APPROVED

Recycled Water Use Plan
For
Hidden Valley High School
2022

NPDES Permit No. 102221
File No. 38625

Facility: Three Rivers School District
Three Rivers School District
Hidden Valley High School Wastewater Treatment Plant

Physical Address Mailing Address
651 Murphy Creek Road
Murphy OR 97533-0160

District Contact: Don Hiler
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Email: Donald.hiler@threerivers.k12.or.us

Contact High School Operator: Debbie Bunker
Phone: 541-499-8041

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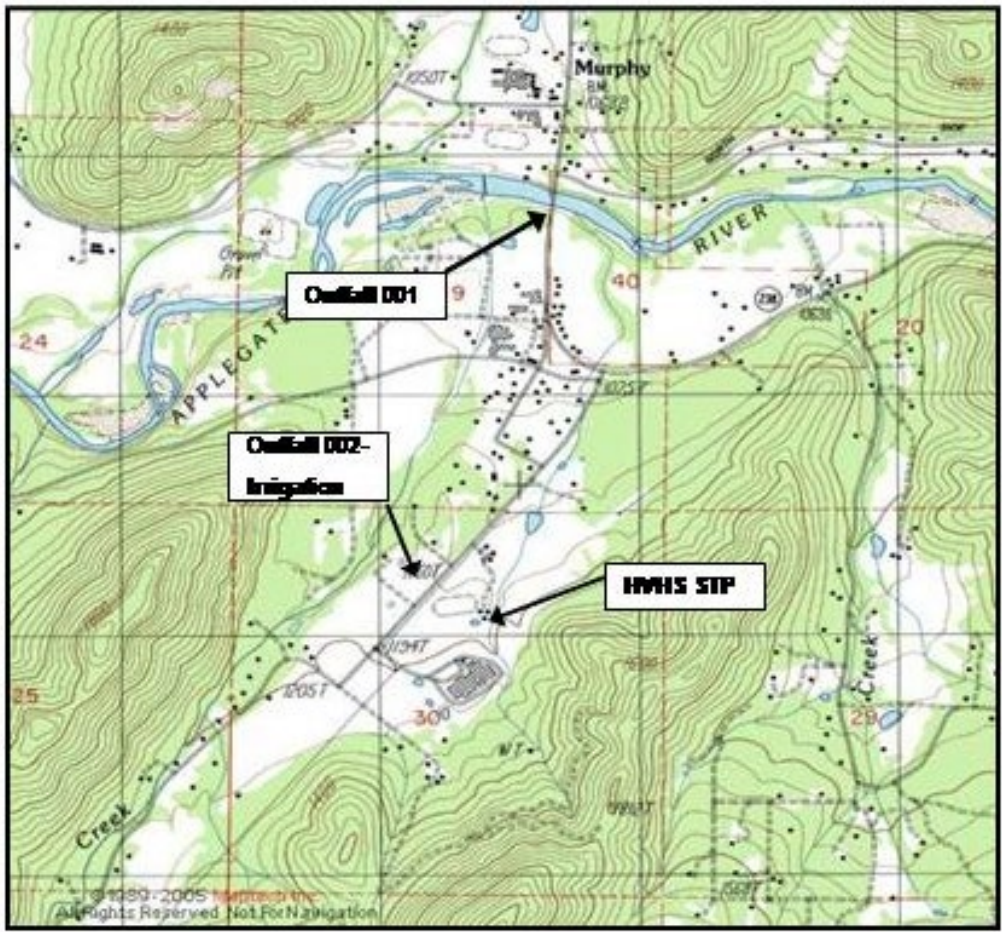

Figure 1: Area Overview

INTRODUCTION

The Three Rivers School District operates a municipal wastewater treatment facility at Hidden Valley High School located in Murphy, Oregon. The school serves the Murphy area of Josephine County about ten miles south of Grants Pass. Wastewater is treated and discharged in accordance with National Pollutant Discharge Elimination System (NPDES) Permit number 102221. Hidden Valley High School (HVHS) and the sewage treatment plant were built in 1977. The plant receives influent from Hidden Valley High School only; no other sources discharge wastewater to the treatment plant.

The current population served at the school is approximately 890 (comprised of about 820 students and 75 faculty). The design conditions for this plant project a school population of 1,355 persons, at a build out date of 2016. The design hydraulic capacity is a maximum of 37,000 gallons per day (gpd). The maximum daily flow recorded has been 21,400 gallons in November 2009. During Hidden Valley's summer recycled water season the flows range from around 2,000 to 4,000 gpd.

This RWUP supersedes any previous approved recycled water use plans. The lines of authority and communication within the recycled water program, including the recycled water user(s) are listed in table 1 below.

Contact information of parties responsible for various aspects of environmental compliance for Hidden Valley High School is also listed in this table.

Table 1: Recycled water operator and site management contact information.

Permittee; Operator; end-user	Contact Name	Phone Number	Email address
System owner: Three Rivers SD	Don Hiler	541-218-5169	donald.hiler@threerivers.k12.or.us
Operator of Record	Michael Bollweg	541-415-1117	sowatertech@ymail.com
Lead Operator	Debbie Bunker	541-499-8041	dbsowatertech@yahoo.com
Operator	Brad Tally	541-761-7166	bradley.tally@threerivers.k12.or.us
Operator in Training	Brian Richardson	541-287-0207	brian.richardson@threerivers.k12.or.us

WASTEWATER TREATMENT

Headworks

The school's wastewater is collected and by gravity passes through a parshall flume and ultrasonic influent flow meter. Wastewater then passes through a comminutor; with a bypass channel that has a bar screen to capture larger pieces of material. The wastewater then passes into a pre-aeration/surge basin. The basin is equipped with a single vertical aerator moored in the center of the basin.

Influent samples are collected just before the comminutor. An Isco-brand automatic sampler is used. The sampler is set to collect a sample every 20 minutes. The collection tub is packed with ice to keep the samples cool (4C) during the collection process.

Treatment Unit

The flow is transferred from the pre-aeration/surge tank to the aeration basin by means of an air-lift pump. The main treatment plant is a Smith and Loveless Ecodyne package plant. It is operated in an extended aeration mode. From the aeration basin, flow enters a secondary clarifier with two sludge accumulation cones, and a single overflow weir. The plant does not have a digester or sludge storage tank. The solids are retained in the aeration basin until they are wasted and hauled off-site by a licensed contract septage hauler or another permitted municipal wastewater facility for disposal. This is done approximately once a year. In 2002 an effluent chlorination/de-chlorination system was brought on-line and the plant effluent routed to a dedicated irrigation field. (**See attachment 1** Recycled Water Use Checklist).

Disinfection

The facility uses liquid sodium hypochlorite chlorination/de-chlorination system for disinfection. Effluent from the clarifier passes through a chlorine injection/mixing tank. The tank has a flash mixer and weir to ensure a complete mix of the chlorine solution. The stock hypochlorite solution is mixed with water in a 1:8 ratio when discharging to the river and a 1:3 ratio when irrigating recycled water.

After sufficient contact time in the chlorine contact basin, sodium bisulphite is used for de-chlorination. This material is not diluted before use. The de-chlorination injection point is at the effluent meter weir, where there is also an ultrasonic meter for flow measurement. Both the chlorine and bisulphite feed are flow-paced.

The recycled water will meet Class C recycled water standards of reduced Total Coliform bacteria to not more than 240 organisms per 100 ml in not more than two consecutive samples, and a seven-day median of 23 organisms per 100 ml. No discharge from the irrigation area to state waters is permitted.

Outfall 002 – Recycled Water

The irrigation system consists of four zones with a total of thirty-five separate irrigation stations each covering 0.5 acre. The irrigation fields are dedicated fields, and are not used for any other purposes. They are fenced and have warning signs posted. The irrigation system is operated and maintained by an onsite high school operator who checks the system daily when irrigation of Class C water is used. The operator has a check list for evaluating the irrigation system. (**See attachment 2** Irrigation System Checklist).

Wastewater Reuse

After de-chlorination, effluent enters the effluent pump vault, where it is either pumped to the river or to the irrigation field. During each winter season from November 1st through April 30th, discharge is allowed to flow through Outfall 001. Effluent is discharged through a 3-inch force main to the Applegate River at river mile 12.5. The outfall is 25 feet downstream of the Hwy. 238 Bridge.

From May 1st through October 31st recycled water is beneficially irrigated on dedicated hay fields adjacent to the treatment plant through Outfall 002 (See attachment 3A). The recycled water is not de-chlorinated when land irrigating. Only field 1 is currently used for recycled water use at this time.

The pump vault is equipped with floats to start and stop the pumps. There are two pumps, and they are periodically alternated. The irrigation system for field 1 consists of six separate irrigation stations that are manually cycled through sequentially (See attachment 3B). Spray heads are standard "Rainbird"-type impact sprinklers. In the event of a power outage the irrigation pumps in the effluent wet well cannot pump recycled water to land application field 1.

If fields 2, 3 and/or 4 are used, there is a minimum of 100-foot setback that must be maintained from all domestic water wells (there are two wells located on the field eastern most boundary of field 2). In addition, Hidden Valley High School needs to notify the DEQ in writing prior to using fields (2-4) for recycled water use; part of this written notification must include a irrigation system specification sheet and layout of all laterals, valves and sprinkler head locations and site setbacks.

BENEFICIAL PURPOSES

Beneficial purposes lie at the core of the recycled water use program and can influence wastewater treatment, monitoring, as well as public health and environmental concerns.

The Hidden Valley can use four irrigation sites on campus property to beneficially land apply recycled water. The beneficial use for all four fields is for growing pasture grass for hay and grazing animals. For this plan under OAR 340-050, beneficial use and setbacks are listed in tables, **See attachments 4 and 5**).

Currently Hidden Valley High School land applies Class C recycled water on approved hay and pasture fields for grass production and pasturing of animals.

Table 2: Existing Recycle Water Use Beneficial Uses

Name/Owner	Address	Site/ac	Use	Class Recycled water
Hidden Valley High School	651 Murphy Creek Road	#1 / 6.5 ac	Grass, hay field/ Pasture, animal grazing	Class C
Hidden Valley High School	651 Murphy Creek Road	#2 / 4.9 ac	Grass, hay field/ Pasture, animal grazing	Class C
Hidden Valley High School	651 Murphy Creek Road	#3 / 3.4 ac	Grass, hay field/ Pasture, animal grazing	Class C
Hidden Valley High School	651 Murphy Creek Road	#4 / 8.7 ac	Grass, hay field/ Pasture, animal grazing	Class C

There is a three-day grazing restriction from time of irrigation to grazing animals when fields are irrigated with Class C recycled water.

Future beneficial recycled water uses/sites in accordance with OAR 340-055 may be added to this plan provided all necessary (city, county and/or state agencies) approvals are obtained prior to DEQ's written site approval and inclusion to this plan.

