Smith Valley Dairy

Application for a Nevada CAFO groundwater discharge permit

June 4, 2014

Prepared by

AG PRO

3050 67th Avenue, Suite 200
Greeley, CO 80634
970-535-9318

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Groundwater Discharge Permit Supplemental Application

State of Nevada
Department of Conservation
and Natural Resources
Division of Environmental Protection

FOR BWPC USE ONLY:	
Check	No.:
Receipt	No.:
Amount:	$

CONCENTRATED ANIMAL FEEDING OPERATION (CAFO) PERMIT APPLICATION SUPPLEMENTAL

☒ APPLICATION – NEW ☐ APPLICATION – RENEWAL ☐ APPLICATION – MODIFICATION

PERMIT NUMBER: ______ (LEAVE BLANK IF NEW PERMIT)

1. OWNER/RESPONSIBLE PARTY INFORMATION:

Business/Agency Name: Smith Valley Dairy
Contact Person: Dirk Vlot
Phone Number: 559-731-3475
Mailing Address: P.O. Box 367
Fax Number: NA
City: Chowchilla County: Madera State: CA Zip Code: 93610
Email Address: valvlot7@aol.com
Federal Tax ID No.: none at this time

Note: The Federal Tax ID number is necessary in the event of any error in monetary transaction, i.e. refund or reimbursement, from the State of Nevada

2. BILLING ADDRESS:

Business/Agency Name: Smith Valley Dairy
Contact Person: Dirk Vlot
Phone Number: 559-731-3475
Mailing Address: P.O. Box 367
Fax Number: NA
City: Chowchilla County: Madera State: CA Zip Code: 93610

3. FACILITY/SITE INFORMATION:

Note: A separate permit application form must be completed for each discharging facility operated by the applicant.

Facility Name: Smith Valley Dairy
Contact Person: Dirk Vlot
Phone Number(s): 1. 559-731-3475 2.
Email Address: valvlot7@aol.com
Fax Number: NA
Street Address/ Location: 40 Hunewill Ln
City: Wellington County: Lyon State: NV Zip Code: 89444
Township: 12 N Range: 23E Section(s): 26
Latitude: 38.87 Longitude: -119.38
Discharge Location(s): Storage pond spillway
Discharge Latitude: approx. 38.88 Discharge Longitude: -119.37
Name of Operator*: ______ Certification Grade*: ______
*If applicable

4. SITE CHARACTERISTICS (if applicable – WPC discharge):

Maps:

Include a topographic map and a site map showing the location of the proposed discharge(s) and the location of proposed or existing groundwater monitoring wells, drinking water wells, irrigation or other wells within a one (1) mile radius.

Wells:

List all wells on the property and include copies of well logs or well specifications. Continue descriptions on additional sheets if necessary. Complete the following information as accurately as possible.

Well Designation	Well Log Number	Notice of Intent Number	Latitude/Longitude	and/ or	Section, Township, Range
N/A	Well to be drilled				

Hydrology:

Depth to groundwater: 18 feet

Groundwater elevation: 4660.9

Groundwater flow direction: North

5. FLOW:

	30-Day Average		Daily Maximum	
Design Capacity:	0.08 MGD	gpm	0.08 MGD	gpm
Requested Flow Limit:	MGD	gpm	MGD	gpm
Current Operational Flow*:	MGD	gpm	MGD	gpm

* If applicable
MGD: million gallons per day
gpm: gallons per minute

6. DISCHARGE ACTIVITY:

Describe the activity producing the discharge. (Example – wastewater treatment, dewatering, cooling, manufacturing, etc.). Include pertinent elements of water processing or treatment that could affect the quality of the water discharged. Include a Process Flow Diagram.

Description of facility process (if applicable):

Process water is generated in the parlor on a daily basis. It flows over a solid separator, and outflow water is stored in holding ponds. Stormwater runoff from corrals, feed storage & manure stockpiles drain to the holding ponds.

7. DISPOSAL/REUSE (if applicable – WPC discharge):

Describe the method of disposal and/or reuse application method (irrigation, percolation, evaporation, spray, disk, etc.):

Wastewater generated at the facility is stored in lined ponds for evaporation and application to crops at agronomic rates.

8. TREATMENT:

Describe the treatment or process that will be used to meet the discharge limits:

None

A. Has NDEP approved the design of this treatment system? ☐ YES ☑ NO Date Approved: ________

B. Does this facility have an approved Operations and Maintenance Manual or Effluent Management Plan? ☐ YES ☑ NO Date Approved: ________ submitted with application

9. DISCHARGE CONSTITUENTS (if applicable – WPC discharge):

Describe the average annual results of the parameters listed below that may be present in the discharge and in the monitoring wells reports. Source: Average values taken from a similar operation in the area.

Analyte	Concentration (mg/L)	Analyte	Concentration (mg/L)
BOD_5:	751.5	Total Nitrogen as N:	758.4
Total Suspended Solids:	2200	Kjeldahl Nitrogen as N:	525
Total Dissolved Solids:	4258	Nitrate as N:	0.99
Fecal Coliform:	235,753	Total Phosphorus:	43.8
pH (Standard Units)	7.58	Other:	
Chloride	275		

10. NOTIFICATION REQUIREMENTS:

In the event of an unauthorized diversion, bypass, spill, overflow, or discharge while operating under an NPDES permit, the Permittee must notify all agencies, organizations, tribes, utilities, and local governments responsible for, having a legal interest in, or impacted by downstream water quality affecting public health and welfare, biological integrity, or designated uses. On the attached form, provide the list of any agencies, organizations, tribes, utilities, and local governments that would be required to be contacted in the event of an unauthorized discharge:

See Attached Form

CAFO PERMIT APPLICATION SUPPLEMENTAL (CONTINUED)

RENEWAL APPLICANTS ONLY: PERMITTEES RENEWING EXISTING PERMITS MUST ALSO COMPLETE ITEMS 11-13.

11. MODIFICATIONS:

List and briefly describe any changes to the production, treatment, or disposal processes of the facility since issuance of the current permit:

12. DISCHARGE DISCREPANCIES:

List Discharge Monitoring Report (DMR) dates and parameters where the facility exceeded the permitted discharge limits (attach additional sheets if necessary):

13. DISCHARGE HISTORY:

Submit graphs of the monitored parameters in the discharge and in any groundwater wells over the time period of the existing permit (e.g., plot BOD_5 vs. month). The time scale should not be less frequent than the permitted sampling frequency. Attach a tabulated compilation of all compliance data for all monitoring parameters analyzed or measured during the preceding five (5) years or the lifetime of the permit, whichever is shorter. Provide the tabulated data in hard copy, and if available, an electronic file compatible with Microsoft Office software (version 97 or later).

I hereby certify that I am familiar with the information contained in the application and that to the best of my knowledge and ability such information is true, complete, and accurate.

Print Name of Applicant: Dirk Vlot

Title: Owner

Signature of Applicant: [signature]

Date: 9/3/13

Any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained by the provisions of NAC445A.070 to 445A.348, inclusive, or by any permit, rule, regulation, or order issued pursuant thereto, or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under the provisions of NAC 445A.070 to 445A.348, inclusive, or by any permit, rule, regulation, or order issued pursuant thereto, is guilty of a gross misdemeanor and shall be punished by a fine of not more than $10,000 or by imprisonment in the county jail for not more than 1 year, or by both fine and imprisonment.

REMIT APPLICATION AND FEE (PER NAC445A.232) TO:
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER POLLUTION CONTROL
901 S. Stewart Street, Ste. 4001
CARSON CITY, NEVADA 89701

PHONE: (775) 687 - 9418

Unauthorized Discharge
Notification List

NPDES CAFO Permit ________________________ (Leave Blank if New Permit)

In the event of an unauthorized diversion, bypass, spill, overflow, or discharge of treated or untreated wastewater from facilities or operations under the control of a Permittee otherwise authorized to discharge under a National Pollutant Discharge Elimination System permit, the Permittee shall notify the Nevada Division of Environmental Protection and all agencies, organizations, tribes, utilities, or municipalities responsible for, having a legal interest in, or impacted by downstream water quality affecting public health and welfare, biological integrity, or designated uses within the State of Nevada, within twenty-four hours of the occurrence.

The following list of agencies, organizations, tribes, utilities, or municipalities have been identified by the Permittee as those that must be notified if an unauthorized discharge occurs during the effective dates of an existing permit or as a condition of a pending NPDES permit.

Entity Name	Contact Name	Mailing Address	Contact Phone Number (if available)	Contact email (if available)

If additional space is needed, please complete and sign additional pages as appropriate.

I hereby certify/recertify that the foregoing information is, to the best of my knowledge and ability, a complete and accurate list of those required to be notified under the conditions or circumstances described above.

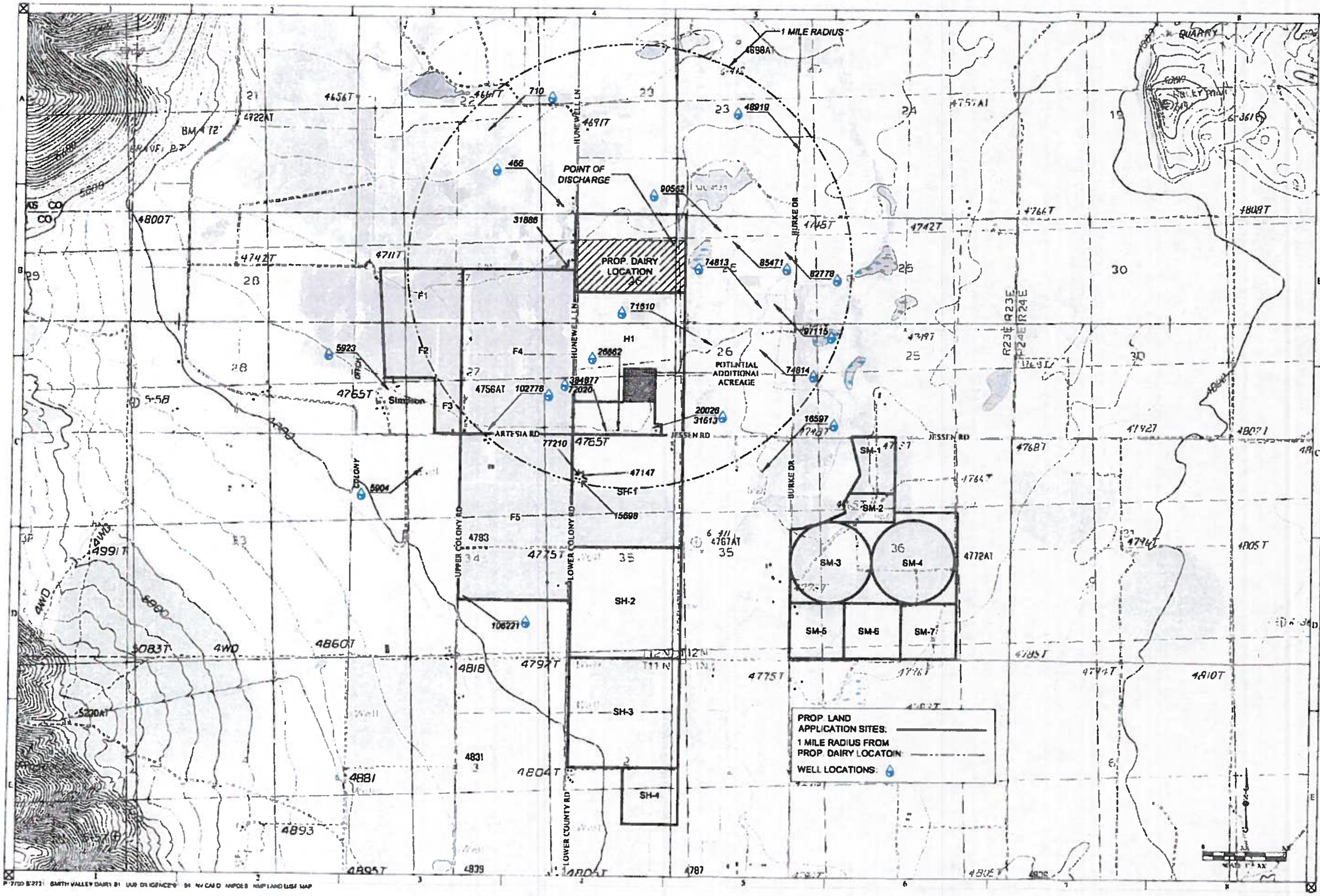
Print Name of Applicant: ________________________

Signature of Applicant ________________________

Title: ________________________ Date: ____________

Recertification Date: ________________________

NDEP – Bureau of Water Pollution Control
http://ndep.nv.gov



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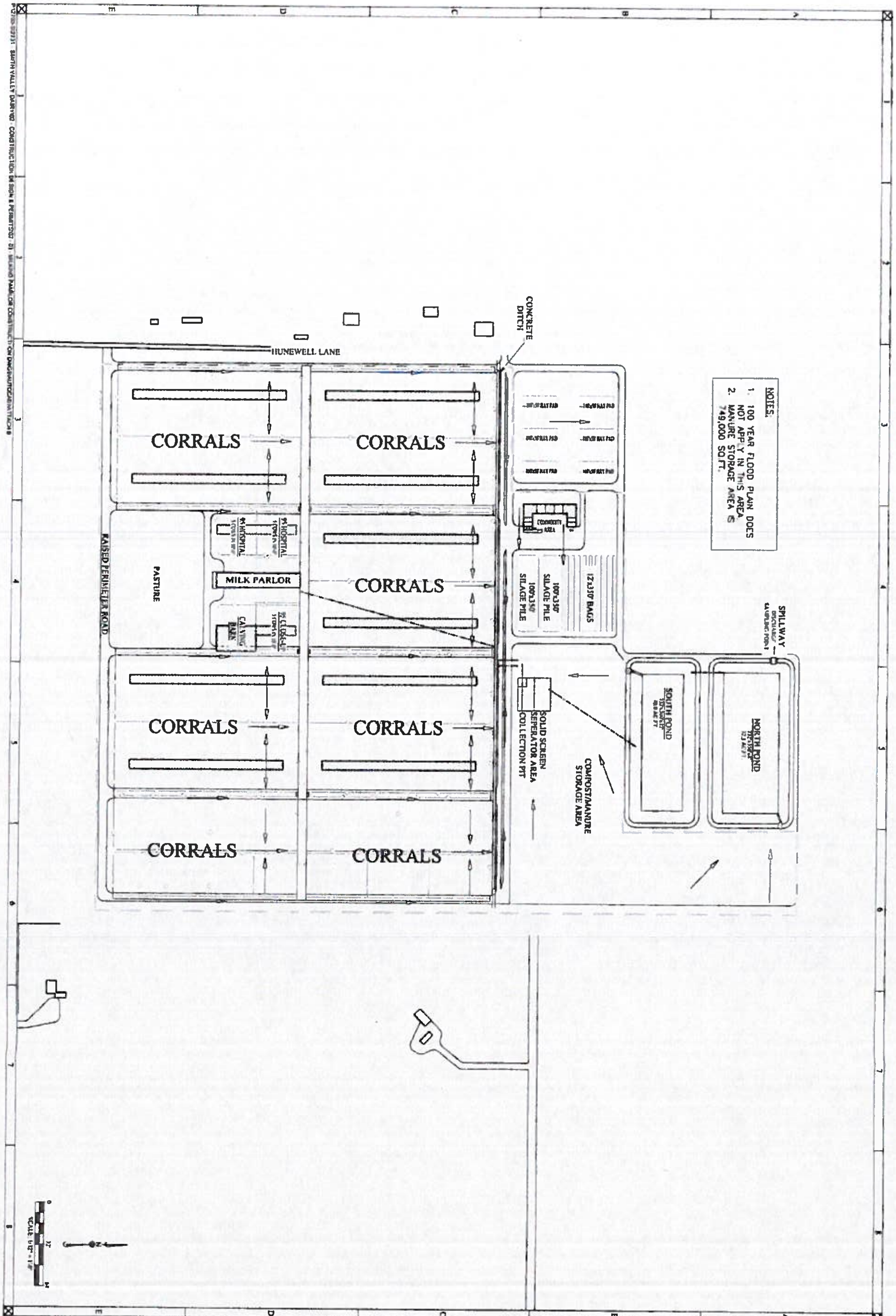
SMITH VALLEY DARIY
LAND USE MAP
LYON COUNTY, NEVADA

SHEET:
LM-1

Engineering Documents



SMITH VALLEY DAIRY
SITE PLAN
LYON COUNTY NEVADA

SHEET: S-1

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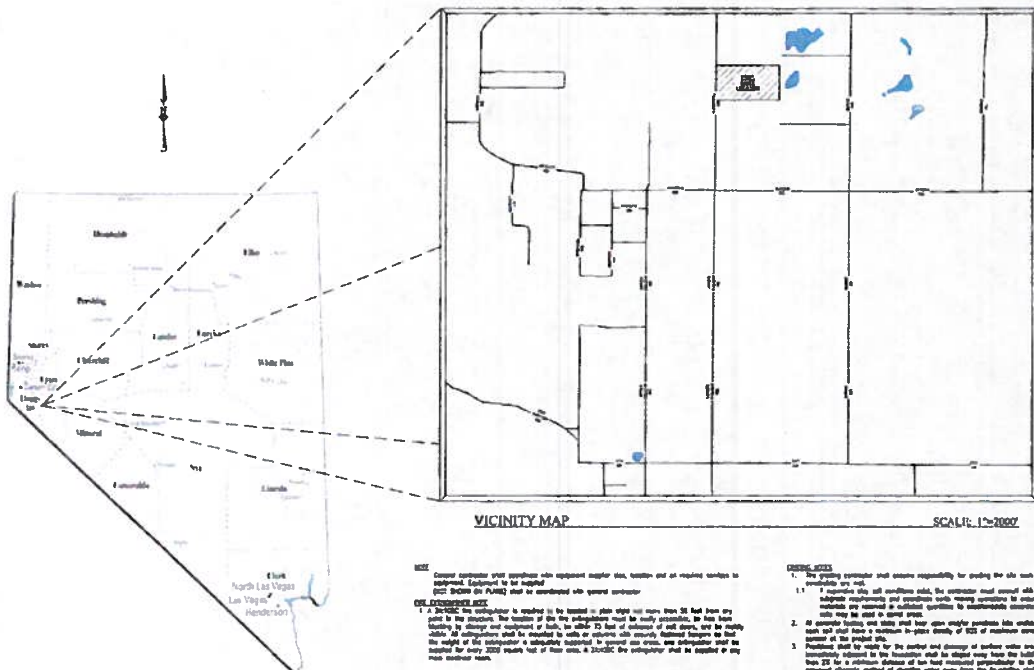
811 Know what's below. Call before you dig.

SMITH VALLEY DAIRY

LYON COUNTY, NEVADA



VICINITY MAP SCALE: 1"=2000'

APPROVED BY:

LYON COUNTY ENGINEER

Sheet List Table

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GR-1	EXISTING CONTOURS
GR-2	PROPOSED CONTOURS
GR-3	PROPOSED CUT FILL
GR-4	PROPOSED SURFACE POINTS
GR-5	OFFSITE DRAINAGE PROFILES
EC-1	EROSION CONTROL
EC-2	EROSION CONTROL DETAILS
P&P-1	POND PLAN AND CROSS SECTIONS
D-1	POND DETAILS 1

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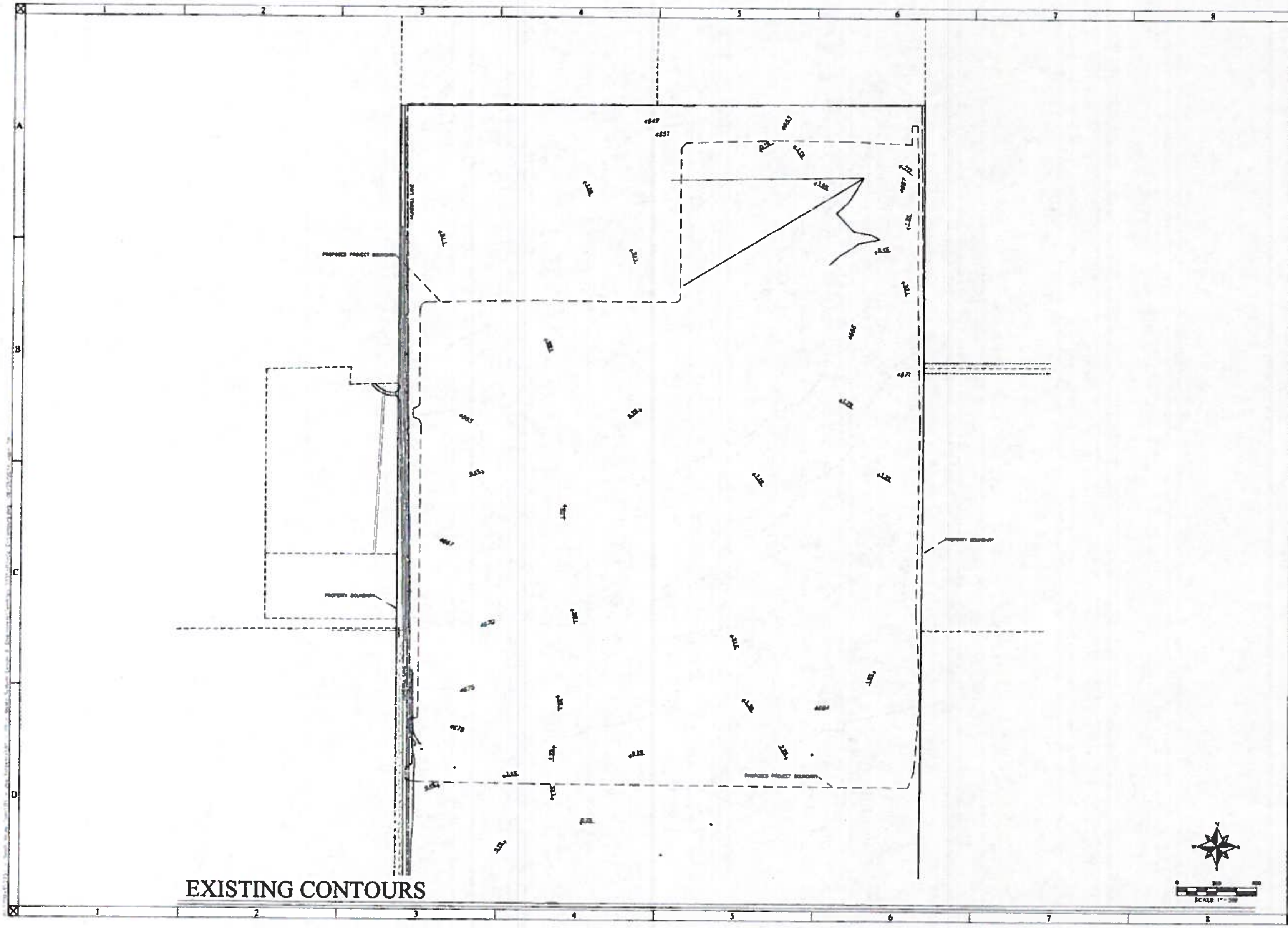
SMITH VALLEY DAIRY
GRADING COVER
LYON COUNTY, NEVADA

SHEET:
C-1



SMITH VALLEY DAIRY
EXISTING CONTOURS
LYON COUNTY, NEVADA

SHEET:
GR-1

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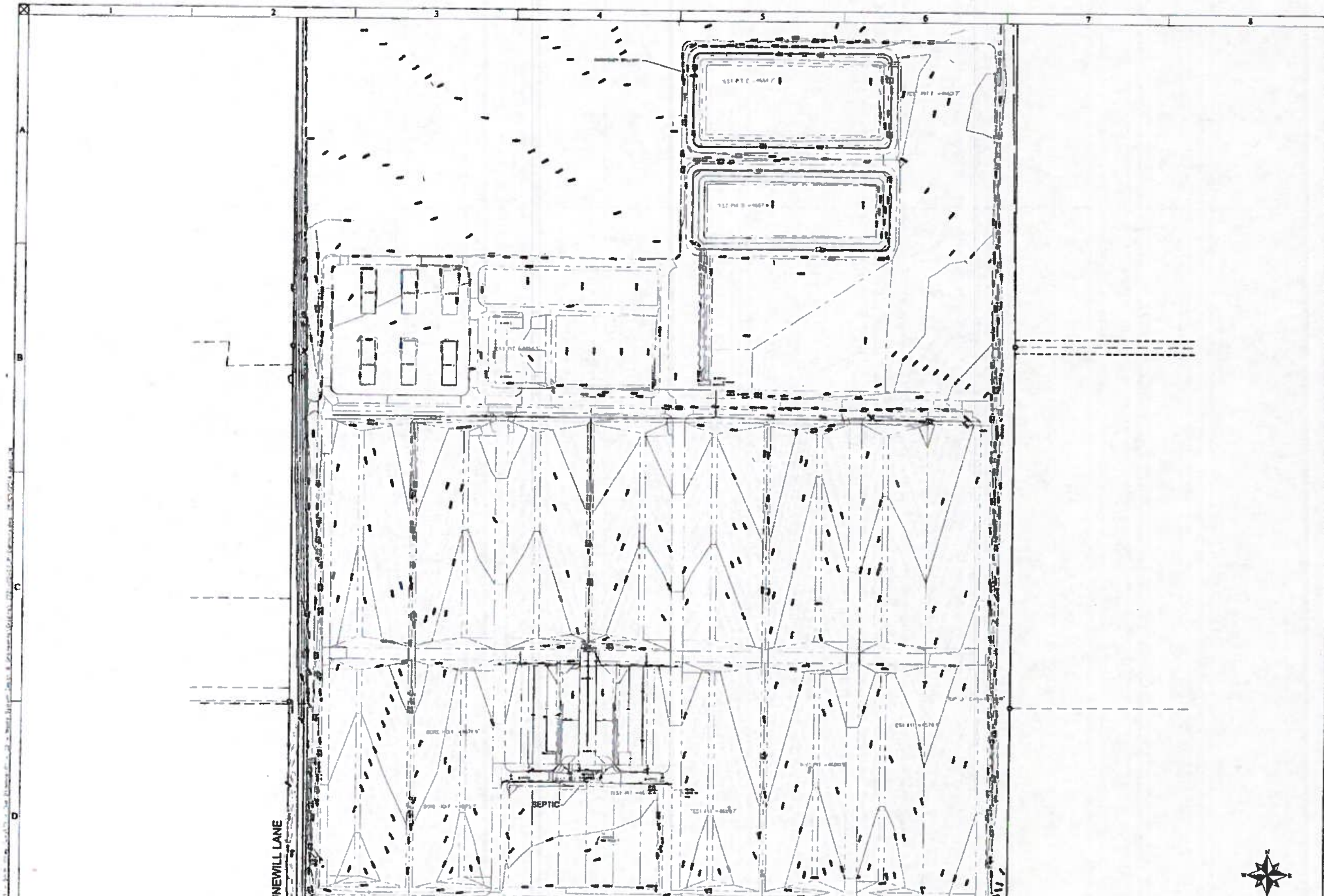
SMITH VALLEY DAIRY
EXISTING CONTOURS



PROPOSED GRADING CONTOURS

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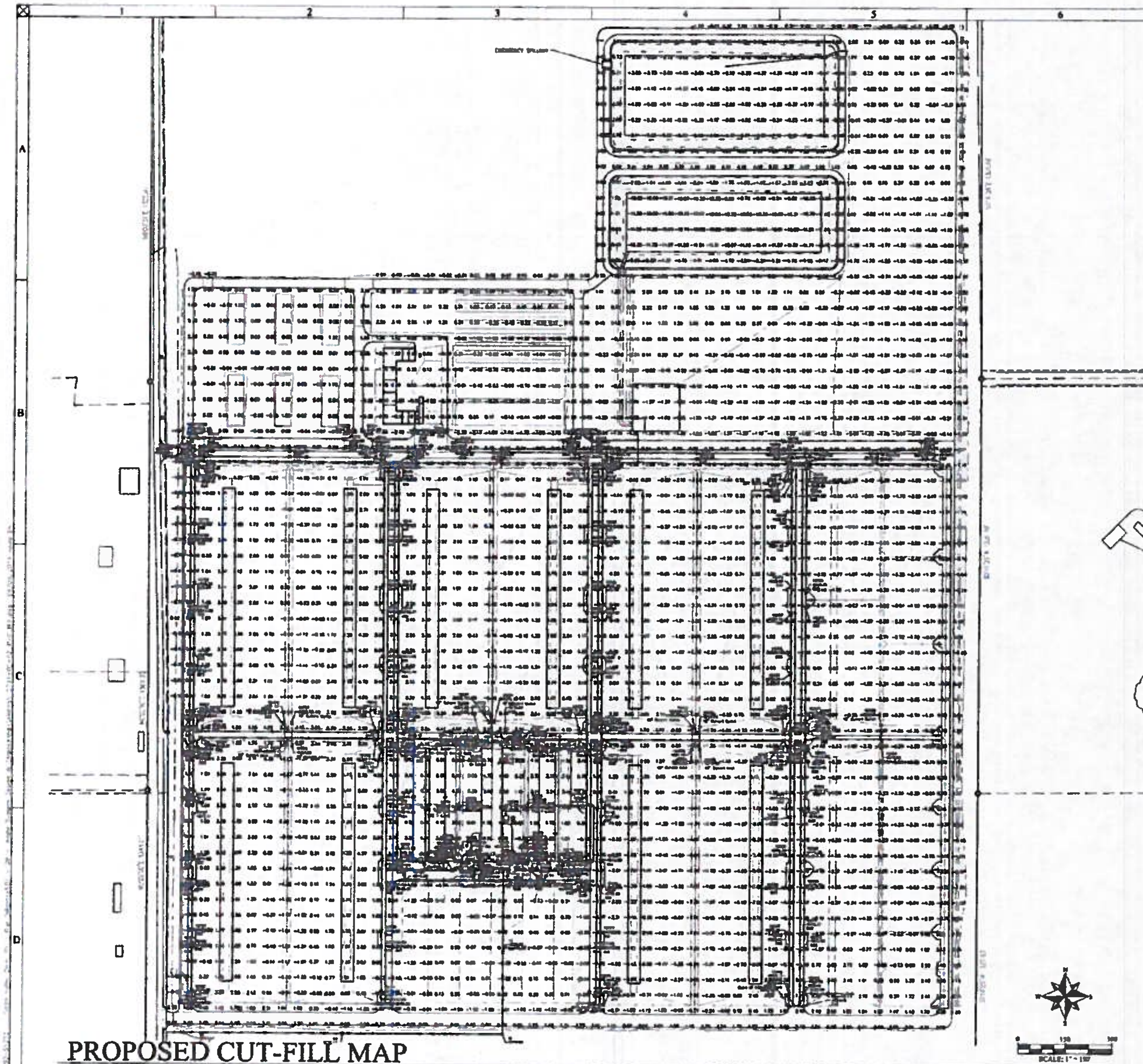
SMITH VALLEY DAIRY
PROPOSED CONTOURS
LYON COUNTY, NEVADA

SHEET:
GR-2

SMITH VALLEY DAIRY
PROPOSED CONTOURS



PROPOSED CUT-FILL MAP

ESTIMATED QUANTITIES

ITEM	ESTIMATED QUANTITY	UNIT
EROSION CONTROL		
SILT FENCE	±2,250	LF
STRAW BALE DAMS (TO BE DETERMINED IN FIELD)	2	EA
VEHICLE TRACKING CONTROL PAD	1	EA
CONCRETE WASHOUT	1	EA
GENERAL EXCAVATION		
CUT	307,183	CY
FILL	226,589	CY
FILL W/ 1.35 CUT FILL RATIO	305,895	CY
POND LINER		
SOUTH POND (FINISHED SURFACE AREA)*	221,436	SQ.FT
NORTH POND (FINISHED SURFACE AREA)*	257,011	SQ.FT
*NO SHRINKAGE CALCULATED IN.		
GRAVEL ROAD		
PROVIDE GRAVEL AND FINISH, (6" CLASS 6 ROAD BASE)	TBD	SF

GENERAL CONSTRUCTION NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING ANY BURIED UTILITIES (WATER, ELECTRIC, GAS, PHONE, ETC.) THAT MAY BE IN THE PROJECT AREA. AGPRO ENVIRONMENTAL, LLC MAKES NO REPRESENTATION OF THE EXISTENCE OR NON-EXISTENCE OF UTILITIES. THE PRESENCE OR ABSENCE OF UTILITIES ON THE CONSTRUCTION DRAWINGS DOES NOT ASSURE THAT THERE ARE OR ARE NOT UTILITIES IN THE WORK AREA.
2. THE CONTRACTOR IS RESPONSIBLE FOR KNOWING AND FOLLOWING THE APPROPRIATE SAFETY STANDARDS AS REQUIRED.
3. EXISTING CONTOURS BASED ON LUMOS & ASSOCIATES SURVEYING TOPOGRAPHICAL SURVEYS FROM AUG. 2013.
4. SEE SURVEY INFORMATION FOR BENCHMARKS
5. SOIL BORES AND TEXTURE EVALUATION CONDUCTED BY FIELD METHODS AND PROVIDED FOR INFORMATION PURPOSES ONLY.
6. THE CUT FILL RATIO IS AN ESTIMATE OF SHRINKAGE. THE FINAL CUT FILL MAY VARY. THIS SHOULD BE VIEWED AS AN ESTIMATE. RATIOS CAN VARY FROM 1.15 TO 1.45 FOR THIS TYPE OF SOIL.

