NOAA ARRA USVI Watershed Stabilization Project

Coral Bay Watershed Management Project – Carolina Valley Drainage Improvements

National Oceanic and Atmospheric Administration
Virgin Islands Resource Conservation & Development Council
Coral Bay Community Council

Patricia Reed
Environmental Projects Manager
Coral Bay Community Council

March 31, 2012

This report described the projects undertaken in one of six subwatersheds in Coral Bay, St. John, USVI with $1.5 million in National Oceanic and Atmospheric Administration (NOAA) funding through the American Recovery and Reinvestment Act of 2009 (ARRA). These funds are part of the $2.7 million USVI Watershed Stabilization Project funds awarded to the Virgin Islands Resource Conservation & Development Council, Inc. (V.I. RC&D). The U.S. Environmental Protection Agency (EPA) provided $300,000 in funding to the Coral Bay Community Council (CBCC) under its Community Action for a Renewed Environment (CARE) program to provide the stormwater engineering expertise to provide the design portion of these projects and staff the CBCC Coral Bay Watershed Management Project. Local homeowners associations, the Virgin Islands government, and community volunteers have also provided more than $400,000 in resources and worked cooperatively to achieve the project objective of reducing the stormwater sediment plumes entering Coral Bay, thereby improving water quality, ecological health, and stormwater management while minimizing future negative impacts associated with roadways and new construction.

There are nine reports in this series, describing the complete NOAA ARRA USVI Watershed Stabilization Project:

- Coral Bay Watershed Management Project – Johnny Horn Trail Drainage Improvements
- Coral Bay Watershed Management Project – Hansen Bay Drainage Improvements
- Coral Bay Watershed Management Project – Lower Bordeaux Drainage Improvements
- Coral Bay Watershed Management Project – John's Folly Drainage Improvements
- Coral Bay Watershed Management Project – Calabash Boom Drainage Improvements
- Coral Bay Watershed Management Project – Carolina Valley Drainage Improvements
- Fish Bay, St. John Drainage Improvements
- East End Bay, St. Croix Erosion Repairs, Trail Construction, and Drainage Improvements
- NOAA ARRA USVI Watershed Stabilization Project Summary Report

Acknowledgements

Based on work by Joseph Mina, P.E., Christopher Laude, P.E, Barry Devine, Ph.D., Sarah Gray, Ph.D., Blake Parker, and Sharon Coldren.

Photos provided by the Coral Bay Community Council.

Overall project management was provided by the Virgin Islands Resource & Development Council and its Board of Directors listed below:

President - Diane Capehart
Vice President - Olasee Davis
Secretary - Marcia Taylor
Treasurer - Dee Osinski (first year)/Olasee Davis
At Large member - Paul Devine

Work would not have been possible without the contributed countless volunteer hours, including the project's Principal Investigator Marcia Taylor who put a substantial amount of volunteer time into this project.

Work in Coral Bay would not have been possible without the Coral Bay Community Council, Inc., a 501(c)(3) organization, its volunteer Board members and many community volunteers. President and Executive Director, Sharon Coldren, spent three years as a volunteer working almost fulltime to implement this project.

Project management and project completion were facilitated by the technical expertise and project management skills of NOAA's Restoration Center, specifically staff members Daphne MacFarlan and Julia Royster.

Executive Summary

The Carolina Valley Watershed contains one primary ghut (Main Ghut) and several other runoff pathways that drain a large uphill area with residential neighborhoods scattered across steep hillsides and accessed primarily by unpaved roads. Development and poor stormwater management has resulted in greater sediment and stormwater flows into the bay from this watershed. These actions plus erosion from unpaved roads have increased sedimentation (Photo 1).

Photo 1: Plume into Coral Bay prior to drainage improvements (Main Ghut plume the top arrow; King's Hill Road plume the bottom arrow).

The goals of the five projects in this watershed are to build both a bioretention pond and a sediment retention basin to capture and control sediment-laden flows, stabilize three unpaved road areas, and implement other stormwater best management practices (BMPs); thereby reducing sediment entering Coral Bay.

In order to accomplish this goal, the Coral Bay Community Council (CBCC) proposed the following actions in the 2009 National Oceanic and Atmospheric Administration (NOAA) American Recovery and Reinvestment Act (ARRA) Coral Bay Workplan:

- Along King's Hill Road, adjust a concrete swale, remove a kneewall, and re-excavate an old channel into the main valley ghut. Also, construct a forebay and larger series of BMPs to create a naturalized treatment area consisting of infiltration and bio-filtration cells and rock check dams and baffles.
- Install a detention/retention facility at 6-4 Carolina.
- Make drainage improvements to neighborhood roadways including redesigning and paving an intersection to the main road including sediment traps and /or "offline" bio-filtration and infiltration areas and more natural flow conditions; installing waterbars and check dams; and, performing general maintenance and repair to roadways to reduce erosion.

Ultimately, the project installed a bioretention pond, a sediment detention basin, a series of reconstructed inlets and culverts, waterbars, roadside drainage channels, a swale, and limited sections of paving. Figures 1-3 show pre-existing and new stormwater structures, and other watershed features. The net effects are:

1) Less sediment loading to Coral Bay because the bioretention pond and sediment detention basin are capturing sediment; and,

2) Reduced road erosion because several segments were paved and other areas received better stormwater management structures to funnel water off the road more frequently.

Figure 1: Mill Vista Subdivision and 6-4 Carolina Sediment Detention Basin Stormwater Structure Locations

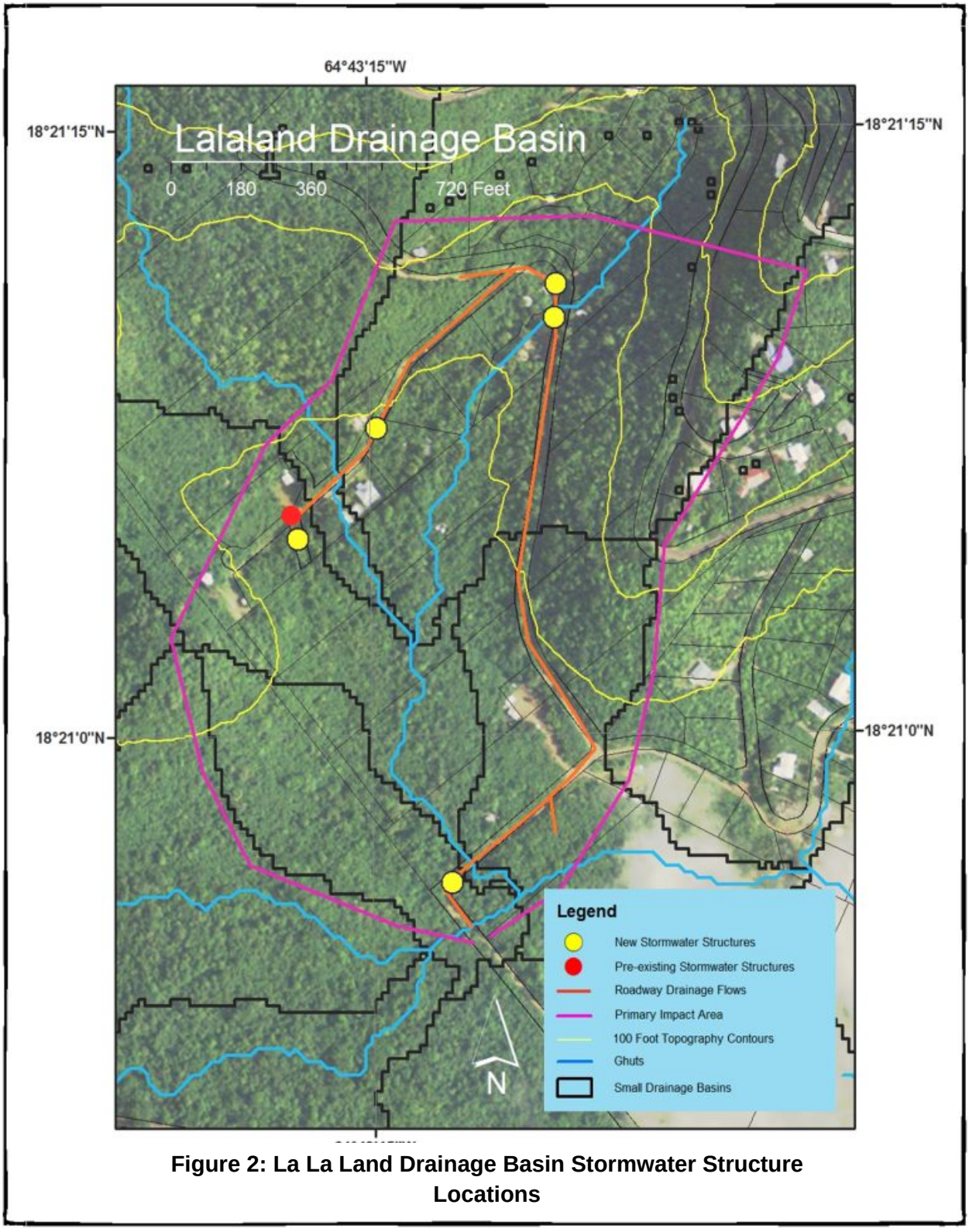


Figure 2: La La Land Drainage Basin Stormwater Structure Locations

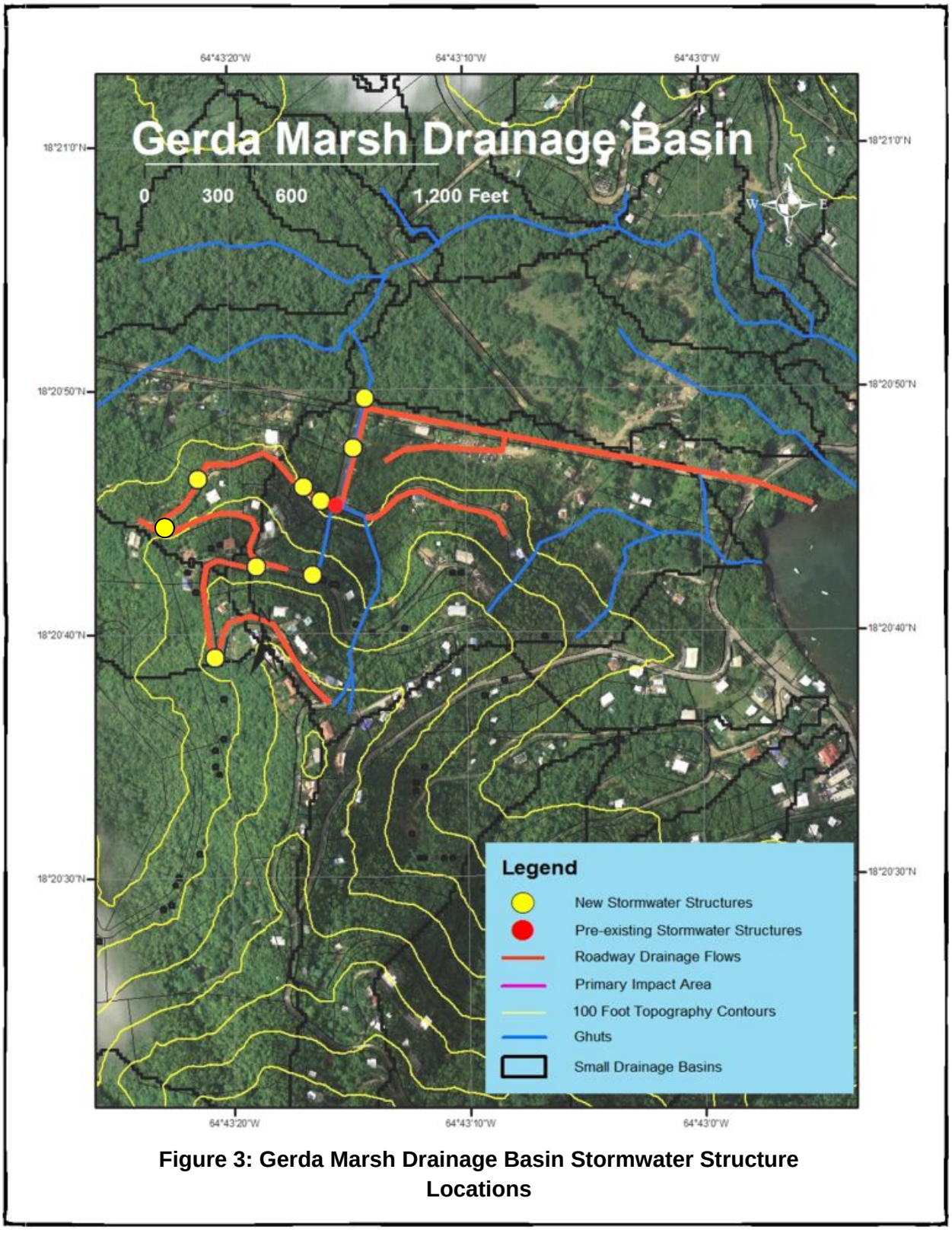


Figure 3: Gerda Marsh Drainage Basin Stormwater Structure Locations

1. Watershed Description

The largest watershed in Coral Bay is the Carolina Valley Watershed starting at the top of Bordeaux Mountain (1,277 feet) and draining approximately 1,200 acres (Photo 2). It's a bowl-shaped watershed generally bounded by Centerline and Bordeaux Mountain Roads and bisected by King's Hill Road running through the valley. Sheer slopes, highly erodible soils, and high water runoff volumes during rain events characterize the watershed. In Pre-Columbian times, stormwater runoff would both sheet flow over the steep hillsides and channel down ghuts to reach the moderately flat Carolina Valley floor. There, water would eventually merge with the main Carolina Valley ghut ("Main Ghut") before emptying into Coral Harbor through a deep mangrove fringed inlet. During the plantation era, it is likely there was significant modification of the drainage patterns on the valley floor. Today the Main Ghut follows an eroded 5 foot or deeper, mostly naturalized path through the valley, and then abruptly, about 400 feet from the ocean, splits into three or more ghut paths that meander and sheet flow through a highly

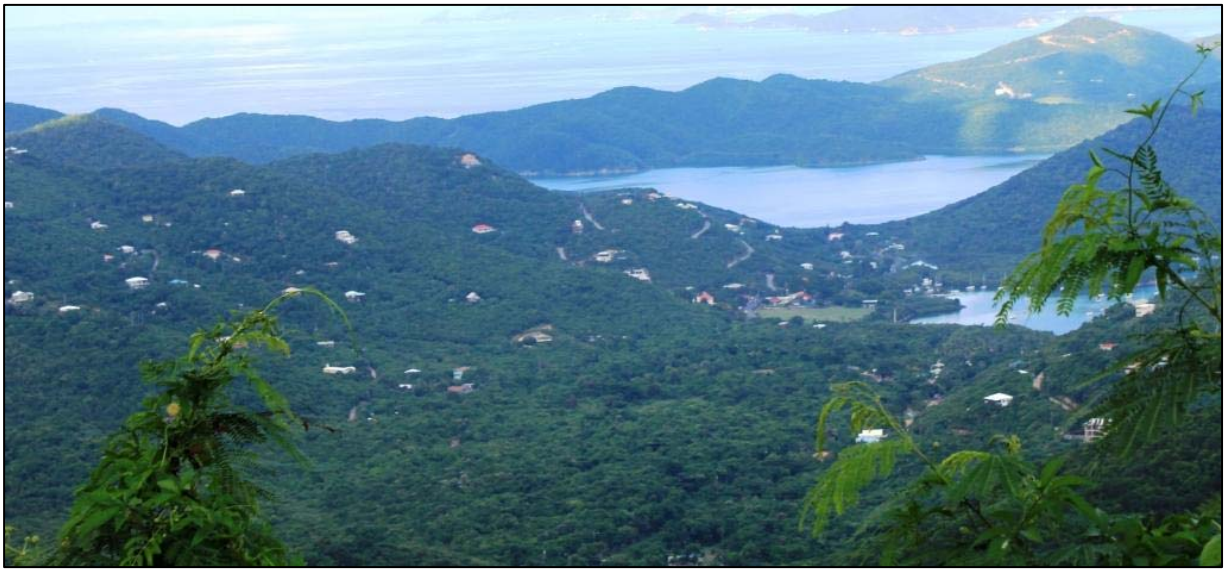


Photo 2: Carolina Valley looking east towards Coral Bay from Centerline Road.

disturbed dry wetlands area. The water then aggregates into three culverts under Route 107 and passes into the mangrove fringes of Coral Harbor.

Historically, as water sheet flowed down the hills, through the valley, and entered natural ghut paths, infiltration would reduce flow and vegetation would serve to reduce velocity and filter out sediment. More recently, as development has occurred in the watershed, water has increasingly been redirected down various subdivision and other private roads. For instance, King's Hill Road, Route 20, has diverted and concentrated enough stormwater runoff to provide another outlet through the mangrove-fringed shoreline to Coral Harbor (Photo 1).

2. Problem Statement

The natural drainage of the watershed has been altered by uphill residential construction, dirt croad erosion, and previous poor stormwater management techniques generating plumes (cover photo and Photo 1) stemming from the Main Ghut and King's Hill Road. Problems from uphill residential construction and dirt road erosion are discussed in Section 2.1. Problems from poor stormwater management techniques are discussed in Section 2.2. Section 2.3 discusses the effect of these two issues on the natural drainage system.

2.1 Gerda Marsh Road, La La Land, and Mill Vista

In many areas of the Carolina Valley Watershed, roadways function as water channels with little or no drainage solutions or swales to direct the water appropriately or protect the dirt roads from erosion that eventually deposits sediment into the ocean. The responsibility for these private subdivision roads nominally lies with the lot owners who face barriers to appropriate stormwater management of: (1) lack of knowledge about effective BMPs; (2) extremely high construction costs, often five times higher than on the US mainland; (3) legally unclear ownership of most road right-of-ways and, (4) no mandatory deed-based shared financing mechanisms or formal homeowners associations (HOAs). The following three private road areas were selected for inclusion in the NOAA ARRA Project because of their need for stormwater management.

Gerda Marsh Road is a mainly one-lane steep dirt road on the south side of the Carolina Valley running from Lower Bordeaux Mountain Road down to King's Hill Road. It provides access to approximately 40 residences, most inhabited by year-round residents, rather than vacationers. Road paving is limited and sporadic. Stormwater management devices are practically non-existent. Regular grading makes the road more susceptible to erosion without proper stormwater management. The road also acts as a conduit for water intercepted from the normal ghut system and redirects it down Gerda Marsh Road to King's Hill Road. Prior to road and residential development, the runoff ran overland, sheeting down the hill and into the main ghut at a point further back in the valley, farther from the ocean, thus allowing more time and area for infiltration (Photos 3-6).

The Lower Carolina Valley, below Centerline Road and north of King's Hill Road, is accessed by private William Marsh Road which crosses the Main Ghut at a steep ravine and continues until it meets private roads serving a subdivision area affectionally called "La La Land" which is in the northeastern portion of the valley floor. This area has about 10 residences. At the entrance to the La La Land area, the roadway crosses an unnamed ghut that can have highly concentrated flow from culverts on Centerline Road (Route 10) above. At these times, the road is impassable and serious erosion of the ghut channel occurs just south of the roadway. This unnamed ghut has had more stormwater funneled down it by both a resident and PW. For instance, Public Works blocked two upstream drainage culverts on Route 10 with fill and concrete in order to protect dwellings built in recent years along the downhill side of Centerline Road (Photos 7-8), sending more runoff to the next two culverts that feed this ghut. This issue has yet to be addressed.

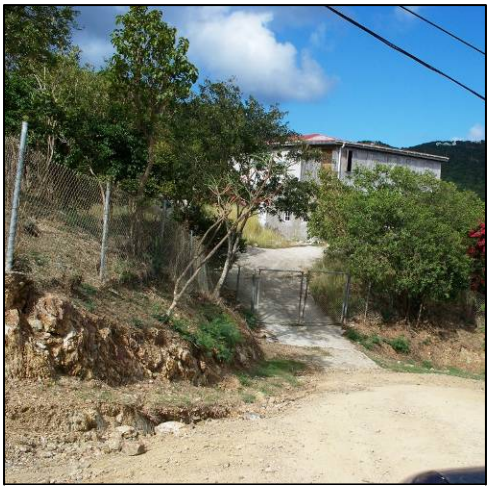


Photo 3: Gerda Marsh unpaved road segment.

Photo 4: Gerda Marsh unpaved road segment – Two Truck Corner.

Photo 5: Gerda Marsh unpaved road segment showing erosion.

Photo 6: Gerda Marsh unpaved road segments showing erosion.

Photo 7: William Marsh Road unpaved Main Ghut crossing.

Photo 8: La La Land Road unpaved ghut crossing.

Mill Vista is a short private dirt road providing access to about 12 homes. It had several stormwater management devices in place; however, they have blocked and overtopped easily in heavy rains, and new driveways off the road have altered drainage flows and forced water onto the downsloping dirt roadway. Modifications to all the existing structures and driveways would improve runoff management, and help the road water reach the area's natural ghuts. The intersection of Mill Vista and Centerline Roads is at a switchback on the main road (Photos 9-11) at a ghut crossing through a simple 30" culvert pipe, with no headwall, which frequently clogs. This ghut drains the Mill Vista subdivision and the residential area above it up to the ridgetop. Water flowing on the Mill Vista dirt road surface is intended to go into this ghut in several places, however the ghut is often bypassed by current grading conditions. Heavy water runoff and the steepness of the dirt road caused the road surface to erode out into the traffic lanes of Centerline Road, and force the muddy runoff down to the next Centerline Road culvert closer to Coral Bay.

Photo 9: Mill Vista unpaved road – intersection with Centerline Road.

Photo 10: Mill Vista unpaved road – looking down towards Centerline Road intersection.

Photo 11: Mill Vista unpaved road – above the first switchback.

2.2 Kings Hill/Gerda Marsh Road Intersection

The King's Hill Road sediment plume is generated by runoff from the roadside concrete swale in King's Hill Road (Photo 12). Public Works attempted to correct flow problems in 2002 by building a headwall (aka kneewall) and concrete swale when it paved this road. However, this effectively created another problem, since the one-quarter mile concrete swale serves as a direct transport path for all sediment water straight into oceanfront mangroves.

This runoff primarily originates in the areas along the private dirt Gerda Marsh Road (discussed above) before it intersects King's Hill Road (Photo 12). This runoff was very contaminated with sediment from the dirt portions of Gerda Marsh Road. The level of sediment in the water is too high for the mangroves to effectively filter and it produces a plume into Coral Bay.

Photo 12: King's Hill Road Stormwater Runoff as it hits the kneewall at the Gerda Marsh Road intersection.

2.3 6-4 Carolina Main Ghut

Development in the Carolina Valley Watershed has decreased the Main Ghut's ability to provide adequate infiltration and filtration services by channeling more stormwater down the ghut and not allowing it to sheet flow across the valley. Thus, increasing sediment loads from unpaved roads and cleared lots that flushed into Coral Bay. A natural sediment deposition area in the ghut (a curve) was brought to CBCC's attention by a local resident, with the suggestion that it be cleaned out and amplified (shown on Figure 1). It is located on a 5-acre parcel of government land: Parcel 6-4 Estate Carolina.

3. Background and Project Planning

Research has shown that as development increased in Coral Bay so has sedimentation of the bay waters, thereby threatening the health of the bay and its marine habitats (Devine et al. 2003). In order to reduce this threat, the partner agencies: CBCC, NOAA, the Virgin Islands Department of Planning and Natural Resources (DPNR), Environmental Protection Agency (EPA), and the Virgin Islands Resource Conservation and Development Council (V.I. RC&D), have aggressively spent the last five years planning and implementing actions to reduce sediment loads in Coral Bay.

Starting in 2007, NOAA funded the Coral Bay Watershed Management Plan (WMP) as a DPNR pilot watershed plan to provide a demonstration site for the whole U.S. Virgin Islands. Immediately upon publication of the WMP in 2008, CBCC applied for a $300,000 EPA Community for a Renewed Environment (CARE) grant, and received it in early 2009 to begin implementation of the WMP as part of the overall Coral Bay Watershed Management Project. The primary goal of the EPA CARE grant was to implement *WMP Recommendation #1 – Provide direct, on-site technical assistance to watershed residents, businesses, developers, and others implementing watershed recommendations*. To help with this recommendation the WMP discussed five actions, two of which CBCC implemented as part of the EPA CARE grant:

- *Near-Term Action 1.1: Use EPA CARE grant as seed money to support a 1-2 year, full-time hydrologist/watershed manager for Coral Bay.*
- *Near-Term Action 1.4: DPNR and CBCC should consider providing resources needed to support new personnel (i.e. GIS, office basics, vehicle, etc.).*

In spring 2009, working through a local nonprofit partner, V.I. RC&D, CBCC secured $1.5 million of NOAA ARRA grant funds. CBCC and V.I. RC&D used these funds to implement actions proposed in the NOAA ARRA Coral Bay Workplan prepared for the grant application, based on the expertise provided by the newly hired CBCC Stormwater Engineer (see Section 4.1). These NOAA ARRA funds allowed for the restoration of natural drainage functions and paving of roads in six subwatersheds in Coral Bay in order to eliminate or reduce the sediment-laden stormwater runoff plumes entering the bay. These projects also implemented portions of *WMP Recommendation #3 - Evaluate and repair erosion and drainage problems that are threatening property, damaging infrastructure, or delivering excessive sediment loads to Coral Bay.* CBCC's website contains a Project Overview of the USVI Watershed Stabilization Project and the Coral Bay Watershed Management Project.

In the NOAA ARRA Coral Bay Workplan, CBCC developed a list of watershed stabilization techniques appropriate for the Coral Bay environment (see Appendix A) and directly aimed at reducing sediment plumes to the bay. These were used to formulate the following goals for the Carolina Valley Project:

1. Retain and slow down water that reaches the valley floor through retention/detention basins (Strategy 2);
2. Reduce erosion and improve sediment control from dirt roads (Strategy 4);
3. Restore natural drainage flow patterns by redirecting water, grading and stabilizing roadways, and improving swales (Strategy 1); and,
4. Correct failed devices and upgrade BMPs (Strategy 4).

4. Project Implementation

4.1 Project Design

CBCC hired Joseph Mina, P.E. as its Stormwater Engineer in 2009 using the EPA CARE grant funds to provide design expertise and recommendations. Initially he wrote a series of engineering design memos based on field conditions to help identify the key BMPs for local implementation. He also contributed significantly to writing the NOAA ARRA Coral Bay Workplan and prioritizing the detailed projects in it. The EPA CARE grant funded the engineering design phase, with the NOAA ARRA funding taking over for the permitting, construction bidding, and field construction phases. V.I. RC&D was directly responsible for the construction phases of the Coral Bay NOAA ARRA projects. For personal reasons, Mr. Mina had to leave CBCC's employment in June 2010 and CBCC hired Christopher Laude, P.E. to complete the design phase and implement the NOAA ARRA BMP projects over the following year.

4.2 BMP Selection Process

CBCC initially divided the Carolina Valley into three areas based on stormwater management needs. The NOAA ARRA Coral Bay Workplan included these areas as described in Table 1. King's Hill/Gerda Marsh Road Intersection (C-1) and 6-4 Carolina (C-2) only saw minor design changes from the NOAA ARRA Coral Bay Workplan based on cost, contractor advice, and field

conditions. By June 2010 for King's Hill and March 2011 for 6-4 Carolina, CBCC had drafted a full Scope of Work, Details, & Specifications (Scope).

For Area C-3 (Gerda Marsh Road, Mill Vista, and La La Land), CBCC's Stormwater Engineers investigated the project sites during rain events to track flows and worked with local residents to refine and amplify the NOAA ARRA Coral Bay Workplan proposed actions. They also encouraged residential contributions to the overall project fund so that larger projects could be implemented. A Scope was finalized for each site, permits obtained, and then the projects were put out to bid. Based on the bids received, some elements had to be removed due to high cost, and other elements reprioritized or funded elsewhere. Implemented actions were based on work that could be funded through NOAA ARRA and HOA contributions. All remaining items were left for future efforts. For instance, on the La La Land Project, NOAA ARRA funds paid for pipe-arch culvert installation, a concrete swale, and 242 linear feet (LF) of a curb design swale, while the local HOA paid for 242 LF of road paving. A proposed waterbar on William Marsh Road was left undone.

Tables 1 & 2 summarize the transition from actions proposed in the NOAA ARRA Coral Bay Workplan to the implemented actions by including dates for proposal, dates for construction, and any additional comments necessary. All engineering design documents have been included in Appendix A.

Table 1: Proposed Actions (2009)

Location	Proposed Action	Status	Comments
C-1 (King's Hill/Gerda Marsh Road Intersection)	Restore natural flow by removing kneewall and blocking roadside to direct water into re-excavated old ghut channel. Install a forebay area and series of BMPs to create a naturalized treatment area consisting of infiltration and bio-filtration cells and rock check dams and baffles.	Refined and Constructed (November 2010)	Actual design was refined to a pond, and did not include originally planned forebay area.
C-2 (6-4 Carolina)	Install a detention/retention facility.	Constructed (July 2011)	
C-3 (Gerda Marsh Road, Mill Vista, and La La Land)	Redesign and pave intersection to the main road including sediment traps and/or "offline" bio-filtration and infiltration areas. Install waterbars, check dams in existing ghuts, and perform general maintenance and repair.	Refined and Constructed (June-July 2011)	See below for changes.

Table 2: Implemented Actions			
Location	**Implemented Action (Designed)**	**Status**	**Comments**
C-1 (King's Hill/Gerda Marsh Road Intersection)	Bioretention Pond (June 2010)	Constructed (November 2010)	Enhanced inflow swale and ramp added in fall 2011; Easement provided by landowner for pond - 1/3 acre valued at approx $200,000.
C-2 (6-4 Carolina)	Sediment Detention Basin (March 2011)	Constructed (July 2011)	
C-3 (Mil Vista Road)	Retrofitted culverts, paving, and roadside ditches. (January 2011)	Constructed (June 2011)	Residents did culvert refits, driveways, and paid for switchback paving to allow for more paving by NOAA Project at entrance to road.
C-3 (La La Land)	Paving and an integrated curb on William Marsh Road leading into the Main Ghut. Installation of a pipe-arch culvert at ghut intersection with road in La La Land area. Paving of portion of road and swale at La La Land. (April 2011)	Constructed (July 2011)	Residents paid for $30,000 of road paving in La La Land
C-3 (Gerda Marsh Road)	Waterbar and ditching, culvert inlet and pipe, swales, and paving. (January 2011)	Constructed (June 2011)	Only a portion of the work needed in this area is completed. Harder to get lot owner cooperation.

4.3 Problems Encountered/Overcome

The projects in these areas were completed without notable problems. It rained heavily during portions of this construction, which had the interesting benefit of seeing the improved results as soon as water paths were appropriately diverted/altered, even if the stabilization and armoring was still to be done.

4.4 Project Costs & Construction

After taking into consideration site conditions, BMP costs, and available project funds, the final BMPs implemented included a bioretention pond, a sediment detention basin, a series of culverts and reconstructed inlets, waterbars, roadside drainage channels, swales, and road paving for a total cost of $374,213, plus over $65,000 in HOA dollars for paving and some volunteer construction work. Table 3 below details project costs for the implemented BMP work. The sections below the table provide a more detailed description of construction activities. Appendix A has detailed design drawings.

Table 3: Carolina Valley Project Costs

6-4 Carolina Sediment Detention Basin Work

Description	*Total Cost*
Construct BMP Entrances	$9,500
Install Erosion Control Measures	$1,200
Install Rock Weir	$14,500
Clear & Grub Specified Areas	$1,150
Excavate and Construct Primary Sediment Basin	$28,500
Clear, Grub, & Excavate Future Sediment Basin Expansion Area	$13,600
Cleanup & Seed All Disturbed Areas	$2,800
Install Gauge	$250
Total 6-4 Carolina Work Cost	$71,500

King's Hill Road/Gerda Marsh Road Intersection Bioretention Pond Work

Description	*Total Cost*
General conditions, water labors, insurance, and subcontractors.	$8,750
Install rock construction entrance and material lay down area. Clear access area towards the geotextile sediment trap, install sediment trap.	$5,740
Clear and grub site, install erosion control blanket, seeding and maintenance, watering and reseeding, temporary fencing and brush berm installation, and final grading.	$18,400
Excavate pond area. Install and fill gabion baskets.	$33,416
Total King's Hill Road Work Cost	$66,306

Gerda Marsh Road Work

Location	*Description*	*Total Cost*
Area 1	Waterbar	$2,456
	Ditching	$1,276
	Inlet and Culvert	$15,155
Area 2	170 LF Ditching	$748
	Armored Swale	$14,599
Area 3	275 LF Ditching	$1,203
Area 4	70 LF long by x 12 foot wide Paving	$16,144
	320 LF Curb and Gutter	$28,679
	Remove 40.5 LF of curb & gutter. Sawcut and remove asphalt and existing concrete swale. Remove driveway wing only. Excavate for and replace approx 56 LF curb and gutter. Replace driveway wing and pavement out to toe of existing curb and gutter. Replace with relocated 8-foot wide concrete swale. Backfill. Pour 6" concrete pavement adjacent to swale in lieu of Public Works patching with asphalt.	$13,280
All Areas	Seed and Stabilization	$6,049
	Total Gerda Marsh Road Work Cost	$99,589

La La Land Work

Location	*Description*	*Total Cost*
Area 1	Grade and install paving with integrated curb on William Marsh Road leading into Main Ghut.	$20,719
Area 3	Install pipe-arch culvert and headwalls and pave over culvert in La La Land.	$34,937
	Pave 242 LF of ditch/swale.	$11,276
Area 4	Clean swale for another ghut crossing.	$1,111
	Total La La Land Work Cost	$68,043

Table 3: Carolina Valley Project Costs (continued)	
Mill Vista Work**	
Description	*Total Cost*
Concrete Inlet Structure	$6,940
150-foot Concrete Swale	$10,725
Paving a 150 LF by 14- to 18-foot wide Segment	$34,500
Earthen Mound	$4,155
Paving a 97 LF by 10-foot wide by 6-inch deep Segment	$12,455
Total Mill Vista Work Cost	$68,775
Total Carolina Valley Work	$374,213

* La La Land HOA paid for paving adjacent to concrete swale at cost of $30,000.
** Mill Vista HOA paved the switchback during the project at a cost of $35,000, and resident construction contractors made the engineer's modifications to their upper stormwater structures.

Culverts

A culvert is used to channel water underneath a road or trail. They can be made of different materials including metal, concrete, or plastic. The contractor installed two culverts as part of the Carolina Valley Project: a corrugated plastic pipe (CPP) at Two Truck Corner on Gerda Marsh Road, and an aluminum pipe-arch culvert on La La Land Road to lessen road damage. The sections below describe construction of each culvert.

Gerda Marsh Road

The contractor excavated and installed a 30-foot long, 30-inch diameter CPP culvert at Two Truck Corner (Photos 13-15). The contractor also constructed a 42-inch wide by 42-inch long

Photo 13: Gerda Marsh Road -Two Truck Corner culvert installation.

Photo 14: Gerda Marsh Road -Two Truck Corner culvert excavation.

Photo 15: Gerda Marsh Road -Two Truck Corner inlet construction.

reinforced concrete box at the culvert inlet. The box walls and floor were minimum six inches thick. The box sides were extended at least six inches beyond the outside diameter of the pipe in all directions. The contractor also installed an outlet structure at the downstream end of the culvert. The outlet structure has a 4-foot by 4-foot endwall, tapered sides and a minimum 6-foot long bottom that flares to 5-foot wide at the discharge end. Sidewalls sloped from the top of the endwall to flush with the discharge end. All exposed box edges were finished with a minimum one-inch bevel. The culvert invert was set flush with the bottoms of the inlet and outlet structures. Finally, the contractor modified the inlet structure so there was a six-inch gap for water entry under the cast iron grate, then backfilled and compacted soil against the concrete so that soil was flush with the top of concrete (completed culvert Photos 55-56.) At the culvert discharge the contractor installed filter cloth, A-Jack® concrete armor units and large rock riprap.

La La Land

Work performed consisted of construction of an aluminum structural plate culvert, commonly known as a pipe arch (6'7" span by 5'8" rise by 28-foot long run), at a secondary ghut crossing on the La La Land road (Photos 16-19). The construction proceeded as follows:

1. Excavate and install aluminum structural plate culvert, then backfill and compact soil.
2. Excavate and install an 8-inch thick concrete inlet structure headwall.
3. Excavate, form, and pave approximately 18 linear feet of 12-foot wide paving and 10-foot by 5-foot paving (6-inch deep wire reinforced concrete) over the aluminum structural plate culvert.

Inlets

Inlets are the entrance to a culvert and are important to the even flow of water through a culvert. CBCC's engineer designed modification to three inlets in Mill Vista to provide better water passage into the culverts. Two were modified by resident volunteer construction contractors, and the headwall and ghut cleaning needed at the Centerline Road intersection was done by the project contractor. The text below describes construction of each inlet.

Mill Vista

Work proposed consisted of: (1) constructing a concrete inlet box attached to the existing 30-inch diameter CPP under Centerline Road (Photos 20-21); (2) removing the wall of an existing inlet box and concrete debris, clearing the pipe, and constructing a 5-foot by 3.5-foot by 8-inch new wall on the existing inlet box; and, (3) constructing a concrete inlet box attached to an existing 36-inch corrugated plastic pipe.

Photo 16: La La Land Road before pipe-arch culvert installation.

Photo 17: La La Land Road during pipe-arch culvert excavation.

Photo 18: La La Land Road during pipe-arch culvert installation.

Photo 19: La La Land Road during pipe-arch culvert backfill.

Photo 20: Mill Vista Road inlet construction – during excavation.

Photo 21: Mill Vista Road inlet construction – after concrete.

Waterbar

Waterbars are angled ridges across a road that catch water and divert it to a roadside area to reduce the chance for erosion. Contractors use a variety of materials to construct waterbars such as logs and concrete. Waterbars were included in the Gerda Marsh Road and Mill Vista implemented actions, with the Mill Vista ones constructed by residents in 2009.

Gerda Marsh Road

Work performed included installing an "open trench" style concrete waterbar up-road from Two Truck Corner (Photo 22). The contractor angled this waterbar to funnel water off the unpaved road and into a roadside drainage channel leading to the culvert at the corner.

Photo 22: Gerda Marsh concrete open trench waterbar construction

Mill Vista

At the CBCC stormwater engineer's suggestion, the Mill Vista owners installed waterbars on their dirt road in June 2009, and immediately saw a reduction in road erosion. Most of these waterbars are still in use today on the upper portion of the road, which remains unpaved.

Roadside Drainage Channel

Where possible, engineers design roadside drainage channels to keep water off a road and funnel it to constructed drainage structures or natural waterways. Roadside drainage channels can be paved or unpaved. Contractors installed two drainage channels as part of the work at Gerda Marsh Road and Mill Vista.

Gerda Marsh Road

Work implemented included installation of approximately 290 linear feet of unpaved roadside drainage channel uphill from the culvert inlet at Two Truck Corner.

Mill Vista

Work implemented included excavating, forming, and paving a 150-foot by 4-foot concrete roadside, drainage channel (Photo 23) from the inlet structure at Centerline Road up Mill Vista Road. The drainage channel was designed to be separate from the pavement for the first 50 feet or so that a Vegetated Safety Berm could be constructed. Further uphill it was formed to be integral with the pavement and drivable.

Photo 23: Mill Vista Road concrete drainage channel installation.

Swale

Stormwater managers typically use swales to convey runoff in a desired direction. For instance, "cross-road" swales are used to channel runoff from one side of the road to the other into appropriate drainages. Concrete swales are typically used at sites where additional stabilization is necessary, such as a roadway.

Gerda Marsh Road

The contractor installed a 12-foot long by 20-foot wide and 12 inches deep concrete swale on a side road where substantial flows eroded the road and hillside below. The swale was specified with a minimum one-inch over four feet slope towards a riprap and A-Jack® energy dissipater (Photos 24-27).

Photo 24: Gerda Marsh cross-road swale excavation and forming.

Photo 25: Gerda Marsh cross-road swale paving.

Photo 26: Gerda Marsh cross-road swale paving.

Photo 27: Gerda Marsh cross-road swale installation.

La La Land

Two swales were originally specified for this area. On William Marsh road, the contractor pointed out that he could construct a wide drivable concrete surface with an integrated curb for the same dollar amount as constructing an oval swale. Therefore, the design for the swale to reduce road erosion where runoff was accumulating on the roadway and then entering the Main Ghut was shifted to incorporate paved road surface too. Another deep ditch swale was specified beside a being-paved section near the pipe-arch culvert, to assure that erosion was not caused by extreme flows in this area coming down from two roads and two Centerline Road culverts.

Paving and Curb and Gutter

Roadway paving, although not typically considered a stormwater BMP, is frequently used in the Virgin Islands to avoid continuing erosion on dirt road surfaces and to channel water. Sometimes, as part of paving, curbs and gutters are installed to funnel stormwater to drainage structures. The contractors in Gerda Marsh, La La Land, and Mill Vista installed pavement and curbs and gutters in selected locations. Vegetated dirt swales and natural ghuts are preferred stormwater conveyances, but will not work well if the flows are routinely heavy and scouring or contain substantial fist-sized rock debris. Normally concrete water conveyances are only desirable where flows cause erosion or might undermine a road or structure. The text below provides more detail on construction.

Gerda Marsh Road

Work consisted of excavating, forming, and paving approximately 56 linear feet of 12-foot wide by six inches deep wire reinforced concrete paving from the top of the existing paving at the lowest intersection upwards. Additionally, the contractor excavated and installed a 320-foot long, 6-inch thick, and 4-foot wide concrete curb and gutter along lower Gerda Marsh Road just before the intersection with King's Hill Road (Photos 28-29). For the roadway paving and curb and gutter installation, the concrete was reinforced with 6 inch by 6 inch welded wire mesh. **These wire mesh sheets are recommended as being superior to fiber-reinforced concrete or wire mesh rolls.** Finally, the contractor installed Propex® turf reinforcement matting (TRM) between the curb and gutter and existing asphalt pavement.

Photo 28: Gerda Marsh Road curb and gutter installation.

La La Land

Work conducted on William Marsh Road consisted of constructing a concrete roadside ditch in an area adjacent to the Main Ghut road crossing. Construction included grading the roadbed to provide positive slope and installing approximately 120 linear feet of 9-foot wide by 6-inch deep wire reinforced paving with integrated curb.

