City of
Santa Rosa

June 6, 2011

Catherine Kuhlman
Executive Officer
California RWQCB
5550 Skylane Blvd., Ste. A
Santa Rosa, CA 95403

LAGUNA NUTRIENT OFFSET PROJECT (REVISED PROPOSAL)

Dear Ms. Kuhlman:

Your letter of May 20, 2011, identified several issues associated with our Laguna *Ludwigia* Nutrient Offset Project Proposal (Proposal) submitted on March 17, 2011. On May 26, 2011, I met with your staff to clarify those issues and our team described proposed revisions to our Proposal, and your staff offered helpful feedback. I provide herewith the City's Revised Laguna Nutrient Offset Project Proposal (Revised Proposal) and Response to Comments that is responsive to your May 20th letter as clarified by your staff on May 26th.

Submittal of this Revised Proposal is the product of a series of meetings with you and your staff that lead to submittal of the March 17th Proposal, and then additional input with your May 20th letter and May 26th follow-up meeting. The City's Proposal and Revised Proposal also reflect input from the staff of the Laguna de Santa Rosa Foundation and the Sonoma County Water Agency (SCWA), who support the project as consistent with their respective missions of ecosystem management and flood control under the Stream Maintenance Program (SMP). We described the project to the *Ludwigia* Task Force, which supports it as consistent with its long-term *Ludwigia* management objectives.

Since the Revised Proposal is submitted in response to your letter of May 20th as clarified at our May 26th meeting, the 60-day review process and 30-day notice requirement described in Resolution R1-2008-0061 (Santa Rosa Nutrient Offset Program) are not triggered. This was confirmed by your staff at our May 26th meeting. To implement the Revised Proposal as proposed and consistent with SMP permit requirements, your acceptance is needed by July 15, 2011. The City is developing the necessary agreement with SCWA to implement the Revised Proposal and intends to request approval of the agreement from the Santa Rosa Board of Public Utilities (BPU) on or before July 14, 2011.

As described to you in prior meetings, we estimate that Ludwigia removal and dairy BMPs represent the lowest cost options and will, nonetheless, require expenditure of $400,000 to

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$900,000 per year to offset our median annual nutrient discharge. As such, this represents a major expenditure of ratepayer funds for which the BPU is responsible. I invite you to attend the BPU meeting at which SCWA agreement will be considered to express your support of nutrient offset projects and attest to their contribution to Laguna water quality improvement. I will provide details of the BPU meeting schedule when it is determined.

Consistent with the City's ongoing commitment to compliance with Regional Water Board requirements, I urge you in the strongest possible terms to approve the Revised Proposal by July 15, 2011, so the Revised Laguna Nutrient Offset Project can be implemented.

Should you have any further questions or comments, please contact Mr. Lynn M. Small, Deputy Director Environmental Services, of my staff at telephone number (707) 543-3350.

Thank you for your consideration,

Sincerely,

Miles A. Ferris
Director of Utilities

c. David Bannister, Laguna Foundation
Jon Niehaus, Sonoma County Water Agency
Keenan Foster Sonoma County Water Agency
Dave Smith, Merritt Smith Consulting

Attachments

REVISED PROPOSAL

LAGUNA NUTRIENT OFFSET PROJECT

Revised June 3, 2011

INTRODUCTION

This document describes the Laguna Nutrient Offset Project (Project) and is intended for consideration by the North Coast Regional Water Quality Control Board (Board) as a basis for Project approval under the Santa Rosa Nutrient Offset Program adopted by the Board with Resolution R1-2008-0061. This proposal is organized according to the Nutrient Offset Program information requirements identified in Attachment 1 to Resolution R1-2008-0061.

PROJECT LOCATION

The Project area includes the Laguna de Santa Rosa (Laguna) main channel and its tributaries. Specifically, this project involves *Ludwigia* removal west of Rohnert Park in Sonoma County near the intersection of Rohnert Park Expressway and Stony Point Road. These sites were chosen because they allow work to proceed in heavily impacted channels (and therefore remove the most *Ludwigia*) while refining the methodology for other future locations. Working upstream down reduces propagule pressure into the treatment area both during the treatment and in future years. Target areas for *Ludwigia* removal are:

