TECHNICAL MEMORANDUM NO. 11

City of Sandpoint Wastewater Facility Plan

Long-Term Treatment Plant Actions and Capital Improvement Plan

March 2007

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1 Introduction

As discussed previously, the existing WWTP site is expected to be inadequate to contain the components required for the build-out treatment plant. Therefore, long-term wastewater treatment will likely be provided by a new facility located elsewhere, on a larger parcel of land[1]. The required facilities are discussed in Technical Memorandum No. 9.

Constructing a new facility will require several years and may be affected by the following:

- Sites suitable for the new treatment facility
- Potential Regionalization and the entities that choose to be involved
- Pumping and piping requirements to convey sewage to the new facility
- Interim phasing to transition between existing and new facilities
- Discharge permit
- Funding acquisition
- Rate and density of population growth

2 Potential Sites

Wastewater treatment facilities similar in size to those required by Sandpoint's build-out population are situated on parcels ranging from 10 to 20 acres. The plants sited on smaller parcels have higher odor and noise mitigation expenses and generally have more "good neighbor" concerns. The plants sited on larger parcels have larger buffer areas between the process facilities and neighbors and therefore can be made to look more "park-like" rather than industrial. Additionally, the green space surrounding the treatment plant provides opportunities for public education and can be irrigated with re-use water to serve as a demonstration site for water re-use.

The City should seek a parcel of land between 20 to 30 acres and budget accordingly in the CIP. The logistics of determining a specific site for the treatment plant is beyond the scope of this memorandum and will likely involve a study involving City staff and residents. However, due to available land and potential service areas, the area west of the railroad tracks and north of Pine Street was chosen for planning purposes because some of the City's existing collection system could gravity flow to that location.

As the City begins to look for future plant sites, consideration should be made to identify low-lying sites that are easily served by gravity and that have public support. The public involvement process should continue throughout the siting and construction process. Site acquisition planning should begin in the next 2 years.

3 Pumping and Piping Requirements

A new main pump station is required at the existing treatment plant to intercept the raw wastewater from the existing collection system and pump it to the new facility. A portion of the existing Lincoln Street sewer can be diverted near Pine Street to flow by gravity to the new plant. Future collection system development will be required to gravity drain to the new plant, if possible. Following treatment, the effluent would be routed back to the existing outfall. Therefore, an effluent line would be required from the new facility to the existing outfall. The effluent line would most likely parallel the new force main.

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[1] New technology may offer alternatives that are not available today.

4 Construction Phasing

The build-out plant will serve the build-out population of approximately 37,200 residences and have a design flow of about 7.5 million gallons per day (mgd). To reduce the initial cost of construction, the build-out plant will be constructed in phases. To further reduce the cost of the initial construction, the existing treatment plant will continue to provide service until sufficient capacity is built at the new plant. The first phase will be more costly than following phases because flow routing facilities (pumping plants and force mains) have to be constructed to convey water to and from the new plant.

The design criteria for each phase are presented in Table 11-1 through Table 11-3.

TABLE 11-1
Design Criteria for 2015 Conditions
March 2007

Design Criteria	Units	2015	2015 50% I/I Reduction
Base Flow	mgd	1.4	1.4
Avg. Dry Weather Flow	mgd	2.8	2.2
Avg. Monthly Flow	mgd	3.6	2.6
Maximum Month Flow	mgd	6.1	3.9
Maximum Day Flow	mgd	15.0	8.4
Average Annual BOD	#/day	5,050	5,050
Maximum Month BOD	#/day	6,870	6,870
Maximum Day BOD	#/day	16,680	16,680
Average Annual TSS	#/day	3,900	3,900
Maximum Month TSS	#/day	5,920	5,920
Maximum Day TSS	#/day	18,710	18,710
Average Annual TKN	#/day	329	329
Maximum Month TKN	#/day	447	447
Maximum Day TKN	#/day	1,085	1,085
Average Annual TP	#/day	97	97
Maximum Month TP	#/day	131	131
Maximum Day TP	#/day	318	318

