TOWN OF DISCOVERY BAY

A COMMUNITY SERVICES DISTRICT

SDLF Platinum-Level of Governance

NOTICE OF THE SPECIAL MEETING
OF THE WATER AND WASTEWATER COMMITTEE
OF THE TOWN OF DISCOVERY BAY
Thursday, JULY 23, 2020
SPECIAL WATER AND WASTEWATER COMMITTEE
MEETING 3:30 P.M.
Website address: www.todb.ca.gov

NOTICE
Coronavirus COVID-19

In accordance with the Governor's Executive Order N-33-20, and for the period in which the Order remains in effect, the Town of Discovery Bay Community Services District Board Chambers will be closed to the public.

To accommodate the public during this period of time that the Board's Chambers are closed to the public, the Town of Discovery Bay Community Services District Board of Directors has arranged for members of the public to observe and address the meeting telephonically.

TO ATTEND BY TELECONFERENCE:
Toll-Free Dial-In Number: (866)848-2216
CONFERENCE CODE: 5193676302
To view the Agenda and Presentation Materials go to
Agenda Packet and Materials at: www.todb.ca.gov/

Water and Wastewater Committee Board Members
Chair Bill Pease
Vice-Chair Bill Mayer

A. ROLL CALL
1. Call business meeting to order 3:30 P.M.
2. Roll Call.

B. PUBLIC COMMENTS (Individual Public Comments will be limited to a 3-minute time limit)
During Public Comments, the public may address the Committee on any issue within the District's jurisdiction which is not on the Agenda. The public may comment on any item on the Agenda at the time the item is before the Committee for consideration by filling out a comment form. The public will be called to comment in the order the comment forms are received. Any person wishing to speak will have 3 minutes to make their comment. There will be no dialog between the Committee and the commenter as the law strictly limits the ability of Committee members to discuss matters not on the agenda. We ask that you refrain from personal attacks during comment, and that you address all comments to the Committee only. Any clarifying questions from the Committee must go through the Chair. Comments from the public do not necessarily reflect the viewpoint of the Committee members.

C. DISCUSSION ITEMS
1. Discuss need to increase the Capital Project Budget for The Denitrification and Plant 1 Refurbishment in the amount of $850,000 to install new rotors at all 3 oxidation ditches as part of the Denitrification project.
2. Discuss option for redirecting money planned for Plant No. 1 core process improvements to a new oxidation ditch at Plant No. 2 as part of the Denitrification Project.

D. FUTURE DISCUSSION/AGENDA ITEMS

E. ADJOURNMENT

1. Adjourn to the next Standing Water and Wastewater Committee Meeting.

“This agenda shall be made available upon request in alternative formats to persons with a disability, as required by the American with Disabilities Act of 1990 (42 U.S.C. § 12132) and the Ralph M. Brown Act (California Government Code § 54954.2). Persons requesting a disability related modification or accommodation in order to participate in the meeting should contact the Town of Discovery Bay, at (925) 634-1131, during regular business hours, at least forty-eight hours prior to the time of the meeting.”

"Materials related to an item on the Agenda submitted to the Town of Discovery Bay after distribution of the agenda packet are available for public inspection in the District Office located at 1800 Willow Lake Road during normal business hours."

	Town of Discovery Bay ***"A Community Services District"*** **STAFF REPORT**	**Meeting Date** July 23, 2020

Prepared By: Gregory Harris, District Wastewater Engineer
Submitted By: Michael R. Davies, General Manager

Agenda Title

Discuss need to increase the Capital Project Budget for The Denitrification and Plant 1 Refurbishment in the amount of $850,000 to install new rotors at all 3 oxidation ditches as part of the Denitrification project.

Recommended Action

It is recommended that the decision authorizing Staff to Increase the budget for the Denitrification and Plant 1 Refurbishment project in the amount of $850,000 be taken to the full Board for approval.

Executive Summary

Intermittently the wastewater treatment plant has been unable to keep up with biological load flowing into the plant, causing oxygen levels to fall below treatment levels throughout the day for hours at a time. This information was discovered in the fall of 2019 and happens to be consistent with the Wastewater Master Plan (the Plan) projections.

The Master Plan anticipated the existing rotors were not putting enough oxygen in the ditch and estimated the oxygen deficit. The Plan also provided a cost to supplement the rotors with oxygen to all three oxidation ditches. It was recommended to perform an oxygen transfer test to verify the actual oxygen deficit for the oxidation ditches as part of the final design.

The Town conducted oxygen testing at Plant No. 1. The test noted that the existing rotors only put out about half the amount of oxygen required under the master plan.

It has been observed that the oxygen deficit is greater than was anticipated in the Master Plan before the oxygen testing took place. HERWIT Engineering has been investigating alternatives to provide the additional oxygen and has narrowed the selection down to the following two feasible alternatives.

The Alternatives are:

1) Add diffusers and aeration blowers to each oxidation ditch and keep the existing rotors.
2) Replace the existing rotors with newer more efficient and higher horsepower rotors from Evoqua.

HERWIT Engineering has completed an Aeration Alternatives Analysis outlining the costs and the pros and cons of each alternative. The results show a significant difference in the operations and maintenance between the two options, however there is a minimal cost difference for operations and maintenance between the two options.

The below cost break down details the two alternative options.

<u>Alternative Option 1 Total Costs $1,207,000</u>
This plan would add diffusers and aeration blowers to each oxidation ditch and keep the existing rotors

Current Budget $728,000
$640,000 Plant 1 and Plant 2 Supplemental Aeration for the Rotors,
$ 88,000 Plant 1 Launder Covers

Leaving a Net Project Deficit of $479,000

Alternative Option 2 Total Costs $2,052,000
This plan replaces the existing roter with new, efficient, higher horsepower rotors

Current Budget $1,208,000
$640,000 Plant 1 and Plant 2 Supplemental Aeration for the Rotors,
$ 88,000 Plant 1 Launder Covers
$480,000 Plant Frame Electrical & Structure Rehab

Leaving a Net Project Deficit of $844,000

Aeration Alternative 1 & 2 Financing Plan								
Alt. 1		**Cost**	**1,207,000.00**	**Alt. 2**			**Cost**	**2,052,000.00**
Description: Add diffusers and aeration blowers to each oxidation ditch and keep the existing rotors.				Description: Replace the existing rotors with newer more efficient and higher horsepower rotors from Evoqua.				
Plant	Project #	Description	Budgeted	Plant	Project #	Description		Budgeted
1 & 2	7005/7018	Supplemental Aeration in Oxidation Ditches	640,000.00	1 & 2	7005/7018	Supplemental Aeration in Oxidation Ditches		640,000.00
1	7005	Clarifier Launder Covers	88,000.00	1	7005	Clarifier Launder Covers		88,000.00
				1	7018	Frame Elect. and Struct. Rehab.		480,000.00
		Total	**728,000.00**				**Total**	**1,208,000.00**
		Net Project Deficit	**(479,000.00)**				**Net Project Deficit**	**(844,000.00)**
					Net Increase in Cost of Alternative No. 1			**(365,000.00)**

Several meetings have been organized to review the pros and cons of each alternative with Veolia, Town Staff, and HERWIT Engineering. Based on these discussions, it is proposed that Alternative No. 2 provides the best long-term value to the District, is less complex, and easier to operate as well as elevates potential noise concerns with operation at Plant No .1.

