Amendment to:

City of Santa Rosa Approved Offset Credit Proposal for Nunes-Ocean View Dairy BMPs

Credit Proposal Summary

On October 30, 2012, the City of Santa Rosa submitted a nonpoint source phosphorus and nitrogen crediting proposal to the North Coast Regional Water Quality Control Board (Regional Board) for the Nunes-Ocean View Dairy site. This proposal was approved by the Regional Board on January 24, 2013. The proposal contained information regarding nutrient reductions that would be achieved from three types of Best Management Practices (BMPs) at the site that included:

- BMP #1: Emptying manure lagoons and appropriately managing for future stormwater collection
- BMP #2: Implementing BMPs in heavy use areas to address accumulated manure
- BMP #3: Distributing 12,700 tons of accumulated manure solids for on-site land application

Since the January 24, 2013 proposal approval, the former owner sold the site to Krasilsa Pacific Farms, LLC (Krasilsa). The site's current managing partner, Mr. Hugh Reimers, is in the process of converting the site to a vineyard. This transition has already included implementation of BMPs #2 and #3.

On March 13, 2014, a site visit to confirm these site conditions was conducted by Mr. Dave Smith (Merritt Smith Consulting), Mr. James Klang (Kieser & Associates, LLC), and Mr. Andrew Fang (Kieser & Associates, LLC). At that time, the site heavy use areas had been scraped of manure and grass establishment on previously denuded areas was underway. Both the accumulated 12,700 tons of manure solids previously stock-piled on-site, as well as the solids separating equipment, had been removed. Early signs of grass establishment were evident where manure previously had been stockpiled. At the direction of Mr. Riemers, the two manure lagoons had been drawn down approximately one-third of the lagoon depth to minimize the imminent risk of lagoon overflows.

Subsequent to this site visit, Mr. Riemers indicated to the City that he had observed a historic construction photo suggesting that the lagoons could be as deep as 30 feet below the top of the berm. Though not yet seen by the City, this could suggest that the amount of accumulated solids remaining in these lagoons may be greater than previous engineering estimates.

The lagoon drawdown and grass establishment are deemed appropriate interim BMPs as stipulated in the Dairy Waste Discharge Regulations[1] and Waiver[2] requirements for nutrient crediting projects. While the current status of the lagoon drawdown was adequate for late spring conditions at the time of the

[1] North Coast Regional Water Quality Control Board. 2012. General Waste Discharge Requirements Order No. R1-2012-002 for Existing Cow Dairies in the North Coast Region. Available online at: http://www.waterboards.ca.gov/northcoast/water_issues/programs/dairies/ Accessed July 2, 2014.

[2] North Coast Regional Water Quality Control Board. 2012. Conditional Waiver of Waste Discharge Requirements Order No. R1-2012-003 for Existing Cow Dairies in the North Coast Region. Available online at: http://www.waterboards.ca.gov/northcoast/water_issues/programs/dairies/ Accessed July 2, 2014

March 2013 site visit, available lagoon capacity potentially would not be adequate to contain a large storm or runoff associated with a wet season.

With BMPs #2 and #3 implemented, the remaining available credit generating activity at the site still of interest is BMP #1. This would include complete emptying of the two manure lagoons including management and appropriate off-site disposal of accumulated manure solids. As such, the previously approved credit estimates are being amended to reflect lagoon cleanout.

Amended Crediting Proposal Considerations

In addition to the site modifications noted above, three other relevant activities or actions that affect crediting for BMP #1 have occurred since the Nunes-Ocean View Dairy proposal was approved on January 24, 2013. These include a modification to the City's waste discharge requirements (WDR) that now requires only phosphorus offsets, up-to-date phosphorus sampling of the dairy manure storage lagoons, and removal of all cattle from the dairy site. These are summarized as follows.

Phosphorus Offsets Only:

On November 21, 2013, the Regional Board approved Order No. R1-2013-0001, which reissued the City of Santa Rosa Water Reclamation Facility Waste Discharge Requirements (WDR) and NPDES permit CA0022764. The reissued permit reduced the requirements of the Nutrient Offset Program. This Order modified the "zero" or "no net loading" requirements by only applying it to phosphorus discharges. Previously, the Nutrient Offset Program addressed both phosphorus and nitrogen discharges from the Water Reclamation Facility. The nitrogen reduction benefits are still tracked by the City of Santa Rosa so that they can be considered for crediting later for TMDL compliance.