Photo 29: Gerda Marsh Road curb and gutter installation.

Work conducted on La La Land Road consisted of excavating, forming, and paving approximately 242 linear feet of 6-inch deep wire reinforced swale, adjacent to the new paving paid for by the HOA (Photos 30-33).

Photo 30: La La Land Road gutter forming.

Photo 31: La La Land Road gutter installation.

Photo 32: La La Land Road road paving.

Photo 33: La La Land Road completed road paving.

Mill Vista

Paving consisted of the following tasks:

1. Excavation and paving of 150 linear feet of 18-foot wide by 6-inch thick wire reinforced concrete from Centerline Road up Mill Vista Road. Pavement width narrows to about 14 feet at the top end. The contractor also backfilled and compacted soil against the concrete so that the soil is flush with the top of concrete. The pavement was separated from the paved drivable ditch for the first 50 feet or so, and then integrated with the drivable paved ditch (Photos 34-37).

2. In the area where the paved ditch is separate from the road paving, the contractor graded the space between the paved areas as a mound (to act as a barrier between the road and the ghut for vehicle traffic) and installed Propex® TRM so that it covered the mound and extended beneath the proposed paving by at least six inches.

3. Continue paving from the switchback down the road such that a 97-foot long by 10-foot wide by 6-inch deep section of concrete was installed.

Photo 34: Mill Vista Road paving.

Photo 35: Mill Vista Road paving.

Photo 36: Mill Vista Road paving and earthen mound.

Photo 37: Mill Vista Road paving.

Bioretention Pond

King's Hill Road

A bioretention pond is a landscaped depression that receives stormwater runoff. The intent of the pond is to retain the water so that it has time to infiltrate into the ground and cleanse itself of pollutants including allowing sediment to settle to the bottom of the pond. Bioretention Pond work (Photos 38-43) by the contractor consisted of the following tasks:

1. Installation of a rock construction entrance and materials laydown area.
2. Installation of a geotextile sediment trap and performing periodic maintenance and sediment removal as needed to maintain performance.
3. Installation of a 250-foot long gabion basket emergency spillway with top elevation at a minimum six inches below the edge of the roadway concrete swale.
4. Clearing and grubbing an area of work and installation of brush berms a minimum of 20 feet away from the outside edge of the gabions.
5. Excavation of the basin area to a 6-foot depth with a bottom area of 3,800 square feet (ft^2) and a top area of 7,400 ft^2.
6. Installation of erosion control blanket in all disturbed areas with Bermuda grass spread both above and below the blanket.
7. Installation of a goat proof fence around the perimeter of the improvements with a 10-foot wide maintenance access gate.
8. Maintenance, watering, and reseeding (if needed) all areas until 70% vegetative cover is established in areas not protected by riprap.

9. Removal of the geotextile sediment trap, all construction materials and debris, and temporary construction laydown area plus seeding and stabilizing these areas with Bermuda grass at rate of 20 pounds per acre**.**

Photo 38: Bioretention Pond before clearing.

Photo 39: Bioretention Pond after clearing.

Photo 40: Swale leading into Bioretention Pond.

Photo 41: Bioretention Pond riprap weir construction.

Photo 42: Bioretention Pond looking at riprap weir.

Photo 43: Completed Bioretention Pond.

Sediment Detention Basin

6-4 Carolina

A sediment detention basin is typically constructed in or adjacent to a river channel to temporarily store water, preventing flooding and allowing sediment and other pollutants to settle out. The 6-4 Carolina sediment detention basin is currently a natural sediment deposition area on the Main Ghut that the project modified and enhanced. Detention basin work (Photos 44-49) consisted of the following tasks:

Photo 44: Sediment Detention Basin before construction.

Photo 45: Sediment Detention Basin during construction.

Photo 46: Sediment Detention Basin during construction.

Photo 47: Sediment Detention Basin during construction looking at weir.

Photo 48: Sediment Detention Basin after construction.

Photo 49: Sediment Detention Basin after construction looking at weir.

1. Installation of a rock construction entrance.
2. Installation of silt fence.
3. Installation of a rock weir.
4. Clearing and grubbing a soil/rock stockpile area.
5. Excavation of the sediment basin area as shown on the plans beginning at the rock weir and proceeding upstream. Excavated material was placed in a stockpile area with the contractor segregating materials into two piles: one with ghut sand and the other with large rocks, cobbles, and boulders.
6. After construction was complete, removal of all construction materials and debris from any temporary construction laydown and soil stockpile areas, and seeding and stabilizing with Bermuda grass.
7. Installation of gauge staffs.

4.5 Achieved Results

Since project completion, the area has received at least six moderate rainfall events, including Tropical Storm Irene in August 2011. As the sediment monitoring discussion outlines below, sedimentation has been reduced post construction, considerably in the case of the King's Hill Road bioretention pond. For a total project cost of $374,213 (including $65,000 in contributions from HOAs), the project was able to stabilize roadways, construct sediment retention and detention features, and improve sediment control from roads; thus, reducing sediment discharged into the ocean. Photos 50-65 show implemented stormwater BMPs. Attachment A includes interpretive posters created to highlight these achievements.

Photos 50: Sediment Detention Basin during Tropical Storm Irene.

Photos 51: Sediment Detention Basin during Tropical Storm Irene.

Photos 52: Sediment Detention Basin during Tropical Storm Irene.

Photos 53: Sediment Detention Basin and sediment deposition after Tropical Storm Irene.

Photo 54: King's Hill Road swale to Bioretention Pond.

Photo 55: King's Hill Road Bioretention Pond with gauges.

Photo 56: Mill Vista Road earthen mound.

Photo 57: Mill Vista Road inlet.

Photos 58: Mill Vista Road paving.

Photo 59: Mill Vista Road paving.

Photo 60: Gerda Marsh Road culvert inlet.

Photo 61: Gerda Marsh Road culvert outlet.

Photos 62: Gerda Marsh Road waterbar.

Photos 63: Gerda Marsh Road curb and gutter.

Photo 64: La La Land Road pipe-arch culvert.

Photo 65: William Marsh Road paving and gutter at Main Ghut.

5. Sediment Reduction Monitoring

Researchers conducted sediment and turbidity monitoring at sites within the Carolina Valley Watershed and below the watershed in Coral Bay. Dr. Barry Devine led a monitoring team (partially NOAA ARRA funded) that tracked turbidity in the watershed over a two-year period (September 2009 through September 2011). Dr. Devine used five primary sampling points in the watershed for turbidity monitoring:

1. The Coral Bay flats outlet of the Main Ghut on the east side of Route 107;
2. King's Hill Road outlet on the east side of the Route 107 intersection;
3. Estate Carolina Junction where King's Hill Road has a large swale for a ghut crossing;
4. King's Hill Road/Gerda Marsh Road intersection; and,
5. La La Land Crossing at the ghut crossing below Centerline.

After analyzing the data, Dr. Devine's results showed:

> "The King('s) Hill detention pond and drainage diversion was the most obviously successful stormwater mitigation project completed in the valley. The pond itself has trapped tens of metric tons of material that would otherwise have gone straight into the bay via the diversion down King's Hill Road to the outlet" (Devine 2012).

Additionally, after project construction, Dr. Devine's monitoring team began to collect a series of samples from the Main Ghut to analyze how well the stormwater BMPs were reducing sediment as water flowed past King's Hill Road, through the Carolina Valley and the sediment detention basin [at 6-4 Carolina], and then out into Coral Bay. This data showed that, in four of six sampling events, flows at the Coral Bay flats outlet (after the detention basin) were less turbid than those measured at the Main Ghut in the valley prior to the detention basin (CBCC 2012).

Dr. Sarah Gray, University of San Diego, and her team (partially NOAA ARRA funded) conducted marine and terrestrial sediment and water quality monitoring in Coral Bay from July 2007 to early March 2012. Her team regularly monitored 25 sediment traps at 14 stations in four bays (Great Lameshur, Little Lameshur, Coral Bay, and Hurricane Hole), collecting water and sediment samples at regular intervals (approximately every 26-28 days) at two trap heights (30 & 60 cm from bottom) and when storms occurred. Dr. Gray selected 11 main sites throughout Coral Bay including three in Hurricane Hole to capture sediment coming off an undisturbed watershed, two offshore reef areas, and the other six sites along the developed Coral Bay shoreline. The North Mangrove (TC-5) and South Mangrove (TC-8) were located at the base of the King's Hill and Main Ghut outlets. Her results showed:

> "Total and terrigenous sediment accumulation was generally higher below the steepest and most developed watersheds (such as Shipwreck [TC-3B] and Coral Harbor [TC-5, TC-8]) than below the [less] developed watersheds (such as Plantation Hill) for equivalent environments. …Total sedimentation accumulation rates below all ARRA mitigated watersheds (North Mangrove [TC-5], South Mangrove [TC-8], Shipwreck Shore [TC-3B]) were lower during the fall of 2011, which was the post-mitigation period compared to 2010. But these 2011 accumulation rates do not appear to be measurably

lower than they were pre-mitigation during the fall rainy season of 2009. Completion of our fall 2011 monitoring and a detailed analysis and comparison of terrigenous (not total accumulation) and environmental data (rainfall and currents) during specific storm periods will be required before we can make an assessment of whether there has been a measurable post-mitigation reduction in marine terrigenous accumulation based on these data" (Gray 2012).

Dr. Carlos Ramos-Scharron and his team took "daily observations of [King's Hill Road] pond water levels and sporadic measurements on the amount of sediment that have settled to the bottom of the pond, in combination with the monitoring of rainfall rates and totals" to evaluate the volumetric capacity of the pond (Ramos-Scharron et al. 2012). This type of analysis also provided a way to rate the effectiveness of the pond in reducing Coral Bay sediment loads. Through the use of pond surveys, staff gauges, field data collection, and modeling and other calculations, Dr. Ramos-Scharron was able to calculate sedimentation rates and concluded:

- "…that the size of the [King's Hill] Detention Pond is adequate to handle the runoff generated from the source catchment"; and,
- "The total mass of sediment retained by the pond during the monitoring period (15-Oct-10 to 19-Aug-11) was roughly 58 tons. Adjusted for rainfall this translates into a sediment delivery rate of 86.5 tons yr-1 and this is the estimated amount of sediment that otherwise would be reaching Coral Bay if the [King's Hill] Detention Pond would not have been constructed" (Ramos-Scharron et al. 2012).

6. Lessons Learned

Sediment retention ponds and detention basins can act as very effective retrofits to help mitigate bad development practices taking place upstream and on the surrounding hills. Where flooding situations can be avoided, ponds that retain water provide a better solution since they also can become naturalized habitat areas, promote the growth of fruit trees, and provide a source of water for livestock and wild creatures. In the future, these ponds might be routinely required below all hillside development, even if agreements and funds need to change hands between owners. Note, even after cleanout, habitat should return quickly. Dragonflies and herons were present in the bioretention pond within two months after original construction.

In two out of three subdivisions, significant funds were brought forward by residents for paving work - after CBCC had done all the engineering, permissions, and even bid out the projects. Residents are reluctant to commit actual dollars until (1) the construction will happen "in the next two weeks;" and, (2) they can see the plans, review them, and talk to the engineer and each other. Thus, the long informal process of encouraging HOAs to be formed, asking for input and participation, and letting them know more work can be done in their neighborhoods if they contribute "real dollars" has generally been a win/win for everyone involved.

7. Next Steps

Residents and HOAs can continue progress on adding stabilization features and paving of their roads throughout the valley, and especially in these three project areas.

As the retention/detention basins settle in, CBCC will be monitoring how quickly they fill and how often they need removal of fill material, which can be recycled to productive construction uses. Additional continuing water quality monitoring is desirable, if funding can be secured. CBCC owns most of the key equipment for this sampling.

On the surrounding hills around Carolina Valley, attention needs to be paid to the Bordeaux Mountain area and how those residential sites, roads, and hillsides contribute to the flows and sedimentation below. Centerline Road, Route 10, and the three large 30-year-old subdivisions on the upper side of this road all need to be reviewed for up-to-date stormwater management recommendations. The Federal Department of Transportation, which is responsible for Route 10 original construction and continued upgrade and maintenance, needs or should undertake some significant stormwater and hillside retention planning and implementation.

8. References

Coral Bay Community Council (CBCC). 2012. *EPA CARE Grant Final Report. Turbidity Report*.

Devine, Barry, Ph.D. 2012. *Virgin Islands NOAA-ARRA Monitoring Program Pre- and Post-Treatment Turbidity Monitoring Report Coral Bay Watershed*.

Devine, B., Brooks, G., and R. Nemeth. 2003. *Coral Bay Sediment Deposition and Reef Assessment Study*. State of the Bay, Final Project Report, Executive Summary. Submitted to VI DPNR Division of Environmental Protection MOA #NPS-01801.

Gray, Sarah, Ph.D. 2012. *Effects of Watershed Erosion Control on Land-Based Sources of Pollution to Coral Reefs in RCP Priority Site*. January 30.2012.

Ramos-Scharron, Carlos E., Ph.D., Bruce Swanson, and Barry Devine, Ph.D. 2012. *Assessment of Runoff and Sediment Trapping Capacity of Kingshill Detention Pond*, Coral Bay, St. John. Submitted to NOAA on behalf of V.I. RC&D as part of: USVI Coastal Habitat Restoration through Watershed Stabilization Project. NOAA-ARRA: 2009-2012- Terrestrial Monitoring Component, East End, St. Croix. February.

Attachment A: Watershed Poster

SEDIMENT DETENTION BASIN

CORAL BAY COMMUNITY COUNCIL

US VIRGIN ISLANDS RC&D COUNCIL, INC.

WHAT IS A SEDIMENT DETENTION BASIN?

This Sediment Detention Basin slows the main ghut water flow in a natural sediment deposition area. Then water is returned to the natural ghut to continue downstream towards Coral Bay. The ghut channel has been expanded so that water slows to allow sediment deposition within the detention basin. During high flows, the stormwater will slow in the basin area but will overtop the spillway and continue seaward in the natural ghut. Deposited materials will be collected and used as building supplies such as gravel, topsoil and building sand. The sediment detention basin can be a source of water for irrigation or other public use as well.

TYPICAL SEDIMENT DETENTION BASIN

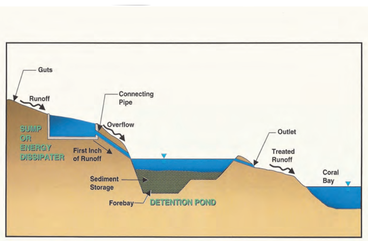


Figure 13
Detention Pond Conceptual Design

BEFORE & AFTER

DURING CONSTRUCTION

THE CAROLINA VALLEY WATERSHED

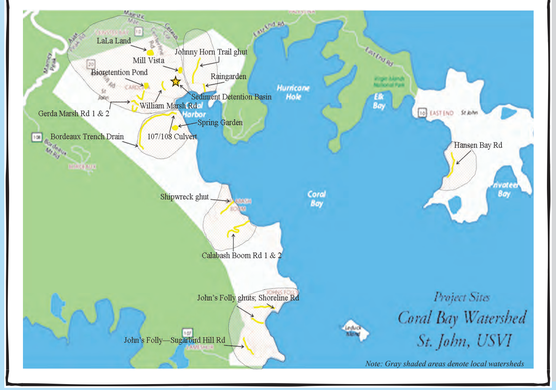
The main ghut in the Carolina Valley watershed historically delivers significant sediment and pollution to Coral Bay Harbor. The natural drainage of the watershed has been altered by uphill residential construction, dirt road erosion, previous poor stormwater management techniques and increased sediment flows. This map shows the Carolina Valley area and the location of the main ghut in the sediment detention basin at 6-4 Carolina, owned by the Virgin Islands government.

AFTER

OBJECTIVES

1. Retain and slow water that reaches the valley floor in detention basins with Best Management Practices (BMPs) including infiltration cells and forebays.
2. Regularly clean sediment deposition basins and reuse sediment as gravel, topsoil and building soil.

SITE LOCATIONS



WATERSHED SCALE GEOGRAPHIC INFORMATION SYSTEM (GIS) PLANNING TOOLS TARGETED WATER QUALITY MONITORING RESEARCH THAT HELPED IN SELECTING THE PRIORITY SITES FOR THESE SEDIMENT REDUCTION PROJECTS. FOLLOW-UP TERRESTRIAL AND MARINE SEDIMENT MONITORING WILL QUANTIFY AND DEMONSTRATE THE SUCCESS IN REDUCING SEDIMENT POLLUTION REACHING THE BAY.

WHAT YOU CAN DO!

- ⇒ Vegetate bare slopes with native plants
- ⇒ Minimize use of pesticides & fertilizers
- ⇒ Clean up driveways, roadsides and gutters
- ⇒ Use cut brush to create berms on steep slopes
- ⇒ Eliminate muddy run-off water
- ⇒ Never dump anything down storm culverts or ghuts
- ⇒ Properly dispose of oils, paints and chemicals
- ⇒ Do not disturb ghuts for 30 feet from center of ghut
- ⇒ Preserve all trees
- ⇒ Pump and inspect your septic tank regularly
- ⇒ Notify DPNR if you notice a problem
- ⇒ DPNR permits are needed for using backhoes & trackhoes
- ⇒ Educate each other
- ⇒ Participate in community projects!

THANKS TO OUR LEAD PARTNERS!

CORAL BAY COMMUNITY COUNCIL (CBCC)
VIRGIN ISLANDS RESOURCES CONSERVATION & DEVELOPMENT COUNCIL (VIRC&D)
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)
US ENVIRONMENTAL PROTECTION AGENCY (EPA)
VIRGIN ISLANDS DEPT. OF PLANNING AND NATURAL RESOURCES (DPNR)
VIRGIN ISLANDS DEPT. OF PUBLIC WORKS (DPW)
COMMUNITY VOLUNTEERS AND HOMEOWNERS' ASSOCIATIONS

PROTECTING COASTAL & CORAL REEF HABITATS BY REDUCING EROSION & SEDIMENTATION

THIS PROJECT IS ONE OF 18 IMPLEMENTED IN THE CORAL BAY WATERSHED WITH $1.5 MILLION IN NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION FUNDING UNDER THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009, AS PART OF THE $2.7 MILLION USVI COASTAL HABITAT RESTORATION THROUGH WATERSHED STABILIZATION PROJECT TO REDUCE SEDIMENT LOADING RATES INTO THE COASTAL WATERS OF THREE USVI WATERSHEDS: CORAL BAY AND FISH BAY ON ST. JOHN AND EAST END BAY ON ST. CROIX. THE U.S. ENVIRONMENTAL PROTECTION AGENCY HAS PROVIDED FUNDING TO THE CORAL BAY COMMUNITY COUNCIL UNDER ITS COMMUNITY ACTION FOR A RENEWED ENVIRONMENT (CARE) PROGRAM TO SUPPORT THIS WORK. LOCAL HOMEOWNERS ASSOCIATIONS, THE VIRGIN ISLANDS GOVERNMENT AND COMMUNITY VOLUNTEERS HAVE ALSO PROVIDED RESOURCES AND WORKED COOPERATIVELY TO ACHIEVE THE PROJECT OBJECTIVE OF REDUCING THE STORMWATER SEDIMENT PLUMES ENTERING BEAUTIFUL BLUE CORAL BAY. THESE PROJECTS ARE ALSO PART OF IMPLEMENTING THE CORAL BAY WATERSHED MANAGEMENT PLAN THROUGH PUBLIC-PRIVATE PARTNERSHIPS TO IMPROVE WATER QUALITY, ECOLOGICAL HEALTH, AND STORMWATER MANAGEMENT WHILE MINIMIZING FUTURE IMPACTS ASSOCIATED WITH WATERSHED DEVELOPMENT.

FOR MORE INFORMATION PLEASE CONTACT:
CORAL BAY COMMUNITY COUNCIL
(340) 776-2099
WWW.CORALBAYCOMMUNITYCOUNCIL.ORG

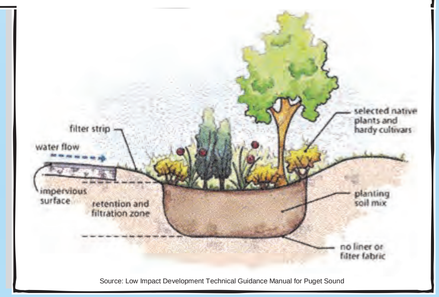
KING'S HILL ROAD BIORETENTION POND

CORAL BAY COMMUNITY COUNCIL

What Is A Bioretention Pond?

Bioretention ponds are shallow constructed depressions used to slow and treat stormwater runoff through filtration. These ponds use physical and biological processes such as native plants to remove pollutants from stormwater, thus leaving clean water to percolate into the surrounding soil or return to the natural ghut with far less sediment. At this particular site, stormwater runoff from uphill residential areas filled with sediment and pollutants historically flowed ¼ mile down King's Hill Road directly into Coral Harbor but is now redirected into the pond. Bioretention ponds can be highly effective during large storms or hurricanes in which there are large volumes of stormwater over a short period of time.

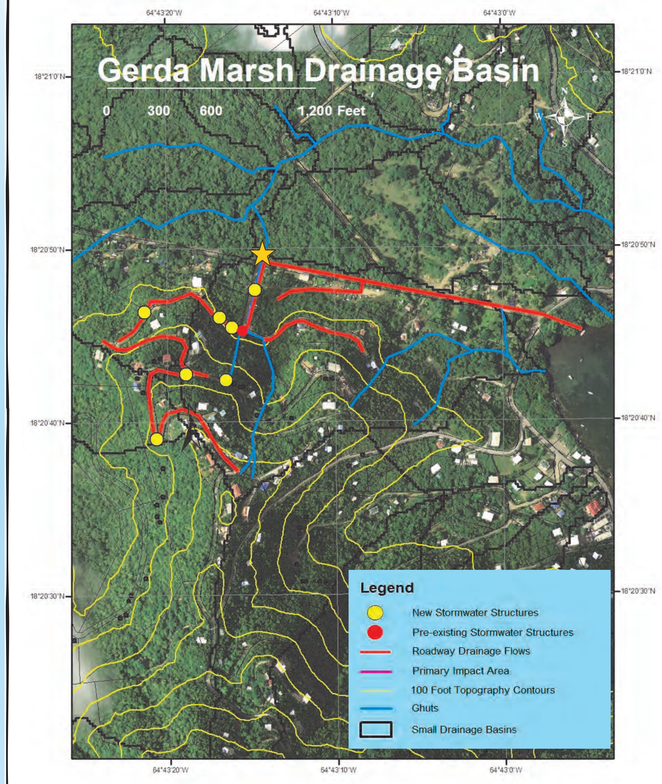
Typical Bioretention Pond



Source: Low Impact Development Technical Guidance Manual for Puget Sound

BEFORE

IN CONSTRUCTION



The Carolina Valley Watershed

Drainage from the Carolina Valley watershed has a significant impact with pollution and sedimentation in Coral Bay Harbor. The natural drainage of the watershed has been altered by uphill residential construction, dirt road erosion, and previous poor stormwater management techniques. This map shows the Carolina Valley area, sub-basins, natural drainage flow, pre-existing and new drainage structures.

AFTER

Bioretention Advantages

- Provides a variety of pollutant removal mechanisms
- Controls flooding
- Provides sediment control
- Ghut and channel protection
- Groundwater recharge
- Reduces runoff velocity
- Reduces runoff volume
- Reduces sediment load
- Reuse filtered sediment as gravel, topsoil, building sand
- Provides wildlife and riparian habitat

Site Locations

Watershed scale Geographic Information System (GIS) planning tools targeted water quality monitoring research that helped in selecting the priority sites for these sediment reduction projects. Follow-up terrestrial and marine sediment monitoring will quantify and demonstrate the success in reducing sediment pollution reaching the bay.

What YOU Can Do!

⇒ Vegetate bare slopes with native plants
⇒ Minimize use of pesticides & fertilizers
⇒ Clean up driveways, roadsides and gutters
⇒ Use cut brush to create berms on steep slopes
⇒ Eliminate muddy run-off water
⇒ Never dump anything down storm culverts or ghuts
⇒ Properly dispose of oils, paints and chemicals
⇒ Do not disturb ghuts for 30 feet from center of ghut
⇒ Preserve all trees
⇒ Pump and inspect your septic tank regularly
⇒ Notify DPNR if you notice a problem
⇒ DPNR permits are needed for using backhoes & trackhoes
⇒ Educate each other
⇒ Participate in community projects!

Thanks to our lead partners!

Coral Bay Community Council (CBCC)
Virgin Islands Resources Conservation & Development Council (VIRC&D)
National Oceanic and Atmospheric Administration (NOAA)
US Environmental Protection Agency (EPA)
Virgin Islands Dept. of Planning and Natural Resources (DPNR)
Virgin Islands Dept. of Public Works (DPW)
Egbert Marsh Trust
Community volunteers and Homeowners' Associations

Protecting Coastal & Coral Reef Habitats by Reducing Erosion & Sedimentation

This project is one of 18 implemented in the Coral Bay watershed with $1.5 million in National Oceanic and Atmospheric Administration funding under the American Recovery and Reinvestment Act of 2009, as part of the $2.7 million USVI Coastal Habitat Restoration through Watershed Stabilization project to reduce sediment loading rates into the coastal waters of three USVI watersheds: Coral Bay and Fish Bay on St. John and East End Bay on St. Croix. The U.S. Environmental Protection Agency has provided funding to the Coral Bay Community Council under its Community Action for a Renewed Environment (CARE) program to support this work. Local homeowners associations, the Virgin Islands Government and community volunteers have also provided resources and worked cooperatively to achieve the project objective of reducing the stormwater sediment plumes entering beautiful blue Coral Bay. These projects are also part of implementing the Coral Bay Watershed Management Plan through public-private partnerships to improve water quality, ecological health, and stormwater management while minimizing future impacts associated with watershed development.

For More Information Please Contact:
Coral Bay Community Council
(340) 776-2099
www.coralbaycommunitycouncil.org

GERDA MARSH ROAD

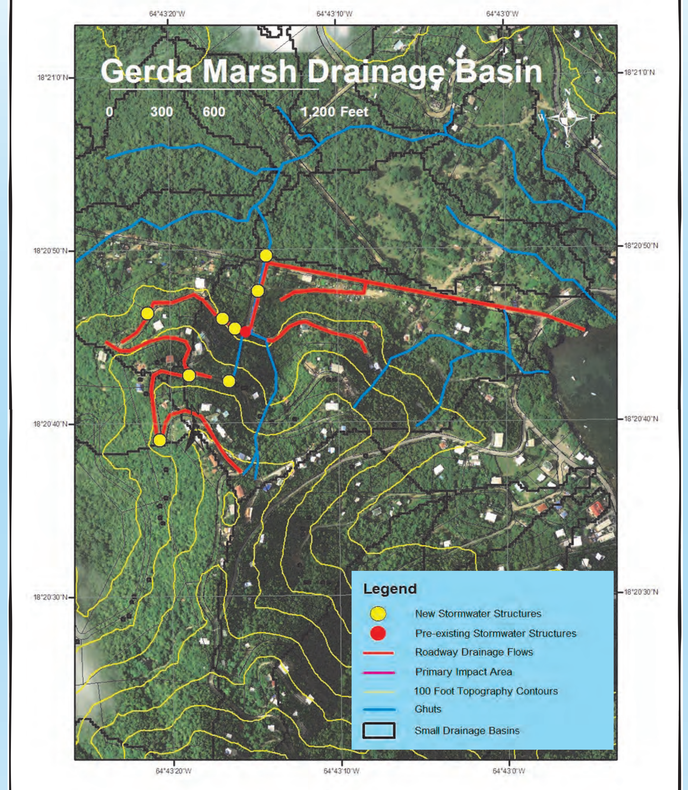
What Is Happening Here?

The major issue here was during heavy rainfall the dirt road functioned as a water channel with few drainage solutions or devices to direct stormwater appropriately. Water would flow down Gerda Marsh Road while causing considerable erosion and collecting sediment that eventually followed King's Hill Road ¼ mile before depositing into the ocean. Limited paving of the road and installing swales, ditches, curbs, and erosion control devices helps direct stormwater in a controlled manner back into the natural ghut or to the King's Hill Bioretention Pond. Removing stormwater from the road and reducing sediment greatly increases water quality flowing into the mangroves and ocean.

Erosion Control Management

Before

During Construction



The Carolina Valley Watershed

Drainage from the Carolina Valley watershed has a significant impact with pollution and sedimentation in Coral Bay Harbor. The natural drainage of the watershed has been altered by uphill residential construction, dirt road erosion, and previous poor stormwater management techniques. This map shows the Carolina Valley area, sub-basins, natural drainage flow, and pre-existing and new drainage structures.

After

Stabilization Objectives

- Reduce sediment transport
- Redirect flow into natural ghuts at higher elevations
- Remove stormwater off the road
- Reduce hillside erosion
- Deposit stormwater into the bioretention pond
- Improve water quality
- Stabilize ditches with rocks, vegetation, or paving heavy flow gutters

Site Locations

Watershed scale Geographic Information System (GIS) planning tools targeted water quality monitoring research that helped in selecting the priority sites for these sediment reduction projects. Follow-up terrestrial and marine sediment monitoring will quantify and demonstrate the success in reducing sediment pollution reaching the bay.

What YOU Can Do!

⇒ Vegetate bare slopes with native plants
⇒ Minimize use of pesticides & fertilizers
⇒ Clean up driveways, roadsides and gutters
⇒ Use cut brush to create berms on steep slopes
⇒ Eliminate muddy run-off water
⇒ Never dump anything down storm culverts or ghuts
⇒ Properly dispose of oils, paints and chemicals
⇒ Do not disturb ghuts for 30 feet from center of ghut
⇒ Preserve all trees
⇒ Pump and inspect your septic tank regularly
⇒ Notify DPNR if you notice a problem
⇒ DPNR permits are needed for using backhoes & trackhoes
⇒ Educate each other
⇒ Participate in community projects!

Thanks to our lead partners!

Coral Bay Community Council (CBCC)
Virgin Islands Resources Conservation & Development Council (VIRC&D)
National Oceanic and Atmospheric Administration (NOAA)
US Environmental Protection Agency (EPA)
Virgin Islands Dept. of Planning and Natural Resources (DPNR)
Virgin Islands Dept. of Public Works (DPW)
Community volunteers and Homeowners' Associations

Protecting Coastal & Coral Reef Habitats by Reducing Erosion & Sedimentation

This project is one of 18 implemented in the Coral Bay watershed with $1.5 million in National Oceanic and Atmospheric Administration funding under the American Recovery and Reinvestment Act of 2009, as part of the $2.7 million USVI Coastal Habitat Restoration through Watershed Stabilization project to reduce sediment loading rates into the coastal waters of three USVI watersheds: Coral Bay and Fish Bay on St. John and East End Bay on St. Croix. The U.S. Environmental Protection Agency has provided funding to the Coral Bay Community Council under its Community Action for a Renewed Environment (CARE) program to support this work. Local homeowners associations, the Virgin Islands Government and community volunteers have also provided resources and worked cooperatively to achieve the project objective of reducing the stormwater sediment plumes entering beautiful blue Coral Bay. These projects are also part of implementing the Coral Bay Watershed Management Plan through public-private partnerships to improve water quality, ecological health, and stormwater management while minimizing future impacts associated with watershed development.

For More Information Please Contact:
Coral Bay Community Council
(340) 776-2099
www.coralbaycommunitycouncil.org

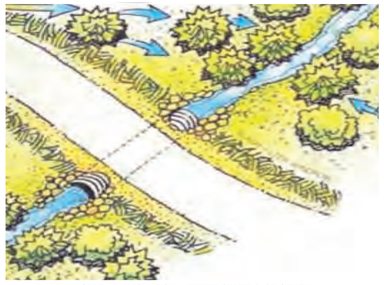
LALA LAND ROAD

CORAL BAY COMMUNITY COUNCIL

What Is Happening Here?

At this site, a ghut crossed the dirt road and caused severe erosion on the down-stream side. The goals were to install concrete swales, road paving on steep slopes, an appropriate ghut crossing and roadside ditches to improve drainage. To reduce sediment transport, erosion, and water channeling down the dirt road, a pipe arch bridge was installed at the ghut crossing. Periodic cleaning of these improvements will ensure they function well during storm events. To check effectiveness, researchers will conduct water quality and turbidity tests in Coral Bay and along hillsides. Local residents funded most of the road paving as their partnership share of the project.

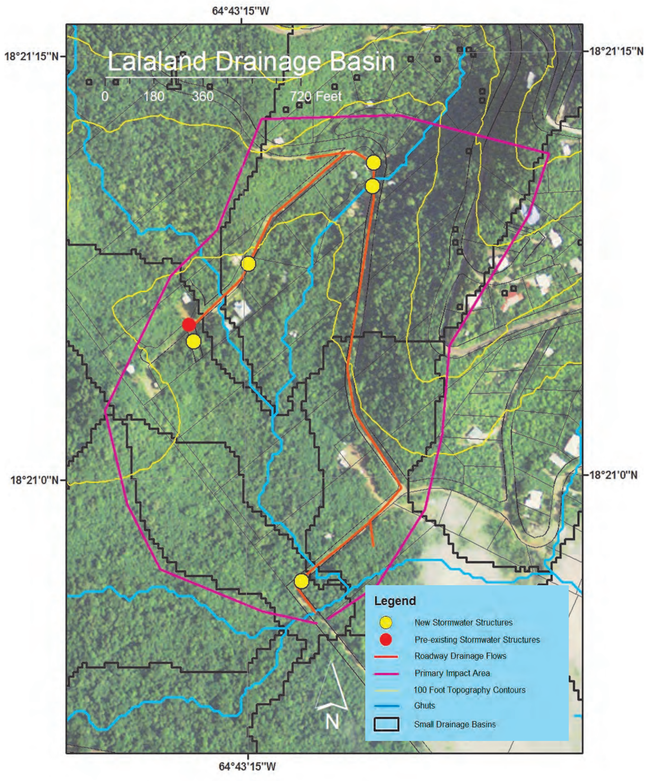
Typical Pipe Arch Layout



Source: Montana Forestry Best Management Practices (BMP's) Guidelines

BEFORE

DURING CONSTRUCTION



The Carolina Valley Watershed

Drainage from the Carolina Valley watershed has a significant impact with pollution and sedimentation impact on Coral Bay Harbor. The natural drainage of the watershed has been altered by uphill residential construction, dirt road erosion, and previous poor stormwater management techniques. This map shows the Carolina Valley area, sub-basins, natural drainage flow, and pre-existing and new drainage structures.

AFTER

Stabilization Objectives

1. Reduce sediment transport and decrease roadway channeling
2. Reduce and repair areas susceptible to erosion
3. Remove stormwater in contact with roadway
4. Re-establish natural flow
5. Increase and improve drainage points along roadway

Site Locations

Watershed scale Geographic Information System (GIS) planning tools targeted water quality monitoring research that helped in selecting the priority sites for these sediment reduction projects. Follow-up terrestrial and marine sediment monitoring will quantify and demonstrate the success in reducing sediment pollution reaching the bay.

What YOU Can Do!

- ⇒ Vegetate bare slopes with native plants
- ⇒ Minimize use of pesticides & fertilizers
- ⇒ Clean up driveways, roadsides and gutters
- ⇒ Use cut brush to create berms on steep slopes
- ⇒ Eliminate muddy run-off water
- ⇒ Never dump anything down storm culverts or ghuts
- ⇒ Properly dispose of oils, paints and chemicals
- ⇒ Do not disturb ghuts for 30 feet from center of ghut
- ⇒ Preserve all trees
- ⇒ Pump and inspect your septic tank regularly
- ⇒ Notify DPNR if you notice a problem
- ⇒ DPNR permits are needed for using backhoes & trackhoes
- ⇒ Educate each other
- ⇒ Participate in community projects!

Thanks to our lead partners!

Coral Bay Community Council (CBCC)
Virgin Islands Resources Conservation & Development Council (VIRC&D)
National Oceanic and Atmospheric Administration (NOAA)
US Environmental Protection Agency (EPA)
Virgin Islands Dept. of Planning and Natural Resources (DPNR)
Virgin Islands Dept. of Public Works (DPW)
Local Landowners and Homeowners
Community volunteers and Homeowners' Associations

Protecting Coastal & Coral Reef Habitats by Reducing Erosion & Sedimentation

This project is one of 18 implemented in the Coral Bay watershed with $1.5 million in National Oceanic and Atmospheric Administration funding under the American Recovery and Reinvestment Act of 2009, as part of the $2.7 million USVI Coastal Habitat Restoration through Watershed Stabilization project to reduce sediment loading rates into the coastal waters of three USVI watersheds: Coral Bay and Fish Bay on St. John and East End Bay on St. Croix. The U.S. Environmental Protection Agency has provided funding to the Coral Bay Community Council under its Community Action for a Renewed Environment (CARE) program to support this work. Local homeowners associations, the Virgin Islands Government and community volunteers have also provided resources and worked cooperatively to achieve the project objective of reducing the stormwater sediment plumes entering beautiful blue Coral Bay. These projects are also part of implementing the Coral Bay Watershed Management Plan through public-private partnerships to improve water quality, ecological health, and stormwater management while minimizing future impacts associated with watershed development.

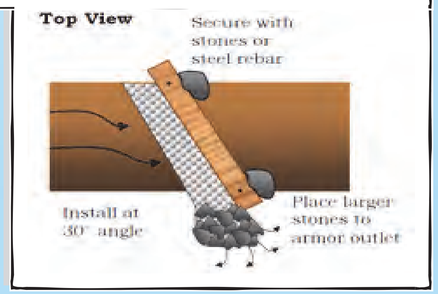
For More Information Please Contact:
Coral Bay Community Council
(340) 776-2099
www.coralbaycommunitycouncil.org

MILL VISTA ROAD

What Is Happening Here?

The Mill Vista Road project is an excellent collaborative effort between the Coral Bay Community Council and the informal Mill Vista Homeowners' Association to improve stormwater management. Proactive solutions and funding from all parties aided in paving a portion of road at the intersection with Centerline Road and also a switchback on the neighborhood road. Upgrading and retrofitting existing stormwater culverts, then paving, and creating roadside ditches all contributed to reducing erosion and sediment-laden flows. Stormwater is redirected off the road and into the natural ghut, through an existing culvert under Route 10 and eventually flowing into the Sediment Detention Basin on parcel 6-4 Carolina.

Typical Log Waterbar Design



After

Before

During Construction

The Carolina Valley Watershed

The main ghut in the Carolina Valley watershed historically delivers significant sediment and pollution to Coral Bay Harbor. The natural drainage of the watershed has been altered by uphill residential construction, dirt road erosion, previous poor stormwater management techniques and increased sediment flows. This map shows the Carolina Valley area, location of the Mill Vista subdivision, and the location of the main ghut in the sediment detention basin at parcel 6-4 Carolina, owned by the Virgin Islands government.

Stabilization Objectives

- Reduce sediment transport
- Remove stormwater off the road
- Deposit stormwater into Sediment Detention Basin
- Reduce and repair areas susceptible to erosion
- Re-establish natural flow
- Increase drainage points along road
- Improve water quality

Site Locations

Watershed scale Geographic Information System (GIS) planning tools targeted water quality monitoring research that helped in selecting the priority sites for these sediment reduction projects. Follow-up terrestrial and marine sediment monitoring will quantify and demonstrate the success in reducing sediment pollution reaching the bay.

What YOU Can Do!

⇒ Vegetate bare slopes with native plants
⇒ Minimize use of pesticides & fertilizers
⇒ Clean up driveways, roadsides and gutters
⇒ Use cut brush to create berms on steep slopes
⇒ Eliminate muddy run-off water
⇒ Never dump anything down storm culverts or ghuts
⇒ Properly dispose of oils, paints and chemicals
⇒ Do not disturb ghuts for 30 feet from center of ghut
⇒ Preserve all trees
⇒ Pump and inspect your septic tank regularly
⇒ Notify DPNR if you notice a problem
⇒ DPNR permits are needed for using backhoes & trackhoes
⇒ Educate each other
⇒ Participate in community projects!

Thanks to our lead partners!

Coral Bay Community Council (CBCC)
Virgin Islands Resources Conservation & Development Council (VIRC&D)
National Oceanic and Atmospheric Administration (NOAA)
US Environmental Protection Agency (EPA)
Virgin Islands Dept. of Planning and Natural Resources (DPNR)
Virgin Islands Dept. of Public Works (DPW)
Community volunteers and Homeowners' Associations

Protecting Coastal & Coral Reef Habitats by Reducing Erosion & Sedimentation

This project is one of 18 implemented in the Coral Bay watershed with $1.5 million in National Oceanic and Atmospheric Administration funding under the American Recovery and Reinvestment Act of 2009, as part of the $2.7 million USVI Coastal Habitat Restoration through Watershed Stabilization project to reduce sediment loading rates into the coastal waters of three USVI watersheds: Coral Bay and Fish Bay on St. John and East End Bay on St. Croix. The U.S. Environmental Protection Agency has provided funding to the Coral Bay Community Council under its Community Action for a Renewed Environment (CARE) program to support this work. Local homeowners associations, the Virgin Islands Government and community volunteers have also provided resources and worked cooperatively to achieve the project objective of reducing the stormwater sediment plumes entering beautiful blue Coral Bay. These projects are also part of implementing the Coral Bay Watershed Management Plan through public-private partnerships to improve water quality, ecological health, and stormwater management while minimizing future impacts associated with watershed development.

For More Information Please Contact:
Coral Bay Community Council
(340) 776-2099
www.coralbaycommunitycouncil.org

Appendix A: Engineering Designs & Drawings

CORAL BAY COMMUNITY COUNCIL, INC.

Mailing: 9901 Estate Emmaus, St. John, VI 00830
Office: 8-1 Estate Emmaus, Coral Bay, St. John, U.S. Virgin Islands
E-mail: coralbaycommunitycouncil@hotmail.com Phone/Fax: 340-776-2099

Coral Bay Projects Design Guidance

Strategies Appropriate for Coral Bay Environment

By: Joseph Mina, P.E.