Staff's recommendation is to proceed with Alternative Option 2 in the amount of $2,052,000 installing new rotors at all three oxidation ditches. There are sufficient reserves to cover the cost of the Net Project Deficit of $844,000.

Previous Relevant Board Actions for This Item

Approved Capital Improvement Budget for the Plant 1 Refurbishment and Denitrification project in the amount $13.8 million.

Fiscal Impact: The new rotors will increase the cost of the Denitrification Project.
Amount Requested: $850,000 in additional costs to install rotors at all 3 oxidation ditches.
Sufficient Budgeted Funds Available: Yes
Prog/Fund # **Category:**

Attachment

1. Discovery Bay Aeration Alternatives Analysis
2. Plant No. 1 Oxygen Test Report

Discovery Bay Aeration Alternative Analysis	Alt 1 Existing Rotors + Diffusers	Alt 2 Evoqua Rotors
Capital Cost (Including Contractor Markups, Overhead, Profit)		
Remove Existing Rotors	0	60,000
New Rotors, Installed	0	1,542,000
Blowers, Installed	450,000	0
Air Diffusion Systems, Installed	207,000	0
Piping	150,000	150,000
Electrical	400,000	300,000
Total Capital Cost	1,207,000	2,052,000
Annual Average Actual Oxygen Requirement Breakdown, lb/d		
Rotors (d)	2,300	6,400
Diffusers/Blowers	4,100	0
Total	6,400	6,400
Annual Average Field Aeration Efficiency, lb/hp.hr (a)		
Rotors	1.52	1.46
Diffusers/Blowers	2.73	---
Weighted Average	2.30	1.46
Power Cost, $ (b)		
Annual Average	114,000	180,000
Present Worth (c)	1,696,000	2,678,000
Operation and Maintenance Cost Differential (Net Alt 1 - Alt 2)		
Annual Average	30,000	0
Present Worth (c)	446,000	0
Total Present Worth Cost	3,349,000	4,730,000

(a) From performance calculations.
(b) Based on average cost input here, $/kWH 0.15
(c) 20 years, 3% discount rate, Present Worth Factor = 14.8775
(d) For existing rotors, presume one inside and one outside per ditch at 75% of maximum power draw.

Alt 1, Existing Rotors + Diffusers		Alt 2, Evoqua Rotors	
Pro	**Con**	**Pro**	**Con**
Lowest capital cost			Highest capital cost
Diffusers have high aeration efficiency and can be used as primary aeration method, resulting in lowest annual power cost.	More complex operation, load allocation between rotors and diffusers at varying loads	Aeration efficiency substantially higher than existing rotors.	High efficiency operation requires reversing flow direction in ditches and additional piping modifications for mixed liquor recirculation.
	Rotor output still dependent on ditch water level, unless add vfds to rotors. In practice water level not adjusted.	Simple operation, DO control by automated rotor selection and rotor speed with VFDs.	
	Annual diffuser maintenance required, resulting in need to take ditches out of service.	New rotors easy to maintain, without taking ditches out of service.	
	Existing low efficiency rotors remain in service. Rotors at Plant 1 are 40 years old, remaining useful life not determined.	Eliminate existing less efficient rotors, some of which are very old.	
	More congested site, blowers on ditch islands, exposed aeration piping.		
	Rags and stringy materials escaping screens will accumulate on diffusers/piping, resulting in possible damage and added maintenance.		
	More difficult to drain and clean ditches with diffusers in the way.		
	protect diffusers even when ditch is out of service. Algae and mosquito mitigation required.		
	Unless we add a building around the blowers, the aeration blowers will make noise that likely can be heard by residences around Plant No. 1 . The cost of a building is not included in the cost breakdown.		
	Blower Filters will have to be replaced often possibly weekly given the amount of dust experienced at both Plant No. 1 and No.2		

REDMON
ENGINEERING
COMPANY

Consulting Engineers

PO Box 044258

Racine, Wisconsin 53404-7005

(414) 467-8993

e-mail: redmonengineering@gmail.com

T May 27, 2020

Town of Discovery Bay CSD
Attn.: General Manager
Gregory Harris – HERWIT Engineering
1800 Willow Lake Road
Discovery Bay, CA 94505

Re: Town of Discovery Bay WWTP - Report of the Clean Water Test Results of the Brush Aeration System

Dear Gregory,

As you know Redmon Engineering Company conducted a series of non-steady state oxygen transfer tests on the Brush Aeration System at Plant #1 for the Town of Discovery Bay, located in Contra Costa County, California. The oxidation ditch tested is approximately 70 feet wide by 350 feet long and was operating at a side water depth of 5.97 feet. The clean water testing took place from February 18 to 20, 2020. The attached report identifies the results of the testing program.

Following your review, should you have any comments or questions, please let me know.

Best regards,

REDMON ENGINEERING COMPANY

David T. Redmon, P.E.

**CLEAN WATER OXYGEN TRANSFER TEST
OF THE
BRUSH AERATION SYSTEM
AT THE
TOWN OF DISCOVERY BAY WWTP IN CONTRA COSTA COUNTY, CA**

February 2020

INTRODUCTION

Redmon Engineering Company was engaged by the Town of Discovery Bay to conduct a series of full-scale non-steady state clean water oxygen transfer tests on the brush aeration system installed at Plant 1, to document oxygen transfer performance characteristics of the system.

This document includes all the information regarding the tests conducted, the testing equipment and procedures followed, and the final results for the conditions tested.

The tests were conducted by David Redmon, of Redmon Engineering Company on February 18 to 20, 2020 under the direction of Gregory Harris of HERWIT Engineering. Assistance was provided by plant staff and Veolia.

DESCRIPTION OF TESTING PROCEDURES AND EQUIPMENT

The Clean Water Oxygen Transfer Tests presented in this document have been carried out by Redmon Engineering Company following the procedures described in the ASCE Standard “A Standard for the Measurement of Oxygen Transfer in Clean Water,”

(ASCE/EWRI 2-06).

Summary of Method

The test method is based upon removal of dissolved oxygen from the water volume by sodium sulfite followed by reaeration to near the saturation level. The dissolved oxygen inventory of the water volume is monitored during the reaeration period by measuring dissolved oxygen concentrations at several sampling points selected to best represent the tank contents.

The data obtained at each determination point are then analyzed by a simplified mass transfer model to estimate the apparent mass transfer coefficient, K_La, and the steady state dissolved oxygen saturation concentration, C^*_∞. The basic model is given by:

$$\mathbf{C = C^*_\infty - (C^*_\infty - C_0)\ \exp(-K_La_t)}$$

Where:

C = dissolved oxygen concentration, mg/l

C^*_∞ = determination point value of the steady DO concentration at time approaches infinity, mg/l,

C_0 = DO concentration at time zero, mg/l, and

K_La = determination point value of the apparent volumetric mass transfer coefficient, 1/hr.

The differentiated form of the above equation, known as the Log Deficit Method, was used to determine the overall value of K_La for each test.

$$K_La = Ln((C^* - C_1)/(C^* - C_2))/(t_2 - t_1)$$

Where:

Ln = is the natural log

C* =. is the saturation value measured at the end of the test

C_1 & C_2 = the dissolved oxygen concentration at times 1 and 2

t_1 & t_2 = times 1 and 2.