PUBLIC HEALTH AND ENVIRONMENTAL CONTROLS

Signage

The irrigation fields are dedicated for recycled water use and are used for growing hay and pasturing animals. The public notification for these fields is posted signage along the irrigation field perimeter fencing at every irrigation site. These signs are written in English and Spanish and state:

ATTENTION: RECYCLED WATER USED FOR IRRIGATION-AVOID CONTACT-DO NOT DRINK.
ATENCION: RECLAMADO DESPERDICIO DE AGUA USADO PARA LA IRRIGACION-EVITE EL CONTACTO-NO BEBA EL AGUA.

In addition to the old signs the school district recently added an additional 50 signs to their district school irrigation sites that state:

In Order To Conserve Water…
Recycled Water In Use Do Not Drink
No Tome El Agua
Wash Hands After Contact
Lavese Las Manos Despues De Tocar

PERMIT

The permittee's recycled water use plan is part of the National Pollutant Discharge Elimination System (NPDES) permit. This is an updated recycled water use plan as required by Oregon Administration Rules (OAR) Chapter 340-Division 055.

Schedule A outlines the utilization of treated effluent for agricultural purposes as regulated under OAR 340-055. Prior to irrigation of the recycled water, the discharge must comply with bacteria limits based on protection of human health due to human pathogens. For Class C recycled water, the limits include a weekly median of 23 total coliform per 100 mL with no two consecutive samples to exceed 240 total coliform per 100 mL. From May 1st through October 31st wastewater disposal is via an irrigation system on fields adjacent to the treatment plant through Outfall 002. The effluent is not de-chlorinated when land irrigating.

E. coli monitoring must be conducted according to any of the following test procedures as specified in Standard Methods for the Examination of Water and Wastewater, 19th Edition, or according to any test procedure that is listed in your current NPDES permit or has been authorized and approved in writing by the Director or an authorized representative.

Permit Limits

Recycled Water Outfall 002 (Spray irrigation)

No discharge to state waters is permitted. Recycled water must be treated to the appropriate level and reused for the following beneficial purposes:

Table 3: Class C Recycle Water Beneficial Uses

Level of Treatment	Beneficial Use (see attachment 4)	Alternative Approval?
Class C	Any purpose allowed by OAR 340-055 for Class C recycled water	No

1. All recycled water use distributed on land for dissipation by evapotranspiration and controlled seepage must follow sound irrigation practices so as to prevent:

- Prolonged ponding of treated recycled water on the ground surface.
- Surface run-off or subsurface drainage through drainage tile.
- The creation of odors, fly and mosquito breeding or other nuisance conditions.
- The overloading of land with nutrients, organics or other pollutant parameters.
- Impairment of existing or potential beneficial uses of groundwater. The overloading of land with nutrients, organics, or other pollutant parameters; all consumptive and agronomic site loadings must be according to your approved RWUP.

- Impairment of existing or potential beneficial uses of groundwater.
- In the event of winds of 10 mile per hour or more, the irrigation system must be shut off due to improper recycled water distribution and risk of aerosol drift onto restricted setback areas.

2. The permittee may irrigate on DEQ approved site(s) after November 1 or prior to May 1 if river levels are low, the irrigation fields are not saturated and with DEQ written prior approval. All other requirements and monitoring for land irrigation will apply. Specific crops, application rates and buffers are approved by the Department within the Recycled Water Use Plan. The bacterial effluent limitations are achievable through proper operation and maintenance.

3. Prior to use, the Class C recycled water must receive at least Class C treatment as defined in OAR 304-055 as: Oxidized and must reduce Total Coliform to 240 organisms per 100 mL in two consecutive samples, and a seven-day median of 23 organisms per 100 mL.

4. All use of recycled water must conform to the Recycled Water Use Plan approved by the Department. Upon approval of the Recycled Water Use Plan, the Plan becomes enforceable through this permit action.

Monitoring and Reporting

Outfall 002 – Class C Recycled Water

Hidden Valley High School has written monitoring and sampling procedures at the high school and at the school district office for recycled water relevant Class C of recycled water.

Monitoring

Recycled water monitoring will be conducted during the irrigation season to verify that public health, regulatory and agronomic objectives are met.

Sampling

Both effluent samples are collected using automatic composite samplers. They are currently run in a time-basis mode. Effluent sampling is done at the effluent meter weir after de-chlorination. Minimum monitoring requirements are listed in Schedule B of the WPCF Permit 102402 and are required only during the months when using recycled water.

Table 4: Recycled water permit monitoring requirements

Item or Parameter	Minimum Frequency	Type of Sample/Action
Total flow (MGD or gpd)	Daily	Measurement
Flow meter calibration	Annual	Verification
Quantity irrigated (inches/acre)	Daily	Measurement
pH	1/week	Grab
Quantity chlorine used	Daily	Measurement
Chlorine residual	Daily	Grab
Total Coliform*	1/week	Grab
Nutrients (TKN, NO_2-NO_3-N, NH_3, Total Phosphorus	Quarterly	Grab

Table 5: Bacteria Test Procedures.

Method	Reference	Page	Method Number
mTEC agar, MF	Standard Methods, 18th Edition	9-29	9213 D
NA-MUG, MF	Standard Methods, 19th Edition	9-63	9222 G
Chromogenic Substrate, MPN	Standard Methods, 19th Edition	9-65	9223 B
Colilert QT Or other DEQ Approved Method	Idexx Laboratories, Inc.		

Reporting

Minimum reporting requirements are also listed in Schedule B of WPCF Permit 102402. Both a monthly monitoring report and an annual summary are required.

The requirements for the monthly report are:

a. Monitoring results must be reported on Department approved forms. The reporting period is the calendar month. Reports must be submitted to the appropriate Department office by the 15th day of the following month.
b. State monitoring reports must identify the name, certificate classification and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports shall also identify each system classification as found on Page One of this permit.
c. Monitoring reports must include a record of all applicable equipment breakdowns and bypassing.

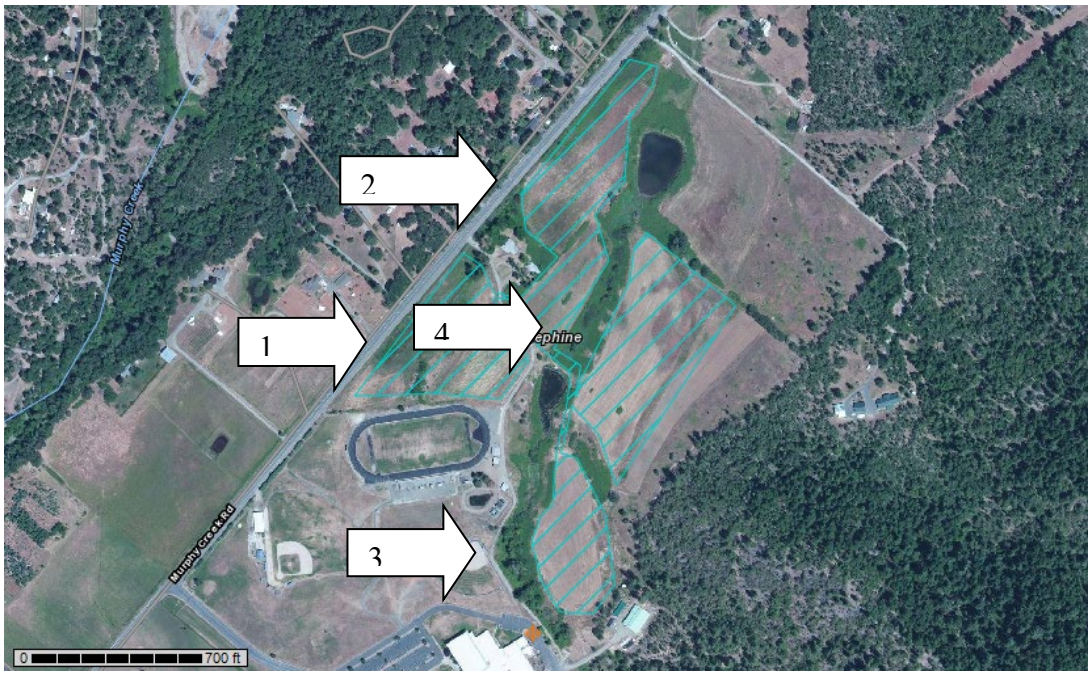

Figure 2. Hidden Valley High School Irrigation fields 1 - 4.

RECYCLED WATER SYSTEM OPERATION AND MAINTENANCE

The RWUP has a maintenance plan for the wastewater treatment equipment and irrigation system. This plan is comprised of an extension publication (Irrigation System Walk-Through Inspection, **See attachment 2**) and best management practices listed in this plan.

Operation and Maintenance

Each component of the system is operated and maintained according to the attached plans for the mainline and the sprinkler system checklist. Management activities follow the best management irrigation guidelines. This plan is reviewed regularly and updated as needed.

No irrigation system should be operated for such a time that it totally saturates the soil profile. This plan has a water balance sheet which provides information about peak water use requirements by month for grass pasture, operation and maintenance tips and a guide to determine how much available water is in the soil profile. This information should be used if there is any doubt whether the root zone has the capacity to absorb the next irrigation application.

Without supplemental irrigation, the effluent volumes will not provide 100% of the water a growing crop would use. Amount and timing of supplemental water will depend on a number of factors. HVHS will implement an irrigation water management plan by using the irrigation inspection and analysis procedures.

In the event that Field #1 (2.3 acre) is saturated with water, then one of the other sites may be irrigated (Fields 2-4). Note that Field #2 has two domestic wells on the eastern side of this site and there is a minimum 100-foot irrigation setback these features.

Recycled water will be applied at such a rate that allows the water to infiltrate into the soil without ponding and/or runoff. Recycled water infiltrates and percolates through the soil so the

water and nutrients can be used by the plants and/or evapotransporated by plants without leaching into groundwater. To assure no surface runoff of effluent, the system is designed to apply water at such a rate (should not exceed 0.2 inches/ hr) that it does not exceed the infiltration capacity of the soil. The volume of water applied will be such that the soil profile is never fully saturated, providing little opportunity to push water past the root zone of the plant. Supplemental irrigation is anticipated in average rainfall years to attain the crop consumption rate.

LAND APPLICATION PLAN

This facility achieves Class C recycled water and provides limited storage prior to chlorination and land application. Land application typically is during the summer season of May 1 through October 31. The treated effluent will be pumped from the chlorine contact chamber through pressurized pipelines and land applied via spray irrigation systems. From May 1 through October 31 recycled water can be applied to a Field #1 (2.3 acres); note all recycled water fields must fenced and signs posted around the site perimeter prior to use of recycled water.

Irrigation System

Effluent from the HVHS treatment plant is applied through standard rotary sprinklers. According to HVHS Recycle Water Irrigation Schematic (**See attachment #3B**) there are six laterals that run east to west within the 2.3-acre land application site. Sprinklers are spaced 30 feet along the lateral and 35 feet between laterals in a rectangular configuration.

