



## MEMORANDUM

**TO:** Dr. Kathy Chaston and Adrienne Loerzel, NOAA CRCP; Vangie Luan and Esther Taitague, Guam Coastal Management Program, Bureau of Statistics and Plans (GCMP); and Margaret Aguilar, Guam Environmental Protection Agency (GEPA)

**FROM:** Anne Kitchell & Michelle West, Horsley Witten Group (HW); and Dave Hirschman, Center for Watershed Protection (CWP)

**DATE:** September 18, 2012

**RE:** Summary of Guam Rain Garden Installation Clinic

This memorandum provides a brief summary of the September 7, 2012 rain garden installation clinic at the Santos Memorial Park and the Piti Church Community Center in Guam. The purpose of the clinic was to construct a demonstration rain garden and to provide written materials that can be adapted by GCMP for a more formal rain garden guide.

A number of planning meetings were required in advance of the workshop to choose an ideal site, review the design plan (Figure 1), secure materials, and navigate the permitting process. Esther Marie Taitague (GCMP), Adrienne Loerzel (NOAA), Margaret Aguilar (GEPA), and Dave Hirschman (CWP) were primarily responsible for coordination efforts. Also, this workshop would not have been possible without the support of the Piti Mayor's Office. Attached is a workshop agenda, material/supply costs list, and workshop evaluation form summary.

There were over 40 participants at the one-day installation clinic including a mixture of Piti residents, Island Girl Power/Ayuda Foundation, NRCS, some folks interested in installing rain gardens at local schools, two private landscaping companies, University of Guam Extension, and agency staff from GCMP and GEPA (see GCMP for a complete participants list). HW and CWP were the primary trainers during the clinic; however, Adrienne Loerzel and Roland Quitugua (Rhino Beetle Eradication Project) also provided instruction on the selection and placement of plants. The workshop included classroom sessions on rain garden features, site selection and design, as well as hands-on installation in the park.

Each participant was given a Guam-specific rain garden installation training guide, as well as copies of the rain garden plan for Santos Park. Electronic copies of all instructional materials, training slideshows, and other materials will be made available to GCMP for distribution to interested participants. CWP created a time-lapse video of the installation process that can be provided upon request.





The installation at Santos Memorial Park was constructed adjacent to the existing (new) pavilion at the park to collect, infiltration, and filter rainwater that runs off three sides of the rooftop of the pavilion (Figure 2). For a video of the installation created by CWP, go to <http://www.youtube.com/watch?v=B2u2t-Z32rY&feature=related>.

**Figure 2.** Participants and completed rain garden at the end of the installation clinic.



The maintenance responsibilities for the rain garden have been accepted by a local Piti resident and the Mayor's Office. A suggested maintenance plan is attached to this memo. The installation involved the following key elements:

- Rough excavation with a backhoe (~12 inches) of a 400 square foot rain garden (with gradual side slopes) along part of the southern and western edges of the pavilion (Figure 3) was completed two days in advance of the clinic. Fine grading was completed by participants with shovels. The excavator was deemed necessary because the existing limestone fill in the area was extremely difficult to dig through. Also, digging would have used up all the volunteer time that was otherwise used for more instructive activities, such as backfilling with sand/compost and planting. Excavation with a backhoe of a shallow trench along the eastern and a part of the southern side of the pavilion was also done in advance. The trench gradually increased in depth from a few inches to approximately 6 inches.