The above equation yields a linear regression of the natural log of the DO deficit versus time. In this test, the average DO data representing approximately 20% to 90% of the DO saturation value was employed to fit the above equation during reaeration period. In this way, an overall estimate of K_La is obtained. This estimate is adjusted to standard conditions (20°C water temperature, zero DO concentration and one atmosphere – 29.92 inches mercury) and the standard oxygen transfer rate (SOTR) is obtained as the product of the overall K_La value, corresponding adjusted determination point C^*_∞ value, and the tank volume.

$$SOTR = K_La_{20} (C^*_{\infty 20}) V$$

Where:

K_La_{20} = determination point value of KLa corrected to 20°C;

$C^*_{\infty 20}$ = determination point value of steady-state DO concentration corrected to 20°C and a standard barometric pressure of 1.00 atmospheres;

V = liquid volume of test water in the test tank when the aerator(s) is turned off.

The standard aeration efficiency (SAE), or rated of oxygen transfer per unit of power input, is often of interest and is computed by the following expression:

SAE = SOTR / Power Input.

Description of the Aeration System and Test Basin

The activated sludge portion of the Town of Discovery Bay Wastewater Treatment Facility (Plant 1) consists of a single looped reactor. The basin is approximately 350 feet in length and has a total width (in plan view) of about 110 feet. The channel width is about 44.5 feet at the top and has a flat bottom that is 29.0 feet wide. The side slopes on either side of the channel have a one-to-one slope. For the non-steady state clean water tests in question, the aeration basin was operated at a side water depth of 5.97 feet. The aeration system is a Lakeside Brush surface aeration system (4 - 30 horsepower brush rotors) and is installed in the test basin according to the design drawings. The test basin was filled with potable water. A plan view of the basin with is shown in Figure 1 along with the DO probe locations. Also, shown in Figure 1 are the four brush rotors. The two inside rotors are referred to as Rotors #1 and #3, while the two outside rotors are referred to as Rotors #2 and #4. The total volume of water in the basin has been computed to be 1,050,000 gallons.

TEST PROCEDURE

The tests have been conducted following the procedures described in the ASCE Standard ASCE/EWRI 2-06, "A Standard for the Measurement of Oxygen Transfer in Clean Water."

Deoxygenation

Deoxygenation of the test water was achieved by the addition of anhydrous sodium sulfite (Na_2SO_3) in excess of the stoichiometric amount required for the removal of all dissolved oxygen present in the test water, using cobalt sulfate heptahydrate ($CoSO_4$-$7H_20$) as a catalyst. In order to assure uniform distribution of the cobalt catalyst, it was dissolved in water and added to the test basin with the aeration system running for several hours before the first addition of sodium sulfite. A total of 4.6 kilograms (10.1 pounds) of the cobalt sulfate heptahydrate was added to the test basin to yield a cobalt ion concentration of approximately 0.20 mg/l. The ASCE Standard requires that the cobalt ion concentration be in the range of 0.10 to 0.50 mg/l.

As a matter of convenience the sodium sulfite was added as a dry powder at the two locations (at the inlet side of the brush rotors). Enough sodium sulfite was added to increase the total dissolved solids by about 150 mg/l per test (approximately 1,000 lbs per test). Care was taken to add the sulfite slowly by moving the bags back and forth. The sulfite was dry and there were no lumps present. The sulfite was added with the brush aerators operating at the specified condition and at the desired side water depth. For all eight test runs the bags of sodium sulfite were added on about 30 second intervals. In all cases, a dissolved oxygen concentration of less than 0.50 mg/l was achieved in all areas of the test volume for at least five minutes.

Measurement of Oxygen Transfer

Determination of dissolved oxygen concentration in the different areas of the test tank was done using five Yellow Springs Instruments (YSI) Model 52 Dissolved Oxygen Meters and membrane probes. All DO probes were fitted with 1.0 mil membranes. Location of the DO probes in the test basin is shown in Figure 1. With the meters and probes in place in the test basin, they were calibrated to the appropriate surface saturation value (correcting for water temperature and local barometric pressure) after the aerators had been operating for several hours.

The DO versus time data for each non-steady state test run was logged on 30 second intervals. All four of the dissolved oxygen meters were automatically logged to an Excel spreadsheet.

TEST PROGRAM

The testing program was designed by Gregory Harris of HERWIT Engineering. A total of eight (8) test runs were conducted. Two sets of runs were made with all four rotors in operation. Two sets of runs were also made with both Aerators 1, 3, and 4, and Aerators 2, 3, and 4 running. Single runs were made with Aerators 1 and 3, and 2 and 4 in operation.

Power Measurements

Readings of frequency (hertz), current, voltage, and power factor were taken manually from the electrical panels in the motor control center. These readings were obtained by the plant staff electrician, and in several cases with the assistance of Gregory Harris, while the individual oxygen transfer test runs were being conducted. In some cases, measurements were also made at a later time under the same operating conditions.

Test Conditions and Results

Table 1 summarizes the non-steady state results for each of the test runs.

This table includes the test run number, the aerators running, the side water depth, the liquid volume, the water temperature, Kla_{20}, C^*_{20}, the standard oxygen transfer rate (SOTR), the total power input, and the standard aeration efficiency (SAE). These values all pertain to the oxygen transfer performance in potable water.

Table 2 contains a summary of the power data as assembled by Gregory Harris. For each test run the average voltage and amperage values are presented for each rotor that was in operation. At the bottom of Table 2 is the total power value for each test run, in both kilowatts and horsepower. These values were used to compute the Standard Aeration Efficiency (SAE – pounds of oxygen transferred per horsepower). In each case the Standard Oxygen Transfer Rate (pounds of oxygen transferred per hour in potable water) was divided by the total power input to compute the SAE value for each test run.

Discussion

The data presented in Table 1 indicate that the SOTR of the aeration system is directly proportional to the power input. This is not surprising. Of interest is the difference of power draw for the two inside rotors and compared to the two outside rotors. The two inside rotors on average had a power draw of 21.5 horsepower for all eight test runs, while the two outside rotors had an average power draw of 16.1 horsepower. Thus the inside rotors power draw was approximately 1.33 times that of the outside rotors. The difference in power draw appears to be related to the liquid velocity approaching each rotor. It is apparent that the liquid velocity on the outside of the channel is faster than it is on the inside of the channel. Also, as the flow rounds the corner of the mid-wall, there is an eddy current on the inside of the channel just ahead of the inside rotor. One can see that the approach velocity is significant slower than at the same location on the outside of the channel.

The impact of the above discussion is plainly seen when comparing the results of Test Run #6 (with only the two inside rotors running) with that of Test Run #8 (with only the two outside rotors running). When the two inside rotors were running the total Standard Oxygen Transfer Rate was 90.5 pounds of oxygen per hour and when the two outside rotors were running the transfer rate was only 67.6 pounds per hour. The SOTR with the two inside rotors running is 1.33 times that when only the two outside rotors were running.

As would be expected, the highest total oxygen transfer rate was obtained when all four rotors were running. As was indicated earlier, the total mass of oxygen transferred in each test is directly proportional to the total power input. The average Standard Aeration Efficiency (SAE) for all eight test runs is 2.49 pounds of oxygen per horsepower-hour. The standard deviation of these runs is 0.0811, and the standard deviation divided by the mean is 0.0326. This data indicates very little variation in the SAE for all eight test runs, regardless of which rotors were operating.

