CITY OF SANDPOINT
Wastewater Facility Plan

Executive Summary
and
Technical Memorandums

March 2007

Prepared by

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City of Sandpoint
Wastewater Facility Plan

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EXECUTIVE SUMMARY

TECHNICAL MEMORANDUMS

1 Service Area Conditions and Population Trends

2 Collection System Infiltration and Inflow Evaluation

3 Collection System Model Development and Evaluation

4 Future Wastewater Collection Facilities and Improvements

5 Collection System Capital Improvement Program

6 Wastewater Treatment Plant Flow and Load Projections

7 Existing Wastewater Treatment Plant Capacity Analysis

8 Facility Planning Effluent Limits

9 Alternative Wastewater Treatment Analysis

10 Interim Treatment Plant Actions and Capital Improvement Plan

11 Long-term Treatment Plant Actions and Capital Improvement Plan

12 Regional Considerations

Acronyms

ACI	area of city impact
ATS	automatic transfer switch
BOD	biochemical oxygen demand
BOD_5	5-day biochemical oxygen demand
BPR	biological phosphorus removal
CBOD	carbonaceous biochemical oxygen demand
CCTV	closed-circuit television
cfs	cubic feet per second
CIPP	cured in-place pipe
d/D	depth of flow/diameter (of pipe ratio)
DEM	digital elevation model
EMDP	emergency distribution panel
ERU	cost per equivalent connection
FIRM	Flood Insurance Rate Maps
FEMA	Federal Emergency Management Agency
F:M	food to microorganism (rate)
gpcd	gallons per capita per day
gpd	gallons per day
gpd/acre	gallons per day per acre
GPS	global positioning system
HRT	hydraulic retention time
I/I	infiltration and inflow
IDEQ (or DEQ)	Idaho Department of Environmental Quality
ISPWC	Idaho Standards for Public Works Construction
JWC	JWC Environmental Channel Monster (primary grinding unit at the WWTP)
KPSD	Kootenai-Ponderay Sewer District
MBR	membrane biological reactor
MCRT	mean cell residence time
MDP	main (normal) distribution panel
mgd	million gallons per day
MLSS	mixed liquor suspended solids
MLVSS	mixed liquor volatile suspended solids

NPDES	National Pollutant Discharge Elimination System
NUFFs	new user facility fees
O_3	ozone
O&M	operations and maintenance
OR	overflow rate
ppd	pounds per day
PPDU	people per dwelling unit
RAS	return activated sludge
SCADA	supervisory control and data acquisition
SLR	solids loading rate
SRT	solids retention time
SWSD	Southside Water and Sewer District
TKN	total Kjedahl nitrogen
TMDL	total maximum daily load
TSS	total suspended solids
UV	ultraviolet
VFDs	variable frequency drives
WAS	waste activated sludge
WWTP	wastewater treatment plant

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1 Purpose

The City of Sandpoint (City) authorized preparation of this planning document as a proactive approach to managing its wastewater facilities. Wastewater facilities' planning was driven by excessive infiltration and inflow (I/I) in the collection system and by rapid population and commercial growth. This growth is expected to significantly expand the existing service boundary. To accommodate such growth, this study was undertaken to:

1. Evaluate I/I in the existing collection system, including identification of probable magnitudes, potential for removal, and recommendations for additional I/I identification and reduction
2. Determine the capacity of the existing collection system and outline necessary improvements with likely schedules, based on current flows and expected growth
3. Evaluate the current condition and performance of the existing wastewater treatment plant (WWTP) and determine unit process capacities with no major upgrades
4. Review current permit requirements and identify potential changes
5. Identify wastewater treatment alternatives (including upgrades or modifications to the existing WWTP and the potential need to relocate it to meet future discharge requirements at the projected flows and loads), then further screen preferred alternatives to determine short- and long-term recommended actions for the City
6. Evaluate the potential to provide regional wastewater treatment

2 Deliverables

This wastewater facility plan (the plan) has been developed in a series of technical memorandums, listed in Table ES-1 and summarized next.