Manure Lagoon Content Sampling for Phosphorus:

Manure samples from the lagoons were collected and lab results were obtained using a composite sample process. The collection of site samples was part of the approved City of Santa Rosa Nunes-Ocean View Dairy Credit Proposal, (as stated on page 7 of that proposal). Specifically, it stated: "Site-specific sampling is being pursued by the City and thus, credit calculations may be adjusted and later communicated with the Regional Board."

The lab results indicated that phosphorus concentrations for Lagoon number 1 had a wet weight of 1,850 ppm or 15 pounds per thousand gallons (2.3 times the book value estimate[3]). For Lagoon number 2, the wet weight phosphorus concentration was 3,700 ppm or 31 pounds per thousand gallons (4.7 times the book value estimate[4]). These lab results are provided as Attachment A. Potential contributing factors to these elevated concentrations include the previous dairy operator's use of a solids separating system. This system sent only the finer particulate materials into the lagoons, contributing organic particles with a high phosphorus content, or fine soil particles that have a high affinity for P sorption. Another contributing factor is that the lagoons are full of solids that have settled out over a long period of time. Lab results indicated that the solids concentrations were 14 and 19 percent. These high solids concentrations likely reflect limited historic lagoon cleanout activities when managed by the Nunes-Ocean View Dairy operation.

[3] Midwest Plan Service. 2004. Manure Characteristics - Manure Management System Series MWPS-18, Section 1 Iowa State University, Aims Iowa

[4] Ibid.

No Cattle on the Site:

In advance of the property transfer to Krasilsa, all but six cattle were removed from the site. The credit calculation therefore is now based on managing the existing manure in the lagoons and does not consider ongoing manure production and capture that would have occurred if the active dairy operation was still present at the site. Previously, the approved proposal brought the site into WDR compliance status by land applying the new runoff that came into contact with manure as well as existing manure in the lagoons. Land application was to be specified in a manure management plan. Manure in the lagoons now will be removed and dried sufficiently for environmentally safe transport to an offsite composting facility. As such, the credit calculation now is based only on removal and management of the existing manure in the lagoons.

Amended Credit Sums

Revised credit sums were calculated that take into account the current Nunes-Ocean View Dairy site conditions and activities (management changes, offset requirements for phosphorus only, manure sample results, and removal of cattle from the site) as noted above. The original and approved phosphorus credit sum estimated 12,242 credits in the first year and 8,569 credits in years 2, 3 and 4 for a total of 37,949 phosphorus credits. In addition, the approved proposal estimated the nitrogen credit sum to be 149,767. These credit amounts are amended, as shown in Table 1. The revised credit estimation also would have provided 33,419 nitrogen credits. However, no nitrogen credits are required for compliance purposes. The methods used to calculate the reductions are included as Attachment B.

Table 1. July 2014 amended credits (pounds of TP) calculated for BMP #1.

Approved Crediting Option	BMP Elements	Adjusted Annual Credits (lbs P/yr)	Approved BMP Eligibility Period	Total Credits (lbs P)
BMP #1 Empty and manage manure lagoons	Agitation and pumping of liquid slurry, removal of solids, stacking/drying and transport to an offsite composting facility. Interim containment of stacked solids using BMPs	5,630	4 years	22,521

To incorporate the appropriate considerations for a margin of safety, the previously approved methods were applied. A conservative margin of safety (MOS) of 30 percent for all four years (instead of just the last three years as in the original proposal) was applied. In addition, the previously approved discount factors were applied to calculate transport losses that occur prior to reaching Windsor Creek and differences in bioavailability between the manure source and the wastewater treatment facility discharges. In summary, Lagoon runoff nutrient loading discount factors as applied in an Excel calculation spreadsheet (included herein as Attachment B) include:

- Edge-of-field factor = 39.9% calculated at 85 feet
- Bioavailability factors:

    - TP = 93.5%
    - TN = 85%
- 30% conservative margin of safety for phosphorus
- 40% conservative margin of safety for nitrogen

As noted above, it is possible that the volume of accumulated solids in these lagoons could be greater than estimated in the original crediting proposal. As such, the City will here again, provide updated credit calculations to the Regional Board if manure solids are greater than noted in these credit estimates.