- Participants backfilled the bottom 6 inches of the rain garden with a sand and compost amendment to improve infiltration and help support plant growth (Figure 4). Compost was donated by Adrienne’s family.
- Participants added a 3-inch mulch layer of shredded coconut palm and other organic debris donated by the Rhino Beetle Eradication project that was treated with biological agent to prevent Rhino Beetle infestation (see Figure 4). This left a ponding depth of approximately 6 inches, which will hold water temporarily after a rainfall event (for less than 24 hours).
- The trench was filled by participants with 3-4-inch diameter, washed coral stone (Figure 5). Thirty feet of perforated pipe (3-inch diameter) was installed in the stone on the southern side of the trench to convey water into the rain garden and also to accommodate future construction of a walkway.
- Participants planted a mixture of native and other locally-available species including ornamental taro, red joyweed, red ginger, caladium, masiksik, Japanese flatsedge, miniature ti plants, mondo grass, crotons, sea purslane, bromeliads, gaogao uchan, figwort, lemongrass, and Indian fleabane (Figure 6). See Adrienne at NOAA for a final planting plan. Newly installed plants were watered.
- A “rough” percolation test was conducted during the afternoon to demonstrate how these techniques can be replicated at other sites. Techniques generally followed the guidance in the Rain Garden Installation Guide, but we also compared two techniques (sleeved and unsleeved test holes).
- In advance of installation, an erosion and sediment control plan was filed with GEPA, and clearance was granted from the historic preservation office. Stabilization of stockpiles and exposed soils was done on-site with a combination of tarps, silt fence, and hydroseeding (Figure 7).

**Figure 3.** An excavator (with operator) was hired to excavate the rain garden and trench in advance of the workshop. Note the orange spray paint used to delineate the rain garden surface.



Figure 4. Filling of the raingarden bottom with sand and compost mixture followed by mulch layer.



Figure 5. Filling trench at the roof drip line with stone and perforated pipe.



Figure 6. Planting through mulch layer.



Figure 7. As part of the following week's Erosion and Sediment Control Training, we went back out to Santos Park and hydroseeded bare soils and installed a silt fence.



A short interview with Peggy Denny of the “Where We Live” show on News Talk K57 was conducted by GCMP, HW, and CWP to discuss the upcoming coastal cleanup and the rain garden installation (Figure 7). Additional news coverage can be found at <http://www.kuam.com/story/19480229/2012/09/07/volunteers-build-rain-garden-in-piti>.

Figure 7. Inside Peggy's studio with Tom Quinata from GCMP.



Some follow-up items for GCMP and NOAA include:

1. Clean up remaining stockpiles. Use some of the remaining mulch to build a small berm around the outside edge of the rain garden. This may help keep out grass from adjacent hydroseeding area and provide a clearer boundary for the garden.
2. Discuss benefits of placing stepping stones in the ideal location in the rain garden.
3. Establish a long-term maintenance plan for the rain garden. The mayor's office and a local Piti resident have committed to short-term maintenance (Figure 8). See suggested maintenance plan attached to this memo.
4. Prepare a schedule for tracking this rain garden's success, particularly with the various plants used. Send photos to HW and CWP of the rain garden over the next few months. Try to get out there when it is raining.
5. Prepare draft educational signage to be placed at the pavilion to inform visitors about the rain garden and its role in helping to protect water resources in Guam. HW will work closely with GCMP to complete this.
6. Prepare a Guam Rain Garden Guide; GCMP has funding for this already.

Figure 8. Piti resident/maintenance lead will need to make sure plants are getting enough water.



## **Attachments**

Agenda

Supplies Cost List

Evaluation Form Summary

Maintenance Recommendations

# Rain Garden Training Workshop

September 7, 2012  
Piti Church Community Center

## Agenda

- 8:00**                      **Registration**
- 8:30 – 9:00**              **Rain Gardens & Stormwater Introduction**  
*What is a rain garden, its function, and key features. Where are good places for rain gardens. Show photos of what rain gardens look like.*
- 9:00 – 12:00**            **Rain Garden Installation (at Santos Park)**  
*Hands on installation of rain garden; walk across street to Santos park pavilion. Spend the morning fine grading, installing French drain, and amending soils.*
- 12:00 – 1:00**            **Lunch (Provided, back at the Community Center)**
- 1:00 – 2:30**              **Rain Garden Design and Maintenance**  
*How do you determine how big the rain garden should be? What is so important about soils on site? How does water get in and out of the rain garden? What plants do you use? Where do you get materials? What kind of maintenance is required?*
- 2:30 – 4:00**              **Planting, Mulch, Watering (at Santos Park)**  
*Let's finish what we started! Walk back to the park to install the plants.*
- 4:00 – 5:00**              **Rain Garden Celebration in the Park**  
*Recap of all that was accomplished today. Take a quiz to test your skills. Answer any last questions. Have a few beers!!*