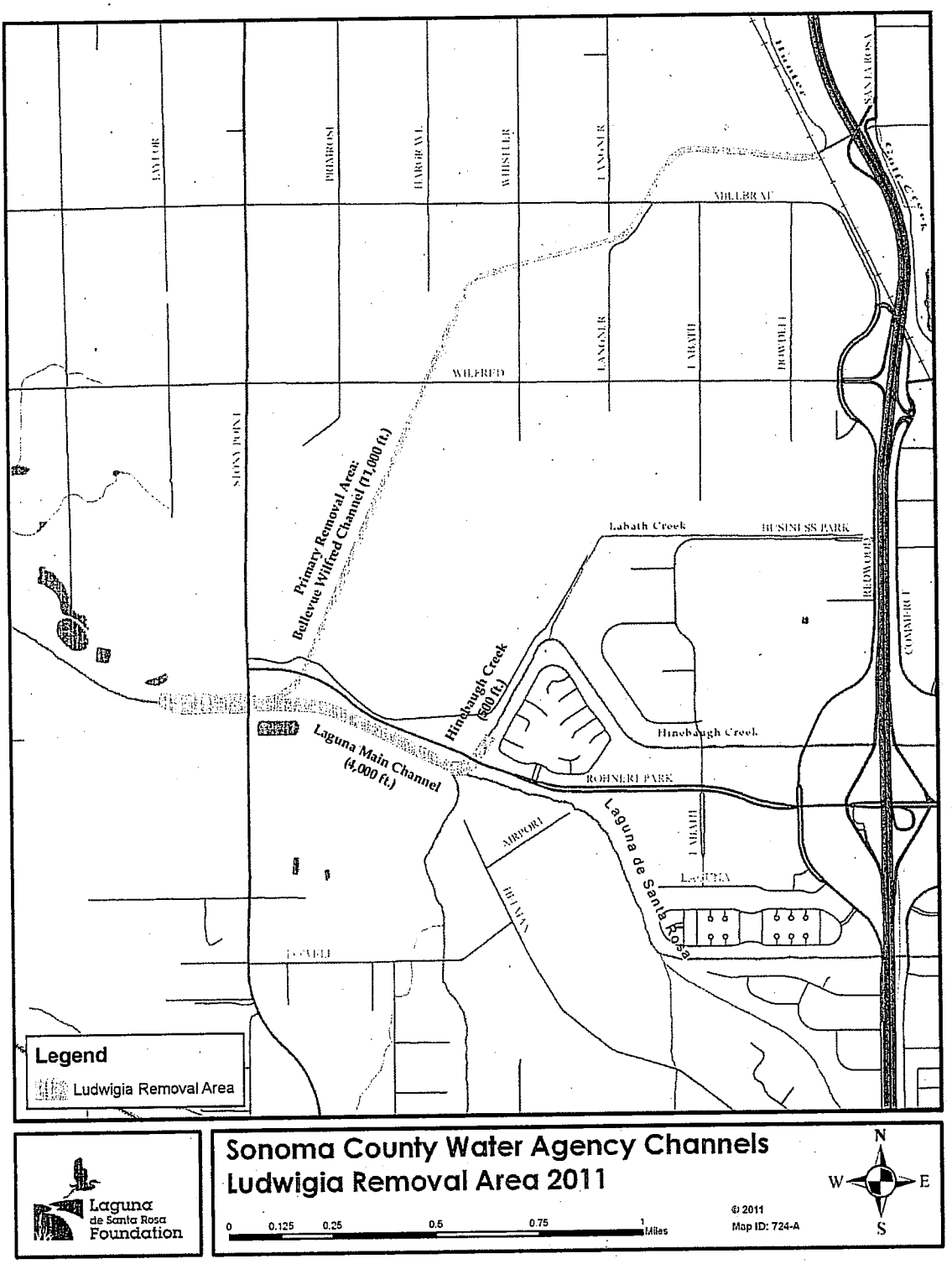
- The 11,000-ft. Bellevue-Wilfred (BW) flood control channel, which runs from Millbrae Avenue to its confluence with the Laguna. The BW channel is a straight trapezoidal channel averaging 75 feet in width. It is fed year-round by urban and agricultural runoff to an average 1–3 foot depth in the dry season.

- A 4,000-ft. section of the Laguna main channel from approximately 200 meters west of Stony Point Road to its confluence with Hinebaugh Creek in Rohnert Park. The channel was straightened in the 1960s and widened in the 1990s to an average 120-foot width.

- A 500-ft. section of Hinebaugh Creek from upstream of the Rohnert Park Expressway to the Laguna confluence.

These locations are shown in **Figure 1**.

Figure 1. Location of *Ludwigia* Removal Area for 2011 Project



PROJECT DETAILS

BACKGROUND

The City of Santa Rosa (City) conducted a preliminary evaluation of the efficacy of *Ludwigia* removal as a nutrient offset option. This evaluation concluded that *Ludwigia* removal could potentially provide some or all of the City's wastewater discharge offset needs. *Ludwigia* removal as a nutrient offset option received tentative support from Board Staff in a January 31, 2011 meeting between City representatives and Board Staff. Therefore the City decided to proceed with developing and implementing a *Ludwigia* removal project to offset potential 2011-2012 nutrient discharge. The Laguna de Santa Rosa Foundation (LF) conducted a *Ludwigia* removal project in the Laguna and Sonoma County Water Agency (SCWA) drainage channels from 2005–2007 (Meisler 2008). Because *Ludwigia* management is consistent with LF's restoration goals and because of LF's prior experience in *Ludwigia* removal, the City is partnering with the LF and SCWA to conduct the Project.

This proposal for nutrient offset credit applies to 2011 only.

Implicit in the methods described in this Proposal is the concept of adaptive management. This Proposal relies heavily on the experiences gleaned from previous *Ludwigia* harvesting conducted in the Laguna and it is expected that most, if not all, potential problems have been anticipated. However, because of the need to adapt to unexpected circumstances, other methods in addition to those outlined in this document may be used as determined based on field conditions. For example if it is determined that harvesting is creating unacceptable water quality conditions, changes to the methodology will be made to ameliorate the problem.

RESPONSIBLE PARTIES

This project will operate in partnership between the City of Santa Rosa (City), the Sonoma County Water Agency, and the Laguna de Santa Rosa Foundation (Laguna Foundation). The City is the sole source of funding for this project.

Keenan Foster, Project Manager
Sonoma County Water Agency
404 Aviation Boulevard, Santa Rosa, CA 95403
(707) 526-5370

Hattie Brown or Catherine Cumberland
Laguna de Santa Rosa Foundation
900 Sanford Rd., Santa Rosa, CA 95401
(707) 527-9277

Lynn Small
City of Santa Rosa
4300 Llano Road
Santa Rosa, CA 95407
(707) 543-3359

TIMING OF REMOVAL.