Sprinkler nozzles will apply water at a rate of about 2.1 gallons per minute or 0.19 inches per hour. This is below the rate recommended in the Oregon Irrigation Guide of 0.30 inches per hour for sprinkler irrigation. Sprinklers are operated on a variable time schedule depending on the weather and month of application. About 23 to 24 sprinkler heads will be operated at a time giving a flow of about 45 gallons per minute. The sprinklers are Hunter full circle (or equivalent) I-1OS, 3/4-inch shrub sprinkler with a low angle single nozzle. These nozzle- head combinations produce a wetted pattern of about 30 feet at 30 psi. The sprinklers on the boundaries are part-circle Hunter (or equivalent) I-10S. All sprinklers are mounted on galvanized risers positioned at least 36 inches above the ground. Each riser is fixed with a treated timber post or a steel 'T' fence post to protect it from damage. The posts are low enough so they do not interfere with the sprinkler head rotation. The irrigated area and specified flow rate of each zone is shown in the following table.

Table 6: Irrigation Field #1

Zone	No. of spray heads	Area (acres)	Flow Rate (gpm) per head	Application rate (inches/hr)
1	18	0.32	2.1	0.19
2	12	0.2	2.1	0.19
3	9	0.15	2.1	0.19
4	8	0.13	2.1	0.19
5	7	0.12	2.1	0.19
6	5	0.08	2.1	0.19

The plan also lists another approximate 17 acres comprised of three fields which are part of the school's system that allows irrigation with reclaimed water on campus property during summer break.

EFFLUENT CHARACTERISTICS

In 2013, HVHS treatment plant land applied about 0.39 million gallons (1.16 acre-feet) of recycled water. The estimated monthly average flows are shown in the nutrient spreadsheet (**See attachment #7**).

The recycled water is good resource which provides water and some nutrients for growth vegetation. Facility's 2013 effluent flow and nutrient data used in the spreadsheet were taken from the HVHS' discharge monitoring reports. The land application of nitrogen was found to be in excess of 120 lbs. plant available nitrogen (PAN-N) in the Oregon State University fertilizer guide for pasture grass for this 2.3 ac site. Therefore, the high school should consider using two fields to irrigate their recycled water each year based on the discharge monitoring report nutrient values.

Using 2013 recycled water flows (0.39 million gallons/yr) and reported nutrient concentrations for the last year the average concentrations of nitrogen were about 45 mg/1total N and 3.2 mg/L total phosphorus. The wastewater plant produced about 200 pounds of nitrogen and 13 pounds of phosphorus last year. The nutrient loading calculations are conservative for this plan; all Total Kjeldahl Nitrogen (TKN) was considered to be converted to ammonia and all the ammonia was considered plant available (50% volatilization).

A summary of the effluent quality for 2013 is presented below. The effluent is also regularly tested for Biochemical Oxygen Demand (BOD) or Total Suspended Solids (TSS).

Table 7: Average Yearly Nutrient Concentrations

	Total P mg/L	TKN mg/L	Nitrate Nitrogen mg/L	Ammonia Nitrogen mg/L
2013	3.2	1.91	44	ND

Based on the yearly average irrigation rate and the average nutrient concentrations, the nutrient loading for field #1 (2.3-acre site) is shown in table 7. Agronomic rates from Nitrogen Uptake and Utilization by Oregon State Fertilizer Guide for pasture grass is also shown for comparison.

Table 8: Average Yearly Nutrient Loading for Pasture Grass

Nutrient	Loading (lbs./year-ac)	Agronomic (lbs./year)
Nitrogen	73	120
Phosphorus	31.4	40

For most the irrigation fields where recycled water could be applied the predominant soils are mapped as Ruch gravelly silt loam on a two to seven percent slopes. There is a small drainage that runs through irrigation sites 1, 2 and 3, 4. The majority of the area slopes toward this

drainage. A setback of 75 feet between the application area and this ephemeral- drainage should be maintained in permanent vegetative cover.

CROP MANAGEMENT

The current crop is pasture grasses, but permittee can change plant types with written approval. Permittee must provide plant type agronomic and consumptive loading rates. This plan does not recommend any changes to this crop. Crop management generally consists of cutting the grass once per year. Management activities should also include inspections to assess weed control, plant health, plant water stress, and plant nutrition. Annual soil sampling should be conducted to track nutrient status and uptake. The key to a reliable disposal system is to maintain a healthy, vigorous crop. Grass hay needs to be harvested at least twice during the application season, once in 'mid'- June, and once in 'mid'-September.

Supplemental fertilizer may be used, but only to the extent that the crop can use the nutrients and the agronomic loading in this plan is not exceeded: See Table 7 above, total nutrients coming on to the field with the effluent. If either pasture renovation or a change to a different crop is contemplated, this plan will need modification. Currently the 2.3-acre field is vegetated with pasture grass mixed with pasture. The pasture will be harvested either by mechanical methods or by using animals.

According to Oregon State University Publication Extension Miscellaneous 8530, Oregon Crop Water Use and Irrigation Requirements, the amount of net irrigation required by grass pasture in the Grants Pass area is shown in the (**See attachment #8**). For the purpose of this plan, the values shown in the column 5 out of 10 years, or the non-parametric median are used. This means the plants will get enough water half of the years and not get enough for half of the years. For this plan an annual net irrigation water requirement of 29.6 inches is used.

Recycled Water Use Requirements

A water balance spreadsheet (**See attachment #9**) shows Inputs - Losses = Outputs and was used to determine how many acres the effluent should be applied to. In the case of irrigation water requirements, the inputs are the amount of water coming from the treatment plant and any additional well makeup water. The losses are water lost during the sprinkler application process and water lost below the root zone of the crop. The outputs are the water used by the crop for transpiration and water which is evaporated from the ground surface. Using the input from the median amount of rainfall for the area, loss of effluent below the root zone is not desirable, so it is considered to be zero, irrigation application efficiency ranges from 55% to 65% for this type of system. A 70% efficiency was used in the irrigation system efficiency analysis. Attachment 6 is a reference that discusses water management, irrigation scheduling and provides a method of estimating an irrigation system's efficiency. Irrigation schedule can be achieved in many ways, but it should be based on current soil moisture measurements. **Attachment 10** is a USDA hand soil moisture sampling method that could be employed by staff to help manage recycled water; there are other methods that can be used to measure soil moisture.

Water

To assure water resources are used properly and no impacts are caused off of the reuse site there are two important areas of operation and monitoring. First, all flow volumes through

the treatment plant need to be recorded on a daily basis. Similarly, accumulated volumes of effluent applied to the field need to be recorded daily.

The second important water related factor to monitor is off-site impacts. No surface runoff should ever be observed under the sprinkler system designed in this plan. If any surface movement of applied water is observed, discontinue application and determine the source of the problem. In order to not apply water when a seasonal water table is present, ground water levels will need to be monitored in May, June, September and October.

Climate, Soil and Topography Characteristics

The climate of the Southern Cascade area is generally arid most of the year with hot summers and cold winters. Annual precipitation averages 20 inches, occurring mostly in the winter months. Average monthly precipitation and pan evaporation for the area is presented in the water balance sheet. Due to the arid climate and low precipitation, irrigation of crops is critical during the summer months. The irrigation season is generally from May through September.

Table 9: Average Monthly Weather Data

Month	Precipitation (in)	Pan Evaporation (in)
January	2.92	0.53
February	2.23	1.02
March	2.00	2.26
April	1.24	3.56
May	1.36	5.29
June	0.87	6.54
July	0.35	8.24
August	0.41	6.78
September	0.82	4.05
October	1.75	1.81
November	2.99	0.76
December	3.42	0.44
Total	20.36	41.28

Notes: a. Data provided by the Western Regional Climate Center, Medford Station, average for the period of record 1937 to 2003.

Topography, Surface Water, and Groundwater

The effluent reuse and the treatment plant are located near Murphy OR. The soils in the area are generally moderately to highly permeable with no historical flooding or potential flooding. There are two wells at the eastern end of reuse site number 2, the setback is 100 feet or more to these domestic drinking water wells.

Soils and Landforms

Soils where the effluent will be applied are predominately Ruch gravelly silt loam two to seven percent slopes. They are shown mapped as symbol 67B on the soil map. Adjacent

mapping units include Cove silt clay loam, map symbol 22, and Ruch gravelly silt loan 7 to 12 % slopes 67C. The soil series and map unit descriptions for the land application sites 1-4 are shown in **Attachment #11**.

Soil Characteristics

The soils indicated by the Josephine County NRCS soils map in the area of the irrigation site are Ruch gravelly loam. A summary of the permeability and water holding capacity of the soil is:

Table 10: Soil Characteristics

Soil Type 0.5 to 3%OM	Ksat Permeability (in/hr)	Water Holding Capacity (in)
Ruch gravelly loam	0.2-0.57	8.4

Typical Ruch soil profile
Typical profile
0 to 5 inches: Gravelly silt loam
5 to 60 inches: Gravelly clay loam
The soil's upper 24 inches (treatment) has a water holding capacity of about 4 inches of water per acre inch of soil.

An irrigation rate at or below 0.2 inches/hour is within the soil infiltration rate for the Ruch gravelly silt loam. As shown in Table 9, the system as currently configured can deliver a maximum of 0.2 inches/hour, which is below the maximum soil infiltration rate.

Attachment 1 – Recycled Water Checklist

Oregon Department of Environmental Quality

RECYCLED WATER USE PLAN SUMMARY

Directions: Check (✓) appropriate boxes for tables and provide brief narrative where necessary. Submit with Recycled Water Use Plan to DEQ.

APPLICANT INFORMATION

Facility Name: Hidden Valley High School

Address: 651 Murphy Creek Road Murphy Or 97533-9160

Contact Name/Phone Number: Robert Herman 541-476-6304

TYPE OF WASTEWATER TREATMENT PLANT

☒	Activated Sludge	☐	Re circulating Gravel/Sand Filter
☐	Mechanically Aerated Lagoon	☐	Rotating Biological Filter
☐	Aerated Lagoon	☐	Other (Specify):

Average Dry Weather Flow, million gallons per day (MGD): _____

TREATMENT CLASS IN ACCORDANCE WITH OAR 340-055-0012

☐	Class A	☒	Class C
☐	Class B	☐	Class D
☐	Non-Disinfected water		

TREATMENT EFFICIENCY CAPABILITY DURING REUSE

☐	Tertiary Treatment	☒	85% or more BOD/TSS removal
☐	95% or more BOD/TSS removal	☐	Rotating Biological Filter
☐	90% or more BOD/TSS removal	☐	Other (Specify):

DISINFECTION METHOD

☐	Chlorine injection just prior to irrigation
☑	Chlorine injection with storage of recycled water
☒	Chlorine injection after storage just prior to irrigation
☐	UV exposure just prior to irrigation
☐	UV exposure with storage of recycled water
☐	UV exposure after storage just prior to irrigation
☐	Other (specify):

STORAGE IMPOUNDMENT	Y	N
Is there a storage facility proposed for this project?	☐	☒
If yes, at the WWTP	☐	☐
If yes, located at a location other than the WWTP	☐	☐

If yes to either of the above, specify the location and length of time the storage facility will be used:

Attachment 2 – HVHS Irrigation System Checklist

Irrigation System Walk-Through Inspection Analysis

This "walk-through" worksheet provides a method for making an organized inspection of an entire irrigation system, both hydraulics and hardware. This inspection will help identify components that need maintenance, repair, replacement, or other attention—so that the system will provide the most satisfactory, safe, and efficient performance.

