FACT SHEET

United States Environmental Protection Agency (EPA)
Region 10
Park Place Building, 13th Floor
1200 Sixth Avenue, OW-130
Seattle, Washington 98101
(206) 553-1214

Date: August 14, 1998

Permit No.: ID-002149-1

PROPOSED REISSUANCE OF A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE POLLUTANTS AND TO TRANSFER SEWAGE SLUDGE (BIOSOLIDS) TO A COMPOSTING FACILITY PURSUANT TO THE PROVISIONS OF THE CLEAN WATER ACT (CWA)

CITY OF MOSCOW

has applied for reissuance of a NPDES permit to discharge pollutants pursuant to the provisions of the CWA. This Fact Sheet includes (a) the tentative determination of the EPA to reissue the permit, (b) information on public comment, public hearing and appeal procedures, (c) the description of the current discharge and biosolids practices, (d) a listing of tentative effluent limitations, schedules of compliance and other conditions, and (e) a sketch or description of the discharge and biosolids transfer locations. We call your special attention to the technical material presented in the latter part of this document.

Persons wishing to comment on the tentative determinations contained in the draft permit reissuance may do so by the expiration date of the Public Notice. All written comments should be submitted to EPA as described in the Public Comments Section of the attached Public Notice.

After the expiration date of the Public Notice, the Director, Office of Water, will make final determinations with respect to the permit reissuance. The tentative determinations contained in the draft permit will become final conditions if no substantive comments are received during the public notice period.

The permit will become effective 30 days after the final determinations are made, unless a request for an evidentiary hearing is submitted within 30 days after receipt of the final determinations.

The draft NPDES permit and other related documents are on file and may be inspected at the above address any time between 8:30 a.m. and 4:00 p.m., Monday through Friday. Copies and other information may be requested by writing to EPA at the above address to the attention of the NPDES Permits Unit, or by calling (206) 553-1214. This material is also available from the EPA Idaho Operations Office, 1435 N. Orchard Street, Boise, Idaho 83706.

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TECHNICAL INFORMATION

I. APPLICANT

City of Moscow
122 E. Fourth St. (P.O. Box 9203)
Moscow, Idaho 83843

NPDES Permit No.: ID-002149-1
Facility contact: Ray Haselhuhn, Wastewater Treatment Plant Supervisor

II. ACTIVITY

The City of Moscow owns and operates a wastewater treatment plant that treats domestic wastewater. The facility provides secondary treatment of wastewater prior to discharging it to Paradise Creek. The facility design flow is 3.6 million gallons per day (mgd).

III. RECEIVING WATER

A. Outfall location: The City of Moscow wastewater treatment plant discharges its wastewater to Paradise Creek via outfall 001. Outfall 001 is located at latitude 46° 44' 21" and longitude 117° 01' 47".

B. Water Quality Standards: A state's water quality standards are composed of use classifications, and numeric and/or narrative water quality criteria. The first part of a State's water quality standard is a classification system for water bodies based on the expected beneficial uses of those water bodies. The second part of a state's water quality standards is the water quality criteria deemed necessary to support the beneficial use classification of each water body. These criteria may be numeric or narrative.

1. Idaho Water Quality Standards: The Idaho *Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 16.01.02.120.01.hh) protect Paradise Creek for the following beneficial use classifications: cold water biota, secondary contact recreation and agricultural water supply. The Idaho State criteria deemed necessary to protect the beneficial uses for Paradise Creek are summarized in Appendix A.

2. Washington Water Quality Standards: Federal regulations at 40 CFR 122.4 state that "No permit may be issued when the imposition of conditions cannot ensure compliance with the applicable water quality requirements of all affected states." The facility is located one half mile upstream from the Washington State border. Since the facility is so close the border, the effluent discharged from the facility may affect the water quality of Paradise Creek in Washington State. Washington State water quality standards must be considered when developing effluent limits. The *Water Quality Standards for Surface Waters of the State of Washington*

(Chapter 173-201A WAC) classify Paradise Creek as a Class A water body. The beneficial uses of Class A waters are domestic, industrial, and agricultural water supply; stock watering; primary contact recreation; aesthetic enjoyment; wildlife habitat; and salmonid and other fish spawning, rearing, migration and harvesting. The Washington State criteria deemed necessary to protect the beneficial uses for Paradise Creek are also summarized in Appendix A.

C. Water Quality Limited Segment: A water quality limited segment is any waterbody, or definable portion of water body, where it is known that the water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards. In 1994, Paradise Creek was identified as a water quality limited segment from its headwaters to the Washington State line. It is listed for ammonia, nutrients, sediment, habitat modification, pathogens, flow alteration, and temperature.

Section 303(d) of the CWA requires States to develop a Total Maximum Daily Load (TMDL) management plan for water bodies determined to be water quality limited. A TMDL documents the amount of a pollutant a waterbody can assimilate without violating a state's water quality standards and allocates that load capacity to known point sources and nonpoint sources. TMDL's are defined in federal regulations at 40 CFR 130 as the sum of the individual Waste Load Allocations for point sources and Load Allocations for nonpoint sources, including a margin of safety and natural background conditions. A TMDL has been prepared for Paradise Creek. The report, entitled *Paradise Creek TMDL, Water Body Assessment and Total Maximum Load* (hereafter referred to as the Paradise Creek TMDL), was prepared by the Idaho Division of Environmental Quality, Lewiston Regional Office. The Paradise Creek TMDL was approved by EPA on February 12, 1998.

IV. FACILITY DESCRIPTION

The Moscow facility discharges its effluent via outfall 001. Treatment consists of influent comminution, primary sedimentation using clarifiers, biological treatment using trickling filters, followed by secondary clarification, aeration, chlorination then dechlorination. During extreme high flow, the city states that sewage is comminuted, primarily clarified, degritted, bypasses the trickling filters, secondarily clarified, aerated, chlorinated, and discharged through outfall 001. Sludge (biosolids) from the wastewater treatment facility is anaerobically digested. Final biosolids are dewatered by belt filter press and trucked to a regional composting facility for disposal.

The wastewater treatment plant has a five-day biochemical oxygen demand and total suspended solids removal rate of 90%. Information provided by the company in February 1998 indicates the facility design flow is 3.6 mgd.

A review of the discharge monitoring reports from 1992 through 1997 indicate that the effluent flow ranges from 2.0 to 2.5 mgd. In 1996 and 1997 there were significant

violations of the permit limitations for five-day biochemical oxygen demand , total suspended solids, fecal coliform bacteria, and total residual chlorine.

As a result of the violations the Idaho Department of Health and Welfare and the City of Moscow entered into a voluntary consent order (Idaho Code 39-108) in November of 1997. Among other things, the order requires the City to submit to the Department an updated Facilities Plan no later than 120 days after receipt of the final discharge limitions for the City's wastewater treatment system. The Facilities Plan shall contain alternatives, costs and financing to bring the City's wastewater system into permanent compliance with the state water quality standards and shall identify the alternative selected by the City.

V. BASIS FOR PERMIT CONDITIONS

A. General Approach: Sections 101, 301(b), 304, 308, 401, 402 and 405 of the CWA provide the basis for the effluent limitations and other conditions in the draft permit. EPA evaluates discharges with respect to these sections of the CWA and the relevant NPDES regulations in determining which conditions to include in the permit. The major elements contained in a permit for a municipal wastewater treatment facility such as the City of Moscow's are: effluent limits based on either water quality standards or technology standards, monitoring requirements and sewage sludge (biosolids) requirements. These elements are briefly discussed below.

Technology Based Effluent Limits/ Water Quality Based Effluent Limits: The CWA requires Publicly Owned Treatment Works to meet performance-based requirements based on available wastewater treatment technology. Section 301 of the CWA established a required performance level, referred to as "secondary treatment," that all POTWs were required to meet by July 1, 1977. EPA developed "secondary treatment" regulations which are specified in 40 CFR 133. These technology-based limits apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by secondary treatment in terms of five-day biochemical oxygen demand, total suspended solids, and pH.

EPA may find, by analyzing the effect of a discharge on the receiving water, that technology based permit limits are not sufficiently stringent to meet water quality standards. In such cases, EPA regulations at 40 CFR 122.44(d)(1) require the development of more stringent, water quality-based limits designed to ensure that water quality standards are met. The draft permit limits reflect whichever limits (technology-based or water quality-based) are most stringent.

Monitoring Requirements: Under Section 308 of the CWA and 40 CFR 122.44(i), EPA must include monitoring requirements in the permit to determine compliance with effluent limitations. Effluent and ambient monitoring may also be required to gather data for future effluent limitations or to monitor effluent impacts on receiving water quality. Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance.

Biosolids Requirements: The biosolids management regulations are contained in

40 CFR 503, and were designed to be self-implementing. Requirements are included in 40 CFR 503 for pollutants in biosolids, the reduction of pathogens in biosolids, the reduction of the characteristics in biosolids that attract vectors, the quality of the exit gas from a biosolids incinerator stack, the quality of biosolids that is placed in a MSWLF unit, the sites where biosolids is either land applied or placed for final disposal, and for a biosolids incinerator.

B. Technology-Based Evaluation

1. Five-Day Biochemical Oxygen Demand and Total Suspended Solids Concentration Limitations: Secondary treatment standards are defined in the federal regulations at 40 CFR 133.102 (state regulations at IDAPA 16.01.02.420) as follows:

Parameter	Monthly Average	Weekly Average	Percent Removal
5-day Biochemical Oxygen Demand	30 mg/L	45 mg/L	85%
Total Suspended Solids	30 mg/L	45 mg/L	85%

2. Five-Day Biochemical Oxygen Demand and Total Suspended Solids Loading Limitations: Federal regulations (40 CFR 122.45 (f)) require secondary treatment standards to be expressed as mass based limits. When developing mass based limits the design flow of the facility (3.6 mgd) is used.

