Best Management Practices Plan
Hagerman National Fish Hatchery

January 2011

NPDES Permit Number IDG130004

Facility Manager: Bryan Kenworthy, 208-837-4896

Goal: To describe the standard operating procedures and best management practices used to minimize, collect, and dispose of pollutants generated during facility operations.

A. Description of Facility

The Hagerman National Fish Hatchery (NFH) is an aquaculture facility that produces approximately 300,000 lbs of steelhead and 20,000 lbs of rainbow trout annually. This facility uses 66, 10 x 100' raceways for steelhead rearing (which are arranged in three banks of 22 raceways for serial reuse) and 12, 8 x 70' raceways for rainbow trout rearing. There are 60 nursery tanks for fry rearing. Cleaning effluent is directed to a pair of parallel Off-Line Settling Basins (OLSB). Non-cleaning effluent exits the facility at a number of points (see facility diagram). The Hatchery is located near Hagerman, Idaho (T85, R14E, Sec06).

B. Water Source

The Hagerman NFH uses water emanating from nearby springs with TSS levels generally less than 2.0 mg/L. Open spring channels are generally cleaned twice a year to remove aquatic vegetation. Trash rack screens are located on Main Spring, Bickel Lake, and Riley Lake and are cleaned at least daily to prevent vegetation from affecting water flow. The springs provide a water supply at a constant temperature of 59^0 F.

C. Treatment Systems Used

1. Raceways

At the downstream end of each raceway is a 3 foot quiescent zone (QZ). Each QZ has a standpipe covering a passage leading to the OLSB system. Raceways and / or QZs are normally cleaned one to two times per week, depending on fish loads and feeding rates. Raceway cleaning is conducted to minimize disturbance and subsequent discharge of accumulated solids:

a. Cleaning is conducted manually with stainless steel and nylon pool brushes or pond vacuum system. All water during cleaning is diverted to the OLSB via the standpipe drain. The maximum number of raceways that may be diverted to the OLSB system is 12 raceways at 1000 gpm, 6 raceways at 2000 gpm, and 4 raceways at 3000 gpm. Raceways generally have 1350 gpm of flow during peak production from November to April. See example calculation:

To calculate the allowable flow rate for the OLSB, the following formula is used (Idaho Waste Management Guideline for Aquaculture Operations):

$Q = AV$

Q = Volume of flow per unit of time, ft^3 / s.

A = Surface area

V = Settling velocity.

The total surface area of the OLSB, for both cells in operation, is 22,816 ft^2 (248 ft x 46 ft for each cell). Settling velocity for lighter particles must be < 0.0015 ft / sec.

Given the above,

Q = 22,816 ft^2 x 0.0015 ft / sec = 34.22 ft^3 / s

This number is reduced by 25 % for real- world conditions: 25.66 ft^3 / s (11,506.7 gpm). Given the allowable flow rate for the OLSB, the maximum number of raceways that can be cleaned at once should be calculated for the raceway water flow rate.

Avg. gpm / raceway	**Max. number of raceways to clean simultaneously**
1,000	12
2,000	6
3,000	4

The above figures only reflect what we believe the OLSB system can handle. It would be highly unusual for our personnel to clean twelve raceways (1,000 gpm each) simultaneously because that would likely create problems with oxygen debt for the fish in the bottom deck of raceways. As a general rule, no more than 4 raceways are directed to the OLSB at one time.

b. After cleaning a raceway and before re-installing the full standpipe, any remaining solid waste is directed to the OLSB. This is accomplished by either of the following procedures:
    i. A short standpipe is used to direct any residual solid waste in the quiescent zone to the OLSB. Do not re-install the full standpipe until these solids have exited the quiescent zone through the pipe leading to the off-line settling basin.
    ii. Replace the full standpipe and allow the raceway to partially refill. Then go back and remove the standpipe, flush out the solid waste, and replace the full standpipe.

c. Pressure wash raceway screens on screen washing pad (constructed July 2008) by the Trout Raceways which divert solids to OLSB.

d. End-of-season headbox and tailrace maintenance:

i. Top deck headbox: After distribution is complete and all the top deck ponds have been scrubbed, the headbox is cleaned in a manner that does not allow sediment to escape to Riley Creek.