Appendix I contains the dissolved oxygen versus time data that was logged for each test run. Also presented are plots of the individual probe values versus time and the average DO value from all four probes versus time. At the very bottom, for each test run, the log deficit plot and the trend line for each data set is presented.

CLEAN WATER OXYGEN TRANSFER TESTS
OF THE
BRUSH AERATION SYSTEM
AT THE
DISCOVERY BAY WWTF

PERFORMED ON BEHALF OF:

THE TOWN OF DISCOVERY BAY

DISCOVERY BAY, CALIFORNIA

CONDUCTED

February 18-20, 2020

PERFORMED BY:

REDMON ENGINEERING COMPANY

PO Box 044258
Racine, Wisconsin 53404

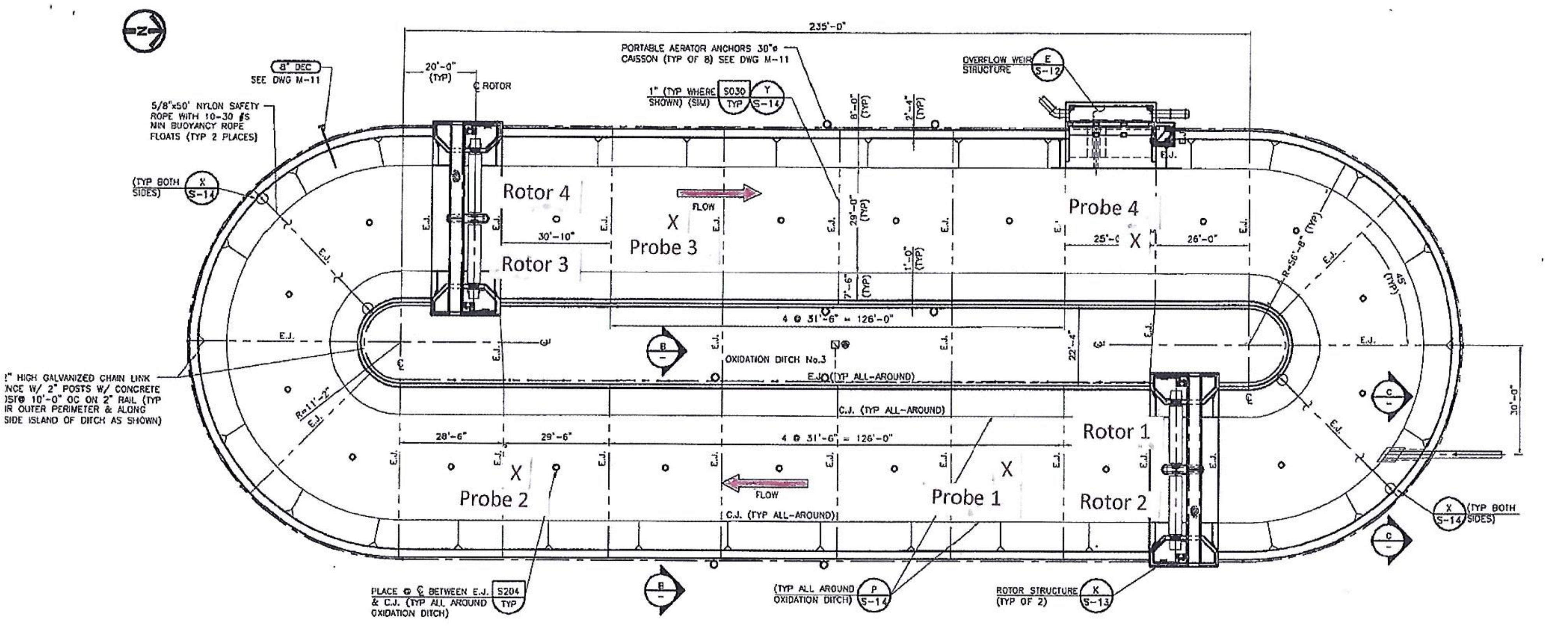
(414) 467-8993

A P P E N D I X   I

NON-STEADY STATE TEST DATA
AND
DATA ANALYSIS

FIGURE 1 - TOWN OF DISCOVERY BAY AERATION BASIN PLAN VIEW

PROBE LOCATIONS FOR CLEAN WATER TESTS CONDUCTED FEBRUARY 2020



OXIDATION DITCH No.3 - PLAN

SCALE: 1/16"=1'-0"

Power Input	SOTR
26.96	67.6
38.12	90.5
44.65	108.9
45.6	112.9
50.47	122.9
53.1	132.8
60.31	153.7
59.76	157.5

