utah Administrative Code
UPDES: Utah Pollutant Discharge Elimination Standards
WWTP: Wastewater Treatment Plant

Definitions

Equivalent Residential Unit (ERU): equivalent to 350 gpd and 0.73 ppd BOD (mean values)

APPENDIX B
ENGINEER'S COST ESTIMATE

Engineer's Estimate of Probable Cost of Construction

Lagoon Aerators - Cell No. 1 - Phase 1

No.	*Item*	*Quantity*	*Unit*	*Unit Cost*	*Cost*
1	7.5 hp Aerator	8	EA	$ 7,000.00	$ 56,000.00
2	4" PVC Conduit	3500	LF	$ 2.00	$ 7,000.00
3	5' Dia. 4" PVC Conduit Sweep	12	EA	$ 50.00	$ 600.00
4	Junction Box	1	EA	$ 500.00	$ 500.00
5	Electrical Cable	5900	LF	$ 1.62	$ 9,558.00
6	Mooring Posts	13	EA	$ 200.00	$ 2,600.00
7	1/4" Mooring Cable	2400	LF	$ 1.75	$ 4,200.00
8	Controls	8	EA	$ 2,089.00	$ 16,712.00
9	Control Panel	1	LS	$ 5,000.00	$ 5,000.00
10	Portable DO Meter	1	LS	$ 1,000.00	$ 1,000.00
11	Mobilization	1	LS	$ 2,000.00	$ 2,000.00
Sub-Total					$ 105,170.00

Contingency (20%)	$ 21,034.00
Engineering	$ 10,320.00
Construction Management	$ 5,410.00
TOTAL	**$ 141,934.00**

This cost estimate is <u>an estimate only</u>. These figures are supplied as a guide only. Ward Engineering Group is not responsible for fluctuation in cost of material, labor or components, or unforeseen contingencies.

APPENDIX C
POPULATION AND FLOW PROJECTIONS

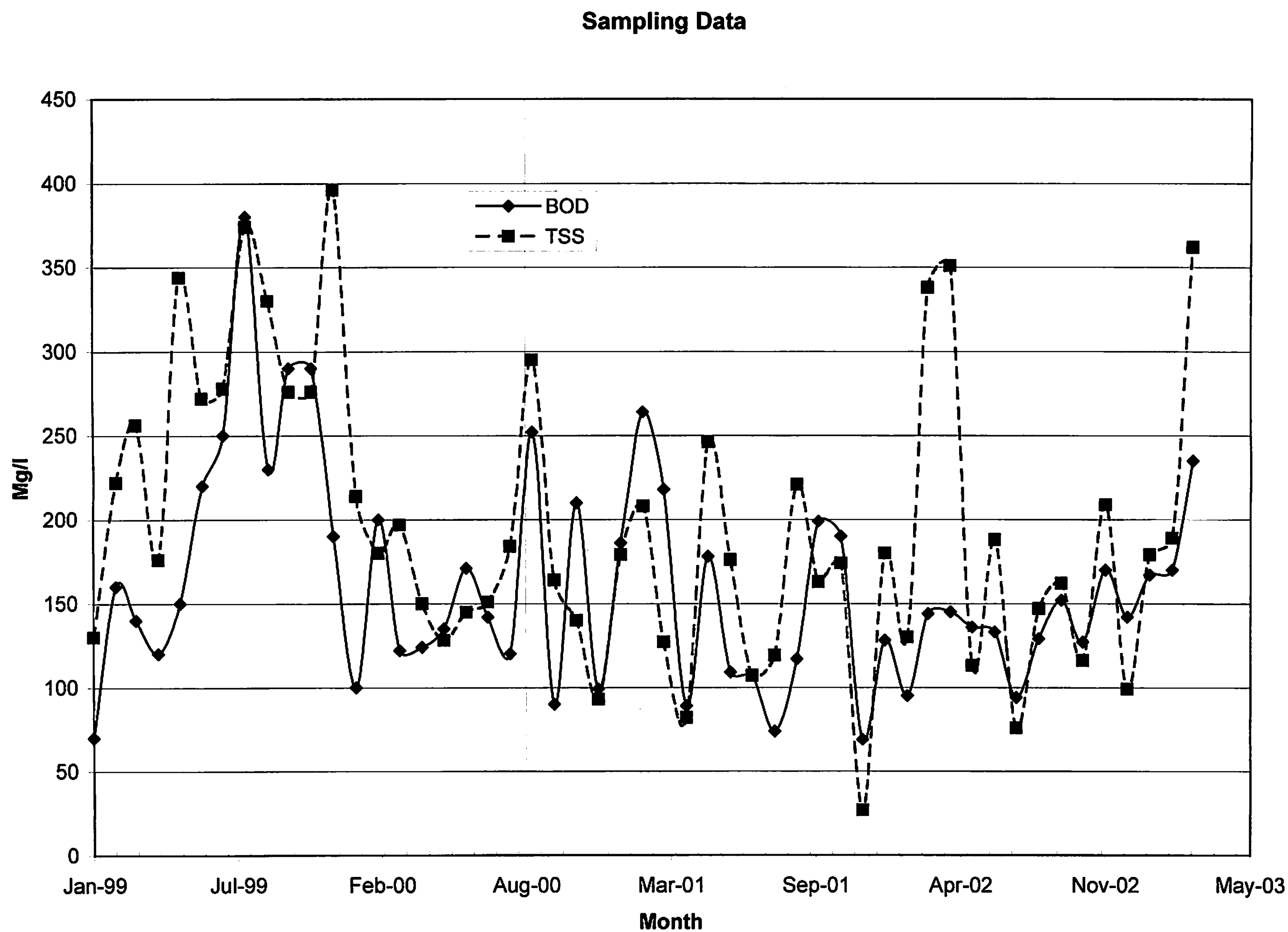
Lake Point Improvement District
Lagoon Aerators - Cell No. 1
LPID 23
Population and Flow Projections

	Residential		Commercial		Total	
Year	ERU	Flow (mgd)	ERU	Flow (mgd)	ERU	Flow (mgd)
2003	212	0.120	331	0.112	543	0.232
2004	225	0.125	331	0.116	556	0.241
2005	238	0.129	343	0.120	581	0.250
2006	252	0.134	356	0.125	608	0.259
2007	268	0.140	369	0.129	637	0.269
2008	284	0.145	383	0.134	667	0.279
2009	301	0.151	398	0.139	699	0.291
2010	319	0.158	414	0.145	733	0.302
2011	338	0.164	431	0.151	769	0.315
2012	358	0.171	449	0.157	807	0.328
2013	380	0.179	467	0.164	847	0.342
2014	402	0.187	487	0.171	890	0.357
2015	427	0.195	509	0.178	935	0.373
2016	452	0.204	531	0.186	983	0.390
2017	479	0.214	555	0.194	1034	0.408
2018	508	0.224	580	0.203	1088	0.427
2019	539	0.234	607	0.212	1145	0.447
2020	571	0.246	635	0.222	1206	0.468
2021	605	0.258	665	0.233	1270	0.491
2022	641	0.270	697	0.244	1338	0.514
2023	680	0.284	731	0.256	1411	0.540

*These tabulations were taken from the Preliminary Engineering Report for Watewater Treatment prepared by Ward Engineering in July 2001.

Lake Point Improvement District
Lagoon Aerators - Cell No. 1
LPID 23
Wastewater Consituents

		Mg/l		Lb/Day	
Month	Average Flow (MGD)	BOD	TSS	BOD	TSS
Jan-99	0.147	70	130	86	159
Feb-99	0.164	160	222	219	304
Mar-99	0.124	140	256	145	265
Apr-99	0.138	120	176	138	203
May-99	0.13	150	344	163	373
Jun-99	0.096	220	272	176	218
Jul-99	0.104	250	278	217	241
Aug-99	0.102	380	374	323	318
Sep-99	0.108	230	330	207	297
Oct-99	0.085	290	276	206	196
Nov-99	0.089	290	276	215	205
Dec-99	0.1	190	396	159	330
Jan-00	0.114	100	214	95	204
Feb-00	0.147	200	180	245	221
Mar-00	0.146	122	197	149	240
Apr-00	0.134	124	150	139	168
May-00	0.132	135	128	149	141
Jun-00	0.105	171	145	150	127
Jul-00	0.121	142	151	143	152
Aug-00	0.108	120	184	108	166
Sep-00	0.113	252	295	238	278
Oct-00	0.106	90	164	80	145
Nov-00	0.086	210	140	151	100
Dec-00	0.106	99	93	88	82
Jan-01	0.114	186	179	177	170
Feb-01	0.114	264	208	251	198
Mar-01	0.127	218	127	231	135
Apr-01	0.119	89	82	88	81
May-01	0.125	178	246	186	257
Jun-01	0.126	109	176	115	185
Jul-01	0.145	107	107	129	129
Aug-01	0.16	74	119	99	159
Sep-01	0.152	117	221	148	280
Oct-01	0.127	199	163	211	173
Nov-01	0.128	190	174	203	186
Dec-01	0.14	69	27	81	32
Jan-02	0.131	128	180	140	197
Feb-02	0.15	95	130	119	163
Mar-02	0.195	144	338	234	550
Apr-02	0.182	145	351	220	533
May-02	0.17	136	113	193	160
Jun-02	0.196	133	188	218	307
Jul-02	0.184	94	76	144	117
Aug-02	0.18	129	147	194	221
Sep-02	0.16	152	162	203	216
Oct-02	0.132	127	116	140	128
Nov-02	0.167	170	209	237	291
Dec-02	0.164	142	99	194	135
Jan-03	0.162	167	179	226	242
Feb-03	0.162	170	189	230	256
Mar-03	0.161	235	362	316	486
	AVERAGE	**161**	**197**	**225**	**274**