(1) Remove headbox damboards from a couple of raceways to evacuate as much water as possible from the headbox.
(2) Install sump and pump system.
(3) Pump sediment and water into OLSB via raceway standpipe or land apply in pasture area across the road to avoid sediment deposition in OLSB conveyance pipe.

ii. Bottom deck tailrace: After all the raceways have been cleaned at the end of the season, the bottom deck tailrace is cleaned in a manner that does not allow waste water to escape to Riley Creek.

(1) Ensure damboards at the downstream end of the tailrace (by R81) are high enough to contain tailrace water. Add boards if necessary.
(2) Shunt as much material as possible into the OLSB system via the raceway standpipes of 81-84.
(3) Place trash pump intake in the downstream end of the tailrace (at the lowest elevation point possible).
(4) Place the pump's effluent hose inside a raceway standpipe to direct the effluent to the OLSB. Start the pump.
(5) Use a pond scraper to clean the tailrace beginning from below R102 and working towards R81.
(6) Check the intake hose frequently for clogging caused by algae.

2. Hatchery Buildings

There are 60 tanks available for fish rearing in two hatchery buildings.

a. Hatchery 1: Hatchery 1 was completed in December 2001 and houses 40 fish rearing tanks with dual effluent ports.

i. The port on the left (looking towards the head end of the tank) holds a short standpipe through which effluent passes during normal operations. This effluent flows directly into Riley Creek.
ii. The port on the right holds a tall standpipe. This tall standpipe is removed during daily tank cleaning, directing cleaning effluents to the OLSB system.
iii. A self-cleaning pipe (a manifold running parallel to the length of the tank through which influent water passes) can be installed in each tank to minimize accumulation of solid waste at the upper end of the tank.

b. Hatchery 2: All effluent from Hatchery 2 is passed through the OLSB system when fish are present in these tanks. Self-cleaning pipes are installed after the fish have transitioned to post-starter feeds, allowing the continuous removal of solid waste.

D. Other Information

Water inflow measurements are taken on a weekly basis as legal documentation of water rights and for practical purposes. The measurements involve readings from staff gages, weirs, flumes, and various flow meters at 17 sites and converting them to GPM, CFS, and Acre Feet via an Excel spreadsheet. Weirs and flumes are brushed as needed to control weed growth and maintain accuracy. Water measuring sites are described in Hatchery files and on the Standard Operating Procedures intranet website.

Live fish are prevented from entering raceway quiescent zones and the OLSB. This is accomplished by utilizing screens on intakes and discharges. Screens are cleaned daily and nightly to prevent clogging and potential overflow. Any fish that escape to quiescent zones or the OLSB are removed as soon as practicable.

All drug and pesticide use is done according to label directions. Any INAD and extra-label use must be prescribed by a qualified veterinarian from the Idaho Fish Health Center or equivalent. If copper is used, it is limited to one raceway at a time.

Chlorine used for disinfection of tanks, hauling trucks, and marking trailers is treated with Sodium thiosulfate for neutralization before discharge to receiving waters. Standard Operating Procedures prescribe 200 ppm of chlorine for 30 minutes for disinfection. Sodium thiosulfate is added at 5.67 grams per gallon of 200 ppm solution to neutralize the chlorine after 30 minutes.

E. Solids Control

1. Feeding

The Hagerman NFH annually feeds approximately 325,000 lbs of fish food with an overall conversion of 1.0 to 1.2. Feed composition charts are attached, and include information on feeds supplied by our current sources, Rangen and Silver Cup. The specific feeds used are highlighted. Frequency of hand feeding tanks and raceways is dependent upon fish size, and can range from as low as once per week (larger fingerlings) to as high as twelve times per day (first feeding fry). In both the Trout and Steelhead Raceways, two demand feeders per raceway are used when the fish have attained a size large enough to consume a 3.5 mm pellet. Demand feeders are supplied with automated cable-vey systems on each raceway deck. Feeding is conducted to minimize the discharge of unconsumed feed from the rearing units:

a. When hand feeding raceways (using floating feed), minimal feeding occurs below the lowest demand feeder to prevent the discharge of uneaten feed from the raceway.

b. When changing feed size, and when feeding behavior becomes aggressive, demand feeders are adjusted to minimize excessive release of feed.
c. Feeding fish in the hatchery tanks is done to minimize feed waste. Because 100% of the effluent from Hatchery 2 is directed to the OLSB, the escape of excess feed particles to Riley Creek from tank feeding operations is less of an issue there. However, Hatchery 1 effluent is normally directly released into Riley Creek, with only cleaning effluents being directed to the OLSB system. Therefore, care is taken to avoid feeding too close to the tailscreens, to minimize loss of feed particles to Riley Creek.
d. Feed is purchased from reputable feed manufacturers that employ good manufacturing practices to avoid contaminants such as PCB's.