TABLE ES-1
Technical Memorandums for the Facilities Plan
March 2007

Technical Memorandum	Title	Issue Date	
		Draft	Final
1	Service Area Conditions and Population Trends	Oct 2005	Nov 2006
2	Collection System Infiltration and Inflow Evaluation	Aug 2005	Nov 2006
3	Collection System Model Development and Evaluation	Oct 2005	Nov 2006
4	Future Wastewater Collection Facilities and Improvements	Oct 2005	Nov 2006
5	Collection System Capital Improvement Program	Mar 2006	Nov 2006
6	Wastewater Treatment Plant Flow and Load Projections	Jan 2006	Nov 2006
7	Existing Wastewater Treatment Plant Capacity Analysis	Jan 2006	Nov 2006
8	Facility Planning Effluent Limits	Dec 2005	Nov 2006
9	Alternative Wastewater Treatment Analysis	Jan 2006	Nov 2006
10	Interim Treatment Plant Actions and Capital Improvement Plan	Mar 2006	Nov 2006
11	Long-term Treatment Plant Actions and Capital Improvement Plan	Apr 2006	Nov 2006
12	Regional Considerations	Apr 2006	Nov 2006

2.1 Service Area Conditions and Population Trends

The City is located in northern Idaho, west of Sand Creek, northwest of Lake Pend Oreille, and north of the Pend Oreille River. The City's existing WWTP discharges into the Pend Oreille River.

Hofman Planning Associates (Laclede, Idaho) has performed a draft impact fee study for the City which includes detailed analyses of local population trends and density changes (Technical Memorandum No. 1, Appendix A). The data has been used as the basis for current population totals, future population estimates, and land-use projections for build-out beyond current City limits and Area of City Impact (ACI). Hofman Planning Associates has developed population projections for two scenarios, ultimate build-out to the current City limits and to an expanded boundary (set as the ACI), as summarized in Table ES-2:

TABLE ES-2
Population Projection Summary
March 2007

Geographic Area	Existing Population	Population Growth to Build-Out	Total Build-Out Population
City Limits	6,829	2,377	9,206
Area of Impact	1,399	26,565	27,965
Total	**8,228**	**28,942**	**37,171**

Data source: Hofman Planning Associates, Laclede, Idaho, 2006.

Population growth rates and trends were evaluated to project and schedule the phasing for required improvements. A final projected growth trend is to be developed, pending input from the City.

2.2 Collection System Infiltration and Inflow Evaluation

An I/I analysis was performed on the City's existing collection system to evaluate the effects of extraneous I/I flows to the WWTP. Portable sewer flow monitors were installed in the collection system from March 12, 2005 to April 19, 2005. These flow monitors recorded flows from five zones:

- Zone I: Lincoln Interceptor Basin
- Zone II: Upper Ella Basin (north of Oak Street)
- Zone III: Lower Ella Basin
- Zone IV: Boyer Basin
- Zone V: First Avenue Basin

Flow data from the recorders was analyzed and distinctions were made between base domestic flow, base infiltration, rapid infiltration, and inflow. Based on the flow monitoring data, the collection system is suffering from excess inflow, rapid infiltration, and base infiltration.

Based on observed flows in spring 2005, the potential reduction of peak infiltration and inflow under a moderate I/I removal approach is estimated at 2.45 mgd, or 24 percent. To meet higher I/I reduction, the City will need to embark on an aggressive removal strategy including work with sump pumps and private sewer laterals. I/I reduction under this scenario could reasonably be 50 percent. A summary of the flow monitoring data is presented in Table ES-3.

2.3 Collection System Model Development and Evaluation

A hydraulic model of the sewer collection and pumping system was developed to evaluate the capacity of the existing system and establish a tool for planning future expansions. The evaluation under the 10-year design storm revealed that much of the existing system is operating at or above capacity in the Ella, Boyer, and First Avenue Basins. During wet-weather events, areas in the Ella and First Avenue Basins experience surcharging near street level. Several localized areas within the Lincoln Basin have poor and even adverse grade. The capacity of the existing lift stations were evaluated and appear to have

adequate pumping capacity to convey the current flows while maintaining reliability, assuming the largest pump at each station is not operating.

TABLE ES-3
Flow Monitoring Summary[a]
March 2007

Zone	Average Observed Flow (mgd) [% Total]	Peak Observed Flow (mgd) [% Total][a]	Peak Observed Infiltration (mgd)	Peak Infiltration Per Acre of Service Area (gpd/acre)	Estimated Inflow Magnitude (mgd)	Estimated Inflow Impervious Area (acres)[c]
I Lincoln Basin	0.95 [27%]	3.30 [35%]	1.65	2,090	1.45	3.1 to 5.2
II Upper Ella Basin	0.50 [14%]	1.83 [19%]	1.1	6,077	0.58	no data[d]
III Lower Ella Basin	0.27 [8%]	1.90 [20%]	0.6	5,940	1.2	5.4
IV Boyer Basin	1.1 [31%]	1.9 [20%]	1.0	5,380	0.5	no data[d]
V First Avenue Basin	0.69 [20%]	2.80 [30%]	1.1	3,956	0.9	2.4 to 2.9
Total	**3.51**	**9.5[B]**	**5.45**	**4,688**	**4.63**	**7.8 to 13.5**

