# St. Thomas East End Reserves Watershed Management Plan

**May 2013**

**Prepared for:**
NOAA Coral Reef Conservation Program
USVI Department of Planning and Natural Resources
The Nature Conservancy

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*The STEER Watersheds Assessment and Planning Project is part of a broader effort by the NOAA Coral Reef Conservation Program to support the St. Thomas East End Reserves (STEER) through monitoring, use studies, and watershed restoration activities. This plan is supplemented by the 2013 STEER Watershed Existing Condition Report.*

## Acknowledgements

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## List of Acronyms

| | |
|---|---|
| ACOE | US Army Corps of Engineering |
| APC | Area of Particular Concern |
| BMP | Best Management Practice |
| BP | Building and Permits |
| CLCC | Caribbean Landscape Conservation Cooperative |
| CRCP | Coral Reef Conservation Program |
| CZM | Coastal Zone Management |
| DPNR | Department of Planning and Natural Resources |
| DEE | Division of Environmental Enforcement |
| DEP | Division of Environmental Protection |
| DFW | Division of Fish and Wildlife |
| DP | Division of Planning |
| DPW | Department of Public Works |
| EAST | Environmental Association of St. Thomas-St. John |
| EPA | Environmental Protection Agency |
| ESC | Erosion and Sediment Control |
| FEMA | Federal Emergency Management Agency |
| LBSP | Land-Based Sources of Pollution |
| IDDE | Illicit Discharge Detection and Elimination |
| IGBA | Island Green Building Association |
| MLWTP | Mangrove Lagoon Wastewater Treatment Plant |
| NOAA | National Oceanic and Atmospheric Administration |
| OSDS | On-Site Disposal System |
| STEER | St. Thomas East End Reserves |
| TBT | Tributyltin |
| TMDL | Total Maximum Daily Load |
| TNC | The Nature Conservancy |
| TPDES | Territorial Pollution Discharge Elimination System |
| USFWS | US Fish and Wildlife Services |
| USDA | US Department of Agriculture |
| VICCC | Virgin Islands Caribbean Cultural Center |
| VIDE | Virgin Islands Department of Education |
| VIHA | Virgin Islands Housing Authority |
| VIHTA | Virgin Islands Hotel and Tourism Association |
| VINE | Virgin Island Network of Environmental Educators |
| VIRG | Virgin Islands Recycling Group |
| VIWMA | Virgin Islands Waste Management Authority |

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# Introduction

This management report provides watershed restoration recommendations for the lands surrounding the St. Thomas East End Reserves (STEER). STEER is a 3.7 sq. mile collection of marine reserves and wildlife sanctuaries that includes the last remaining mangrove lagoon on St. Thomas. Widely recognized as one of the Territory's most significant nursery grounds for commercially and recreationally-important fisheries, STEER encompasses Mangrove Lagoon, Benner Bay, Compass Pt. Salt Pond, Jersey Bay, Nazareth Bay, Cowpet Bay, and Great Bay. The STEER watershed is 6.2 sq. miles of upland area that drain directly to these waters. More information on the environmental, social, and economic aspects of STEER can be found in the ***2011 STEER Management Plan*** and in the ***2012 STEER Coastal Use Survey***.

In 2011, NOAA CRCP sponsored a watershed assessment and planning effort to identify potential land-based threats to STEER. This project was conducted concurrently with a sediment sampling and biological monitoring project, and with a study of current uses within STEER. Collectively, this information will be used to inform territorial management decisions related to STEER protection and restoration.

## Purpose and Limitations of this Plan

The purpose of this plan is to identify priority watershed management recommendations and an approach to implementation based on three main objectives:

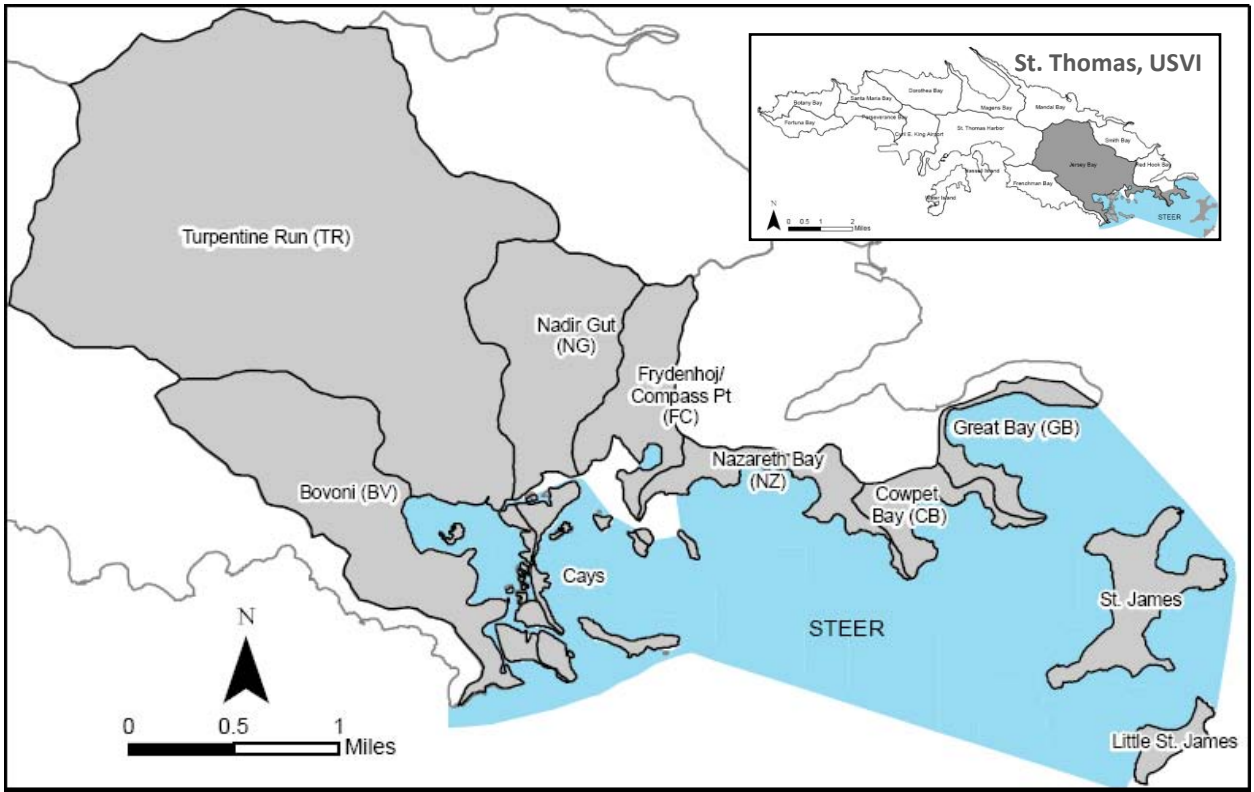
1. *To meet existing federal and territorial public health criteria and water quality standards by reducing sediment, bacteria, nutrients, and other contaminant loading to STEER.*
2. *To engage a diversity of local residents and businesses in STEER watershed restoration activities and inspire a sense of community ownership and activism.*
3. *To support existing efforts to improve development regulations and advance sensitive habitat conservation goals.*

This plan summarizes 8 key watershed recommendations, 39 strategic actions, and potential projects at 93 locations throughout the watershed. The information presented here is based on a review of previous studies and existing territorial planning documents, input from a subset of watershed stakeholders, and a rapid field assessment. The size and complexity of the watershed coupled with budgetary limitations and inaccurate mapping information necessitated a broad approach to the watershed planning process (e.g., limitations on the number of sites visited, number of public meetings held, extent of project concept designs and cost estimates). The implementation strategy is preliminary, and is expected to

evolve as funding opportunities arise, management priorities shift, and additional information is collected.

The following list summarizes gaps to fill in order to develop a more comprehensive watershed management plan:

- Evaluate conditions and opportunities on Great St. James, Little St. James, and on individual commercial/ industrial properties where issues have been raised, but assessments not completed;
- Further refine concept designs, cost estimates, and potential benefits of structural restoration projects;
- Collect information on the location, capacity, and condition of existing stormwater and wastewater infrastructure (e.g., effluent concentrations, extent of combined system, design of existing BMPs);
- Estimate the extent of impervious cover managed by cisterns and their capacity/drawdown for small storms;
- Estimate potential pollutant loading based on best professional knowledge of wastewater inputs, land use event mean concentrations, and other secondary sources (this will require calibration with existing TMDL models and available water quality data);
- Investigate the role of climate change and anticipated sea level rise on shoreline properties, groundwater, and rainfall;
- Review Bovoni Landfill closure plans; and
- Engage a broader cross-section of the watershed community in the management planning process (e.g., homeowner associations, DPW, EPA).




**The STEER Watershed includes the land area draining to waters within the STEER boundary. The watershed was divided into 10 smaller subwatershed drainage units for ease of future management.**

## The STEER Watershed

The STEER watershed is one of the largest and, arguably, most heavily impacted watersheds in the USVI. It includes the Jersey Bay and a portion of Red Hook Bay Watersheds—extending eastward from Bovoni to Cabrita Pt., and northward to the ridgeline above Anna's Retreat and New Tutu Valley. The watershed was divided into 10 smaller subwatershed drainages, listed in **Table 1**.

This highly urban watershed is home to over 1/3 of the population of St. Thomas and is a mosaic of compact residential, commercial, and industrial uses including the Bovoni Landfill, Tutu Park Mall, and Heavy Materials quarry. Sited directly along the shoreline are the Clinton Phipps Racetrack, a dense string of marinas and boatyards, and half a dozen resorts and condominiums. The steep slopes of the interior watershed remain largely undeveloped, although a handful of planned residential developments are under construction or have been proposed.

Roughly 20% of the watershed is impervious, which is equivalent to over 800 acres of roads, rooftops, and parking lots. The vast majority of the developed area in the STEER watershed is not managed for stormwater; thus, sediments eroded from construction sites and other pollutants washed off impervious surfaces are carried directly to guts (or *ghuts*), ponds, and waters of STEER. Turpentine Run, which drains over 60% of the watershed, discharges untreated stormwater and sewage overflows directly into Mangrove Lagoon. The Bovoni Landfill is unlined, and the extent of groundwater contamination and leachate seepage into the adjacent Mangrove Lagoon is unknown. Poor soils and steep slopes render a majority of the watershed unsuitable for convention septic systems, but less than a quarter of the developed area is currently serviced by the Mangrove Lagoon Wastewater Treatment Plant (MLWTP). A significant portion of the sanitary sewer system consists of old, failing pipe; is combined with stormwater drainage; and is often subject to overflows.

**Table 1.** Summary of STEER Subwatershed Characteristics

| Water-shed | STEER Sub-watershed | Area *(Acres)* | % IC | Impaired Waters (DPNR, 2010) |
|---|---|---|---|---|
| Jersey Bay | Bovoni (BV) | 531.4 | 15% | Mangrove Lagoon *(bacteria, turbidity, temp.)* |
| | Frydenhoj/ Compass Pt. (FC) | 193.5 | 23% | Benner Bay Lagoon Marina *(bacteria, turbidity)* |
| | Nadir Gut (NG) | 385.2 | 15% | |
| | Nazareth Bay (NB) | 117.6 | 28% | Nazareth Bay *(turbidity)* |
| | Turpentine Run (TR) | 2265.8 | 23% | Mangrove Lagoon *(bacteria, turbidity, temp.)* |
| Redhook Bay | Cowpet Bay (CB) | 91.5 | 39% | Cowpet Bay *(DO)* |
| | Great Bay (GB) | 68.2 | 31% | Great Bay (DO, turbidity) |
| Other | Cays | 123.0 | 0 | Mangrove Lagoon *(bacteria, turbidity, temp.)* |
| | Little St. James (LSJ) | 36.4 | 14% | No* |
| | Great St. James (GSJ) | 153.5 | 0 | Great Bay *(DO, turbidity)* |
| **Total** | | **3966.0** | **20%** | |

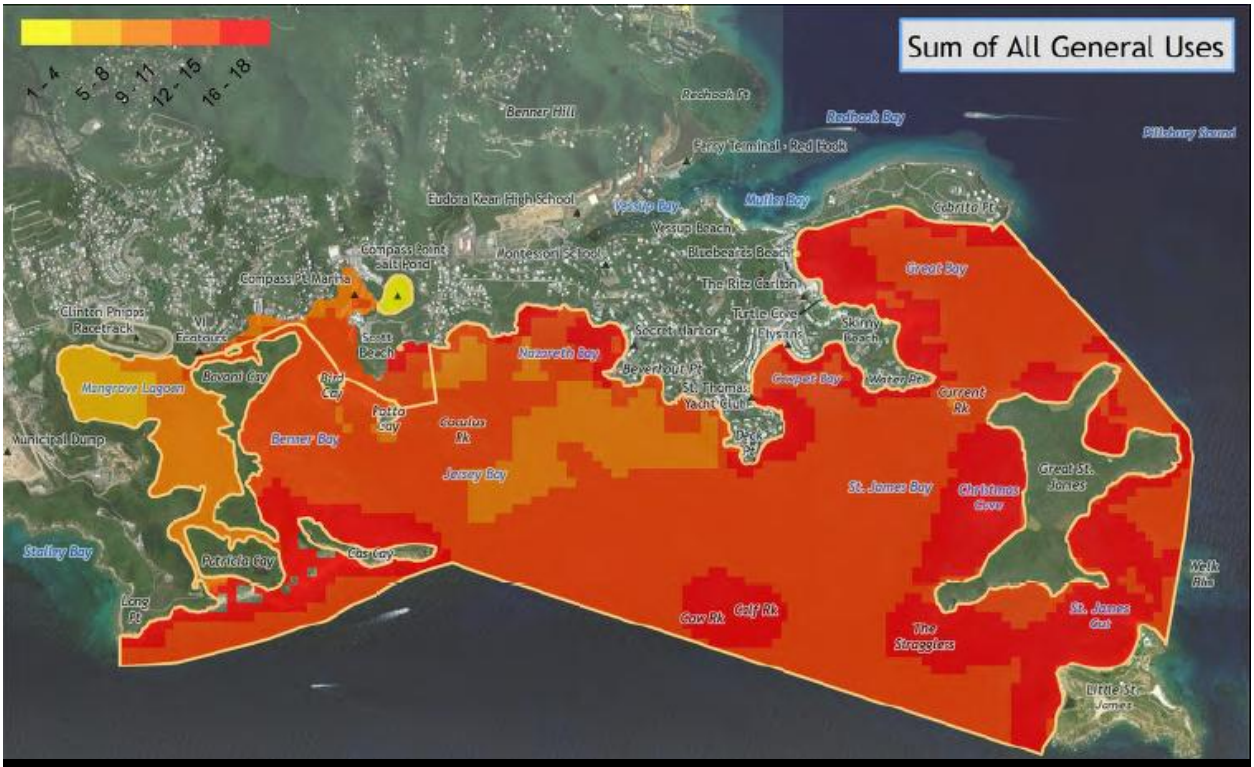
IC = Impervious Cover, DO = Dissolved Oxygen
*Waterbodies on LSJ not included by DPNR (2010)

More detail on existing conditions, hydrology, geology, land use and other watershed factors can be found in the supplemental ***2013 STEER Watershed***

***Existing Conditions Report***. Given the intensity of urbanization and limited treatment infrastructure, it is not surprising that:

- Most of the bays within STEER are currently listed as impaired by DPNR for dissolved oxygen, bacteria, temperature, and/or turbidity;
- Two TMDLs have been established for dissolved oxygen and bacteria in Mangrove Lagoon and Benner Bay;
- Sediments in northern Benner Bay and Mangrove Lagoon are contaminated and have the third highest TBT concentration ever recorded by NOAA. Biological sampling shows that the health of benthic organisms has been negatively impacted in STEER;
- A federal consent decree has been issued for the Bovoni landfill requiring leachate interception, stormwater management, and other cleanup activities prior to closure;
- The Tutu Wellfield Superfund Site was established to clean groundwater in that was contaminated from gas stations and dry cleaners;
- Classic impacts of urbanization are observed in many of the guts and wetlands (e.g., sedimentation, water level fluctuation, channelization, water quality impacts, buffer encroachment, bank erosion, dumping, and loss of native vegetation); and
- Watershed impacts have translated into impacts on human health and on recreational and commercial uses of STEER (boating, fishing, swimming, diving, etc.).

**Most of the waters within STEER are currently listed as impaired by DPNR. The areas shown here in yellow are the 303(d) listed assessment units listed in Table 1.**




**This map from NOAA's 2012 STEER Coastal Use Survey shows where most commercial and recreational uses (fishing, boating, diving, swimming, etc.) occur. Red indicates more uses. They found that due to water quality impacts, historic uses of Mangrove Lagoon have declined.**

**Monitoring well caps located in the parking lot of the Four Winds Plaza are reminders of the ongoing groundwater treatment efforts at the Tutu Wellfield Superfund Site.**

## Watershed Recommendation Summary

**Table 2** summarizes watershed recommendations and strategic actions that are described in more detail in the remaining sections of this report. Each section includes a description of the issue, an elaboration on each strategic action, and a list of next steps for moving forward with implementation. Table 2 includes a preliminary schedule for initiating actions in the short-term (1-2 years), mid-term (2-5 years) and long-term (5-10 years and beyond). Suggested partners for coordinating, funding, or technical implementation of each activity are also listed; however, there may be other potential partners not listed here that may also be involved (see discussion in subsequent sections of this report).

Tables summarizing proposed projects identified at 89 sites throughout the watershed are provided in **Appendix A**. These tables are organized by subwatershed. Each table includes a site ID# and name, a description of the proposed project, an initial feasibility ranking, and comments on implementation. Ranking is not based on a formal prioritization process. It merely represents an initial assessment of feasibility based on property ownership, cost, visibility, and stakeholder priorities, and should be adjusted as more information is collected. Implementation of projects ultimately comes down to opportunity and interest.

Site locations can be found on the subwatershed management maps located in **Appendix B**.

Field notes and concept sketches for each site visited can be found in **Appendix C.**

**This section of Turpentine Run reveals the impact of upstream urbanization on water quality, gut ecology, and natural floodplains (e.g., channelization, loss of buffer, lack of in-stream habitat, and algal mats).**

**Table 2.** Summary of STEER Watershed Recommendations

| Watershed Recommendation | Strategic Actions | Implement (years from 2013) | Key Partners |
|---|---|---|---|
| **#1**. Quantify and reduce water quality and wetland impacts on Mangrove Lagoon from the Bovoni Landfill prior to proposed closure in 2021. | 1.1 Provide public access to regularly updated information on compliance activities, enforcement actions, and closure plans on federal and territorial agency websites. | 1 | EPA, VIWMA, DPNR |
| | 1.2 Conduct groundwater monitoring to quantify the amount, flow rates, and spatial extent of contaminated leachate reaching Mangrove Lagoon. | 1-2 | UVI, VIWMA, EPA |
| | 1.3 Advance temporary measures to manage and treat stormwater runoff in the short-term where necessary. | 1-2 | VIWMA, DPNR |
| | 1.4 In addition to the scrap tire removal requirements of the CD, develop a plan for restoring the fringing mangrove and enhancing the vegetated wetland buffer, where feasible. | 1-2 | UVI, DFW, NOAA, Bovoni Tire |
| | 1.5 Design and implementation of leachate controls (i.e., pumping or perimeter interceptor prior to treatment). | 1-2 | VIWMA, TNC, DPNR, EPA |
| #2. Reduce nutrient and pathogen loading to STEER through improvements to sanitary sewer infrastructure and by addressing inadequacies of privately-operated systems. | 2.1 Provide immediate public access to monthly effluent monitoring reports and enforcement actions for small package systems by posting on agency website. | 1 | DPNR |
| | 2.2 Complete mapping of sanitary sewer and combined network for MLWTP. Collect information on pipe diameter, structural condition, invert elevations, manholes, outfalls, and suspicious discharges. | 2-5 | VIWMA, EPA |
| | 2.3 Conduct inventory of on-site sewage disposal systems (OSDS) including system type and location, maintenance, and feasibility of sewer connection. | 2-5 | DPNR, EPA, local businesses |
| | 2.4 Identify and secure funding to replace failing pipes, disconnect the combined system, and extend sewer service to priority areas. | 5-10+ | VIWMA, EPA, DPNR |
| | 2.5 Develop a subsidy program for sewer service connection or advanced OSDS installation. | 5-10+ | VIWMA, DPNR, EPA |
| #3. Reduce flooding, gut erosion, and water quality impacts through the improved management of stormwater runoff from existing and future developments. | 3.1 Establish pollutant removal, recharge, and channel protection criteria for post-construction stormwater management for new development and redevelopment projects. Investigate new regulatory or policy updates to improve technical review capacity and mechanisms to encourage private properties to retrofit. | 2-5 | DEP, CZM, DPW, VIHA, EPA, NOAA |
| | 3.2 Enforce existing TPDES, Earth Change, and other environmental regulations through stop-work orders and/or mitigation. Clarify the mechanism for stakeholder reporting of observed violations. | 2-5 | DEP, CZM, BP, DPW, FEMA, ACOE |
| | 3.3 Complete mapping of stormwater infrastructure (e.g., catch basins, pipe diameter, invert elevations, culverts, manholes, outfalls, BMPs, and suspected illicit discharges). Coordinate with sewer mapping. | 2-5 | DEP, DPW, VIWMA, EPA |
| | 3.4 Design and implement priority stormwater retrofits and drainage improvements to improve water quality and reduce flooding and erosion problems. | 2-10+ | DPNR, DPW, VIDE, VIHA, NOAA |

| Watershed Recommendation | Strategic Actions | Implement (years from 2013) | Key Partners |
|---|---|---|---|
| #4. Implement non-structural and other pollution prevention measures to minimize exposure of trash, oil, sediment, TBT, and other chemicals to the drainage system. | 4.1 Conduct site inspections at each marina/boatyard facility to document potential sources of TBT, boat fluids, and other contaminants, and to provide technical assistance in the development of a cost-effective and practical pollution prevention plan. | 1-2 | TNC, CZM, business owners, Blue Flag, EPA, NOAA |
| | 4.2 Work with Heavy Materials to develop a plan for reducing sediment, equipment fluids, and wastewater loads from quarry-related activities (e.g., secondary containment at truck filling station, bathrooms for workers). | 1-2 | TNC, DPNR, EPA, business owner |
| | 4.3 Conduct site inspection of Clinton Phipps horse track to document animal waste management procedures and to develop a pollution prevention plan for the facility. | 1-2 | DPNR, EPA, operator |
| | 4.4 Conduct site inspections at each automotive repair business along Turpentine Run Rd. and near Tutu Park Mall to document potential sources of stormwater contamination and to provide technical assistance in the development of a cost-effective and practical pollution prevention plan for each business. | 1-2 | DEP, business owners; EPA |
| | 4.5 Retrofit trash collection/roll-off dumpster stations to provide secondary containment, covered storage, and signage announcing household hazardous waste collection opportunities. | 2-5 | VIWMA, DPW |
| | 4.6 Work through the Inter-Virgin Islands Council to ban TBT used in products in the British Virgin Islands. | 2-5 | TNC, CLCC, business owners |
| **#5**. Protect and restore existing wetland habitats through land conservation, benthic restoration, and gut corridor enhancements. | 5.1 Remove trash and prevent dumping at key locations within the gut corridor. | 1-2 | EAST, VIWMA |
| | 5.2 Enforce *USVI Buffer Protection Regulations* and require mitigation where recent violations occurred. | 1-5 | DPNR |
| | 5.3 Conserve land surrounding priority freshwater and salt ponds (e.g., Herrnhut, Tutu Reservoir, Cabrita Pt.) via conservation easements, land acquisition, or stringent development criteria. | 2-5 | TNC, DFW, CZM, DEP |
| | 5.4 Develop design plans/feasibility studies for Compass Pt. Salt Pond restoration, opening of Mangrove Lagoon false entrance, and removal of contaminated sediments in Benner Bay. | 2-5 | DFW, CZM, UVI, USFWS, ACOE, NOAA |
| | 5.5 Implement priority gut stabilization and buffer restoration projects. | 2-10+ | USDA, DPNR, NOAA |
| **#6**. Develop a unified watershed monitoring program that integrates and tracks various sampling efforts in STEER. | 6.1 Develop a STEER monitoring plan that identifies key elements of known monitoring efforts, information needs and technical gaps, links to regulatory priorities, proposed future monitoring projects, and a data sharing plan. | 1 | UVI, DEP, DFW, VIWMA, EPA, NOAA, USGS |
| | 6.2 Update watershed residents on the status of the Tutu Wellfield Superfund Site cleanup and monitoring efforts. | 1-2 | EPA, DPNR |

| Watershed Recommendation | Strategic Actions | Implement (years from 2013) | Key Partners |
|---|---|---|---|
| | 6.3 Install rain & stream gauges throughout watershed in order to correlate sedimentation with rainfall quantity and intensity. | 1-2 | UVI, DPNR, USGS |
| | 6.4 Provide access on the STEER website to annual monitoring reports, trends analyses, and/or links to data. | 2-5 | TNC, UVI, DPNR, EPA |
| | 6.5 Conduct illicit discharge detection and elimination sampling concurrently with sanitary sewer system mapping efforts. | 2-5 | UVI, VIWMA, EPA, DPNR |
| **#7**. Implement a long-term education plan that provides opportunities for residents and businesses to actively engage in watershed stewardship activities. | 7.1. Engage community centers and homeowners associations in a residential education campaign linking STEER (and human) health with proper maintenance of septic systems, vegetated buffer protection, and household waste disposal. | 1 | EAST, VICCC, DPNR, EPA, VIWMA, VIHA, HOAs |
| | 7.2. Convene boating-related businesses and boaters to investigate benefits of participation in the Blue Flag marina program or other certification program. | 1-2 | TNC, DPNR, Blue Flag, NOAA, site managers |
| | 7.3. Convene resort managers workshop to discuss potential waste disposal, lawn care, visitor education, and stormwater improvements that could be advanced to improve STEER. | 1-2 | TNC, VIHTA, Blue Flag, resort managers |
| | 7.4. Conduct a watershed tour for politicians and commissioners to highlight big ticket items. | 1-2 | DPNR |
| | 7.5. Link recycling efforts to STEER watershed benefits and increase the number of household hazardous waste collection days and/or stations. | 1-2 | VIWMA, VIRG |
| | 7.6. Use demonstration projects (e.g., drainage improvements, storm drain stenciling, trash cleanups, rain gauges) at schools and community centers to educate and engage kids and residents in STEER. | 2-5+ | VIDE, DPNR, EAST, VINE, NOAA, EPA |
| | 7.7. Increase overall awareness of the STEER watershed through storm drain stenciling, watershed radio series, and watershed signage. | 2-5+ | TNC, EAST, UVI, DPNR, DPW |
| | 7.8. Target engineers, designers, contractors, and agency staff with training on implementing stormwater design criteria and green construction techniques. | 2-5+ | DPNR, NOAA, IGBA |
| **#8.** Establish a formal mechanism for implementation oversight. | 8.1 Designate or hire a STEER watershed coordinator. | 1 | DPNR, NOAA, EPA |
| | 8.2 Organize a STEER working group to serve as watershed implementation steering committee. | 1 | DPNR, EPA, TNC, UVI |

# 1. Bovoni Landfill

## Quantify and reduce water quality and wetland impacts on Mangrove Lagoon from the Bovoni Landfill prior to proposed closure in 2021.