2. OLSB System

As stated above, we estimate that the OLSB system can handle a flow of approximately 11,507 gpm. Wastewater enters the ponds from a single gravity flow pipe that splits to supply each pond. Water spills over the downstream end of the ponds into a channel which is connected to Riley Creek by a pipe. Flows are measured on Permit sampling days with a flow meter (sensor installed in the pipe leading to Riley Creek).

After all steelhead have been outplanted, one pond is taken out of service for harvest of accumulated biosolids. A floating pump platform is used to pump the water from the first pond into the head end of the other pond (which is still in use). It is best to do this when the weather is hot so it dries quickly. Slow drying time can result in the sediment becoming foul. The dried sludge is collected and stored in an area on the northwest end of the Hatchery property. The dried sludge is then composted with leaf and grass clipping material before eventual land application. The amount of sludge removed is documented in the sampling log book and reported in the Annual Report of Operations Log. All procedures are done within accordance with IDAPA 58.01.02, Department of Environmental Quality, Water Quality Standards.

Frequency for cleaning OLSB: Page 32 of Idaho Waste Management Guidelines for Aquaculture Operations recommends minimum harvest frequency for OLS ponds should be every six months. However, just prior to this statement, the authors say that OLS ponds are typically 3.5 feet deep, although many are deeper. They go on to say that depth is not required for settling efficiency, but is required to provide storage for solids; 3.5 feet provides adequate storage for OLS ponds in which solids are removed monthly. Since the OLSB cells at Hagerman National Fish Hatchery are 6 feet deep, and our cleaning effluent is much more dilute than that of many commercial operations, we clean our OLSB cells *at least* once every two years (one cell will be cleaned in odd numbered years, the other in even numbered years, if not more frequently).

OLSB skimmers at the tail ends are maintained to prevent overflow or bypass of floating, suspended, or submerged matter.

3. Mortality

Mortality from both the hatchery buildings and the raceways is recorded and normally sent to the OLSB system for disposal. During disease outbreaks in which there is high mortality, the carcasses are buried in two mort pits at the southwest side (since April 2008) of the Hatchery property. The mort pits are 10 feet deep and above the water table and are buried with 3 feet of earth after they are filled. The mort pits are in compliance with Idaho Code IDAPA 02.04.17 and are located:

a. At least 100 yards from any wells, surface water intake structures, and public or private drinking water supply lakes or springs
b. At least 100 yards from any existing residences;
c. At least 50 feet from property lines;
d. At least 100 feet from public roadways;
e. At least 200 feet from any body of surface water such as a river, stream, lake, pond, intermittent stream, or sinkhole;
f. Not located in low-lying areas subject to flooding, or in areas with a high water table where the seasonal high water level may contact the burial pit.

F. Material Storage

1. Chemical Storage

All drugs, disinfectants, and chemicals used at the Hagerman NFH are used and stored according to label directions.

a. Procedures described in Spill Prevention, Control, and Countermeasure plan are followed for storing disinfectant or other chemicals and petroleum products.
b. Material Safety Data Sheets (MSDS) are kept in three ring binders near chemical storage areas.
c. All drugs and chemicals are stored in a manner to prevent spills that may result in discharge to waters of the United States.
d. Any spilled materials are contained, cleaned, and disposed of using the spill containment kit in the Chiller Building according to the Spill Prevention, Control, and Countermeasure plan. Any spills that result in accidental discharges to Riley Creek are reported within 24 hours to EPA, 206-553-1846, and if the spill endangers listed Snake River snail Species, to the USFWS, 208-378-5243.

2. Feed Storage

a. Bulk feeds are stored in cable-vey bins located near the raceways or in the bins near the shop and inside the feed truck.
b. Bagged feeds are stored in the cool room of the Hatchery 1 building and in the dry storage area of the Hatchery 2 building.

c. We use the first in / first out rule for feed storage and use.

