WASTEWATER TREATMENT CORRECTIVE ACTION REPORT ADDENDUM

CITY OF FERNDALE

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INTRODUCTION

This document was written as an addendum to the City of Ferndale's "Wastewater Treatment Corrective Action Report" dated December 10, 2003. The goal of this addendum is to address the questions and concerns posed by the North Coast Regional Water Quality Control Board (RWQCB) on April 26, 2004. Enclosed with this document is an updated "Application for Wastewater Discharge Dilution Reduction (Revision 1)" which provides current information on effluent water quality from the Wastewater Treatment Facility (WWTF) and its impact on the receiving body.

The project description for the proposed Sequencing Batch Reactor (SBR) process has been updated to reflect additional work performed by Spencer Engineering and Construction Management, Inc. and SHN Consulting Engineers and Geologists. The updated Recommended Project Description, with the construction cost estimate, is included as Appendix A.

QUESTIONS AND RESPONSES TO RWQCB LETTER DATED APRIL 26, 2004

"Clarification on dilution variance you are requesting."

Response: Using the only Francis Creek flow rate data available and the corresponding influent flow rates to the existing facility, a water balance was performed to approximate future discharge conditions. For the water balance model, the SBRs were assumed to treat influent flows at an average rate of 1.5 MGD (design flow rate), and have the capacity to treat up to 4.0 MGD for a maximum of two days during peaks in wet weather flows. Any influent flow over 4.0 MGD will be routed to a surge basin and treated later. For this model, the influent flow rate data was used to approximate the future effluent flow rate.

During times of low flow in Francis Creek, conceptual discharge rates are constrained by the dilution requirement (ratio of creek flow to effluent.) During high flow conditions in Francis Creek, the discharge capacity of the facility limits the discharge flow rate. When the effluent flow rate was greater than allowed by the conceptual discharge ratio, only part of the treated water was discharged to Francis Creek. Any excess treated wastewater was assumed to be stored on site. In order to discharge the best quality effluent to Francis Creek, storage of treated effluent would need to be short-term.

Storing a high quality effluent in an open pond will pose operational challenges. The water quality of the effluent could decrease due to contamination by air-borne particles. Wildlife can also introduce nutrients and contaminants. The effluent could increase in temperature due to solar gain or the effect of ambient air temperatures. The wrong conditions could result in an algae bloom, increasing ammonia concentrations and decreasing dissolved oxygen. Any contamination during storage will degrade the effluent, and make it unsuitable for discharge. In some cases, additional treatment may be required prior to discharge.

Based on the initial analysis, the 1:1 minimum dilution requirement in the receiving body is the best scenario for the City's WWTF because the highest quality wastewater could be discharged

directly to Francis Creek. Based on this dilution ratio, the model storage requirements for the flows occurring during the 2002-03 water year are minimal. All of the wastewater influent flow rates during the 2002-03 water year were below 4 MGD. For the 2003-04 water year model, the required storage is slightly higher. The proposed minimum dilution could be achieved for the 2003-04 flow rates, with the exception of 13 days where effluent flow rates would exceed creek flow rates. When the dilution of 1:1 can not be met under direct discharge conditions, excess treated wastewater will be stored for a short time. The pond would be operated to minimize the degradation of treated wastewater.

Depending on the flow rates in Francis Creek, there may be times when the maximum retention time in the storage pond is reached, or the storage pond is full. For those times, a temporary waiver will be requested to release effluent at a dilution less than 1:1. As a result of the temporary waiver, the effluent quality will be maintained and temporary storage capacity in the pond would be restored.

The temporary waiver to discharge at dilutions less than 1:1 would typically be applied during the transition times in early spring and late fall, or times when the peak wet weather flows in the creek lag behind the peak inflow and infiltration augmented wastewater flows.

This scenario ensures that the highly treated effluent from the SBRs is discharged to Francis Creek, and that the beneficial uses are protected.

"Effluent dilution ratios should be calculated at various points in the Salt River and at the confluence of the Eel River."

Response: Tributaries to the Salt River are Francis Creek, Russ Creek, Smith Creek, and Reas Creek. Since its diversion in 1998, Williams Creek no longer contributes flow to the Salt River. Flow upstream of the confluence of the Salt River and Francis Creek is considered negligible, as the channel remains dry most of year.

To simulate the "worst case scenario" the average low flow from Francis Creek was calculated. Based on the data provided by the City, the average low flow from Francis Creek was determined to be 0.7 mgd.

No flow information on the Russ Creek, Smith Creek, or Reas Creek could be located as these are small creeks. Due to lack of data for the small creeks, an alternate means was used to estimate flows in these creeks. The California Department of Fish and Game had one record of a flow measurement taken in April 1974 on Reas Creek (1.5 cfs or 0.9mgd). Flow estimations were made based on flow data found in Francis Creek. The tributary flows were estimated proportionally to the ratio of low flow and drainage area in Francis Creek. Drainage areas were obtained from the *Salt River Watershed Local Implementation Plan* (USDA-SCS, 1993). The drainage areas are only for the upper watershed, since flow contributions in the lower watershed are difficult to determine.

Flow data for the Eel River was collected from the California Department of Water Resources Bulk Data Selector. The data used in this analysis was taken from the closest gauging station, in Scotia. The flows from the Eel River at Scotia provide a conservative estimate as the Van Duzen River provides flow contributions downstream of the Scotia station.

By setting the dilution of stream flow in Francis Creek to treated effluent at 3:1, the anticipated dilutions can be calculated in the Salt River as tributary flows are added. Table 1 provides a summary of the anticipated dilutions. Because the estimated dilutions are based on low flows in Francis Creek and average WWTF effluent flow, the dilutions presented herein represent the poorest situation anticipated to occur. The dilutions in the Salt River are presented to illustrate the how the tributary flows contribute to the relative dilution of wastewater in the Salt River, and are not meant to provide definitive dilutions in the Salt River.

Table 1: Anticipated Dilutions in Salt River with Proposed Project

Creek	Upper Drainage Area (acres)	Average Low Flow (mgd)	Average Salt River Flow (mgd)	Estimated Dilution
Francis	1,990	0.7	0.7	3 : 1
Reas	1,210	0.43	1.13	4.9 : 1
Smith	160	0.06	1.19	5.1 : 1
Russ	2,080	0.73	1.92	8.3 : 1
Eel River	-	7,072	7,074	30,756:1

"In order to meet the burden of justification required by the Basin Plan for a dilution exception, additional analyses of beneficial uses is required, evaluating cumulative effects of all discharges, including point and nonpoint source contributions, both in existence and reasonably foreseeable."

Response: Please refer to the "Application for Wastewater Discharge Dilution Reduction (Revision 1)."

"Francis Creek turned north in March 2004 thereby no longer passing directly by the WWTF before entering the Salt River. How will future discharges be assured to enter the Salt River, given the siltation issues in the Ferndale area?"

Response: The siltation of creeks in the Ferndale area is a subject of great concern for the City of Ferndale, neighbors, and other public agencies. The WWTF site is outside Ferndale's city limits, thus limiting their influence.

The silt in Francis Creek along the WWTF was dredged by a neighbor in April 2004. Thus, the channel of Francis Creek has been restored to its pre-March 2004 river channel.

Avenues are currently being pursued to develop a long term plan for addressing siltation issues in the Ferndale area. We are currently working with the Salt River Group, led by the Humboldt

County Resource Conservation District, to evaluate options regarding this issue. Several agencies are involved and are working together to identify a feasible solution. The Salt River Group is currently working on a demonstration project to dredge the Salt River from the WWTF to just downstream of the Dillon Street Bridge. The Army Corps of Engineers (ACOE) is also involved in a project to dredge the entire Salt River to the confluence with Eel River. The ACOE Salt River project is an active project, although currently on hold waiting for funding to proceed.