1. Many natural drainage flows have been disturbed by construction and other man-made activities. A primary method of addressing water quality exiting the watershed into the bay will be to restore natural drainage flow patterns to the greatest extent possible both in intermittent drainage swales and ghuts and restoring sheet flow over steep slopes where possible. This will be accomplished primarily by:

a. Redirecting drainage from channels and redirecting the large areas of upslope water intercepted along many roads and construction sites and distribute that water using level spreaders, bioretention/infiltration devices and/or rock aprons or similar means to recreate the natural sheet flow, reduce velocity and improved percolation into soil.

i. Regrade roadbeds to direct flows to appropriate outflow devices where feasible, and add additional paving or permanent structures as appropriate to make preferred patterns of flow permanent.

ii. Add shallow vegetated swales, and detention areas with rocks and naturalized vegetation where possible to reduce velocity and promote infiltration.

iii. Install trench drains across driveways and roads into rain gardens, infiltration trenches, localized water collection systems for irrigation, or other appropriate devices.

b. Eliminate deep excavated unlined ditches which are common to many of the dirt roads in order to slow velocities and reduce amount of sediment produced by erosion. Check dams, bioretention swales, and underground stone trenches with perforated pipe will be installed where appropriate.

c. Reduce the length water travels in roadside swales by directing flow from roadways into devices often. Preferably at each switchback at a minimum by incorporating drywells, rain gardens and infiltration chambers using locally available materials and native species.

2. Retain and slow down water that reaches valley floor in larger scale regional detention/retention basins with Best Management Practices installed including forebays, infiltration cells and bioretention pond areas:

a. Devices will utilize native plantings and species where possible and available to mimic local Caribbean seasonal flow dry ghut conditions to promote both stormwater quality and to provide wildlife and riparian habitat restoration.

b. Sediment deposition retention area, cleaned regularly, with reuse of sediment material as gravel, topsoil, building sand, etc.

3. Provide “Last Chance” effort to reduce sediment entering sea at ends of ghuts and drainage ways immediately adjacent to where the flows enter the ocean.

a. Install devices just upstream of exit to the ocean from ghuts including:

i. Combination of weirs, pre-manufactured sediment retention chambers and/or small bioretention areas with local rock rip-rap aprons and multi-step natural rock retention step pools.

ii. Baffles and check dams where ghut is large enough.

iii. Construct and maintain natural “Caribbean Berm” (usually created by wave action and sand deposition) where water enters ocean in each area to provide natural sediment protection. Protection against mosquitoes and parasites in sitting water with guppies)

b. Slow, redirect and/or restore gut flow within 300 yards of ocean by installing the following where appropriate and feasible:

i. Re-vegetate gut outflow areas.

ii. Rock weirs, ghut slope and embankment protection including erosion control blankets, concrete cable mats or other manufactured devices to reduce erosion.

c. Install in-line biofiltration areas and flow spreading devices to slow velocities and provide opportunities for sediment to drop out and naturalized vegetation to reduce pollutant loading in the runoff.

4. Correction of failed devices, culverts, water routing by installing any appropriate Best Management Practices to attempt to solve some past poor choices of storm water management, or areas where no thought was given to management.

June 2009

CORAL BAY COMMUNITY COUNCIL, INC.

Mailing: 9901 Estate Emmaus, St. John, VI 00830 E-mail: coralbaycommunitycouncil@hotmail.com
Office: 8-1 Estate Emmaus, Coral Bay, St. John, U.S. Virgin Islands Phone/Fax: 340-776-2099

Engineering Recommendation Memo
A Series of Observations & Preliminary Recommendations

CBCC Engineering Recommendation #4

From: Joseph A. Mina, P.E. **Date:** May 15, 2009

Subject Property: Coral Bay

Specific Issue: Plumes of Sediment Laden Runoff in Multiple Locations – Coral Bay at King's Hill Road

There are four primary areas where plumes of sediment laden water flow into the bay as a result of improper erosion and sediment pollution control in the various watersheds. These are Johnson Bay, Coral Bay at Voyages, Coral Bay at Kings Hill Road, and The Creek behind Skinny Legs. Due to the large amount of photos, these four areas will be the subject of four Engineering Recommendations Memos. This is the third of the four memos on this topic. The summary paragraphs below are repeated from ERM#2 for ease of reference.

Summary

On May 4, 2009 there was a substantial rainfall event that, according to various sources, dropped between 10 to 12 inches of rain on Cruz Bay. By my observations of the storm event's intensities in both Coral Bay and Cruz Bay, I estimate that between 8 and 10 inches fell in Coral Bay. During the event, I performed numerous site visits and took many photos.

It should be noted that in general, during an event of this magnitude, it is almost impossible to manage the runoff, and most BMP's seek to control the first 1" to 1.5" of runoff from a drainage area, or the 3" rain event. While I am still making a decision on which rain event to choose for our future BMP designs, I do know the devices will not manage this type of storm but only serve to pass larger events through safely after controlling the first 1" to 1.5" of runoff. It also needs to be noted that my estimates are prevalent throughout the memo. These are based on my personal observations of the intensities and reports from others describing the type of rain falling. At this time, there is no scientific measurement of these amounts, just a "best guess" based on professional experience.

During the early portion of my observations (prior to 8AM) few of the ghuts were actually flowing, and much of the runoff observed watershed-wide was clearly the result of impervious surfaces, construction activities, or runoff from existing roadways that acted as channels and decreased the initial runoff Times of Concentration. The Ghuts began to run between 8:30 and 10AM depending on the upstream watershed characteristics. This supports my "first flush" theory that the initial 1.5" of runoff is clearly the real culprit in the spiking amounts of sediment laden waters entering the bay.

CORAL BAY COMMUNITY COUNCIL, INC.

Mailing: 9901 Estate Emmaus, St. John, VI 00830 E-mail: coralbaycommunitycouncil@hotmail.com
Office: 8-1 Estate Emmaus, Coral Bay, St. John, U.S. Virgin Islands Phone/Fax: 340-776-2099

Engineering Recommendation Memo
A Series of Observations & Preliminary Recommendations

Kings Hill Road Plume

This plume is generated by runoff from the roadside concrete swale in King's Hill Road. Runoff primarily originates in the areas along the Gerda Marsh Road before it intersects King's Hill Road and has it's direction changed by a kneewall and then proceeds down the road discharging across Rt. 107 into the Mangroves adjacent to the dumpster area. This runoff is very contaminated with sediment from the dirt portions of Gerda Marsh Road. The level of sediment in the water is too high for the mangroves to effectively filter, and it produces the plume in the bay. The conditions contributing to the problem in this area are the fact that Gerda Marsh Road acts as a conduit for water intercepted from the normal ghut system and redirects it down the road to King's Hill Road. Prior to being directed down the road, much of the runoff ran overland, sheeting down the hill and into a major Ghut that runs across King's Hill Road just northwest of the kneewall. The photos below are from a previous storm, but the conditions shown are compatible to any storms that produce runoff in this watershed.

Plume evident in lower right even during Small runoff events

Change of direction at Kneewall

Water flows down King's Hill Road

Water coming down paved portion of Gerda Marsh Rd.

Unpaved Roads upstream of paved portion of Gerda Marsh Rd.

CORAL BAY COMMUNITY COUNCIL, INC.

Mailing: 9901 Estate Emmaus, St. John, VI 00830 E-mail: coralbaycommunitycouncil@hotmail.com
Office: 8-1 Estate Emmaus, Coral Bay, St. John, U.S. Virgin Islands Phone/Fax: 340-776-2099

Engineering Recommendation Memo
A Series of Observations & Preliminary Recommendations

Recommended Action

- Return water to ghut system at Gerda Marsh/King's Hill Intersection –
  In order to restore the flow into a more natural area, and encourage the natural cleansing and recharge that the gut system provides, it is recommended to remove a portion of the Kneewall to allow water to flow overland to the ghut. Some existing channelization is evident behind the kneewall from previous water flows prior to installation of the kneewall. A small amount of excavation is necessary behind the kneewall to allow the water to flow from the road into this conveyance channel and ultimately into the ghut. Any new channel cut should be provided with a simple rock liner and immediately seeded to prevent further erosion. It is noted that initial conversations with the landowner in this area indicated a desire to cooperate and allow us rights to construct and maintain any structures. Formal easement documents are being worked towards at the time this memo is being written.
- Install BMP at corner of King's Hill & Gerda Marsh Road to clean the water prior to returning to the ghut. Simply restoring the flow to the ghut will address road flooding and deposition of silt on the downstream areas of King's Hill Road, but in order to properly clean the water, it is necessary to install some kind of SWM BMP in the area just behind the kneewall. Currently, where the ghut downstream of the kneewall crosses Rt. 107 there is evidence that the water in the ghut is already surcharged with sediment, and simply running the Gerda Marsh Rd. flow through there will not sufficiently clean it. The initial concept is to put in a large triangular retention/detention basin with a series of baffle berms, rock filters, step pools, and other devices intermittently throughout the flow path. This can be done in stages after the initial channel is cut and before the flow is diverted to the ghut. The initial estimate of size for the overall device envelope is a large triangle with the base centered on the kneewall and having a base of about 200 to 300 feet and a height of about 200 to 250 feet. This would basically encompass the area from the kneewall to the existing Ghut, and efforts can and should be made to protect and preserve any existing trees in this area when installing any devices.
- Pave Gerda Marsh Road and provide additional upstream diversions across the road to direct water to natural drainage areas and paths.
- Ultimately, in order to prevent the sediment from being picked up, paving any unpaved portions of Gerda Marsh Rd. and any major private roads off intersecting Gerda Marsh Rd is strongly recommended. When performing this paving, careful consideration needs to be given to getting the water in the roadside swales into natural ghuts and watercourses as often as possible. Ideally, there should be some kind of system to convey the water out of the channels using a combination of trench drains, waterbars, and pipes approximately every 50 feet to prevent large volumes of water from needing to be managed. Where possible, the outlets to these devices should be directed to a level spreader device to re-establish a more sheet flow like condition. Consideration should also be given to where parcel lines fall, and where possible, these devices should discharge where property lines abut the road right-of-way in order to place less of a burden on the private property owner. In the past, there have been worries about placing water in the middle of the lot, however if there is no existing building, discharging to private property should not be a problem from an engineering prospective since the future builders can divert this water around the construction using pipes, swales or other systems, or the owner may even want to capture some or all of the water for use in their grey-water cisterns or for irrigation.

Environmental Assessment Report

Carolina Valley Sediment Detention Basin

St. John, U.S. Virgin Islands

Submitted by

Virgin Islands Resource Conservation & Development Council, Inc.

Prepared by

Coral Bay Community Council, Inc.

9901 Emmaus St. John, VI

coralbaycommunitycouncil@hotmail.com

340-776-2099

1. Name and Address of Applicant:

VI Resource Conservation & Development Council, Inc.
5030 Anchor Way Suite 2
Christiansted, VI 00820

2. Location of Project:

Parcel 6-4 Estate Carolina.
See attached survey; vicinity map, location and Agency Review Map.

3. Abstract:

Installation of a sediment detention basin in the Coral Bay Watershed valley main gut to allow collection of sediment.

4. **Statement of objectives sought by the Proposed Project**.

The object is to slow the main gut water flow in a natural sediment deposition area and provide for a continuous means to remove the sediment and allow for future deposition of sediment, then return the water to the natural gut to continue downstream toward the ocean. Deposited materials will be collected and used as building supplies. The sediment detention basin can be a source of water for irrigation or other public use. Agreements between the applicant, the Government of the Virgin Islands, and a cooperating landowner further describe the objectives of the project. See Agreements.

Photographs showing the area of 6-4 Carolina to be used as a Sediment Deposition Basin.

Current Sediment Deposition “Ridge”, gut to left, looking toward natural gut outflow to east

Gut channel to west

Debris piled beside gut channel

An area of sediment to be removed to allow for future deposition

Portion of 6R-2a for Excavated soil/gravel stockpile

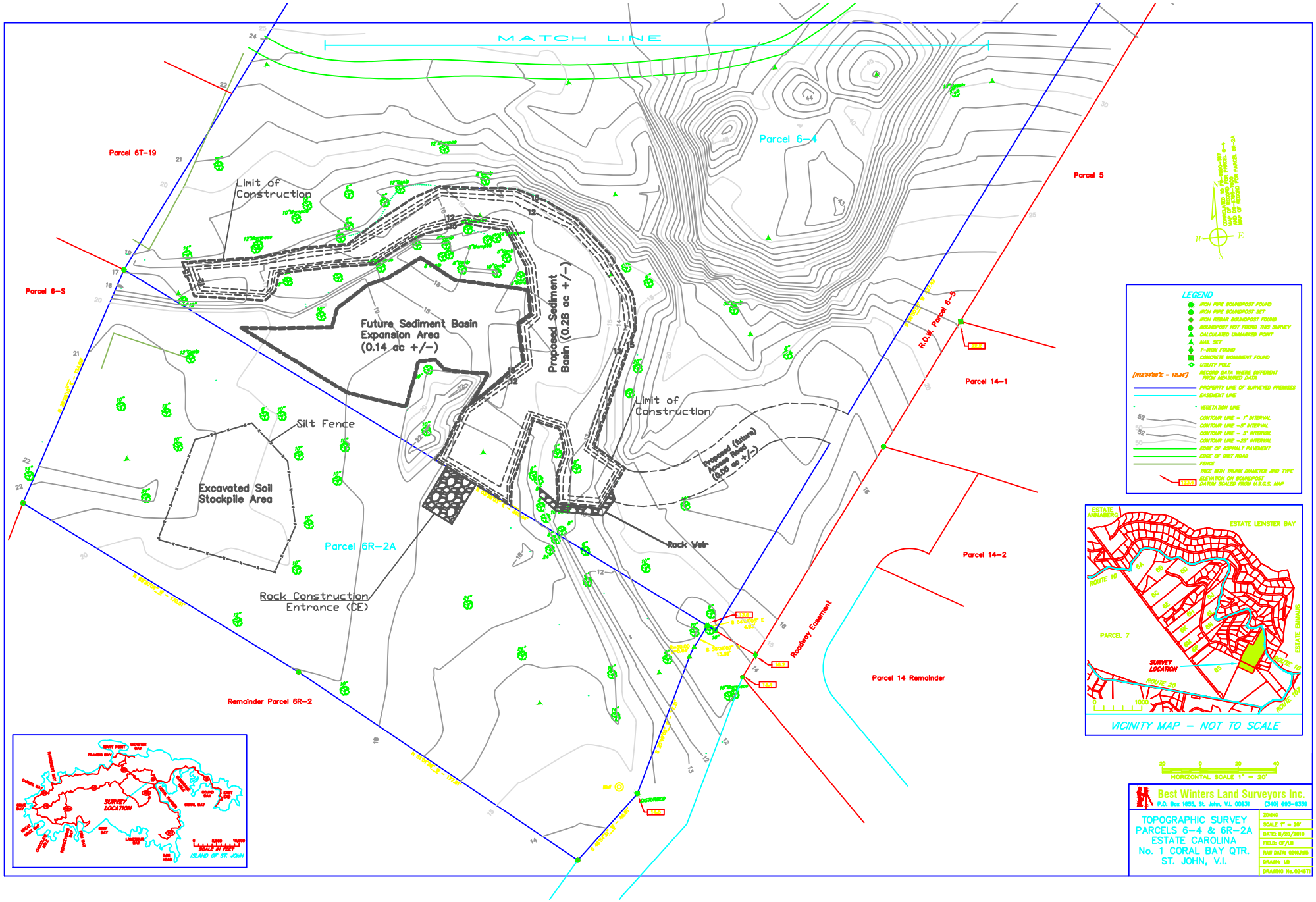
Construction/Maintenance Entrance location from 6R-2A

Future access road on 6-4 Carolina, after 5 years for sediment removal

Gut area to have sediment removed and create basin

Main sediment area looking northeast, standing in exit gut channel

Sediment ridge into existing gut channel in center of photo


MATCH LINE
Parcel 6T-19
Parcel 6-4
Parcel 5
Parcel 6-S
Limit of Construction
Future Sediment Basin Expansion Area (0.14 ac +/-)
Proposed Sediment Basin (0.28 ac +/-)
Limit of Construction
Silt Fence
Excavated Soil Stockpile Area
Parcel 6R-2A
Rock Construction Entrance (CE)
Rock Weir
Proposed (future) Access Road (0.05 ac +/-)
R.O.W. Parcel 6-5
Parcel 14-1
Parcel 14-2
Roadway Easement
Parcel 14 Remainder
Remainder Parcel 6R-2
DISTURBED
LEGEND
IRON PIPE BOUNDPOST FOUND
IRON PIPE BOUNDPOST SET
IRON REBAR BOUNDPOST FOUND
BOUNDPOST NOT FOUND THIS SURVEY
CALCULATED UNMARKED POINT
NAIL SET
T-IRON FOUND
CONCRETE MONUMENT FOUND
UTILITY POLE
[N12°34'56"E - 12.34'] RECORD DATA WHERE DIFFERENT FROM MEASURED DATA
PROPERTY LINE OF SURVEYED PREMISES
EASEMENT LINE
VEGETATION LINE
CONTOUR LINE - 1' INTERVAL
CONTOUR LINE - 5' INTERVAL
CONTOUR LINE - 25' INTERVAL
EDGE OF ASPHALT PAVEMENT
EDGE OF DIRT ROAD
FENCE
TREE WITH TRUNK DIAMETER AND TYPE
ELEVATION ON BOUNDPOST DATUM SCALED FROM U.S.G.S. MAP
ESTATE ANNABERG
ESTATE LEINSTER BAY
ROUTE 10
PARCEL 7
ESTATE EMMAUS
SURVEY LOCATION
ROUTE 20
ROUTE 10
ROUTE 104
VICINITY MAP - NOT TO SCALE
SURVEY LOCATION
ISLAND OF ST. JOHN
HORIZONTAL SCALE 1" = 20'
Best Winters Land Surveyors Inc.
P.O. Box 1655, St. John, V.I. 00831 (340) 693-8339
TOPOGRAPHIC SURVEY
PARCELS 6-4 & 6R-2A
ESTATE CAROLINA
No. 1 CORAL BAY QTR.
ST. JOHN, V.I.
ZONING
SCALE 1" = 20'
DATE: 8/30/2010
FIELD: CF/LB
RAW DATA: CDMJRWB
DRAWN: LB
DRAWING No. 024611

AGREEMENTS

1. Government of the Virgin Islands; Commissioner St. Claire Williams; Parcel 6-4 Estate Carolina – attached. (More agreements to be executed).
2. Adjacent landowner agreement re Parcel 6R-2A Estate Carolina – withdrawn.

December 7th, 2010 –CLARIFICATIONS AND CHANGE TO MAINTENANCE PLANS FOR CAROLINA VALLEY SEDIMENT DETENTION BASIN

The topographical survey conducted after the following letters of intent were executed showed that the total area of sediment basin would be located on parcel 6-4 Carolina owned by the VI government.

The plan for the sediment basin does not encroach upon 6R-2A Estate Carolina, the parcel owned by Mr. Elvis Marsh, although we are providing for a construction entrance and temporary storage on that lot. All construction and excavation will take place on Parcel 6-4 Estate Carolina, the parcel owned by the Government of the Virgin Islands. The project does not exceed one acre in size. The sediment basin is planned to cover an area of .42 acres.

Since the EAR was submitted for DPNR review, there has been a change in the ongoing maintenance plans for the Carolina Valley Sediment Detention Basin . Originally, Mr. Marsh, the adjacent landowner, was going to provide five years of maintenance (removal of sediment) in the basin. He is no longer willing to make this long term commitment. Therefore we are in discussion with Public Works about providing this maintenance.

Because of the change, it is contemplated that the project will be let out to bid – and not sole-sourced to Mr. Marsh. If he is the successful bidder then presumably he will use the construction entrance currently delineated and place removed materials on his property as indicated in the plan. If he is not the successful bidder, it is intended that a different construction entrance will be designed on the government owned property upstream (at approximately where the plan says "Limit of Construction"). Removed materials would be stockpiled (and then removed for re-use elsewhere) on 6-4 Carolina in the location of the piles which were a result of TS Otto.

In all other respects the plan remains the same.

Note: After October 8th, 2010 6-4 Carolina surface topography was modified by Public Works storing piles of landslide debris caused by TS Otto. The previous survey no longer is accurate with respect to the debris piles on 6-4 Carolina. Furthermore, the location and size of these piles is currently under continuous change, and some if not all of the soil and rocks will be used in the landslide repairs by Public Works. None of this materially influences the design or construction of the sediment detention basin.

Final agreements for maintenance will be completed prior to construction start and are intended to be completed prior to the Public Hearing. (VITEMA/FEMA emergency work by PW needed to take precedence over these discussions.)

CORAL BAY COMMUNITY COUNCIL, INC.

Mailing: 9901 Estate Emmaus, St. John, VI 00830
Office: 8-1 Estate Emmaus, Coral Bay, St. John, U.S. Virgin Islands
E-mail: coralbaycommunitycouncil@hotmail.com Phone/Fax: 340-776-2099

May 21, 2010

Commissioner St. Claire Williams
Housing, Parks and Recreation
Government of the Virgin Islands (delivered via email)

Dear Commissioner Williams,

Thank you very much for coming to Coral Bay to meet with us about 6-4 Carolina and utilizing that parcel in some productive ways to assist the NOAA-ARRA Watershed Stabilization Project and improve our environment both on the site and in the whole valley watershed. This letter summarized our areas of general agreement and the actions to be taken in the near future. If these actions are agreeable with you, please sign on the signature line at the bottom.

1. CBCC, as an agent for the Virgin Islands Resource and Development Council(VIRCD) will begin the DPNR Major CZM permitting process, including studies, designs, surveying , permissions and documents for submittal in August 2010 to CZM – to construct a sediment detention area on a portion of the large gut on 6-4 Carolina. There will be no cost to the Government of the Virgin Islands for these activities.

2. It is generally agreed, subject to approval of the actual design and permitting and written agreements, that the gut portion of 6-4 Carolina, currently a natural sediment deposition area, will be modified, per the details below, to be an enhanced sediment detention area, for the benefit of the entire valley watershed and the ocean habitat. This project is being done in cooperation – for five years of maintenance - with the neighboring property owner of 6R-2a Carolina, Elvis Marsh, with whom CBCC has a letter of intent. There will be written agreements between all parties executed within the next three months.

3. It is agreed that, beginning now, the contractors under the VIRCD NOAA Watershed Stabilization project may, with VIRCD & CBCC permission, store topsoil , rocks and erosion stabilization products on the parcel 6-4 Carolina. They may also remove and utilize any existing piles of rocks or topsoil. CBCC commits to leaving the area, at the end of the VIRCD project in June 2011 in better physical condition than when we started. (Details of this will be part of the Major CZM Application.)

4. It is agreed that a portion of 6-4 Carolina (under 2 acres) near the gut will be made usable for agricultural purposes by the Dept. of Agriculture and its permitted

farmers. The sediment detention pond will be constructed so that water can be pumped into a cistern for agricultural purposes. (Details of this will be part of the Major CZM Application.)

With conceptual agreement on this process and the desired outcomes, CBCC and the VIRCD project and our partners, will begin to move forward with the necessary steps, as outlined above, to make this happen.
Thank you very much for your cooperation. If you have any questions, please contact me. If you are in agreement, please sign on the line below and return a copy to our office at the address on the letterhead.

Sincerely,

Sharon Coldren,
President, CBCC

Acknowledged and agreed to:

_____ Date: 5/24/10
St. Claire Williams, Commissioner, Housing Parks and Recreation

5. **Description of Proposed Activity**. See plan drawing.

5.01 Summary of Proposed Activity.

a. **Purpose:** The primary purpose of project is to provide a basin where sediment will settle out of stormwater flows. The basin will reduce the amount of sediment conveyed into Coral Bay, and allow the retained sediment to be used for beneficial use.
b. **Presence and Location of Any Critical Areas and Possible Trouble Spots**: There are no critical areas known to exist on the site. An archeological survey (attached) performed on the site demonstrated no significant historic or cultural resources that require mitigation. A biological survey (attached) performed on the site did not identify wetlands on the site and demonstrated that the local hydrologic conditions would not be greatly altered by the construction of the proposed sediment basin.
c. **Land clearing:** Land clearing will be limited only to the area of the sediment basin, which has historically been a highly disturbed area with significant debris deposits. Approximate limits of disturbance are shown on the attached topographic survey map.
d. **Topsoil**: No topsoil exists in the area – the area has historically been a debris fill area. Site disturbance will be limited to excavation of the sediment basin to an extent necessitated by the topography. About 2,000 cubic yards of fill will be removed from within the limits of disturbance. Excavated material will be stockpiled on the adjoining parcel as shown on the topographic survey map.
e. **Erosion Control**: Silt fencing and other required BMPs will be installed prior to construction.

f. **Project Schedule**: Schedule for earth change activities and implementation of ersion/sediment control measures – See Section 5.03.

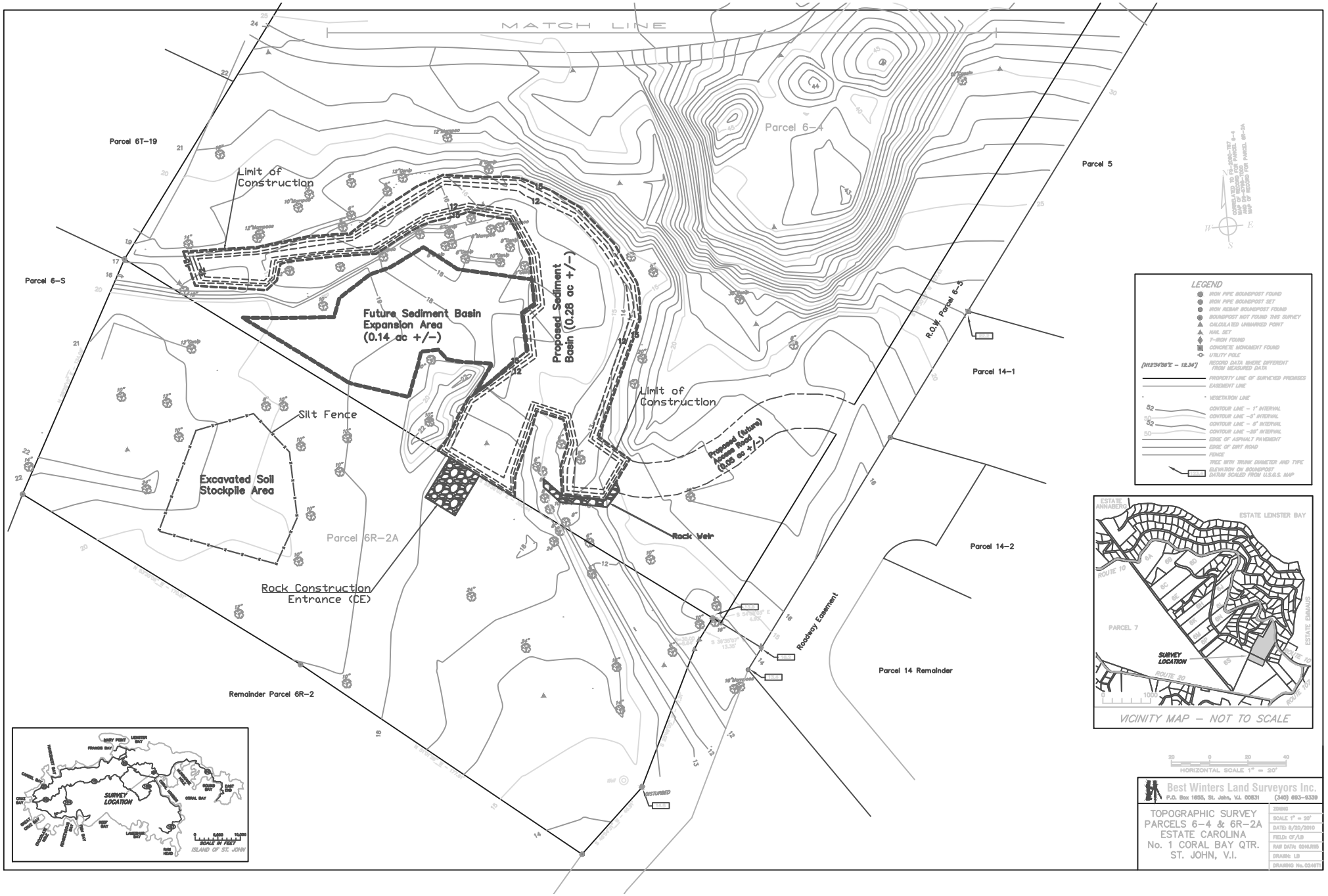
g. Maintenance of erosion and sediment control measures during construction as necessary. The VI RC&D stormwater engineer will perform daily onsite inspections and instructions for correction of problems. Silt and sediment shall be removed from behind silt fences once depths of 8" has accumulated. Removed silt and sediment shall be mixed with native excavated soils for use on site.

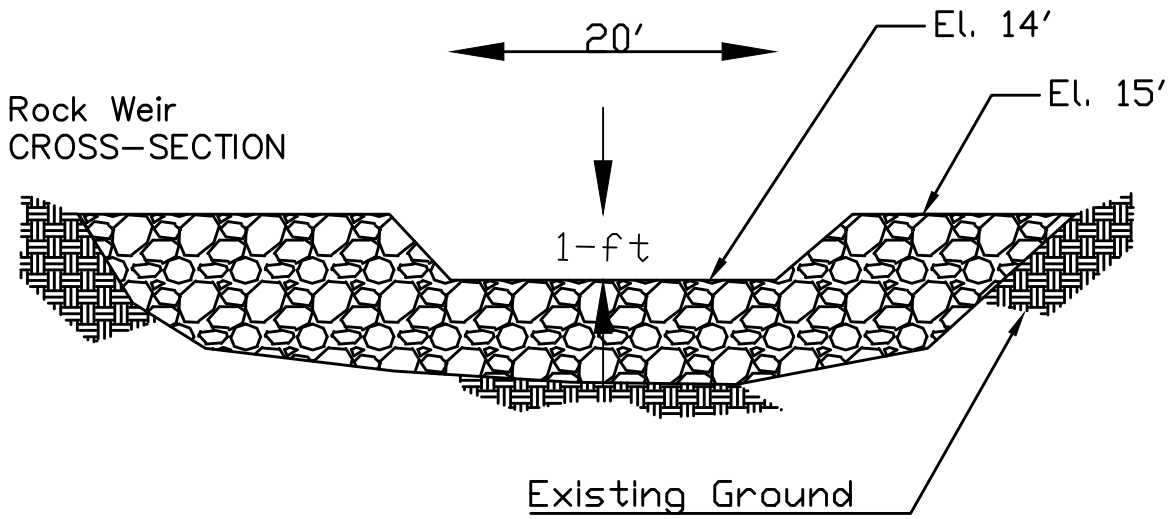
h. **Stormwater management:** The sediment basin is designed inline with the gut. All stormwater will remain in the gut channel, the gut channel will be expanded so that water slows to allow sediment deposition within the design area. Dyuring low flows virtually all the stormwater will be detained with the detention basin and allowed to infiltrate. During high flows the stormwater will slow in the basin area but will overtop the spillway and continue seaward in the natural gut.

i. It is anticipated that removal of sediment will be done by the Government of the Virgin Islands, Public Works. Agreements are being sought.

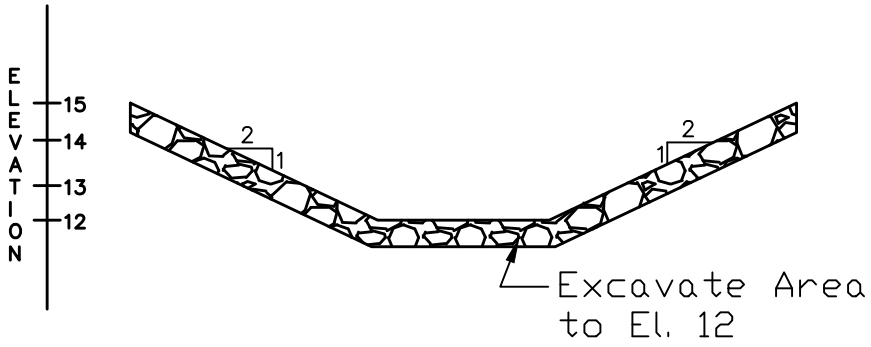
j. **Sewage disposal:** – not applicable. No sewage disposal will take place on site.

5.02Site plans


MATCH LINE
Parcel 6T-19
Parcel 6-4
Parcel 5
Parcel 6-S
Limit of Construction
Future Sediment Basin Expansion Area (0.14 ac +/-)
Proposed Sediment Basin (0.28 ac +/-)
Silt Fence
Excavated Soil Stockpile Area
Parcel 6R-2A
Rock Construction Entrance (CE)
Limit of Construction
Proposed (future) Access Road (0.05 ac +/-)
R.O.W. Parcel 6-5
Parcel 14-1
Parcel 14-2
Rock Weir
Roadway Easement
Parcel 14 Remainder
Remainder Parcel 6R-2
LEGEND
IRON PIPE BOUNDPOST FOUND
IRON PIPE BOUNDPOST SET
IRON REBAR BOUNDPOST FOUND
BOUNDPOST NOT FOUND THIS SURVEY
CALCULATED UNMARKED POINT
NAIL SET
T-IRON FOUND
CONCRETE MONUMENT FOUND
UTILITY POLE
RECORD DATA WHERE DIFFERENT FROM MEASURED DATA
PROPERTY LINE OF SURVEYED PREMISES
EASEMENT LINE
VEGETATION LINE
CONTOUR LINE - 1' INTERVAL
CONTOUR LINE - 5' INTERVAL
CONTOUR LINE - 5' INTERVAL
CONTOUR LINE - 25' INTERVAL
EDGE OF ASPHALT PAVEMENT
EDGE OF DIRT ROAD
FENCE
TREE WITH TRUNK DIAMETER AND TYPE
ELEVATION ON BOUNDPOST
DATUM SCALED FROM U.S.G.S. MAP
ESTATE ANNABERG
ESTATE LEINSTER BAY
ROUTE 10
PARCEL 7
SURVEY LOCATION
ESTATE EMMAUS
ROUTE 80
VICINITY MAP - NOT TO SCALE
SURVEY LOCATION
CORAL BAY
EAST END
ISLAND OF ST. JOHN
HORIZONTAL SCALE 1" = 20'
Best Winters Land Surveyors Inc.
P.O. Box 1655, St. John, V.I. 00831 (340) 693-9339
TOPOGRAPHIC SURVEY
PARCELS 6-4 & 6R-2A
ESTATE CAROLINA
No. 1 CORAL BAY QTR.
ST. JOHN, V.I.
ZONING
SCALE 1" = 20'
DATE: 8/20/2010
FIELD: CF/LB
RAW DATA: 0246JRB
DRAWN: LB
DRAWING No. 03467I



Sediment Basin
CROSS-SECTION



SEDIMENT BASIN DETAILS

N.T.S.

6-4 Carolina
Drainage Improvements

Details

Prepared for:
Coral Bay Community Council
- CBCC is a 501(c)(3) nonprofit organization -

Physical Address:
8-1 Emmaus
St. John, VI
340-776-2099

Mailing Address:
9901 Emmaus
St. John, VI 00830
cbcc@coralbaycommunitycouncil.com

Date: 09-5-10

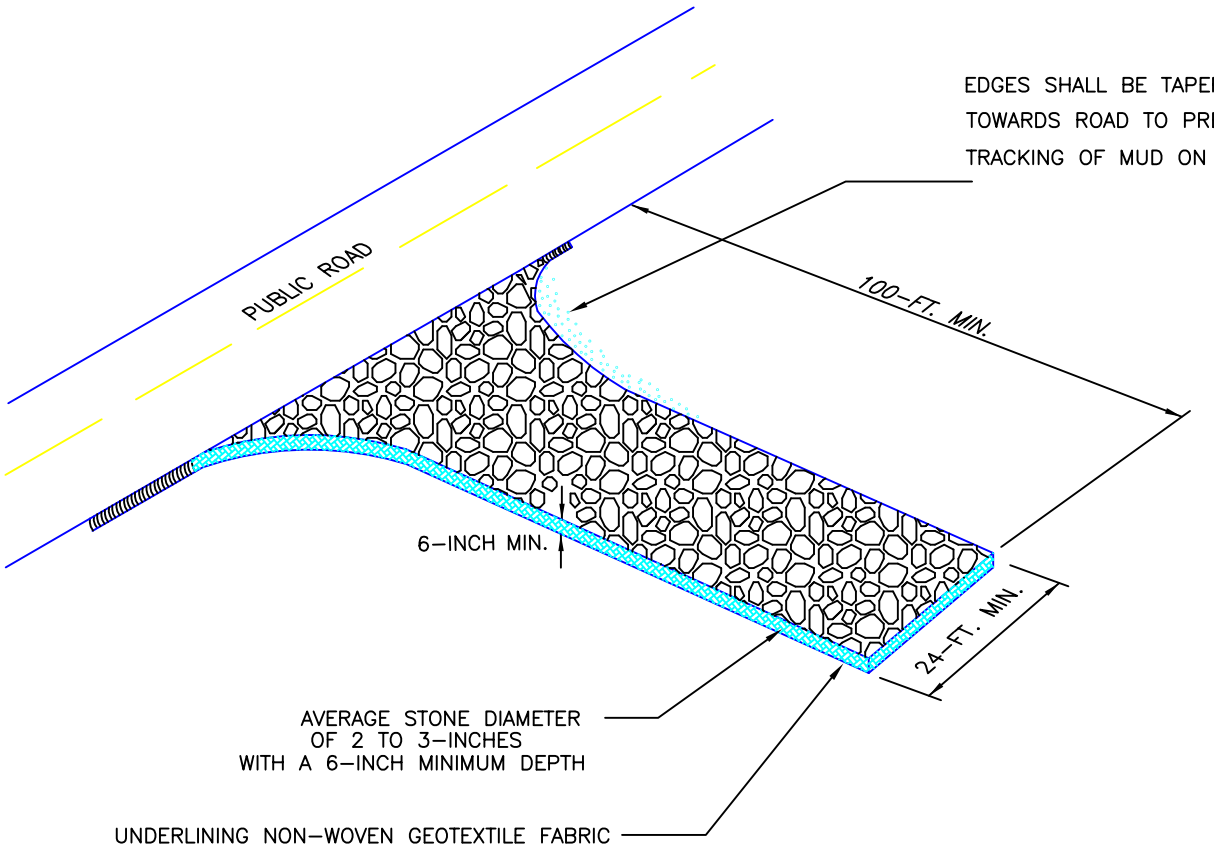
Drawn: CSL Checked: CSL

Project No: C2A

Sheet 2

Not To Scale

Prepared by:
Christopher S. Laude, PE
Stormwater ∞ Civil Engineering ∞ Planning
9901 Emmaus
St. John, VI 00830
910/612-5990



INSTALL A CULVERT PIPE ACROSS THE ENTRANCE WHEN NEEDED TO PROVIDE POSITIVE DRAINAGE.

DIVERT ALL SURFACE RUNOFF AND DRAINAGE FROM THE STONE PAD TO A SEDIMENT TRAP OR BASIN OR OTHER SEDIMENT TRAPPING STRUCTURE.

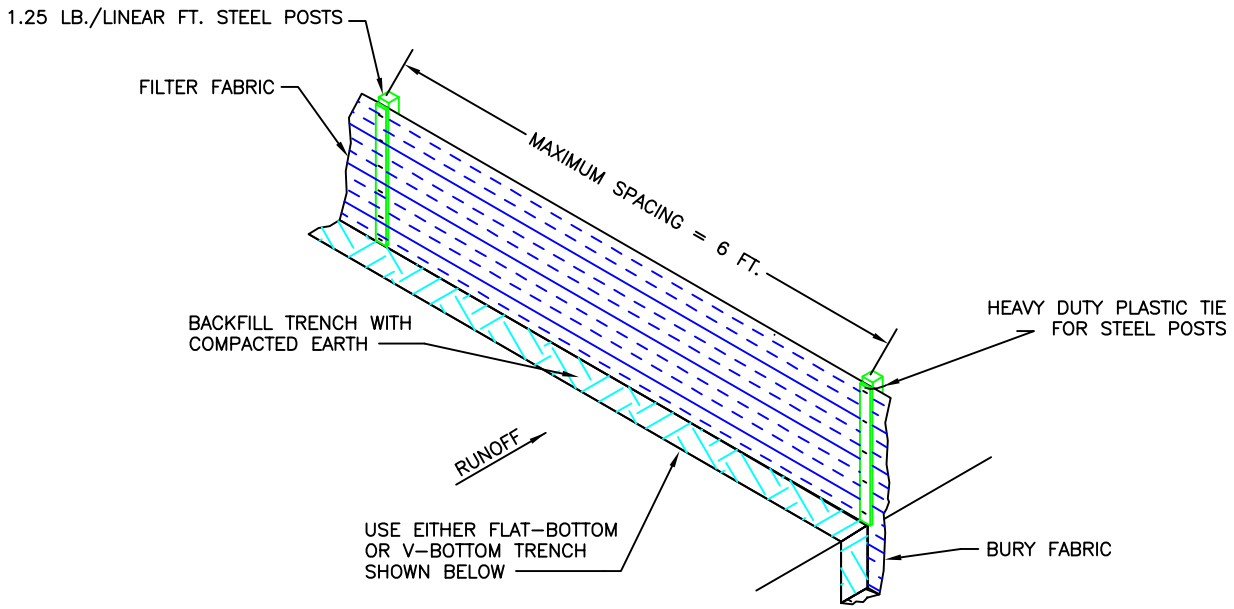
South Carolina Department of Health and Environmental Control

STABILIZED CONSTRUCTION ENTRANCE

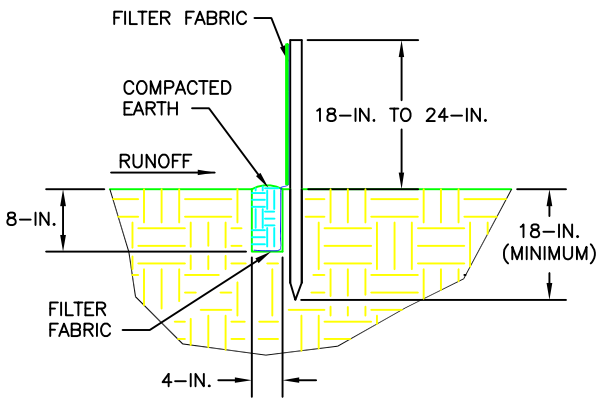
STANDARD DRAWING NO. SC-06 Page 1 of 3

APPROVED BY: _____ SCDHEC

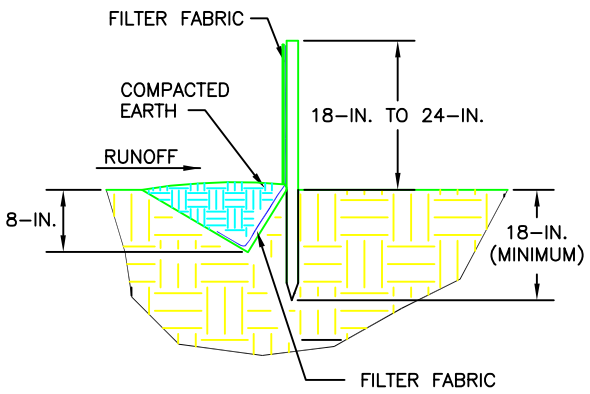
AUGUST, 2005 DATE



SILT FENCE INSTALLATION



FLAT-BOTTOM TRENCH DETAIL



V-SHAPED TRENCH DETAIL

South Carolina Department of Health and Environmental Control

SILT FENCE

STANDARD DRAWING NO. SC-03 Page 1 of 2

APPROVED BY: _____ SCDHEC

AUGUST, 2005 DATE

5.03 Project Workplan.

The proposed dates for design, permitting and construction shall be as follows:

Sept. 8, 2010	Apply for Coastal Zone Management Permit
January 15, 2011	Obtain Coastal Zone Management Permit
February 1, 2011	Commence Construction
March. 30, 2011	Complete Construction

Project Schedule for Phasing and Subprojects.