Sampling Data
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400
350
300
250
200
150
100
50
0
Mg/l
BOD
TSS
Jan-99
Jul-99
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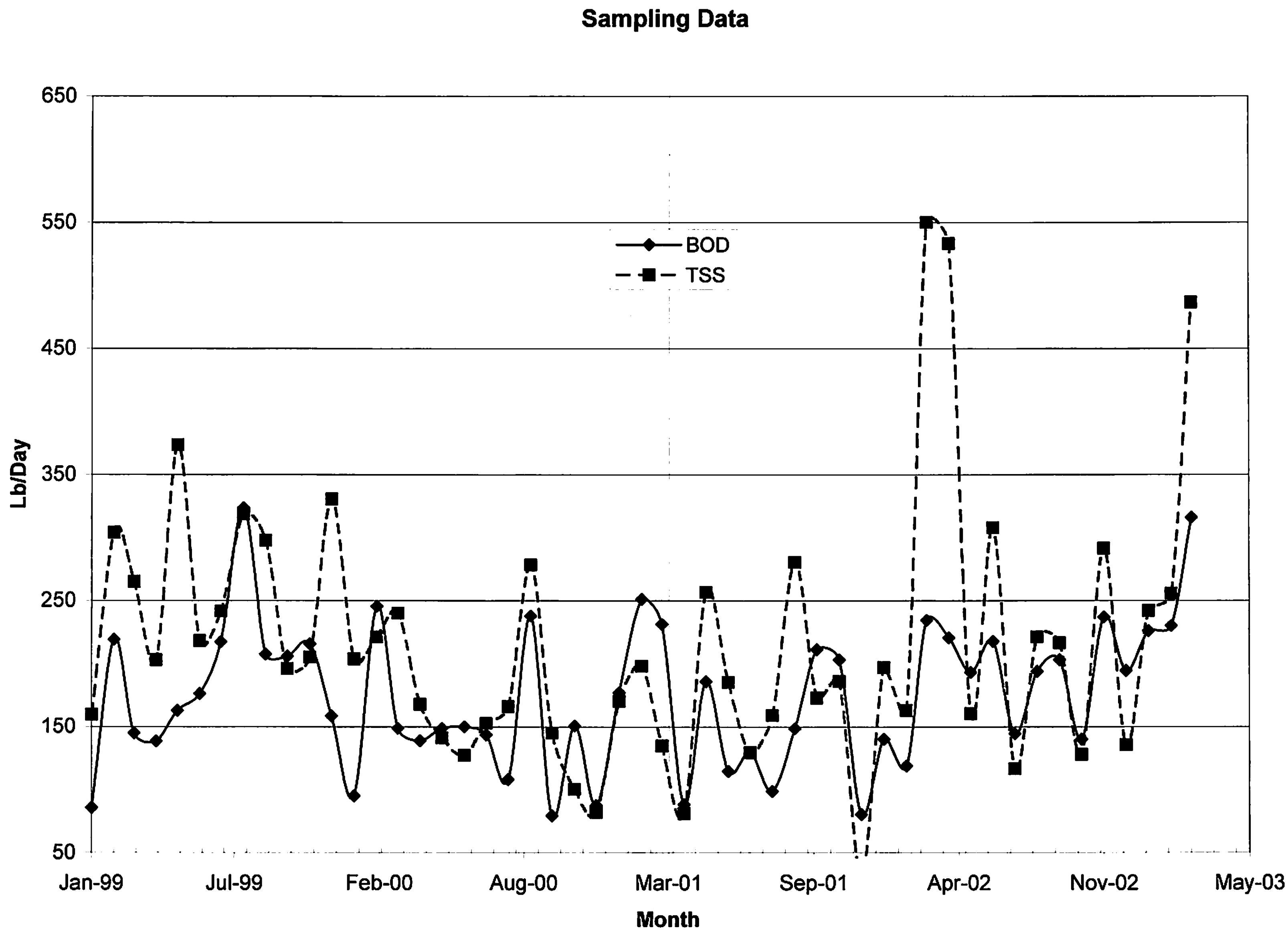
Nov-02
May-03
Month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Lb/Day
BOD
TSS
Jan-99
Jul-99
Feb-00
Aug-00
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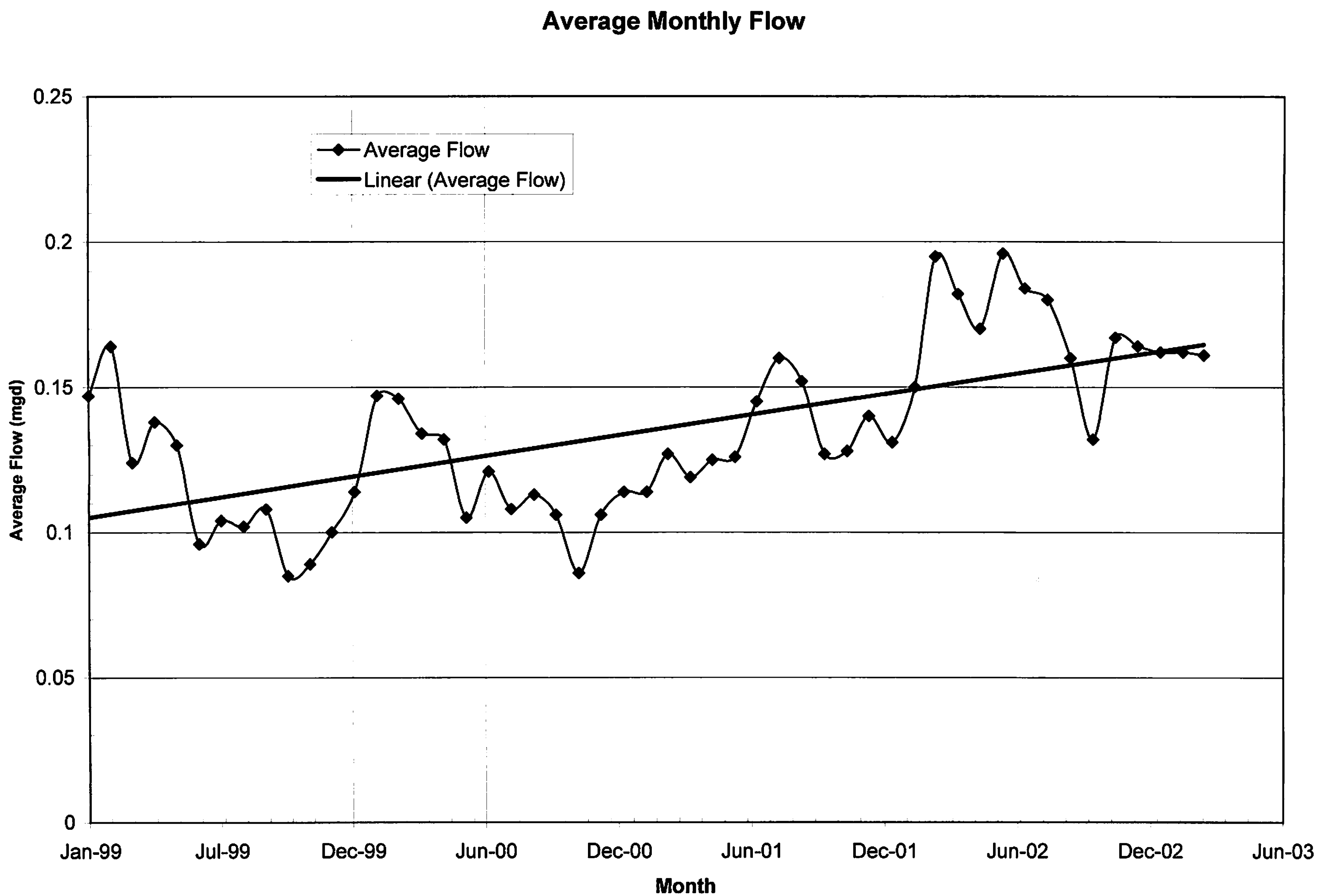
Sep-01
Apr-02
Nov-02
May-03
Month


Average Monthly Flow
Average Flow
Linear (Average Flow)
Average Flow (mgd)
0.25
0.2
0.15
0.1
0.05
0
Jan-99
Jul-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Jun-03
Month

APPENDIX D
CALCULATIONS

AEROMIX Systems, Inc.
2611 North Second Street
Minneapolis, MN 55411 USA
Within USA: 1-800-879-3677 Phone: 612-521-8519 Fax 612-521-1455
E-mail: aeromix@aeromix.com

Lagoon Sizing Calculation using TORNADO Aerators
Prepared for: LPID Lagoon
April 14, 2004

Design Criteria

To convert mg/l into lbs. / day, use the following formula: mg/l *8.34*Daily flow (MGD)

Flow :	0.27	million gallons per day	
BOD demand:	250	mg/l converts to:	562 lbs. / day
TKN :		0 lbs. / day	
Total Suspended Solids:	0	mg/l converts to:	0 lbs. / day

The basin volume is found using the following equation:

V = D/3(As + Ab + square root(As * Ab)

Where:

V = Cell volume in cubic feet	D = water depth
As = surface area	Ab = bottom area

Detention time is found by dividing volume by daily flow.