The proposed project includes annual maintenance dredging of Francis Creek upstream of the discharge point. This will decrease the velocity of the creek, allowing sediment to drop out of suspension. By annually dredging the channel, the sedimentation of Francis Creek will be hindered and the channel will remain open.

"Please provide a map depicting the current topographic conditions and drainage areas affecting the Ferndale area."

Response: The work performed by the Salt River Group also includes the preparation of a topographic survey for the Salt River and Francis Creek. The survey will be used to aid the Salt River Group in identifying areas in the Salt River of Francis Creek to be dredged as part of their demonstration project. The topographic survey will be forwarded to your office as soon as it is prepared.

"Clarification on planned use of finished effluent storage area: i.e. will the storage be used only to regulate irrigation flows or will it be used for additional purposes?"

Response: Please refer to the Preferred Project Description (Appendix A).

Please note that Figures 15 and 16 of the original CAR incorrectly identify the entire lagoon as "finished effluent storage," please find enclosed the corrected figures. Figure 13 is correctly shown.

"Considering the 91.6 percent contribution reported for infiltration and inflow to peak wet weather flows, documentation of the City's past actions and proposed plan for reduction of infiltration and inflow is needed."

Response: The City of Ferndale has been evaluating and correcting their infiltration and inflow (I/I) contributions to the sewer system. The process of reducing I/I has been ongoing, and improvements are made as funds become available. Following is an outline of the efforts made by the City to identify and correct the I/I problems:

In 1987, a *Sanitary Sewer Evaluation Survey* was performed by Chandler Engineering as part of a $400,000 project funded by the State Water Resources Control Board to improve the City's wastewater collection system. Improvements were constructed in 1989. Analysis of recent flow

data have shown that these improvements decreased dry weather I/I significantly, but only reduced wet weather I/I by a small amount. Up to 91.6% of wet weather flow is currently estimated to be I/I, while only 13.5% of dry weather flow is estimated to be I/I (City of Ferndale, 2002).

In order to reduce wet weather I/I, the City began to identify problem areas, and quantify the problem (City of Ferndale, 2002; City of Ferndale, 2004). The City's flow measurement analysis focused on three areas of the City. The first area was Berding Street, including all the side streets, to Main Street. The second area was Grant Avenue to Main Street, and McKinley Avenue south of Cream Court. The third area was Ocean Avenue to Shaw Avenue along 5th Street, and through the Humboldt County Fairgrounds. Selected sewer lines on the west, north, and east sides of the City were video taped.

The measurement of wet weather flow rates throughout the system was completed in April 2003. During the assessment in April 2003, measurements were recorded between 2:00 a.m. and 7:00 a.m. City staff was able to measure approximately 75% of the City's collection system and documented I/I flow of 115 gpm. By extrapolation, the total estimated I/I at the time was 153 gpm. An average flow of 0.3 mgd was used to determine the percentage of I/I. The results of the analysis indicated that the I/I totaled approximately 73% of the total flow at the time the measurements were taken. Approximately 14,000 feet of City sewer line was video taped. At that time, thirty manholes were identified for replacement. Twenty-one of these manholes have since been replaced or repaired (City of Ferndale, 2004.).

The City completed an update for the I/I assessment in March 2004. According to this update, the most serious I/I occurs along the pipeline from Cream Court to Ambrosini Lane, along Berding Street from Eugene Street to Herbert Street, and on sections of 5th Street and California Street.

The assessment concluded the following:

- the remaining nine high priority manholes initially identified in the 2003 assessment need to be replaced;
- eight additional manholes may need to be installed to provide access and facilitate the completion of video taping;
- fifteen additional low priority manholes and fifteen low priority clean outs could be installed to facilitate operations and maintenance; and
- the sewer line between Howard Street and Herbert Street should be abandoned.

Additional video taping is needed to assess the full extent of the repairs required. The additional video taping will occur after the eight new manholes are installed. Upon completion of the video taping, the City can assess which sections of sewer pipe should be prioritized for repair and complete the repairs as funds become available.

Concurrently, the City prepared an updated Drainage Master Plan which identifies and prioritizes areas of concern. Improvements to the storm drain system should help reduce the amount of I/I entering the sewer collection system and contributing flows to the WWTF.

In 2003, improvements were made on Herbert Street and Shaw Avenue. The Herbert Street sewer line was videotaped and determined to be in fair condition. On Shaw Avenue, approximately $100,000 was used from the City's Sewer Reserve Funds to repair and replace approximately 1,000 feet of 8-inch sewer line.

The City has also adopted an ordinance to reduce components of I/I. The ordinance requires sewer lateral testing upon the sale of a property, or construction of a new sewer lateral for any new development on a property. Testing must be performed to determine if repairs or replacement of the lateral will be required. The City will inspect the testing procedure, and upon approval, will issue a permit inspection card. The approved permit accompanies the title transfer proceedings.

"Table 15 indicates that the SBR can reliably reach a total suspended solids (TSS) concentration of 10 mg/l. Section 5.3.7 UV Disinfection System indicates that the design of the disinfection system would be based on a TSS of 5 mg/l. This discrepancy must be addressed."

Response: Please refer to the Preferred Project Description (Appendix A)

"Costs and planning associated with emptying the facultative sludge pond should be addressed."

Response: The question presented in the RWQCB letter is related to future sludge removal from the proposed Facultative Sludge Lagoon (FSL), but it could also be posed for removal and disposal of the accumulated sludge in the existing lagoon. There will be a capital cost associated with removal and disposal of existing sludge. The costs are included in the Preferred Project Description (Appendix A). The cost to find and permit a sludge disposal site is not included specifically in the estimate.

The periodic O&M cost to dredge and dispose of accumulated sludge in the proposed FSL has not been specifically addressed, but is not expected to be significant given the anticipated life cycle of the FSL.

"Does the equalization tank have potential to accumulate sludge? If so, maintenance of this portion of the system must be addressed."

Response: We do not anticipate that the equalization tank will accumulate sludge. The sludge removal will take place in the facultative sludge pond and SBR, with only the supernatant flowing into the equalization tank.

The equalization basin located immediately downstream of the SBR basins is designed to equalize flows to the disinfection process. This basin is operated in a batch mode and experiences wet dry cycles. At the end of each cycle, the equalization basin is emptied until the

next SBR batch is decanted. By the time decanted effluent enters the equalization basin, the BOD and TSS levels have been reduced to meet discharge requirements, and there is little opportunity for solids settlement. Periodic cleaning may become necessary, but not on a routine basis.

"What costs will be incurred during demolition of the out-dated headworks, and other appurtenances, which will be abandoned?"

Response: Demolition costs will be analyzed and included in the cost estimate in the Preferred Project Description (Appendix A)

"How will this project be funded?"

Response: The City has identified two potential funding sources, the Federal Emergency Management Agency (FEMA) Disaster Assistance and the USDA Rural Utilities Services Water and Waste Disposal Loan and Grant Program.

Sometime in early April 1998, the California El Niño Disaster storms caused Williams Creek, the main tributary to Salt River upstream of the WWTF, to change course due to a debris blockage. Williams Creek now drains into the Lower Eel River. These storms have been designated as a federal emergency under Presidential Disaster Declaration FEMA-1203-DR-CA. Williams Creek no longer contributes flow to the Salt River since it changed course in 1998. This change has significantly reduced the amount of surface water available to dilute the City's treated wastewater entering Salt River from Francis Creek. FEMA has indicated that they may fund improvements up to $3,433,600.