### Problem

The Bovoni Landfill is unlined, and over thirty years of subsurface seepage of contaminated leachate is thought to contribute to the observed die-off of adjacent mangroves. Lack of stormwater management controls indicates that rainwater falling on the site becomes contaminated before it drains into Mangrove Lagoon or into the groundwater. The historical expansion of dumping areas in the adjacent wetland has reduced the separation distance between the landfill and the primary fish nursery and the largest remaining mangrove forest in the USVI. Leachate seepage was cited by the USVI District Court as a cause of sediment contamination in Mangrove Lagoon. Air quality and other public health concerns are significant for surrounding residents.

A Consent Decree (CD) between the US Government, the VI Government, VIWMA, and Joseph and Zulma Hodge (owners of Bovoni Tire) was entered by the U.S. District Court for the Virgin Islands in 2012 for: 1) the continued operation of the Bovoni Landfill in a manner that may present *"imminent and substantial endangerment to public health and the environment;" 2)* illegal dumping of scrap tires in the adjacent wetland; and *3)* failure to comply with 1998 and 2008 Administrative Orders on Consent regarding these regulatory violations. The Virgin Islands Port Authority (VIPA) is also a party to the CD for regulatory violations at the Anguilla Landfill. Until closure in 2021, VIWMA has been directed to operate the landfill in accordance with the CD and the federal municipal landfill operating criteria. The CD requires substantial engineering improvements to control stormwater runoff, leachate seepage, and gas collection, as well as:

- Implementation of a groundwater monitoring program;
- Implementation and maintenance of a program for detecting and preventing disposal of regulated hazardous wastes;
- Application of adequate cover material;
- Control of disease vectors;
- Control of explosive gases;
- Prohibition on open burning of solid wastes;
- Control of access to the Landfill;
- Control of stormwater run-off;
- Prevention of discharges of pollutants into waters of United States; and
- Prevention of bulk or non-containerized liquid wastes disposal in landfill.

The CD does not include explicit language regarding the impacts of landfill operations on STEER. A *Wetlands Impact and Compensation Plan* is required for submittal

based on the closure schedule (Table 3); however, other than scrap tire removal, specific measures for the restoration of adjacent wetlands or vegetated buffers are not detailed in the CD.

**Table 3.** Closure Schedule (from CD, Appendix B)

| Phase | Task | Deadline |
|---|---|---|
| -- | Complete temporary road | 4/15/12 |
| | Submit Closure Plan Engineering Report | 5/1/12 |
| | Submit Wetlands Impact Minimization Plan | 5/31/12 |
| | Submit 2012 Closure Plan | 7/15/12 |
| | Submit Wetlands Impact Compensation Plan | 8/31/12 |
| | Complete Subsurface Debris and Earthen Fill Removal | 12/31/12 |
| | Complete Land Acquisition to West (unless not to be used for waste disposal) | 6/30/13 |
| 1 | East – Install storm water detention pond, storm water control | 5/31/14 |
| 1B | East – Complete permanent roadway relocation, leachate interceptor system, sewer force main relocation, | 5/31/14 |
| 2 | North – Complete slope stabilization , detention pond, storm water control | 12/31/14 |
| 3 | West – Complete slope stabilization, detention pond, storm water control | 12/31/14 |
| 4 | Top – Complete fill/grade and storm water control | 1/1/16 |
| 5 | South – Complete slope stabilization and storm water control | 8/31/17 |
| | Permanently cease accepting waste at landfill. | 4/30/19 |
| 6 | East – Complete slope stabilization and storm water control | 8 months after deadline above |
| 7 | Final closure – Complete well field adjustments, closure/fill/grade, impermeable cap & cover over entire filled landfill area | 18 months after Phase 6 deadline |

## Potential Restoration Opportunities

Many of the mitigation requirements for the landfill are in-line with STEER watershed management objectives. VIWMA has indicated that the following mitigation activities are being considered, among others:

- Restoration of a section of white mangrove where previous dumping has occurred;
- Installation of a leachate collection system at the landfill boundary, which may include treatment at the WWTP, relocation of the service road, and additional encroachment into the adjacent wetland;
- Top cover and reshaping of the landfill, which will redirect drainage for a portion of the site out of the STEER watershed and into Bovoni/Stalley Bay;
- Installation of three permanent stormwater detention basins to manage surface runoff after final grading and cover have been completed; and
- Methane gas collection and control system and construction of a gas-to-energy facility (operational).

Closure design plans are currently undergoing revision, but VIWMA anticipates a final plan release at the end of 2013. At this time, details on the proposed control measures and wetland mitigation, if any, will be publicly available. Additional opportunities may exist for mangrove restoration and vegetative buffer enhancements, as well as temporary stormwater control measures in areas where permanent controls are not expected to be installed in the next few years.

## Implementation Actions

Compliance with the CD and closure planning for 2021 will ultimately drive the schedule for implementation of restoration activities. The following actions are recommended for short-term implementation over the next one to two years:

***1.*** *Provide public access to updated information on compliance activities, enforcement actions, and closure plans on federal and/or territorial agency websites.* While EPA confirms that proper public notification procedures were followed prior to issuance of the final CD, many watershed stakeholders were unaware that a public comment period was open and suggested EPA expand its notification effort in the future. In addition, access to related documents (e.g., Administrative Orders, compliance reports, draft closure plans) has been difficult to obtain without formal requests through the Freedom of Information Act. Given the relevance of Bovoni activities on the STEER, US EPA or VIWMA should post relevant documents on their website for easy public download within the year and commit to posting regular compliance updates as well. The CD includes a number of reporting requirements that include quarterly submittals to EPA, which could easily be used to meet this objective.

***2.*** *Conduct groundwater monitoring to quantify the amount, flow rates, and spatial extent of contaminated leachate reaching Mangrove Lagoon.* In 2012, researchers from UVI began applying for grant funding to establish additional groundwater monitoring wells to better characterize leachate impacts. Letters of support and permission to access the site were requested from VIWMA. Since groundwater monitoring and control is a requirement of the CD, collaboration between VIWMA and UVI could be cost effective.

**Black streams of liquefied wastewater sludge dumped at the Bovoni landfill flow directly to Mangrove Lagoon after storm events.**

Over the next two years, UVI and VIWMA should work together to secure funding and initiate monitoring. This information will be important to quantify the impact of the landfill on groundwater and the extent and rate of seepage into the adjacent marine environment. Official wetland delineation has been completed. Results from this effort should help inform wetland restoration planning efforts.

***3.*** *Advance temporary measures to manage and treat stormwater runoff in the short-term where necessary.* The design details for proposed stormwater management practices are unknown, but based on the closure schedule (see Table 3), it appears that a number of detention basins have been proposed for installation. The capacity of these facilities to provide water quality treatment is unknown and will depend on their design and maintenance. The CD requires the immediate control of stormwater on site rather than waiting until final grading and cover have been completed for closure. VIWMA should work with DPNR and EPA to develop and implement temporary stormwater management measures where controls may not be proposed for installation within the next few years. Temporary controls should consist of both structural and non-structural measures, as necessary.

***4.*** *In addition to the scrap tire removal requirements of the CD, develop a plan for restoring the fringing mangrove and enhancing the vegetated wetland buffer, where feasible.* The CD does not specify mangrove restoration requirements other than removal of scrap tires. The CD closure schedule includes submittal of a wetlands impact and compensation plan; however, the proposed contents of this plan have not been widely distributed. Over the next two years, VIWMA should coordinate with DFW, wetland scientists at UVI, and the ACOE to develop a comprehensive wetland restoration plan.

**Cover operations leave acres of exposed soils vulnerable to erosion during rain events, indicating a need for temporary and permanent stormwater control measures to prevent sediment loading to adjacent mangroves.**

This plan should include looking at options for mangrove restoration and/or mitigation at other sites, as well as enhancement of the vegetated wetland buffer. It has been reported that VIWMA is planning on moving an existing road further east towards the mangroves in order to achieve the proper slope for closure. Where further buffer encroachment is anticipated, additional effort should be made to improve vegetation density and prevent direct discharges of stormwater and leachate. Fencing or other barriers to public access may be necessary to restrict illegal dumping activities and promote vegetative regeneration. Increased buffer widths should be proposed for other portions of the property or elsewhere in Mangrove Lagoon, wherever feasible.

Investigate funding opportunities for restoration planning and implementation through the NOAA Restoration Center, NFWF, or USFWS.

***5.*** *Design and implementation of a leachate control system (i.e., pumping or perimeter interceptor prior to treatment).* Typically, two alternatives for implementing gas and leachate collection systems include: 1) the installation of drilled wells for both gas and leachate extraction; or (2) separate collection systems where wells are used for gas extraction and collection, and a gravity, perimeter trench system directs leachate to a treatment facility. A combined system may be the most cost-effective alternative; depending on how the existing gas collection system was designed. The closure schedule in the CD indicates that the leachate control system should be installed in 2014.

**The cause of dead vegetation observed in the wetlands adjacent to the landfill should be investigated to determine if restoration activities can successfully restore this habitat.**

# 2. Wastewater

**Reduce nutrient and pathogen loading to STEER through improvements to sanitary sewer infrastructure and by addressing inadequacies of privately-operated systems.**

## Problem

The source of water quality impairments in four STEER waterbodies is cited by DPNR as being related to overflows from the combined sanitary sewer network into guts in the headwaters of the watershed, as well as direct discharges into STEER from small package plants and vessels.

The Mangrove Lagoon Wastewater Treatment Plant (MLWTP) was constructed in 2002 to replace four smaller treatment systems in the upper watershed—Old Tutu, New Tutu, Donoe, and Nadir. It was designed to handle 0.75 MGD with a 1.2 MGD capacity, and discharges offshore to the west of the Bovoni Landfill. It serves a population of approximately 13,500 persons (Cadmus, 2011) over roughly 20% of the STEER watershed area. The MLWTP accepts septic system pumpout loads by private companies at a smaller, adjacent facility and has recently begun accepting marine vessel pumpout from one entrepreneur on a limited scale.

This improved sewage treatment was the primary recommendation of the Benner Bay/Mangrove Lagoon dissolved oxygen and bacteria TMDLs, which assumed that upgrades to an advanced wastewater facility would significantly reduce water quality impairments in Benner Bay and Mangrove Lagoon. However, conversion of the system did not include replacement of the extensive pipe network throughout Anna's Retreat or the New Tutu Valley. The majority of these pipes were installed in the 1960s and have far exceeded their life expectancy. According to VIWMA, breaks in the system are frequent, manholes and joints are leaky, sewer overflows are common, and there is a significant amount of inflow and infiltration occurring (>30%). Portions of the service area are a combined storm and sewer system, but complete mapping of the sewer system is not available and no active program to eliminate sewage discharges into the stormwater system exists (although these measures are reportedly underway). Because much of the pipe network is behind homes and in heavily vegetated areas, maintenance access is reportedly difficult.

To compound the wastewater problem, approximately 40% of the watershed still relies on conventional on-site disposal systems (OSDS) to manage wastewater. Most of these systems (80%) are located on poor soils where there is a medium to high likelihood of OSDS failure. An inventory of

septic systems has not been conducted; thus, little is known about the condition of these systems or the feasibility and cost of sewer hookups.

In addition, a number of resorts/condos and commercial properties operate small package plants. Managers routinely monitor effluent concentrations and submit reports to DPNR as required; however, information on the capacity, effectiveness, or maintenance of these systems is not easily accessible.

Preliminary mapping of the wastewater system in the STEER watershed was presented in the ***2013 STEER Watershed Existing Conditions Report***.

### Potential Restoration Opportunities

A number of potential projects were identified by VIWMA, stakeholders, and field crews related to reducing the impact of wastewater on STEER. These include:

- Future extension of sewer service along Route 38 to bring Cost-U-Less, Ft. Mylner Plaza, and other businesses or residences on-line (e.g., Whispering Hills development). The installation of a pump station near Tropical Marine and trunk line extension further east on Bovoni Rd. would allow the marinas/boatyards and residential areas in Frydenhoj/Compass Pt. subwatershed to connect (see map **Appendix B**).
- Replacement of failing pipes, repair of leaky connections, and disconnection from the stormwater system in Anna's Retreat and New Tutu Valley (specific locations not identified).
- Investigation and replacement of on-site systems that are suspected of failure, or illegal discharge of raw sewage (see **Table 4**).

**Blue shaded areas represent approximate sewer service areas, where yellow lines approximate the main trunk lines. Dashed blue lines are proposed areas of service expansion. Green markers and purple shaded areas show locations of privately owned package systems. The remaining areas rely on septic systems.**

- Installation of an alternative OSDS for demonstration purposes at a willing residence on Water Pt.
- Tracking and reporting of effluent monitoring results and maintenance logs at 11 small package plants (see **Table 4**).
- Continued support of vessel pumpout options and enforcement of illegal discharges.

**Table 4.** Sites for Wastewater Investigations

| Type | Site ID* | Name |
|---|---|---|
| Sewage discharge investigation and elimination and/or structural improvement | BV-5 | Premier Wines and Spirits |
| | BV-10 | Lew Henley's |
| | BV-12 | Sweet Pie's/Laundry |
| | TR-8 | Grandview Apartments |
| | TR-38 | Heavy Materials |
| | NG-5 | The Patch |
| | FC-2 | Food Center |
| | FC-8 | Compass Pt. Marina |
| Tracking of system effluent concentrations and maintenance | TR-3 | Humane Society |
| | TR-5 | Cost-U-Less |
| | TR-31 | Ft. Mylner Plaza |
| | FC-4 | Independent Boat Yard/ Budget Marine |
| | FC-8 | Compass Pt. Marina |
| | NZ-3 | Secret Harbor Condos |
| | CB-1/2 | Anchorage Resort/ Yacht Club |
| | CB-3 | Cowpet Bay West |
| | CB-4/5 | Elysian/ Cowpet Bay East |
| | GB-2 | Ritz Carlton |

* Site ID includes abreviated subwatershed name. See Appendix for location map and site description.

## Implementation Actions

Wastewater system expansions and pipe replacements are a long-term capital effort that will require upfront mapping, design, and permitting in order to secure the funds necessary for implementation. The following early action is recommended for short-term implementation over the next year:

***1.*** *Provide immediate public access to monthly effluent monitoring reports and enforcement actions for small package systems by posting on agency website.* This is not intended to put an additional burden on facility managers, since they are already monitoring and submitting reports in compliance with discharge permits. To make better use of these reports and to improve our understanding of the effectiveness of these technologies in reducing impacts on STEER, DPNR or EPA should provide access to these reports by posting them on a website for easy download. DPNR should produce and make publicly available an annual report summarizing system capacity, average effluent concentrations and standards, number of water quality violations, and general maintenance or enforcement actions of all permitted systems.

The following actions are recommended for mid-term implementation over the next two to five years:

***2.*** *Complete mapping of the sanitary (and combined) sewer network for MLWTP. Collect information on pipe diameter, structural condition, invert elevations, manholes, outfalls, and suspected illicit discharges.* EPA and VIWMA reportedly have agreed to develop a comprehensive program to investigate, map and repair the collection system. EPA reports that the agreement is in a Court Order that should be signed by the District Judge in the very

near future. According to local engineers and VIWMA staff, some progress on mapping has been initiated. VIWMA should elevate completion of system mapping to a high priority over the next two years. Customers should be notified of the effort in advance to improve access in residential areas. Ideally, as much information should be collected on the system as possible so priorities can be set and costs estimated for maintenance, repair, and replacement of infrastructure.

***3.*** *Conduct inventory of on-site sewage disposal systems (OSDS) including system type and location, maintenance, and feasibility of sewer connection.* Over the next two years, DPNR and EPA should conduct a septic system inventory to verify the location, type, and condition of existing OSDS in the watershed. Coordinate this effort with local businesses that provide pump outs and system maintenance. Inventory crews should provide owners with educational brochures on proper maintenance, system replacement options, and information on sewer connection. This information could help determine priorities for sewer service expansion or direct pilot incentive programs for maintenance or system replacement.

In the long-term (5 to 10 years and beyond), VIWMA, DPNR, and EPA should make strides towards implementing the following:

***4.*** *Identify and secure funding to replace failing pipes, disconnect the combined system, and extend sewer service to priority areas.* While VIWMA receives approximately $2-4 million per year in grant monies to address sewer system problems across all three islands, additional sources of funding will likely be necessary to fully address the MLWTP system. EPA reports that repairs of some of these sewer lines

**Effluent from small package systems was cited by DPNR as a source of water quality impairment for Cowpet Bay. There are at least nine of these systems and two advanced OSDS in the watershed to track.**

are included in an Order soon to be signed with VIWMA. Through the EPA grants program, some of these repairs are already being funded. Service expansion and pipe replacement should be put on the priority list for Capital Improvements as soon as possible in order to be eligible for funding in the next 5-10 years. The sooner mapping is completed and infrastructure priorities determined, cost estimations can be made. Because this infrastructure improvement can be directly tied to federal water quality impairments, there may be additional sources of funding available for this work (e.g., Department of Interior).

As part of sewer service expansion efforts, additional technical and financial assistance should be devoted to addressing issues associated with the MLWTP capacity to accept vessel pump outs. Vessel waste water is high in salinity and often mixed with oil and gas, which is harmful to the bacteria used in the treatment process. VIWMA should work closely with EPA, the boating community, and other experts to address this capacity problem.

***5.*** *Develop a subsidy or incentive program for sewer service connection or advanced OSDS installation.* Pilot programs have been used in other US jurisdictions to incentivize maintenance, upgrades, and sewer connection through partial subsidies to homeowners and businesses. VIWMA and DPNR should brainstorm how a program like this could be established in the USVI, and target a residential area where soils are poor and OSDS failure was highest based on findings from the septic system inventory. EPA is involved in supporting alternative septic system installations in Puerto Rico and may be a funding option.

**Deteriorating on-site sewage systems and evidence of recent wastewater discharges to guts were observed at multiple locations in the watershed.**

Between the restrooms and Benner Bay is the onsite wastewater system at "the Patch." The access manhole for this OSDS is less than 15 ft from the water's edge, leaving little distance for groundwater

Manholes in the newly installed Grandview sanitary sewer line lack covers. This creates a public safety hazard and exposes the system to additional volume during rain events.

# 3. Stormwater

**Reduce flooding, gut erosion, and water quality impacts through the improved management of stormwater runoff from existing and future development.**

## Problem

When it rains on the STEER watershed, trash, sediment, and other pollutants (e.g., oils, brake fluid, fertilizer) that have collected on roads, parking lots, and other impervious surfaces is washed off into the drainage system. Either through a network of storm drains and underground pipes—or by direct discharge—contaminated runoff finds its way to guts, ponds, or the bay. Once vegetation is removed during the development process, exposed soils are subject to erosion, and rainfall is no longer absorbed by trees or allowed to seep into the ground. Over 20% of the watershed is impervious cover, which generates large volumes of surface runoff that can lead to flooding problems, gut erosion, and warmer temperatures of receiving waterbodies.

Approximately 60% of the watershed drains to Turpentine Run and ultimately into Mangrove Lagoon. This means that used oil dripped on roads from home car repair in Anna's Retreat, soapy water from car washes near Tutu Park mall, eroded sediment from Grandview construction, and human and animal waste deposited near the gut are carried into Mangrove Lagoon.

The source of water quality impairments in five STEER waterbodies is cited by DPNR as urban runoff and erosion and sediment. This should not be surprising given that watersheds with as little as 10% impervious cover generally exhibit water quality, biological, and hydrologic impacts.

A number of techniques are used to reduce the impacts of urban stormwater:

- Avoidance—minimizing the clearing of native vegetation, loss of top soil, and creation of impervious cover is the best way to reduce the amount of stormwater runoff generated in the first place.
- Erosion and sediment control (ESC)—temporary ESC measures during construction can help to stabilize exposed soils and prevent muddy runoff.
- Post-construction stormwater management—apply practices that capture runoff and either reuse it, allow for evapotranspiration by plants and the sun, or infiltrate it into the ground to reduce the volume of surface runoff leaving a site. Another option is to filter pollutants out of runoff before discharging it, or at a minimum, slow it down long enough to prevent downstream erosion and flooding. Cisterns and detention ponds are the primary practices used in the USVI.

**The oil stains seen here are one of a number of pollutants collecting on impervious surfaces throughout the watershed that are washed into Turpentine Run and discharged into Mangrove Lagoon when it rains.**

**Discharge pipes visible on the beach drain parking lots, roads, and other developed areas in the watershed. In most cases throughout STEER, this runoff is not cleaned prior to discharge.**

**Two examples of existing stormwater management facilities are the dry detention basins at Cost-U-less and the wet basin at the Ritz Carlton.**

Unfortunately—with the exception of cisterns and a handful of detention basins—most of the existing development in the STEER watershed is not managed for stormwater. Cisterns intercept rooftop runoff for water reuse in most houses and businesses. This helps reduce the amount of rooftop runoff that then flows across more polluted surfaces like parking lots. The number and capacity of cisterns in use in the STEER watershed is unknown, and estimates on their overall contribution to stormwater management has not been measured. Cisterns are generally required in the USVI, however, the disconnection of existing cisterns and new construction lacking cisterns has been observed (including some public housing projects, for example). Reduction in the use of cisterns runs contrary to stormwater management objectives.

For the management of non-roof impervious cover, there are only six stormwater detention basins in the watershed that collectively manage less than 30 impervious acres (e.g., Tutu Park Mall, Ritz Carlton, Cost-U-less, PriceSmart, Home Depot, and Raphune Vista). In general, these facilities tend to manage only a portion of the site, are not designed to effectively remove pollutants, and may have originally been natural wetlands. Some appear non-functional.

More disconcerting, some new development projects appear to lack post-construction stormwater management all together. Numerous active construction sites were observed during field assessments where temporary and permanent stormwater controls were inadequate or absent. For example, Grandview, a 6-acre publicly-financed apartment complex, lacks comprehensive ESC practices, and appears to discharge unmanaged stormwater from parking areas and roadways directly to the gut. Where practical, public construction projects should demonstrate the application of preferred design and construction techniques, serving as a model for private sector construction.

Another example includes three newly-constructed parking lots built without any stormwater management practices—one parking lot was constructed in a gut and none had required permit information posted.

Each of these examples represents a "lost opportunity" during the review and inspection phase of development to address stormwater and hold developers to the same standards expected in other parts of the US.

As stormwater from unmanaged development increases, downstream culverts must pass higher volumes of flow than they were initially designed for. This is no more evident than at the three culverts along Turpentine Run Rd. At the lowermost culvert, hillside development in Mariendahl adds uncontrolled runoff volumes to an already swelling Turpentine Run causing chronic flooding, road deterioration, and gut erosion problems at the culvert.

DEP is the delegated authority for administering the Territorial Pollution Discharge Elimination Program (TPDES), and EPA is responsible for ensuring that the program is in compliance with approved measures of the territorial discharge permit. The Division of Building Permits oversees the Earth Change

Program for construction activities. The permitting and review process for development projects differs depending where the site is located in the island's two-tier system. CZM and DEP are responsible for processing Tier I and Tier II projects, respectively, which leads to differing levels of oversight and enforcement. In many cases, additional environmental protection permits are also required related to endangered species or ACOE wetland jurisdictions.

Currently, there are no post-construction stormwater design standards in the USVI that state how much runoff must be managed on site or criteria for pollutant removal, recharge, volume reduction, or channel protection. The *2002 Environmental Protection Handbook* provides some recommended guidance for site design and stormwater BMPs, but this manual is not mandatory and does not necessarily reflect modern stormwater designs for a changing climate. The DPW has established road design standards as a matter of policy, but there are currently no design requirements mandated by the regulations. The *2001 Hydrologic Design of Highway Culverts* by US Department of Transportation and the Federal Highway Administration is a reference guide used by DPW and DPNR staff. IGBA and NOAA also provide design and construction guidance for "green building" in the USVI.

**Grandview uses erosion control blankets and riprap to stabilize some slopes, but there remain acres of exposed soils and failing perimeter silt fencing that result in sedimentation downstream.**

**Outfalls discharge stormwater from Grandview roads and parking lots directly to the gut without any form of water quality treatment or flow detention.**

The lack of regulatory stormwater standards and clear design guidance is a critical gap in the USVI's capacity to protect natural resources from the impacts of development.

### Potential Restoration Opportunities

**Table 5** summarizes potential stormwater improvement projects that were identified during field assessments. **Appendix A** provides more information on each of these sites and an initial feasibility ranking of high, medium, and low. **Appendix B** and **C** show the locations and provide notes and sketches of proposed activities, respectively. The projects include:

- Seven sites where enforcement of stormwater regulations is recommended. This includes sites currently under construction; where stormwater infrastructure raises safety concerns; and where a review of proposed drainage plans should be conducted to ensure stormwater management is adequate.
- The installation of additional ESC measures at six sites specifically to prevent sediment loading from exposed soils and unpaved roads. ESC may also be needed on other sites listed elsewhere in **Table 5**.
- Specific locations where culvert repair and/or replacement is recommended to reduce flooding on roads and protect stream beds from erosion.
- Stormwater retrofits to manage existing runoff on 48 public and private properties. This includes the potential retrofit of existing detention basins to improve water quality treatment.
- Four proposed locations where opportunities exist on undeveloped parcels for stormwater retrofits that can manage runoff from multiple locations. These locations may be priorities for acquiring drainage easements or purchasing land.

### Implementation Actions

Given the total number of projects that would need to be implemented to show measurable downstream results, improved stormwater management at a watershed scale can be expensive and challenging. At a minimum, efforts should be made to prevent new development from further contributing to the problem. Likewise, opportunities to improve conditions during redevelopment and repair activities should be aggressively seized.

The following actions are recommended for mid-term implementation over the next two to five years:

*1. Establish pollutant removal, recharge, and channel protection criteria for post-construction stormwater management for new development and redevelopment projects. Investigate new regulatory or policy updates to improve technical review capacity and mechanisms to encourage private properties to retrofit.* Agency staff and local stakeholders have been aware of the need for better stormwater regulations for some time. NOAA and EPA have been working on funding to support revisions to the *Environmental Handbook* that would provide an opportunity for engineers, environmental groups, and agencies to reach consensus on post-construction stormwater performance standards and design criteria that are practical for the USVI.