SCALE: 1" = 150'

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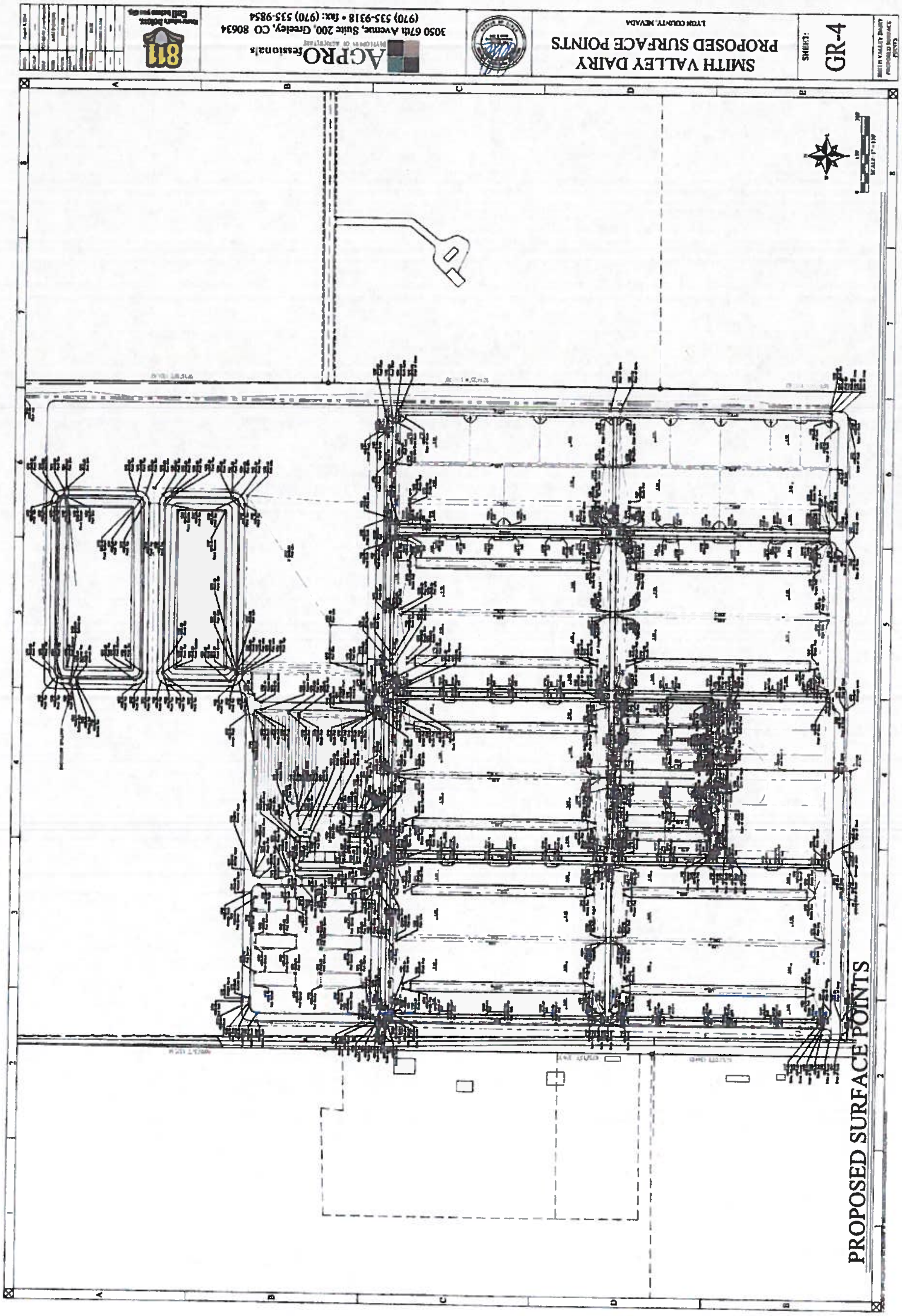
SMITH VALLEY DAIRY
PROPOSED CUT FILL
LYON COUNTY, NEVADA

SHEET:
GR-3

SMITH VALLEY DAIRY
PROPOSED CUT FILL


SMITH VALLEY DAIRY
PROPOSED SURFACE POINTS
LYON COUNTY, NEVADA
SHEET:
GR-4
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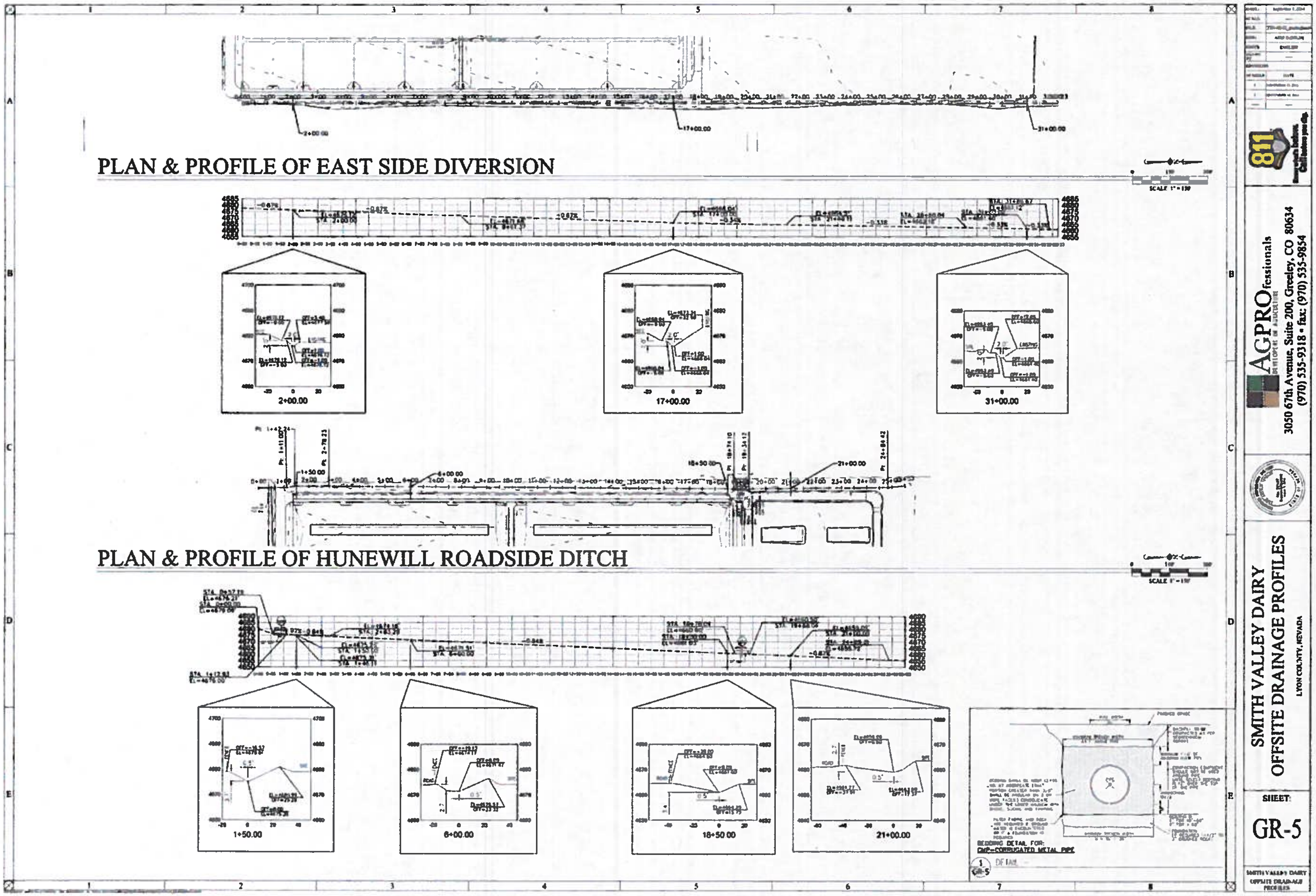
811
PROPOSED SURFACE POINTS


PLAN & PROFILE OF EAST SIDE DIVERSION
2+00.00
17+00.00
31+00.00
PLAN & PROFILE OF HUNEWILL ROADSIDE DITCH
1+50.00
6+00.00
18+50.00
21+00.00
BEDDING DETAIL FOR:
CMP=CORRUGATED METAL PIPE
DETAIL
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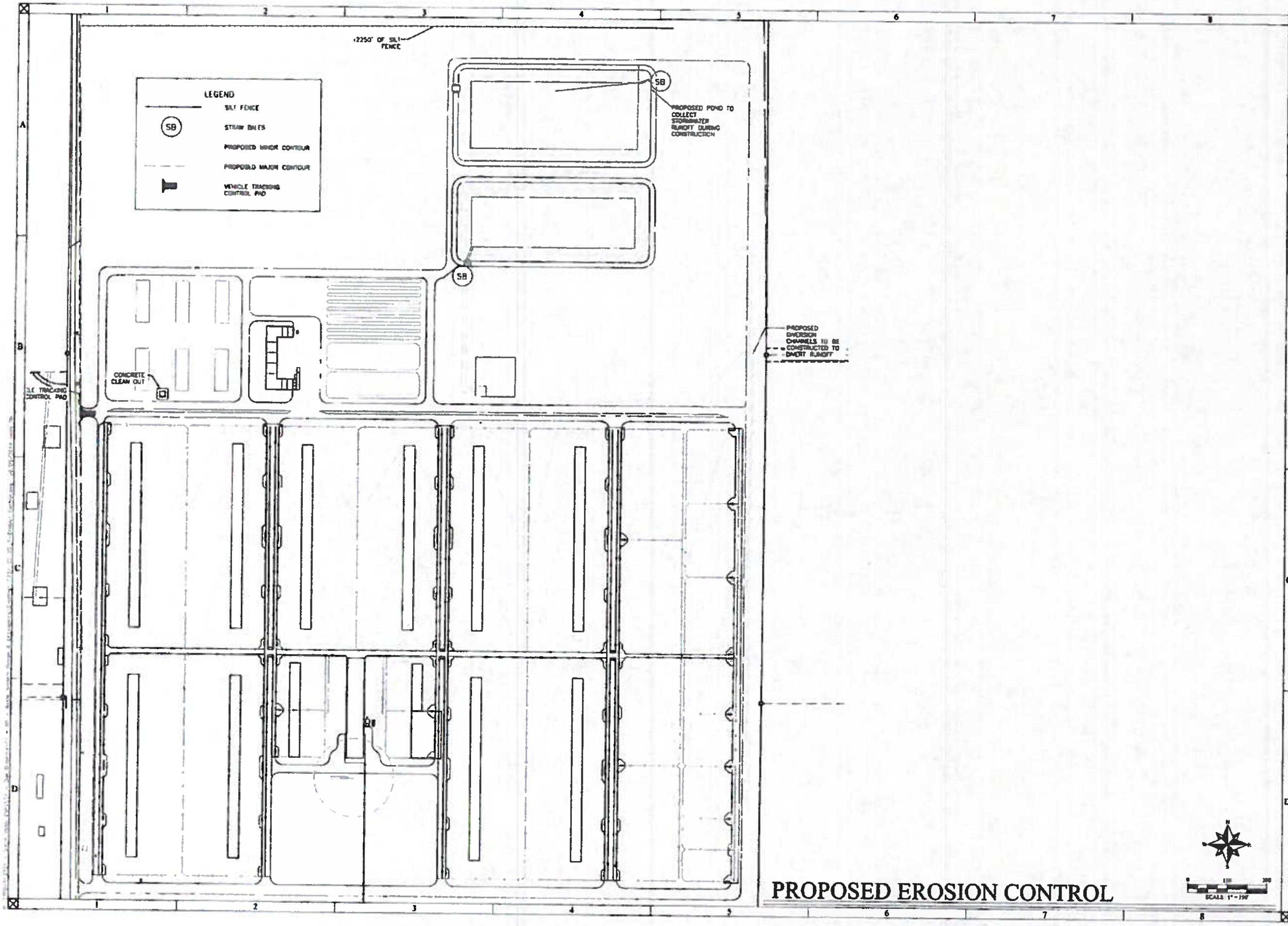
SMITH VALLEY DAIRY
OFFSITE DRAINAGE PROFILES
LYON COUNTY, NEVADA
SHEET:
GR-5



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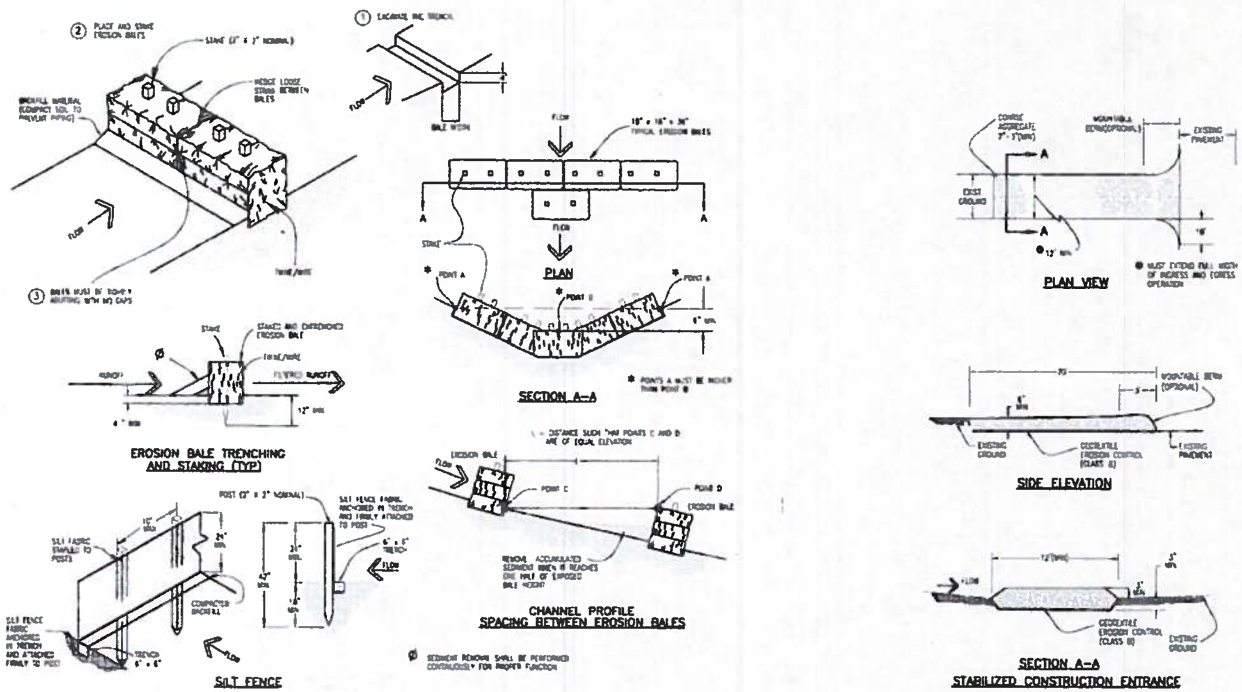
SMITH VALLEY DAIRY
EROSION CONTROL
LYON COUNTY, NEVADA

SHEET:
EC-1

SMITH VALLEY DAIRY
EROSION CONTROL



EROSION CONTROL NOTES

1. THIS DOCUMENT CONTAINS THE MINIMUM REQUIRED EROSION CONTROL MEASURES. THE CONTRACTOR IS RESPONSIBLE FOR ANY ADDITIONAL MEASURES REQUIRED BY THE CITY, COUNTY OR STATE.
2. TEMPORARY EROSION CONTROL MEASURES SHALL BE PROVIDED BY THE CONTRACTOR AS IDENTIFIED IN THIS PLAN. MAINTENANCE OF ONSITE DRAINAGE AND EROSION CONTROL FACILITIES DURING CONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
3. THE CONTRACTOR MUST COMPLY WITH ALL MEASURES AS DIRECTED WITHIN THE SITE SPECIFIC STORMWATER MANAGEMENT PLAN.
4. THE CONTRACTOR MUST SEED DISTURBED AREAS, DURING THE NEXT GRASS PLANTING SEASON, TO PREVENT FURTHER EROSION. IF CONSTRUCTION IS COMPLETED AFTER JULY 1ST A COVER CROP WILL BE SEEDED TILL THE NEXT PLANTING SEASON.
5. THE RETENTION PONDS LOCATED ON SITE WILL BE PRIMARY SOURCE OF SEDIMENT AND OTHER MINOR POLLUTANT CONTROL.
6. STRAW BALE BARRIERS WILL BE UTILIZED IN AREAS SUBJECT TO RUNOFF OFFSITE AS REQUIRED DURING CONSTRUCTION.
7. SITE TO BE SEEDED WITH FINAL COVER OR COVER CROP WITHIN 30 DAYS OF CONSTRUCTION COMPLETION.
8. IF DEBRIS IS TRACKED ONTO COUNTY ROAD IT WILL BE SCRAPED CLEAN WITH FRONT END LOADER AND HAND SWEPT IMMEDIATELY. ANY DAMAGE TO THE ROAD FROM CLEANING ACTIVITIES WILL BE THE RESPONSIBILITY OF THE OWNER.
9. WATER TRUCK WILL BE USED FOR DUST CONTROL WHEN NECESSARY.
10. EROSION INSPECTOR: CONTRACTOR

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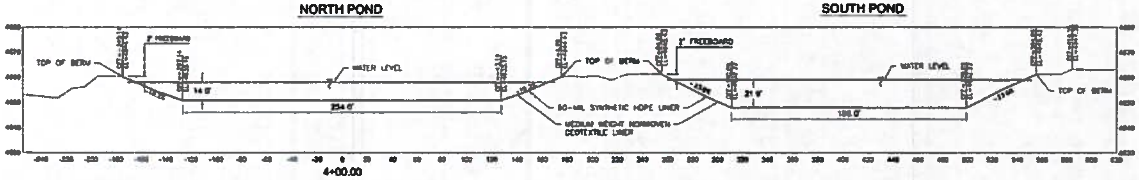
SMITH VALLEY DAIRY
EROSION CONTROL DETAILS

LYON COUNTY, NEVADA

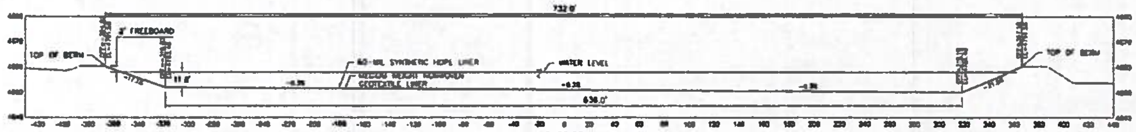
SHEET:

EC-2

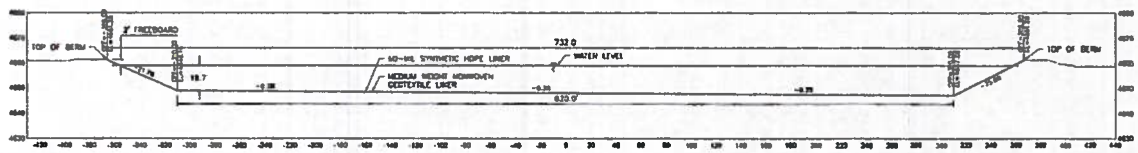
SMITH VALLEY DAIRY
EROSION CONTROL DETAILS



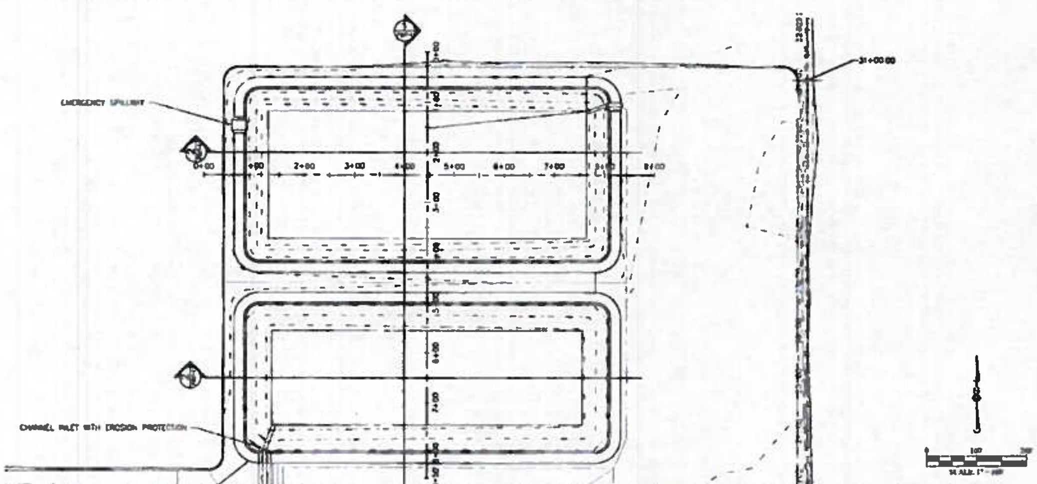
1 POND PROFILES LOOKING EAST
SCALE: 1" = 40'



2 NORTH POND PROFILE LOOKING NORTH
SCALE: 1" = 40'



3 SOUTH POND PROFILE LOOKING NORTH
SCALE: 1" = 40'



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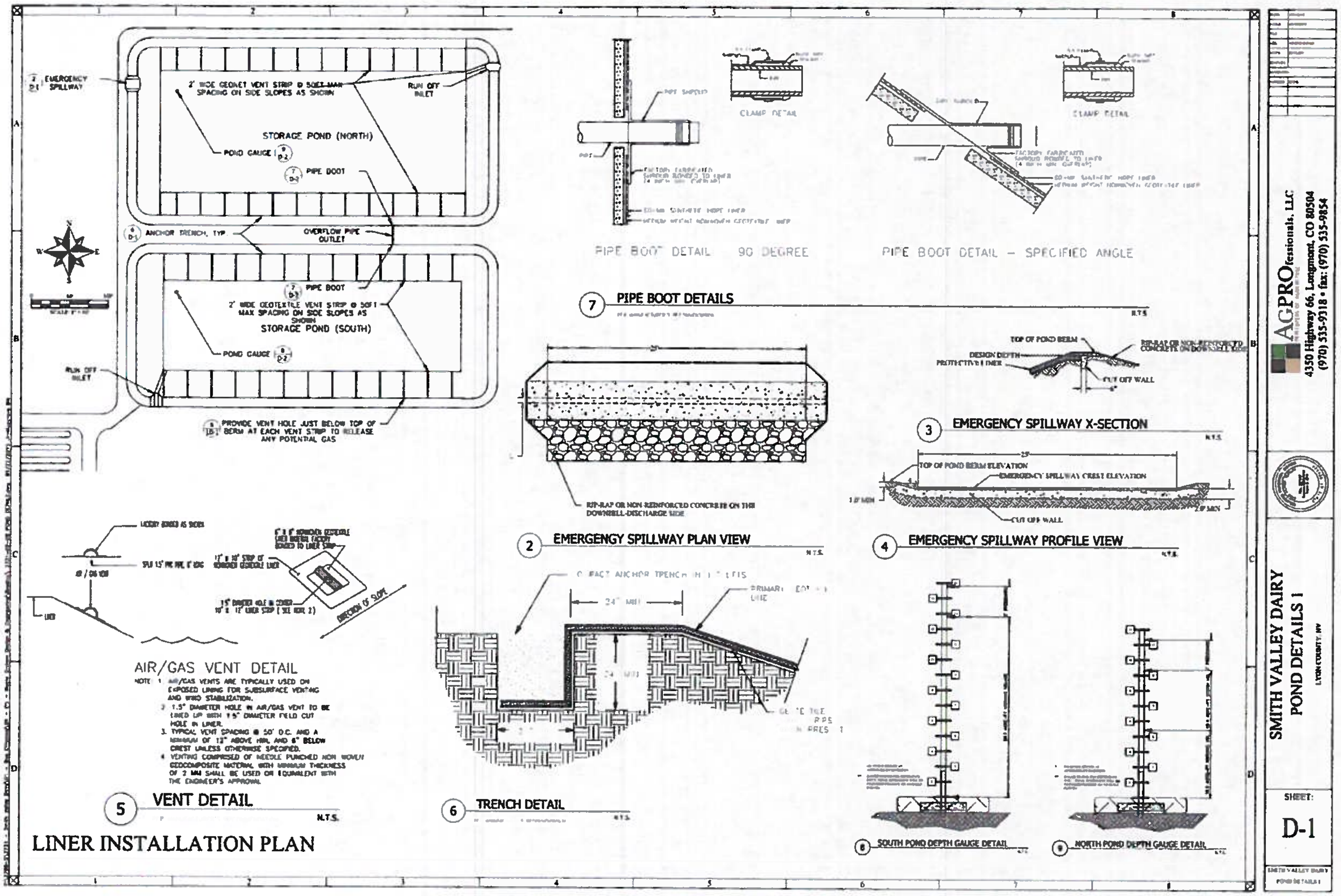
SMITH VALLEY DAIRY
POND PLAN AND CROSS SECTIONS

SHEET:
P&P-1

SMITH VALLEY DAIRY POND PLAN AND CROSS SECTIONS



LINER INSTALLATION PLAN
EMERGENCY SPILLWAY
2' WIDE GEONET VENT STRIP @ 50FT MAX SPACING ON SIDE SLOPES AS SHOWN
RUN OFF INLET
STORAGE POND (NORTH)
POND GAUGE
PIPE BOOT
ANCHOR TRENCH, TYP
OVERFLOW PIPE OUTLET
2' WIDE GEOTEXTILE VENT STRIP @ 50FT MAX SPACING ON SIDE SLOPES AS SHOWN
STORAGE POND (SOUTH)
PROVIDE VENT HOLE JUST BELOW TOP OF BERM AT EACH VENT STRIP TO RELEASE ANY POTENTIAL GAS
AIR/GAS VENT DETAIL
NOTE: 1. AIR/GAS VENTS ARE TYPICALLY USED ON EXPOSED LINING FOR SUBSURFACE VENTING AND WIND STABILIZATION.
2. 1.5" DIAMETER HOLE IN AIR/GAS VENT TO BE LINED UP WITH 1.5" DIAMETER FIELD CUT HOLE IN LINER.
3. TYPICAL VENT SPACING @ 50' O.C. AND A MINIMUM OF 12" ABOVE HWL AND 6" BELOW CREST UNLESS OTHERWISE SPECIFIED.
4. VENTING COMPRISED OF NEEDLE PUNCHED NON WOVEN GEOCOMPOSITE MATERIAL WITH MINIMUM THICKNESS OF 2 MM SHALL BE USED OR EQUIVALENT WITH THE ENGINEER'S APPROVAL.
DIRECTION OF SLOPE
5 VENT DETAIL N.T.S.
PIPE BOOT DETAIL 90 DEGREE
PIPE BOOT DETAIL - SPECIFIED ANGLE
CLAMP DETAIL
7 PIPE BOOT DETAILS N.T.S.
RIP-RAP OR NON-REINFORCED CONCRETE ON THE DOWNHILL-DISCHARGE SIDE
2 EMERGENCY SPILLWAY PLAN VIEW N.T.S.
TOP OF POND BERM
DESIGN DEPTH
PROTECTIVE LINER
CUT OFF WALL
3 EMERGENCY SPILLWAY X-SECTION N.T.S.
TOP OF POND BERM ELEVATION
EMERGENCY SPILLWAY CREST ELEVATION
4 EMERGENCY SPILLWAY PROFILE VIEW N.T.S.
24" MIN
6 TRENCH DETAIL N.T.S.
8 SOUTH POND DEPTH GAUGE DETAIL
9 NORTH POND DEPTH GAUGE DETAIL
AGPROfessionals, LLC
4350 Highway 66, Longmont, CO 80504
(970) 535-9318 • fax: (970) 535-9854
SMITH VALLEY DAIRY
POND DETAILS 1
LYON COUNTY, NV
SHEET:
D-1

RECTANGULAR WASTE STORAGE POND DESIGN COMPUTATIONS

Project Name: Smith Valley Dairy
Location: Wellington, Nevada
Climate Station: Select a climate station from the list; sel...

Computed By: AGPRO
Date: 9/19/2013
Checked By:
Date:

BASIC DATA

Solids & Slurry Inflow:	0 cu. ft. /day
Other Liquid Waste Inflow:	80000 gal. /day
Contributing Roof Area:	0 sq. ft.
Contributing Paved Lot Area:	0 sq. ft., CN = 49
Contributing Earth Lot Area:	140 Acres, CN = 90
25yr-24hr Precipitation Depth:	2.07 inches
10yr-10day Precipitation Depth:	0.00 inches
Annual FWS Evaporation:	48 inches

POND DESIGN VOLUME

Max Working Storage:	55.42 Acre-ft
Design Storm Runoff:	15.35 Acre-ft
Design Requirement:	70.77 Acre-ft
Available Storage:	100% of design
Storage Safety Factor: (w/ freeboard)	1.3

RECTANGULAR STORAGE POND DESIGN DIMENSIONS

VOLUMES OVERWRITTEN WITH ACTUAL PROPOSED DESIGN

Freeboard:	0.0 ft.	Design Surface Area:	475,800 sq. ft.
Inside Slope:	4 H:1V	Available Storage Volume:	71.0 Acre-ft
Evaporation Area:	357,500 sq.ft.	Freeboard Volume:	22.1 Acre-ft
Seepage Rate:	0.000 inches/day	Total Volume:	93.1 Acre-ft
Seepage Area:	0 sq.ft.		

AVERAGE ANNUAL MASS BALANCE FOR ESTIMATING MAXIMUM WORKING STORAGE REQUIREMENTS

Month	MONTHLY POND INFLOW: Monthly Contribution to Working Storage from Precipitation: Precip. (inches)	Earth Lot Runoff (inches)	Earth Lot Runoff (Acre-ft)	Paved Lot Runoff (inches)	Paved Lot Runoff (Acre-ft)	Roof Runoff (inches)	Roof Runoff (Acre-ft)	On Pond (Acre-ft)	Waste Inflow: Solids (Acre-ft)	Waste Inflow: Liquids (Acre-ft)	Total Inflow (Acre-ft)	MONTHLY POND OUTFLOW: Surface Evaporation (inches)	Surface Evaporation (Acre-ft)	Seepage Loss (Acre-ft)	Planned Drawdown (Acre-ft)	Total Outflow (Acre-ft)	WORKING STORAGE: Monthly In - Out (Acre-ft)	Accumulated Storage (Acre-ft)
Jan.	0.79	0.01	0.14	0.35	0.0000	0.59	0.0000	0.7191	0.0000	7.6012	8.46	0.00	0.0000	0.0000	0.00	0.00	8.46	38.50
Feb.	0.83	0.02	0.20	0.34	0.0000	0.63	0.0000	0.7555	0.0000	7.3560	8.31	0.00	0.0000	0.0000	0.00	0.00	8.31	46.81
Mar.	0.85	0.02	0.23	0.33	0.0000	0.65	0.0000	0.7737	0.0000	7.6012	8.61	0.00	0.0000	0.0000	0.00	0.00	8.61	55.42
Apr.	0.30	0.03	0.38	0.56	0.0000	0.15	0.0000	0.2731	0.0000	7.3560	8.01	5.01	3.4230	0.0000	15.00	18.42	-10.41	45.01
May	0.64	0.00	0.01	0.41	0.0000	0.45	0.0000	0.5826	0.0000	7.6012	8.19	6.38	4.3614	0.0000	10.00	14.36	-6.17	38.84
June	0.54	0.00	0.01	0.45	0.0000	0.35	0.0000	0.4915	0.0000	7.3560	7.86	7.66	5.2375	0.0000	10.00	15.24	-7.38	31.46
July	0.35	0.02	0.26	0.54	0.0000	0.19	0.0000	0.3186	0.0000	7.6012	8.18	8.88	6.0705	0.0000	10.00	16.07	-7.89	23.56
Aug.	0.33	0.03	0.30	0.55	0.0000	0.17	0.0000	0.3004	0.0000	7.6012	8.20	8.09	5.5343	0.0000	10.00	15.53	-7.33	16.24
Sep.	0.36	0.02	0.24	0.53	0.0000	0.19	0.0000	0.3277	0.0000	7.3560	7.92	6.16	4.2130	0.0000	10.00	14.21	-6.29	9.94
Oct.	0.35	0.02	0.26	0.54	0.0000	0.19	0.0000	0.3186	0.0000	7.6012	8.18	4.17	2.8485	0.0000	0.00	2.85	5.33	15.27
Nov.	0.51	0.00	0.03	0.47	0.0000	0.33	0.0000	0.4642	0.0000	7.3560	7.85	1.95	1.3357	0.0000	0.00	1.34	6.51	21.78
Dec.	0.50	0.00	0.04	0.47	0.0000	0.32	0.0000	0.4551	0.0000	7.6012	8.09	0.00	0.0000	0.0000	0.00	0.00	8.09	29.88
Totals:	6.35	0.18	2.09	5.55	0.00	4.19	0.00	5.78	0.00	89.99	97.86	48.29	33.02	0.00	65.00	98.02		

RAINFALL AND RUNOFF ESTIMATION FOR WASTE STORAGE POND DESIGN

	Earth Areas	Paved Areas	Roofed Areas	Pond Surface
	25yr-24hr Storm Event			
1 day Curve Numbers:	90	49	100	100 %
25yr-24hr Rainfall:	2.07 inches	2.07 inches	2.07 inches	2.07 inches
25yr-24hr Runoff:	1.15 inches	0.00 inches	2.07 inches	2.07 inches
Runoff Volume:	13.46 Acre-ft	0.00 Acre-ft	0.00 Acre-ft	1.88 Acre-ft
	Total 24hr-25yr Event Runoff Volume:			15.35 Acre-ft
	Chronic Storm (10 day event)			
10 day Curve Numbers:	81	41	100	100 %
10yr-10day Rainfall:	0.0 inches	0.0 inches	0.0 inches	0.00 inches
10yr-10day Runoff:	0.12 inches	0.72 inches	0.00 inches	0.00 inches
Runoff Volume:	1.39 Acre-ft	0.00 Acre-ft	0.00 Acre-ft	0.00 Acre-ft
	Total 10yr-10day Event Runoff Volume:			1.39 Acre-ft
	Average Monthly Runoff Contribution to Working Storage			
30 day Curve Numbers:	77	41	98	100 %
Monthly Runoff:	(see computations in monthly mass balance table above)			
Average Annual Rainfall:	0.0 inches	0.0 inches	0.0 inches	0.0 inches
Average Annual Runoff:	0.18 inches	5.55 inches	4.19 inches	6.35 inches
Runoff as % of Rainfall:	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

REGISTERED PROFESSIONAL ENGINEER
CHAD ARTHUR TEVELDE
No. 22147
Expires 6/30/2014
STATE OF NEVADA

co313pond.xls jae 8/31/2001

North Pond

Bottom Width:	0.0	Inside Top Width:	0
Bottom Length:	0.0	Inside Top Length:	0
Design Depth:	0.0	Total Depth:	2
Freeboard:	2.0 ft.	Design Surface Area:	256,200 sq. ft.
Inside Slope:	0 H:1V	Available Storage Volume:	31.30 Acre-ft
Evaporation Area:	195,000 sq.ft.	Freeboard Volume:	12.20 Acre-ft
Seepage Rate:	0.000 inches/day	Total Volume:	43.50 Acre-ft
Seepage Area:	0 sq.ft.		

South Pond

Bottom Width:	0.0	Inside Top Width:	0
Bottom Length:	0.0	Inside Top Length:	0
Design Depth:	0.0	Total Depth:	2
Freeboard:	2.0 ft.	Design Surface Area:	219,600 sq. ft.
Inside Slope:	0 H:1V	Available Storage Volume:	39.70 Acre-ft
Evaporation Area:	162,500 sq.ft.	Freeboard Volume:	9.90 Acre-ft
Seepage Rate:	0.000 inches/day	Total Volume:	49.60 Acre-ft
Seepage Area:	0 sq.ft.		

Pond ???

Bottom Width:	0.0	Inside Top Width:	0
Bottom Length:	0.0	Inside Top Length:	0
Design Depth:	0.0	Total Depth:	2
Freeboard:	2.0 ft.	Design Surface Area:	0 sq. ft.
Inside Slope:	0 H:1V	Available Storage Volume:	0.00 Acre-ft
Evaporation Area:	0 sq.ft.	Freeboard Volume:	0.00 Acre-ft
Seepage Rate:	0.000 inches/day	Total Volume:	0.00 Acre-ft
Seepage Area:	0 sq.ft.		

Pond ???

Bottom Width:	0.0	Inside Top Width:	0
Bottom Length:	0.0	Inside Top Length:	0
Design Depth:	0.0	Total Depth:	2
Freeboard:	2.0 ft.	Design Surface Area:	0 sq. ft.
Inside Slope:	0 H:1V	Available Storage Volume:	0.00 Acre-ft
Evaporation Area:	0 sq.ft.	Freeboard Volume:	0.00 Acre-ft
Seepage Rate:	0.000 inches/day	Total Volume:	0.00 Acre-ft
Seepage Area:	0 sq.ft.		

Pond ???

Bottom Width:	0.0	Inside Top Width:	0
Bottom Length:	0.0	Inside Top Length:	0
Design Depth:	0.0	Total Depth:	2
Freeboard:	2.0 ft.	Design Surface Area:	0 sq. ft.
Inside Slope:	0 H:1V	Available Storage Volume:	0.00 Acre-ft
Evaporation Area:	0 sq.ft.	Freeboard Volume:	0.00 Acre-ft
Seepage Rate:	0.000 inches/day	Total Volume:	0.00 Acre-ft
Seepage Area:	0 sq.ft.		