G. Maintenance

The Hatchery regularly inspects fish culture units daily during fish culture activities and nightly during routine security inspections. Inspections include cleaning screen intakes to prevent overflowing the facility. Demand feeders are adjusted as necessary to ensure proper feed delivery and maximize FCRs. In addition:

a. Raceways, tanks, and OLSBs are inspected annually for damage.

b. Raceways, tanks, and OLSBs are regularly maintained to ensure their proper function. This includes annual resetting of damboards and routine damboard replacement as needed.

c. Maintenance activities do not use paint or caulk manufactured before the banned manufacture of PCB's in 1977.

H. Record Keeping

a. Maintain records for aquatic animal rearing units documenting fed amounts and number and weight of aquatic animals.

The Hatchery maintains production records of fish feed on a daily basis. In addition, estimates of number and weight of fish are recorded monthly. Records are available upon request to the Hatchery Manager.

b. Keep records documenting the frequency of cleaning and maintenance.

Cleaning frequency is recorded on daily mortality sheets. Cleaning is designated by circling the raceways that have been cleaned on the day. Any maintenance or other notes are also recorded on the daily mortality records.

c. Record data collection for DMR reports.

Data collection for DMR reports is recorded in the EPA sample log book. All waste removed from OLSBs is also recorded in this log book. The log book is available for review upon request.

d. Remain in compliance with IDAPA 13.01.10.100.

Secure permits for importation and transportation of live fish or non-native fish from the Idaho Department of Fish and Game.

I. Training Requirements

a. Train personnel in spill prevention and response.

Personnel are trained on spill prevention and response according to the Spill Prevention, Control, and Countermeasure plan. This plan is accessible to all employees and is available for review.

b. Train personnel on proper operation and cleaning of rearing units and OLSB ponds and feeding procedures.

All new personnel are trained to follow the Standard Operating Procedures regarding raceway cleaning and feeding procedures. Employees involved with OLSB pond cleanout have additional Standard Operating Procedures to follow.

c. Train personnel on BMP plan implementation.

All personnel review the current BMP plan and are expected to follow its guidelines.

J. Diagram or Map

A diagram/map of the facility is attached to this BMP plan to illustrate the layout of the operation.

K. Review and Endorsement of the BMP Plan

Certification of Completion and Implementation
of the Best Management Practices Plan

Hagerman National Fish Hatchery
NPDES Permit Number ID-G-13-0004

This BMP plan has been written, reviewed and is being implemented at the Hagerman National Fish Hatchery. The BMP plan is available to employees and IDEQ and EPA upon request.

We, the Hatchery Manager and the individuals responsible for implementing the BMP plan, have reviewed and endorsed this BMP plan.

Bryan Kenworthy Project Leader	Date	Brian Clifford Motor Vehicle Operator	Date
Nathan Wiese Assistant Project Leader	Date	Eric Willet Motor Vehicle Operator	Date
Jeremy Trimpey Fish Biologist	Date	Adam Leija Animal Caretaker	Date
Andy Eiman Animal Caretaker	Date	Anna Ray Fisheries Program Assistant	Date
Steve Money Maintenance Mechanic	Date		

BMP Plan Draft Dates:

developed	August 2000	sixth modification	January 2007
first modification	November 2000	seventh modification	December 2007
second modification	February 2003	eighth modification	January 2009
third modification	January 2004	ninth modification	January 2010
fourth modification	January 2005	tenth modification	January 2011
fifth modification	July 2006		

APPENDIX I: WASTE DISPOSAL PLAN

General Information
Pursuant to IDAPA 16.01.02.650 waste solids from aquacultural facilities may be utilized as soil augmentation
in accordance with either a sludge disposal plan or site-by-site sludge utilization proposal which has been approved by the Idaho Department of Health and Welfare, Division of Environmental Quality. The purpose of this document is to meet requirements for an approved sludge utilization proposal. This document does not cover the disposal of stabilized sewage sludge or human septage, only undigested waste solids from an aquaculture facility.