The average monthly loading for five-day biochemical oxygen demand and total suspended solids =
(monthly average) X (design flow) X (conversion factor) =
(30 mg/L) X (3.6 mgd) X (8.34) = 900.7 lbs/day

The allowable weekly loading for five-day biochemical oxygen demand and total suspended solids =
(weekly average) X (design flow) X (conversion factor) =
(45 mg/L) X (3.6 mgd) X (8.34) = 1351.1 lbs/day

3. pH: The technology-based pH limitation for POTW's is defined in the federal regulations 40 CFR 133.102. The pH of the effluent is required to be within the range of 6.0 to 9.0 standard units.

4. Fecal Coliform Bacteria: The technology-based fecal coliform bacteria limitation for POTW's is defined in Idaho's water quality standards (IDAPA 16.01.02.420.05.). Fecal coliform concentrations in secondary treated effluent must not exceed a geometric mean of 200/100 ml based on no more than one week's data and a minimum of five samples.

C. Water Quality-Based Evaluation

1. Statutory Basis for Water Quality-Based Limits

Section 301(b)(1)(C) of the CWA requires the development of limitations in permits necessary to meet water quality standards by July 1, 1977. Discharges to state waters must also comply with limitations imposed by the state as part of its certification of NPDES permits under section 401 of the CWA.

The NPDES regulation (40 CFR 122.44(d)(1)) implementing section 301 (b)(1)(C) of the CWA requires that permits include limits for all pollutants or parameters which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality."

The regulations require that this evaluation be made using procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving water. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation.

2. Reasonable Potential Determination

When evaluating the effluent to determine if water quality-based effluent limits are needed based on chemical specific numeric criteria, a projection of the receiving water concentration (downstream of where the effluent enters the receiving water) for each pollutant of concern is made. The chemical specific concentration of the effluent and ambient water and, if appropriate, the dilution available from the ambient water are factors used to project the receiving water concentration. If the projected concentration of the receiving water exceeds the numeric criterion for a specific chemical, then there is a reasonable potential that the discharge may cause or contribute to an excursion above the applicable water quality standard, and a water quality-based effluent limit is required.

As mentioned above, sometimes it is appropriate to allow a small area of ambient water to provide dilution of the effluent. These areas are called mixing zones. Mixing zone allowances will increase the mass loadings of the pollutant to the water body, and decrease treatment requirements. Mixing zones can be used only when there is adequate ambient flow volume and the ambient water is below the criteria necessary to protect designated uses. Paradise Creek has been listed as a water quality limited segment because the creek already exceeds the applicable criteria for turbidity (TSS), fecal coliform bacteria, phosphorus, ammonia and temperature. Of these parameters, the Paradise Creek TMDL determined that a mixing zone could be allowed for temperature but only during those periods when Paradise Creek was below the applicable criterion for temperature.

3. Derivation of Water Quality-Based Effluent Limits

The first step in developing a permit limit is development of a wasteload allocation for the pollutant. A wasteload allocation is the concentration (or loading) of a pollutant that the Permittee may discharge without causing or contributing to an exceedance of water quality standards in the receiving water. Wasteload allocations for Paradise Creek were determined in one of the following ways:

(a) TMDL-Based Wasteload Allocation

Where the receiving water quality does not meet water quality standards, the wasteload allocation is generally based on a TMDL developed by the State. A TMDL is a determination of the amount of a pollutant from point, non-point, and natural background sources, including a margin of safety, that may be discharged to a water body without causing the water body to exceed the criterion for that pollutant. Any loading above this capacity risks violating water quality standards. Section 303(d) of the CWA requires states to develop TMDLs for water bodies that will not meet water quality standards after the imposition of technology-based effluent limitations to ensure that these waters will come into compliance with water quality standards. The first step in establishing a TMDL is to determine the assimilative capacity (the loading of pollutant that a water body can assimilate without exceeding water quality standards). The next step is to divide the assimilative capacity into allocations for non-point sources, point sources, natural background loadings, and margin of safety to account for any uncertainties. Permit limitations are then developed for point sources that are consistent with the allocation for point source.

The Paradise Creek TMDL determined that water quality-based effluent limits were required for turbidity, fecal coliform bacteria, phosphorus, ammonia, and temperature. Wasteload allocations for each of these parameters were developed in the TMDL.

(b) Criterion as the Wasteload Allocation:

The USGS gage station on Paradise Creek indicates a 7Q10 low flow of 0.1 cubic feet per second (cfs). The Idaho water quality standards allow twenty five percent of the low flow to be used as a mixing zone, or in this case 0.025 cfs. The effluent flow from the Moscow facility is 5.6 cfs. The flow volume in Paradise Creek is so small in relation to the effluent volume that it cannot provide dilution of the effluent, therefore a mixing zone is not appropriate. When a mixing zone is not available, the criterion becomes the wasteload allocation. Establishing the criterion as the wasteload allocation ensures that the Permittee will not contribute to an exceedance of the criteria. The wasteload allocations for chlorine and dissolved oxygen reflect the criterion.

Once the wasteload allocation has been developed, the EPA applies the statistical permit limit derivation approach described in Chapter 5 of the "Technical Support Document for Water Quality-Based Toxics Control" (EPA/505/2-90-001, March 1991, hereafter referred to as the TSD) to obtain monthly average, and weekly average or daily maximum permit limits. This approach takes into account effluent variability, sampling frequency, and water quality standards.

4. Water Quality-Based Effluent Limits

(a) Turbidity

The Paradise Creek TMDL implemented the turbidity standard by requiring the reduction of total suspended solids. The TMDL is requiring an average monthly discharge limit of 15 mg/L and an average monthly loading of 500 lbs/day for the Moscow Wastewater Treatment Plant. The total suspended solids loading was derived using a facility discharge flow of 4.0 mgd.

When developing effluent limitations, federal regulations require 1) the limits be calculated based on the design flow of the facility (40 CFR 122.45(b)); and 2) the limits developed are consistent with the assumptions and requirements of any available wasteload allocation for the discharge prepared by the State and approved by EPA pursuant to 40 CFR 130.7 (40 CFR 122.44(d)(vii)(A).

Information provided by the facility states that the design flow of the facility is 3.6 mgd. In order to be consistent with the federal regulations the total suspended solids loading was recalculated based on a design flow of 3.6 mgd and the TMDL concentration of 15 mg/L. Based on this information the average monthly loading is 450.4 lbs/day.

Federal regulations also require that permit limits for publicly owned treatment works be expressed as average monthly limits and average weekly limits unless impracticable (40 CFR 122.45(d)). To be consistent with federal regulations an average weekly limit for total suspended solids were calculated (30 mg/L, 900.7 lbs/day). See Appendix B for additional information on calculating the effluent limits.

(b) pH

To protect water quality standards the pH must be within the range of 6.5 - 8.5 standard units.

(c) Fecal Coliform Bacteria

The TMDL requires the Moscow Wastewater Treatment Plant to meet an average monthly discharge limitation of 100 colonies/100 ml. Additionally, the Idaho water quality standards state that waters designated for

secondary contact recreation are not to contain fecal coliform bacteria significant to the public health in concentrations exceeding 800/100 ml at any time.

(d) Dissolved Oxygen/Biochemical Oxygen Demand

Dissolved Oxygen: The water quality criteria for dissolved oxygen states that levels of dissolved oxygen must exceed 8.0 mg/L. Data collected upstream and downstream of the Moscow facility indicate that Paradise Creek is not meeting Washington's or Idaho's water quality criterion for dissolved oxygen.

Effluent data show that the dissolved oxygen. ranges from 6.6 mg/L to 9.7 mg/L with a median value of 7.5 mg/L. Since the effluent exceeds the criterion, an effluent limit is required. The proposed effluent limit is 8.0 mg/L.

Biochemical Oxygen Demand: Biochemical oxygen demand is a measure of the amount of oxygen required to stabilize organic matter in wastewater. It measures the total concentration of dissolved oxygen that would eventually be demanded as wastewater degrades in the stream. As such, the biochemical oxygen demand loading from the wastewater treatment facility may impact downstream dissolved oxygen levels.

Currently, there is insufficient data to determine the effect that the effluent from the Moscow facility is having on dissolved oxygen concentrations in Paradise Creek. Monitoring requirements have been incorporated into the draft permit. The data collected will be used during the next permitting cycle (five year life of the permit or as appropriate if reopened for a TMDL) to determine if more stringent water quality-based effluent limitations are necessary for biochemical oxygen demand.

(e) Total Residual Chlorine

The previous fact sheet for this facility (July 1991) determined that water quality-based effluent limits were required for chlorine, and established the wasteload allocation as the average monthly limit. The TSD discourages using the chronic wasteload allocation as the average monthly limit. The effluent limits have been revised to be consistent with the TSD (see Appendix B). The proposed average monthly limit is 9.0 µg/L (0.3 lbs/day).

As stated previously, federal regulations require permit limits for publicly owned treatment works to be expressed as an average monthly limit and an average weekly limit unless impracticable. Federal regulations do not prohibit a Permittee from increasing their sampling events above what is required in an NPDES permit. This is significant because a Permittee may

collect as many samples as necessary during a week to bring the average of the data set below the average weekly effluent limit. In such cases, spikes of a pollutant could be masked by the increased sampling. While this is not a concern with pollutants that are not toxic, such as total suspended solids or phosphorus, it is a significant concern when toxic pollutants, such as chlorine or ammonia, are being discharged. Using a maximum daily limit instead of an average weekly limit will ensure that spikes do not occur, and will be protective of aquatic life. For these reasons EPA, Region 10 considers it impracticable to develop an average weekly limit for chlorine. The proposed maximum daily limit is 18.0 µg/L (0.5 lbs/day).