Suction system

Inspect system from water supply to pump intake. Generally, suction line should provide smooth water flow with a minimum of fittings that cause obstructions, water turbulence, or head losses.

From surface supplies and shallow wells Note: On shallow wells with aboveground pump mounting, consider pulling suction line to make starred (*) checks.	OK	Needs attention
1. Trash screening device (if used) clean and properly placed.		
*2. Intake screen clean, good condition, properly placed.		
*3. Foot or check valve operating smoothly.		
*4. Suction line does not collapse when pumping.		
*5. Suction pipe size/pump capacity properly matched to maintain flow velocity at 5 feet per second (fps) or less (preferably 2-3 fps).		
*6. Maximum elevation rise from water surface to pump impeller eye does not exceed 10 feet. Required net positive suction head (NPSH) must not exceed NPSH available; see pump performance curve.		
*7. Suction pipe inlet submerged adequately to prevent entrance of air and eddying of water.		
*8. Suction line free of air leaks.		
9. No unnecessary or undersized plumbing fittings in suction line to increase friction losses.		
10. Elbows, bends of flanged type.		
11. Couplings flanged or smooth interior bore.		
12. Eccentric adapter to pump with 12° taper (not over 28°).		
13. Eccentric adapter installed with slope on bottom side.		
14. Straight pipe at least 4 diameters in length before pump inlet to reduce water turbulence, cavitation.		
15. Horizontal suction line to pump sloped upward at least ¼ inch per foot.		
16. High point of suction line at pump entrance to eliminate air entrapment.		
17. Vacuum gauge or port installed on suction line.		
18. No part of suction piping smaller in diameter than pump suction inlet.		
From deep wells		
1. Well casings properly located and perforated to allow water intake without cascading or introducing air into impellers.		
2. Bowls set below water drawdown level.		
3. Bowl settings properly adjusted.		

Pump and fittings *Inspect pump assembly with its associated inlet and discharge fittings. Consider motor separately.*	OK	Needs attention
Aboveground centrifugal pumps		
1. Sturdy pump base with pump firmly attached.		
2. Intake pipe firmly supported within 3 feet of pump.		
3. Discharge pipe firmly supported within 3 feet of pump.		
4. Impeller rotates freely in casing.		
5. Pump operates with no excess vibration.		
6. Bearings in good condition.		
7. Shaft properly aligned with motor.		
8. Impeller firmly attached to shaft.		
9. Stuffing, seals, shaft packing adjusted for proper water drip lubrication.		
10. Wear ring in good condition with no deposition, cavitation, or abnormal configuration.		
11. Water velocity in pipeline at 5 fps or less.		
12. Pressure gauge or port at pump discharge.		
13. Discharge increaser has 12° taper (maximum 28°).		
14. Increaser near as possible to pump.		
15. Straight pipe run out of pump discharge to minimize turbulence (for flow measurement).		
16. No unnecessary or undersized fittings in discharge line that increase friction losses:		
Size, location of tees		
Size, location of elbows, bends		
Size, location of valves		
Size, location of couplings, unions		
Size, location, taper of enlargers		
17. Flow meter with low flow restriction.		
18. Air relief valve at high point in system to release trapped air.		
19. Isolation valve on primer pump.		
Deep well turbines		
1. Sturdy motor base; motor firmly supported.		
2. Discharge pipe firmly supported.		
3. Pump operates with no excess vibration.		
4. Pump lubricated with turbine-type oil.		
5. Oilers working properly.		
6. Working airline in well to measure drawdown.		
7. Water velocity in pipeline at 5 fps or less.		
8. Pressure gauge or port in discharge line.		
9. Concentric discharge fitting, if appropriate.		
10. Straight pipe run out of pump discharge to minimize turbulence (for flow measurement).		
11. No unnecessary or undersized plumbing fittings in discharge line that increase friction losses:		
Size, location of tees		
Size, location of elbows, bends		
Size, location of valves		
Size, location of couplings, unions		
Size, location, taper of enlargers		
12. Flow meter with low-flow restriction.		
13. Air relief valve at high point in system to release trapped air.		

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PNW 293
January 1986

Electric motor

Inspect motor for mechanical and electrical soundness.

	OK	Needs attention
1. Sturdy base mounting.		
2. Proper shaft alignment with pump.		
3. Proper belt alignment and tension between motor and pump.		
4. Motor bearings in good condition, properly lubricated.		
5. Motor frame free of debris, vegetation, straw, caked-on dirt and oil, rodent or insect nests.		
6. Motor ventilation vents open, unobstructed, and protected with ¼- to ½-inch mesh screen.		
7. Cover over motor for shade and rain protection.		
8. Unobstructed ventilation around motor—if in motor house, ample-sized openings on opposite walls for ventilation.		
9. Good drainage away from motor base.		
10. Wiring to motor in good, safe condition.		
11. Safety shields attached and functioning.		
12. Access plates and cover dome in place and secure.		
13. Motor free of evidence of excess heat due to electrical overloading.		
14. Motor runs quietly, free of excess vibration or noise.		

Electric service

Inspect electric service for safety and serviceability.

	OK	Needs attention
1. Overhead lines free of tree branches, other physical obstructions.		
2. Conductors properly secured to prevent flexing, shorting hazards.		
3. Conductors free of frayed, cracked, or worn insulation.		
4. Service panel properly grounded independently of pumping plant.		
5. Service head grommets in place, in good condition.		
6. All conduit or shielded cable in good condition.		
7. Service panel properly, securely installed.		
8. Service panel has functioning interlocking door latches, padlock.		
9. Service panel door has adequate seals and/or drip traps.		
10. Service panel free of open holes, missing knockout plugs.		
11. Electrical connections within service panel secure, free of signs of arcing.		
12. Service panel interior free of moisture, corrosion, insects, rodents, snakes.		
13. Lightning arrestors properly installed on meter and motor side of buss and breaker.		
14. Overload protection properly sized.		
15. Circuit breakers operable; no slugs or copper bars used in place of fuses.		
16. Shade over service panel to cool thermal breakers.		

Mainline system

Inspect entire mainline from pump to terminal end.

	OK	Needs attention
1. Pipe condition:		
Bent or flattened piping		
Split seams		
Bullet holes or other punctures		
Leaky joints, connections, valves		
Gaskets worn, sand or dirt behind		
Leaky end plugs		
2. If buried, mainline protected and covered.		
3. Evidence of sink holes indicating unsupported piping.		
4. Line designed and sized for minimum hydraulic turbulence or friction.		
5. Pipe size adequate to handle water discharge at flow rate of 5 fps or less.		
6. No unnecessary or undersized plumbing fittings in line to increase friction losses:		
Elbows, bends		
Tees		
Valves		
Reducers, enlargers		
Couplings, unions		
7. Flow meter with low flow restriction.		
8. Air release valves and vacuum relief installed as needed on high points of line.		
9. Provision made to drain and flush line if subject to freezing.		
10. Line equipped with check valve, if needed.		
11. Pressure relief valve set at 10 psi above normal operating pressure.		

Stationary and moving laterals

	OK	Needs attention
1. System layout compatible with topography; if not, appropriate pressure control devices used.		
2. Lateral spacing on mainline satisfactory.		
3. Adequate water flow rate and pressure.		
4. System free of leaks from breaks, couplers, drain valves, risers, end plugs.		
5. System free of excessive corrosion or wear.		
6. Chains, bearings, drive gears of all wheel-move systems in good operating condition.		
7. Electric motors covered and protected.		
8. Pipe condition:		
Bent or flattened piping		
Split seams		
Bullet holes or other punctures		
Leaky joints, connections, valves		
Gaskets worn, sand or dirt behind		

Risers and sprinklers

Walk the entire sprinkler line to inspect the following:

	OK	Needs attention
1. Mainline valves and gaskets in good condition.		
2. Risers all in place, no broken units.		
3. Self-leveler risers operating freely, properly aligned.		
4. Sprinkler heads operating properly, no plugged nozzles.		
5. Sprinkler nozzles properly sized, not worn (check orifice by using shank of high-speed drill bit as a gauge).		
6. Sprinkler heads rotate smoothly and freely at 1 to 2 revolutions per minute.		
7. Sprinkler head base gaskets in good condition.		
8. Visual inspection of each sprinkler indicates uniform application pattern.		
9. Pressure at sprinkler appropriate.		
10. Sprinklers match operating pressure.		

Prepared at Oregon State University by Hugh J. Hansen, Extension agricultural engineer, and Walter L. Trimmer, Extension irrigation specialist.

