

Wastewater Facilities Plan Administrative Draft

**MCSD Wastewater Management Facility
NPDES Permit No. CA0024490
Order No. WQ 2011-0008-DWQ**

Prepared for:

McKinleyville Community Services District

***SEN* Consulting Engineers & Geologists, Inc.**

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October 2011
008189.300



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Reference: 008189.300

October 6, 2011

Mr. Norman Shopay, General Manager
McKinleyville Community Services District
P.O. Box 2037
McKinleyville, CA 95519

Subject: MCSD Wastewater Management Facility, Facilities Plan Administrative Draft; NPDES Permit No. CA0024490, Order No. WQ 2011-0008-DWQ

Dear Mr. Shopay:

Please find enclosed the administrative draft of the facilities plan for the McKinleyville Community Services District (MCSD) wastewater management facility. This draft incorporates updates to the revised draft submitted to MCSD for review and comment on August 10, 2011. Edits were made to the August draft based on comments received by MCSD staff and peer review comments from Kennedy/Jenks Consultants. This revised plan is being submitted for presentation to the MCSD Board on October 19, 2011. If you have any questions, please call Mike Veach or me at 707-441-8855.

Sincerely,

SHN Consulting Engineers & Geologists, Inc.

A handwritten signature in blue ink, appearing to read 'Lisa K. Stromme', is written over the printed name.

Lisa K. Stromme, P.E.
Water Resources Engineer

LKS:lms

Enclosure: Wastewater Facilities Plan Administrative Draft
c. w/Encl: Greg Orsini, MCSD

Wastewater Facilities Plan Administrative Draft

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NPDES Permit No. CA0024490
Order No. WQ 2011-0008-DWQ**

Prepared for:

McKinleyville Community Services District
McKinleyville, California

Prepared by:



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October 2011

QA/QC: MCV 

Executive Summary

The McKinleyville Community Services District (MCSD, the District) maintains and operates a Wastewater Management Facility (WWMF) that serves the community of McKinleyville in Humboldt County, California. The WWMF discharges to surface waters, and the District is required to obtain a National Pollutant Discharge Elimination System permit that sets forth specific discharge requirements to ensure protection of public health, environmental health, and water quality. This permit is renewed every five years by the California Regional Water Quality Control Board. At each renewal, the permit may incorporate new treatment objectives and discharge standards that require an upgrade or modification to the facility to meet new regulatory requirements.

Facility Plan Objective

The objective of this facilities plan is to provide a clear, feasible, and appropriate “road map” to capital improvements, upgrades, and maintenance of the District’s wastewater collection, treatment, and disposal facilities for the next 20 years. The plan is designed to be used in the development of a wastewater management system that addresses immediate permit requirements, anticipates future permit and regulatory requirements, and accommodates anticipated growth and community needs.

Current Regulatory Issues

The current area of concern for the existing WWMF is the presence of high ammonia concentrations in treated effluent. High nutrient loading is impacting the ability of the WWMF to comply consistently with current disposal and reclamation system requirements. Although the current permit does not directly limit ammonia in effluent discharges, the District anticipates ammonia regulatory compliance limits will be established in the next permit cycle.

Population Growth Forecasts

McKinleyville is the most populated unincorporated area in Humboldt County and is one of the fastest growing communities in the county. Population growth forecasts for McKinleyville were presented in the McKinleyville Community Plan (Humboldt County, 2002). For purposes of this facilities plan, the average growth rate used to develop 20-year flow projections was based on the alternative growth rate presented in the plan that projects a 1.8% annual increase in population. This projected increase is reflective of the 10-year historic growth rate in the community (MCSD, 2011).

Existing Wastewater Treatment System

The existing WWMF consists of a collection system, wastewater treatment facility, and effluent disposal and land reclamation systems. Community wastewater is collected at five lift stations for pumping to the WWMF. The existing WWMF is a secondary treatment process that consists of three aerated ponds and one stabilization pond followed by a two-stage treatment wetland. The average dry weather design flow of the treatment facility is 1.6 million gallons per day (MGD) and the wet weather design flow is 3.3 MGD.