Sludge Utilization Proposal
Generator: Hagerman National Fish Hatchery Telephone: 208.837.4896
Address: 3059-D National Fish Hatchery Rd., Hagerman, ID 83332
Recipient Hagerman National Fish Hatchery Telephone: 208.837.4896
Address: 3059-D National Fish Hatchery Rd., Hagerman, ID 83332
Township: 8 S and 7 S Range: 14E and 13E
Section: 5,6,8 (8S 14E) and 2,36 (7S 13E) Acres: 1179
Quarter of Quarter: n/a

Agreement Between Recipient and Generator
The applicator specifies:
1. only solids from aquacultural settling ponds will be transported and applied; and
2. land disposal will be done in such a manner as to protect the surface and ground waters of the State of Idaho.

The recipient agrees: sludge will be incorporated into the soil within 24 hours of application or as soon as site conditions allow (except for pasture where normal percolation is acceptable).

Land application of aquaculture solids is currently regulated by IDAPA16.01,02.650. Application must be performed within these regulations.

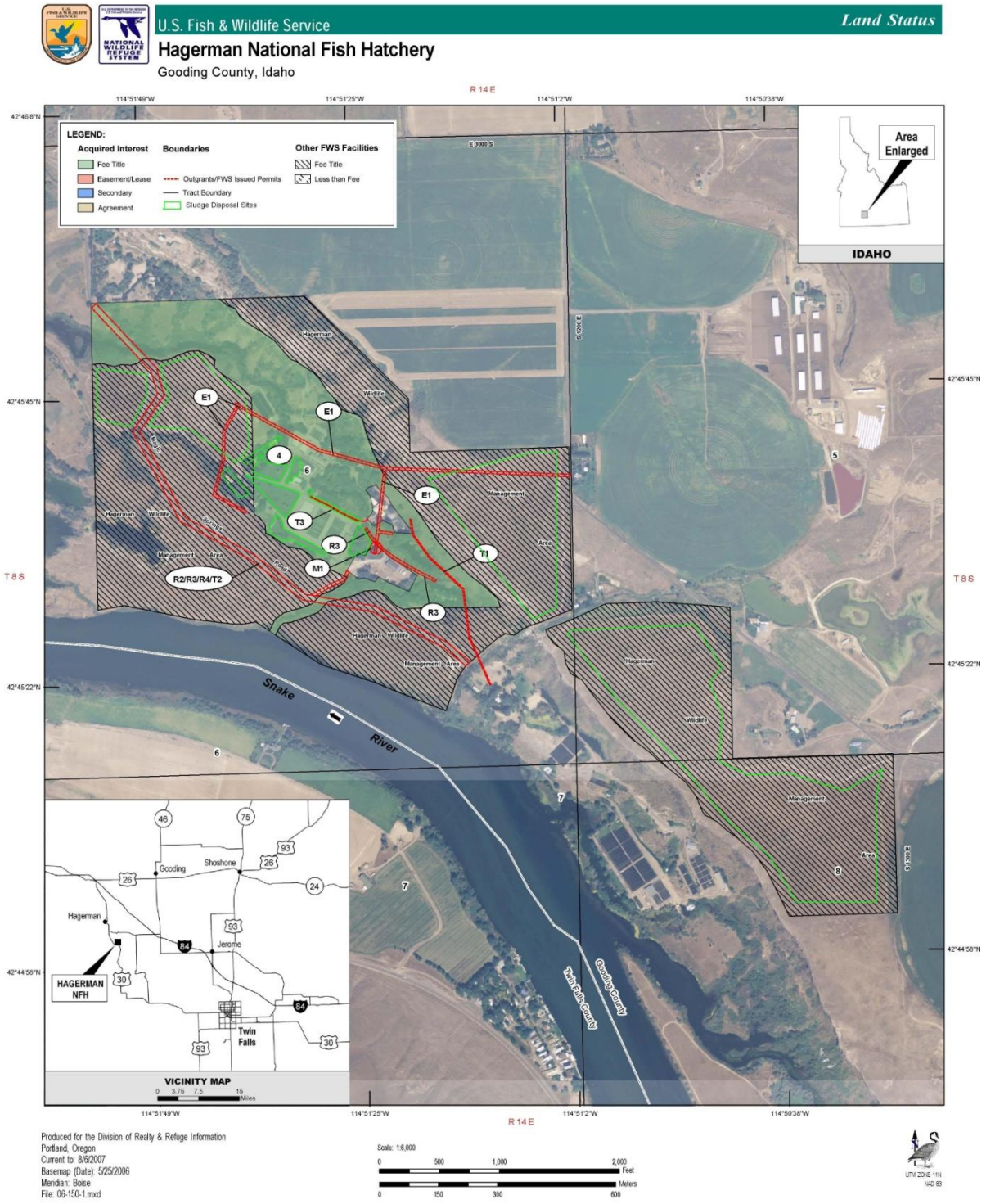
_____ _____
Generator: Bryan Kenworthy, Hagerman NFH Date