The USDA RUS program has indicated that they could provide a loan for improvements that would make up the shortfall in funding from FEMA. The current cost estimate for the preferred alternative is $5,787,426 (see Preferred Project Description, Appendix A). The City is in the process of applying for a loan with USDA to make up the $2,353,826 difference. These amounts may change pending final project costs and final funding determination from FEMA.

"The schedule proposed in Table 18 seems ambitious and we realize that these comments have come to you in April 2004. Therefore, the requested addendum should be accompanied by a revised schedule."

Response: The proposed project schedule has been updated to accommodate the need for review and approval by permitting and funding agencies. The revised schedule in Table 2 assumes that environmental review and approval will be completed within six months after the funding is awarded, and that survey and design can be completed in six months. We anticipate that construction will take approximately one year.

Table 2: Amended Proposed Time Schedule for Implementing Corrective Actions

Action	Action Completion Date
City Selection of Preferred Alternative	December 2003
Approval of Dilution Reduction	December 2004
Funding Agency Review	February 2005
Environmental Review and Permitting	August 2005
Funding Agency Commitment of Funds	August 2005
Survey and Final Design	August 2005 to February 2006
Bidding Process	March 2006
Construction	April 2006 to April 2007

"Mitigation of potential increased temperatures caused by the discharge of effluent into Francis Creek is required"

Response: As noted in the "Application for Wastewater Discharge Dilution Reduction (Revision 1)," currently the data shows in-stream temperatures rising 0.7º F as a result of the effluent discharge. This may be due to the fact that the effluent is stored in the aeration basin for extended periods of time, exposing it to the radiation effects of the sun.

The proposed SBR process will significantly shorten detention times within the WWTF compared to the existing lagoon process. The result is that wastewater will have a greatly reduced chance to increase in temperature during those times of the year when ambient temperatures are higher than incoming wastewater temperatures (summertime for example). During those times of the year when ambient temperatures are lower, there will be a reduced opportunity for wastewater to be cooled to the ambient level. However, the relatively large I/I component during colder, wet weather periods and lower ambient air temperatures tends to lower the temperature of the wastewater component and reduce the risk of warmer-than-ambient water temperatures entering the receiving stream.

However, mitigation of potential increased temperatures caused by the WWTF discharge was discussed briefly in the CAR. We will continue to investigate other areas of mitigation to ensure that the WWTF discharge does not degrade the water quality of its receiving body.

REFERENCES

Chandler Engineering; "City of Ferndale Sanitary Sewer Evaluation Survey"; November 1987.

"City of Ferndale Application for Wastewater Discharge Dilution Reduction;" prepared by Spencer Engineering and Construction Management for the City of Ferndale; December 2002.

"Salt River Watershed Local Implementation Plan" and "Appendix A – Salt River Water Quality Report," written by the United States Department of Agriculture, Soil Conservation Service; 1993.

"Sewer Survey/Repair Summary" and attached letter to the City Manager; City of Ferndale; March 1, 2004.

APPENDIX A- RECOMMENDED PROJECT DESCRIPTION

PROPOSED CORRECTIVE ACTION

The City has made a concerted effort to improve the reliability of its WWTF, however, the existing facility is unable to operate under compliant effluent discharge rates. Over the past few years, the City has been investigating alternatives to upgrade its WWTF, and potential funding sources for these improvements. The 2003 Corrective Action Report (CAR) presented alternatives for WWTF upgrades and a recommendation for the preferred alternative. Based on the results of the CAR, the City has approved a sequencing batch reactor (SBR) system as the preferred alternative.

In order to resolve the dilution dilemma posed by physical changes that have occurred to the hydrology of the watershed, future wastewater treatment system improvements include replacing the existing system with advanced technology that will provide the opportunity for additional treatment beyond the capacity of existing processes and structures.

In addition to improvements to secondary treatment and finished water quality, new headworks facilities will be installed. The existing pump station and headworks building is in poor condition, and has out-lived its useful lifetime. The existing influent pumps appear to be inadequately sized for the proposed improvements. Also, the existing chlorination building may be too small to house the required controls for the proposed improvements (Personal Communication, 2004).

The recent modifications to the chlorination facilities may have increased treatment reliability, but have not addressed violations of the 100:1 dilution requirement. Because of physical and economic constraints, the upgraded treatment facility will not be designed to discharge at 100:1. However, the proposed treatment system will guarantee reliably high-quality effluent that could be discharged at a reduced dilution and protect the beneficial uses of Francis Creek and the Salt River.

Sequencing Batch Reactor Description

An SBR system will replace the existing aerated lagoon and polishing pond. This treatment method is a fill-and-draw activated sludge treatment system in which aeration, nutrient removal, and sedimentation are carried out sequentially in the same vessel. SBRs will provide improved treatment with a high degree of reliability. This technology compares well to other types of secondary treatment methods. The SBR system can provide excellent treatment performance for small communities, and is automated to reduce operational complexity.

SBRs have a small footprint, compared to alternative systems. The preliminary treatment, SBRs, controls, pumps and blowers, flow equalization basin, and solids digesters will be installed at the site of the existing headworks on Port Kenyon Road. Figures 1 and 2 show the proposed layout of the facility and hydraulic profile of the facility. The area of the existing aeration pond will be available for a surge basin, facultative sludge lagoon (FSL), and finished effluent storage, if needed.

Figure 1: Sequencing Batch Reactors

Figure 2: Hydraulic Profile with SBR Process

Influent Pumping

The hydraulic grade line (Figure 2) illustrates the necessity of installing a new influent pump station as part of the proposed project. Raw wastewater from the collection system will be pumped from the new influent pump station to preliminary treatment and then to a splitter box on the upper floor of the SBR process equipment building. The splitter box will be used to divert wastewater to either the SBR basins or to the surge basin.

The influent pump station is sized with a firm capacity equal to the Peak Instantaneous Flow (PIF) of 6.0 MGD. Firm capacity is defined as the ability to convey the maximum one-hour sustained influent flow without excessive surcharge or a sewage overflow with one pump off-line. Various pumping scenarios were evaluated to achieve the design criteria. The lowest cost and most efficient station for the design flow rate requires a total of four pumps. The wet well size for a four-plex pump station is a minimum of 10-feet in diameter. Based on the elevation of the existing sewer, the invert elevation of the pumps will be below 0.0 feet MSL.

Based on a four-pump layout, two smaller pumps on a dedicated force main will be designed to pump the majority of influent flows. Each of the smaller pumps will be 18 Hp, and have a maximum output of approximately 700 gpm when the wet well is full. Each of the smaller pumps will be equipped with a variable frequency drive (VFD) to provide a range of flows between 0.2 MGD (165 gpm), the ADWF, and 1.0 MGD (700 gpm), exceeding the AWWF of 0.71 MGD. Each of the smaller pumps will be designed with vortex impellors capable of passing 4-inch spherical solids.

For higher flow conditions, two large, 56-Hp, constant speed pumps will rotate to pump wet weather flows to the plant. During extreme conditions, excess flows will be diverted to the surge basin. To improve efficiencies with the larger pumping units, these pumps will be designed with channel impellors sized to pass 3-inch solids. With the 4-pump configuration, one of the larger or one of the smaller pumps could be off-line while the remaining two pumps deliver the peak instantaneous flow (PIF) of 6.0 MGD.

During construction, the existing pump station will stay on-line and continue to pump influent to the existing aeration pond for treatment. After the new pump station is constructed and the new treatment facility is operational, the existing pump station will be abandoned or demolished. During the pre-design phase of the project, the existing influent pump station wet well should be evaluated to determine if will be possible to utilize this structure for the new facility.

Treatment Components

The proposed treatment consists of primary treatment with influent pre-screening and grit removal, biological secondary treatment using sequencing batch reactors (SBRs), aerobic digestion of sludge, disinfection with chlorine solution, dechlorination with a liquid agent (sodium bisulfite), and disposal to either Francis Creek or irrigation. Discharge to irrigation does not require dechlorination.

