January 31, 2012

MEMORANDUM

TO: Erick Neher; DEQ Idaho Falls Regional Office Administrator.
Greg Eager, PE; DEQ Idaho Falls Regional Office Engineering Manager.

FROM: C. Mazzone; DEQ Idaho Falls Regional Office Staff Engineer.

SUBJECT: Permit Renewal Staff Analysis: City of Menan Wastewater Treatment and Reuse Facility; LA-000066-03.

1.0 Purpose

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400.05 *Application Processing Procedure – Contents of the Staff Analysis* for issuing wastewater reuse permits. Specifically, this staff analysis shall briefly state the principal facts and the significant questions considered in preparing the permit conditions, and a summary of the basis for the conditions with references to applicable requirements and supporting materials.

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2.0 Process Description

The City of Menan collects wastewater from a population of approximately 726, and treats the wastewater in two complete mix/part time aeration lagoons, three facultative treatment and storage lagoons, and a new winter storage lagoon. The winter storage lagoon was added to the system in 2010 and increased capacity by another 600 capita, totaling 1,326 capita capacity for the City of Menan.

Wastewater is disinfected with hypochlorite solution to Class D wastewater (230 cfu/100 mL), and land applied via wheel line sprinklers to two hydraulic management units (13 acres in HMU 6601; 21 acres in HMU 6603; 34 acres total).

Lagoon Data

Lagoon	**Description**	**Acreage**	**Depth** (feet)	**Volume** (gallons)	**Storage** (gallons)
Cell A	Part time complete mix aeration	0.70	8	1,825,000	
Cell B	Part time complete mix aeration	0.75	8	1,955,000	
Cell 1	Facultative	2.3	5	3,233,630	
Cell 2	Facultative / storage	2.7	5	3,796,000	3,796,000
Cell 3	Facultative / storage	4.1	5	5,816,000	5,816,000
Cell 4	Storage	5.5	5	8,166,483	8,166,483
Total					17,778,483

3.0 Summary of Events

1979: the Wastewater Treatment Facility Planning Study is completed.

1986: the Operation and Maintenance Manual is completed.

September 1987: a facility inspection finds that the influent flow meter is not functioning, the “sewer line clearing rod system” [sic] is inadequate, vegetation needs to be cleared, and cites minor maintenance issues (gate valve lubrication).

February 1989: after a brief “walk around” inspection, land application or surface water discharge is recommended when the inspector notices only one foot of freeboard in the last lagoon.

February 1990: the first permit is issued.

February 1995: the first permit expires.

December 1997: a permit renewal application is submitted.

September 2003: the facility submits an application for additional land application acreage.

October 31, 2006: the second permit is issued (permit renewal).

March 8, 2010: the DEQ approved plans and specifications for a new winter storage lagoon

August 2010: construction of the new storage lagoon is completed and the lagoon is placed into service.

May 17, 2011: a DEQ inspection is conducted and the permit application requirement is waived in lieu of specific items necessary for the permit renewal.

4.0 Discussion

4.1 Site Characterization

4.1.1 Climate

Menan is 4795 feet in altitude, and is characterized by:

- 12 inches to 14 inches of annual precipitation;
- a 125 day growing season (Idaho Falls – Pocatello area data);
- 45 inches to 50 inches mean annual (Class A) pan evaporation;
- a 10 mph (mean) southwest prevailing wind; and,
- 9/10 inch of precipitation for the 5 year, 6 hour event frequency.

4.1.2 Soils

The facility contains Hayeston sandy loam and Heiseton loam soil types. Hayeston sandy loam is a deep, well drained alluvium, sloped 0 to 1 percent, with moderately rapid permeability, rooting depth to 60 inches or more, low or moderate water capacity, slow surface runoff, and low erosion hazard.

Heiseton loam is a deep, moderately well drained alluvium, sloped 0 to 1 percent, with moderately rapid permeability, rooting to 60 inches or more, high water capacity, very slow runoff, and slight erosion hazard.

4.1.3 Ground water

Ground water flow fluctuates seasonally. Limited data suggests that ground water flows west-northwest during the growing season and flows north during the non-growing season. The facility's most recent application reports depth to ground water from monitoring wells "located near the land application units" varying from 5 to 8 foot depths.

4.1.4 Surface Water

The Dry Bed Canal runs along the southern and eastern perimeter of the facility; the canal flows into the Snake River during the growing season, but holds no flow during the non-growing season.

The facility lies outside of the 25 and 50 year flood plain, but the 100 year flood plain overlaps part of the lagoon system.