Month 1 Month 2

Install BMP's ---

Construct Sediment Detention Basin

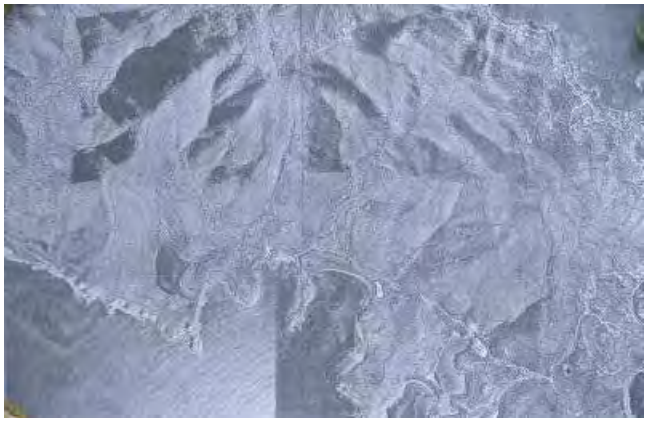
6.00 Setting and Probable Project Impact on the Natural Environment.

6.01 Climate/Weather.

This project will be influenced by normal weather patterns and is not expected to be change any local climate/weather patterns. No impervious surfaces will be constructed to increase run-off. The sediment pond is an alteration to approximately half an acre within a five acre parcel. There will be no change in the existing topography or the natural drainage pattern. No additional stormwater will be introduced to the natural gut. Only stormwater flow will be altered by the expansion of the gut into a pond.

6.02 Landform Geology, Soils and Historic Landuse.

The higher elevations of the project site have, in recent history, been used to stockpile dirt fill. The gut area where the sediment basin is proposed is full of naturally occurring sediment, including large stones. No potentially significant cultural resources were identified during a Phase I Cultural Resources Survey.



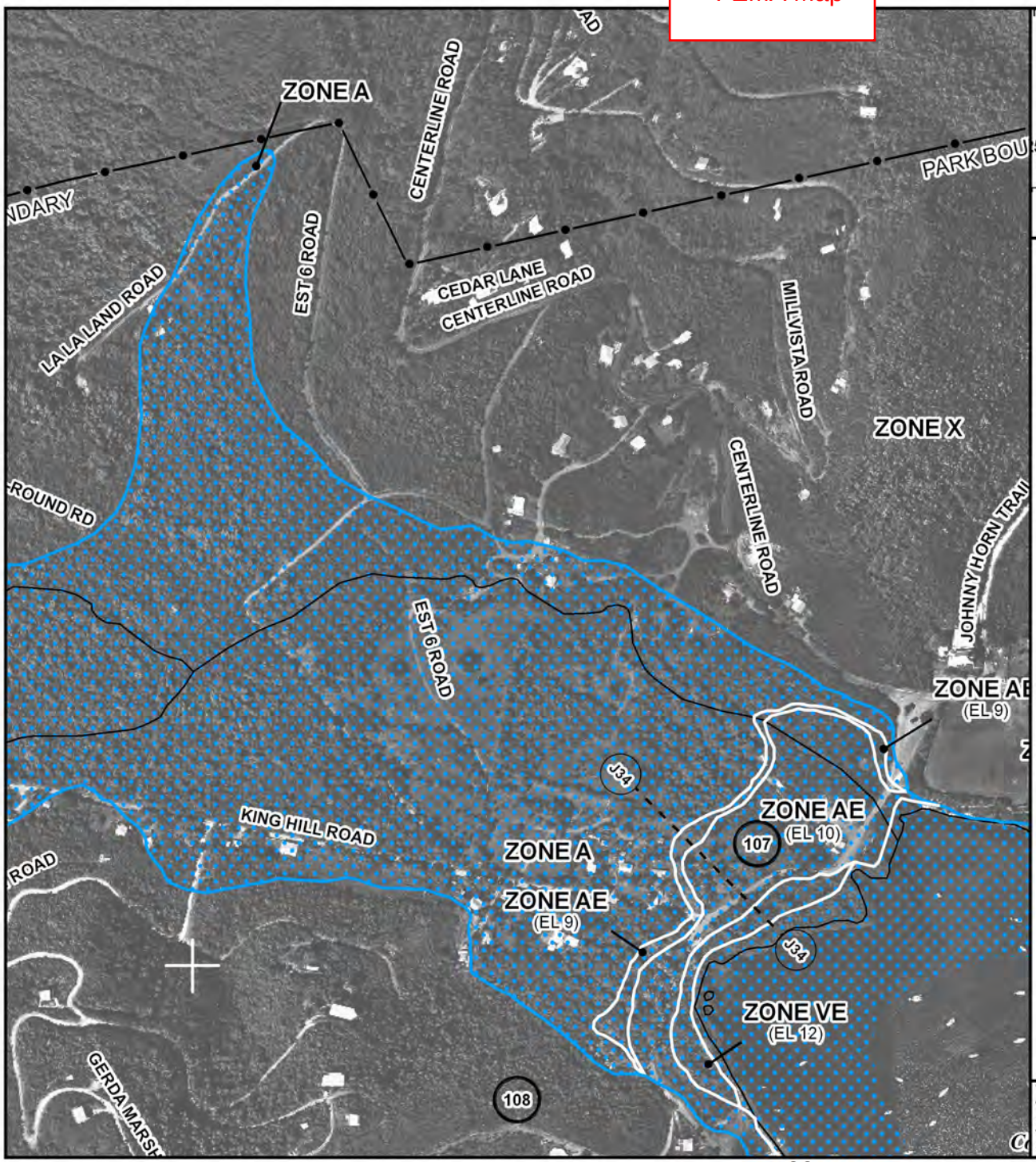
6.03 Drainage, Flooding and Erosion Control.

a. **Existing drainage pattern**. The existing drainage pattern is along the gut from west to east. The project site receives runoff from adjoining parcels and transmits the runoff to downstream parcels.

b. **Proposed alterations to drainage pattern**. No changes to the drainage pattern are proposed.

c. **Relationship of project to the Coastal Flood Plain**. The project area is within the Coastal Flood Plain. The area is zoned AE on the current FIRMETTE dated April 16, 2007.

FEMA Map



rance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000

FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0035G

FIRM

FLOOD INSURANCE RATE MAP

U.S. VIRGIN ISLANDS

PANEL 35 OF 94

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
U.S. VIRGIN ISLANDS	780000	0035	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
7800000035G

MAP REVISED
APRIL 16, 2007

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

d. **Peak Stormwater Flow Calculations**. The proposed project will not generate additional stormwater runoff. Although the primary project purpose is sediment removal, it will provide about 52,000 cubic feet of temporary stormwater detention. the discharge from the sediment basin will be as wide as the existing gut channel, so very little increase in velocity is anticipated.

e. **Existing Stormwater Disposal Structure**. There are no existing stormwater disposal structures on the project site. Stormwater is conveyed through the gut channel from the west side of the site to the east.

f. **Proposed Stormwater Control Facilities**. A rock weir is proposed for the east side of the site. The area behind the weir will be excavated to remove accumulated fill material and debris.

g. **Maintenance Schedule for Stormwater Facilities**. Accumulated fill and debris will be removed at a schedule to be determined after observing stormwater events and evaluating deposition rates.

h. **Proposed Method of Land Clearing**. Land clearing will not be required for this project. Soil excavation will be limited to areas where fill deposition has historically occurred.

i. **Provisions to Preserve Topsoil and Limit Site Disturbance**. The top soil has been largely truncated as a result of land clearing activities using bladed heavy equipment. See Cultural Resources Survey. There is no topsoil present in the area of the proposed sediment basin.

j. **Critical areas and Trouble Spots**. No critical areas or trouble spots were identified during wetland and cultural surveys.

k. **Erosion and Sediment Control Devices to be implemented**. The proposed sediment basin is a sediment control device. Erosion control BMPs, such as silt fence and construction entrances will be install prior to construction.

l. **Maintenance of Erosion and Sediment Control Devices**. The project construction phase will last less than 60-days. The stormwater engineer will inspect all BMPs on a daily basis during construction. The project contractor will be responsible for repairing BMPs noted by the stormwater engineer.

m. **Impact of Terrestrial and Shoreline Erosion**. The project site is not located on the shoreline. Terrestrial erosion will flow into the sediment basin. During small storm events, we anticipate capturing a large percentage of sediment caused by terrestrial erosion.

6.04 Fresh Water Resources. Not applicable.

6.05 Oceanography. Not applicable.

6.06 Marine Resources. Not applicable.

6.07 Terrestrial Resources.

A Biological Wetlands Survey for this parcel is attached. This survey identifies 27 plant species and 7 bird species. Amphibians were not directly observed but 7 species are known to exist in the area. Goats, sheep, cats, rats and deer were not observed directly, but known to frequent the area. No rare or endangered species were noted during the survey.

6.08 Wetlands.

This project involves a drainage area served by an intermittent stream consisting of forested slopes, and valley floor vegetated by a tropical semi-deciduous woodland. The stream channel ranges in width from 10 to 35 feet and the channel banks range in height from approximately 1 to 5 feet. Flow rates in the channel are variable and governed by erratic rainfall events. The remainder of the parcel contains small, medium and large spoil piles.

6.09 Rare and Endangered Species.

No rare or endangered species were noted during the Biological Survey. This project will not displace any rare, endangered or threatened species from its natural niche or habitat.

6.10 Air Quality.

Dust may be created when removing sediment, sand and gravel. Attempts will be made to ameliorate dust by spraying affected area with water prior to sediment removal.

7.00 Impact of the Proposed Project on the Human Environment.

7.01 Land and Water Use Plans.

The Parcel is zoned Public having been deeded to the Government of the Virgin Islands in 1968. The adjacent parcel (6R-2A Carolina), that is cooperating in this project, is zoned Commercial. The surrounding lands are zoned R-2, Commercial and B2. Long term use of the rest of the 5 acre parcel is uncertain at this time. Currently, 6-4 Carolina contains large quantities of fill and debris from past Public Works projects and illegal dumping by private haulers. There are local desires that this land be used for recreational purposes. One possibility is that a portion of the 5 acres, perhaps 2 acres, might be used for community gardening with associated cisterns**.**

7.02 Visual Impact.

The gut area will look substantially as it does now from the surrounding hills.

7.03 Impacts on Public Services and Utilities.

This project will create no public water demand, no public utility demand, no sewage disposal demand or solid waste disposal.

7.04 Social Impacts.

The Carolina gut is the main gut of the Coral Bay Valley area. The gut meanders through the valley and crosses a natural sediment deposition area within a five acre public property parcel (6-4 Carolina) which will be the site of this project. The gut then continues to meander another few hundred feet, and then divides into several streamlets, some of which sheet flow through forested areas before reaching manmade channels and culverts under public Route 107, then through the mangrove fringe to the ocean.

7.05 Economic Impacts.

There would be no impact on adjacent real estate values as this is public property. No tax benefits or changes to overall tax revenue of the Government will be seen.

The reduction of sediment entering the bay will improve the bay's water quality and benthic resources, and is anticipated to be a positive economic asset for the whole tourism business in Coral Bay and general quality of life. Direct impact on property assessments/values and revenues will be minimal.

7.06 Impact on Historical and Archeological Resources.

An archeological study was conducted by Soltec International Inc. The report is appended. That report recommends that the VI SHPO issue a conditioned finding of no objection to the proposed improvements to the existing drainage system and construction of the sediment basin within Parcel 6-4 Carolina. The finding by Soltec International Inc. was that there was no potentially significant cultural resources identified during the Phase I Cultural Resources Survey.

7.07 Recreational Use.

No recreational use is anticipated within this project. A potential of a secondary purpose would be community-based raised bed gardening enjoying the benefits of retained storm water that would be sourced from the sediment pond.

7.08 Waste Disposal. Not applicable. No waste disposal will be a result of this project.

7.09 Accidental Spills.

Hazardous materials that may be present during construction are only those used to power construction equipment. All fueling operations will take place, if at all, at the planned construction entrance. Any spilled materials will immediately be removed from the site in approved containers and hauled to the Landfill for proper disposal. No hazardous materials will be stored on site.

7.10 Potential Adverse Effects which Cannot be Avoided.

During construction the possibility of increased erosion exists. To minimize this erosion measures will be taken as described in this document. After construction all areas that

remain exposed will be seeded. Any erodible slopes will be covered with erosion control blankets and overseeded for permanent stabilization of the soil.

No more than four trees larger than 6" in diameter may need to be removed with a total diameter of removed trees of less than 40". Only native species will be utilized to replace the trees that are removed.

8.0 Mitigation Plans.

Stringent sediment controls will be implemented during construction phases. Landscaping is planned to provide permanent erosion control after installation of the sediment pond.

9.0 Alternatives to Proposed Action.

- Do nothing.
- Engineered sediment removal device; i.e. baffle box or other similar type of sediment removal device.

Sediment ponds are known as one of the most effective methods of removing sediment from stormwater. This parcel is a natural sediment deposition area. Increasing the size of the area where the gut can spread out and slow the flow of the stormwater will result in more sediment being deposited. Planned maintenance will continue to keep the effectiveness of the sediment pond.

10.0 Relationship Between Short and Long Term Uses of Man's Environment.

The project area is an undeveloped 5 acre parcel that has been used as a spoil dump for soil and hard fill such as concrete slabs, guard rails, and rubble from masonry buildings. The project's environment is impacted by occasional grazing by free-range sheep and goats. The project will not change the current character of the area.

11.0 References.

PHASE I CULTURAL RESOURCES SURVEY
PARCELS 6-4 AND 6R-2A
ESTATE CAROLINA
ST. JOHN, U.S. VIRGIN ISLANDS

Prepared for:

Coral Bay Community Council
And
VI RC&D
9901 Emmaus
St. John, Virgin Islands
00830

Prepared by:

Soltec International Inc.
P.O. Box 267011
Weston, Florida
33326

August 25, 2010

TABLE OF CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

Soltec International Inc. (Soltec) performed a Phase I Archaeological Survey for approximately 5 acres of land located in Parcels 6-4 and 6R-2a, Estate Carolina, Coral Bay Quarter, St. John, U.S. Virgin Islands (Figures 1 and 2). The study was performed on behalf of the Coral Bay Community Council. The following report provides a description of the proposed project, areas of concern, and the methods employed for the survey, survey findings, conclusions and recommendations.

Figure 1: Satellite image of eastern St. John showing the location of the subject properties

1.1 PROPOSED PROJECT

The proposed project consists of improvement to existing stream channels and construction of a sediment basin to minimize the rates and quantities of sediments entering into the Coral Bay marine ecosystem.

1.2 REGULATORY FRAMEWORK

The proposed project is required to comply with Title 29,Chapter 17, Section 959, of the Virgin Islands Code, also known as the Antiquities and Cultural Properties Act of 1998.

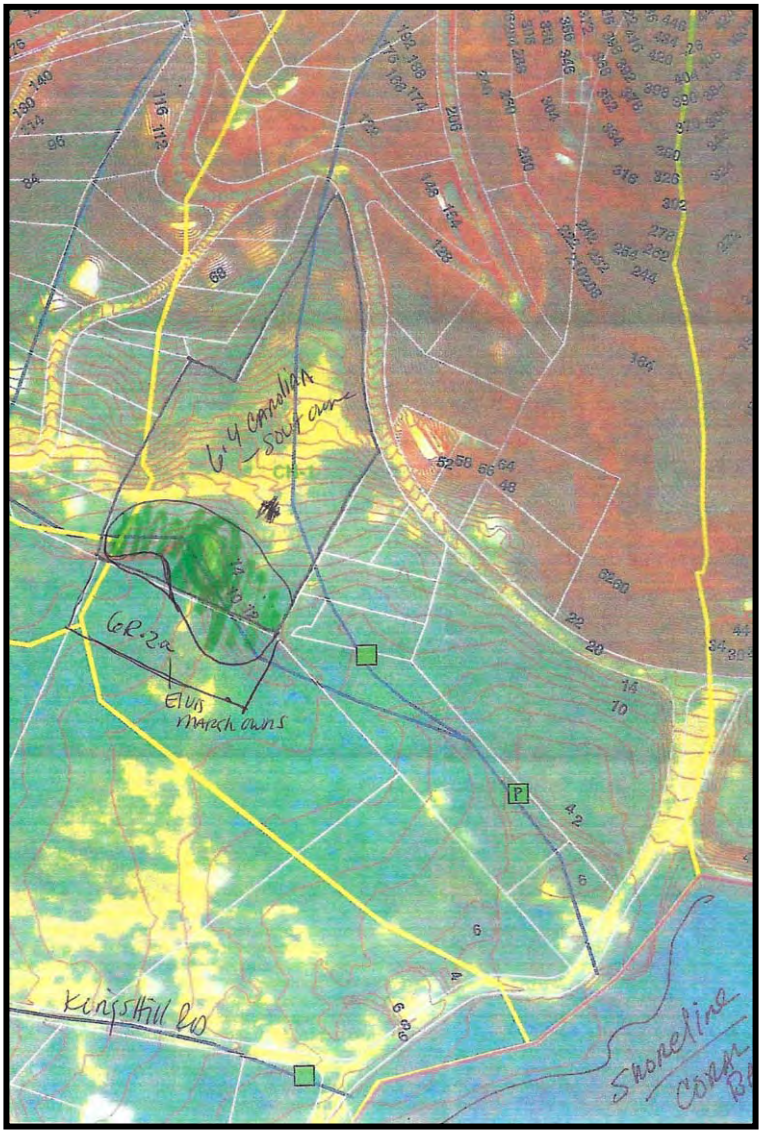


Figure 2: Map showing the polygon encompassing Parcels 6-4 and 6R-2A

1.3 ENVIRONMENTAL SETTING: EXISTING CONDITIONS

The subject properties are located in the east central part of the Carolina Valley. The topography is nearly level with some moderately sloping land located on the northern parts of Parcel 6-4 and steeper land on the northwest parts of Parcel 6-4. Parcel 6R-2a is nearly level. Two major soil series were noted on the subject properties, the nearly level lands consist of soils characteristic of the Solitude series and consist of gravelly fine sandy loam throughout the soil column. These lands are subject to frequent flooding.

The northern slopes contain surface soils of very stony, yellowish brown loam and are underlain by weathered igneous bedrock. The vegetation within both parcels, where present, consists of a mix of pioneer species such as acacia, tan-tan and numerous genip and mampoo interspersed throughout both parcels. The top soil on both parcels have been largely truncated as a result of land clearing activities using bladed heavy equipment, as evidenced by exposed subsoil on the surface and large spoil piles on the edge of fields (Figure 3).

Both parcels contain small, medium and large spoil piles, particularly Parcel 6-4, which has been used to dump soil and hard fill such as concrete slabs, guard rails, and numerous other items, including the remains of a rubble masonry building. We currently estimate that approximately one half of Parcel 6-4 contains spoil piles such as those shown in Figures 4 through 9. These spoil piles are also indicated on the recently completed topographic map as contour anomalies, however we note that not all of the spoil piles are shown on the map presented in Section 3.0, particularly the smaller ones that dot both of the subject properties. No information regarding the conditions of the ground surfaces on which the spoil piles rest is available, but we assume that these materials (spoil) were deposited on both disturbed and natural ground surfaces.

Figure 3: Photograph of characteristic ground surface in Parcel 6-4

Figure 4: Photograph of push pile on edge of field of Parcel 6R-2a

Figure 5: Photograph of large spoil pile in Parcel 6-4

Figure 6: Photograph of active dump site in the northern part of Parcel 6-4

Figure 7: Photograph of sand and gravel spoil piles and graded surfaces in Parcel 6R-2a

Figure 8: Photograph of concrete slabs in Parcel 6-4

Figure 9: Section of a rubble masonry wall in spoil pile in Parcel 6-4

The north part of Parcel 6-4 also contains an excavated pond, which at the time of our survey held water. Figure 10 shows a partial view of this pond.

Figure 10: Photograph of pond located on Parcel 6-4

1.4 DRAINAGE

The subject properties are drained by a meandering stream that appears to undergo accelerated rates of deposition as evidenced by the formation of a sand and gravel bar shown on Figure 11. Additionally, one area in or near the southeast part of the proposed basin was found to contain a well sorted sand bar.

Figure 11: Sand and gravel bar associated with the meandering stream

2.0 STUDY METHODS

The methods employed during the Phase I Cultural Resources Survey are discussed below.

2.1 LITERATURE AND RECORDS SEARCH

The site files of the Virgin Islands State Historic Preservation Office (VISHPO) indicate that no cultural resources are recorded for the specific areas of concern (Parcels 6-4 and 6R-2a). However the study area is located in close proximity to a number of precolonial and colonial archaeological sites that include the Emmaus Moravian Church and Manse which are listed in the National Register of Historic Places (NRHP), the Estate Carolina Plantation Site, also listed in the NRHP, the Coral Bay Precolonial Archaeological Site which has been nominated to the NRHP as a distinct component of the Carolina Plantation Site, the Bay Rum Distillery, precolonial midden deposits on Parcel 6R-1 and another precolonial archaeological site on Parcel 11. The precolonial contexts on Parcel 6R-1 and Parcel 11 may actually be the same site separated by a colonial road and disturbed areas.

The exact location of the Coral Bay site is ambiguous at best; the NRHP nomination form indicates that the site occupies the same space as the Estate Carolina Point Plantation settlements, however Ripley Bullen who visited the site in the early 1960's, describes its location as being one eighth of mile west of the valley mouth at Coral Harbor and approximately one mile east of the Carolina Estate valley head (1962). To the best of our understanding no archaeologist has visited the site since Bullen; according to Emily Lundberg, the landowners would not permit access to the site when she and other archaeologists sought to visit the site in the early 1980's (E. Lundberg personal communication to C. Solis July 23, 2010)

2.2 FIELD SURVEY

As originally planned, the field survey was to be performed along systematically aligned transects of 20 meter intervals, with shovel testing performed at 20 meter intervals along each transect, however the presence of a large number of large spoil piles, one of which was approximately 1.5 acres in extent, prohibited the systematic approach. Instead, the survey was performed by surface inspections and shovel testing of areas that did not contain spoil materials. The shovel tests (Figures 12 and 13) measured at least 30 centimeters in diameter and were excavated to depths no longer considered to have the potential of containing non-random artifact bearing matrices. The excavated soil was screened for artifact content.

Figure 12: Photograph of typical shovel test in relatively undisturbed area

Figure 13: Photograph of shovel test in sand bar

2.3 LABORATORY ACTIVITIES

No artifacts were recovered during the course of this study, as such; the laboratory activities were restricted to the organization of the field data collected.

3.0 FINDINGS AND CONCLUSIONS

No potentially significant cultural resources were identified during the Phase I Cultural Resources Survey performed for Parcels 6-4 and 6R-2a, Estate Carolina, St. John, U.S. Virgin Islands.

Prior to starting the survey, it was anticipated that the subject properties had a high potential of containing precolonial resources, as precolonial sites are known to be located approximately 200 meters southeast from the approximate center of the subject properties on Parcels 6R-1 and 11. Additionally, the Coral Bay site is believed to be located approximately 200 meters to the north. During the survey, it quickly became evident that the properties had been extensively disturbed by erosion, grading, and by the placing of large amounts of spoil materials on these lands.

During the colonial period, these lands were used for sugar cane agriculture and subsequently as pastures, both of which cause accelerated rates of erosion to take place to the detriment of archaeological deposits, as noted for the resources identified on Parcel 11 by Barbara Johnston (1982) and Soltec (2010). In the case of the subject properties, the past and continued modern practice of land clearing using bladed heavy equipment may have resulted in the further degradation of archaeological resources if they existed within the areas of the properties where we were able to test and/or perform surface inspections.

The purpose of the proposed project is to capture a part of the ongoing eroding sediments and to minimize their entry into the Coral Bay marine ecosystem. This in itself points to the issue of accelerated rates of erosion within the Carolina Valley floor and surrounding valley walls.

There does exist the possibility that cultural resources may remain preserved beneath the large spoil piles as depicted in the photographs shown in Section 1 and on the recently completed topographic map prepared by the surveyor contracted by the Coral Bay Community Council and shown as the areas with the tight contour lines (Figures 14 and 15). We note that the small, discrete spoil piles consisting largely of sand and gravel in 6R-2a, are not depicted in the topographic map. No testing was performed beneath the spoil piles.

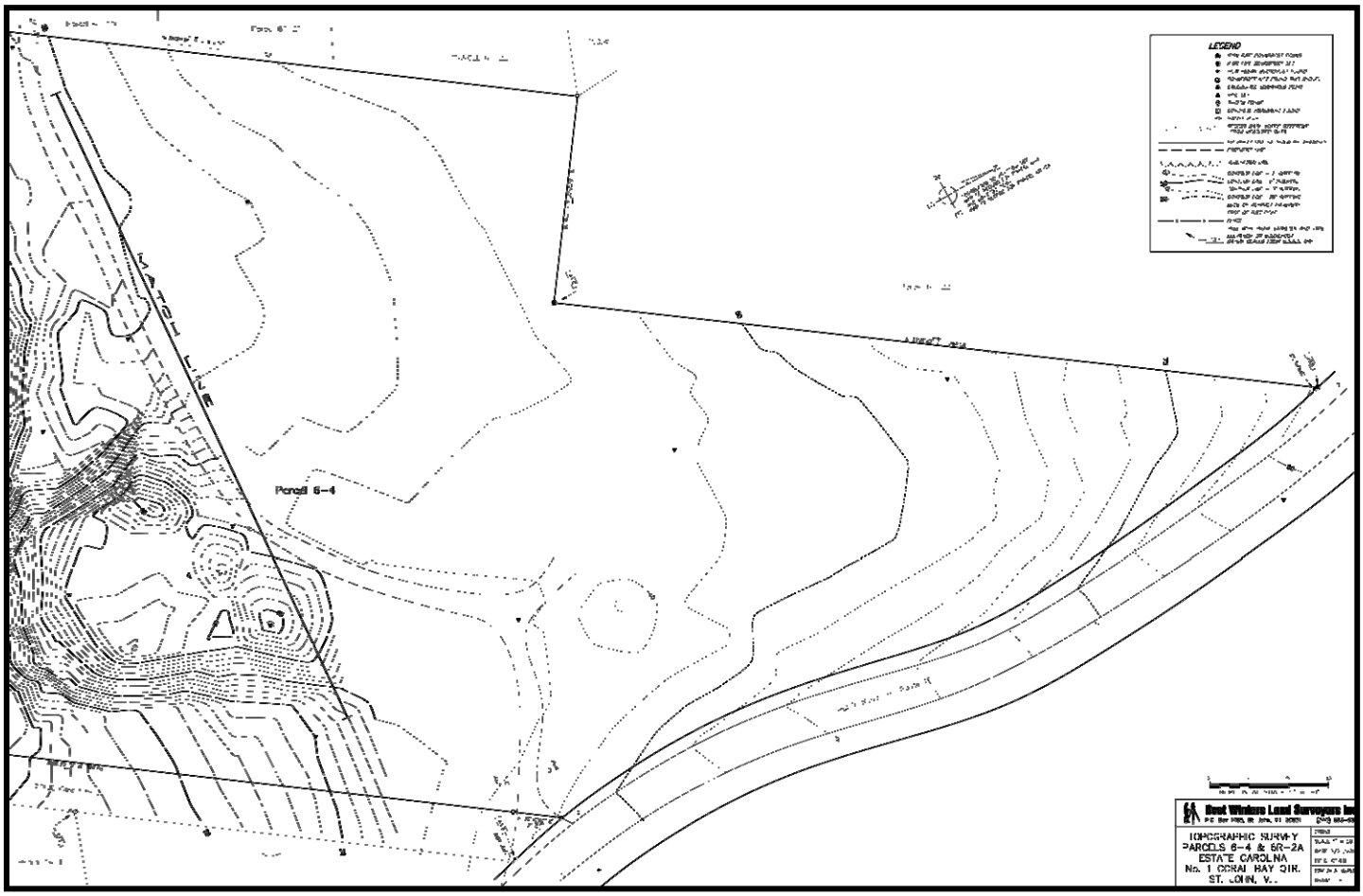


Figure 14: Topographic Map of Parcel 6-4 (partial)

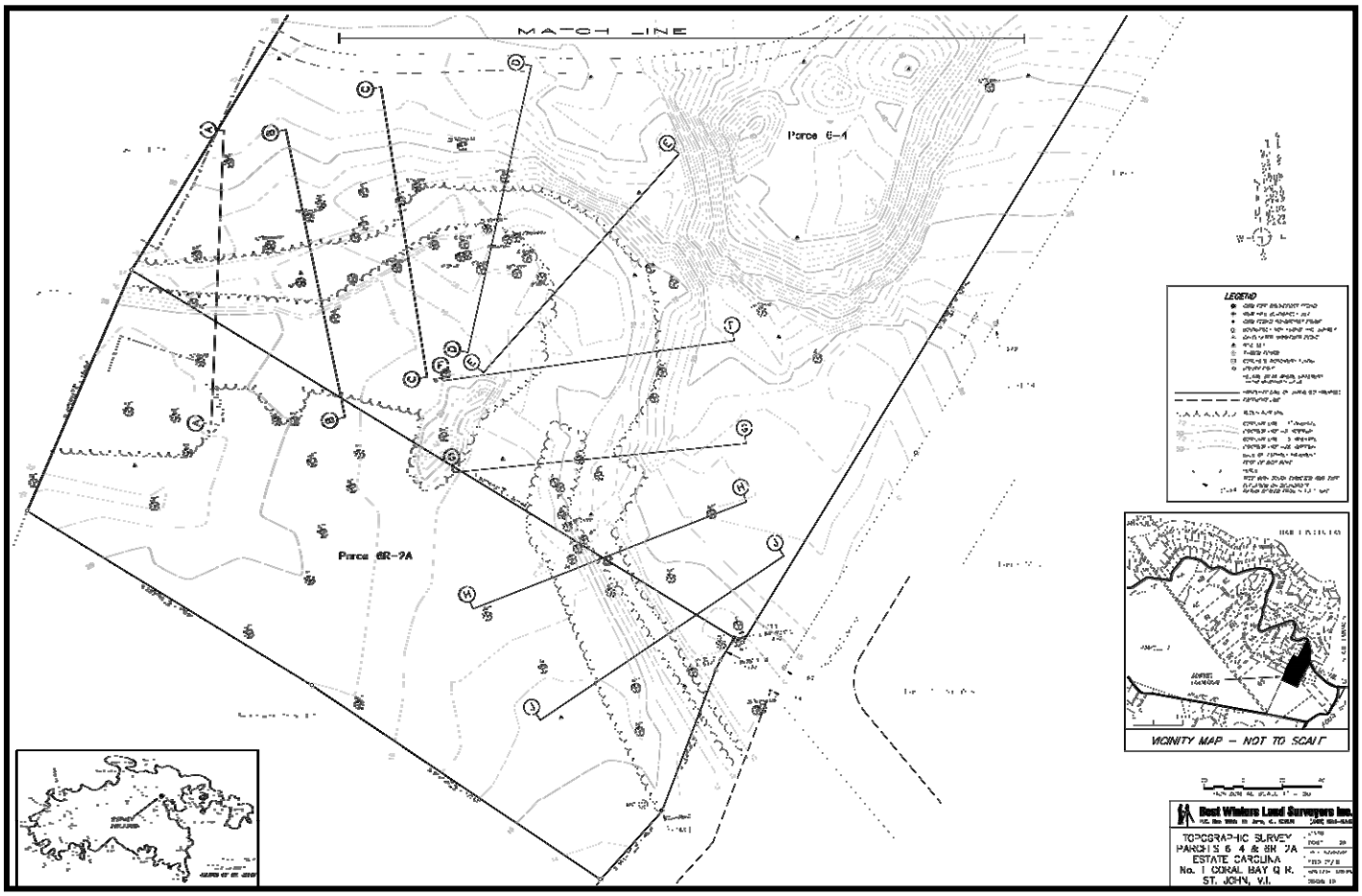


Figure 15: Topographic map of Parcel 6-4 (partial) and Parcel 6R-2a

4.0 RECOMMENDATIONS

Soltec recommends that the Virgin Islands State Historic Preservation Office issue a conditioned finding of ***no objection*** to the proposed improvements to the existing drainage system and construction of the sediment basin within Parcels 6-4 and 6R-2a, Estate Carolina, St. John, U.S. Virgin Islands. The only condition recommended is that in the event that it is necessary to remove all or parts of the existing spoil piles in Parcel 6-4, those areas should be tested to assess the potential for the presence of cultural resources beneath the piles. Testing beneath the spoil piles may be accomplished by mechanical testing using a back hoe.

Government of the Virgin Islands of the United States
Department of Planning & Natural Resources
St. Thomas/St. John Historic Preservation Office
"Preserving The Past For The Future"

Memorandum

October 26, 2010

To: Maureen Burke-Ventura, Director, Building Permits
Dr. Nadine Noorhasen, Director, Environmental Protection
Norman Williams, Acting Director, Coastal Zone Management
Blake Parker, Coral Bay Community Council

From: Lorna A.C. Thomas, Director, State Historic Preservation Office

Subject: **Phase I Archaeological Survey for approximately five (5) acres of land in Parcels 6-4 and 6R-2a, Estate Carolina, Coral Bay Quarter, St. John, U.S. Virgin Islands, conducted by Soltec International, Inc.**

VISHPO staff has reviewed the report for the Phase I Archaeological Survey carried out by Soltec International, in August 2010, of approximately 5 acres of land located in Parcels 6-4 and 6R-2a, Estate Carolina, Coral Bay Quarter, St. John, U.S. Virgin Islands. This work was performed on behalf of the Coral Bay Community Council in accordance with their plans to construct a sediment basin in order to minimize the amount of sediment entering Coral Bay

Parcels 6-4 and 6R-2a are currently vacant lots that have been selected for the excavation of a large sediment basin. The lots have been utilized as an informal trash disposal site, and spoil piles are present throughout both lots. Based on the report prepared by Soltec International, the Phase I Archaeological Survey conducted at the site consisted of pedestrian survey and opportunistically placed shovel tests in undisturbed areas. Their testing did not locate any significant cultural deposits on either property and no artifacts were recovered in the tested areas, despite the nearby location of important historic and prehistoric sites. Due to the presence of the modern spoil piles, some areas were not tested. Based on the Phase I Archaeological Survey, no significant cultural deposits were identified on these lots and thus no cultural resources will be negatively impacted if the area of impact were limited to the currently exposed surfaces.

Therefore, the VISHPO issues a finding of "no objection with conditions" to the proposed development. No significant cultural resources will be impacted if development is restricted to the tested areas. However, given the nearby presence of important archaeological sites and the potential for any undiscovered deposits to be impacted by the nature of the proposed construction, the VISHPO recommends that further testing would be necessary if the spoil piles were moved or if any untested areas were impacted by the excavation of the sediment basin. In this case, the VISHPO would require additional subsurface testing of the areas underneath the spoil piles or monitoring by a CRM professional during the excavation of the sediment basin. In the event that additional testing is necessary, the applicant is instructed to consult with the VISHPO.

Thank you for consulting the VISHPO on this matter.

CC: Carlos Solis- Soltec International, Inc.

Kongens Gade 17, Kongens Quarter
Charlotte Amalie, St. Thomas, Virgin Islands 00802
Tel: (340) 776-8605
Fax: (340) 776-7286

Biological Survey of Carolina Gut

Parcels 6-4 & 6R-2A, Estate Carolina

Coral Bay, St. John, Virgin Islands

Gary Ray, Ph.D.

Virgin Forest Restorations

9901 Emmaus

St. John, VI 00830

June 28, 2010

INTRODUCTION

This biological assessment concerns a stream channel of privately-owned parcels in lower Carolina Valley. Our description pertains specifically to Parcels 6-4 and 6R-2A, Estate Carolina, #1 Coral Bay Quarter, St. John. This document reports the outcome of biological work completed in support for an application for a Major Permit under the Coastal Zone Management Act of the Virgin Islands. In fulfillment of TIER 1 requirements, we have conducted search for rare species surveyed the biota of the parcels. Our focus is the stream channel and its banks – the proposed site of a storm water retention area intended to trap terrestrial sediments en route to Coral Harbor. This work is supported by a federal grant, namely the American Recovery and Reinvestment Act of 2009.

SITE DESCRIPTION and APPROACH

This drainage area served by this intermittent stream consists of forested slopes and valley floor vegetated by a tropical semi-deciduous woodland in late pioneer stage of recovery from a historical (plantation era) period of substantial agricultural activity, and more recently by intensive grazing by free-roaming goats and other feral livestock. The stream channel ranges in width from 10 to 35 ft (3.0 to 10.7 m), and the channel banks in height from approximately 1 to 2.5 ft (0.30 to 0.75 m). These banks are highly eroded in places. Flow rates are variable and governed by erratic rainfall events.

Fig. 1. Survey map of Parcels 6-4 and 6R-2A, Estate Carolina, #1 Coral Bay Quarter, St. John (top central) and surrounding parcels. The area bio-surveyed in indicated by the red arrow. *Source: Marvin Berning & Associates, Red Hook, St. Thomas, VI.*

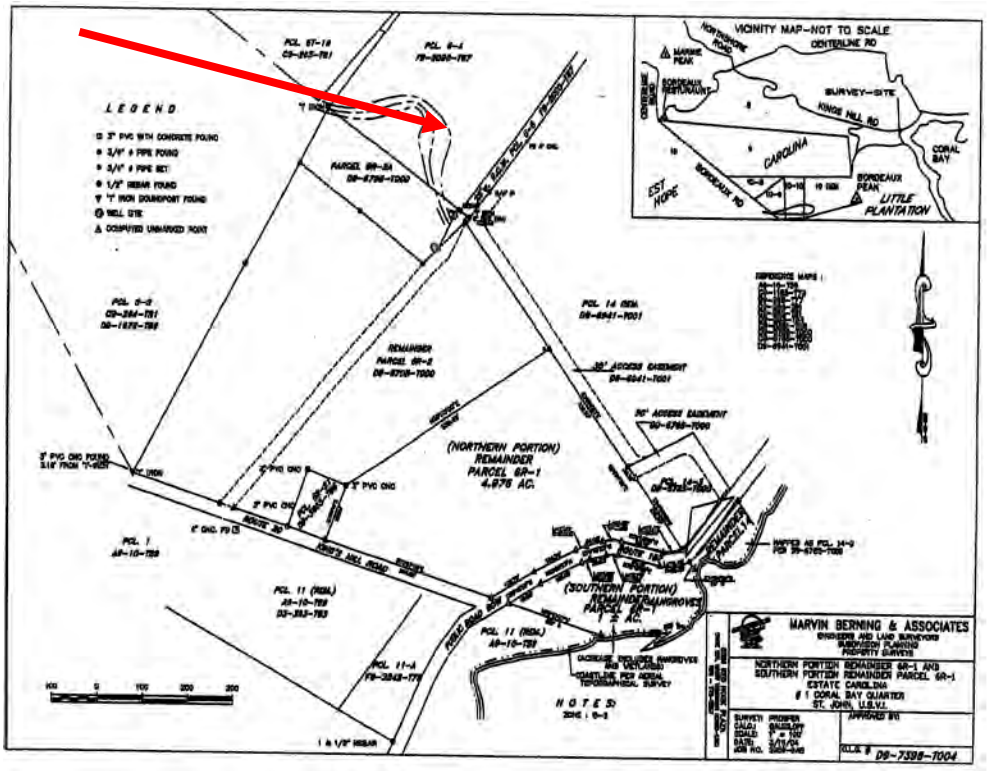
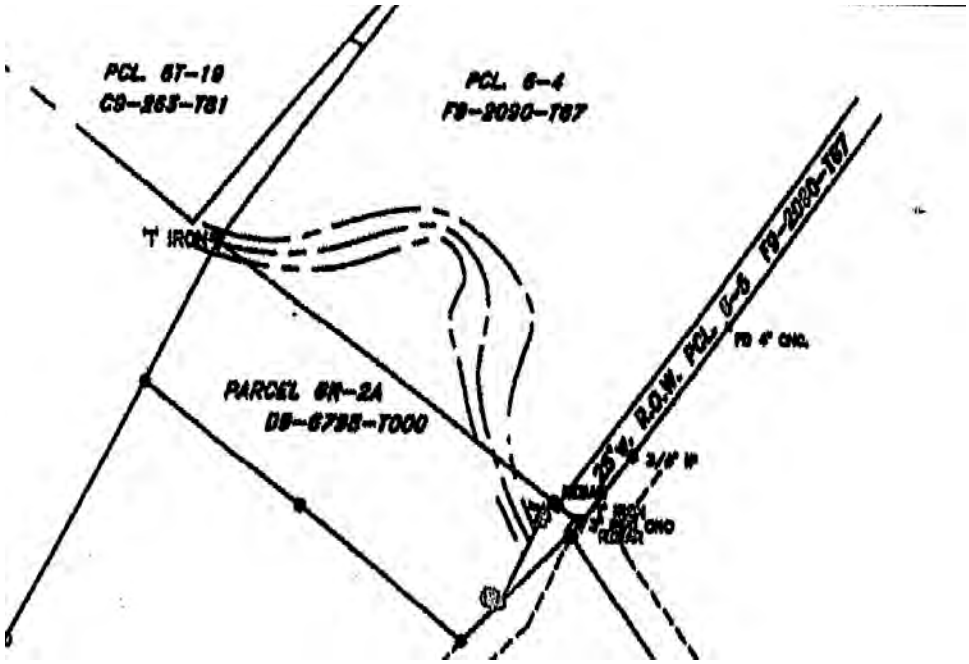


Fig. 2. Detail of Survey map of Parcels 6-4 and 6R-2A,
Estate Carolina, #1 Coral Bay Quarter, St. John, U.S. Virgin Islands.
Source: Marvin Berning & Associates, Red Hook, St. Thomas, VI.