Headworks

City staff described several disadvantages with the existing headworks site, including the lack of access during significant wet weather events due to local flooding, broken down comminuter equipment, no grit removal, and confined space entry requirements for routine maintenance. Based on these concerns and operational inefficiencies, it was determined that a new headworks should be constructed for the new treatment facility. The recommended project calls for the headworks to be constructed at an elevation above grade, and directly adjacent to the SBR reactors, as shown on the site plan (Figure 1).

The multi-leveled headworks structure will be constructed over the blower/pump room, and will share a common wall with the SBRs. The influent pump station will deliver raw wastewater up to the headworks facilities at an elevation that provides sufficient hydraulic head for gravity flow into each SBR tank. As indicated on the hydraulic profile (Figure 2), the influent will be pumped into a pre-screening channel, and will flow by gravity through a grit removal system into the splitter box. The splitter box will be operated to divert flow to either of the two SBRs, or to the surge basin.

Pre-screening

One of the deficiencies in the existing treatment facility is the lack of pre-screening. The new headworks facility will be equipped with an in-channel screen installed for removing solid material such as rags, grit, and floatable inorganic material. The recommended device will have a rotating inclined screw that lifts and separates inorganic solids while allowing for biodegradable material to be washed back into the channel through a coarse screen. Some systems suitable for consideration are also provided with a grinder prior to the lifting screw to enhance the separation of biodegradable material and coarse solids. After separation, coarse solids will be fed into a compactor to remove additional water. The compacted solids will drop into a collection bin for disposal to a landfill. The pre-screening solids channel will be constructed with a false floor, allowing for space underneath the compactor for a collection bin at ground level. The collection bin will be placed on wheels so that it could be easily moved for maintenance and operations.

Grit Removal

The type of grit separator considered for the Ferndale facility is called the HEAD CELL™, a modular, multi-tray solids concentrator that has proven to be a reliable and effective grit separation device. The use of a multi-cell cyclonic separator involves distributing influent flows across conical shaped trays stacked to form a multi-layered hopper. The grit separator will be located in the center of a 10-foot concrete tank, and surrounded by a circular channel. The bottom and sidewalls of the tank will be sloped to the center. Flow passing across each cell of the hopper experiences a vortex flow pattern that utilizes centrifugal force to separate liquids and

solids. Solids are settled out while liquids are allowed to flow outward along each tray. Once settled, solids are carried down to the center of the hopper where a central collection chamber concentrates the collected grit.

Grit collected on the bottom of the concentrator will be pumped to a smaller cyclonic concentrator, or an auger-style classifier, for further concentration of the grit-laden flow stream. After de-watering, grit will fall into the collection bin for transport to landfill. The classifier will be installed on the same level as the in-channel solids screen, so that grit and screenings share the same collection bin.

Surge Basin

The 1996-2004 influent flow data analysis for the existing treatment plant varies from 0.22 MGD (AWWF) to 3.85 MGD (PDAF). This exceptional range of influent flows creates a unique process control challenge since the treatment system must be designed to achieve high quality effluent during both conditions. If the facility is sized based on the peak hydraulic condition, then the process will be over-sized for the dry weather low flow conditions. Conversely, if the process is downsized, then overflow events or solids washout leading to poor quality effluent could occur. In order to satisfy both conditions while maintaining an economical facility, a temporary storage facility (surge basin) is recommended prior to secondary treatment. This surge facility will be sized to reduce the peak daily flows and contain the peak instantaneous flow.

As discussed below, the treatment units will be designed for a maximum month flow associated with a 5-year storm event (MMWWF-5=1.50 MGD). On a sustained basis, the proposed treatment process will also treat a peak flow of up to 4 MGD for a period of no greater than a couple of days. During this period, effluent quality may begin to deteriorate if sudden surges exceed this level. Therefore, influent flows that exceed 4 MGD will be diverted to the surge basin. A volume of 2 MG will be provided in the surge basin based on reducing the peak instantaneous flow from a 6 MGD to the plant capacity of 4 MGD.

As proposed, the surge basin will be constructed in the existing lagoon by separating a portion of the pond with an earthen berm. Two additional basins are also proposed: one for a facultative sludge lagoon (FSL) and the other for treated effluent storage, if needed. Lining of the surge basin is highly recommended since surge events can deposit unsightly materials in the basin and raw sewage leaching from an unlined pond could contaminate ground water. For planning purposes, a 40 mil HDPE liner will be installed in the surge basin. Since the existing lagoon could have residual sludge entrained in the earthen bottom, a geocomposite material will be provided under the impermeable liner. The function of the geocomposite material is to allow venting of gases generated from latent digestion of existing organic material and reduce the potential for the new liner to float.

After a major surge event and/or annually, the surge basin will require cleaning. The liner will reduce the effort required to clean the basin by providing a washable surface. Cleaning of the surge basin will involve the operator hosing down the basin using either water cannons located along the top of the earthen berm or multiple hose-bibs located around the perimeter of the basin. Access for the operator will be constructed by building a rigid ramp under the liner in one corner of the facility. A special textured surface along the ramp and top layer of the liner is also desirable to provide additional traction and prevent slippage.

The surge basin will be equipped with a drain and a return pump station to facilitate washing and allow temporarily stored wastewater to be returned to the SBRs for treatment. The proposed pumping facilities will provide a return rate of 200 gpm and allow draining of the surge basin over a one-week period. The proposed surge basin pumping facility will also be connected to the FSL overflow to allow rainwater collected in the FSL to be conveyed back to the treatment system during lower hydraulic loading conditions.

Secondary Biological Treatment

The installation of sequencing batch reactors (SBRs) to replace the secondary lagoon biological treatment process provides the opportunity to produce a reliable, high-quality secondary effluent. The secondary treatment facilities include two SBR tanks and associated blower and pumping facilities. The facility design includes an area reserved for a third SBR that could be added in the future.

As the name implies, the SBR process is operated in a cyclical batch manner, using a single tank for both the biologic treatment process and the sedimentation process. Unlike conventional activated sludge treatment, an SBR is operated using time as a process and hydraulic control variable, rather than tank volume. A typical operating cycle consists of five steps:

1. Fill
2. React
3. Settle
4. Decant
5. Idle

An SBR cycle begins with the introduction of wastewater into a partially filled tank containing settled mixed liquor suspended solids (MLSS) from the previous batch. During the fill step, influent wastewater is fed into the bottom of the SBR basin and allowed to contact the settled MLSS blanket. This initial fill step occurs under anoxic conditions, promoting biological nutrient removal. After the fill is completed, the SBR tank is operated in the react mode where oxygen and mixing occurs within the basin. After achieving the set reaction time, typically four to six hours, the air and mixing pumps are turned off and the process enters the settle mode. With no moving parts (i.e. sludge rakes or draft tubes) the settle cycle occurs in the tank under ideal quiescent conditions, resulting in highly efficient clarification. After the mixed liquor has settled, a floating decanter in the tank drafts the highly clarified, highly treated supernatant. By the end of the decant mode, approximately one third of the tank volume is discharged.

Depending on the influent flow to the facility, during the idle step, the SBR unit is either operated with mixing only, or is allowed to completely idle until the next batch of wastewater enters the facility.

The SBR is a time-based process. Depending on operational goals, the fill phase and the react phase, or the decant phase and the fill phase of the process can be performed simultaneously. In addition, mixing and aeration can be cycled during the react phase to allow additional biological nutrient removal by promoting anoxic modes for nitrogen and phosphorous removal. In general, the SBR process is considered one of the most advanced forms of activated sludge treatment with perhaps the least complex method for controlling the process.