The proposed water quality based effluent limits for chlorine fall below the level at which chlorine can be accurately quantified using EPA analytical test methods (the method detection limit for chlorine is 10 µg/L). In such cases it is difficult to determine compliance with the effluent limits. The inability to measure to the necessary level of detection is addressed by establishing the Minimum Level[1] as the compliance evaluation level for use in reporting Discharge Monitoring Report data. Effluent discharges at or below the Minimum Level would be considered in compliance with the Water quality-based effluent limit.

In the absence of promulgated Minimum Levels, Interim Minimum Levels are used. EPA believes that Interim Minimum Levels values can be derived most effectively as a multiple of the existing method detection limit value for a given analyte. The Interim Minimum Level is calculated as 3.18 X the published method detection limit for the analyte for a specific analytical method approved under Section 304(h) or previously approved for use by the permitting authority (Draft National Guidance for the Permitting, Monitoring, and Enforcement of Water Quality-based Effluent Limitations Set Below Analytical Detection/Quantitation Levels, March 1994); it is then rounded to the nearest multiple of 1, 2, 5, 10, 20 , 50, etc.

In addition to the water quality based effluent limits an Interim Minimum Level will be incorporated into the permit. The Interim Minimum Level for chlorine is 20 µg/L. EPA will consider the Permittee in compliance with the water quality based effluent limits for chlorine provided the effluent does not exceed the interim minimum level.

(f) Whole Effluent Toxicity (WET)/No Toxics Substances in Concentrations that Impair Designated Uses

Both Idaho and Washington State water quality standards require surface

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[1] Minimum Level - the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method-specified sample weights, volumes, and processing steps have been followed.

waters of the State to be free from toxic substances in concentrations that impair use classifications. Data do not exist to support the development of a WET limit at this time. The draft permit will require the Permittee to monitor for WET, and this information will be used in the next permitting cycle to determine if a WET limit is required.

(g) Phosphorus

The TMDL requires a phosphorus limit from May 15 through October 15 of each year. The average monthly limit in the TMDL is 0.136 mg/L of total phosphorus. The loading in the TMDL is based on 4.0 mgd which results in an average monthly loading of 4.5 lbs/day. As stated previously, effluent limits must be based on the design flow of the facility, and must be consistent with the assumptions and requirements of any available wasteload allocation for the discharge prepared by the State. Since the Moscow facility design flow is 3.6 mgd the average monthly loading was recalculated. Using a design flow of 3.6 mgd, the average monthly loading is 4.1 lbs/day.

The average weekly limitation is 0.27 mg/L and the average weekly loading is 8.1 lbs/day. See Appendix B for additional information on calculating the effluent limits.

(h) Ammonia

The TMDL established an average monthly limit of 0.9 mg/L from April 1 through October 31; and an average monthly limit of 1.5 mg/L from November 1 through March 31. These limits were based on ammonia criteria in Washington water quality standards, which were more stringent than the Idaho water quality standards. The Washington standards for ammonia have since been revised. IDEQ proposes to revise the Paradise Creek TMDL to reflect the new ammonia criteria. The water quality based effluent limits in this fact sheet were derived based on the updated Washington water quality standards for ammonia. The proposed limits are as follows:

	Maximum Daily Limit	Average Monthly Limit
April 1 - October 31	2.0 mg/L (60.0 lbs/day)	1.0 mg/L (30.0 lbs/day)
November 1 - March 31	3.5 mg/L (105.1 lbs/day)	1.7 mg/L (51.0 lbs/day)

As stated previously, federal regulations require permit limits for publicly owned treatment works to be expressed as the an average monthly limit and an average weekly limit unless impracticable. EPA considers developing an average weekly limit for ammonia is impracticable, and has developed a maximum daily limit instead (for additional information see section (e) Total Residual Chlorine.

(i) Temperature/Flow

The instream temperature criterion for Paradise Creek is 18°C. A point source effluent, that has a temperature greater than the receiving stream, will increase the temperature of the receiving stream near the outfall where it is discharged. As the downstream distance from the outfall increases the temperature of the receiving stream may start to decrease because energy is dissipated to cooler ambient air, or the effluent becomes more completely mixed with cooler stream water. Such a decrease in temperature can only occur when the ambient air or receiving stream temperature is less than the point source discharge temperature. Therefore, the instream temperature criterion can be met by either requiring the temperature of the effluent discharged to the stream to be at or below 18°C, or if the ambient temperature of the stream is less than 18°C by determining the effluent flow volume that can be discharged to the stream without causing an exceedance of the criterion.

For the Moscow facility, the TMDL implemented the temperature criterion by establishing the allowable effluent volume the facility could discharge to Paradise Creek without causing the stream to exceed the criterion of 18 C. The allowable effluent volume was calculated using the treatment facility effluent discharge volume and temperature, and the flow volume and temperature of Paradise Creek upstream of the treatment facility. The allowable effluent flow volumes will be included in the draft permit (see Appendix C for allowable effluent flow volume).

(j) Floating, Suspended or Submerged Matter

The Idaho state water quality standards require surface waters of the state to be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses. A condition of the permit requires that there shall be no discharge of floating solids or visible foam in other than trace amounts.

D. Proposed Effluent Limitations

As stated previously, the draft permit reflects the more stringent of the technology and water quality based effluent limits. Table 1 summarizes the applicable technology based effluent limits (section V.B. of the fact sheet), Table 2 summarizes the water quality based effluent limits (section V.C.4 of the fact sheet) and Table 3 summarizes the more stringent of the limits in Table's 1 and 2.

TABLE 1
Technology Based Permit Limits

Parameter	Average Monthly Limit	Average Weekly Limit	Percent Removal	Range
5-day Biochemical Oxygen Demand	30 mg/L	45 mg/L	85%	----
	900.7 lbs/day	1351.1 lbs/day	85%	----
Total Suspended Solids	30 mg/L	45 mg/L	85%	----
	900.7 lbs/day	1351.1 lbs/day	85%	----
Fecal Coliform Bacteria	----	200 colonies/100 ml	---	----
pH	----	----	----	6.0 - 9.0 standard units

TABLE 2
Water Quality Based Effluent Limits

Parameter	Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit	Range
Total Suspended Solids	15 mg/L	30 mg/L	----	----
	450.4 lbs/day	900.7 lbs/day	----	----
pH	----	----	----	6.5 - 8.5 standard units
Fecal Coliform Bacteria	100 colonies/100 ml	----	800 colonies/100 ml	----
Total Residual Chlorine	9.0 µg/L	----	18.0 µg/L	----
	0.3 lbs/day		0.5 lbs/day	
Total Phosphorus May 15 - October 15	0.136 mg/L	0.27 mg/L	----	----
	4.1 lbs/day	8.2 lbs/day	----	----
Total Ammonia April 1 - October 31	1.0 mg/L	----	2.0 mg/L	----
	30.0 lbs/day	----	60.0 lbs/day	----
Total Ammonia November 1 - March 31	1.7 mg/L	----	3.5 mg/L	----
	51.0 lbs/day	----	105.1 lbs/day	----
Temperature	see Appendix C	----	----	----

Additional Requirements:
1. There shall be no discharge of floating solids or visible foam in other than trace amounts, or oily wastes which produce a sheen on the surface of the receiving water.
2. At a minimum, Dissolved Oxygen shall be 8.0 mg/L.

TABLE 3
Proposed Effluent Limitations

Parameter	Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit	Percent Removal	Range
5-day Biochemical Oxygen Demand	30 mg/L	45 mg/L	----	85%	----
	900.7 lbs/day	1351.1 lbs/day	----	85%	----
Total Suspended Solids	15 mg/L	30 mg/L	----	85%	----
	450.4 lbs/day	900.7 lbs/day	----	85%	----
pH	----	----	----	----	6.5 - 8.5 standard units
Fecal Coliform Bacteria	100 colonies/100 ml	200 colonies/100 ml	800 colonies/100 ml	----	----
Total Residual Chlorine, µg/L	9.0 µg/L	----	18.0 µg/L	----	----
	0.3 lbs/day	---	0.5 lbs/day		
Total Phosphorus May 15 - October 15	0.136 mg/L	0.27 mg/L	----	----	----
	4.1 lbs/day	8.2 lbs/day	----	----	----
Total Ammonia April 1 - October 31	1.0 mg/L	----	2.0 mg/L	----	----
	30.0 lbs/day	----	60.0 lbs/day	----	----
Total Ammonia November 1 - March 31	1.7 mg/L	----	3.5 mg/L	----	----
	51.0 lbs/day	----	105.1 lbs/day	----	----
Temperature	see Appendix C	----	----	----	----

Additional Requirements:
1. There shall be no discharge of floating solids or visible foam in other than trace amounts, or oily wastes which produce a sheen on the surface of the receiving water.
2. At a minimum, Dissolved Oxygen shall be 8.0 mg/L.

E. Sewage Sludge (Biosolids) Requirements

The biosolids management regulations at 40 CFR 503 were designed to be directly enforceable against most users or disposers of biosolids, whether or not they obtain a permit. The publication of Part 503 in the *Federal Register* on February 19, 1993 served as notice to the regulated community of its duty to comply with the requirements of the rule, with the exception of those requirements that will be specified by the permitting authority.