ALL PONDS FOR AREA ?

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Smith Valley Dairy

North Pond

Elev (ft)	Gauge Reading (ft)	Contour Area (ft^2)	Slice Volume (ft^3)	Cumulative Volume (ft^3)	Cumulative Volume (ac-ft)	
4649	0.0	47,965	0	0	0.0	
4650	1.0	68,695	58,330	58,330	1.3	
4651	2.0	83,390	76,043	134,373	3.1	
4652	3.0	145,067	114,228	248,601	5.7	
4653	4.0	187,246	166,157	414,758	9.5	
4654	5.0	201,475	194,361	609,118	14.0	
4654.4	5.4	206,207	81,536	690,655	15.9	Pumpdown
4655	6.0	213,305	207,390	816,508	18.7	
4656	7.0	225,447	426,922	1,036,040	23.8	
4657	8.0	237,899	231,673	1,048,182	24.1	
4658	9.0	250,664	244,281	1,292,463	29.7	
4658.28	9.3	267,388	72,527	1,364,990	31.3	Freeboard mark
4659	10.0	263,729	257,197	1,549,660	35.6	
4660.28	11.3	251,867	329,982	1,879,641	43.2	Top of Berm

Based on proposed design contours

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STATE OF NEVADA

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Smith Valley Dairy

South Pond

Elev (ft)	Gauge Reading (ft)	Contour Area (ft^2)	Slice Volume (ft^3)	Cumulative Volume (ft^3)	Cumulative Volume (ac-ft)	
4646.34	0.0	15,000	-	0	0.0	
4647.28	0.9	25,000	18,800	18,800	0.4	
4648.28	1.9	75,000	50,000	68,800	1.6	
4649.28	2.9	101,178	88,089	156,889	3.6	
4650.28	3.9	127,384	114,281	271,170	6.2	
4651.28	4.9	134,806	131,095	402,265	9.2	
4652.28	5.9	142,257	138,532	540,796	12.4	
4653.28	6.9	149,842	146,050	686,846	15.8	
4654.28	7.9	157,561	153,702	840,547	19.3	
4655.28	8.9	165,414	161,488	1,002,035	23.0	
4656.28	9.9	173,401	169,408	1,171,442	26.9	
4657.28	10.9	181,553	177,477	1,348,919	31.0	
4658.28	11.9	189,778	185,666	1,534,585	35.2	
4659.28	12.9	198,169	193,974	1,728,558	39.7	Freeboard mark
4660.28	13.9	206,693	202,431	1,930,989	44.3	
4661.28	14.9	215,351	211,022	2,142,011	49.2	Top of Berm

Based on proposed design contours

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Assumptions
used in the
Trapezoidal Waste Storage Pond Design Worksheet

1. The storage pond has a trapezoidal cross section with a level bottom.
2. Pond Volume, V, in Acre-Feet is computed using the following formula:

$$V = \frac{(W_b L_b D_d) + zD_d^2(W_b + L_b) + \frac{4}{3}z^2D_d^3}{43,560}$$

where: Wb = bottom width in feet,
Lb = bottom length, in feet,
Dd = design depth, or Dt is design dept + freeboard, in feet, and
z = inside slope ratio, expresed as horizontal run (z) per 1 foot rise.

3. Surface area is computed at the maximum depth, Dt (design depth + freeboard), for the purpose of estimating the volume of direct precipitation on the pond as: (Wb + 2zDt)(Lb +2zDt)
4. Required Design Volume is the sum of working storage and storm runoff storage.
5. Working storage is the maximum monthly value of accumulated storage computed from an average annual water budget process, which includes solid and liquid waste inflow, storm runoff from contributing darinage areas, and direct precipitation on the pond surface.
6. Accumulated storage is the sum of monthly storage increment plus the accumulated storage from the previous month.
7. The monthly storage increment is computed as total inflow less total outflow during each month.
8. Total monthly inflow is the sum of waste loading, precipitation on the pond surface and runoff from contributing drainage areas described in the basic data input.
9. Waste loading is computed as the product of a daily value and the days per month.
10. Average monthly precipitation is used to estimate the runoff component of the working volume. Data from WETS tables[5] have been entered into the Colorado Climate Data worksheet. Appropriate values are inserted in the pond design worksheet when the user selects a climate station from the drop down menu. Note the average annual precipitation depth, which is computed independently of the monthly values, is always less than the sum of the average monthly values. This indicates that use of the average monthly values for an annual water budget process is a conservative assumption.
11. Monthly runoff, in inches is computed using the average monthly precipitation and the NRCS runoff equation[7] with the one day runoff curve number adjusted to a 30 day curve number, as follows:

$$q = \frac{\left[P - 0.2\left(\frac{1000}{CN_{30}} - 10\right)\right]^2}{P + 0.8\left(\frac{1000}{CN_{30}} - 10\right)}$$

ıere: q = runoff depth, in inches
P = average monthly precipitation in inches
CN_{30} = 30 day curve number[8], computed as:

$$CN_{30} = CN_1 - 1.48\left[CN_1 - 15 - \left(\frac{CN_1^{2.365}}{631.79}\right)\right]$$

12. Total monthly outflow is the sum of evaporation losses, seepage losses and planned draw down volumes.

13. Monthly Evaporation is estimated as the product of the average annual free water surface evaporation[9] and a monthly distribution factor[10]. The monthly loss is the product of the evaporation depth and the evaporation area. The default evaporation area is the pond bottom surface area, $W_b x L_b$.

14. Monthly seepage losses are computed as the product of the seepage rate and the seepage area. The default seepage area is assumed to be the bottom surface area plus the side slope area at 1/2 of the design depth.

15. In accordance with the current Colorado CAFO General Permit requirements, the storm runoff volume is either the 24hr-25yr rainfall runoff amount or the 10day-10year runoff amount, whichever is larger. The runoff depths are computed using the NRCS runoff equation described above, substituting the appropriate rainfall amounts and using either a one day or 10 day curve number. 10 day curve numbers[11] are estimated using the following equation:

$$CN_{10} = 0.000115 CN_1^3 - 0.013 CN_1^2 + 1.32 CN_1 - 16.6$$

REFERENCES CITED

1. NOAA. 1973. Atlas 2 - Precipitation Frequency Maps of the Western United States, Volume III - Colorado. National Weather Service. Washington, D.C.

2. NRCS. 2001. Technical Note 25 - Ten Year Ten Day Rainfall Depths for Selected Climate Stations in Colorado. USDA Natural Resources Conservation Service. Lakewood, Colorado.

3. NOAA. 1982. NOAA Technical Report NWS 33, Evaporation Atlas for the Contiguous 48 United States. National Weather Service. Washington, D.C.

4. Wolfe, D. and R. Stenzel. 1995. Evaporation. In proceedings of Evaporation and Irrigation Efficiency Seminar, Arvada, CO, 10/10-11/1995. American Consulting Engineers Council of Colorado. Denver, CO.

5. NRCS. 2000. Climate Analysis for Wetlands (WETS Tables). USDA Natural Resources Conservation Service, National Water and Climate Center. Portland, OR.

6. NRCS. 1964. National Engineering Handbook Section 4, Hydrology - Chapter 10, Direct Estimation of Rainfall Runoff. USDA Natural Resources Conservation Service. Washington, D.C.

7. Stettler et.al. 2000. Monthly Runoff Volume. (unpublished paper). USDA Natural Resources Conservation Service, National Water and Climate Center. Portland, OR.

8. same as 3.

9. same as 4.

10. NRCS. 1985. Technical Release 60, Earthen Dams and Reservoirs, Table 2-3B. USDA Natural Resources Conservation Service. Washington, D.C.

ENGINEER'S NARRATIVE

Smith Valley Dairy **6.03.2014**

Smith Valley Dairy is a new dairy facility located 6 miles NE of Smith Valley, on the east side of Hunewill Lane in Sec 26, T12N, R23E, Lyon County Nevada. The facility is located within a non-discharging drainage basin. Discharges from the facility would ultimately flow through a series of public ditches to the evaporative Artesia Lake, an alkali flat 3 miles north of the facility. Therefore it is appropriate for the facility to apply for a Nevada CAFO Groundwater Discharge Permit.

Dairy construction will be industry-typical open corrals with pipe and cable fence, concrete feed aprons and feed bunks, feed alleys and cow movement alleys, feed storage areas and associated storage structures, maintenance facilities, and waste management/control structures. The facility will operate a lane flush system that utilizes recycled water. In cold temperatures the lanes will be scraped to collection lanes.

The ultimate maximum capacity at the 140 acre facility will be 7,248 head (see NMP for details). Initially young stock will be transferred off site, and replacement stock will be imported from other farms. However, the facility has been designed to keep all stock on site and wishes to be permitted for such.

The facility will have one drainage basin and be graded so that all stormwater runoff from the production area, corrals, and processed feed storage areas, and water generated in the milk parlor will be captured in a pump station which delivers water to a 2 stage detention pond system. Runoff from the unprocessed hay storage area will be directed away from the facility's containment system to reduce the amount of non-production area water the facility needs to manage. A concrete ditch along the north side of the corrals facilitates the movement of stormwater from the corrals to the collection pit.

The NRCS Rectangular Waste Storage Pond Design Computations were used to predict runoff and pond storage needs. The ponds have been designed to hold 4 months or more of process generated water and winter stormwater runoff as well as the runoff generated in a 25-year, 24-hour storm event while maintaining 2 feet of freeboard. An emergency spillway in the north and final pond in the series has been designed to accommodate flows in excess of those expected during a 25-year, 24-hour storm event.

The milk parlor produces process wastewater that flows via pipeline into a concrete ditch, which then flows to a collection pit. From the pit wastewater is pumped over a solid separator screen to allow for solids removal prior to entering the ponds. Water from the screen can also be redirected back into the collection pit for use in flushing the barns.

The soil was bored in 15 locations around the proposed facility, and groundwater levels were determined (see application). The test pit boring logs from the location of the ponds is attached. A minimum 2' setback from the pond bottoms has been maintained in the design standards. Further protection of groundwater will be accomplished through the use of a 60 ml high density polyethylene liner in the storage ponds coupled with a leak detection system. See further information in the document titled "Impoundment Construction: Specifications, Liner and Leak Detection Installation".

The groundwater gradient indicated in the application was determined after a review of "Geology and Water Resources of Smith Valley, Lyon and Douglas Counties Nevada", Geologic Survey Water-Supply Paper 1228, by O.J. Loeltz and T.E. Eakin, 1953. West Walker River flows towards the river. A groundwater divide exists approximately 1 to 2 miles north of the West Walker River and runs parallel to the river. Unconfined groundwater south of the divide flows towards the river. Smith Valley Dairy is located north of the divide, and therefore unconfined groundwater flows north to the alkali flat Artesia Lake, located at the north end of Smith Valley.

Run-on from adjacent land will not be a concern. Surrounding topography is gently sloped and will be farmed. The entire production area of the facility will be surrounded by a 2' raised perimeter farm road that will prevent any irrigation water or run-on from entering the production area.

No mapped 100yr floodplain impacts this facility.

A calibrated staff gauge will be installed in a manner that does not compromise the integrity of the pond liner in the final lagoon. This gauge will be marked in 1ft increments with the pump down (level required to be maintained in order for the pond to hold the runoff generated in a 25-year, 24-hr storm event) and freeboard (2') levels clearly indicated.

Pond capacity information, including the working volume, process water runoff and storage, design storm, and its corresponding runoff are located in the facility's nutrient management plan (NMP), along with plans for operations/maintenance of the ponds.

Manure is handled in both solid and liquid forms and is distributed to crop production areas. Manure generated by the dairy in excess of crop production needs and land availability will be stockpiled or composted within the footprint of the production area in a manner that is compliant with all permit requirements. Excess manure and compost will then be transferred to neighboring farmers. Runoff collected from the dairy which does not evaporate will be used to irrigate the dairy's crops. Compost will only include agricultural waste and will not be sold to the public without a permit from the NDEP Bureau of Waste Management.

All land application areas in the nutrient management plan are owned by the dairy. There are approximately 1640 tillable acres with planned corn silage, alfalfa, grass, and wheat rotations. Other crops might be grown depending upon environmental and economic factors. The cropping system is outlined in the NMP. The narrative NMP describes how agronomic application rates will be calculated. Manure or wastewater will be applied based upon the nitrogen needs of the crop unless the Phosphorus Index Risk Assessment indicates otherwise. Because the dairy is new, planned crops and acres may change, but the procedures outlined in the NMP will be followed, and any changes will be noted in the facility records. The NMP includes all potential acres, and only the distribution of acres within a field may change as land is divided up into management units.

Sheet 1 of 1

Test Pit: D

Logged By: KK

Date Logged: 8/22/13

Drill Type: Case CX160 Excavator

Total Depth: 18.5

Water Depth: 14'

Ground Elev.: 4657.9 − 14' = 4643.9

Sample types: Shelby Tube; Split Spoon; Ziplock Sample; California; Bulk Sample; Static Water Sample

Depth in Feet	Soil Description	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Expansion Index
0	0 -1' Medium Brown Silty Sand with organtics (SM)										
1	1' - 3.5' Light Brown Cemented Silty Sand (SM)										
3.5	3.5' - 6' Light Brown Silty Sand (SM)										
6	6' - 15' Medium Brown Silt with Clay (CL) with mottling throughout										
14	at 14' Groundwater Encountered										
15	15' - 16' Medium Brown Poorly Graded Sand (SP)										
16	16' - 17' Reddish Brown Poorly Graded Sand (SP)										
17	17' - 17.5' Mesdium Brown Sandy Lean Clay (CL)										
17.5	17.5' - 18.5' Reddish Brown Poorly Graded Sand (SP)										
18.5	Test Pit Terminated Due to Caving										

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Smith Valley Dairy Development

LOG OF EXPLORATION

Job No: 8403.000

Date: 8/22/13

PLATE D

Sheet 1 of 1

Logged By: KK

Date Logged: 8/22/13

Drill Type: Case CX160 Excavator

Test Pit: E

Total Depth: 17.0'

Water Depth: 15'

Ground Elev.: 4654.70 - 15 = 4639.7

Legend: Shelby Tube; Split Spoon; Z Ziplock Sample; California; B Bulk Sample; Static Water Sample

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Expansion Index
0			0 -8" Medium Brown Silty Sand with organtics (SM)										
1			8" - 2' Light Brown Cemented Silty Sand (SM)										
4			2' - 6.5' Light BrownSilty Sand (SM)										
6.5			6.5' - 8' Medium Reddish Brown Silty Sand (SM)										
8			8' - 11' Moist Brown Sandy Lean Clay (CL)										
11			11' - 12' Dark Black Silt (OL)										
12			12' - 15.5' Moist Brown Sandy Lean Clay (CL) with mottling throughout										
15			at 15' Groundwater Encountered										
15.5			15.5' - 17' Medium Brown Poorly Graded Sand (SP)										
17			Test Pit Terminated Due to Caving 17.0										

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Smith Valley Dairy Development

LOG OF EXPLORATION

Job No: 8403.000

Date: 8/22/13

PLATE **E**

Sheet 1 of 1

Logged By: KK

Date Logged: 8/22/13

Drill Type: Case CX160 Excavator

Test Pit: F

Total Depth: 18.0'

Water Depth: 15'

Ground Elev.: 4660.70 – 15' – 4645.7

Legend: Shelby Tube; Split Spoon; Z Ziplock Sample; California; B Bulk Sample; Static Water Sample

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Expansion Index
0			0 -1' Medium Brown Silty Sand with organtics (SM)										
1			1' -5' Light Brown Sandy Silt slightly moist (SM)										
5			5' - 9' Medium Reddish Brown Silty Sand (SM) moist										
9			9' - 15' Moist Silty Lean Brown Clay (CL)										
15			at 15' Groundwater Encountered										
15			15' - 16' Medium Brown Poorly Graded Sand (SP)										
16			16' - 16.5' Dark Red Poorly Graded Sand (SP)										
16.5			16.5' - 17' Dark Brown Silt (CL)										
17			17' 18' Grey Silty Sand (SM)										
18.0			Test Pit Terminated Due to Caving										

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Smith Valley Dairy Development

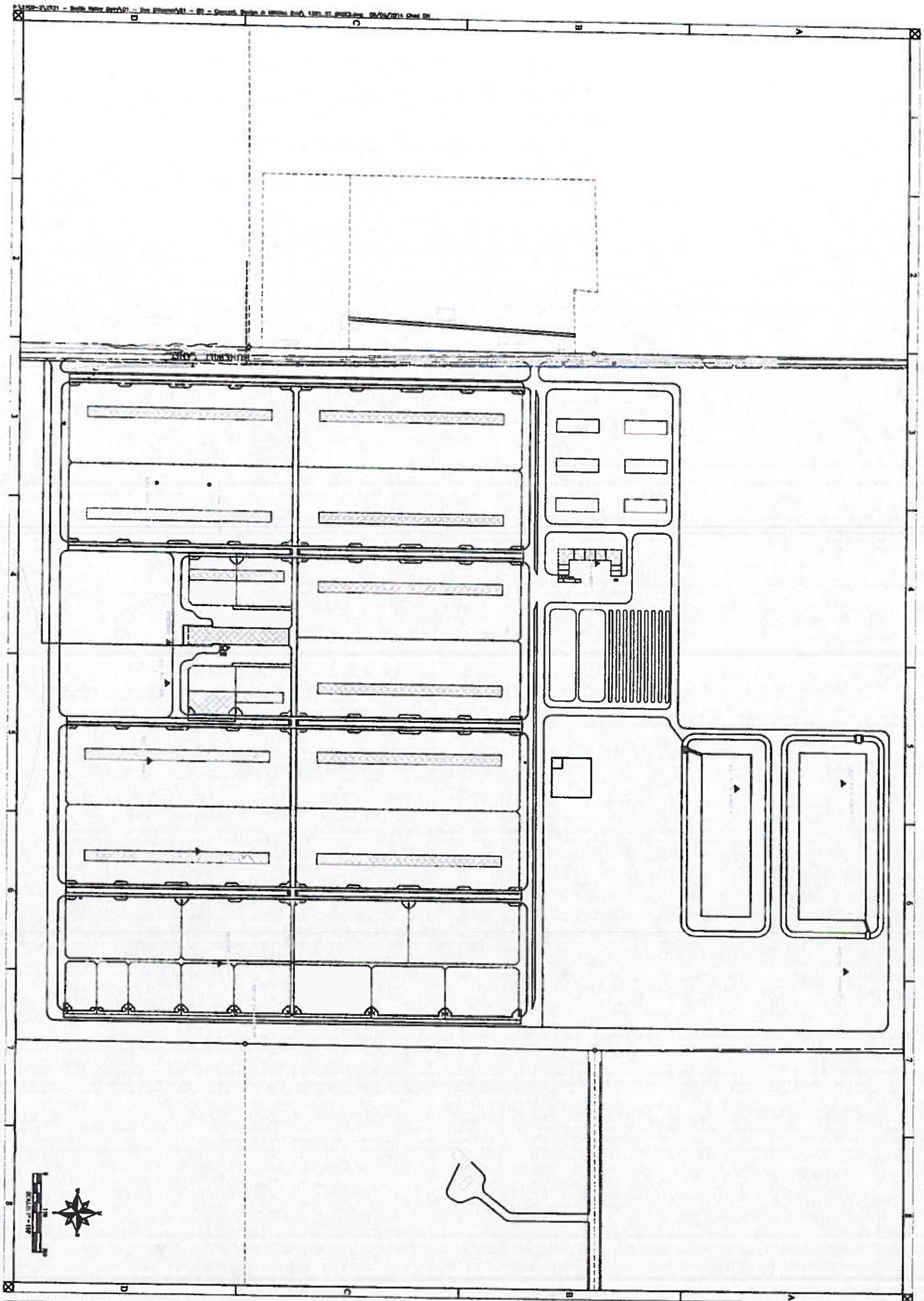
LOG OF EXPLORATION

Job No: 8403.000

Date: 8/22/13

PLATE

F



B-1

SHEET:

SMITH VALLEY DAIRY
BORE HOLE LOCATIONS

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Smith Valley Dairy

GROUNDWATER MONITORING PLAN

for Leak Detection Monitoring from Manure Impoundments

July 16, 2014
Revision July 31, 2014

Prepared by

AG PRO

3050 67th Avenue, Suite 200
Greeley, CO 80634
970-535-9318

Background

Smith Valley Dairy is a new dairy facility located 6 miles NE of Smith Valley, on the east side of Hunewill Lane in Sec 26, T12N, R23E, Lyon County, Nevada. Refer to Exhibit ST-1 Smith Valley Dairy, Site Vicinity Map. The facility is located within a non-discharging drainage basin. Discharges from the facility would ultimately flow through a series of public ditches to the evaporative Artesia Lake, an alkali flat 3 miles north of the facility. No mapped 100yr floodplain impacts this facility.

The regional groundwater gradient was determined to be trending north based on a review of "Geology and Water Resources of Smith Valley, Lyon and Douglas Counties Nevada", Geologic Survey Water-Supply Paper 1228, by O.J. Loeltz and T.E. Eakin, 1953. The West Walker River flows towards the river. A groundwater divide exists approximately 1 to 2 miles north of the West Walker River and runs parallel to the river. Smith Valley Dairy is located north of the divide. Unconfined groundwater south of the divide flows towards the river and north of the divide unconfined groundwater flows north to the alkali flat Artesia Lake, located at the north end of Smith Valley. There are no potential receptors between the site and Artesia Lake.

On-site during two separate geotechnical investigations in support of construction, groundwater was encountered at approximately 14-15 feet below grade. Soils were classified throughout this depth. The 8 to 15 foot depths below grade were predominately classified as CL (Silt with Clay, Sandy Lean Clay or Lean Clay.) No soil testing was performed on the samples. Permeability of the subsurface clays can be expected $5.5 * 10^{-4}$ to 10^{-7} cm/sec range. The Smith Valley Dairy is constructing two new surface impoundments to hold production water and facility surface water runoff from their Concentrated Animal Feeding Operation (CAFO). Refer to Exhibit ST-1 Smith Valley Dairy, Groundwater Map, for the site layout and positioning of the two surface impoundments.

The EPA guidance indicates that at these permeabilities, in-situ soils have the natural ability to hinder transport and reduce concentration of constituents sufficiently to not need a constructed liner. However, for this site a single liner of 60 mil HDPE that will withstand the stress of construction, weight load of the waste, and allow for seaming to bind separate geomembrane panels has been selected. This synthetic liner in addition to the underlain natural clay materials and separation from the groundwater should provide ample protection of groundwaters. The natural in-situ clays provide a defacto secondary liner.

This design is further supplemented with a groundwater monitoring plan. Per the direction of the Nevada Division of Environmental Protection (NDEP), Bureau of Water Pollution Control (BWPC), Permits Branch; this plan follows the guidance for monitoring well installation, set forth in "A Guidance Document for the Design and Construction of Groundwater Monitoring Wells for Use at Wastewater Treatment Facilities, Technical Publication, WTS-4., Rev July 2012." These two impoundments are manure storage ponds and are in no way classified as treatment facilities. They are not designed nor operated to treat waste, only to hold manure.

Well Placement

Facility groundwater contours indicated on the attached plans, were interpolated based on where water was encountered while advancing holes during construction geotechnical investigations and supplemented with water elevations reported in nearby historic wells along the Hunewill Road. While the regional trend of the groundwater is to the North, there will be seasonal variations in groundwater elevations and localized flow directions based on weather patterns, pump withdrawals and field irrigation. Freshwater and agricultural wastewaters are pumped and applied to fields in the immediate vicinity. The dairy will be withdrawing water from a well on-site for production water. These activities will affect the elevation and direction of groundwater flow. It is anticipated that the groundwater flow direction could swing anywhere from Northeasterly to Northwesterly dependent on season, weather patterns, and agricultural activities. Three groundwater monitoring wells are proposed to provide liner leak detection for the two nested impoundments; one upgradient (MW-1) and two downgradient (MW-2 and MW-3). The proposed locations of these wells are along the south, north and west boundaries. Onsite conditions or ancillary facility support features may require adjusting the well locations. GPS coordinates are for the proposed locations. As groundwater data is obtained from these formal monitoring wells, the true water table elevation and flow direction will be establish. If found necessary, the well monitoring network can be expanded.

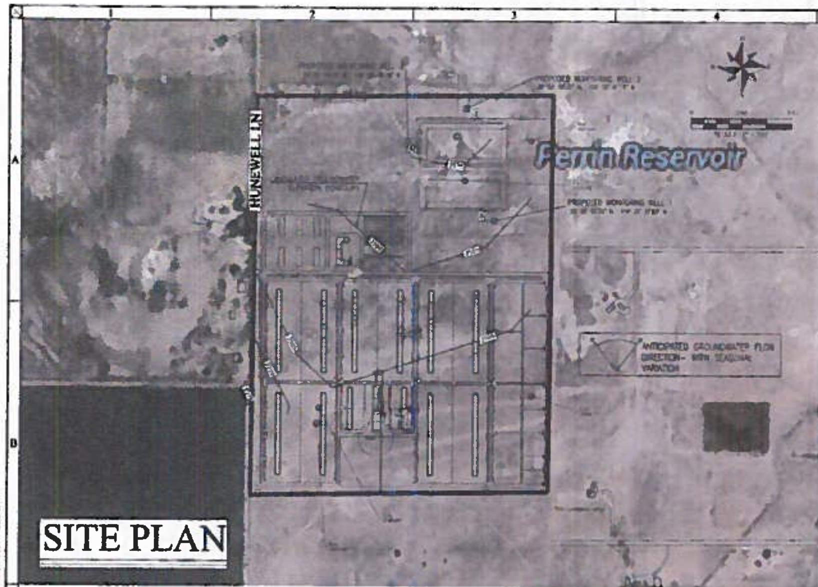
Well Construction and Development

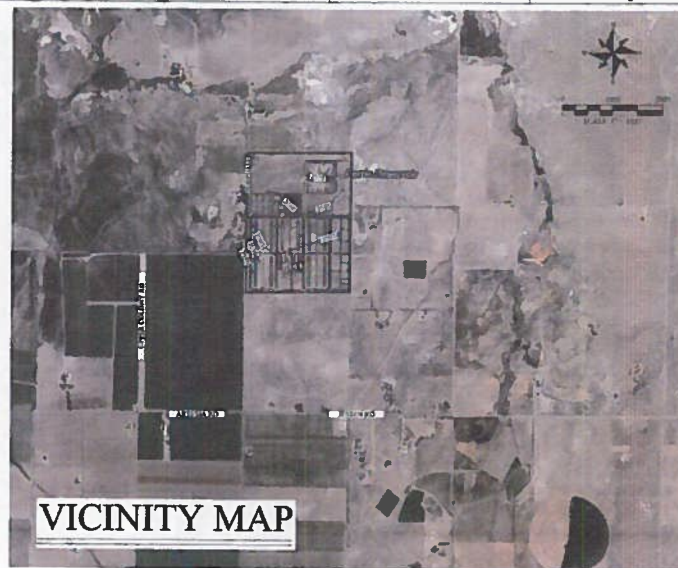
Wells will be designed, constructed and developed in accordance with the requirements listed in Nevada Administrative Code (NAC) Sections 533 and 534. Monitoring wells will be drilled by a water well driller currently licensed in the State of Nevada and familiar with the Smith Valley hydrogeology. Two-inch (2-in) diameter, PVC wells, capped at both ends will be installed. Wells will be either flush mounted or extend at least 2 feet above ground surface and will be clearly marked and secured with a locking device. Well screen and filter pack will be selected based on the driller's knowledge of the region and confirmed with the well logging that takes place during drilling operations. At this time it is anticipated that approximately ten (10) feet of solid stock and twenty (20) feet of perforated well screen will be required to achieve the required 5 feet above seasonal high-water table and 15 feet into static water level. Well seals will include filter pack and annular seals with bentonite plugs. Additionally, concrete pads will be set to assure drainage away from the wells.

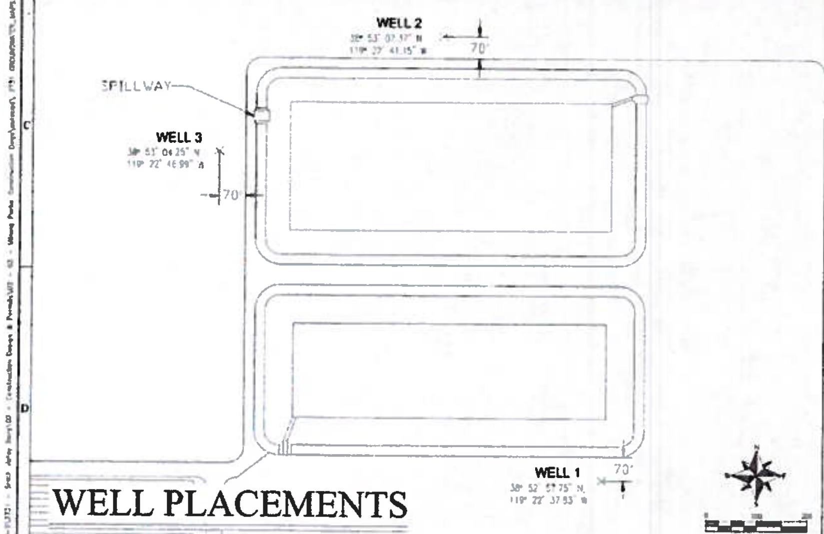
Monitoring Plan

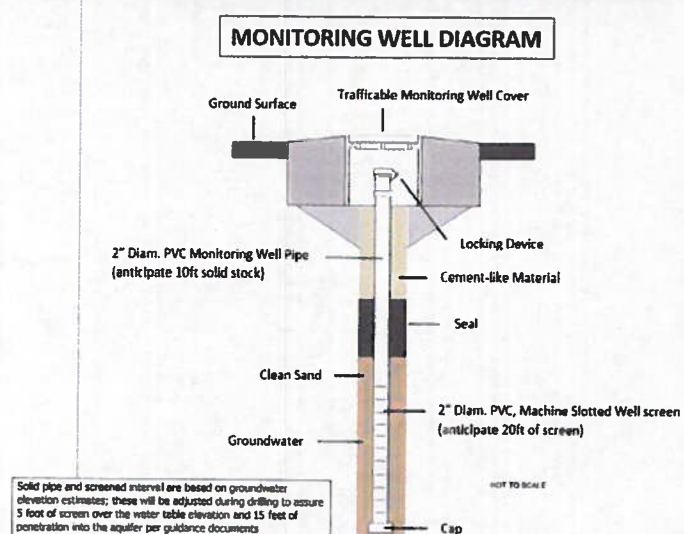
AGPRO proposes to install, develop, purge and sample the wells to establish baseline, existing conditions currently in the basin. We anticipate sampling the three wells at monthly intervals this fall and winter a minimum of three times in advance of moving animals onto the facility. During these sampling events, we will field monitor for pH, temperature, and electric conductivity and laboratory analyze for selected chemicals such as, nitrate, TKN and general minerals (Ca, Mg, Na, K, carbonate, bicarbonate, sulfate and chloride). Samples will be collected, handled, transported and analyzed according to standard EPA practices.

Based on these results we will develop an appropriate list of parameters and frequency for the ongoing monitoring program. AGPROfessionals will negotiate relevant criteria with BWPC to establish if elevated levels are attributable to leakage from either lagoon, and the sequence of events to react to increases in the selected parameters.









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SMITH VALLEY DAIRY GROUNDWATER MAPS

LYON COUNTY, NEVADA

SHEET: ST-1

SMITH VALLEY DAIRY GW MAPS

Operations and Maintenance Plan

A plan for operation and maintenance (O&M) of the liner and structure will be prepared. The plan will be consistent with the purposes of the type of liner chosen, intended life, safety requirements and design criteria. The plan will contain requirements including but not limited to:

1. Design capacity and liquid level of the structure.
2. A description of the normal operation, safety concerns and maintenance requirements.
3. Repair procedures.
4. Periodic inspection of the following:
   - Visible portions of the liner for tears punctures, or other damage;
   - Liner interface with inlets, outlets, ramps, or other appurtenances for damage;
   - Liquid level in the structure;
   - Ballooning of the liner indicating presence of gas beneath the liner and
   - Physical inspection of Leak Detection wetwell.