During peak flow events, the SBR cycle is operated to produce a continuous effluent stream by varying the timing of each cycle in each tank. One tank operates in the fill and react mode, while the other tank is in the settle and decant mode. Automated control valves are used to adjust the cycle time based on the effluent quality desired by the process. For example, an SBR can be operated in the summer to minimize energy consumption during irrigation season or to provide biological nutrient removal for nitrogen and phosphorous during the discharge period.

The system proposed for Ferndale WWTF would be of concrete construction using a two-tank common wall configuration. Each SBR basin will be 86 feet long, 44 feet wide and 18 feet deep. The volume of each tank is 510,000 gallons, providing a total treatment system volume of 1.02 MG. Based on tank sizing, the hydraulic retention time at the 1.5 MG design flow is 16.32 hours. The decant volume per cycle will be 0.15 MG per reactor. Table A-1 summarizes the SBR cycle times when it is operating in a true batch mode at the 1.5 MGD design flow.

Table A-1: SBR Cycle Times

Number of Batches per day per basin	5 per SBR Basin
Complete treatment cycle time per batch per tank	4.8 hours per basin
Fill time at Design flow	2.4 hours
Anoxic Fill	0.95 hours
Aerated Fill	1.45 hours
Reaction Time	0.85 hours
Settle Time	0.80 hours
Decant Time	0.55 hours
Idle Time	0.2 hours

Solids Handling

Biosolids created in the SBR process will be wasted to an aerobic digester for stabilization and then pumped to a facultative sludge lagoon for long-term storage. If time and temperature requirements are satisfactory, sludges treated in the aerobic digester could be taken directly to a land-application site. A brief solids balance and an estimate of the volume of solids that are produced on a daily basis follows:

According to an analysis of the average of the influent BOD_5 test results between 1997 and April 2004, the average BOD loading on the plant is 312 lbs/day (0.21 ppcd) and the total suspended solids in the influent averages 381 lbs/day (0.26 ppcd).[1] Based on the average biosolids yield for an SBR, the mass of volatile biosolids created is approximately 158 lbs/day. The total solids that must be wasted includes the inert fraction of TSS, which is estimated to be 40% of the total influent solids since primary treatment is not provided in the process train, or 144 lbs. per day. Based on these estimates, a total of 300 lbs of solids must be wasted from the system to the digester on a daily basis. Assuming an average sludge blanket concentration of 10,000 ppm (1 percent solids) during the SBR settle mode, the average volume of wasted sludge will be approximately 3,600 gallons per day.

During the digestion process, the volatile fraction of the solids will be reduced by an additional 30% to 40%. Each day, biosolids in the digester settles and the supernatant decants to increase solids concentrations. Assuming an average concentration of 1.3 percent solids with 300 pounds per day loading, the digester will need a volume of approximately 110,000 gallons. Using the same depth as the SBR units of 18 feet, the area required for the digester will be 822 square feet or approximately 19 feet wide by 44 feet long.

Based on 40 percent volatile solids reduction, the estimated loading on the facultative sludge lagoons will be approximately 200 lbs/day. Assuming an average influent concentration of 1.3 percent solids, approximately 1,800 gallons of settled solids and wastewater will be sent to the FSL basin each day. The FSL will provide additional stabilization of the solids and further reduction of the total volume of solids, resulting in an effluent with an average of 5 percent solids.

The facultative sludge lagoon (FSL) will be constructed within the westerly portion of the existing stabilization pond, as shown in Figure 1. Assuming that the lagoon has an average liquid depth surface area of approximately 1.5 acres, and can accumulate up to 7 feet of solids with a 5-foot water cap, the FSL will provide an estimated 20 years of storage. Stored solids will be covered with a clear water cap to prevent odors from escaping the FSL surface. Overflow from the FSL will drain by gravity to the influent sewer or the surge return pump station.

The City will need to develop a long-term biosolids management plan. This plan will include taking an inventory of the sludge in the lagoon every five years, and a plan for ultimate disposal

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[1] BOD loading is within the expected ranges of 0.13-0.25 ppcd and per capita suspended solids loading is somewhat higher than the expected ranges due to higher than average wet-weather loadings

of the solids. Sludge removal should be performed once every twenty years and there are a variety of options open to the City for final disposal. The solids will have been sufficiently stabilized to comply with requirements for EPA regulations for beneficial use and land application under 40 CFR (Code of Federal Registry part 503). Pursuant to the 503 Regulations, a sludge-sampling program will need to be carried out prior to land application to demonstrate compliance with those requirements. The solids can be dredged and land-applied as a liquid, or if suitable sites are not available in the local vicinity, the solids can be dewatered to reduce the volume for hauling to more distant application sites. A single contractor can carry out dredging and disposal operations.

Flow Equalization

An effluent equalization basin will be located immediately downstream from the SBR units, and would share a common wall with the treatment tanks. The basin will equalize the flow rate from the SBR basins to the disinfection process. An automatic valve controls the discharge rate of the equalization basin. The equalization basin will be sized based on the decant rate of 4500 gpm from one SBR cycle. The required equalization volume is 0.075 MG, based on a peak discharge flow rate of 4.0 MGD. Additional volume will be provided in the tank to serve as contact time for the disinfection system as discussed below.

Disinfection

Construction of the SBR reactors will require that the existing chlorine system be modified, creating an opportunity to upgrade the disinfection process and eliminate the safety and monitoring issues related to hazardous gaseous chlorine and sulfur dioxide. Three alternatives for disinfection were considered in the CAR: bulk hypochlorite, onsite generation of dilute hypochlorite, and ultra-violet disinfection. Of these three alternatives, onsite generation of dilute hypochlorite is preferred because of cost, overall safety and ease of operation.

Onsite Generation

Onsite generation is less expensive to construct than UV disinfection, and has the advantage that the dilute solution can be pumped to a location near the discharge point for re-chlorination of any treated wastewater that may have been temporarily stored in the finished water storage basin.

The onsite hypochlorite generation system will be designed to treat a maximum flow of 4 MGD. Preliminary design of the system assuming a dosage of 3 mg/l at maximum flow requires a generator with a capacity of 100 pounds per day. The generator, a 3,000-gallon day tank, and several chemical-metering pumps will be located in a chlorine building adjacent to the main treatment unit.

Chlorine will be injected into the equalization basin at the point of discharge from the batch reactor tanks. The 150,000 equalization tank volume will provide storage for the difference

between the decant rate of 4,500 gpm and a 2,800 gpm flow rate out of the basin. The basin will provide mixing and 30 minutes of contact time at peak flows.

Because the secondary process is a batch process, the disinfection process will also need to operate in a batch mode. The chemical metering pumps will be programmed to deliver chlorine only during the decant cycle. The system will be designed to treat 2,800 gpm, but at low flows, the discharge from the equalization tank will be significantly less frequent. A 16-inch gravity line will convey flows from the equalization basin to the discharge side of the existing chlorine contact basin or to temporary treated water storage. This pipe will also provide additional volume for contact time.

A secondary chlorine supply line to the discharge location will be installed to allow re-chlorination of temporarily stored treated water prior to the discharge to Francis Creek. Rather than size the on-site system to generate additional chlorine for peak discharge rates from both the SBR and the temporary storage pond, an additional 6,000 gallons of storage of dilute hypochlorite will be provided, equivalent to 300 pounds of chlorine.

Dechlorination will be provided at the end of the existing chlorine contact basin. It is recommended that the existing sulfur-dioxide system be replaced with liquid sodium bisulphate, which is safer to handle than gas and is simple to operate. The bisulfate pumps and tanks will be located in the existing chlorine building. The total size for the dechlorination system is based on an 8.0 MGD discharge; 4.0 MGD from the SBR units and 4.0 MGD from the temporary treated wastewater storage basin.