Soils

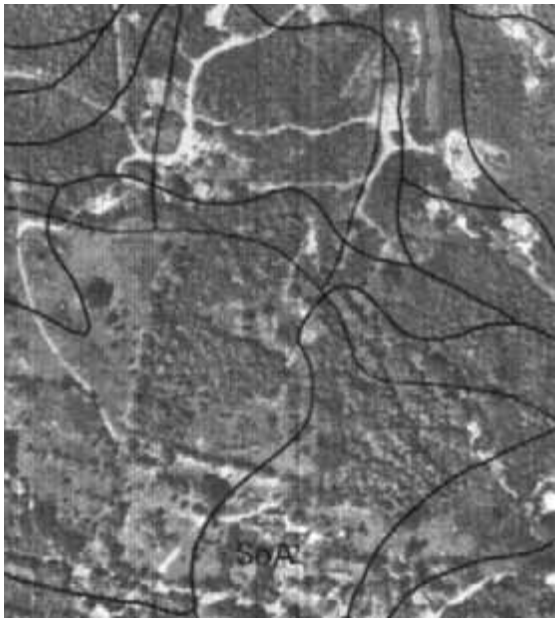


Fig. 3. Soil map (detail) of Parcels 6-4 and 6R-2A, Estate Carolina. The site is Indicated by red arrow.

The soils of the site are of the Solitude series, consisting of very deep, somewhat poorly drained soils of saline marshes, flats and salt ponds. They are formed in alluvial and marine sediments; slopes range from 0-2 percent. Soils of this series are classified as fine-loamy, mixed superactive, nonacid, isohyperthermic Aeric Tropaquepts. The site of the proposed retention pond is mostly an associated “Carib” soils, which lie on flood plains and have a rich, mollic epipedon (a thick, dark, humus-rich surface horizon).

Most of the area under study here in stream channel and its associated flood plain terrace. When revisited, late in the study, a spate of thunderstorms had filled the intermittent stream channel. Much fine eroded terrestrial sediment was in evidence. The streambed sorted gravel to the inside of the curving stream channel. Large chunks of concrete road bed had been discarded at stream side, perhaps as riprap to discourage flooding.

Fig. 4. Lower Carolina Valley (Elvis Marsh) Gut (an Intermittent stream) showing flow carrying sediment in a riffle during a rainy period in late June 2010.

Fig. 5. A pool just downstream from the reach depicted above (fig. 4), in which flow velocity has slowed. This is the site of the proposed sediment retention pond.

RESULTS

Vegetation

The stream banks of Carolina Gut were covered mostly with native plant species. Of the 27 plant species tallied, three species (11%) were exotics (Table 1). Although much of the surrounding area is intensively disturbed by livestock grazing, dumping of construction debris, road and residence construction, the largely indigenous character of the flora is evidence that the stream channel has not been greatly altered in recent years from its original condition. It is apparent, however, that riprap has been added, and the stream braiding in downstream reaches may be highly influenced by topographic changes associated with agriculture.

Rare or Endangered Species Search

None of these plants occurring on this site exhibit high fidelity to wetlands, and none were rare or endangered. Most plant species are associated with early to middle stages of plant community succession, indicating a process of continued recovery from plantation-era disturbance.

Table 1. Vascular plant species of Elvis Marsh' Gut..

No.	Scientific name	Family	Common name	Vernacular family	Habit	Nativity
1	*Cordia collococca*	*Boraginaceae*	red manjack	Heliotrope	tree	native
2	*Heliotropium angiospermum*	*Boraginaceae*	eyebright	Heliotrope	herb	native
3	*Tournefortia microphylla*	*Boraginaceae*	small leaved chigory	Heliotrope	liana	native
4	*Capparis amplissima*	*Capparaceae*	burro blanco	Caper	tree	native
5	*Capparis indica*	*Capparaceae*	whie caper	Caper	tree	native
6	*Erythroxylum brevipes*	*Erythroxylaceae*	brazilet	Cocaine	tree	native
7	*Croton flavens var. rigidus*	*Euphorbiaceae*	yellow maran	Spurge	shrub	native
8	*Acacia macracantha*	*Fabaceae*	Stink casha	Pea	tree	native
9	*Acacia retusa*	*Fabaceae*	catch-and-keep	Pea	liana	native
10	*Andira inermis*	*Fabaceae*	dog almond	Pea	tree	native
11	*Piscidia carthagenensis*	*Fabaceae*	fish poison tree	Pea	tree	native
12	*Casearia guianensis*	*Flacourtiaceae*	Guiana coffee	Flacourtia	tree	native
13	*Eugenia biflora*	*Myrtaceae*	rodwood	Myrtle	tree	native
14	*Eugenia monticola*	*Myrtaceae*	mountain eugenia	Myrtle	tree	native
15	*Pimenta racemosa*	*Myrtaceae*	bay rum	Myrtle	tree	native
16	*Guapira fragrans*	*Nyctaginaceae*	black mampoo	Four O' Clock	tree	native
17	*Trichostigma octandrum*	*Phytolaccaceae*	hoop vine	Pokeweed	vine	native
18	*Gouania lupuloides*	*Rhamnaceae*	whiteroot	Buckthorn	liana	native
19	*Guettarda odorata*	*Rubiaceae*	blackberry	Coffee	shrub	native
20	*Serjania polyphylla*	*Sapindaceae*	basket wiss	Soapberry	liana	native
21	*Capraria biflora*	*Scrophularieaceae*	goat weed	Figwort	herb	native
22	*Clerodendrum aculeatum*	*Verbenaceae*	haggarbush	Verbena	shrub	native
23	*Cissus trifoliata*	*Vitaceae*	trifoliate cissus	Grape	vine	native
24	*Cissus verticillata*	*Vitaceae*	pudding vine	Grape	vine	native
25	*Jatropha gossypiifolia*	*Euphorbiaceae*	bellyache bush	Spurge	herb	introduced

No.	Scientific name	Family	Common name	Vernacular family	Habit	Nativity
26	*Leucaena leucocephala*	*Fabaceae*	tan tan	Mimosa	tree	introduced
27	*Melicoccus bijugatus*	*Sapindaceae*	genip; kenep	Soapberry	tree	introduced

Animals

Nine native bird species were observed on the site (Table 2), and four other species are likely to inhabit the area. Gray kingbirds, Bananaquits, and Pearly-eyed thrashers were the most common birds sighted.

Table 2. Birds observed or likely to be found Elvis Marsh' Gut.

No.	Species name	Common name	Family	Family Relatives
Observed				
1	*Tiarus bicolor*	Grassquit, Black-faced	*Emberizidae*	Wood Warblers, Blackbirds, Tanagers
2	*Margarops fuscatus*	Thrasher, Pearly-eyed	*Mimidae*	Mockingbirds & Thrashers
3	*Columba squamosa*	Red necked pigeon	*Columbidae*	Pigeons & Doves
4	*Columbina passerina*	Dove, Common Ground	*Columbidae*	Pigeons & Doves
5	*Zenaida aurita*	Dove, Zenaida	*Columbidae*	Pigeons & Doves
6	*Coereba flaveola*	Bananaquit	*Emberizidae*	Wood Warblers, Blackbirds, Tanagers
7	*Loxigilla noctis*	Bullfinch, Lesser Antillean	*Emberizidae*	Wood Warblers, Blackbirds, Tanagers
8	*Eulampis holosericeus*	Green-throated Carib	*Trochilidae*	Hummingbirds
9	*Tyrannus dominicensis*	Kingbird, Gray	*Tyrannidae*	Tyrant Flycatchers
Likely				
10	*Orthorhyncus cristatus*	Hummingbird, Antillean Crested	*Trochilidae*	Hummingbirds
11	*Coccyzus minor*	Cuckoo, Mangrove	*Cuculdae*	Cuckoos & Anis
12	*Crotophaga ani*	Ani, Smooth-billed	*Cuculdae*	Cuckoos & Anis
13	*Falco sparverius*	Kestral, American	*Falconidae*	Falcons

Terrestrial mammals observed or likely to be observed on the site were all introduced to the island. These included goats, which were very much in evidence, and cats, rats and deer, which were not observed directly, but known to frequent the area (Table 3). No evidence of feral pigs was found, and no survey for bats was conducted.

Five reptiles were observed (Table 4), including two anoline lizards (the barred anole and the crested anole), one iguana, a ground lizard and cotton ginner.

Table 3. Terrestrial mammals Elvis Marsh' Gut.

No.	Scientific name	Common name	Family	Order	Nativity
Observed					
1	*Capra hircus*	goat	*Bovidae*	*Ortiodactyla*	Introduced
Likely					
2	*Rattus rattus*	black rat	*Capromyidae*	*Rodentia*	Introduced
3	*Felis catus*	cat	*Felidae*	*Carnivora*	Introduced
4		white tailed deer			Introduced

Table 4. Reptiles of Elvis Marsh' Gut.

No.	Scientific name	Common name	Family	Suborder
Observed				
1	*Ameiva exsul*	Ground lizard	Teiidae	Sauria
2	*Sphaerodactylus macrolepis*	Cotton ginner	Gekkonidae	Sauria
3	*Iguana iguana*	Iguana	Iguanidae	Sauria
4	*Anolis cristatellus*	Crested anole	Polychrotidae	Sauria
5	*Anolis pulchellus*	Grass anole	Polychrotidae	Sauria
Likely				
6	*Anolis stratalus*	Barred anole	Polychrotidae	Sauria
7	*Arrhyton exiguum*	VI garden snake	Colubridae	Serpentes
8	*Typhlops richardi*	Blind snake	Colubridae	Serpentes

Amphibians were not directly observed, but five species are common by song from the area. The cane toad (Bufo marinus) was recently reintroduced to St. John, likely aboard of shipment of landscape plants up-valley from the site.

Table 5. Amphibians of Elvis Marsh' Gut

No.	Scientific name	Common name	Family
The following species are known to be in this area, but were not observed			
1	*Bufo marinus*	Cane toad	Bufonidae
2	*Osteopilus septentrionalis*	Cuban tree frog	Hylidae
3	*Eleutherodactylus antillensis*	Antillean tree frog	Leptodactylidae
4	*Eleutherodactylus cochranae*	Cochran's tree frog	Leptodactylidae
6	*Eleutherodactylus lentus*	Mute tree frog	Leptodactylidae
7	*Leptodactylus albilibris*	White-lipped frog	Leptodactylidae

Conclusions

The area seems appropriate for a retention pond. The local hydrologic conditions would not be greatly altered by the construction of a retention pool. On the day of final visits to the site were conducted, the consultant observed much sediment being carried into Coral Harbor from the stream studied. Rainfall had been abundant in the preceding fortnight, and particularly intensive the night prior to the final visit. A red plume of suspended terrestrial sediment was evident this day.

References

Acevedo-Rodriguez, P. 1996. Flora of St. John, U.S. Virgin Islands. Memoirs of the New York Botanical Garden, Vol. 78. Bronx, NY. 581 pp.

"Elvis Marsh Gut" 18^0 20' 56.25" N and 64^0 43' 00.25" W. Google Earth. October 31, 2006. Accessed: June 13, 2010.

Raffaele, H. A. 1989. A Guide to the Birds of Puerto Rico and the Virgin Islands. Princeton University Press, Princeton, NJ. 254 pp.

Schwartz A. and R.W. Henderson. 1991. Amphibians and Reptiles of the West Indies. University of Florida Press. 720 pp.

USDA SCS. 1993. Soil Survey of the U.S. Virgin Islands.

5.0 REFERENCES

Espenshade, Christopher T.
2008 Phase I Archaeological Survey of the Northern Remainder, Parcel 6R-1, Estate Carolina, St. John, U.S. Virgin Islands; Technical Report 1643; for Alton Adams; New South Associates, Stone Mountain, Georgia

Johnson, B. R.
1982 Cultural Resources Assessment, Estate Carolina, Parcel #11, Coral Bay. St. John, USVI: contracted for Virgin Islands Planning Office, Division for Archaeology and Historic Preservation.

Rodríguez Rámos, Reniel
2010 Rethinking Puerto Rican Precolonial Archaeology. University of Alabama Press, Tuscaloosa

Rouse, Irving
1992 The Tainos. Yale University Press, New Haven and London

Sleight, Fredrick W and Ripley P. Bullen
1962 Archaeological Reconnaissance of the Island of St. John, United States Virgin Islands. And Ceramic Periods of St. Thomas and St. John Islands, Virgin Islands. The William Bryant Foundation, American Studies, Reports Number 3 and 4. Orlando

CURRICULUM VITAE

Gary J. Ray, Ph.D.

University of the Virgin Islands
College of Science and Mathematics
#2 John Brewers Bay
St. Thomas, VI 00802
gray@uvi.edu
virginforestvi@gmail.com

DATE & PLACE OF BIRTH:

December 10, 1954 Lynchburg, VA (USA)

EDUCATION:

1993 Ph.D. Land Resources, Institute for Environmental Studies, University of Wisconsin-Madison -- focus: restoration ecology

1985 M.S. Botany University of Montana – effects of heavy metals on riverside plant communities

1978 B.S. Botany University of Maryland

EMPLOYMENT:

1/09 to present Asst. Prof. of Biology, University of the Virgin Islands, Coll. of Science & Mathematics, Biology Program

5/05 to present Ecological Consultant, Virgin Forest Restorations

8/99 to 5/05: Asst. Prof. of Biology, Division of Science & Mathematics, University of the Virgin Islands, St. Thomas, VI

5/97 - 4/99: `A`ali`i Consulting Ecologists, Honolulu, HI

10/94 - 5/97: Conservation Coordinator, Hawaii Office - Center for Plant Conservation, Bishop Museum, Honolulu, HI

1993 -1994: Virgin Forest Ecological Consulting, St. John, U.S. Virgin Islands

1999-2005: Asst. Prof. of Biology, University of the Virgin Islands, Div. of Science & Mathematics, Biology Program

2005 to present: Virgin Forest Ecological Consulting, St. John, U.S. Virgin Islands

TEACHING EXPERIENCE:

University of the Virgin Islands, Div. of Science & Mathematics, Biology Program (7.5 years); courses: Terrestrial Ecology, Botany, General Biology, Science Ethics, Junior and Senior Biology Seminar, and two General Education Science courses

University of Wisconsin-Madison Ph.D. Program, held Teaching Assistantships in Evolution, Genetics and Ecology (Biological Core Curriculum --1988-89)

University of Montana Master's Program, held Teaching Assistantships in Plant Physiology, Introductory Biology, and Trailside Botany (Ecology for non-majors -- 1983-85)

Field Seminars in Virgin Islands Natural History, sponsored by Friends of the Virgin Islands National Park (1991-present)

Course on Ecology and Watershed Management, Lavity Stout Community College summer session, 1992
Public Lectures on Virgin Islands Natural History, St. John Historical Society, VI Audubon Society
Public Lectures on Plant Conservation and Restoration Ecology in Hawaii, Sierra Club Mauna Loa Chapter, Native Hawaiian Plant Society, Hawaii Botanical Society

CONSULTING WORK

Biological surveys of proposed coastal developments of the Virgin Islands
Rare plant surveys for land management organizations
Rare plant restoration for public agencies and private property owners
Floristic Inventory and Digital Mapping of the Vegetation of Buck Island, St. Croix, US Virgin Islands: National Park Service, South Florida – Caribbean Cooperative Ecosystem Studies Unit
Propagation of the native flora of the Virgin Islands

PROFESSIONAL CONSERVATION COMMITTEE WORK (1994-1997):

Chairman, Hawaii Rare Plant Task Force – met annually to update statewide database and debate conservation actions for 600+ Hawaiian rare plants
Chairman, Hawaii Rare Plant Restoration Group – created to set policy and plan actions related to the collection, propagation and reintroduction of Hawaiian rare plants, and to integrate these activities with on-site recovery efforts
Member, Hawaii Pacific Plant Recovery Coordinating Committee – expert panel appointed by FWS to devise recovery strategy for Hawaii's imperiled flora
Member, Hawaii Conservation Forum – interagency council formed to enhance cooperation among academic, governmental and private organizations for the advancement of Hawaiian conservation.

CURRENT RESEARCH FOCUS:

Dry forest dynamics; effects of catastrophic disturbance on plant community structure
Rare plant reintroduction and habitat restoration
Restoration of tropical dry forest communities
Rare plant population ecology

RESEARCH ACTIVITIES:

Community ecology a population dynamics of five Virgin Islands rare plant species
Monitoring forest dynamics of Virgin Islands dry forests using various sets of permanent forest plots established by the Smithsonian Institution's Monitoring and Biodiversity Program (SI-MAB), and the University of Wisconsin-Madison
Analyzed techniques for restoring native tree communities to degraded dry forest sites in the Caribbean region

Assembled data on flowering and fruiting cycles, seed ecology and propagation requirements of dry forest tree species

COMMUNITY SERVICE ACTIVITIES

Co-founder of the St. John Community Land Trust. Ltd., a non-profit corporation dedicated to protecting wild lands of the Virgin Islands

CONSERVATION ACTIVITIES:

Listing advocacy with Center for Biological Diversity on behalf of Solanum conocarpum and Agave eggersiana

Advocacy for Land Purchases by NPS to Trust for Public Land – Maho Tract and major new tract (in planning stages), to National Park Trust – Nanny Point, Concordia, St. John

Rare plant conservation plan for 7 acres inhabited by the Virgin Islands rarest plant

Propagation and re-introduction of a rare endemic shrub, *Solanum conocarpum,* to the Virgin Islands National Park

Population surveys for the federally endangered tree, St. Thomas Prickly Ash (*Zanthoxylum thomasianum*) for the Virgin Islands National Park

Propagation and selection of plants indigenous to the Virgin Islands for the horticultural landscape trade

Established two permanent monitoring plots in stands of tropical dry forest on St. John, U.S. Virgin Islands in collaboration with the Smithsonian Institution as part of an international network of unique plant communities

PUBLICATIONS:

Ray, G.J., F. Dallmeier and J.A. Comiskey. 1998. The structure of two subtropical dry forest communities on the island of St. John, U.S. Virgin Islands. In Dallmeier, F. and J.A. Comiskey, (eds) *Forest Biodiversity in North, Central, and South America, and the Caribbean: Research and Monitoring*, Man and the Biosphere Series, Vol. 21. UNESCO and the Parthenon Publishing Group, Camforth, Lancashire, UK.

Ray, G.J. and B.J. Brown. 1995. The structure of five successional stands in a subtropical dry forest, St. John, U.S. Virgin Islands. *Caribbean Journal of Science* 31(3-4):212-222.

Ray, G.J. and B.J. Brown. 1995. Restoring Caribbean dry forests: evaluation of tree propagation techniques. *Restoration Ecology* 3(2):86-94.

Ray, G.J. and B.J. Brown. 1994. Seed ecology of woody species in a Caribbean dry forest. *Restoration Ecology* 2(3):156-163.

Brown, B.J. and G.J. Ray. 1993. Restoring Caribbean dry forest: a systems framework for site analysis and restoration research. In Lieth, H. and M. Lohman (eds) *Restoration of Tropical Forest Ecosystems,* Kluwer Academic Publishers, Netherlands.

Dallmeier, F., J.A. Comiskey and G. Ray. 1993. User's Guide to the Virgin Islands Biosphere Reserve Biodiversity Plot 1, U.S. Virgin Islands. The Smithsonian Institution/Man and the Biosphere Biological Diversity Program, Washington, DC.

RECENT REPORTS:

Ray, G. and A. Stanford. "Population Genetics, Propagation and Reintroduction of *Solanum conocarpum*, A Rare Shrub of St. John, U.S. Virgin Islands", Final Report to National Park Service Project PMIS #: 49192, Virgin Islands National Park, August 31, 2005, 19 pp.

Ray, G. and A. Stanford. "Zanthoxylum thomasianum Survey, Mapping and Population Status Update for the Virgin Islands National Park, St. John, U.S. Virgin Islands", Final Report Project PMIS #: 80373, VIIS Strategic Plan Goal #1a2B, December 31, 2005, 30 pp.

Miles, E. and Ray, G.J. "A Habitat Assessment for the Virgin Islands Tree Boa (*Epicrates monensis ssp. granti*) on Parcels 2A, 2U, 2X-1, & 2G0, #1 Red Hook Quarter, St. Thomas, U.S. Virgin Islands", August 2006, For: Dolphin Cove, LLP, 17 pp.

Ray, G.J. "Habitat Assessment for Virgin Islands Tree Boa (*Epicrates monensis ssp. grant*) at Smith Bay, Parcel 3, St. Thomas, U.S. Virgin Islands", November 2006, for William McComb Engineering, St. Thomas, VI, 21 pp.

Ray, G.J. and R. Slatton "Terrestrial Biological Survey of Cane Bay, St. Croix, U.S. Virgin Islands", for: Pinnacle Developments and Investments, LLC, November, 2007, 25 pp.

Ray, G.J. and R. Slatton "Comprehensive Terrestrial Survey of Estates William and Punch, St. Croix, U.S. Virgin Islands", For: William and Punch, LLC, September 2007, 30 pp.

Ray, G.J. "Rare Plant Mapping and Natural Community Conservation Plan, Thatch Cay, St. Thomas, U.S. Virgin Islands" for Thatch Cay, LLC, September 2007, 17 pp.

Ray, G.J. "Endangered & Threatened Species Search and Vegetation Summary of Parcel 1-68, Estate Bakkero, St. Thomas, U.S. Virgin Islands" November 2007, For: Nick Pourzal, C&N Holding, Inc., St. Thomas, USVI, 7 pp.

PROFESSIONAL AFFILIATIONS:

Center for Biological Diversity
Union of Concerned Scientists
Endangered Species Coalition

RESPONSE TO DEFICIENCIES

Virgin Islands
Resource
Conservation &
Development
Council, Inc.

5030 Anchor Way, Suite 2
Christiansted, VI 00820-4692
Phone: (340) 692-9632
Fax: (340) 692-9607
www.usvircd.org

November 8, 2010

Mr. Manuel Ramos
DPNR Coastal Zone Management Division
Cyril E. King Airport, 2nd Floor
St. Thomas, VI 00802

Greetings Mr. Ramos,

Please be advised that Ms. Sharon Coldren, President of Coral Bay Community Council, Inc., is hereby appointed as Agent on behalf of the Virgin Islands Resource Conservation & Development Council, Inc. [V.I. RC&D] for purposes of obtaining **Major CZM Permit Application No. CZJ-01-10(L)** for the V.I. RC&D Carolina Valley Sediment Detention Basin, St. John, U.S. Virgin Islands. This project is being implemented as part of V.I. RC&D's ***USVI Habitat Restoration through Watershed Stabilization Project***, funded by a NOAA-ARRA grant.

Please feel free to contact me should you have any questions regarding this designation.

Regards,

Diane T. Capehart
President, V.I. RC&D

CORAL BAY COMMUNITY COUNCIL, INC.

Mailing: 9901 Estate Emmaus, St. John, VI 00830
Office: 8-1 Estate Emmaus, Coral Bay, St. John, U.S. Virgin Islands
E-mail: coralbaycommunitycouncil@hotmail.com Phone/Fax: 340-776-2099

November 12, 2010

Jean-Pierre L. Oriol
Acting Assistant Director
Department of Planning and Natural Resources
Coastal Zone Management Program
Cyril King Airport Terminal Building 2nd Floor
St. Thomas, U.S. Virgin Islands 00802

Re: Major CZM Permit Application No. CZJ-01-10(L)
VI Resource Conservation & Development Council, Inc.
Carolina Valley Sediment Detention Basin
St. John, Virgin Islands

Dear Mr. Oriol:

This is in response to the List of Deficiencies sent out concerning the above-named CZM Permit. VI RC&D would like to correct these deficiencies by providing the following information:

1. **A Power of Attorney authorizing CBCC / Sharon Coldren as agent for VI RC&D.**

   Response: Attached letter of agency from VI RC&D.

2. **CBCC needs to submit a copy of the agreement between CBCC and VI RC&D.**

   Response: Attached.

3. **Copy of the Warranty Deed for Parcel 6R-2A Estate Carolina, St. John owned by Elvis Marsh.**

   Response: Attached.

4. **Proof of Legal Interest for Parcel No. 6R-2A Estate Carolina, St. John, VI.**

   Response: VI RC&D requests that this be removed as a "deficiency" from this application. Changes in the design and implementation of the project are such that no part of 6R-2A Estate Carolina is intended to be used in the project. VI RC&D requests that on Page 10 and Page 18 of the EAR the Rock Construction entrance (including Page 20) and the Excavated Soil Stockpile area be deleted from the design. In all other respects the design

remains the same. In addition the Statement of Intent (Pages 14-15 of the EAR) from Mr. Elvis Marsh should no longer be considered.

5. **What type of deposited material in the detention basin that can be used for irrigation?**

   Response: As a clarification and correction to the EAR – no deposited materials will be used for irrigation purposes. Deposited materials will be collected and used as building materials. After rain events stormwater that is collected in the sediment detention pond can be a source of water for irrigation or other non-potable public use. See EAR page 4.

6. **What is the size of the sediment basin?**

   Response: The diagram of the proposed sediment detention basin (EAR page 10) shows that the proposed basin is approximately .28 acres with a future expansion area of another .14 acres. This translates into a capacity of approximately 400,000 gallons of water for the proposed basin.

7. **Property Tax Clearance from Department of Finance for Parcel No. 6R-2A, Estate Carolina, St. John, VI.**

   Response: Attached.

8. **Letter from State Historic Preservation Office – SHPO approving the Phase 1 Archaeological Resource Survey for Parcel Nos. 6-4 and 6R-2A, Estate Carolina, St. John, VI.**

   Response: Attached.

Concerns from Division of Environmental Protection.

The Letter of Intent from Elvis Marsh covers a larger land area than needed. The current plan for the sediment basin does not encroach upon 6R-2A Estate Carolina, the parcel owned by Mr. Elvis Marsh. After topographical survey work, allowed by the Letter of Intent, the topography support a .42 acre detention basin utilizing only Parcel 6-4 Carolina. All construction and excavation will take place on Parcel 6-4 Estate Carolina, the parcel owned by the Government of the Virgin Islands. The total disturbed area does not exceed one acre in size.

If Mr. Elvis Marsh (or anyone else) makes available at retail excavated materials it will be explained to him that a permit will be necessary for such purpose.

We understand and will comply with DEP procedures.

Sincerely,

Blake Parker
Coordinator, NOAA Project

Scope of Work & Specifications

for

Kings Hill Road/Gerda Marsh Road Intersection Improvements

and

Stormwater Management Facilities

PROJECT NO. C001-09

SITUATE IN

CORAL BAY, ST. JOHN
US VIRGIN ISLANDS

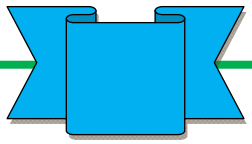
February 17, 2010
REVISED: June 10, 2010

PREPARED FOR:

Coral Bay Community Council, Inc.
&
Virgin Islands Resource Conservation and Development Council, Inc.
NOAA-ARRA Grant
9901 Emmaus
St. John, USVI 00830

PREPARED BY:

JAM Engineering Associates LLC
Stormwater* ∞ *Civil Engineering* ∞ *Planning
Joseph A. Mina, P.E.



1.0 SCOPE OF WORK

Work shall consist of completing the following tasks in accordance with the plans and specifications.

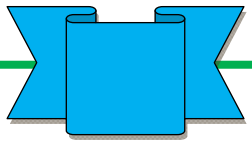
1. Install Rock Construction Entrance & Materials Laydown Area
2. Install Geotextile Sediment Trap. Perform periodic maintenance and sediment removal as needed to maintain performance.
3. Install 250' long Gabion Basket Emergency Spillway with top elevation a minimum of 6" below the edge of the roadway concrete swale.
4. Clear and Grub area of work and install Brush Berms a minimum of 20' away from the outside edge of the gabions.
5. Excavate Basin Area to 6' depth with bottom area 3,800 s.f. and top area 7,400 sf.
6. Install Erosion Control Blanket (Supplied by VIRC&D/CBCC) as directed by the engineer and seed all disturbed areas with bermudagrass at a rate of 20lbs/acre. Seed shall be spread both above and below the erosion control blanket.
7. Install goat proof fence around perimeter of the improvements with a 10' wide maintenance access gate.
8. Maintain, water and reseed(if needed) all areas until 70% vegetative cover is established in areas not protected by Rip-Rap. VIRC&D engineer will determine when 70% cover condition is reached.
9. Remove Geotextile Sediment Trap, all construction materials and debris, and temporary construction laydown area and seed and stabilize with bermudagrass at rate of 20lbs/acre.

2.0 NARRATIVE

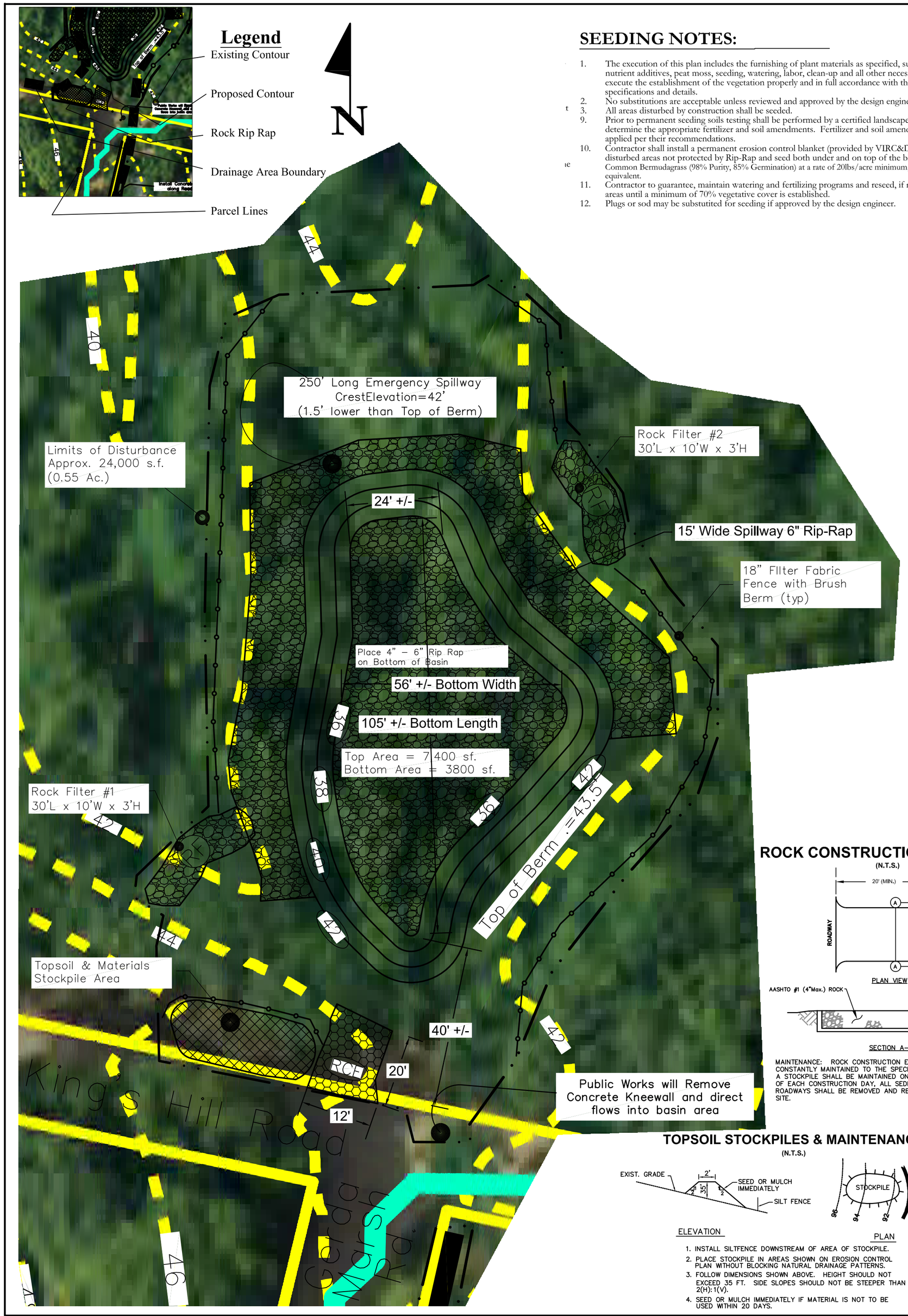
Project is located in Coral Bay on St. John USVI. Location is as shown on the enclosed Plan on the Site Location Map. Site is located at the intersection of Kings Hill Rd. (Rt 20) and Gerda Marsh Rd and on private property to the North of the intersection. Work will be performed in conjunction with Public Works ("PW"), and the Coral Bay Community Council ("CBCC"). Public Works has removed a portion of the knee wall and provided rough grading to direct water to the infiltration basin area. Additional Terms and Conditions are as follows:

1. Contractor will be familiar with all plans and specifications, and a copy of the plan will be maintained on site at all times.
2. Contractor shall commit to becoming familiar with all Erosion and Sediment Control techniques shown on plans and install the devices per the plan requirements. If any question arises, or site conditions require changes to the devices proposed, Contractor shall consult with the CBCC Stormwater Engineer for appropriate changes or adjustments to the plan.
3. CBCC shall obtain all permissions from property owners, easement agreements with PW, and permits required to perform the work.

4. Contractor shall be responsible for any Temporary and Permanent seeding as indicated in these specifications, and on the plan notes.
5. All work shall be performed in compliance with VI DPW and FP-2006 specifications. Any deviation from the specifications required by site conditions, or product availability shall be discussed and approved by the CBCC Stormwater Engineer.
6. Gabion Baskets will be buried a minimum of 6" into the ground to anchor the spillway properly.
7. Contractor must commit to paying special attention to maintenance and repair of Erosion Control devices. All maintenance activities must be performed per the plan notes and details and specifications.
8. Contractor is responsible for notification of the CBCC Stormwater Engineer in case the designed Erosion Controls are not adequately protecting the downstream areas from sediment laden runoff. Contractor will work with CBCC Engineer to create additional controls as site conditions warrant.
9. Traffic Flow must be maintained in at least one lane at all times, appropriate traffic control methods will be used in accordance with all Public Works requirements.
10. Excess material excavated shall be placed on-site or at other sites within 1 mile of the excavation.
11. During grading & excavation work, sufficient water will be kept onsite to ensure that exposed soil and road surfaces can be sprayed down to control dust.
12. All grading and excavation included on this job shall include all rock and ledge removal necessary to install items as specified. No additional fees shall be charged for rock work. If encountered, design will be field modified to avoid rock.
13. Contractor shall be responsible for installing up to four sign posts consisting of a 4" x 4" post set 2' into the ground and extending 6' above grade at locations to be determined upon the start of construction. Signs will be provided by VIRCD and mounted on the signpost by the contractor.
14. BUY AMERICAN CLAUSE: Contractors are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this award.
15. Contractor must have a VI business license to do the type of work that is being performed.
16. Contractor must have a DUNS number.
17. All workers on the projects must legally be able to work in the VI.
18. Notify Project manager, CBCC and all abutters at least 24 hours prior to beginning work.



19. Contractor must conduct a weekly safety meeting for all on site personnel
20. Provide $ 1 million liability insurance with CBCC and VIRC&D as named insured
21. Comply with all Federal and VI, DPW and DPNR regulations and requirements.



SEEDING NOTES:

1. The execution of this plan includes the furnishing of plant materials as specified, sufficient topsoil nutrient additives, peat moss, seeding, watering, labor, clean-up and all other necessary services to execute the establishment of the vegetation properly and in full accordance with these specifications and details.
2. No substitutions are acceptable unless reviewed and approved by the design engineer.
3. All areas disturbed by construction shall be seeded.
9. Prior to permanent seeding soils testing shall be performed by a certified landscape professional to determine the appropriate fertilizer and soil amendments. Fertilizer and soil amendments shall be applied per their recommendations.
10. Contractor shall install a permanent erosion control blanket (provided by VIRC&D/CBCC) to all disturbed areas not protected by Rip-Rap and seed both under and on top of the blanket with Common Bermudagrass (98% Purity, 85% Germination) at a rate of 20lbs/acre minimum, or approved equivalent.
11. Contractor to guarantee, maintain watering and fertilizing programs and reseed, if necessary, all areas until a minimum of 70% vegetative cover is established.
12. Plugs or sod may be substutited for seeding if approved by the design engineer.

EROSION & SEDIMENT CONTROL NOTES

1. All erosion and sediment control measures shall be constructed and maintained according to the standards and specifications of the Virgin Islands Department of Planning and Natural Resources and Department of Environmental Protection. Until the site is stabilized, all erosion and sedimentation controls must be maintained properly. Maintenance must include inspections of all erosion and sedimentation controls after each runoff event and on a weekly basis. All preventative and remedial maintenance work, including clean out, repair, replacement, regrading, reseeding, remulching, and renetting, must be performed immediately. If erosion and sediment control BMP's fail to perform as expected, replacement BMP's, or modifications to those installed will be required.
2. A copy of this approved erosion and sediment control plan must be available upon request.
3. No work shall commence until permits for soil disturbance have been obtained and provided to the Contractor by the VIRC&D/CBCC.
4. At least 2 days before starting any earth disturbance activities, the contractor shall invite all parties involved including the VIRC&D Project Manager, the CBCC Coordinator, Stormwater Engineer & President, any appropriate territorial officialsto an on-site pre-construction meeting.
5. All temporary erosion and sediment control devices used shall be constructed and maintained in accordance with the details provided. All devices shall be inspected weekly and after each runoff event. All required repairs and/or replacement must be done immediately.
6. Any disturbed area on which activity has ceased and which will remain exposed for more than 3 days must be temporarally seeded & stabilized immediately. Temporary seeding specification is Annual ryegrass (Lolium multiflorum), [98% purity, 90% germination, applied at 100 lbs/acre.] or approved equivalent. During non-germinating periods, chipped wood or brush mulch should be applied at a minimum of 2" depth.
7. Permanent seeding shall be performed on all disturbed soil areas that are at finished grade, and all disturbed soil areas that will not be disturbed within one year. Minimum specifications are indicated in the Seeding Notes.
8. Sediment removed from BMP's shall be disposed of by spreading in landscape areas outside of steep slopes, wetlands, floodplains or drainage swales and immediately mulched, seeded & stabilized.
9. Temporary erosion and sedimentation pollution control measures, in addition to those shown on this plan, shall be provided by the contractor if there is evidence of silt, sediment and/or mud leaving the site during construction.
10. The contractor must develop, and have approved by DPNR, a separate erosion and sedimentation pollution control plan for each spoil, borrow, or other work area not located within the construction limits.
11. The contractor will be responsible for the proper construction, stabilization, and maintenance of all temporary and permanent erosion and sedimentation controls.
12. The operator/contractor shall remove from this site, recycle, or dispose of all building materials and wastes in accordance with all Territorial regulations. The contractor shall not illegally bury, dump, or discharge any building material or wastes at this site.

GENERAL NOTES:

1. Existing features shown hereon taken from existing GIS data compiled from previous studies and is based on National Park System Data. No detailed topographic or boundary survey was performed.
2. Contractor will be provided with copies of appropriate permissionsn to enter upon land and perform construction.
9. All construction work and materials shall be in accordance with the US Virgin Islands Department of Public Works Standards. Interpretations of, or changes to, the construction standards must be approved by the Design Engineer.
14. All fine grading work including the repair of Rip-Rap, erosion control blanket, washouts, gullies, etc., shall be guaranteed for one calendar year from the date of establishment of 70% vegetative cover.
15. All existing signs that are impacted by the proposed improvements shall be reset or replaced by the Contractor.
16. Control of traffic in the work zone shall be in accordance with the VI Department of Public Works Standards.

Site Location Map Scale: 1"=800'

SEQUENCE OF CONSTRUCTION:

All earth disturbance activities shall proceed in accordance with the following sequence. Each stage shall be completed before any following stage is initiated.

1. Install Rock Construction Entrance & Materials Laydown area. Limited clearing and grubbing may be performed in this area to install required devices.
2. Install filter fabric fence and Rock Filters. Limited clearing and grubbing may be performed in these area to install required devices. All erosion and sediment controls must be constructed, stabilized, and functional before any additional site disturbance.
3. Clear and grub site. Utilize cleared vegetation to construct Brush Berms along filter fabric fence as shown on plan and details.
4. Strip top soil (if any exists) from proposed areas. Remove or stockpile topsoil where indicated on plan for use with final grading. Install perimeter filter fabric fence and immediately apply temporary seeding and mulching to the stockpiles. Stockpile heights must not exceed 35 feet. Stockpile slopes must be 2:1 or flatter.
5. Rough grade areas to the proposed sub-grade elevation and gradient.
6. Install Rip-Rap protection in the bottom of the basin, and on the spillway areas as shown on plans and in details.
7. Fine grade remaining areas using removed topsoil to bring the site to final grades. If sufficient topsoil is not available, additional suitable planting soil should be used as recommended by a certified landscape professional.
8. Permanently Seed and Stabilize all remaining areas. Refer to Planting and Seeding notes for specifications. Install Fencing around the perimeter to protect new plantings from livestock.
9. After final site stabilization has been achieved, temporary erosion and sediment controls must be removed. The standard for a stabilized, erosion resistant, perennial vegetative cover will be a uniform coverage or density of 70% across the disturbed area. Areas disturbed during removal of the controls must be seeded and stabilized immediately.

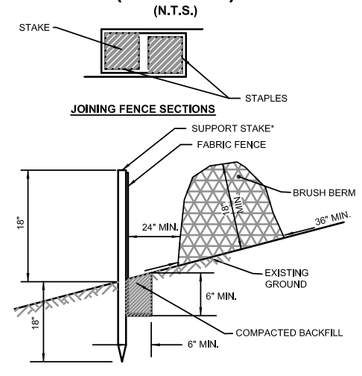
ROCK CONSTRUCTION ENTRANCE

(N.T.S.)

MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. AT THE END OF EACH CONSTRUCTION DAY, ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE.