Ludwigia removal will be conducted during the 2011 dry season subject to terms and conditions of SCWA's Stream Maintenance Program (SMP) permits.

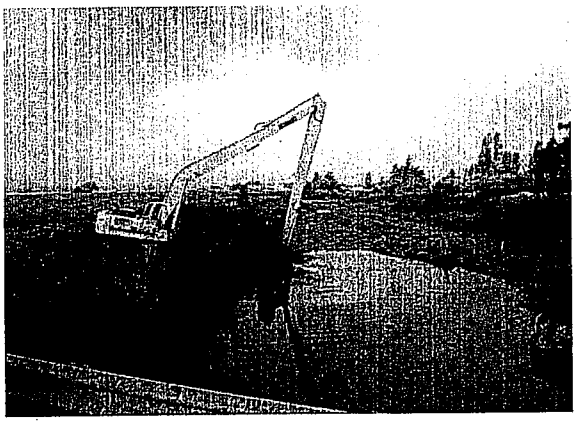
SITE PREPARATION

Staging areas for heavy equipment parking and offloading harvested vegetation are expected to be established in advance. Mobilization and demobilization at the project site may require use of a crane for launching and retrieving equipment from the waterway. If so, a path may need to be cleared. For the 2005 project, clearing of willows and other shoreline vegetation was required to enable unloading of harvested vegetation.

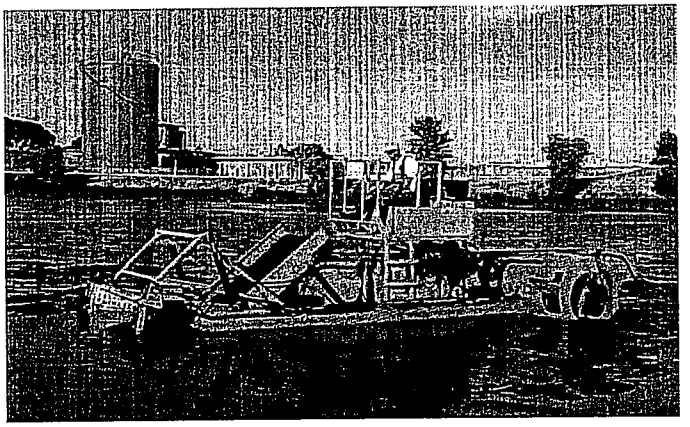
Prior to removal work, a floating boom with an attached silt curtain will be erected across the channel to help confine short-term increases in turbidity to the immediate work area. The silt curtain also captures fragments of *Ludwigia* which could otherwise float downstream and potentially establish the plant in new locations. Removal work is expected to progress from upstream to downstream thus allowing existing vegetation to filter turbid water as it moves downstream.

REMOVAL METHOD

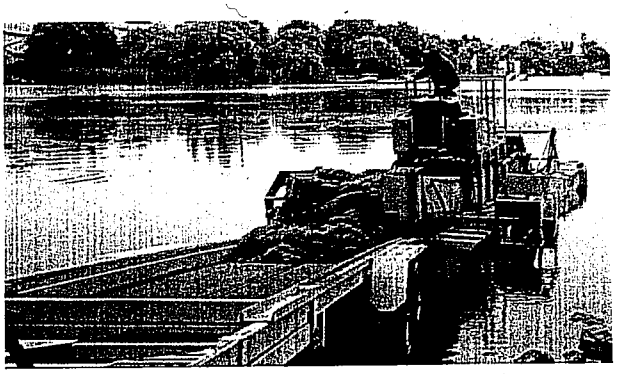
Mechanical removal is expected to be carried out using an excavator with a 70-ft. boom. This type of excavator is very efficient in sites where water is present and can reach up to 62.5 feet. Instead of a general use bucket the boom will have a modified "skeleton" bucket attached. This custom slotted bucket has tines which allow water and excess sediment to drain out before loading plant biomass into trucks for disposal.

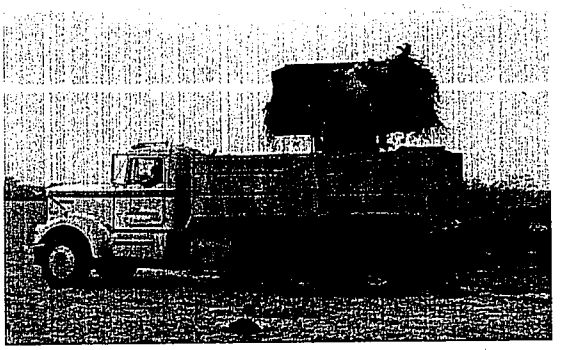


In areas where the long-reach excavator cannot access *Ludwigia* patches (e.g., in the Laguna main channel on both sides of Stony Point bridge), the plant may be gathered via the use of an aquatic harvester. The harvester is designed to collect floating and submerged vegetation to a depth of five feet below the waterline:



The *Ludwigia* removed will either be stockpiled temporarily along the side of channel access roads, placed temporarily in an adjacent storage field, or loaded and hauled to the storage area via truck, then loaded into dump trucks for transport to the permanent disposal site:





If stockpiled, *Ludwigia* will be left to dry for approximately two weeks. After drying, a tub grinder may be used to shred the material. Biomass can be shredded directly into trucks and hauled for immediate disposal, or composted on-site in piles for later transport to the disposal location.

Non bio-degradable trash from stockpiled *Ludwigia* will be removed to the fullest practical extent and disposed of properly.