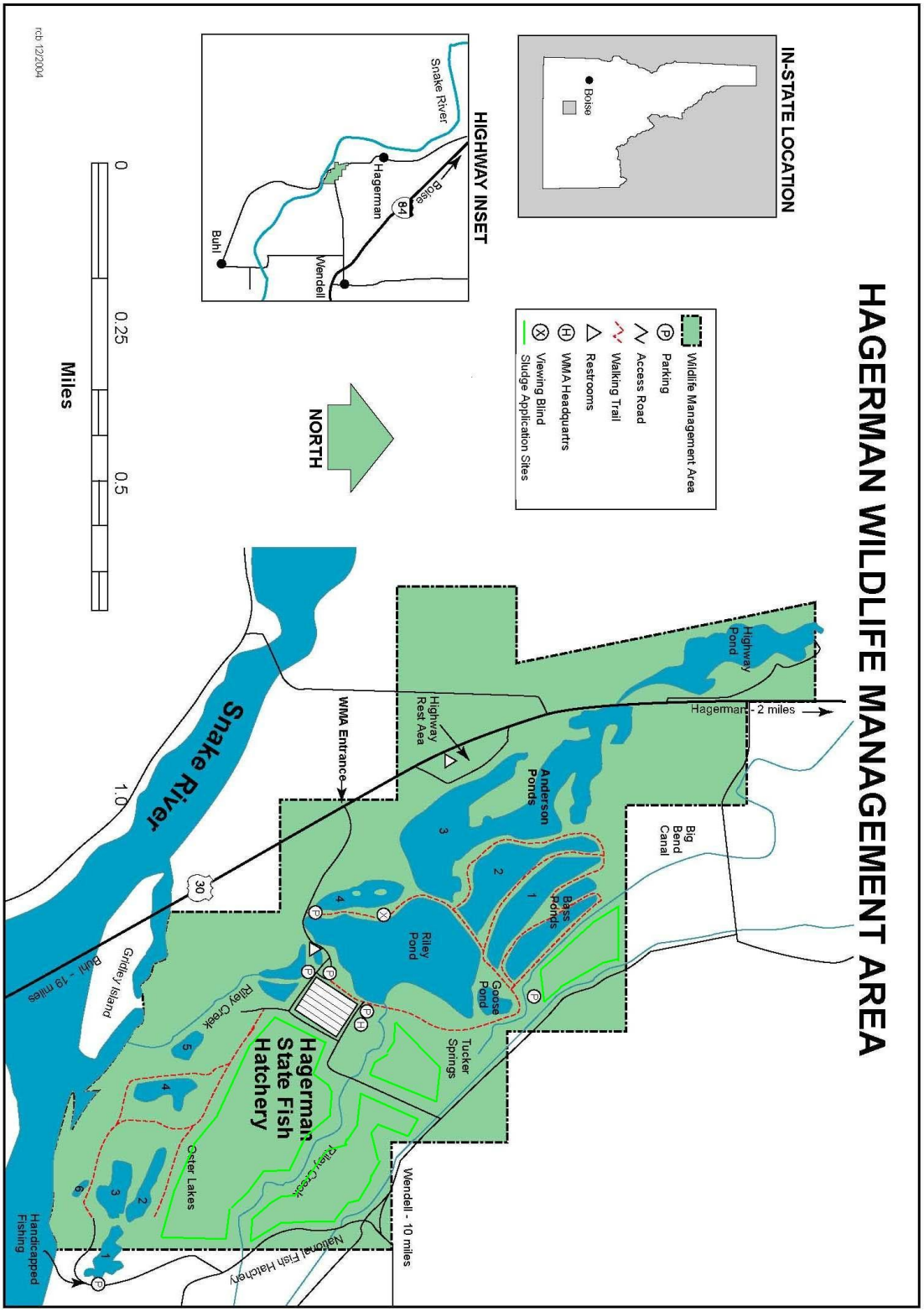
_____ _____
Recipient : Frank Edelmann, Hagerman WMA Date

Based upon a review of information in this document, the Idaho Department of Health and Welfare, Division of Environmental Quality approves this sludge utilization proposal.