**Table 5**. Sites for Stormwater Improvement

| Type | Site ID* | Name |
|---|---|---|
| Enforcement or stormwater design review activities | TR-4 | Whispering Hills |
| | TR-8 | Grandview Apartments |
| | TR-16 | New parking lot in gut behind Curriculum Center |
| | TR-20 | Four Winds Plaza |
| | FC-9 | New parking lots |
| | NZ-1 | Dolphin Cove |
| | NZ-2 | Secret Harbor Estates |
| Erosion and Sediment Control | TR-1 | Flag Hill/Signal Hill Rd. |
| | TR-38 | Heavy Materials** |
| | TR-41 | Equipment storage area |
| | TR-43 | Cheyenne's Excavating |
| | TR-45 | Old truck disposal area |
| | NG-4 | Tropical Marine |
| Culvert Replacements | TR-35 | Turpentine Run Rd. Culvert (upper) |
| | TR-37 | Turpentine Run Rd. Culvert (Mid) |
| | TR-40 | Mariendahl/ Turpentine Rd. Culvert (lower) |
| | NG-2 | Gold Hill & Elm Rds. |
| | FC-2 | Food Center |
| | FC-5 | Fryd. gut/Rt 32 culvert |
| Post-construction Stormwater Retrofits (public property) | BV-1 | BCB School** |
| | BV-2 | Thomasville Cooperative |
| | BV-4 | Bovoni Projects |
| | BV-14 | Bovoni Landfill |
| | BV-15 | Mangrove Lagoon WTP |
| | TR-9 | Alvin MacBean Rec. Center |
| | TR-10 | DPW land across from Alvin MacBean |
| | TR-12 | Anna's Retreat Community Center |
| | TR-14 | Tutu I High Rise/Gut Confluence |
| | TR-15 | Joseph A Gomez Elementary School |
| | TR-17 | Fire Station |
| | TR-18 | VI Housing Authority |
| | TR-30 | Edith Williams Alternative Academy |
| | TR-33 | EB Oliver Elementary School |
| Post-construction Retrofits (cont.) | TR-34 | Willy George Community Center |
| | TR-44 | Nadir Bridge Park |
| | NG-3 | Nadir Ball Park |
| Post-construction Stormwater Retrofits (private property) | BV-7 | Texaco |
| | BV-9 | Bovoni Center Storage |
| | BV-11 | Gas Station |
| | TR-2 | 7th Day Adventist Church |
| | TR-5 | Cost-U-Less** |
| | TR-6 | Home Depot** |
| | TR-7 | Raphune Vista** |
| | TR-13 | Faith Christian Fellowship Church/ School |
| | TR-19 | Holy Family Church |
| | TR-20 | Four Winds Plaza |
| | TR-21 | Tutu Park Mall** |
| | TR-22 | Merchants Com.Bank |
| | TR-23 | Lutheran Church |
| | TR-24 | Innovation Parking Lot |
| | TR-26 | Mr. Rodriguez Auto Body/ Total Gas |
| | TR-27 | First Bank |
| | TR-28 | Church Schools |
| | TR-32 | Price Smart** |
| | TR-47 | Clinton Phipps Racetrack |
| | TR-51 | Behind old humane society |
| | NG-5 | The Patch |
| | FC-2 | Food Center |
| | FC-3 | East End boat yard |
| | FC-4 | Independent Boat Yard/ Budget Marine** |
| | FC-8 | Compass Pt. Marina |
| | NZ-3 | Secret Harbor Condos |
| | CB-1 | Anchorage Resort |
| | CB-2 | Yacht Club |
| | CB-4 | Elysian |
| | CB-5 | Cowpet Bay East |
| | GB-2 | Ritz Carlton** |
| Easements/ land acquisition targets for stormwater | BV-3 | Wooded area below BV-2 |
| | BV-8 | Luton Storage Area |
| | TR-31 | Smith Bay Rd./ Ft. Mylner Plaza |
| | TR-46 | Lima Property |

* Site ID includes abreviated subwatershed name. See Appendix for location map and description.

**Sites with existing stormwater facilities.

These standards, for example, would outline how much rainfall needs to be managed at a site for given return intervals; pollutant removal targets; infiltration requirements; and practice sizing calculation methods and design criteria needed to meet performance standards. Adopting clear standards will help engineers design better stormwater facilities; provide consistent guidance to reviewers on how to evaluate proposed projects; and incentivize site design techniques that minimize the amount of stormwater generated on site to begin with. DEP should be the lead on developing stormwater criteria, with extensive participation by knowledgeable CZM and DPW staff. VIHA also should be included in the effort, given their involvement in the development and financing of new public housing projects.

In addition DEP and EPA should consider alternatives for expanding technical review capacity and encourage private properties to retrofit, such as:

- Provisions to allow third-party peer reviews of proposed plans at a cost to the Applicant. This practice helps supplement overburdened agency staff, while educating all parties on how to best apply stormwater management requirements on individual sites.
- Expanded EPA involvement to provide additional technical assistance for stormwater reviews and site inspections.
- Issue retro-active permits requiring private properties with unmanaged impervious cover (e.g., >1 acre) to retrofit where necessary to meet water quality standards. This is being done in New England by EPA Region 1; perhaps there is some adaptation of this approach that could be used to engage private properties in the USVI in stormwater retrofitting.

***2.*** *Enforce existing TPDES, Earth Change, and other environmental regulations through stop-work orders and/or mitigation. Clarify mechanism for stakeholder reporting of observed violations.* Consistent enforcement of environmental regulations during permitting and construction is critical. DEP, DEE, CZM, BP, DPW, and EPA should reach agreement on how to improve enforcement of existing regulations, particularly as relates to increased inspection frequency and meaningful mitigation penalties. Otherwise, DPNR and EPA may leave themselves vulnerable to actions for failure to enforce stormwater discharge provisions of the federal Clean Water Act and associated Territorial laws. Where FEMA, ACOE, and USFWS are involved in development projects additional enforcement support may be avialable.

***3.*** *Complete mapping of stormwater infrastructure (e.g., catch basins, pipe diameter, invert elevations, culverts, manholes, outfalls, BMPs, and suspected illicit discharges).* DEP and DPW should work with VIWMA and EPA to map stormwater infrastructure in coordination with current sanitary sewer mapping efforts. Each agency has internal knowledge of where existing BMPs, drainpipes, outfalls and culverts are located, but information sharing is limited. Departmental tracking of the maintenance and condition of existing facilities should be a long-term stormwater program goal.

Over the long-term (10 years+), DPNR, DPW, VIDE, and VIHA should coordinate with appropriate federal partners to:

***4.*** *Design and implement priority stormwater retrofits and drainage improvements to improve water quality and reduce flooding and erosion problems.* The list of opportunities provided herein is not exclusive and lacks design detail. A review of the list will show that there are a significant number of opportunities on publicly-owned properties (e.g., schools, public housing sites, parks, and road rights-of-way). If there are sites of interest, further investigation of those sites is recommended in order to develop a design plan sufficient to determine feasibility, cost, pollutant load reduction estimates, and permitting requirements. Having design plans already prepared can come in handy as grant funding becomes available for implementation of shovel-ready projects.

EPA's 319 program and capital improvement grants, CZM funds, NFWF, FEMA, USFWS, and NOAA are potential sources of future grant funding for urban stormwater retrofitting, particularly where impaired waters, sensitive habitats, or flooding issues are involved. Where retrofits can be associated with road runoff or culvert replacement, the Department of Transportation may offer funding.

Applicants and reviewers should keep retrofitting opportunities in mind as new permit requests for redevelopment or repair are made at individual, private sites.

**Retrofitting can help improve existing conditions. An easy fix at Home Depot is to block this inlet and allow parking lot runoff to flow into landscaping via curb cuts, allowing for plant uptake, infiltration, and filtering.**

# 4. Pollution Prevention

## Implement pollution prevention measures to minimize exposure of trash, oil, sediment, TBT, and other chemicals to the drainage system.

### Problem

No drive through the STEER watershed is complete without observations of scattered solid waste and debris, leaky grease traps, and the outdoor storage of unidentified liquids just waiting for the next rain event to make their way into Turpentine Run. Fortunately, pollution prevention is one of the most proactive and cost-effective ways of improving water quality. Pollution prevention requires: 1) identifying pollutants on a site with a high potential of coming into contact with stormwater; and 2) changing behaviors or implementing simple solutions to prevent that exposure. Examples include dumping wash water down the sink instead of into the gutter on the road, covering dumpsters and outdoor storage areas, storing buckets of oil or other fluids within a secondary containment unit, and moving operations away from guts and storm drain inlets.

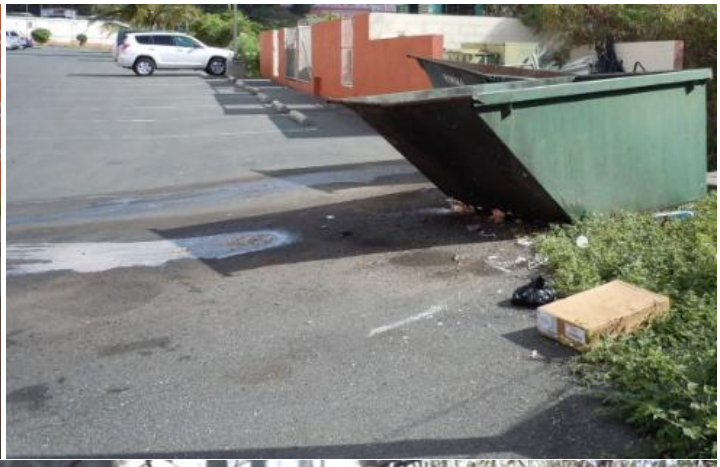
Pollution prevention can be done on any property, though commercial and industrial "hotspots" tend to generate the highest concentrations of some pollutants. In the STEER watershed, there are a few key commercial activities where an emphasis on pollution prevention is recommended: quarry operations, car-related businesses, marinas and boat repair yards, resorts/condos, and the horse track. Trash collection stations are a highly visible site where pollution prevention measures can be implemented. VIWMA can play a significant role in not only spreading the word about pollution prevention, but also by providing watershed residents and businesses with options for disposing of solid waste and collection of hazardous materials often.

### Potential Restoration Opportunities

A number of specific sites were identified during field assessments where opportunities for pollution prevention measures were observed. **Table 6** divides sites up into the following general categories, recognizing that a wider range of opportunities may exist at many of these sites:

- Improved dumpster management and outdoor storage—these sites offer opportunities to cover or relocate dumpsters and to provide secondary containment for hazardous materials or other pollutants. Covers reduce the amount of direct rainfall onto materials and secondary containment provides a barrier to leaking containers. Placing materials in a shed, elevating them or moving them away from drains are relatively inexpensive solutions.

Overflowing buckets of used oil were found along the gut at locations where easy access allows for dumping and the abandonment of vehicular equipment.



Unused cistern overflows, mop bucket waste, and dumpster juice at this site drain across the parking lot carrying pollutants into the storm drain system and discharging them downstream even when it is not

- Collection and disposal of fluids from vehicle maintenance activities—whether at car repair shops, fleet storage areas, or at home, some options include: providing a designated location for all repair work where fluids can be drained and properly disposed; cleaning up spills; and disconnecting floor drains from the stormwater system.
- Structural maintenance—includes paying attention to the chemicals and procedures used for cleaning buildings, resurfacing roads and parking lots, and general repair.
- Disposal of wash water—generally related to the best procedures for disposing of dirty mop buckets and the selection of cleaning products used. Commercial car washes should not discharge to the storm drain system without some form of advanced treatment or they should be connected to the sanitary sewer system).
- Boating-related practices—a variety of industry-specific practices that could help reduce impact of boat repair and maintenance operations on water quality, such as designated areas for changing hydrologic fluids and disposing of used oil and filters; vacuums, ground tarps, and covers for paint stripping areas; and absorbent pads and booms for spill cleanup/response.
- Proper landscape management—limited application of fertilizers, spray irrigation, pesticides, or other chemicals to turf and landscaping, as well as targeted irrigation can help prevent pollution (not included in Table 6).

**Table 6.** Sites for Pollution Prevention Actvities

| Type | Site ID* | Name |
|---|---|---|
| Dumpster management and outdoor material storage | BV-1 | BCB School |
| | BV-4 | Bovoni Projects |
| | BV-11 | Gas Station |
| | BV-13 | Unregulated Dumping Site |
| | BV-14 | Bovoni Landfill |
| | TR-24 | Innovation Parking Lot |
| | TR-41 | Equipment storage area |
| | TR-42 | Dumpsters/ collection station |
| | TR-43 | Cheyenne's Excavating |
| | TR-45 | Old truck disposal area |
| | TR-48 | Trash collection station |
| Vehicle maintenance | BV-2 | Thomasville Cooperative |
| | BV-9 | Bovoni Center Storage |
| | TR-18 | VI Housing Authority |
| | TR-24 | Innovation Parking Lot |
| | TR-25 | Auto/tire hotspot |
| | TR-26 | Mr. Rodriguez Auto Body/ Total Gas |
| | TR-36 | Auto Salvage Yard |
| | TR-39 | The Best Tires |
| | CB-3 | Cowpet Bay West |
| Structural maintenance | GB-1 | Water Point |
| Proper disposal of wash water and other | BV-6 | Bulk Storage |
| | BV-10 | Lew Henley's |
| | BV-12 | Sweet Pie's/Laundromat |
| | TR-5 | Cost-U-Less |
| | TR-20 | Four Winds Plaza |
| | TR-38 | Heavy Materials |
| | TR-39 | Best Car Wash |
| | TR-47 | Clinton Phipps Racetrack |
| Boating-related practices | TR-50 | Derelict Vessels |
| | NG-4 | Tropical Marine |
| | NG-5 | The Patch |
| | FC-1 | Saga Haven Marina |
| | FC-3 | East End Boat Park |
| | FC-4 | Independent/Budget Mar. |
| | FC-8 | Compass Pt. Marina |

* Site ID includes abreviated subwatershed name. See Appendix for location map and description.

### Implementation Actions

Once aware of the issues, owners and operators should have the most knowledge of their on-site materials and procedures that may inadvertently lead to contaminated runoff. They are ultimately responsible for the implementation of voluntary and regulated pollution prevention measures on their properties.

Therefore, in the short-term, we recommend that TNC and DPNR's Small Business Environmental Assistance Program coordinate on providing technical support and/or training for willing business owners in the development of pollution prevention plans specific to their property. DPNR could also assist by providing adaptable, industry-specific pollution prevention plan template that prompts businesses to evaluate and address common issues. Many of these efforts will be linked with education priorities as well.

Over the next two years, this could include the following actions:

***1.*** *Conduct site inspections at each marina/boatyard facility to document potential sources of TBT, boat fluids, and other contaminants, and to provide technical assistance in the development of a cost-effective and practical pollution prevention plan.* We recommend starting with the key properties including Independent Boatyard (which will also provide ideas for potential solutions), Compass Pt., East End, and the Patch. DPNR, EPA, and the Blue Flag program coordinator in USVI could provide technical assistance. Crown Bay Marina on STT is a member of the Blue Flag marina program, and may be able to offer some technical advice on assessment and planning. NOAA's Clean Marina Program also has assessment checklists that could be used. The Coast Guard may also be able to provide technical assistance.

**Tarps used below lifts where hydrologic fluids are being changed is an example of a simple, non-structural practice that can be implemented at little cost.**

***2.*** *Work with Heavy Materials to reduce sediment, equipment fluids, and wastewater loads from quarry-related activities (e.g., secondary containment at truck filling and wash stations, bathrooms for workers).* TNC has already been in contact with managers regarding potential restoration activities. Start by reviewing copies of the original pollution prevention plan submitted under the approved, TPDES industrial discharge permit for the site.

***3.*** *Conduct site inspection of Clinton Phipps horse track to document animal waste management procedures and to develop a pollution prevention plan for the facility.* This location houses a dozen horses at any given time. Investigate the procedures for handling horse waste, as well as the solid waste generated by large crowds to determine if pollution prevention options are available.

***4.*** *Conduct site inspections at each automotive repair businesses along Turpentine Run Rd. and near Tutu Park Mall to document potential sources of stormwater contamination and to provide technical assistance in the development of a cost-effective and practical pollution prevention plan for each business.* Given time constraints, many of these individual sites were not investigated during field assessments.

The remaining actions are proposed for mid-term implementation over the next 2-5 years.

***5.*** *Retrofit trash collection/roll-off dumpster stations to provide secondary containment, covered storage, and signage announcing household hazardous waste collection opportunities.* There are a number of locations where roll-off dumpsters are located adjacent to wetlands. These dumpster are uncovered, and trash often overflows or is blown into adjacent wetlands. VIWMA and DPW (where appropriate) should investigate options for installing covered areas with fencing or other containment design. These sites are frequently visited by watershed residents and would be good locations to publicize recycling programs and household hazardous waste collection opportunities.

***6.*** *Work through the Inter-Virgin Islands Council to ban TBT used in products in the British Virgin Islands.* With the weight of compelling evidence provided by the sediment contaminants monitoring study, boating supply and repair businesses, TNC, CLCC, and boaters in STEER should work with DPNR to raise the issue of TBT to the Governor's office and formally petition the British Virgin Islands to stop the sale of products with TBT and identify preferred paint alternatives.

# 5. Wetland Habitats

## Protect and restore existing wetland habitats through land conservation, benthic restoration, and gut corridor enhancements.

### Problem

The mangroves in STEER represent the largest remaining mangrove forest in the USVI. Sediment and biological sampling of the benthic community has shown that this ecosystem has been measurably impacted by land-based sources of pollution. Many of the remaining salt and freshwater ponds have reduced capacity and other water quality problems due to stormwater contributions. The fringing mangroves of these systems, as well as the terrestrial vegetated buffers, have been encroached upon by development and illegal dumping activities.

Turpentine Run, while not the only gut in the STEER watershed, is the largest and the only with perennial flow. It displays typical characteristics of an urban stream corridor impacted by changes in water quality, morphology, and hydrology. Given the paucity of information on the ecology of guts in the USVI, the consequences of in-stream habitat degradation on intermittent and perennial guts is not well known. Conversely, the capacity of guts to transport harmful sediment and pollutants to ponds and nearshore waters is much better documented.

The *USVI Buffer Protection Regulations* require a minimum 25-30 ft undisturbed vegetated buffer from the edge or center, respectively, of guts. This requirement is intended to protect property and structures from flooding issues by requiring a minimal setback, but it is also intended to maintain a vegetated gut corridor important for wildlife. Adherence to this requirement is not regularly enforced. In fact, recent construction of a parking lot in the gut was observed behind the Curriculum Center and Fire station during the watershed assessment. This project involved relocating the gut and installing weir barriers within the channel.

DFW, UVI, and others have inventoried the wetland habitats of the USVI and identified priorities for wetland protection and restoration. Some of the following key management recommendations from the *2005 USVI Marine Resources and Fisheries Strategic Plan, 2006 Draft Wetlands Conservation Plan*, and *2008 Strategy for Management of Ghuts in the USVI* include:

- Mangrove Lagoon/Benner Bay; Compass Pt. and Cabrita Pt. salt ponds; a fresh pond at the Humane Society and Hernhutt; and the Tutu Reservoir are priorities for conservation;
- Turpentine Run and Nadir guts are of significant interest for research and restoration;
- Restoration of pond functionality may involve dredging, but should also

include mangrove restoration, buffer enhancements, and improved recreational access;
- Addressing land-based sources of pollution in the watershed areas draining to each wetland and gut is necessary, particularly wastewater and stormwater discharges;
- Removing derelict vessels and wastewater discharges from boats; and
- Reduced lighting around ponds.

These habitats not only have a value for wildlife, but also provide recreational and historical interests for East End residents.

### Potential Restoration Opportunities

A number of specific sites were identified by DFW staff, other stakeholders, and field crews where opportunities exist for wetland habitat restoration and protection. **Table 7** divides sites up into the following general categories:

- Gut corridor restoration and trash removal—opportunities for reestablishing natural gut channels; stabilizing eroding banks; or enhancing the vegetated buffer through trash cleanups, blocking vehicular access, invasive plant removal or planting.
- Wetland restoration—bigger-scale mangrove restoration, derelict vessel removal, and potential wetland expansion activities.
- Pond protection and restoration opportunities—land conservation and development restrictions to protect ponds, dredging, and fringe habitat and buffer restoration activities.
- Other—includes flow restoration and contaminated sediment removal projects in the bays.

**Table 7.** Sites for Wetland Habitat Restoration

| Type | Site ID* | Name |
|---|---|---|
| Gut corridor restoration and trash removal | BV-2 | Thomasville Cooperative |
| | BV-8 | Luton Property/ Storage Area |
| | TR-8 | Grandview Apartments |
| | TR-12 | Anna's Retreat Community Center |
| | TR-13 | Faith Christian Fellowship Church/ School |
| | TR-15 | Joseph A Gomez School |
| | TR-16 | Parking lot behind Curr. Cntr. |
| | TR-32 | Price Smart** |
| | TR-36 | Auto Salvage Yard** |
| | TR-37 | Turpentine Run Rd. Culvert (Mid) |
| | TR-41 | Equipment storage area** |
| | TR-42 | Dumpsters/ collection station** |
| | TR-44 | Nadir Bridge Park |
| | TR-45 | Old truck disposal area** |
| | TR-46 | Lima Property** |
| | TR-48 | Trash collection station** |
| | NG-1 | Elm Road** |
| | NG-4 | Tropical Marine |
| | FC-5 | Fryd. gut/Rt 32 culvert** |
| Wetland restoration | BV-14 | Bovoni Landfill** |
| | TR-31 | Smith Bay Rd./ Ft. Mylner** |
| | TR-47 | Clinton Phipps Racetrack |
| | TR-50 | Derelict Vessels |
| | TR-51 | Behind old humane society |
| Pond protection/ restoration+ | TR-3 | Humane Society |
| | TR-11 | Tutu Reservoir/ Hartman's |
| | TR-29 | Herrnhut Pond |
| | FC-6 | Compass Pt. Salt Pond |
| | GB-1 | Water Point |
| | GB-3 | Cabrita Pt Salt Pond |
| Other | BV-16 | Second False Entrance |
| | FC-7 | Benner Bay/Marina sediments |

*Site ID includes abreviated subwatershed name. See Appendix for location map and description.
**Significant trash/dumping cleanup effort
+ Great St. James and Little St. James were not included in this assessment, but are likely conservation targets.

**Salt ponds protect our bays from sediment and other watershed loads, as well as provide habitat for wildlife. Maintaining functionality of the salt pond shown here is a key goal of the Water Pt. community.**

**DPNR staff inspecting the installation of a new parking lot. Construction activities included the re-grading of the natural gut channel and floodplain and the installation of stone weirs and low flow pipes.**

Table 8 summarizes a list of specific parcels where options for land acquisition, conservation easements, or drainage easements should be investigated. These parcels were identified for potential wetland protection and restoration, stormwater, or recreational projects.

**Table 8.** Potential Properties for Conservation

| Name | Purpose | Acres |
|---|---|---|
| BV-3. Wooded lot on corner next to BCB School | Stormwater retrofit and community park. Area may include a small existing wetland. | 14.7 |
| BV-7. Luton Property | Stormwater retrofit/drainage improvement and gut restoration project. | 1.1 |
| TR-46. Lima Property | Stormwater retrofit/community park adjacent to wetland. Involves removal of dumping. | 13.3 |
| TR-31. PriceSmart Entrance/Smith Bay Rd. | Stormwater retrofit potential along gut and existing wetland area. | 2.6 |
| TR-29. Hernhutt Pond | Conservation of freshwater pond resources | 41.2 |
| TR-11. Tutu Reservoir/ Hartmans Pond | Conservation of freshwater pond resources | 70.4 |
| GB-3. Cabrita Salt Pond | Conservation of salt pond/wetland s | 3.7 |

Great St. James and Little St. James were not included in this assessment, but may be candidates for restoration/conservation. Though privately-owned, these areas are still subject to environmental regulations, and issues on Little St. James have been reported.

## Implementation Actions

With the exception of the stream restoration project at Tropical Marine, no detailed design plans have been developed for the projects and opportunities identified. In the short-term, however, the following actions can be implemented.

***1.*** *Remove trash and prevent dumping at key locations within the gut corridor.* A good way to kick-off watershed implementation efforts and build community support is to initiate trash cleanups. The Environmental Association of St. Thomas-St. John should work with VIWMA to schedule cleanups and transportation of collected material to the landfill. Some of the cleanups will require removal of large objects (e.g., cars), and possibly will include hazardous materials. Start by going to each of the sites identified and determine the level of effort, access, and potential community or business involvement required to complete each cleanup. Evaluate any options for reducing future dumping in these locations.

***2.*** *Enforce USVI Buffer Protection Regulations and require mitigation where recent violations occurred.* DPNR, and in some cases ACOE, needs to improve the consistency of enforcement with the current regulations starting at plan review and earth change permitting, and followed through at the site during clearing and grading. BP staff should ensure that buffer setbacks are visibly demarcated in the field before any earth change activities begin. Penalties for violations should be revised to include removal of structures and mitigation planting. Consider updates to this regulation that increases a “no-touch” buffer width to a minimum of 50 ft for guts and 100 ft from ponds and other wetlands to get the attention of developers and provide a better chance of actual protection of remaining vegetated buffers.

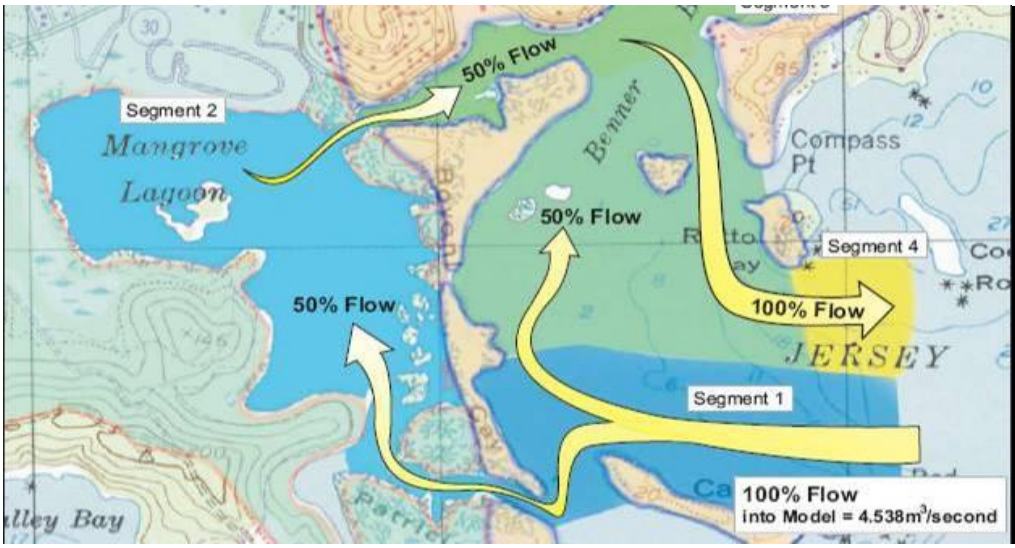
Over the next two to five years, the recommended mid-term actions are:

***3.*** *Develop design plans/feasibility studies for Compass Pt. salt pond restoration, opening of Mangrove Lagoon false entrance, and removal of contaminated sediments in Benner Bay.* DFW has identified restoration of the Compass Pt. salt pond, opening of the second false entrance to Mangrove Lagoon, and restoration of Redhook Bay salt ponds as priorities. Additional studies are proposed for each to ascertain feasibility and priorities including: an analysis of aerial photos to establish historic conditions; bathymetric studies to establish dredging capacity; sediment contaminant sampling of organic and inorganic parameters; and water modeling to better understanding flushing rates. Given the commercial interest in dredging Benner Bay for proposed marina expansion, perhaps there is an opportunity for private sector funding of a feasibility study looking specifically at dredging and contaminated sediment removal. UVI, NOAA's Restoration Center and National Marine Fisheries Services, USFWS, and ACOE may be good partners in advancing these studies. The US Coast Guard may provide assistance for derelict vessel removal. Proposed changes to mooring fees and boat registration by DPNR may also help with derelict vessel issues.

***4.*** *Conserve land surrounding priority freshwater and salt ponds (e.g., Herrnhut, Tutu Reservoir, Cabrita Pt.) via conservation easements, land acquisition, or stringent development criteria.* TNC, DFW, CZM, and DEP should investigate parcel ownership and communicate with property owners on future plans and level of interest in working with the Territory to protect these sensitive habitats. Explore feasible mechanisms for government or third-party land acquisition and/or easement holdings.