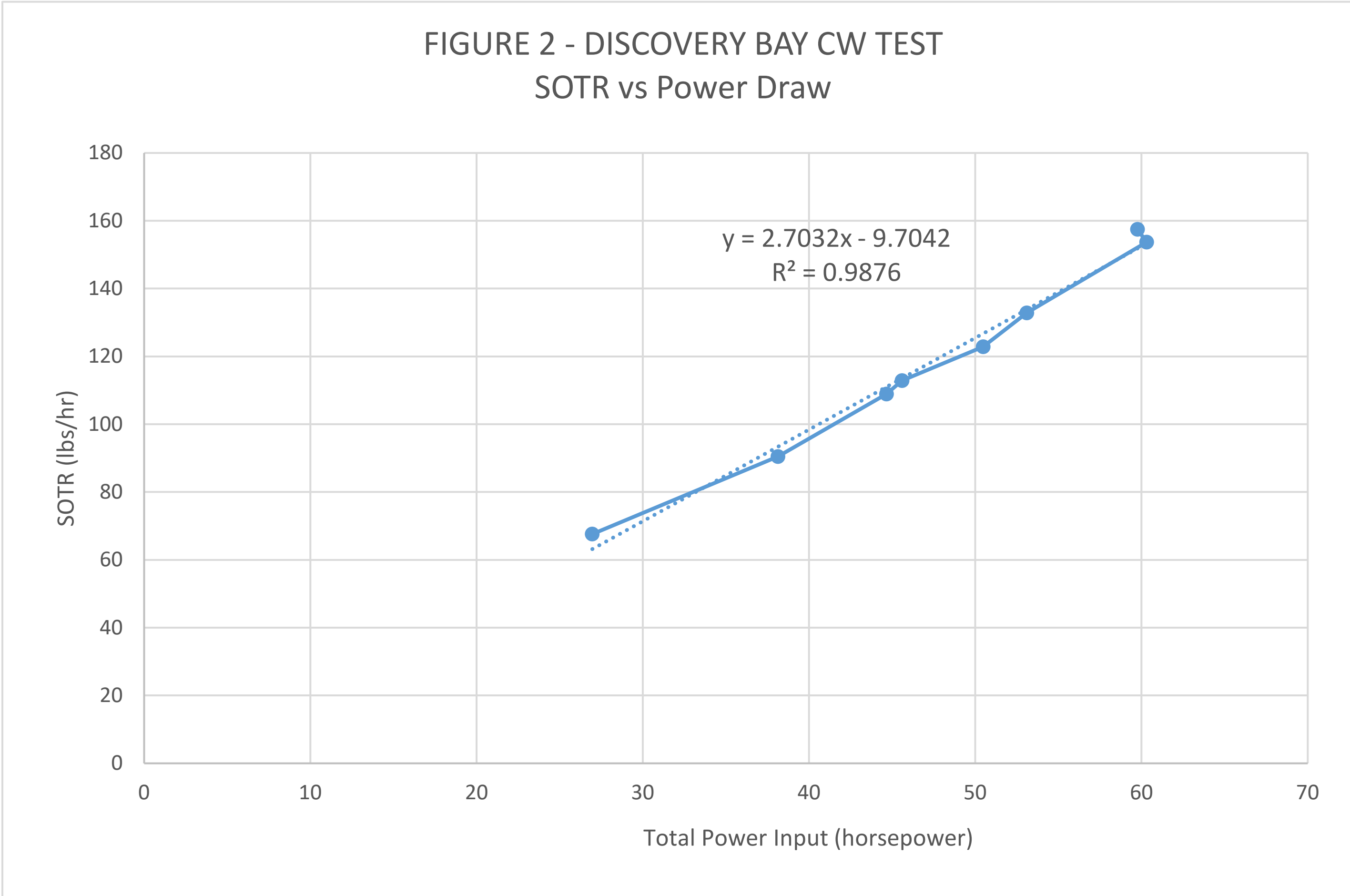


TABLE 1 - SUMMARY OF CLEAN WATER TEST RESULTS FOR DISCOVERY BAY

Test #	**Aerators Running**	**Side Water Depth** (feet)	**Basin Volume** (gallons)	**Water Temp.** (degrees Celcius)	**Kla 20** (1/hr)	**C*20** (mg/l)	**SOTR** (lbs/hr)	**Power Input - Total** (hp)	**SAE** (lbs/HP-hr)
1	1, 3, & 4	5.92	1,050,000	12.9	1.669	9.09	132.8	53.10	2.50
2	2, 3, & 4	5.92	1,050,000	13.6	1.369	9.09	108.9	44.65	2.44
3	1, 2, 3, & 4	5.92	1,050,000	12.1	1.976	9.09	157.5	59.76	2.64
4	2, 3, & 4	5.92	1,050,000	12.5	1.419	9.09	112.9	45.60	2.48
5	1, 3, & 4	5.92	1,050,000	13.0	1.544	9.09	122.9	50.47	2.44
6	1 & 3	5.92	1,050,000	13.4	1.137	9.09	90.5	38.12	2.37
7	1, 2, 3, & 4	5.92	1,050,000	12.1	1.932	9.09	153.7	60.31	2.55
8	2 & 4	5.92	1,050,000	13.0	0.85	9.09	67.6	26.96	2.51

TABLE 2 - POWER DRAW DATA FOR CLEAN WATER TESTING - DISCOVERY BAY

	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8
Rotor #1- Ave Volts	478.7	--	478.0	--	478.3	479.3	478.0	--
Rotor #1- Ave amps	20.4	--	21.5	--	20.8	21.0	20.6	--
Rotor #2- Ave Volts	--	475.7	477.7	477.3	--	--	477.7	477.0
Rotor #2- Ave amps	--	16.0	15.4	15.9	--	--	17.8	16.2
Rotor #3- Ave Volts	478.7	475.3	477.7	478.0	478.3	479.7	477.7	--
Rotor #3- Ave amps	24.5	22.8	20.9	22.9	22.4	22.8	20.3	--
Rotor #4- Ave Volts	476.3	475.7	477.7	477.3	478.0	--	478.0	477.0
Rotor #4- Ave amps	17.4	15.6	15.2	16.1	16.6	--	14.6	16.7
Total Power -kW	39.61	33.31	44.58	34.02	37.65	28.44	44.99	20.11
Total Power -hp	53.09	44.65	59.76	45.6	50.47	38.12	60.31	26.96

Town of Discovery Bay

"A Community Services District"

STAFF REPORT

Meeting Date

July 23, 2020

Prepared By: Gregory Harris, District Wastewater Engineer
Submitted By: Michael R. Davies, General Manager

Agenda Title

Discuss option for redirecting money planned for Plant No. 1 core process improvements to a new oxidation ditch at Plant No. 2 as part of the Denitrification Project.

Recommended Action

It is recommended that the decision to build a new oxidation ditch at Plant No. 2 with money redirected from Plant No. 1 be taken to the full board for approval.

Executive Summary

This discussion is separate and independent of the discussion on supplemental aeration/new rotors previously brought up for the Denitrification Project.

As part of the wastewater master plan for the denitrification project, approximately $3.1 million is planned to make repairs to the oxidation ditch and clarifiers at Plant No. 1. These repairs are necessary to provide the full redundancy and capacity for build out of the remaining connections in the Town's current service area. The master Plan was previously accepted by the Town Board and funding for the improvements included in the current CIP.

As part of the recent staff changeover at Veolia, new staff have been reviewing plans for the Denitrification Project and proposed changes that might save money for the Town or improve the process. HERWIT Engineering has been evaluating those recommendation as part of weekly meetings with the Town and Veolia on the Denitrification Project.

Several suggestions from Veolia were evaluated by staff. One suggestion was to not build the Clarifiers at Plant No.2 at all or at least not as part of the current Denitrification Project. While this will not work, it led to the discussion of an alternative where we do not spend any money at Plant No. 1 on core process improvements to the oxidation ditch and clarifiers and instead just build Oxidation Ditch No.4 at Plant 2. This alternative showed promise and was analyzed further because of the many benefits it would provide the Town.

One of the benefits of this alternative is that the Town is investing its money in new facilities that will last a lot longer and will be suitable for 24-hour 7 day a week operation. The rehabilitation of Plant No. 1 would only make Plant No. 1 functional in a backup capacity to Plant No. 2

HERWIT Analyzed the Oxidation Ditch No. 4 Alternative for process impacts, physical implementation impacts, and cost impacts to the Denitrification Project. A drawing of Oxidation Ditch No. 4 at Plant No. 2 is attached for reference.

Process Impacts

Per the wastewater Master Plan, current Average Annual Flow (AAF) for the Town is 1.32 million gallons per day (MGD). The build out flow for everything in the current service boundary of the Town is an AAF of 1.63 MGD. Adding Oxidation Ditch No. 4 to Plant No. 2 and not building any clarifiers at Plant No. 1 or No. 2 takes the plant capacity to approximately 1.54 MGD with back up redundancy. The limiting factor is the number of clarifiers when one clarifier is out of service in the winter. At some point in the future, when the plant flows reach 1.54 MGD, the Town would have to build Clarifier No. 6 (4th Clarifier at Plant No. 2) to accommodate the remaining development in the current service boundary. A copy of Table 5-12 from the wastewater master plan detailing the current and future flows and loads for the Town is attached to this report for reference.

The Town has several near term developments for Pantages, Newport Point, and Hofmann. The wastewater master plan indicates the new wastewater flow per equivalent dwelling unit (Single Family Home) is 235 gallons per day. Building Oxidation Ditch No. 4 only at plant No. 2 would accommodate 936 new connections before reaching 1.54 MGD. This number of connections seems to accommodate the near term developments for the Town. After that point, the Town would need to build Clarifier No. 6 at Plant No. 2 to accommodate the final buildout lots in the existing service area.