Even though 40 CFR 503 is largely self-implementing, Section 405(f) of the CWA requires the inclusion of biosolids use or disposal requirements in any NPDES permit issued to a Treatment Works Treating Domestic Sewage (TWTDS). In addition, the biosolids permitting regulations in 40 CFR 122 and 124 have been

revised to expand its authority to issue NPDES permits with these requirements. This includes all biosolids generators, biosolids treaters and blenders, surface disposal sites and biosolids incinerators. Therefore, the requirements of 40 CFR 503 have to be met when biosolids is applied to the land, placed on a surface disposal site, placed on a municipal solid waste landfill (MSWLF) unit, or fired in a biosolids incinerator.

Requirements are included in 40 CFR 503 for pollutants in biosolids, the reduction of pathogens in biosolids, the reduction of the characteristics in biosolids that attract vectors, the quality of the exit gas from a biosolids incinerator stack, the quality of biosolids that is placed in a MSWLF unit, the sites where biosolids is either land applied or placed for final disposal, and for a biosolids incinerator.

NPDES Biosolids Only permits have not yet been issued to any composting facilities in Idaho. The biosolids practices are still regulated, however, because all composting facilities are automatically subject to all the requirements in the current federal standards (40 CFR 503), and are subject to state solid waste permitting.

To ensure compliance with the CWA and federal standards for the use or disposal of biosolids (40 CFR 503), the draft permit contains the following requirements:

1. Biosolids Transfer: Biosolids from the wastewater treatment facility are anaerobically digested. Final biosolids are dewatered by belt filter press and trucked to a regional composting facility for disposal. The facility produces approximately 227 dry metric tons of biosolids per year. The receiving facility uses the biosolids in the production of Class A[2] compost that is placed in bags for sale or give-away. The draft permit authorizes the transfer of biosolids to a composting facility located in Idaho, for the purpose of producing compost that will be land-applied.

2. Disposal of Biosolids: To ensure that biosolids from the facility are being properly disposed of, the permittee must take reasonable steps to ensure that the facility receiving its biosolids is complying with the applicable portions of 40 CFR 503.

3. State Laws and Federal Standards: Pursuant to 40 CFR 122.41(a), a condition has been incorporated into the draft permit requiring the Permittee to comply with all existing federal and state laws, and all applicable regulations applying to biosolids use and disposal. These standards are interpreted using *Part 503 Implementation Guidance*, EPA 833-R-95-001, and *Environmental Regulations and Technology: Control of Pathogens and Vector Attraction in Sewage Sludge*, EPA/625/R-92/013. These documents are used by EPA Region 10 as the primary technical references for both permitting and enforcement activities.

4. Health and Environmental General Requirement: The CWA requires that the

[2] Class A - means the biosolids must meet the Class A pathogen reduction requirements outlined in 40 CFR 503.32.

environment and public health be protected from toxic effects of any pollutants in biosolids. Therefore, the Permittee must handle and use/dispose of biosolids in such a way as to protect human health and the environment.

5. Protection of Surface Waters from Biosolids Pollutants: Section 405(a) of the CWA prohibits any practice where biosolids pollutants removed in a treatment works at one location would ultimately enter surface waters at another location. Under this requirement the Permittee must protect surface waters from metals, nutrients, and pathogens contained in the biosolids.

6. Notification: A condition has been incorporated into the permit to comply with 40 CFR 503.12(g) which requires the Permittee to provide the receiving facility necessary information to comply with the requirements of the biosolids regulations.

7. Monitoring Requirements: The draft permit requires that biosolids samples be representative of the variability in biosolids quality, and that location, season, processing and handling also be considered when planning sample collection (see 40 CFR 503.8). At a minimum, sampling frequency must be in accordance with 40 CFR 503.16.

8. Contingency Plan: Since treatment processes are dependent on mechanical systems, there is a potential for periods of break-down, major repair, or maintenance. An assessment of the maximum duration of any period when the receiving facility may be unavailable for biosolids disposal is necessary to maintain compliance with 40 CFR 503. The contingency plan must be prepared within 18 months of the effective date of the permit. If any measures or changes are needed so that safe disposal will always be available, those changes must be implemented within 36 months from the effective date of the permit.

9. Record keeping: 40 CFR 503.17 requires the Permittee to retain records of biosolids pollutant concentrations for a minimum of five years. In addition, the EPA is also requiring the Permittee to keep a record of the receiving facility, and the company that transfers the biosolids to the receiving facility.

10. Reporting: At a minimum, 40 CFR 503.18 specifies that certain facilities report annually the information that they are required to develop and retain under the record keeping requirements specified at 503.17. This requirement applies to Permittees defined as Class I management facilities, POTWs with a flow rate equal to or greater than (one million gallons per day) mgd, and POTWs serving a population of 10,000 or greater. The EPA is requiring the submittal of information retained under the Record keeping requirement discussed above, as well as the following information: (1) number of samples collected during the monitoring period, (2) sample collection techniques and analytical methods.

11. Inspection and access: The Permittee must notify the receiving facility and any other affected party that, for inspection purposes, EPA must have access to any facility where the Permittee's biosolids are transported, stored, processed, or

disposed.

F. Antidegradation

In proposing to issue this permit, EPA has considered Idaho's antidegradation policy (IDAPA 16.01.02051.01). This policy states in part, that "the existing in stream water uses and the level of water quality necessary to protect the existing uses will be maintained and protected." The "level of water necessary to protect the existing uses" is defined by the State's water quality standards. Meeting these standards will ensure that existing uses will be protected. The limits in the draft permit are consistent with the state standards. Therefore, the draft permit is consistent with Idaho's antidegradation policy.

VI. MONITORING REQUIREMENTS

A. Quality Assurance Plan

The draft permit requires the Permittee to develop and a submit a Quality Assurance Plan to ensure that the monitoring data submitted is accurate. The Quality Assurance Plan consists of standard operating procedures the Permittee must follow for collecting, handling, storing and shipping samples, laboratory analysis, and data reporting.

B. Effluent Monitoring

Under Section 308 of the CWA and 40 CFR 122.44(i), EPA must include monitoring requirements in the permit to determine compliance with effluent limitations. Effluent and ambient monitoring may also be required to gather data for future effluent limitations or to monitor effluent impacts on receiving water quality. Table 4 presents the proposed monitoring requirements based on the minimum sampling necessary to adequately monitor the facility's performance. The draft permit requires influent and effluent monitoring for the following parameters.

TABLE 4
Effluent Monitoring

Parameter	Sample Location	Sample Frequency	Sample Type
Flow, mgd	Effluent	Continuous	Recording
Five-day Biochemical Oxygen Demand, mg/L	Influent and Effluent	3/week	24-hour composite
Total suspended solids, mg/L	Influent and Effluent	3/week	24-hour composite
Fecal Coliform Bacteria, colonies/100 ml	Effluent	5/week	Grab
Total Residual Chlorine, µg/L	Effluent	1/week	Grab
pH, standard units	Effluent	3/week	Grab
Ammonia as N, mg/L	Effluent	1/week	24-hour composite
Dissolved Oxygen, mg/L	Effluent	3/week	Grab
Temperature, °C	Effluent	Daily	Grab
Total Phosphorus[1], mg/L	Effluent	1/week	24-hour composite
WET, TU_c	Effluent	1/5 year	24-hour composite
1. Monitoring for total phosphorus shall occur from May 15 through October 15.			

C. Ambient Monitoring

The Permittee shall implement a receiving water monitoring program. The data collected will be used in the next permitting cycle to ensure water quality standards are being achieved. The following parameters shall be sampled.

TABLE 5
Ambient Monitoring

Parameter	Upstream	Downstream	Frequency
Flow, mgd	Recording	---	Continuous
Five-Day Biochemical Oxygen Demand, mg/L	Grab	---	3/week
Dissolved Oxygen, mg/L	Grab	Grab	3/week
Temperature, °C	Grab	Grab	Daily
pH, standard units	Grab	---	3/week

VII. OTHER LEGAL REQUIREMENTS

A. Compliance Schedule

Section 16.01.02400.03 of the *Idaho Water Quality Standards and Treatment Requirements* allow discharge permits to incorporate compliance schedules which allow a discharger to phase in compliance with water quality-based effluent limits when new limits are in the permit for the first time. This permit is incorporating water quality-based effluent limits for total suspended solids, dissolved, total phosphorus, flow (to implement the temperature criteria), and total ammonia for the first time. The permit requires compliance with the effluent limitations for total suspended solids, dissolved oxygen, flow, and ammonia by February 1, 2002, and compliance with the effluent limitations for total phosphorus within five years from the effective date of the permit. The Permittee will be required to submit annual reports which document progress towards meeting the final compliance level (40 CFR 122.47).

B. Endangered Species Act

The Endangered Species Act requires federal agencies to consult with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service if their actions could beneficially or adversely affect any threatened or endangered species. U.S. Fish and Wildlife did not list any proposed or candidate species in the area of the discharge.

In a letter dated January 29, 1998, the National Oceanic and Atmospheric Administration, National Marine Fisheries Service stated that anadromous fish do not occur in Paradise Creek. Available information indicates that ESA listed Snake River steelhead, Snake River fall chinook salmon, and designated critical habitat for fall chinook salmon occur downstream form Paradise Creek, in the Palouse River below Palouse Falls. EPA has determined that issuance of this permit will not affect any of the endangered species in the vicinity of the discharge.

C. State Certification

Because state waters are involved in this permitting action, the provisions of Section 401 of the Clean Water Act apply. In accordance with 40 CFR 124.10(c)(1), public notice of the draft permit has been provided to the State of Idaho agencies having jurisdiction over fish, shellfish, and wildlife resources.