For long-term implementation (10 years):

***5.*** *Implement priority gut stabilization & buffer restoration projects.* Additional site investigations and hydrologic analyses will need to be conducted at potential sites in order to develop more refined design plans, invasive control and native planting plans, and cost estimates. USDA, DPNR, DPW, potentially ACOE, and local plant specialists should coordinate on implementing these projects.




**Models used to develop TMDLs for Mangrove Lagoon assumed predominant clockwise currents. A feasibility analysis of opening the second false entrance should more accurately document flow patterns.**

# 6. Monitoring

## Develop a unified watershed monitoring program that integrates and tracks various sampling efforts in STEER.

### Problem

There are many federal and territorial entities—currently and historically—that have conducted monitoring in STEER and the surrounding watershed. These efforts range from groundwater quality, rainfall and flow measurements, surface water quality, sediment contaminant studies, and biological sampling. In many cases, the data gathered under these efforts are used for regulatory purposes, such as establishing groundwater quality monitoring at the Tutu Wellfield Superfund Site to meet remediation requirements. In other cases, results are used to make routine management decisions, such as determining if beaches are safe for swimming under DPNR's beach monitoring program.

While filling critical information gaps, these monitoring efforts do not yet provide enough information to establish baseline conditions from which performance of restoration efforts can be measured. In addition, there remain outstanding questions that may need to be answered before some restoration efforts are implemented (e.g., what is the extent of leachate seepage into Mangrove Lagoon and how does this influence mangrove restoration in this area? What is the flushing rate of coastal ponds and mangrove lagoon?).

Sampling stations and parameters are not always easily comparable across efforts (e.g., measuring different bacteria species in one study when regulatory impairments are measured using a different species). Data is not always accessible or widely shared (e.g., difficult to access water quality data collected by DPNR). In some cases, datasets critical to other efforts are no longer being populated (e.g., flow gauge no longer operating in Turpentine Run). In other cases, entities historically responsible for certain data collection efforts have changed hands (e.g., EPA shifting Tutu Superfund monitoring to DPNR). A broad look across STEER and the watershed to put the pieces together and summarize long–term trends has never been done.

Monitoring data that is being or has been collected in STEER includes, but is certainly not limited to:

- Rainfall information at USGS and DPW weather gauges;
- Stream flow in Turpentine Run, although USGS has abandoned this station;
- Water quality of groundwater wells and the contaminated plume at the Tutu Wellfield Superfund Site;

- Sediment contaminants, benthic fauna, and water column samples at sites across STEER by NOAA and UVI;
- Recent sedimentation rate studies by UVI;
- Regulatory sampling by DPNR to ensure waters are meeting designated uses;
- Wastewater discharge effluent monitoring by operators and EPA;
- Biological surveys of in-stream fauna, pond ecology, and marine habitats by DFW, UVI, and NOAA; and
- Proposed groundwater monitoring near Bovoni Landfill by UVI.

To better utilize existing information, fill in data gaps with current and future efforts, and be more cost effective in future sampling and analysis, it makes sense to work cooperatively within a more comprehensive framework.

### Implementation Actions

UVI and TNC are currently in the process of developing a monitoring plan for STEER. This process could be expanded to include watershed inputs, but also to create a consensus-based framework for monitoring efforts for the next decade. As part of this process, we recommend the following in the short-term (within the next two years):

***1.*** *Develop a STEER monitoring plan that identifies key elements of known monitoring efforts, information needs and technical gaps, links to regulatory priorities, proposed future monitoring projects, and a data sharing plan.* UVI should continue to take the lead on developing a long-term monitoring plan, soliciting input from other agencies and organizations involved in monitoring projects in the area including DEP, DFW, VIWMA, NOAA, USGS, and EPA. This plan should identify:

*a.* Key elements of existing monitoring efforts (e.g., station locations, parameters sampled, equipment, reports) in order to identify commonalities and gaps;

*b.* Information gaps and technical needs (e.g., flow in Turpentine Run, groundwater monitoring at Bovoni, flushing rates, lab capacity, sampling equipment);

*c.* Guidance to sampling conundrums (e.g., methods for monitoring intermittent guts);

*d.* Regulatory program needs (e.g., 303(d), TMDL, beach monitoring, Tutu Wellfield Superfund, Bovoni Consent Decree, Benner Bay TBT contamination);

*e.* A list of future monitoring activities ranked based on need. Top projects should be refined to provide a basic description of the questions to be answered, a sampling plan, and a preliminary cost estimate; and

*f.* A proposed mechanism for sharing data and reporting findings.

This plan can then be used to apply for funds, provide graduate students with projects, etc.

***2.*** *Update watershed residents on the status of the Tutu Wellfield Superfund cleanup and monitoring efforts.* The operation and maintenance of the Tutu Wellfield Superfund Site has passed from EPA to DPNR, and DPNR will be responsible for continued monitoring and operation of the treatment system. DPNR and EPA should make publicly available the details of this transition plan, as well as monitoring

reports, plume spatial mapping, and progress updates.

***3.*** *Install rain & stream gauges in order to better correlate sedimentation with rainfall quantity and intensity.* UVI and DPNR should work with local schools to install rain gauges as part of an overall watershed education effort. A monitoring priority needs to be the re-establishment of the stream gauge at Turpentine Run. USGS has been cutting back on the gauging commitment over the past few years; however, given the importance of Turpentine Run flow information to so many federal and territorial programs, the case can be made for re-establishment.

In the mid-term (2-5 year), the following actions are recommended:

**4.** *Provide access on the STEER website to annual monitoring reports, trends analyses, and/or links to data.* TNC and UVI should determine the best forum for such a clearing house. Posting of regulatory monitoring information has been recommended for DPNR and/or EPA as well. To more easily establish the links between effluent discharge violations from a resort with surface water quality violations in the receiving water, for example, having quick access to these disparate data sources would be helpful. It is also recommended that an annual meeting be held with the objective of producing a summary report of monitoring efforts and findings, trends, and next steps.

***5.*** *Conduct illicit discharge detection and elimination sampling concurrently with sanitary sewer system mapping efforts.* Ideally, watershed monitoring efforts can be integrated with recommended infrastructure investigations, specifically water quality sampling, to identify and eliminate raw sewage and other non-stormwater discharges from outfalls in the guts and ponds in the watershed. VIWMA should coordinate with UVI and DPNR on these efforts. NOAA has funded similar IDDE investigations in Puerto Rico.

**Biological characterizations of STEER included quantifying benthic habitat composition using quadrants (shown here), as well as establishing transects to document the abundance and diversity of fish, debris, and macro-invertebrates.**

**(Photo: NOAA NCCOS)**

# 7. Education & Stewardship

**Implement a long-term education plan that provides opportunities for residents and businesses to actively engage in watershed stewardship activities.**

### Problem

Perhaps the most important and implementable recommendation in the watershed plan is the continued effort to educate those that live or work in the watershed, and those that use the resources of STEER. The case must be made to these stakeholders as to why they should engage in watershed stewardship activities, either through simple adjustments to everyday behaviors (e.g., I will start recycling) to more substantial commitments of time and resources (e.g., I will install this stormwater retrofit to manage runoff from my parking lot). Raising awareness of the issues is not enough. The goal of a good education program is to inspire long-term engagement and activism.

DPNR has an education program that can provide support for nonpoint source messaging. VIWMA, VIHA, and VIDE are other agencies with education programs and established delivery mechanisms for reaching their constituents. TNC, EAST, and VINE are non-government organizations involved in environmental education in the USVI. VICCC has the expertise to craft the watershed message in a way that is culturally meaningful. IGBA is trying to expand membership to St. Thomas and is developing commercials and other advertisements for green construction. CLCC may be a good regional partner for promoting watershed messages.

Recent action on STEER management planning coordinated by TNC has resurrected stakeholder education and involvement on the East End; although the boating industry, residents at Water Pt., and arguably, residents in Bovoni, are the most engaged communities. Little work to date has been done to connect those who work and reside in the upper watershed to the STEER management movement. Without broader representation and participation in the process, watershed priorities and long-term management strategies may not be fully implemented.

Fortunately, there is a wide range of watershed restoration topics to choose from when targeting selected audiences; there is a compelling story of a visible resource that can be told; and there are a number of schools, community centers, resorts, and other businesses that can be targeted over the next few years. Also, with completion of the 2012 STEER Coastal Use Survey by NOAA, there is a better understanding of who the resource users are and how they interact with STEER.

The key challenges for successful education and outreach are likely to include:

- Overcoming the cynicism and frustrations arising from repeated efforts to improve environmental conditions by those who are already educated on the issues;
- Piquing the interest of the youth in the upper watershed in activities that benefit downstream resources;
- Strategically implementing demonstration projects that can engage a diversity of stakeholders and inspire continued activism;
- Convincing others that individuals can make a difference; and
- Remembering that watershed restoration is a long-term endeavor that will evolve overtime.

**Table 9** summarizes a number of locations where specific public education and outreach efforts could reach the broader watershed community. These sites include schools, neighborhoods, community gathering areas, as well as high-traffic businesses where the public is likely to patron or demonstrations can be marketed. While overarching messages relating land use activities directly to STEER health are needed throughout the watershed, audience-specific messages should also be targeted to businesses, government employees, and in some cases, tourists. Audience-specific messages are discussed below in more detail.

**Table 9.** Sites for Community Education & Stewardship Activities

| Type | Site ID* | Name | Comments |
|---|---|---|---|
| Schools | BV-1 | BCB School | Retrofit demos, rain gauges, pollution prevention, and watershed school curriculum |
| | TR-13 | Faith Christian Fellowship Church/ School | Great location for simple retrofit demonstration project and gut restoration |
| | TR-15 | Joseph A Gomez Elementary School | Watershed curriculum; rain gauge installation |
| | TR-28 | Church Schools | Watershed curriculum |
| | TR-30 | Edith Williams Alternative Academy | Watershed curriculum |
| | TR-33 | EB Oliver Elementary School | Great location for retrofit, high visibility, parents participation, rain gauge |
| Neighborhoods | BV-2 | Thomasville Cooperative | Link with stormwater retrofits; residential pollution prevention |
| | TR-7 | Raphune Vista | Good site for green construction training; possible rain garden demonstration for homeowners |
| | TR-8 | Grandview Apartments | Good site for green construction training. |
| | TR-14 | Tutu I High Rise | Public housing, good location for signage and priority stormwater retrofit |
| | NG-1 | Elm Road/Frydenhoj | Target residents with education on septic system maintenance, gut protection, and residential pollution prevention; organize community trash cleanup days; lay groundwork for obtaining early buy-in from residents for sewer expansion projects. |

| Type | Site ID* | Name | Comments |
|---|---|---|---|
| | GB-1 | Water Point | Good community for demo wastewater project; active members in environmental issues |
| | -- | Nadir Crescent | Two cul-de-sacs that could be retrofitted; focus education on car maintenance (parking was directly over stormwater swale), cistern use, and general watershed issues. Education in this neighborhood would be effective (seemed like a cohesive community). |
| | -- | Estate Bovoni | Active HOA. Lots of drainage and landfill related issues for these residents. Residential education on disconnecting driveway runoff; car maintenance may be successful here. |
| | -- | Mariendahl | Target residents with volume reduction (e.g., driveway disconnection, rain gardens), septic system maintenance, and green construction messaging. |
| | -- | Nadir | Target residents with education on septic system maintenance, gut protection, and residential pollution prevention; lay groundwork for obtaining early buy-in from residents for sewer expansion projects. Link with Nadir ballpark retrofits. |
| | -- | Cabrita Point | Target residents with green construction messaging. |
| | -- | Nazareth Bay | Target residents with septic maintenance and residential pollution prevention messaging. |
| Community Centers/Parks/ Other | TR-1 | Flag Hill/Signal Hill Rd. | Top of hill, watershed overview linked to STEER |
| | TR-9 | Alvin MacBean Rec. Center | Great visibility and way to engage the Anna's retreat community with signage and retrofit demonstration projects |
| | TR-12 | Anna's Retreat Community Center | |
| | TR-34 | Willy George Community Center | Good way to reach Tutu Valley community |
| | TR-44 | Nadir Bridge Park | Highly visible location for watershed signage |
| | TR-48 | Trash collection station | High visibility, post signage on recycling and hazmat pickup schedules |
| | NG-3 | Nadir Ball Park | Great location for signage and events |
| | CB-2 | Yacht Club | Good location for signage and events |
| Churches | TR-2 | 7th Day Adventist Church | Example of impervious cover impacts; could provide a forum for reaching out to community |
| | TR-19 | Holy Family Church | Good opportunity to reach community on cistern uses |
| | TR-23 | Lutheran Church | Inexpensive stormwater retrofit demonstration |
| Commercial | TR-3 | Humane Society | Good examples of green construction; site users probably receptive to watershed message |
| | TR-5 | Cost-U-Less | High foot traffic area, signage; good site for stormwater training |
| | TR-6 | Home Depot | Good location to hold stormwater and green construction training; use for stormwater manual design examples |
| | TR-21 | Tutu Park Mall | High foot traffic area, signage; good site for stormwater training |
| | TR-47 | Clinton Phipps Racetrack | High visibility, good location for signage, maybe events |

| Type | Site ID* | Name | Comments |
|---|---|---|---|
| | TR-49 | Sea Kayak Tours | Good location for signage, but also to give STEER watershed information; primarily tourists |
| | FC-2 | Food Center | High traffic, good for signage |
| | FC-4 | Independent Boat Yard/ Budget Marine | Good site for pollution prevention training |
| | FC-8 | Compass Pt. Marina | Relatively high visibility; Good site for watershed signage |
| | GB-2 | Ritz Carlton | Participates in Blue Flag Beach Program; good site for education of tourists & resort managers |

### Implementation Actions

STEER education and outreach efforts are already underway. The following actions are suggested to supplement these efforts. In the short-term (within the next two years):

***1.*** *Engage community centers and homeowners associations in a residential education campaign linking STEER (and human) health with proper maintenance of septic systems, vegetated buffer protection, and household waste disposal.* EAST and DPNR could take the lead on identifying homeowner association and community group leaders. Meet with them and VICCC to solicit recommendations for how to best reach residents (e.g., flyers, attend association meetings, present at a church picnic, social marketing), and what messages might resonate. If there is a project that can be implemented in the vicinity, use that as a way to initiate stewardship efforts.

Use the information provided in **Table 9** to inform this effort. VIWMA could contact residents through its sanitary sewer and solid waste education program. VIHA can reach residents of public housing communities.

***2.*** *Convene boating-related businesses and boaters to investigate benefits of participation in the Blue Flag Marina program or other certification program.* Given TNC's working relationship with the boating community, consider organizing a focus group meeting with the owners and users to review watershed issues targeting the industry, present information on the Blue Flag marina program, and solicit input on the value of imitating such a program (or adopting elements of this or similar program) in the USVI. The Blue Flag Marina coordinator, and potentially representatives from the Coast Guard may be able to lend additional insight to the group. . Specifically, the focus group could provide DEP with input on practical performance standards or certifications for marinas and boatyards.

***3.*** *Convene a workshop for resort managers to discuss potential waste disposal, lawn care, visitor education, and stormwater improvements that could be advanced to improve STEER.* TNC, the Blue Flag Beach coordinator, and the VI Hotel and Tourism Association could organize a similar focus group meeting with resort managers on the west end of STEER to gauge interest in eco-friendly practices to improve water quality and habitat conditions in Nazareth, Cowpet, and Great

Bays while promoting tourism. The Ritz Carlton is part of the Blue Flag Beach program and may have suggestions for other resorts. What incentives could be provided to encourage implementation of potential restoration projects?

***4.*** *Conduct a watershed tour for politicians and agency Commissioners to highlight big-ticket items.* DPNR should take the lead on organizing a watershed tour to make sure politicians are aware of the impacts land development, waste management, and capital improvement budgeting decisions have on the unique resources of STEER, public health, and the economy. Specific regulatory and policy solutions to help alleviate impairments should be discussed (e.g., enforcement, buffer protection, stormwater requirements, and TBT bans).

Over the next few years (2-5+ years), initiate the following mid-term actions:

***5.*** *Link recycling efforts to STEER watershed benefits and increase the number of household hazardous waste collection days and/or stations.* VIWMA and VIRG educational messaging should explicitly state that recycling, proper solid waste management, and sewer hookups all are individual actions that benefit STEER. As closure planning continues, investigate the potential for increasing options for proper hazardous waste disposal.

***6.*** *Use demonstration projects (e.g., drainage improvements, storm drain stenciling, trash cleanups, rain gauges) at schools and community centers to educate and engage kids and residents in STEER.* VIDE should review the proposed opportunities identified at each school in the watershed and identify the most feasible for implementation. Work with DPNR, EAST, NOAA, EPA, and CLCC to secure funding to advance demonstration designs.

**Regardless of your level of expertise in watershed hydrology, no one ever gets tired of making it rain on the watershed model.**

Implementation of each project should involve a hands-on experience for kids and their parents, as well as a classroom teaching lesson. Work with VINE to develop a STEER watershed program for educators.

***7.*** *Increase overall awareness of the STEER watershed through storm drain stenciling, watershed radio series, and watershed signage.* Install STEER-specific storm drain markers in the watershed as infrastructure mapping is occurring (2-5 years). TNC, EAST, UVI, and DPNR should coordinate on the type, design, and placement of watershed signage throughout the watershed. DPW will need to be involved if signage is placed along roads ("You are now entering the STEER watershed!"). TNC could work with local radio contacts to set up a bi- monthly radio spot (e.g., Watershed Wednesday) to talk about ongoing STEER Watershed activities. Special guests from UVI, EAST, DPNR, Budget Marine, Water Pt., VIDE, VIHA, VIWMA, and others involved in implementation efforts could discuss how their agencies, businesses, etc. are making a difference in the STEER and offer suggestions for what listeners can do.

***8.*** *Target engineers, designers, contractors, and agency staff with training on implementing stormwater design criteria and green construction techniques.* DPNR, IGBA, and NOAA are in the process of kicking off a green construction training series on each of the islands over the next two years. These trainings provide classroom and field opportunities for practitioners on how to design, build, and live green. Many of these messages resonate with the STEER watershed management objectives. In the short-term, there is a potential to showcase field sites within the STEER watershed during the training planned for St. Thomas. Key sites for field trips during trainings may include: the Humane Society; Whispering Hills; Grandview; Raphune Vista; Home Depot/Cost-U-less; parking lot behind the Curriculum Center; Thomasville Cooperative; and the Ritz Carlton.

**Construction sites make great field trips for Green Building Training to showcase home designs, site grading, erosion and sediment control, and landscape vegetation management practices (photo: Frank Galdo).**

# 8. Watershed Oversight

## Establish a formal mechanism for implementation oversight.

### Problem

As the number of watershed planning efforts has exponentially grown over the last 20 years, it has become widely apparent that implementation is unlikely to occur without a dedicated watershed champion to provide implementation oversight. There is less agreement on the actual mechanism for providing that oversight, but consensus is growing that designating a watershed coordinator is ideal.

Experience on other islands confirms this notion. For example, Coral Bay Community Council is the lead organization responsible for implementing and updating the 2008 Coral Bay Watershed plan. With CBCC leadership, millions of dollars have been secured for implementation; dozens of projects have been installed; performance monitoring initiated; and measurable improvements in sediment load reduction to the Bay have been made. A similar approach was taken in the Guanica watershed in Puerto Rico, where a local non-profit was established to serve as the watershed coordinator. NOAA has provided financial support for Guanica watershed coordination efforts over the past few years. DOI, NOAA, and NFWF have also supported watershed coordinators in the Pacific Islands.

Alternatively, clear leadership for the 2011 St. Croix East End Watershed Plan has not yet fully formed (primarily due to changes in staffing at the St. Croix East End Marine Park). Early implementation efforts were initiated by the St. Croix Environmental Association. The STXEEMP has moved the watershed plan information to the park's website and will soon be taking on implementation leadership.

The primary role of a coordinator is to connect the activities identified in the watershed plan with the key people required to implement them (including funders). A working group represented by the key individuals identified as strategic action leads should be organized and administered by the watershed coordinator, although selection of a chairperson from the committee is recommended. The chair would be responsible for running meetings, extracting decisions from the group, and assigning action items. The chairmanship should rotate on an annual or semi-annual basis to other members of the committee. The current STEER advisory committee includes most of the individuals that would ideally participate in a watershed implementation group.

These efforts need to be tracked over time and the watershed plan updated as

priorities shift, new opportunities arise, and implementation lessons are learned. The coordinator is responsible for being the face of the watershed restoration effort and must communicate with stakeholders on a regular basis regarding the successes (and failures) of the management effort.

### Implementation Actions

Over the next year, some decisions need to be made regarding the desired approach to coordination temporarily or for the long-term. The following actions are recommended:

***1.*** *Designate or hire a STEER watershed coordinator.* CZM and DFW should approach the DPNR Commissioner with a recommended approach to supporting a watershed coordinator. Suggestions to consider include, but are not limited to:

- Re-assign the CZM's APC coordinator position to a full or part-time STEER watershed coordinator position;
- Create a new position under CZM, DFW, or both dedicated to implementation;
- Secure grant funding to expand TNC's STEER planning role to include watershed implementation for a minimum of three years;
- Build financial and staffing capacity of EAST to support a full-time position dedicated to the STEER watershed efforts;
- Establish a new non-profit; and/or
- Provide office space at DFW in Redhook for a federal contractor position to oversee implementation efforts. Consider discussing options with NOAA, USDA, USGS, EPA, and other CLCC partners.

***2.*** *Organize a STEER working group to serve as watershed implementation steering committee.* In the short-term, it makes sense to use the existing STEER Core Team; although, representatives from VIWMA, DPW, VIHA, DE, and a few additional watershed residents from Bovoni and the upper watershed would make good additions. TNC and UVI may want to suggest an appropriate size and mix of members. Consider including key federal partners who can also guide projects that might require permits and/or consultations.

# Implementation Strategy

There are many potential restoration activities presented in this management plan. Efforts were made throughout this report to provide suggested timeframes for implementation and potential leads for those efforts. While an initial attempt to prioritize projects was made (see **Appendix A**), there was not sufficient detail for most of these projects to estimate costs at this time.

Obviously, millions of dollars will be required to implement remediation efforts at the Bovoni landfill and for sewer system upgrades. Land acquisition, dredging projects, culvert replacements, and large stormwater retrofits will cost less on an individual basis, yet collectively may require an equivalent investment. Small demonstration projects, education activities, trash cleanups, and coordination meetings are comparatively minimal.

In order to advance implementation efforts, this section presents a preliminary strategy for allocating a hypothetical budget of **$2,500,000** in grant funds over the next five years. This estimate is not meant to suggest that full implementation of all the watershed recommendations in this report can be implemented.

The schedule presented in **Table 10** is preliminary in nature, and is intended to provide a platform to launch internal planning discussions among the STEER Core Team, implementation partners, and funders.

It should be noted that implementation is already underway on a number of priority recommendations, and many of the activities presented here already fall under existing program budgets, are within existing job descriptions (public or private sector), or are in the grant request pipeline.

**This rain garden installation at the boat yard in Coral Bay is an implementation success story.**

The hypothetical budget excludes costs associated with implementing the minimum compliance measures at the Bovoni landfill and wastewater infrastructure improvements. In addition, the local lead identified should not be interpreted to exclude potential partners, rather to identify a single entity on the ground ideally positioned to spearhead implementation.