4.2 Site Loading

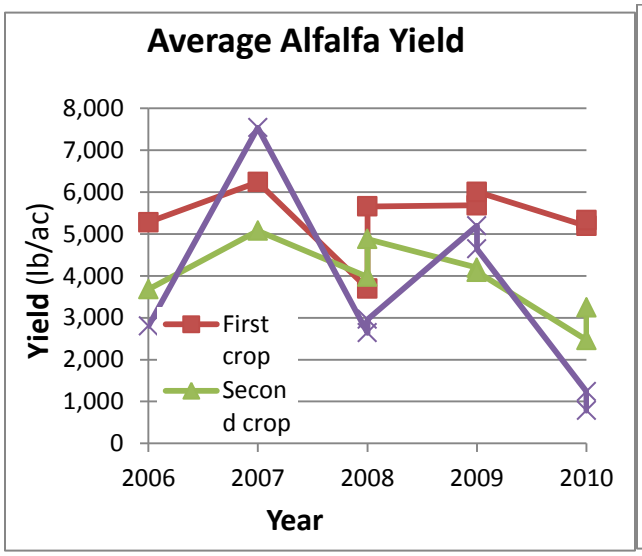
4.2.1 Loading Rates – General

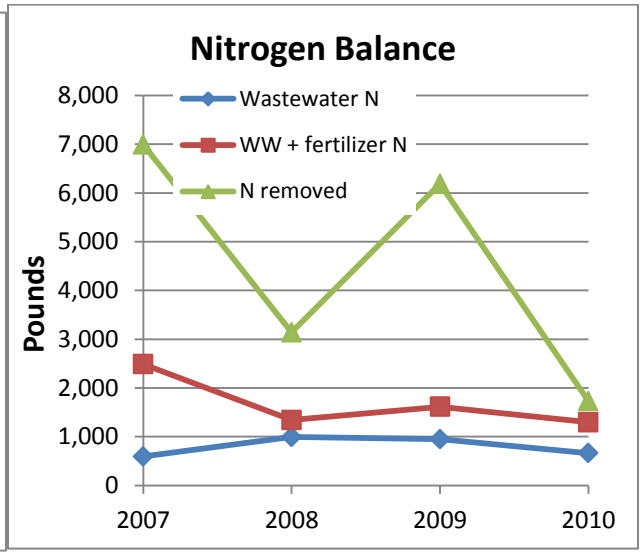
2007 thru 2010 averaged loading rates are summarized below.

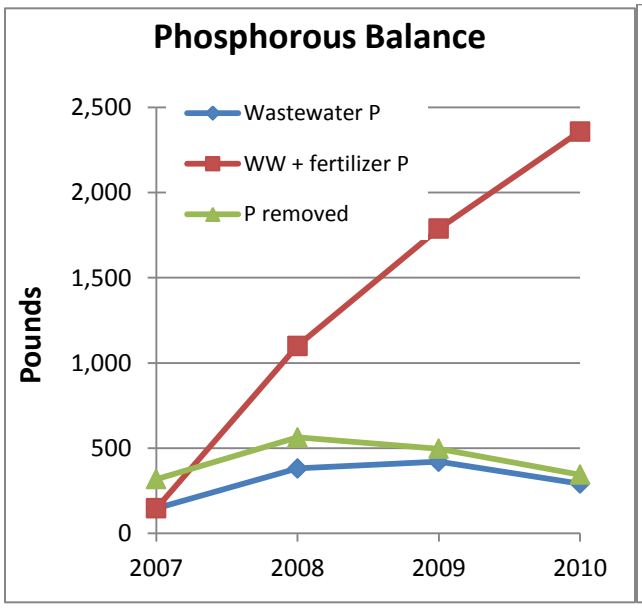
PARAMETER	LOADING			GROUND WATER SAMPLE
	Recommended	Source	Amount	RESULTS 2007-2010 (mg/l)
Water	Less than recommended 45 ac*in./ac	Wastewater	27 ac*in./ac	
		Irrigation	1 ac*in./ac	
		Deficit (-) or Surplus (+)	-17 ac*in./ac	
Nitrogen	< 150% of averaged crop uptake of 46 lb/ac	Wastewater	23 lb/ac	Upgradient average: 2.0; Downgradient average: 0.9; Average differential: -1.1
		Fertilizer	15.7 lb/ac	
		Deficit (-) or Surplus (+)	-7.3 lb/ac (below crop uptake); -30.3 lb/ac (below 150% of crop uptake)	
COD	< 50 lb/ac*d	Wastewater	1 lb/ac*d	
TDS	Based on ground water standard of 500 mg/L	Wastewater	2,594 lb/ac	Upgradient average: 409; Downgradient average: 302; Average differential: -107
		Fertilizer	78.5 lb/ac as potassium	
Phosphorus	< 125% of crop uptake of 4 lb/ac; equal to 5 lb/ac	Wastewater	9 lb/ac	Upgradient average: 0.17; Downgradient average: 0.16; Average differential: -0.01
		Fertilizer	32.4 lb/ac	
		Deficit (-) or Surplus (+)	+ 36.4 lb/ac	