Finish Effluent Storage

The proposed project could include modifications to the existing lagoon to provide three facilities for the upgraded plant, including temporary finished effluent storage for irrigation and delayed discharge (Figure 1). The space available in the existing aeration pond could be used to temporarily store treated effluent and add operational flexibility during the dry season. This storage will provide a holding area that will also provide operational flexibility during transitions between irrigation and creek discharge. Treated water will not be stored under conditions that will significantly degrade the effluent.

Process Control

A new laboratory and office space will be included on the top floor of the long multi-level building running along the east end of the SBRs. The space will be divided into an electrical control room, laboratory and office, and bathroom facilities. The room containing the new laboratory and office will be approximately 600 square feet. Laboratory equipment will be provided to enable the operator to perform necessary analyses for permit compliance and process monitoring.

Discharge Location

The current recommendation for the discharge location is the existing discharge point, located at the treatment facilities north of Port Kenyon Road (Figure 1). A new outfall pipe will be constructed to Francis Creek.

Sediment Basin

Sediment deposits upstream of the WWTF have blocked the flow of Francis Creek, resulting in localized flooding, diversion of the channel, and seasonal ponding of stormwater on a large area of pasture to the north of the treatment facility. While most of the sediment accumulates in this first relatively flat stretch of Francis Creek, some sediment does migrate downstream, where it settles out, reducing the flow capacity of the Salt River channel.

The risk of flooding the WWTF site is also a concern. In the September 24, 2003, letter to the City of Ferndale from Spencer Engineering, the accumulation of sediment in Francis Creek and Salt River were cited as factors that may result in stormwater over-topping the berm separating Francis Creek from the aeration ponds. Yearly in-creek sediment removal in the channelized reach of Francis Creek may help to minimize the potential for WWTF site flooding during heavy storm events.

In order to minimize seasonal flooding of the adjacent upstream pasture and protect the WWTF facilities, regular sediment removal is planned for the channelized creek reach that borders the existing facility site immediately upstream of the discharge point. The existing channelized stream will be maintained to allow Francis Creek to convey stormwater past the pasture and immediately to the discharge location during high flow conditions. Annual maintenance will include removal of the previous year's sediment deposits and placement of that material on an approved site. In-creek maintenance will help to solve an on-going flooding problem for local landowners, as well as facilitate the continuous flow of Francis Creek past the discharge location and on to the Salt River.

It has been estimated by local landowners that up to seven feet of sediment have been deposited on the adjacent agricultural area over the past few years. The perimeter of the WWTF site that borders Francis Creek is approximately 1,000 feet long. Based on previous experience, the yearly amount of sediment deposited after storm events is estimated to be two feet deep over the length of a five-foot-wide channel. Approximately 370 cubic yards (CY) would be removed annually under these conditions.

Sediment removal has occurred at this location in Francis Creek on several occasions. In January 1997, the City had obtained an emergency permit (CDP-1-97-008-G) to dredge and maintain the berm along the perimeter of the WWTF, with the understanding that a regular permit would be completed in the future. An October 11, 2000, letter from the California Coastal Commission to the City of Ferndale included a description of a site visit made by Coastal Commission staff on September 25, 2000. During this site visit, Commission staff inspected a recently constructed berm along the channelized reach of Francis Creek. This letter to the City

included a request for information on the construction of the berm, and a recommendation to the City to resolve any potential violation of their coastal development permit. In further correspondence with the Coastal Commission, an application for a permit to allow on-going maintenance of the channel and berm was recommended by Coastal Commission staff.

The permitting of maintenance activities in Francis Creek will involve an assessment of the volume of stormwater sediment that would be removed, the method for excavating the sediment, and the location for disposal of the excavated material. Permits for this activity would be sought from the Army Corps of Engineers, California Department of Fish and Game, and the Regional Water Quality Control Board. Letters from these agencies will be part of the application package for the coastal development permit from the Coastal Commission.

Design Criteria

Design Flow

The statistical maximum month flow at the treatment facility during the period from 1996 to 2002 was 1.50 MGD. It is considered appropriate to design for the statistical maximum month flow for preliminary sizing of treatment processes.

Preliminary Treatment Component Design Criteria

Table A-2 summarizes the criteria used for each of the treatment process components and gives some preliminary estimates of required volumes.

Table A-2: Summary of Design Criteria for SBR Process

Design Flow	
Peak Day	4.0 MGD
MMWWF-5	1.5 MGD
Average Day	0.5 MGD
BOD Loading	
Average	312 lbs /day
Peak	600 lbs/ day
Required Effluent Quality	
Effluent BOD	10 mg/l
Effluent TSS	10 mg/l
Effluent Ammonia	1 mg/l
SBR Reactors	
# of Basins	2
LxWxH	86'x44x20'
Total Volume	1.02 MG
Retention Time @ 1.5 MGD	16.3 hrs.
Decant Volume	0.15 MG
Equalization Volume	0.75 MG
Disinfection System	100# / day onsite generator
Contact Time at Peak Day	30 minutes
Rechlorination	100 #/day stored hypochlorite (0.8 %)
Dechlorination	8 MGD
Aerobic Digestion	
# of Basins	1
Detention time	40 days at current loading
Volume	20,000 CF
Surge Basin	
Volume	2 MG
Facultative Sludge Lagoon	
Loading	200 lbs/day
Required area	1 Acre
Temporary Water Storage	Up to 15 MG

Target Discharge Quality

The reliability of the SBR process was ranked high in the analysis of alternatives and can assure water quality which will meet the typical conditions of the NPDES permit requirements. Sequencing batch reactors are a proven technology that has been shown to consistently produce BOD and TSS effluent quality in the 5 mg/L to 10 mg/L range. When designed to nitrify, SBRs will significantly reduce effluent ammonia concentrations. The proposed facility design will guarantee ammonia removal to 1 mg/L. Design of the SBR system will be based on the ability to consistently achieve this effluent quality.

Effluent ammonia concentrations less than 1 mg/L are documented at other SBR facilities. Information provided by US Filter documents an average of 0.4 mg/L NH_3-N (ammonia) in effluent from the City of McPherson SBR facility (Jet Tech, 2004). The guaranteed design criterion for this plant is 3.0 mg/L NH_3-N. Capacity to achieve 98% nitrification efficiency has also been documented at the SBR facility in Park City, Kansas. During a removal rate study, the average ammonia concentration in the effluent was 0.4 mg/L. From January 1998 to December 2002, the average effluent ammonia concentration in the effluent was 0.14 mg/L NH_3-N.

The ammonia concentration of 1 mg/l guaranteed by the SBR process is a consistent goal for protecting the beneficial uses in the creek and prohibiting chronic and acute toxicity for fish and other aquatic species within the stream. Ammonia toxicity is a function of temperature and pH within a water body, and the levels vary depending on if salmonids are present in a stream. For our analysis, salmonids are considered present as a conservative assumption since there is a history of presence. The data from Francis Creek indicates that the average wet weather temperature in the stream is approximately 54.0 ºF (12.2 ºC) and an average pH of 7.6. Based on the chronic and acute ammonia toxicity values from the EPA (EPA, 1999), chronic toxicity with the parameters in Francis Creek is approximately 4.17 mg N/L and an acute toxicity of 14.86 mg N/L. Thus, by guaranteeing 1 mg/l, with the distinct possibly of providing a lower effluent ammonia concentration, the beneficial uses of the stream, including fish species, can be assured.

With the current system, the data shows in-stream temperatures rising 0.7º F as a result of the effluent discharge. This may be due to the fact that the effluent is stored in the aeration basin for extended periods of time, exposing it to the radiation effects of the sun.