	Cell 1		Cell 2		Cell 3	
Width:	0.0	feet	-	feet	-	feet
Length	0.0	feet	-	feet	-	feet
Depth:	0.0	feet	-	feet	-	feet
Volume:	2,205,730	cubic feet	1,818,055	cubic feet	1,229,861	cubic feet
Capacity	16,498,860	Gallons	13,599,051	Gallons	9,199,360	Gallons
Detention time:	61.11	Days	50.37	Days	34.07	Days

Calculations of Oxygen Requirements

This application is sized using 2 lbs. of oxygen per lbs. of BOD, and 4.6 lbs. of oxygen per lbs. of TKN (under working conditions). A residual oxygen level of 2 mg/l will be maintained in the basin at all times.

BOD Oxygen requirement calculation.
562 lbs. of BOD/day x 2 lbs. of O2 / lbs. BOD = 1124 lbs. O2/day.

TKN Oxygen requirement calculation:
0 lbs. of TKN / day x 4.6 lbs. of O2 / lbs. TKN = 0 lbs. O2/day

Total Oxygen required per day is the total of the BOD and TKN demands.
1124 lbs. / day BOD + 0 lbs. / day TKN = 1124 lbs. of oxygen per day (under field conditions).

Oxygen transfer rates for aerators are reported under standard conditions. In order to make proper comparisons under field conditions, Total Oxygen Requirement (TOR) should be converted to Standard Condition Total Oxygen Requirement (STOR). Conversion from field conditions can be accomplished with the following equation:

$$No = \frac{N}{\dfrac{Beta * Cwalt - Cl}{9.17} * Alpha * 1.024^{(T-20)}}$$

Where:

No = STOR lbs. / day

N = TOR =	1,124	lbs. per day
Beta = Salinity, surface tension factors =	0.95	
Cwalt = Saturation at given altitude & temp =	7.90	
Cl = Residual oxygen =	2.00	mg/l
Alpha = Oxygen transfer correction factor =	0.85	
T = Operating temperature (68 degrees F)	20	degrees C

$$= \frac{1124}{\dfrac{(0.95 * 7.9) - 2}{9.17 \text{ mg/l}} * 0.85 * 1.024^{0}}$$

= 2,203 lbs. of O2/day

At standard conditions, the TORNADO aerator transfers up to 2.5 lbs. / HP . For this system, an Oxygen Transfer rate of 1.65 lbs. O2 / HP per hour is used, and 24 hours of daily operation is assumed.

Oxygen power = 2202 lbs. / day / 1.65 lbs. / Hp per hour * 24 hours per day = 56 HP

Calculation of Mixing Requirements

Treatment efficiency is directly related to mixing. To completely mix and keep all biological solids in suspension, for a lagoon application, typically required the application of 0.08 HP per 1000 cubic feet of wastewater. Lower power to volume ratios produce different results as shown below.

Cell	Complete Mix HP	Partial Mix HP	Odor Control HP
1	176	88	35
2	145	72	29
3	98	49	19

TOTAL POWER RECOMMENDATION:

The total power recommended is generally the greater of the mixing and oxygen requirements, AEROMIX recommends:

Cell 1	-	-	HP TORNADO Aerators
Cell 2	-	-	HP TORNADO Aerators
Cell 3	-	-	HP TORNADO Aerators

"Specialists in Aeration and Mixing Equipment"

AEROMIX Systems, Inc.
2611 North Second Street
Minneapolis, MN 55411 USA
Within USA: 1-800-879-3677 Phone: 612-521-8519 Fax 612-521-1455
E-mail: aeromix@aeromix.com

Lagoon Sizing Calculation using TORNADO Aerators
Prepared for: LPID Lagoon
April 14, 2004

Design Criteria

To convert mg/l into lbs. / day, use the following formula: mg/l *8.34*Daily flow (MGD)

Flow :	0.35	million gallons per day	
BOD demand:	250	mg/l converts to:	729 lbs. / day
TKN :		0 lbs. / day	
Total Suspended Solids:	0	mg/l converts to:	0 lbs. / day

The basin volume is found using the following equation:

V = D/3(As + Ab + square root(As * Ab)

Where:

V = Cell volume in cubic feet   D = water depth
As = surface area   Ab = bottom area

Detention time is found by dividing volume by daily flow.

	Cell 1		Cell 2		Cell 3	
Width:	0.0	feet	-	feet	-	feet
Length	0.0	feet	-	feet	-	feet
Depth:	0.0	feet	-	feet	-	feet
Volume:	2,205,730	cubic feet	1,818,055	cubic feet	1,229,861	cubic feet
Capacity	16,498,860	Gallons	13,599,051	Gallons	9,199,360	Gallons
Detention time:	47.14	Days	38.85	Days	26.28	Days

Calculations of Oxygen Requirements

This application is sized using 2 lbs. of oxygen per lbs. of BOD, and 4.6 lbs. of oxygen per lbs. of TKN (under working conditions). A residual oxygen level of 2 mg/l will be maintained in the basin at all times.

BOD Oxygen requirement calculation.
729 lbs. of BOD/day x 2 lbs. of O2 / lbs. BOD = 1458 lbs. O2/day.

TKN Oxygen requirement calculation:
0 lbs. of TKN / day x 4.6 lbs. of O2 / lbs. TKN = 0 lbs. O2/day

Total Oxygen required per day is the total of the BOD and TKN demands.
1458 lbs. / day BOD + 0 lbs. / day TKN = 1458 lbs. of oxygen per day (under field conditions).

Oxygen transfer rates for aerators are reported under standard conditions. In order to make proper comparisons under field conditions, Total Oxygen Requirement (TOR) should be converted to Standard Condition Total Oxygen Requirement (STOR). Conversion from field conditions can be accomplished with the following equation:

$$No = \frac{N}{\frac{Beta * Cwalt - Cl}{9.17} * Alpha * 1.024^{(T-20)}}$$

Where:

No = STOR lbs. / day		
N = TOR =	1,458	lbs. per day
Beta = Salinity, surface tension factors =	0.95	
Cwalt = Saturation at given altitude & temp =	7.90	
Cl = Residual oxygen =	2.00	mg/l
Alpha = Oxygen transfer correction factor =	0.85	
T = Operating temperature (68 degrees F)	20	degrees C

$$= \frac{1458}{\frac{(0.95 * 7.9) - 2}{9.17 \text{ mg/l}} * 0.85 * 1.024^{0}}$$

= 2,857 lbs. of O2/day

At standard conditions, the TORNADO aerator transfers up to 2.5 lbs. / HP . For this system, an Oxygen Transfer rate of 1.65 lbs. O2 / HP per hour is used, and 24 hours of daily operation is assumed.

Oxygen power = 2857 lbs. / day / 1.65 lbs. / Hp per hour * 24 hours per day = 72 HP

Calculation of Mixing Requirements

Treatment efficiency is directly related to mixing. To completely mix and keep all biological solids in suspension, for a lagoon application, typically required the application of 0.08 HP per 1000 cubic feet of wastewater. Lower power to volume ratios produce different results as shown below.

Cell	Complete Mix HP	Partial Mix HP	Odor Control HP
1	176	88	35
2	145	72	29
3	98	49	19

TOTAL POWER RECOMMENDATION:

The total power recommended is generally the greater of the mixing and oxygen requirements, AEROMIX recommends:

Cell 1	-	-	HP TORNADO Aerators
Cell 2	-	-	HP TORNADO Aerators
Cell 3	-	-	HP TORNADO Aerators

AEROMIX Systems, Inc.
2611 North Second Street
Minneapolis, MN 55411 USA
Within USA: 1-800-879-3677 Phone: 612-521-8519 Fax 612-521-1455
E-mail: aeromix@aeromix.com

Lagoon Sizing Calculation using TORNADO Aerators
Prepared for: LPID Lagoon
April 14, 2004

Design Criteria

To convert mg/l into lbs. / day, use the following formula: mg/l *8.34*Daily flow (MGD)

Flow :	0.44	million gallons per day	
BOD demand:	250	mg/l converts to:	917 lbs. / day
TKN :		0 lbs. / day	
Total Suspended Solids:	0	mg/l converts to:	0 lbs. / day

The basin volume is found using the following equation:

V = D/3(As + Ab + square root(As * Ab)

Where:

V = Cell volume in cubic feet — D = water depth
As = surface area — Ab = bottom area

Detention time is found by dividing volume by daily flow.

	Cell 1		Cell 2		Cell 3	
Width:	0.0	feet	-	feet	-	feet
Length	0.0	feet	-	feet	-	feet
Depth:	0.0	feet	-	feet	-	feet
Volume:	2,205,730	cubic feet	1,818,055	cubic feet	1,229,861	cubic feet
Capacity	16,498,860	Gallons	13,599,051	Gallons	9,199,360	Gallons
Detention time:	37.50	Days	30.91	Days	20.91	Days

Calculations of Oxygen Requirements

This application is sized using 2 lbs. of oxygen per lbs. of BOD, and 4.6 lbs. of oxygen per lbs. of TKN (under working conditions). A residual oxygen level of 2 mg/l will be maintained in the basin at all times.