D. Length of Permit

This permit shall expire five years from the effective date of the permit.

APPENDIX A
Water Quality Criteria

This appendix is divided into three sections. Section I outlines the State of Idaho water quality criteria that are applicable to Paradise Creek. Section II outlines the State of Washington water quality criteria applicable to Paradise Creek. Section III compares the Idaho and Washington water quality criteria and lists whichever criterion is more stringent. The criteria in section III are the criteria that were used to develop the draft permit limits for the City of Moscow.

I. *Idaho Water Quality Criteria*

Idaho water quality standards include criteria necessary to protect designated beneficial uses. The standards are divided into three section: General Water Quality Criteria, Surface Water Quality Criteria for Use Classifications, and Site-Specific Surface Water Quality Criteria. The following criteria are applicable to Paradise Creek:

IDAPA 16.01.02.200.03: Surface waters of the State shall be free from deleterious materials in concentrations that may impair designated beneficial uses.

IDAPA 16.01.02.200.05: Surface waters of the State shall be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses. This matter does not include suspended sediment produced as a result of non-point source activities.

IDAPA 16.01.02.200.06: Surface waters of the State shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses.

IDAPA 16.01.02.200.07: Surface waters of the State shall be free from oxygen demanding materials in concentrations that would result in an anaerobic water condition.

IDAPA 16.01.02.200.08: Sediment shall not exceed qualities specified in Section 250, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350.02.b. Subsection 350.02.b generally describes the best management practice (BMP) feedback loop for non-point source activities.

IDAPA 16.01.02.250.01.b: Waters designated for secondary contact recreation are not to contain fecal coliform bacteria significant to the public health in concentrations exceeding:

i. 800/100 ml. at any time; and
ii. 400/100 ml. in more than ten percent (10%) of the total samples taken over a thirty (30) day period; and
iii. A geometric mean of 200/100 ml. Based on a minimum of five (5) samples taken over a thirty day period.

IDAPA 16.01.02.250.02.a: Waters designated for aquatic life use (warm water or cold water):

I. Hydrogen Ion Concentration (pH) values within the range of 6.5 to 9.5.

iii. Total residual chlorine: One (1) hour average concentration not to exceed nineteen (19) µg/L; Four (4) day average concentration not to exceed eleven (11) µg/L.

IDAPA 16.01.02.250.02.c: Waters designated for cold water biota are to exhibit the following characteristics:

I. Dissolved oxygen concentrations exceeding 6 mg/L at all times.

ii. Water temperatures of 22°C or less with a maximum daily average of no greater than 19°C.

iii. Ammonia:

One (1) hour average concentration of un-ionized ammonia as N is not to exceed (0.43/A/B/2) mg/L, where:
A=1 if water temperature is greater than or equal to 20°C, or
$A=10^{(0.03(20-T))}$ if T is less than 20°C, and
B=1 if the pH is greater than or equal to 8; or
$B=(1+10^{(7.4-pH)})/1.25$ if pH is less than 8

Four day average concentration of un-ionized ammonia as N is not to exceed (0.66/A/B/C) mg/L, where:
A=1.4 if the water temperature is greater than or equal to 15°C, or
$A=10^{(0.03(20-T))}$ if T is less than 15°C, and
B=1 if the pH is greater than or equal to 8; or
$B=(1+10^{(7.1-pH)})/1.25$ if pH is less than 8, and
C=13.5 if pH is greater than or equal to 7.7, or
$C=20(10^{7.7-pH})/(1\div10^{7.4-pH})$if the pH is less than 7.7.

Criteria (April 1 - October 31)
The *Paradise Creek TMDL, Water Body Assessment and Total Maximum Load* based the ammonia criteria on a temperature of 22.3°C and a pH of 7.56 standard units. Using these parameters the total ammonia acute aquatic life criterion is 11.4 mg/L and the chronic aquatic life criterion is 1.5 mg/L.

Criteria (November 1 - March 31)
The *Paradise Creek TMDL, Water Body Assessment and Total Maximum Load* based the ammonia criteria on a temperature of 13.6°C and a pH of 7.47 standard units. Using these parameters the total ammonia acute aquatic life criterion is 12.8 mg/L and the chronic aquatic life criterion is 1.8 mg/L.

iv. Turbidity below any applicable mixing zone set by the department, shall not exceed background turbidity by more than 50 NTU instantaneously or more than 25 NTU for more than ten (10) consecutive days.

II. *Washington Water Quality Criteria*

WAC 173-201A-030(2)(c)

(I) Fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100ml and not have more than 10 percent or all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 ml.

(ii) Dissolved oxygen shall exceed 8.0 mg/L.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 18°C due to human activities. When natural conditions exceed 18°C, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

(v) pH shall be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

(vi) turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

Total residual chlorine: Acute aquatic life concentration not to exceed nineteen (19) µg/L; Chronic aquatic life concentration not to exceed eleven (11) µg/L.

Ammonia:
Acute concentration of un-ionized ammonia as NH_3 is not to exceed
(0.52 ÷(FT)(FPH)(2) mg/L, where:
=1 if water temperature is greater than or equal to 20°C, or
$FT=10^{(0.03(20-TCAP))}$; $TCAP \leq T \leq 30$
$FT=10^{(0.03(20-T))}$; $0 \leq T \leq TCAP$
FPH=1; $8 \leq pH \leq 9$
$FPH=(1+ 10^{7.4-pH}) \div 1.25$; $6.5 \leq pH \leq 8.0$
TCAP = 20°C; when salmonids present
TCAP = 25°C; when salmonids absent

Chronic concentration of un-ionized ammonia as NH_3 is not to exceed
0.80 ÷ (FT)(FPH)(RATIO) where
RATIO = 13.5; $7.7 \leq pH \leq 9.0$
$RATIO = 20.25 \times 10^{(7.7-pH)} \div (1+ 10^{(7.4-pH)})$; $6.5 \leq pH \leq 7.7$, where
FT and FPH are as shown above for the acute criterion except

TCAP = 15°C; when salmonids present
TCAP = 20°C; when salmonids absent

Criteria (April 1 - October 31)
The *Paradise Creek TMDL, Water Body Assessment and Total Maximum Load* based the ammonia criteria on a temperature of 22.3°C and a pH of 7.56 standard units. Using these parameters the total ammonia acute aquatic life criterion is 9.4 mg/L and the chronic aquatic life criterion is 1.2 mg/L.

Criteria (November 1 - March 31)
The *Paradise Creek TMDL, Water Body Assessment and Total Maximum Load* based the ammonia criteria on a temperature of 13.6°C and a pH of 7.47 standard units. Using these parameters the total ammonia acute aquatic life criterion is 12.9 mg/L and the chronic aquatic life criterion is 2.1 mg/L.

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

III. *Criteria Used to Develop Effluent Limits for the City of Moscow*

IDAPA 16.01.02.200.03: Surface waters of the State shall be free from deleterious materials in concentrations that may impair designated beneficial uses.

IDAPA 16.01.02.200.05: Surface waters of the State shall be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses. This matter does not include suspended sediment produced as a result of non-point source activities.

IDAPA 16.01.02.200.06: Surface waters of the State shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses.

IDAPA 16.01.02.200.07: Surface waters of the State shall be free from oxygen demanding materials in concentrations that would result in an anaerobic water condition.

IDAPA 16.01.02.200.08: Sediment shall not exceed qualities specified in Section 250, or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in Subsection 350.02.b. Subsection 350.02.b generally describes the BMP feedback loop for non-point source activities.

IDAPA 16.01.02.250.01.b.i: Waters designated for secondary contact recreation are not to contain fecal coliform bacteria significant to the public health in concentrations exceeding 800/100 ml. at any time.

WAC 173-201A-030(2)(c)(I): Fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100mL and not have more than 10 percent or all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 ml.

IDAPA 16.01.02.250.02.a.iii: Total residual chlorine: One (1) hour average concentration not to exceed nineteen (19) µg/L; Four (4) day average concentration not to exceed eleven (11) µg/L.

IDAPA 16.01.02.250.02.a.iv.: Turbidity below any applicable mixing zone set by the department, shall not exceed background turbidity by more than 50 NTU instantaneously or more than 25 NTU for more than ten (10) consecutive days.

WAC 173-201A-030(2)(c) ii.: Dissolved oxygen shall exceed 8.0 mg/L.

WAC 173-201A-030(2)(c) iv.: Temperature shall not exceed 18°C due to human activities. When natural conditions exceed 18°C, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

WAC 173-201A-030(2)(c) v: pH shall be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

WAC 173-2201-040(3): Ammonia Criteria:
April 1 - October 31: acute aquatic life criterion is 9.4 mg/L; chronic aquatic life criterion is 1.2 mg/L.
November 1 - March 31: acute aquatic life criterion is 12.9 mg/L; chronic aquatic life criterion is 2.1 mg/L.

APPENDIX B
Derivation of Water Quality-Based Effluent Limits

1. TOTAL PHOSPHORUS

Federal regulations at 40 CFR 122.44(d)(vii)(B) require EPA to incorporate effluent limits based on WLAs from the State's watershed management plan into NPDES permits.

In translating the wasteload allocation (WLA) into permit limits, EPA followed the procedures in the *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001, March 1991, TSD). The first step in developing limits is to determine the time frame over which the WLAs apply. In general, the period over which a criterion applies is based on the length of time the target organism can be exposed to the pollutant without adverse effect. For example, aquatic life criteria generally apply as one-hour averages (acute criteria) or four-day averages (chronic criteria). In the case of total phosphorus, the target organisms are aquatic vegetation which respond to high phosphorus concentrations with excess growth, resulting in eutrophication. The period over which this effect occurs is uncertain. However, EPA believes that applying the WLA as a monthly average is appropriate.