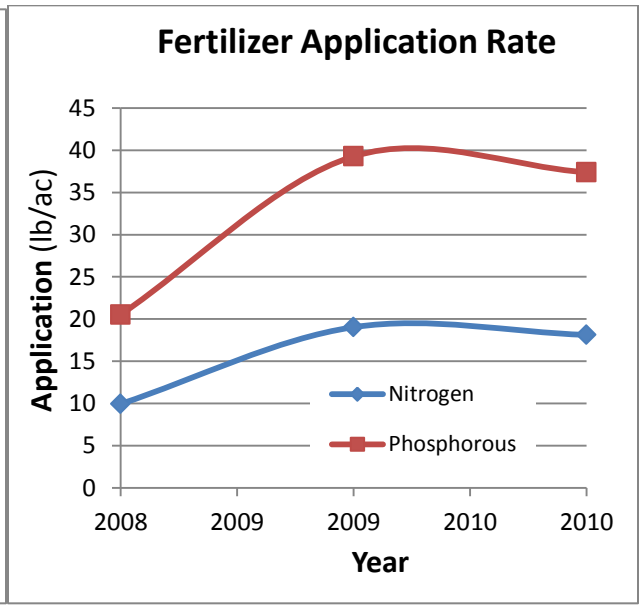
*Estimated loading rates are based on wastewater chemistry, crop tissue analysis, and theoretical crop moisture uptake.

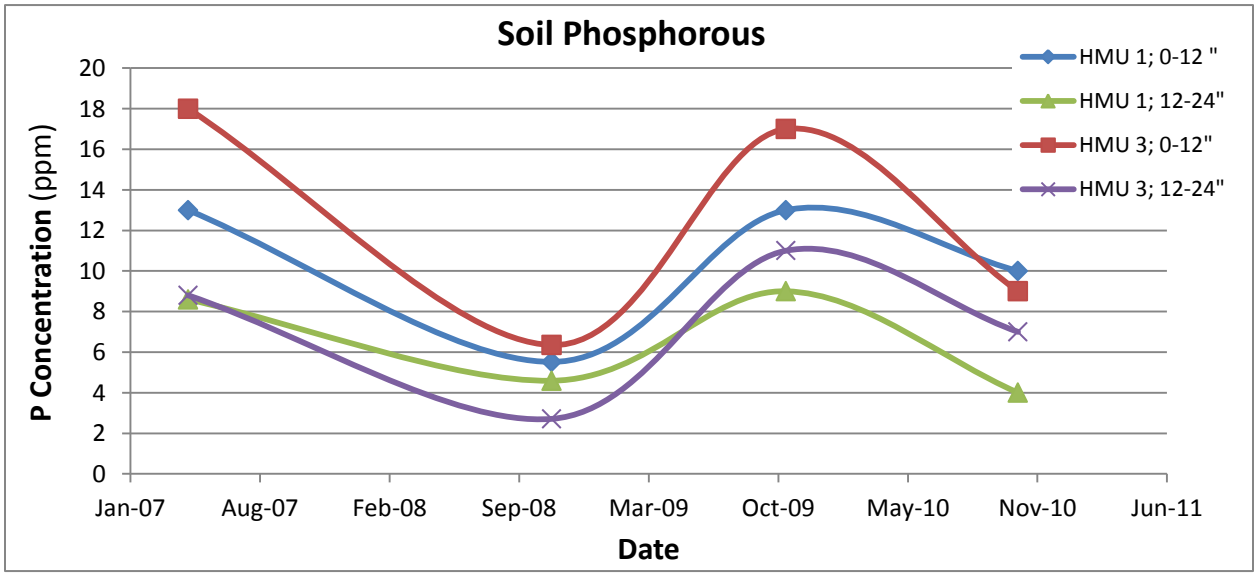
Graphs related to loading are presented below. Note that phosphorus appears to be added in excess as fertilizer.