***Please bring appropriate clothing to do landscaping work. Bring work gloves and a shovel. Shade and water will be provided, but you may want also want to bring a hat and your own bottle of water.***



**Guam Rain Garden Workshop Materials & Costs**

Item	Vendor	Cost	Notes
<b>Rain Garden Materials</b>			
Sand	Hawaiian Rock Products	\$610.00	4.5 tons (\$495) + \$112.20 for delivery
Compost	Adrienne Loerzel	donated	Composted Horse Manure
Mulch	Rhino Beetle Eradication Project	donated	Aged shredded coconut
Plants	Amot Taotao Tano Farm	\$90.00	Native plants
Plants	Greenscape Nursery	\$131.00	Ornamental plants
Washed Coral Stone	Smithbridge	\$60.00	2 CY, 3-4 inch stone
More coral stone	Perez Brothers	\$25.00	1 CY, 1-2 inch stone
Perforated 3" corrugated plastic pipe with end cap	Home Depot	\$20.00	30 lf, sold by 10 ft lengths
Fabric staples	Home Depot	\$30.00	2 packs of 75
Hydroseeding	LMS	donated	hydroseeding used to stabilize bare areas around garden
<b>Rain Garden Prep</b>			
Excavation	Ben Lujan Towing	\$320.00	4 hours, \$55/hour + \$100 transport fee
Spray Paint	Home Depot	\$6.00	To mark rain garden for excavator
<b>Workshop Materials</b>			
Tools	Benson	NA	shovels, rakes, silt fence, trowels, hack saw, weed block, etc.
Plastic Sheeting, Power Strip	Mark's Hardware	\$45.00	
Tarp, trash bags, shovel	Mark's Hardware	\$70.00	12'x20' tarp

\* These costs are for the Santos Memorial Park installation. We encourage looking into alternative suppliers for sand, plants, and other supplies. The silicon-based sand is the largest expense item on this list, for example. We recommend looking into the recycled/pulverized glass available at Anderson, as well as looking into supplies at golf courses. Remember to avoid using the limestone sand as an amendment.

# EVALUATION FORM SUMMARY

## Guam Rain Garden Installation Clinic

### September 7, 2012

**N=15**

**1. Please rate your agreement with the following statements. Circle your response.**

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree, NA = does not apply.

	1	2	3	4	5	NA	Avg.
I know how to choose a proper site for a rain garden.	0%	0%	7%	53%	40%	0%	4.3
I know how to prepare a rain garden.	7%	0%	0%	47%	47%	0%	4.0
I know how to maintain a rain garden.	7%	0%	0%	67%	26%	0%	4.1
I know how to create a landscape design for a rain garden	7%	0%	7%	67%	20%	0%	3.9
I know the costs involved with installing a rain garden	0%	13%	13%	67%	7%	0%	3.7
I know how to correct standing-water problems in a rain garden.	7%	0%	7%	67%	20%	0%	3.9

**2. Strengths and Weaknesses:**

Which aspects of the workshop did you consider most beneficial?

- Hands on experience, animated and experienced presenters, community knowledge, good food
- Designing (2) and creating a rain garden
- Knowing the proper function of having a rain garden
- Layout of a rain garden
- How to make a rain garden
- Working the actual garden/hands on training/actual installation (5)
- Brief group discussion
- Hands on experience creating a garden; universal participation of attendees; knowledgeable facilitators
- Design, maintenance, mulching and planting

Which aspects of the workshop did you consider least beneficial?

- None (5)
- Nothing, it was very good
- Calculating the size of a rain garden, somewhat confusing and diagram was not clear to me.
- Composting material
- Driving to and from the community center to park—we should all walk in a group

3. Did this workshop meet your expectations?  Yes  No **100% Yes**

4. Overall rating of the entire workshop:	<u>Poor</u>		<u>Good</u>		<u>Excellent</u>	<b>Avg. Response</b>
	1	2	3	4	5	
	0%	0%	0%	0%	100%	<b>5.0</b>

Other comments:

- Thank you so much
- Love it!
- In terms of preparation beforehand, and hands on experience that encouraged and enabled everyone to participate...the best workshop I have ever attended. It created a community spirit among everyone involved.
- I strongly recommend the training in my island (American Samoa)
- Thank you very much for coming to Guam!