_____ _____
Idaho Dept. H&W, DEQ Date

Location of Sludge Application Site
Distances to:
Residences >10 feet Canals & Drainage Ditches > 100 feet
Surface Water > 100 feet Public Roadways > 100 feet
Private Water Supply Wells and Springs > 100 feet
Community Water Supply Well n/a Depth to Ground Water > 10 feet
Acreage Used for Sludge Disposal ≈ 200


U.S. Fish & Wildlife Service
Land Status
Hagerman National Fish Hatchery
Gooding County, Idaho
R 14 E
T 8 S
LEGEND:
Acquired Interest
Fee Title
Easement/Lease
Secondary
Agreement
Boundaries
Outgrants/FWS Issued Permits
Tract Boundary
Sludge Disposal Sites
Other FWS Facilities
Fee Title
Less than Fee
Area Enlarged
IDAHO
E1
T3
R3
T1
M1
R2/R3/R4/T2
Hagerman Wildlife Management Area
Snake River
Twin Falls County
Gooding County
HAGERMAN NFH
VICINITY MAP
Gooding
Shoshone
Jerome
Twin Falls
Hagerman
Produced for the Division of Realty & Refuge Information
Portland, Oregon
Current to: 8/6/2007
Basemap (Date): 5/25/2006
Meridian: Boise
File: 06-150-1.mxd
Scale: 1:6,000
Feet
Meters
UTM ZONE 11N
NAD 83


HAGERMAN WILDLIFE MANAGEMENT AREA
IN-STATE LOCATION
Boise
HIGHWAY INSET
Snake River
Hagerman
84
Boise
Buhl
Wendell
Wildlife Management Area
Parking
Access Road
Walking Trail
Restrooms
WMA Headquartrs
Viewing Blind
Sludge Application Sites
NORTH
0
0.25
0.5
1.0
Miles
rcb 12/2004
Snake River
Highway Pond
Hagerman - 2 miles
Big Bend Canal
WMA Entrance
Highway Rest Area
Anderson Ponds
Bass Ponds
Riley Pond
Goose Pond
Tucker Springs
Hagerman State Fish Hatchery
Riley Creek
Otter Lakes
Wendell - 10 miles
National Fish Hatchery
Handicapped Fishing
Buhl - 19 miles
Gridley Island
30

Information Regarding Sludge Application and Site

Description of the waste collection process and the removal, transportation, treatment , and disposal methods used:

Biosolids are collected biannually from two off-line settling basins. Biosoldis are stored and composted onsite until stablilized. The dried and composted solids are then spread with a manure spreader to support nutrient requirements on the Hatchery landscaping and the Hagerman Wildlife Management Area. Solids applications are reported annually on the Annual Report of Operations submitted to the Environmental Protection Agency and the Department of Environmental Quantity.

The quantity of material applied in a typical application: < 100 yd^3
What time of the year will the site be used: Spring and Fall

Typical constituent concentrations:
Total Nitrogen 15 lb/ton Total Phosphorus 45 lb/ton
Total Potassium 10 lb/ton COD n/a

Estimated Loading Rates:
Total Nitrogen 75 lbs/Acre Total Phosphorus 220 lbs/Acre
Total Potassium 50 lbs/Acre COD n/a
Soil Description: Sandy Loam
Depth to Ground Water (estimate) > 10 feet
Surrounding Land Use Agriculture and fallow
Site Slope < than 5% to shear
Unusual Geologic Features Basalt outcroppings
Ground Water Concerns Avoid spreading on slopes greater than 5% or near basalt outcroppings
Crops and Nutrient Needs 5 ton/Acre

Dates of Most Recent Applications:

	Date	Gallons	Applied Acres
1.	11/9-10/2010	30 Tons	6 acres
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

STUKENHOLTZ LABORATORY, INC.