TABLE 11-2
Design Criteria for 2025 Interim Conditions
March 2007

Design Criteria	Units	2025	2025 50% I/I Reduction
Base Flow	mgd	2.07	
Avg. Dry Weather Flow	mgd	3.7	2.9
Avg. Monthly Flow	mgd	4.5	3.3
Maximum Month Flow	mgd	7.2	4.6
Maximum Day Flow	mgd	16.00	9.1
Average Annual BOD	#/day	6,820	6,820
Maximum Month BOD	#/day	9,270	9,270
Maximum Day BOD	#/day	22,490	22,490
Average Annual TSS	#/day	5,770	5,770
Maximum Month TSS	#/day	8,770	8,770
Maximum Day TSS	#/day	27,690	27,690
Average Annual TKN	#/day	467	487
Maximum Month TKN	#/day	661	661
Maximum Day TKN	#/day	1,605	1,605
Average Annual TP	#/day	144	144
Maximum Month TP	#/day	194	194
Maximum Day TP	#/day	472	472

TABLE 11-3
Design Criteria for Build-out Conditions for Sandpoint
November 2003

Design Criteria	Units	Sandpoint	50% I/I Reduction
Base Flow	mgd	4.3	
Avg. Dry Weather Flow	mgd	6.8	
Avg. Monthly Flow	mgd	7.6	5.5
Maximum Month Flow	mgd	10.7	6.2
Maximum Day Flow	mgd	19.6	10.3
Average Annual BOD	#/day	12,000	12,000
Maximum Month BOD	#/day	16,300	16,300
Maximum Day BOD	#/day	39,600	39,600
Average Annual TSS	#/day	11,900	11,900
Maximum Month TSS	#/day	18,100	18,100
Maximum Day TSS	#/day	57,100	57,100
Average Annual TKN	#/day	2,400	2,400
Maximum Month TKN	#/day	3,260	3,260
Maximum Day TKN	#/day	7,920	7,920
Average Annual TP	#/day	480	480
Maximum Month TP	#/day	650	650
Maximum Day TP	#/day	1,580	1,580

To facilitate project phasing, the new plant will initially be constructed with a capacity of 1.25 mgd to serve new growth. Subsequent upgrades will be constructed in 1.25-mgd increments. Each 1.25-mgd increment is able to treat the flow from approximately 6,200 residents to the expected build-out population of 37,200 residents.

Based on these flow and loading criteria, preliminary plant sizing is presented for the 20-year planning period in Tables 11-4 and full build-out in Table 11-5.

TABLE 11-4

Wastewater Treatment Facilities for Sandpoint, Projected **20-year** (2025) Flow and Loading

March 2007

BIOLOGICAL TREATMENT - SEASONAL P REMOVAL, NITRIFICATION-DENITRIFICATION					
HEADWORKS - Peak Year Round Flow					
Fine screens	2	63" x 1/4"	+ Reliability		Rotomat #63
Grit Chamber	1	16'Φ	+ Bypass		Pista Grit #20
BIOLOGICAL TREATMENT - SECONDARY TREATMENT YEAR ROUND, BNR SEASONAL - May - October					
Anaerobic Basins	4	0.85 MG	Total	4 @ 0.22 MG	Seasonal MMF, Φ = 2 hr
Anaerobic Mixers	4	15 HP Ea	VFD Drive	Downflow Turbine	50 HP/MG
Anoxic Basins	3	1.5 MG	Total	3 @ 0.5 MG	Seasonal MMF, Φ = 1.1 hr
Anoxic Mixers	3	25 HP Ea	VFD Drive	Downflow Turbine	50 HP/MG
Anoxic Recycle		24 mgd	Total	Pumps	Seasonal Recycle ~ 7:1 for NO3-N = 8 mg/l
Aeration Basins	3	2.64 MG	Total	3 @ 0.8 mgd	MM SRT = 11 days, MLSS = 4,000 mg/l
Aeration Horsepower		900	+ Reliability	Fine Bubble Aeration OR	Slow Speed Surface Turbines
SECONDARY CLARIFIERS	**3**	**80' Φ**	**16' swd**	**1 Redundant for Reliability**	**Circular, Suction Sludge Removal**
RAS Pumping		5,000 gpm	+ Reliability		Max @ MMF, 8,000 mg/l
WAS Pumping		320 gpm	+ Reliability		Max 6 hr/day wasting
DISINFECTION					
UV Disinfection	2	55'x3' channels	+ Reliability	8 Modules of 40 lamps	Low pressure, high intensity dose = 50,000 NW•S/cm^2
EXCESS FLOW TREATMENT - Flow in Excess of Annual MMF or Seasonal MDF					
Rapid Mix Basins	2	18,000 Gal Ea	2,000 CF		HRT = 2 Min
Flocculation Basin	1	92,000 Gal	12,000 CF		HRT = 10 Min
Clarifier	1	42' Φ	16' swd	920 SF Settling Tubes	OR = 10 gpm/SF for Settling Tube Area
SLUDGE THICKENING - Secondary Sludge (No Primary Clarifiers) - For Sludge Digestion					
Gravity Belt Thickeners (GBT)	1	2 meter			30 - 40 Hr/Wk Operation
SLUDGE DIGESTION					
Aerobic Digesters	3	1.9 MG Ea	125'Φ x 20'd	Coarse Bubble Diffusers	30 day SRT/HRT @ 4% DS, Max Mo Sludge
LIQUID SLUDGE STORAGE - Short Term					
Sludge Storage Tanks	3	0.9 MG Ea	90'Φ x 20'd	Coarse Bubble Diffusers	7 day HRT
SLUDGE DEWATERING - Digested Sludge or Stored Sludge w/o Digestion					
Belt Filter Presses	2	2 meter			30 - 40 Hr/Wk Operation
DEWATERED SLUDGE STORAGE & LAND APPLICATION					
Covered Storage Area		3,300 CY	17,500 SF	6 Months Storage - 5' deep	Paved, Covered, Contained
Land Application Area		440 Acres		200 #N/Acre-Year	Managed, Tested Annually