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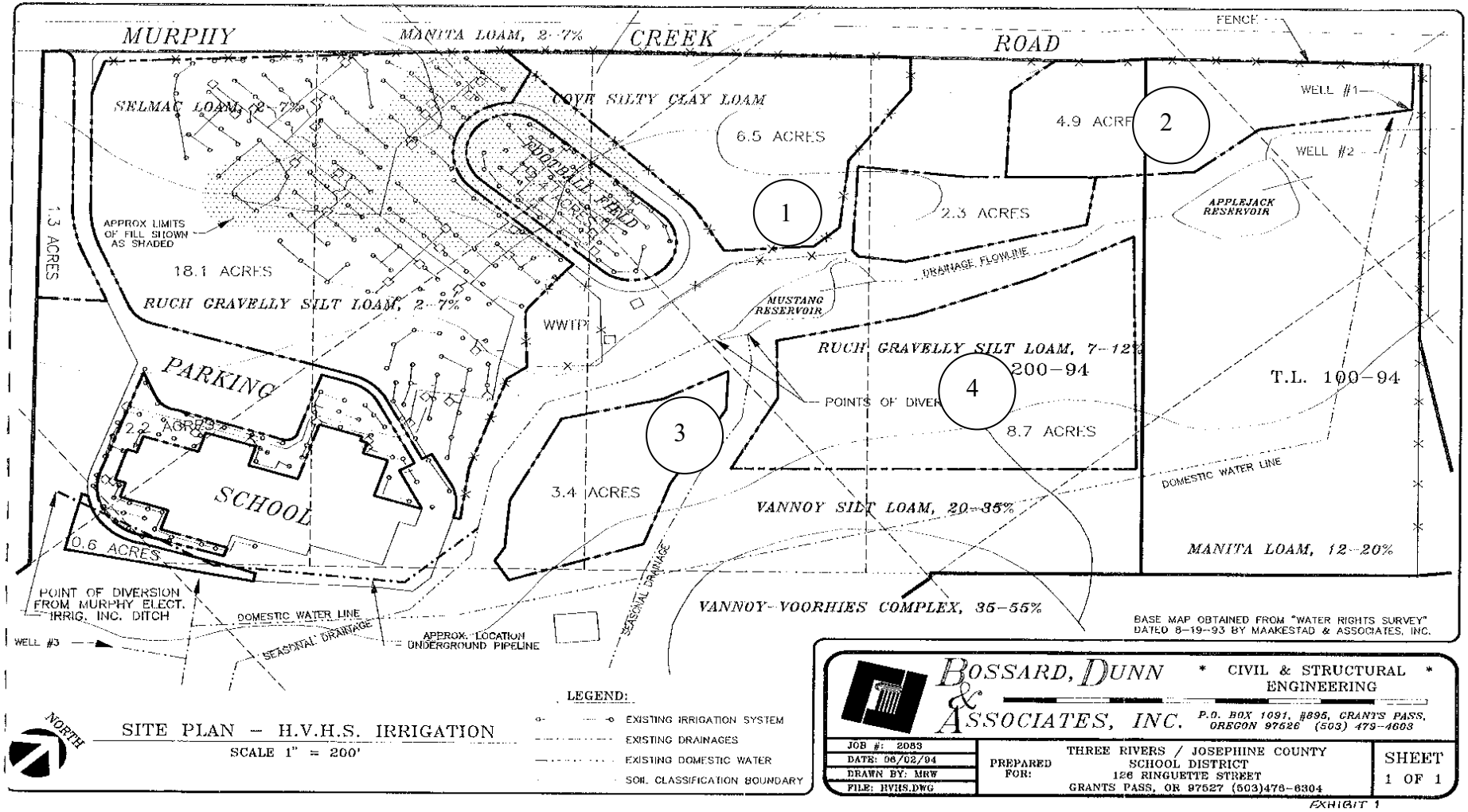
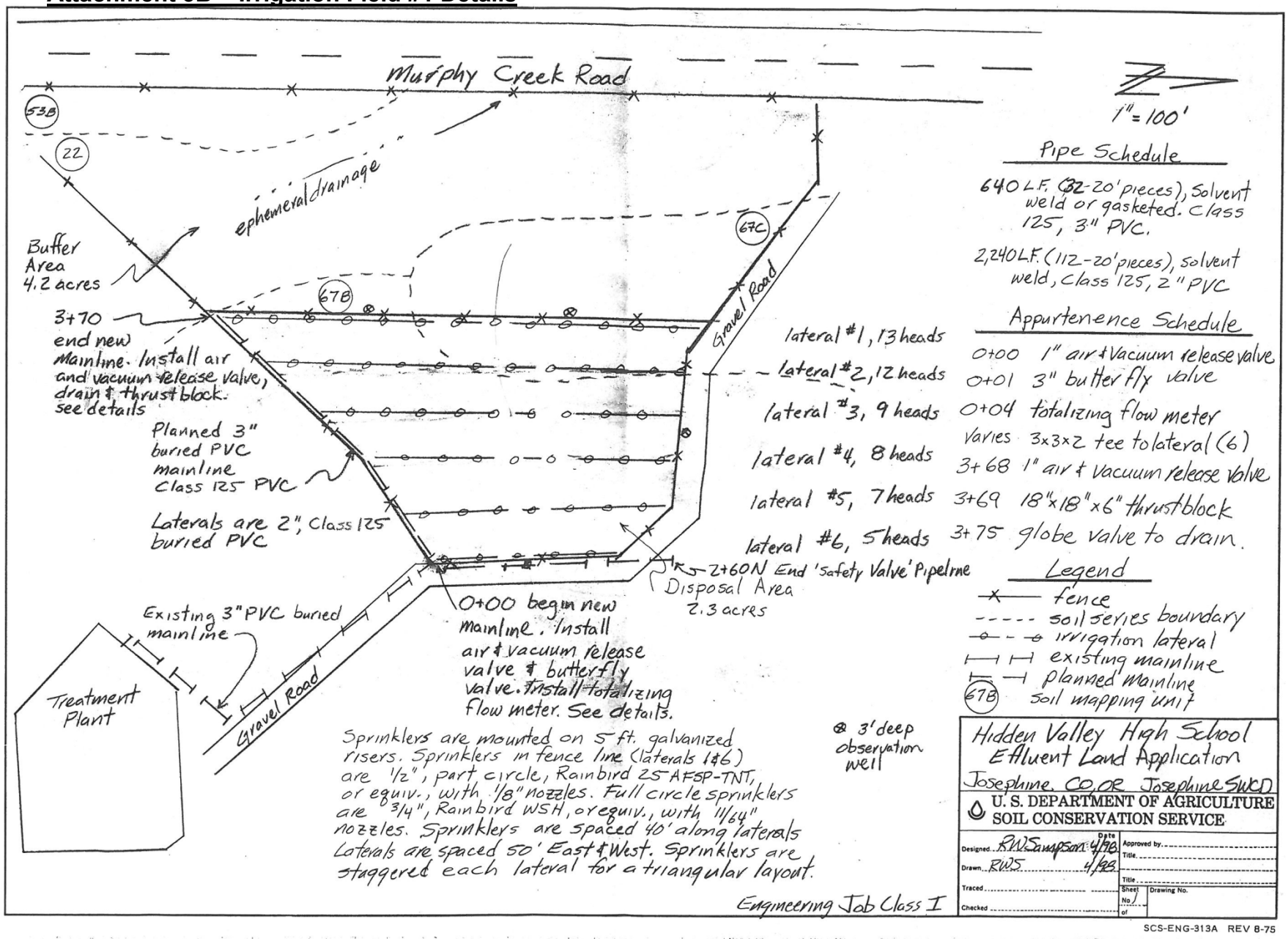
Attachment 3A – HVHS Irrigation System Transmission Line Schematic

Hidden Valley High School recycled water use fields numbered 1 through 4. No recycled water is used on football field or campus lawns.



Attachment 3B – Irrigation Field #1 Details



Attachment 4 – Recycled Water Beneficial Uses

Beneficial Purpose	Class A	Class B	Class C	Class D	Non-disinfected
Irrigation					
Parks, playground, residential landscapes, other landscapes accessible to public	**Yes**	No	No	No	No
Any Agriculture or Horticulture use*	**Yes**	No	No	No	No
Golf courses, cemeteries, Highway medians, industrial and business campuses	**Yes**	**Yes**	**Yes**	No	No
Orchards or vineyards if an irrigation method is used to apply recycled water directly to the soil	**Yes**	**Yes**	**Yes**	No	No
Processed food crops	**Yes**	**Yes**	**Yes**	No	No
Pasture for animals**	**Yes**	**Yes**	**Yes**	**Yes**	No
Sod**	**Yes**	**Yes**	**Yes**	**Yes**	No
Firewood, ornamental nursery stock, Christmas trees	**Yes**	**Yes**	**Yes**	**Yes**	No
Fodder, Fiber, Seed Crops not intended for human consumption	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Industrial, Commercial or Construction					
Fountains when the water is not intended for human consumption (bathing)	**Yes**	No	No	No	No
Commercial car washing	**Yes**	No	No	No	No
Nonresidential toilet or urinal flushing, floor drain trap priming	**Yes**	**Yes**	No	No	No
Stand alone fire suppression systems in commercial buildings	**Yes**	**Yes**	No	No	No
Street sweeping or sanitary sewer flushing	**Yes**	**Yes**	**Yes**	No	No
Nonstructural fire fighting using aircraft	**Yes**	**Yes**	**Yes**	No	No
Dust control	**Yes**	**Yes**	**Yes**	No	No
Rock crushing, aggregate washing, mixing concrete	**Yes**	**Yes**	**Yes**	No	No
Industrial cooling	**Yes**	**Yes**	**Yes**	No	No
Impoundments or Artificial Groundwater Recharge					

Artificial groundwater recharge	**Yes**	No	No	No	No
Non-restricted recreational impoundments including, but not limited to, recreational lakes, water features accessible to the public and public fishing ponds	**Yes**	No	No	No	No
Restricted recreation impoundments	**Yes**	**Yes**	No	No	No
Water supply for landscape impoundments including, but not limited to, golf course water ponds and non-residential landscape ponds	**Yes**	**Yes**	**Yes**	No	No

* Horticulture intensive plant cultivation for human use.

** Depending on the season the permittee may request a recycled water use for out season use with written DEQ authorization.

Attachment 5 – Recycled Water Setback Table

All site setbacks, restrictions and site management are listed by Class of recycled water and type of irrigation system used as followings:

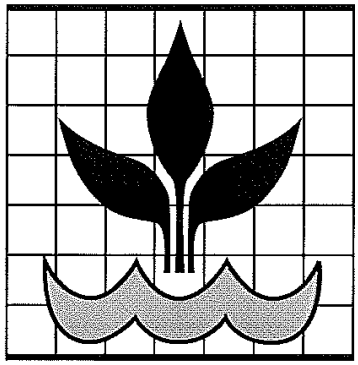
Setbacks, Restrictions and Site Management						
Recycle Water Treatment/ Disinfection	**Food Preparation / drinking water fountains**	**Drinking Water Supply**	**Public road/ public walk way access**	**Property line (PL)/Site Management (SM)**	**Access/ Exposure**	**Aerosol Drift**
Class A (Signage/notification required around irrigation site)						
Directly to soil	No set back	Use on agriculture, horticulture, industrial, commercial notify people in area	Use on agriculture, horticulture, industrial, commercial notify people in area	(SM) Use on agriculture, horticulture, industrial, commercial notify people in area	Use on agriculture, horticulture, industrial, commercial notify people in area	No direct contact with public / cannot create public health hazard
Sprinkler	Cannot spray directly on area / public	Cannot spray directly on area / structure	Cannot spray directly on area / roadway	(SM) Use on agriculture, horticulture, industrial, commercial notify people in area	Use on agriculture, horticulture, industrial, commercial notify people in area	No direct contact with public / cannot create public health hazard
Cannon	50'- aerosol cannot spray directly on area / public	50'- aerosol cannot spray directly on area	Cannot spray directly on area / structure	(SM) Use on agriculture, horticulture, industrial, commercial notify people in area	Use on agriculture, horticulture, industrial, commercial notify people in area	No direct contact with public / cannot create public health hazard
Class B (Signage required around irrigation site)						
Directly to soil	As approved by DEQ	As approved by DEQ	As approved by DEQ	(P/L) 10' No direct contact with public	No direct contact with public / No contact with edible foods	No direct contact with public / cannot create public health hazard