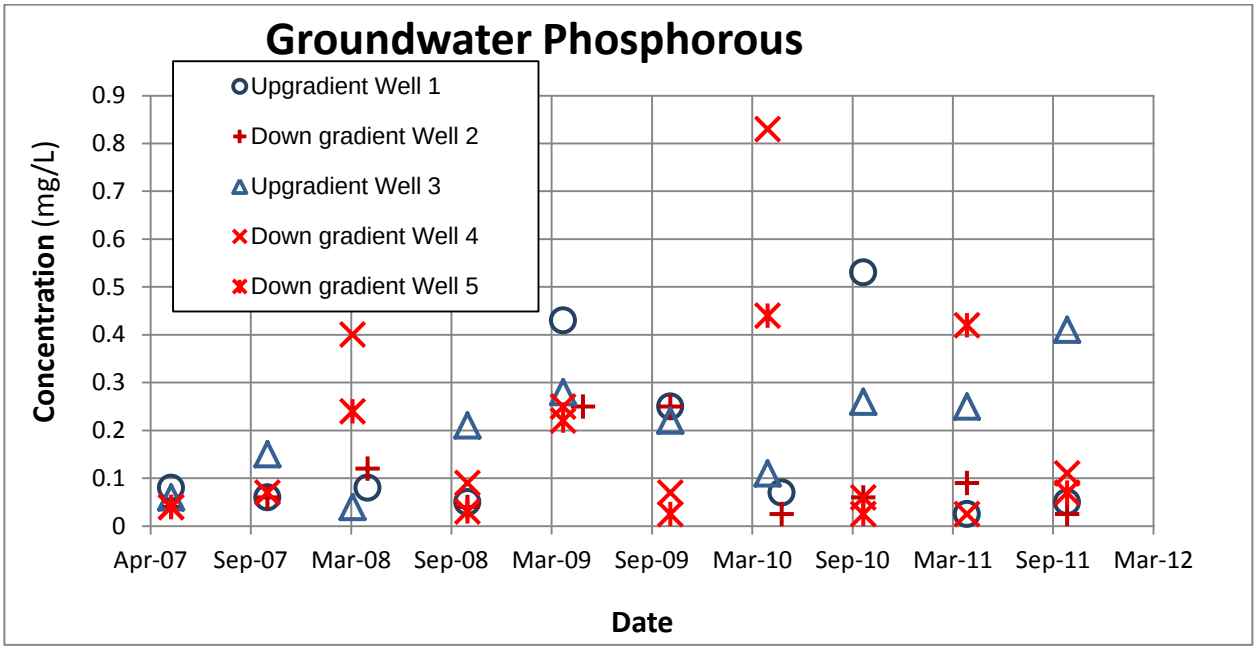

Average Alfalfa Yield
Yield (lb/ac)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2006
2007
2008
2009
2010
Year
First crop
Second crop


Nitrogen Balance
Pounds
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2007
2008
2009
2010
Wastewater N
WW + fertilizer N
N removed


Phosphorous Balance
Pounds
2,500
2,000
1,500
1,000
500
0
2007
2008
2009
2010
Wastewater P
WW + fertilizer P
P removed


Fertilizer Application Rate
Application (lb/ac)
45
40
35
30
25
20
15
10
5
0
2008
2009
2009
2010
2010
Year
Nitrogen
Phosphorous


Soil Phosphorous
P Concentration (ppm)
20
18
16
14
12
10
8
6
4
2
0
Jan-07
Aug-07
Feb-08
Sep-08
Mar-09
Oct-09
May-10
Nov-10
Jun-11
Date
HMU 1; 0-12 "
HMU 1; 12-24"
HMU 3; 0-12"
HMU 3; 12-24"



4.2.2 Wastewater Characterization

According to the 2005 *City of Menan Wastewater Study* by Keller Associates, the City of Menan produces approximately 212 gallons per capita day (56 MG per year; 730 capita). Wastewater is roughly estimated at 2% from Walker Produce (a fresh pack potato processing plant), 47% from sanitary waste, and 51% from infiltration and inflow. BOD and Suspended Solids are estimated at 115 and 127 pounds per day, respectively.

4.2.3 Nitrogen

Crop Nitrogen Requirements

Crop nitrogen requirements listed below are based on 2010 crop yield for alfalfa. Note that the crop nitrogen requirements are well above the nitrogen supplied by the wastewater, and approximately equal to wastewater plus fertilizer nitrogen.