Natural Resources Conservation Service
United States Department of Agriculture

Trapezoidal Channel Section

Participant: Smith Valley
Location: At north pond spillway
County: County, NV

Designer: Agpro
Date: 06/06/2014

Checker: ______________
Date: ______________

Hydraulics Formula, Version 2.2.1

Dairy Facility

Slope: 0.0005 ft/ft
'n' value: 0.015

Hydraulic Radius: 1.24
Area: 46.50 sq ft
Velocity: 2.56 ft/sec
Capacity: 119.16 cfs

Sideslope: 4:1
Bottom Width: 25 ft
Depth of Flow: 1.5 ft.
Width @ surface 37 ft

Client: Smith Valley Dairy
County: State: NV
Practice: Peak Flow for Spillway Design
Calculated By: Agpro Date: 6/6/2014
Checked By: ________ Date: ________

Drainage Area:	140	Acres (provided from RCN Calculator)
Curve Number:	82	(provided from RCN Calculator)
Watershed Length:	500	Feet
Watershed Slope:	.7	Percent
Time of Concentration:	0.34	Hours (calculated value)
Rainfall Type:	II	

Storm Number	1	2	3	4	5	6	7
Frequency (yrs)	25						
24-Hr rainfall (in)	2.07						
Ia/P Ratio	0.21	0.00	0.00	0.00	0.00	0.00	0.00
Used	0.21	0.00	0.00	0.00	0.00	0.00	0.00
Runoff (in)	0.70						
(ac-ft)	8.17	0.00	0.00	0.00	0.00	0.00	0.00
Unit Peak Discharge (cfs/acre/in)	0.909	0.000	0.000	0.000	0.000	0.000	0.000
Peak Discharge (cfs)	88						

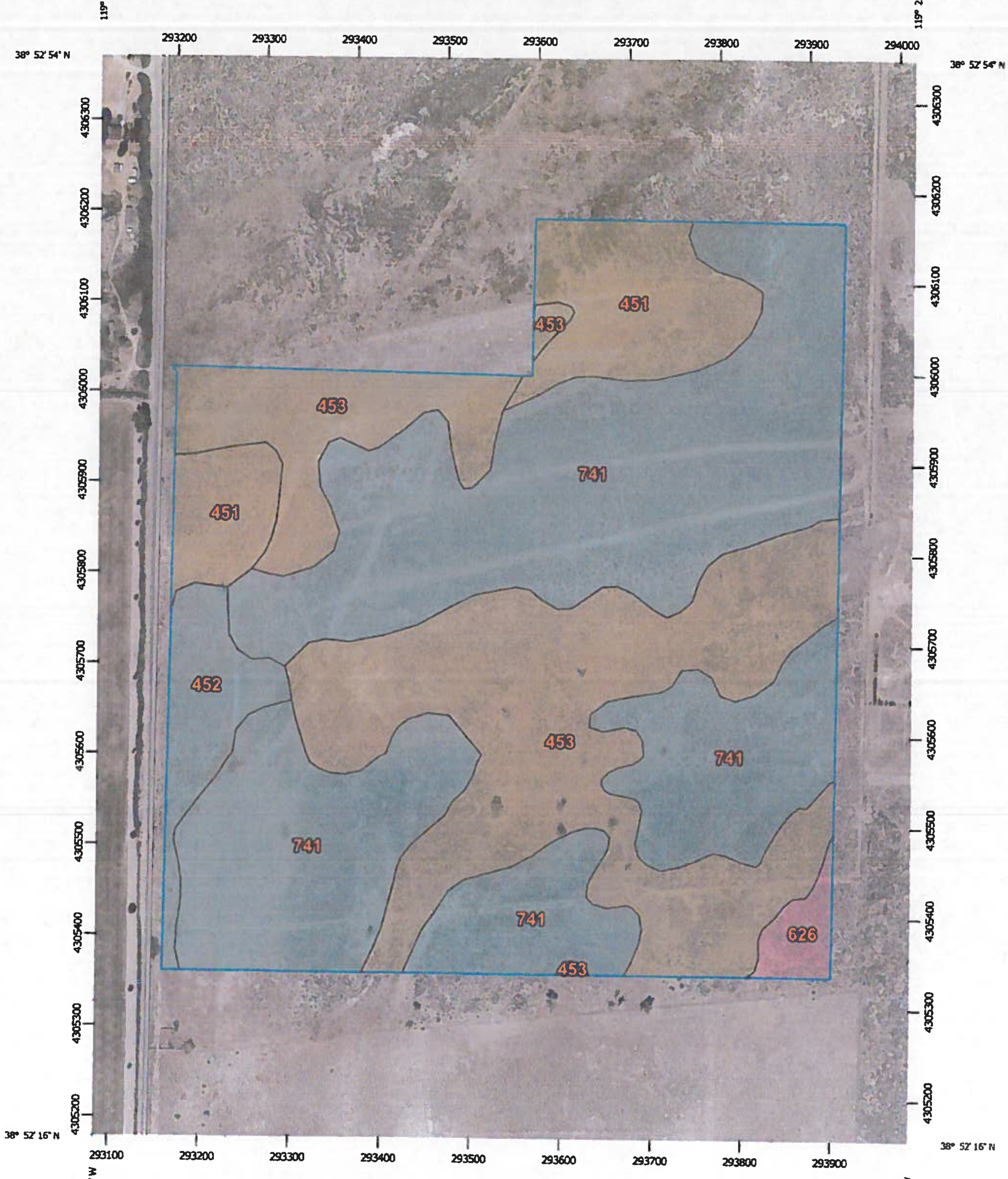
ESTIMATING RUNOFF AND PEAK DISCHARGE

Curve number Computation

Client: Smith Valley Dairy
County:
State: NV
Practice: Peak Flow for Spillway Design
Calculated By: Agpro
Date: 6/6/2014
Checked By: ________
Date: ________

COVER DESCRIPTION		Acres (CN)			
		Hydrologic Soil Group			
		A	B	C	D
OTHER AGRICULTURAL LANDS					
Farmsteads	----	2(59)	-	138(82)	-
Total Area (by Hydrologic Soil Group)		2		138	
TOTAL DRAINAGE AREA: 140 Acres		WEIGHTED CURVE NUMBER: 82			

Hydrologic Soil Group—Lyon County Area, Nevada
(Smith Valley Dairy Hydro Soil Group)



Map Scale: 1:5,810 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lyon County Area, Nevada
Survey Area Data: Version 9, Nov 12, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 1, 2010—Jul 3, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Lyon County Area, Nevada (NV625)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
451	Obanion loamy coarse sand	C/D	13.1	9.6%
452	Obanion sandy loam, drained	C	5.5	4.0%
453	Obanion sandy loam, saline-alkali	C/D	44.7	32.8%
626	Saralegui loamy sand, undulating	A	1.8	1.4%
741	Wedertz-Wellington-Saralegui complex, 0 to 2 percent slopes	C	71.0	52.1%
Totals for Area of Interest			**136.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Nutrient Management and Operations/Maintenance Plan

Smith Valley Dairy
Lyon County, Nevada
CAFO Nutrient Management (NMP) and Operations/Maintenance Plan

I. GENERAL INFORMATION

Facility Name:	Smith Valley Dairy	**Lat/Long:**	38.87, -119.38
Owner/Operator:	Dirk Vlot		
Facility Physical Address:	40 Hunewill Lane		
City:	Wellington	**State:** Nevada	**Zip Code:** 89444
Facility Phone:	N/A	**Email/Cell No.:**	Valvlot7@aol.com; 559-731-3475

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. NAME AND OFFICIAL TITLE (PRINT OR TYPE) Dirk Vlot	*B. PHONE NUMBER* 559 731-3475
C. SIGNATURE [signature]	*D. DATE SIGNED* 9/3/13

II. NUTRIENT MANAGEMENT PLAN INFORMATION[1]

NMP Public Notice Date: ____ **NMP Approval Date:** ____

NMP Implementation Date: ____ **NMP Revision Date[2]:** ____

Permit Expiration Date: ____

[1]To be used by NDEQ if desired.

[2]Note to CAFOs: To revise an NMP, the CAFO must provide the NDEQ the most current version of the NMP and identify changes from the previous version (preferably in track changes or otherwise highlighted and clearly identified). The Ag Program will review the revised NMP to ensure that it meets applicable requirements including effluent standards. If the NMP changes necessitate revision to the terms incorporated into the CAFO's permit, the NDEQ will determine if such changes are substantial as described in by state regulations.

If the changes are deemed to be non-substantial, the NDEQ will revise the terms of the NMP that are already incorporated into the permit, notify the owner or operator, and inform the public of such changes (public notice not required). The revised NMP will then be added to the permit record.

If the changes to the terms of the NMP are deemed substantial, the DNEQ will provide public notice regarding the proposed changes. Information submitted by the CAFO in support of the NMP changes will be available for public review and comment upon request during this time. Once changes to the terms of the NMP are incorporated into the permit, the NDEQ will notify the CAFO and inform the public of the final decision concerning changes to the terms and conditions of the permit.

ASSOCIATED RECORDS: A current and approved version of the Nutrient Management Plan is kept on-site at the permitted facility at all times.

III. STORAGE OF MANURE AND PROCESS WASTEWATER

Adequate storage of manure and process wastewater is maintained, including the implementation of procedures to ensure proper operation and maintenance of the impoundments and tanks.

The following procedures are followed by the facility:

(A) Except during the designed storm event, manure and process wastewater stored in impoundments and terminal tanks is removed as necessary to maintain a minimum of two feet of freeboard.

(B) Whenever the design capacity of impoundments and tanks is less than the volume required to store runoff from the designed storm event, the structures are dewatered to a level that restores the required capacity as soon as soils on a land application site have the water holding capacity to receive process wastewater.

Storage Needs

Process wastewater volume generated annually by the facility: 31 million gallons

Process Wastewater Storage Information

Impoundment/ Tank/Drainage Basin ID	Total Capacity Required to Hold all Wastes Accumulated During the Storage Period (acre-feet)	Total Capacity Required to Contain Storm Event Runoff and Direct Precipitation (acre-feet)	Total Capacity Available (acre-feet)
North & South Ponds	54.9 (Nov-Mar)	15.3	71

Manure Storage Information:

Manure Storage Area ID	Amount of Manure Produced (tons/year)	Total Amount of Non-Pen Area Manure Storage Available (estimated tons)
Compost/Manure Storage	29,417	150,000

Manure is transferred to a third party? ☒ Yes ☐ No Initially not, but as facility grows, manure may be given away.

Note: Manure may be stockpiled in and around pens and anyplace on the facility that drains to an impoundment.

ASSOCIATED RECORDS:

The facility maintains the following records to ensure adequate storage of manure and process wastewater:

1) This NMP documents the current design of all manure storage structures, including volume of solids accumulation, design treatment volume, total design volume, and approximate number of days of storage capacity.
2) Records documenting that manure and process wastewater stored in impoundments are removed (i.e. pumping records) as necessary to maintain a minimum of two feet of freeboard.
3) The amount of manure taken by neighbors.

IV. ANIMAL MORTALITY MANAGEMENT

Animal mortalities (i.e., dead animals) are managed to prevent discharge of pollutants to surface water. Mortalities remain on the production area until disposal and are managed to ensure that they are not disposed of in a liquid manure, storm water, or process wastewater storage system that is not specifically designed to treat animal mortalities.

Expected animal mortality rate: approximately 3-8%

Method of Animal Mortalities Handling (check all that are applicable):

☒ Composting (routine mortalities) *On-site within Production Drainage Area*

☒ Rendering (routine mortalities) *Daily to Reno Rendering or other authorized facility*

☒ Burial (catastrophic mortalities) *per NV Dept. Public Safety, Disaster Debris Management Plan*

☒ Other: landfill (catastrophic mortalities) *Carson City Sanitary Landfill or other authorized facility*

Mortality Storage Area ID	Drainage	Impoundment/ Tank/Drainage Basin ID
Compost/Manure Storage	*Drains to*	Collection Pit
	Drains to	
	Drains to	
	Drains to	

ASSOCIATED RECORDS:

The facility maintains the following records to document proper management of mortalities:

1) This NMP serves to document that animal mortalities are not disposed of in liquid manure, storm water, or process wastewater storage system that is not specifically designed to treat animal mortalities. Such records are maintained for a period of five years from the date created.

V. DIVERSION OF CLEAN WATER

Clean water is diverted, as appropriate, from the production area (i.e., from holding pens, manure and process wastewater storage systems, manure stockpiles, composting areas, etc.).

Clean water diversions used (check all that apply and indicate location where diversion is used):

	Diversion	Location Used:
☐	Berms	_____
☐	Channels	_____
☒	Natural Topography	Surrounding terrain is nearly flat
☒	Other	Perimeter farm road is raised 2 feet

ASSOCIATED RECORDS:

The facility maintains the following records to document appropriate diversion of clean water from production area:

1) Periodically inspect the production area and storm water run-on diversion devices and structures.

VI. PREVENTION OF DIRECT CONTACT OF ANIMALS WITH SURFACE WATER

Confined animals are prevented from having direct contact with surface water that is defined as waters of the United States.

Waters of the United States means, in part:

a) All waters… susceptible to use in interstate or foreign commerce…;
b) All interstate waters…;
c) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands[1] (including wetlands adjacent to waters identified in (a) through (e) of this definition), sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:
    1) Which are or could be used by interstate or foreign travelers for recreational or other purposes;
    2) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
    3) Which are used or could be used for industrial purposes…;
d) All impoundments of waters otherwise defined as waters of the United States under this definition[2]; and
e) Tributaries of waters identified in paragraphs (a) through (d) of this definition.

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[1] Wetlands means those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

[2] Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the federal Clean Water Act (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the U.S. This exclusion applies only to manmade bodies of water which neither was originally created in waters of the U.S. (such as disposal area in wetlands) nor resulted from the impoundment of waters of the U.S.

1. Waters of the United States flow through the production area? ☐ Yes ☒ No
2. Animals have access to waters of the United States? ☐ Yes ☒ No
3. If yes, list the measures (e.g. fencing) used in the production area to prevent direct contact of animals with waters of the United States: ____

Note: The facility is located in a self contained drainage basin which is isolated from waters of the US

ASSOCIATED RECORDS:

The facility maintains the following records to document that animals are prevented from direct contact with waters of the United States:

1) This NMP serves to document the prevention of direct contact of confined animals with waters of the U.S.

VII. CHEMICAL OIL HANDLING

Chemicals are properly handled on-site and are not disposed of in any manure, storm water, or process wastewater storage system unless specifically designed to treat such chemicals and other contaminants. See the attached document regarding manure/wastewater spill containment.

Chemical disposal location: Oils and petroleum products are not stored at the dairy

☐ Chemicals are used and empty containers are disposed of in accordance with manufacturer's guidelines
☒ No chemicals are used at the facility
☐ Other: _____

Chemicals storage location: N/A

☐ Chemicals are not stored in a room with a floor drain that discharges outside (i.e., into the production area)
☐ Storage is covered
☐ Storage has secondary containment
☐ Chemicals are stored in proper containers
☐ Other: _____

ASSOCIATED RECORDS:

The facility maintains the following records to demonstrate proper handling of chemicals:

1) This NMP serves to document that chemicals handled on-site are not disposed of in any manure, storm water, or process wastewater storage system unless specifically designed to treat such chemicals.

VIII. CONSERVATION PRACTICES

Site-specific conservation practices are identified and implemented to control runoff of pollutants to surface water.

Conservation practices include, but are not limited to the following:

- It is recommended that solid manure be incorporated into the soils as soon as possible after application, unless the application site has perennial vegetation or is no-till cropped.
- Application of process wastewater to furrow- or flood-irrigated land application sites is done in a manner that prevents any process wastewater runoff into surface waters.
- When process wastewater is sprinkler-applied, the water holding capacity of the soil is not exceeded.
- Nutrients shall not be applied to frozen, snow-covered, or saturated soils if the potential risks for runoff exist.
- Waste should not be applied on soils that frequently flood during the period when flooding is expected.
- Avoid winter application for spring seeded crops.
- Air temperature must be >50 degrees F for 7 days before incorporation and the rate shall not be made on frozen/snow-covered ground.
- Manure or process wastewater is not applied within 200 feet of domestic water supply wells.

The facility implements the following best management practices to control runoff of pollutants to surface water. (check all that apply)

Conservation Practice	*Land Application Site ID Where Practice is Implemented
☐ Buffer	
☒ Setback	All fields have a minimum 35' setback from ditches where water is able to run into a public ditch.
☒ Conservation Tillage	Cover crops and strip tillage are utilized on fields
☐ Constructed Wetland	
☐ Infiltration Field	
☐ Grass Filter	
☐ Terrace	
☒ Tail Water Pit	F 1-5
☐ Process wastewater is not allowed to reach end of field	
☐ Other (describe):	
☐ Other (describe):	
☐ Other (describe):	

***For land application sites where surface water is located in or down-gradient of the site.**

ASSOCIATED RECORDS:

The facility maintains the following records to document site-specific conservation practices:

1) This NMP serves to document that site-specific conservation practices have been identified and implemented to control runoff of pollutants to surface water.

IX. SAMPLING & TESTING OF MANURE, PROCESS WASTEWATER AND SOIL

Manure and soil are analyzed according to the schedule below. The results are used to determine application rates for manure and process wastewater. The following protocols are used to ensure appropriate sampling and testing of manure, process wastewater and soil.

Manure is transferred to a third party? ☒ Yes[1] ☐ No

Process wastewater is transferred to a third party? ☐ Yes[1] ☒ No

	Required Sampling Frequency	Required Analysis	Sampling Protocol	Testing Protocol
Manure[5]	Annually	Total Nitrogen Ammonia-N Nitrate-N (NPDES) Total Phosphorus Total Potassium Percent Solids	☒ USU testing lab ☐ Other *Specify*:	Lab certified through the state of Nevada laboratory certification program
Process Wastewater[5]	Annually	Total Nitrogen Ammonia-N Nitrate-N (NPDES) Total Phosphorus Total Potassium Percent Solids	☒ USU testing lab ☐ Other *Specify*:	Lab certified through the state of Nevada laboratory certification program
Soil Nitrate	Annually[6]	Nitrate in necessary depth zone(s)	☒ USU testing lab[4] ☐ Other *Specify*:	Lab certified through the state of Nevada laboratory certification program or a NAPT-PAP certified lab if a suitable state lab cannot be found.
Soil pH, EC, OM, Phosphorus, potassium, sodicity if sodium is a concern	Annually[6]	[3]Phosphorus in necessary depth zone(s)	☒ USU testing lab[4] ☐ Other *Specify*:	Lab certified through the state of Nevada laboratory certification program or a NAPT-PAP certified lab if a suitable state lab cannot be found.

[1] Note to CAFOs: Prior to transferring manure or process wastewater to other persons, Large CAFOs must provide the recipient of the manure or process wastewater with the most current nutrient analysis. Large CAFOs must retain for five years records of the date, recipient name and address, and approximate amount of manure or process wastewater transferred to another person.

[2] Manure and process wastewater are sampled and tested for nitrate annually, but an average nutrient value may be used for calculating land application rates once it is established.

[3] Appropriate soil sampling depths for phosphorus will be 1 foot for conducting the Phosphorus index risk assessment but may be shallower for no-till or perennial forage phosphorus application determination.

[4] Soil will be routinely sampled to 1 foot for annual crops or 6" for perennial grass and no-till.

[5] Listed are NRCS required analytes for land application of nutrients. Per terms of the permit, fecal coliforms in manure and wastewater, and pH, chlorides, TDS, TSS, and BOD_5 of wastewater may also need to be monitored. If all manure is given away, it should be analyzed for Total N, Total P and fecal coliforms. See permit Factsheet for specifics.

[6] Soil may be sampled once every 5 years in fields with perennial crops or the same crop as the previous year. Facilities which are obtaining a EPA NPDES discharge permit will sample all fields receiving manure and wastewater annually prior to application.

ASSOCIATED RECORDS:

The facility maintains the following records to document manure, process wastewater and soil testing:

1) The references for protocols used for appropriate sampling and testing of manure, process wastewater and soil are maintained on-site for at least five years from the date created.
2) Results from sampling and testing of manure, process wastewater and soil are maintained on-site for at least five years from the date created.

X. LAND APPLICATION

Land application of manure or process wastewater is done in accordance with site-specific nutrient management practices that ensure appropriate agricultural utilization of the nutrients in the manure or process wastewater.

Map(s) of land application sites are included in **Appendix A**.

Fields utilized for land application of manure and/or process wastewater are listed in Table B-1 in **Appendix B**.

Intended crops for each land application field are listed in Table B-2 in **Appendix B**. However, any crop listed might be planted, as determined by economics, field conditions at planting, and expected irrigation water availability.

Yield goals for each crop are included in **Appendix C** and are based upon historical yield data, soil productivity information, climatic conditions, nutrient test results, level of management, and local research results considering comparable production conditions, industry-demonstrated yield, and nutrient utilization information.

The methodology outlined in this section is adhered to each year in order to determine nutrient application rates, as a term of the permit. Nutrient applications and field nutrient balances are projected for the next five years, but these projections are for planning purposes only.

The basic application rates are determined in accordance with NRCS Code 590, or as otherwise listed in **Appendix D** and are based on the following:

- The amount of N and P in the manure that will be plant available is determined using one of the fertilizer suggestions for each crop.
- Nitrogen application rates (commercial fertilizer + plant available manure N) will not exceed crop N requirements (listed in Table 3), plus additional N needs, minus N credits:

  Gross N Recommendation
  \+ Extra N Needed
  − Past Year Legume N Credit
  − Past 2 Years Manure N Credit
  − Organic Matter N Credit
  − Soil Residual Nitrate
  ____
  Total N Application
  (Manure + Commercial Fertilizer)

- Nitrogen credits including past year legume credits, past 2 years manure credits, organic matter credit, and soil residual N will be determined in accordance with NRCS Code 590, or other sources as listed in **Appendix D**, for each crop.
- Nitrogen needs might include nitrogen to mineralize high residue from the previous crop, for grazing a grain crop, as a starter where no fertilizer is required, or to fertilize a second crop grown and harvested in the same crop year.
- Given the variable mineralization potential of manure and losses of soil nitrate, it is not uncommon to need to adjust nitrogen applications during the growing season. **Appendix D** outlines tools and methods that might be used.
- The outcome of field-specific assessment of potential for nitrogen and phosphorus transport to surface water for each field, using the USDA, NRCS Phosphorus Index Risk Assessment tool or other Division-approved method. The Nevada Phosphorus Index Risk Assessment is detailed in **Appendix E**.
- Application calculations are included in **Appendix F**, including projected manure and process wastewater applications and field nutrient balances for five years.

ASSOCIATED RECORDS:

The facility maintains the following records to document land application in accordance with site-specific nutrient management practices:

1) Documentation demonstrating that protocols established for land application of manure or process wastewater is conducted in accordance with site-specific nutrient management practices (allowable land application rate calculations).
2) Calculation records demonstrating appropriate agricultural utilization of the nutrients in the manure or process wastewater (dates, rates, and N or P applied).
3) Crops grown, management problems, and yields for each field.
4) Weather conditions during land application.

XI. LAND APPLICATION EQUIPMENT INSPECTIONS

Manure and process wastewater is applied as uniformly as possible with properly calibrated equipment.

1) Nutrient application equipment is calibrated at least annually? ☒ Yes ☐ No
2) Method(s) of process wastewater application? Pivot, Sideroll sprinklers
3) Method(s) of manure application? Truck mounted box spreader
4) Nutrient application equipment is inspected within the six month period prior to the first application of manure or process wastewater (required for NPDES permits)? ☐ Yes ☐ No ☒ N/A
5) Nutrient application equipment is inspected daily when wastewater is being applied (required for NPDES permits)? ☐ Yes ☐ No ☒ N/A

ASSOCIATED RECORDS:

The facility maintains the following records to document equipment inspections:

1) Records documenting the date of periodic leak inspections of equipment used for land application of manure or process wastewater.

XII. SETBACK REQUIREMENTS

Manure and process wastewater setbacks, where manure and wastewater are not applied, are as follows:

1) A 35' setback is used between land application sites and any down-gradient surface waters of the state, open tile line intake structures, sinkholes, agricultural wellheads, or other conduits to surface waters of the state.
2) A 100' setback or 35-foot vegetated buffer is used between land application sites and all down-gradient water of the U.S., open tile intake structures, sinkholes, agricultural wellheads, or other conduits to waters of the U.S. (required for NPDES permits)
3) A 200' setback setback is used between land application sites and domestic wellheads.

The following combination of setbacks, buffers and/or approved alternatives are used, as indicated below:

	Compliance Practice Implemented [(1) or (2) above]:	**Land Application Site ID Where Practice is Implemented[1]:**
Down-gradient Surface Waters	1	SM3
Open Tile Line Intake Structure		
Sinkholes		
Agricultural Wellheads	1	SH3, F5
Other Conduits to Surface Waters	3	F4/5, H1, SH1, SH3, SM1, SM5

[1]Only identify fields in which a specific buffer must be maintained because of the proximity of the feature to the land application site. Do not identify naturally occurring setbacks or buffers.

ASSOCIATED RECORDS:

The facility maintains the following records to document setback requirements:

1) This NMP serves to document setbacks used.
2) Maintain records of Department approval of any setback alternatives.

APPENDIX A

NUTRIENT MANAGEMENT PLAN TERMS (1 – 6)

1) LAND APPLICATION FIELD MAPS & SOIL SURVEY

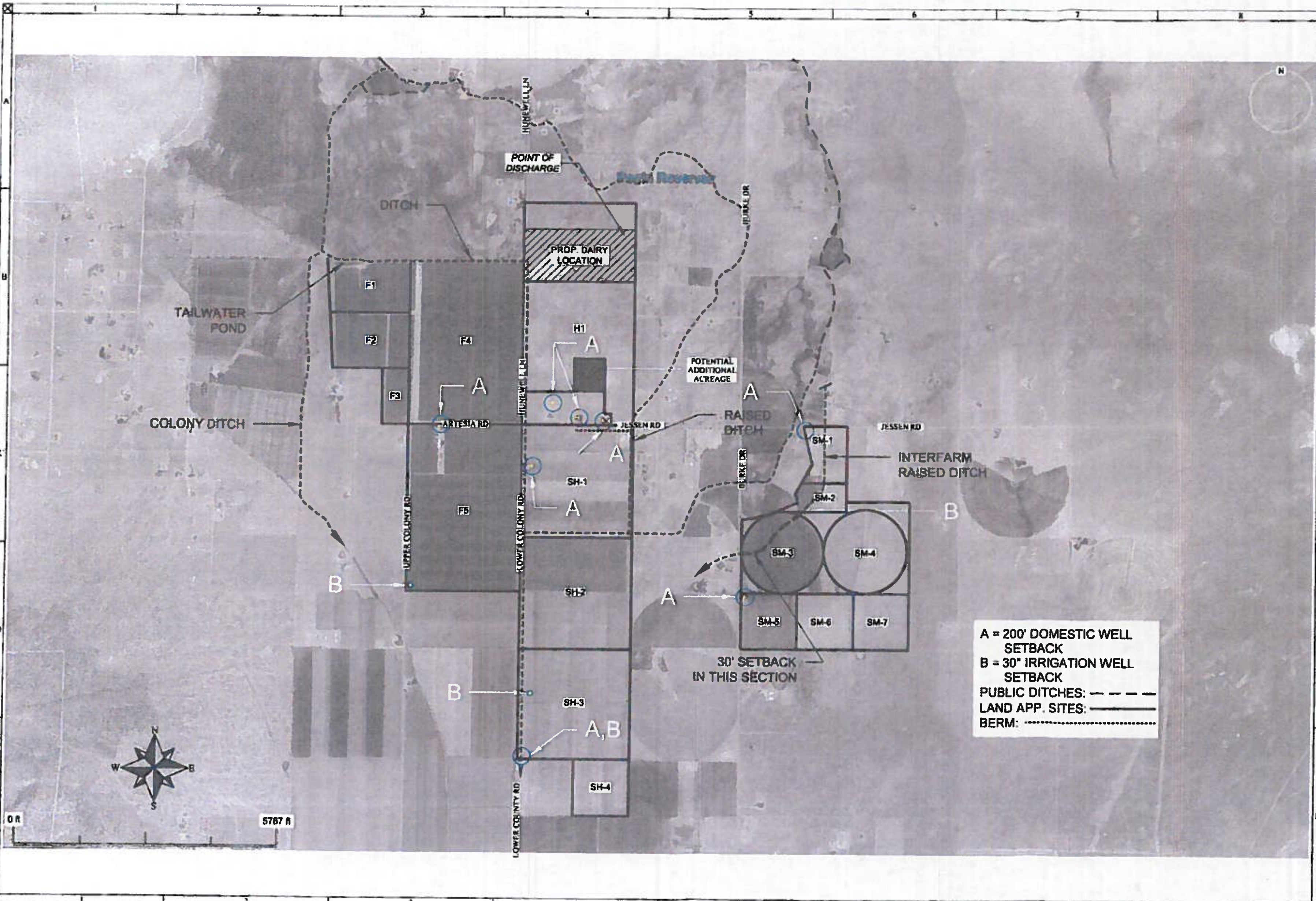
CONSERVATION PRACTICES/SETBACKS

The attached map depicts overall land application sites, surface water features, and buffer needs. As the facility is developed, pivots will be installed on some fields, or fields may be subdivided into management units. Therefore spreadable acreages of each field may change, but total acreage will not. On site records will be kept reflecting these changes.

Fields F1-5 all drain to farm ditches that flow to the tailwater pond in the NW corner of the property. No runoff enters off-site (public) ditchs. Tile drains on this field drain to the tailwater pond.

Where rainfall runoff flows into a public ditch, 35' waste application setbacks will be maintained. Manure and wastewater will not be applied over a public ditch.

Several wells within land application sites are identified on the buffer map. 35' and 200' setbacks from irrigation and drinking water wells, respectively, will be maintained.



AGPRO fessionals
4350 Highway 66, Longmont, CO 80504
(970) 535-9318 • fax: [illegible] 535-9854

SMITH VALLEY DARIY CONSERVATION MAP

SHEET:

CM-1

1 OF 1

Soil Map—Lyon County Area, Nevada
(Cowifornia Dreamen Land App Sites)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

- Gully
- Short Steep Slope
- Other

Political Features

- Cities
- PLSS Township and Range
- PLSS Section

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:22,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lyon County Area, Nevada
Survey Area Data: Version 8, Sep 17, 2012

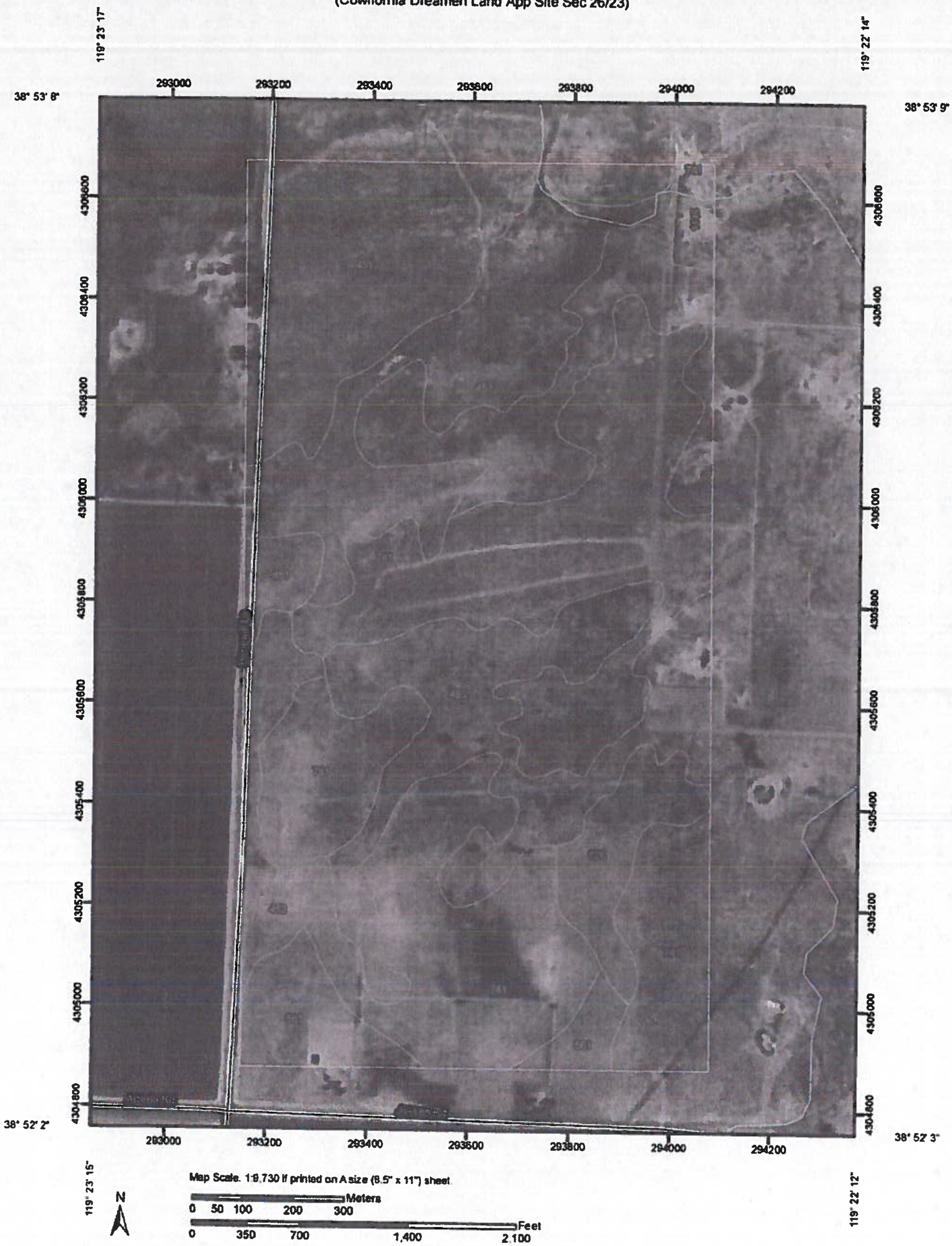
Date(s) aerial images were photographed: 7/12/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Lyon County Area, Nevada (NV625)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
321	Haybourne loam	355.8	15.1%
353	Hotsprings gravelly loamy coarse sand, 0 to 2 percent s lopes	242.8	10.3%
354	Hotsprings-Holbrook complex, 2 to 4 percent slopes	24.1	1.0%
451	Obanion loamy coarse sand	249.5	10.6%
452	Obanion sandy loam, drained	204.3	8.7%
453	Obanion sandy loam, saline-alkali	72.2	3.1%
561	Rebel sandy loam, 0 to 2 percent slopes	947.0	40.2%
613	Sagouspe loam, wet	42.5	1.8%
625	Saralegui sandy loam, 0 to 2 percent slopes	4.9	0.2%
626	Saralegui loamy sand, undulating	12.1	0.5%
741	Wedertz-Wellington-Saralegui complex, 0 to 2 percent slopes	148.0	6.3%
742	Wedertz-Wellington coarse sandy loams, 2 to 4 percent slopes	54.3	2.3%
Totals for Area of Interest		2,357.5	100.0%

Soil Map—Lyon County Area, Nevada
(Cowifornia Dreamen Land App Site Sec 26/23)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:9,730 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lyon County Area, Nevada
Survey Area Data: Version 8, Sep 17, 2012

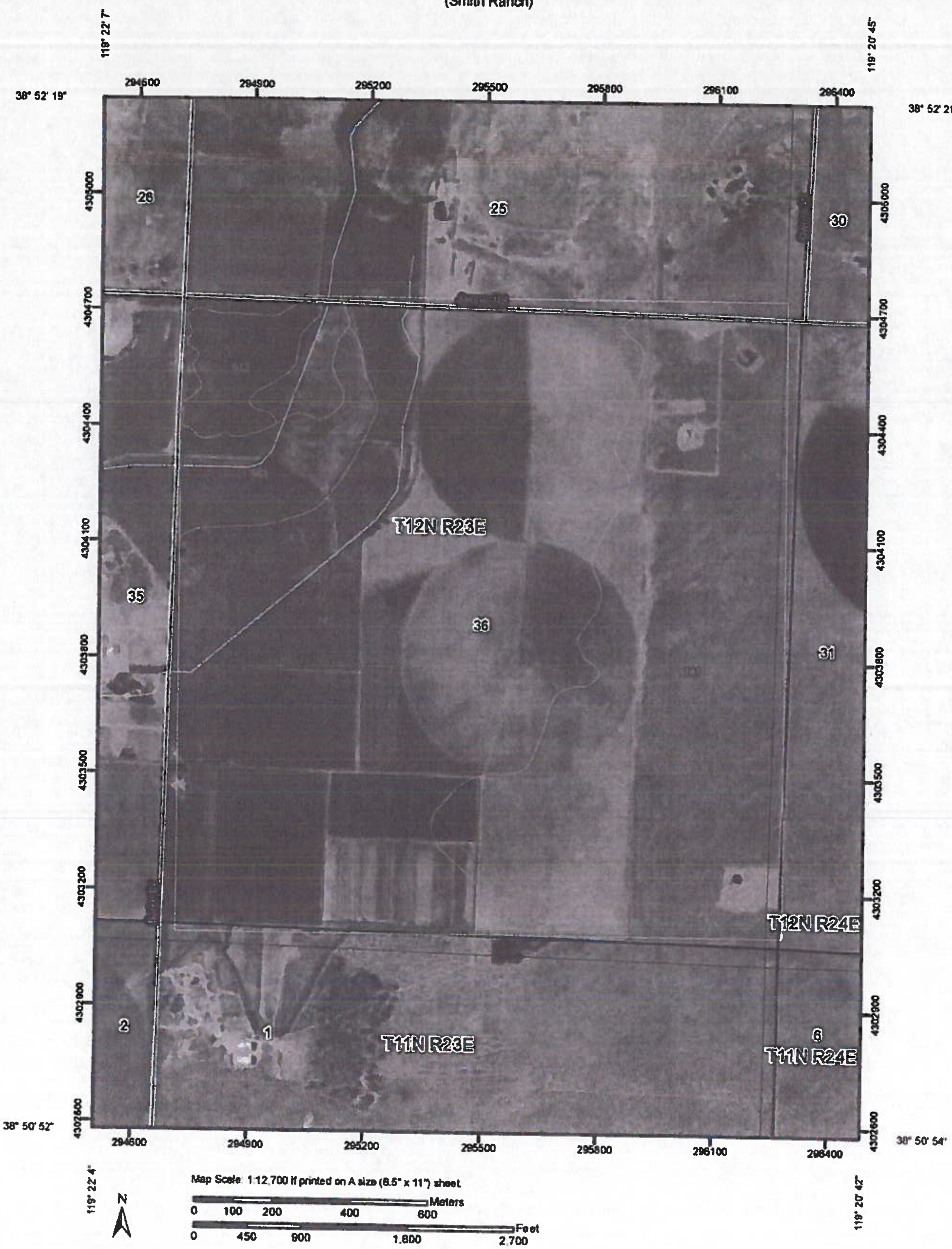
Date(s) aerial images were photographed: 7/12/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Lyon County Area, Nevada (NV625)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
451	Obanion loamy coarse sand	98.1	23.9%
452	Obanion sandy loam, drained	15.4	3.7%
453	Obanion sandy loam, saline-alkali	104.6	25.4%
561	Rebel sandy loam, 0 to 2 percent slopes	18.1	4.4%
626	Saralegui loamy sand, undulating	15.0	3.6%
741	Wedertz-Wellington-Saralegui complex, 0 to 2 percent slopes	156.4	38.0%
1145	Water	3.8	0.9%
Totals for Area of Interest		411.4	100.0%

Soil Map—Lyon County Area, Nevada
(Smith Ranch)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities
- PLSS Township and Range
- PLSS Section

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:12,700 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lyon County Area, Nevada
Survey Area Data: Version 8, Sep 17, 2012

Date(s) aerial images were photographed: 7/12/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Lyon County Area, Nevada (NV625)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
451	Obanion loamy coarse sand	13.8	2.1%
561	Rebel sandy loam, 0 to 2 percent slopes	32.4	5.1%
613	Sagouspe loam, wet	19.3	3.0%
741	Wedertz-Wellington-Saralegui complex, 0 to 2 percent slopes	233.0	36.4%
742	Wedertz-Wellington coarse sandy loams, 2 to 4 percent slopes	341.3	53.4%
Totals for Area of Interest		**639.7**	**100.0%**

APPENDIX B

NUTRIENT MANAGEMENT PLAN TERMS

2) LAND APPLICATION INFORMATION

NMP TERMS - 2) LAND APPLICATION FIELDS

All land application fields are listed below.