TRANSPORT METHOD AND ROUTE

Biomass will be transported in dump trucks. Where possible, drivers will avoid use of public roads by accessing staging area and worksites via SCWA maintenance roadways alongside channels where work is conducted. Trucks loaded with wet biomass will stand for at least 10 minutes before transport to allow any excess water to drain. Alternatively, biomass will be first dried at the removal site prior to disposal. If necessary, biomass will also be shredded prior to transport. Biomass will be transported to the City's Kelly Farm for disposal via Stony Point Road north to Todd Road, and Todd Road west to Llano Road and Highway 12 west to Kelly Farm. Contractor will assume responsibility for cleanup of incidental spills of sediment or biomass along public roadways.

DISPOSAL LOCATION(S)

Biomass will be taken to a disposal location where it will be spread and ultimately disked into soil. Possible disposal locations include:

- City of Santa Rosa's Kelly Farm, 5344 Occidental Rd. APN #s 060-010- 005, 027, 028, 030, 032 & 060-020-001, 081, 082, 084, 085.

- City of Santa Rosa's Brown Farm, 2200 Llano Rd. APN #'s 060-060-059 and -060.

All sites are upland and will not directly discharge water, sediment, or *Ludwigia* to surface waterbodies. City farms have an on-going monitoring program and a program to insure application of nutrients at agronomic rates and this addition of nutrients will be a component of the annual nutrient load evaluation.

ROLES AND RESPONSIBILITIES

Roles of the City, LF and SCWA are as follows:

- City. Provide funding, leadership in the planning and reporting phases, water quality and *Ludwigia* nutrient monitoring during field operations, preparation of this proposal, and RWQCB liaison to obtain nutrient offset credit approval.

- LF. Project planning support, ecosystem management perspective, technical advice, follow-up monitoring, and implementation of mitigation. Also management of field operations and implementation of BMPs if selected as the SCWA contractor

- SCWA. Project permitting and CEQA coverage pursuant to terms and conditions of its SMP, and oversight on field operations and implementation of required compensatory mitigation.

QUANTITY OF N AND P REMOVED

The City is entitled to credit for bioavailable nutrients removed. Bioavailability is defined here as those nutrients that have the potential to be used by algae and rooted aquatic plants (macrophytes) for growth. The quantity of nutrients removed or controlled by *Ludwigia* and removal activities will be determined using specific protocols described in this section.

LUDWIGIA REMOVAL

Ludwigia contains nutrients that are mineralized upon plant decay; therefore removing *Ludwigia* removes nutrients that would stimulate additional plant growth. Mineralization, or the conversion of organic nitrogen and phosphorus to nitrate via ammonium species, and bioavailable phosphorus occurs in decomposition of aquatic vegetation such as *Ludwigia*. Therefore, nutrient offset credit for *Ludwigia* removal is appropriate. This section describes the procedure that will be used to estimate nutrient offset credit for *Ludwigia* that is removed.

Offset credit is mass of N and P, with the nutrient mass removed calculated as follows (the example given is for N, but the calculations will be the same for N and P):

$$\text{Total N removed} = \sum(WWLl*NLl*BFLl)+(WWLsh*NLs*BFLsh)+(WWS*NS*BFS)$$

Where: WWLl = total wet weight of *Ludwigia* leaves removed
NLl = nitrogen content of *Ludwigia* leaves per unit wet weight
BFLl = bioavailability factor of *Ludwigia* leaves
WWLsh = total weight of *Ludwigia* shoots (non-leaf biomass) removed
NLsh = nitrogen content of *Ludwigia* shoots per unit wet weight
BFs = bioavailability factor of *Ludwigia* shoots
WWS = total weight of sediment (non-leaf biomass) removed
NS = nitrogen content of sediment per unit wet weight
BFS = bioavailability factor of sediment

The methodology for determining each of these factors is as follows:

WWLl, WWLsh, WWS. Harvesting likely will be conducted using a long-reach excavator equipped with a skeleton basket that will strain the vegetation and result in very little sediment or water removal although in some locations a harvester may be needed. The removed material may be stockpiled for several days nearby before disposal by dump truck. The total wet weight of

Ludwigia leaves removed, *Ludwigia* shoots, and whatever sediment is present will be measured immediately prior to disposal by weighing at least four dump trucks in full and empty condition. This will be used as an estimate of the weight removed of subsequent full truck loads. Although attempts will be made always to remove full truck loads, this may not always be possible. Therefore, the truck volume will also be measured (or the information will be obtained from the contractor). The ratio full truck weight to truck volume will be used to estimate the weight of a partial truck load. At least four composite samples of harvested material will be collected at the time of disposal and taken to the Laguna Environmental Laboratory. In the lab, the percent composition by wet weight of *Ludwigia* leaves, *Ludwigia* shoots, and sediment will be determined so that the composition of the total wet weight can be estimated.

NLl, NLsh, NS. The nitrogen (and phosphorus) content of each of the three types of harvested material will be determined in each of the field samples.

BFLl, BFLsh, BFS. Research conducted by Dr. Brenda Grewell (UC Davis) indicates early *Ludwigia* leaves (leaves measured early in the growth season) have zero N and P left by <100 days and, extrapolating from the graphs she provided, late leaves (leaves measured late in the growing season) have zero N and P left by about less than 150 days. Therefore, leaves decay within a year and 100 percent of the leaf biomass is bioavailable (BFLl = 1). However, Dr. Grewell's work indicates that within about 170 days (the study was not conducted for a full year) *Ludwigia* shoots have lost only about 20 percent of their N and 60 percent of their P. Therefore the BFLsh for nitrogen will be 0.2 and for P it will be 0.6. At this time, the City is not seeking offset credit for nutrients contained in removed sediment. Therefore, the BFS is = 0 for purposes of the 2011 Project.

MARGIN OF SAFETY

According to the Resolution, the Santa Rosa Nutrient Offset Program should include a MOS to address uncertainty in offsets. Uncertainty within credit estimation methods can be attributed to input parameter variability, over-simplification, assumptions made in the absence of data, variations in laboratory analyses or sampling methods, and/or stochastic variability in the environment affecting averaged non-point source loading assumptions.

For this project, some of the parameters that enter into the calculation of offset credit are measurements of the entire "population" (such as number of truck loads) and thus are not subject to variance and do not require a MOS. Some of the parameters involve measurements of a sample of the entire population and have associated uncertainty, and this uncertainty should be reflected in the MOS. Table 1 summarizes parameters that are used in the offset calculation and classifies them as to whether they are "sample" parameters (thus a component of the calculated MOS) or "population" parameters (not a component of the calculated MOS). To account for uncertainty represented by sample parameters, the City will use the sample mean +/- one standard error (SE) associated with sample parameters for a MOS. Whether the SE is subtracted or added depends on the parameter, whichever is most conservative (i.e. reduces the offset credit) will be used.

Table 1. Parameters that are used in the offset calculation.

Sample Parameters	Population Parameters
Weight of harvested material per dump truck	Dump truck empty weight

Percent composition of harvested material	Dump truck volume
Nutrient content of the harvested material	Number of dump truck loads removed
Bioavailability factor	

Further MOS is attained by not taking credit for nutrients in sediment removed, nutrients lost through further decay of shoot material (past the 170 days of the Grewell study) and nutrients released by the anoxia resulting from decayed *Ludwigia*. In addition, the nutrients removed in this project are directly available in the parts of the Laguna that are most impaired, whereas, the nutrients that are being offset (nutrients in the City's effluent) occur in winter when unavailable to stimulate growth and at a location downstream of the parts of the Laguna most impaired.

MONITORING PLAN

WATER QUALITY MONITORING

Beginning approximately one week prior to commencement of harvesting, the City will monitor water quality conditions using data loggers placed at strategic locations or via hand held units.

Parameters for water quality monitoring will include:

- Temperature
- Turbidity
- pH
- Dissolved oxygen

During mechanical removal, dissolved oxygen, turbidity, pH, and temperature readings will be taken via grab samples daily, data loggers, or hand held units, depending on accessibility and movement of machinery. Water quality monitoring will continue after harvesting until stable or baseline conditions have been achieved. Water quality parameters will be evaluated in as near real-time as practical. If significant adverse changes in water quality conditions are observed the field crew will contact SCWA and the City/Merritt Smith Consulting (Dave Smith or Marcie Commins) who, in consultation the selected SCWA contractor, will make changes to the harvesting, or, if necessary halt harvesting, until water quality conditions are restored.

In addition, samples for chlorophyll *a* analysis (an indicator of phytoplankton abundance) will be collected before and after the project to help determine whether a shift from macrophyte dominance to phytoplankton dominance has occurred

PROJECT AREA MONITORING

Photo monitoring and vegetation monitoring will be used to provide a qualitative assessment of the project. Photo points and vegetation transects will be established throughout the project area. Photos will be taken and vegetation will be monitored before after mechanical removal. Transects will be arranged to capture variability including factors such as water depth and others as identified.

Follow-up monitoring of plant coverage at site(s) from which *Ludwigia* is removed will be conducted using standard plant coverage estimating methods possibly including line intercept, point intercept, and quadrat sampling methods.

POTENTIAL IMPACTS AND MITIGATION

The Nutrient Offset Project is a mitigation project, undertaken to offset nutrients entering the Laguna via discharges from the City's Delta Pond. *Ludwigia* infestation has numerous ecologically detrimental impacts. Because of the restorative nature of *Ludwigia* removal, the project is to a certain extent self-mitigating. Potential impacts to water quality and biota and associated mitigation are discussed in the SCWA Stream Maintenance Program (SMP) 2011 Projects Supplemental Notification for City of Santa Rosa's Nutrient Reduction Strategy submitted concurrent with this proposal. Mitigation includes all of the Best Management Practices (BMP's) listed in the SMP which cover General Impact Avoidance and Minimization; Air Quality Protection; Biological Resources Protection; Cultural Resources Protection; Hazardous Materials Safety; Vegetation Management; Water Quality and Channel Protection (Apply Erosion Control Fabric to or Hydroseeding of Exposed Soils; Good Neighbor Policies; Public Outreach; Noise Control; Traffic Flow, Pedestrians, and Safety Measures; and Odor Control. Tree mitigation includes the provision that any native tree or native analog tree (Appendix E, of the SMP Manual) larger than 4 inches diameter at breast height would be replaced (at the specified replacement ratios identified below, in suitable locations) and monitored for five years. To offset the temporal loss of in-stream vegetation resulting from implementation of the project, in-stream planting will be conducted following SMP restoration techniques. This involves installing appropriate in-stream graminoids along the toe of the slope following removal of *Ludwigia* from the water column.

BEST MANAGEMENT PRACTICES TO CONTROL TURBIDITY IMPACTS

Three additional BMP's will be utilized to minimize and contain turbidity:

- Control pace of work at all times to minimize stirring of sediments;
- Work in an upstream to downstream direction to allow existing *Ludwigia* to act as a filter of turbid waters; and
- Deploy silt curtain at the downstream end of the project area to prevent turbid water from leaving the site. This will also capture *Ludwigia* propagules and prevent downstream spread of *Ludwigia* resulting from harvesting.

EXPECTED LIFE OF PROJECT

The Project is scheduled to occur in the summer of 2011 prior to the 2011-2012 discharge season, during which the zero nutrient discharge limit is scheduled to take effect. Therefore, any credit for nutrients removed by the Project would be banked and then applied to offset the discharge of nutrients for the three discharge seasons beginning with the 2011-2012 discharge season as described in Resolution R1-20080061.

REPORTING PLAN

The nutrient offset credit derived from Laguna Nutrient Offset Project removal will be calculated using an estimate of the bioavailable nutrients as described in the Quantity of N and P Removed section above. This information will generally be available in fall 2011 and prior to the 2011-2012

discharge season. By spring 2012 and after the 2011-12 discharge season, the quantity of nutrients discharged and the quantity of nutrients removed (as calculated the fall 2011), will be tabulated and reported on or before July 1st, 2012 consistent with the Nutrient Offset Policy (see Section 5 of Attachment 1 to Resolution R1-2008-0061). Follow-up monitoring of vegetation coverage will be reported annually by the Laguna Foundation under contract to the City.

CEQA COMPLIANCE

The City conferred with key permitting agencies (i.e., DFG and RWQCB) and determined that permitting of the project under SCWA's Stream Maintenance Program (SMP) is the preferred permitting approach. The SMP EIR upon which the SMP permits are based covers the proposed activity. The SMP EIR and permits include measures to avoid or mitigate water quality impacts.

REFERENCES

Meisler, Julian. 2008. *Ludwigia* Control Project Final Report.

Laguna Nutrient Offset Project Proposal – Response to Comments

In March 2011, the City of Santa Rosa (City) submitted a proposal to the North Coast Regional Water Quality Board for consideration by the North Coast Regional Water Quality Control Board (Board) as a basis for approval of the Laguna Nutrient Offset Project Proposal (Project) under the Santa Rosa Nutrient Offset Program adopted by the Board with Resolution R1-2008-0061. The Board rejected the Laguna Nutrient Offset Project Proposal (Proposal) for reasons outlined in a letter dated May 20, 2011. The purpose of this Response to Comments is to address the Board's issues with the Proposal, explain revisions to the proposal and support approval of the revised proposal. This Response to Comments includes each of the issues identified in the Board's May 20, 2011, letter (in bold) and the City's response follows.

1. **The Board states that simply removing *Ludwigia* in open water without reducing the water column nutrients will simply shift the system to a eutrophic phytoplankton driven system.** (From page 2 Attachment B) The proposed Project removes nutrients that have already entered the system. The nutrients bound in *Ludwigia* biomass decay rapidly and are transported downstream to areas not dominated by *Ludwigia* and support a eutrophic phytoplankton driven system. Removing *Ludwigia* prior to decay controls an internal source of nutrient loading, which has value to controlling downstream phytoplankton. If and when upstream external nutrient sources are controlled under other City offset projects and the TMDL, *Ludwigia* will continue to proliferate in the absence of an active *Ludwigia* control program and represent in internal nutrient source. Thus, *Ludwigia* removal represents a legitimate and effective nutrient control strategy. In addition, decaying *Ludwigia* results in anoxia which, in turn, results in nutrient release from the sediment. The City's Project will reduce this source of nutrients in the Laguna although the City is not seeking offset credit for it. The City is developing other projects to control external nutrient sources, but as discussed in meetings with Board staff, such projects require longer lead times. The City expects to propose external nutrient control projects later in 2011 for approval and implementation in 2012.

2. **The Board stated that the Project fails to identify a specific project location.** As was conveyed to Board staff prior to submitting the proposal, not all of the details of the Project had been resolved by the time the proposal was submitted. However, since that time many of the details, such as specific locations have been developed. The specific removal sites are described in the Revised Laguna Nutrient Offset Project Proposal (Revised Proposal) to which this Response to Comments is attached.
3. **The Board stated that the Project fails to include units of the selected decay rate.** The decay rate is described in a simplified manner in the Proposal as the standard rate coefficient, which applies to growth and decay, with standard units of time^{-1}. This decay rate coefficient (k) is a component of the following equation to calculate the mass or quantity (M) at time t based on initial M (M_0):

$$M_t=M_0e^{-kt}$$

In this specific case, the units of the loss for macrophyte leaf litter due to decomposition in units of year^{-1}. Kadlec and Wallace (2009 page 78) present a table with rate loss coefficients (k_1) and the resulting half-life to describe decomposition for plants in wetlands. This table is reproduced below.

Table 3.8 Summary of Lumped Loss Rate Coefficients for Herbaceous Plants in Various Wetlands (Kadlec and Wallace, 2009)				
Species	Data Sets N	Mean k_1 (yr^{-1})	Median k_1 (yr^{-1})	Mean Half-Life (d^{-1})
All submersed species	107	17.3	10.2	15
All floating species	80	13.9	8.9	18
All emergent species	280	3.03	0.80	83

4. **The Board stated that the Project fails to provide adequate justification for the decay rate and nutrient bioavailability.** The Board further stated that some such factors that should be addressed to justify the suggested percent bioavailability include the rate of decay, the rate and extent of mineralization, and the residence time of *Ludwigia* in the system (i.e., an accounting for losses of *Ludwigia* during high flows).

   Rate of decay. As described above, the rate of decay used in the Proposal came from Kadlec and Wallace (2009), a widely used textbook on treatment wetlands. The median decay rate was the median of 80 data sets. However, since the Proposal was submitted, actual decay rates of *Ludwigia* in the Laguna were obtained from Dr. Brenda Grewell, UC Davis. These decay rates have been incorporated into the Revised Proposal as bioavailability factors. These bioavailability factors were confirmed by Dr. Grewell as appropriate given the information that is currently available (B. Grewell pers. comm. to M. Commins, Merritt Smith Consulting, 3 June 2011)

   Percent Extent of mineralization. According to Kadlec and Wallace (2009) decomposition generally refers to the disintegration of dead organisms into particulate form (or detritus), and the further breakdown of large particles to smaller and smaller particles, until the structure can no longer be recognized and complex organic molecules have been broken down into CO_2, H_2O, and mineral components. Therefore, the decomposition rates used in the Revised Proposal are for complete mineralization.

   Residence time of *Ludwigia*. To our knowledge, the amount of *Ludwigia* lost via scour is not known, nor is it known what velocity will dislodge *Ludwigia*. However professional judgment (Keenan Foster, SCWA; David Bannister, Hattie Brown, Laguna Foundation) is that since it is rooted in the sediment velocities in the Laguna never get high enough to result in significant loss of *Ludwigia*. Otherwise, it would not accumulate in such large quantities.

5. **The Board stated that the Project fails to include a Margin of Safety (MOS).** According to the Resolution, the Santa Rosa Nutrient Offset Program should include a MOS to address uncertainty in offsets. A MOS has been incorporated into the calculation of offset credits as described in the Revised Proposal.

6. **The Board stated that the Project fails to exclude the *Ludwigia* and soil water-weight from the nutrient offset calculation**. The proposal describes the nutrient offset calculation as multiplying the mass removed by the nutrient concentration. The mass in, for example, kg wet weight would be

multiplied by the nutrient content measured per unit wet weight (mg/kg). Therefore, the water weight cancels out resulting in nutrient content in mg.

7. **The Board stated that the Project fails to propose monitoring to evaluate the likely potential for rebound blooms of phytoplankton (which could be dominated by blue green algae).** Monitoring of phytoplankton biomass has been added to the water quality and *Ludwigia* the monitoring program in the Revised Proposal. Monitoring of chlorophyll is proposed to evaluate for rebound blooms.

8. **The Board stated that the Project fails to include provisions to assess candidate *Ludwigia* removal locations to determine actions that could be undertaken to achieve long-term control of the pest population.** The Sonoma County Water Agency is currently addressing sediment and *Ludwigia* colonization downstream of the proposed Project area by removing sediment, increasing capacity, and conducting onsite restoration activities required under the SMP and programmatic permits. The object of these efforts besides restoring stream capacity and enhancing habitat is to reduce water backing up into Rohnert Park/ Cotati from the Laguna de Santa Rosa Flood Control Channel and tributaries during high flows and (key for these areas) to lower the summer water level. Lower water levels will reduce the habitat available for *Ludwigia* to colonize. Following the reduction of summer water levels, the Water Agency would evaluate what channel morphology associated with sediment removal in these areas would further reduce habitat available for *Ludwigia* colonization and implement strategies to realize this goal. Essentially applying a two pronged approach that includes follow-up management; 1) change habitat conditions that are supporting the plant, and 2) control regrowth (through limited, focused, backpack herbicide application). To apply an approved herbicide in the manner will require the Water Agency to obtain a NPDES general permit for aquatic herbicide use. The Water Agency has begun the process to obtain this permit and anticipates being able to implement control measures this year following *Ludwigia* removal. The City's Laguna *Ludwigia* Offset Project provides the Water Agency with an opportunity to start managing *Ludwigia* through these up-stream reaches prior to conducting sediment removal by removing a large source of propagules from the system (that are colonizing sediment removal projects downstream).

9. **The Board stated that the Project fails to acknowledge the lessons learned from previous *Ludwigia* removal projects sponsored by the Laguna Foundation.**

   In an e-mail to Dave Smith dated 24 May, 2011, Kason Grady listed some examples of lessons learned as follows:

   - **The need for a thorough site-specific implementation plan that includes redundant water quality protections and predetermined alternative plans for in-the-field changes.** Water quality is protected via BMPs designed to reduce turbidity impacts. These are described in the Revised Proposal. In addition, water quality monitoring will continue after harvesting until stable or baseline conditions have been achieved. Water quality parameters will be evaluated in as near real-time as practical. If significant adverse changes in water quality conditions are observed the field crew will contact Merritt Smith Consulting (Dave Smith or Marcie Commins) who, in consultation with Hattie Brown (Laguna Foundation) and Keenan Foster (SCWA), will make changes to the harvesting, or, if necessary halt harvesting, until water quality conditions are restored.

- **The importance of a thorough water quality monitoring program before, during, and after the Project.** Water quality monitoring program, described in the Revised Proposal includes monitoring temperature, dissolved oxygen, turbidity and pH, before, during and after the Project.

- **The importance of considering the effect of the activity on the larger *Ludwigia* population.** Harvesting activities have the potential to break off propagules which can result in the establishment of downstream populations of *Ludwigia*. The Revised Proposal includes measures designed to prevent this, including working from upstream locations to downstream locations and the use of a silt containment curtain downstream of the work area. Long-term control of *Ludwigia* is discussed in response to comment #8 above.

- **The need for sediment control BMPs if not dewatering,** BMPs designed to reduce turbidity impacts are outlined in the Revised Proposal, and they include.