The WLAs must then be statistically converted to average weekly and monthly average permit limits. In this case, because the averaging period for the pollutant is monthly, no conversion is necessary and the monthly average permit limits are equal to the WLAs. Derivation of the average weekly permit limit from the monthly average limit is based in part on the coefficient of variation (CV) for the effluent at the facility. Because Moscow is planning to upgrade their facility the data collected in the past will not accurately represent the effluent from the upgraded facility. The TSD recommends using a default CV of 0.6.

a) Average Monthly Limit: The TMDL provided the City of Moscow with a WLA of 0.136 mg/L. Based on the WLA, the average monthly limit is 0.136 mg/L.

b) Average Weekly Limit: The average weekly limit is calculated by using the following relationship:

$$\frac{\text{Average Weekly Limit}}{\text{Average Monthly Limit}} = \frac{\exp[Z_m \sigma - .5\sigma^2]}{\exp[Z_a \sigma_n - .5\sigma_n^2]}$$

CV = 0.6
n = 4 (number of sampling events per month)
σ_n^2 = $\ln(CV^2/n + 1) = \ln(.6^2/4 + 1) = 0.08618$
σ^2 = $\ln(CV^2 + 1) = \ln(.6^2 + 1) = 0.307$
Z_m = percentile exceedance probability for AWL (99%) = 2.326
Z_a = percentile exceedance probability for AML (95%) = 1.645

$$\frac{\text{average monthly limit}}{\text{average weekly limit}} = \frac{3.11}{1.55} = 2.01$$

Average weekly limit = 2.01 X 0.136 mg/L = 0.273 mg/L

c) Average Monthly Loading: The allowable monthly loading of TSS is as follows:

Loading = (AML) X (design flow) X (8.34) =
Loading = (0.136 mg/L) X (3.6 mgd) X (8.34) = 4.1 lbs/day

d) Average Weekly Loading: The allowable weekly loading is as follows:

Loading = (AWL) X (design flow) X (8.34) =
Loading = (0.273 mg/L) X (3.6 mgd) X (8.34) = 8.2 lbs/day

2. TURBIDITY/TOTAL SUSPENDED SOLIDS

In the case of turbidity, the target organisms are aquatic life. The Idaho water quality standards state that turbidity below any applicable mixing zone set by the department, shall not exceed background turbidity by more than 50 NTU instantaneously or more than 25 NTU for more than ten (10) consecutive days.

Studies conducted in Paradise Creek by the Washington Department of Ecology (Joy, 1987) indicate that the total suspended solids/turbidity relation in Paradise Creek is about 2:1. Based on this relationship between turbidity and total suspended solids, the total suspended solids in Paradise Creek shall not exceed 100 mg/L instantaneous, or more than 50 mg/L for more than 10 consecutive days (*Paradise Creek TMDL, Water Body Assessment and Total Maximum Load*). IDEQ believes the applying the WLA for total suspended solids as a monthly average is appropriate.

The WLA for total suspended solids must then be statistically converted to average monthly limit and average weekly limit. In this case, because the averaging period for the pollutant is monthly, no conversion is necessary and the monthly average permit limits are equal to the WLAs. Derivation of the average weekly limit from the monthly average limit is based in part on the coefficient of variation (CV) for the effluent. Because Moscow is planning to upgrade their facility the data collected in the past will not accurately represent the effluent from the upgraded facility. The TSD recommends using a default CV of 0.6.

a) Average Monthly Limit: The TMDL provided the City of Moscow with a WLA of 15 mg/L. Based on the WLA, the average monthly limit is 15 mg/L.

b) Average Weekly Limit: The average weekly limit is calculated by using the following relationship:

$$\frac{\text{Average Weekly Limit}}{\text{Average Monthly Limit}} = \frac{\exp[Z_m \sigma - .5\sigma^2]}{\exp[Z_a \sigma_n - .5\sigma_n^2]}$$

CV = .6
n = 4 (number of sampling events per month)
$\sigma_n^2 = \ln(CV^2/n + 1) = \ln(.6^2/4 + 1) = .08618$
$\sigma^2 = \ln(CV^2 + 1) = \ln(.6^2 + 1) = .307$
Z_m = percentile exceedance probability for AWL (99%) = 2.326
Z_a = percentile exceedance probability for AML (95%) = 1.645

$$\frac{\text{Average Weekly Limit}}{\text{Average Monthly Limit}} = \frac{3.11}{1.55} = 2.01$$

Average Weekly Limit = 2.01 X 15 mg/L = 30 mg/L

c) Average Monthly Loading: The allowable monthly loading of total suspended solids is as follows:

Loading = (AML) X (design flow) X (8.34) =
Loading = (15 mg/L) X (3.6 mgd) X (8.34) = 450.4 lbs/day

d) Average Weekly Loading: The allowable weekly loading is as follows:

Loading = (AWL) X (design flow) X (8.34) =
Loading = (30 mg/L) X (3.6 mgd) X (8.34) = 900.7 lbs/day

3. TOTAL AMMONIA

The period over which a criterion applies is based on the length of time the target organism can be exposed to the pollutant without adverse effect. The target organism in this case is aquatic life. The aquatic life criteria for ammonia apply as a one-hour average (acute criteria) and a four-day average (chronic criteria). The following is a summary of the procedures recommended in the TSD in deriving water quality-based effluent limitations for toxicants. This procedure translates water quality criteria to "end of the pipe" effluent limits.

Step 1

The acute and chronic criteria are converted to acute and chronic waste load allocations (WLA_{acute} or $WLA_{chronic}$) for the receiving waters based on the following mass balance equation:

$$Q_dC_d = Q_eC_e + Q_uC_u$$

where, Q_d = downstream flow = $Q_u + Q_e$
C_d = aquatic life criteria that cannot be exceeded downstream
Q_e = effluent flow
C_e = concentration of pollutant in effluent = WLA_{acute} or $WLA_{chronic}$
Q_u = upstream flow
C_u = upstream background concentration of pollutant

Rearranging the above equation to determine the effluent concentration (C_e) or the wasteload allocation results in the following:

$$C_e = WLA = \frac{Q_dC_d - Q_uC_u}{Q_e}$$

when a mixing zone is allowed, this equation becomes:

$$= \frac{C_d(Q_u \text{ X } \%MZ) + C_dQ_e}{Q_e} - \frac{Q_uC_u(\%MZ)}{Q_e}$$

where, %MZ is the mixing zone[3] allowable by the state standards. Establishing a mixing zone is a State discretionary function. Because Paradise Creek flows are so low, a mixing zone in not appropriate. When there is no mixing zone the WLA equation is as follows:

$$C_e = WLA = \frac{C_d(Q_u \text{ X } 0) + C_dQ_e}{Q_e} - \frac{Q_uC_u(0)}{Q_e} =$$

$$C_e = WLA = \frac{C_dQ_e}{Q_e} = C_d$$

Therefore,

[3] Mixing zone - is an allocated impact zone where water quality criteria can be exceeded as long as acutely toxic conditions are prevented. Only the State of Idaho has the regulatory authority to grant a mixing zone.

$C_e = WLA_{acute}$ = acute aquatic life criteria, and
$C_e = WLA_{chronic}$ = chronic aquatic life criteria.

therefore,

a) April 1 - October 31:

Ammonia WLA_{acute} = 9.4 mg/L
Ammonia $WLA_{chronic}$ = 1.2 mg/L

b) November 1 - March 31:

Ammonia WLA_{acute} = 12.9 mg/L
Ammonia $WLA_{chronic}$ = 2.13 mg/L

Step 2

The acute and chronic WLAs are then converted to Long Term Average concentrations (LTA_a and LTA_c) using the following equations:

$LTA_{acute} = WLA_{acute} \text{ X } e^{[0.5\sigma^2 - z\sigma]}$
where
$\sigma^2 = \ln(CV^2 + 1)$
$z = 2.326$ for 99^{th} percentile probability basis
CV = coefficient of variation = standard deviation/mean (if information is not available EPA recommends using .6 for the CV. Since Moscow will be updating their plant in the future .6 will be used as the CV.

$LTA_{chronic} = WLA_{chronic} \text{ X } e^{[0.5\sigma^2 - z\sigma]}$

where
$\sigma^2 = \ln(CV^2/4 + 1)$
$z = 2.326$ for 99^{th} percentile probability basis
CV = coefficient of variation = standard deviation/mean

Step 3

Using the equations in step 2 calculate the LTA_{acute} and the $LTA_{chronic}$
a. April 1 - October 31:

Ammonia LTA_{acute} = 3.01
Ammonia $LTA_{chronic}$ = 0.63

b. November 1 - March 31:

Ammonia LTA_{acute} = 4.14
Ammonia $LTA_{chronic}$ = 1.12

Step 4

To protect a water body from both acute and chronic effects, the more limiting of the calculated LTA_{acute} and $LTA_{chronic}$ is used to derive the effluent limitations. The TSD recommends using the 95^{th} percentile for the average monthly limit and the 99^{th} percentile for the maximum daily imit.