BOD Oxygen requirement calculation.
917 lbs. of BOD/day x 2 lbs. of O2 / lbs. BOD = 1834 lbs. O2/day.

TKN Oxygen requirement calculation:
0 lbs. of TKN / day x 4.6 lbs. of O2 / lbs. TKN = 0 lbs. O2/day

Total Oxygen required per day is the total of the BOD and TKN demands.
1834 lbs. / day BOD + 0 lbs. / day TKN = 1834 lbs. of oxygen per day (under field conditions).

Oxygen transfer rates for aerators are reported under standard conditions. In order to make proper comparisons under field conditions, Total Oxygen Requirement (TOR) should be converted to Standard Condition Total Oxygen Requirement (STOR). Conversion from field conditions can be accomplished with the following equation:

$$No = \frac{N}{\dfrac{Beta * Cwalt - Cl}{9.17} * Alpha * 1.024^{(T-20)}}$$

Where:

No = STOR lbs. / day		
N = TOR =	1,834	lbs. per day
Beta = Salinity, surface tension factors =	0.95	
Cwalt = Saturation at given altitude & temp =	7.90	
Cl = Residual oxygen =	2.00	mg/l
Alpha = Oxygen transfer correction factor =	0.85	
T = Operating temperature (68 degrees F)	20	degrees C

$$= \frac{1834}{\dfrac{(0.95 * 7.9) - 2}{9.17 \text{ mg/l}} * 0.85 * 1.024^{0}}$$

= 3,594 lbs. of O2/day

At standard conditions, the TORNADO aerator transfers up to 2.5 lbs. / HP . For this system, an Oxygen Transfer rate of 1.65 lbs. O2 / HP per hour is used, and 24 hours of daily operation is assumed.

Oxygen power = 3594 lbs. / day / 1.65 lbs. / Hp per hour * 24 hours per day = 91 HP

Calculation of Mixing Requirements

Treatment efficiency is directly related to mixing. To completely mix and keep all biological solids in suspension, for a lagoon application, typically required the application of 0.08 HP per 1000 cubic feet of wastewater. Lower power to volume ratios produce different results as shown below.

Cell	Complete Mix HP	Partial Mix HP	Odor Control HP
1	176	88	35
2	145	72	29
3	98	49	19

TOTAL POWER RECOMMENDATION:

The total power recommended is generally the greater of the mixing and oxygen requirements, AEROMIX recommends:

Cell 1	-	-	HP TORNADO Aerators
Cell 2	-	-	HP TORNADO Aerators
Cell 3	-	-	HP TORNADO Aerators

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E-mail: aeromix@aeromix.com

Lagoon Sizing Calculation using TORNADO Aerators
Prepared for: LPID Lagoon
April 14, 2004

Design Criteria

To convert mg/l into lbs. / day, use the following formula: mg/l *8.34*Daily flow (MGD)

Flow :	0.53	million gallons per day	
BOD demand:	250	mg/l converts to:	1105 lbs. / day
TKN :		0 lbs. / day	
Total Suspended Solids:	0	mg/l converts to:	0 lbs. / day

The basin volume is found using the following equation:

V = D/3(As + Ab + square root(As * Ab)

Where:

V = Cell volume in cubic feet　　D = water depth
As = surface area　　Ab = bottom area

Detention time is found by dividing volume by daily flow.

	Cell 1		Cell 2		Cell 3	
Width:	0.0	feet	-	feet	-	feet
Length	0.0	feet	-	feet	-	feet
Depth:	0.0	feet	-	feet	-	feet
Volume:	2,205,730	cubic feet	1,818,055	cubic feet	1,229,861	cubic feet
Capacity	16,498,860	Gallons	13,599,051	Gallons	9,199,360	Gallons
Detention time:	31.13	Days	25.66	Days	17.36	Days

Calculations of Oxygen Requirements

This application is sized using 2 lbs. of oxygen per lbs. of BOD, and 4.6 lbs. of oxygen per lbs. of TKN (under working conditions). A residual oxygen level of 2 mg/l will be maintained in the basin at all times.

BOD Oxygen requirement calculation.
1105 lbs. of BOD/day x 2 lbs. of O2 / lbs. BOD = 2210 lbs. O2/day.

TKN Oxygen requirement calculation:
0 lbs. of TKN / day x 4.6 lbs. of O2 / lbs. TKN = 0 lbs. O2/day

Total Oxygen required per day is the total of the BOD and TKN demands.
2210 lbs. / day BOD + 0 lbs. / day TKN = 2210 lbs. of oxygen per day (under field conditions).

Oxygen transfer rates for aerators are reported under standard conditions. In order to make proper comparisons under field conditions, Total Oxygen Requirement (TOR) should be converted to Standard Condition Total Oxygen Requirement (STOR). Conversion from field conditions can be accomplished with the following equation:

$$No = \frac{N}{\dfrac{Beta * Cwalt - Cl}{9.17} * Alpha * 1.024^{(T-20)}}$$

Where:

No = STOR lbs. / day		
N = TOR =	2,210	lbs. per day
Beta = Salinity, surface tension factors =	0.95	
Cwalt = Saturation at given altitude & temp =	7.90	
Cl = Residual oxygen =	2.00	mg/l
Alpha = Oxygen transfer correction factor =	0.85	
T = Operating temperature (68 degrees F)	20	degrees C

$$= \frac{2210}{\dfrac{(0.95 * 7.9) - 2}{9.17 \text{ mg/l}} * 0.85 * 1.024^{0}}$$

= 4,331 lbs. of O2/day

At standard conditions, the TORNADO aerator transfers up to 2.5 lbs. / HP . For this system, an Oxygen Transfer rate of 1.65 lbs. O2 / HP per hour is used, and 24 hours of daily operation is assumed.

Oxygen power = 4330 lbs. / day / 1.65 lbs. / Hp per hour * 24 hours per day = 109 HP

Calculation of Mixing Requirements

Treatment efficiency is directly related to mixing. To completely mix and keep all biological solids in suspension, for a lagoon application, typically required the application of 0.08 HP per 1000 cubic feet of wastewater. Lower power to volume ratios produce different results as shown below.

Cell	Complete Mix HP	Partial Mix HP	Odor Control HP
1	176	88	35
2	145	72	29
3	98	49	19

TOTAL POWER RECOMMENDATION:

The total power recommended is generally the greater of the mixing and oxygen requirements, AEROMIX recommends:

Cell 1	-	-	HP TORNADO Aerators
Cell 2	-	-	HP TORNADO Aerators
Cell 3	-	-	HP TORNADO Aerators

"Specialists in Aeration and Mixing Equipment"

AEROMIX Systems, Inc.
2611 North Second Street
Minneapolis, MN 55411 USA
Within USA: 1-800-879-3677 Phone: 612-521-8519 Fax 612-521-1455
E-mail: aeromix@aeromix.com

Lagoon Sizing Calculation using TORNADO Aerators
Prepared for: LPID Lagoon
April 14, 2004

Design Criteria

To convert mg/l into lbs. / day, use the following formula: mg/l *8.34*Daily flow (MGD)

Flow :	1.31	million gallons per day	
BOD demand:	250	mg/l converts to:	2731 lbs. / day
TKN :		0 lbs. / day	
Total Suspended Solids:	0	mg/l converts to:	0 lbs. / day

The basin volume is found using the following equation:

V = D/3(As + Ab + square root(As * Ab)

Where:

V = Cell volume in cubic feet — D = water depth
As = surface area — Ab = bottom area

Detention time is found by dividing volume by daily flow.

	Cell 1		Cell 2		Cell 3	
Width:	0.0	feet	-	feet	-	feet
Length	0.0	feet	-	feet	-	feet
Depth:	0.0	feet	-	feet	-	feet
Volume:	2,205,730	cubic feet	1,818,055	cubic feet	1,229,861	cubic feet
Capacity	16,498,860	Gallons	13,599,051	Gallons	9,199,360	Gallons
Detention time:	12.59	Days	10.38	Days	7.02	Days

Calculations of Oxygen Requirements

This application is sized using 2 lbs. of oxygen per lbs. of BOD, and 4.6 lbs. of oxygen per lbs. of TKN (under working conditions). A residual oxygen level of 2 mg/l will be maintained in the basin at all times.

BOD Oxygen requirement calculation.
2731 lbs. of BOD/day x 2 lbs. of O2 / lbs. BOD = 5462 lbs. O2/day.

TKN Oxygen requirement calculation:
0 lbs. of TKN / day x 4.6 lbs. of O2 / lbs. TKN = 0 lbs. O2/day

Total Oxygen required per day is the total of the BOD and TKN demands.
5462 lbs. / day BOD + 0 lbs. / day TKN = 5462 lbs. of oxygen per day (under field conditions).