Table B-1-a – Land Application Fields

Field Identification	Latitude[1]	Longitude[2]	Spreadable Acres[3]
F1	38.8764	-119.3969	55
F2	38.8729	-119.3970	55
F3	38.8695	-119.3948	19
F4	38.8728	-119.3892	217
F5	38.8610	-119.3892	231
SH1	38.8640	-119.3800	154
SH2	38.8565	-119.3804	160
SH3	38.8492	-119.3804	160
SH4	38.8459	-119.3777	40
SM1	38.8660	-119.3599	(25)
SM2	38.8630	-119.3605	(25)
SM3	38.8590	-119.3627	(70)
SM4	38.8592	-119.3558	(70)
SM5	38.8547	-119.3639	(40)
SM6	38.8547	-119.3591	(40)
SM7	38.8547	-119.3543	(40)
SMITH RANCH (SM) TOTAL*			385
H	38.8723	-119.3793	160
Total			1636

[1]Enter latitude in decimal degrees.

[2]Enter longitude in decimal degrees [number should be negative (eg. -104.3315)].

[3]Field acreages reduced by any setbacks, buffers, or otherwise unspreadable areas.

***Smith Ranch acreages are for current configuration of fields. Pivots will be installed, utilizing more ground. This acreage indicates the maximum acreage which may be available for land application as the fields change size.**

Table B-1-b – Major soil properties

Field	Map Unit	Soil Component Name	Surface Texture	Slope Range (%)	Water Table* (cm)	Drainage Class	Available Water Holding Capacity Top 150 cm (5 feet) (cm)	KSat 0-50 cm (0-20 in) (Micro m/sec)	Salinity (mmhos/cm)
F1-4	451	Obanion	lcos	0-2	38	Poor	23	51.7274	0-4
"	452	Obanion	sl		84	Very poor	24	16.5902	0-4
F5	561	Rebel	sl	0-2	>200	Well	19.3	28	0
SH1	613	Sagouspe	l, wet	0-2	77	Somewhat poor	15.3	59.4510	0-2
"	321	Haybourne	l	0-2	>200	Well	16	17.5686	0
SH2	321	Haybourne	l	0-2	>200	Well	16	17.5686	0
"	742	Wedertz-Wellington	cosl	2	>200	Well	13.6	14.1098	0
SH3-4	561	Rebel	sl	0-2	>200	Well	19.3	28	0
"	321	Haybourne	l	0-2	>200	Well	16	17.5686	0
H	451/3	Obanion	lcos/sl, saline/alk	0-2	38	Poor	23-25	51/16	0-4 8-16
"	741	Wedertz-Wellington-Saralegui complex	cosl	0-2	>200	Well	13.7	14.1098	0-2
SM1-7	742	Wedertz-Wellington	Cosl	2-4	>200	Well	13.6	14.098	0

*** NA=No water table Coarse textured soils are sands, loamy sands, sandy loams. Medium-textured soils are silts,** silt loams, loams, sandy clay loams. **Fine textured are** sandy clays, clay loams, silty clay loams, silty clays, and clays.

NMP TERMS - 2) LAND APPLICATION CROPS

Potential crops or other uses for each land application field are listed below.

Table –B-2 – Potential Land Application Field Crops

Field Identification	Crop	Realistic Yield Goal	Yield Unit (bushels, tons, etc.)	Source (see Appendix C)
All	Alfalfa	6.5	tons	Farm records
All	Corn Silage	28	tons	NASS * 1.1
All	Corn Grain	162	bu	NASS * 1.1
All	Grass	5	tons	Farm records
All	Wheat	107	bu	NASS * 1.1
All	Small grain haylage	3.3 DM/8.25 Wet	tons	NASS * 1.1
All	Sorghum Silage	20	tons	CSU 568A
All	Spring Small Grain	107	bu	NASS * 1.1

APPENDIX C

NUTRIENT MANAGEMENT PLAN TERMS

3) EXPECTED CROP YIELD INFORMATION

Yield goals are based upon a variety of sources and are indicated in Table B-2:

Most yield goals in Table B-2 are based upon Ag Statistics (NASS) for the state and crop – 2-5 years of data + 10%, or upon farm data

Calculations will be used if a grain yield goal is known but not a forage yield goal for the same crop, based upon the following data:

Olsen Lab – "Guidelines for Fertilizer Recommendations, Plant Tissue Analysis, and Water Analysis"
Forage sorghum yield goal (t/a) x 20 = grain yield
Sorghum silage yield goal (t/a) x 6 = grain yield

Servi-Tech Lab (Crop File 1.02.022)
Small grain hay (t/a) x 14 = grain yield
Small grain silage (t/a) x 6 = grain yield

APPENDIX D

NUTRIENT MANAGEMENT PLAN TERMS

3) NUTRIENT BUDGET INFORMATION

Formulas for gross nitrogen needs are provided using recommendations from Cooperative Extension publications. Recommendations from Stukenholtz Lab or A&L Western Lab may also be used as printed on the soil test reports. These laboratories are regionally based in Idaho and California, respectively.

Soil nitrate from 0-12" will be subtracted from the gross nitrogen need, as will mineralization of nitrogen from manure and wastewater applied in the previous year, unless it is accounted for in the year of application. Organic matter credits will be given at a rate of 30 lbs N/% organic matter.

Manure will be sampled annually and wastewater will be sampled per permit requirements. Plant available nitrogen will be determined using nutrient availability as identified in Appendix D of this NMP. The laboratory's plant available assessment, as indicated on the lab results, may also be used.

4) NUTRIENT BUDGET INFORMATION

Formulas for calculating nutrient budgets:

4) NUTRIENT BUDGET INFORMATION

Cooperative Extension Nutrient Budget Information:

Crop:	Manure and Process Wastewater Application Rate Calculated Using:	Description of Method to be Used (calculation, look-up table, etc.):
Corn Silage	X CSUCE Published Fertilizer Suggestions ☐ Adjacent State CE-Published Fertilizer Suggestions ☐ CNMP Method that meets USDA-NRCS standards ☐ CO NRCS NMP guidelines ☐ Department-approved Method	35+ (7.5*YG (tons/a)) Tables 7a. CSU Bulletin #568A
Corn Grain	X CSUCE Published Fertilizer Suggestions ☐ Adjacent State CE-Published Fertilizer Suggestions ☐ CNMP Method that meets USDA-NRCS standards ☐ CO NRCS NMP guidelines ☐ Department-approved Method	35 + (1.2 * YG (bu/acre)) Tables 7b. CSU Bulletin #568A
Sorghum Silage	X CSUCE Published Fertilizer Suggestions ☐ Adjacent State CE-Published Fertilizer Suggestions ☐ CNMP Method that meets USDA-NRCS standards ☐ CO NRCS NMP guidelines ☐ Department-approved Method	9 * YG (tons/A) Tables 7d. CSU Bulletin #568A
Sorghum Grain	X CSUCE Published Fertilizer Suggestions ☐ Adjacent State CE-Published Fertilizer Suggestions ☐ CNMP Method that meets USDA-NRCS standards ☐ CO NRCS NMP guidelines ☐ Department-approved Method	1.2 * YG (lbs/A) Tables 7c. CSU Bulletin #568A
Small Grain Hay & Silage	X CSUCE Published Fertilizer Suggestions ☐ Adjacent State CE-Published Fertilizer Suggestions ☐ CNMP Method that meets USDA-NRCS standards ☐ CO NRCS NMP guidelines ☐ Department-approved Method	yield goal (lbs/a DM) * (% protein/6.25/100) multiply silage yield by 0.4 to get dry matter of silage Crop Removal Where protein is not known, 9% is used (KSU Bulletin MF-2227)
Oat Hay & Silage	X CSUCE Published Fertilizer Suggestions ☐ Adjacent State CE-Published Fertilizer Suggestions ☐ CNMP Method that meets USDA-NRCS standards ☐ CO NRCS NMP guidelines ☐ Department-approved Method	YG (tons wet)*2000 lb/t*1.6% N/100 Multiply silage yield by 0.4 to get dry matter of silage Crop removal, CSU 568A.
Spring Seeded Small Grain	X CSUCE Published Fertilizer Suggestions ☐ Adjacent State CE-Published Fertilizer Suggestions ☐ CNMP Method that meets USDA-NRCS standards ☐ CO NRCS NMP guidelines ☐ Department-approved Method	125 lbs N per 100 bu/A, minus 20 lb N/a for each 10 bu/A difference CSU Do-It-Yourself Manure Mgt Plan
Winter Wheat Grain	☐ CSUCE Published Fertilizer Suggestions X Adjacent State CE-Published Fertilizer Suggestions ☐ CNMP Method that meets USDA-NRCS standards ☐ CO NRCS NMP guidelines ☐ Department-approved Method	YG (bu/a) * 1.75 KSU Bulletin C-529 Wheat Production Handbook, 1997

4) NUTRIENT BUDGET INFORMATION

Cooperative Extension Nutrient Budget Information:

Crop:	Manure and Process Wastewater Application Rate Calculated Using:	Description of Method to be Used (calculation, look-up table, etc.):
Alfalfa	☐ CSUCE Published Fertilizer Suggestions ☐ Adjacent State CE-Published Fertilizer Suggestions X CNMP Method that meets USDA-NRCS standards ☐ CO NRCS NMP guidelines ☐ Department-approved Method	Yield Goal * 56.6 lbs N/ton Crop Removal, Nevada NRCS
Grass/hay or grass/legume	X CSUCE Published Fertilizer Suggestions ☐ Adjacent State CE-Published Fertilizer Suggestions ☐ CNMP Method that meets USDA-NRCS standards ☐ CO NRCS NMP guidelines ☐ Department-approved Method	185 lbs N/ton +/– 40 lbs N per ton for each ton yield goal more or less than a 4 ton yield goal. Reference is CSU 568A.

Suggested broadcast P application rates (lbs. P_2O_5/acre).*

	NaHCO$_3$-P (ppm)			
	0 - 6	7 - 14	15 - 22	>22
	lbs. P_2O_5/acre			
Corn, irrigated and dryland	80	40	0	0
Dry Beans	80	40	0	0
Sorghum	80	40	0	0
Potatoes	240	180	120	60
Sugarbeets	100	75	50	0
Sunflowers	80	40	0	0
Wheat	80	40	0	0
Alfalfa, irrigated				
new stand	200	150	50	0
established	100	75	0	0
Alfalfa, dryland				
new stand	60	40	0	0
established	45	30	0	0
Grass and grass legume mixtures				
new stand	80	40	0	0
established	80	40	0	0

* Band application rates for row crops are half of the suggested broadcast rate.

Phosphorus and Potassium Credits

90% of the P and 93% of the K in wastewater and manure is assumed to be available (NRCS, Nevada).

Nitrogen Credits

Available Nitrogen in Wastewater (CSU Bulletin 568A)
1st year N availability in wastewater, sprinkler applied (Organic N * 30%) + (NH_4-N * 55%)
1st year N availability in wastewater, flood applied (Organic N * 30%) + (NH_4-N * 78%)
2nd year N availability in wastewater (Organic N * 10%)
3rd year N availability in wastewater (Organic N * 7%)

Available Nitrogen in Manure (minimum values) (CSU personal communication, UN Nebguide G1335)
1st year N availability in manure (Organic N * 25%) + (NH_4-N * % available below)
2nd year N availability in manure (Organic N * 10%)
3rd year N availability in manure (Organic N * 7%)

Available Nitrogen in Slurry (minimum values) (CSU Bulletin 568A)
1st year N availability in fresh slurry (Organic N * 35%) + (NH_4-N * % available below)
2nd year N availability in slurry (Organic N * 15%)
3rd year N availability in slurry (Organic N * 7%)

Available Nitrogen in Compost (minimum values) (UCD Manure Technical Bulletin Series Manure N Mineralization, and UN Nebguide G1335)
1st year N availability in compost (Organic N * 10-20%) + (NH_4-N * % available below)
2nd year N availability in compost (Organic N * 5-10%)
3rd year N availability in compost (Organic N * 5-10%)

Research is varied in regards to compost mineralization, but the more mild climates of University of California and Oregon State University publications indicate that N mineralization from compost is from 0-10%. C:N ratio and % total N affect this. University of Nebraska indicates that mineralization is 18-20%. It is expected that in the first 5 years of operation, a 10% rate will be used. If total % N is >3%, it could be appropriate to use the higher number. After 5 years of manure and/or compost application to the new facility when a steady state of the organic N pool is reached, mineralization research and residual soil nitrate will be re-evaluated.

NH4-N % available, solid manure, compost, and slurry (UN NebGuide G1335).
Inject or immediate incorporation – 95%
Incorporate within 1 day – 50-70%
Incorporate 2-5 days – 0-50%
Incorporate >5 days – 0%

The laboratory's plant available nutrient schedule may also be used. In fields which receive a similar amount of manure or wastewater each year, the 2 year mineralization rate may be added together and credited all in one year for simplicity.

Legume Credit- Previous crop, alfalfa

>80% stand	100-140 lbs N/A
60-80% stand	60-100 lbs N/A
<60% stand	30-60 lbs N/A

Additional nitrogen needs

Crop decomposition

Up to 20 lbs/A additional nitrogen may need to be applied to carbonaceous crop residues.

Starter fertilizer

Regardless of the recommendations for nutrient application, up to 35 lbs of N and 35 lbs P_2O_5 may be added as a starter fertilizer at or just prior to planting in order to ensure nutrient availability to seedlings, promoting a more vigorous plant more capable of utilizing nutrients already in the soil. Any commercial fertilizer applied will be counted towards the total recommendation and subtracted from the gross recommendation in the N credit section ("other") of the rate determination sheet. If 35 lbs N are not required to grow the crop, this amount of starter will still be used.

Small grain grazing

Where small grains are fall grazed, additional nutrient needs based upon animal intake or a flat rate (30-50 lbs N/a) (CSU).

In Season N adjustments

The formulas provided represent the maximum amount of N to be applied with advanced planning. It is not uncommon for nitrogen rates to be adjusted during the growing season. The following outlines procedures which may be used to make in season adjustments. Only one test will be used at any given time of plant growth to provide a recommendation. However, additional tests may be used at other stages of crop growth. For instance, it is possible that a soil test at side dressing could indicate the soil is likely to have enough nitrogen to grow a crop, but a tissue test at the reproductive phase of growth could show the plant is now deficient in nitrogen and needs more N.

Pre-Sidedress Nitrate Test (PSNT)

1 foot soil samples are analyzed for nitrate when corn is 6 to 12" tall. Guidance documents from Cooperative Extension, either from CSU or from a surrounding state, will be used to interpret results.

Tissue testing

Plant samples will be analyzed for nitrogen at the appropriate time, and from the appropriate location on the plant for the given crop. The results will be compared with expected nitrogen content for the plant at the specified growth stage. Deficiencies will be managed with additional N.

Leaf chlorophyll meters & near infrared sensors

There are a number of meters on the market which detect the amount of chlorophyll in leaves. By comparing the chlorophyll meter readings from the reference strips to those from the rest of the field, N sufficiency and the need for additional N can be determined. Latest research will be used to interpret meter readings. Suggestions include: Pennsylvania State University's tool may be used at first side dress when the corn is at the V6-V8 growth stages (Fact Sheet 53: *The Early Season Chlorophyll Meter Test for Corn)* and Purdue University's tool may be used later in the season when the crop is at the V8-V12 growth stages through pollination (Fact Sheet: AY-317-W, *Determining Nitrogen Fertilizer Side dress Application Needs in Corn Using a Chlorophyll Meter*). Interpretation of NIR sensors will be made with the latest available data.

Visual analysis

Visual symptoms are an excellent diagnostic tool to determine nutrient limitations in crop fields. The visual characteristics displayed when plants are nutrient deficient vary by plant species and variety, stage of growth, and severity of the deficiency, and they are well documented and available as a reference from numerous Extension and industry sources. Visual symptoms of nitrogen deficiency may be used to adjust nitrogen recommendations. Many factors will be taken into account to determine the need for nitrogen, including but not limited to unusual weather conditions, previous crop history, source and amount of nitrogen already applied, crop stage of growth, soil physical properties, disease, insect, herbicide injury, and other factors related to root growth. Typically 20-40 lbs N will be recommended.

Nitrogen reference strip

Several reference strips are established through the field where more than enough nitrogen has been applied and is known to not be limiting. These strips are established for comparison to potential problem spots in the field. It is useful to have reference strips when interpreting soil tests and tissue tests. It is crucial that reference strips be established for a chlorophyll meter be calibrated for each field, previous crop, hybrid, fertilizer and/or manure application and differing soil types. Reference strips vary in size and are dependent upon field characteristics and equipment size, but they are often 12,000 square feet for each 60 acres of crop of each hybrid. If the reference strip is developed using commercial fertilizer, it will receive 10-25% above the recommended rate for the field (Purdue University Fact Sheet AY-317-W), and if manure is used to produce the reference strip, it will be applied at 100% above the recommended rate (Iowa State University Fact Sheet PM 2026, *Sensing Nitrogen Stress in Corn*). This latter rate is appropriate because there are many sources of variability when using manure, and the reference strip must be fully fertilized.

APPENDIX E

NUTRIENT MANAGEMENT PLAN TERMS

5) FIELD ASSESSMENTS

A Phosphorus Index Risk Assessment is completed when bicarbonate P_2O_5 levels are greater than 50 ppm. No fields require a Phosphorus Index Risk Assessment at this time.

RUSLE2 and WEPS results for individual fields are attached if required for the Phosphorus Index Risk Assessment.

NRCS does not have a nitrogen leaching index at this time.

APPENDIX F

NUTRIENT MANAGEMENT PLAN TERMS

6) FIELD NUTRIENT BALANCE CALCULATIONS

Crop rotations are the currently planned rotations, but rotations vary based upon markets, field and climatic conditions, water availability, and the need for feed. Any crop in table B-2 may be planted, using the yield goals of Table B-2 and the formulas in Appendix D to determine agronomic balance, without the need for changes to the NMP. The Smith Ranch (fields SM 1-7) will change configuration (size) and crop as pivots are installed, therefore recommendations for combined fields planted to corn silage are also provided.

Starter fertilizer is planned, but when yearly calculations are done, starter fertilizer could be replaced with manure or wastewater by using the organic material to provide the same amount of nutrients that the recommendation is based upon.

The facility is new, and the amount of manure and wastewater will change in the next few years, as will application timing and method, and the use of starter fertilizer. This NMP spells out how nutrient balances will be developed and will be used in the event that applications or crops vary. Where the likelihood of either manure wastewater being applied was high, recommendations were made for both sources. Where it is low, recommendations were made for only one source.

The wastewater analysis used is an average from a large dairy facility located in Yerrington, NV (lbs/1000 gal).
NH4-N – 1.94
Organic N – 4.35
Total P2O5 – 0.36

Manure analysis used is from Utah State University/Colorado State University Regional Publication Manure Best Management Practices, and CSU Bulletin 568A, Best Management Practices for Manure Utilization (lbs/ton).
NH4-N – 5
Organic N – 8
Total P2O5 – 16

Method and timing of application of nutrients are provided on rate determination sheets.

Total Manure Production:

Table 4: Solid Manure Produced and Associated Nutrients

ASAE D384.1 - Dec 2001				Moisture	Manure	Manure	TS	VS	Nitrogen	Phosphorus	Potassium
Animal Type	Number of Hd	Wt./hd, lbs.	Total Wt., lbs.	(%)	(lbs. / day / 1000#)	(ft^3 / day / 1000#	(lbs. / day / 1000#)	(lbs. / day / 1000#)	(lbs. / day / 1000#)	(lbs. / day / 1000#)	(lbs. / day / 1000#)
Milk Cows	3,200	1,400	4,480,000	86.0	86.0	1.40	12.0	10.0	0.45	0.094	0.29
Dry Cows	592	1,550	917,600	86.0	86.0	1.40	12.0	10.0	0.45	0.094	0.29
Springers	144	1,050	151,200	86.0	86.0	1.40	12.0	10.0	0.45	0.094	0.29
Heifers	3,312	750	2,484,000	86.0	86.0	1.40	12.0	10.0	0.45	0.094	0.29
Totals	7,248		8,032,800								
	Total Daily Production				690,821	11,246	96,394	80,328	3,615	755	2,330
	Total Annual Production				252,149,592	4,104,761	35,183,664	29,319,720	1,319,387	275,605	850,272
	Manure produced w/ moisture content of			86.0%	126,075 tons						
	Manure as hauled w/ moisture content of			46.0%	32,686 tons						
	Compost produced w/ moisture content of			40.0%	29,417 tons						

Land Base Requirement:

200 acres of alfalfa or 330 acres of corn silage are needed to utilize the nutrients produced in parlor wastewater and runoff in an average rainfall year, and 2,648 acres of corn silage will be needed to utilize the nutrients in manure.

Land Application Requirements for Average Years' Stormwater & Process Water - Sprinkler Applied				
Maximum pumping requirement (68.3 A.F.), gallons		22,254,107		
Total Nitrogen contained in liquid, lbs.		89,016	**Total-N =	4.0 lbs./1,000 gal
Ammonium-Nitrogen contained in liquid, lbs.		44,508	**NH3-N =	2.0 lbs./1,000 gal
Organic-Nitrogen contained in liquid, lbs.		44,508	Organic-N =	2.0 lbs./1,000 gal
Ammonium-Nitrogen available after irrigation, lbs.		24,480	45.0%	Sprinkler-Irrigation loss**
Organic-Nitrogen available 3rd year, lbs.		20,919	47%	Equilibrium mineralization rate for organic-N**
Nitrogen available to plants (PAN) yr. after yr., lbs.		45,398		
Soil Organic Matter, %	1.0			
Irrigation Water NO_3 content, ppm	5.0			
Residual soil NO_3 (2 ft), ppm	16.0	Alfalfa	Corn Silage	
Expected Yield (grain, Bu/acre; silage, tons/acre)		6	28	Based on CSU Extension
N req. w/ listed O.M., soil N, & Irr. Water NO_3, (lb./acre)		225	137	Bulletin #538 & #0.565
Acres req. if effluent applied via sprinkler irrigation		202	331	

***Taken from CSU's Bulletin No. 568A <u>Best Management Practices for Manure Utilization</u>*

Land Application Requirements - Solid Manure				
Nitrogen produced annually, 100% used, rest giver		1,319,387		
Nitrogen loss during storage & handling, lbs.		527,755	40%	lost as ammonia
Total Nitrogen in manure before application, lbs.		791,632		
Ammonium-Nitrogen contained in manure, lbs.		304,778	*NH_4-N =	38.5% of total N in solid manure
Organic-Nitrogen contained in manure, lbs.		486,854	*Organic-N=	61.5% of total N in solid manure
NH_4-N available after spreading (no incorporation), lbs.		236,203	*NH_4-N loss=	22.5% within 4 days of application
Organic-Nitrogen available 3rd year, lbs.		267,770	55%	Equilibrium mineralization rate for organic-N*
Nitrogen available to plants (PAN) yr. after yr., lbs.		503,973		
Soil Organic Matter, %	1.0			
Irrigation Water NO_3 content, ppm	5.0			
Residual soil NO_3 (2 ft), ppm	16.0	Corn Silage		
Expected Yield (tons)		28	Based on CSU Extension	
N req. w/ listed O.M. & residual soil N, lb./acre		137	Bulletin #538	
Acres req.		3,680		

**Taken from CSU's Bulletin No. 568A <u>Best Management Practices for Manure Utilization</u>*

Farm: *Smith Valley Dairy*

Field: SH 1N

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	11.3	5	142	1.8	0.8	7.6

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5*	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	150	40	0	50	20	16	80	24	pond	2.37	0.33	33,890	2,609,553
2015	CS	28	150	40	15	0	20	16	116	24	pond	2.37	0.33	48,767	3,755,057
2016	CS	28	150	40	21	0	20	16	109	24	pond	2.37	0.33	46,036	3,544,806
2017	CS	28	150	40	20	0	20	16	110	24	pond	2.37	0.33	46,538	3,583,396
2018	CS	28	150	40	20	0	20	16	110	24	pond	2.37	0.33	46,446	3,576,313
2019	CS	28	150	40	20	0	20	16	110	24	pond	2.37	0.33	46,463	3,577,613

Starter 10-8-4, 200#, wastewater applied in fall, spring, summer, via pivot or sprinkler. Double P for broadcast applications and retest following year.

Field: SH 1S

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	11.3	5	142	1.8	0.8	7.6

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5*	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	150	40	0	0	20	16	130	24	pond	2.37	0.33	54,987	4,234,025
2015	CS	28	150	40	24	0	20	16	106	24	pond	2.37	0.33	44,895	3,456,894
2016	CS	28	150	40	20	0	20	16	111	24	pond	2.37	0.33	46,747	3,599,532
2017	CS	28	150	40	20	0	20	16	110	24	pond	2.37	0.33	46,407	3,573,352
2018	CS	28	150	40	20	0	20	16	110	24	pond	2.37	0.33	46,470	3,578,157
2019	CS	28	150	40	20	0	20	16	110	24	pond	2.37	0.33	46,458	3,577,275

Starter 10-8-4, 200#, wastewater applied in fall, spring, summer, via pivot or sprinkler. Double P for broadcast applications and retest following year.

Field: SH2

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	4.5	3.3	99	1.6	0.6	7.7

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	181	40	0	50	20	16	111	24	pond	2.37	0.33	46,751	7,480,169
2015	CS	28	181	40	20	0	20	16	140	24	pond	2.37	0.33	59,267	9,482,754
2016	CS	28	181	40	26	0	20	16	135	24	pond	2.37	0.33	56,970	9,115,191
2017	CS	28	181	40	25	0	20	16	136	24	pond	2.37	0.33	57,392	9,182,656
2018	CS	28	181	40	25	0	20	16	136	24	pond	2.37	0.33	57,314	9,170,272
2019	CS	28	181	40	25	0	20	16	136	24	pond	2.37	0.33	57,328	9,172,645

Starter 10-8-4, 200#, wastewater applied in fall, spring, summer, via pivot or sprinkler. Double P for broadcast applications and retest following year.

Farm: *Smith Valley Dairy*

Field: SH 1N

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	11.3	5	142	1.8	0.8	7.6

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P2O5*	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P2O5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P2O5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P2O5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	150	40	0	50	20	16	80	24	Manure	4.5	14.4	18	1,374
2015	CS	28	150	40	14	0	20	16	116	24	Manure	4.5	14.4	26	1,986
2016	CS	28	150	40	21	0	20	16	110	24	Manure	4.5	14.4	24	1,877
2017	CS	28	150	40	20	0	20	16	111	24	Manure	4.5	14.4	25	1,896
2018	CS	28	150	40	20	0	20	16	111	24	Manure	4.5	14.4	25	1,893
2019	CS	28	150	40	20	0	20	16	111	24	Manure	4.5	14.4	25	1,893

Starter 10-8-4, 200#, manure applied in fall, spring, via spreader truck. Double P for broadcast applications and retest following year.

Field: SH 1S

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	11.3	5	142	1.8	0.8	7.6

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P2O5*	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P2O5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P2O5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P2O5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	150	40	0	0	20	16	130	24	Manure	4.5	14.4	29	2,230
2015	CS	28	150	40	23	0	20	16	107	24	Manure	4.5	14.4	24	1,833
2016	CS	28	150	40	19	0	20	16	111	24	Manure	4.5	14.4	25	1,904
2017	CS	28	150	40	20	0	20	16	111	24	Manure	4.5	14.4	25	1,891
2018	CS	28	150	40	20	0	20	16	111	24	Manure	4.5	14.4	25	1,894
2019	CS	28	150	40	20	0	20	16	111	24	Manure	4.5	14.4	25	1,893

Starter 10-8-4, 200#, manure applied in fall, spring, via spreader truck. Double P for broadcast applications and retest following year.

Field: SH2

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	4.5	3.3	99	1.6	0.6	7.7

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P2O5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P2O5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P2O5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P2O5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	181	40	0	50	20	16	111	24	Manure	4.5	14.4	25	3,940
2015	CS	28	181	40	20	0	20	16	141	24	Manure	4.5	14.4	31	5,017
2016	CS	28	181	40	25	0	20	16	136	24	Manure	4.5	14.4	30	4,825
2017	CS	28	181	40	24	0	20	16	137	24	Manure	4.5	14.4	30	4,859
2018	CS	28	181	40	24	0	20	16	137	24	Manure	4.5	14.4	30	4,853
2019	CS	28	181	40	24	0	20	16	137	24	Manure	4.5	14.4	30	4,855

Starter 10-8-4, 200#, manure applied in fall, spring, via spreader truck. Double P for broadcast applications and retest following year.

Farm: *Smith Valley Dairy*

Field: SH3

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	5.5	3	86	1.7	0.6	7

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	174	40	0	0	20	16	154	24	pond	2.37	0.33	65,063	10,410,127
2015	CS	28	174	40	28	0	20	16	126	24	pond	2.37	0.33	53,121	8,499,407
2016	CS	28	174	40	23	0	20	16	131	24	pond	2.37	0.33	55,313	8,850,109
2017	CS	28	174	40	24	0	20	16	130	24	pond	2.37	0.33	54,911	8,785,740
2018	CS	28	174	40	24	0	20	16	130	24	pond	2.37	0.33	54,985	8,797,554
2019	CS	28	174	40	24	0	20	16	130	24	pond	2.37	0.33	54,971	8,795,386

Starter 10-8-4, 200#, wastewater applied in fall, spring, summer, via pivot or sprinkler. Double P for broadcast applications and retest following year.

Field: SH4

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	6	5	70	1.6	0.5	7

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	alfalfa	6.5	298	200	0	0	20	16	278	184	pond	2.37	0.33	117,426	4,697,046
2015	alfalfa	6.5	298	100	51	0	0	0	247	100	pond	2.37	0.33	104,312	4,172,483
2016	alfalfa	6.5	298	100	45	0	0	0	253	100	pond	2.37	0.33	106,719	4,268,764
2017	alfalfa	6.5	298	100	46	0	0	0	252	100	pond	2.37	0.33	106,277	4,251,092
2018	alfalfa	6.5	298	100	46	0	0	0	252	100	pond	2.37	0.33	106,358	4,254,335
2019	alfalfa	6.5	298	100	46	0	0	0	252	100	pond	2.37	0.33	106,344	4,253,740

Starter 10-8-4, 200#, wastewater applied in fall, spring, summer, via pivot or sprinkler. P recommendation assumes broadcast application. Retest each year.

Field: H1

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	6	17	525	0.6	1.2	9.3

P-Index Score N/A Application rate based upon Nitrogen

*soil sample taken from a different part of property but is believed to represent current field.

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	205	0	0	0	20	16	185	-16	pond	2.37	0.33	78,228	12,516,456
2015	CS	28	205	0	34	0	20	16	151	-16	pond	2.37	0.33	63,870	10,219,132
2016	CS	28	205	0	28	0	20	16	158	-16	pond	2.37	0.33	66,505	10,640,792
2017	CS	28	205	0	29	0	20	16	156	-16	pond	2.37	0.33	66,021	10,563,399
2018	CS	28	205	0	29	0	20	16	157	-16	pond	2.37	0.33	66,110	10,577,604
2019	CS	28	205	0	29	0	20	16	157	-16	pond	2.37	0.33	66,094	10,574,997

Starter 10-8-4, 200#, wastewater applied in fall, spring, summer, via pivot. P high, pH and K very high and salts are moderately high. Monitor use of manure and wastewater.

Farm: *Smith Valley Dairy*

Field: SH3

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	5.5	3	86	1.7	0.6	7

P-Index Score N/A   Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	174	40	0	0	20	16	154	24	Manure	4.5	14.4	34	5,483
2015	CS	28	174	40	27	0	20	16	127	24	Manure	4.5	14.4	28	4,508
2016	CS	28	174	40	23	0	20	16	132	24	Manure	4.5	14.4	29	4,681
2017	CS	28	174	40	23	0	20	16	131	24	Manure	4.5	14.4	29	4,650
2018	CS	28	174	40	23	0	20	16	131	24	Manure	4.5	14.4	29	4,656
2019	CS	28	174	40	23	0	20	16	131	24	Manure	4.5	14.4	29	4,655

Starter 10-8-4, 200#, manure applied in fall, spring, via spreader truck. Double P for broadcast applications and retest following year.

Field: SH4

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	6	5	70	1.6	0.5	7

P-Index Score N/A   Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	alfalfa	6.5	298	200	0	0	20	16	278	184	Manure	4.5	14.4	62	2,474
2015	alfalfa	6.5	298	100	49	0	0	0	249	100	Manure	4.5	14.4	55	2,212
2016	alfalfa	6.5	298	100	44	0	0	0	254	100	Manure	4.5	14.4	56	2,258
2017	alfalfa	6.5	298	100	45	0	0	0	253	100	Manure	4.5	14.4	56	2,250
2018	alfalfa	6.5	298	100	45	0	0	0	253	100	Manure	4.5	14.4	56	2,252
2019	alfalfa	6.5	298	100	45	0	0	0	253	100	Manure	4.5	14.4	56	2,251

Starter 10-8-4, 200#, manure applied in fall, spring or summer via spreader truck. P recommendation assumes broadcast application. Retest each year.