    1. Control pace of work at all times to minimize stirring of sediments;

    2. Work in an upstream to downstream direction to allow existing *Ludwigia* to act as a filter of turbid waters; and

    3. Deploy silt curtain at the downstream end of the project area to prevent turbid water from leaving the site. This will also capture *Ludwigia* propagules and prevent downstream spread of *Ludwigia* resulting from harvesting.

- **The need of mitigation for these impacts and the inappropriateness of a categorical exemption from CEQA.** This is discussed in response to comment # 10 below.

- **The need to monitor disposal sites to ensure application and degradation at agronomic rates, adequate prevention measures for stormwater runoff, and monitoring of nuisance conditions.** All sites are upland and will not directly discharge water, sediment, or *Ludwigia* to surface waterbodies. City farms have an on-going monitoring program and a program to insure application of nutrients at agronomic rates and this addition of nutrients will be a component of the annual nutrient load evaluation.

Other lessons learned (provided by the Laguna Foundation) are as follows:

- Lessons learned regarding impacts on water quality and the general Laguna environment. The potential impacts of the Project and mitigation are discussed under item #10 below.

- Lessons learned regarding long-term control of *Ludwigia*:

    - Control efforts tend to be more successful in deeper water or in areas that dry completely. .

    - Mechanical removal can provide 1-3 years of control, possibly more, depending on depth and plant density.

    - Ongoing maintenance will be required until underlying hydrologic, nutrient loading, and other systemic problems are addressed.

The Revised Proposal includes monitoring of regrowth to determine how and where *Ludwigia* and other species reestablish to determine how frequently removal needs to occur and how effective treatment is. SCWA is currently addressing sediment and *Ludwigia* colonization as described in response to comment # 8 above. The City's proposed Project would be implemented in deeper water at locations that can be reached with the type of equipment considered most effective as a result of the Laguna Foundations prior Ludwigia control work.

- Lessons learned regarding the use of herbicides:
    - Neither glyphosate (Glypro®) nor triclopyr (Renovate 3®) provided systemic control at the rate used and the timing of application.
    - Results may improve in less dense infestations.
    - If glyphosate is used care should be taken not to coat plants in fine sediment while spraying. This can happen when using equipment like the MarshMog, which drives over the plant as it sprays. Glyphosate coming in contact with sediment becomes inactive."
    - In dense infestations (e.g. entire channels covered in thick mats) it may be better to remove first and then spray regrowth.
    - Spraying dense infestations without removing biomass will cause unacceptable drops in dissolved oxygen concentrations."

The use of pesticides is not a part of this proposal. However, as described above, SCWA is considering follow-up treatment through limited, focused, backpack herbicide application. To apply an approved herbicide in the manner will require the SCWA to obtain a NPDES general permit for aquatic herbicide use. The SCWA has begun the process to obtain this permit and anticipates being able to implement control measures this year following *Ludwigia* removal.

10. **The Board stated that the Project fails to anticipate a process of CEQA compliance that includes mitigation for potential impacts. In addition, the Board states that the Proposal erroneously anticipates a categorical exemption for CEQA compliance, based solely on the rationale of the 2005-2007 Laguna de Santa Rosa Foundation *Ludwigia* removal project that was considered categorically exempt. The 2005-2007 Laguna Foundation *Ludwigia* removal project resulted in impacts to water quality, which would be foreseeable for the proposed project and require a higher level of CEQA compliance that would include, at a minimum, mitigation.** Since submittal of the City's Proposal, the City conferred with key permitting agencies (i.e., DFG and RWQCB) and determined that permitting of the proposed Ludwigia Removal Project under SCWA's Stream Maintenance Program (SMP) is the preferred permitting approach. The SMP EIR upon which the SMP permits are based includes the proposed *Ludwigia* removal activity. The SMP EIR and permits include measures to avoid or mitigate water quality impacts. These measures are therefore included in the proposed *Ludwigia* Removal Project and described in the SCWA Stream Maintenance Program (SMP) 2011 Projects Supplemental Notification for City of Santa Rosa's Nutrient Reduction Strategy submitted concurrent with the Revised Proposal.

11. **The Board states that the Proposal does not appear to be a good long-term option to offset nutrients in the Laguna de Santa Rosa (the Laguna) because it makes no attempt to control sources of nutrients to the Laguna from areas outside of the water body and it does not address**

long term maintenance to assure the *Ludwigia* does not repopulate after its removal. (From Letter) Resolution No. R1-2008-0061 does not require a long-term solution. The City's Laguna Nutrient Offset Project provides many benefits that are consistent with the Nutrient Offset Policy as follows:

- Removes nutrients that have been harvested and incorporated into biomass in the process of Ludwigia growth;
- Ludwigia decay consumes dissolved oxygen, a constituent for which the Laguna is considered impaired;
- Ludwigia-caused anoxia liberates nutrients from sediment. Thus, Ludwigia removal not only removes nutrients that have been harvested in the process of Ludwigia growth, it also helps control another internal nutrient source;
- Ludwigia removal provides SCWA and the Laguna Foundation with an opportunity to start managing *Ludwigia* through these up-stream reaches prior to conducting sediment removal by removing a large source of propagules from the system.
- The decaying plant material also contributes to sediment (another item the Laguna is impaired for)
- The removal of the plant material frees up the ecosystem for waterfowl, and aquatic mammals (river otter, mink)
- The removal of the plant material improves the public's perception of and ability to use the Laguna for recreation
- The removal of the plant material has a major positive impact on mosquito numbers