Step 5

To derive the maximum daily imit and the average monthly limit for ammonia the calculations would be as follows:

maximum daily limit = $LTA_{chronic}$ X $e^{[z\sigma-0.5\sigma^2]}$
where,
$\sigma^2 = \ln(CV^2 + 1)$
z = 2.326 for 99^{th} percentile probability basis
CV = coefficient of variation = 0.6

average monthly limit = $LTA_{chronic}$ X $e^{[z\sigma- 0.5\sigma^2]}$
where,
$\sigma^2 = \ln(CV^2/n + 1)$
z = 1.645 for 95^{th} percentile probability basis
CV = coefficient of variation = 0 .6
n = number of sampling events required per month = 4

a) The effluent limits from April 1 through October 31 are:

maximum daily limit = 2.0 mg/L
maximum daily load = (2.0 mg/L) X (3.6 mgd) X (8.34) = 60.0 lbs/day

average monthly limit = 1.0 mg/L
average monthly load = (1.0 mg/L) X (3.6 mgd) X (8.34) = 30.0 lbs/day

b) The effluent limits from November 1 through March 31 are:

maximum daily limit = 3.5 mg/L
maximum daily load = (3.5 mg/L) X (3.6 mgd) X (8.34) = 105.1 lbs/day

average monthly limit = 1.7 mg/L
average monthly load = (1.7 mg/L) X (3.6 mgd) X (8.34) = 51.0 lbs/day

4. TOTAL RESIDUAL CHLORINE

Step 1

The period over which a criterion applies is based on the length of time the target organism can be exposed to the pollutant without adverse effect. The target organism in this case is aquatic life. The aquatic life criteria for chlorine apply as a one-hour average (acute criteria) and a four-day average (chronic criteria). The acute and chronic criteria are converted to acute and chronic waste load allocations (WLA_{acute} or $WLA_{chronic}$). Because there is no mixing zone the WLA is equal to the criterion, therefore

WLA_{acute} = 19 µg/L
$WLA_{chronic}$ = 11 µg/L

Step 2

The acute and chronic WLAs are then converted to Long Term Average concentrations (LTA_a and LTA_c) using the following equations:

$LTA_{acute} = WLA_{acute} \times e^{[0.5\sigma^2 - z\sigma]}$
where,
$\sigma^2 = \ln(CV^2 + 1)$
z = 2.326 for 99th percentile probability basis
CV = coefficient of variation = standard deviation/mean (if information is not available EPA recommends using .6 for the CV. Since Moscow will be updating their plant in the future .6 will be used as the CV.

$LTA_{chronic} = WLA_{chronic} \times e^{[0.5\sigma^2 - z\sigma]}$

where,
$\sigma^2 = \ln(CV^2/4 + 1)$
z = 2.326 for 99th percentile probability basis
CV = coefficient of variation = standard deviation/mean

Step 3

Using the equations in step 2 calculate the LTA_{acute} and the $LTA_{chronic}$

Chlorine LTA_{acute} = 6.1
Chlorine $LTA_{chronic}$ = 5.8

Step 4

To protect a water body from both acute and chronic effects, the more limiting of the calculated LTA_{acute} and $LTA_{chronic}$ is used to derive the effluent limitations. The TSD recommends using the 95th percentile for the average monthly limit, and the 99th percentile for the maximum daily limit.

Step 5

To derive the maximum daily limit and the average monthly limit for chlorine the calculations would be as follows:

maximum daily limit = $LTA_{chronic}$ X $e^{[z\sigma-0.5\sigma^2]}$
where,
$\sigma^2 = \ln(CV^2 + 1)$
z = 2.326 for 99th percentile probability basis
CV = coefficient of variation = 0.6
maximum daily limit = 5.8 X 3.11 = 18 µg/L
maximum daily load = (.018 mg/L) X (3.6 mgd) X (8.34) = 0.5 lbs/day

average monthly limit = $LTA_{chronic}$ X $e^{[z\sigma- 0.5\sigma^2]}$
where,
$\sigma^2 = \ln(CV^2/n + 1)$
z = 1.645 for 95th percentile probability basis
CV = coefficient of variation = .6
n = number of sampling events required per month = 4
average monthly limit = 5.8 X 1.55 = 9.0 µg/L
average monthly load = (0.009 mg/L) X (3.6 mgd) X (8.34) = 0.3 lbs/day

APPENDIX C
Allowable Effluent Flow

The following tables provide the effluent flow (cfs) the City of Moscow wastewater treatment facility is allowed to discharge to Paradise Creek. To determine the allowable effluent flow the temperature and flow of Paradise Creek upstream of the facility's outfall, and the effluent temperature must be known. Once these parameters are known the allowable effluent flow can be found in the following tables. For example if the Paradise Creek temperature is 4°C, the Paradise Creek flow is 5 cfs, and the effluent temperature is 19°C then the allowable flow that the facility can discharge is 70 cfs (see Table C-1).

TABLE C-1
Allowable Effluent Flow (cfs) When
Effluent Temperature = 19°C

Paradise Creek Flow (cfs)	Paradise Creek Temperature, °C																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0.5	9	8.5	8	7.5	7	6.5	6	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	0.5	0
1	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8	6	4	2	0
3	54	51	48	45	42	39	36	33	30	27	24	21	18	15	12	9	6	3	0
4	72	68	64	60	56	52	48	44	40	36	32	28	24	20	16	12	8	4	0
5	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	0
6	108	102	96	90	84	78	72	66	60	54	48	42	36	30	24	18	12	6	0
7	126	119	112	105	98	91	84	77	70	63	56	49	42	35	28	21	14	7	0
8	144	136	128	120	112	104	96	88	80	72	64	56	48	40	32	24	16	8	0
9	162	153	144	135	126	117	108	99	90	81	72	63	54	45	36	27	18	9	0
10	180	170	160	150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	0
15	270	255	240	225	210	195	180	165	150	135	120	105	90	75	60	45	30	15	0
20	360	340	320	300	280	260	240	220	200	180	160	140	120	100	80	60	40	20	0
25	450	425	400	375	350	325	300	275	250	225	200	175	150	125	100	75	50	25	0
30	540	510	480	450	420	390	360	330	300	270	240	210	180	150	120	90	60	30	0
40	720	680	640	600	560	520	480	440	400	360	320	280	240	200	160	120	80	40	0
50	900	850	800	750	700	650	600	550	500	450	400	350	300	250	200	150	100	50	0
100	1800	1700	1600	1500	1400	1300	1200	1100	1000	900	800	700	600	500	400	300	200	100	0
150	2700	2550	2400	2250	2100	1950	1800	1650	1500	1350	1200	1050	900	750	600	450	300	150	0
200	3600	3400	3200	3000	2800	2600	2400	2200	2000	1800	1600	1400	1200	1000	800	600	400	200	0
250	4500	4250	4000	3750	3500	3250	3000	2750	2500	2250	2000	1750	1500	1250	1000	750	500	250	0
300	5400	5100	4800	4500	4200	3900	3600	3300	3000	2700	2400	2100	1800	1500	1200	900	600	300	0
400	7200	6800	6400	6000	5600	5200	4800	4400	4000	3600	3200	2800	2400	2000	1600	1200	800	400	0
800	14400	13600	12800	12000	11200	10400	9600	8800	8000	7200	6400	5600	4800	4000	3200	2400	1600	800	0

TABLE C-2

Allowable Effluent Flow (cfs) When
Effluent Temperature = 20°C

Paradise Creek Flow (cfs)	Paradise Creek Temperature, °C																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0.5	4.5	4.3	4	3.8	3.5	3.3	3	2.8	2.5	2.3	2	1.8	1.5	1.3	1	0.8	0.5	0.3	0
1	9	8.5	8	7.5	7	6.5	6	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	0.5	0
2	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
3	27	26	24	23	21	20	18	17	15	14	12	11	9	7.5	6	4.5	3	1.5	0
4	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8	6	4	2	0
5	45	43	40	38	35	33	30	28	25	23	20	18	15	13	10	7.5	5.0	2.5	0
6	54	51	48	45	42	39	36	33	30	27	24	21	18	15	12	9	6	3	0
7	63	60	56	53	49	46	42	39	35	32	28	25	21	18	14	11	7	3.5	0
8	72	68	64	60	56	52	48	44	40	36	32	28	24	20	16	12	8	4	0
9	81	77	72	68	63	59	54	50	45	41	36	32	27	23	18	14	9	4.5	0
10	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	0
15	135	128	120	113	105	98	90	83	75	68	60	53	45	38	30	23	15	7.5	0
20	180	170	160	150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	0
30	270	255	240	225	210	195	180	165	150	135	120	105	90	75	60	45	30	15	0
50	450	425	400	375	350	325	300	275	250	225	200	175	150	125	100	75	50	25	0
100	900	850	800	750	700	650	600	550	500	450	400	350	300	250	200	150	100	50	0
150	1350	1275	1200	1125	1050	975	900	825	750	675	600	525	450	375	300	225	150	75	0
200	1800	1700	1600	1500	1400	1300	1200	1100	1000	900	800	700	600	500	400	300	200	100	0
250	2250	2125	2000	1875	1750	1625	1500	1375	1250	1125	1000	875	750	625	500	375	250	125	0
300	2700	2550	2400	2250	2100	1950	1800	1650	1500	1350	1200	1050	900	750	600	450	300	150	0
400	3600	3400	3200	3000	2800	2600	2400	2200	2000	1800	1600	1400	1200	1000	800	600	400	200	0
800	7200	6800	6400	6000	5600	5200	4800	4400	4000	3600	3200	2800	2400	2000	1600	1200	800	400	0