Sprinkler	10’	10’	50’	(P/L) 10’ (SM) No direct contact with public/ cannot create public health hazard	No direct contact with public / No contact with edible foods	Irrigation system shut off winds of 10 mph or higher*
Cannon	70’	70’	100’	(P/L) 100’ (SM) No direct contact with public/ cannot create public health hazard	No Public Access to Site Restriction / No contact with edible foods	Irrigation system shut off winds of 10 mph or higher*
Class C (Signage required around irrigation site)						
Directly to soil	As approved by DEQ	As approved by DEQ	As approved by DEQ	(P/L) 10’	Site restricted No Public access	N/A
Sprinkler	70’	70’	100’	(P/L) 70’: (SM)3-day irrigation restriction on before harvesting	No Public Access to Site, No direct contact with public	Irrigation system shut off winds of 10 mph or higher*
Cannon	300’	300’	300’	(P/L) 300’	No Public Access to Site, No direct contact with public	Irrigation system shut off winds of 10 mph or higher*
Class D (Signage required around irrigation site)						
Directly to soil	As approved by DEQ	As approved by DEQ	As approved by DEQ	(P/L) 10’: (SM) 3-day irrigation restriction on before harvesting	No Public Access to Site Restriction	N/A
Sprinkler	70’	70’	100’	(P/L) 100’: (SM) 3-day irrigation restriction on before harvesting	No Public No Public Access to Site Restriction	Irrigation system shut off winds of 10 mph or higher*
Cannon	300’	300’	300’	(P/L) 100’: (SM) 3-day irrigation restriction on	No Public Access to Site Restriction	Irrigation system shut off winds of

				before harvesting		10 mph or higher*
Non-disinfected (Signage required around irrigation site)						
Directly to soil	Not Allowed	Not Allowed	Not Allowed	(P/L) 10': (SM) 30-day irrigation restriction on before harvesting	No Public Access to Site Restriction. No Direct contact with animals used for milk Production	N/A
Sprinkler	70'	70'	100'	(P/L) 100': (SM) 30-day irrigation restriction on before harvesting	No Public Access to Site Restriction. No Direct contact with animals used for milk Production	Irrigation system shut off winds of 10 mph or higher*
Cannon	300'	300'	300'	(P/L) 300': (SM) 30-day irrigation restriction on before harvesting	No Public Access to Site Restriction. No Direct contact with animals used for milk Production	Irrigation system shut off winds of 10 mph or higher*

* Wind shut off: to irrigate recycled water above constant wind speeds of 10 mph or higher: the permittee can propose wind mitigation measures for written DEQ approval.

Attachment 6 – Irrigation Efficiencies



IRRIGATION MANAGEMENT SERIES

EFFICIENCIES AND WATER LOSSES OF IRRIGATION SYSTEMS

Danny H. Rogers, Freddie R. Lamm, Mahbub Alam, Todd P. Trooien, Gary A. Clark, Philip L. Barnes and Kyle Mankin, Kansas State University, Research and Extension Engineers

Efficiency ratings receive a lot of attention. We like efficient engines, air conditioners, water heaters and furnaces. Conservationists like efficient water systems that deliver water for its intended use without loss due to leakage, spills or contamination. Since irrigation is the largest appropriated water user in Kansas, irrigation systems also receive merit based on how efficient they are reported to be. While this might sound straightforward and simple, there is room for confusion because there are different ways to define efficiency. Efficiencies also vary in time and with management. Very "efficient" systems by some definitions can be very poor performers by other definitions, for example, if distribution uniformity and delivery amount are inadequate to fulfill crop need. This bulletin will define and explain several common efficiency terms in use for irrigation systems and show how these terms apply to some common irrigation situations.

DEFINITIONS

Water Conveyance Efficiency (E_c): The percentage of source water that reaches the field.

$E_c = 100 (W_f / W_s)$
W_f = Water delivered to field
W_s = Water diverted from source

Conveyance efficiency is generally a concern for irrigation districts that supply a group of farmers through a system of canals and open ditches. Since most Kansas irrigation water pumped and carried in closed conduits, conveyance efficiency should be nearly 100 percent.

Water Application Efficiency (E_a): The percentage of water delivered to the field is used by the crop.

$E_a = 100 (W_c / W_f)$
W_c = Water available for use by the crop
W_f = Water delivered to field

Water application efficiency gives a general sense of how well an irrigation system performs its primary task of getting water to the plant roots. However, it is possible to have a high E_a but have the irrigation water so poorly distributed that crop stress exists in areas of the field. It is also possible to have nearly 100 percent E_a but have crop failure if the soil profile is not filled sufficiently to meet crop water requirements. It is easy to manipulate W_f so that E_a can be nearly 100 percent. Any irrigation system from the worst to the best can be operated in a fashion to achieve nearly 100 percent E_a if W_f is sufficiently low. Increasing E_a in this manner totally ignores the need for irrigation uniformity. For E_a to have practical meaning, W_c needs to be sufficient to avoid undesirable water stress.

Water application efficiency sometimes is incorrectly used to refer to the amount of water delivered to the surface of the soil in an irrigated field by a sprinkler system. Water losses can occur after reaching the soil surface, leading to overestimation of the application efficiency. E_a is often confused with water storage efficiency (E_s), which is the fraction of an irrigation amount stored in the crop root zone. The use of this term is discouraged because of the difficulty in determining the crop root zone and because E_s can be very low while sufficient water is provided to the crop.

Water losses include surface runoff and deep percolation. If a center pivot is equipped with a properly designed nozzle package and operated using best management practices and irrigation scheduling, these losses can be negligible. However, for many systems, these losses can be large and result in poorly distributed or nonuniform irrigation.

Irrigation Efficiency (E_i): The percentage of water delivered to the field that is used beneficially.

$E_i = 100 (W_b / W_f)$
W_b = Water used beneficially
W_f = Water delivered to field

Irrigation efficiency is more broadly defined than water application efficiency in that irrigation water may have more uses than simply satisfying crop water requirements. Other beneficial uses could include salt leaching, crop cooling, pesticide or fertilizer applications, or frost protection. However, most Kansas irrigation systems are single-purpose, that is to supply water for crop use, which allows water application efficiency and irrigation efficiency to be used interchangeably.

Attachment 7 – Nutrients Loading

File No.	38625	PN	102221	**Year**	2013
Source	**Hidden Valley HS**				
Contact	**Debbie Bunker**				
				Input values	

Estimated Wastewater Flows and Nutrient Loading

1 MGD = 1.547 cfs
1 MGD = 694.4 gal/min
1 ac in. = 27154 gal

Wastewater irrigated monthly

	Head Flow	Field 1 acres 2.3	No. heads in system	Total hours	Total gal./ac	ac-inch
Month	gal/min	gal./hr.		irrigated/mon.	month	
January	**2.1**	126	59	**0.0**	0	0
February	**2.1**	126	59	**0.0**	0	0
March	**2.1**	126	59	**0.0**	0	0
April	**2.1**	126	59	**0.0**	0	0
May	**2.1**	126	59	**9.9**	73597	3
June	**2.1**	126	59	**6.2**	46091	2
July	**2.1**	126	59	**9.9**	73597	3
August	**2.1**	126	59	**10.3**	76570	3
September	**2.1**	126	59	**16.3**	121174	4
October	**2.1**	126	59	**0.0**	0	0
November	**2.1**	126	59	**0.0**	0	0
December	**2.1**	126	59	**0.0**	0	0
Total				53	391028	14

	Head Flow	Field 2 acres 4.9	No. heads in system	Total hours	Total gal./ac	ac-inch
Month	gal/min	gal./hr.		irrigated/mon.	Month	
January	**2.1**	126	0	**0.0**	0	0
February	**2.1**	126	0	**0.0**	0	0
March	**2.1**	126	0	**0.0**	0	0
April	**2.1**	126	0	**0.0**	0	0
May	**2.1**	126	0	**0.0**	0	0
June	**2.1**	126	0	**0.0**	0	0
July	**2.1**	126	0	**0.0**	0	0
August	**2.1**	126	0	**0.0**	0	0
September	**2.1**	126	0	**0.0**	0	0
October	**2.1**	126	0	**0.0**	0	0
November	**2.1**	126	0	**0.0**	0	0
December	**2.1**	126	0	**0.0**	0	0
Total	**0**			0	0	0.0

Month	Head Flow gal/min	Field 3 acres 3.4 gal./hr.	No. heads in system	Total hours irrigated/mon.	Total gal./ac month	ac-inch
January	2.1	126	0	0.0	0	0
February	2.1	126	0	0.0	0	0
March	2.1	126	0	0.0	0	0
April	2.1	126	0	0.0	0	0
May	2.1	126	0	0.0	0	0
June	2.1	126	0	0.0	0	0
July	2.1	126	0	0.0	0	0
August	2.1	126	0	0.0	0	0
September	2.1	126	0	0.0	0	0
October	2.1	126	0	0.0	0	0
November	2.1	126	0	0.0	0	0
December	2.1	126	0	0.0	0	0
Total				0	0	0

Month	Head Flow gal/min	Field 4 acres 8.7 gal./hr.	No. heads in system	Total hours irrigated/mon.	Total gal./ac month	ac-inch
January	2.1	126	0	0.0	0	0
February	2.1	126	0	0.0	0	0
March	2.1	126	0	0.0	0	0
April	2.1	126	0	0.0	0	0
May	2.1	126	0	0.0	0	0
June	2.1	126	0	0.0	0	0
July	2.1	126	0	0.0	0	0
August	2.1	126	0	0.0	0	0
September	2.1	126	0	0.0	0	0
October	2.1	126	0	0.0	0	0
November	2.1	126	0	0.0	0	0
December	2.1	126	0	0.0	0	0
Total				0	0	0.0

	Total inches irrigated on Fields 1, 2, 3, 4
January	0
February	0
March	0
April	0
May	3
June	2
July	3
August	3
September	4
October	0
November	0
December	0
	14

gallons irrigated Fields1, 2, 3, 4
391028

Nutrient Loading **# of Nutrient samples/yr**

3 **Input the number of lab analysis run for the year**

N Analysis	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	ave. ppm year
TKN (%)	0.00	0.00	0.00	0.00	1.40	0.00	0.00	2.10	0.00	2.24	0.00	0.00	0.96
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NH3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NO3	0.00	0.00	0.00	0.00	56.00	0.00	0.00	10.07	0.00	66.42	0.00	0.00	44.16
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P	0.00	0.00	0.00	0.00	2.98	0.00	0.00	1.19	0.00	5.43	0.00	0.00	3.20
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Example N-N calculation (mg/L = ppm)

(N-N ppm) = (N mg/L)(g/1000 mg)(1 lb. N/454 g)(3.78L/1gal.)(1 gal./7.84 H2O lb)(total gal/yr)= N lb./yr.