a. Based on monitoring conducted from March 12, 2005, to April 19, 2005
b. Based on peak flow from WWTP Influent chart recorder from March 27, 2005
c. Based on calculations of flow-monitored inflow events in relation to monitored precipitation events; based on Q=CiA, where Q=inflow volume, C=1, i=rainfall total in inches, A=area of impervious surface
d. Flow monitoring manhole surcharged in Zone IV (Site 4) and Zone II (Site 6) during rainfall event of March 27, 2005, causing attenuation of inflow in the collection system; no calculations made to separate infiltration and inflow

2.4 Future Wastewater Collection Facilities and Improvements

The existing calibrated hydraulic model was used as the basis for collection system plan, to serve both the current City limits and the ultimate expanded boundary.

Service to the expanded boundary will require an additional 12 new lift stations. In addition to these new lift stations, both the South Boyer and Jail lift stations will require capacity upgrades to pump the projected flows.

A new interceptor will be required to accommodate increased flows resulting from the anticipated population growth. Because much of that growth will occur to the north and west, the new interceptor should be located west of the existing railroad. This future Westside Interceptor will drain a large portion of the expanded boundary by gravity, west of the current City limits, and will accommodate the Northern Service Area, north of the current City limits.

Two preferred alternative routes were identified for the new Westside Interceptor. The first alignment would connect to the existing Lincoln Interceptor at the intersection of Lincoln Road and Poplar Street, and extend north to Selle Road. This route would require increasing the size of the Lincoln Interceptor from the connection point downstream to the WWTP. The second alignment would connect to the existing Ella Interceptor at the intersection of Ella Avenue and Main Street, and extend north to Selle Road. This route would require increasing the size of the Ella Interceptor from the connection point downstream to its connection with the lower end of the Lincoln Interceptor, and subsequently into the WWTP.

Based on discussions with City staff, the final recommended alignment would route the new Westside Interceptor through the lower end of the existing Ella Interceptor Basin (Alternative No. 1).

2.5 Collection System Capital Improvement Plan

2.5.1 CIP Organization

The Capital Improvement Program for the collection system has been divided into two segments:

General improvements to the existing system to remediate areas with excessive deterioration and I/I.

System Expansion and Capacity Improvements required to expand the system to serve the expanded future sewer service boundary.

2.5.2 General Improvements

Several general improvements are suggested, critical to maintaining the longevity of the system and alleviating system deficiencies. These improvements were identified as key to reducing I/I and rehabilitating weak points of the system. An opinion of probable cost for each of the recommended system upgrades is summarized in Table ES-4.

TABLE ES-4
Opinion of Probable Cost for General Improvements
March 2007

Project	Capital Cost (2006 Dollars)
Phase I Project - Lower Ella Basin	$3,166,800
Phase II Project - Upper Ella Basin	$4,247,500
Phase III Project - First Ave. Basin	$4,432,100
Phase IV Project - Lincoln Basin	$832,200
Phase V Project - Boyer Basin	$2,810,400
Total (all phases)	**$15,489,000**

A potential phasing and implementation plan for the General Improvement Projects is included in Table ES-5. This plan groups the various basin projects into 5-year phases. The project costs have been inflated at 3 percent per year until the midpoint of construction for each phase.

2.5.3 System Expansion and Capacity Improvements

Several major upgrades to the City's collection system will be required as the system expands west of the current City limits, including the recommended alignment for the proposed Westside Interceptor.

Two separate costs were developed for the interceptor and are shown in Table ES-6. The first assumes the WWTP will remain at the existing site near the Pend Oreille River. The

second assumes the WWTP will be relocated to a new location near the intersection of Baldy Road and Great Northern Road (west of the current City limits).

TABLE ES-5
Collection System Phasing Plan
March 2007

Project	Project Phasing Period				
	2006 to 2011	2011 to 2016	2016 to 2021	2021 to 2026	2027 to 2032
Phase I Project – Lower Ella Basin	$3,410,000				
Phase II Project – Upper Ella Basin		$5,300,000			
Phase III Project - First Ave. Basin			$6,410,000		
Phase IV Project - Lincoln Basin				$1,400,000	
Phase V Project – Boyer Basin					$5,465,000

Notes:
Costs do not include financing fees, etc.
Costs include 3 percent interest per year to midpoint of project phase.
Costs are ±30 percent and should be verified prior to construction.