Oxygen transfer rates for aerators are reported under standard conditions. In order to make proper comparisons under field conditions, Total Oxygen Requirement (TOR) should be converted to Standard Condition Total Oxygen Requirement (STOR). Conversion from field conditions can be accomplished with the following equation:

$$No = \frac{N}{\dfrac{Beta * Cwalt - Cl}{9.17} * Alpha * 1.024^{(T-20)}}$$

Where:

No = STOR lbs. / day

N = TOR =	5,462	lbs. per day
Beta = Salinity, surface tension factors =	0.95	
Cwalt = Saturation at given altitude & temp =	7.90	
Cl = Residual oxygen =	2.00	mg/l
Alpha = Oxygen transfer correction factor =	0.85	
T = Operating temperature (68 degrees F)	20	degrees C

$$= \frac{5462}{\dfrac{(0.95 * 7.9) - 2}{9.17 \text{ mg/l}} * 0.85 * 1.024^{0}}$$

= 10,704 lbs. of O2/day

At standard conditions, the TORNADO aerator transfers up to 2.5 lbs. / HP . For this system, an Oxygen Transfer rate of 1.65 lbs. O2 / HP per hour is used, and 24 hours of daily operation is assumed.

Oxygen power = 10703 lbs. / day / 1.65 lbs. / Hp per hour * 24 hours per day = 270 HP

Calculation of Mixing Requirements

Treatment efficiency is directly related to mixing. To completely mix and keep all biological solids in suspension, for a lagoon application, typically required the application of 0.08 HP per 1000 cubic feet of wastewater. Lower power to volume ratios produce different results as shown below.

Cell	Complete Mix HP	Partial Mix HP	Odor Control HP
1	176	88	35
2	145	72	29
3	98	49	19

TOTAL POWER RECOMMENDATION:
The total power recommended is generally the greater of the mixing and oxygen requirements, AEROMIX recommends:

Cell 1	-	-	HP TORNADO Aerators
Cell 2	-	-	HP TORNADO Aerators
Cell 3	-	-	HP TORNADO Aerators

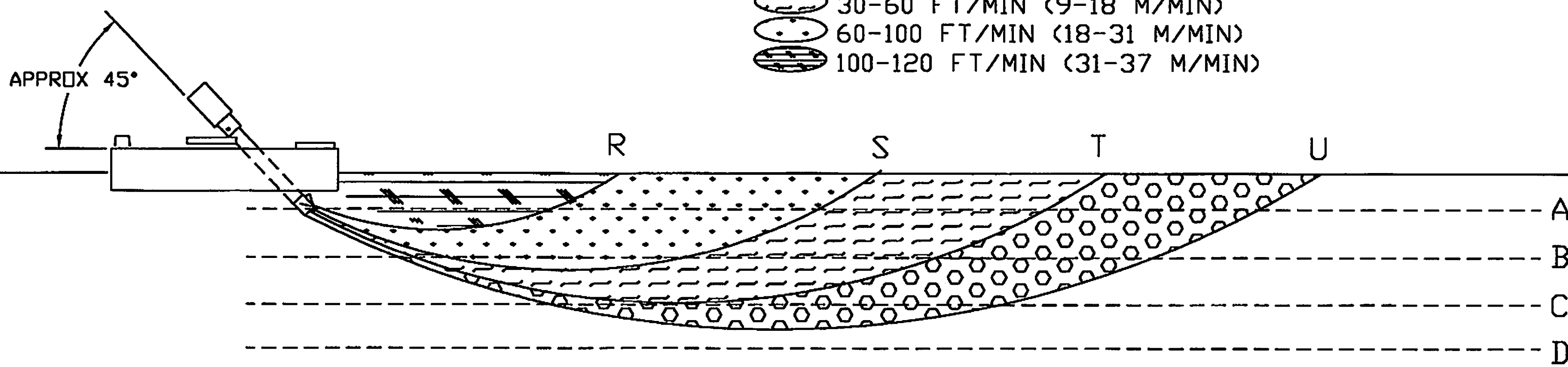
APPENDIX E
MANUFACTURER'S DATA

REV.	DESCRIPTION	DATE	CHK.
B	MINOR TEXT CHANGES	2/03	JCM

UNITS GIVEN IN FEET (METERS)

SIZE	A	B	C	D	R	S	T	U
2-5HP	2 (0.6)	3 (0.9)	5 (1.5)	7 (2.1)	6 (1.8)	20 (6.1)	50 (15)	80 (24)
7.5-10HP	2 (0.6)	4 (1.2)	6 (1.8)	8 (2.4)	7 (2.1)	23 (7)	55 (16.5)	95 (28.5)
20-25HP	2.5 (0.8)	5 (1.5)	7.5 (2.3)	10 (3.1)	10 (3.1)	28 (8.5)	60 (18)	110 (33)
30-40HP	3 (0.9)	6 (1.8)	9 (2.7)	12 (4.2)	12 (4.2)	32 (9.6)	70 (21)	130 (39)
50-100HP	6 (1.8)	13 (4)	19 (5.8)	25 (7.6)	15 (4.6)	45 (13.5)	110 (33)	200 (60)

10-30 FT/MIN (3-9 M/MIN)
30-60 FT/MIN (9-18 M/MIN)
60-100 FT/MIN (18-31 M/MIN)
100-120 FT/MIN (31-37 M/MIN)



ITEM	DWG.#	PART#	DESCRIPTION	QTY

PARTS LIST

AEROMIX
2611 North Second Street
Minneapolis, Minnesota 55411 U.S.A.
612/521-8819 800/879-3677
FAX 612 521-1455

TITLE: TORNADO MIXING PROFILE (SIDE)

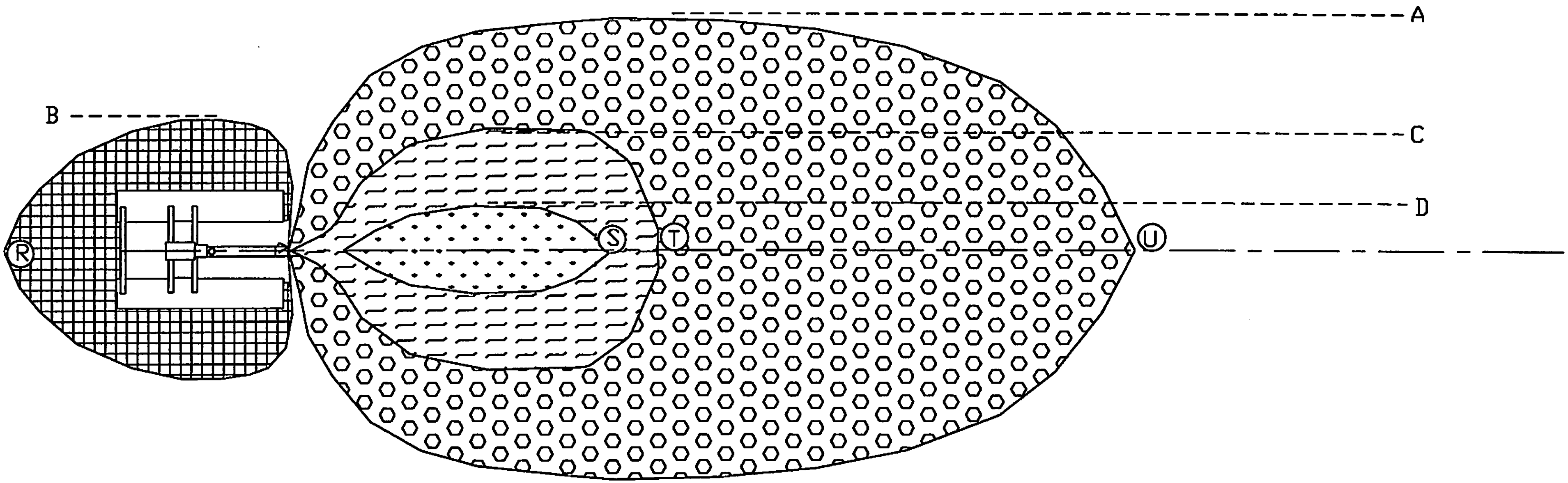
DATE: 3-22-97
DRAWN BY: WES
PATENTS: AEROMIX PRODUCTS MAY BE COVERED BY ONE OR MORE PATENTS OR PATENTS PENDING. THESE REMAIN THE PROPERTY OF AEROMIX.
DRAWING#: AT5MIXPT

REV.	DESCRIPTION	DATE	CHK.
B	MINOR TEXT CHANGES	2/03	JCM

UNITS GIVEN IN FEET (METERS)

SIZE	A	B	C	D	R	S	T	U
2-5HP	25 (7.5)	10 (3)	20 (6)	5 (1.5)	25 (7.5)	20 (6.1)	50 (15)	80 (24)
7.5-10HP	60 (18)	21 (6.3)	38 (11.4)	6 (1.8)	48 (14.4)	23 (7)	55 (16.5)	95 (28.5)
20-25HP	100 (30)	38 (11.4)	50 (15)	7 (2.1)	70 (21)	28 (8.5)	60 (18)	110 (33)
30-40HP	140 (42)	60 (18)	70 (21)	8 (2.4)	92 (27.6)	32 (9.6)	70 (21)	130 (39)
50-100HP	180 (54)	80 (24)	100 (30)	12 (3.6)	140 (42)	45 (13.5)	110 (33)	200 (60)

5-15 FT/MIN (1.5-4.5 M/MIN)
10-30 FT/MIN (3-9 M/MIN)
30-60 FT/MIN (9-18 M/MIN)
100-120 FT/MIN (31-37 M/MIN)



ITEM	DWG.#	PART#	DESCRIPTION	QTY

PARTS LIST

AEROMIX

2611 North Second Street
Minneapolis, Minnesota 55411 U.S.A.
612/521-8619 800/879-3677
FAX 612 521-1455

TITLE: TORNADO MIXING PROFILE (TOP)

DATE: 4-21-98

DRAWN BY: WES

PATENTS: AEROMIX PRODUCTS MAY BE COVERED BY ONE OR MORE PATENTS OR PATENTS PENDING. THESE REMAIN THE PROPERTY OF AEROMIX.