**Table 10.** Hypothetical 5-yr Implementation Schedule

| Action | Local Lead | Implementation Year and Planning Level Cost Estimate (thousands of $) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2014 | 2015 | 2016 | 2017 | 2018 | Total |
| Hire a watershed coordinator. | CZM | $50 | $50 | $50 | $55 | $60 | *$265* |
| Refine concepts for top stormwater retrofit concepts; estimate costs and load reduction benefits. | CZM | $30 | | | | | *$30* |
| Conduct feasibility studies for priority wetland habitat restoration projects. | DFW | $100 | $150 | | | | *$250* |
| Adopt post-construction stormwater standards and design criteria, and train agency staff and engineers. | DEP | $75 | $50 | $25 | | | *$150* |
| Map drainage infrastructure and conduct illicit discharge investigations. | VIWMA/ DPNR | $50 | $100 | | | | *$150* |
| Annual education and outreach coordination efforts. | EAST/ TNC | $10 | $5 | $5 | $5 | $5 | *$30* |
| Pollution prevention planning. | TNC | $30 | | | | | *$30* |
| Implement small-scale demonstration projects. | CZM/DEP | $25 | $50 | $50 | $100 | | *$225* |
| Design and implement larger stormwater and wetland restoration projects (including drainage improvements). | CZM/DEP/ DPW | | $20 | $300 | $350 | $500 | *$1,170* |
| Monitor guts and outfalls, including establishment of rain and stream gauge; supplement for groundwater monitoring. | UVI | $25 | $50 | $50 | | $75 | *$200* |
| **Annual Total** | | **$395** | **$475** | **$480** | **$510** | **$640** | **$2,500** |

# Appendix A:

## Potential Restoration Projects by Subwatershed

A1. Bovoni Subwatershed ..... 1

A2. Turpentine Run Subwatershed ..... 4

A3. Nadir Gut Subwatershed ..... 11

A4. Frydenhoj/Compass Pt. Subwatershed ..... 12

A5. Nazareth, Cowpet, and Great Bay Subwatersheds ..... 13

**Table A1:** Potential Project Opportunities in the Bovoni Subwatershed

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| BV-1 | BCB School | | ✓ | | ✓ | | | ✓ | A) Retrofit concrete channel up-gradient of school's infrastructure to detain and infiltrate as much offsite run-on as possible. B) Retrofit existing open field (which is supposed to be a detention basin) by modifying existing infrastructure (large outlet baffle, a few catch basins, etc.). C) All courtyards at the school have vegetated areas where downspouts are currently directed; convert these to actual rain gardens with signage. A few other areas could be converted to rain gardens where existing catch basins/parking lot islands exist. D) Stabilize eroding slope in main courtyard; restrict driving in this area or formalize specific driveways/parking areas. E) Excessive impervious cover could be reduced throughout school property, and additional cisterns use could be explored (observed it overflowing). F) Pollution prevention opportunities include moving/covering the dumpster to reduce pollution directly discharging into gut. | High | Excellent retrofit and educational opportunities here. Most cost-effective and achievable retrofit in the watershed, particularly when done in phases. Will help reduce flooding on Bovoni Rd. |
| BV-2 | Thomasville Cooperative | | ✓ | | ✓ | | ✓ | ✓ | There is major flooding downstream from this area, particularly where Bovoni Rd intersects with runoff from BCB School Gut. Several locations were identified where existing parking lot runoff could be managed with rain gardens. Restore unvegetated slopes on gut. Trash was observed as well as staining in parking lots, and an exposed sewer pipe was observed crossing gut at downstream end of development. | Med | Good locations for retrofit; would need buy-in from development, which doesn't have many existing problems. |
| BV-3 | Wooded parcel below BV-2 | | | | ✓ | | | | Wooded area downstream of development would be ideal for a storage practice in conjunction with, or upstream of, existing wetland. Install roadside swale to direct runoff to open parcel. This area could be converted to a community park. | High | Could help alleviate downstream flooding by collecting road drainage. Area actively used for cock fighting and other activities. |
| BV-4 | Bovoni Projects | | | | ✓ | | | ✓ | Projects built on steep slope with parking lot runoff directed underneath buildings in paved chutes with trash racks – headwaters of gut that crosses Bovoni Rd at Sweet Pie's, may also contribute some to Texaco gut. Cisterns are no longer used and pump chambers were closed up due to pigeon waste on roofs as well as airborne trash from landfill. Erosion was observed on steep, maintained lawn around buildings. Space is available to formalize stable drainage swales and provide storage, particularly at downstream edge of projects where a large, flat area exists. Open dumpsters should be covered. | Low | Retrofits are relatively easy here and would beautify the area. Would be great to reconnect cistern pumps for use in toilets, etc. May be hard to convince because there are no real problems here now (on hill), but would help address flooding downgradient. |

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| BV-5 | Premier Wines and Spirits | ✓ | | | | ✓ | | | Recommend to evaluate the septic system that is immediately adjacent to the gut and repair as needed. | High | |
| BV-6 | Bulk Storage | ✓ | | | | | | ✓ | Currently, sink discharge, floor cleaning, and possibly roof runoff is being directed to a paved swale that discharges directly into the gut at back of property (which is paved at this location). Owners should be made aware of illicit discharges and make infrastructure changes to address them. | High | Easy reduction of pollutants directly discharging to the gut. |
| BV-7 | Texaco | | | | ✓ | | | | Neighborhood development resulted in re-routing of the gut into the road from its historic drainage path, with no drainage infrastructure – only paved swales. Flooding occurs at intersection with Bovoni Rd. at the old Texaco. There is open space adjacent to gas station that could be used for minor runoff treatment. Addressing runoff here alone will not solve problem due to off-site run-on; however, It could be good example of how to manage runoff generated at a gas station. | Low | Gas station is currently closed, but good opportunity if redevelopment/new business opens. |
| BV-8 | Luton Property/ Storage Area | | | | ✓ | | ✓ | | Create more natural stream channel for gut and provide storage/treatment in large open area adjacent to gut just prior to Bovoni Rd. Area already showed signs of ponding. Fix clogged/damaged/potentially undersized culvert under road. Possible to bring drainage from Texaco/Estate Bovoni here via catchbasin/pipes. | High | Great location and potential restoration project! Private ownership is a big hurdle for this one, but the Luton family owns the property and may be interested in such a project. |
| BV-9 | Bovoni Center Storage | | | | ✓ | | | ✓ | Retrofit existing drainage system to help reduce parking lot flooding while providing additional storage/treatment. Educate facility manager on ways to reduce parking lot pollution. Could also create formal swale to help manage flooding from gut overflows/road runoff. | Low | Relatively easy to retrofit existing system, but adjacent land ownership might be an issue. |
| BV-10 | Lew Henley's | ✓ | | | | ✓ | | ✓ | This sewage disposal site requires massive clean-up and ideally would be moved to a different location. Currently, located in the gut near an area of repeated flooding (see BV-7) – owner has tried to block off runoff, adding to the flooding problem. | High | This is a severe water quality issue that should be addressed in some way. |
| BV-11 | Gas Station | | | | ✓ | | | ✓ | Uncovered dumpster should be dealt with and restricted from private use. The open grass area on property could accommodate a stormwater facility to manage parking lot runoff, as well as a covered vehicle storage/maintenance area. Existing landscape swale along edge of property could be converted into stormwater swale. | Med | Relatively easy retrofits, but may be difficult to convince private owner; except for the dumpster, which they would most likely be in favor of based on existing signage. |

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| BV-12 | Sweet Pie's/ Laundromat | ✓ | | | | ✓ | | ✓ | An illicit sewage discharge was observed at Sweet Pie's, and an illicit laundry discharge was observed at the adjacent Laundromat. Both discharged directly into gut behind the property. | High | High priority. Both could access sewer in Bovoni Rd, easy to address. |
| BV-13 | Unregulated Dumping Site | ✓ | | | | | | ✓ | Area requires extensive clean-up, signage, and owner education. | Low | Scale of required clean-up and extensive long-term dumping would make this a difficult project to undertake at this time. |
| BV-14 | Bovoni Landfill | | | | ✓ | | ✓ | ✓ | Need to provide stormwater management in interim between now and closure. Conduct groundwater monitoring to determine extent/movement of leachate; address wetland restoration requirements; and enhance buffer. | High | High priority; requirements under Consent Decree. |
| BV-15 | Mangrove Lagoon WWTP | | | | ✓ | | | | Bioretention area to treat parking lot runoff at operations building. | Low | Ledge removal is likely |
| BV-16 | Second False Entrance | | | | | | ✓ | | Opening/dredging of false entrance has been proposed by a number of agency staff as potential mechanism for increasing flushing of mangrove lagoon. Feasibility study required to evaluate historic conditions, understand bathymetry and required dredging extent, contaminant sampling, and modeling of flushing rates. | Low | DFW identified as one of three priority sites for assessment; Army Corps of Engineers would likely need to be involved. |

[1] Site IDs correspond to site locations on Subwatershed Management Maps and Field Notes found in Appendix B and C of this report, respectively. Numbering is based on geographic location, primarily in a west to east and upstream to downstream pattern.

[2] See Appendix C of this report for a more detailed description of existing and proposed conditions.

[3] Initial ranking across all sites in the STEER Watershed is not based on a formal prioritization process. It merely represents an initial assessment of feasibility based on property ownership, cost, visibility, and stakeholder priorities, and should be adjusted as more information is collected. Implementation of projects ultimately comes down to opportunity and interest.

**Table A2:** Potential Project Opportunities in the Turpentine Run Subwatershed

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| TR-1 | Flag Hill/Signal Hill Rd. | | ✓ | ✓ | | | | | Stabilize unpaved road network. Sedimentation from unpaved road observed at entrance and guard house. Eroded discharge point evident across entrance from red-roofed apartment complex. Install STEER watershed signage at overlook on top of hill. | Med | Further investigation required to determine maintenance needs for existing road side traps, swales, and stabilization options. |
| TR-2 | 7th Day Adventist Church | | ✓ | | ✓ | | | | Site generates a tremendous amount of runoff that goes directly to roadside gut. Propose new parking layout to incorporate landscape bioretention and minimize loss of parking spaces. May be good forum for getting watershed message to community. | Low | Chance of implementation low since it is a private property. |
| TR-3 | Humane Society | | ✓ | | | ✓ | ✓ | | Under construction. Site has LID parking lot, alternative wastewater system, many native plants in landscaping, and could serve as a demonstration site for green construction training. Develop plan to protect small freshwater pond along road. | Low | Need to re-visit when project is completed. Reach out to owner. |
| TR-4 | Whispering Hills | ✓ | | ✓ | | | | | New construction project; ESC practices observed on site. Keep an eye on effectiveness of practices; check plans to ensure post-construction stormwater management has been provided. | High | Get site plans from DEP. |
| TR-5 | Cost-U-Less | | ✓ | | ✓ | ✓ | | ✓ | A) Retrofit existing stormwater basin to accept more runoff from entrance road by installing speed hump to ensure water enters existing inlet under sidewalk. Add sediment forebays for easier maintenance and more vegetation for additional pollutant uptake. B) Retrofit existing drainage swales to reduce erosion and improve performance. Add pipe from concrete forebay to existing Home Depot basin to prevent overflows directly into the gut. Train Cost-U-Less workers to stop dumping wash water. Maintain package plant that is located directly adjacent to gut; this location is priority sewer expansion area. | Med | Despite the fact that this is private property, it is low-hanging fruit – easy and inexpensive fixes for a large amount of impervious area. High visibility for educational signage. |
| TR-6 | Home Depot | | ✓ | | ✓ | | | | Retrofit existing basin adjacent to Cost-U-Less with sediment forebay, vegetation, and an outlet structure to detain stormwater. Reduce excessive pavement in parking lot. Add curb cuts in landscape islands to accept runoff – already depressed in some cases. Divert some runoff across street to open area for storage before discharging to gut. | Med | Retrofits here are easy and relatively inexpensive, especially the existing basin. A highly visible site for a demonstration project. |

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| TR-7 | Raphune Vista | | ✓ | | ✓ | | | | Very little water appears to reach existing large detention basin. Retrofit existing basin to accept more road runoff. Possible rain garden sites as demonstration for homeowners. Site provides interesting LID components (solar, cisterns, narrow roads, construction materials, etc.) | Med | Need to look at site plans, but this could be an easy fix of an existing practice. Potential green construction training site. |
| TR-8 | Grandview Apartments | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | No long-term stormwater management is evident at the new multifamily residential development. Some ESC measures (e.g., erosion control blankets, silt fence) are in place, but additional erosion control measures are needed. A new sewer line was installed in the gut between construction and the Tutu Reservoir. Sewage was flowing in the lines, but none of the manholes were covered, posing a water quality and public safety threat. The gut below the construction site should be restored, and sediment and trash removed (old cars, etc.). | High | Look at site plans and determine how to retrofit site. How was this permitted with no long-term stormwater management? Is stormwater connected to the sanitary sewer? How does this impact Tutu Reservoir? Green construction training site? |
| TR-9 | Alvin MacBean Rec. Center | | ✓ | | ✓ | | | | A) Fix existing drainage issue by redirecting runoff from roadway above rec. center to grassy open area along ball field. B) Fix flooding near playground by adjusting invert of yard drain and adding/enlarging weep holes in wall. C) Opportunity to disconnect roof runoff. Add public educational signage about stormwater and watershed issues. | High | Great location for easy retrofits and public outreach. Potential land use conflict with area along ball field (may be an area where spectators stand). |
| TR-10 | DPW land across from Alvin MacBean | | | | ✓ | | | | Potential for storage retrofit available in DPW land across the street for road runoff – this area currently has a lot of trash and stored vehicles adjacent to the gut/reservoir that should be cleaned up. Project could alleviate chronic flooding along road. | High | Public land makes project more feasible. |
| TR-11 | Tutu Reservoir/ Hartman's | | | | | | ✓ | | Upstream development likely contributes sediment and other pollutants to reservoir, which was a manmade farm impoundment. Restore the storage capacity of reservoir by dredging accumulated sediment and revegetating with wetland species where possible. Consider long-term options for land conservation around pond. | Low | Large-scale project that could restore significant freshwater wetland habitat. One of DFW priority wetlands for conservation. |
| TR-12 | Anna's Retreat Community Center | | ✓ | | ✓ | | ✓ | | Construct rain garden for parking lot runoff; restore/supplement gut capacity, potentially removing one or both basketball courts; fix upstream culvert to reduce roadway flooding; add educational signage, particularly on guts and importance of maintaining capacity (e.g., no material storage in gut). | High | Good project – one of the few in Anna's Retreat. |

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| TR-13 | Faith Christian Fellowship Church/ School | | ✓ | | ✓ | | ✓ | | Convert existing open grass areas into additional, off-line storage for gut flow during large storm events. Retrofit existing, eroding swale along driveway to improve performance/capacity and direct runoff from new paved swale into it. Restore gut channel with natural stream features/keep downstream box culvert clear of woody debris. Educate students on watershed issues. | Med | Great location for effective project. Private ownership could be an issue. |
| TR-14 | Tutu I High Rise/Gut Confluence | | ✓ | | ✓ | | | | Tutu High Rises are built around a flat, depressed open grass area where two branches of the gut merge—one from the Christian school to the north, and one from the other Tutu High Rise area to the east. This gut flows down towards the Curriculum Center. Convert open area into a stormwater storage/treatment facility; could possibly get more storage to the east, but the gut there is highly vegetated. Clean up existing trash and cock fighting ring; educate residents. | High | This would be an inexpensive, effective project showcased at public housing – work with VIHA |
| TR-15 | Joseph A Gomez Elementary School | | ✓ | | ✓ | | ✓ | | Gut divides school property; upper part of school on a steep slope and lower buildings and ball field in floodplain. Offsite run-on and roof runoff may be an issue. Opportunities may exist for rain gardens and gut restoration; however, additional assessment is required. | Low | Challenging site given steepness |
| TR-16 | New parking lot in gut behind Curriculum Center | ✓ | | | ✓ | | ✓ | | New parking lot created behind curriculum center. Gut was channelized and weirs installed. Not clear whether this construction and gut alteration was permitted, or the consequences on downstream properties. Restore gut behind curriculum center to original capacity and deal with runoff from new parking lot as possible. | High | High priority to address enforcement issue. |
| TR-17 | Fire Station | | | | ✓ | | | | Retrofit roadside swale to keep runoff out of fire station; do on-site management where possible, potentially converting paved swale to vegetated swale (lined if necessary due to Superfund site); and enlarge existing opening into road inlet, adding a trash rack. | Med | Good, easy projects. |
| TR-18 | VI Housing Authority | | | | ✓ | | | ✓ | Extra impervious cover in both upper and lower parking lots that could be retrofitted with stormwater BMPs. Vehicle maintenance area and a dumping site behind building should be cleaned up. | Low | Not a good demonstration site. VIHA may be a good partner in efforts throughout watershed. |
| TR-19 | Holy Family Church | | ✓ | | ✓ | | | | Almost a completely impervious site – runoff flows directly to Smith Bay Rd. Some possible rain garden locations, and education opportunities about using cistern water (cistern was just overflowing). | Low | Possible demonstration site if church is interested, but not great watershed value. |

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| TR-20 | Four Winds Plaza | ✓ | | | ✓ | | | ✓ | Currently no stormwater management for large parking lot. Retrofit large parking lot with lined bioretention (no recharge due to superfund site?) underground detention, or additional rooftop detention via cisterns or blue roof. Large open outfall is a potential safety concern and should be inspected and covered. Car wash drainage goes directly to outfall so look for pollution prevention. | Med | Private property and expensive, unless redoing parking area. Public safety concern at outfall. |
| TR-21 | Tutu Park Mall | | ✓ | | ✓ | | | | Large expanse of impervious cover. Portion of lot drains to large existing detention basin in rear of mall. A) Further investigate retrofit potential of basin to improve water quality treatment. Install small bios in parking lot at B) Plaza Extra and C) McDonalds. D) Possible conversion of spillover parking to grass-pavers. | Low | Retrofit of existing basin could be inexpensive. Difficult and expensive for in-lot solutions, but highly visible and good location for signage. |
| TR-22 | Merchants Commercial Bank | | | | ✓ | | | | Retrofit with a swale and bioretention in corner of parking lot and alongside the road utilizing existing landscaped area. | Low | Good demo for managing commercial parking lot. Relatively inexpensive. |
| TR-23 | Lutheran Church | | ✓ | | ✓ | | | | Intercept drainage from existing concrete swale in a large rain garden between church and parking lot. Overflow onto road via existing paved channel. | Low | Inexpensive, maybe a good project demo to engage community |
| TR-24 | Innovation Parking Lot | | | | ✓ | | | ✓ | Large parking lot drains to catchbasin in southwest corner. Further investigate opportunities for retrofitting (e.g., underground chambers or forebay/sediment trap beyond wall, stabilize unpaved upper lot) and pollution prevention for vehicle and outdoor storage areas. | Low | Private property |
| TR-25 | Auto/tire hotspot | | | | | | | ✓ | Investigate this area and surrounding automotive businesses to identify easy pollution prevention practices to reduce potential for stormwater contamination. | Med | Did not investigate |
| TR-26 | Mr. Rodriguez Auto Body/ Total Gas | | | | ✓ | | | ✓ | Install perimeter sand filters in central aisle and at entrance to fueling station to provide WQ treatment prior to discharge to gut. Auto shop is built over the gut; ensure proper pollution prevention practices for material storage and washing and maintenance activities. | Med | Private property, could be expensive |
| TR-27 | First Bank | | | | ✓ | | | | Convert existing landscaping along road into bioretention. Use curb cuts to direct flows into practice. Overflow to drain in street via piped outlet or overflow into existing paved flume. | Low | Could be good demonstration project for commercial/road right-of-way treatments |
| TR-28 | Church Schools | | ✓ | | ✓ | | | | Disconnection of runoff; bioretention in front parking lot along stream | Low | Steep, difficult, loss of parking likely. Low priority |

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| TR-29 | Herrnhut Pond | | | | | | ✓ | | Investigate options for land conservation easements and/or acquisition. Potential enhancement of the Herrnhut Pond to promote access, recreation, and education. | High | Recommendation of the 2006 Wetlands Management Plan |
| TR-30 | Edith Williams Alternative Academy | | ✓ | | ✓ | | | | School reports having to pay for water when cistern runs dry. Hook up rest of rooftops to cistern. Rest of site is difficult for retrofits, although a portion of roof could be used to supplement garden or for demonstration rain garden in the back. | High | Easy downspout additions. |
| TR-31 | Smith Bay Rd./ Ft. Mylner Plaza | ✓ | | | ✓ | ✓ | ✓ | | There is a package WTP adjacent to gut. Capacity and functionality of the WTP is unknown and should be inspected; this area is on the list for potential hook up to MLWTP. A constructed stormwater wetland retrofit is recommended near the shopping center entrance on Smith Bay Road. There is an existing paved flume that directly discharges road runoff to a nearby wetland area. | High | Highly visible retrofit location for treating road runoff; potential issues with existing wetland. |
| TR-32 | Price Smart | | | | ✓ | | ✓ | | Several opportunities for bioretention areas and/or pavement removal within the parking lot. Investigate existing BMP to see if water quality improvements can be made through simple modification of orifice in outlet structure. Remove trash and debris from gut corridor. | Low | Easy retrofit of existing facility. Highly visible location but private property |
| TR-33 | EB Oliver Elementary School | | ✓ | | ✓ | | | | Demonstration rain garden in courtyard; bioretention in landscaped island in front. The school reports flooding issues in interior courtyard. | High | School eager; community group involvement likely; high visibility |
| TR-34 | Willy George Community Center | | ✓ | | ✓ | | | | Two locations where stormwater retrofits are feasible to reduce existing ponding, provide treatment/storage, and serve as demonstration project. Great location for educating the community about watershed issues and retrofit opportunities. | Med | Steep site may pose some implementation challenges. |
| TR-35 | Turpentine Run Rd. Culvert (upper) | | | | ✓ | | | | ~8x4 ft box culvert north of quarry on Turpentine Gut Rd. at confluence of guts and road. Reportedly, culvert backs up during heavy rains; evidence of flooding was observed. Recommend replacing box culvert with a bridge. | High | Stakeholder priority |
| TR-36 | Auto Salvage Yard | | | | | | ✓ | ✓ | Possible pollutants observed – trash, oils, and grease. Gut runs through middle of property. Further investigate for pollution prevention activities and buffer protection opportunities | Med | Coordinate with broad cleanup and pollution prevention efforts along Turpentine Run Rd. |

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| TR-37 | Turpentine Run Rd. Culvert (Mid) | | | | ✓ | | ✓ | | ~48" CMP near northern entrance to quarry. Significant erosion from concrete drainage channel along road and large scour hole in channel exposing 15 ft of CMP. Recommend upgrading/replacing culvert, stabilizing stream bank, and repairing road drainage channel. | High | Stakeholder priority |
| TR-38 | Heavy Materials | | | ✓ | ✓ | ✓ | | ✓ | Possible pollutants observed – sediment, turbidity (concrete), bacteria (human waste), temperature, pH, oils, and grease. Drainage improvements to control on-site runoff from directly discharging into gut. Erosion control lacking for much of the quarried areas. | High | Manager seemed receptive to possible ideas. High priority site. |
| TR-39 | Best Car Wash /The Best Tires | | | | | | | ✓ | Possible pollutants observed – phosphorus, oils, and grease, metals. A vehicle washing station is recommended with a wash water collection and treatment system. Wash water currently runoffs directly to gut. Develop pollution prevention plan. | Med | Coordinate with broad cleanup and pollution prevention efforts along Turpentine Run Rd. |
| TR-40 | Mariendahl/ Turpentine Rd. Culvert (lower) | | | | ✓ | | | | 24" undersized and misaligned culvert under road. High runoff velocity and volume from the uphill neighborhood are contributing to undermining of Turpentine Rd. and significant gut erosion. Recommend culvert replacement and relocation, as well as additional drainage control throughout the very steep road network. | High | High priority due to damage on Turpentine Run Rd. Need to link with stormwater management in Mariendahl neighborhood. Requires additional investigation. |
| TR-41 | Equipment storage area | | | ✓ | | | ✓ | ✓ | Trash and debris dumped near gut and material stockpiles observed with no containment or stabilization. Open barrels of used oil found sitting on site. Basic pollution prevention and dumping prevention required at this site. Recommend trash cleanup and oil recycling. | Med | Coordinate with broad cleanup and pollution prevention efforts along Turpentine Run Rd. |
| TR-42 | Dumpsters/ collection station | | | | | | ✓ | ✓ | Dumpster areas should be retrofitted to provide covered storage and secondary containment to prevent trash from migrating into gut corridor. Investigate options for restricting access to reduce dumping and reducing sedimentation from unpaved vehicle access. | Med | Coordinate with broad cleanup and pollution prevention efforts along Turpentine Run Rd. |
| TR-43 | Cheyenne's Excavating | | | ✓ | | | | ✓ | Construction equipment and other vehicles and parts are parked on an oil-stained, dirt parking area with no drainage infrastructure or stormwater treatment practice. Unprotected soil stockpiles were observed within the parking area. Recommend application of basic ESC practices at a minimum to prevent sediment mobilization via stormwater. Simple pollution prevention practices to better manage waste and outdoor material storage. | Med | Easy to apply ESC practices. Coordinate with broad cleanup and pollution prevention efforts along Turpentine Run Rd. |

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| TR-44 | Nadir Bridge Park | ✓ | ✓ | | ✓ | | ✓ | | Improve park grading and drainage to limit flooding; install bioretention facilities to provide water quality treatment and enhanced aesthetics. Restore gut by reconnecting it to the floodplain and removing the concrete liner. Good location for educational signage. | High | Review existing design plans for improved intersection. Link with cul-de-sac rain garden demo in adjacent Nadir neighborhood. |
| TR-45 | Old truck disposal area | | | ✓ | | | ✓ | ✓ | Site has dirt parking area/road shoulders that discharge directly to the gut. Investigate further to develop a pollution prevention plan, remove trash and debris, and prevent sediment loading to gut. | Med | Review existing design plans for improved intersection and coordinate with other activities along Turpentine Run Rd. |
| TR-46 | Lima Property | | | | ✓ | | ✓ | | Consider conservation easements for stormwater drainage improvements. Retrofit upland area for constructed wetland to treat runoff from road and uphill neighborhood (current and future). Trash cleanup (tires), and wetland buffer restoration. | Low | Initial concept already developed; owner interested; work with DPW |
| TR-47 | Clinton Phipps Racetrack | | ✓ | | ✓ | | ✓ | ✓ | Turpentine run discharges at race track; further investigation required to confirm that facility is sewered, and to evaluate potential to divert and manage additional off-site runoff here. Investigate how horse waste is managed. Most of the dirt track is cross-sloped toward the infield where there is a mangrove/wetland area. Sediment management practices and/or mangrove restoration may be feasible. | Med | Requires additional investigation. Could be an opportunity for improved treatment of stormwater runoff. |
| TR-48 | Trash collection station | | ✓ | | | | ✓ | ✓ | Work with VIWMA to redesign dump site for covered storage and secondary containment to keep windblown trash out of wetland. Provide recycling and special collection schedules. | High | Low hanging fruit. Good demonstration location to pilot structural improvements. |
| TR-49 | Sea Kayak Tours | | ✓ | | | | | | Located in the floodplain making it an low priroty site for retrofitting; however, this site is ideal for watershed education. | Low | |
| TR-50 | Derelict Vessels | | | | | | ✓ | ✓ | Removal of marine debris and derelict vessels. | High | Priority in STEER Management Plan. |
| TR-51 | Behind old humane society | | | | ✓ | | ✓ | | Additional investigation needed to determine if upland areas behind humane society provide available space for wetland expansion or stormwater storage/treatment. | Low | Linked with restoration activities at Nadir Bridge Park (TR-44). |

[1] Site IDs correspond to site locations on Subwatershed Management Maps and Field Notes found in Appendix B and C of this report, respectively. Numbering is based on geographic location, primarily in a west to east and upstream to downstream pattern.

[2] See Appendix C of this report for a more detailed description of existing and proposed conditions.

[3] Initial ranking across all sites in the STEER Watershed is not based on a formal prioritization process. It merely represents an initial assessment of feasibility based on property ownership, cost, visibility, and stakeholder priorities, and should be adjusted as more information is collected. Implementation of projects ultimately comes down to opportunity and interest.

**Table A3:** Potential Project Opportunities in the Nadir Gut Subwatershed

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| NG-1 | Elm Road | | ✓ | | | | ✓ | | Encroachment of Nadir gut is common in this community and eroding/un-vegetated slopes along gut were observed; unauthorized vegetation removal along gut banks, particularly at goat farm in gut. Target residents with education regarding buffer protection; restore vegetated buffer and stabilize slopes. Organize community trash cleanup day. | Low | Limitations include private properties and lack of a homeowners association to help organize. |
| NG-2 | Gold Hill & Elm Rds. | | | | ✓ | | ✓ | | Trash/debris removal. Possible bioretention in road shoulder. Headcut at end of culvert splash pad – more energy dissipation required. | Low | |
| NG-3 | Nadir Ball Park | | ✓ | | ✓ | | | | Constructed wetland or wetland restoration at Elm Rd/Route 32 intersection. Bioretention area in dirt parking area. | High | Highly visible location; good opportunity for education; public property |
| NG-4 | Tropical Marine | | | ✓ | | | ✓ | ✓ | Undersized culverts and poor channel alignment exacerbate flooding. No erosion control for newly graded driveway adjacent to mangrove. Rainwater harvesting opportunities for large rooftops. Develop pollution prevention plan for boatyard. Investigate reports of potential discharges of non-stormwater at culvert location. | Med | Existing culvert realignment design plans. Owner receptive to improvements. Include in broader marina/boatyard pollution prevention planning. |
| NG-5 | The Patch | | | ✓ | ✓ | ✓ | | ✓ | Need to upgrade cesspool and relocte, which sits less than 10 ft from edge of water. Drainage from road cuts through property in a small outlet channel, which is clogged. Unpaved parking and drive aisles highly erodible. Develop site specific pollution prevention plan. | High | Further investigation required. Include in broader marina/boatyard pollution prevention planning. |

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**Table A4:** Potential Project Opportunities in the Frydenhoj/Compass Pt. Subwatershed

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| FC-1 | Saga Haven Marina | | | | | | | ✓ | Observed oils stains on parking area; did not access docks. Educate residents and owner on pollution prevention practices. | Low | Include in marina/boatyard pollution prevention planning. |
| FC-2 | Food Center | | ✓ | | ✓ | ✓ | | | Rerouted drainage contributes to flooding issue at culvert. Site constructed into rock. Above grade septic system likely underperforming and should be inspected. Runoff attenuation is required to relieve downstream flooding. Evaluate potential for diversion to retrofits on adjacent properties, or added cisterns or blue roof to extend detention. Replace culvert and reconfigure discharge channel. | Med | Local priority for culvert redesign. Potential on-site options not likely to solve full problem. Additional investigations needed. |
| FC-3 | East End Boat Park | | | | ✓ | | ✓ | ✓ | Possible pollutants observed – oil and grease. Flooding at adjacent restaurant. Scour at building foundation. Drainage should be treated with oil/grit separator or sand filter, then piped to outfall. | Med | Include in broader marina/boatyard pollution prevention planning. |
| FC-4 | Independent Boat Yard/ Budget Marine | | ✓ | | ✓ | ✓ | | ✓ | Site adjacent to highest recorded TBT levels in STEER. There are good examples of pollution prevention BMPs currently in use that could be emulated elsewhere. Drainage improvements in roadway to divert flow away from site recommended. | High | TNC has requested funding to support retrofit efforts. Include in marina/boatyard pollution prevention planning. |
| FC-5 | Fryd. gut/Rt 32 culvert | | | | ✓ | | ✓ | | Flooding; undersized and deteriorated culvert. Routine maintenance required. Trash cleanup needed. | Low | Gut fairly stable |
| FC-6 | Compass Pt. Salt Pond | | | | | | ✓ | | Feasibility study required to evaluate historic conditions, understand bathymetry and required dredging extent, contaminant sampling, and modeling of flushing rates. | High | DFW conservation plan identifies this for restoration. |
| FC-7 | Benner Bay/Marina sediments | | | | | | ✓ | | Proposed remediation of TBT contaminated sediments located off the Independent slipway. Likely part of a larger Benner Bay dredging discussion and feasibility assessment; with political implications related to proposed Compass Point Marina dock expansion. | Low | Include in broader marina/boatyard pollution prevention planning. |
| FC-8 | Compass Pt. Marina | | ✓ | | ✓ | ✓ | | ✓ | Treated wastewater and parking lot runoff flows in an open channel across parking lot to Benner Bay. Should separate stormwater and wastewater and keep wastewater discharge covered or piped. Bioretention possible in parking lot. Routine drainage infrastructure maintenance required. | Med | Interested property manager; high visibility for education opportunities. TNC office location. |
| FC-9 | New parking lots | ✓ | | | ✓ | | | | Clearing, grading, and installation of two new (unpermitted) gravel parking lots on hillside at Compass Pt. Marina entrance. Investigate enforcement options and require mitigation and stormwater retrofit. | High | Example of disregard for existing development regulations. |

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[3] Initial ranking across all sites in the STEER Watershed is not based on a formal prioritization process.