The recently discussed Cechinni ranch project is not in the Town's service district. If this project progresses, they would be required to construct a new oxidation ditch, anoxic basin, Return Activate Sludge and Waste Activated Sludge (RAS)/(WAS) pump station and two new clarifiers. The plan would then be for Cechinni to demolish and construct new facilities at Plant No. 1. In this way, the Town would have all new facilities going forward.

From an operations point of view, having Oxidation Ditch No. 4 at Plant No.2 is a vast improvement in process control over having it at Plant No. 1. Gravity flow piping and flow splitting between Ditches No. 2, 3 and 4 at Plant 2 allows any of the ditches to easily be brought on line and rotated in and out of service. The complexity of starting Plant No. 1 from scratch with its additional facilities, flow splitting, and mixed liquor intertie requirements to Plant No. 2 has prevented Plant No. 1 from operating over the past 3 years. This alternative also saves the operation and maintenance costs of operating the ancillary equipment at Plant No. 1 required to service Oxidation Ditch No. 1, including the Plant No. 1 influent valve station, two clarifiers, clarifier lift pumps, RAS Pumps, WAS Pumps, and the headworks screen.

Physical Implementation Impacts

Oxidation Ditch No. 4 was originally envisioned to be built at Plant No. 2 with 2 supporting clarifiers and a RAS/WAS pump station. This drove the cost up substantially in the Master Plan analysis of moving Plant No. 1 to Plant No. 2. HERWIT has figured out a way to integrate Oxidation Ditch No. 4 into the existing Plant No. 2 facilities without initially building any more clarifiers or an additional RAS/WAS pump station. Clarifier No. 6 (4^{th} Clarifier at Plant No. 2) needed for buildout, can also be accommodated as a future construction item. This overcomes a major hurdle to this alternative. HERWIT now deems this alternative feasible with the process impacts noted above.

HERWIT is currently reviewing ways to construct all the new facilities at Plant No. 2 without having to restart Plant No. 1. This will save time and reduce risk during construction.

Cost Impacts

Costs to construct Oxidation Ditch No. 4 at Plant No. 2 were developed based on the construction costs to build Oxidation Ditch NO. 3 in 2014. These costs were then escalated for inflation at 3% a year for 8 years to match the midpoint of construction for the Denitrification Project. The total cost is estimated at $3.69 million. A detailed cost breakdown is attached.

The cost of improvements scheduled for Plant No. 1 under the Denitrification Project/CIP 7005 is attached. $4.489 million is planned for Plant No. 1. The potential savings at Plant No. 1 if Oxidation Ditch No. 4 is constructed at Plant No. 2 range from $3.14 Million to $3.45 Million, depending on options for using contingency budget and demolition work at Plant No. 1. One of the reasons for the contingencies in the total project budget is due to the unknows that we will undoubtedly find once construction starts at Plant No. 1. By eliminating construction activities on the Clarifiers, Oxidation Ditch, and Motor Control Center at Plant No. 1, we feel confident that far less contingency money will be needed for the project. Contractor overhead should also be less by not having to continually cross Hwy 4 during construction or have two staging areas. Construction management and inspection costs may be less since there will be fewer unknows that will need to be dealt with during construction. The long term operating costs for the Town for not maintaining and operating Plant No. 1 will also be less under this alternative. Veolia may have less costs for not having to maintain and operate Plant No. 1 which may translates to less operating costs for Veolia's Operations contract with the Town.

The estimated net increase in cost to build Oxidation Ditch No. 4 and abandon the core facilities at Plant No. 1 is then $240,000 to $550,000.

The cost to build Clarifier No. 6 (4^{th} Clarifier at Plant No. 2) is estimated at $2.5 Million. This cost would be incurred by the District five (5) or more years in the future to accommodate growth inside the existing service boundary beyond Pantages, Newport Point, and Hofmann.

Previous Relevant Board Actions for This Item

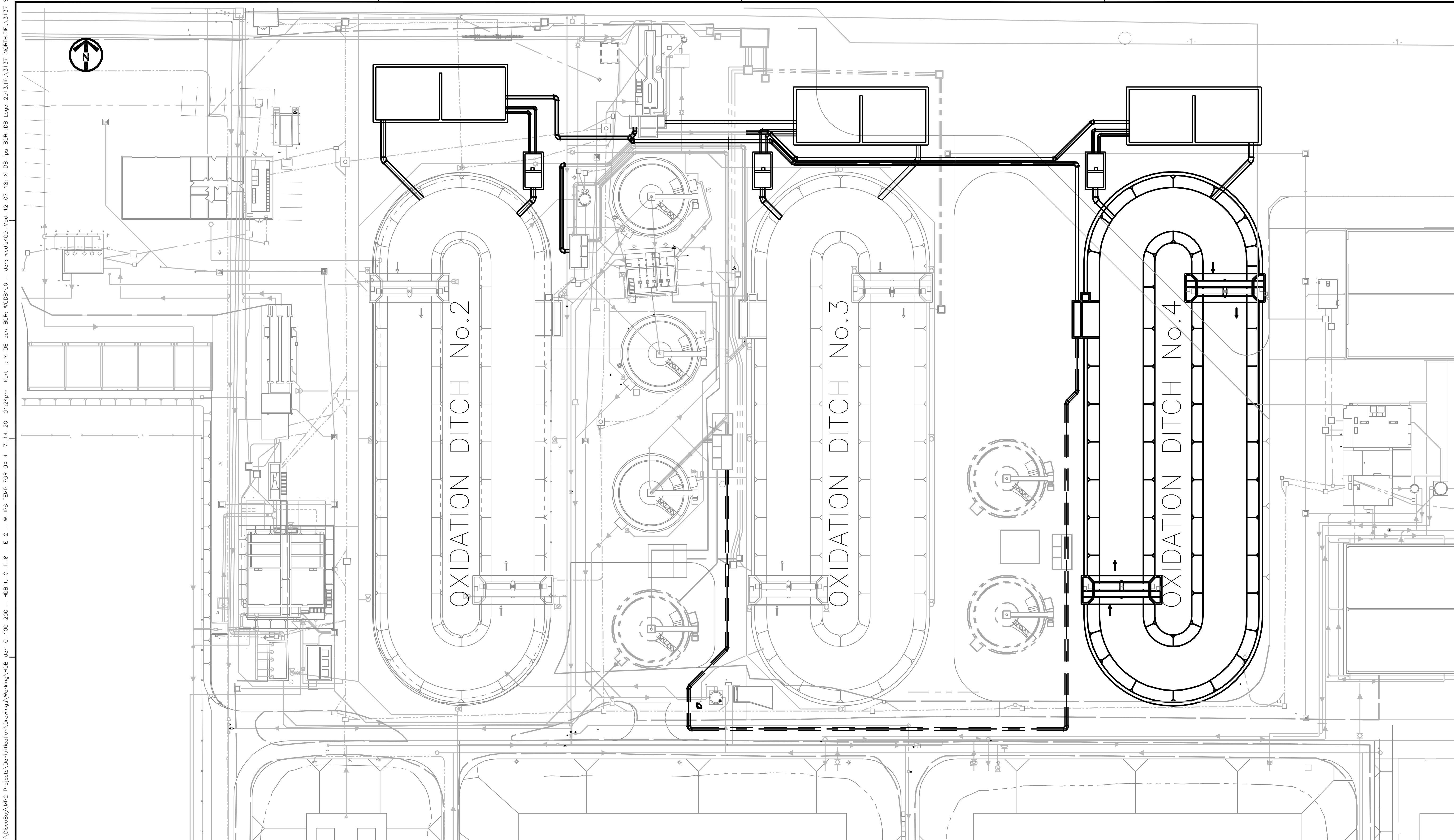
Acceptance of the 2019 Wastewater Master Plan
Adoption of the current CIP

Fiscal Impact:
Amount Requested:
Sufficient Budgeted Funds Available?:
Prog/Fund # Category:

Attachments

1. Drawing of Oxidation Ditch No. 4 at Plant No. 2.
2. Table 5-12 from the Wastewater Master Plan.
3. Detailed cost breakdown estimated at $3.69 million.