The proposed SBR process will significantly shorten detention times within the WWTF compared to the existing lagoon process. The result is that wastewater will have a greatly reduced chance to increase in temperature during those times of the year when ambient temperatures are higher than incoming wastewater temperatures (summertime for example). During those times of the year when ambient temperatures are lower, there will be a reduced opportunity for wastewater to be cooled to the ambient level. However, the relatively large I/I component during colder, wet weather periods and lower ambient air temperatures tends to lower the temperature of the wastewater component and reduce the risk of warmer-than-ambient water temperatures entering the receiving stream.

Discharge Dilution Analysis

Using the available Francis Creek flow rate data and the corresponding influent flow rates to the existing facility, a water balance was performed to approximate future discharge conditions. For the water balance model, the SBRs were assumed to treat influent flows at an average rate of 1.5 MGD (design flow rate), and have the capacity to treat up to 4.0 MGD for a maximum of two days during peaks in wet weather flows. Any influent flow over 4.0 MGD will be routed to a surge basin and treated after influent flows drop. For this model, the influent flow rate data was used to approximate the future effluent flow rate.

During times of low flow in Francis Creek, conceptual discharge rates are constrained by the dilution requirement (ratio of creek flow to effluent.) During high flow conditions in Francis Creek, the discharge capacity of the facility limits the discharge flow rate. When the effluent flow rate was greater than allowed by the conceptual discharge ratio, only part of the treated water was discharged to Francis Creek. Any excess treated wastewater was assumed to be stored on site. In order to discharge the best quality effluent to Francis Creek, storage of treated effluent would need to be short-term.

Storing a high quality effluent in an open pond will pose operational challenges. The water quality of the effluent could decrease due to contamination by air-borne particles. Wildlife can also introduce nutrients and contaminants. The effluent could increase in temperature due to solar gain or the effect of ambient air temperatures. The wrong conditions could result in an algae bloom, increasing ammonia concentrations and decreasing dissolved oxygen. Any contamination during storage will degrade the effluent, and make it unsuitable for discharge. In some cases, additional treatment may be required prior to discharge.

Based on the initial analysis, the 1:1 minimum dilution requirement in the receiving body is the best scenario for the City's WWTF because the highest quality wastewater could be discharged directly to Francis Creek. Based on this dilution ratio, the model storage requirements for the flows occurring during the 2002-03 water year are minimal. All of the wastewater influent flow rates during the 2002-03 water year were below 4 MGD. For the 2003-04 water year model, the required storage is slightly higher. The proposed minimum dilution could be achieved for the 2003-04 flow rates, with the exception of 13 days where effluent flow rates would exceed creek flow rates. When the dilution of 1:1 can not be met under direct discharge conditions, excess treated wastewater will be stored for a short time. The pond would be operated to minimize the degradation of treated wastewater.

Depending on the flow rates in Francis Creek, there may be times when the maximum retention time in the storage pond is reached, or the storage pond is full. For those times, a temporary waiver will be requested to release effluent at a dilution less than 1:1. As a result of the temporary waiver, the effluent quality will be maintained and temporary storage capacity in the pond would be restored.

The temporary waiver to discharge at dilutions less than 1:1 would typically be applied during the transition times in early spring and late fall, or times when the peak wet weather flows in the creek lag behind the peak inflow and infiltration augmented wastewater flows.

This scenario ensures that the highly treated effluent from the SBRs is discharged to Francis Creek, and that the beneficial uses are protected.

Recommended Project Construction Cost Estimate

Construction Contingency

The cost estimates presented are based on preliminary design concepts. An allowance must be made for variations in final quantities, bidding market conditions, and adverse construction conditions. Actual costs may vary based on the need for unanticipated specialized investigations and studies, and other tasks that may be required by permitting agencies, or are necessary to complete the design or facilitate construction. The total project cost estimate includes a contingency of 15% of the estimated construction cost.

Planning and Pre-design

Planning and pre-design costs include preparation of pre-design reports. The pre-design is essentially a 15% design and would provide greater details of each process. An updated cost estimate will be provided with the pre-design report.

Engineering Services and Surveying

The cost of engineering services for major projects typically includes special investigations, surveying, and preparation of contract drawings and specifications. Construction phase services include bidding services, construction management, inspection, construction staking, start-up services, and the preparation of operation and maintenance manuals.

Depending on the size and type of project, engineering costs typically range from 15 to 25 percent of the project costs when all of the above services are provided. The lower percentage applies to large cost projects without complicated mechanical systems. The higher percentage applies to smaller, complicated projects. For planning purposes, design and construction phase engineering services for the recommended project are estimated to be 18% of the construction cost.

Geotechnical Investigations

Geotechnical site investigations will include analysis of foundation requirements for the proposed treatment structures. Information on soil characteristics including a recommendation regarding the use of native material for dike construction, pipe bedding, backfill, and foundation system will be obtained. The proposed report would involve on-site geotechnical borings performed to a depth of 50 to 80 feet or greater.

Environmental Document and Permitting

Environmental documentation and permitting costs are estimated based on the identified need to gain approval from the Regional Water Quality Control Board. Efforts to achieve this goal include the investigation and preparation of a beneficial use analysis and an application for a dilution reduction. A new NPDES permit may be required for the project.

Other permitting efforts include the analysis of potential environmental impacts to comply with Federal and State laws. For this project, we have included $35,000 for this item.

Administrative, Interest, and Legal Costs

An allowance of two percent (2%) of construction costs has been added for legal and administrative services, including internal project planning, budgeting, grant administration, coordination with other agencies, accumulation of interest on term loan financing, legal services, review fees, legal advertisements, and other expenses associated with the project.