**Table A5:** Potential Project Opportunities in the Nazareth Bay, Cowpet Bay, and Great Bay Subwatersheds

| ID #[1] | Site Name | Type | | | | | | | Description[2] | Initial Site Rank[3] | Comments/Next Steps |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Enforcement | Education | ESC | SWM/Repair | WW | Wetland/Gut | Pollution Prv. | | | |
| NZ-1 | Dolphin Cove | ✓ | | ✓ | | | | | Planned development project in one of last remaining undeveloped coastal areas. Employ strict development standards and make a high priority for enforcement and inspections. Consider applying water quality standards since it drains to impaired waterbody (turbidity). | High | Easier to be proactive; focus on limiting turbidity |
| NZ-2 | Secret Harbor Estates | ✓ | | ✓ | | | | | Planned development project in one of last remaining undeveloped coastal areas. Employ strict development and water quality standards. | High | Easier to be proactive; focus on limiting turbidity |
| NZ-3 | Secret Harbor Condos | | | | ✓ | ✓ | | | Bioretention to treat upper parking lot. | Low | Private ownership. |
| CB-1 | Anchorage Resort | | | | ✓ | ✓ | | | Retrofit with a shallow bio or wet swale near tennis courts. Parking lot runoff discharges to beach. Investigate existing yard drains. Track package plant effluent readings due to impaired water status. | Med | Private ownership, but could help solve Yacht Club problem. |
| CB-2 | Yacht Club | | ✓ | | ✓ | ✓ | | | Undersized culverts and lack of infrastructure along access road contribute to flooding issues around boat shed. Drainage path blocked by Anchorage. | Med | High visibility for watershed projects. |
| CB-3 | Cowpet Bay West | | ✓ | | | ✓ | | ✓ | Residents observed repairing vehicles in parking lot; no real drainage issues at site; limited opportunities for demo projects. Track package plant effluent due to impaired water status. | Low | Limited opportunities |
| CB-4 | Elysian | | | | ✓ | ✓ | | | Track package plant effluent readings due to impaired water status. 36" stormwater drain pipe discharges untreated onto beach. There are a number of opportunities for parking lot retrofits. | Low | Private property; some drainage from Cowpet East comes through here also. |
| CB-5 | Cowpet Bay East | | | | ✓ | ✓ | | | Bioretention area to treat runoff from eastern-most parking lot. Opportunities for pavement removal. Heightened attention to package plant effluent readings due to impaired water status. | Low | Adequate head; possible poor soils or ledge. May be difficult to convince owner. |
| GB-1 | Water Point | | ✓ | | | ✓ | ✓ | ✓ | Talk to them about asphalt sealants; demo advanced on-site system | Med | Active HOA that can help with implementation. |
| GB-2 | Ritz Carlton | | ✓ | | ✓ | ✓ | | | Add new outlet to existing wetland near beach to prevent wetland overtopping and restaurant flooding. Potential bioretention area in upper parking lot, but challenging. Check maintenance logs on other existing BMPs on site (e.g., Stormceptor and detention basin). | Low | Private property; part of Blue Flag Beach Program; good site for education of tourists & resort managers. |
| GB-3 | Cabrita Pt Salt Pond | ✓ | | | | | ✓ | | Investigate opportunities for land acquisition/conservation easement to protect remaining salt pond. Alternatively, be proactive about flagging this site for stringent development requirements. | High | Check if under existing easement already; could be expensive to purchase. |

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[3] Initial ranking across all sites in the STEER Watershed is not based on a formal prioritization process.

# Appendix B:

## Subwatershed Management Maps

Bovoni Subwatershed ..... 1

Turpentine Run Subwatershed- North ..... 2

Turpentine Run Subwatershed- South ..... 3

Nadir Gut Subwatershed ..... 4

Frydenhoj/Compass Pt. Subwatershed ..... 5

Nazareth, Cowpet, and Great Bay Subwatersheds ..... 6

# Appendix C:

## Concept Sketches and Field Notes

Bovoni Sites

Turpentine Run Sites (TR-1 through TR-25)

Turpentine Run Sites (TR-26 through TR-51)

Nadir Gut Sites

Frydenhoj/Compass Pt. Sites

Nazareth, Cowpet, and Great Bay Sites

# Appendix B:

## Subwatershed Management Maps

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Turpentine Run Subwatershed- North ..... 2

Turpentine Run Subwatershed- South ..... 3

Nadir Gut Subwatershed ..... 4

Frydenhoj/Compass Pt. Subwatershed ..... 5

Nazareth, Cowpet, and Great Bay Subwatersheds ..... 6

## Legend

- Subwatershed
- STEER Watershed
- Parcels
- STEER Boundary
- Potential Land Conservation
- Roads
- 20 Foot Contours
- Wastewater Treatment
- Proposed Projects
- Proposed Sewer Expansion (appr.)
- Proposed Sewer Service Ext. (appr.)

**Wetlands**

- Mangrove
- Salt flat
- Salt pond
- Mixed swamp
- Ponds
- Guts (HW Revised)

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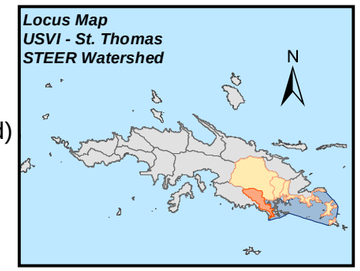


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# Bovoni Subwatershed Management Map

Date: 6/3/2013

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## Legend

- Subwatershed
- STEER Watershed
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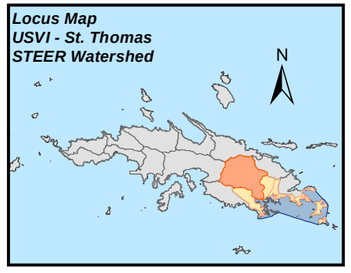
- 20 Foot Contours
- Wastewater Treatment
- Proposed Projects
- Proposed Sewer Line Ext. (appr.)
- Proposed Sewer Service Ext. (appr.)

**Wetlands**

- Mangrove
- Salt flat
- Salt pond
- Mixed swamp
- Ponds
- Guts (HW Revised)

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# Turpentine Run- North Subwatershed Management Map

Date: 3/31/2013

See TR Map- North
Match Line

TR -1
TR -29
TR -32
Price Smart
Martendahl Rd
TR -35
TR -36
TR -37
TR -39
Heavy Materials
TR -38
TR -40
32
TR -41
TR -42
TR -43
TR -44
Nadir Bridge Park
Nadir Crescent
Bovoni
TR -45
Nadir
TR-51
30
TR -48
TR -46
TR -47
Clinton Phipps Race Track
TR -49
TR-50
Red Ho
BV-4
BV-2
BV-5
BV-6
BV-1
BV-3
BV-8
Bovoni Rd
BV-7
BV-11
BV-12
Bovoni Rd
BV-9
STEER
Mangrove Lagoon

Path: H:\Projects\NOAA\11084 NOAA St. Thomas\GIS\Maps\Watershed Plan\TurpentineRun_south.mxd

## Legend

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- STEER Boundary
- Potential Land Conservation
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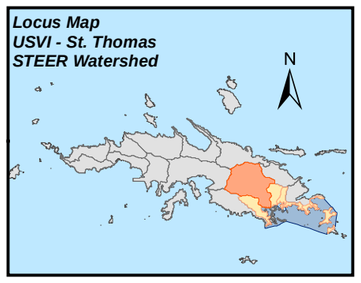
- 20 Foot Contours
- Wastewater Treatment
- Proposed Projects
- Proposed Sewer Line Ext. (appr.)
- Proposed Sewer Service Ext. (appr.)

**Wetlands**

- Mangrove
- Salt flat
- Salt pond
- Mixed swamp
- Ponds
- Guts (HW Revised)

Locus Map
USVI - St. Thomas
STEER Watershed

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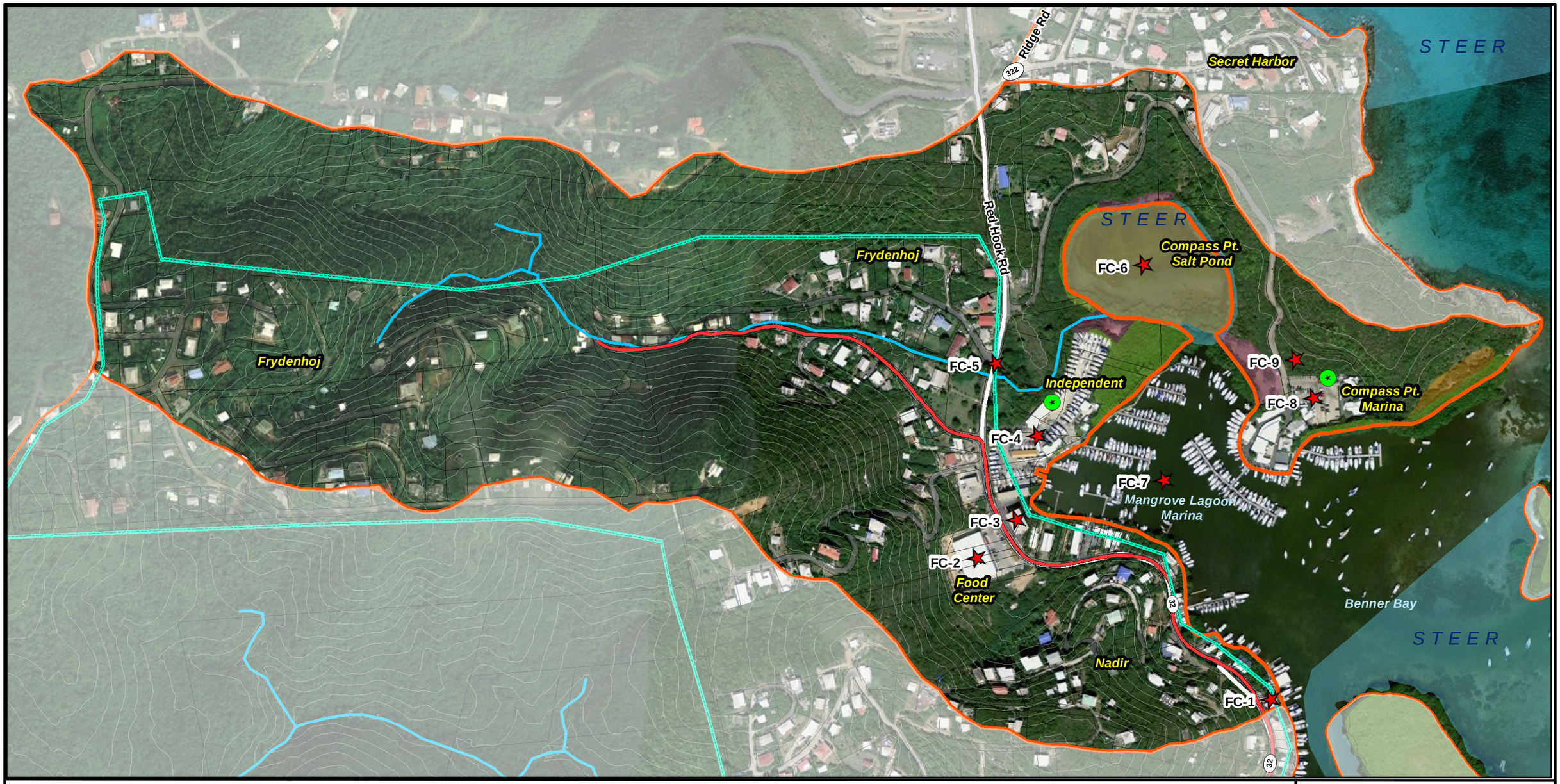
# Turpentine Run- South Subwatershed Management Map

Date: 3/31/2013




## Legend

- Subwatershed
- STEER Watershed
- Parcels
- STEER Boundary
- Roads
- 20 Foot Contours
- Wastewater Treatment
- Proposed Projects
- Proposed Sewer Line Ext. (appr.)
- Proposed Sewer Service Ext. (appr.)

**Wetlands**

- Mangrove
- Salt flat
- Salt pond
- Mixed swamp
- Ponds
- Guts (HW Revised)

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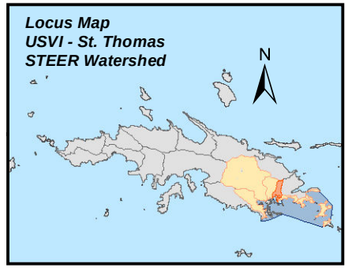


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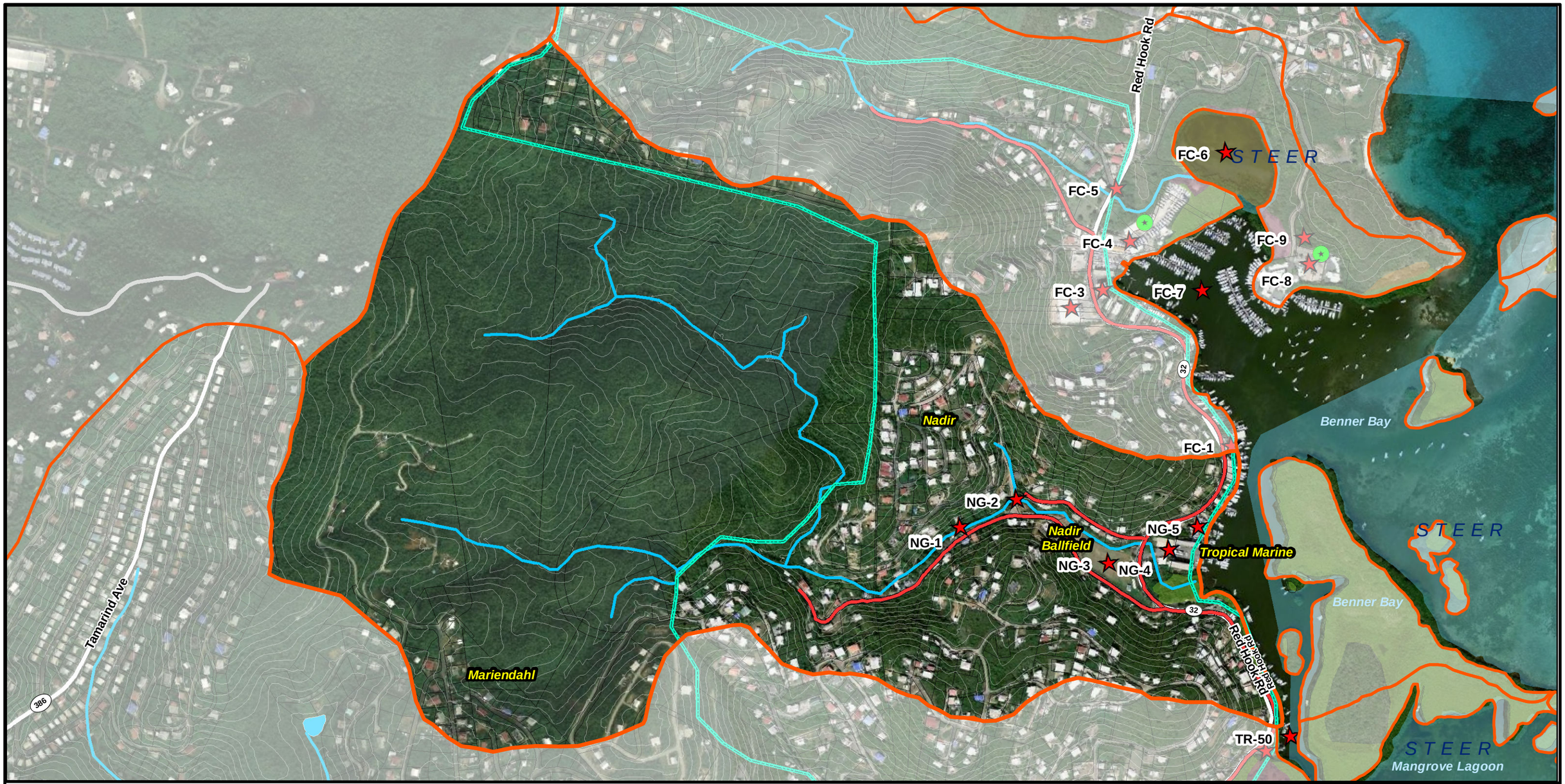
# Frydenhoj/Compass Pt. Subwatershed Management Map

Date: 3/31/2013




## Legend

- Turpentine Run Subwatershed
- STEER Watersheds
- Parcels
- STEER Boundary
- Roads
- 20 Foot Contours
- Wastewater Treatment
- Proposed Projects
- Proposed Sewer Line Ext. (appr.)
- Proposed Sewer Service Ext. (appr.)

**Wetlands**

- Mangrove
- Salt flat
- Salt pond
- Mixed swamp
- Ponds
- Guts (HW Revised)

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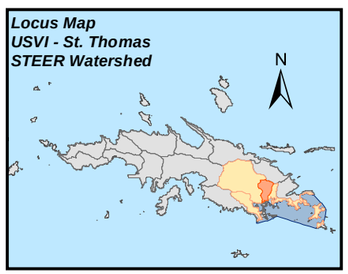


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Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

# Nadir Gut Subwatershed Management Map

Date: 3/31/2013

Red Hook
Muller Bay
Cabrita Pt.
GB-3
Vessup WWTP
Great Bay
32
Red Hook Rd
Compass Pt.
Salt Pond
FC-6
Secret Harbor
(neighborhood)
NZ-1
NZ-2
322
Rtiz Carlton
GB-2
Elysian
NZ-3
Secret Harbor
Nazareth Bay
Ridge Rd
322
CB-4
CB-5
CB-3
Cowpet East
GB-1
Cowpet West
Water Pt.
Cowpet Bay
CB-2
Yacht Club
CB-1
Anchorage
Deck Pt.
STEER

## Legend

- Subwatersheds
- STEER Watershed
- Parcels
- STEER Boundary
- Potential Land Conservation
- Roads
- 20 Foot Contours
- Wastewater Treatment
- Proposed Projects
- Proposed Sewer Line Ext. (appr.)
- Proposed Sewer Service Ext. (appr.)

**Wetlands**

- Mangrove
- Salt flat
- Salt pond
- Mixed swamp
- Ponds
- Guts (HW Revised)

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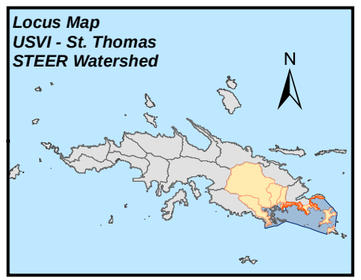
Locus Map
USVI - St. Thomas
STEER Watershed

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Feet
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# Nazareth, Cowpet, & Great Bays Subwatersheds Management Maps

Date: 3/31/2013

# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [x] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: Bovoni

Site Name: BCB School (BO-1)

Description of Existing Conditions:

used to have flooding problem, fixed it with a 6-foot pipe from behind the school down to the gut. Inlet to pipe is clogged with vegetation. Some roof drains connected to a cistern that overflows since it isn't used.

Septic/Sewer? Sewer

cisterns? Yes, one big cistern → irrigation. Next to cafeteria

How does $H_2O$ enter 6' pipe? There is an inlet, but we couldn't find it.

Courtyards all have "rain gardens" that could be retrofit to function better. Graded slope in main courtyard. All catchbasins flow down to same outfall area at corner of parking lot → into gut. Some $H_2O$ may eventually flow into unused ball field. Dumpsters are right by gut, uncovered, and leaking into catchbasin.

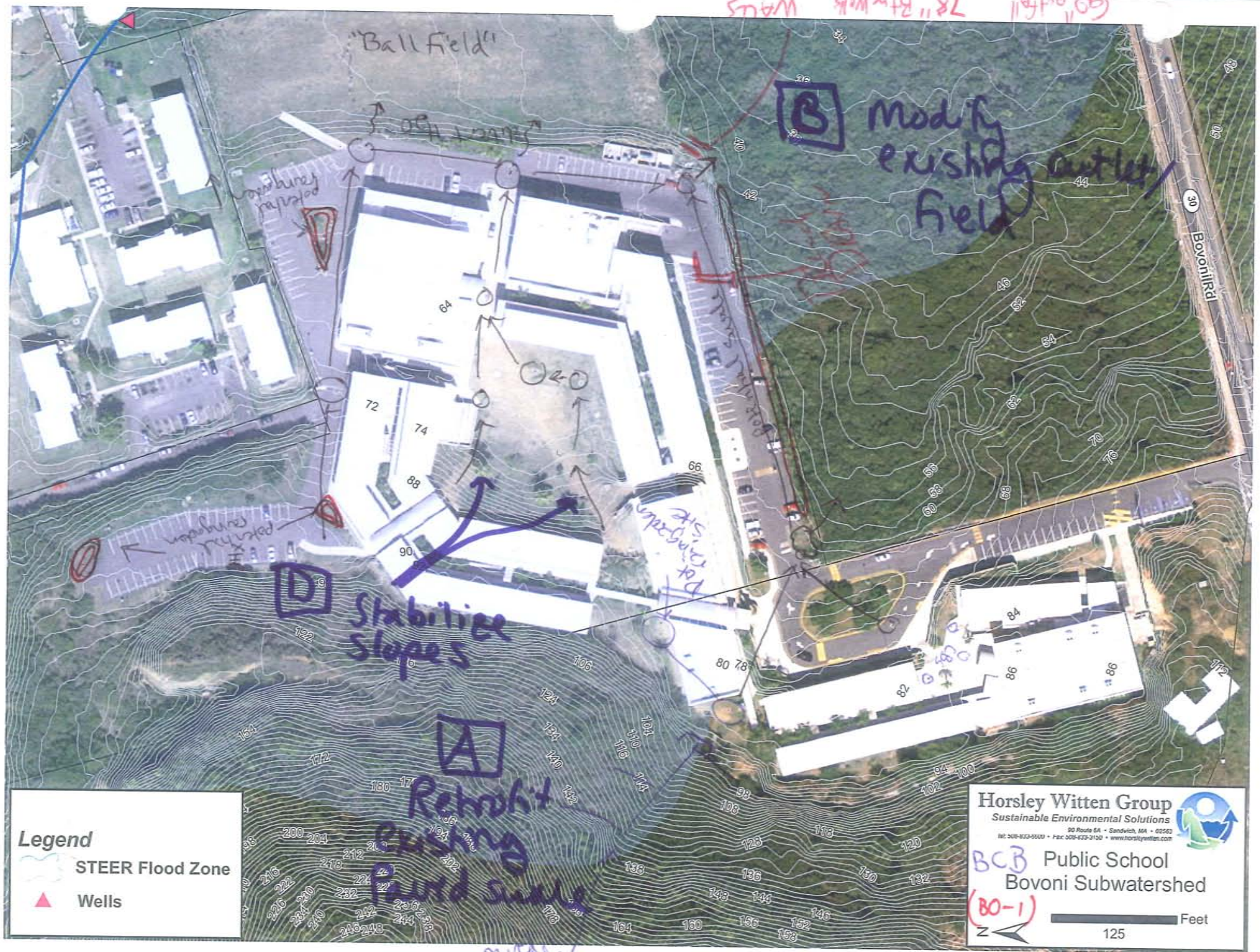
Additional Notes and/or Sketch Information:

Description of Proposed Project:

- Retrofit concrete swales with baffles and detention to slow $H_2O$ down and infiltrate as possible
- Convert courtyard gardens into rain gardens
- Stabilize eroded slope in courtyard and redirect $H_2O$ (prevent driving there?)
- Move dumpsters to better location and cover
- Redirect stormwater into ball field to create stormwater wetland
- convert a few other areas near catchbasins/parking areas into rain gardens as demo projects
- Reduce unnecessary impervious cover throughout school property (excessive parking lots?).