AGENDA ITEM: C-2



SITE PLAN
SCALE: 1"=30'
A
–

30% SUBMITTAL

REV.	DATE	BY	DESCRIPTION
FILENAME:			

DESIGNED KAG
DRAWN IG
CHECKED GPH
DATE JUNE 2020

DISCIPLINE ENGINEER

PROJECT ENGINEER

HERWIT ENGINEERING

TOWN OF DISCOVERY BAY
CONTRA COSTA COUNTY

DISCOVERY BAY COMMUNITY SERVICES DISTRICT
DENITRIFICATION
CIVIL
PLANT No.2 – OXIDATION DITCH No.4 YARD PIPING – PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 2019-135 T01
DRAWING NO. C-XXX
SHEET NO. OF XX

Table 5-12 Existing and Future Flows and Loads

Parameter (a)	Existing (b)	Increment (c)	Baseline Future (d)	Alternate Future (e)	Previous Master Plan Future (f)
Flow Ratios					
ADWF/AAF	1.0	1.0	1.0	1.0	0.97
ADMMF/AAF	1.2	1.2	1.2	1.3	1.1
PDF/AAF	2.1	2.1	2.1	2.8	2.0
PHF/AAF	3.0	3.0	3.0	4.3	3.0
Load Ratios					
ADMML/AAL	1.3	1.3	1.3	1.3	1.3
PDL/AAL	2.0	2.0	2.0	2.0	2.0
Flow, Mgal/d					
ADWF	1.32	0.31	1.63	0.98	2.35
AAF	1.32	0.31	1.63	0.98	2.42
ADMMF	1.58	0.37	1.96	1.30	2.66
PDF	2.77	0.65	3.42	2.77	4.84
PHF	3.96	0.93	4.89	4.24	7.26
Annual Average Load, lb/d					
BOD	3,027	711	3,738	3,738	4,037
TSS	3,027	711	3,738	3,738	4,037
TKN	605	142	748	748	807
Average Day Maximum Monthly Load, lb/d					
BOD	3,936	924	4,860	4,860	5,248
TSS	3,936	924	4,860	4,860	5,248
TKN	787	185	972	972	1,050
Average Constituent Concentrations, mg/L					
BOD	275	275	275	459	200
TSS	275	275	275	459	200
TKN	55	55	55	92	40
Constituent Concentrations with ADMMF and ADMML,					
BOD	298	298	298	448	236
TSS	298	298	298	448	236
TKN	60	60	60	90	47
Constituent Concentrations with AAF and ADMML, mg/L					
BOD	358	358	358	597	260
TSS	358	358	358	597	260
TKN	72	72	72	119	52

(a) ADWF = Average Dry Weather Flow, AAF = Annual Average Flow,
ADMMF = Average Day Maximum Monthly Flow,
PDF = Peak Day Flow, PHF = Peak Hour Flow
AAL = Annual Average Load, ADMML = Average Day Maximum Monthly Load

(b) Based on AAF = 1.32 Mgal/d as of March 31, 2018.

(c) Average incremental flow from Table 5-11.

(d) Baseline future presumes per capita flows remain same as existing (83.5 gal/d, average). Flow and load peaking factors assumed same as existing.

(e) Alternate Future presumes exteme water conservation with average per capita flow of 50 gal/d. Differences between average flows and peak flows assumed same as Baseline Future. Flow peaking factors adjusted per above. Loads assumed same as Baseline Future.

(f) Final Master Plan dated February 13, 2013, Including Amendment 1.

Plant No. 1 CIP Items

CIP 7005	**Wastewater Treatment Plant 1 Refurbishment**	**Unit Cost**	**Saved for Ox Ditch No. 4**
	Supplemental Aeration in Oxidation Ditches	$ 213,333	$ 213,333
	SCADA Networking Improvements	$ 45,333	$ 45,333
	Influent Pump Station Grating	$ 12,000	
	Oxidation Ditch Structural Rehab and Guardrail Repair	$ 665,000	$ 665,000
	Clarifiers Structural Rehab	$ 66,000	$ 66,000
	Clarifiers Mechanical Replacement and Upgrade	$ 718,000	$ 718,000
	MCC-C Replacement	$ 333,000	$ 333,000
	MCC-C Standby Power	$ 199,000	$ 199,000
	Headworks Grating	$ 34,000	$ 34,000
	Storm Drainage Improvements	$ 30,000	
	Transfer Station Instrumentation and Controls	$ 30,000	$ 30,000
	Demolish Existing Abandoned Facilities	$ 134,000	
	Extend Pump Sta. F Force main to Pump Sta. W Manhole	$ 30,000	
	Coat Electrical Cabinets at Influent Pump Sta.	$ 6,000	
	Pump Sta. W Isolation Valve	$ 24,000	
	Oxidation Ditch Rotor Frame Elect. and Struct. Rehab.	$ 480,000	$ 480,000
	Clarifier Launder Covers	$ 108,000	$ 88,000
	CEQA Permitting	$ 4,000	
	Surveying	$ 10,000	
	Engineering & Design	$ 335,224	
	Construction Management & Engineering Support	$ 343,060	
	Geotechnical Inspection	$ 10,000	
	TODB Project Management	$ 42,000	
	Project Contingency	$ 350,036	
	Inflation to midpoint of Construction	$ 267,720	$ 267,720
	Total	$ 4,489,707	$ 3,139,387
	Total Cost of New Ox Ditch at Plant No. 2		$ 3,690,510
	Credit from Plant No. 1 CIP		$ (3,139,387)
	Net Cost to Move Ox Ditch to Plant No. 2		**$ 551,124**

Plant No. 1 CIP Items (Least Cost Option)