Existing and Projected WWMF Flows

Based on analysis of the dry weather season data for May 2003 through October 2010, the current average dry weather flow is approximately 0.9 MGD. Based on analysis of the wet weather season data for November 2003 through May 2010, the average wet weather flow is approximately 1.1 MGD. The peak day flow was approximately 2.0 MGD.

Projected 20-year flows for year 2030 were developed based on a 1.8% annual increase in population. The projected average dry weather flow for year 2030 is 1.4 MGD and the projected average wet weather flow is 1.7 MGD. The projected peak day flow for year 2030 is 3.1 MGD.

Existing Disposal and Reclamation System

During the discharge period, October 1 through May 14, treated wastewater effluent is discharged to the Mad River, or, if the flow in the river is less than 200 cubic feet per second, effluent is discharged to the percolation ponds adjacent to the river and/or to land for reclamation (use as irrigation water). During the discharge prohibition period, May 15 through September 30, effluent is discharged to the percolation ponds and/or to land for reclamation. Land discharge occurs at the Lower Fisher Ranch, Upper Fisher Ranch, the Hiller Parcel, and the Pialorsi Ranch.

Under current conditions, wastewater reuse on the existing wastewater reclamation areas does not conform to the current waste discharge requirements for reclamation activities. The Upper Fisher Ranch is not operated for reclamation; wastewater effluent is applied by overland flow irrigation methods in quantities that exceed agronomic rates for hay grass. Opportunities to increase irrigation on the lower pastures may balance these effects; however, based on current nitrogen loading rates, the existing available reclamation area is not sufficient to reclaim wastewater.

In order to accommodate the land application of effluent, modifications to the existing disposal management practices will need to include a reduction in total nitrogen in the plant effluent and an increase of the crop cover's ability to use the available nitrogen being applied through land application.

The District is in the process of preparing a proposal to the Regional Water Quality Control Board that proposes an alternative to the continued use of the existing percolation ponds for effluent disposal during the summer discharge prohibition period. This facilities plan presents proposed upgrades to the existing treatment system that will enable the District to take the existing percolation ponds offline following completion of the upgrades to the secondary treatment and the existing land reclamation system.

Treatment System Upgrades

Secondary treatment alternatives were evaluated with regard to treatment, cost, implementability, public acceptance, and regulatory issues. Nitrogen removal, in addition to secondary treatment, was considered a priority. Secondary treatment alternatives reviewed in detail included a high performance aeration system with a nitrifying filter; an in-basin extended aeration system; an oxidation ditch; an activated sludge system and a membrane treatment system.

The in-basin extended aeration system provides a high quality effluent that would meet anticipated permit requirements for land application and discharge to Mad River. Of the alternatives considered, the in-basin extended aeration system had the lowest capital and operational costs. Costs for the in-basin extended aeration system were estimated to be \$7.4M. Additional costs for a new headworks were estimated to be \$1.1M.

Collection System Upgrades

The central gravity main line (Line 5) that crosses under Highway 101 and the southern gravity main line (Line 3) that extends west from Highway 101 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 installing parallel pipe networks adjacent to each main line in these areas. Additional improvements are recommended at the system lift stations. Total costs for the proposed collection system upgrades were estimated to be \$3.4M.

Disposal and Reclamation System Upgrades

To increase reclamation capabilities at the land reclamation sites, installation of a poplar forest is proposed. The proposed poplar forest disposal plan includes planting approximately 45 acres of the lower Fisher Ranch property with poplars in 4- to 5-acre plots. If poplars replaced the current crop mixture on the lower Fisher Ranch property, total acreage efficiency could be increased by 130%. Disposal costs also include decommissioning the existing percolation ponds. Total costs for the proposed disposal and reclamation system upgrades were estimated to be \$1.9M.