Typically in irrigation water ORG-N is in a NH4 like form and 50% lossed to due to volatilization.

				lb. /gal	lb./yr.			
TKN		3.12	ppm	1.3	19			
ORG=TKN-NH_3								
NH_3	77%N by wt.	0.00	ppm	0.0	0	0	208.14	**total lbs. N /yr**
NO_3	22%N by wt.	144.02	ppm	59.8	861	189.48		
P		10.44	ppm	4.3	62	**lb. P /yr**		
K		0.00	ppm	0.0	0	**lb. K /yr**		

	Ave. Conc. Mg/l
TKN (%)	0.96
NH3	0.00
NO3	44.16
P	3.20
K	0.00

FERTILIZERguide
FG 63
Reprinted January 2000

Pastures

Western Oregon and Western Washington

J. Hart, G. Pirelli, L. Cannon, and S. Fransen

In western Oregon and Washington, forage shortages typically occur in late fall and early spring. In contrast, an excess supply may exist in late spring. By fertilizing in early fall and late winter, you can increase forage supply in deficient times. To reduce production in times of excess, reduce or eliminate late spring fertilization.

A single fertilization program will not fit all pastures. Determine which combination of grazing management, fertilization, and irrigation fits your resources and environment. Use a soil test and an assessment of forage supply and forage species to determine fertilizer need.

If suitable species are not present, fertilization will not compensate. In this case, consider renovating the pasture.

New Seedings

Match the pasture species to site conditions and livestock needs when renovating a pasture. Cows prefer grasses over legumes and graze perennial ryegrass before tall fescue. Sheep graze selectively, preferring clover and grass mixtures with short, lush feed to tall, coarse plants.

Horses are selective grazers, eating a wide range of plants. The horse digestive system cannot handle large amounts of legumes. Small and frequent amounts of forage are best. Horses avoid grazing near their own manure and urine; therefore, managing grazing on horse pastures is difficult.

Cool season forages such as tall fescue, perennial ryegrass, orchardgrass, subclover, and white clover are suited for our climate.

After choosing the appropriate forage species and planting method, use a soil test as the basis for fertilization. EC 628, *How to Take a Soil Sample . . . and Why*, contains instructions for obtaining a soil sample.

For a preplant soil test, obtain samples from the tillage depth, generally the surface to 6 inches. If you use a minimum tillage method of planting, you may wish to divide the sample into two parts: the top 2 inches and the lower 4 inches.

Analyze the soil sample for the following:

- pH
- Lime requirement (SMP or LR)
- Phosphorus (P)
- Potassium (K)
- Calcium (Ca)
- Magnesium (Mg)

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Soil pH indicates whether lime is needed, and the SMP buffer or lime requirement (LR) test estimates the amount of lime needed. Estimate the rate of lime application from the following SMP buffer table.

Table 1.—Lime application rates for grass or white clover-grass pastures.

If the SMP buffer test for lime is:	Apply this amount of lime (t/a):
under 5.5	4–5
5.5–5.8	3–4
5.8–6.1	2–3
6.1–6.5	1–2
over 6.5	0–1

If soil pH is below 5.5, incorporate lime for stand establishment and longevity. Mix lime into the seedbed before seeding to allow time for lime to neutralize soil acidity.

Exceptions to Table 1 are subclover seedings and pastures on coastal county bottomland soils. For new subclover seedings where the pH of the top 2 to 3 inches of soil is 5.5 or lower, mix 1 to 2 t lime/a into the surface 2 inches of soil before seeding. Using lime-pelleted seed also can improve seedling establishment on acidic soils.

If your pasture is on coastal county bottomland soils, apply a maximum of 2 t lime/a if the soil pH is below 5.5.

Additional information about lime requirement and the SMP buffer is in FG 52, *Fertilizer and Lime Materials*.

Nitrogen fertilization usually is necessary to establish grass forages in western Oregon and Washington. Broadcast 20 to 40 lb N/a at planting, or band this amount 1 to 2 inches below the seed. When P or K is needed, N can be banded with these nutrients. The total N plus K_2O in the band should not exceed 100 lb/a. *Do not include B in band applications because this concentration of B can be toxic to seedlings.*

Working P into the top 2 inches of the soil during seedbed preparation is more effective than broadcasting after seeding. The most effective P application method is banding.

If you band P, place the band 1 to 2 inches to the side or below the seed. Some soil should separate seed from fertilizer. Phosphorus fertilization rates are given in Table 2.

In new clover or clover and grass seedings, broadcast K and work it into the seedbed anytime before seeding. See Table 3 for fertilization rates based on a soil test.

John Hart, Extension soil scientist; Gene Pirelli, Extension agent, Polk County; Lynn Cannon, Extension agent emeritus, Coos County; Oregon State University; and Steve Fransen, Washington State University.
Reviewed by western Oregon county Extension agents.

Attachment 9 – Water Balance

HVHS Irrigation, Consumptive Loading, Crop Irrigation Requirements and Soil Water Holding Capacity

I

FN PN

			Wastewater Plant Consumptive Loading				Water Storage capacity in gal.	Crop Irrigation Requirements					Soil Water Storage Capacity			**One Half SWHC gal./ field
							3,600									
Month*	Effluent Flow gal.	Rainfall inches/ac (1)	Rainfall gallons	ET Crop Evaporation inches/ac (2)	ET Crop Evaporation gallons (2)	flow+rain-ET gal.	Storage gal.	Crop Net Irr inches (2)	Irrigation % efficiency	Net Crop Irr. Required inches (2)	Net Crop Irr. Required gallons	Crop needs vs flow+rain-ET	SWHC/ac (3) inches/ac	Field #1 acres	SWHC gal./ field	Minus Flow rain &ET
January	0	2.92	79290	0.00	0	79290	3597	0.00	70	0.00	0	-79290	8	2.3	499634	420344
February	0	2.23	60553	0.00	0	60553	3598	0.00	70	0.00	0	-60553	8	2.3	499634	439080
March	0	2.00	54308	1.97	53493	815	3598	0.24	70	0.31	8472	-99329	8	2.3	499634	391832
April	0	1.24	33671	3.58	97211	-63540	3599	2.28	70	2.96	80484	-50398	8	2.3	499634	368751
May	8160	1.36	36929	5.04	136856	-91767	-4561	3.78	70	4.91	133435	-48511	8	2.3	499634	317688
June	6320	0.97	26339	6.02	163467	-130808	-2721	5.16	70	6.71	182149	-13977	8	2.3	499634	303507
July	6540	0.35	9504	7.32	198767	-182723	-2940	7.20	70	9.36	254161	39350	8	2.3	499634	284822
August	5720	0.41	11133	6.06	164553	-147700	-2120	5.91	70	7.68	208624	27218	8	2.3	499634	318227
September	9280	0.82	22266	4.45	120835	-89289	-5681	3.74	70	4.86	132023	-20359	8	2.3	499634	347252
October	11420	1.75	47520	2.83	76846	-17906	-7822	1.22	70	1.59	43066	-92719	8	2.3	499634	363848
November	0	2.99	81190	0.04	1059	80131	3597	0.04	70	0.05	1412	-80837	8	2.3	499634	417384
December	0	3.42	92867	0.00	0	92867	3597	0.00	70	0.00	0	-92867	8	2.3	499634	406767
Total	47440	20	555571	37	10130995			30		38	1043827					
	Peak flows: 4,591,104 gallons															

*Irrigation flow data taken from Hidden Valley High School 2013 Discharge Monitoring Reports.

Crop pasture grass and hay field

**soil capacity to hold on to and take more water

(1) Rainfall data from Medford Oregon weather station

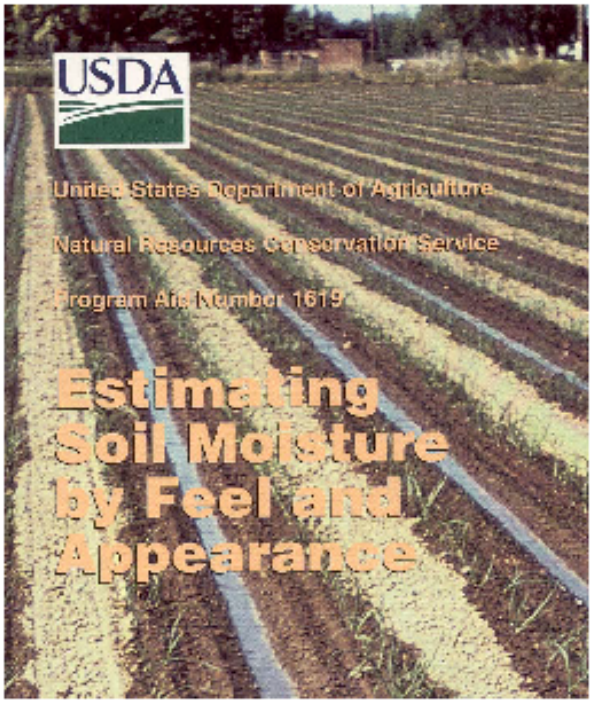
(2) Oregon Crop Water Use and Irrigation Requirements Extension Miscellaneous 8530 (used 5 in 10 probablility for Medford area pasture grass)

(3) NRCS soil survey data Ruch gravelly silt loam has a AWHC of about 8.4 inches per acre

Attachment 10 – Soil Moisture

Estimating Soil Moisture by Feel and Appearance

Irrigation Water Management (IWM) is applying water according to crop needs in an amount that can be stored in the plant root zone of the soil.



The "feel and appearance method" is one of several irrigation scheduling methods used in IWM. It is a way of monitoring soil moisture to determine when to irrigate and how much water to apply. Applying too much water causes excessive runoff and/or deep percolation. As a result, valuable water is lost along with nutrients and chemicals, which may leach into the ground water.

The feel and appearance of soil vary with texture and moisture content. Soil moisture conditions can be estimated, with experience, to an accuracy of about 5 percent. Soil moisture is typically sampled in I-foot increments to the root depth of the crop at three or more sites per field. It is best to vary the number of sample sites and depths according to crop, field size, soil texture, and soil stratification. For each sample the "feel and appearance method" involves:

1. Obtaining a soil sample at the selected depth using a probe, auger, or shovel;
2. Squeezing the soil sample firmly in your hand several times to form an irregularly shaped "ball";
3. Squeezing the soil sample out of your hand between thumb and forefinger to form a ribbon;
4. Observing soil texture, ability to ribbon, firmness and surface roughness of ball, water glistening, loose soil particles, soil/water staining on fingers, and soil color. [Note: A very weak ball will disintegrate with one bounce of the hand. A weak ball disintegrates with two to three bounces;
5. Comparing observations with photographs and/or charts to estimate percent water available and the inches depleted below field capacity.

Example:

Sample Depth	Zone	USDA Texture	AWC* for Zone	Soil Moisture Deipetion**	Percent Depletion
6"	0-12"	sandy loam	1.4"	1.0"	70
18"	12-24"	sandy loam	1.4"	.8"	55
30"	24-36"	loam	2.0"	.8"	40
42"	36-48"	loam	2.0"	.5"	25
			6.8"	3.1"	

Result: A 3.1" net irrigation will refill the root zone.
** Available Water Capacity*
*** Determined by "feel and appearance method"*

Available Water Capacity (AWC) is the portion of water in a soil that can be readily absorbed by plant roots of most crops.