Additional Notes and/or Sketch Information:

Site Priority: ☒ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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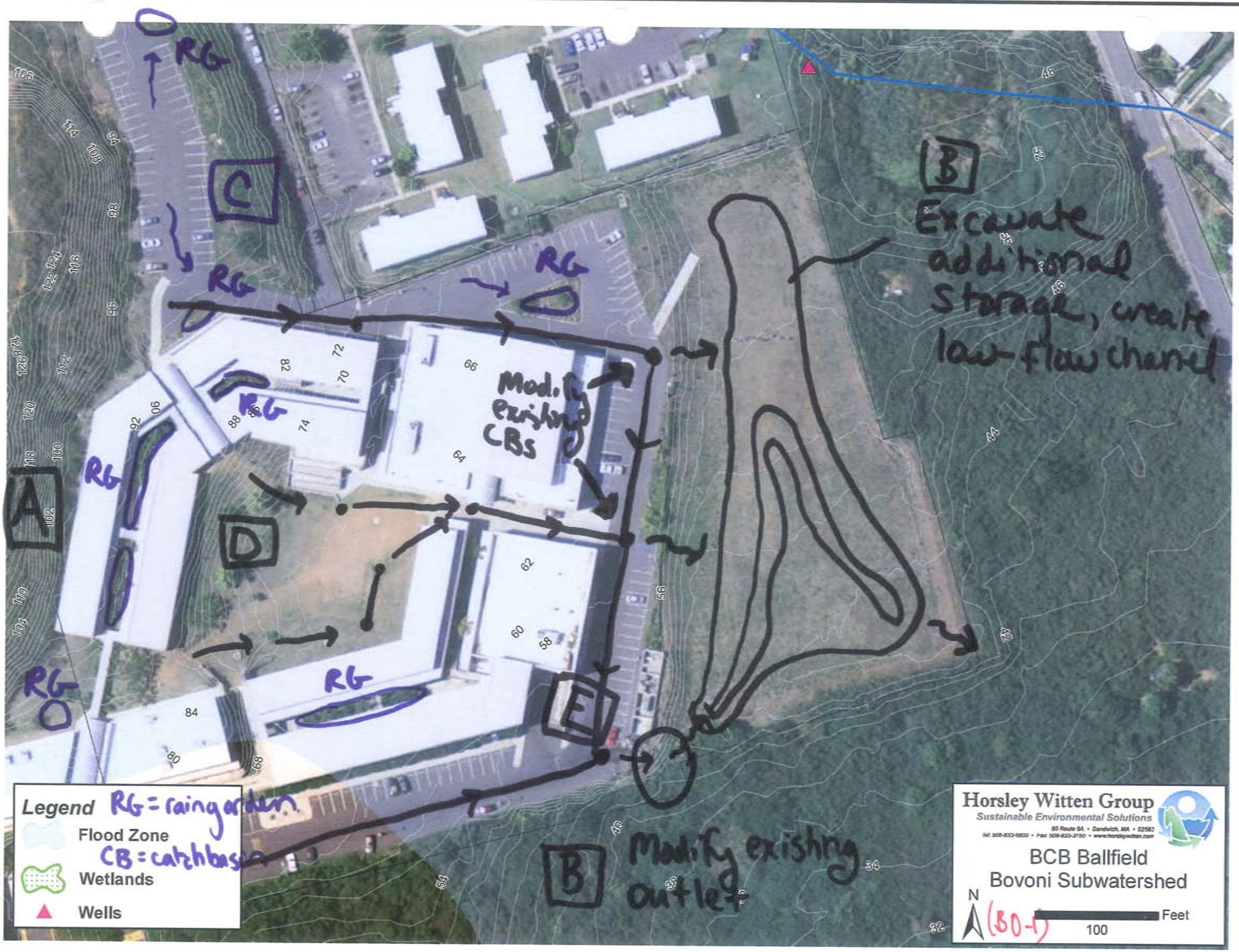


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Subwatershed: BAVONI

Site Name: Thonsville Cooperative (BO-2)

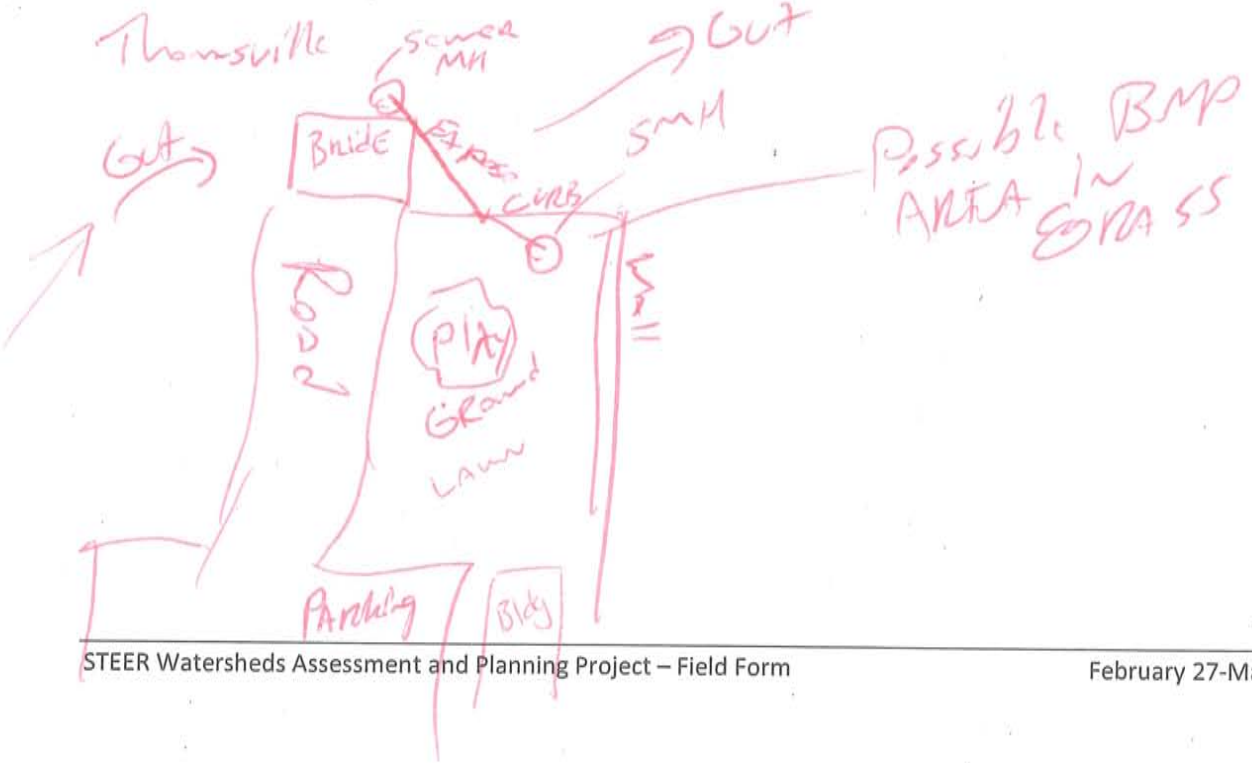
Description of Existing Conditions:

HAVE Sewer, HAVE water
HAVE cisterns w/ cistern overflow
Under parking Lot
Sydney → Maintenance supervison
Some erosion in Lower gut
Upper → Fairly good shape
Some Trash Mostly Lower

AREA 7 → Gut down Center of Road of Residential Development, Covente Road.

* FURTHER INVESTIGATE SITE FOR R.G. OPTIONS

Additional Notes and/or Sketch Information:



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- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: BOVONI

Site Name: (BO-3) Wooded Parcel & Thomasville Co-op

Description of Existing Conditions:

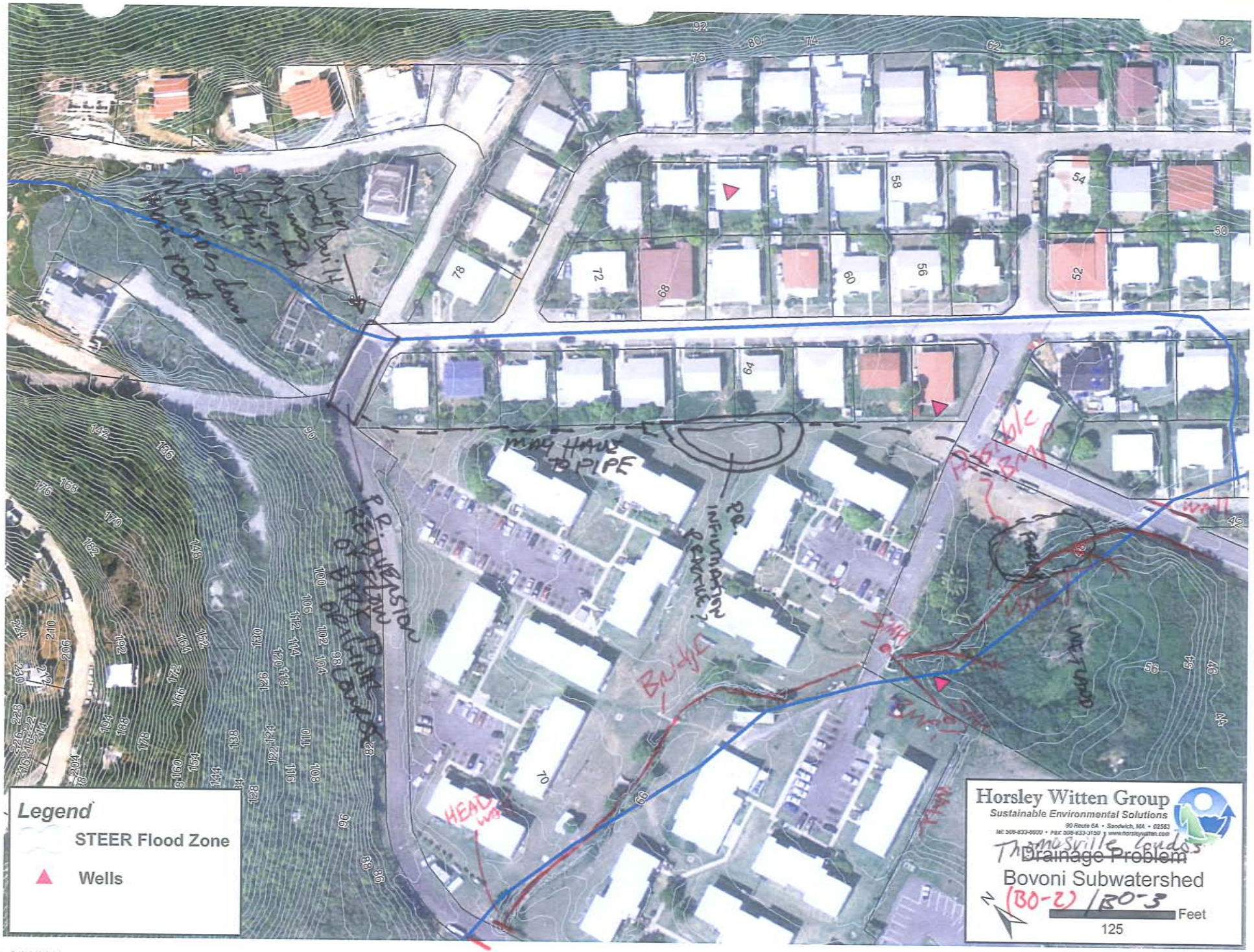
UPSTREAM OF SITE, GUT WAS DIVERTED WHEN CO-OP ROAD CONSTRUCTED (REPORTED BY CO-OP FACILITY MANAGER)
NOW GUT GOES DOWN ROAD TO TEXACO (BO-7).

CONSIDER OPTION FOR RESTORING GUT TO ORIGINAL PATH; PIPE IT BEHIND HOMES, Open up into an infiltration or underground storage tank (to use for irrigation at co-op) AND THEN OVERFLOW TO WOODED LOT.

WOODED LOT HAS WETLAND AREA IN IT THAT NEEDS TO BE DELINEATED. FIRST, BUT THERE IS POTENTIAL FOR A LOT OF STORMWATER MANAGEMENT HERE.

Additional Notes and/or Sketch Information:

CURRENTLY, THE AREA USED FOR COCK/DOG FIGHTING AND OTHER SHADY ACTIVITIES. DEPENDING ON OWNERSHIP, THIS COULD BE A SIGNIFICANT OP. FOR A COMMUNITY PARK & REGIONAL STORMWATER FACILITY WITH PATHS TO SCHOOL FOR KIDS.

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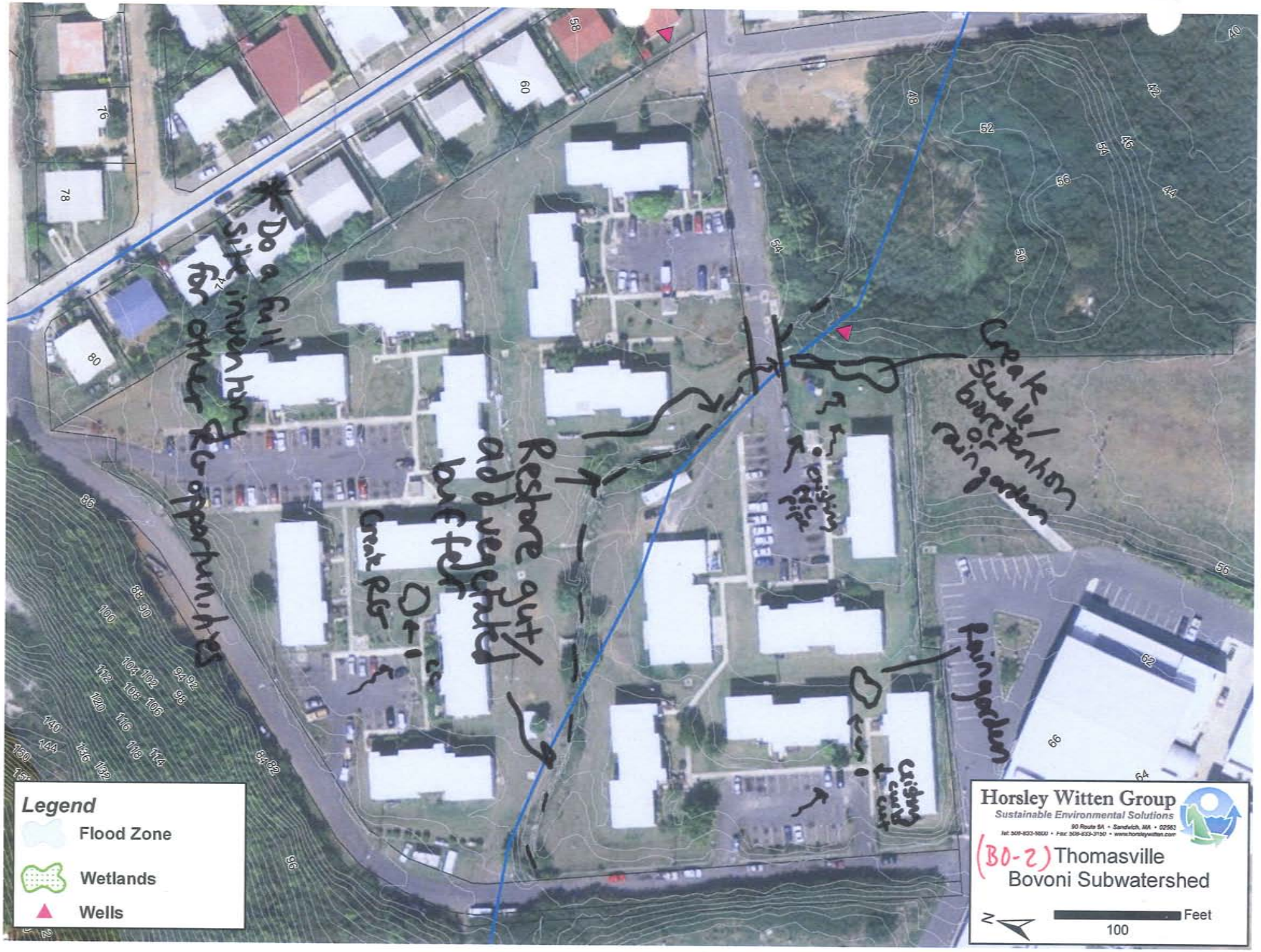


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- ☐ Other _____

Subwatershed: Bovoni

Site Name: (BO-4) Bovoni Projects

Description of Existing Conditions:

HAVE cisterns → not used Pigeons. Also mentioned a natural spring

Erosion outback from spring and/or Runoff (most likely). Regrading ~~[illegible]~~ AREA in Progress → MR Austin

MR Austin is the Maintenance Supervisor (very nice)

Stormwater Collects by Curb cuts that direct under buildings that are equipped w/ Trash Racks. Trash Racks have maintenance doors for Access & Mr Austin said they clean Regularly. Cisterns → slowly Release To ground To help storage.

cisterns ~~[illegible]~~ pump chambers were closed up.

Solar Hot water Heaters.

Additional Notes and/or Sketch Information:

Dumpsters uncovered. Mr Austin mentioned that he has a problem with Air borne Trash & Debris Around the site.

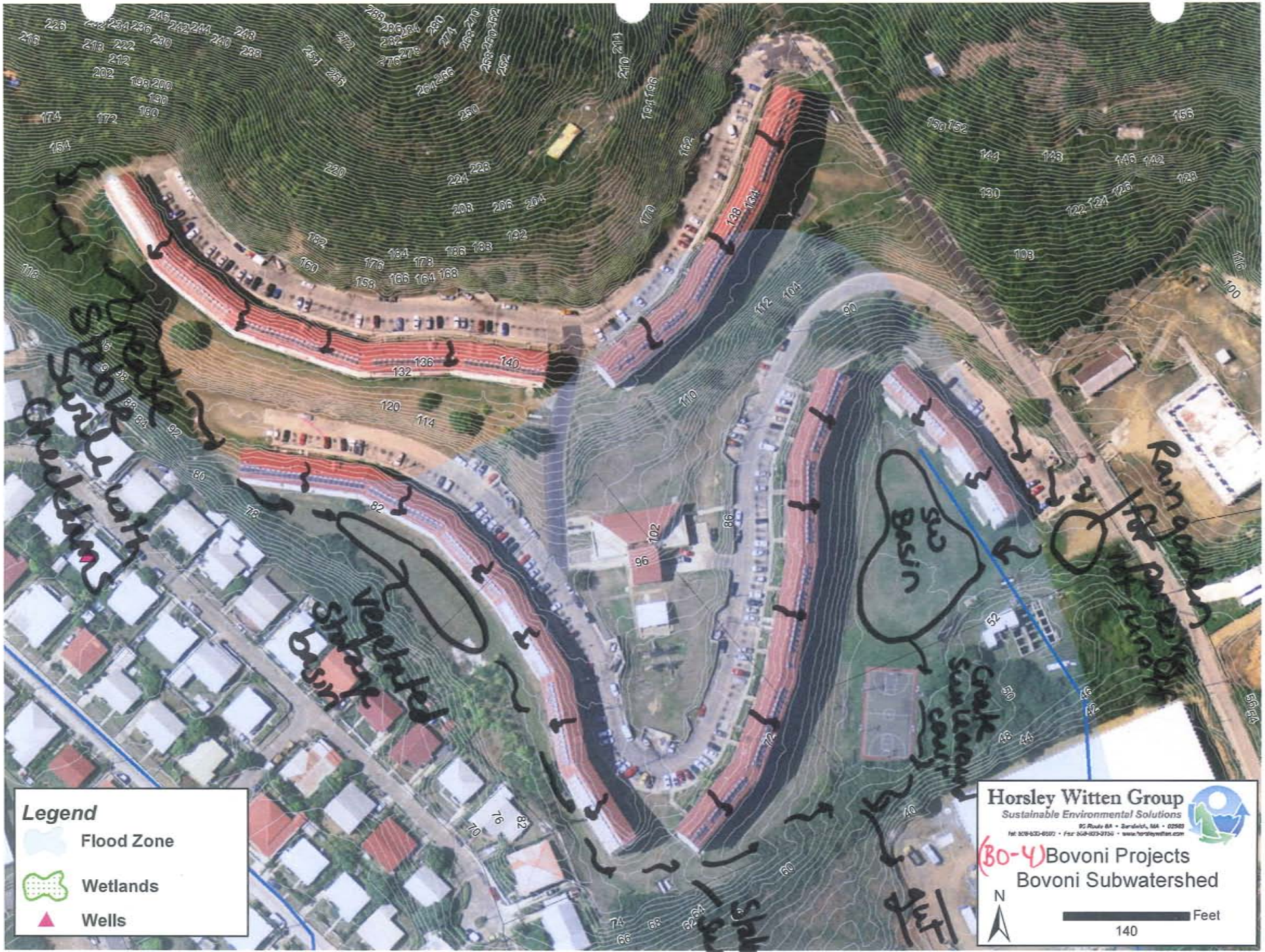
Abandoned WW treatment Facility To the South of the Development.

Description of Proposed Project:

- Cover dumsters
- Stabilize steep slopes with vegetation to reduce erosion
- Consider using cisterns again for gray water
- formalize stable swales add stormwater vegetated stormwater basins for water quality and storage → prevent/reduce downstream issues.
- Construct raingarden near easternmost parking lot

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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- ☐ Stormwater Retrofit
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- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: Bayou

Site Name: Winery (Premier) (BO-5)

Description of Existing Conditions: Managed

Met with one operator. Hesitant To TALK To us.

Winery →

Onsite Septic, Own WATER Source → Cistern

DRAIN To a gut out behind Building

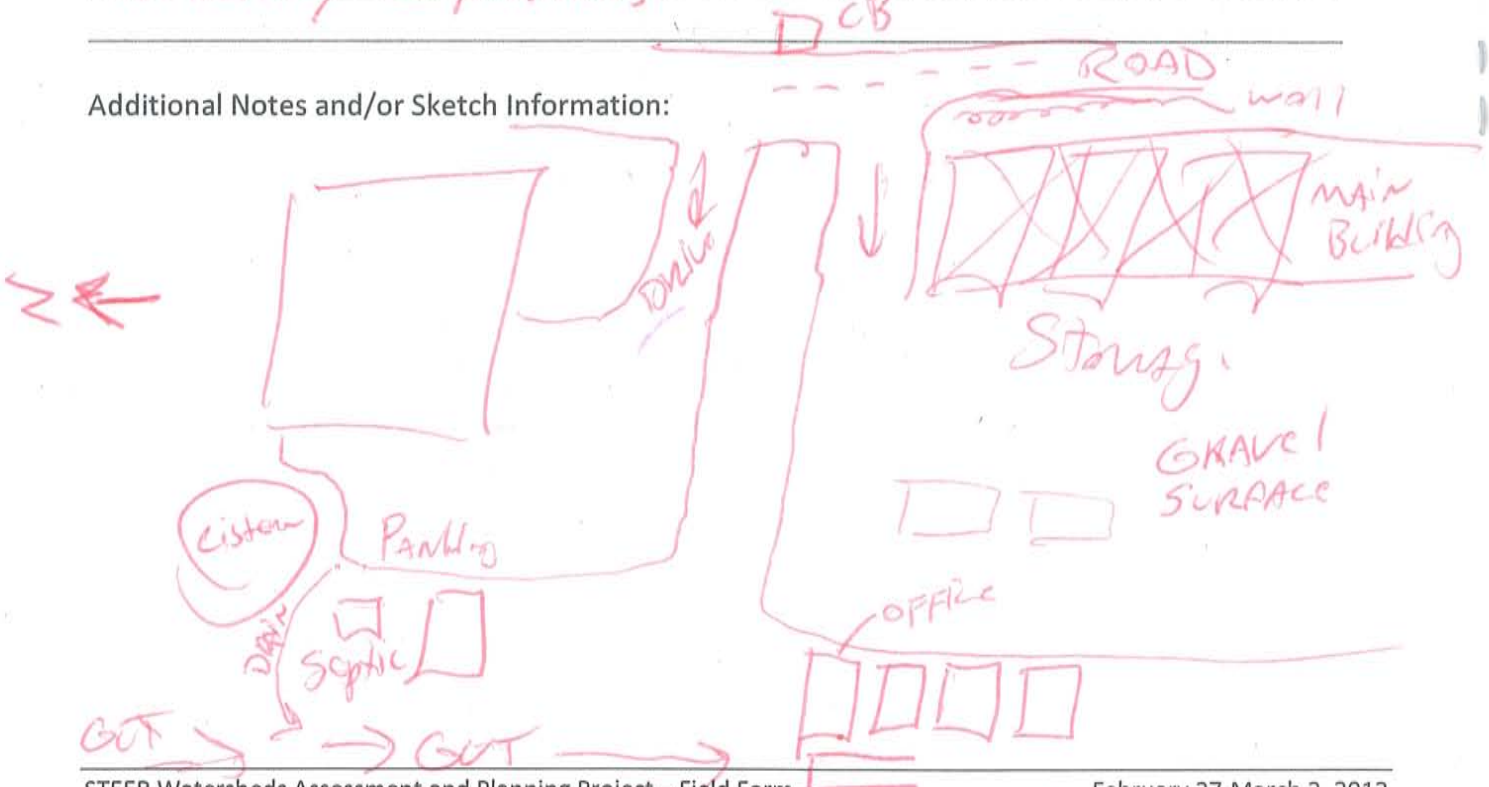
They HAVE not had Flooding ISSUES According To Manager

Field

Septic directly Adjacent To gut w/ BANANA TREES over & Around. HAS what appears To be A Septic TANK.

Site is Fairly clean & mostly Impervious (Mostly Necessary Impervious).

Additional Notes and/or Sketch Information:



Description of Proposed Project:

Recommendations:
Monitor/Maintenance of Septic system

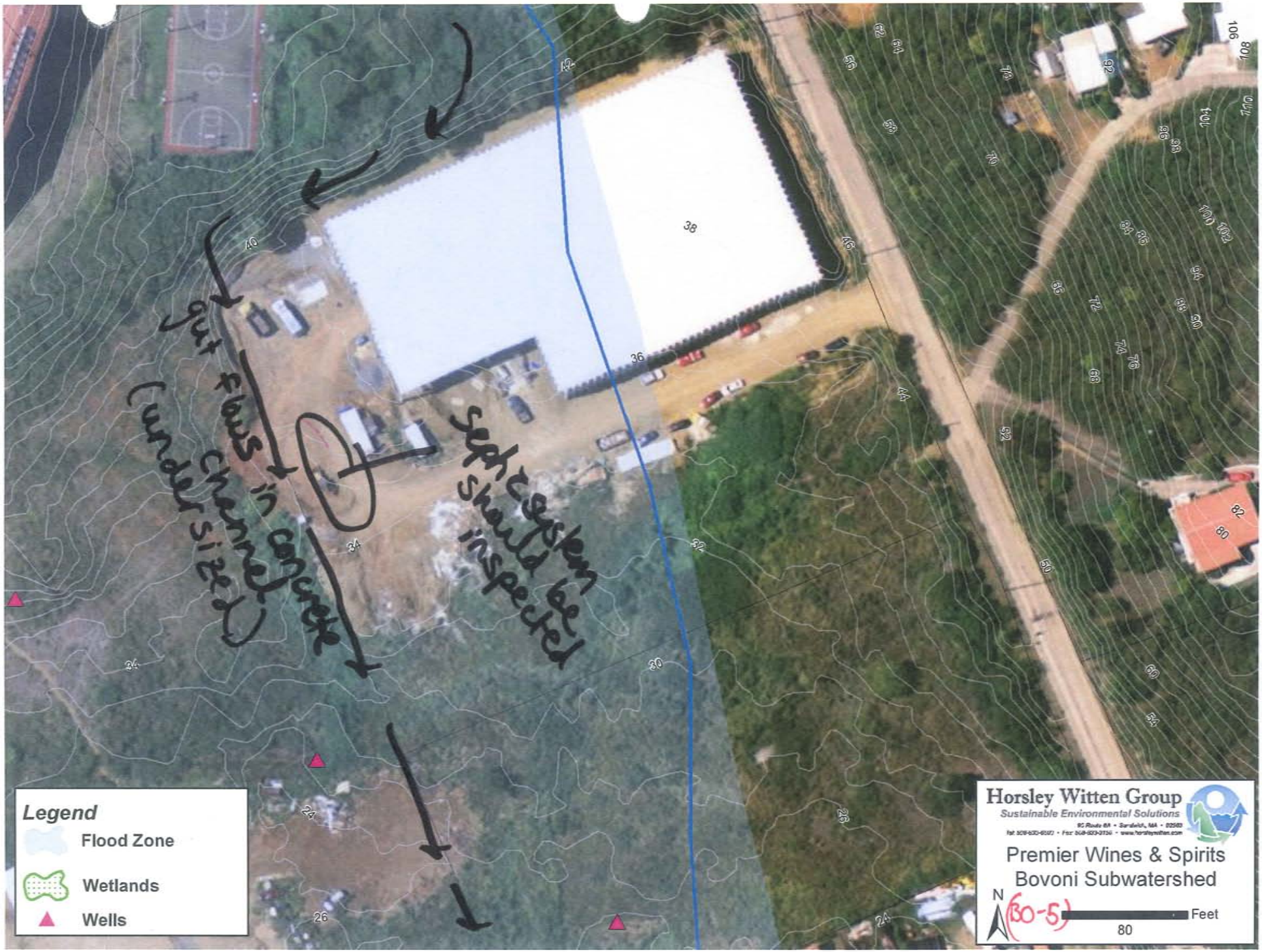
Additional Notes and/or Sketch Information:

PREMIER wines & spirits ltd.