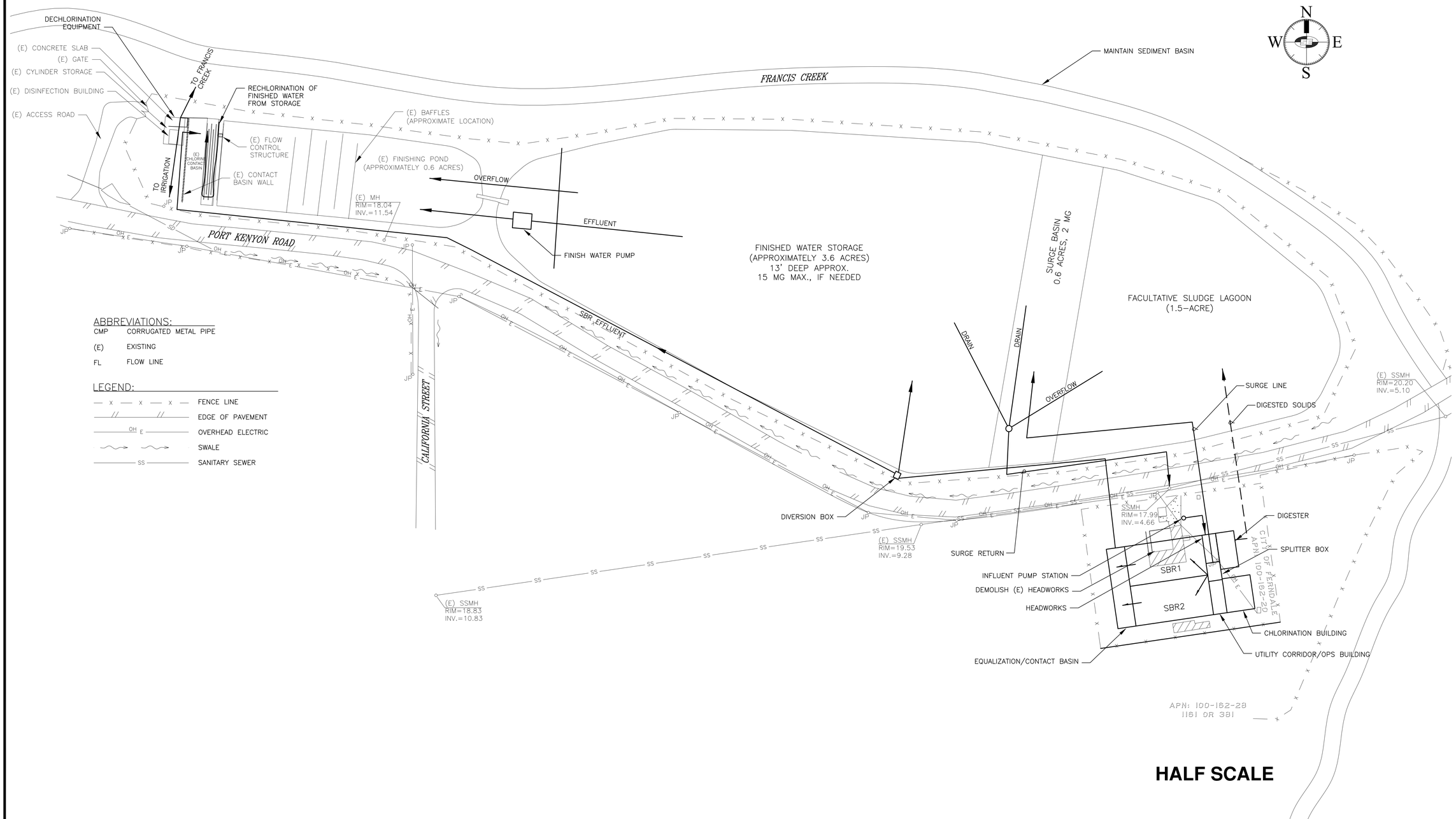
Land/Rights

The recommended project may not require the acquisition of additional land. Easements may be required along County roadways for the proposed collection pipeline extensions to the new facilities.

Following is a summary of the estimated costs:

Table A-3: Construction Cost Estimate for the Recommended Project-Sequencing Batch Reactors

ITEM	TOTAL COST
Mobilization	$400,000
Office Lab Control Building	$120,000
Lab Equipment and Furnishings	$45,000
Influent PS	$305,500
Headworks	$324,500
SBR Reactors, Equalization, Splitter	$2,094,305
Storage Ponds	$424,575
Back-up power, Sludge removal	$135,000
Chlorination System	$386,750
Total Estimated Construction Cost	**$4,235,130**
Construction Contingency	$635,270
Pre-Design	$84,703
Engineering Design	$338,810
Bid Services	$21,176
Construction Management	$84,703
Inspection Services	$148,230
O&M During Construction	$84,703
Geotechnical	$25,000
Environmental Document & Permitting	$35,000
Legal & Administration	$84,703
Kennel Relocation	$10,000
TOTAL ESTIMATED PROJECT COST	$5,787,426



ABBREVIATIONS:

CMP	CORRUGATED METAL PIPE
(E)	EXISTING
FL	FLOW LINE

LEGEND:

— x — x — x —	FENCE LINE
// //	EDGE OF PAVEMENT
OH E	OVERHEAD ELECTRIC
	SWALE
SS	SANITARY SEWER

SPENCER ENGINEERING & CONSTRUCTION MANAGEMENT, INC.
1585 HEARTWOOD DRIVE, SUITE F McKINLEYVILLE, CA 95519
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Designed: N. FIORENTINO
Drawn: J. BAKER
Checked: T. S. KELLY

PREPARED FOR:
CITY OF FERNDALE

VERSION:	DATE:	DESCRIPTION:
1	JULY 15, 2004	ORIGINAL VERSION

VERSION:	DATE:	DESCRIPTION:

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FIGURE 10
RECOMMENDED PROJECT SITE PLAN SBR-TREATMENT PROCESS
CAR ADDENDUM

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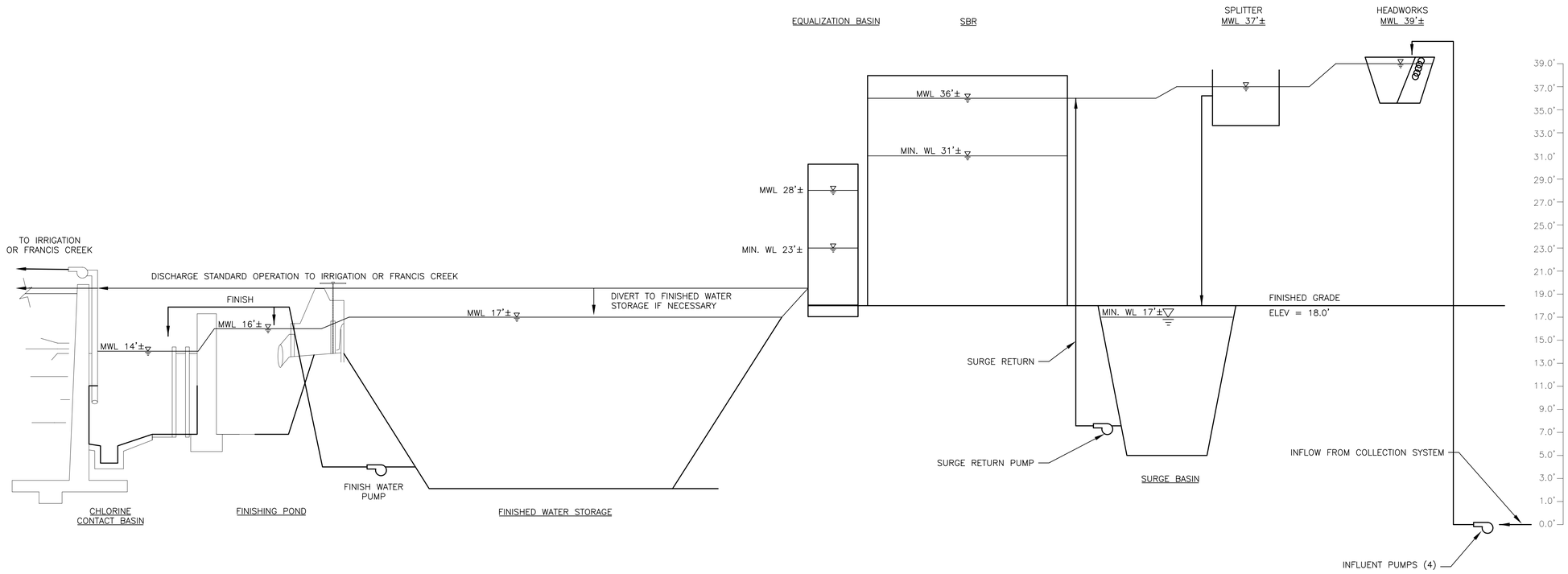

HYDRAULIC GRADE LINE

SCALE: HORIZ. NOT TO SCALE VERT. 1"=5'

HALF SCALE

SPENCER ENGINEERING & CONSTRUCTION MANAGEMENT, INC. 1585 HEARTWOOD DRIVE, SUITE F McKINLEYVILLE, CA 95519 TELEPHONE (707) 839-4336 FAX (707) 839-4012	BAR IS ONE INCH ON ORIGINAL DRAWING 0 — 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	Designed: N. FIORENTINO Drawn: J. BAKER Checked: T. S. KELLY	PREPARED FOR: CITY OF FERNDALE	VERSION: 1	DATE: JULY 15, 2004	DESCRIPTION: ORIGINAL VERSION	VERSION:	DATE:	DESCRIPTION:	scale: AS SHOWN Job No.: 98132.6 File Name: 98132-6_FIGURE-5	FIGURE 2 HYDRAULIC GRADE LINE SBR-TREATMENT PROCESS CAR ADDENDUM	SHEET: