



MEMORANDUM

TO: Dr. Kathy Chaston and Dana Okano, NOAA CRCP; and Rachel Zuercher, CNMI Coastal Resource Management

FROM: Anne Kitchell, Horsley Witten Group

DATE: May 9, 2012

RE: Summary of CNMI Rain Garden Installation Clinic

This memorandum provides a brief summary of the April 25-26, 2012 rain garden installation clinic at the Museum of Culture and History in Garapan, Saipan. The purpose of the clinic was to: 1) construct a demonstration rain garden; 2) develop guidance material and provide basic training for future installations; and 3) identify additional opportunities for rain gardens in Garapan. Horsley Witten Group and the Center for Watershed Protection were the primary trainers during the clinic, however Rachel Zuercher and Ryan Okano (DEQ) both had key instructor roles related to permitting, supply acquisition, and planting. The memo is organized as follows: Site Selection; Clinic Agenda; Rain Garden Design and Installation; Maintenance Recommendations; and Key Observations/Next Steps. Attached are the attendance list, material list, rain garden inventory field sheets from three sites in Garapan, and an evaluation form summary.

A link to an article in the *Marianas Variety* on the installation can be found at:
www.mvariety.com/cnmi/cnmi-news/local/45917-not-your-average-garden-party.php.



Site Selection

The museum site was selected in advance by Rachel Zuercher (CRM), Dana Okano (NOAA), and Emanuel Borja (DEQ) as a publicly-owned and highly visible demonstration site. A number of locations at the site were considered including the open grassed area/ditch to the right of the museum drive entrance, the landscape island between the drive aisle and Middle Rd., and the grassed area between the building's main entrance and cistern (Figure 1). After much discussion regarding the pros and cons of each location, the landscaped island was selected due to the smaller drainage area, higher perceived visibility, and potential to alleviate standing water issues on the drive aisle (Figure 2). Tree roots, foundation setbacks, and flooding potential limit the feasibility of a rain garden near the building; however, the site in the open area remains a viable installation location.



Figure 1. Three options considered at the CNMI Museum of Culture and History. The star indicates the location selected for the installation clinic.

Potential rain garden options at the hospital and at Garapan Elementary School were also considered. The site selection process and concept design for these alternative sites were discussed in small groups during Day 1 and Day 2 of the clinic.



Figure 2. Rain garden location selected for installation clinic. Note evidence of ponding water and debris accumulation on edge of pavement. An existing ditch starts to the left of the small palm tree that was used as overflow from the rain garden.

Clinic Agenda

The three days in advance of the clinic were spent finalizing the rain garden design, completing major excavation, and collecting and stockpiling materials on site in preparation. The clinic itself spanned two-days. There were 34 participants that signed in (see attached sign in sheet). Each was given a design sketch of the rain garden to be installed, as well as a packet that included an agenda, a brochure outlining how to install a rain garden on CNMI, an example sizing exercise, information on how to test soils, and a field form. An evaluation form and a short quiz were also included in the packet.

Day 1 started with the rain garden construction in the morning, followed by lunch and a classroom session in the afternoon. A tent on-site was provided for the installation, and a nearby church community center was used as an air-conditioned space for lunch and afternoon classroom activities. The room was too bright to show prepared powerpoint presentations; so sessions on rain garden siting, design, installation, and maintenance relied on a white board and the clinic packet. Participants were broken into small groups to practice sizing calculations, which was followed with a short group discussion on installation and maintenance procedures. Participants returned to the museum site at the end of the day in small groups that rotated between three field stations: site selection, infiltration testing, and drainage area determination.

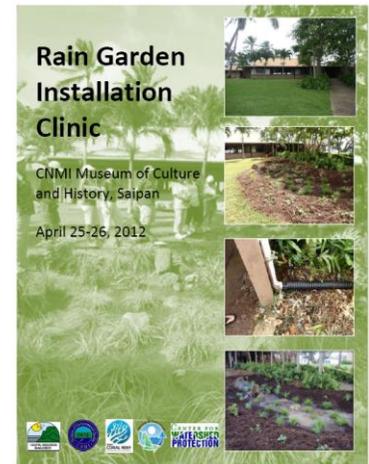
Day 2 began at the American Memorial Park and involved small groups conducting a rain garden inventory at three other sites in Garapan: the hospital, the Garapan elementary school, and the Micro Beach parking lot using the field form. Each group developed a concept for these sites, which are attached to this memo. The groups reconvened at the park and reported out their findings. The hospital and Micro Beach both offer rain garden opportunities. The school site seems less feasible. Alternative stormwater retrofits were identified at the school site by Winzler and Kelly (2010) as part of the Garapan Drainage Improvement Study. Participants then completed a short quiz and clinic evaluation form. Everyone passed the quiz. A summary of evaluation forms is provided below.

Rain Garden Design and Installation

The sizing equation used to estimate the surface area of the rain garden is based on the drainage area, desired ponding depth, which depends primarily on soils, and the target rainfall for CNMI, which is 1.5 inches according to the CNMI Stormwater Design Manual.

$$\text{Rain garden surface area (ft}^2\text{)} = \frac{\text{Drainage area (ft}^2\text{ impervious)} \times \text{CNMI target rainfall depth (ft)}}{\text{Ponding Depth (ft)}}$$

The impervious area draining to the rain garden was estimated to be approximately 2,600 square feet and consists of a portion of the driveway entrance and the drive aisle pavement,



which is pitched towards the grassed island. The soils are heavily-disturbed and compacted fill, with a heavy clay and limestone rock content. We designed for a 6-inch ponding depth with an amended soil media. In this scenario, ideally, we would try to install a 650 square foot rain garden; however, given the uncertainty of material availability, excavator access, and the training environment we felt that a 200-300 square foot rain garden was the largest we could reasonably manage.

An approximately 8-foot wide linear rain garden was designed to fit in the existing grassed area adjacent to the drive aisle. Figure 3 shows the site design sketch. The key design elements included:

- A 1.5 ft-wide rock apron (2" washed coral stone) over a non-woven geotextile that sits 1 inch below the top of the asphalt drive aisle edge. The purpose of the stone apron is to accept stormwater from the pavement area and to distribute inflow evenly and non-erosively into the rain garden. The geotextile prevents the rock from sinking into the native soils and vegetation from blocking flow path.
- The native soils were over-excavated and amended with two truckloads of sand (course dredge sand NOT fine crushed limestone) and 1 truckload of compost to enhance infiltration and plant growth. A 2-inch layer of shredded mulch was spread across the bed and slopes. Boulders and stone accents were added for aesthetic interest during the initial start up period.
- The side slopes were cut back to 3:1 and planted to reduce erosion potential.
- The outlet structure is an earthen berm with overflow spillway set at an elevation below that of the pavement, but 6-inches above the level bed to allow for ponding prior to outflow to an existing ditch down gradient. This ditch starts at the berm, runs the remaining length of the landscaped island, enters a trench culvert below the drive entrance, and then continues through an open grass area (the other potential rain garden site) until it disappears near the property boundary. Overflow from this area drains to a roadside swale and eventually down to Beach Rd. and into the ocean.

CRM coordinated with a number of agencies and local vendors for the installation clinic:

- Division of Environmental Quality (DEQ)—for initial design assistance and to apply for construction permits. DEQ conducted an erosion control inspection of the site to ensure compliance with the permit. DEQ also worked closely with NOAA and CRM to visit the local plant nurseries and identify plant species that would be appropriate for a rain garden installation.
- Commonwealth Utility Company (CUC)—to verify the location of water and other utility lines in the area. It was determined that a historic water line was below the area of interest, which indicated that the area had been previously disturbed and not likely a historic or safety concern.
- Department of Public Works (DPW)—also notified since the area is within/or close to the road right-of-way. DPW donated excavator and operator, as well as water tank and pump for short-term watering of plants.
- Department of Agriculture—supplied vetiver grass
- Forestry Department—supplied Ti trees and mulch

- Museum facilities manager—provided information on drainage patterns and maintenance procedures on site.
- Mayor’s Office—across the street for water to fill the water tank as well as access to bathrooms during the installation.
- MINA- for long-term maintenance support

DEQ and CRM staff collected materials needed for the installation including the plants, sand, and mulch. Hawaiian Rock donated stone and filter fabric and delivered materials to the site. Plants were purchased from Wireless Ridge Nursery and Tropical Gardens. Silt fence material was purchased from Hawaiian Rock. Mulch was donated from the Lao Lao golf course/resort and from Forestry. Compost/organic mix was purchased from Ted Topsoil next door to the museum and from ACE Hardware. Tools and supplies (e.g., wheel barrow, line and hand levels, grass seed, spray paint, etc) were purchased at ACE Hardware.

A list of supplies, plants, and unit costs (where available) are attached to this memo. Figure 4 shows a planting plan for the rain garden based on the actual installation.

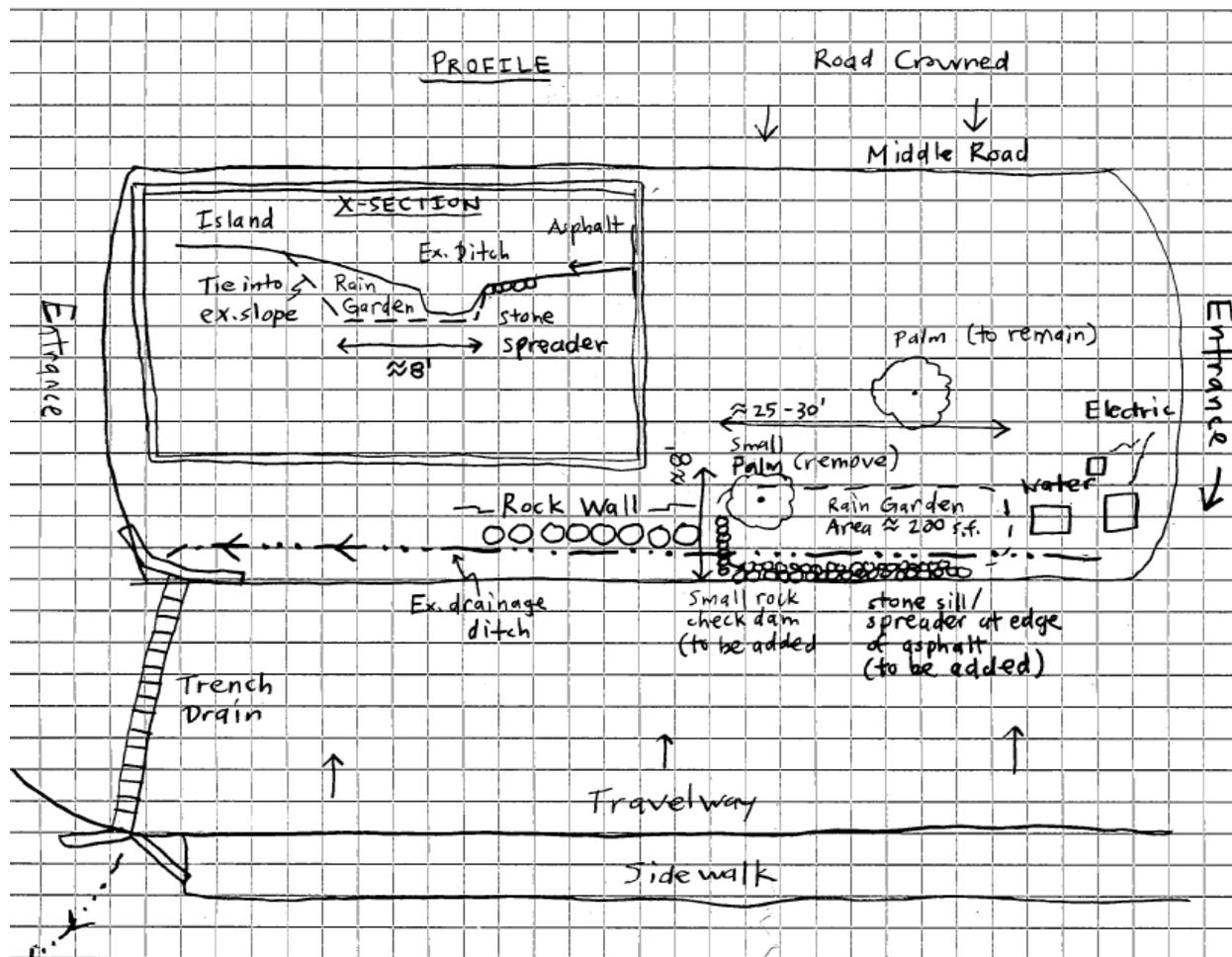


Figure 3. Design sketch for rain garden; plan view and cross section. Note existing utilities, drainage ditch, and trees.

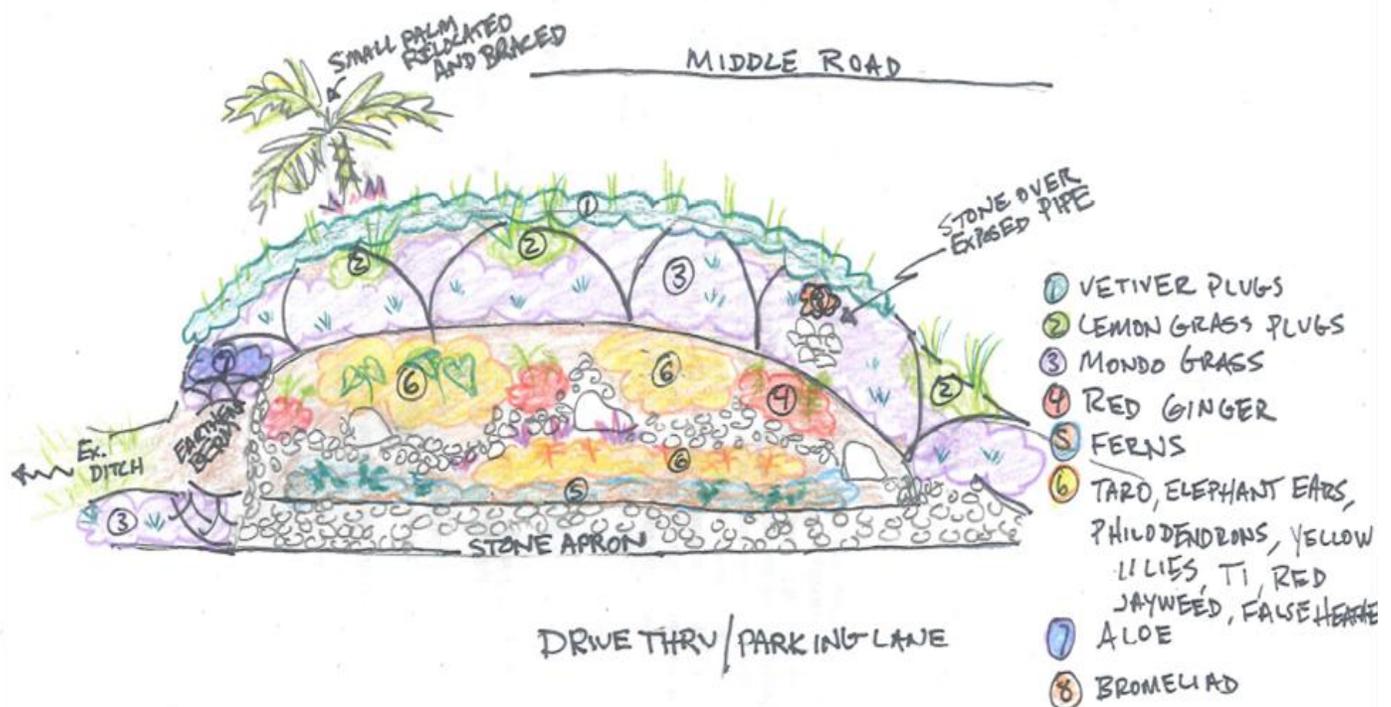


Figure 4. Planting plan for the CNMI Culture and History Museum Rain Garden. Plant selection was a bit of an experiment and was influenced by availability and expected inundation patterns.

After initial excavation by DPW, the installation process was roughly divided into five phases to help distribute the workload across clinic participants (see Figure 5):

1. Installation of stone apron;
2. Amending of soil media;
3. Installation of the overflow berm;
4. Plant placement and installation (overseen by Ryan Okano); and
5. Mulching (mulch added after initial watering).

Relative elevations were checked with an engineer’s survey level to ensure that the height of the rock apron, top of bed, and top of berm/spill way were at the appropriate elevations to result in uniform ponding and positive overflow drainage to the existing down-gradient ditch. Final elevation of the planting bed resulted in a 4-inch ponding depth rather than the 6-inch depth target.

Maintenance Recommendations

A full list of 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.



Figure 5. (From top left to bottom right) The site after major excavation the morning of the installation; amending native topsoil with coarse sand and compost; laying of stone apron; leveling of the overflow berm; placement of plants based on inundation zones; and watering of the final product.

A number of specific items are recommended for this installation in the short-term (first 3-6 months):

1. Identify who is responsible for short vs long-term care. Is this the Museum groundkeeper, MINA, DPW, or DEQ?
2. Once all stockpiled material is removed; mulch or seed disturbed area where topsoil was stored. This area will ultimately drain to the rain garden, so the less sediment transported the better.
3. Daily watering is recommended until the rainy season kicks in or until plants have fully adjusted. Since the water is not working at the Museum, continued assistance from DPW and the Mayor's Office will be paramount. Be sure to water/re-brace the small palm that was relocated during excavation. It wasn't the best replanting job, and the bracing technique is questionable.
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 of mulch and compost, it would not be surprising for *tangan tangan* to attempt a rain garden overrun.
5. Check to make sure the rock apron and berm armoring remain stable after storm events. If additional rock is needed, pull replacement aggregate from the aesthetic channel in the center of the bed. Be sure to maintain the 1-inch drop from the edge of pavement to the top of the apron. If adding stone to the berm, be sure the elevation remains lower than the rock apron. If small stones are always moving, you may need to mix some larger stones into the apron to help stabilize.
6. During or after the first major rain event, verify that inflow is well distributed across the apron, uniform ponding occurs in the bed, and overflow across berm occurs. Adjustment of the berm height may be needed if backup onto the pavement is occurring or water remains stagnant for more than a few days after the last rainfall. Ponding water could also mean that additional soil amendments or an underdrain may be required. If so, call your engineers at 508.833.6600 to brainstorm the best options for this. One option may be to extend the raingarden the full length of the grassed island and discharge directly into the trench drain under the drive lane.
7. Check for erosion of the berm spillway. If you see erosion, add more native topsoil (clay) and really try to compact it down. You may end up having to embed rock while maintaining the current elevation (you may need to bring survey equipment back out to check).
8. Check on the erosion on the side slope. You may need to add more mulch where erosion is occurring, but also ensure that the vetiver at the top of the slope gets established.
9. 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 and or in areas where stabilization is critical (slope).
10. Remove trash.

Many of the short-term items also carry over for long-term maintenance; the frequency can be reduced as needed for many of those items (i.e., annually or only after major storm events). Feedback from those conducting inspections and maintenance in the short-term will be needed to establish 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.
- 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 of various species.
- 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 and sediment 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 further downgradient, or to add an underdrain system, if needed.

Key Observations and Next Steps:

The following observations were made during the course of this project that will likely influence our understanding of how rain garden should be constructed in the Pacific (in no particular order):

- There was a lot of back and forth regarding the recommended method for sizing rain gardens. We opted to use a simple, consistent calculation based on CNMI's target rainfall of 1.5 inches, which represents about 90% of all storms during the year. Using this method, the installation at the museum site is undersized (by about $\frac{1}{2}$), meaning we are not capturing the full 1.5 inches. This should not affect performance, just the ability to manage and treat all rainfall during the small storms. Larger storms are not intended to be managed by the raingarden, regardless. Rain garden sizing differs from bioretention sizing, which accounts for storage/flow through the media.
- This rain garden is on-line, meaning that all the stormwater generated in the drainage area will flow through the practice, even if the practice doesn't manage all that water (e.g., doesn't pond the water for infiltration, evaporation, or plant uptake). It will be interesting to see how the practice holds up during large events.

- There are options available if the rain garden does not function correctly, depending on the diagnosis. Adjusting the elevation of the overflow berm or expanding the size of the facility are probably the simplest measures if standing water is an issue. High evaporation rates may alleviate (or mask) any ponding issues associated with reduced plant uptake or infiltration.
- Digging in Saipan soils would have been extremely difficult, if not impossible, without the use of heavy equipment. In fact, digging holes for infiltration tests was difficult, given the high clay and stone content. Plus, it was the dry season and antecedent moisture conditions were low making soils that much more compact. Having the hole dug in advance was critical to completing the installation within the available training time.
- Most materials were available thanks to significant, advanced coordination by CRM. The hardware stores have limited supplies of bagged compost and mulch. Fortunately, Forestry Department and the golf course were able to supply mulch. Compost from Ken topsoil seems to be a good supply if enough advanced notice can be provided. Sand for soil amendments is available, but it is important to distinguish between course sand (from dredging activities) vs. crushed limestone. The fine limestone “sand” will turn to concrete when wet and is NOT recommended for use in soil amendments. Stone from the quarry should be washed. They can do this, but may require advanced notice. They do have a gravel size available, but it is not washed and the quarry is currently not set up to wash that size of aggregate.
- Plant selection is highly dependent on availability. Many of the species used were propagated in advance specifically for this installation (i.e., lemongrass, ferns, ti) and many were considered experimental given the uncertainty of the inundation regime for this installation. Because we planted during the dry season, having a supply of water on site to help plants get established was critical.
- There is no “dig safe” equivalent in Saipan; however, staff from the CUC came out to the site to verify existing pipe locations. This was partially helpful due to lack of mapping records that distinguish between abandoned vs active utility lines.
- We can’t comment enough how critical it was to have on-the-ground coordinators.

Next steps with this rain garden include:

1. Installing interpretive signage. There is potential to link up with signage for the Guam installation. NOAA, CRM, and HW to discuss.
2. Establishing a short and long-term maintenance plan. CRM/MINA/DPW/Museum?
3. Planning to track plant success. DEQ and NOAA?
4. Deciding if any of the sites identified during the field inventory on Day 2 are worth pursuing. The hospital has shown an interest. NOAA?
5. Consider producing a rain garden brochure that can be distributed by DEQ or CRM. DEQ?

Rain Garden Installation Workshop
Sign-In Sheet

| Name | Agency/Organization | Email |
|-------------------------|---------------------|-----------------------------------|
| 1. Dana Okano | NOAA CRCP | dana.okano@noaa.gov |
| 2. Carlos Comape | Tapochan Farm | danielclaman@gmail.com |
| 3. Reyes, Julius | NMC / ENRO | juliusreyes670@gmail.com |
| 4. JAY Doronila | USDA - NRCS | jay.doronila@pp.usda.gov |
| 5. Angie Villagomez | | cv.angie@gmail.com |
| 6. Ken BAER | Retired | kbzer30@gmail.com |
| 7. ANDRE KOZIJ | APASEEM | akaspn@hotmail.com |
| 8. FRANCISCO VILLAGOMEZ | MINA | fcvillagomez@gmail.com |
| 9. PETER T. OLOFAI | DLNR PARKS + REC | |
| 10. Aric Bickel | DEQ | aricbickel@deq.gov.mp |
| 11. Okano, Ryan | DEQ | ryanoakano@deq.gov.mp |
| 12. Jose Owen | DEQ | joseowen@deq.gov.mp |
| 13. Steven Johnson | DEQ | stevenjohnson@deq.gov.mp |
| 14. Rachel Zuercher | CRM | rachel.zuercher@gmail.com |
| 15. ANTHONY RAGSLOFOI | PARKS - RECREATION | |
| 16. Angel Palacios | DEQ | angel.palacios@deq.gov.mp |
| 17. Jihan Buniaga | DEQ | jihanbuniaga@gmail.com |
| 18. Olivia G.A. Tehmtob | DEQ | oliviatchmtob@deq.gov.mp |
| 19. STEVE MCKAGAN | NOAA | STEVE.H.MCKAGAN@NOAA.GOV |
| 20. Karen Benson | | karenbenson.spn@gmail.com |
| 21. Kaitlin Mattos | DEQ | kaitlinmattos@deq.gov.mp |
| 22. Tim Quan | DPW - HIGHWAYS | tim tq.dpwt@deq.gov.mp |
| 23. WAYNE SANCHEZ | M.O.S. | |

Rain Garden Installation Workshop
Sign-In Sheet

| | Name | Agency/Organization | Email |
|-----|-------------------|---------------------|-----------------------------|
| 24. | LEONARDO BABALATA | M.O.S. | |
| 25. | James W. Babawita | Forestry | |
| 26. | Juan Castro | DEQ | juancastro@deg.gov.mp |
| 27. | Kapiloo Patricia | Parks & Rec. | |
| 28. | RAY B. MATABOLAZ | Park & Rec | |
| 29. | Becky Skeeckle | CRM | rebecca.skeeckle@grm.gov.mp |
| 30. | MUNCH | CRASKE@DEQ.GOV.MP | DEQ |
| 31. | Daniel Lamar | CHCC | daniellelamar@gmail.com |
| 32. | Sonya Dancoe | DPW FH | Spd.dpwtst@gmail.com |
| 33. | Sam Sablan | MINA | sablansam@gmail.com |
| 34. | John Iguel | DEQ | johniguell@deg.gov.mp |
| 35. | | | |
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Unit costs and plant list for CNMI Historic and Cultural Museum Rain Garden Installation April 25, 2012

| Item | Quantity Used | Cost | Source |
|----------------------------------|----------------|-----------|--|
| Silt fence | 50 ft | \$62.00 | Hawaiian Rock (75 ft roll) |
| Tarps | 3 | \$50.00 | ACE Hardware |
| Grass seed (stabilization of dis | small bag | \$7.50 | ACE Hardware |
| Non-woven geotextile | ~75 sq ft | Donated | Hawaiian Rock (\$0.25/sq ft) |
| 1.5"-2" washed aggregate | ~1/2 cu yd | Donated | Hawaiian Rock (\$25/ton) |
| 3"-4" aggregate | ~1/2 cu yd | Donated | Hawaiian Rock (\$25/ton) |
| Boulders | 3 | Donated | Hawaiian Rock |
| Sand | ~2 cu yd | Donated | Dredge pile |
| Compost | ~1 cu yd | \$110 | ACE Hardware (~\$10/small bag) and Ken Topsoil (\$40/8 large bags) |
| Mulch | ~1 cu yd | Donated | Lao Lao Resort and Forestry |
| Plants | see list below | \$350 | Wireless Ridge Nursery and Tropical Garden with donations from Forestry, Ag, and CRM |
| Levels, tapes, string, etc | 1 | \$50 | ACE Hardware |
| shovels, rakes, etc | - | Donated | Coastal Resource Management (CRM) |
| Equipment/Operator | 1 full day | Donated | Public Works |
| Volunteers | 34 | priceless | |

Plant List

Vetiver (2 large clumps-divided)
 Taro (5+)
 Elephant Ear (5)
 Ferns (5)
 Philodendron (5)
 Red Jayweed (5)
 False Heather (10)
 Mondo Grass (107)
 Red Ginger (10)
 Yellow Lillies (2)
 Lemongrass (~8)
 Aloe (4)
 Ti (10)
 Ferns -laau (9)
 Bromeliad (1)
 Grass seed (small bag)

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Mirafi[®] 140NC is a nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. Mirafi[®] 140NC is inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.

| Mechanical Properties | Test Method | Unit | Minimum Average Roll Value | |
|--------------------------------|------------------------------------|--|----------------------------|------------|
| | | | MD | CD |
| Grab Tensile Strength | ASTM D 4632 | kN (lbs) | 0.45 (100) | 0.45 (100) |
| Grab Tensile Elongation | ASTM D 4632 | % | 60 | 60 |
| Toughness | Grab Tensile Strength x Elongation | lbs | 6000 | |
| Trapezoid Tear Strength | ASTM D 4533 | kN (lbs) | 0.20 (45) | 0.20 (45) |
| Mullen Burst Strength | ASTM D 3786 | kPa (psi) | 1447 (210) | |
| Puncture Strength ¹ | ASTM D 4833 | kN (lbs) | 0.29 (65) | |
| CBR Puncture Strength | ASTM D 6241 | kN (lbs) | 1.12 (250) | |
| Apparent Opening Size (AOS) | ASTM D 4751 | mm (U.S. Sieve) | 0.212 (70) | |
| Permittivity | ASTM D 4491 | sec ⁻¹ | 1.8 | |
| Flow Rate | ASTM D 4491 | l/min/m ² (gal/min/ft ²) | 5704 (140) | |
| Mass / Unit Area | ASTM D 5261 | g/m ² (oz/yd ²) | 136 (4.0) | |
| UV Resistance (at 500 hours) | ASTM D 4355 | % strength retained | 70 | |

¹ASTM D 4833 has been replaced with ASTM D 6241

| Physical Properties | Test Method | Unit | Typical Value | |
|-------------------------------------|-------------|-----------------------------------|--|-------------------------|
| Thickness | ASTM D 5199 | mm (mils) | 0.99 (39) | |
| Roll Dimensions (width x length) | -- | m (ft) | 3.8 x 110 ((12.5 x 360)) | 4.5 x 110 (15 x 360) |
| Roll Area | -- | m ² (yd ²) | 418 (500) | 502 (600) |
| Estimated Roll Weight | -- | kg (lb) | 69 (152) | 83 (182) |

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Geotextile 12 1/2' x 50' = 625

FGS000388
ETQR19

\$ 131.95

Bill Fence @ \$ 62.00/roll

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materials that make a difference

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WIRELESS RIDGE LANDSCAPING
NURSERY PRICE LISTS

| Plant Name | Size | Price |
|---------------------|---------|----------|
| Ground Cover | | |
| Begonia (Hanging) | pcs | \$ 5.00 |
| Blue Dase | 1gal | \$ 1.50 |
| Copeya | 1gal | \$ 1.50 |
| Firecracker | 1 gal | \$ 5.00 |
| Fishtail Fern | 2 gal | \$ 15.00 |
| Ground Orchids | 4" | \$ 1.50 |
| Ground Orchids | 1 gal | \$ 5.00 |
| Leriope | 1 gal | \$ 5.00 |
| Mondo Grass | 4" | \$ 1.50 |
| Mondo Grass | 1 gal | \$ 1.50 |
| Shrubs | | |
| Alamanda | 1 gal | \$ 7.00 |
| Bougainvillea | 2 gal | \$ 15.00 |
| Bougainvillea | 1.5 gal | \$ 12.00 |
| Bougainvillea | 1 gal | \$ 7.00 |
| Bougainvillea | 4" | \$ 3.00 |
| Cariza | 10 gal | \$ 45.00 |
| Chinese Bamboo | 3 gal | \$ 15.00 |
| Chinese Bamboo | 1 gal | \$ 7.00 |
| Croton | 7 gal | \$ 25.00 |
| Croton | 2 gal | \$ 15.00 |
| Dessert Rose | 1 gal | \$ 8.00 |
| Dracena Margenata | 7 gal | \$ 25.00 |
| Dracena Multicolor | 2 gal | \$ 15.00 |
| Elephant Ear | 1 gal | \$ 7.00 |
| Exora Dwarf | 7 gal | \$ 25.00 |
| Exora Dwarf | 2 gal | \$ 15.00 |
| Exora Dwarf | 1 gal | \$ 7.00 |
| Exora Dwarf | 4" | \$ 3.50 |
| Five Finger | 10 gal | \$ 45.00 |
| Fortune Plant | 7 gal | \$ 25.00 |
| Fortune Plant | 2 gal | \$ 15.00 |
| Fortune Plant | 1 gal | \$ 10.00 |
| Golden Duranta | 1 gal | \$ 5.00 |
| Heleconia | 2 gal | \$ 15.00 |
| Hibiscus | 3 gal | \$ 25.00 |
| Hibiscus | 1.5 gal | \$ 7.00 |
| Hibiscus | 1 gal | \$ 7.00 |
| Roses | 1 gal | \$ 5.00 |
| Roses | 2 gal | \$ 12.00 |
| Roses | 10 gal | \$ 35.00 |
| Sampaguita | 10 gal | \$ 35.00 |
| Sampaguita | 1 gal | \$ 7.00 |
| Song of India | 10 gal | \$ 75.00 |
| Song of India | 5 gal | \$ 25.00 |
| Song of India | 3 gal | \$ 15.00 |
| Song of India | 1 gal | \$ 10.00 |
| Song of Jamaica | 3 gal | \$ 15.00 |
| Spottyphylum | 3 gal | \$ 25.00 |
| Spottyphylum | 2 gal | \$ 15.00 |
| Spottyphylum | 1 gal | \$ 10.00 |

WIRELESS RIDGE LANDSCAPING
NURSERY PRICE LISTS

| Plant Name | Size | Price |
|--|--------------------|-----------|
| Spottyphylum | 1.5 gal | \$ 15.00 |
| Spottyphylum | 10 gal | \$ 25.00 |
| Texas Ranger | 10 gal | \$ 45.00 |
| Ti Plant | 2 gal | \$ 15.00 |
| Ti Plant | 1 gal | \$ 12.00 |
| Varrigated Hibiscus | 1 gal | \$ 7.00 |
| Zebra | 2 gal | \$ 10.00 |
| Orchids | | |
| Cattleya | 4" clay pot | \$ 20.00 |
| Dendrovium | wood pot | \$ 15.00 |
| Local Vanda Orchid Wood Post | | \$ 10.00 |
| Local Vanda Orchids | Hanging | \$ 15.00 |
| MKRA-ASCDA | 2 gal | \$ 20.00 |
| Purple Lily Hibrid | | |
| Song of Manila | 2 gals | |
| Songomhay Orchids | wood pot | \$ 2.50 |
| Songomhay Orchids 8" Clay Pot | pcs | \$ 15.00 |
| Field Stock | | |
| Avocado | | |
| Betelnut Palm | | |
| Bird of Paradise (white) 20gals | Strelitzia Nicolai | \$ 150.00 |
| Bird of Paradise (Yellow) | Strelitzia Regiane | |
| Bismarkia | | |
| Bleeding Heart | | |
| Bottle Palm | | |
| Calamansi | | |
| Croton | | |
| Dona Aurora-Pink | 10 gal | \$ 60.00 |
| Dona Aurora-White | 10 gal | \$ 60.00 |
| Dwarf Snowbush | 10 gal | \$ 15.00 |
| Dwarf Snowbush | 3 gal | \$ 12.00 |
| Ficos Benjamina | | |
| Flametree | | |
| Foxtail | | |
| Giant Heliconia - Parrot (Field Stock) | | |
| Giant Heliconia - Red (Field Stock) | FS | |
| Giant Heliconia - Yellow (Field Stock) | FS | |
| Ginger plant | pc. | \$ 5.00 |
| Ginger Red | pc | \$ 5.00 |
| Golden Shower | FS | |
| Guyabano | | |
| Ilang-Ilang | | |
| Indian Tree | FS | |
| Jackfruit | | |
| Lemon Tree | | |
| Macopa | | |
| Mango | | |
| Manila Palm | | |
| McArthur Palm | | |
| Oil Palm | | \$ 45.00 |
| Pacifico Palm | | |
| Pandanos | | |

WIRELESS RIDGE LANDSCAPING
NURSERY PRICE LISTS

| Plant Name | Size | Price |
|---|-----------|-----------|
| Plumbago | 7 gal | \$ 35.00 |
| Plumeria | | |
| Rainbow Shower | FS | |
| Royal Palm | | |
| Sakura tree | FS | |
| Santol | | |
| Star Apple | FS | |
| Tamarind | | |
| Varrigated Irantimum | 2 gal | \$ 10.00 |
| Palm | | |
| Chamaedonea | 2 gals | \$ 45.00 |
| Chamaedonea | 3 gals | \$ 35.00 |
| Clustering Palm | 2 gals | \$ 45.00 |
| Cycas Palm | 3 gals | \$ 15.00 |
| Cycas Palm | 1 gal | \$ 10.00 |
| Licuala Espinosa | 7 gals | \$ 60.00 |
| Livistona Australis | 7 gals | \$ 45.00 |
| Pinanga Maculata(tiger palm) | 2 gals | \$ 35.00 |
| Pinanga Maculata(tiger palm) | 7 gals | \$ 35.00 |
| Pinanga Minahassai | 3 gals | \$ 65.00 |
| Pritchardia Palm (Field Stock) | | \$ 60.00 |
| Traveller Palm | 10 gals | \$ 60.00 |
| Traveller Palm | FS | \$ 40.00 |
| Traveller Palm | | \$ 20.00 |
| Yeitchia Joannis | 10 gals | \$ 45.00 |
| Palm Tree | | |
| Ariica Palm | 7 gal | \$ 60.00 |
| Ariica Palm | 1 gal | \$ 25.00 |
| Bottle Palm | 10 gal | \$ 75.00 |
| Bottle Palm | 2 gal | \$ 12.00 |
| Bottle Palm | 3 gal | \$ 15.00 |
| Bottle Palm | 5 gal | \$ 35.00 |
| Fishtail Palm | 1 gal | \$ 10.00 |
| Fishtail Palm | 10 gal | \$ 45.00 |
| Foxtail Palm | 1 gal | \$ 35.00 |
| Foxtail Palm | 1.5 gal | \$ 35.00 |
| Foxtail Palm | 10 gal | \$ 75.00 |
| Foxtail Palm | 3 feet | \$ 60.00 |
| Foxtail Palm | 5 feet | \$ 75.00 |
| Foxtail Palm | 7 feet | \$ 150.00 |
| Foxtail Palm | 7 gal | \$ 45.00 |
| Heliconia Giant | per stick | \$ 5.00 |
| King Palm | 10gal | \$ 75.00 |
| Manila Palm | 10 gal | \$ 35.00 |
| Manila Palm | 4 gal | \$ 20.00 |
| Manila Palm | 1 gal | \$ 15.00 |
| McArthur Palm | 10gal | \$ 35.00 |
| Pan Palm | 10 gal | \$ 50.00 |
| Panama Hat Plant | 3 gal | \$ 25.00 |
| Phoenix Roebelenii | 10 gal | \$ 50.00 |
| Pinanga Geonomaefonmis | 3 gal | \$ 20.00 |
| Ptychosperma Macanthurii(McArthur palm) | 7gal | \$ 60.00 |

WIRELESS RIDGE LANDSCAPING
NURSERY PRICE LISTS

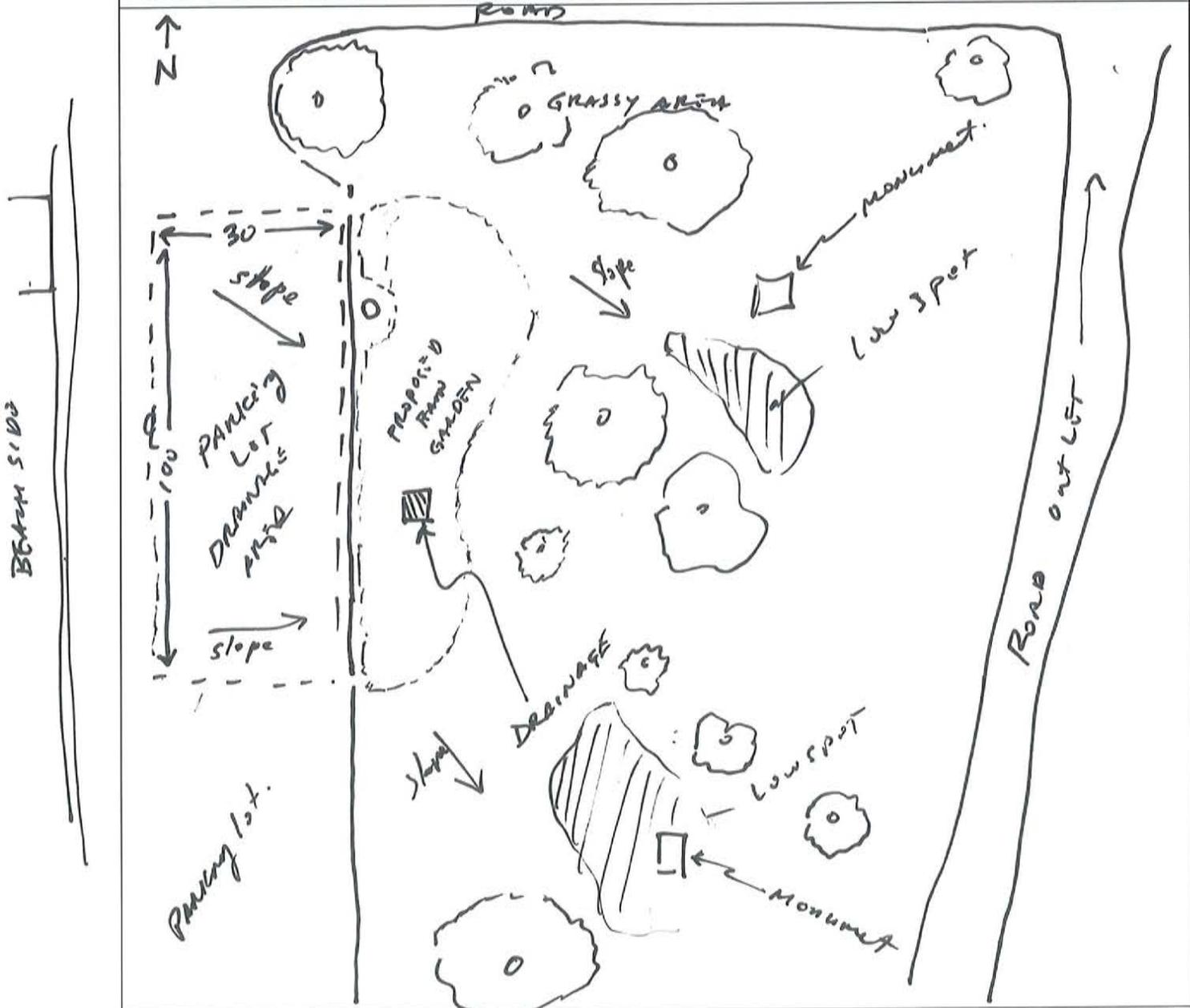
| Plant Name | Size | Price |
|---------------------------|---------|-----------|
| Queen Palm | 10 gal | \$ 75.00 |
| Queen Palm | 7 gal | \$ 50.00 |
| Raphes | 3gal | \$ 25.00 |
| Red Palm | 7 gal | \$ 75.00 |
| Rhapis Humilis | 3 gal | \$ 45.00 |
| Rhapis Humilis | 5 gal | \$ 45.00 |
| Rhapis Humilis | 1 gal | \$ 12.00 |
| Royal Palm | 10 gal | \$ 80.00 |
| Royal Palm | 7 gal | \$ 35.00 |
| Royal Palm | 3 gal | \$ 30.00 |
| Royal Palm | 1 gal | \$ 15.00 |
| Royal Palm | 7 feet | \$ 150.00 |
| Royal Palm | 15 feet | \$ 300.00 |
| Sago Palm | 2 gal | \$ 15.00 |
| Sealing Wax Palm | 10 gal | \$ 75.00 |
| Sealing Wax Palm | 3 gal | \$ 45.00 |
| Touch Palm | 10 gal | \$ 45.00 |
| Touch Palm | 7 gal | \$ 25.00 |
| Tufted Fishtail Palm | 7 gal | \$ 35.00 |
| Tufted Fishtail Palm | 25 gal | \$ 60.00 |
| Young Palm | 10 gal | \$ 45.00 |
| Zamia Pumila | 10 gal | \$ 45.00 |
| Trees | | |
| Avocado | 3 gal | |
| Carrot Wood Tree | 10 gal | \$ 75.00 |
| Carrot Wood Tree | FS | |
| Chinese Acacia | 2 gal | \$ 15.00 |
| Chinese Acacia | FS | |
| Coral Tree | 10 gal | \$ 50.00 |
| Flame Tree | 10 gal | \$ 75.00 |
| Flame Tree | 7 gal | \$ 45.00 |
| Fruit Trees | | |
| Gardenia | 7 gal | \$ 25.00 |
| Gardenia | 2 gal | \$ 12.00 |
| Gold Tree | 5 gal | \$ 20.00 |
| Golden Shower | 1.5 gal | \$ 12.00 |
| Ilang-ilang Tree | 10 gal | \$ 75.00 |
| Ilang-ilang Tree | 5 gal | \$ 25.00 |
| Ilang-ilang Tree | 2 gal | \$ 10.00 |
| Ilang-ilang Tree | 1 gal | \$ 5.00 |
| Indian Tree | 5 gal | \$ 25.00 |
| Indian Tree | 1 gal | \$ 7.00 |
| Jack Fruit | 3 gal | |
| Jetropha Husta | 10 gal | \$ 60.00 |
| Mahogany Tree | 10 gal | \$ 60.00 |
| Mango | 3 gal | |
| Melandres | 10 gal | \$ 45.00 |
| Melandres | 7 gal | \$ 35.00 |
| Melandres | 2 gal | \$ 25.00 |
| Octopus Tree | 10 gal | \$ 45.00 |
| Okinawa tree | 10 gal | \$ 100.00 |
| Orchid Tree (Field Stock) | FS | |

WIRELESS RIDGE LANDSCAPING
NURSERY PRICE LISTS

| Plant Name | Size | Price |
|-------------------|-------------|--------------|
| Pinktacoma Tree | 10 gal | \$ 60.00 |
| Pinktacoma Tree | 1 gal | \$ 7.00 |
| Plumeria | 3 gal | \$ 15.00 |
| Plumeria | 2 gal | \$ 25.00 |
| Sakura Tree | 7 gal | \$ 45.00 |
| Santol | 1 gal | |
| Star Apple | 1 gal | |

| | | |
|---|---|--|
| DATE: <u>4/26/12</u> | WATERSHED: <u>GARAPAN</u> | NAME: <u>Jay Downer</u> |
| SITE IDENTIFICATION: | | |
| Name/Address: <u>Micro Beach Pavilion Parking Lot</u> | | |
| Ownership: | <input type="checkbox"/> Public | <input type="checkbox"/> Private |
| If Public, Government Jurisdiction: | <input type="checkbox"/> Local | <input checked="" type="checkbox"/> State <u>FED</u> |
| | <input type="checkbox"/> DOT | <input type="checkbox"/> Other: <u>A.M.P</u> |
| WHAT AREA IS BEING TREATED BY YOUR PROPOSED RAIN GARDEN? | | |
| <input type="checkbox"/> Roof | <input checked="" type="checkbox"/> Parking Lot | <input type="checkbox"/> Walkway/Patio |
| <input type="checkbox"/> Other: _____ | | |
| HOW BIG IS THE DRAINAGE AREA TO BE TREATED? (MEASURE OR PACE OFF) | | |
| Length = <u>100</u> feet | | |
| Width = <u>30</u> feet | $= \frac{3000 \times 0.125}{0.5}$ | |
| Area = <u>3,000</u> square feet | $= 750 \text{ sq.ft}$ | |
| DESCRIBE THE SOIL IN THE AREA PROPOSED FOR THE RAIN GARDEN | | |
| <input type="checkbox"/> Clay | <input checked="" type="checkbox"/> Sand | <input type="checkbox"/> Loam |
| <input type="checkbox"/> Compacted | <input type="checkbox"/> High groundwater (<2 ft) | Other: <u>Sandy loam.</u> |
| DESCRIBE THE LOCATION OF YOUR PROPOSED RAIN GARDEN? | | |
| Slope: <input checked="" type="checkbox"/> Area is flat <input checked="" type="checkbox"/> Area has moderate slope <input type="checkbox"/> Area has steep slope | | |
| Veg.: <input checked="" type="checkbox"/> Grassy <input checked="" type="checkbox"/> Existing trees & shrubs <input type="checkbox"/> Existing forest | | |
| Visibility: <input checked="" type="checkbox"/> High visibility area/lots of people will see it <input type="checkbox"/> Some visibility <input type="checkbox"/> Low visibility/hidden | | |
| Cover: <input type="checkbox"/> Sunny <input checked="" type="checkbox"/> Mixed sun & shade <input type="checkbox"/> Shady | | |
| Utilities: <input type="checkbox"/> Likely <input checked="" type="checkbox"/> Maybe or nearby <input type="checkbox"/> unlikely | | |
| Inlet: <input checked="" type="checkbox"/> Already goes there <input type="checkbox"/> Some effort <input type="checkbox"/> Will require work <input type="checkbox"/> not sure | | |
| Outlet: <input checked="" type="checkbox"/> Easy <input type="checkbox"/> Hard <input type="checkbox"/> Not sure | | |
| Setbacks: <input checked="" type="checkbox"/> Met <input type="checkbox"/> May be too close <input type="checkbox"/> Probably not enough room | | |
| Describe features of your proposed rain garden location: | | |
| <ul style="list-style-type: none"> - ocean level, high water table - confirm existing drainage use? or where does it go to? | | |

SKETCH YOUR PROPOSED RAIN GARDEN (INCLUDE DIMENSIONS OF AVAILABLE SPACE)



TARGET SURFACE AREA ESTIMATES

Drainage area (impervious) _____ sf X CNMI target rainfall 0.125 ft / ponding depth _____ ft (e.g., 0.25, 0.50, 0.67 ft)
 = Target rain garden surface area _____ sf



Is space available? Yes, full Partial (≥50%) Partial (<50%)

• digital copy

| | | |
|----------------------|---------------------------|------------------|
| DATE: <u>7/27/12</u> | WATERSHED: <u>GARAPON</u> | NAME: <u>MLW</u> |
|----------------------|---------------------------|------------------|

SITE IDENTIFICATION:

Name/Address: HOSPITAL

Ownership: Public Private Unknown
 If Public, Government Jurisdiction: Local State DOT Other: _____

WHAT AREA IS BEING TREATED BY YOUR PROPOSED RAIN GARDEN?

Roof Parking Lot Walkway/Patio Other: _____

HOW BIG IS THE DRAINAGE AREA TO BE TREATED? (MEASURE OR PACE OFF)

Length = 63 feet
 Width = 62 feet
 Area = 3600 square feet

DESCRIBE THE SOIL IN THE AREA PROPOSED FOR THE RAIN GARDEN

Clay Sand Loam Other: _____
 Compacted High groundwater (<2 ft)

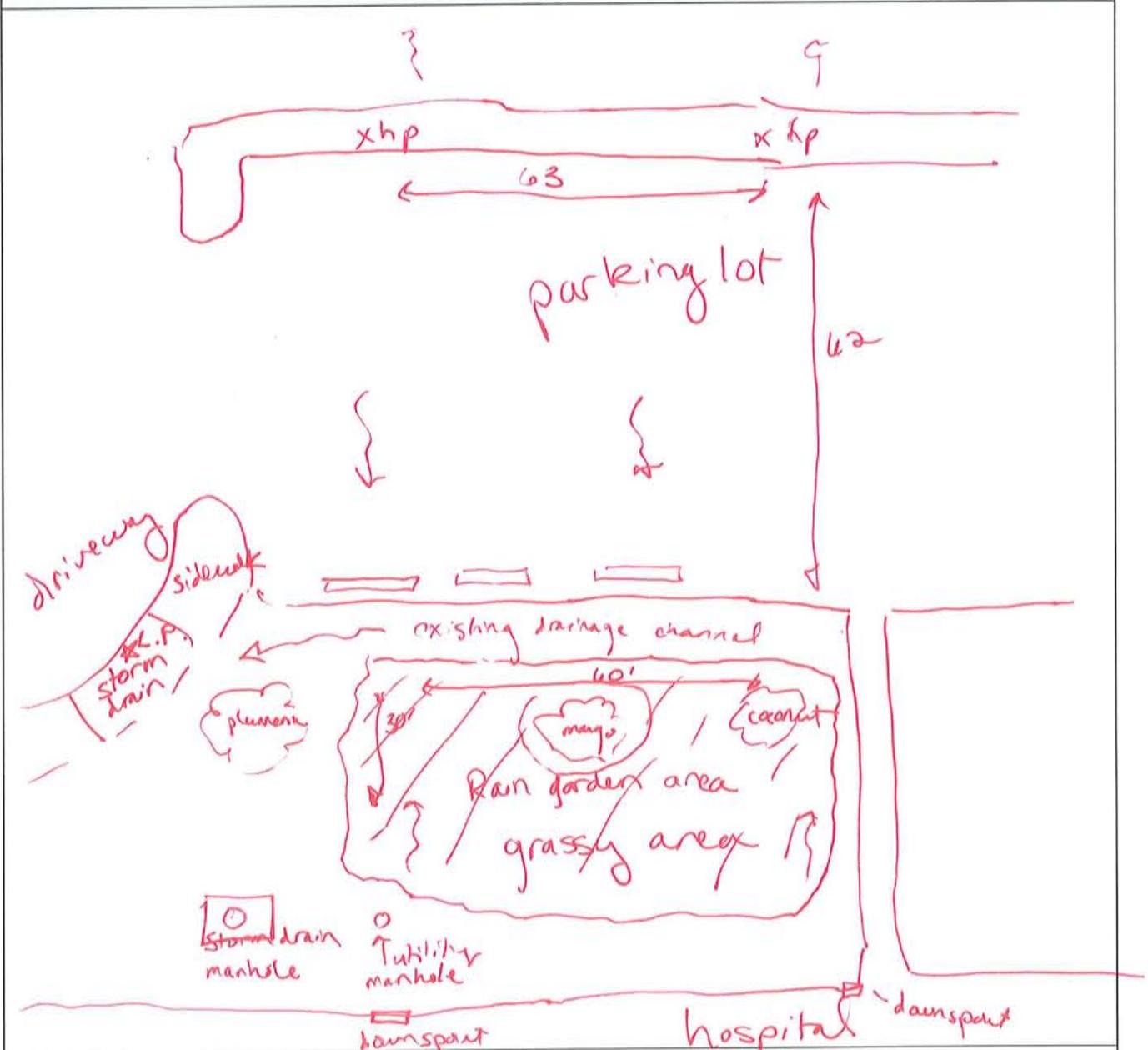
DESCRIBE THE LOCATION OF YOUR PROPOSED RAIN GARDEN?

Slope: Area is flat Area has moderate slope Area has steep slope
 Veg.: Grassy Existing trees & shrubs ^{mango tree} Existing forest
 Visibility: High visibility area/lots of people will see it Some visibility Low visibility/hidden
 Cover: Sunny Mixed sun & shade Shady
 Utilities: Likely Maybe or nearby unlikely
 Inlet: Already goes there Some effort Will require work not sure
 Outlet: Easy Hard Not sure
 Setbacks: Met May be too close Probably not enough room

Describe features of your proposed rain garden location:

sloped from parking lot, possibly could get roof runoff

SKETCH YOUR PROPOSED RAIN GARDEN (INCLUDE DIMENSIONS OF AVAILABLE SPACE)



TARGET SURFACE AREA ESTIMATES

Drainage area (impervious) 3600 sf X CNMI target rainfall 0.125 ft / ponding depth 0.25 ft (e.g., 0.25, 0.50, 0.67 ft)
 = Target rain garden surface area 1800 sf

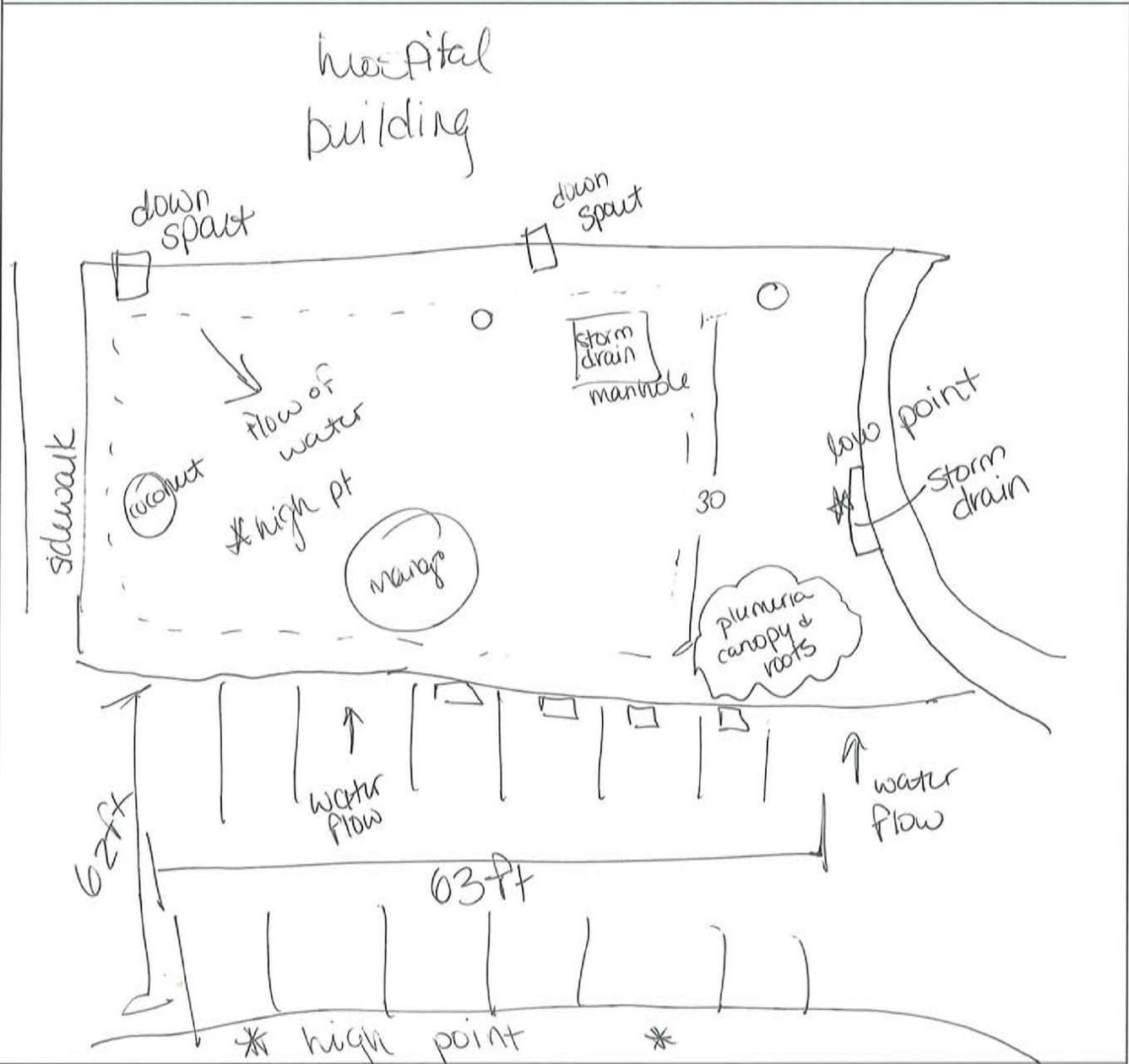
Space is available, but a lot of excavation required due to existing slope (~3' elevation change). Easy inlet and outlet for rain garden

Is space available? Yes, full Partial (≥50%) Partial (<50%)

| | | |
|--|--------------------------------|------------------|
| DATE: 26 Apr 2012 | WATERSHED: U. Takpochau | NAME: KSM |
| SITE IDENTIFICATION: | | |
| Name/Address: Hospital | | |
| Ownership: <input checked="" type="checkbox"/> Public <input type="checkbox"/> Private <input type="checkbox"/> Unknown If Public, Government Jurisdiction: <input type="checkbox"/> Local <input checked="" type="checkbox"/> State <input type="checkbox"/> DOT <input type="checkbox"/> Other: _____ | | |
| WHAT AREA IS BEING TREATED BY YOUR PROPOSED RAIN GARDEN? | | |
| <input checked="" type="checkbox"/> Roof <input checked="" type="checkbox"/> Parking Lot <input type="checkbox"/> Walkway/Patio <input type="checkbox"/> Other: _____ | | |
| HOW BIG IS THE DRAINAGE AREA TO BE TREATED? (MEASURE OR PACE OFF) | | |
| Length = 63 feet | | |
| Width = 62 feet | | |
| Area = 3900 square feet | | |
| DESCRIBE THE SOIL IN THE AREA PROPOSED FOR THE RAIN GARDEN | | |
| <input checked="" type="checkbox"/> Clay <input type="checkbox"/> Sand <input type="checkbox"/> Loam <input checked="" type="checkbox"/> Other: nasty, rocky <input checked="" type="checkbox"/> Compacted <input type="checkbox"/> High groundwater (<2 ft) | | |
| DESCRIBE THE LOCATION OF YOUR PROPOSED RAIN GARDEN? | | |
| Slope: <input type="checkbox"/> Area is flat <input checked="" type="checkbox"/> Area has moderate slope <input type="checkbox"/> Area has steep slope | | |
| Veg.: <input checked="" type="checkbox"/> Grassy <input checked="" type="checkbox"/> Existing trees & shrubs <input type="checkbox"/> Existing forest | | |
| Visibility: <input checked="" type="checkbox"/> High visibility area/lots of people will see it <input type="checkbox"/> Some visibility <input type="checkbox"/> Low visibility/hidden | | |
| Cover: <input checked="" type="checkbox"/> Sunny <input type="checkbox"/> Mixed sun & shade <input type="checkbox"/> Shady | | |
| Utilities: <input type="checkbox"/> Likely <input checked="" type="checkbox"/> Maybe or nearby <input type="checkbox"/> unlikely probably deep | | |
| Inlet: <input checked="" type="checkbox"/> Already goes there <input type="checkbox"/> Some effort <input type="checkbox"/> Will require work <input type="checkbox"/> not sure | | |
| Outlet: <input checked="" type="checkbox"/> Easy <input type="checkbox"/> Hard <input type="checkbox"/> Not sure | | |
| Setbacks: <input checked="" type="checkbox"/> Met <input type="checkbox"/> May be too close <input type="checkbox"/> Probably not enough room | | |
| Describe features of your proposed rain garden location: | | |
| nice slope for inlet & outlet, 1 coconut, 1 mango - would need to be pruned, 1 plumeria w/ lots of roots | | |

maybe →

SKETCH YOUR PROPOSED RAIN GARDEN (INCLUDE DIMENSIONS OF AVAILABLE SPACE)



TARGET SURFACE AREA ESTIMATES

Drainage area (impervious) 3600 sf X CNMI target rainfall 0.125 ft / ponding depth ____ ft (e.g., 0.25, 0.50, 0.67 ft)
 = Target rain garden surface area 1800 sf

blk of existing slope (3ft elev. Δ)
 need to dig a lot, allow trees as islands, easy inlet + outlet

Is space available? Yes, full Partial (≥50%) Partial (<50%)

DATE: 4/27/12 WATERSHED: West Top NAME: Aric Birkel

SITE IDENTIFICATION:

Name/Address: Hospital (CHC)

Ownership: Public Private Unknown
 If Public, Government Jurisdiction: Local State DOT Other: _____

WHAT AREA IS BEING TREATED BY YOUR PROPOSED RAIN GARDEN?

Roof Parking Lot Walkway/Patio Other: _____

HOW BIG IS THE DRAINAGE AREA TO BE TREATED? (MEASURE OR PACE OFF)

Length = _____ feet
 Width = _____ feet
 Area = 1565 square feet + Roof

DESCRIBE THE SOIL IN THE AREA PROPOSED FOR THE RAIN GARDEN

Clay Sand Loam Other: _____
 Compacted High groundwater (<2 ft)

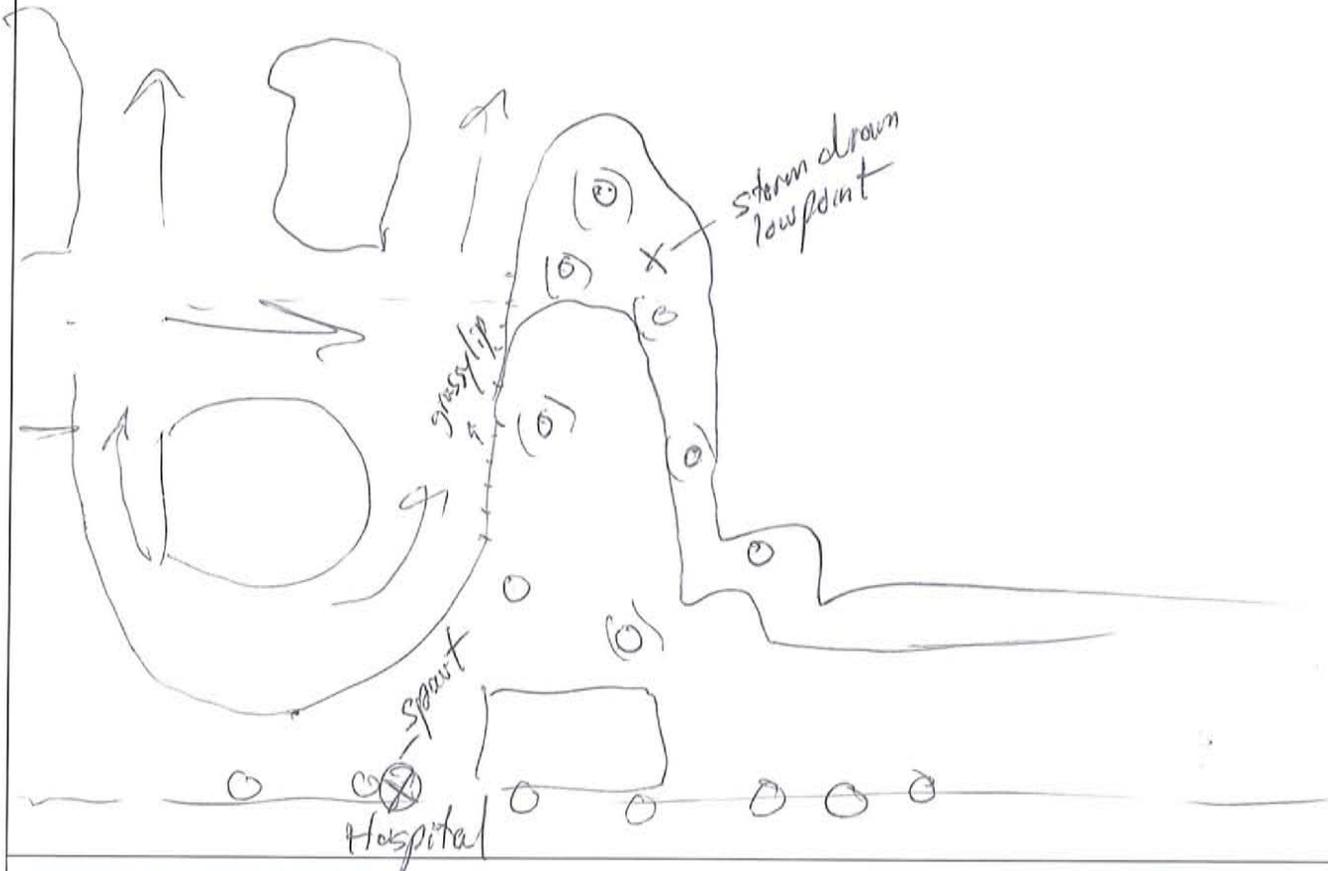
DESCRIBE THE LOCATION OF YOUR PROPOSED RAIN GARDEN?

Slope: Area is flat Area has moderate slope Area has steep slope
 Veg.: Grassy Existing trees & shrubs Existing forest
 Visibility: High visibility area/lots of people will see it Some visibility Low visibility/hidden
 Cover: Sunny Mixed sun & shade Shady
 Utilities: Likely Maybe or nearby unlikely
 Inlet: Already goes there Some effort Will require work not sure
 Outlet: Easy Hard Not sure
 Setbacks: Met May be too close Probably not enough room

Describe features of your proposed rain garden location:

Benches & trees in area; would need inlet help

SKETCH YOUR PROPOSED RAIN GARDEN (INCLUDE DIMENSIONS OF AVAILABLE SPACE)



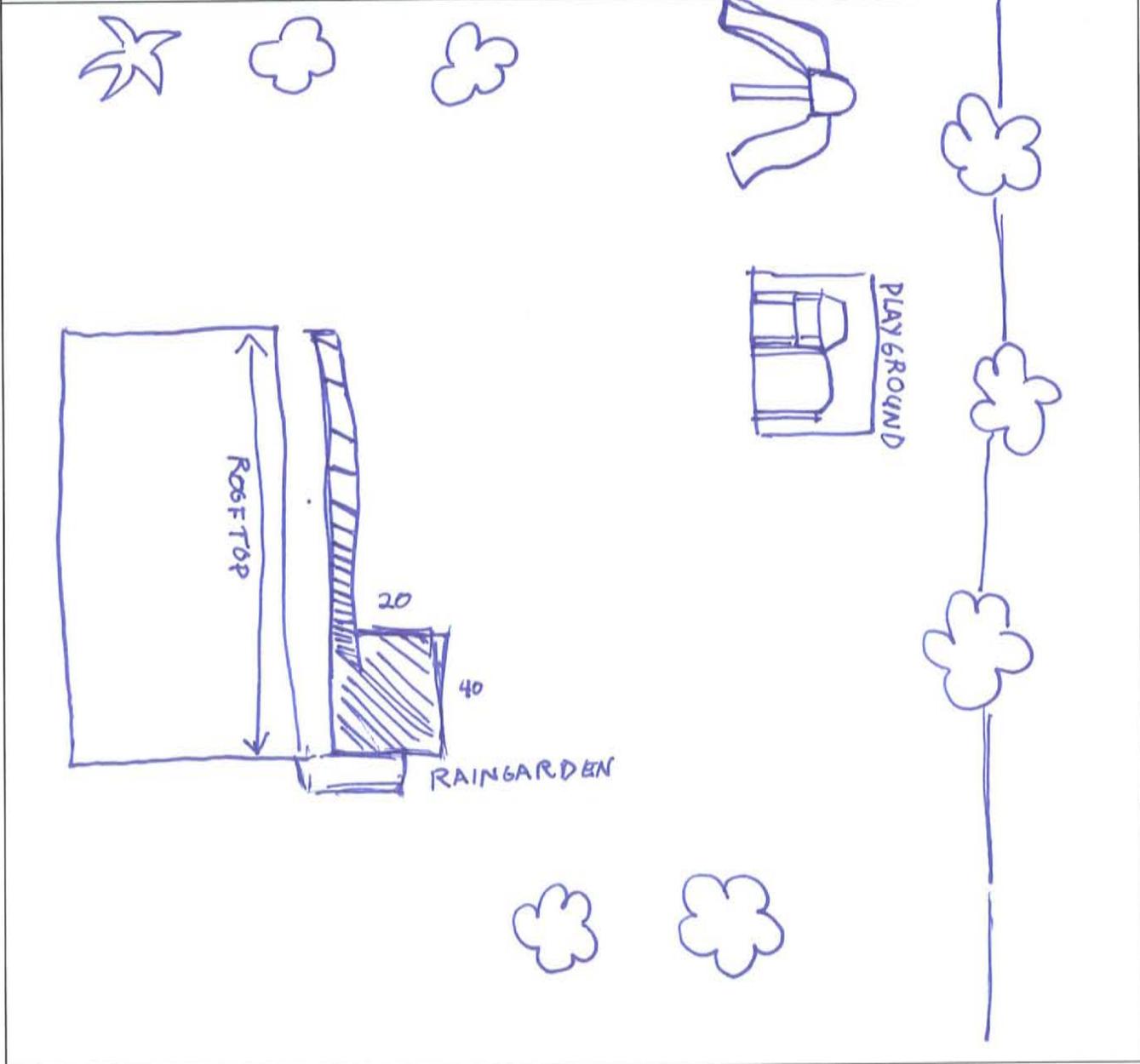
TARGET SURFACE AREA ESTIMATES

Drainage area (impervious) 1565 sf X CNMI target rainfall 0.125 ft / ponding depth .5 ft (e.g., 0.25, 0.50, 0.67 ft)
 = Target rain garden surface area 400 sf (est)

Is space available? Yes, full Partial (≥50%) Partial (<50%)

| | | |
|--|---------------------------------|--------------------|
| DATE: <u>4/26/12</u> | WATERSHED: <u>Garapan Elem.</u> | NAME: <u>Jihan</u> |
| SITE IDENTIFICATION: <u>Garapan Elem. School</u> | | |
| Name/Address: _____ | | |
| Ownership: <input checked="" type="checkbox"/> Public <input type="checkbox"/> Private <input type="checkbox"/> Unknown If Public, Government Jurisdiction: <input type="checkbox"/> Local <input checked="" type="checkbox"/> State <input type="checkbox"/> DOT <input type="checkbox"/> Other: _____ | | |
| WHAT AREA IS BEING TREATED BY YOUR PROPOSED RAIN GARDEN? | | |
| <input checked="" type="checkbox"/> Roof <input type="checkbox"/> Parking Lot <input type="checkbox"/> Walkway/Patio <input type="checkbox"/> Other: _____ | | |
| HOW BIG IS THE DRAINAGE AREA TO BE TREATED? (MEASURE OR PACE OFF) | | |
| Length = <u>150</u> feet | | |
| Width = <u>22</u> feet | | |
| Area = <u>3300</u> square feet | | |
| DESCRIBE THE SOIL IN THE AREA PROPOSED FOR THE RAIN GARDEN | | |
| <input type="checkbox"/> Clay <input type="checkbox"/> Sand <input type="checkbox"/> Loam <input checked="" type="checkbox"/> Other: <u>Limestone fill</u> <input type="checkbox"/> Compacted <input type="checkbox"/> High groundwater (<2 ft) | | |
| DESCRIBE THE LOCATION OF YOUR PROPOSED RAIN GARDEN? | | |
| Slope: <input checked="" type="checkbox"/> Area is flat <input type="checkbox"/> Area has moderate slope <input type="checkbox"/> Area has steep slope | | |
| Veg.: <input type="checkbox"/> Grassy <input type="checkbox"/> Existing trees & shrubs <input type="checkbox"/> Existing forest <input checked="" type="checkbox"/> none | | |
| Visibility: <input checked="" type="checkbox"/> High visibility area/lots of people will see it <input type="checkbox"/> Some visibility <input type="checkbox"/> Low visibility/hidden | | |
| Cover: <input checked="" type="checkbox"/> Sunny <input type="checkbox"/> Mixed sun & shade <input type="checkbox"/> Shady | | |
| Utilities: <input type="checkbox"/> Likely <input checked="" type="checkbox"/> Maybe or nearby <input type="checkbox"/> unlikely | | |
| Inlet: <input type="checkbox"/> Already goes there <input checked="" type="checkbox"/> Some effort <input type="checkbox"/> Will require work <input type="checkbox"/> not sure | | |
| Outlet: <input type="checkbox"/> Easy <input type="checkbox"/> Hard <input type="checkbox"/> Not sure <u>none</u> | | |
| Setbacks: <input type="checkbox"/> Met <input type="checkbox"/> May be too close <input type="checkbox"/> Probably not enough room | | |
| Describe features of your proposed rain garden location: | | |

SKETCH YOUR PROPOSED RAIN GARDEN (INCLUDE DIMENSIONS OF AVAILABLE SPACE)



TARGET SURFACE AREA ESTIMATES

Drainage area (impervious) 3300 sf X CNMI target rainfall 0.125 ft / ponding depth .5 ft (e.g., 0.25, 0.50, 0.67 ft)
 = Target rain garden surface area 825 sf

Is space available? Yes, full Partial (≥50%) Partial (<50%)

DATE: 4/26/12 WATERSHED: Garapan NAME: Steve Johnson

SITE IDENTIFICATION:

Name/Address: Garapan Elementary School

Ownership: Public Private Unknown
 If Public, Government Jurisdiction: Local State DOT Other: _____

WHAT AREA IS BEING TREATED BY YOUR PROPOSED RAIN GARDEN?

Roof Parking Lot Walkway/Patio Other: _____

HOW BIG IS THE DRAINAGE AREA TO BE TREATED? (MEASURE OR PACE OFF)

Length = 150 feet
 Width = 22 feet
 Area = 3300 square feet

DESCRIBE THE SOIL IN THE AREA PROPOSED FOR THE RAIN GARDEN

Clay Sand Loam Other: LS fill
 Compacted High groundwater (<2 ft)

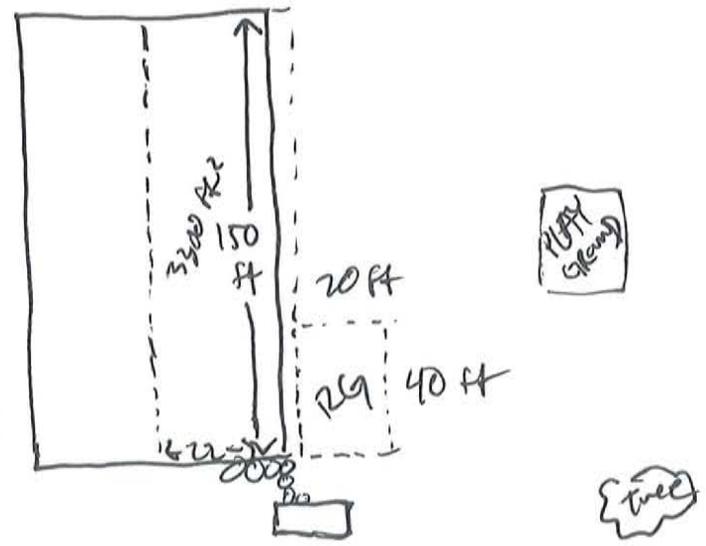
DESCRIBE THE LOCATION OF YOUR PROPOSED RAIN GARDEN?

Slope: Area is flat Area has moderate slope Area has steep slope
 Veg.: Grassy Existing trees & shrubs Existing forest none
 Visibility: High visibility area/lots of people will see it Some visibility Low visibility/hidden
 Cover: Sunny Mixed sun & shade Shady
 Utilities: Likely Maybe or nearby unlikely
 Inlet: Already goes there Some effort Will require work not sure
 Outlet: Easy Hard Not sure Street Flow
 Setbacks: Met May be too close Probably not enough room

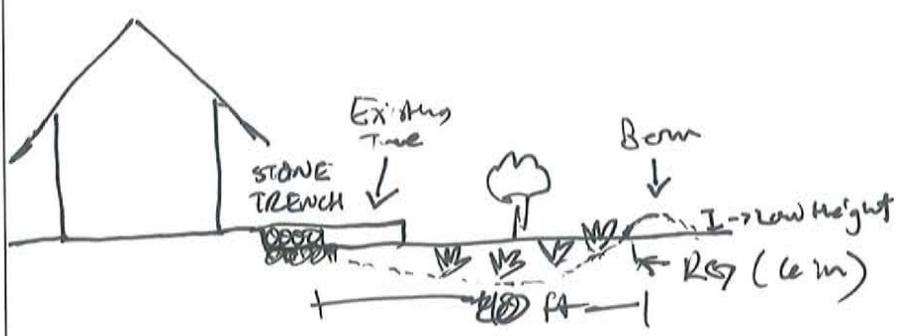
Ramblers Kids
 Describe features of your proposed rain garden location:
 • Stone Touch @ drip line
 • Overflow into RG
 • Stepping Stone

SKETCH YOUR PROPOSED RAIN GARDEN (INCLUDE DIMENSIONS OF AVAILABLE SPACE)

Planar View:



X-Section



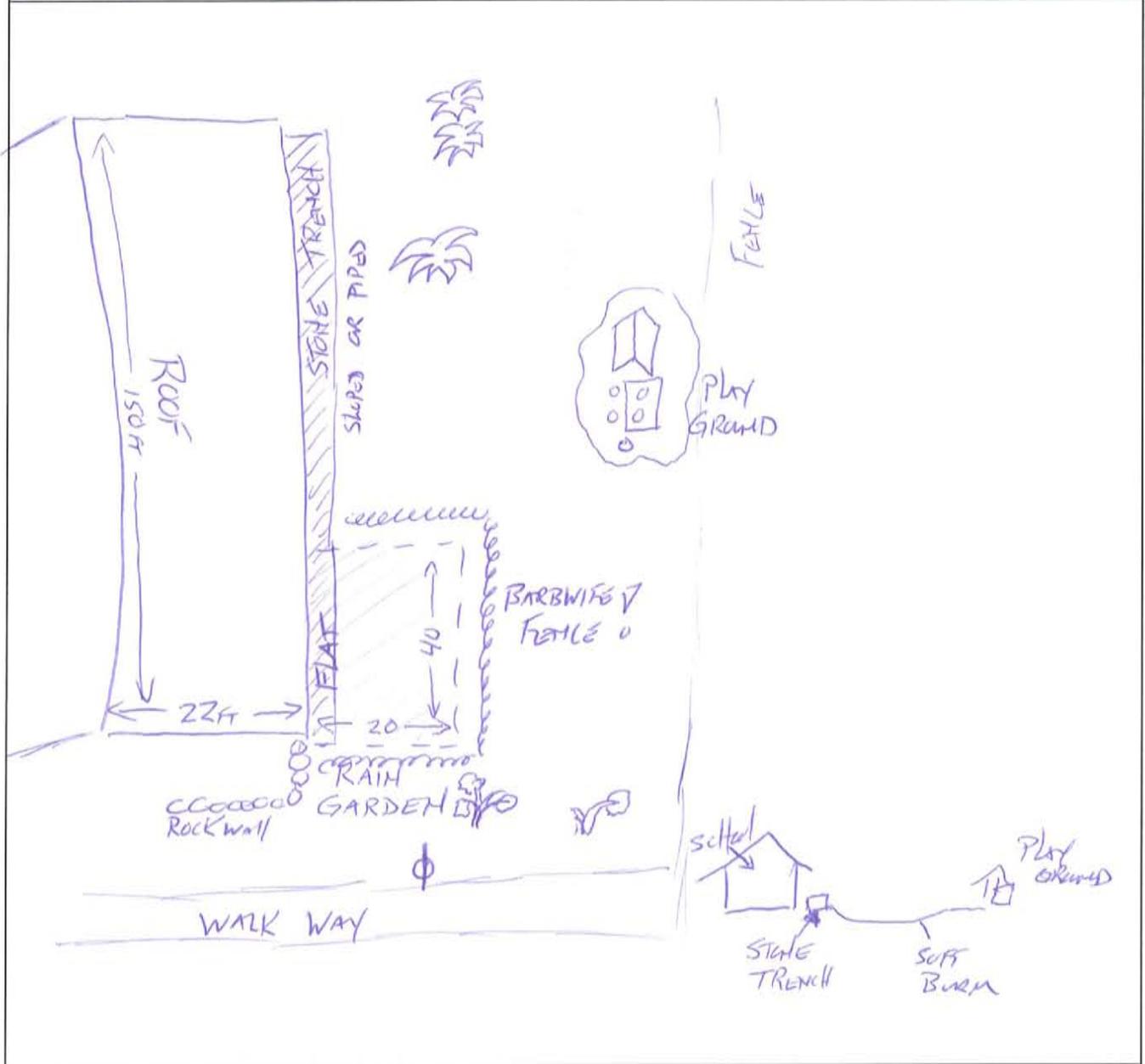
TARGET SURFACE AREA ESTIMATES

Drainage area (impervious) 3300 sf X CNMI target rainfall 0.125 ft / ponding depth .5 ft (e.g., 0.25, 0.50, 0.67 ft)
 = Target rain garden surface area 825 sf

Is space available? Yes, full Partial (≥50%) Partial (<50%)

| | | |
|--|-----------------------|--------------------|
| DATE: <u>4/26/12</u> | WATERSHED: <u>GES</u> | NAME: <u>STEVE</u> |
| SITE IDENTIFICATION: | | |
| Name/Address: <u>GES</u> | | |
| Ownership: <input checked="" type="checkbox"/> Public <input type="checkbox"/> Private <input type="checkbox"/> Unknown If Public, Government Jurisdiction: <input type="checkbox"/> Local <input checked="" type="checkbox"/> State <input type="checkbox"/> DOT <input type="checkbox"/> Other: _____ | | |
| WHAT AREA IS BEING TREATED BY YOUR PROPOSED RAIN GARDEN? | | |
| <input checked="" type="checkbox"/> Roof <input type="checkbox"/> Parking Lot <input type="checkbox"/> Walkway/Patio <input type="checkbox"/> Other: _____ | | |
| HOW BIG IS THE DRAINAGE AREA TO BE TREATED? (MEASURE OR PACE OFF) | | |
| Length = <u>150</u> feet | | |
| Width = <u>22</u> feet | | |
| Area = <u>3300</u> square feet | | |
| DESCRIBE THE SOIL IN THE AREA PROPOSED FOR THE RAIN GARDEN | | |
| <input type="checkbox"/> Clay <input type="checkbox"/> Sand <input type="checkbox"/> Loam <input checked="" type="checkbox"/> Other: <u>LIMESTONE FILL</u> <input type="checkbox"/> Compacted <input type="checkbox"/> High groundwater (<2 ft) | | |
| DESCRIBE THE LOCATION OF YOUR PROPOSED RAIN GARDEN? | | |
| Slope: <input checked="" type="checkbox"/> Area is flat <input type="checkbox"/> Area has moderate slope <input type="checkbox"/> Area has steep slope | | |
| Veg.: <input type="checkbox"/> Grassy <input type="checkbox"/> Existing trees & shrubs <input type="checkbox"/> Existing forest <input type="checkbox"/> <u>DNN</u> | | |
| Visibility: <input checked="" type="checkbox"/> High visibility area/lots of people will see it <input type="checkbox"/> Some visibility <input type="checkbox"/> Low visibility/hidden | | |
| Cover: <input checked="" type="checkbox"/> Sunny <input type="checkbox"/> Mixed sun & shade <input type="checkbox"/> Shady | | |
| Utilities: <input type="checkbox"/> Likely <input checked="" type="checkbox"/> Maybe or nearby <input type="checkbox"/> unlikely | | |
| Inlet: <input checked="" type="checkbox"/> Already goes there <input checked="" type="checkbox"/> Some effort <input type="checkbox"/> Will require work <input type="checkbox"/> not sure | | |
| Outlet: <input type="checkbox"/> Easy <input type="checkbox"/> Hard <input type="checkbox"/> Not sure <input checked="" type="checkbox"/> <u>NEEDS DEVELOPMENT</u> | | |
| Setbacks: <input type="checkbox"/> Met <input type="checkbox"/> May be too close <input type="checkbox"/> Probably not enough room <input checked="" type="checkbox"/> <u>No less</u> <input checked="" type="checkbox"/> <u>At least 10 FT TRAFFIC</u> | | |
| Describe features of your proposed rain garden location: | | |
| <u>STATE TRENCH AT DRIP LINES w/ FLOW INTO GARDEN</u> <u>w/ SOME BARRIER... w/ DEFINED WALK SPACE</u> <u>OR THE LIKE.</u> | | |

SKETCH YOUR PROPOSED RAIN GARDEN (INCLUDE DIMENSIONS OF AVAILABLE SPACE)



TARGET SURFACE AREA ESTIMATES

Drainage area (impervious) 3300 sf X CNMI target rainfall 0.125 ft / ponding depth 0.5 ft (e.g., 0.25, 0.50, 0.67 ft)
 = Target rain garden surface area 825 sf

Is space available? Yes, full Partial (≥50%) Partial (<50%)

EVALUATION FORM SUMMARY

CNMI Rain Garden Installation Clinic

April 25-26, 2012

N=12

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. Response |
|---|---|---|---|---|---|----|----------------------|
| I know how to choose a proper site for a rain garden. | | | | | | NA | 4.2 |
| I know how to prepare a rain garden. | | | | | | NA | 4.2 |
| I know how to maintain a rain garden. | | | | | | NA | 3.8 |
| I know how to create a landscape design for a rain garden | | | | | | NA | 3.8 |
| I know the costs involved with installing a rain garden | | | | | | NA | 3.3 |
| I know how to correct standing-water problems in a rain garden. | | | | | | NA | 3.9 |

2. Please provide your evaluation of the workshop by completing this form. For each category below, please CIRCLE the number that best reflects your evaluation.

| | <u>Poor</u> | | <u>Good</u> | | <u>Excellent</u> | <u>N/A</u> | |
|--|-------------|---|-------------|---|------------------|-----------------------|------------|
| Rain Garden Field Installation | | | | | | | |
| 1. Relevance and usefulness | 1 | 2 | 3 | 4 | 5 | <input type="radio"/> | 4.8 |
| 2. Quality of presentation | 1 | 2 | 3 | 4 | 5 | | 4.5 |
| Rain Garden Site Selection and Design | | | | | | | |
| 1. Relevance and usefulness | 1 | 2 | 3 | 4 | 5 | <input type="radio"/> | 4.1 |
| 2. Quality of presentation | 1 | 2 | 3 | 4 | 5 | | 4.2 |
| Rain Garden Installation & Maintenance | | | | | | | |
| 1. Relevance and usefulness | 1 | 2 | 3 | 4 | 5 | <input type="radio"/> | 4.2 |
| 2. Quality of presentation | 1 | 2 | 3 | 4 | 5 | | 3.9 |
| Walking Field Trip to Identify Sites | | | | | | | |
| 1. Relevance and usefulness | 1 | 2 | 3 | 4 | 5 | <input type="radio"/> | 4.4 |
| 2. Quality of presentation | 1 | 2 | 3 | 4 | 5 | | 4.3 |

3. Strengths and Weaknesses:

Which aspects of the workshop did you consider most beneficial?

- Day 2
- The installation of the raingarden at the museum
- constructing the rain garden
- hands-on work
- I learned a lot. Much of the material is useful to me, while a raingarden may not be
- well planned and executed presentation
- hands on approach, get a better idea of whats going on
- the building of the rain garden and the site assessment field trip
- site selection field trip on day 2, classroom on day 1
- visiting the three stations after the lecture

Which aspects of the workshop did you consider least beneficial?

- Missed out on some aspects of installation b/c lots of people so few opps to do all aspects
- for me, a senior, it was a relaxing and enjoyable event. The presenters and staff were well prepared and knew their subject. It made me feel good to know that a much younger generation is doing so well.
- well attended and wide spectrum of participants
- the 1st classroom session after lunch (but it was good!)
- building a garden was useful, but it was difficult to fully participate and learn with so many people and fewer tools and space
- planting might be more useful after learning about rain gardens

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

5. Overall rating of the entire workshop:

| | | | | | |
|-------------|---|-------------|---|------------------|----------------------|
| <u>Poor</u> | | <u>Good</u> | | <u>Excellent</u> | Avg. Response |
| 1 | 2 | 3 | 4 | 5 | 4.3 |

Other comments:

- im sure that b/c of funding, site size was limited, but if it could be bigger so everyone could do diffenet things, it would be better
- more discussion of other non-raingarden solutions would be helpful
- thanks gang
- im glad space in the workshop was expanded, but it was difficult on day 1 with so many people. Maybe stagger activities for installation so 1 group does this and others do site scouting? Just an idea. Otherwise it was great!

Evaluation Summary Comments: Installation (from 9 AM-12) ran slightly longer than anticipated and classroom portions was shortened and afternoon field trip added. Slideshows intended for presentation in the afternoon to address some of the details were not shown due to lighting issues. The packet handed out contains much of this information; however, landscape and costs were not included since they were unknowns at the time. To address these issues, we are providing slideshows, cost summaries, and landscape plan to participants via email.