TABLE ES-6
Opinion of Probable Cost for Westside Interceptor Alternatives
March 2007

Project	Capital Cost (2006 Dollars)
Westside Interceptor (outside current City limits)[a]	$2,795,000
Westside Interceptor (inside current City limits)	
Alternate A: Existing WWTP site	
Westside Interceptor (Ella Basin reconstruction) flow to existing WWTP site[b]	$8,850,000
Alternate B: New WWTP Site	
Westside Interceptor (Ella Basin reconstruction) flow to new WWTP site	$4,270,000
Pressure Lines (to and from new WWTP site)	$7,195,000

a. This project is required regardless of WWTP location.
b. Flow from the north end of the Lincoln Interceptor will be directed to the west in a new gravity line to the new WWTP location. The cost reflects this modification and subsequent smaller pipe size required for the lower Ella Basin reconstruction. These costs include new pressure lines to convey flow from the existing plant to the new site and new pressure lines to return flow from the new treatment plant site to the existing outfall. Pumping station costs have not been included here but are discussed in the WWTP evaluation.

2.6 Wastewater Treatment Plant Flow and Load Projections

Flows at the WWTP are dominated by I/I throughout most of the year. Domestic flows are estimated at 0.79 mgd (115 gallons per capita per day [gpcd]), based on water meter records. However, base dry weather flows are approximately 2.0 mgd, indicating a base infiltration rate of approximately 1.2 mgd. I/I is most severe during the spring when heavy rain-on-snow events increase flows to observed peaks of 14.7 mgd.

Flows at the WWTP are expected to change in the planning period due to the following factors and are summarized in Tables ES-7 to ES-10.

- Changes in the base domestic flow due to population growth and expansion of the service area into the ACI. The current population of 6,829 is expected to increase to 37,171 at build-out.
- I/I in the existing collection system was examined in three ways: 1) remain unchanged, 2) be reduced approximately 24 percent by moderate I/I reduction projects, or 3) be reduced up to 50 percent with an aggressive I/I reduction plan.
- I/I in new service areas in the ACI can be expected to occur at 300 gallons per day per acre (gpd/acre) on average, with peak events at 500 gpd/acre.

The 5-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) data also were reviewed to identify probable load during the planning period. Average per capita loading and peaking factors were determined for the period from January 2002 to present. The average and peak events were higher than typical design guidance, presumably due to industrial and commercial inputs. Assuming the observed loading trends remain consistent, projected loads for build-out of the existing service boundary and expansion into sewered areas in the ACI are as shown in Table ES-9.

TABLE ES-7
Base Domestic Flow Projections
(Based on Technical Memorandum #1, Service Area Conditions and Population Trends)
March 2007

	Current	Year 2015	Year 2025	Build-out
Population	6,829	12,179	18,029	**37,171**
Base Domestic Flow (mgd)[a]	0.79	1.40	2.07	**4.27**

a. Based on a per capita flow of 115 gpd

TABLE ES-8
Projected Flow Conditions at Year 2015
March 2007

	No Change in I/I					Reduced I/I	Moderate/ Aggressive			
	Avg Day Dry Weather	Yearly Average	Peak Month - Seasonal	Peak Month - Year Round	Peak Day	Avg Day Dry Weather	Yearly Average	Peak Month - Seasonal	Peak Month - Year Round	Peak Day
Domestic Flow (mgd)										
Existing Service Area[a]	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Expanded Service Area[b]	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
I/I Contribution (mgd)										
Existing Service Area	1.21	2.00	2.59	4.33	13.21	0.92/.6	1.52/1.0	1.97/1.3	3.29/2.2	10.04/6.6
Expanded Service Area[c]	0.22	0.22	0.22	0.36	0.36	0.22	0.22	0.22	0.36	0.36
Total (mgd)	**2.83**	**3.62**	**4.21**	**6.09**	**14.97**	**2.54/2.2**	**3.14/2.62**	**3.59/2.9**	**5.05/3.9**	**11.80/8.4**

a. Current population of 6,829 with additional City growth of 594 residents at 115 gpcd
b. Build-out from zero service currently to a served population of 4,756 at 115 gpcd, for a total population of 12,179
c. Based on an average I/I component of 300 gpd/acre and a peak I/I component of 500 gpd/acre, with 17 percent of the total I/I experienced corresponding to percent of in-fill in the expanded service area

TABLE ES-9
Projected Flow Conditions at Year 2025
March 2007

	No Change in I/I					Reduced I/I	Moderate/ Aggressive			
	Avg Day Dry Weather	Yearly Average	Peak Month - Seasonal	Peak Month - Year Round	Peak Day	Avg Day Dry Weather	Yearly Average	Peak Month - Seasonal	Peak Month - Year Round	Peak Day
Domestic Flow (mgd)										
Existing Service Area[a]	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Expanded Service Area[b]	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
I/I Contribution (mgd)										
Existing Service Area	1.21	2.00	2.59	4.33	13.21	0.92/.6	1.52/1.0	1.97/1.3	3.29/2.2	10.04/6.6
Expanded Service Area[c]	0.46	0.46	0.46	0.76	0.76	0.46	0.46	0.46	0.76	0.76
Total (mgd)	**3.74**	**4.53**	**5.12**	**7.16**	**16.04**	**3.45/3.1**	**4.05/3.5**	**4.50/3.8**	**6.12/5.03**	**12.87/9.4**

a. Current population of 6,829, with additional City growth of 1,189 residents at 115 gpcd
b. Build-out from zero service currently to a served population of 10,012 at 115 gpcd, for a total population of 18,029
c. Based on an average I/I component of 300 gpd/acre and a peak I/I component of 500 gpd/acre, with 36 percent of the total I/I experienced corresponding to percent of in-fill in the expanded service area

TABLE ES-10
Projected Flow Conditions at Build-Out
March 2007

	No Change in I/I					Reduced I/I	Moderate/ Aggressive			
	Avg Day Dry Weather	Yearly Average	Peak Month - Seasonal	Peak Month - Year Round	Peak Day	Avg Day Dry Weather	Yearly Avg	Peak Month - Seasonal	Peak Month - Year Round	Peak Day
Domestic Flow (mgd)										
Existing Service Area[a]	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
Expanded Service Area[b]	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22
I/I Contribution (mgd)										
Existing Service Area	1.21	2.00	2.59	4.33	13.21	0.92/.6	1.52/1.0	1.97/1.3	3.29/2.2	10.04/6.6
Expanded Service Area[c]	1.28	1.28	1.28	2.13	2.13	1.28	1.28	1.28	2.13	2.13
Total (mgd)	**6.77**	**7.56**	**8.15**	**10.74**	**19.62**	**6.48/6.2**	**7.08/6.6**	**7.53/6.9**	**9.70/8.6**	**16.45/13.01**

a. Current population of 6,829, with additional City build-out of 2,377 residents at 115 gpcd
b. Build-out from zero service currently to a served population of 27,965 at 115 gpcd, for a total population of 37,171
c. Based on an average I/I component of 300 gpd/acre and a peak I/I component of 500 gpd/acre, with all of the total I/I experienced corresponding to percent of in-fill in the expanded service area.

TABLE ES-11
Projected Loading Conditions
March 2007

Parameter	Average Day[a]	Peak Day using Observed Peaking Factors
BOD_5		
lbs/day	12,000	39,600
lbs/day/capita	0.32	1.07
TSS		
lbs/day	11,900	57,100
lbs/day/capita	0.32	1.54

a. Based on served population of 37,171

Influent nutrient data is based on typical literature values, pending additional sampling at the WWTP. Probable loadings are shown in Table ES-12.

TABLE ES-12
Probable Current and Future Nutrient Loading Conditions
March 2007

Parameter	Value[a] (lbs/day/capita) Range	Value[a] (lbs/day/capita) Typical	Current Average Day[b] (lbs/day)	2015 Average Day (lbs/day)	2025 Average Day (lbs/day)	Buildout Average Day[c] (lbs/day)
Total Kjeldahl Nitrogen	0.020-0.031	0.027	184	329	487	1,003
Total Phosphorus	0.007-0.011	0.008	55	97	144	297

a. Metcalf and Eddy, 3rd Edition, Table 5-4
b. Based on a current population of 6,829
c. Based on a projected population of 37,171

2.7 Existing Wastewater Treatment Plant Capacity Analysis

The WWTP capacity was evaluated in terms of existing average loads and peak loads. At present, the plant has adequate capacity to handle up to 2.5 mgd of average flow, but the high volume of I/I exceeds the plant's biological capacity during extreme events. The plant is nearing the end of its useful life and is in need of substantial improvements.

The existing plant site is not adequate for future flows or to add unit processes that will be necessary to meet upcoming permit requirements. Thus, the existing plant site can be considered to have nearly reached its full capacity.

2.8 Facility Planning Effluent Limits

2.8.1 Current and Projected Effluent Limits

The consultant team members, the City, and Idaho Department of Environmental Quality (IDEQ or DEQ) worked together to establish criteria appropriate to the receiving water environment, including its future potential needs.

Table ES-13 contains the current permit limits and the current performance of the wastewater treatment plant toward meeting the limits, based on data analysis from discharge monitoring reports dated January 2002 through March 2005.

Table ES-14 contains effluent quality standards proposed for use in evaluation of alternatives for the existing WWTP, expansion at the existing site, or a new facility located remotely from the existing site. Some of the limits (e.g., nutrients nitrogen and phosphorus) may be seasonal to protect water quality in Pend Oreille Lake and the Pend Oreille River. The assumed seasonal limits are noted, within a proposed period of May 1 to October 31 annually to coincide with the growing season and to avoid the peak flow period.

TABLE ES-13
Current Permit Limits and Current Performance
March 2007

	Current Permit Limit			2002-2004 Performance Range		
Parameter	**Monthly**	**Weekly**	**Daily**	**Monthly**	**Max Week**	**Max Day**
BOD	30 mg/l	45 mg/l	*	7-18 mg/l	12-26 mg/l	**
BOD Rem	85%	*	*	75-90%	**	**
TSS	30 mg/l	45 mg/l	*	4-12 mg/l	9-34 mg/l	**
TSS Rem	85%	*	*	82-97%	**	***
Total N	*	*	*	***	***	***
NH_3-N	*	*	*	***	***	***
Total P	*	*	*	***	***	***
O-PO_4-P	*	*	*	***	***	***
Temp.	*	*	*	6-22 °C	***	***
pH	Within the Range 6.5 – 9.0			Range = 6.6 – 7.7		
Cl_2	0.45 mg/l	*	1.01 mg/l	0.34-0.49 mg/l	***	0.6-1.0 mg/l
E-coli	126 cfu/100 ml	*	406 cfu/100 ml	2-35 cfu/100 ml	2-434 cfu/100 ml	2-680 cfu/100 ml

Notes:
* No limits
** Data not compiled
*** Data not available

TABLE ES-14
Projected Permit Limits for Planning
March 2007

	Projected Permit Limit			2002-2004 Performance Range		
Parameter	**Monthly**	**Weekly**	**Daily**	**Monthly**	**Max Week**	**Max Day**
BOD	30 mg/l	45 mg/l	*	15 mg/l	23 mg/l	*
BOD Rem	85%	*	*	85%	*	*
TSS	30 mg/l	45 mg/l	*	15 mg/l	23 mg/l	*
TSS Rem	85%	*	*	85%	no limits	*
Total N	*	*	*	10 mg/l[a]	15 mg/l*	*
NH_3-N	1 mg/l[a]	*	3 mg/l[a]	1 mg/l[a]	no limits	3 mg/l[a]
Total P	*	*	*	1 mg/l[a]	2 mg/l[a]	*
O-PO_4-P	*	*	*	*	*	*
Temp.	*	*	*	*	*	*
pH	Within the Range 6.5 – 9.0			Within the Range 6.5 – 9.0		
Cl_2	0.1 mg/l	*	0.2 mg/l	0.1 mg/l	*	0.2 mg/l
E-coli	126 cfu/100 ml	*	406 cfu/100 ml	126 cfu/100 ml	*	406 cfu/100 ml

Notes:
a. Seasonal Limits (May 1 through October 31)
* = No limits

A total nitrogen removal requirement would be associated with a conclusion by the States of Washington and/or Idaho that excessive dissolved nitrogen in the Pend Oreille River in Washington is promoting macrophyte (bottom growing plants) growth in the river. The Washington Total Maximum Daily Load (TMDL) study on the river is not expected to be completed for about 5 years, after which recommendations will be presented and a water quality improvement implementation plan developed. Imposition of nitrogen removal requirements could be mandated as part of the 2012 or 2017 permit renewals, which could call for implementation prior to the start of the following permit period (e.g., 2017 or 2022).

Based on best information available, planning for wastewater facility improvements needs to include each of these potential future requirements from the implementation dates indicated:

- Chlorine toxicity removal - 2012
- Ammonia removal - 2017
- Phosphorus removal - 2017
- Nitrogen removal - 2022

Design criteria for potential seasonal requirements will be based on flow projections for May through October, not on the annual flow projections (peak flows).