2924 Addison Ave. E., P.O. Box 353 Twin Falls
208.734.3050, Fax: 734.3919 www.stukenholtz.com

2411

HAGERMAN NATIONAL FISH HATCH. 208/837-4896 /000-0000
3059 D. NATIONAL FISH HAT RD Report No.: 67149
Date Received: 11/14/10
HAGERMAN ID 83332 Date Reported: 11/15/10

SOIL TEST DATA	Sample 1	Sample 2
pH	7.8	H
Salts, mmhos/cm	0.6	VL
Chlorides, ppm	25	L
Sodium, meq/100g	0.2	VL
CEC, meq/100g	10.6	M
Excess Lime, %	0.7	L
Organic Matter, %	2.61	H
Organic N, lb/Acre	95	H
Ammonium - N, ppm	6.6	L
Nitrate - N, ppm	4	VL
Phosphorus, ppm	7	L
Potassium, ppm	110	L
Calcium, meq/100g	6.8	M
Magnesium, meq/100g	3.2	VH
Sulfate - S, ppm	12	M
Zinc, ppm	4.0	H
Iron, ppm	11.3	H
Manganese, ppm	3.4	M
Copper, ppm	0.5	L
Boron, ppm	0.95	M

	Sample 1	Sample 2
Grower:	**HAGERMAN FISH HATCH**	
Sample Identity	**LAWN**	
Crop	**GRASS**	
Yield Goal	**6 T**	
Acres		
Prev. Crop T/Acre	**LAWN**	
Manure T/Acre		
Prev. Applied Nutrients		

RECOMMENDATIONS, lbs. Nutrients or Units Per Acre.

Nitrogen	100
P_2O_5 - Phosphate	0
K_2O - Potash	100
Calcium	0
Magnesium	0
Sulfate - Sulfur	40
Zinc	0
Iron	0
Manganese	0
Copper	1
Boron	0
Elemental Sulfur	0

RELATION OF CEC TO SOIL TEXTURE

0 - 5	Sand
5 - 12	Loamy Sand
12 - 18	Sandy Loam
18 - 24	Silt Loam
24 -36	Clay Loam
36 +	Clay

ACTUAL AND RECOMMENDED PERCENT OF CEC

SAMPLE	Actual % Potassium	Recommended Potassium	Actual % Calcium	Recommended Calcium	Actual % Magnesium	Recommended Magnesium	Actual % Sodium	Recommended Sodium
1	3.5	3.0 - 6.0 %	64.2	65 - 80 %	30.2	15 - 25 %	1.9	< 3.0 %
2								

Crop1:Split application of N is advised. Monitor crop with plant tissue tests and add N as needed.
Crop1: Recommendations assume 5 T/Ac compost report # 67150 applied.

STUKENHOLTZ LABORATORY, INC.

2924 Addison Ave. E., P.O. Box 353 Twin Falls, ID 83303
208.734.3050, Fax: 734.3919 www.stukenholtz.com

Compost Analysis

208/837-4896
/000-0000

HAGERMAN NATIONAL FISH HATCH.
3059 D. NATIONAL FISH HAT RD

HAGERMAN ID 83332

Report No.: 67150
Account No.: 2411
Date Received: 11/15/10
Date Reported: 11/16/10

Grower: HAGERMAN FISH HATCH **Sample ID.: FISH COMPOST**

Nutrients Analyyzed	Analysis Dry Wt. Basis	lb./Ton on As Recv'd Basis
Total N, %	0.92	14.74
Total C, %	5.98	95.80
C:N Ratio	6.5:1	
Nitrate N, ppm	928	1.49
P_2O_5, %	2.72	43.57
K_2O, %	0.58	9.29
Calcium, %	3.46	55.43
Magnesium, %	0.64	10.25
Sulfur, %	0.25	4.01
Zinc, ppm	188	0.301
Iron, ppm	13694	21.94
Manganese, ppm	255	0.409
Copper, ppm	19	0.030
Boron, ppm	17	0.027
Sodium, %	0.05	0.801
pH	7.0	
Salts as EC, mmhhos	4.6	
Dry Matter	80.1	1,602

RECEIVED
NOV 18 2010
HAGERMAN NAT'L FISH HATCHERY
HAGERMAN, IDAHO

Notes:

Supervised by: Paul Stukenholtz