TABLE 11-5
Wastewater Treatment Facilities for Sandpoint **Build-out** Flow and Loading
March 2007

BUILD-OUT TREATMENT FACILITIES - BIOLOGICAL TREATMENT - SEASONAL P REMOVAL, NITRIFICATION-DENITRIFICATION					
HEADWORKS - Peak Year Round Flow					
Fine screens	2	63" x 1/4"	+ Reliability		Rotomat #63
Grit Chamber	1	16'Φ	+ Bypass		Pista Grit #20
BIOLOGICAL TREATMENT - SECONDARY TREATMENT YEAR ROUND, BNR SEASONAL - May - October					
Anaerobic Basins	4	1.44 MG	Total	4 @ 0.36 MG	Seasonal MMF, Φ = 2 hr
Anaerobic Mixers	8	10 HP Ea	VFD Drive	Downflow Turbine	50 HP/MG
Anoxic Basins	4	3.0 MG	Total	4 @ 0.75 MG	Seasonal MMF, Φ = 1.1 hr
Anoxic Mixers	4	40 HP Ea	VFD Drive	Downflow Turbine	50 HP/MG
Anoxic Recycle		48 mgd	Total	Pumps	Seasonal Recycle ~ 7:1 for NO3-N = 8 mg/l
Aeration Basins	4	5.6 MG	Total	4 @ 1.4 mgd	MM SRT = 11 days, MLSS = 4,000 mg/l
Aeration Horsepower		1,600 HP	+ Reliability	Fine Bubble Aeration OR	Slow Speed Surface Turbines
SECONDARY CLARIFIERS	**4**	**80' Φ**	**16' swd**	**1 Redundant for Reliability**	**Circular, Suction Sludge Removal**
RAS Pumping		7,500 gpm	+ Reliability		Max @ MMF, 8,000 mg/l
WAS Pumping		400 gpm	+ Reliability		Max 12 hr/day wasting
EXCESS FLOW TREATMENT - Flow in Excess of Annual MMF or Seasonal MDF					
Rapid Mix Basins	2	15,000 Gal Ea	2,000 CF		HRT = 2 Min
Flocculation Basin	1	75,000 Gal	10,000 CF		HRT = 10 Min
Clarifier	1	36' Φ	16' swd	680 SF Settling Tubes	OR = 10 gpm/SF for Settling Tube Area
SLUDGE THICKENING - Secondary Sludge (No Primary Clarifiers) - For Sludge Digestion					
Gravity Belt Thickeners (GBT)	2	2 meter			30 - 40 Hr/Wk Operation
SLUDGE DIGESTION					
Aerobic Digesters	4	3 MG Ea	160'Φ x 20'd	Coarse Bubble Diffusers	30 day SRT/HRT @ 4% DS, Max Mo Sludge
LIQUID SLUDGE STORAGE - Short Term					
Sludge Storage Tanks	4	1.3 MG Ea	100'Φ x 20'd	Coarse Bubble Diffusers	7 day HRT
SLUDGE DEWATERING - Digested Sludge or Stored Sludge w/o Digestion					
Belt Filter Presses	4	2 meter			30 - 40 Hr/Wk Operation
DEWATERED SLUDGE STORAGE & LAND APPLICATION					
Covered Storage Area		6,700 CY	40,000 SF	6 Months Storage - 5' deep	Paved, Covered, Contained
Land Application Area		900 Acres		200 #N/Acre-Year	Managed, Tested Annually
DISINFECTION					
UV Disinfection	3	55'x3' channels		12 Modules of 40 lamps	Low pressure, high intensity dose = 50,000 NW•S/cm^2 60% transmissivity

