

## **Part 4 Recommendations**

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### **9.0 Recommended Plan**

This section presents the plan to correct deficiencies in the MCSD wastewater collection, treatment, and disposal systems and defines the upgrades required to enable the WWMF to meet secondary permit limits for the 20-year planning period. A site layout showing the recommended plan is included as Figure 9-1.

#### **9.1 Collection System**

The results of the preliminary collection system evaluation were presented in Section 6.0. The following sections describe the recommended collection system pipe network and pump station improvements.

##### **9.1.1 Pipe Network Improvements**

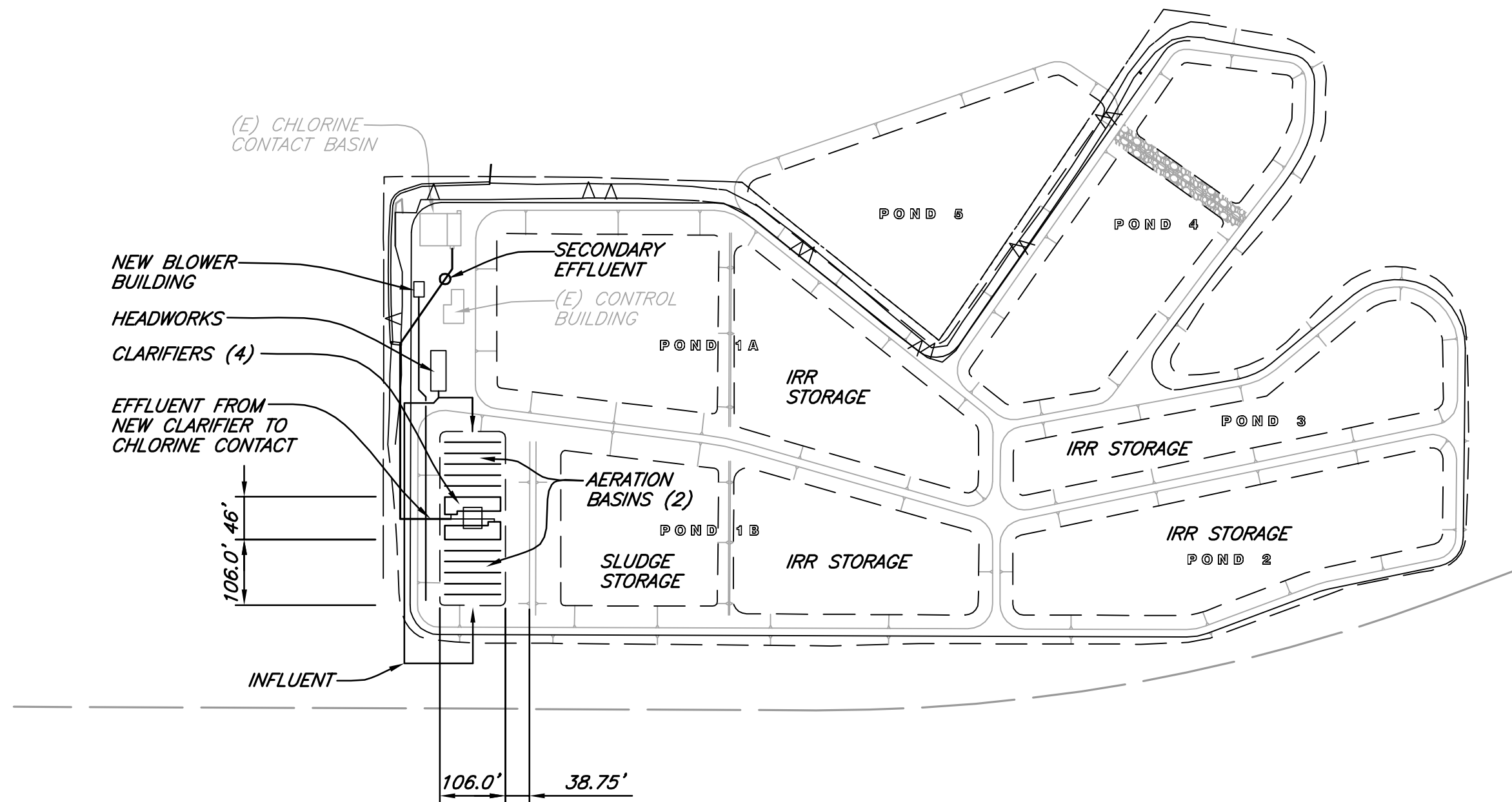
The central trunk line under Highway 101 (Line 5) and the southern trunk line west of Highway 101 (Line 3) have been identified as the critical areas in the collection system that will require upgrades under projected flow conditions. Recommended improvements to the collection system network include lining the existing 10-inch AC pipes that comprise the central trunk line (Line 5) with Cured In Place Pipe (CIPP) and installing a 12-inch pipe parallel to the 10-inch line to increase capacity. For the pipes that comprise the southern trunk line (Line 3), recommendations include lining the existing 15-inch pipe with CIPP and installing a 15-inch pipe parallel to the existing 15-inch line.