Additional Interim BMPs

The updated approach for implementing BMP #1 includes first agitating and then removing the manure from the lagoons. The excavated manure will be placed at an on-site location in close proximity to the lagoon. Interim BMPs will be used to prevent release of runoff that has come in contact with the stockpiled manure and subsequent transport of the manure to an offsite compost facility. The removal of manure from the lagoon will take place during the dry season to minimize runoff. Effective interim BMPs during the manure stacking phase will consist of selecting a location that provides the use of either:

- A containment berm around the manure stacking pile and grass establishment between the berm and Windsor Creek, or
- A number of stacking piles placed under the former stall barn complex

The selection of either option will consider the current owner's preferences and the type of equipment used to remove and stack the manure. The method to transport the manure to the composting facility will incorporate transportation practices selected from the National Manual of Good Practices for Biosolids[5] as appropriate for the characteristics of the manure.

Monitoring and Reporting

The previously approved monitoring and reporting procedures will be followed throughout the operating period required to empty the manure lagoons. One inspection will take place during the removal operation (or on a monthly basis if excavation takes more than one month) and one inspection will occur after all manure has been transported off-site. A verification report will include:

- A summary of the interim practices implemented
- BMP #1 schedule of events
- Confirmed volume of manure removed, and the adjusted credit sum reflecting actual volume
- Documentation of the manure being safely transported to the offsite composting facility

The documents will include site photos (as appropriate) and observations that record the performance of interim BMPs and the lagoon manure removal project activities. In addition, the documents will include a summary of site complications encountered (if any) and the methods used to resolve the complications in order to prevent potential discharges of manure contaminated runoff.

[5] Water Environment Federation (for the National Biosolids Partnership). 2005. National Manual of Good Practices for Biosolids. Available online at: http://www.wef.org/Biosolids/page.aspx?id=7767 Accessed June 30, 2014.

A project verification letter documenting that the BMP verification/monitoring goals were met will be included in the City's annual report to the Regional Board. An annual verification letter will be submitted to the Regional Board for each of the four years of crediting to provide a record that the credits are active because the manure cleanout efforts were successfully completed.

Amendment Conclusions

Implementation planning is underway for the Nunes-Ocean View Dairy BMP #1 crediting project to completely remove historic manure accumulations from the two existing lagoons. The project will follow the previously approved proposal methods for managing the removal, stacking, and drying of the manure. Under the amended approach, the dried manure will be transported off-site rather than the on-site agronomic application described in the original proposal. Activities that have taken place since the January 24, 2013 approval have necessitated adjustments to the credit sum, reducing the total to 22,521 phosphorus credits. These credits will be applied across four years, at 5,630 phosphorus credits per year. The nitrogen reductions from BMP #1, as amended, will produce related reductions of 33,419 pounds, though these will not be used as compliance credits. The total verified phosphorus credits that will be awarded may change based on the measurement of actual manure volumes removed from the site. Site verification protocols as outlined herein will be followed, as will reporting procedures.

Attachment A

Nunes-Ocean View Dairy Lagoon Sample Testing Results

City of Santa Rosa
Utilities Department

Laguna Environmental Laboratory
ELAP Cert. #1126
4300 Llano Rd.
Santa Rosa, CA 95407
707-543-3350

Laboratory Examination Report

REPORT TO:

Cynthia Kaul
Utilities
Environmental Services
(707) 543-3363

Lab ID# NN14712

Ocean View Dairy Manure Lagoon 1 NORTH

Collection Date: **4/24/14** **12:00** Date Received: **4/24/14** **12:38** Sample Type: Grab Sampler: THROOP (R) REIMERS (H