The interim upgrades for the existing treatment plant will be designed to provide ten years of additional life with a gradual transition to the new facility. A preliminary construction sequence is shown in Table 11-6.

TABLE 11-6
Construction Phasing
March 2007

Phase	ER	Maximum Month Capacity Required mgd [1]	Peak Day Capacity Required [2] mgd	Estimated Year Complete	Existing Plant Capacity mgd	New Plant Capacity mgd	New Plant Peak Capacity mgd [3]	Peak Day Flow Handling mgd [4]
1	10,000	3.6	11.8	2015	2.4	1.25	2.50	9.3
2	11,500	4.0	12.3	2020	2.4	2.5	5.0	4.8
3	13,530	4.5	12.9	2025	---	5.0	10.0	2.9
4	18,650	5.7	12.9	2037	---	6.25	12.5	0.4
5	23,775	6.9	13.1	2043	---	7.5	15.0	---

1. Base domestic flow plus base I/I contribution.
2. Assuming I/I reduction goals are eventually met and per capita is approximately 202± gallons per day.
3. Assuming the new plant can handle a peak day flow of twice the design flow.
4. Peak flow handling required is difference between peak flow and combined capacity of new plant and existing plant (2.5 mgd) - existing plant or facilities at new plant site.

Actual construction phasing will be based on treatment plant flow and equivalent connections. As a result, the assumptions used to project population, per capita contributions, and I/I reduction will have to be reevaluated periodically to maintain an accurate capital improvement program.

The projected project phasing is presented in the following table.

TABLE 11-7
20-Year Capital Improvement Plan
March 2007

	2014	2016	2020	2025
New plant (1.25 mgd capacity)	$15.0 million			
Full nitrification/P removal (1.25 mgd)		$5.0 million		
Plant upgrade to 2.5 mgd			$20.0 million	
Plant upgrade to 5.0 mgd				$21.6 million
Outfall + peak flow handling	$6.3 million			
TOTALS	**$21.3 million**	**$5.0 million**	**$20.0 million**	**$21.6 million**

This table includes peak flow handling (primary clarification) at the new facility assuming I/I cannot be reduced. If peak flows continue to be treated at the existing plant site, the overall costs can be significantly reduced.

5 Infiltration and Inflow Reduction

Treatment plant capital costs are directly related to treatment capacity. To minimize capital costs, extraneous flow should be eliminated to the extent possible. As discussed in Technical Memorandum No. 6, the existing system receives extensive extraneous flow in the form of I/I. Sandpoint has an aggressive program to remove 50 percent of the existing I/I from the influent and to maintain very low rates of I/I from new development. If the I/I reduction goal is not met, the phasing schedule may have to be shortened, the capacity of the build-out plant increased, and/or additional peak flow handling facilities included in the overall design of the new facilities.

6 Discharge Permit

New discharge requirements are expected to be phased in over the next 20 years. Ongoing conversations with the regulatory agencies should be maintained throughout the process. The ultimate project phasing includes future tertiary treatment units.

7 Funding

It is assumed that funding the new treatment facility will require substantial grant support. However, if the project is funded strictly by user rates, the following will be required.

TABLE 11-8
Projected User Rates (in future dollars)
March 2007

Period	ERU	Pre-Payment Cost [1]	Monthly User Cost [2]
2014-2015	10,030	$2,200	$17 [3]
2016-2019	10,850	$500	$5
2020-2024	11,500	$1,750	$20
2025-2030	13,530	$1,600	$28

1. Based on 2006 costs.
2. Costs based on 2006 costs escalated by 5% per year to time of construction.
3. Costs do not include peak flow handling. Add $975 pre-payment and $5/month.

To ensure that growth pays its fair share of the required capacity improvements, the City should re-visit its current new user facility fees (NUFFs) within the next two years. The City also will need to begin planning to borrow money to build the proposed new treatment plant. All funding should be in place by 2011 to allow completion of construction by 2014.