Alternatives to the recommended improvements include direct pipe replacement rather than parallel pipe installation for each pipe network. These alternatives will be investigated for costs savings during design. Direct pipe replacement will require re-routing of flows during construction on each pipe segment, which may prove problematic for the larger trunk lines.

##### **9.1.2 Lift Station Improvements**

Recommendations for lift station improvements include mechanical and electrical system upgrades to the Letz, Hiller, and Fisher lift stations. Mechanical system upgrades will include replacing the pumps, motors, and any necessary but minor equipment (i.e., heating and ventilation systems) at the Letz, Hiller, and Fisher lift stations. Electrical system upgrades would include installing new motor control centers, adding variable frequency drives, installing a programmable logic controller (PLC), installing more modern level sensing equipment, and making any changes to the electrical system to comply with current electrical code requirements. At the Hiller Station, a new generator and automatic transfer switch will be added with the lift station upgrade project.

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BASE MAP PROVIDED BY :  
WINZLER & KELLY, DATED JUNE 2005



McKinleyville Community Services District  
Wastewater Management Facility  
McKinleyville, CA

August 2011

In -Basin Extended Aeration System  
Recommended Project  
SHN 008189

008189-POND-REC

Figure 9-1

The improvements will benefit MCSD by increasing the pump station efficiency, lowering electrical demands, increasing the station reliability, increasing worker safety, and reducing wear on the pumps. Upgrades to the pumps will include the capacity to discharge to an elevated headworks, adding approximately 10-feet of elevation to the existing hydraulic profile.

### 9.1.3 Detailed Cost Estimate

Preliminary cost estimates for the recommended pipe network and lift station improvements are presented in Table 9-1.

<b>Table 9-1</b> <b>Engineer's Opinion of Probable Cost for Collection System Improvements</b> <b>MCSD Wastewater Management Facility</b>				
<b>Description</b>	<b>Unit</b>	<b>Unit Cost</b>	<b>Quantity</b>	<b>Total Cost</b>
Mobilization 12%				\$241,800
Install 12-inch PVC parallel to Line 5 (trenchless installation)	LF <sup>1</sup>	\$750	400	\$300,000
Install 12-inch PVC parallel to Line 5 (trenching)	LF	\$200	1,000	\$200,000
Line Existing 10-inch Pipe	LF	\$50	1,400	\$70,000
Install 15-inch PVC parallel to Line 3	LF	\$200	2,900	\$580,000
Line Existing 15-inch Pipe	LF	\$75	3,000	\$225,000
Letz Lane Station Upgrades	LS	\$175,000	1	\$175,000
Hiller Lift Station Upgrades	LS	\$175,000	1	\$175,000
Fisher Lift Station Upgrades	LS	\$290,000	1	\$290,000
Construction Subtotal				\$2,256,800
Contingency 20%				\$451,360
Engineering 25%				\$564,200
Admin 4%				\$90,272
<b>Project Subtotal</b>				<b>\$3,362,632</b>
1. LF: Lineal Foot 2. LS: Lump Sum				

## 9.2 Treatment System

Alternatives for providing secondary treatment and biosolids management were evaluated in Section 7.0. The following sections describe the preferred secondary treatment and biosolids management systems in more detail, and summarize the recommended project.

### 9.2.1 Pre-treatment

Proposed preliminary treatment at the MCSD facility will include pre-screening, and grit removal. The recommended screening option is to install two inclined, 2-MGD spiral screens. The three grit removal options evaluated in Section 7 were comparable in cost. The HeadCell® is recommended as more effective than the aerated channel and easier to maintain than the vortex system.

Preliminary cost estimates for an elevated headworks are presented in Table 9-2. The screenings channel would be located on the second floor with drive through access for collecting screenings and grit from a dumpster on ground level.