METHOD	*ANALYTE*	*RESULT*	*RL*	*RESULT DRY WT.*	*DRY WT. RL*	*UNITS*	*ANALYSIS START*	*QUALIFIER*
6010B	Phosphorus, ICP-Soils	1850	125	13000	890	mg/kg	5/1/14	5,1
EPA 353.2	Nitrite as N - Soils	5.0	1.0	36	7.1	mg/kg	4/29/14	
EPA 353.2	Nitrate as N - Soils	1.7	1.0	12	7.1	mg/kg	4/29/14	1
SM4500NorgC-NH3B	Tot. Kjeldahl Nitrogen - Soils	4200	10	30000	71	mg/kg	4/30/14	
Calculation	Total Nitrogen in Soils	4200	12	30000	86	mg/kg	5/12/14	
SM2540B-1997	Total Solids	19	0.1			%	4/24/14	

Lab ID# NN14713

Ocean View Dairy Manure Lagoon 2 SOUTH

Collection Date: **4/24/14** **12:00** Date Received: **4/24/14** **12:38** Sample Type: Grab Sampler: THROOP (R) REIMERS (H

METHOD	ANALYTE	RESULT	RL	RESULT DRY WT.	DRY WT. RL	UNITS	ANALYSIS START	QUALIFIER
6010B	Phosphorus, ICP-Soils	3700	125	26000	890	mg/kg	5/1/14	5,1
EPA 353.2	Nitrite as N - Soils	Not detected	1.0	Not detected	7.1	mg/kg	4/29/14	
EPA 353.2	Nitrate as N - Soils	Not detected	1.0	Not detected	7.1	mg/kg	4/29/14	1
SM4500NorgC-NH3B	Tot. Kjeldahl Nitrogen - Soils	6200	10	44000	71	mg/kg	4/30/14	
Calculation	Total Nitrogen in Soils	6200	12	44000	86	mg/kg	5/12/14	
SM2540B-1997	Total Solids	14	0.1			%	4/24/14	

Qualifiers

1 - Batch LFM/D or MS/D outside acceptance limits. Data is accepted based on passing method required LFB and/or QCS/LCS.

5 - Reporting Limit(s) have been raised to account for sample dilution due to probable matrix interference.

This data has been reviewed and approved for release.

Shirlee Johnson
Lab Supervisor
sjohnson@srcity.org

Digitally signed by Shirlee Johnson
Date: 2014.05.12 12:31:02 -07'00'

City of Santa Rosa
Utilities Department

Laguna Environmental Laboratory
ELAP Cert # 1126
4300 Llano Road Santa Rosa, CA 95407
(707) 543-3365

Chain of Custody

Department: ENVIRONMENTAL COMPLIA Phone: (707) 543-3363
Report To: Cynthia Kaul Utilities Project Name/#: NUTRIENT_OFFSET
Sampled By: ROY THROOP/Reimers(H) **Date Submitted:** 4/24/14
Date Sampled: 4/24/14 Reported As: LIMS

NN14712 - Ocean View Dairy Manure Lagoon 1

Time	Bottle / Preservation	Matrix	Col. Meth.	Requested Analyses
12:00	1L_P_UNPRES		G	TN
	P_H2SO4		G	TKN
	P_HN03		G	ICP-P
	P_UNPRES		G	NO2 NO3 TS

NN14713 - Ocean View Dairy Manure Lagoon 2

Time	Bottle / Preservation	Matrix	Col. Meth.	Requested Analyses
12:00	1L_P_UNPRES		G	TN
	P_H2SO4		G	TKN
	P_HN03		G	ICP-P
	P_UNPRES		G	NO2 NO3 TS

Relinquished By	Received By	Date	Time
		4/24/14	1200 PM
~~Remarks/Comments~~		4/24/14	12:38

LEGEND

Matrix:		Sample Method:
DW = Drinking Water	SW = Surface Water	G = Grab
SL = Sludge	WW = Waste Water	C = Composite
SO = Soils	GW = Ground Water	F = Filtered

Attachment B

Crediting Methods Applied for Laguna Offset Calculations

Site Name: Nunes -- Ocean View Dairy

Address: 3975 Mark West Station Road, Windsor, CA 95436

Location Information: **Description of watershed location:**

Watershed Segment Adjacent to Windsor Creek, drains to Laguna de Santa Rosa

Location Factor 100%

Distance to nearest conveyance 85 **feet**

Delivery Ratio (Edge-of-Field) 39.88%

(Based on MN delivery ratio formula (Moncrief, 2002): distance$^{-0.2069}$)

Area Served: 7.46 acres

Manure Lagoon Volume Calculation from Erickson Engineering, Inc.