Soil Moisture Deficit (SMD) or Depletion is the amount of water required to raise the soil-water content of the crop root zone to field capacity.

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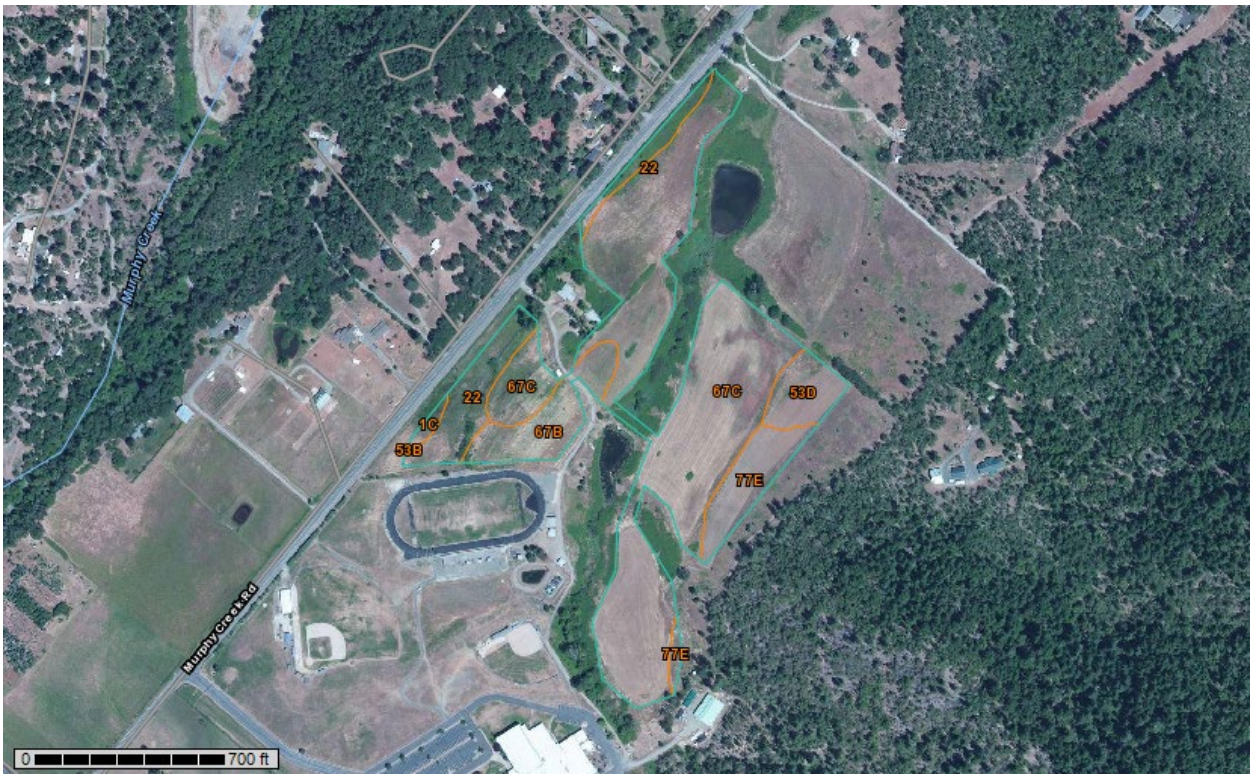
Attachment 11 – Soils

Hidden Valley High School
Recycled Water Use Irrigation Fields
Soil series

Hidden Valley High School irrigation fields 1-4.

Josephine County, Oregon (OR033)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1C	Abegg gravelly loam, 7 to 12 percent slopes	0.2	0.8%
22	Cove silty clay loam	2.6	10.5%
53B	Manita loam, 2 to 7 percent slopes	0.0	0.0%
53D	Manita loam, 12 to 20 percent slopes	1.3	5.2%
67B	Ruch gravelly silt loam, 2 to 7 percent slopes	2.1	8.5%
67C	Ruch gravelly silt loam, 7 to 12 percent slopes	16.8	67.1%
77E	Vannoy silt loam, 20 to 35 percent slopes	2.0	7.8%
Totals for Area of Interest		25.1	100.0%



Hidden Valley High School irrigation fields soil map units.

Josephine County, Oregon

67C—Ruch gravelly silt loam, 7 to 12 percent slopes

Map Unit Setting

- *Elevation:* 800 to 3,000 feet
- *Mean annual precipitation:* 30 to 35 inches
- *Mean annual air temperature:* 52 to 54 degrees F
- *Frost-free period:* 140 to 170 days

Map Unit Composition

- *Ruch and similar soils:* 74 percent
- *Minor components:* 1 percent

Description of Ruch

Setting

- *Landform:* Hillslopes, alluvial fans
- *Landform position (two-dimensional):* Footslope
- *Landform position (three-dimensional):* Base slope, riser
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Parent material:* Alluvium derived from metavolcanics and metasedimentary rock

Properties and qualities

- *Slope:* 7 to 12 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Available water capacity:* Moderate (about 8.4 inches)

Interpretive groups

- *Farmland classification:* Farmland of statewide importance
- *Land capability classification (irrigated):* 4e
- *Land capability (nonirrigated):* 2e
- *Hydrologic Soil Group:* C

Typical profile

- *0 to 5 inches:* Gravelly silt loam
- *5 to 60 inches:* Gravelly clay loam

Minor Components

Aqualfs

- *Percent of map unit:* 1 percent
- *Landform:* Alluvial fans

Josephine County, Oregon
53D—Manita loam, 12 to 20 percent slopes

Map Unit Setting

- *Elevation:* 800 to 4,000 feet
- *Mean annual precipitation:* 30 to 35 inches
- *Mean annual air temperature:* 46 to 54 degrees F
- *Frost-free period:* 100 to 170 days

Map Unit Composition

- *Manita and similar soils:* 91 percent
- *Minor components:* 1 percent

Description of Manita

Setting

- *Landform:* Hillslopes, alluvial fans
- *Landform position (two-dimensional):* Footslope
- *Landform position (three-dimensional):* Base slope, riser
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Parent material:* Alluvium and colluvium derived from metavolcanic and metasedimentary rock

Properties and qualities

- *Slope:* 12 to 20 percent
- *Depth to restrictive feature:* 40 to 60 inches to paralithic bedrock
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Available water capacity:* Moderate (about 8.7 inches)

Interpretive groups

- *Farmland classification:* Farmland of statewide importance
- *Land capability classification (irrigated):* 4e
- *Land capability (nonirrigated):* 3e
- *Hydrologic Soil Group:* C

Typical profile

- *0 to 1 inches:* Slightly decomposed plant material
- *1 to 12 inches:* Loam
- *12 to 51 inches:* Clay loam

- *51 to 61 inches:* Weathered bedrock

Minor Components

Aqualfs

- *Percent of map unit:* 1 percent
- *Landform:* Alluvial fans

Josephine County, Oregon
22—Cove silty clay loam

Map Unit Setting

- *Elevation:* 100 to 2,500 feet
- *Mean annual precipitation:* 30 to 60 inches
- *Mean annual air temperature:* 50 to 54 degrees F
- *Frost-free period:* 140 to 210 days

Map Unit Composition

- *Cove and similar soils:* 84 percent
- *Minor components:* 11 percent

Description of Cove

Setting

- *Landform:* Flood plains
- *Landform position (three-dimensional):* Tread
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Parent material:* Clayey alluvium

Properties and qualities

- *Slope:* 0 to 1 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Poorly drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.06 in/hr)
- *Depth to water table:* About 0 to 12 inches
- *Frequency of flooding:* Occasional
- *Frequency of ponding:* None
- *Available water capacity:* High (about 9.9 inches)

Interpretive groups

- *Farmland classification:* Farmland of statewide importance
- *Land capability classification (irrigated):* 3w
- *Land capability (nonirrigated):* 3w
- *Hydrologic Soil Group:* D

Typical profile

- *0 to 8 inches:* Silty clay loam
- *8 to 60 inches:* Silty clay

Minor Components

Wapato

- *Percent of map unit:* 10 percent
- *Landform:* Flood plains, basin floors
- *Landform position (three-dimensional):* Tread
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear

Cove, gravelly surface

- *Percent of map unit:* 1 percent
- *Landform:* Flood plains

Josephine County, Oregon
77E—Vannoy silt loam, 20 to 35 percent slopes

Map Unit Setting
- *Elevation:* 1,000 to 4,000 feet
- *Mean annual precipitation:* 30 to 35 inches
- *Mean annual air temperature:* 46 to 54 degrees F
- *Frost-free period:* 100 to 170 days

Map Unit Composition
- *Vannoy and similar soils:* 75 percent

Description of Vannoy

Setting
- *Landform:* Hillslopes
- *Landform position (two-dimensional):* Shoulder, summit
- *Landform position (three-dimensional):* Nose slope, interfluve, crest
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Parent material:* Colluvium derived from metavolcanics and metasedimentary rock

Properties and qualities
- *Slope:* 20 to 35 percent
- *Depth to restrictive feature:* 20 to 40 inches to paralithic bedrock
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Available water capacity:* Low (about 4.7 inches)

Interpretive groups
- *Farmland classification:* Farmland of statewide importance
- *Land capability (nonirrigated):* 4e
- *Hydrologic Soil Group:* C

Typical profile
- *0 to 7 inches:* Silt loam
- *7 to 29 inches:* Clay loam
- *29 to 39 inches:* Weathered bedrock

Josephine County, Oregon
1C—Abegg gravelly loam, 7 to 12 percent slopes

Map Unit Setting
- *Elevation:* 800 to 2,500 feet
- *Mean annual precipitation:* 30 to 60 inches
- *Mean annual air temperature:* 50 to 54 degrees F
- *Frost-free period:* 140 to 170 days

Map Unit Composition
- *Abegg and similar soils:* 83 percent
- *Minor components:* 1 percent

Description of Abegg

Setting

- *Landform:* Stream terraces
- *Landform position (three-dimensional):* Riser
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Parent material:* Alluvium and colluvium from igneous, metamorphic and sedimentary rock

Properties and qualities

- *Slope:* 7 to 12 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Well drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Available water capacity:* Low (about 5.6 inches)

Interpretive groups

- *Farmland classification:* Prime farmland if irrigated
- *Land capability classification (irrigated):* 4s
- *Land capability (non-irrigated):* 4s
- *Hydrologic Soil Group:* B

Typical profile

- *0 to 2 inches:* Slightly decomposed plant material
- *2 to 18 inches:* Gravelly loam
- *18 to 28 inches:* Very gravelly clay loam
- *28 to 57 inches:* Extremely gravelly loam
- *57 to 61 inches:* Extremely gravelly loamy sand

Minor Components

Aqualfs

- *Percent of map unit:* 1 percent
- *Landform:* Terraces