CIP 7005	Wastewater Treatment Plant 1 Refurbishment	Unit Cost	Saved for Ox Ditch No. 4
	Supplemental Aeration in Oxidation Ditches	$ 213,333	$ 213,333
	SCADA Networking Improvements	$ 45,333	$ 45,333
	Influent Pump Station Grating	$ 12,000	
	Oxidation Ditch Structural Rehab and Guardrail Repair	$ 665,000	$ 665,000
	Clarifiers Structural Rehab	$ 66,000	$ 66,000
	Clarifiers Mechanical Replacement and Upgrade	$ 718,000	$ 718,000
	MCC-C Replacement	$ 333,000	$ 333,000
	MCC-C Standby Power	$ 199,000	$ 199,000
	Headworks Grating	$ 34,000	$ 34,000
	Storm Drainage Improvements	$ 30,000	
	Transfer Station Instrumentation and Controls	$ 30,000	$ 30,000
	Demolish Existing Abandoned Facilities	$ 134,000	$ 134,000
	Extend Pump Sta. F Force main to Pump Sta. W Manhole	$ 30,000	
	Coat Electrical Cabinets at Influent Pump Sta.	$ 6,000	
	Pump Sta. W Isolation Valve	$ 24,000	
	Oxidation Ditch Rotor Frame Elect. and Struct. Rehab.	$ 480,000	$ 480,000
	Clarifier Launder Covers	$ 108,000	$ 88,000
	CEQA Permitting	$ 4,000	
	Surveying	$ 10,000	
	Engineering & Design	$ 335,224	
	Construction Management & Engineering Support	$ 343,060	
	Geotechnical Inspection	$ 10,000	
	TODB Project Management	$ 42,000	
	Project Contingency	$ 350,036	$ 175,018
	Inflation to midpoint of Construction	$ 267,720	$ 267,720
	Total	$ 4,489,707	$ 3,448,405
	Total Cost of New Ox Ditch at Plant No. 2		$ 3,690,510
	Credit from Plant No. 1 CIP		$ (3,448,405)
	Net Cost to Move Ox Ditch to Plant No. 2		**$ 242,106**

Oxidation Ditch No. 4 Costs based on Previous Oxidation Ditch No. 3 Construction Cost

	Description			Previous Construciton Cost
	SITE WORK			
1	Pothole	1	LS	$ 16,000.0
2	Dewater Pipelines	1	LS	$ 42,000.0
3	24" ML to Ox Ditch Inlet	1	LS	$ 149,500.0
4	24" ML to Ox Ditch Outlet	1	LS	$ 175,500.0
5	Shoring for 16" SE Line	1	LS	$ 15,000.0
6	Ductbank to PB-34	1	LS	$ 24,000.0
7	Ductbank to PB-31	1	LS	$ 28,000.0
8	Ductbank to PB-32	1	LS	$ 27,000.0
9	Misc Conduits	1	LS	$ 50,000.0
10	Light Poles	1	LS	$ 10,000.0
11	Pull Wire	1	LS	$ 65,000.0
12	Sawcut/Demo AC	1	LS	$ 8,000.0
13	Agg Base Roadway	1	LS	$ 12,000.0
14	Aggregate Base	1	LS	$ 60,000.0
15	AC Paving	1	LS	$ 50,000.0
16	Trench Patch	1	LS	$ 16,000.0
	FLOW SPLITTER #2			
17	Drain Ox Ditch #2	1	LS	$ 3,000.0
18	Isolate Flow Splitter	1	LS	$ 4,000.0
19	Demo Splitter	1	LS	$ 7,500.0
20	Grout	1	LS	$ 1,500.0
21	Slide gates	1	LS	$ 16,250.0
22	Handrail/Metals/Weirs	1	LS	$ 15,000.0
	Oxidation Ditch NO. 4			
23	Dewater Ox Ditch	1	LS	$ 90,000.0
24	Clear & Grubb	1	LS	$ 12,000.0
25	Excavate/Haul Peat	1	LS	$ 24,000.0
26	Mass Excavation/Haul	1	LS	$ 95,000.0
27	Grade Bottoms/Slopes	1	LS	$ 24,000.0
28	Backfill Center	1	LS	$ 26,000.0
29	Excavate/ABC Overflow	1	LS	$ 9,000.0
30	Overflow Structure-Lower Slab	1	LS	$ 19,000.0
31	Overflow Structure-Lower Walls	1	LS	$ 16,000.0
32	Backfill/ABC Upper Slab	1	LS	$ 4,000.0
33	Overflow Structure-Upper Slab	1	LS	$ 23,000.0
34	Overflow Structure-Upper Walls	1	LS	$ 30,000.0
35	Backfill Overflow	1	LS	$ 6,000.0
36	Slide gates	1	LS	$ 60,000.0
37	Scum Pump	1	LS	$ 15,000.0
38	Handrail/Metals/Baffles	1	LS	$ 20,000.0
39	Scum Pump Piping	1	LS	$ 10,000.0
40	Electrical at Overflow	1	LS	$ 25,000.0
41	Exc/ABC at Rotors	1	LS	$ 18,000.0
42	Rotor Structure-Slabs	1	LS	$ 80,000.0
43	Rotor Structure-Lower Walls	1	LS	$ 90,000.0
44	Rotor Structure-Walkways	1	LS	$ 30,000.0
45	Rotor Structure-Upper Walls	1	LS	$ 85,000.0
46	Rotor Structure Fillets	1	LS	$ 3,000.0
47	Backfill Rotor Structures	1	LS	$ 10,000.0

Oxidation Ditch No. 4 Costs based on Previous Oxidation Ditch No. 3 Construction Cost

	Description			Previous Construciton Cost
48	FRP Covers			$ 30,000.0
49	Sump Pumps	1	LS	$ 20,000.0
50	PD/PW Piping	1	LS	$ 21,000.0
51	Handrail/Metals	1	LS	$ 26,000.0
52	Electrical at Rotors	1	LS	$ 30,000.0
53	Inlet Structure	1	LS	$ 11,000.0
54	Excavate Thickened Edges	1	LS	$ 16,000.0
55	Grade/ABC Ox Ditch	1	LS	$ 70,000.0
56	Form/Strip Edges #1	1	LS	$ 25,000.0
57	Rebar #1	1	LS	$ 12,000.0
58	PRV/Embeds	1	LS	$ 6,000.0
59	Shotcrete #1	1	LS	$ 120,000.0
60	Expansion Joints	1	LS	$ 8,000.0
61	Form/Strip Edges #2	1	LS	$ 25,000.0
62	Rebar #2	1	LS	$ 12,000.0
63	Shotcrete #2	1	LS	$ 120,000.0
64	CL Fencing	1	LS	$ 20,000.0
65	Shotcrete Center	1	LS	$ 25,000.0
66	Caulk	1	LS	$ 6,000.0
67	Misc Equipment	1	LS	$ 4,000.0
68	Paint Ox Ditch	1	LS	$ 26,000.0
69	Water Test Ox Ditch	1	LS	$ 5,000.0
70	Startup Aerators	1	LS	$ 4,000.0
	MCC BLDG			
71	Purchase MCC	1	LS	$ 45,000.0
72	Install MCC/PLC	1	LS	$ 13,000.0
73	Interior Electrical	1	LS	$ 12,000.0
74	Pull Wire	1	LS	$ 9,000.0
75	Terminate	1	LS	$ 4,000.0
76	Test Gear	1	LS	$ 9,000.0
	Misellaneous			
77	Additional Peat Removal	1	LS	$ 27,496.0
78	Rebar at Ox Ditch Center	1	LS	$ 13,755.0
79	Moisture Conditioning	1	LS	$ 20,000.0
80	Haul/Surcharge Dirt	1	LS	$ 10,104.0
			Total Construction Cost April 2014	$ 2,424,605.0
			Inflation	$ 0.0
			Years to Mid Point of Construction April 2022	$ 8.0
			Total increase	$ 0.2
			Adjusted Mid Point of Cost	$ 3,006,510.2
			New Rotors	$ 684,000.0
			Total	$ 3,690,510.2