TABLE C-3
Allowable Effluent Flow (cfs) When
Effluent Temperature = 21 °C

Paradise Creek Flow (cfs)	Paradise Creek Temperature, °C																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0.5	.3	2.8	3	2.5	23	2.2	2	1.8	1.7	1.5	1	1.2	1	0.8	1	0.5	0.3	0.2	0
1	6	5.7	5.3	5	47	4.3	4	3.7	3.3	3	2.7	2.3	2	1.7	1.3	1	0.7	0.3	0
2	12	11	11	10	93	8.7	8	7.3	6.7	6	5.3	4.7	4	3.3	2.7	2	1.3	0.7	0
3	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4	24	23	21	20	19	17	16	15	13	12	11	9.3	8	6.7	5.3	4	2.7	1.3	0
5	30	28	27	25	23	22	20	18	17	15	13	12	10	8.3	6.7	5	3.3	1.7	0
6	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8	6	4	2	0
7	42	40	37	35	33	30	28	26	23	21	19	16	14	12	9.3	7	4.7	2.3	0
8	48	45	43	40	37	35	32	29	27	24	21	19	16	13	11	8	5.3	2.7	0
9	54	51	48	45	42	39	36	33	30	27	24	21	18	15	12	9	6	3	0
10	60	57	53	50	47	43	40	37	33	30	27	23	20	17	13	10	6.7	3.3	0
15	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	0
20	120	113	107	100	93	87	80	73	67	60	53	47	40	33	27	20	13	7	0
30	180	170	160	150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	0
50	300	283	267	250	233	217	200	183	167	150	133	117	100	83	67	50	33	17	0
00	600	567	533	500	467	433	400	367	333	300	267	233	200	167	133	100	67	33	0
50	900	850	800	750	700	650	600	550	500	450	400	350	300	250	200	150	100	50	0
200	1200	1133	1067	1000	933	867	800	733	667	600	533	467	400	333	267	200	133	67	0
250	1500	1417	1333	1250	1167	1083	1000	917	833	750	667	583	500	417	333	250	167	83	0
300	1800	1700	1600	1500	1400	1300	1200	1100	1000	900	800	700	600	500	400	300	200	100	0
400	2400	2267	2133	2000	1867	1733	1600	1467	1333	1200	1067	933	800	667	533	400	267	133	0
800	4800	4533	4267	4000	3733	3467	3200	2933	2667	2400	2133	1867	1600	1333	1067	800	533	267	0

TABLE C-4
Allowable Effluent Flow (cfs) When
Effluent Temperature = 22°C

Paradise Creek Flow (cfs)	Paradise Creek Temperature, °C																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0.5	2.3	2.1	2	1.9	1.8	1.6	1.5	1.4	1.3	1.1	1	0.9	0.8	0.6	0.5	0.4	0.3	0.1	0
1	4.5	4.3	4	3.8	3.5	3.3	3	2.8	2.5	2.3	2	1.8	1.5	1.3	1	0.8	0.5	0.3	0
2	9	8.5	8	7.5	7	6.5	6	5.5	5	4.5	4	3.5	3.0	2.5	2	1.5	1	0.5	0
3	14	13	12	11	11	9.8	9	8.3	7.5	6.8	6	5.3	4.5	3.8	3	2.3	1.5	0.8	0
4	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
5	23	21	20	19	18	16	15	14	13	11	10	8.8	7.5	6.3	5	3.8	2.5	1.3	0
6	27	26	24	23	21	20	18	17	15	14	12	11	9	7.5	6	4.5	3	1.5	0
7	32	30	28	26	25	23	21	19	18	16	14	12	11	8.8	7	5.3	3.5	1.8	0
8	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8	6	4	2	0
9	41	38	36	34	32	29	27	25	23	20	18	16	14	11	9	6.8	4.5	2.3	0
10	45	43	40	38	35	33	30	28	25	23	20	18	15	13	10	7.5	5	2.5	0
15	68	64	60	56	53	49	45	41	38	34	30	26	23	19	15	11	7.5	3.8	0
20	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	0
30	135	128	120	113	105	98	90	83	75	68	60	53	45	38	30	23	15	7.5	0
50	225	213	200	188	175	163	150	138	125	113	100	88	75	63	50	38	25	13	0
100	450	425	400	375	350	325	300	275	250	225	200	175	150	125	100	75	50	25	0
150	675	638	600	563	525	488	450	413	375	338	300	263	225	188	150	113	75	38	0
200	900	850	800	750	700	650	600	550	500	450	400	350	300	250	200	150	100	50	0
250	1125	1063	1000	938	875	813	750	688	625	563	500	438	375	313	250	188	125	63	0
300	1350	1275	1200	1125	1050	975	900	825	750	675	600	525	450	375	300	225	150	75	0
400	1800	1700	1600	1500	1400	1300	1200	1100	1000	900	800	700	600	500	400	300	200	100	0
800	3600	3400	3200	3000	2800	2600	2400	2200	2000	1800	1600	1400	1200	1000	800	600	400	200	0

TABLE C-5
Allowable Effluent Flow (cfs) When
Effluent Temperature = 23°C

Paradise Creek Flow (cfs)	Paradise Creek Temperature, °C																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0.5	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0
1	3.6	3.4	3.2	3	2.8	2.6	2.4	2.2	2	1.8	1.6	1.4	1.2	1	0.8	0.6	0.4	0.2	0
2	7.2	6.8	6.4	6	5.6	5.2	4.8	4.4	4	3.6	3.2	2.8	2.4	2	1.6	1.2	0.8	0.4	0
3	11	10	9.6	9	8.4	7.8	7.2	6.6	6	5.4	4.8	4.2	3.6	3	2.4	1.8	1.2	0.6	0
4	14	14	13	12	11	10	9.6	8.8	8	7.2	6.4	5.6	4.8	4	3.2	2.4	1.6	0.8	0
5	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
6	22	20	19	18	17	16	14	13	12	11	9.6	8.4	7.2	6	4.8	3.6	2.4	1.2	0
7	25	24	22	21	20	18	17	15	14	13	11	9.8	8.4	7	5.6	4.2	2.8	1.4	0
8	29	27	26	24	22	21	19	18	16	14	13	11	9.6	8	6.4	4.8	3.2	1.6	0
9	32	31	29	27	25	23	22	20	18	16	14	13	11	9	7.2	5.4	3.6	1.8	0
10	36	34	32	30	28	26	24	22	20	18	16	14	12	10	8	6	4	2	0
15	54	51	48	45	42	39	36	33	30	27	24	21	18	15	12	9	6	3	0
20	72	68	64	60	56	52	48	44	40	36	32	28	24	20	16	12	8	4	0
30	108	102	96	90	84	78	72	66	60	54	48	42	36	30	24	18	12	6	0
50	180	170	160	150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	0
100	360	340	320	300	280	260	240	220	200	180	160	140	120	100	80	60	40	20	0
150	540	510	480	450	420	390	360	330	300	270	240	210	180	150	120	90	60	30	0
200	720	680	640	600	560	520	480	440	400	360	320	280	240	200	160	120	80	40	0
250	900	850	800	750	700	650	600	550	500	450	400	350	300	250	200	150	100	50	0
300	1080	1020	960	900	840	780	720	660	600	540	480	420	360	300	240	180	120	60	0
400	1440	1360	1280	1200	1120	1040	960	880	800	720	640	560	480	400	320	240	160	80	0
800	2880	2720	2560	2400	2240	2080	1920	1750	1600	1440	1280	1120	960	800	640	480	320	160	0

TABLE C-6
Allowable Effluent Flow (cfs) When
Effluent Temperature = 24°C

Paradise Creek Flow (cfs)	Paradise Creek Temperature, °C																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0.5	1.5	1.4	1.3	1.3	1.2	1.1	1	0.9	0.8	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.1	0
1	3	2.8	2.7	2.5	2.3	2.2	2	1.8	1.7	1.5	1.3	1.2	1	0.8	0.7	0.5	0.3	0.2	0
2	6	5.7	5.3	5	4.7	4.3	4	3.7	3.3	3	2.7	2.3	2	1.7	1.3	1	0.7	0.3	0
3	9	9	8	7.5	7	6.5	6	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	0.5	0
4	12	11	11	10	9	9	8	7.3	6.7	6	5.3	4.7	4	3.3	2.7	2	1.3	0.7	0
5	15	14	13	13	12	11	10	9.2	8.3	7.5	6.7	5.8	5	4.2	3.3	2.5	1.7	0.8	0
6	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7	21	20	19	18	16	15	14	13	12	11	9	8.2	7	5.8	4.7	3.5	2.3	1.2	0
8	24	23	21	20	19	17	16	15	13	12	11	9	8	6.7	5.3	4	2.7	1.3	0
9	27	26	24	23	21	20	18	17	15	14	12	11	9	7.5	6	4.5	3	1.5	0
10	30	28	27	25	23	22	20	18	17	15	13	12	10	8.3	6.7	5	3.3	1.7	0
15	45	43	40	38	35	33	30	28	25	23	20	18	15	13	10	7.5	5	2.5	0
20	60	57	53	50	47	43	40	37	33	30	27	23	20	17	13	10	6.7	3.3	0
30	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10	5	0
50	150	142	133	125	117	108	100	92	83	75	67	58	50	42	33	25	17	8	0
100	300	283	267	250	233	217	200	183	167	150	133	117	100	83	67	50	33	17	0
150	450	425	400	375	350	325	300	275	250	225	200	175	150	125	100	75	50	25	0
200	600	567	533	500	467	433	400	367	333	300	267	233	200	167	133	100	67	33	0
250	750	708	667	625	583	542	500	458	417	375	333	292	250	208	167	125	83	42	0
300	900	850	800	750	700	650	600	550	500	450	400	350	300	250	200	150	100	50	0
400	1200	1133	1067	1000	933	867	800	733	667	600	533	467	400	333	267	200	133	67	0
800	2400	2267	2133	2000	1867	1733	1600	1467	1333	1200	1067	933	800	667	533	400	267	133	0

APPENDIX D

Facility Location