DRAWING#: AT5MIXTT

APPENDIX E: HISTORICAL FLOW AND SAMPLING DATA

- Raw Data Sheets

Lake Point Improvement District

		Flows (mgd)				Influent				Effluent	
		Influent		Effluent		mg/l		Lbs/day		mg/l	
		Avg	Max	Avg	Max	BOD	TSS	BOD	TSS	BOD	TSS
2014	Jan	0.214	0.229	0.203	0.209	99	77	177	137	13	5
	Feb	0.256	0.279	0.217	0.220	122	153	260	327	26	4
	Mar	0.243	0.294	0.197	0.230	102	152	207	308	15	13
	Apr	0.241	0.271	0.108	0.172	57	95	115	191	5	10
	May	0.210	0.241	0.155	0.177	190	214	333	375	9	6
	Jun	0.194	0.200	0.124	0.144	125	147	202	238	13	23
	Jul	0.199	0.206	0.062	0.119	98	109	163	181	13	52
	Aug	0.188	0.216	0.151	0.160	123	122	193	191	5	32
	Sep	0.183	0.188	0.137	0.159	177	127	270	194	5	52
	Oct	0.155	0.208	0.141	0.144	190	199	246	257	5	45
	Nov	0.144	0.161	0.063	0.090	184	238	221	286	5	4
	Dec	0.160	0.218	0.145	0.202	197	113	263	151	13	15
	Avg	0.199	0.226	0.142	0.169	139	146	221	236	11	22
	Max	0.256	0.294	0.217	0.230	197	238	333	375	26	52
	Min	0.144	0.161	0.062	0.090	57	77	115	137	5	4
	% Loading	50.7%						34%	36%		
								51%	57%		
2015	Jan	0.162	0.181	0.168	0.197	109	135	147	204	16	23
	Feb	0.178	0.208	0.099	0.108	173	170	257	295	15	18
	Mar	0.207	0.216	0.037	0.038	119	131	205	236	7	37
	Apr	0.191	0.199	0.042	0.124	107	138	170	229	16	22
	May	0.213	0.270	0.153	0.173	108	100	192	225	5	11
	Jun	0.200	0.219	0.059	0.088	195	286	325	522	11	21
	Jul	0.174	0.190	0.018	0.029	185	220	268	349	5	14
	Aug	0.158	0.209	0.040	0.042	191	201	252	350	5	11
	Sep	0.171	0.174	0.042	0.069	188	271	268	393	15	32
	Oct	0.151	0.177	0.082	0.102	88	173	111	255	8	12
	Nov	0.154	0.154	0.110	0.173	94	170	121	218	7	45
	Dec	0.160	0.177	0.160	0.207	157	234	210	345	5	8
	Avg	0.177	0.198	0.084	0.113	143	186	211	302	10	21
	Max	0.213	0.270	0.168	0.207	195	286	325	522	16	45
	Min	0.151	0.154	0.018	0.029	88	100	111	204	5	8
	% Loading	45.0%						32%	46%		
								50%	80%		
2016	Jan	0.160	0.165	0.153	0.202	106	185	141	255	5	11
	Feb	0.166	0.176	0.170	0.202	185	138	256	203	10	16
	Mar	0.192	0.208	0.164	0.166	106	228	170	396	12	22
	Apr	0.194	0.243	0.135	0.209	132	203	214	411	12	7
	May	0.207	0.221	0.114	0.122	93	150	161	276	11	24
	Jun	0.184	0.195	0.036	0.079	117	75	180	122	20	18
	Jul	0.154	0.187	0.000	0.000	243	188	312	293	0	0
	Aug	0.147	0.156	0.000	0.000	160	159	196	207	0	0
	Sep	0.159	0.174	0.000	0.000	179	151	237	219	0	0
	Oct	0.168	0.197	0.000	0.080	185	141	259	232	10	16
	Nov	0.159	0.165	0.094	0.105	231	149	306	205	7	10
	Dec	0.146	0.155	0.111	0.124	212	150	258	194	16	20
	Avg	0.170	0.187	0.081	0.107	162	160	224	251	9	12
	Max	0.207	0.243	0.170	0.209	243	228	312	411	20	24
	Min	0.146	0.155	0.000	0.000	93	75	141	122	0	0
	% Loading	43.3%						34%	38%		
								48%	63%		

Lake Point Improvement District

	Flows (mgd)				Influent				Effluent	
	Influent		Effluent		mg/l		Lbs/day		mg/l	
	Avg	Max	Avg	Max	BOD	TSS	BOD	TSS	BOD	TSS
2017 Jan	0.158	0.167	0.130	0.144	193	160	254	223	15	38
Feb	0.165	0.170	0.131	0.137	171	144	235	204	17	36
Mar	0.193	0.211	0.081	0.130	172	167	277	294	21	29
Apr	0.256	0.266	0.182	0.216	100	74	214	164	26	42
May	0.235	0.256	0.158	0.205	242	257	474	549	31	30
Jun	0.209	0.243	0.066	0.109	145	179	253	363	19	18
Jul	0.163	0.183	0.013	0.036	171	194	232	296	15	91
Aug	0.157	0.160	0.000	0.000	290	332	380	443	0	0
Sep	0.159	0.175	0.031	0.088	236	204	313	298	11	11
Oct	0.178	0.178	0.038	0.046	186	180	276	267	15	45
Nov	0.147	0.154	0.106	0.130	193	202	237	259	16	20
Dec	0.180	0.277	0.125	0.130	125	90	188	208	15	16
Avg	0.183	0.203	0.088	0.114	185	182	278	297	17	31
Max	0.256	0.277	0.182	0.216	290	332	474	549	31	91
Min	0.147	0.154	0.000	0.000	100	74	188	164	0	0
% Loading	46.8%						42%	45%		
							73%	84%		
2018 Jan	0.161	0.164	0.143	0.158	146	161	196	216	17	14
Feb	0.156	0.163	0.140	0.158	212	225	276	293	45	60
Mar	0.190	0.213	0.139	0.151	255	220	404	349	33	24
Apr	0.216	0.257	0.153	0.187	162	157	292	283	7	5
May	0.216	0.230	0.144	0.151	312	339	562	611	10	14
Jun	0.232	0.257	0.064	0.090	162	180	313	348	12	9
Jul	0.216	0.236	0.038	0.047	193	191	348	344	9	4
Aug	0.170	0.176	0.023	0.030	178	277	252	393	20	62
Sep	0.154	0.174	0.019	0.022	198	205	254	263	27	44
Oct	0.157	0.162	0.095	0.101	331	586	433	767	28	24
Nov	0.155	0.158	0.107	0.129	180	153	233	198	12	23
Dec	0.181	0.182	0.131	0.144	104	127	157	192	12	14
Avg	**0.184**	**0.198**	**0.100**	**0.114**	**203**	**235**	**310**	**355**	**19**	**25**
Max	**0.232**	**0.257**	**0.153**	**0.187**	**331**	**586**	**562**	**767**	**45**	**62**
Min	**0.154**	**0.158**	**0.019**	**0.022**	**104**	**127**	**157**	**192**	**7**	**4**
% Loading	46.9%						47%	54%		
							86%	117%		
2019 Jan	0.156	0.170	0.194	0.202	227	290	295	377	21	14
Feb	0.214	0.217	0.206	0.230	156	202	278	361	14	32
Mar	0.235	0.318	0.220	0.230	126	218	247	427	25	11
Apr	0.400	0.431	0.429	0.432	96	98	320	327	14	16
May	0.395	0.434	0.256	0.259	82	119	270	392	10	9
Jun	0.334	0.386	0.228	0.252	78	94	217	262	15	29
Jul	0.279	0.293	0.101	0.113	144	238	335	554	17	61
Aug	0.225	0.245	0.074	0.076	162	168	304	315	11	4
Sep	0.214	0.226	0.074	0.108	131	118	234	211	27	32
Oct	0.244	0.249	0.091	0.128	114	136	232	277	24	61
Nov	0.245	0.260	0.180	0.198	119	131	243	268	29	43
Dec	0.293	0.298	0.202	0.205	463	639	1131	1561	148	30
Avg	**0.270**	**0.294**	**0.188**	**0.203**	**158**	**204**	**342**	**444**	**30**	**29**
Max	**0.400**	**0.434**	**0.429**	**0.432**	**463**	**639**	**1131**	**1561**	**148**	**61**
Min	**0.156**	**0.170**	**0.074**	**0.076**	**78**	**94**	**217**	**211**	**10**	**4**
% Loading	68.8%						52%	68%		
							173%	239%		