Field: SM1

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	8	4	165	2	1	7.6

P-Index Score N/A   Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	Wheat	107	98	40	0	0	20	16	78	24	Manure	4.5	14.4	17	436
2015	Wheat	107	98	40	14	0	20	16	65	24	Manure	4.5	14.4	14	358
2016	Wheat	107	98	40	11	0	20	16	67	24	Manure	4.5	14.4	15	372
2017	Wheat	107	98	40	12	0	20	16	67	24	Manure	4.5	14.4	15	370
2018	Wheat	107	98	40	12	0	20	16	67	24	Manure	4.5	14.4	15	370
2019	Wheat	107	98	40	12	0	20	16	67	24	Manure	4.5	14.4	15	370

Starter 10-8-4, 200#, manure applied in fall, spring, summer, via spreader truck. Double P for broadcast applications and retest following year.

Farm: Smith Valley Dairy

Field: SM2

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	29	9	230	1.1	1.4	7.4

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	grass/alfalfa	5	83	40	0	0	0	0	83	40	Manure	4.5	14.4	18	459
2015	grass/alfalfa	5	83	40	15	0	0	0	68	40	Manure	4.5	14.4	15	377
2016	grass/alfalfa	5	83	40	12	0	0	0	71	40	Manure	4.5	14.4	16	392
2017	grass/alfalfa	5	83	40	13	0	0	0	70	40	Manure	4.5	14.4	16	389
2018	grass/alfalfa	5	83	40	12	0	0	0	70	40	Manure	4.5	14.4	16	390
2019	grass/alfalfa	5	83	40	12	0	0	0	70	40	Manure	4.5	14.4	16	390

Manure applied in fall, spring, summer, via spreader truck. P recommendation assumes broadcast application. Retest each year of the rotation.

Field: SM3

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	7	3	60	1.7	0.9	7.4

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	grass/alfalfa	5	144	80	0	0	0	0	144	80	Manure	4.5	14.4	32	2237
2015	grass/alfalfa	5	144	80	26	0	0	0	118	80	Manure	4.5	14.4	26	1839
2016	grass/alfalfa	5	144	80	21	0	0	0	123	80	Manure	4.5	14.4	27	1910
2017	grass/alfalfa	5	144	80	22	0	0	0	122	80	Manure	4.5	14.4	27	1897
2018	grass/alfalfa	5	144	80	22	0	0	0	122	80	Manure	4.5	14.4	27	1900
2019	grass/alfalfa	5	144	80	22	0	0	0	122	80	Manure	4.5	14.4	27	1899

Manure applied in fall, spring, summer, via spreader truck. P recommendation assumes broadcast application. Retest each year of the rotation.

Field: SM5

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	6	5	90	1.8	0.7	7.1

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	169	40	0	0	20	16	149	24	Manure	4.5	14.4	33	1328
2015	CS	28	169	40	27	0	20	16	123	24	Manure	4.5	14.4	27	1092
2016	CS	28	169	40	22	0	20	16	128	24	Manure	4.5	14.4	28	1134
2017	CS	28	169	40	23	0	20	16	127	24	Manure	4.5	14.4	28	1126
2018	CS	28	169	40	23	0	20	16	127	24	Manure	4.5	14.4	28	1128
2019	CS	28	169	40	23	0	20	16	127	24	Manure	4.5	14.4	28	1128

Starter 10-8-4, 200#, manure applied in fall or spring via spreader truck. Double P for broadcast applications.

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Farm: *Smith Valley Dairy*

Field: SM6

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	37	13	130	1.4	1.6	7

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	Wheat	107	12	0	0	0	10	8	2	-8	Manure	4.5	14.4	0	0
2015	Wheat	107	12	0	0	0	10	8	2	-8	Manure	4.5	14.4	0	0
2016	Wheat	107	12	0	0	0	10	8	2	-8	Manure	4.5	14.4	0	0
2017	Wheat	107	12	0	0	0	10	8	2	-8	Manure	4.5	14.4	0	0
2018	Wheat	107	12	0	0	0	10	8	2	-8	Manure	4.5	14.4	0	0
2019	Wheat	107	12	0	0	0	10	8	2	-8	Manure	4.5	14.4	0	0

Starter 10-8-4, 100#. When nitrate is reduced to allow manure applications, it may be applied in fall, spring, summer, via spreader truck.

Field: SM4W

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	4	5	95	1.1	0.7	8.1

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	198	40	0	0	20	16	178	24	Manure	4.5	14.4	39	1381
2015	CS	28	198	40	32	0	20	16	146	24	Manure	4.5	14.4	32	1136
2016	CS	28	198	40	26	0	20	16	152	24	Manure	4.5	14.4	34	1179
2017	CS	28	198	40	27	0	20	16	151	24	Manure	4.5	14.4	33	1172
2018	CS	28	198	40	27	0	20	16	151	24	Manure	4.5	14.4	34	1173
2019	CS	28	198	40	27	0	20	16	151	24	Manure	4.5	14.4	34	1173

Starter 10-8-4, 200#, manure applied in fall, spring via spreader truck. Double P for broadcast applications and retest following year.

Field: SM4E

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	20	4	55	0.95	0.9	7.2

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	Wheat	107	87	40	0	0	20	16	67	24	Manure	4.5	14.4	15	519
2015	Wheat	107	87	40	12	0	20	16	55	24	Manure	4.5	14.4	12	427
2016	Wheat	107	87	40	10	0	20	16	57	24	Manure	4.5	14.4	13	443
2017	Wheat	107	87	40	10	0	20	16	57	24	Manure	4.5	14.4	13	440
2018	Wheat	107	87	40	10	0	20	16	57	24	Manure	4.5	14.4	13	441
2019	Wheat	107	87	40	10	0	20	16	57	24	Manure	4.5	14.4	13	441

Starter 10-8-4, 200#, manure applied in fall, spring, summer, via spreader truck. Double P for broadcast applications and retest following year.

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Farm: *Smith Valley Dairy*

Field: SM7

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	18	4	80	0.73	0.6	6.4

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	Wheat	107	101	40	0	0	20	16	81	24	Manure	4.5	14.4	18	716
2015	Wheat	107	101	40	14	0	20	16	66	24	Manure	4.5	14.4	15	589
2016	Wheat	107	101	40	12	0	20	16	69	24	Manure	4.5	14.4	15	611
2017	Wheat	107	101	40	12	0	20	16	68	24	Manure	4.5	14.4	15	607
2018	Wheat	107	101	40	12	0	20	16	68	24	Manure	4.5	14.4	15	608
2019	Wheat	107	101	40	12	0	20	16	68	24	Manure	4.5	14.4	15	608

Starter 10-8-4, 200#, manure applied in fall, spring, summer, via spreader truck. Double P for broadcast applications and retest following year.

Field: SM 1-2

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	18.5	6.5	198	1.6	1.2	7.5

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	130	40	0	0	20	16	110	24	Manure	4.5	14.4	25	1,227
2015	CS	28	130	40	0	0	20	16	110	24	Manure	4.5	14.4	25	1,227
2016	CS	28	130	40	0	0	20	16	110	24	Manure	4.5	14.4	25	1,227
2017	CS	28	130	40	0	0	20	16	110	24	Manure	4.5	14.4	25	1,227
2018	CS	28	130	40	0	0	20	16	110	24	Manure	4.5	14.4	25	1,227
2019	CS	28	130	40	0	0	20	16	110	24	Manure	4.5	14.4	25	1,227

Starter 10-8-4, 200#, manure applied in fall, spring. Double P for broadcast applications and retest following year.

Field: SM 3-7

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	15.3	5.7	85	1.3	0.9	7.2

P-Index Score N/A Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	151	40	0	0	20	16	131	24	Manure	4.5	14.4	29	9,746
2015	CS	28	151	40	0	0	20	16	131	24	Manure	4.5	14.4	29	9,745
2016	CS	28	151	40	0	0	20	16	131	24	Manure	4.5	14.4	29	9,745
2017	CS	28	151	40	0	0	20	16	131	24	Manure	4.5	14.4	29	9,745
2018	CS	28	151	40	0	0	20	16	131	24	Manure	4.5	14.4	29	9,745
2019	CS	28	151	40	0	0	20	16	131	24	Manure	4.5	14.4	29	9,745

Starter 10-8-4, 200#, manure applied in fall, spring. Double P for broadcast applications and retest following year.

Farm: *Smith Valley Dairy*

Field: F4S

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	7.3	9.3	147	2.5	0.8	8.1

P-Index Score ______ *Application rate based upon* ______

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	Trit/Alfalfa	8.3/6.5	359	150	0	0	0	0	359	150	pond	2.37	0.33	151,485	12,118,819
2015	Alfalfa	6.5	267	75	66	0	0	0	201	75	pond	2.37	0.33	84,694	6,775,491
2016	Alfalfa	6.5	267	75	37	0	0	0	230	75	pond	2.37	0.33	96,953	7,756,228
2017	Alfalfa	6.5	267	75	42	0	0	0	224	75	pond	2.37	0.33	94,703	7,576,220
2018	Alfalfa	6.5	267	75	41	0	0	0	225	75	pond	2.37	0.33	95,116	7,609,259
2019	Alfalfa	6.5	267	75	41	0	0	0	225	75	pond	2.37	0.33	95,040	7,603,195

Wastewater applied in fall, spring, summer, via pivot or sprinkler. P recommendation assumes broadcast application. Retest following year.

Field: F1

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	4	7	260	1.8	2	8.4

P-Index Score N/A *Application rate based upon* Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	Trit/Alfalfa	8.3/6.5	392	150	0	0	0	0	392	150	pond	2.37	0.33	165,359	9,094,726
2015	Alfalfa	6.5	300	75	72	0	0	0	228	75	pond	2.37	0.33	96,021	5,281,137
2016	Alfalfa	6.5	300	75	42	0	0	0	258	75	pond	2.37	0.33	108,747	5,981,099
2017	Alfalfa	6.5	300	75	47	0	0	0	252	75	pond	2.37	0.33	106,411	5,852,625
2018	Alfalfa	6.5	300	75	46	0	0	0	253	75	pond	2.37	0.33	106,840	5,876,206
2019	Alfalfa	6.5	300	75	46	0	0	0	253	75	pond	2.37	0.33	106,761	5,871,878

Wastewater applied in fall, spring, summer, via pivot or sprinkler. P recommendation assumes broadcast application. Retest following year. Salts moderately high. Monitor use of wastewater.

Field: F2

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	5	21	235	1.7	0.9	8.4

P-Index Score N/A *Application rate based upon* Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	Commercial Fertilizer (lbs/a) N	Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	Trit/Alfalfa	8.3/6.5	391	0	0	0	0	0	391	0	pond	2.37	0.33	165,105	9,080,802
2015	Alfalfa	6.5	299	0	72	0	0	0	227	0	pond	2.37	0.33	95,814	5,269,768
2016	Alfalfa	6.5	299	0	42	0	0	0	257	0	pond	2.37	0.33	108,532	5,969,262
2017	Alfalfa	6.5	299	0	47	0	0	0	252	0	pond	2.37	0.33	106,198	5,840,874
2018	Alfalfa	6.5	299	0	46	0	0	0	253	0	pond	2.37	0.33	106,626	5,864,439
2019	Alfalfa	6.5	299	0	46	0	0	0	253	0	pond	2.37	0.33	106,548	5,860,114

Wastewater applied in fall, spring, summer, via pivot or sprinkler.

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Farm: *Smith Valley Dairy*

Field: F3

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	6	4	190	1.6	0.6	8.2

P-Index Score N/A   Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	Trit/Alfalfa	8.3/6.5	391	200	0	0	0	0	391	200	pond	2.37	0.33	164,852	3,132,194
2015	Alfalfa	6.5	298	100	72	0	0	0	227	100	pond	2.37	0.33	95,607	1,816,538
2016	Alfalfa	6.5	298	100	42	0	0	0	257	100	pond	2.37	0.33	108,317	2,058,019
2017	Alfalfa	6.5	298	100	47	0	0	0	251	100	pond	2.37	0.33	105,984	2,013,697
2018	Alfalfa	6.5	298	100	46	0	0	0	252	100	pond	2.37	0.33	106,412	2,021,832
2019	Alfalfa	6.5	298	100	46	0	0	0	252	100	pond	2.37	0.33	106,334	2,020,339

Wastewater applied in fall, spring, summer, via pivot or sprinkler. P recommendation assumes broadcast application. Retest each year.

Field: F4N

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	7.3	9.3	147	2.5	0.8	8.1

P-Index Score N/A   Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	CS	28	124	20	0	0	20	16	104	4	pond	2.37	0.33	43,764	5,995,629
2015	CS	28	124	20	19	0	20	16	85	4	pond	2.37	0.33	35,731	4,895,165
2016	CS	28	124	20	16	0	20	16	88	4	pond	2.37	0.33	37,205	5,097,149
2017	CS	28	124	20	16	0	20	16	88	4	pond	2.37	0.33	36,935	5,060,076
2018	CS	28	124	20	16	0	20	16	88	4	pond	2.37	0.33	36,985	5,066,881
2019	CS	28	124	20	16	0	20	16	88	4	pond	2.37	0.33	36,975	5,065,632

Starter 10-8-4, 200#, wastewater applied in fall, spring, summer, via pivot or sprinkler. Double P recommendation for broadcast application. Retest yearly.

Field: F5

Soil test results	Date	NO_3-N	P (Olsen), ppm	K (NH4OAc) ppm	OM	EC (mmhos/cm)	pH
	6.26.13	6.2	3	64.2	1.9	0.6	7.6

P-Index Score N/A   Application rate based upon Nitrogen

Year	crop	Expected Yield tons or bu/acre	Gross Nutrient Needs (lbs/acre) N	Gross Nutrient Needs (lbs/acre) P_2O_5	N Credits: Previous Manure (lbs/a) N	N Credits: Legume (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) N	N Credits: Commercial Fertilizer (lbs/a) P_2O_5	Recommended Nutrient Application Rate (lbs/acre) N	Recommended Nutrient Application Rate (lbs/acre) P_2O_5	Manure Type	Plant Available Manure Nutrients lbs/1000 gal or lb/ton N	Plant Available Manure Nutrients lbs/1000 gal or lb/ton P_2O_5	Manure Application Rate gallons/acre tons/a	Total Manure Applied per Field gallons tons
2014	Trit/Alfalfa	8.3/6.5	381	200	0	0	0	0	381	200	pond	2.37	0.33	160,751	37,133,494
2015	Alfalfa	6.5	289	100	70	0	20	16	199	84	pond	2.37	0.33	83,820	19,362,409
2016	Alfalfa	6.5	289	100	36	0	20	16	232	84	pond	2.37	0.33	97,940	22,624,191
2017	Alfalfa	6.5	289	100	43	0	20	16	226	84	pond	2.37	0.33	95,349	22,025,509
2018	Alfalfa	6.5	289	100	41	0	0	0	247	100	pond	2.37	0.33	104,263	24,084,761
2019	Alfalfa	6.5	289	100	45	0	0	0	243	100	pond	2.37	0.33	102,627	23,706,797

Wastewater applied in fall, spring, summer, via pivot or sprinkler. P recommendation assumes broadcast application. Retest each year.

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APPENDIX G

EMERGENCY ACTION PLAN AND SAFETY PRECAUTIONS

Summary Action Plan

Facility Name	Smith Valley Dairy	
Emergency Numbers	Ambulance, Fire, Police	911
	Sheriff Dept.:	775-463-6600 or 577-5020
	Smith Valley Fire Department	775-465-2577
	Nevada Hwy patrol	775-687-5300
Non-Emergency Numbers		
	Nevada Department of Agriculture	
	Elko	775-738-8076
	Las Vegas	702-486-4690
	Reno	775-688-1182
	Winnemucca	775-623-6502
	NDot	775-664-2890
	Lyon County Road Department	775-463-6551

Recovery Equipment

Heavy equipment is located on farm at various staging locations within 1 mile or closer to the feedlot facility.

Type of equipment includes large farm tractors, front end loaders.

Action Plan

Spills from manure and wastewater containment structures: In event of such failure, containment of the spill will be addressed by properly draining the structures, with effluent allowed to evaporate or be applied to cropland fields. Structures will then be repaired or replaced according to a certified engineering design.

Spills during Pumping: In the event of such failure, containment of the spill will be address by constructing a dike (an earthen embankment) around the spill. Effluent will be allowed to evaporate or be pumped into a transport tanker for delivery to the storage lagoon. Structures will then be repaired or replaced according to a certified engineering design.

Spills during transport: In the event of such failure, containment of the spill will be addressed by constructing a dike around the spill, ceasing the transport of effluent, and allowing the effluent to evaporate or be pumped into a transport tanker for delivery to the storage lagoon. Structure or equipment will then be repaired or replaced accordingly.

APPENDIX H

SUGGESTED RECORDKEEPING FORMS

(inclusion in this NMP does not constitute a requirement for these forms to be used)

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DEVELOPERS OF AGRICULTURE

MANURE and/or COMPOST REMOVAL LOG

(track manure and/or compost each time it is removed from facility by others)

Facility Name:__________________

Date (mm/dd/yy)	# of loads hauled	Average weight of loads	Total weight hauled	Person receiving manure & address	*Manure analysis provided

*Yearly testing required for CAFO permit holders.

Comments:

____

____

AGPROfessionals
DEVELOPERS OF AGRICULTURE

STORM/PROCESS WASTEWATER REMOVAL LOG

(track wastewater each time it is removed from facility and given to others)

Facility Name:____________________

Date	Time Elapsed	GPM being Pumped	OR Meter Reading	Total Trans-ferred	Person receiving water & address	Wastewater analysis provided*

*Yearly testing required for CAFO permit holders.

Comments:

____

____

____

Revised 02/2010

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STORM/PROCESS WASTEWATER APPLICATION FORM

(Record manure application data several times per day when applying process wastewater. Use a new sheet for each application – see environmental maintenance notebook for additional sheets)

Facility Name:__________________ Application method: _______________

Field I.D.: __________ Crop: __________ Crop year: __________

Lagoon ID: _______ Date Annual Equipment Inspection:______
Date of Annual Equipment Calibration:______

Date (mm/dd/yy)	Lagoon ID	Hours of application	GPM being Pumped	Meter Reading	Gallons pumped	Was land application equipment inspected today

Notes:____

____

Nutrient Application Calculation:

(1) Total Gallons Pumped: ______________
(2) Total Acres in Field: ______________
(3) Gallons per Acre Pumped: ____________ *[Line 1 ÷ Line 2]*
(4) Plant Available Nitrogen in Effluent: ________ lb./1000 gal *[Line 4f from Process Wastewater Application Rate – Determination Sheet]*
(5) Plant Available Nitrogen Applied: ________lb./Acre *[(Line 4 * Line 3) ÷ 1000]*
(6) Plant Available Phosphate in Effluent: ________ lb./1000 gal *[0.6 or 0.8 * P_2O_5]*
(7) Plant Available Phosphate Applied: ________lb./Acre *[(Line 6 * Line 3)/ 1000]*

Lab test # __________ Organic N ________lbs/1000 gal P_2O_5________ lbs/1000 gal

Revised 02/2010

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DEVELOPERS OF AGRICULTURE

SOLID MANURE/COMPOST APPLICATION LOG

(Record manure application data every day when applying solid manure. See environmental maintenance notebook for additional sheets)

Facility Name:____________________ Application method: ________________

Field I.D.: ____________ Crop: _____________ Crop year: __________

Slurry/Manure/Compost *(circle)*

Date Annual Equipment Inspection:______

Date of Annual Equipment Calibration:______

Date (mm/dd/yy)	# Of loads hauled	Average tare-weight of loads hauled	Total tons hauled

Notes:

(1) Total Tons Applied: ________________
(2) Total Acres in Field: ________________
(3) Tons per Acre Applied: ________________ *[Line 1 ÷ Line 2]*
(4) Plant Available Nitrogen in Solid Manure: _________lb/ton *[Line 4] from Agronomic Rate Determination Sheet – Solid Manure Application]*
(5) Plant Available Nitrogen Applied: _________lb/Acre *[Line 4 * Line 3]*
(6) Plant Available P_2O_5 in manure : _________lb/ton (% availability = ____)
(7) Plant Available P_2O_5 Applied: _________lb/Acre *(Line 6 * Line 3)*

Lab test # __________ Organic N _________lb/tons P_2O_5 _________ lbs/ton

Revised 02/2010

CROP ROTATIONS AND YIELD GOALS

Field ID	Acres	Last Year's Crop	Last Year's Yield	Comments*	Commercial Fertilizer Applied (amt N, P, or amount and grade)	Next Year's Crop	Next Year's Yield Goal

***water deficient, hail/insect/weed damage, nutrient deficient, etc.**

APPENDIX I

REFERENCES

(inclusion in this NMP does not constitute a requirement for these references to be used unless specifically indicated in the NMP)

SOIL ANALYSIS INFORMATION SHEET

USU ANALYTICAL LABORATORIES

Utah State University Extension

USU Analytical Labs
Ag Science Rm 166
Logan UT 84322-4830
(435) 797-2217 or Fax (435) 797-2117
www.usual.usu.edu

Date: ______________________

Name: ______________________

Address: ______________________

____

County: ______________________

Phone : ______________________

Fax: ______________________

Email : ______________________

	Sample Numbers 1	2	3	4
Sample I.D.	____	____	____	____
Sample Depth	____	____	____	____
Tests Desired*	____	____	____	____

***TESTS DESIRED** — Price/sample

1. Routine (pH, salinity, texture, P, K, recommendations) 14.00
2. Basic (Phosphorus + Potassium only =P+K) 10.00
3. Manure application - (Routine + Nitrate-N**) 24.00
4. Micro Plus (Routine + micronutrients) 24.00
5. Complete (pH, salinity, texture, P, K, Nitrate-N**, micronutrients, sulfate, organic matter) 50.00
6. UDOT Required (pH, salinity, SAR, organic matter, particle size, >2mm) 50.00

<u>Individual Component Analysis</u>

Please contact the lab for individual analyses/additional analyses

**Nitrate-N analysis requires special sampling/handling. See procedures on reverse side.

TESTS REQUIRE 2 CUPS OF SOIL/SAMPLE - FILL BOX COMPLETELY FULL

COMMENTS or special problems: ______________________

____

____

Total cost of analysis: $ ____________

☐ Check # ____________ ☐ Cash

☐ Credit Card

______________________ exp ________

☐ Visa ☐ Master card ☐ Discover

PLEASE INCLUDE PAYMENT WITH SAMPLE TO PREVENT DELAY ON SAMPLE PROCESSING

LAWN • GARDEN • ORCHARD

Crops to be Grown	Sample Numbers 1	2	3	4
1. Garden/flowers	☐	☐	☐	☐
2. Lawn	☐	☐	☐	☐
3. Shrubs/trees	☐	☐	☐	☐
4. Fruit trees	☐	☐	☐	☐
5. ____________	☐	☐	☐	☐

MATERIALS APPLIED DURING PAST YEAR

	1	2	3	4
1. Manure	☐	☐	☐	☐
2. Leaves/ grass/residues	☐	☐	☐	☐
3. Commercial fertilizer	☐	☐	☐	☐
4. ____________	☐	☐	☐	☐

FIELD CROPS

Crops to be Grown	Sample Numbers 1	2	3	4
IRRIGATED				
1. Alfalfa 100%	☐	☐	☐	☐
2. Grass Hay 100%	☐	☐	☐	☐
3. Legume /Grass Hay	☐	☐	☐	☐
% Legume	____	____	____	____
4. Grass Pasture	☐	☐	☐	☐
5. Legume/Grass Pasture	☐	☐	☐	☐
% Legume	____	____	____	____
6. Corn (silage)	☐	☐	☐	☐
7. Corn for grain	☐	☐	☐	☐
8. Wheat	☐	☐	☐	☐
9. Barley/Oats	☐	☐	☐	☐
10. Potatoes	☐	☐	☐	☐
11. Turf (golf/sports)	☐	☐	☐	☐
12. ____________	☐	☐	☐	☐
NON-IRRIGATED				
13. Grain	☐	☐	☐	☐
14. Alfalfa	☐	☐	☐	☐
15. Grass Pasture	☐	☐	☐	☐
16. Reclamation	☐	☐	☐	☐
17. ____________	☐	☐	☐	☐
YIELD GOAL**	____	____	____	____
Acres in field	____	____	____	____
CROP LAST YEAR	____	____	____	____
Yield per acre	____	____	____	____
Was straw/stover removed? __Yes	☐	☐	☐	☐
__No	☐	☐	☐	☐

MANURE FOR THIS CROP:

Tons per acre ____ ____ ____ ____

**use realistic goals for your conditions

Rev. 10/15/2003

SOIL SAMPLING PROCEDURE

Good samples are required to derive useful information from soil tests.

WHEN: Any time of the year; early fall is often preferred. Allow two weeks to get results before buying fertilizer. For special nitrate tests, sample in the spring (see instructions below).

TOOLS: (a) A clean plastic container for each depth to be sampled. (b) Sampling auger or tube (USU Extension Office) or a shovel will serve for plow-layer samples.

AREA: Select an area having uniform color, texture, drainage, and the same cropping and fertilizer treatment last year. Leave out non-typical spots or sample them separately. For each area to be sampled, take separate samples from 8 to 10 locations in a pattern that will represent the entire area.

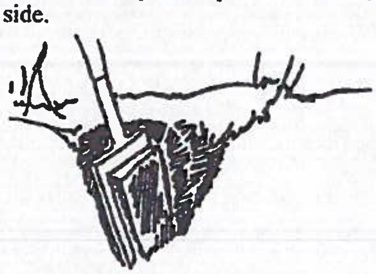
DEPTH: (a) Standard topsoil sample: from surface down to 12 inches; (b) Turf samples: surface down to 6 inches (4 inches for golf greens); (c) For special nitrate tests, see instructions below.

TAKING THE SAMPLE: Scrape away surface litter. Avoid manure spots. If previous fertilizer was banded, take special care to get a representative sample.

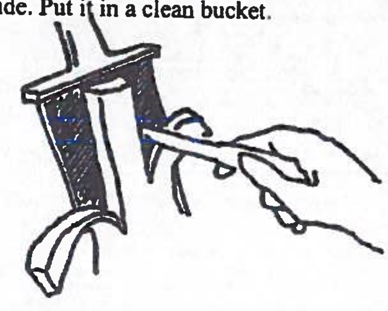
(a) Using a soil tube or auger: follow the instructions given with the tool.

(b) Using shovel:

1. Dig a V-shaped hole to plow depth. Remove a 1-inch slice of soil from one side.



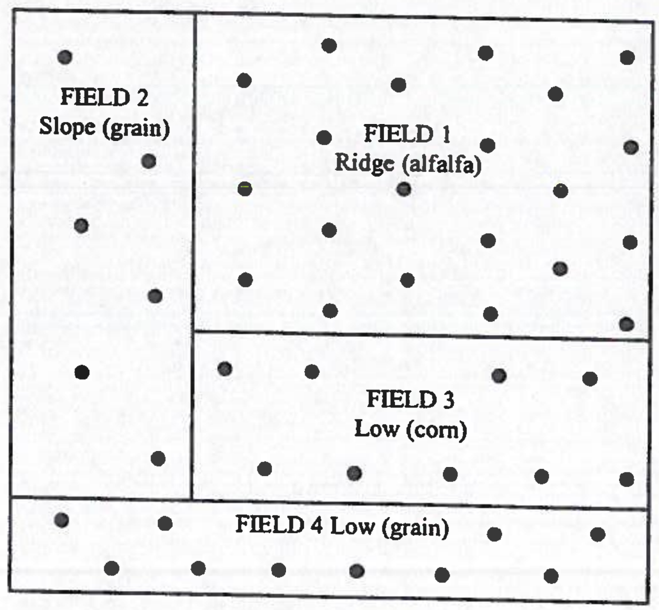
2. Discard the edges of the slice until your sample is about 1 or 2 inches wide. Put it in a clean bucket.



3. Repeat 1 and 2 for other samples for the sampling areas.

SAMPLE HANDLING: Combine the samples from the field in a clean container. Mix them well, then **take about 1 pint (to fill the soil box provided)** to send for analysis. Assign it an identification and record details in your files.

SHIPPING: Send samples prepaid by parcel post or express, accompanied by this description form and a check payable to USU Analytical Laboratories, Logan, UT 84322-4830. Retain a copy for your files.



SPECIAL SAMPLING for nitrate-N or suspected salinity problems:

a. Sample for nitrate-N in the spring.

b. Take samples 0 to 12 inches deep as described above. Put these in one container.

c. Starting at the bottom of the hole in (b), sample the 12 to 24-inch (or 12 to 36-inch) depth. Put these subsoil samples into a separate container. Mix and label the combined subsoil sample as above.

d. Spread samples out on a clean surface and air-dry them before mailing (or deliver them to the lab within 24 hours).

MANURE ANALYSIS INFORMATION SHEET

USU Analytical Labs
Ag Science Room 166
Logan UT 84322-4830
(435) 797-2217 or Fax (435) 797-2117
www.usual.usu.edu

USU ANALYTICAL LABORATORIES

Date: ______________________
Name: ______________________
Address: ______________________
____
County: ______________________
Phone: ______________________
Fax: ______________________
Email: ______________________

	Sample number 1	2	3
Sample ID:	____	____	____
Manure type (Y)			
Milking cows	☐	☐	☐
Heifer/dry cows	☐	☐	☐
Beef feeder	☐	☐	☐
Calves	☐	☐	☐
Sheep	☐	☐	☐
Horse	☐	☐	☐
Turkey, grower	☐	☐	☐
Swine, grower	☐	☐	☐
Swine, sow	☐	☐	☐
Poultry, pullet	☐	☐	☐
Poultry, layer	☐	☐	☐
Other	____	____	____

Comments: ______________________
____
____

	Sample number 1	2	3
Storage system (Y)			
Solid			
Bunker	☐	☐	☐
Stacked	☐	☐	☐
Open lot scrape	☐	☐	☐
Slurry/liquid			
Pit or tank	☐	☐	☐
Pond (<6 feet)	☐	☐	☐
Pond (>6 feet)	☐	☐	☐
Compost	☐	☐	☐
Length of storage (Y)			
0 to 3 months	☐	☐	☐
3 to 6 months	☐	☐	☐
6 to 12 months	☐	☐	☐
12+ months	☐	☐	☐
Bedding included (Y)			
Yes	☐	☐	☐
No	☐	☐	☐
Bedding type:	______		
Present results in:			
lb/ton (solids)	☐	☐	☐
lb/1000 gallons	☐	☐	☐
lb/acre-inch	☐	☐	☐

Test	Price per sample
Total elemental composition: N, P, K, Ca, Mg, Na, S, B, Zn, Cu, Fe, Mn; moisture, pH and salinity (EC)	$40.00

Total cost of analysis: $ ______________

☐ **Check #** ______________ ☐ **Cash**
☐ **Credit Card #** ______________________ **exp** ________
☐ **Visa** ☐ **Master card** ☐ **Discover**

PLEASE INCLUDE PAYMENT WITH SAMPLE TO PREVENT DELAY ON SAMPLE PROCESSING.

Rev. 10/15/2003

GUIDELINES FOR SAMPLING MANURE

Manure and wastewater sampling is messy and unpleasant. When sampling, acknowledge this fact and prepare ahead of time to collect the samples. Use rubber boots and gloves (if necessary), proper sampling tools (described below), clean buckets, and heavy-duty plastic bags or jars to ship the sample.

Manure is highly variable. In order to obtain a representative sample of manure or wastewater you will have to collect several small *subsamples* and combine them together into *one composite sample*. Follow the guidelines below for sampling solid and liquid manure sources.

Sampling Solids
When sampling manure solids, *remove the surface 6 to 8 inch crust* from the pile. Use a clean auger, probe, or shovel to *core into the pile as far as possible* and retrieve a subsample. Take samples from all sides, collecting *a minimum of six subsamples* from each pile. Place the subsamples into a clean bucket and mix well. Transfer approximately one pound (2 to 3 pints volume) of manure into a heavy duty, sealable plastic bag. Double bag the sample, mark the bag in pen with the sample identification, and place in a cooler or freezer. Ship the sample to the analytical lab as soon as possible. *Do not dry the manure sample before shipping* since the lab must determine moisture content in order to report manure nutrient values on an "as is" basis.

Sampling Liquids and Slurries
There are three ways to sample liquids and slurries:
1. Sample directly from the storage structure using a water sampler. A simple water sampler can be constructed by mounting a tin can on the end of a wooden dowel or old broom handle. Walk around the structure and collect a minimum of six subsamples of the liquid. If possible, mix or otherwise agitate the liquid prior to sampling.

2. Sample from a valve inserted in a recovery line or directly from the structure outlet. Collect a minimum of six subsamples, two at the beginning, two at the middle, and two at the end of the pumping cycle.

3. Place cups or cans in the field to collect manure as it is applied through a sprinkler system. Place a minimum of six cans in the field to collect the subsamples.

Combine the liquid subsamples in a clean bucket and mix thoroughly. Transfer approximately 1 to 2 pints of liquid into a clean sample jar. Label the jar with the sample identification. Pack the samples carefully to prevent breakage. Ship the sample to the analytical lab as soon as possible.

Presentation of Results
Results will be adjusted for the moisture content of the sample as it was submitted to the lab and presented on an "as is" basis (pounds per ton for solids, pounds per 1000 gallons or pounds per acre-inch for slurries and liquids). Additional information on interpreting a manure and wastewater analysis will be included with your test results.

Utah State University Extension

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

ANIMAL MORTALITY FACILITY

(No.)

CODE 316

DEFINITION

An on-farm facility for the treatment or disposal of livestock and poultry carcasses for routine and catastrophic mortality events.

PURPOSE

This practice supports one or more of the following purposes:

- Reduce impacts to surface and groundwater resources
- Reduce the impact of odors
- Decrease the spread of pathogens

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to livestock and poultry operations where animal carcass treatment or disposal is needed.

This practice includes disposal of both routine and catastrophic animal mortality; however, it may not apply to catastrophic mortality resulting from disease. In cases of disease related catastrophic mortality, this standard is applicable only when directed by the appropriate state or federal authority (typically the state veterinarian or USDA APHIS) to use the methods in this standard.

CRITERIA

General Criteria Applicable to All Purposes

Design animal mortality facilities to handle routine mortality and/or catastrophic mortality.

The planning and design of animal mortality facilities or processes must conform to all federal, State and local laws, rules and regulations. This includes provisions for closing and/or removing the facility where required.

Design of all structural components integral to the animal mortality facility shall meet the structural loads and design criteria as described in NRCS conservation practice standard Waste Storage Facility (313), and conservation practice standard Roofs and Covers (367), unless otherwise designated.

Divert all runoff away from the animal mortality facility.

Use safety devices such as fencing, warning signs, and refrigeration unit locks where necessary.

Address bio-security concerns in all aspects of planning, installation, and operation and maintenance of an Animal Mortality Facility.

Location. Locate the facility where movement of odors toward neighbors will be minimized.

Locate the facility down gradient from springs or wells where possible or take steps necessary to prevent contamination.

Locate animal mortality facilities above the 100-year floodplain elevation unless site restrictions require location within the floodplain. If located in the floodplain, protect the facility from inundation or damage from a 25 -year flood event.

Ensure that the location of the animal mortality facility is consistent with the overall site plan for the livestock or poultry operation. Locate the facility for acceptable ingress and egress and where it will not interfere with other travel patterns on the farm.

Spread ash according to NRCS conservation practice standard Nutrient Management (590) or provide for other acceptable means of disposal.