2.9 Alternative Wastewater Treatment Analysis

2.9.1 Summary of Alternatives

A summary of the alternatives reviewed for a future wastewater treatment plant are presented in Table ES -15.

TABLE ES-15
Pre-screened Alternatives
March 2007

Element	Alternatives
Biological Treatment	Conventional Activated Sludge
	Conventional Activated Sludge Without Primary Treatment
	Membrane Bioreactors
Peak Flow Handling	Storage
	Filtration
	Stormwater Clarification
Disinfection	Chlorination
	Ozonation
	Ultraviolet Light
Tertiary Treatment	Upflow Sand Filtration
	Microfiltration
	Chemical Addition

TABLE ES-15
Pre-screened Alternatives
March 2007

Element	Alternatives
Effluent Discharge	Land Application (fodder crops)
	River Discharge (Pend Oreille River)
	Water Reuse (lawn irrigation, wetlands)
Solids Handling	Gravity Thickening
	Mechanical Gravity Belt Thickening
	Aerobic Digestion
	Anaerobic Digestion
	Land Application
	Composting
	Contract Disposal

These alternatives were evaluated for preliminary feasibility, capital and operations costs, ability to meet future permit requirements, and flexibility.

2.9.2 Recommendations

Based on expected future permit requirements, current capital cost information, and ease of phasing, a conventional activated sludge process without primary treatment and continued river discharge is recommended. Initially, a new WWTP could be constructed without nutrient removal facilities. These could be added in subsequent phases as required by changing permits.

The current facility should be retained for peak flow handling until I/I contributions from the existing service area are reduced. Solids should be aerobically digested and continue to be land applied. Because implementation of the majority of these recommendations will be 5 to 10 years ahead, this selection process should be reviewed for any changes in regulatory requirements or in technology, notably membrane bioreactors, at that time.

2.10 Interim Treatment Plant Actions and Capital Improvement Plan

Based on a review of the existing treatment plant site, equipment condition, and required size of future treatment components, the existing site is not adequate. However, to identify a new treatment site, obtain funding, and construct new facilities will require 5-15 years. Therefore, some improvements must be completed in the near term to maintain effluent quality from the existing facility. The recommended interim upgrades to the existing WWTP are summarized next.

2.10.1 Improvements

- Headworks improvements including influent screening, new grit washer, and vent/odor control
- Modifications to the aeration system including fine bubble diffusers and automatic control of the blower
- Replacement of the gravity thickener with a gravity belt thickener
- Digester improvements including cleaning, pipe replacement, a new heat exchanger, and gas scrubbing
- Gas dechlorination for the effluent

2.10.2 Phasing and Budget

Certain projects must be implemented immediately. The City should consider funding these improvements in fiscal year 2007 and/or fiscal year 2008. Table ES-16 presents a summary of interim costs and a preliminary phasing schedule.

TABLE ES-16
Summary of Interim Costs and Preliminary Phasing Schedule
March 2007

Item No.	Description	Total Est. Cost[b]	FY 2007	FY 2008
Treatment Plant[a]				
1	Headworks Improvements	$862,700		$862,700
2	Aeration Basin and Blower	$388,400	$388,400	
3	In-line Chlorine Meter	$23,250	$23,250	
4	Dechlorination System	$191,250	$191,250	
5	Solids Thickening	$1,078,000		$1,078,000
6	Digester Cleaning and Piping/Valving Upgrades	$377,500	$377,500	
7	Digester Odor Control – new biofilter	$87,400	$87,400	
8	Heat Exchanger/Boiler Building	$174,700	$174,700	
9	Energy Recovery	$132,600	$132,600	
	Total	**$3,316,000**	**$1,375,000**	**$1,941,000**

Notes:
a. Projects based on "high priority" list provided by City
b. Costs in 2006 dollars

2.11 Long-term Treatment Plant Actions and Capital Improvement Plan

Since the Ella Avenue plant site is inadequate for future expansion, the treatment facility will need to be relocated. A minimum of 10 years is generally required to acquire property, secure funding, design, and construct a new facility. The final analysis considered four alternatives for the ultimate buildout capacity:

1. **Secondary treatment with river discharge** - This option includes interim treatment plant improvements, secondary treatment process cost, piping to the existing river outfall, and peak flow handling using primary clarification.
2. **Highest quality treatment with river discharge** - In addition to the items associated in the basic secondary treatment, biological nutrient removal and effluent filtration have been added to this option.
3. **Seasonal discharge** - This option has no discharge during the summer months and a discharge to the river in the winter. It would require a land application site of approximately 2,000 acres.
4. **Full water reuse with no river discharge** - This would include the secondary process cost, biological nutrient removal, lagoon storage, and lastly, seasonal land application of year-round flow.