Total Anticipated Project Cost

The opinion of probable cost to complete the recommended WWMF collection, treatment, and disposal system improvements is approximately \$13.8M including planning and design.

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Abbreviations and Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
<	less than
>	greater than
ac. ft.	acre feet
BHP	Brake horsepower
BOD/ acre/day	Biochemical Oxygen Demand per acre per day
CF	cubic feet
cfs	cubic feet per second
cm	centimeter
CY	cubic yards
d	day
EA	each
ft	feet
ft/s	feet per second
g/EDU/d	gallons per Equivalent Dwelling Unit per day
g/kg	grams per kilogram
gpcd	gallons per capita per day
gpd/EDU	gallons per day per Equivalent Dwelling Unit
gpd/SF	gallons per day per square foot
gpm	gallons per minute
gpm/SF	gallons per minute per square foot
hp	horsepower
hp/MG	horsepower per Million Gallons
hp-hr	horsepower-hour
in	inch
in/day	inches per day
kg/ha	kilogram per hectare
kV	kilovolts
kWhr	kilowatt-hours
lbs	pounds
lbs/acre	pounds per acre
LF	Linear Foot
LS	Lump Sum
m	meter
MG	Million Gallons
mg/kg	milligrams per kilogram
mg/L	milligrams per Liter
MGD	Million Gallons per Day
ml/L	milliliters per Liter
mm	millimeter
MPN/100 ml	Most Probable Number per 100 milliliters
NTU	Nephelometric Turbidity Units
ppcd	pounds per capita per day
ppd	pounds per day
ppd/ac	pounds per day per acre

Abbreviations and Acronyms, Continued

ppd/EDU	pounds per day per Equivalent Dwelling Unit
psi	pounds per square inch
SF	square feet
t/yr	tons per year
TKN	Total Kjeldahl Nitrogen
TUc	Toxicity Unit
yr	year
µg/L	micrograms per Liter
µm	micrometer
4,4'-DDT	4,4'-Dichlorodiphenyltrichloroethane
AAF	Average Annual Flow
ACV	Arcata-Eureka Airport
ADWF	Average Dry Weather Flow
alpha-BHC	alpha-1,2,3,4,5,6-hexachlorocyclohexane
ALR	Area Loading Rate
AWHC	Available Water Holding Capacity
AWWF	Average Wet Weather Flow
BHP	Brake Horsepower
BMID-MF	Alternative B with Multi-Family
BNR	Biological Nutrient Removal
BOD	Biochemical Oxygen Demand
CalARP	California Accidental Release Program
Cal-OSHA	California-Occupational Health and Safety Administration
CCC	California Coastal Commission
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CFR	U.S. Code of Federal Regulations
CIMIS	California Irrigation Management Information System
CIP	Capital Improvement Program
CIPP	Cured In-Place Pipe
Cl ₂	Chloride
CMC	Criteria Maximum Concentration
CNDDDB	California Natural Diversity Database
CO ₂	Carbon Dioxide
CO ₃	Carbon Trioxide
CoCC	Chronic or Continuous Concentration
COR	Coefficient of Reliability
CSD	Community Services District
CSLC	California State Lands Commission
CT	Chlorine Concentration over Time
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Fund
DHS	(California) Department of Health Services
DO	Dissolved Oxygen
DPMC	Dual Power Multicellular
DPS	Distinct Population Segment