Lake Point Improvement District

	Flows (mgd)				Influent				Effluent	
	Influent		Effluent		mg/l		Lbs/day		mg/l	
	Avg	Max	Avg	Max	BOD	TSS	BOD	TSS	BOD	TSS
2020 Jan	0.309	0.317	0.202	0.216	191	284	492	732	17	27
Feb	0.337	0.422	0.23	0.24	171	142	481	399	17	39
Mar	0.335	0.338	0.249	0.251	217	172	606	481	18	22
Apr	0.356	0.375	0.243	0.245	168	205	499	609	29	67
May	0.308	0.315	0.226	0.245	187	191	480	491	20	22
Jun	0.304	0.346	0.179	0.18	133	199	337	505	34	43
Jul	0.263	0.308	0.182	0.223	99	139	217	305	22	21
Aug	0.257	0.278	0.099	0.108	200	100	429	214	20	30
Sep	0.223	0.333	0.135	0.144	210	175	391	325	10	12
Oct	0.303	0.352	0.188	0.22	233	160	589	404	12	16
Nov	0.231	0.232	0.202	0.32	117	190	225	366	33	56
Dec	0.230	0.232	0.251	0.259	287	309	551	593	27	32
Avg	**0.288**	**0.321**	**0.199**	**0.221**	**184**	**189**	**441**	**452**	**22**	**32**
Max	**0.356**	**0.422**	**0.251**	**0.320**	**287**	**309**	**606**	**732**	**34**	**67**
Min	**0.223**	**0.232**	**0.099**	**0.108**	**99**	**100**	**217**	**214**	**10**	**12**
YTD % Loading	73.5%						67%	69%		
							93%	112%		

Lake Point Improvement District

	Flows (mgd)				Influent				Effluent	
	Influent		Effluent		mg/l		Lbs/day		mg/l	
	Avg	Max	Avg	Max	BOD	TSS	BOD	TSS	BOD	TSS
2021 Jan	0.230	0.247	0.357	500	162	211	311	405	20	39
Feb	0.240	0.264	0.374	0.41	213	248	426	496	23	86
Mar	0.247	0.260	0.324	0.357	180	182	371	375	21	47
Apr	0.249	0.259	0.357	0.403	217	181	451	376	19	38
May	0.265	0.303	0.212	0.368	148	179	327	396	17	20
Jun	0.213	0.248	0.119	0.190	231	205	410	364	35	31
Jul	0.303	0.328	0.158	0.288	200	189	505	478	29	42
Aug	0.310	0.314	0.217	0.230	131	180	339	465	29	93
Sep	0.301	0.306	0.230	0.207	122	177	306	444	15	34
Oct	0.301	0.335	0.274	0.302	180	186	452	467	33	20
Nov	0.303	0.314	0.289	0.295	221	215	558	543	35	40
Dec										
Avg	**0.269**	**0.289**	**0.265**	**45.732**	**182**	**196**	**405**	**437**	**25**	**45**
Max	**0.310**	**0.335**	**0.374**	**500.000**	**231**	**248**	**558**	**543**	**35**	**93**
Min	**0.213**	**0.247**	**0.119**	**0.19**	**122**	**177**	**306**	**364**	**15**	**20**
YTD % Loading	68.7%						62%	67%		
							85%	83%		

Lake Point Improvement District

	Flows (mgd)				Influent				Effluent	
	Influent		Effluent		mg/l		Lbs/day		mg/l	
	Avg	Max	Avg	Max	BOD	TSS	BOD	TSS	BOD	TSS
2022 Jan	0.308	0.339	0.324	0.36	107	202	275	519	13	27
Feb	0.332	0.416	0.308	0.396	183	150	507	415	44	40
Mar	0.403	0.655	0.368	0.382	129	187	434	629	31	41
Apr	0.347	0.406	0.350	0.382	84	128	243	370	28	36
May	0.339	0.416	0.321	0.346	171	223	483	630	21	51
Jun	0.189	0.255	0.259	0.321	174	144	274	227	17	21
Jul	0.297	0.401	0.147	0.179	227	229	562	567	5	31
Aug	0.290	0.334	0.170	0.245	167	298	404	721	21	25
Sep	0.277	0.294	0.183	0.208	154	196	356	453	22	32
Oct	0.254	0.576	0.312	0.423	147	222	311	470	19	26
Nov	0.298	0.460	0.121	0.134	165	176	410	437	25	18
Dec	0.315	0.329	0.260	0.267	150	95	394	250	25	50
Avg	**0.304**	**0.407**	**0.260**	**0.304**	**155**	**188**	**388**	**474**	**23**	**33**
Max	**0.403**	**0.655**	**0.368**	**0.423**	**227**	**298**	**562**	**721**	**44**	**51**
Min	**0.189**	**0.255**	**0.147**	**0.179**	**84**	**128**	**243**	**227**	**5**	**21**
YTD % Loading	77.6%						59%	72%		
							86%	110%		

Lake Point Improvement District

		Flows (mgd)				Influent				Effluent	
		Influent		Effluent		mg/l		Lbs/day		mg/l	
		Avg	Max	Avg	Max	BOD	TSS	BOD	TSS	BOD	TSS
2023	Jan	0.440	0.456	0.299	0.0331	100	105	366.96	385.31	37	40
	Feb	0.389	0.409	0.342	0.0357	172	142	558.01	460.68	40	35
	Mar	0.546	0.564	0.383	0.418	124	122	564.65	555.54	27	6
	Apr					78	277	0.00	0.00	16	44
	May	0.409	0.644	0.124	0.311	101	109	344.52	371.81	16	11
	Jun	0.358	0.040	0.218	0.258	185	167	552.36	498.62	22	19
	Jul	0.357	0.395	0.161	0.172	197	241	586.54	717.55	35	64
	Aug	0.249	0.292	0.177	0.18	314	317	652.07	658.30	27	44
	Sep	0.224	0.309	0.169	0.18	259	216	483.85	403.52	23	44
	Oct	0.265	0.313	0.182	0.202	308	258	680.71	570.21	35	45
	Nov	0.271	0.397	0.223	0.245	157	250	354.84	565.04	11	30
	Dec	0.271	0.282	0.243	0.252	164	145	370.66	327.72	28	32
	Avg	**0.344**	**0.373**	**0.229**	**0.208**	**180**	**196**	**459.60**	**459.52**	**26**	**35**
	Max	**0.546**	**0.644**	**0.383**	**0.418**	**314**	**317**	**680.71**	**717.55**	**40**	**64**
	Min	**0.224**	**0.040**	**0.124**	**0.033**	**78**	**105**	**0.00**	**0.00**	**11**	**6**
YTD	**% Loading**	**87.6%**						**70%**	**70%**		
								104%	**110%**		
		0.367			0.245						
		0.625	0.560		0.612	0.648					

Lake Point Improvement District

		Flows (mgd)				Influent				Effluent	
		Influent		Effluent		mg/l		Lbs/day		mg/l	
		Avg	Max	Avg	Max	BOD	TSS	BOD	TSS	BOD	TSS
2024	Jan	0.312	0.360	0.256	0.266	193	170	502.20	442.35	20	28
	Feb	0.329	0.375	0.288	0.316	196	184	537.80	504.87	11	34
	Mar	0.404	0.450	0.318	0.334	69	127	232.49	427.91	23	71
	Apr	0.517	0.732	0.754	2.750	141	201	607.96	866.67	43	78
	May	0.643	0.789	0.558	0.693	207	169	1110.06	906.28	27	31
	Jun	0.511	0.634	0.251	0.317	113	338	481.58	1440.47	26	46
	Jul	0.352	0.383	0.245	0.274	170	201	499.07	590.07	36	50
	Aug	0.314	0.345	0.232	0.252	142	118	371.86	309.01	19	39
	Sep	0.301	0.306	0.203	0.207	122	17	306.26	42.68	15	34
	Oct	0.358	0.367	0.263	0.270	205	248	612.07	740.46	18	27
	Nov	0.370	0.407	0.292	0.302	205	213	632.59	657.28	19	30
	Dec	0.353	0.370	0.312	0.327	378	177	1112.84	521.09	21	44
	Avg	**0.397**	**0.460**	**0.331**	**0.526**	**178**	**180**	**590.73**	**596.80**	**23**	**43**
	Max	**0.643**	**0.789**	**0.754**	**2.750**	**378**	**338**	**1112.84**	**1440.47**	**43**	**78**
	Min	**0.301**	**0.306**	**0.203**	**0.207**	**69**	**17**	**232.49**	**42.68**	**11**	**27**
YTD	**% Loading**	**101.3%**						**90%**	**91%**	**23.7**	**44.0**
								170%	**220%**		

Lake Point Improvement District

		Flows (mgd)				Influent				Effluent	
		Influent		Effluent		mg/l		Lbs/day		mg/l	
		Avg	Max	Avg	Max	BOD	TSS	BOD	TSS	BOD	TSS
2025	Jan	0.381	0.397	0.328	0.357	84	172	266.91	546.54	20	20
	Feb	0.373	0.0392	0.316	0.364	147	141	457.29	438.63	26	26
	Mar	0.434	0.437	0.329	0.346	147	98	532.08	354.72	36	36
	Apr	0.500	0.553	0.318	0.353	204	218	850.68	909.06	38	38
	May	0.490	0.522	0.334	0.353	143	126	584.38	514.91	27	27
	Jun	0.401	0.416	0.251	0.309	128	134	428.08	448.14	40	40
	Jul	0.389	0.463	0.184	0.192	154	154	499.62	499.62	45	45
	Aug	0.311	0.326	0.181	0.187	174	273	451.31	708.09	26	26
	Sep	0.211	0.202	0	0	309	158	543.76	278.04	44	44
	Oct	0.305	0.369	0.316	0.033	292	227	742.76	577.42	19	19
	Nov	0.327	0.349	0.284	0.292	154	250	419.99	681.80	20	20
	Dec	0.309	0.337	0.589	0.302	188	133	484.49	342.75	23	23
	Avg	**0.369**	**0.368**	**0.286**	**0.257**	**177**	**174**	**545.08**	**534.81**	**30**	**30**
	Max	**0.500**	**0.553**	**0.589**	**0.364**	**309**	**273**	**850.68**	**909.06**	**45**	**45**
	Min	**0.211**	**0.039**	**0.000**	**0.000**	**84**	**98**	**266.91**	**278.04**	**19**	**19**
YTD	**% Loading**	**94.2%**						**83%**	**82%**	**30.6**	**30.6**
								130%	**139%**		