Crop	Average Yield	Nitrogen uptake	Nitrogen supplied
Alfalfa	972 lb/ac	36 lb/ac	37.67 lb/ac

4.2.4 Total Dissolved Solids

Total Dissolved Solids (TDS) are introduced at this facility with wastewater and fertilizer (potash). Because TDS mass balances are difficult, groundwater sampling TDS values are used to assure TDS is within limits. The City of Menan had no TDS groundwater standard exceedances in the years 2006 thru 2010.

4.2.5 Hydraulic Loading

Non Growing Season Hydraulic Loading

The Menan facility does not land apply in the non-growing season.

Growing Season Hydraulic Loading

Alfalfa irrigation requirements have a recommended maximum of 45 acre*inches/acre; the City is able to provide 27 ac*in./ac of wastewater, and supplemental irrigation water is available from the Long Island Canal. This facility does not over apply wastewater, and supplemental irrigation water is applied only when necessary.

4.2.6 Chemical Oxygen Demand Loading

Growing season COD loading at this facility has not been above 3 lb/acre*day, well below the DEQ limit of 50 lb/acre*day. Therefore, wastewater COD analysis and COD loading limit have been removed as a requirement in this permit renewal.

4.3 Site Management

4.3.1 Buffer Zones

The City of Menan requested this permit renewal change the disinfection level from Class C effluent (less than 23 coliform forming organisms per 100 milliliters (< 23 cfu/100 mL) to Class D effluent (less than 230 cfu/100 mL).

The facility meets the Class D effluent required buffer distances as reported below (DEQ recommended distances for Class D effluent are in parenthesis):

- greater than 800 feet to any inhabited dwelling (at least 1,000 feet); see the explanation below;
- greater than ¼ mile to any public drinking water supply well (at least 1,000 feet);
- greater than 500 feet to any private drinking water supply well (at least 500 feet);
- greater than 300 feet to any publicly accessible area (at least 300 feet);
- greater than ¼ mile to any natural surface waters (at least 100 feet); and,
- greater than 65 feet to any surface water (at least 50 feet to temporary surface water and irrigation ditches and canals).

A three wire pasture fence exists around the land application units. Signs are posted in each corner and every 500 feet along the perimeter and state “Sewage Effluent Application – Keep Out”. See Compliance Activity 03 in the permit and in Section 1.3, below for new Spanish language requirement: “WARNING, RECYCLED WATER – DO NOT ENTER”.

Inhabited Dwelling Buffer Distance

In 2010 a facility expansion resulted in a residence closer than 1,000 feet. Consequently, the facility constructed a six foot berm between the application area and the residence (see the map appended to the permit). Based on the use of wheel line irrigation, and the rule citation below, the DEQ considers Class D effluent allowable.

604. REUSE FACILITIES - BUFFER DISTANCES.

02. Determining Buffer Distances. In determining buffer distances for inclusion in a reuse permit the Department will consider the following:

a. Characterization of the recycled water;
b. The method of irrigation
c. The physical or vegetative barriers;
d. Microbial risk assessments;
e. Any applicable best management practices;
f. Environmental conditions, such as wind speed and direction; and
g. Any other information relevant to the purposes described in this section.

4.3.2 Crop Management

The latest cropping plan was submitted in the 2003 application for increased land application acreage. The plan calls for five years of alfalfa, followed by two years of grain.

4.3.3 Grazing Plan

The Menan facility will disinfect to Class D effluent upon issuance of this permit. Grazing is not allowed on Class D effluent (chlorine disinfection to less than 230 Total Coliform Organisms per 100 mL).

4.3.4 Lagoons

Seepage Tests

Under new DEQ rules, lagoons are seepage tested every ten years to determine liner integrity and meet IDAPA 58.01.16.493.

Lagoon: Serial #	Previous Seep Test Date	Next Seep Test Due Date
Cell A: LG-6604	April 2008	April 2018
Cell B: LG-6605	April 2008	April 2018
Lagoon 1: LG-6601	July 2006	July 2016
Lagoon 2: LG-6602	July 2006	July 2016
Lagoon 3: LG-6603	July 2006	July 2016
Lagoon 4: LG-6606	September 2010	September 2020

Sludge Depths

Sludge depths were measured in Cells A & B in July 2009; depths averaged 19 inches. Use of *Probiotic Scrubber* II chemical treatment from Bio Lynceus, LLC from January to August 2010 reduced sludge depth by 15.5%, averaging 16 inches of sludge. Sludge depths in all other lagoons have not been measured recently.