Location. Locate the incinerator/gasifier a minimum of 20 feet from any structure. Place the unit on a concrete pad with the fuel source as distant as practical. If the incinerator is covered with a roof, at least six inches of air space is required between the chimney and any combustible roof parts.

Criteria Applicable to Catastrophic Mortality

General. Burial and composting are the only processes addressed by this standard. Collect and treat catastrophic mortality as soon as practical.

Location. Locate the animal mortality facility site as far away from neighboring dwellings and the poultry or livestock operation as site conditions permit.

Locate on sites with restricted percolation and a minimum of two feet between the bottom of the facility and the seasonal high water table unless special design features are incorporated that address seepage. Use AWMFH Appendix 10D for selection of sites where seepage will be restricted with normal construction techniques.

Burial Pit

General. Bury catastrophic mortality on-site or as otherwise directed by state and local regulatory agencies. Time the burial of catastrophic mortality to minimize the effects of mortality expansion during the early stages of the decay process. Where possible and permitted by state law, leave large mortality uncovered or lightly covered until bloating has occurred, or use methods to reduce or eliminate bloating. Retain topsoil to re-grade the disposal site after the ground has settled as the decay process is completed. Place stockpiled soil no closer than 20 feet from the edge of the burial pit.

Remove or render inoperable all field tile (subsurface drains) within the operational area of the burial pit.

Soil Suitability

Perform onsite soils investigation to determine the suitability of the site for a burial pit. Locate burial pits on soils which do not flood and which do not have a water table within two feet of the bottom of the burial pit. Avoid areas which have the presence of hard bedrock, bedrock crevices, or highly permeable strata at or directly below the proposed trench bottom. These sites are undesirable because of the difficulty in excavation and the potential pollution of underground water.

Size and Capacity. Size pits to accommodate catastrophic mortality using appropriate weight to volume conversions. Dig the pit bottoms to be relatively level. Lengths may be limited by soil suitability and slope. If more than one pit is required, separate the pits by a minimum of three feet of undisturbed or compacted soil. Place a minimum of 2 feet of cover over the mortality. Provide a finished grade for the burial site that is slightly above natural ground elevation to accommodate settling and reduce ponding from precipitation events. Vegetate all disturbed areas according to NRCS Conservation Practice Standard Critical Area Planting (342).

Structural Loading and Design. Use barriers to keep vehicular traffic at least four feet from the pit edge.

Use pit excavation techniques which are OSHA compliant. For pits that are four to five feet deep, provide a step or bench 18 inches wide and one foot deep dug around the perimeter of the main pit so that the remaining vertical wall will not exceed four feet. For pits greater than five feet deep, provide earthen walls that are sloped back at 2 horizontal and 1 vertical or flatter.

Composting

General. Use composting as described in NEH Part 637, Chapter 2 – Composting (NEH 637.0210 and NEH 637.0211)) and NEH Part 651, Chapter 10 – Composting (NEH 651.1004(f)).

Protect composting mortality from precipitation as necessary, or provide an appropriate filter area or means for collecting contaminated runoff. Cover

6. Periodic inspections
7. Prompt repair or replacement of damaged components
8. Site references and/or manufacturer or installer for trouble shooting.

Additional O&M for Incinerators and Gasifiers

1. Use incinerators and gasifiers only for the disposal of animal carcasses.
2. Operate units properly to maximize equipment life and minimize emission problems.
3. Load the units according to the manufacturer's recommendations.
4. Remove ashes frequently to maximize combustion and prevent damage to equipment. Include methods for collecting and disposing of the ash material remaining after incineration.
5. Inspect the units periodically to ensure that all components are operating as planned and in accordance with the manufacturer's recommendations.

Additional O&M for Refrigeration units

1. Operate refrigeration units properly to maximize equipment life and minimize potential problems.
2. Load the refrigeration unit according to manufacturer's recommendations and do not exceed the design capacity.
3. Use refrigeration units only for the dead animals associated with the planned operation.
4. Inspect the refrigeration unit periodically for leaks, structural integrity and temperature.

Additional O&M for Composters

1. Include a recipe of ingredients which gives the layering/mixing sequence.
2. Provide maximum and minimum temperatures for operation, land application rates, moisture level, management of odors, testing, etc.
3. Inspect the compost facility regularly when the facility is empty.
4. Replace or repair any damaged structural components.
5. Closely monitor temperatures above 165°F. Take action immediately to cool piles that have reached temperatures above 185°F.

Include the method, procedure, and record keeping requirements for proper utilization of compost.

Additional O&M for Catastrophic Mortality

Identify locations for catastrophic animal mortality disposal. Maintain recordkeeping of number, average weight, cause, and date of animal deaths. Provide the landowner with contact information for state authorities since they may have specific requirements dependent upon cause of death, livestock species and housing.

Where composting is used for catastrophic mortality disposal, identify in the O&M plan the most likely compost medium, possible compost recipes, operational information, and equipment that will need to be readily available.

REFERENCES

Nutsch, A., J. McClaskey, and J. Kastner, Eds., 2004. Carcass disposal: a comprehensive review, National Agricultural Biosecurity Center, Kansas State University, Manhattan, Kansas.

USDA, NRCS. 1992. National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook. Washington, D.C.

USDA, NRCS. 2000. National Engineering Handbook, Part 637, Chapter 2, Composting, Washington, D.C.

STATEMENT OF WORK
Animal Mortality Facility (316)

Nevada 9/28/10
Contact: State Conservation Engineer

These deliverables apply to this individual practice. For other planned practice deliverables refer to those specific Statements of Work.

DESIGN

Deliverables:

1. Design documentation that will demonstrate that the criteria in NRCS practice standard have been met and are compatible with other planned and applied practices.
   a. Practice purpose(s) as identified in the conservation plan
   b. List of required permits to be obtained by the client
   c. Compliance with NRCS national and state utility safety policy (NEM Part 503-Safety, Subpart A - Engineering Activities Affecting Utilities 503.00 through 503.06)
   d. Practice standard criteria related computations and analyses to develop plans and specifications including but not limited to:
      i. Geology and Soil Mechanics (NEM Subpart 531a)
      ii. Capacity
      iii. Structural, Mechanical and Appurtenance design
      iv. Environmental Considerations (e.g. air quality, bio-security)
      v. Safety Considerations (NEM Part 503-Safety, Subpart A, 503.10 through 503.12)
2. Written plans and specifications including sketches and drawings shall be provided to the client that adequately describes the requirements to install the practice and obtain necessary permits...
3. Design Report and Inspection Plan as appropriate (NEM Part 511, Subpart B Documentation, 511.11 and Part 512, Subpart D Quality Assurance Activities, 512.30 through 512.32).
4. Operation and Maintenance Plan
5. Certification that the design meets practice standard criteria and comply with applicable laws and regulations (NEM Subpart A, 505.3).
6. Design modifications during installation as required.

INSTALLATION

Deliverables

1. Pre Installation conference with client and contractor.
2. Verification that client has obtained required permits.
3. Staking and layout according to plans and specifications including applicable layout notes.
4. Installation inspection (according to inspection plan as appropriate).
   a. Actual materials used (Part 512, Subchapter D Quality Assurance Activities, 512.33)
   b. Inspection records
5. Facilitate and implement required design modifications with client and original designer
6. Advise client/NRCS on compliance issues with all federal, state, tribal, and local laws, regulations and NRCS policies during installation.
7. Certification that the installation process and materials meets design and permit requirements.

CHECK OUT

Deliverables

1. As-Built documentation.
   a. Extent of practice units applied
   b. Drawings

NRS 571.200 Disposal of carcasses of diseased livestock.

1. The owner or agent in charge of any livestock that has died or has been killed as a result of any infectious, contagious or parasitic disease shall immediately bury the carcasses thereof at least 3 feet underground or cause the carcasses to be consumed by fire, and such carcasses shall not be sold or given awav.

2. In order to carry out the requirements of subsection 1, such carcasses may be conveyed on a public highway or public road, or conveyed on land not owned by the owner or agent in charge of such carcasses, in accordance with rules and regulations promulgated by the state quarantine officer.

3. The expense of burying, burning or conveying such carcasses shall be paid by the owner or agent in charge of such carcasses, and such expense shall be a lien upon remaining livestock or other real or personal property of such owner or agent in charge until paid.

Nevada Division of Environmental Protection Good Management Practices

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Solid Waste Disposal

NRS 444.620 provides that "*No plan for a solid waste management system adopted pursuant to NRS 444.440 to 444.616, inclusive, applies to any agricultural activity or agricultural waste.*" We interpret this provision of the statute as an exemption for on-site disposal of agricultural waste including dead livestock.

NAC 444.640 allows disposal of animal carcasses by open burning, done in accordance with air quality open burning- regulations (NAC 445B.381, discussed below), except that open burning is prohibited at municipal landfills and industrial waste landfills.

NAC 444.694 requires that a separate trench be established for disposal of dead animals at municipal solid waste landfills and that dead animals be covered with soil immediately

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Water Pollution Control

1. The fundamental concern of NDEP regarding the burial of diseased livestock will be the protection of ground and surface water systems from contamination. Animal carcasses are a potential source of pathogens, excess nutrients or other contaminants. Carcasses should be disposed of in a manner that prevents the movement of these contaminants through leaching, runoff, erosion or air emissions.

2. Burial is a common disposal practice, that when properly conducted, minimizes the movement of contaminants through the environment. The disposal of animal carcasses by burial should prevent the movement of pathogens, excess nutrients and other contaminants through the control of leaching, runoff,erosion and airborne processes.

3. To avoid environmental contamination, we recommend the following practices:

Animals should be buried in properly sited and constructed disposal pits and never in trenches, open pits or landfills. Do not locate disposal sites in natural drainages, near surface water or in areas where the water table is shallow. Burial pits should not be located in flood plains or wetlands.

The fundamental concern of NDEP regarding the burial of diseased livestock will be the protection of ground and surface water systems from contamination. Animal carcasses are a potential source of pathogens, excess nutrients or other contaminants. Carcasses should be disposed of in a manner that prevents the movement of these contaminants through leaching, runoff erosion or air emissions. Burial pits should be constructed to minimize infiltration of fluids through the pit. The bottom of the burial pit should be at least five feet above the seasonal high water table. This distance may need to be increased in areas with highly permeable soils. Specific sites should be evaluated based upon soil type and depth to groundwater to ensure that contaminants from the waste site will not reach the water table.

4. Burial pits should be located:

At least 200 feet from dwellings and/or the nearest water well;

At least 300 feet from a flowing stream or other body of water;

At east 100 feet from ephemeral drainages;

At least 50 feet from an adjacent property line; and

At least 500 feet from a neighboring residence:

5. Animals should be buried within 24 hours of death. Consider covering animals with quick lime during burial to control odors and promote decomposition.

6. Animals should be covered with at least 3 feet of soil that is compacted and mounded to maximize runoff and minimize infiltration;

Air Pollution Control

1. NAC 445B.38 1 prohibits the open burning of wastes. Burning for agricultural purposes and managment is exempted from the prohibition. However, local ordinances or regulations may apply. No open bum variance or permit would be required from NDEP to burn agricultural wastes, including dead livestock.

2. The NDEP recommends, however, that such operations occur at such location and in such manner to avoid impacting any residence or Other occupied facility with smoke. We also recommend that the

Department of Agriculture work closely with the Division of Health to ensure that burning will destroy,

and not spread the disease.

3. In the event that this highly contagious disease does make its way to the U.S. and to Nevada, the NDEP will assist in any way possible to control its spread and protect public health and environmental quality. Please let as know what we can do to assist you.

Manure Applicator Calibration Guide

1. **Spreader Capacity is Known.** From chart below, select 1) Spreader Capacity: _________lbs. or gallons; 2) Distance traveled (length) to empty spreader: ___________feet; and 3) Spread pattern width or distance between individual passes: ___________feet. 4) Intersection indicates application rate:_________

If appropriate values cannot be found in table below, calculate application rate as follows: Rate per acre = Spreader Capacity X 43560 (Width X Length).

Example: 3000 gallon tank spreader that makes a pass every 4 30"-corn rows (10 feet) and empties spreader in 1200 feet is applying 11,000 gallons per acre.

Liquid manure application rate (1000's of gallons per acre)

Spread Width--> Length	2000 gallon tank: 10'	15'	20'	25'	30'	35'	2500 gallon tank: 10'	15'	20'	25'	30'	35'	3000 gallon tank: 10'	15'	20'	30'	40'	50'
600'	15	10	7	6	5	4	18	12	9	7	6	5	22	15	11	7	5	4
800'	11	7	5	4	4	3	14	9	7	5	5	4	16	11	8	5	4	3
1000'	9	6	4	3	3	2	11	7	5	4	4	3	13	9	7	4	3	3
1200'	7	5	4	3	2	2	9	6	5	4	3	3	11	7	5	4	3	2
1400'	6	4	3	2	2	2	8	5	4	3	3	2	9	6	5	3	2	2
1600'	5	4	3	2	2	2	7	5	3	3	2	2	8	5	4	3	2	2
1800'	5	3	2	2	2	1	6	4	3	2	2	2	7	5	4	2	2	1
2000'	4	3	2	2	1	1	5	4	3	2	2	2	7	4	3	2	2	1
2500'	3	2	2	1	1	1	4	3	2	2	1	1	5	3	3	2	1	1
3000'	3	2	1	1	1	1	4	2	2	1	1	1	4	3	2	1	1	1

Spread Width--> Length	3500 gallon tank: 10'	15'	20'	30'	40'	50'	4000 gallon tank: 10'	15'	20'	30'	40'	50'	4500 gallon tank: 10'	15'	20'	30'	40'	50'
600'	25	17	13	8	6	5	29	19	15	10	7	6	33	22	16	11	8	7
800'	19	13	10	6	5	4	22	15	11	7	5	4	25	16	12	8	6	5
1000'	15	10	8	5	4	3	17	12	9	6	4	3	20	13	10	7	5	4
1200'	13	8	6	4	3	3	15	10	7	5	4	3	16	11	8	5	4	3
1400'	11	7	5	4	3	2	12	8	6	4	3	2	14	9	7	5	4	3
1600'	10	6	5	3	2	2	11	7	5	4	3	2	12	8	6	4	3	2
1800'	8	6	4	3	2	2	10	6	5	3	2	2	11	7	5	4	3	2
2000'	8	5	4	3	2	2	9	6	4	3	2	2	10	7	5	3	2	2
2500'	6	4	3	2	2	1	7	5	3	2	2	1	8	5	4	3	2	2
3000'	5	3	3	2	1	1	6	4	3	2	1	1	7	4	3	2	2	1

Slurry or Liquid Manure

Liquid manure application rate (1000's of gallons per acre)

Spread Width--> Length	5000 gallon tank: 10'	15'	20'	30'	40'	50'	5500 gallon tank: 10'	15'	20'	30'	40'	50'	6000 gallon tank: 10'	15'	20'	30'	40'	50'
600'	36	24	18	12	9	7	40	27	20	13	10	8	44	29	22	15	11	9
800'	27	18	14	9	7	5	30	20	15	10	7	6	33	22	16	11	8	7
1000'	22	15	11	7	5	4	24	16	12	8	6	5	26	17	13	9	7	5
1200'	18	12	9	6	5	4	20	13	10	7	5	4	22	15	11	7	5	4
1400'	16	10	8	5	4	3	17	11	9	6	4	3	19	12	9	6	5	4
1600'	14	9	7	5	3	3	15	10	7	5	4	3	16	11	8	5	4	3
1800'	12	8	6	4	3	2	13	9	7	4	3	3	15	10	7	5	4	3
2000'	11	7	5	4	3	2	12	8	6	4	3	2	13	9	7	4	3	3
2500'	9	6	4	3	2	2	10	6	5	3	2	2	10	7	5	3	3	2
3000'	7	5	4	2	2	1	8	5	4	3	2	2	9	6	4	3	2	2

Solid manure application rate (tons per acre)

Spread Width--> Length	3 ton spreader (90 bushel): 10'	15'	20'	25'	30'	35'	4 ton spreader (120 bushel): 10'	15'	20'	25'	30'	35'	6 ton spreader (175 bushel): 10'	15'	20'	25'	30'	35'
600'	22	15	11	9	7	6	29	19	15	12	10	8	44	29	22	17	15	12
800'	16	11	8	7	5	5	22	15	11	9	7	6	33	22	16	13	11	9
1000'	13	9	7	5	4	4	17	12	9	7	6	5	26	17	13	10	9	7
1200'	11	7	5	4	4	3	15	10	7	6	5	4	22	15	11	9	7	6
1400'	9	6	5	4	3	3	12	8	6	5	4	4	19	12	9	7	6	5
1600'	8	5	4	3	3	2	11	7	5	4	4	3	16	11	8	7	5	5
1800'	7	5	4	3	2	2	10	6	5	4	3	3	15	10	7	6	5	4
2000'	7	4	3	3	2	2	9	6	4	3	3	2	13	9	7	5	4	4
2500'	5	3	3	2	2	1	7	5	3	3	2	2	10	7	5	4	3	3
3000'	4	3	2	2	1	1	6	4	3	2	2	2	9	6	4	3	3	2

Solid Manure

Solid manure application rate (tons per acre)

Spread Width--> Length	8 ton spreader (230 bushel): 10'	15'	20'	25'	30'	35'	10 ton spreader (290 bushel): 10'	15'	20'	25'	30'	35'	12 ton spreader (350 bushel): 10'	15'	20'	25'	30'	35'
600'	58	39	29	23	19	17	73	48	36	29	24	21	87	58	44	35	29	25
800'	44	29	22	17	15	12	54	36	27	22	18	16	65	44	33	26	22	19
1000'	35	23	17	14	12	10	44	29	22	17	15	12	52	35	26	21	17	15
1200'	29	19	15	12	10	8	36	24	18	15	12	10	44	29	22	17	15	12
1400'	25	17	12	10	8	7	31	21	16	12	10	9	37	25	19	15	12	11
1600'	22	15	11	9	7	6	27	18	14	11	9	8	33	22	16	13	11	9
1800'	19	13	10	8	6	6	24	16	12	10	8	7	29	19	15	12	10	8
2000'	17	12	9	7	6	5	22	15	11	9	7	6	26	17	13	10	9	7
2500'	14	9	7	6	5	4	17	12	9	7	6	5	21	14	10	8	7	6
3000'	12	8	6	5	4	3	15	10	7	6	5	4	17	12	9	7	6	5

Spread Width--> Length	14 ton spreader (410 bushel): 10'	15'	20'	25'	30'	35'	16 ton spreader (470 bushel): 10'	15'	20'	25'	30'	35'	18 ton spreader (530 bushel): 10'	15'	20'	25'	30'	35'
600'	102	68	51	41	34	29	116	77	58	46	39	33	131	87	65	52	44	37
800'	76	51	38	30	25	22	87	58	44	35	29	25	98	65	49	39	33	28
1000'	61	41	30	24	20	17	70	46	35	28	23	20	78	52	39	31	26	22
1200'	51	34	25	20	17	15	58	39	29	23	19	17	65	44	33	26	22	19
1400'	44	29	22	17	15	12	50	33	25	20	17	14	56	37	28	22	19	16
1600'	38	25	19	15	13	11	44	29	22	17	15	12	49	33	25	20	16	14
1800'	34	23	17	14	11	10	39	26	19	15	13	11	44	29	22	17	15	12
2000'	30	20	15	12	10	9	35	23	17	14	12	10	39	26	20	16	13	11
2500'	24	16	12	10	8	7	28	19	14	11	9	8	31	21	16	13	10	9
3000'	20	14	10	8	7	6	23	15	12	9	8	7	26	17	13	10	9	7

2. Spreader Capacity Is Unknown.

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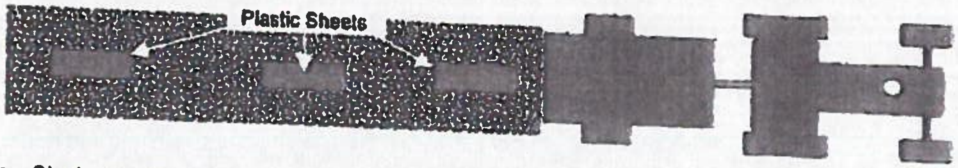
a. Cut three or more sheets of equally sized plastic. 22 square feet (3' x 7'4" or 4' X 5'6") is preferred size.
b. Weigh empty 5 gallon bucket plus one plastic sheet on a scale: ____________ lbs.
c. Lay sheets in field with edges secured by stones or other heavy objects.
d. Drive tractor at normal speeds and discharge manure at typical rates over plastic sheets. Record tractor gear: __________, engine RPM: __________, and spreader settings: __________



e. Check the sheet. Did a reasonably representative application rate fall on the plastic sheet?
f. Carefully fold individual sheets without losing manure and place each sheet in separate buckets. Weigh each bucket. Bucket 1: ________lbs. Bucket 2: ________lbs. Bucket 3: ________lbs.
g. Subtract weight of empty bucket and plastic (step b) to determine net manure weight is each bucket. Net manure weight for Bucket 1: ________lbs. Bucket 2: ________lbs. Bucket 3: ________lbs.
h. Calculate average weight of buckets. Average Net Manure Weight: ________lbs.
i. Calculate application rate. Tons per Acre = (Net Manure Weight X 22) / area of plastic sheet (ft^2)
If plastic sheet = 22 ft^2, then: Tons per Acre = Net Manure Weight

3. Pivot Calibration

If Pivot Flow Rate Is Known:

a. Estimate pumping time: ____________ hours
b. Estimate water flow rate: ____________ gallons per minute
c. Estimate acres covered: ____________ acres
d. Estimate application rate:

$$\text{Inches (or ac-in/ac)} = \frac{\text{Pumping Time X Flow Rate}}{\text{Acres X 450}} = \frac{\_\_\_\_ \text{ X } \_\_\_\_}{\_\_\_\_ \text{ X 450}} = \_\_\_\_\_\_ \text{ in.}$$

If Pivot Flow Rate Is NOT Known: Use this method once a year

a. Place 4 to 6 rain gauges (pans or straight sided plastic cups will also work) in line with the pivot center point at roughly equally spaced intervals. Placement on access road away from crop canopy is preferred.
b. Measure depth in rain gauges and calculate average.
Gauge #1: _____ in. #2: _____ in. #3: _____ in. #4: _____ in. #5: _____ in. #6. _____ in.
Average Depth: _______inches

OR

a. Identify Rated Pump Pressure and Flow Rate: ________ psi at ________ gpm
b. Identify Actual Pump Pressure: ________ psi
c. Estimate Actual Flow Rate.

$$GPM_{actual} = GPM_{rated} \times \sqrt{P_{actual} / P_{rated}}^{*} = \_\_\_\_ \times \sqrt{\_\_\_\_ / \_\_\_\_}^{*} = \_\_\_\_\_\_ \text{ gpm}$$

d. Substitute actual flow rate in part d for "If Flow Rate Is Known" and complete calculation of application rate.

* Square Root

Rick Koelsch, University of Nebraska

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Designing Dairy Nutrient Management Systems

University of California Cooperative Extension
Stanislaus County

Measuring Liquid Manure Application Rates

Marsha Campbell Mathews and Carol A. Frate
University of California Cooperative Extension

Introduction

Knowing he amount of manure nutrients that have been applied is essential for achieving the best crop production, protecting environmental quality and meeting regulatory requirements. There are several methods that can be used to measure, or at least estimate, the amount of liquid manure applied to a field. However, in selecting a method to use, it is important to also consider if the chosen method will enable the operator to easily apply a specific desired target rate of a nutrient at the precise time that it can be best utilized by the crop.

In order to know how many pounds per acre of nitrogen or other crop nutrient are being applied in lagoon water, several types of information are needed:

- the volume of the material that went onto the field (gallons),
- the amount of nitrogen in the water (concentration), and
- the area (acres) onto which the material was applied.

To avoid either under- or over-application of nitrogen, it is necessary to have a practical method of measuring, and ideally controlling, the amount of liquid manure applied. In most cases, a flow meter installed on the lagoon pump outlet is the simplest way to measure application amounts from the lagoon. A flow meter allows the user to easily calculate the amount of liquid manure and nutrients applied and, when combined with a flow control device such as a throttling valve, also makes it easy to adjust the flow rate so that the specific amount of nitrogen called for in a nutrient managmentplan can be applied to the crop.


To calculate the amount of nutrients applied, a sample must be taken of the same material that is being measured. This sampling spigot is well-positioned for ease of use.

Although an installed flow meter is almost always the best choice for managing lagoon nutrients and every effort should be made to install one, in reality other methods may need to be used on a temporary or permanent basis. Each of the other ways of estimating lagoon water application rates, and each has advantages and disadvantages.

In addition to measuring the amount of lagoon nutrients applied, regulations require all other sources of water and nitrogen be measured, so methods for measuring sources such as fresh water and reapplied tailwater are also needed. If some of the water that is applied to a field runs off as tailwater and is not returned to the same field, the amount of runoff should be measured as well so that it can be subtracted from the application amounts in order to accurately measure and report the actual rates of water and nutrients that were applied to the crop.

The method or combination of methods selected for making these measurements will be influenced by many factors including cost, irrigation system limitations, and the accuracy of nutrient applications required to maintain yields and avoid groundwater contamination and/or runoff to surface waters. In choosing a method, consider if it is adequate to simply monitor the amount of nutrients that have been or are being applied, or if it is also necessary to proactively apply a specific target nutrient application.

Measuring Volume with a Flow Meter on the Lagoon Water Discharge

Installing an in-line flow meter on the lagoon water outlet pipe is the easiest method of measuring and controlling nutrient application when using pond water nutrients. Most flow meters will display both the current gpm and the totalized gallons. The amount of nutrients applied to each field is calculated using the starting and ending total gallons from the meter along with the nitrogen concentration in the liquid manure. If both a flow meter and a control valve are installed, the meter can be used to proactively apply a specific quantity of lagoon nutrients.

Having the capacity to control the application rate and apply precise amounts of nitrogen gives the flexibility to apply the nitrogen in several smaller applications over a number of irrigations rather than in one large application during a single irrigation. Applying nitrogen in multiple smaller amounts has several advantages:

- Ensuring that the nitrogen is available to the crop during critical growth periods
- Preventing crop injury from excess salts
- Minimizing leaching losses on light and medium soils
- Minimizing denitrification losses on heavier soils
- Preventing excessive applications by being able to adjust rates in subsequent irrigations if the run time or concentration was not what was expected

Affordable flow meters for measuring dairy lagoon water are available with solar or battery power, data loggers and wireless data transfer. The right flow meter can greatly simplify nutrient management recordkeeping, and, when installed with a throttling valve or variable frequency drive controller, make it possible to accurately apply the specific amounts of nitrogen called for in the nutrient plan.

To apply a specific application rate, the concentration of lagoon water nitrogen is determined and the length of time for the irrigation is estimated. Then a chart or spreadsheet is consulted which gives the target gpm for the desired nitrogen application rate. The valve on the lagoon outflow is adjusted until the flow meter readout displays the targeted gpm. The flow meter is checked periodically during the irrigation to ensure that the desired application rate is maintained.

It is essential that the right kind of flow meter is installed and that it is installed correctly. There are many types of flow meters available but only a few are appropriate for use in dairy lagoon water because of the presence of debris and solids which clog or foul the mechanisms. Only flow meters commonly used for sewage, pulp, or other similar applications are appropriate for use with lagoon water.

All flow meters have placement requirements to enable them to read accurately. The pipeline where they are located must always be completely full. Sometimes there is already a location where they can be placed such as a vertical pipe, otherwise a metering run must be constructed that provides a section of pipe downstream from the meter where the pipeline is at least 1 pipe diameter higher than the pipe where the sensor is located. Many flow meters also require placement on a straight section of pipe that is at least 5 pipe diameters upstream and 10 pipe diameters downstream from an elbow or tee. A pipe with a 12-inch diameter would need total of 15 feet of straight run. The meter may need to placed even further away from active valves, which distort the flow pattern more severely than elbows. In general, insertion style electromagnetic meters which measure the velocity of the liquid at one or two points near pipe wall are more sensitive to irregular flow patterns within the pipeline, and require more straight pipe, than full bore (tube style) electromagnetic meters which have multiple sensors surrounding the pipe or wetted Doppler insertion meters that integrate the velocity across the entire cross section of the pipe. The installation of a constructed metering run that meets the placement requirements for the selected meter must be factored in to the cost of the meter.

For additional information on selecting and installing flow meters, see Flow Meters for Measuring Dairy Lagoon Water and Installing Flow Meters on Dairies in this series.

Calculating nutrients applied using flow meter data

Record the beginning and ending reading from the flow meter totalizer for each field or area to which lagoon water is applied. The flow meter totalizer is usually set to read in either hundred or thousands of gallons. Be certain you know which multiplier is being used for your meter. If your meter is set to read in hundred of gallons, multiply your readings by 10 before using the following method.

1. How many gallons were applied to the field, as thousand gallons:
   Ending totalized gallons – beginning totalized = gallons applied

2. How many pounds of nitrogen were in that volume
   ppm or mg/L nitrogen x thousand gallons x .008345 = pounds nitrogen applied

3. How much was applied to each acre
   pounds nitrogen applied ÷ number of acres = lbs N applied per acre

Operators who have experience using flow meters report that people often make mistakes when writing down totalizer numbers. It is a good idea to also record the average gpm and run time for each field to double check that the numbers were correctly transcribed. If the flow meter has a data logger, the totalizer reading at the start and end times can be looked up off the downloaded data.

Using a flow meter to apply a specific nitrogen application rate ("Target" Application)

Applying a specific amount of lagoon nitrogen or other nutrient is simple with a flow meter and throttling valve. The flow rate of lagoon water in gallons per minute (gpm) that will result in the desired amount of nitrogen applied is calculated, and the throttling valve or pump controller is adjusted until the flow meter displays that flow rate.

The target gpm is based on the amount of nitrogen needed, the concentration in the pond, and the expected run time. The gpm can be looked up using a chart such as the one below, available at manure.ucdavis.edu, or calculated using the following method:

1. Determine the amount of nitrogen to be applied to the area to be irrigated.
   Lbs N/acre x number of acres to be irrigated = lbs N needed

2. Calculate the amount of nitrogen in the lagoon water from the analysis. Mg/L or ppm N x .008345 = pounds of nitrogen per 1000 gallons

3. Calculate how many gallons of lagoon water it will take to supply the amount of nitrogen to be applied (See Step 1).

   pounds of nitrogen to apply ÷ lbs of N per 1000 gallons x 1000 = total number of gallons of lagoon water

Gallons per minute to achieve a target application rate

50 lbs N/acre

lbs/Kgal	lbs/ac-in	mg/L or ppm	irrigation hours/acre 1½	1¼	1	irrigation minutes/acre 50	40	30	20
1.7	45	200	333	399	499	599	749	999	1498
2.5	68	300	222	266	333	399	499	666	999
3.3	91	400	166	200	250	300	374	499	749
4.2	113	500	133	160	200	240	300	399	599
5.0	136	600	111	133	166	200	250	333	499
5.8	159	700	95	114	143	171	214	285	428
6.7	181	800	83	100	125	150	187	250	374
7.5	204	900	74	89	111	133	166	222	333

Applying a specific amount of lagoon nitrogen or other nutrient is simple with a flow meter and throttling valve. Determine the flow rate needed to obtain the desired pounds of lagoon nitrogen based on the pond concentration and expected irrigation run time. Adjust the flow with the throttling valve or pump controller until the meter displays the needed flow rate. Complete charts are available at manure.ucdavis.edu.

4. Divide the number of gallons by the number of minutes it will take to irrigate this area.
   total gallons of lagoon water ÷ minutes = gallons per minute (gpm)

Be careful when adjusting the flow rate to not go so low as to damage the pump or to allow solids to settle out and plug the pipeline. Determine ahead of time the minimum gpm for your pipeline and don't allow anyone to set a flow rate that is lower than that. If the required pump gpm is too low for the infrastructure to accommodate, consider redesigning the system or running the pump during only part of the irrigation as described in the pump output method section below. Additional options are discussed in Designing Liquid Manure Transfer Systems in this series.

Minimum gpm to maintain velocity in pipe to prevent solids from settling

feet per second	manure pipeline diameter (inches)												
	2	4	6	8	10	12	15	16	18	20	24	30	36
2	20	78	176	313	489	705	1101	1253	1585	1957	2819	4404	6342
2.3	23	90	203	360	563	810	1266	1441	1823	2251	3241	5065	7293
3	29	117	264	470	734	1057	1652	1879	2378	2936	4228	6606	9513
4	39	157	352	626	979	1409	2202	2505	3171	3915	5637	8808	12,684
5	49	196	440	783	1223	1762	2753	3132	3964	4893	7047	11,010	15,855

Use this chart to determine the minimum gpm that will maintain a high enough velocity to prevent solids from settling out and plugging the pipeline. NRCS recommends a minimum of 2-5 ft/sec for 4-10% suspended solids. Use the higher or lower value depending on your solids level, the slope and roughness of the pipeline, and how difficult it would be to clean out your pipeline should plugging occur.

Measuring Application Volume using Pump Output and Run Time

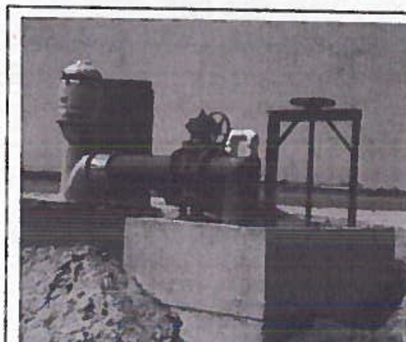
With this method, the output of the pump (gpm) is estimated and the time the pump runs is recorded. Once the concentration of nitrogen in the lagoon water is known, a "lookup" table or simple calculation gives the total pounds of nitrogen applied. The total pounds of nitrogen applied divided by the number of acres gives the pounds of nitrogen applied per acre. This method is prone to inaccuracies and allows only limited flexibility in controlling application rates of lagoon water nutrients. Nonetheless, it avoids the expense of a flow meter and may be the only option in some circumstances.

Seldom does a pump put out exactly the rated amount. Actual pump output is influenced by:

- The depth of water in the pond
- The amount of wear on the pump
- Debris on the impellor
- The distance and elevation the water is being pumped
- The type and diameter of pipeline
- How many solids are in the pumped material

The lower the water level in the pond, the less the pump output. This is true for both floating pumps and stand pumps because it is the difference in elevation between the level of water in the pond and the level of the discharge that determines the amount of energy required to pump the water through the same section of pipe.

Friction, constrictions and elbows increase the amount of head pressure or pumping pressure that it takes to move the same amount of liquid at the same velocity. If the lagoon water is in a pressurized pipeline with multiple discharge points, those discharges that are further away have more losses from friction, bends, constrictions and flatter slope, resulting in lower flow rates when pumping to far fields compared to closer ones at the same pond level.



Pump output and run time is often used as an interim method to estimate the volume of lagoon water applied in situations such as this where the close proximity of the pump and valve to the discharge make it necessary to make modifications to the pipe before a flow meter can be installed.

Measuring Flow Using a Pump Output Chart

In a pumped system, the liquid manure is often lifted from the pond and discharged into a box or standpipe and there is an air gap between the outlet of the pipe and the receiving water. If an air gap exists so that the lagoon water is pumped without backpressure from the freshwater it is mixed with, creating a chart which relates the gpm of the pump output to the depth of water in the pond will make calculating the amount applied more accurate by adjusting the gpm rate used in the calculations according to the depth of the pond at the time of the irrigation.

feet below full	gpm
full	1990
1	1910
2	1840
3	1770

Pump output declines as the pond is lowered. Making a chart such as this one can make pump output estimates more accurate. Remember that thick solids also can decrease the pump output by as much as half.