Lake Point Improvement District

Lake Point Improvement District

Year	Month	Influent BOD	Influent TSS	Influent pH	Influent Flow Avg	Influent Flow Max\	Effluent BOD	Effluent TSS	Effluent E Coli	Effluent pH	Effluent Cl2 Max	Effluent O&G	Effluent Flow Avg	Effluent Flow Max\
2026	January	270	262	7.8	0.329	0.371	15	26	<1	8.8	0.36	N/D	0.261	0.281
	February	285	180	7.7	0.340	0.342	23	36	7	8.8	0.34	N/D	0.275	0.288
	March	176	135	7.7	0.366	0.386	24	32	100	8.9	0.32	N/D	0.260	0.290
	Avg	244	192	7.7	0.345	0.366	21	31	54	9	0.340	N/D	0.265	0.286
	Min	176	135	7.7	0.329	0.342	15	26	7	8.8	0.32	N/D	0.26	0.281
	Max	285	262	7.8	0.366	0.386	24	36	100	8.9	0.36	N/D	0.275	0.290
2025	January	184	172	7.7	0.381	0.0397	14	20	<1	8.8	0.24	N/D	0.328	0.358
	February	149	141	7.7	0.373	0.392	20	26	<1	8.7	0.39	N/D	0.316	0.364
	March	148	98	7.7	0.434	0.437	27	36	<1	8.8	0.34	N/D	0.329	0.346
	April	204	218	7.8	0.500	0.553	26	38	1	8.8	0.29	N/D	0.318	0.353
	May	143	126	7.7	0.490	0.522	28	27	<1	8.7	0.22	N/D	0.334	0.353
	June	128	134	7.8	0.401	0.413	18	70	<1	8.6	0.38	N/D	0.251	0.309
	July	154	154	7.7	0.389	0.463	10	45	<1	8.8	0.42	N/D	0.184	0.192
	August	174	273	7.7	0.311	0.325	13	26	<1	8.8	0.31	N/D	0.181	0.187
	September	309	158	7.8	0.211	0.212	17	44	<1	8.6	0.27	N/D	0.067	0.069
	October	292	227	7.7	0.305	0.369	6	19	12	8.7	0.19	N/D	0.316	0.353
	November	154	250	7.7	0.317	0.349	8	20	<1	8.7	0.27	N/D	0.284	0.292
	December	188	133	7.7	0.309	0.337	14	23	1	8.7	0.24	N/D	0.289	0.302
	Avg	186	174	7.7	0.368	0.368	17	33	5	9	0.30	N/D	0.266	0.290
	Min	128	98	7.7	0.211	0.0397	6	19	1	8.6	0.19	N/D	0.067	0.069
	Max	309	273	7.8	0.500	0.553	28	70	12	8.8	0.42	N/D	0.334	0.364

2024	January	107	202	7.7	0.303	0.339	13	27	<1	8.8	0.19	N/D	0.324	0.36
	February	183	150	7.7	0.332	0.416	44	40	<1	8.9	0.25	N/D	0.038	0.396
	March	129	187	7.7	0.403	0.655	31	41	<1	8.7	0.49	N/D	0.368	0.382
	April	84	128	7.7	0.347	0.406	28	36	<1	8.9	0.38	N/D	0.350	0.382
	May	171	223	7.7	0.339	0.416	21	51	<1	8.9	0.34	N/D	0.321	0.321
	June	174	144	707	0.189	0.255	17	21	<1	8.8	0.25	N/D	0.259	0.321
	July	227	229	7.7	0.297	0.401	5	31	<1	8.7	0.36	N/D	0.147	0.179
	August	167	298	7.8	0.29	0.334	21	25	<1	8.7	0.35	N/D	0.170	0.245
	September	154	196	707	0.277	0.294	22	32	<1	8.8	0.21	N/D	0.183	0.208
	October	147	222	708	0.254	0.576	19	26	<1	8.9	0.42	N/D	0.312	0.423
	November	165	176	708	0.298	0.600	25	18	<1	8.9	0.45	N/D	0.121	0.134
	December	150	95	7.8	0.315	0.327	25	50	<1	8.9	0.24	N/D	0.260	0.267
	Avg	155	188	241.0	0.304	0.418	23	33	<1	9	0.33	N/D	0.238	0.302
	Min	84	95	7.7	0.189	0.255	5	18	<1	8.7	0.19	N/D	0.038	0.134
	Max	227	298	708	0.403	0.655	44	51	<1	8.9	0.49	N/D	0.368	0.423
2023	January	100	108	7.7	0.440	0.453	37	40	<1	8.9	0.38	N/D	0.299	0.331
	February	172	142	7.6	0.389	0.409	40	35	<1	8.8	0.44	N/D	0.342	0.367
	March	124	122	7.7	0.546	0.564	27	6	2	8.8	0.27	N/D	0.380	0.418
	April	78	277	7.7	0.625	0.650	16	44	<1	8.6	0.19	N/D	0.612	0.648
	May	101	109	7.8	0.409	0.644	16	11	<1	8.7	0.61	N/D	0.124	0.311
	June	185	167	7.8	0.356	0.400	22	19	<1	8.7	0.24	N/D	0.218	0.258
	July	197	241	7.8	0.357	0.395	35	24	<1	8.8	0.31	N/D	0.161	0.172
	August	314	317	7.7	0.249	0.292	27	44	17	8.8	0.29	N/D	0.177	0.180
	September	259	216	7.7	0.224	0.309	23	44	1	8.7	0.59	N/D	0.167	0.180
	October	308	258	7.8	0.265	0.313	35	45	<1	8.8	0.16	N/D	0.182	0.202
	November	157	250	7.8	0.276	0.307	11	30	<1	8.8	0.21	N/D	0.223	0.245
	December	164	145	7.8	0.271	0.292	28	32	<1	8.8	0.19	N/D	0.243	0.252
	Avg	180	196	7.7	0.367	0.419	26	31	<1	8.8	0.32	N/D	0.261	0.297
	Min	78	108	7.6	0.224	0.292	11	6	<1	8.6	0.16	N/D	0.124	0.172
	Max	314	317	7.8	0.625	0.65	40	45	<1	8.9	0.61	N/D	0.612	0.648

Lake Point Improvement District

	Influent		Effluent						
	TLN	ToTal PO4	Ammonia	Nitrate	Notrite	Ortho PO4	TKN	Total PO4
25-Jan	45.1	5.0	ND	0.98	0.4	0.92	10.0	1.5
25-Mar	33.3	3.8	14.00	0.76	0.2	1.80	17.8	2.7
25-Jun	70.3	8.1	13.70	0.50	0.1	1.50	19.5	2.8
25-Sep	45.5	6.1	2.89	N / D	0.1	0.71	10.9	3.3
24-Jan	42.0	4.7	8.25	0.41	0.4	1.40	12.1	2.4
24-Mar	65.0	5.5	5.42	0.52	0.4	1.50	23.4	2.6
24-Sep	89.2	11.0	3.72	ND	0.4	2.00	33.9	3.1
24-Dec	79.6	4.7	8.25	0.41	0.4	1.40	12.1	2.4
23-Feb	121	16.4	22.60	ND	ND	2.9	27.1	4.4
23-Jun	84.5	12.3	8.49	ND	ND	2.0	12.2	3.1
23-Aug	70.2	9.9	2.37	0.43	ND	1.3	5.8	2.0
23-Dec	88.2	17.9	8.43	0.27	0.2	2.3	13.2	2.9
22-Jan	70.4	6.6	6.40	1.2	0.3	2.5	4.1	17.7
22-Mar	86.3	12.2	1.70	2.6	0.4	0.9	50.5	4.4
22-Aug	106	11.9	10.00	ND	0.2	2.5	20.1	4.7
22-Dec	66.5	7.5	9.16	0.61	0.3	1.9	12.8	2.5

Lake Point Improvement District

Year	Cyanide	Aluminum	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
Jun-25	ND	N/D	N/D	0.067	N/D	N/D	0.026	N/D	N/D	N/D	N/D	N/D	0.02
Dec-25	ND	0.8	0.116	0.098	0.003	0.0043	0.0504	0.0075	ND	0.006	0.00608	ND	0.55
24-Jul	ND	0.4	0.0078	113	0.0011	0.0033	0.176	0.0028	IND	0.0047	95	ND	0.24
23-Oct	ND	0.3	ND	0.078	ND	ND	0.059	ND	ND	ND	ND	ND	0.23