<b>Table 9-2</b> <b>Engineer's Opinion of Probable Cost for New Headworks</b> <b>MCSD Wastewater Management Facility</b>				
Description	Unit	Unit Cost	Quantity	Total Cost
Mobilization 12%				\$81,960
Vertical Screens and Compactor	EA <sup>1</sup>	\$65,000	2	\$130,000
HeadCell®	EA	\$90,000	1	\$90,000
Grit Classifier	EA	\$78,000	1	\$78,000
Grit pumps	EA	\$20,000	2	\$40,000
Electrical	LS <sup>2</sup>	\$75,000	ALL	\$75,000
Headworks Construction	LS	\$250,000	ALL	\$250,000
Yard piping	LS	\$20,000	ALL	\$20,000
Construction Subtotal				\$764,960
Contingency 20%				\$152,992
Engineering 25%				\$191,240
Admin 4%				\$30,598
<b>Project Subtotal</b>				<b>\$1,139,790</b>
1. EA: Each 2. LS: Lump Sum				

## 9.2.2 Secondary Treatment System

Secondary treatment alternatives with the capacity to treat projected loadings and produce a high quality effluent complying with requirements for discharge to the Mad River in wet weather, and land reclamation or land disposal during the summer, were evaluated with regard to treatment, cost, implementability, public acceptance, and regulatory issues. Nitrogen removal, in addition to secondary treatment, was considered a priority.

The in-basin extended aeration system provides a high quality effluent that would be reliable in meeting anticipated permit requirements for land application and discharge to Mad River with effluent ammonia concentration less than 1 mg/L, and total nitrogen concentrations of 8 mg/L. Of the alternatives considered the in-basin extended aeration system had the lowest capital and operational costs. Project costs for the in-basin extended aeration system were estimated to be \$7,426,000 as itemized in Table 7-6 and as summarized in Table 9-3.

<b>Table 9-3</b> <b>Engineer's Opinion of Probable Cost for Recommended Secondary Treatment Alternative<sup>1</sup></b> <b>MCSD Wastewater Management Facility</b>	
<b>Description</b>	<b>Total Cost</b>
Mobilization 12%	\$534,004
Earthwork	\$1,194,250
Structural	\$614,000
Equipment	\$2,334,280
Mechanical	\$307,500
Construction Subtotal	\$4,984,034
Contingency 20%	\$996,807
Engineering 25%	\$1,246,008
Admin 4%	\$199,361
<b>Project Subtotal</b>	<b>\$7,426,210</b>
1. The recommended secondary treatment alternative is the in-basin extended aeration system consisting of suspended aerators and integral clarifiers, itemized costs as presented in Table 7-6.	

### 9.2.3 Biosolids Management

Three options for biosolids management were presented in Section 7.7. One option presented included the land application of liquid biosolids at the reclamation sites not used for the poplar forest plantation. Although disposal of both effluent and biosolids on the land reclamation sites may be feasible following plant modifications at current flows, crop uptake rates of nitrogen would probably be exceeded at future loadings without additional area for disposal and/or modification of crop cover. Planting additional acres of trees at the reclamation sites will provide for the potential application of biosolids as part of a diverse biosolids disposal plan. Development of the reclamation reserve area may also provide the additional area necessary for biosolids disposal.

The other options considered were hauling to a regional facility in Fortuna or contracting to have the biosolids dewatered and hauled away approximately every 10 years. Currently, disposal at the regional facility exceeds \$1,000 per dry ton, but if the facility is expanded during the next five years, costs are expected to decrease.

## 9.3 Disposal and Reclamation

MCSD is applying wastewater effluent to the reclamation areas at irrigation rates that exceed the soil moisture deficit of the pastures (SHN, 2011). Without improvements to the disposal system, an increase in effluent flows distributed to the pastures, due to either the necessity to remove percolation ponds from the disposal system or from future urban growth, would further exceed the agronomic water demand of the existing reclamation sites. Improvements to the existing disposal and reclamation system are necessary to achieve compliance with effluent disposal and land reclamation requirements.

### 9.3.1 Storage

Discharge to the Mad River ceases on May 14. During a wet spring, it may be necessary to store effluent when land application rates are limited by precipitation, low rates of evapotranspiration, and high groundwater on the lower portions of the reclamation sites. The existing basins and wetlands that will not be converted for use in the extended aeration process, or used for sludge storage, will have approximately 23 MG of storage capacity. This additional basin and wetland storage area will be available for storage following completion of the secondary treatment system improvements.