STANDARD FILTER FABRIC FENCE (18" HIGH)

(N.T.S.)



* Stakes spaced @ 8' maximum. Use 2" x 2" wood or equivalent steel stakes.

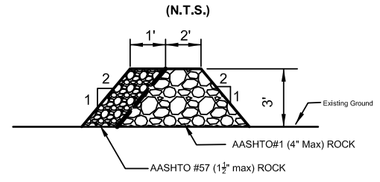
Filter Fabric Fence must be placed at level existing grade. Both ends of the barrier must be extended at least 8 feet up slope at 45 degrees to the main barrier alignment.

Sediment must be removed when accumulations reach 1/2 the above ground height of the fence.

Any section of Filter Fabric Fence which has been undermined or topped must be immediately replaced with a Rock Filter Outlet. See Standard Construction Detial #18.

ROCK FILTER CROSS SECTION DETAIL

(N.T.S.)

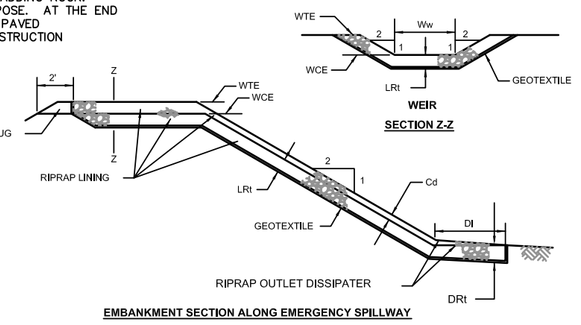


Sediment must be removed when accumulations reach 1/2 the height of the filters.

Immediately upon stabilization of each channel, remove accumulated sediment, remove Rock Filter, and stabilize disturbed areas.

BASIN SPILLWAY DETAIL

(N.T.S.)



EMBANKMENT SECTION ALONG EMERGENCY SPILLWAY

WEIR			LINING		DISSIPATER	
TOP ELEV WTE (FT)	CREST ELEV WCE (FT)	WIDTH Ww (FT)	RIPRAP SIZE (in)	RIPRAP THICK. LRt (IN)	DEPTH Cd (FT)	LENGTH DI (FT)
43.5	42	250	6	9	9	5

TOPSOIL STOCKPILES & MAINTENANCE

(N.T.S.)

1. INSTALL SILTFENCE DOWNSTREAM OF AREA OF STOCKPILE.
2. PLACE STOCKPILE IN AREAS SHOWN ON EROSION CONTROL PLAN WITHOUT BLOCKING NATURAL DRAINAGE PATTERNS.
3. FOLLOW DIMENSIONS SHOWN ABOVE. HEIGHT SHOULD NOT EXCEED 35 FT. SIDE SLOPES SHOULD NOT BE STEEPER THAN 2(H):1(V).
4. SEED OR MULCH IMMEDIATELY IF MATERIAL IS NOT TO BE USED WITHIN 20 DAYS.

Site Improvement Plan
Infiltration Basin
7-Rem Carolina

Kings Hill Road/Cerda Marsh Road Intersection Improvements and Stormwater Management Facilities

Prepared for:
Coral Bay Community Council
CBCC is a 501(c)(3) nonprofit organization
Mailing Address
9901 Emmaus
St. John, VI 00830
Physical Address
8-1 Emmaus
St. John, VI
340-779-2099
cbcc@coralbaycommunitycouncil.com

Prepared by:
JAM Engineering Associates LLC
Civil Engineers ≈ Stormwater ≈ Planning
1912 Koffel Rd.
Hatfield, PA 19440
215-920-2985
joe@jam-engineering.com

J.A.M.

Date: 02-17-10

Project No: C001-09

Sheet 1 of 1

0' 10' 20' 40'
Scale: 1"=20'

Gerda Marsh Road
Drainage Improvements
Scope of Work, Details & Specifications

PROJECT NO. C3A

SITUATE IN
CORAL BAY, ST. JOHN
US VIRGIN ISLANDS

January 14, 2011

PREPARED FOR:
Coral Bay Community Council, Inc., and:
Virgin Islands Resource Conservation
& Development Council, Inc.
NOAA-ARRA Grant
9901 Emmaus
St. John, USVI 00830

PREPARED BY:
Christopher S. Laude, PE
9901 Emmaus
St John, VI 00830
(910) 612-5990

1.0 SCOPE OF WORK

Project is located in Coral Bay on St. John USVI. The project entails work in 4 separate areas along Gerda Marsh Road and its side roads, as well as general grading and ditch improvement along the entire road. Locations are as shown on the enclosed Site Location Map. Exact installation locations for work items shall be indicated in the field by the VIRC&D Inspector.

Area 1

Work proposed for Area 1 consists of constructing a low rock wall alongside a private driveway, blocking a gap in an existing wall, excavation and installation of concrete lined ditch, a concrete swale across Gerda Marsh Road, a concrete water bar and a Concrete Swale at Two Truck Corner. The construction shall proceed as follows:

1. Excavate and construct a concrete swale at Two Truck Corner. Swale shall be approximately 60' long 9' wide x 6" thick, 8" deep, and extend from existing discharge to a location determined by the VI RC&D inspector. Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete.
2. Install filter cloth, A-Jacks Concrete Armor Units and large rock rip rap at discharge of the swale as directed by VI RC&D inspector.
3. Install concrete water bar upstream of Two Truck Corner at the location and angle to be determined by the VI RC&D inspector (see attached Water Bar Detail). Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete.
4. Install approximately 290 linear feet of roadside ditching from the concrete swale at Two Truck Corner to a location determined by the VI RC&D inspector. (See Roadside Ditch Detail).
5. Sawcut existing concrete pavement at location to be determined by VI RC&D inspector; remove concrete debris, construct approximately 72' long x 12" wide x 8" deep concrete ditch near the junction of Lipsey driveway and Gerda Marsh Road (See area Layout Near Lipsey Drive detail). Install concrete swale across Gerda Marsh Road below Lipsey driveway gate at a location and angle determined by the VI RC&D inspector. Swale shall be a minimum of 17' long x 9' wide x 6" thick, 8" deep. (See Concrete Ditch and Swale Near Lipsey Drive Detail).
6. Deleted.
7. Deleted.
8. Seed and stabilize all disturbed areas. Upon final grading of an area, all disturbed earth surfaces shall be seeded with Bermuda grass (98% purity) at a rate of to be determined by VI RC&D inspector.

Area 2

Work to be performed in Area 2 consists of constructing a swale across the road. The construction shall proceed as follows:

9. Excavate a minimum 20' long x 12' wide x 12" deep (finished dimensions) swale at the location and alignment determined by the VI RC&D inspector (see Waterfall Swale detail). Install ArmorFlex blocks (provided by VI RC&D) into the swale excavation in accordance with the manufacturer's recommendations (see attached ArmorFlex spec sheets). Install filter cloth, A-Jacks (provided by VI RC&D) and large rock rip rap at the discharge of the swale. Backfill and compact soil against Armorflex Concrete Block in manner approved by VI RC&D Inspector so that soil is flush with top of concrete.
10. Seed and stabilize all disturbed areas. Upon final grading of an area, all disturbed earth surfaces shall be seeded with Bermuda grass (98% purity) at a rate of to be determined by VI RC&D inspector.

Area 3

Work to be performed in Area 3 consists of installing 2 concrete swales, ditching and 3 concrete water bars across Gerda Marsh Road. The construction shall proceed as follows:

11. Excavate and construct a concrete swale approximately 40' long x 9' wide x 6" thick, 8" deep (finished dimensions) at the switchback (See Switchback Swale Detail) at the location and alignment determined by the VI RC&D inspector. Install filter cloth, A-Jacks and large rock rip rap at the discharge of the swale. Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete.
12. Install approximately 275 linear feet of roadside ditching from the switchback swale to a location determined by the VI RC&D inspector. (See Roadside Ditch Detail).
13. Excavate and construct a concrete swale approximately 25' long x 9' wide x 6" thick, 8" deep (finished dimensions) at the Roller Residence driveway at the location and alignment determined by the VI RC&D inspector (see Roller Swale detail). Install filter cloth, A-Jacks and large rock rip rap at the discharge of the swale. Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete.
14. Excavate and construct 3 concrete water bars at the locations and alignments determined by the VIRC&D Inspector. (See Water Bar Details). Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete.
15. Seed and stabilize all disturbed areas. Upon final grading of an area, all disturbed earth surfaces shall be seeded with Bermuda grass (98% purity) at a rate of to be determined by VI RC&D inspector.

Area 4

Work to be performed in Area 4 consists of installing 1 concrete water bar, backfilling an area of erosion, paving about 56 linear feet of the road and construction of 3 step pools along Gerda Marsh Road. The construction shall proceed as follows:

16. Excavate, form and pour uppermost step pool (see Typical (Typ) Step Pool detail) at the location and alignment determined by the VI RC&D inspector.
17. Fill existing erosion (approximately 10 cubic yards) beside road above first step pool with washed gravel at the location and alignment determined by the VI RC&D inspector.
18. Excavate, form and pour middle step pool (See Typ Step Pool detail) at the location and alignment determined by the VI RC&D inspector.
19. Excavate, form and pour lower step pool (See Typ Step Pool detail) at the location and alignment determined by the VI RC&D inspector.
20. **Deleted**
21. Excavate, form and pave approximately 56 linear feet of 12' wide x 6" deep wire reinforced concrete paving from the top of the existing paving upwards. Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete.
22. Excavate and construct a concrete water bar at the locations and alignment determined by the VI RC&D Inspector. Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete.
23. Seed and stabilize all disturbed areas. Upon final grading of an area, all disturbed earth surfaces shall be seeded with Bermuda grass (98% purity) at a rate of to be determined by VI RC&D inspector.

NOTES AND CONDITIONS

Additional specifications and adjustments, at the discretion of the VIRC&D Inspector, shall be field implemented to adequately install devices and provide protection and stabilization. Contractor shall be responsible for implementing any such adjustments as deemed necessary by the Inspector that are reasonably similar to the written specifications.

a. A-Jacks and Armorflex concrete block shall be provided by VIRC&D. All other materials and supplies including but not limited to grates, rock, concrete, and geotextile are to be provided by the contractor.
b. Contractor shall barricade freshly poured concrete for a minimum of 48 hours from the end of pour to prevent damage from traffic. All concrete shall have a minimum compressive strength at 28-days of 3,000 pounds per square inch (psi). Contractor shall notify VI RC&D Inspector at least 24-hours in advance of each and every concrete pour so that the Inspector may verify construction. Contractor shall not pour any concrete unless the work has been observed and approved the Inspector.
c. Contractor shall remove excess excavated material from the site. At the direction of the VI RC&D inspector, contractor may use such material to fill eroded roadway and roadside areas. All non-traffic areas filled and repaired, and all other disturbed areas shall be protected with Erosion Control Blanket (at the direction of the VI RC&D inspector) and seeded with Bermuda grass (98% purity) at 20lbs. per acre. No material other than that used for roadside repairs shall remain onsite. VIRCD shall provide Erosion Control Blanket, contractor shall install erosion control blanket and seed with Bermuda grass at specified rate.
d. Contractor shall maintain traffic flow in at least one lane at all times using appropriate traffic control methods in accordance with all Public Works requirements.
e. During grading & excavation work, sufficient water will be kept onsite to ensure that exposed soil and road surfaces can be sprayed down to control dust.
f. All workmanship shall comply with VI DPW specifications and FP-2006 specifications.
g. All grading and excavation included on this job shall include all rock and ledge removal necessary to install items as specified. No additional fees shall be charged for rock work.
h. Contractor shall be responsible for installing prior to start of construction up to four sign posts consisting of a 4" x 4" post set 2' into the ground and extending 6' above grade at locations to be determined upon the start of construction. Signs will be provided by VIRCD and mounted on the signpost by the contractor.
i. BUY AMERICAN CLAUSE: Contractors are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this award.
j. Contractor shall have a VI business license to do the type of work that is being performed.
k. Contractor shall provide a valid DUNS number.
l. All workers on the projects must legally be able to work in the VI.
m. Contractor shall notify Project manager, CBCC and all abutters at least 4 days prior to beginning work. DPNR/CZM shall be notified 72 hours prior to beginning work.
n. Contractor must conduct a weekly safety meeting for all on site personnel
o. Provide $ 1 million liability insurance with CBCC and VIRC&D as named insured
p. Comply with all Federal and VI, DPW and DPNR regulations and requirements.

1. Excavate and install a 30-foot long, 30-inch diameter culvert at Two Truck Corner. Culvert shall be corrugated plastic (CPP) or reinforced concrete pipe (RCP). The culvert shall begin and extend to locations determined by the VI RC&D inspector.

   Construct a 42-inch wide by 42-inch long reinforced concrete inlet box at the culvert inlet. The box walls and floor shall be minimum 6-inches thick. The box sides shall extend at least 6-inches beyond the outside diameter of the pipe in all directions. Install an outlet structure at the downstream end of the culvert. The outlet structure shall have a 4-ft x 4-ft endwall, tapered sides and a minimum 6-ft long bottom that flares to 5-ft wide at the discharge end. Sidewalls shall slope from the top of the endwall to flush with the discharge end. All exposed box edges shall be finished with a minimum 1-inch chamfer. The culvert invert shall be set flush with the bottoms of the inlet and outlet structures.

   Concrete shall be reinforced with a minimum 0.20 Square Inches per foot. REINFORCING STEEL SHALL BE ASTM A-706. LOW-ALLOY STEEL DEFORMED BARS FOR CONCRETE REINFORCEMENT, GRADE 60. WIRE MESH SHALL CONFORM TO AASHTO M 55 AND M. and reinforced with a Concrete shall have a minimum compressive strength of 3,000 psi at 28-days.

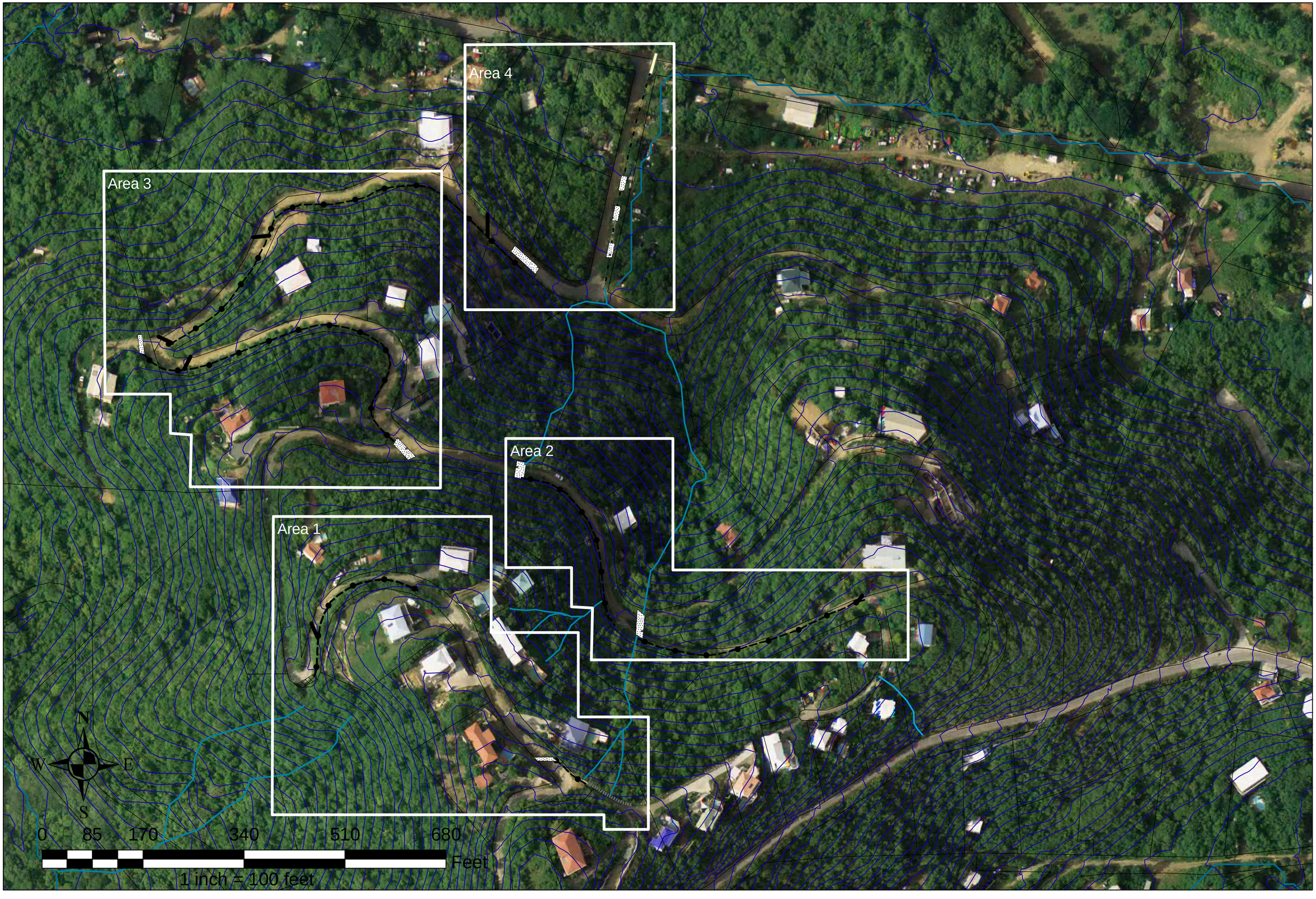
   Install a raised cast iron grate on the inlet structure. ALL frame and grate CASTINGS SHALL CONFORM TO AASHTO M 105. CLASS 358 AND M 306, and must be traffic rated.

   Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete.

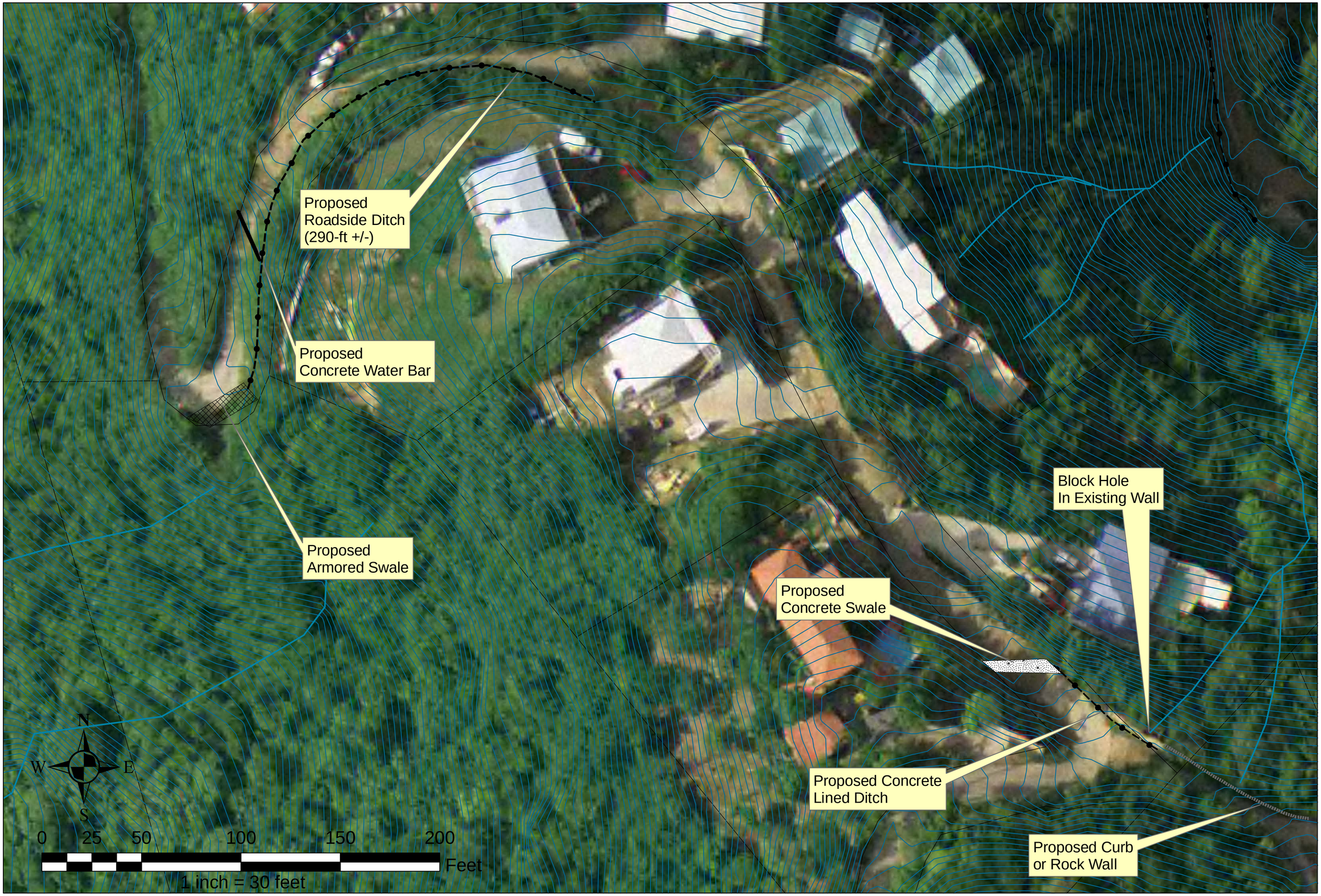
1. Excavate and install a 320-foot long, 6-inch thick and 4-foot wide concrete curb and gutter along Gerda Marsh Road. The curb and gutter shall begin and extend to locations determined by the VI RC&D inspector. Concrete shall be reinforced with 6" x 6" welded wire mesh and shall have a minimum compressive strength of 3,000 psi at 28-days.

   Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete. Install Propex TRM between curb and gutter and existing asphalt pavement as directed by VIRCD Inspector. Seed bare soil behind curb as directed by VIRC&D Inspector.

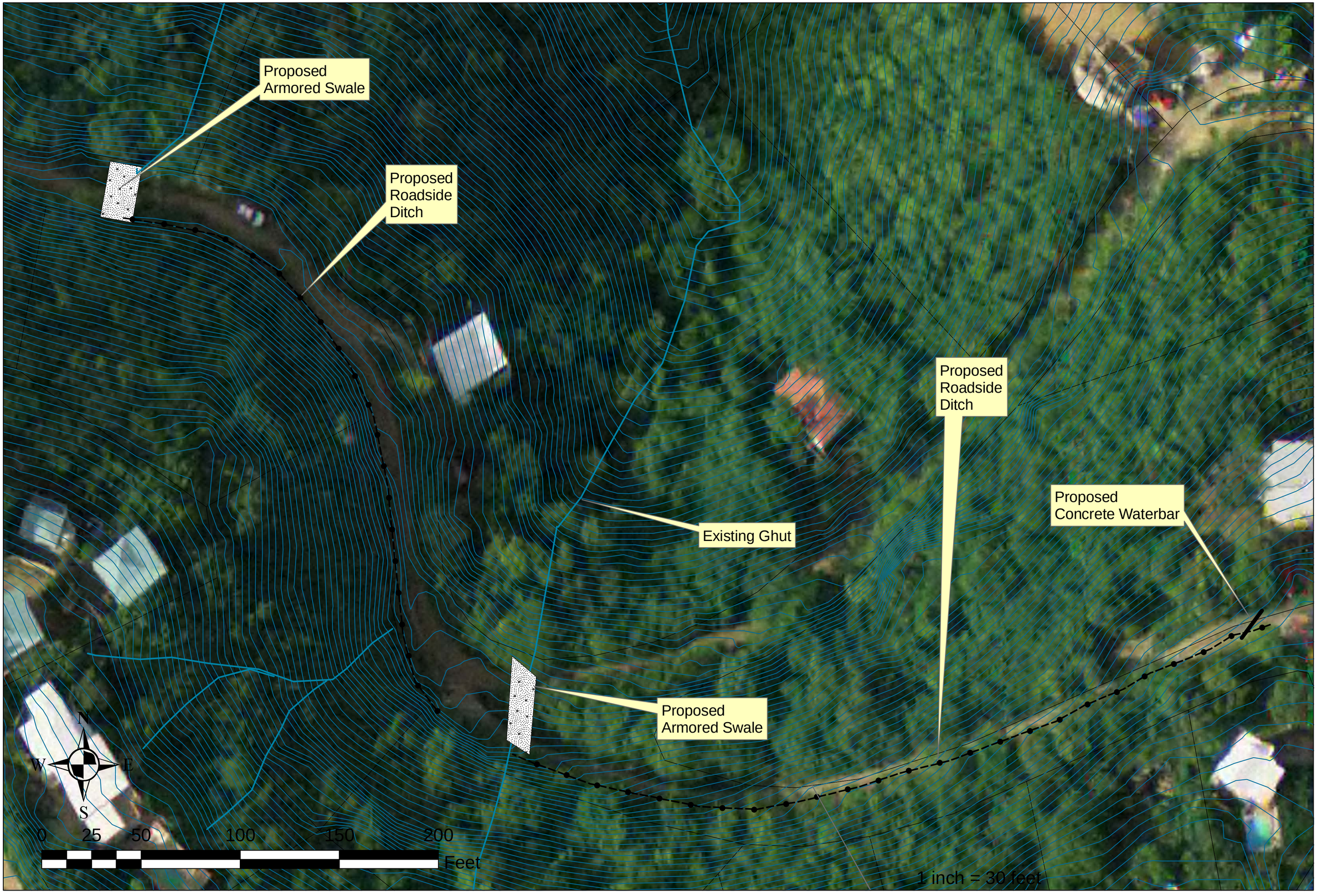
Gerda Marsh
Project Areas



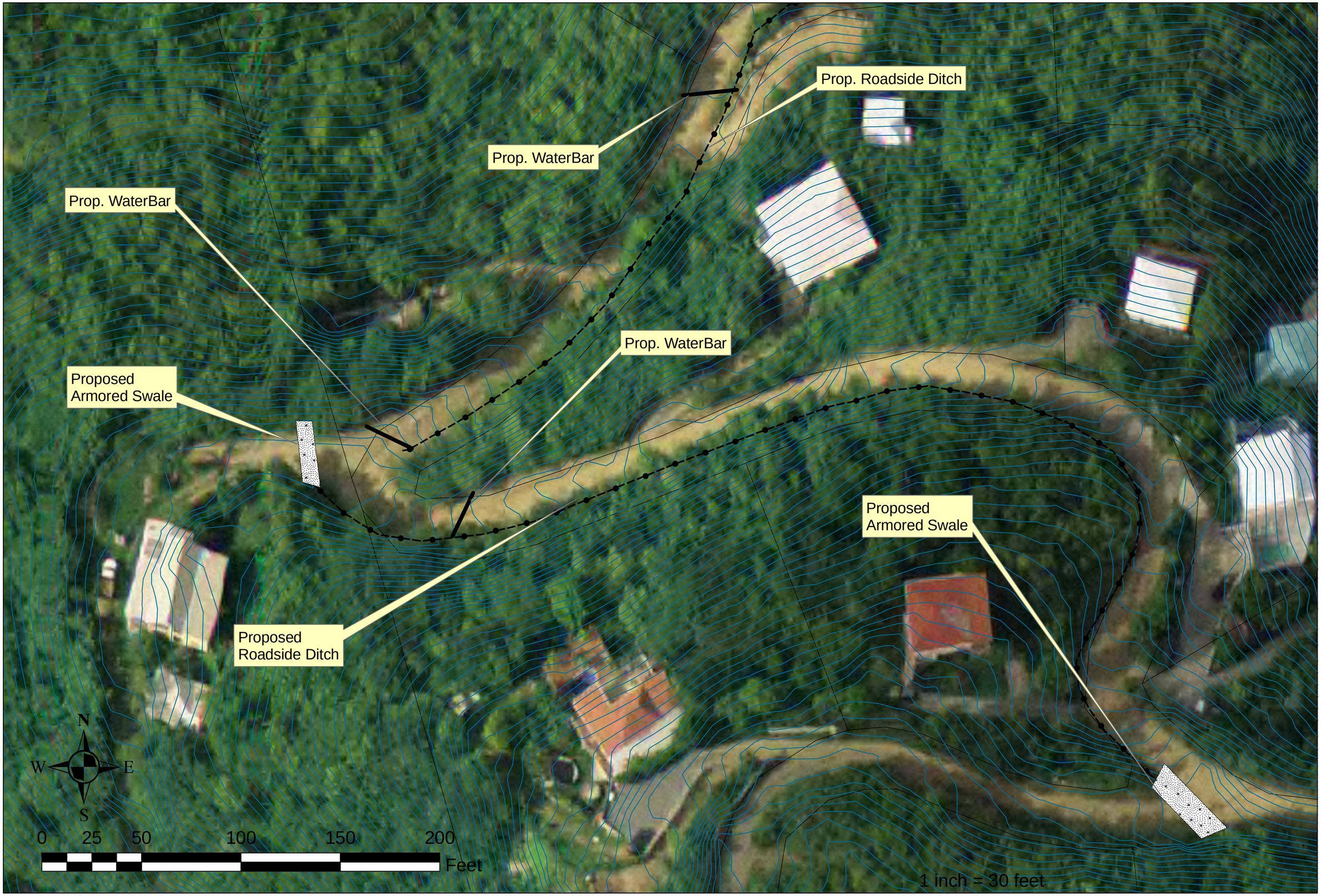
Gerda Marsh
Area 1



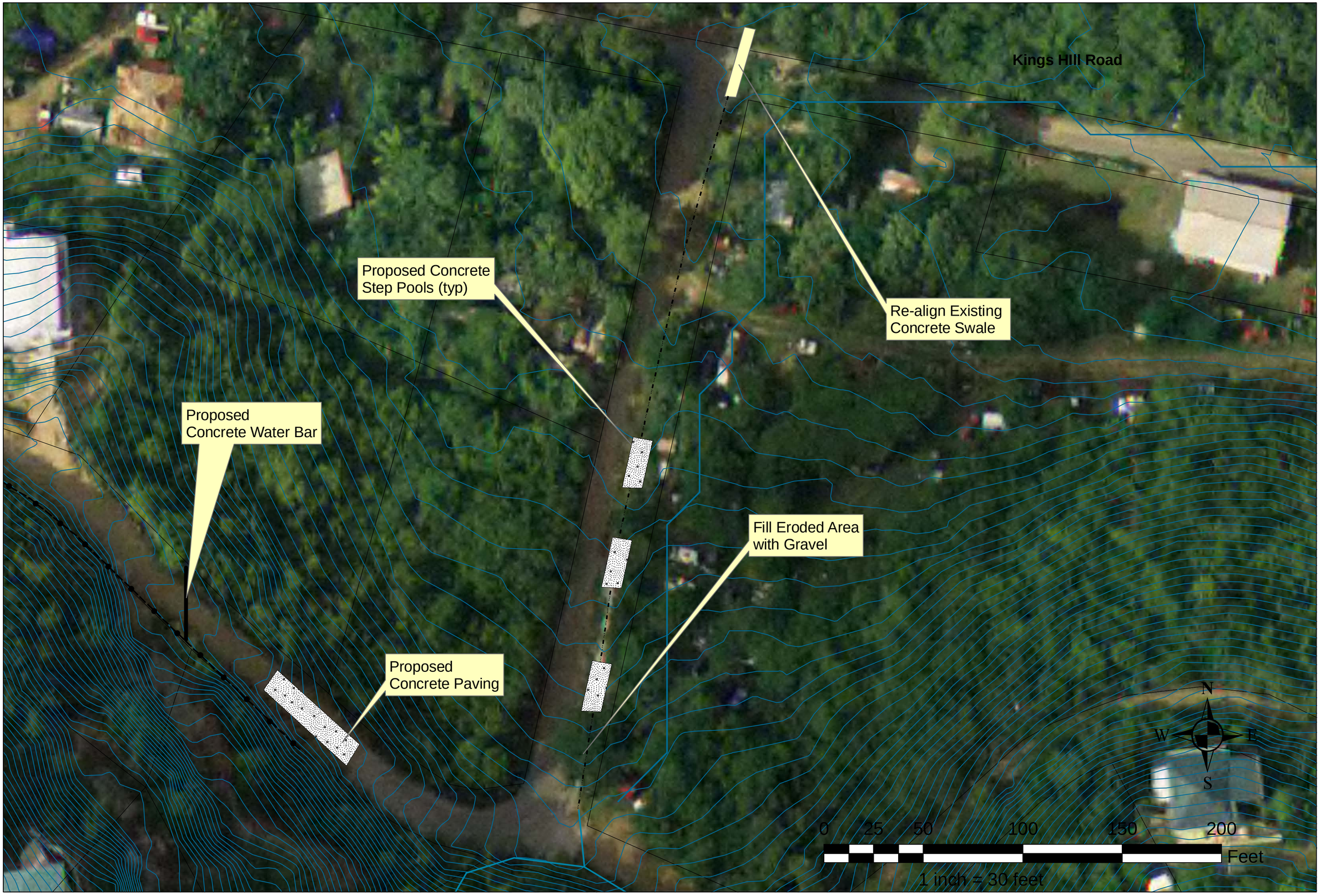
Gerda Marsh
Area 2



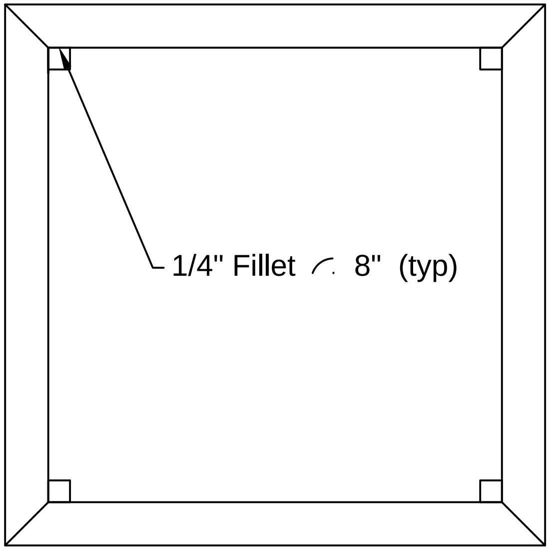
Gerda Marsh
Area 3



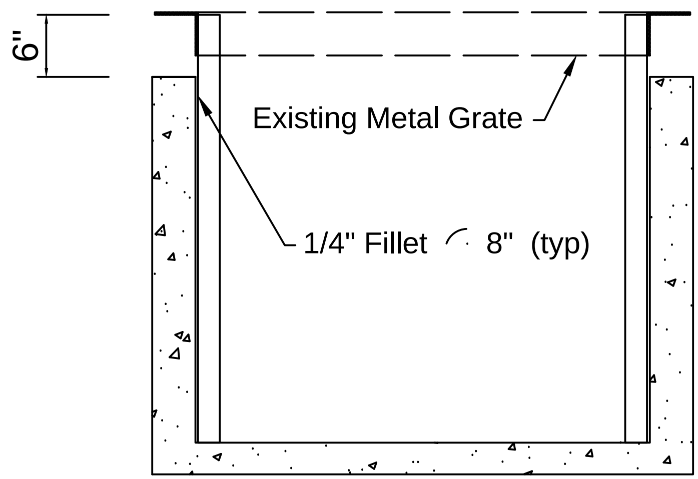
Gerda Marsh
Area 4



Plan View



X-Section View



Inlet Grate Details

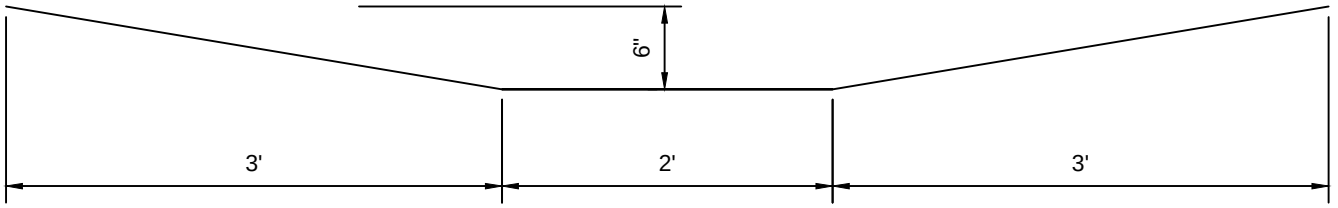
Drainage Improvements
Gerda Marsh Drive
Coral Bay, St John, USVI

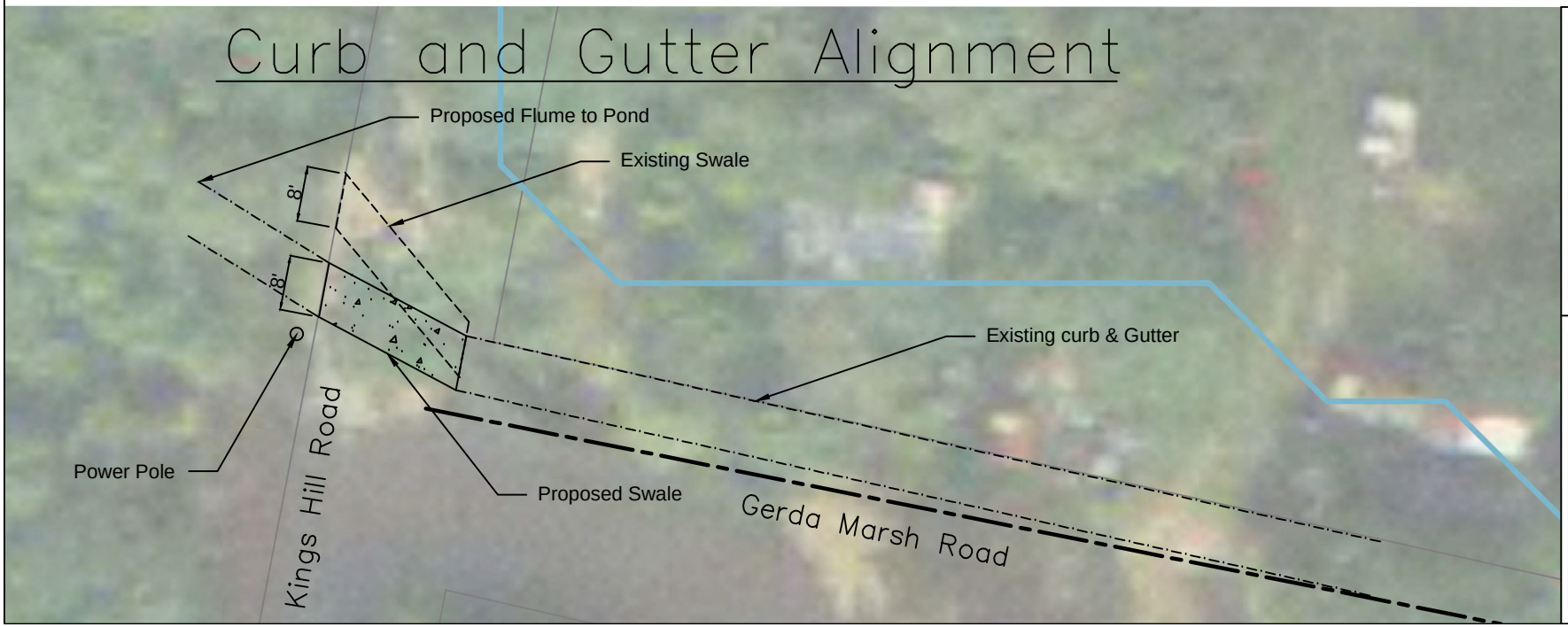
Prepared for:
Coral Bay Community Council
- CBCC is a 501(c)(3) nonprofit organization -
Physical Address: 8-1 Emmaus, St. John, VI, 340-776-2099
Mailing Address: 9901 Emmaus, St. John, VI 00830, cbcc@coralbaycommunitycouncil.com

Date: 01/11/2011
Project No: C3A
CSL
Sheet 7 of 7
Not To Scale

Prepared by:
Christopher S Laude, P.E.
Stormwater D Civil D Planning
Physical Address: 8-1 Emmaus, St. John, VI, 910-612-5990
Mailing Address: 9901 Emmaus, St. John, VI 00830, cslaude@mac.com

Curb and Gutter X-Section





Curb and Gutter Plan

Drainage Improvements
Gerda Marsh Drive
Coral Bay, St John, USVI

Prepared for:
Coral Bay Community Council
8-1 Emmaus
St. John, VI
340-776-2099

Prepared by:
Christopher S Laude, P.E.
8-1 Emmaus
St. John, VI
9901 Emmaus
St. John, VI 00830

CSL
Sheet 8 of 8
Date: 08/02/2011
Project No: C3A
Not To Scale

Lower Carolina Valley Road
Drainage Improvements
Scope of Work, Details & Specifications

PROJECT NO. C3C

SITUATE IN
CORAL BAY, ST. JOHN
US VIRGIN ISLANDS

February 11, 2011
REVISED

PREPARED FOR:
Coral Bay Community Council, Inc., and:
Virgin Islands Resource Conservation
& Development Council, Inc.
NOAA-ARRA Grant
9901 Emmaus
St. John, USVI 00830

PREPARED BY:
Christopher S. Laude, PE
9901 Emmaus
St John, VI 00830
910/612-5990

1.0 SCOPE OF WORK

Project is located in Coral Bay on St. John USVI. The project entails work in 2 separate areas along William Marsh Road and one area on LaLa Land Road. Locations are as shown on the enclosed Site Location Map. Exact installation locations for work items shall be indicated in the field by the VIRC&D Inspector.

Area 1 - William Marsh Road.

Work proposed for Area 1 consists of constructing a concrete roadside ditch in area shown on Site Location map. The construction shall proceed as follows:

1. Excavate and construct approximately 215' x 4' concrete swale along side William Marsh Road at location determined by the VI RC&D Inspector. (See Roadside Swale Detail)
2. Seed and stabilize all disturbed areas. Upon final grading of an area, all disturbed earth surfaces shall be seeded with Bermuda grass (98% purity) at a rate of to be determined by VI RC&D inspector.

Area 3 - William Marsh Road.