4.3.5 Nuisance Plan

The City of Menan submitted a Nuisance Odor Plan to the DEQ in June 2011. The plan was approved.

4.3.6 Plan of Operation

The Plan of Operation was updated, submitted, and approved by the DEQ as part of the 2010 Plan and Specification submittal.

4.3.7 Waste Solids Management Plan

The City of Menan has not dredged lagoons during the last permit cycle. The facility will be required to submit an updated plan prior to dredging. The current approved plan involves Probiotic treatment of the lagoons (see Section 1.2.4 *Sludge Depths*, above).

4.4 Compliance Activities

New Compliance Activities

CA-066-01: Review and verify to the DEQ that the December 2010 updated Operation and Maintenance Manual (O&M Manual), as submitted for the for the wastewater reuse facility expansion, is up to date.

CA-066-02: Prepare and submit to DEQ for approval a runoff management plan with control structures and other BMPs (e.g. collection basins, berms, etc.) designed to prevent runoff from any

site or fields used for wastewater reuse to property not owned by the City of Menan except in the event of a 25-year, 24-hour storm event or greater.

Although the City of Menan submitted verbal verification of runoff control, the DEQ requires the above calculations as proof of sufficient containment.

CA-066-03: Change the facility perimeter warning signs to conform with current rule including the Spanish translation “Warning: Recycled Water - Do not Enter”

CA-066-04: Submit a Waste Solids Management Plan to DEQ for review and approval. The Plan shall describe how waste solids generated at the facility will be handled and disposed of to meet the requirements of permit section I, No. 5.

Previous Permit Compliance Activities

Number	Description	Status
CA-066-01	A Plan of Operation (Operation and Maintenance Manual or O&M Manual) for the wastewater reuse facilities, incorporating the requirements of this permit, shall be submitted to DEQ for review and comment.	Complete
CA-066-02	An Odor Management Plan shall be submitted to the DEQ for review and comment.	Complete
CA-066-03	Submit a Waste Solids (Sludge) Management Plan to DEQ for review and approval.	Complete
CA-066-04	A Runoff Management Plan shall be submitted to the DEQ for review and comment.	Complete
CA-066-05	*Monitoring Wells* Plans and specifications for the installation of all wells must be submitted to the DEQ for review and approval prior to construction.	Complete
CA-066-06	Conduct Seepage Tests on all lagoons according to the most recent DEQ procedures.	Complete
CA-066-07	Actions required if a lagoon is found to be leaking greater than 0.25 inches per day.	Complete – no leaks
CA-066-08	Submit current facility maps.	Complete
CA-066-09	Submit a Wellhead Protection Plan for protecting the onsite monitoring wells from leaching and ground water contaminations. All wells located on or within impact of the facility must be evaluated and determined to be in compliance with the plan.	Complete

4.5 Monitoring Requirements

Permit Section G contains monitoring requirements for the facility. The table below reorganizes the monitoring requirements according to the medium sampled; the table is intended as a sample timing aid only. Note that calculation requirements listed in the Permit Section G *Facility Monitoring Table* are not listed in below – only monitoring requirements are listed. See the Permit for exact descriptions of monitoring and calculations required.

Monitoring Requirements by Medium

Parameter	Weekly	Monthly	Semi-annually	Annually	Other frequencies
Wastewater – lagoon effluent	Wastewater quantity	Grab sample			
Supplemental irrigation water		Irrigation quantity		Backflow test	
Ground water			1. Ground water analysis; 2. Ground water level.		
Soil				Composite soil sample	First year of permit: composite soil sample.
Fertilizer					Per harvest fertilizer added
Crop					Per harvest crop yield and dry basis tissue analysis; record harvest date.
Flow meters					Once per permit meter calibration

4.6 Conclusions and Recommendations

The DEQ recommends this draft permit be finalized.

5.0 Recommendation for Processing the Permit

Staff recommends that the attached draft municipal wastewater reuse permit be issued. The permit specifies loading limits and establishes monitoring requirements to help protect public health and the environment.

6.0 References

USDA – “Soil Survey of Jefferson County, Idaho”, United States Department of Agriculture, Soil Conservation Service, December 1979.

R.G. Allen and C.E. Brockway – "Estimating Consumptive Irrigation Requirements for Crops in Idaho" University of Idaho, August, 1983.

Keller Associates – “City of Menan Wastewater Study”, May 2005.