### 9.3.2 Disposal

The District is in the process of studying alternatives to the continued use of the existing percolation ponds for effluent disposal. This facilities plan provides the basis for a proposed alternative that will allow for the percolation ponds to be abandoned in place and removed from use. The volume of water discharged annually to the percolation ponds will be discharged instead through increased land reclamation and/or land disposal following upgrades to the secondary treatment system. The estimated cost for percolation pond decommissioning is shown in Table 9-4. As an alternative to the decommissioning of the percolation ponds, the CDFG has expressed an interest in use of the percolation ponds for fish rearing facilities. This alternative use for the percolation ponds should be considered and investigated as part of the pre-design process.

<b>Table 9-4</b> <b>Engineer's Opinion of Probable Cost for Percolation Pond Decommissioning</b> <b>MCSD Wastewater Management Facility</b>				
<b>Description</b>	<b>Unit</b>	<b>Unit Cost</b>	<b>Quantity</b>	<b>Total Cost</b>
Mobilization 12%				\$11,700
Clearing and Grubbing	ac <sup>1</sup>	\$3,500	3	\$10,500
Earthwork	CY <sup>2</sup>	\$8	10,500	\$84,000
Replanting	ac	\$1,000	3	\$3,000
Construction Subtotal				\$109,200
Contingency 20%				\$21,840
Engineering 25%				\$27,300
Admin 4%				\$4,368
<b>Project Subtotal</b>				<b>\$162,708</b>
1. ac: acre 2. CY: cubic yard				

The in-basin extended aeration will reduce total nitrogen levels to less than 8 mg/L; however, effluent flows will gradually increase over time as the population of McKinleyville continues to grow. Because of the reduced nitrogen loading, land application of effluent at rates that exceed agronomic application rates should not negatively impacting soil or groundwater with regard to nitrate, which is generally the contaminant of concern. However, if application rates are higher than agronomic rates for a given land application area, the District will need to apply for a land disposal permit, rather than a land reclamation permit, for those specific areas.

The RWQCB grants land disposal permits if protection of groundwater beneficial uses can be demonstrated. The in-basin extended aeration system will provide the necessary effluent quality to ensure protection of groundwater for land disposal.

### 9.3.3 Reclamation

It is recommended that the reclamation efficiency of the land reclamation sites be increased by substituting poplar trees for the existing perennial grasses. Given the improved quality and low nitrate levels expected in the treated effluent, reclamation of effluent using poplar trees is a viable land reclamation improvement that will allow for increased hydraulic loading on the land reclamation sites. The cost to convert the land reclamation sites to a 45-acre poplar forest was estimated to be approximately \$1,690,000.

## 9.4 Project Cost Summary

### 9.4.1 Project Cost

Table 9-5 presents the engineer's opinion of probable cost for the complete WWMF collection, treatment, and disposal system improvements.

<b>Table 9-5</b> <b>Engineer's Opinion of Probable Cost for Complete WWMF System Improvement</b> <b>MCSD Wastewater Management Facility</b>		
<b>Component</b>	<b>Description</b>	<b>Total Cost</b>
Collection System	Gravity Mains/Lift Stations	\$3,363,000
Pre-treatment	Headworks	\$1,139,800
Secondary Treatment <sup>1</sup>	In-Basin Extended Aeration	\$7,426,300
Land Reclamation	Poplar Forest	\$1,689,700
Effluent Disposal	Percolation Pond Removal	\$162,700
<b>Total Project Cost</b>	<b>---</b>	<b>\$13,781,500</b>
1. Includes long-term Biosolids Storage		

### 9.4.2 Operation and Maintenance

The proposed in-basin extended aeration system is more operationally complex than the current facultative pond system, but operation is very straight forward compared to other activated sludge systems. The fact that this system is operated at very long detention times not only produces a high quality effluent, but also makes it very forgiving in terms of operation.

Operational costs developed in Section 7 are presented in Table 9-6. Implementation of an extended aeration system will approximately double the amount of biosolids produced when compared to the facultative lagoons and add to operations and maintenance significantly. Based on a contract cost of \$1,000 per dry ton produced annual cost for biosolids management would be

approximately \$216,000 per year. However, because the District could significantly reduce costs by land applying a significant portion of the biosolids produced, and/or costs for hauling to a regional facility may decrease, annual costs for biosolids management are estimated to be \$150,000.

<b>Table 9-6</b> <b>Estimated Annual Operating Costs</b> <b>MCSD Wastewater Management Facility</b>	
<b>Description</b>	<b>Cost</b>
Power Costs	\$124,000
Biosolids Management <sup>1</sup>	\$150,000
Chlorine Disinfection/Sulfide	\$9,500
Operation Personnel	\$100,000
Annual Training	\$3,000
<b>Annual Operating Costs</b>	<b>\$386,500</b>
1. Estimated cost for liquid hauling and land application	



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