Abbreviations and Acronyms, Continued

DT	Detention Time
E1UBL	Estuarine Subtidal Unconsolidated Bottom Permanently Flooded
E2US2N	Estuarine Intertidal Unconsolidated Shore San Regularly Flooded
EDU	Equivalent Dwelling Unit
effl	effluent
EPA	U.S. Environmental Protection Agency
EQ	Excellent Quality biosolids, as defined in 40 CFR Part 503
ESU	Evolutionary Significant Unit
ET	Evapotranspiration
FC	Fecal Coliform
FES	Freshwater Environmental Services
FS Re.	Removal in facultative system preceding wetlands
FWS	Free Water Surface
FY	Fiscal Year
HBMWD	Humboldt Bay Municipal Water District
HDD	Horizontal Directional Drilling
HPAS	High Performance Aerated Pond System
HRT	Hydraulic Retention Time
I/I	Infiltration and Inflow
KT	Removal Rate
K _x	Crop Coefficient
LAFCo	Local Agency Formation Commission
MAD	Management Allowable Depletion
MBR	Membrane Bioreactors
MCL	Maximum Concentration Limit
MCSD	McKinleyville Community Services District
MLE	Modified Ludzack-Ettinger (process)
MLRS	Mixed Liquor Recycle (pumps)
MMDWF	Maximum Month Dry Weather Flow
MMWWF	Maximum Month Wet Weather Flow
MRfz	Mad River fault zone
MSL	Mean Sea Level
N:P:K	Nitrogen:Phosphorous:Potassium
N ₂	Nitrogen gas
NA	Not Applicable
NC	Not Calculated
NCUAQMD	North Coast Unified Air Quality Management District
NF	Nitrifying Filter
NFPA	National Fire Protection Association
NFR	Non-filterable Residue
NH ₃	Ammonia
NH ₃ -N	Ammonia-Nitrogen
NH ₄	Ammonium
NH ₄ -N	Ammonium-Nitrogen
NO ₃ -N	Nitrate-Nitrogen
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System

Abbreviations and Acronyms, Continued

NR	No Reference
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
O&M	Operations and Maintenance
O ₂	Oxygen
OLA	Oscar Larson & Associates
Org-N	Organic Nitrogen
PAN	Plant-Available Nitrogen
PC	Pollutant Concentration biosolids, as defined in 40 CFR Part 503
PDAF	Peak Day Average Flow
PEMIC	Palustrine Emergent Persistent Seasonally Flooded
PFO1C	Palustrine Forested Broad Leaved Deciduous Seasonally Flooded
PFRP	Processes to Further Reduce Pathogens
PG&E	Pacific Gas and Electric Company
PIF	Peak Instantaneous Flow
PLC	Programmable Logic Controller
PM-10	Particulate Matter of less than 10 micrometers in diameter
POTW	Publicly Owned Treatment Works
PSRP	Processes to Significantly Reduce Pathogens
PSS1C	Palustrine Scrub-Shrub Broad Leaved Deciduous Seasonally Flooded
PUBHx	Palustrine Unconsolidated Bottom Permanently Flooded
R3UBH	Riverine Upper Perennial Unconsolidated Bottom Permanently Flooded
RAS	Return Activated Sludge
RDII	Rainfall Derived Infiltration and Inflow
Re	Percent Removal
RGF	Recirculating Gravel Filter
RMZ	Regulatory Mixing Zone
RWQCB	California Regional Water Quality Control Board
SAV	Submerged Aquatic Vegetation
SHN	SHN Consulting Engineers & Geologists, Inc.
SO ₂	Sulfide
SRT	Solids Retention Time
SSO	Sanitary Sewer Overflows
SWRCB	State Water Resources Control Board
TBD	To Be Determined
TCDD	Tetrachlorobenzene-p-dioxin
TDZ	Toxic Dilution Zone
TMDL	Total Maximum Daily Loads
TN	Total Nitrogen
TRE	Toxicity Reduction Evaluation
TSS	Total Suspended Solids
UH	Unit Hydrograph
USA	Urban Study Area
USC	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service

Abbreviations and Acronyms, Continued

USGS	United States Geological Survey
UV	Ultraviolet
VSS	Volatile Suspended Solids
W&K	Winzler & Kelly Consulting Engineers
WAS	Waste Activated Sludge
WDR	Waste Discharge Requirement
WEF	Water Environment Federation
WER	Water Effects Ratio
WRCC	Western Regional Climate Center
WSA	Water Study Area
WWMF	Wastewater Management Facility