18 acre-feet total of lagoon storage

Manure lagoon #2 has a capacity of 8 acre-feet

Manure lagoon #1 has a capacity of 10 acre-feet

Which equals:

5,865,325 gallons of manure

56%	in Lagoon 1
44%	in lagoon 2

After implementing the initial interim BMPs by removing approximately 1/3 of the pond depth to prevent overflow:

3,871,115 gallons of manure remain

Previous Midwest Plan Service Based Estimated Nutrient Content:

Nutrient content estimates from Midwest Plan Service, Section 1, Second Edition. 2004. Iowa State University **2,710 1000 gallons**

Table 7. Estimated liquid pit manure characteristics.

lbs/1000 gallons of manure

Total N	P205	TP
31	15	6.6

Midwest Plan Service, 2004. Manure Characteristics: Manure Management System Series. Second Edition. MWPS-18 S-1. Iowa State University. http://www.mwps.org/index.cfm?fuseaction=c_Products.viewProduct&catID=719&productID=6421&skunumber=MWPS18S1. Accessed March 1, 2011.

Modified Estimated Nutrient Content Based on Measured Nutrient Concentrations

Lagoon 1:

10 acre-feet of storage, at two-thirds full. 2,150,619 gallons 19% total solids

wet weight TP concentration **1,850 ppm**

Pounds TP per 1000 gallons = PPM * 0.00834 **15 lbs/1,000gallons**

33,182 lbs. of TP in lagoon 1

N Tracking: Pounds TN per 1000 gallons = PPM * 0.00834

wet weight TN concentration 4,200 ppm

Pounds TN per 1000 gallons = PPM * 0.00834 35 lbs/1,000gallons

75,332 lbs. of TN in lagoon 1

Lagoon 2:

8 acre-feet of storage, at two-thirds full. 1,720,495 gallons 14% total solids

wet weight TP concentration **3,700 ppm**

Pounds TP per 1000 gallons = PPM * 0.00834 **31 lbs/1,000gallons**

53,091 lbs. of TP in lagoon 2

N Tracking: Pounds TN per 1000 gallons = PPM * 0.00834

wet weight TN concentration 6,200 ppm

Pounds TN per 1000 gallons = PPM * 0.00834 52 lbs/1,000gallons

88,963 lbs. of TN in lagoon 1

Assumed concentration strength of lagoon (1st year)

	TP released during over topping		**86,273 lbs**	
TP	**Assumed an additional 30% loss as a conservative assumption**		**60,391**	**Conservative MOS**
MOS:	**Delivery Ratio**	**39.9%**		From Lagoons to Windser Creek

Reference: Moncrief, J., Bloom, P., Hansen, N. Mulla, D., Bierman, P., Birr, A., and Mozaffari, M., 2002. Minnesota Phosphorus Site Risk Index. Final GEIS on Animal Agriculture. Environmental Quality Board (EQB), July 2002. http://www.eqb.state.mn.us/geis/GEIS-AnimalAgFinal.pdf. Accessed July 3, 2014.

P Bioavailability	**93.5%**	

P Bioavailability factor = 80% manure bioavailability/85.5% WWTP bioavailability

Reference: Barr Engineering Company, 2004. Detailed Assessment of Phosphorus Sources to Minnesota Watersheds. Supporting Technical Memorandum: Assessment of Bioavailable Fractions of Phosphorus and Annual Phosphorus Discharge for Each Major Basin memo. Available on line at: http://www.pca.state.mn.us/index.php/view-document.html?gid=3987 Accessed July 3, 2014.

Estimated Credit Amount	**TP Credits**	**22,521**	
	4-year crediting period	**5,630**	**credits per year**

TN Tracking:	TN Released during over topping		98,577	lbs.	Assumed 40%
	Delivery Ratio	39.9%			MOS
	N Bioavailability	85%			
	TN Credits		33,419		
	4-year crediting period		8,354.85	credits per year	