In a gravity or pumped system where the liquid manure is discharged directly into an underground freshwater pipeline, the lagoon flow rate can be greatly influenced by the amount of backpressure in the freshwater pipeline. There are many factors that determine the final lagoon flow rate, which is ultimately a function of the difference between the elevation of the freshwater source such as a canal, the pond level and the field discharge. This can vary throughout the irrigation for many reasons, including

- The depth of water in the pond
- The depth of water in the canal
- the number and degree of opening of the field valves
- the friction losses in the pipe as determined by distance and pipeline interior roughness
- the number of elbows or restrictions
- some fields having a different pipeline diameter
- some areas that are served by pipelines that have a flatter or steeper slope than others

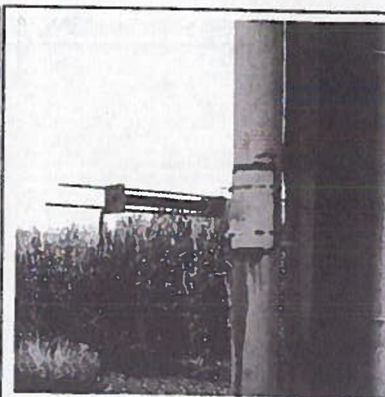
Because of these factors, the flow rate from the pond discharging directly into an underground pipeline is often different for different fields and possibly within the same field even at the same pond elevation and valve opening. This method should be used with caution in a gravity system.

Methods of Measuring Pump Output

One of the difficulties in using the pump output method is determining what the lagoon pump output is. The most common way of testing freshwater pump output is to insert a pitot tube type device into the outflow of the pump. Lagoon pumps are not commonly tested with this method because lagoon water contains particles that clog the device, which somewhat resembles a drinking straw, almost as quickly as it is inserted.

The easiest way to verify the output of the lagoon pump is to temporarily install a flow meter. Even if the installation is temporary, it is still critical to choose the correct flow meter and to have the meter sited in a location that ensures that it is reading accurately. Sometimes it is possible to find a place to install a probe style insertion meter that requires only minor modifications of existing plumbing and still meet the requirements of a full pipe with the minimum length of straight run to ensure a uniform flow cross section. Sloping pipes from floating pumps and vertical pipes that discharge liquid manure into irrigation boxes often have suitable conditions. If sufficient length of straight pipe is not available, there are several options, including:

- Use a wetted Doppler insertion meter which requires less straight run than traditional insertion style electromagnetic meters
- Construct a metering run for installing a temporary meter with the intention of purchasing a permanent meter later
- Temporarily install a probe style magmeter and take velocity readings at multiple points in a transect across the pipe to make a custom profile factor to compensate for a less than ideal placement
- Use a different measurement method, such as the pond drop method described below.



The existing vent (left) was moved over to accommodate temporary installation of an insertion-style meter on the floating pump. The sloping pipeline ensured that the meter was in a full pipe. A PVC saddle on a vertical liquid manure pipe discharging into a concrete standpipe was not difficult to install and was capped when the temporary meter was removed. The rods on these meters allow the sensor probe to be precisely positioned to a specific depth inside the pipe.

An external Doppler meter has the advantage of being able to be strapped onto a pipe without cutting into it, but it is usually difficult to find a location on a dairy that meets the stringent conditions that this type of meter needs to be accurate.

Once a meter is installed, make a chart by recording the pump output at varying pond levels. If desired, the chart could also include the flow rates when a valve is partially closed, including the number of turns or stem height, so that the operator can have more control over application rates. The chart can be used proactively to tell the operator how much to open the valve in order to obtain a desired flow rate at a given lagoon level.

Another way to estimate lagoon pump output is by measuring pond drop (gallons) over time. First, turn off all other inflows and outflows to the pond. Record the exact starting level of the pond on a vertical pole or structure. Record the exact starting time. Run the pump until the pond has dropped a measurable distance, such as a foot. Note the exact ending time and the inches of vertical drop. Measure the dimensions of the surface water in the pond when the pond is at the mid-point of the total anticipated drop. Calculate the number of gallons that were discharged by converting pond acre-inches to gallons (1 ac-in = 27,154.3 gallons) and divide by the number of minutes to get gallons per minute. This procedure can be repeated for as many intervals as desired.

Calculating nutrients applied from GPM and run time

Once the flow rate is known, the rate of nitrogen application can calculated based on the concentration of the nitrogen in the lagoon water. It may be helpful to estimate ahead of time what that application rate is likely to be using a chart such as the one to the right. The time that the irrigation ran on each field or area must be recorded accurately. The pond level and amount of solids should also be recorded so that the gpm can be adjusted accordingly. After the application, the amount of water and nutrients that were applied can be calculated using this method:

Pounds of Nitrogen per Hour

concentration of N in lagoon: lbs per thsnd gal	lbs/ac-in	mg/L or ppm	gallons per minute (GPM): 250	500	750	1000	1250	1500	1750	2000
1.7	45	200	25	50	75	100	125	150	175	200
2.5	68	300	38	75	113	150	188	225	263	300
3.3	91	400	50	100	150	200	250	300	350	401
4.2	113	500	63	125	188	250	313	376	438	501
5.0	136	600	75	150	225	300	376	451	526	601
5.8	159	700	88	175	263	350	438	526	613	701
6.7	181	800	100	200	300	401	501	601	701	801
7.5	204	900	113	225	338	451	563	676	789	901

Use a chart such as this one to estimate the rate of nutrient application based on the pond concentration and pump gpm. Complete charts are available at manure.ucdavis.edu

1. How many gallons were applied to the field, as thousand gallons:
   Gallons per minute (gpm) x hours x 60 minutes/hour = gallons applied
   Divide by 1000 to get thousand gallons
   Gallons applied ÷ 1000 = thousand gallons

2. How many pounds of nitrogen were in that volume
   ppm or mg/L nitrogen x thousand gallons x .008345 = pounds nitrogen applied

3. How much was applied to each acre
   pounds nitrogen applied ÷ number of acres = lbs N applied per acre

Applying Targeted Amounts of Nitrogen Using the Pump Output (GPM) Method

A limitation of using pump output to measure application rates is the difficulty in adjusting application rates that are too high. If a throttling valve is used to restrict the flow, it will no longer be possible to determine the amount of liquid and nutrients applied unless a different method such as a temporary flow meter, is used to revise the pump output chart to include the pump output at that valve opening for various pond levels.

Applying Lagoon Water in Only the Last Portion of an Irrigation

Field study: field length = 1200', avg. irrigation amount = 7.1"

Liquid manure added	Nitrogen applied (lbs N/ac)	Application uniformity
During entire irrigation	242	+
When freshwater advance was at 75% of field length	86	++
When freshwater advance was at 85% of field length	31	++++

Schwankl & Frate 2004

Turning on the lagoon pump for only the last portion of each check or irrigation set not only resulted in a lower application rate without throttling back the pump, but also greatly improved the application uniformity in this study.

Another way to decrease the application rate is to run the pump at the full amount but only turn the pump on during the last portion of each irrigation set or check. This method allows the pump to be run at full capacity but for a shorter period of time. The uniformity of the application is also improved, especially in situations where the water takes a long time to move across the field and the upper portions of the field have water on them for a much longer period of time than the lower portions. Turning on the lagoon water pump later into the irrigation also minimizes the solids buildup around the valves by helping to spread the solids out over the whole field.

Since the lagoon pump must be turned on and off for each check or set, if the run times or acres in each set or check are not all the same, the pump run time will need to calculated individually each time the water is used. Calculate the amount of nitrogen that each area will need to receive by multiplying the desired application rate in pounds per acre by the number of acres to be irrigated. Divide this amount by the pounds of nitrogen per hour that the pump is applying (from chart) to determine the number of hours to run the pump on that check.

Important note on this method:
When the lagoon pump is turned on or off the lagoon water at the discharge of a pressurized system will start or stop immediately because the water in the pipe is a continuous column. However, it may take a long time for the lagoon water to travel from where it is introduced into the fresh water until it actually reaches the field and the irrigation for that check may be over by the time the lagoon water arrives. This lag time needs to be considered and accounted for when determining when to turn on and off the pump.

How long to run the pump on each check or set

Run time for lagoon pump to achieve a target application rate

lbs N for this set	lbs of nitrogen per hour from pump					
	100	200	300	400	500	600
250	2 h 30 m	1 h 15 m	0 h 50 m	0 h 38 m	0 h 30 m	0 h 25 m
500	5 h 0 m	2 h 30 m	1 h 40 m	1 h 15 m	1 h 0 m	0 h 50 m
750	7 h 30 m	3 h 45 m	2 h 30 m	1 h 53 m	1 h 30 m	1 h 15 m
1250	12 h 30 m	6 h 15 m	4 h 10 m	3 h 8 m	2 h 30 m	2 h 5 m
1500	15 h 0 m	7 h 30 m	5 h 0 m	3 h 45 m	3 h 0 m	2 h 30 m
1750	17 h 30 m	8 h 45 m	5 h 50 m	4 h 23 m	3 h 30 m	2 h 55 m

Multiply the target application rate (lbs per acre) by the acres in the set to get the total amount of nitrogen needed for this area. Divide this amount by the pounds of nitrogen per hour that the pump is applying (from chart above) to determine the number of hours to run the pump on that check, or use a chart like this, available at manure.ucdavis.edu.

For example, a pump that is putting out 400 lbs of nitrogen per hour will need to be run 1 hour 15 minutes to apply 50 lbs/ac of nitrogen on 10 acres (500 lbs total)

Measuring Application Volume Using the Pond Drop Method

This staff gauge has metal cross bars. Painted markings become difficult to read when coated with scum.

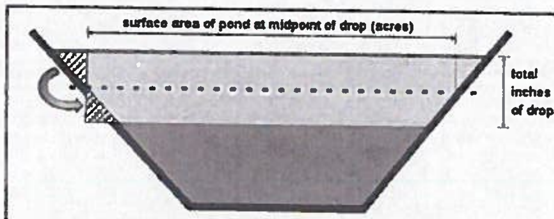
The concept behind the pond drop method is to determine the surface area of the pond in acres, then multiply the pond surface acreage by the number of inches of vertical drop as the pond is used to irrigate a field of known size. Multiplying the area of the pond (in acres) by the drop (in inches) gives the acre-inches of pond water that went out during the irrigation. Acre-inches multiplied by the pounds of nutrient per acre-inch gives the total pounds of nitrogen applied. The pounds of nitrogen applied per acre are determined by dividing the total applied by the number of acres irrigated.

While the pond drop method may appear to be simple and straightforward, in practice it is often challenging to obtain accurate application volumes using this technique. There are many reasons pond drop volumes may be difficult such as odd pond shapes, non-uniform side slopes, the presence of irregular areas of built up solids, other inflows to the pond (the capacity of a flush pump is typically much higher than that of the irrigation pump), two or more interconnected ponds, the difficulty of establishing and using a measuring pole, and the short distance a large pond drops when low rates are applied to a small field. If fresh water is introduced into the pond at the same time as the pond is being drawn down, using pond drop as a method of estimating nutrient application is especially difficult. Irrigations that begin and/or end during the middle of the night can be a problem if the measuring pole cannot be read in the dark by a competent person. Devices for accurately measuring the depth of the pond exist, however, the more economical choice would usually be to invest in a flow meter.

Despite the potential inaccuracies, the pond drop method is often used on dairies to determine how much water has been applied because this method is relatively simple and requires few capital inputs. And there are some situations where the pond drop method can provide very accurate information and can be used not only for measuring application amounts but also to check the accuracy of other measurement methods. The pond drop concept is useful for other purposes such as calculating the volume applied from tailwater return ponds.

Because the sides of most ponds are sloped, an inch of drop when the pond is full is not the same volume applied as when the pond drops an inch when the pond is lower. If the slope of the pond is fairly uniform, the pond surface area (length x width in acres) at the half way depth of the drop multiplied by the total inches of drop will give an accurate estimation of the acre-inches of water applied. Having a chart for the pond which gives the surface area of the pond at different depths can simplify calculations. Make the chart either by measuring the pond surface length and width at intervals as the pond is drawn down, or by entering the dimensions of the pond and run and rise of the slope into an Excel template available at manure.ucdavis.edu.

It can be difficult to achieve a target application rate using the pond drop method because of the large amount of acreage that must be irrigated before the rate of drop can be established and adjusted. Constructing a chart which gives the estimated pump output (in gpm) from the pond at different pond levels can be helpful in proactively estimating if a planned application will result in an appropriate application rate.



Nitrogen Applied per Inch of Drawdown by Depth in Pond

300	pond length (ft)	rise	10
150	pond width (ft)	run	20
		run/rise	2.0
10	total depth in feet from full to bottom		

distance below full feet		inches		pond surface acres	gpm at this depth		Pounds of nitrogen applied per inch of drawdown								
						lbs/ac-in	45	68	91	113	136	159	181	204	227
						lbs/Kgal	1.7	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.3
						mg/L	200	300	400	500	600	700	800	900	1000
full		0		1.03	1800		47	70	94	117	141	164	187	211	234
1/2	ft	6	in	1.01	1775		46	69	92	115	138	161	184	207	230
1	ft	12	in	0.99	1750		45	68	90	113	135	158	180	203	225
1 1/2	ft	18	in	0.97	1725		44	66	88	110	132	154	176	198	220
2	ft	24	in	0.95	1700		43	65	86	108	130	151	173	194	216
2 1/2	ft	30	in	0.93	1675		42	63	85	106	127	148	169	190	211

The effects of side slope can be accounted for when using pond drop by using the surface area of the pond in acres nearest to the midpoint of the drop multiplied by the inches of drop to calculate acre-inches applied. Constructing a chart with this information will simplify calculations.

Measuring Lagoon Flow Rate using Dilution

If only the freshwater flow rate can be measured, it is possible to estimate the flow rate of lagoon water by sampling the combined lagoon and fresh water and the undiluted lagoon water, and then analyzing both samples for a constituent that is not present in the fresh water. Potassium is a good constituent to use for this purpose since it occurs in only one form in water and is not commonly present in greater than trace amounts in freshwater. Some "fresh" water sources that do contain significant amounts of potassium or sodium include manured tailwater, some tile drain water, canal water that receives tile drain water, and most municipal or food processing wastewaters. In these situations, the fresh water source will need to be analyzed in addition to the lagoon and blended water. Ammonium is another constituent that can be

Calculating lagoon flow rate from dilution

Example:

The measured freshwater flow rate is 1300 gpm. The concentration of soluble K in the freshwater is negligible.

The concentration of soluble K (potassium) in the lagoon water is 490 mg/L and 160 mg/L in the blended water.

160 ÷ 490 = .33 or 33% of the total flow came from the lagoon.

If 33% came from the lagoon, then 67% came from the freshwater.

1300 gpm ÷ .67 = 1930 gpm combined flow rate.

1930 gpm - 1300 gpm = 630 gpm lagoon flow rate analyzed for dilution but it can volatilize or change form under some circumstances. Other constituents such as sodium would work as well as potassium but may require analyses that or otherwise not required.

Both lagoon and blended water samples should be taken at the same time and as close as possible to the time that the flow was measured to minimize the effect of fluctuations in flow rates or concentrations. Be sure that the flow from the lagoon has run long enough to have cleared out water from previous applications. Where pipeline runs are long, this can take a long time.

To calculate the flow rate of the lagoon water, divide the concentration of potassium in the mixed water by the concentration in the lagoon water to find what percent of the total flow came from the lagoon. The percent that came from the freshwater is 100% minus the lagoon flow percentage. Divide the measured freshwater flow rate by the freshwater percentage to calculate what the total flow rate must have been. Subtract the freshwater flow rate from the total flow rate to determine the lagoon flow rate.


Measuring velocity in an underground pipe with an electromagnetic meter mounted on aluminum concrete finishing poles that can be snapped together to obtain the length needed.

The freshwater flow rate can be measured with a flow meter on the freshwater pump, a recent pump test, or by using a hand-held velocity meter inserted down a vent or standpipe. If an accurate measurement of the blended fresh and lagoon flow can be obtained, this method can be adapted to estimate both the fresh and lagoon flow rates. It can also be adapted for use in other difficult situations, such as measuring tailwater runoff.

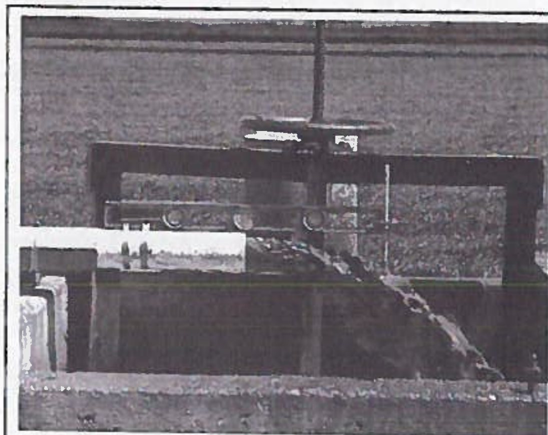
The dilution method is somewhat cumbersome for most dairy operators to use regularly but is useful when it is not feasible to make permanent changes to the system. Also, any method such as this one that measures the flow rate at a single point in time assumes that the flow rate from the district and the pond is the same throughout an irrigation, which is often not true. Even if the district or pump flow rate is uniform, the flow rate for a particular field, or portion of a field, may vary due to differences in pipeline characteristics such as slope, pipe length and diameter, in addition to the number and degree of opening of valves. For this reason, this method can be considered only an estimate of actual flow rates.

Measuring Lagoon Water Flow Rate by Difference

If it is not possible to directly measure the flow rate of the lagoon water but it is possible to measure the flow rates of both the fresh water and the combined fresh and lagoon water, the flow rate of the lagoon water can be calculated by subtracting the freshwater flow rate from the combined water flow rate.

For example, if the blended water flow rate is 1500 gpm and the freshwater flow rate is 500 gpm, then the lagoon water flow rate is 1500 gpm - 500 gpm = 1000 gpm.

If only the blended water flow rate can be measured, turning off the pond pump and comparing the blended flow rate to the freshwater only flow rate will not usually provide an accurate measure of the lagoon flow rate unless the blended water is measured in an open channel or in a pipeline that is not full. Both the velocity and level of the water must be measured. If When the blended water to be measured is in a full pipeline and the pond water pump is turned off, part of the original mixed flow may be taken up by additional fresh water, giving an erroneously low estimation of the difference between the total flow and the fresh water flow.



The trajectory of water being discharged from an open pipe may be used to estimate flow rate.

Measuring Lagoon Flow Rate from a Pipe Discharge

If there is a location where the liquid manure discharges from an accessible pipe, and the flow rate is not high, there are a couple of inexpensive options for measuring the flow rate. If the pipe is horizontal, the output can be estimated by measuring the distance from the pipe at the point where the output stream has dropped 4 inches from horizontal. The flow rate is estimated from this distance and the pipe diameter using a table. Similar charts exist for pipes that are not horizontal.

This method may be useful as a temporary estimate, however it may be awkward to do in the dark and is less convenient for throttling purposes. For charts and additional information on this method, see "Hanson and Schwankl, Measuring Irrigation Water Flow Rates."

Another option is simply to record the amount of time it takes for the discharge to fill a container of known volume, such 5 gallon bucket, and calculate the gallons per minute (gpm). This method works best when the expected flow rate is less than about 30 gpm.

The flow rate of this liquid manure discharge could be estimated by timing how many seconds it takes to fill a 5 gallon bucket. If it takes 10 seconds, or 10 ÷ 5 = 2 seconds per gallon, then in 60 seconds (1 minute), 60 ÷ 2 = 30 gallons or 30 gpm would be pumped. Or, calculate gpm by dividing 300 by the number of seconds it takes to fill 5 gallons.

Measuring Freshwater and Blended Fresh and Lagoon Water with Flow Meters

Accurate measurement of fresh water applied is important for many reasons in addition to being required. Inexpensive mechanical meters such as propeller type meters are often used when pumping groundwater. If the meter must be located near an elbow or valve, propeller meters that measure the entire cross section of the pipe are more accurate than those that measure only a portion of the flow. Accuracy can also be improved by placing the meter in a standard metering run. Other types of meters, such as electromagnetic flow meters, can be used to measure fresh or blended water but are considerably more expensive.

On freshwater pumps with minimal variation in pumping levels, the pump output, verified by an accurate pump test, can be used along with pump run time to calculate the volume applied with sufficient accuracy for most purposes.

When measuring water pumped from a canal or river, however, propeller type meters may not be the best choice because water weeds or other stringy debris can interfere with any sort of meter which is installed inside or protrudes far into the pipe. Screened intakes can help but may need to be frequently cleaned. Electromagnetic or Doppler meters with minimal protrusions are preferred for these situations but are more expensive.

The flow meter sensor above is mounted to the inside wall of a large diameter pipeline. If the pipe does not always run full, another sensor to detect the water level in the pipe will be needed in addition to the velocity sensor. The level and velocity sensor may be integrated on the same mount, or they may be separate devices. The installation in the photo below has a ultrasonic level sensor mounted at the top of the pipe and a velocity sensor through the side, with no wires inside the pipe.
Photos: Mace USA LLC

Water received from a district is usually delivered in open canals. Travel from the district turnout to the fields may be in underground pipeline or it may be in an open channel.

The easiest way to measuring the flow of water in a large underground pipeline is with an electromagnetic or wetted Doppler meter with a debris shedding sensor mounted to the inside wall of the pipe. On pipes less than about 30 inches in diameter, the sensor is often mounted to a band that fits snugly inside the pipe. On larger pipes where access to the inside of pipe is possible, affixing a bracket to the inside wall of the pipe to hold the sensor may be preferable. In either case, it is critical that the sensor, bracket and interior cable be configured tight to the wall in such a way that water weeds and debris cannot be trapped and interfere with the reading.

Pipes that do not run full and open channels will require that both the velocity of the water, as measured by the flow meter velocity sensor, and the depth of water in the pipe or canal, be simultaneously measured. Flow meters measure the velocity of the water but the flow rate is determined by both the velocity (the number of feet a water particle travels per second) of the water and the cross sectional area (square feet) that the water travels through. Combined, these two pieces of information give the volume (cubic feet) passing through that cross sectional area per second (cubic feet per second, or cfs).

Open air space in the top of the pipe, and silt or debris in the bottom of the pipe change the area of the pipe. The depth of the silt layer may change even during the irrigation of an individual field depending on the velocity of the water in the pipe, which can be affected by a variety of factors including the number of valves open or the elevation of the irrigation valves in comparison to the height of the canal.

Both an estimate of depth of the silt in the pipe and the depth of water in the pipe are necessary to calculate the volume of water flowing through the pipe in a non-pressurized system This can be done by using a sensor mount that has a capacitive pressure diaphragm which measures the weight of the water above it, or with a separate downward looking ultrasonic depth sensor mounted at the top of the pipe. The pressure diaphragm method is suitable in situations where the sensor will be wet. The downward looking depth sensor is mounted above the fluid and does not come in direct contact with it, making it ideal for very dirty or debris laden water. Both methods of measuring and recording water levels are useful for a variety of other purposes, such as turning on a sump pump or recording the depth of water in lagoons, open channels or weirs.

An ultrasonic downward-looking depth sensor tracks the depth of water in this canal.

Computer software that will calculate the flow rate from the velocity and cross sectional area is essential and is generally supplied by the meter manufacturer. When selecting a meter and depth sensor, be sure that that you will be able to understand and use whatever additional software is needed to determine flow rate.

The same meters and level sensors that are used to measure flow rate in partially full pipes can also be used for the same purpose in open channels such as canals. If a temporary metering solution is needed, an electromagnetic meter on a lightweight pole can be used to obtain a velocity reading at a single point in time. Access to straight stretch of pipeline through a vent is necessary. Either an electromagnetic velocity meter or wetted Doppler insertion meter can be used as a temporary meter for blended liquid manure in open channel canals and irrigation ditches.

Measuring Freshwater and Blended Fresh and Lagoon Water without using a flow meter

There are a variety of ways to measure irrigation water being applied to or running off of fields without using a flow meter. These involve portable flumes, various constructed weirs or the size and number of siphon pipes being used. All of these methods measure the depth of water in or difference in depth of water on either side of a constriction of specific shape and size. The flow rate is usually read off a chart for that device. These methods do not usually require expensive devices and are especially useful when exact volumes are not essential. They are most appropriate in situations where the flow rates are fairly constant, unless multiple readings are taken. A data logging depth sensor can provide a log of the height of the water passing through a flume or weir. This may be a cost effective solution if the depth sensor can be accommodated by an existing data logging controller box. An excellent reference for these and other method is Detailed information on these methods is "Hanson and Schwankl, 2010. Measuring Irrigation Water Flow Rates"

The depth of the water passing through a flume or weir can be used to estimate flow rates.

Measuring Tailwater Runoff

A method to measure or estimate the amount of tailwater runoff from fields is essential to avoid over estimating the amount of nutrients applied to the field and to avoid over reporting of nutrients and salts when calculating application amounts in relation to crop removal.

Water and nutrients that run off the field and are not re-applied to that same field should be measured and subtracted from what was applied so that the crop is not inadvertently shorted of nutrients and so that application amounts are not over—reported.

Allowing some of the water applied to run off the field as tailwater is often necessary on fields where infiltration is slow. On these fields, 15 to 25% of the total water applied is allowed to run off in order for the water to remain on the surface long enough to wet through the root zone. This runoff water is collected and either pumped back on to the same field, to a different field or to the retention pond. If this runoff is not reapplied back to the same field, that portion of water and nutrients that ran off needs to be subtracted from the application amount.

If the runoff is applied to the same field and the re-applied water contains significant concentrations of nutrients, the portions of the field that received the additional tailwater may receive more nutrients than portions that did not unless adjustments are made.

There are several options for measuring the volume of tailwater runoff.

As with undiluted lagoon water, using a suitable flow meter is the easiest and most accurate method of measuring runoff. Solar or battery powered datalogging wetted Doppler or electromagnetic flow meters are ideal for this purpose if the water can be routed through a length of pipe that is configured so that it will always run full. If the water is in a pipeline or open channel that is not full, the flow meter velocity reading can be used in conjunction with a level sensor to calculate the flow. It may be possible to use a temporary meter to obtain percent runoff estimates that can be used at other times.

Calculating flow rate by sump fill time

Example:

A 5 foot deep tailwater sump is 8 feet wide and 10 feet long when it is halfway full.

8 ft x 10 ft is 800 square feet surface area, or 800 ÷ 43560 ft^2/ac = .001837 acres

The pond is 5 feet deep or 5 x 12 in/ft = 60 inches deep

Measuring the pond surface area when the pond is half full, or 2.5 feet below full accounts for the side slope of the pond.

The pond capacity is .001837 acres x 60 inches = .110193 acre inches.

1 ac-in = 27,154.3 gallons

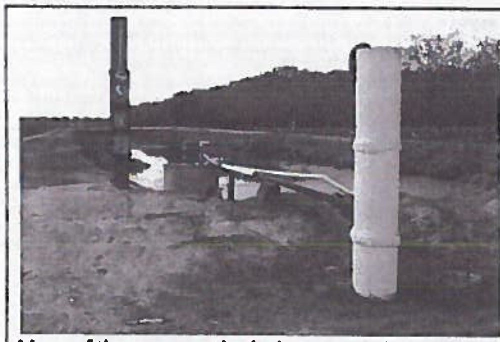
.110193 acre inches x 27,154 gallons/ac-in = 2,992 gallons in the pond.

If it takes 30 minutes to fill the pond, the inflow rate is

2992 gallons ÷ 30 minutes = 100 gpm.

If the runoff drains into a sump out of which water is pumped, the volume pumped can be estimated by multiplying the length of time the pump ran by the pump output. The pump output in gpm can be determined by stopping the inflows to the sump and timing how long it takes for the pump to draw down a known volume. At a minimum, the pump should have a run time meter and the hours of runoff for each field recorded. A totalizing flow meter on the pump discharge would be more accurate.

Another way to estimate the runoff flow rate is to record the length of time it takes to fill a sump of known volume and use this to calculate the flow rate. Ideally, this should be done several times over the course of the irrigation to confirm that the flow rate is constant. The flow rate is then multiplied by how long the entire flow ran to calculate the total volume of runoff for that field. The more variable the flow rate and uncertain the start and end times of the runoff, the less accurate this method will be for a particular irrigation and field.



Many of the same methods that are used to measure flows from wastewater lagoons can also be used to measuring the flow into and out of tailwater retention ponds like this one.

If there is a tailwater retention pond, measuring the volume of water in that pond is useful only if the entire runoff from a single field is captured in the pond, and if the pond is not being drawn down at the same time as it is being filled. If the runoff from only one field it may be possible to calculate the runoff rate.

Ideally, a tailwater pump sumps and tailwater retention ponds should be constructed in a way that facilitates a way to measure or estimate the amount of runoff that occurred, and to measure the amount of tailwater that was re-applied onto a different field.

References

Hanson, B. R. and L. J. Schwankl. 2010. Measuring Irrigation Water Flow Rates. University of California Agriculture and Natural Resources Publication 21644

Schwankl, L. and C. Frate. 2004. Alternative techniques improve irrigation and nutrient management on dairies. California Agriculture. Vol 50 NO. 3 pp 159-163

Management Plan

For

Nuisance

Control

For

Smith Valley Dairy
Lyons County, Nevada

Developed in accordance with
Generally Accepted Agricultural Best Management Practices

September 2014

Introduction

This *Management Plan for Nuisance Control* (MPNC) has been developed and implemented to identify methods that Smith Valley Dairy ("SVD") will use to minimize the inherent conditions that exist in confinement feeding operations. This Management Plan outlines management practices generally acceptable and proven effective at minimizing nuisance conditions. Neither nuisance management, nor this Management Plan, is required by Nevada State statute or specifically outlined in the Nevada Concentrated Animal Feeding Operations Control Regulations. This is a proactive measure to assist integration into local communities. Smith Valley management will use these management and control practices to their best and practical extent.

Legal Description

The concentrated animal feeding facility described in this MPNC is located 6 miles northeast of Smith Valley, on the east side of Hunewill Lane in Sec 26, T12N, R23E, Lyon County, Nevada.

Odor Control

Odors result from the natural decomposition processes that start as soon as the manure is excreted and continue as long as any usable material remains as food for microorganisms living everywhere in soil, water and the manure. Odor strength depends on the kind of manure, and the conditions under which it decomposes. Although occasionally unpleasant, the odors are not dangerous to health in the quantities one customarily notices around animal feeding operations and fields where manure is spread for fertilizer. SVD will use the following methods and management practices for odor control:

1. Pen Management

   - *Drainage*
     Dry manure is less odorous than moist manure. The dairy will conduct routine pen cleaning and surface harrowing to reduce standing water and dry or remove wet manure.

   - *Regular Manure Removal*
     To reduce the overall quantity of odor producing sources, the dairy will conduct routine pen cleaning and harrowing, as needed.

   - *Reduce Standing Water*
     Standing water can increase microbial digestion and odor-producing by-products. Proper pen maintenance and surface grading will be conducted by the dairy to reduce standing water.

2. Manure / Stormwater Pond Management

- *Solid / Liquid Separation*
  Separation of liquids and solids will help reduce odors. SVD has separators in advance of the storage ponds to assist in reducing odors.

- *Aerobic Designed Ponds*
  The manure ponds are designed to be rather shallow in order to keep aerobic conditions.

- *Floating Fiber Crust*
  Crust formation on ponds will be encouraged to further reduce volatilization and odors.

- *Pond Management*
  Ponds will be dewatered regularly in accordance with the *Nutrient Management Plan* for SVD.

- *Chemical Treatment*
  No chemical additives or treatments of the stormwater ponds for odor control are planned. Research to date indicates poor efficacy, if any, of these products.

3. Land Application

- *Timing*
  Typically air rises in the morning and sinks in the evening. SVD considers weather conditions, time of day and prevailing wind direction to minimize odors from land application.

- *Application Modification*
  SVD will modify application methods to reduce odors; this may include dis-use of end guns, increase in droplet size to reduce volatilization, dilution of applied wastes, and/or injection or immediate incorporation after application.

4. Composting

- SVD may compost manure to reduce volume, nutrients, odor and pests. If so, Smith Valley will utilize Composting BMPs to reduce odors.

Dust Control

Dust from pen surfaces is usually controlled by intensive management of the pen surface by routine cleaning and harrowing of the pen surface. The purpose of intensive surface management is twofold: to keep cattle clean and to reduce pest habitat. The best management systems for dust control involve moisture management. Management methods SVD will use to control dust are:

1. Pen Density
    - Moisture will be managed by varying stocking rates and pen densities. The animal's wet manure and urine keep the surface moist and control dust emissions. Stocking rates are considered in the management of dust.
2. Regular Manure Removal
    - SVD will conduct regular manure removal. Manure removal and pen maintenance are conducted as needed.
3. Water Trucks
    - Should nuisance dust conditions arise, water tanker trucks or portable sprinkling systems will be used for moisture control on pens and roadways to minimize nuisance dust conditions.

If it is determined that nuisance dust and odor conditions persist, SVD may increase the frequency of the respective management practices previously outlined, such as pen cleaning, surface grading and pen maintenance. Additionally, if nuisance conditions continue to persist beyond increased maintenance interval controls, SVD will install physical or mechanical means, such as living windbreaks and/or solid fences to further minimize nuisance conditions from dust and odors.

Pest Control - Insects and Rodents

Insects and rodents inhabit environments that have an adequate-to-good food supply, and that foster habitat prime for breeding and living. SVD will manage insects and rodents' habitat and available food supply by minimizing the existence of such environments through practicing routine good housekeeping, feedbunk cleaning, site grading and maintenance. Traps and chemical treatments are effective control methods and will be used as necessary.

1. Habitat Management

- *Regular Manure Removal and Lot Management*
  Proper manure management removes both food sources and habitat for flies. SVD manure management consists of: routine lot harrowing, lot scraping, cleaning of alleys, removal of manure for windrowing to facilitate drying, parlor flushing will be separated through a liquid/solid separator, manure inventory will be kept to a minimum in conjunction with the land application availability during the year, the requirements for Smith Valley's crop and pasture plan, as well as its bedding material needs.

- *Reduce Other Fly Habitats*
  Standing water, weeds and grass are all prime habitats for fly reproduction and protection. SVD tends each field and mows the grass and weeds as appropriate to control fly breeding conditions. Where practical, Smith Valley's management of these areas will consist of: ditch burning and mowing along roadways and waterways and lot, pasture and roadway grading to reduce standing water.

2. Controls – Biological and Chemical

- *Biological Control*
  Parasitic wasps make excellent biological fly control and are widely used. The wasps lay their eggs in fly larvae hindering fly reproduction. Smith Valley's biological control management may consist of: sourcing of and releasing at Kansas State University (KSU) recommended levels naturally occurring wasp species indigenous to the area as selected and identified.

- *Baits and Chemical Treatments*
  Baits and treatments are generally very effective. SVD will use USDA approved fly sprays and baits, such as Pyganic. Application levels and methods of such will be warranted by the results of the other control measures previously outlined.

In the event it is determined that nuisance conditions from pests, such as flies and rodents, persist, SVD will initially increase the frequency of the housekeeping and management practices outlined previously. If further action is necessary, SVD will increase use of USDA approved chemical controls and treatments, such as fly sprays and baits and rodendicide for pest control.