## **Maintenance Recommendations Santos Memorial Park Rain Garden**

A full list of general maintenance activities for rain gardens is provided in the clinic packet. In the first few months following installation, more frequent inspections and maintenance effort will be required to support plant establishment. Less intensive care will be required after the first 6 months. A number of specific items are recommended for this installation as follows:

### Short-term (first 3-6 months):

1. Daily watering (on days when it doesn't rain in the park) is recommended until plants have fully adjusted. This will need to be coordinated with the Mayor's Office to make sure a hose is available and the water is turned on.
2. Consider using remaining mulch pile to add a small berm along the outside edge of the rain garden to separate garden from surrounding park area.
3. Check for erosion along the stone trench at the drip line. We noticed after a recent rain event that we may have missed the actual drip line in the corner where the trench was narrow. Add stone where you see soil dimpling and erosion (see Figure 9).
4. Keeping weeds out will likely be the biggest challenge, and weeding should be done on a weekly or more frequent basis for the first few months, at a minimum. Given the tenacity of tropical vegetation and the unknown origin/composition of mulch and compost, it would not be surprising for weeds to attempt a rain garden overrun.
5. Ensure that grass grows in the bare area around the rain garden. We used a hydroseeder to seed the surrounding area (and probably got a little into the mulch at the edge of the rain garden).
6. During or after the first major rain event, verify that water is discharging from the perforated pipe/trench and that uniform ponding occurs in the rain garden bed. If scouring of the rain garden bed is occurring at the inlet, add stone to that area.
7. If water remains ponded after 24 hours, consider expanding the rain garden surface area (include soil amendments) and reducing the ponding depth from 6 to 3 inches. The rain garden is already oversized, so we don't anticipate this being an issue. Alternately, the rain garden may dewater faster than expected (for instance, less than 4 hours). If this is the case, monitor vegetation to see how it responds to the relatively dry conditions. Some replanting of more "droughty" species may be called for.
8. Observe the health of plants and be prepared to replace dead plants on an as needed basis, particularly in areas where vegetative density appears low.
9. Remove trash.

### Long-term maintenance (6 months and beyond)

Many of the short-term items carry over here; the frequency can be reduced as needed for many of those items (e.g., annually or only after major storm events). Feedback from those

conducting inspections and maintenance in the short-term is important to establishing an effective long-term plan. Consider some of the following:

- Since this is a demonstration site, the aesthetics of the rain garden will be extremely important; therefore, more landscape maintenance will likely be required.
- Once plants are established, watering should not be necessary, except during the dry season if needed.
- Weeding frequency should be reduced and/or replaced by pruning and trimming activities once preferred species have enjoyed two or three full growing seasons.
- Since plant selection was a bit of an experiment, specific attention should be paid to what plants seem to thrive and in which inundation zone. You may consider switching out species with alternatives to improve color, texture, seasonal patterns, or to test inundation tolerance.
- Mulch replacement may need to occur on an annual basis, or more frequently depending on how mulch responds to tropical conditions.
- Stone (and some bed material) may need to be removed/replaced in order to clean out accumulated sediment. The filter fabric may also need to be replaced or re-stapled.
- Eventually, the growth of plants and the accumulation of mulch in the planting bed will reduce the available ponding area. This will require a more extensive maintenance effort to re-establish ponding capacity. Perhaps this would be a good opportunity to extend the rain garden if needed.
- As part of any additional work done in the park, improvements to the rain garden and surrounding area should be considered (Figure 10). In particular, any sidewalk installation that crosses the stone trench should be sure to incorporate the pipe to allow flow through. Also, opportunities to amend surrounding soils and to plant trees and other vegetation should help with water uptake.

Figure 9. Dimpling indicating that the roof drip line and the trench were not properly aligned.



Figure 10. Amending adjacent, compacted soils could help improve overall site infiltration.