Work to be performed in Area 3 consists of construction of an aluminum structural plate culvert (provided by VI RC&D) 6'7" span x 5'8" rise x 28 feet long at location of secondary gut crossing on William Marsh Road; paving and construction/repair of roadside ditch as necessary. The construction shall proceed as follows:

3. Excavate for and install a 6'7" span x 5'8" rise x 27' long aluminum structural plate culvert (provided by VI RC&D) pursuant to specs. Backfill and compact soil consistent with specs provided by manufacturer and in manner approved by VI RC&D Inspector. (See Culvert Detail).
4. Excavate and install concrete inlet structure headwall. See Inlet Structure Headwall detail.
5. Excavate, form and pave approximately 18 LF of 12' wide paving and 10' x 5' paving 6" deep wire reinforced concrete over the aluminum structural plate culvert at location to be determined by VI RC&D Inspector. (See Paving Detail).
6. Excavate, form and pave approximately 242 LF of 9' wide and 6" deep wire reinforced concrete paving uphill of the aluminum structural plate pipe. Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete. (See Paving Detail).
7. Seed and stabilize all disturbed areas. Upon final grading of an area, all disturbed earth surfaces shall be seeded with Bermuda grass (98% purity) at a rate of to be determined by VI RC&D inspector.

Area 4 - LaLa Land Road.

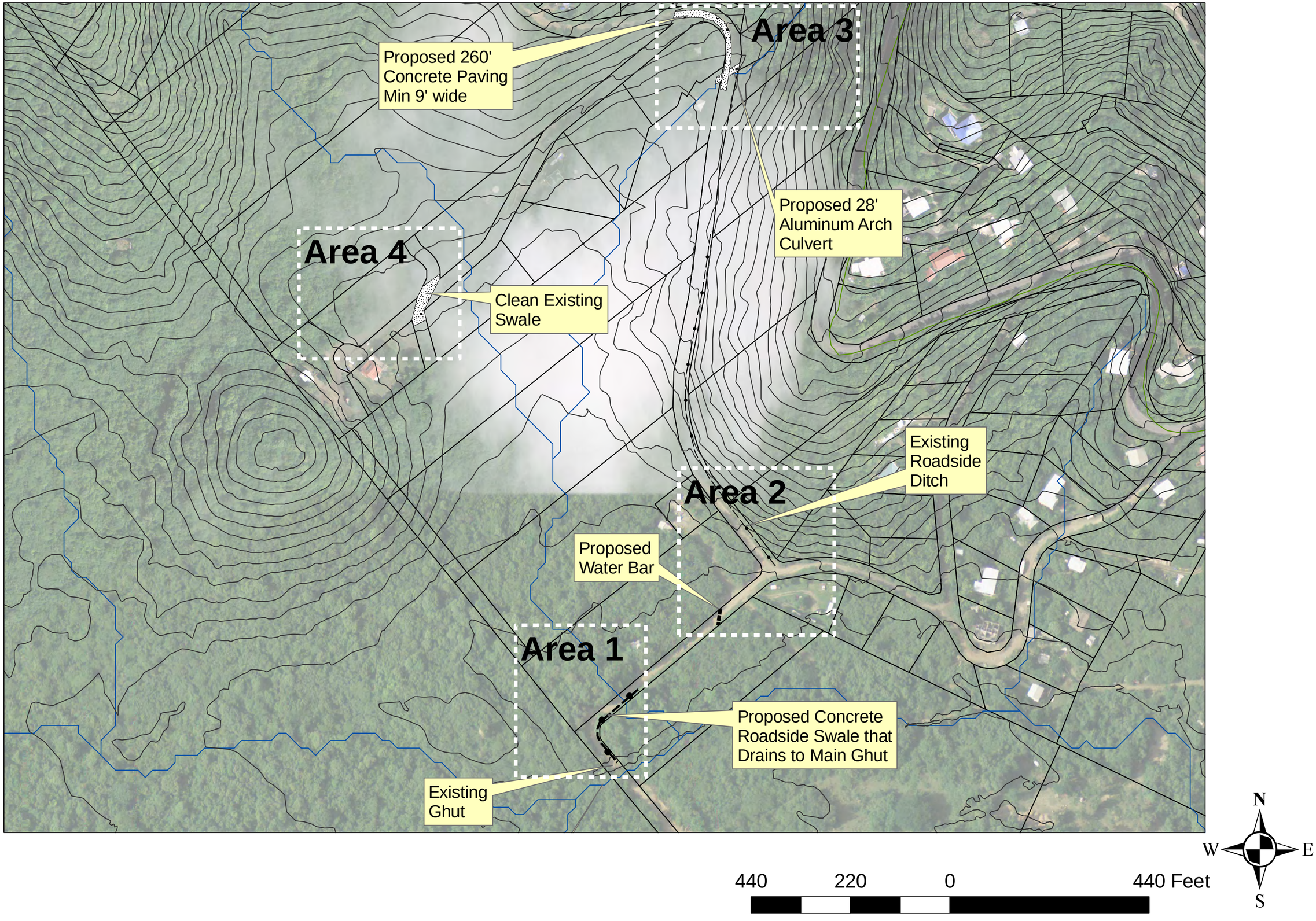
8. Excavate /clear debris in existing swale.

NOTES AND CONDITIONS

Additional specifications and adjustments, at the discretion of the VIRC&D Inspector, shall be field implemented to adequately install devices and provide protection and stabilization. Contractor shall be responsible for implementing any such adjustments as deemed necessary by the Inspector that are reasonably similar to the written specifications.

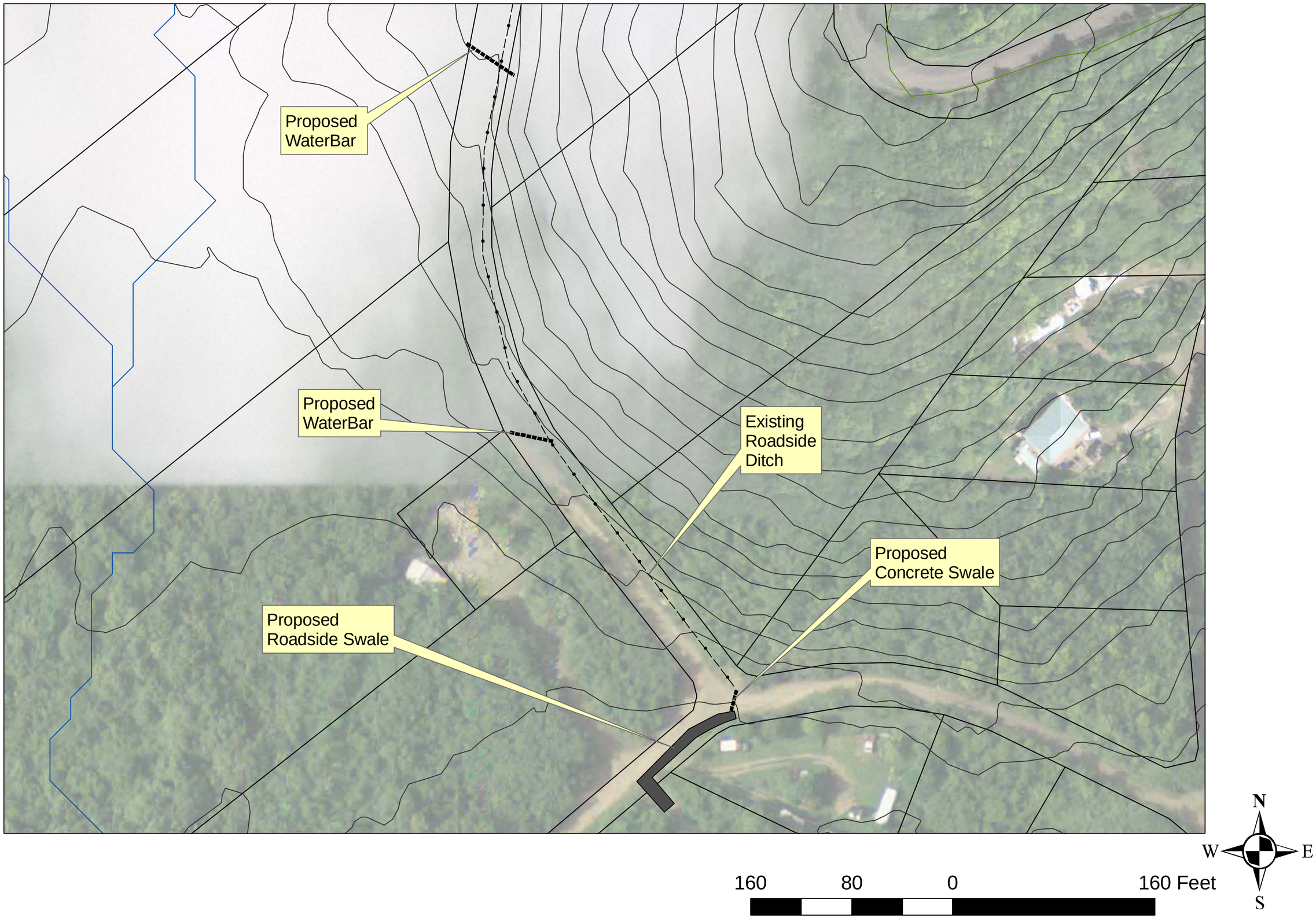
a. A-Jacks and ArmorFlex concrete block shall be provided by VIRC&D. All other materials and supplies including but not limited to grates, rock, concrete, and geotextile are to be provided by the contractor.
b. Contractor shall barricade freshly poured concrete for a minimum of 48 hours from the end of pour to prevent damage from traffic. All concrete shall have a minimum compressive strength at 28-days of 3,000 pounds per square inch (psi). Contractor shall notify VI RC&D Inspector at least 24-hours in advance of each and every concrete pour so that the Inspector may verify construction. Contractor shall not pour any concrete unless the work has been observed and approved by the Inspector.
c. Contractor shall remove excess excavated material from the site. At the direction of the VI RC&D inspector, contractor may use such material to fill eroded roadway and roadside areas. All non-traffic areas filled and repaired, and all other disturbed areas shall be protected with Erosion Control Blanket (at the direction of the VI RC&D inspector) and seeded with Bermuda grass (98% purity) at 20lbs. per acre. No material other than that used for roadside repairs shall remain onsite. VIRCD shall provide Erosion Control Blanket, contractor shall install erosion control blanket and seed with Bermuda grass at specified rate.
d. Contractor shall maintain traffic flow in at least one lane at all times using appropriate traffic control methods in accordance with all Public Works requirements.
e. During grading & excavation work, sufficient water will be kept onsite to ensure that exposed soil and road surfaces can be sprayed down to control dust.
f. All workmanship shall comply with VI DPW specifications and FP-2006 specifications.
g. All grading and excavation included on this job shall include all rock and ledge removal necessary to install items as specified. No additional fees shall be charged for rock work.
h. Contractor shall be responsible for installing prior to start of construction up to four sign posts consisting of a 4" x 4" post set 2' into the ground and extending 6' above grade at locations to be determined upon the start of construction. Signs will be provided by VIRCD and mounted on the signpost by the contractor.
i. BUY AMERICAN CLAUSE: Contractors are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this award.
j. Contractor shall have a VI business license to do the type of work that is being performed.
k. Contractor shall provide a valid DUNS number.
l. All workers on the projects must legally be able to work in the VI.
m. Contractor shall notify Project manager, CBCC and all abutters at least 4 days prior to beginning work. DPNR/CZM shall be notified 72 hours prior to beginning work.
n. Contractor must conduct a weekly safety meeting for all on site personnel
o. Provide $ 1 million liability insurance with CBCC and VIRC&D as named insured
p. Comply with all Federal and VI, DPW and DPNR regulations and requirements.

LaLa Land
Project Layout

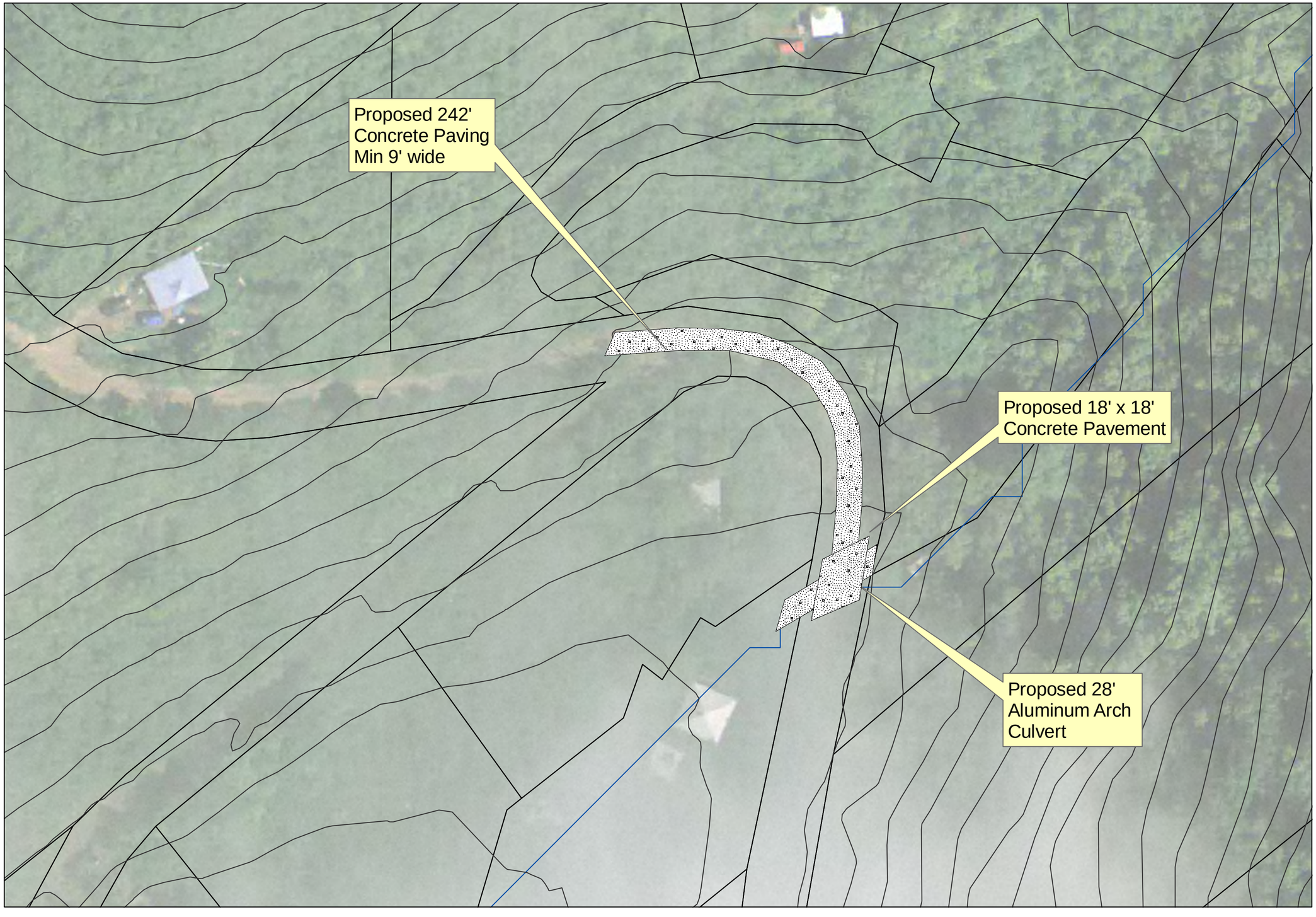


LaLa Land
Area 1 Layout

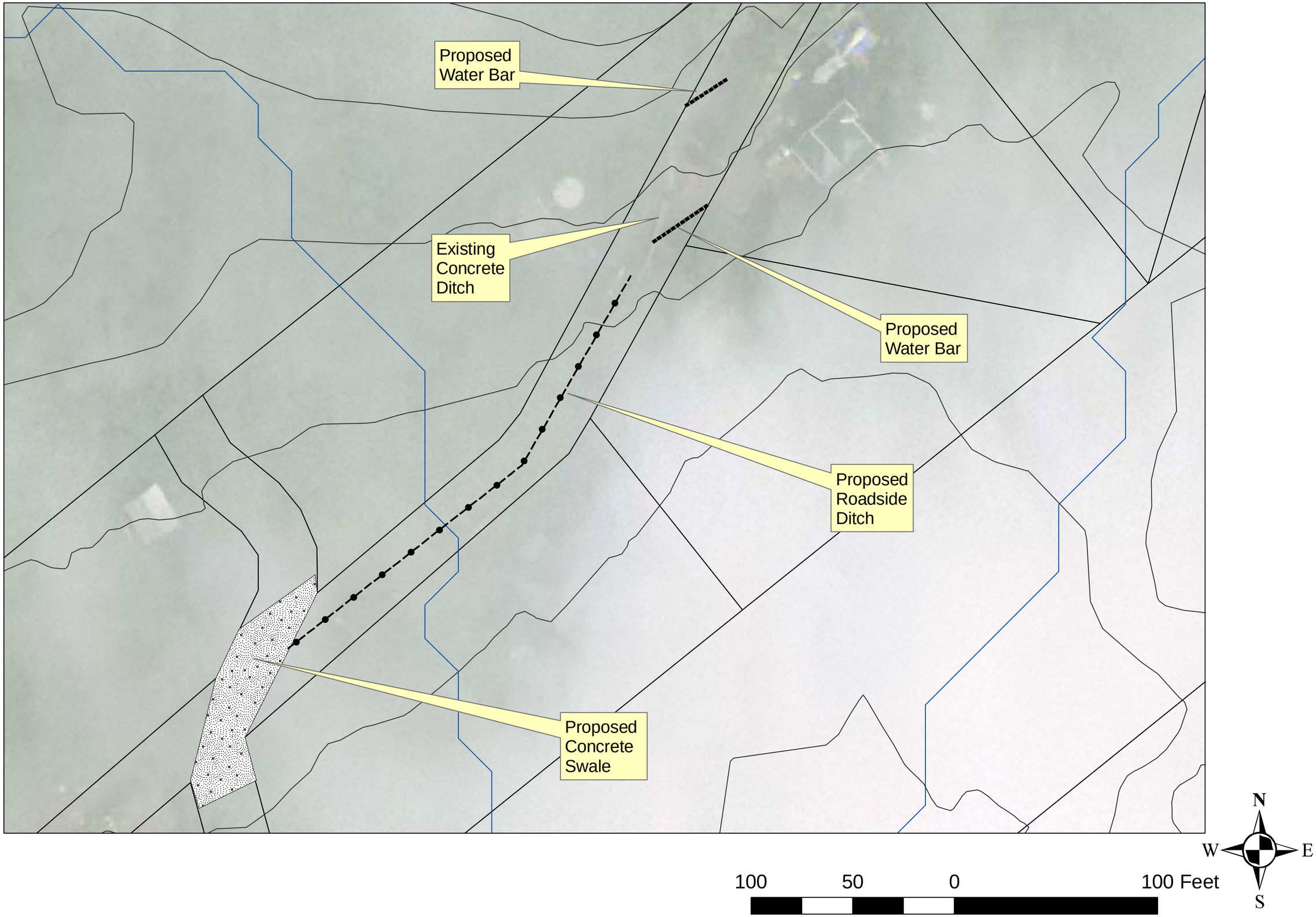
LaLa Land
Area 2 Layout



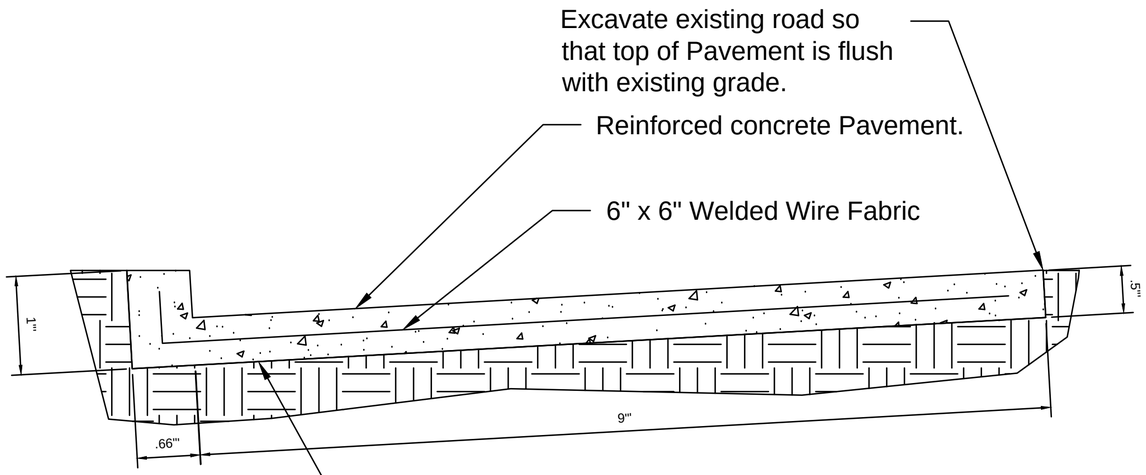
LaLa Land
Area 3 Layout



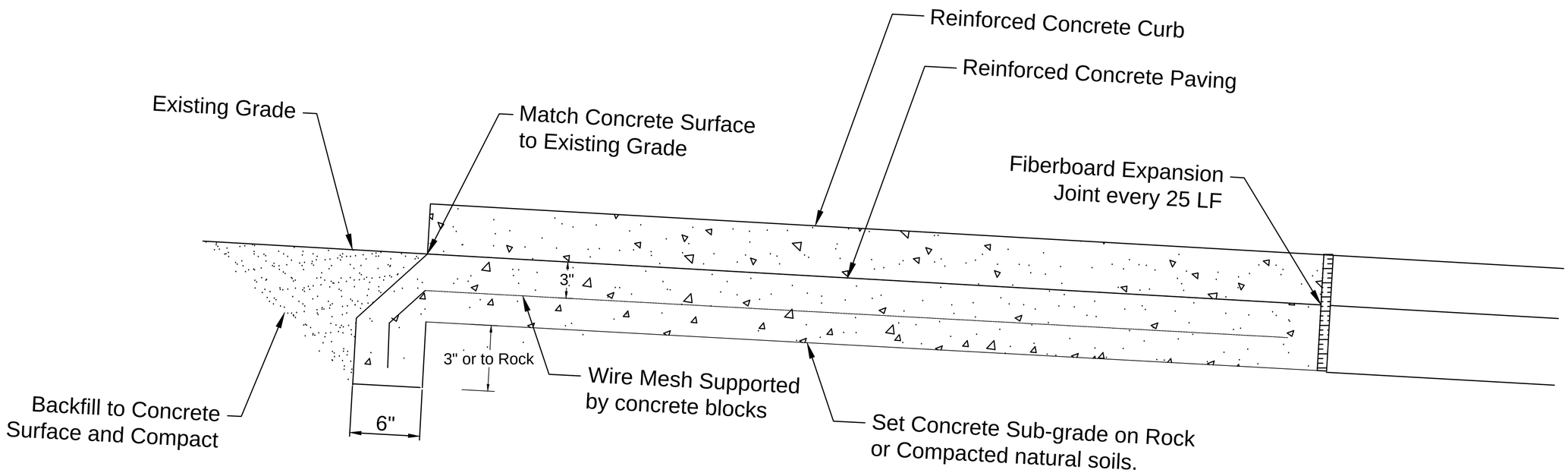
LaLa Land
Area 4 Layout



X–SECTION



PROFILE VIEW



Roadside Swale Details

Drainage Improvements
LaLa Land
Coral Bay, St John, USVI

CSL | Sheet 1 of 4

Date: 01/11/2011
Project No: C3C

Not To Scale

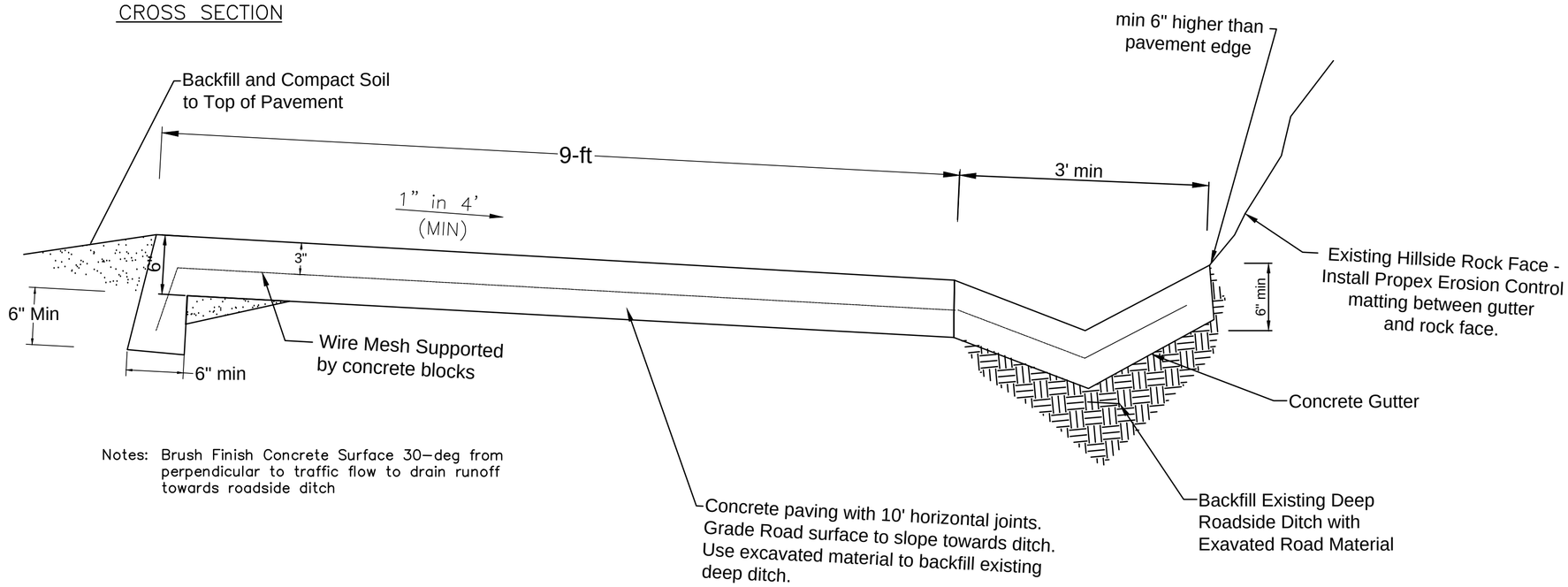
Prepared by:
Christopher S Laude, P.E.
Stormwater & Civil Engineering
Mailing Address
9901 Emmaus
St. John, VI 00830
cslaude@mac.com
Physical Address
8-1 Emmaus
St. John, VI
910-612-5990

Prepared for:
Coral Bay Community Council
- CBCC is a 501(c)(3) nonprofit organization -
Mailing Address
9901 Emmaus
St. John, VI 00830
cbcc@coralbaycommunitycouncil.com
Physical Address
8-1 Emmaus
St. John, VI
340-776-2099

CONCRETE PAVING DETAIL

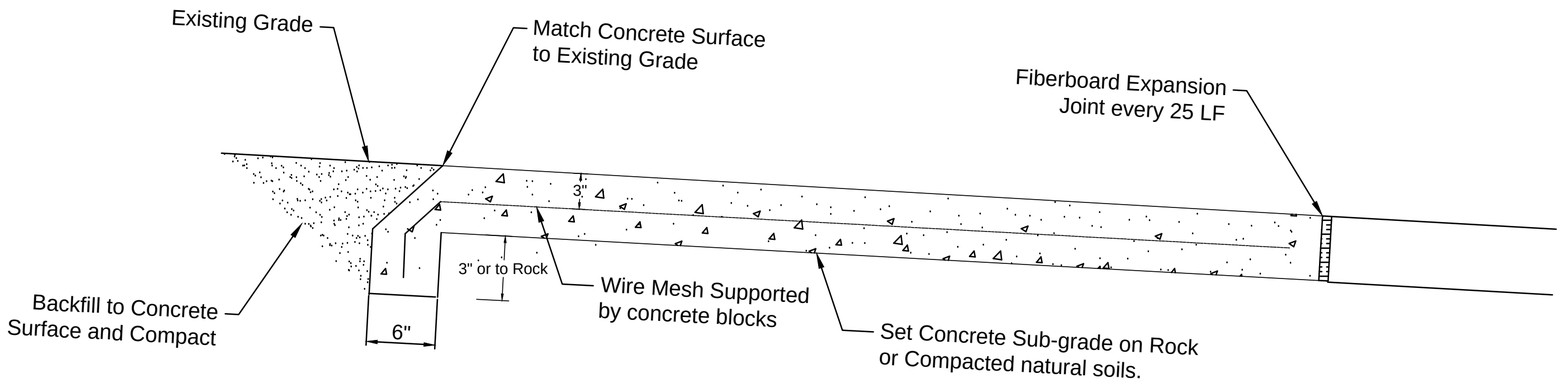
N.T.S.

CROSS SECTION



Notes: Brush Finish Concrete Surface 30–deg from perpendicular to traffic flow to drain runoff towards roadside ditch

PROFILE VIEW



Pavement Details

Drainage Improvements
Lala Land
Coral Bay, St John, USVI

Date: 02/01/2011
Project No: C3C
CSL
Sheet 4 of 4
Not To Scale

Prepared for:
Coral Bay Community Council
- CBCC is a 501(c)(3) nonprofit organization -
Mailing Address
8-1 Emmaus
St. John, VI
340-776-2099

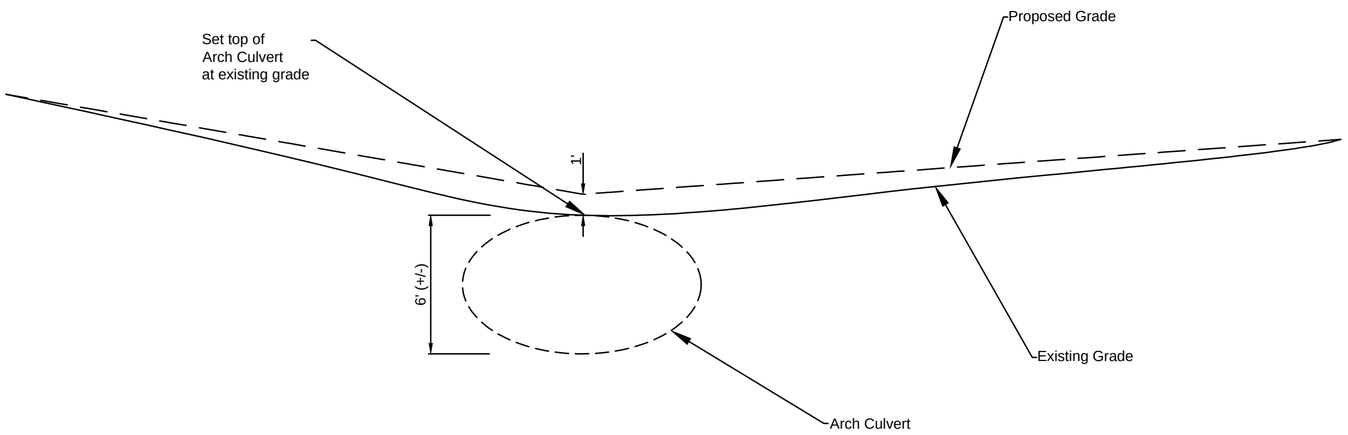
Prepared by:
Christopher S Laude, P.E.
Stormwater & Civil & Planning
Mailing Address
9901 Emmaus
St. John, VI 00830
cslaude@mac.com
Physical Address
8-1 Emmaus
St. John, VI
910-612-5990

Mailing Address
9901 Emmaus
St. John, VI 00830
cbcc@coralbaycommunitycouncil.com

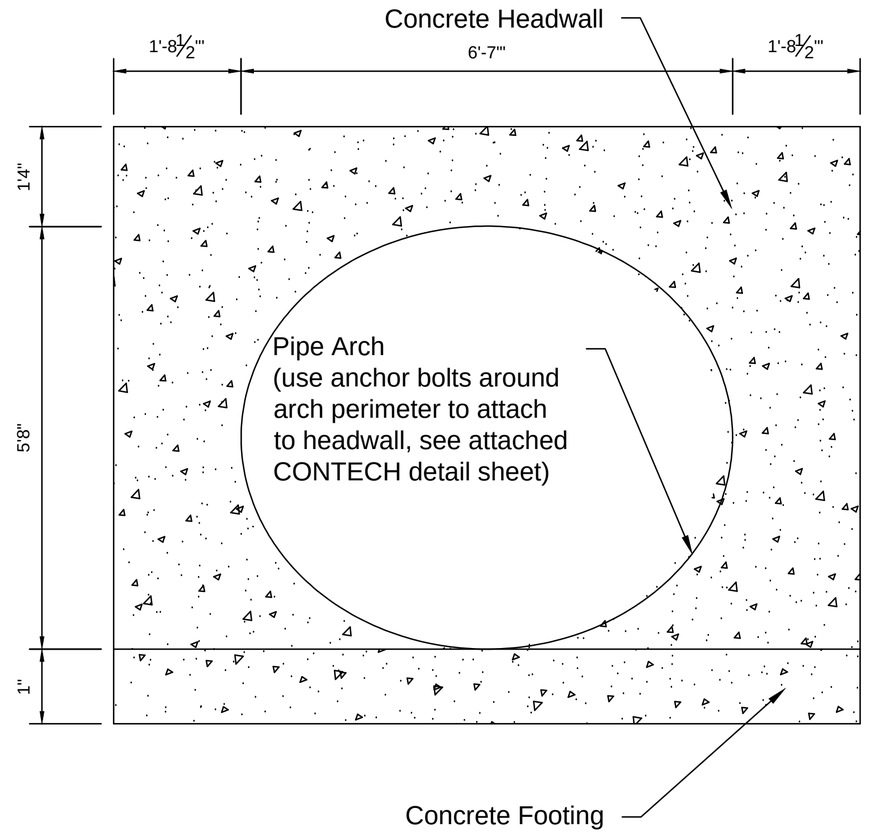
Arch Culvert DETAIL

N.T.S.

CROSS SECTION



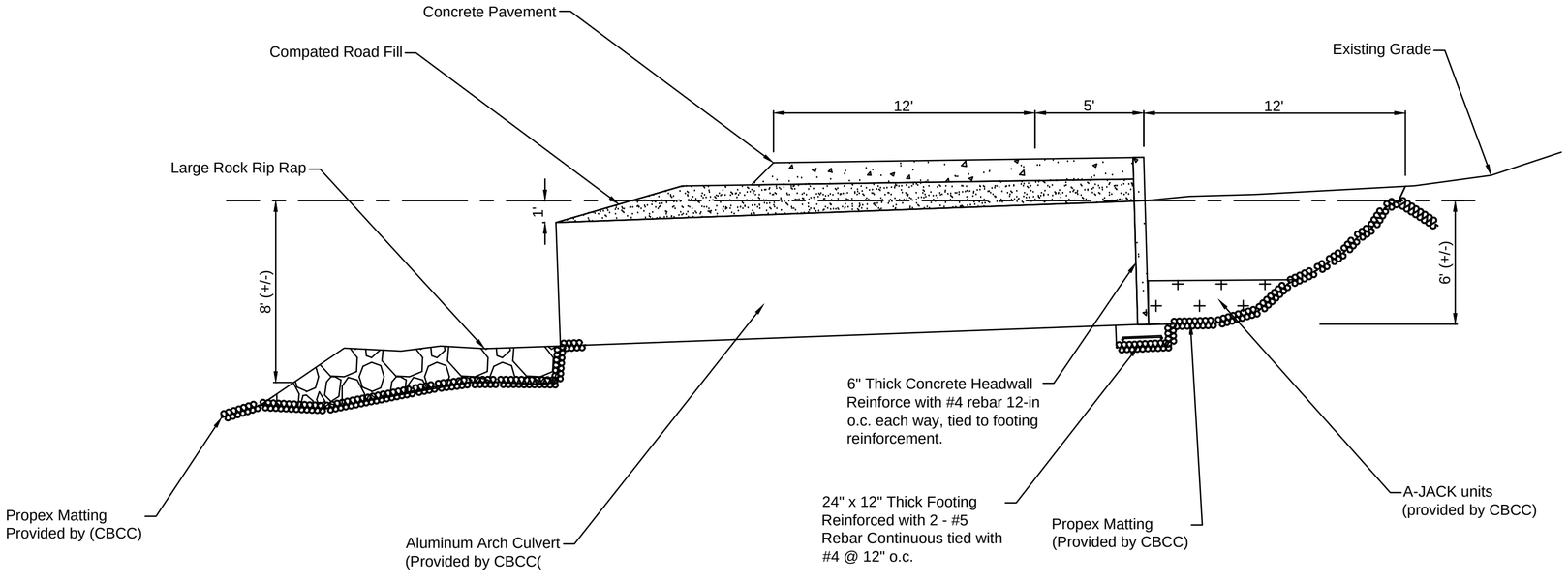
Arch Culvert DETAIL



Arch Culvert DETAIL

N.T.S.

Profile View



Arch Culvert Details

Drainage Improvements
Lala Land
Coral Bay, St John, USVI

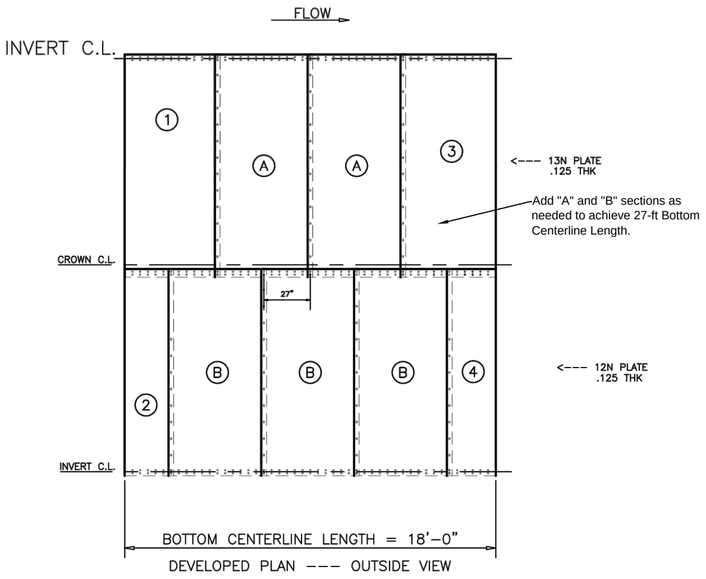
CSL | Sheet 3 of 4

Date: 02/01/2011
Project No: C3C

Not To Scale

Prepared by:
Christopher S Laude, P.E.
Stormwater D Civil D Planning
Physical Address
8-1 Emmaus
St. John, VI
910-612-5990
Mailing Address
9901 Emmaus
St. John, VI 00830
cslaude@mac.com

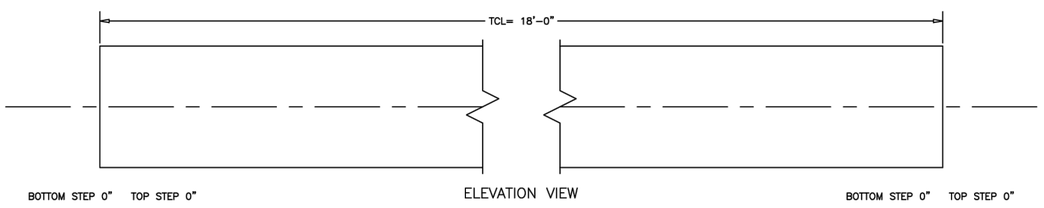
Prepared for:
Coral Bay Community Council
-- CBCC is a 501(c)(3) nonprofit organization --
Physical Address
8-1 Emmaus
St. John, VI
340-776-3099
Mailing Address
9901 Emmaus
St. John, VI 00830
cbcc@coralbaycommunitycouncil.com



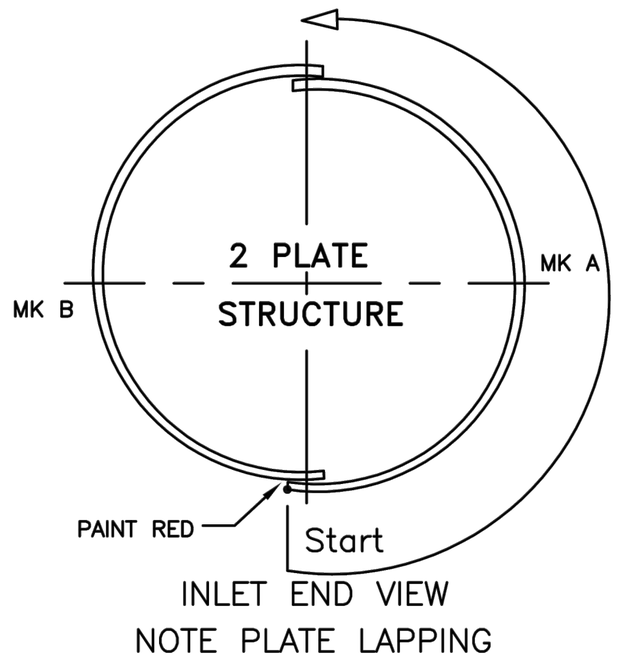
DEVELOPED PLAN --- OUTSIDE VIEW

4 STRUCTURES REQUIRED

COLOR CODE: GREEN



ELEVATION VIEW



INLET END VIEW

NOTE PLATE LAPPING

Installation

Required elements
Satisfactory site preparation, trench excavation, bedding and backfill operations are essential to developthe strength of any flexible conduit. In order to obtain proper strength while preventing settlement, it is necessary that the soil envelope around the structure be of good granular material, properly placed, and carefully compacted. Pipe–arch and underpass shapes pose special installation problems not found in other shapes. These two shapes generate high corner bearing pressures against the side fill and foundation. Therefore, special installation care must be implemented to achieve a composite soil structure. Contractor shall engage a qualified testing and inspection firm, approved by the Engineer, to verify proper foundation preparation, adequate bedding, and backfill compaction.

Trench excavation
If the adjacent embankment material is structurally adequate, the trench requires only a bottom clear width of the structure's span plus sufficient room for compaction equipment.

Bedding
Proper bedding preparation is critical to both structure performance and service life. The bed should be constructed to avoid distortions that may create undesirable stresses in the structure and/or rapid deterioration of the roadway. The bed should be free of rock formations, protruding stones, and frozen matter that may cause unequal settlement. It is recommended that the bedding be stable, well graded granular material. Placing the structure on the bedding surface is generally accomplished by one of the two following methods:

ÅShaping the bedding surface to conform to the lower section of the structure
ÅCarefully tamping a granular or select material beneath the haunches to achieve a well–compacted condition.

Assembly
Assembly drawings and detailed assembly instructions are shipped with each order. Structures can be pre–assembled and lifted into place all at once or in sections, allowing for staged construction. If the site conditions allow, structures can be assembled in place. The contractor shall assemble the structure in accordance with the CONTECH Pipe Design Manual that is available online or in the CBCC Office.

Backfill
Satisfactory backfill material, proper placement, and compaction are key factors in obtaining maximum strength and stability. The backfill material should be free of rocks, frozen lumps, and foreign material that could cause hard spots or decompose to created voids. Backfill material should be well graded granular material that meets the requirements of A.A.S.H.T.O. M 145 for soil classifications A–1, A–2, or A–3. Backfill must be placed symmetrically on each side of the structure in six–inch loose lifts. Each lift shall be compacted to a minimum of 95 percent density per A.A.S.H.T.O. T 99. Backfill material shall be well graded to prevent soil migration. During backfill, only small tracked vehicles (D–4 or smaller) should be near the structure as fill progresses above the crown and to the finished grade. Minimum cover may need to be increased to handle temporary construction vehicle loads (larger than D–4).

Pavement
For minimum cover applications, CONTECH recommends that a properly designed flexible or rigid pavement be provided above the structure to distribute live loads and maintain cover.

Precautions
During installation and prior to the construction of permanent erosion control and end treatment protection, special precautions may be necessary. The structure must be protected from unbalanced loads from any structural loads or hydraulic forces that might bend or distort the unsupported ends of the structure. Erosion or washout of previously placed soil support must be prevented to ensure that the structure maintains its load capacity.

GENERAL NOTES:

1. Confirmation of cover – This structure is within the minimum and maximum allowable height of cover, for the designated loading, as follows: Loading: HS–20 or _____, Minimum cover (FT) 1.50, Maximum cover (FT) 24
2. For proper bolt size usage, refer to following:

Plate only	2 plate lap	3 plate lap	4 plate lap
0.100" – 0.125" thk. plate	1–1/4"	1–1/4"	1–1/4"*
0.150" – 0.200" thk. plate	1–1/4"	1–1/2"	2"
0.225" – 0.250" thk. plate	1–1/2"	2"	N/A
With Reinforcing Rib (if req'd)	**1 plate**		
0.100" – 0.175" thk. plate	1–1/4"	1–1/2"	2"	2"
0.200" – 0.250" thk. plate	1–1/2"	2"	2"	2"

*Occurs with full inverts only which have 0.100" thick plates.

3. Nuts may be located on structure's interior or exterior to allow conventional access during assembly and torquing. Only one side of nut has a curved surface and it should be in direct contact with plate valley.
4. All plate laps and reinforcing ribs must be properly mated in a tangent fashion using proper alignment techniques and held in alignment by fasteners (finger tightened only). Before backfilling commences, all fasteners must be torqued for adequate component contact. Good component fit is better than high torque.
5. Fastener torque requirements: 0.100" thick plate at 90–115 foot–pounds. For all thicker plates and reinforcing ribs, torque at 115–135 foot–pounds. Torque levels are for installation, not residual, in–service requirements. Since torquing may loosen previously tightened fasteners, multiple passes may be necessary. When seam sealant tape is used, fasteners should be torqued again after 24 hours.
6. All aluminum structural plate material is manufactured in accordance with AASHTO M219, ASTM B746 and ASTM B864 specifications.
7. See ASSEMBLY INSTRUCTIONS shipped with material in fastener container. Also refer to specific product catalog for additional product information.

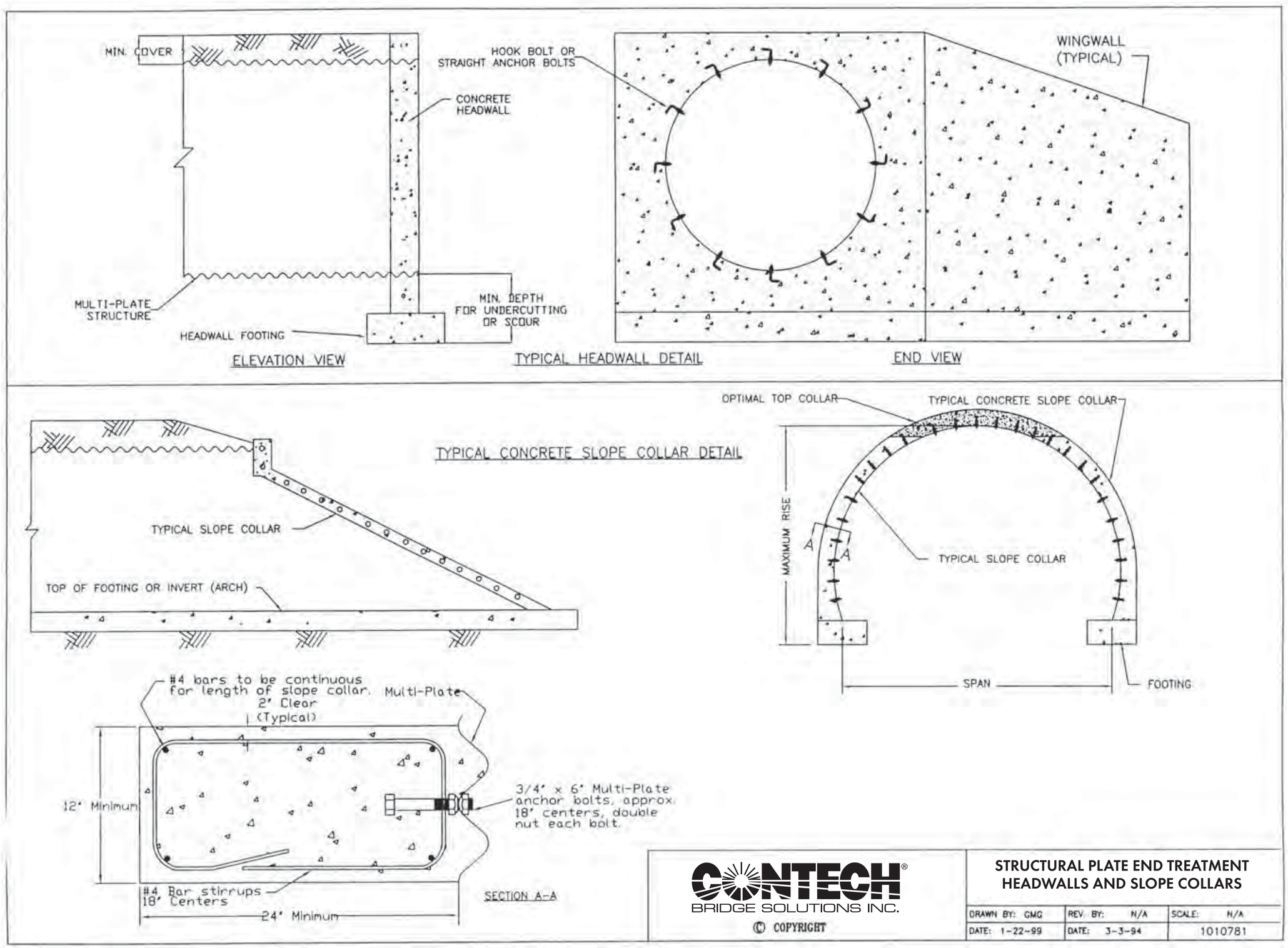
Arch Culvert Details

Drainage Improvements
Lala Land
Coral Bay, St John, USVI

Date: 02/01/2011
Project No: C3C
CSL
Sheet 2 of 4
Not To Scale

Prepared by:
Christopher S Laude, P.E.
Stormwater D Civil D Planning
Street Address
8-1 Emmans
St. John, VI
910-612-2599
Mailing Address
9901 Emmans
St. John, VI 00830
claude@me.com

Prepared for:
Coral Bay Community Council
- CBCC is a 501(C)(3) nonprofit corporation -
Street Address
8-1 Emmans
St. John, VI
340-776-2099
Mailing Address
9901 Emmans
St. John, VI 00830
cbcc@coralbaycommunitycouncil.com



Typical End Treatments

Mill Vista Road
Drainage Improvements
Scope of Work, Details & Specifications

PROJECT NO. C3B

SITUATE IN
CORAL BAY, ST. JOHN
US VIRGIN ISLANDS

January 20, 2011

PREPARED FOR:
Coral Bay Community Council, Inc., and:
Virgin Islands Resource Conservation
& Development Council, Inc.
NOAA-ARRA Grant
9901 Emmaus
St. John, USVI 00830

PREPARED BY:
Christopher S. Laude, PE
9901 Emmaus
St John, VI 00830
(910) 612-5990

1.0 SCOPE OF WORK

Project is located in Coral Bay on St. John USVI. The project entails work in 3 separate areas along Mill Vista Road. Locations are as shown on the enclosed Site Location Map. Exact installation locations for work items shall be indicated in the field by the VIRC&D Inspector.

Area 1

Work proposed for Area 1 consists of constructing an inlet box attached to the existing 30" diameter corrugated plastic pipe (CPP) under CenterLine Road; and paving the entrance off of CenterLine Road. The construction shall proceed as follows:

1. Excavate and construct a concrete inlet structure attached to the existing 30" CPP (see attached detail). An undetermined amount of concrete is present at and above design sub-grade that will need to be removed.
2. Excavate, form and pave 150' x 4' wide concrete ditch from inlet structure to location determined by VIRC&D Inspector (see detail). Contractor shall remove an approximately 15' long outcropping of blue bit rock that extends about 2' into the proposed ditch area and concrete rubble in ditch area. The ditch shall be separate from the pavement for the first 50-feet or so, then shall be integral with the pavement and formed to be driveable.
3. Excavate, form and pave 150' x 18' wide (more or less – see paving detail) x 6" thick wire reinforced concrete paving from CenterLine Road (Route 10) to location determined by VIRC&D Inspector. Pavement width narrows to about 14' at the top end. Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete. The pavement shall be separate from the paved drivable ditch for the first 50-feet or so, then shall be integral with the drivable paved ditch.
4. Seed and stabilize all disturbed areas. Upon final grading of an area, all disturbed earth surfaces shall be seeded with Bermuda grass (98% purity) at a rate to be determined by VI RC&D inspector.
5. In the area where the paved ditch is separate from the road paving, grade the space between the paved areas as a mound and install propex erosion control fabric (provided by VI RC&D) so that it covers the mound and extends beneath the proposed paving by at least 6-inches (see attached detail).

Area 2

Work to be performed in Area 2 consists of construction of a concrete waterbar; and repair/reconstruction of an existing inlet box. The construction shall proceed as follows:

6. Excavate and construct a concrete water bar at the location and alignment determined by the VIRC&D Inspector. Backfill and compact soil against concrete in manner approved by VI RC&D Inspector so that soil is flush with top of concrete.

7. Remove wall of existing inlet box in manner determined by VI RC&D inspector. Remove concrete debris. Clear pipe. Construct 5' x 3.5' x 8" new wall on existing inlet box aligned in the manner directed by the VI RC&D inspector.
8. Seed and stabilize all disturbed areas. Upon final grading of an area, all disturbed earth surfaces shall be seeded with Bermuda grass (98% purity) at a rate of to be determined by VI RC&D inspector.

Area 4

Work to be performed in Area 4 consists of construction of concrete inlet box attached to the existing 36" corrugated metal pipe (CMP). The construction shall proceed as follows:

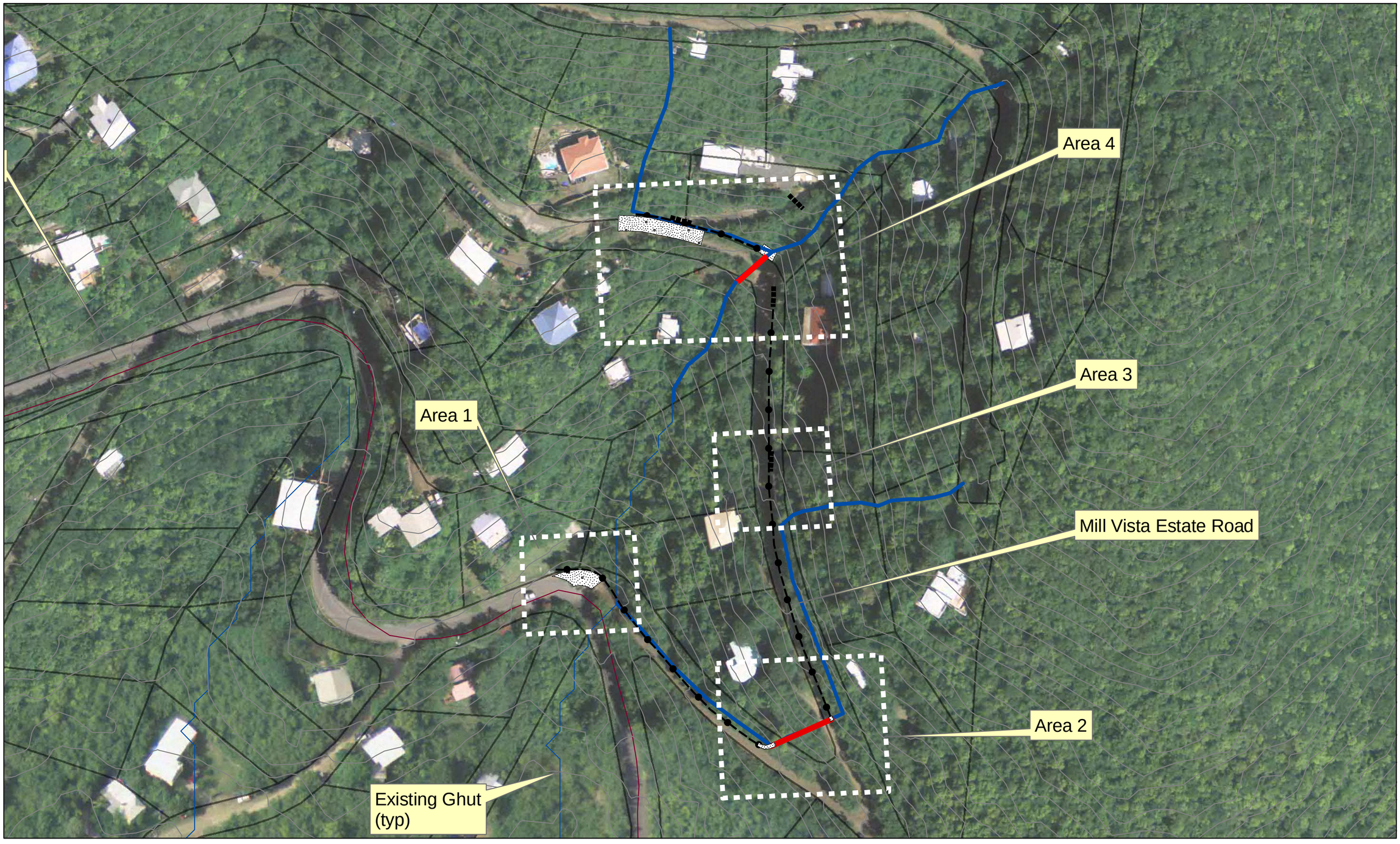
9. Excavate area for inlet pipe and clear all debris from 36" CMP. Construct concrete inlet box contiguous to the existing 36" CMP.
10. Seed and stabilize all disturbed areas. Upon final grading of an area, all disturbed earth surfaces shall be seeded with Bermuda grass (98% purity) at a rate of to be determined by VI RC&D inspector.

NOTES AND CONDITIONS

1. Additional specifications and adjustments, at the discretion of the VIRC&D Inspector, shall be field implemented to adequately install devices and provide protection and stabilization. Contractor shall be responsible for implementing any such adjustments as deemed necessary by the Inspector that are reasonably similar to the written specifications.
2. Propex erosion control matting shall be provided by VIRC&D. All other materials and supplies including but not limited to backfill, rock, concrete, and geotextile shall be provided by the contractor. VI RC&D has permission for contractors to use fill material available at 6-4 Carolina, which adjoins the project site to the west.
3. Contractor shall barricade freshly poured concrete for a minimum of 48 hours from the end of pour to prevent damage from traffic.
4. Contractor shall remove excess excavated material from the site and dispose of properly. At the direction of the VI RC&D inspector, contractor may use such material to fill eroded roadway and roadside areas. All non-traffic areas filled and repaired, and all other disturbed areas shall be protected with Erosion Control Blanket (at the direction of the VI RC&D inspector) and seeded with Bermuda grass (98% purity) at 20lbs. per acre. No material other than that used for roadside repairs shall remain onsite. VIRCD shall provide Erosion Control Blanket, contractor shall install erosion control blanket and seed with Bermuda grass at specified rate.
5. Contractor shall maintain traffic flow in at least one lane at all times using appropriate traffic control methods in accordance with all Public Works requirements. If the Contractor sees a need to close the road at any time contractor shall, as part of this bid, submit a plan detailing how parking and access for residents will be provided.

6. During grading & excavation work, sufficient water will be kept onsite to ensure that exposed soil and road surfaces can be sprayed down to control dust.
7. All workmanship shall comply with VI DPW specifications and FP-2006 specifications.
8. All grading and excavation included on this job shall include all rock and ledge removal necessary to install items as specified. No additional fees shall be charged for rock work.
9. Prior to commencing construction, the Contractor shall install up to four sign posts consisting of a 4" x 4" post set 2' into the ground and extending 6' above grade at locations to be determined by the VI RC&D inspector. Signs will be provided by VIRCD and mounted on the signpost by the contractor.
10. BUY AMERICAN CLAUSE: Contractors are hereby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this award.
11. Contractor shall have a VI business license to do the type of work that is being performed.
12. Contractor shall provide a valid DUNS number.
13. All workers on the projects must legally be able to work in the VI.
14. Contractor shall notify Project manager, CBCC and all abutters at least 4 days prior to beginning work.
15. Contractor must conduct a weekly safety meeting for all on site personnel
16. Provide $ 1 million liability insurance with CBCC and VIRC&D as named insured
17. Comply with all Federal and VI, DPW and DPNR regulations and requirements.

Mill Vista Estate Road
Project Map

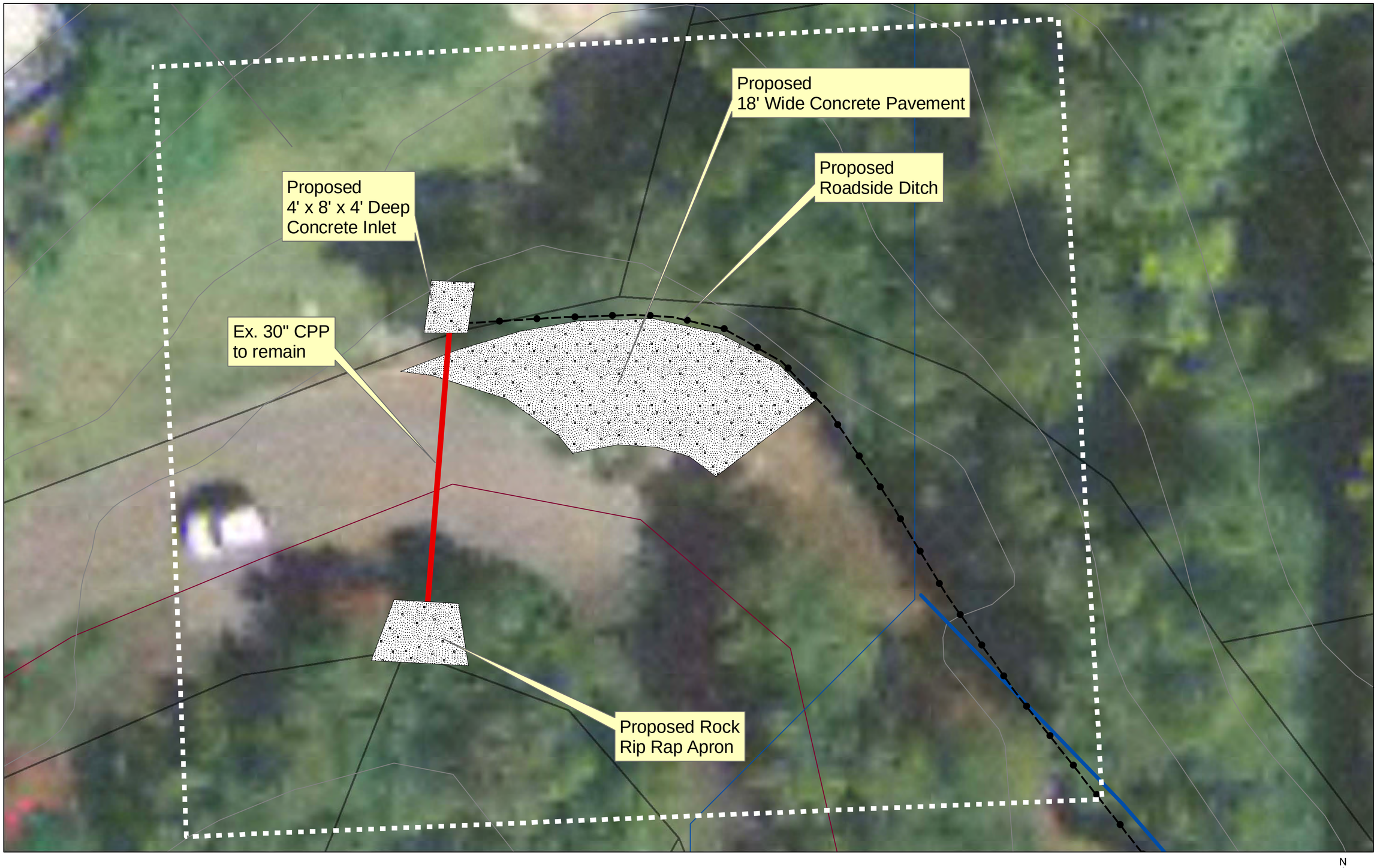


1 inch = 83 feet

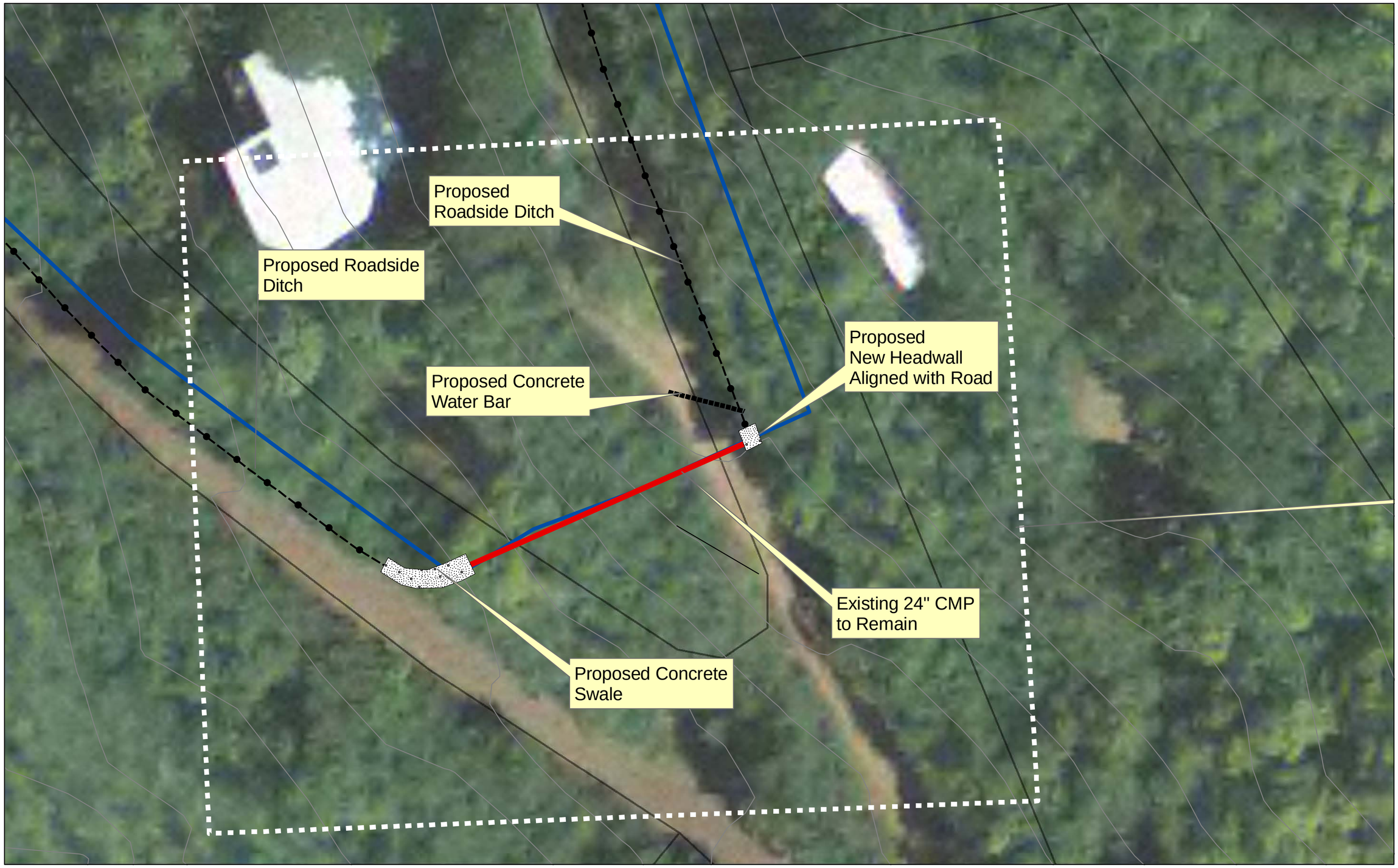
0 45 90 180 Feet

N

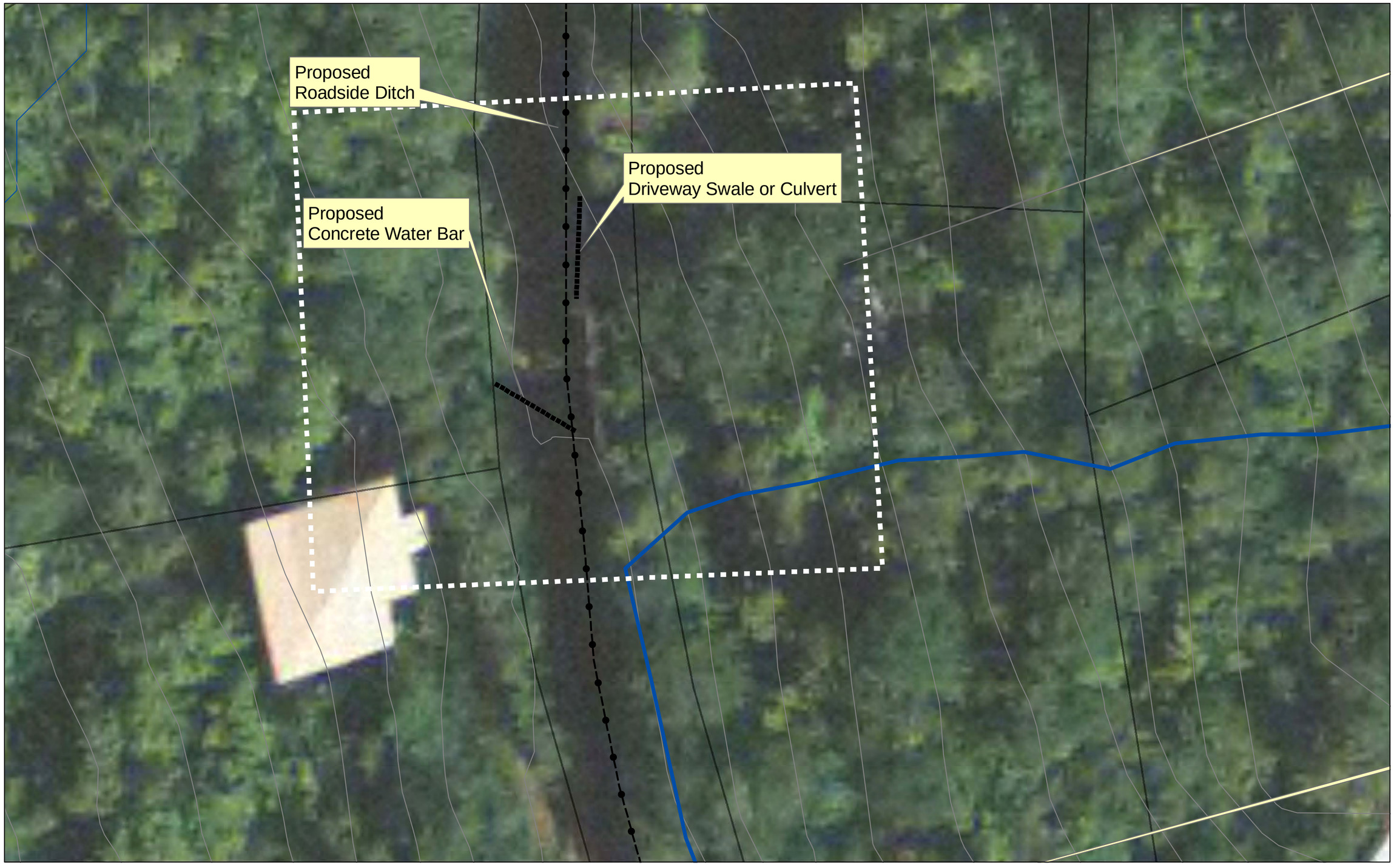
Mill Vista Estate Road
Project Map



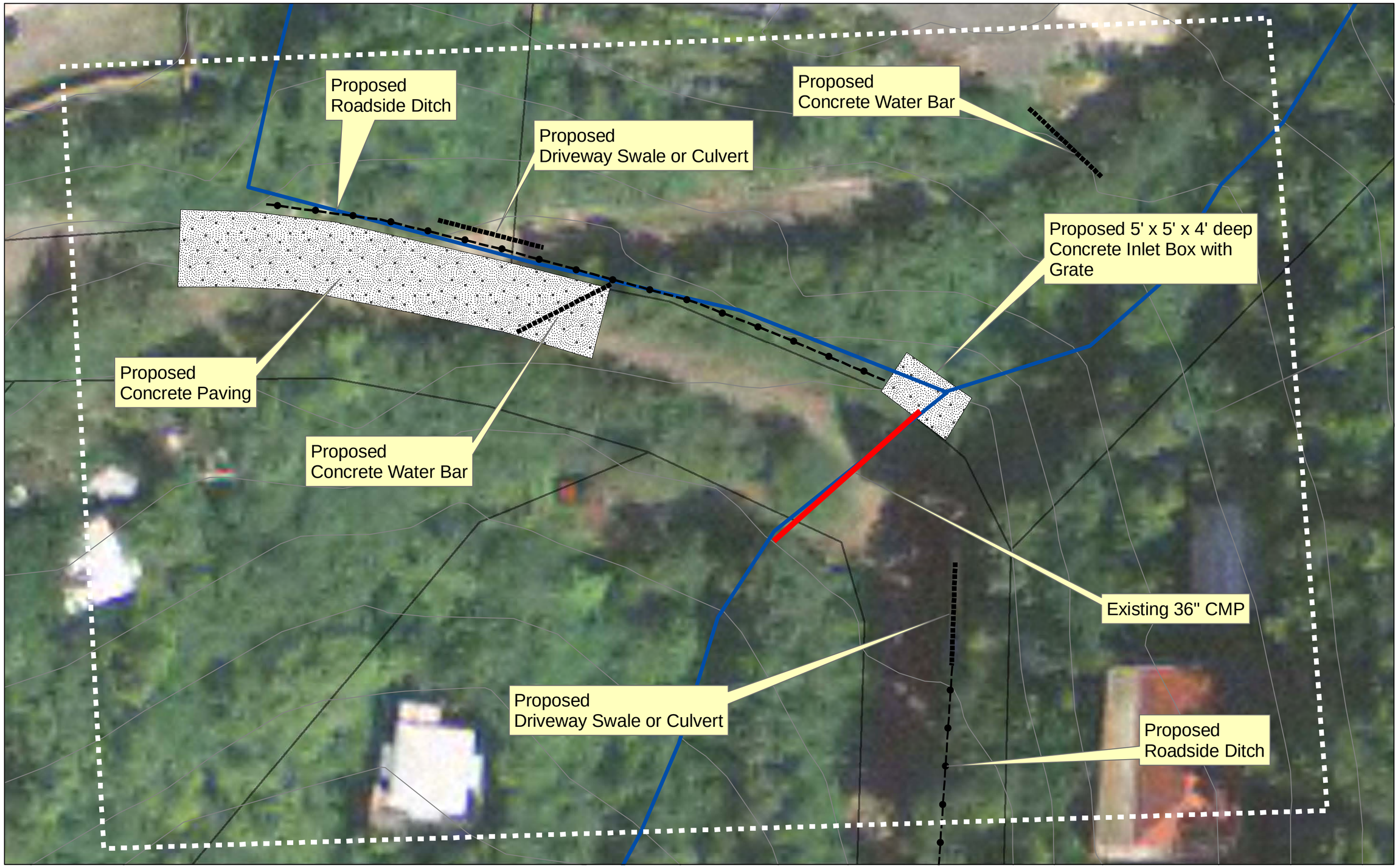
Mill Vista Estate Road
Area 2 Layout



Mill Vista Estate Road
Area 3 Layout

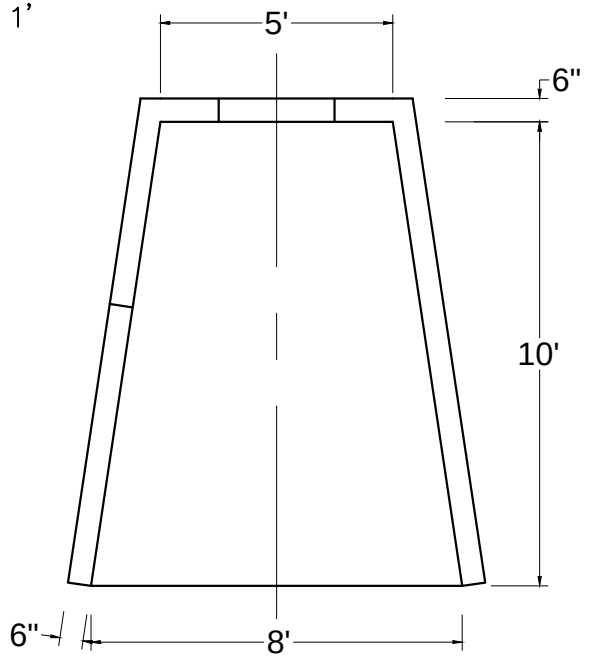


Mill Vista Estate Road
Area 4 Layout



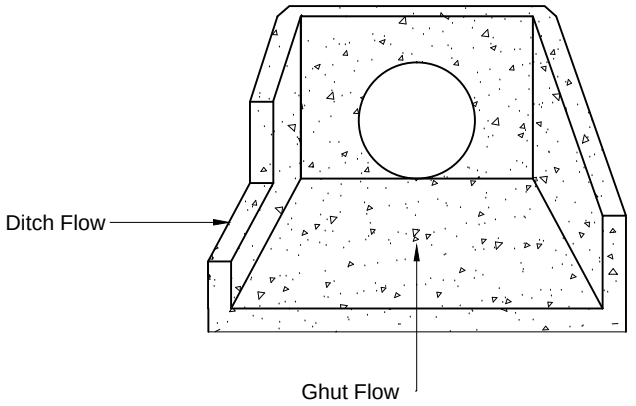
Plan View

1/4" = 1'



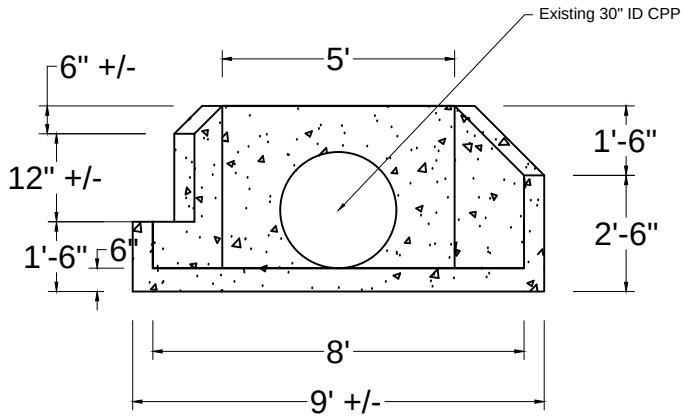
Perspective View

1/4" = 1'



X—Section View

1/4" = 1'



Notes:

1. Concrete shall have a minimum compressive strength of 4,000 psi at 28-days
2. Exposed edges shall be finished with a 1" chamfer
3. Concrete shall be reinforced with a minimum of 0.12 s.i. per foot each way. (e.g. #4 bars @ 12" o.c. each way)

Drainage Improvements
Mill Vista Drive
Coral Bay, St John, USVI

Drainage Structure Details at Centerline Road

Prepared for:
Coral Bay Community Council
- CBCC is a 501(c)(3) nonprofit organization -

Physical Address:
8-1 Emmaus
St. John, VI
340-776-2099

Mailing Address:
9901 Emmaus
St. John, VI 00830
cbcc@coralbaycommunitycouncil.com

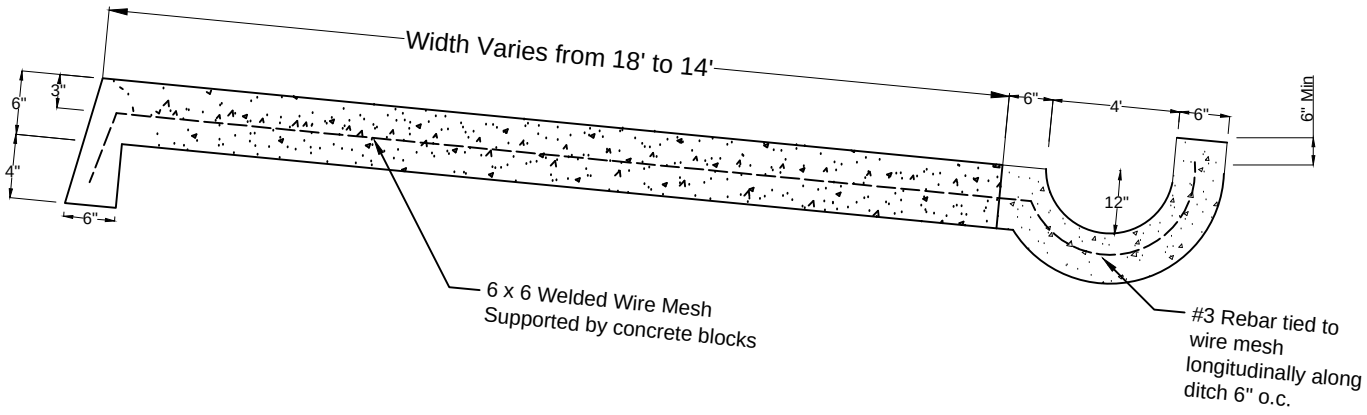
Date: 01/17/2011 | CSL
Project No: C3B | Sheet 1 of 5
Not To Scale

Prepared by:
Christopher S Laude, P.E.
Civil, Environmental, Geotechnical & Structural Engineering
9901 Emmaus, St. John, VI 00830
(910) 612-5990 CSLaude@mac.com

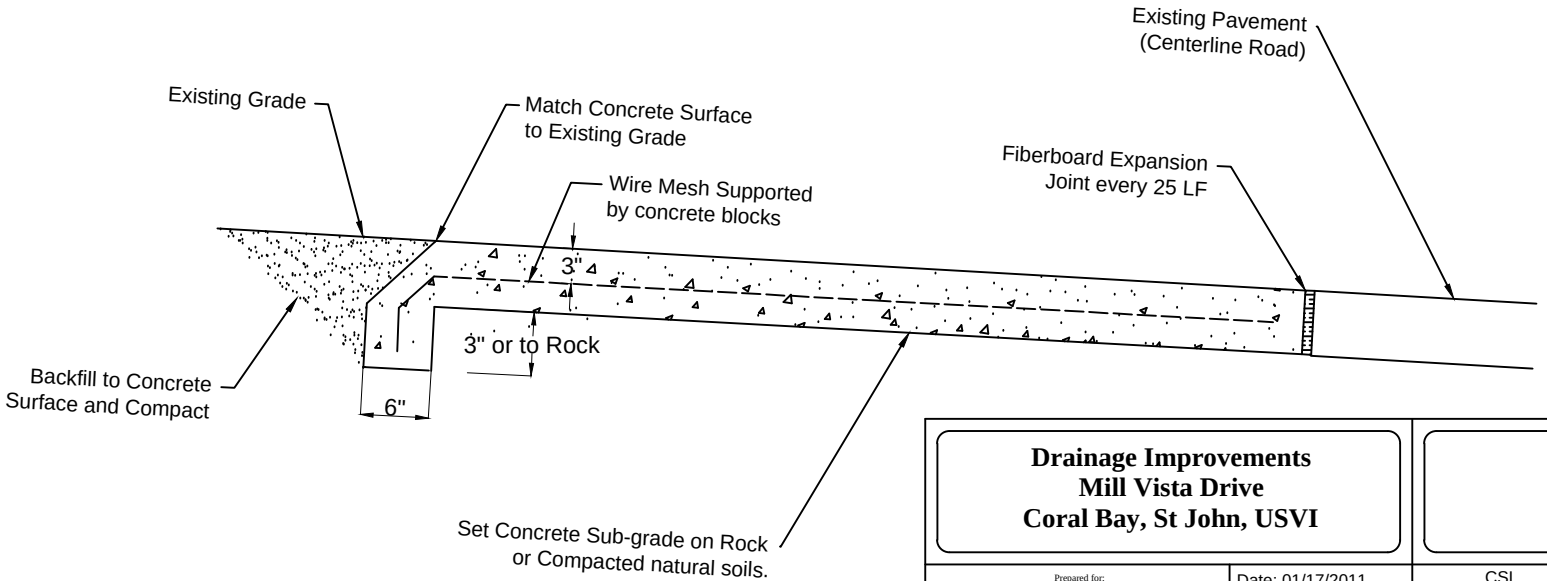
CONCRETE PAVEMENT DETAILS

N.T.S.

CROSS-SECTION



PROFILE VIEW



Drainage Improvements
Mill Vista Drive
Coral Bay, St John, USVI

Pavement Details

Prepared for:
Coral Bay Community Council
- CBCC is a 501(c)(3) nonprofit organization -
Physical Address: 8-1 Emmaus, St. John, VI, 340-776-2099
Mailing Address: 9901 Emmaus, St. John, VI 00830, cbcc@coralbaycommunitycouncil.com

Date: 01/17/2011 | CSL
Project No: C3B | Sheet 3 of 5
Not To Scale

Prepared by:
Christopher S Laude, P.E.
Civil, Environmental, Geotechnical & Structural Engineering
9901 Emmaus, St. John, VI 00830
(910) 612-5990 CSLaude@mac.com