The cost for each of these four options to serve the ultimate buildout population, including the cost per equivalent connection (ERU), is presented in Table ES-17. For this analysis, the number of future connections for the City is estimated at 23,775.

TABLE ES-17
Sandpoint Treatment Options
March 2007

Option	Capital Costs [a]	Cost/ERU
1. Basic Secondary Treatment	$73,900,000	$3,100
2. Highest Quality River Discharge	$93,300,000	$3,900
3. Basic Secondary Treatment with Seasonal Land Application	$118,400,000	$5,000
4. Full Water Reuse	$241,500,000	$10,100

a. Costs are in 2006 dollars and do not include interim treatment plant upgrades.

Implementation of the final upgrades is recommended on an incremental basis, beginning with basic secondary treatment to serve the projected 2015 population. Nutrient removal capabilities can be added as required by changes in permit requirements in subsequent years. Based on the City's selection of "highest quality river discharge" as the treatment target, a projected 20-year capital improvement plan is presented in Table ES-18.

TABLE ES-18
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 a 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. If the City is able to reduce I/I by more than 50 percent, the size of the wastewater treatment plant can be reduced.

2.12 Regional Considerations

2.12.1 Regional Flows and Loads

A regional wastewater treatment plant would receive flows from five participating entities. To estimate the appropriate size for a potential regional facility, wastewater flows and loads from each entity were estimated based on current wastewater facility planning for Sandpoint, Southside Water and Sewer District (SWSD), and Kootenai-Ponderay Sewer District (KPSD). Flows and loads from Dover were estimated by assuming a 3 percent growth rate. Flows and loads from Schweitzer were estimated by using standard engineering assumptions, based on the expected number of dwelling units at build-out (as provided by Mountain Utilities Corporation). The estimated wastewater flows and loads are shown in Table ES-19 and ES-20, respectively.

TABLE ES-19
Approximate Wastewater Flows
March 2007

	Flow (mgd)		
Entity	**Average**	**Peak**	**ERUs**
SWSD[a]	0.11	0.2	600
Schweitzer[a]	0.49	1.33	2,100
KPSD[b]	1.414	3.789	8,350
Dover[c]	0.47	1.27	2,000
Sandpoint[a]	7.55	19.61	23,775
Total	**10.0**	**26.2**	**36,825**

SWSD - Southside Water and Sewer District
KPSD – Kootenai-Ponderay Sewer District
a. Approximate flow at build-out of existing boundary
b. Approximate flow at built-out of expanded boundary
c. Approximate flow in 40 years
d. ERU based on 37,171 residents at 2.29 res/ERU plus additional commercial/industrial load projected at 0.5#/ERU

TABLE ES-20
Approximate Wastewater Loads
March 2007

Entity	Average Load (pounds/day)	
	BOD_5	TSS
SWSD	202	202
Schweitzer	905	905
KPSD	2766	1579
Dover	862	862
Sandpoint	12000	11900
Total	**16736**	**15448.7**

These projected flows and loads were used for preliminary sizing of a regional wastewater treatment facility. The same alternatives were evaluated for regional treatment options. Those costs are presented in Table ES-21. The costs per connection are based on 36,825 equivalent connections.

TABLE ES-21
Regional Treatment Options
March 2007

Option	Cost	Cost/ERU
1. Basic Secondary Treatment	$101,500,000	$2,700
2. Highest Quality River Discharge	$127,100,000	$3,450
3. Basic Secondary Treatment with Seasonal Land Application	$162,500,000	$4,400
4. Full Water Reuse	$330,500,000	$9,000

The projected costs per ERU for the City's wastewater treatment facility and a regional facility are compared along with costs for other systems in Table ES-22. Note that regional costs are for 2005 and have been increased by 25 percent to account for general project inflation.

TABLE ES-22
Regional Cost Comparison
March 2007

	ERU	Project Cost	2005 Cost/ERU
Southside Water and Sewer District	600	$4.1 Million	$8,500
Kootenai Ponderay Sewer District (Current Boundary)	4,100	$9.8 Million	$3,000
Schweitzer		N/A	
Dover		N/A	
Sandpoint Only – I/I Removal[a]	23,775	$96,600,000	$4,100
Regional – I/I Removal[a]	36,825	$127,100,000	$3,500

a. Due to the high cost of treating I/I, both options, including the City of Sandpoint, assume a 50% decrease in I/I.