**St. Thomas – Main Office**
7020 Estate Bovoni
P.O.Box 502790
St. Thomas, VI 00805-2790
T. 340.775.1275
F. 340.777.3695

**St. Croix – Branch**
57-C Eliza's Retreat
P.O. Box 922
St. Croix, VI 00821
T. 340.773.6437
F. 340.773.5034

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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- ☒ Illicit Discharge
- ☐ Other _____

Subwatershed: Bovoni

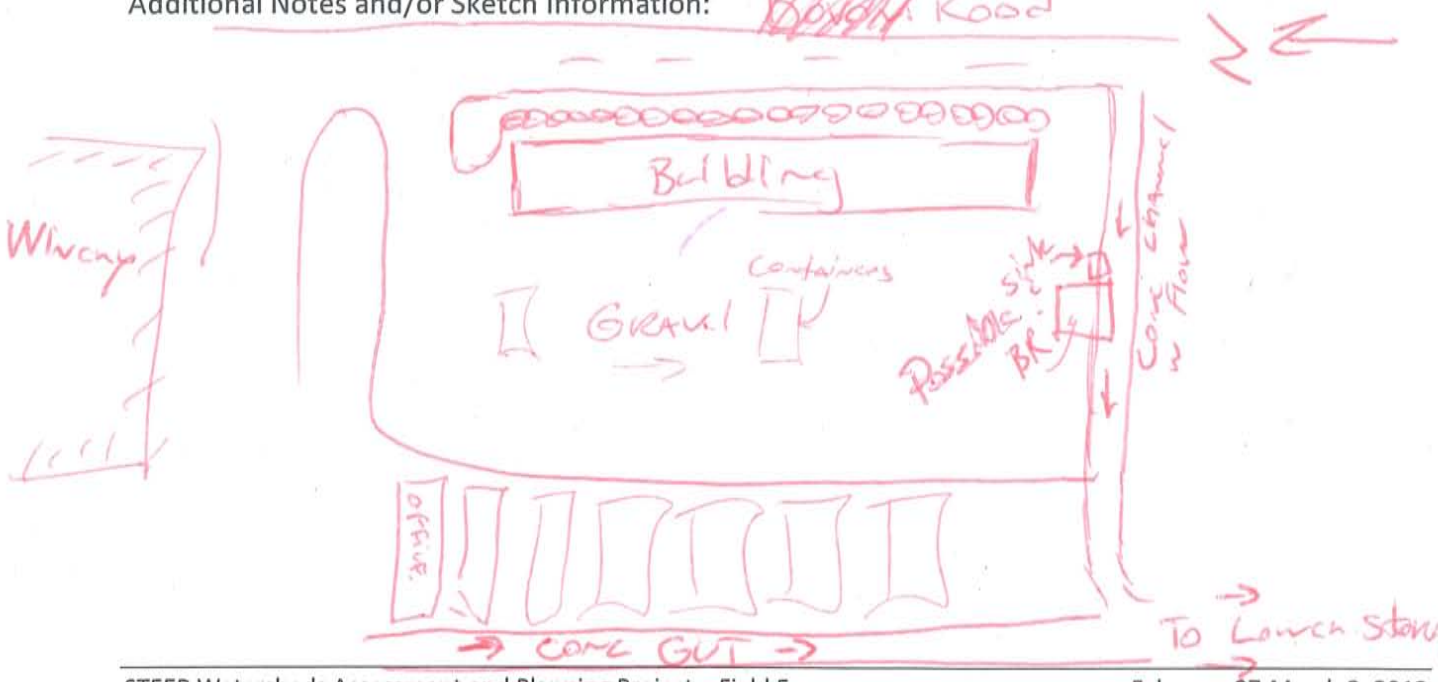
Site Name: Bulk Storage (BO-6)

Description of Existing Conditions:

Site is Mostly gravel surface. Talked To Christian Rosenberg and she said she has not had Flooding ISSUES They Lease property From Storage Facility Along Bovoni Rd. Have a Retaining wall Along Projects Road and one Main Building. Other AREAS Used For Storage containers. Cut Runs Along back Property (Fence) in Concrete Channel (About 40" wide at Top) 24" +/- 18" +/-

Runoff From site collected in Concrete channel Along Southern property line. Also discharging A sink and spray down cleaning from within main building. Appears Roof Runoff Also goes To channel. Possible water closet Adjacent To sink. Not sure where it discharges but did not Appear To be the channel.

Additional Notes and/or Sketch Information:



Description of Proposed Project:

Retrofit would be education of cleaning operations and containment impacts.

Additional Notes and/or Sketch Information:

CHRISTIAN ROSENBERG

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

(BO-6) Boroni Bulk Storage

(*) wash area and floor drains discharge to concrete channel → gut. Need to stop illicit discharges or provide a treatment retrofit (e.g., sand filter, holding tank)

Wednesday, January 30, 2013 1:03:53 PM

# FIELD ASSESSMENT NOTES

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- ☐ Stream/Wetland Restoration
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- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: ~~Bovani~~ Bovani

Site Name: TEXACO DRAINAGE PROBLEM (BO-7)

Bovani Projects on BACK SIDE →

Description of Existing Conditions:

Abandoned Gas station → Robbed too many times

Appears Roof is Directed To A grassed (wetland Area) To the North of the GAS STATION, CB is clogged w/ sediment

Pump STATION upgrade, Project South of STATION.

WWPS is in bad shape and desperate For An upgrade.

Flooding on Bovani Rd. Appears Septic hauling company installed A berm TO on effort To keep Runoff in Road.

Additional Notes and/or Sketch Information:

* Install new catchbasins/pipe at intersection to carry SW to BO-8

* If site is redevelopment, manage on-site runoff in existing open space (e.g. rain garden/bioretention).

Date: 1/30/2013

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- [x] Stormwater Retrofit
- [x] Stream/Wetland Restoration
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- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: Bovoni (BO-8)

Site Name: Storage Facility At Intersection of Bovoni Rd/ LUTON PROPERTY Project Rd

Description of Existing Conditions:

Owners are the Dvergsten Company, Inc
Owner is interested in lower taxes/donating
Approx 8 Acre of wetland To Island/government.

Property is mostly storage units. Out is dirt
For the most part with two piped sections -
ONE drive Aisle & 1 Under bovoni Rd (see sketch)

Out Flows From north property by Concrete
channels - 1 that is the out if one Taking
Flow From Storage Facility (Bulk storage) To
the North.

Onsite Person Mentioned he has not seen
it Flood outside the out but the lower
AREAS of the property were showed
signs of ponding.

Additional Notes and/or Sketch Information:

Out Discharg Pipe Under Bovoni Appeared clogged.

Note:
Owner (Christina Luton) is a longtime Resident
and her family has owned this property
the 13 Acres Across the street (Undeveloped)
For Awhile. Very Nice & educated on wetland
& environment.

Description of Proposed Project:

Possibly could do a wet BMP in the grass/gravel lot prior to Bovoni Rd However, it is likely used for storage and may be difficult to Aquire For such a BSP

Additional Notes and/or Sketch Information:

SEE Attached

cluton@dvgvi.com

THE DVERGSTEN COMPANY INC.

Christina Luton

PO Box 9355
St Thomas, VI 00801

Tel: (340) 779-4532
Cell: (340) 643-4815
Fax: (340) 779-4533

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

BY _____ DATE _____

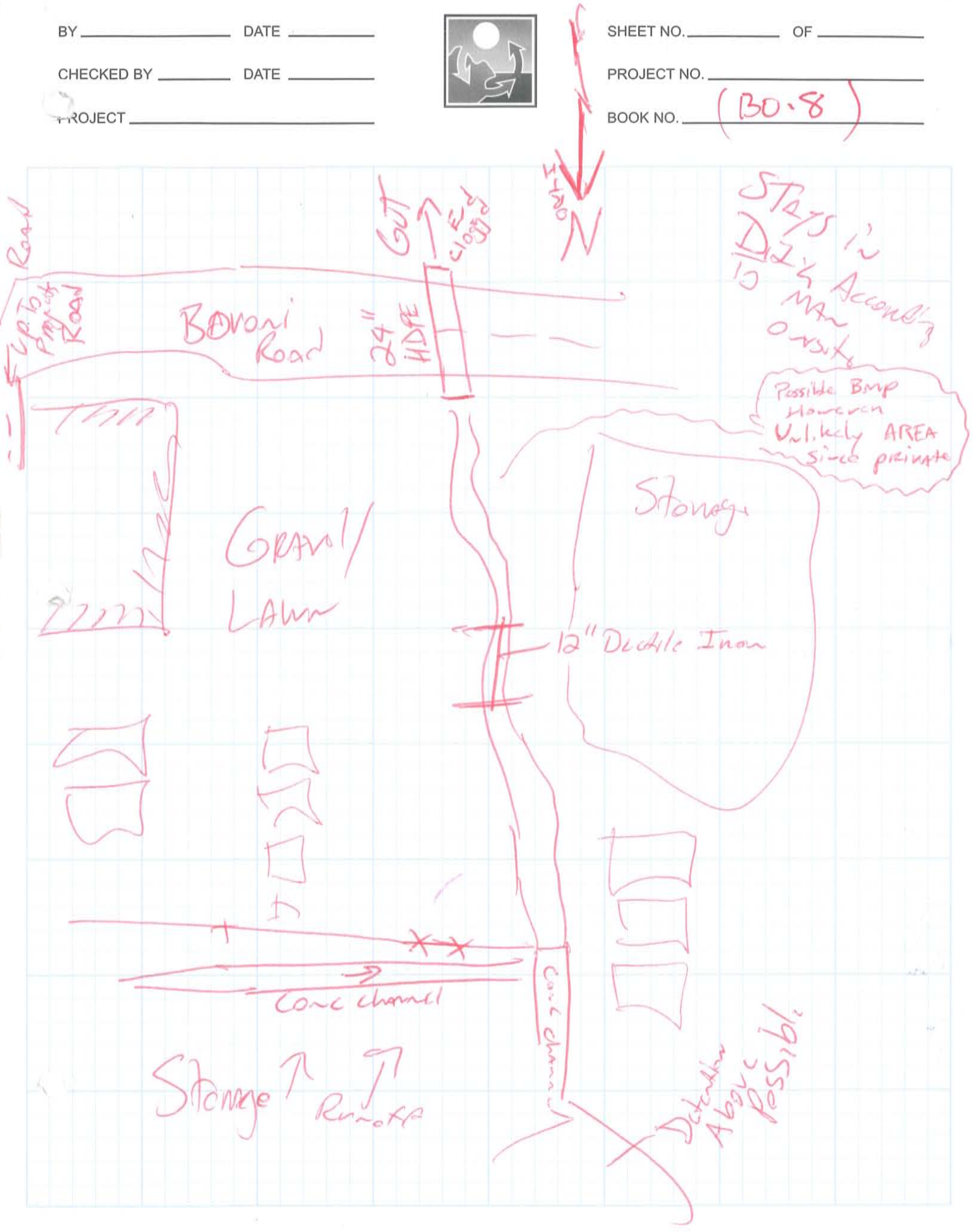
CHECKED BY _____ DATE _____

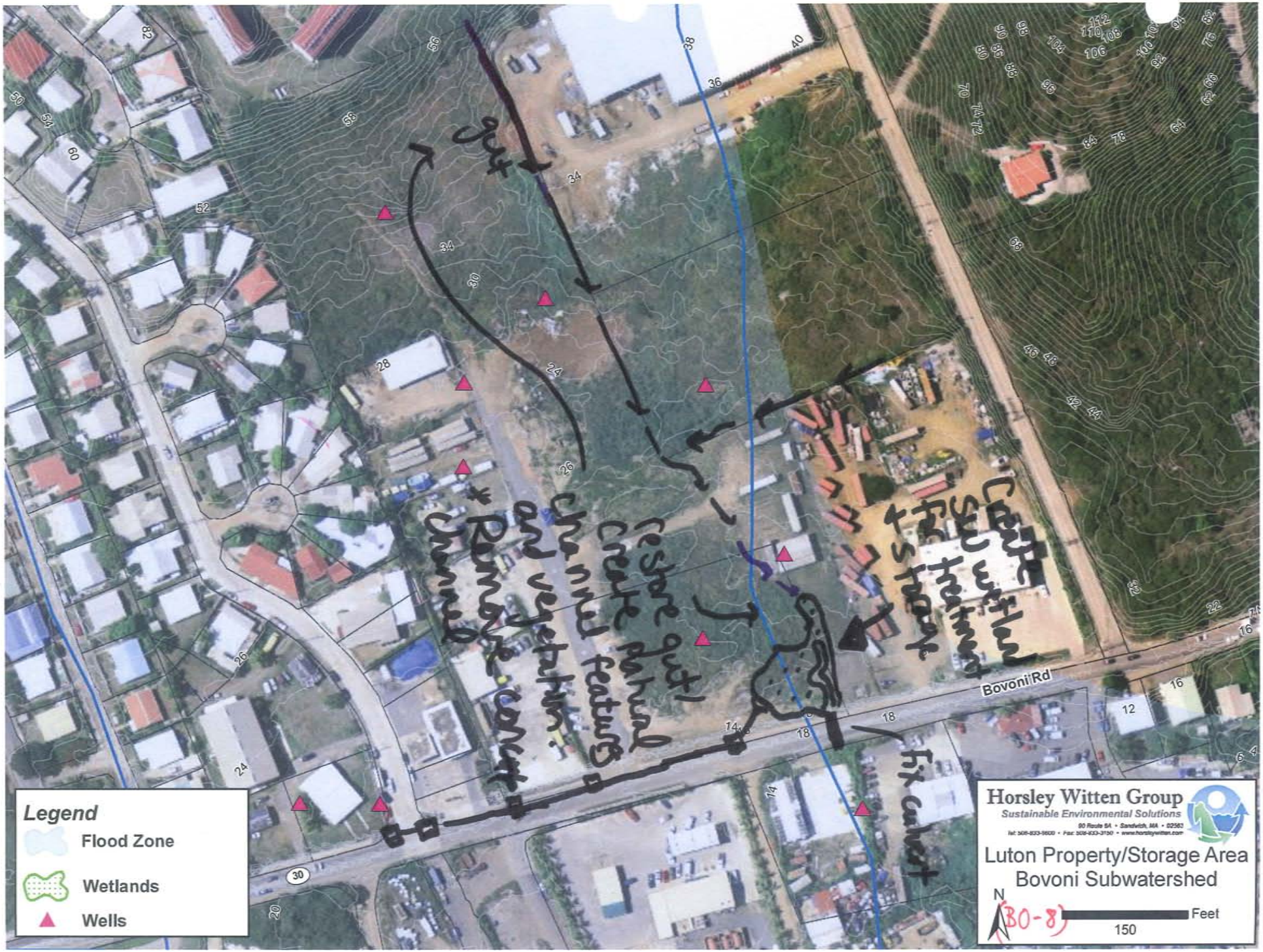
PROJECT _____

SHEET NO. _____ OF _____

PROJECT NO. _____

BOOK NO. (BO-8)



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- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: Bovoni

Site Name: ~~Storage Facility~~ BOVONI CENTER STORAGE (BO-9)

Description of Existing Conditions:

Mostly concrete Pavement, Buildings have cisterns At Ends To collect Roof Runoff. USE cisterns To wash Buildings but APPEAR To mostly overflow To Adjacent gut & drainage. CB's down Center of Parking AREA that ARE connected by pipe To the lowest CB and discharged To the Gut. Operator of Facility (( FRANCEE ) note: have his card )) said his parking Lot Floods back into his property in Large Storms due To the 12" pipe under the Access Road To the Maintenance/Housing being too High. Appears this AREA he was Talking About is Actually Functioning AS A veg/wetland. Could possibly USE A Second culvert At same elevation To convey the Larger events while maintaining current TREATment

Additional Notes and/or Sketch Information:

SEE Attached sketch

Virgin Islands Development Corp
Bovoni Center Storage Corp
Southshore Storage, Inc.

P.O. Box 6287
St. Thomas, VI 00804

**Francee A. Carter**
General Manager
Francois Baron

Tel: (340) 775-0300 Fax: (340) 777-7143

Description of Proposed Project:

possibly add A pipe For conveyance of Lg events

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☒ Not Likely ☐ Enforcement Needed

BY _____ DATE _____

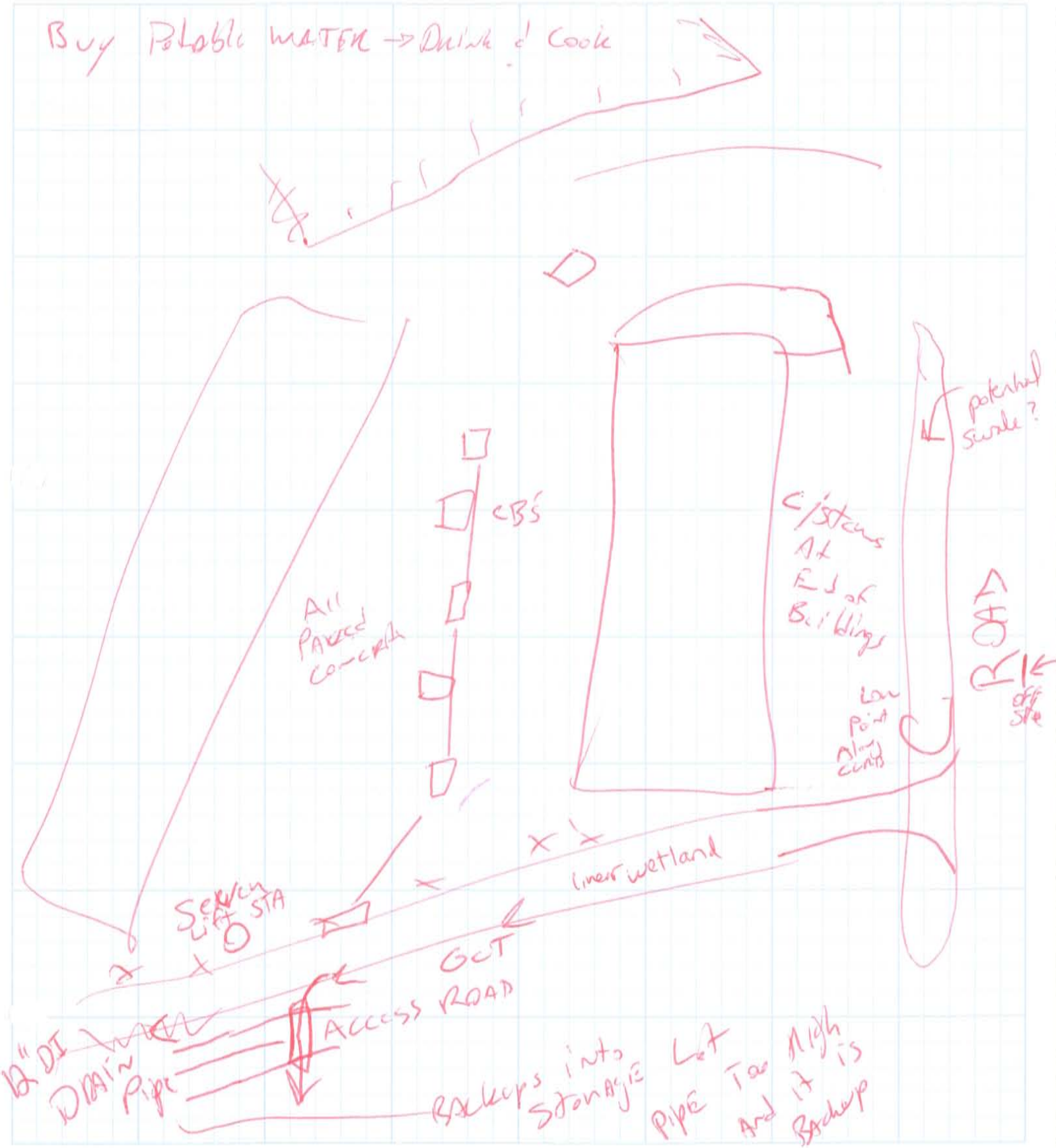
CHECKED BY _____ DATE _____

PROJECT _____

SHEET NO. _____ OF _____

PROJECT NO. _____

BOOK NO. (BO-9)



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- [ ] Other _____

Subwatershed: Bovoni

Site Name: Lew Henley's (BO-10)

Description of Existing Conditions:

Site Is south of Bovoni Rd. Mostly all gravel and sloped From North To South. Majority of AREA is used For storage of Active and inactive Tankers (Septic Haulers) & House Horses (PortaPots). Some of the older Tankers appear to be Leaking septage on To surrounding AREA. Various times during inspection smells of septic were prevalent. Lew not available at time of Inspection & secretary said she had only been there For a couple months.

Gut Flows From North Bovoni Rd To the North and it appears someone made an effort To stop the Runoff From entering the site & contain on the Road. BERM Looks Recent and is made of plastic BARRIERS and Loose dirt. Appears constructed Recently.

Additional Notes and/or Sketch Information:

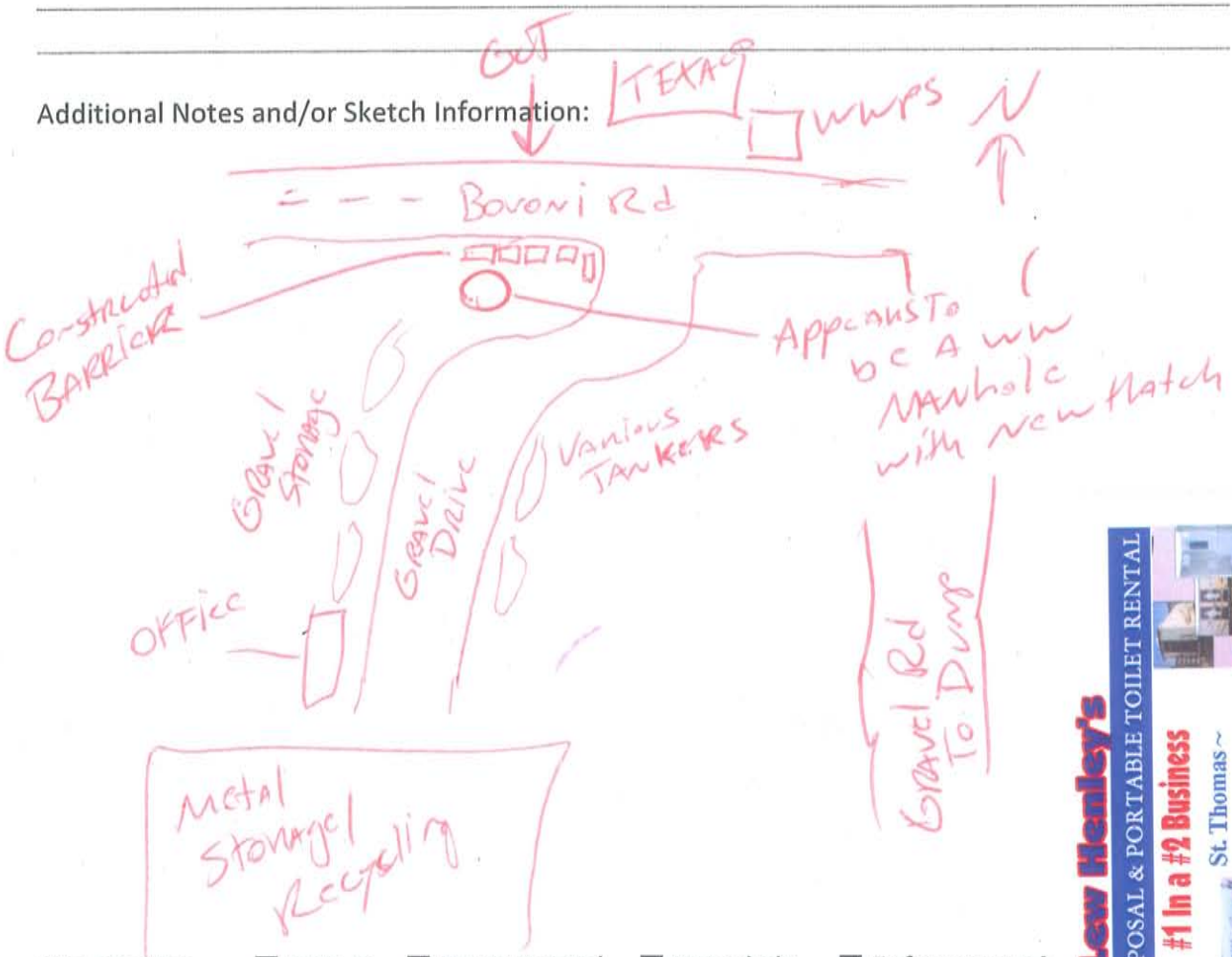
This part of Bovoni Rd Floods (TETACO & WW Pump STATION upgrade).

There is a metal stripping (copper) Facility to the south of Lew's. Metal stripping was in progress at time of Inspection. Metal Byproducts prevalent throughout gravel surface & staining

Description of Proposed Project:

Being at bottom of watershed These sites Receive highest volumes of offsite Runoff and ANF Likely are on the Highest contributors To the Bays degradation. Clean-up would be a substantial undertaking i would Likely Require construction of a new Facility offsite w/ advanced containment & Treatment.

Additional Notes and/or Sketch Information:




Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement N

Lew Henley's
SEWAGE DISPOSAL & PORTABLE TOILET RENTAL
#1 In a #2 Business
St. Thomas ~ 775-6259
St. John ~ 693-9300
Fax: 715-3674
7227 Estate Bovoni 17A St. Thomas, VI 00802
Email: lewhenleysewagedisposal@viaccess.net

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- [ ] Other _____

Subwatershed: Bovoni (BO-11)

Site Name: Gas Station on Bovoni Rd between Texaco + Sweet Pea's Flooding issues

Description of Existing Conditions:

- Uncovered, overflowing dumpster. Signage indicates a problem w/ public using the private dumpster.
- Storage of vehicles on property, evidence of uncovered maintenance
- Indications of ponding on pavement near areas that could be converted to SW retrofits (planter, curbs, open grass area)

Additional Notes and/or Sketch Information:

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- [ ] Other _____

Subwatershed: Bovoni

Site Name: Sweet Pies/Laundry (BO-12)

Description of Existing Conditions:

Site is located To the south of Bovoni Rd; East of the ~~[illegible]~~ site. There is A gut along GAS STATION → The west property line that is Fed by the HDPE culvert that is under Bovoni Rd. Culvert upstream end is within the STORAGE FACILITY To the EAST Talked To the owner of sweet PIES And he explained that he has ISSUES with Road Runoff from Bovoni Rd; the culvert Flooding his property. Flooding From culvert would have To be FROM culvert backing up on the upstream end; even Topping the Road on the gut capacity overflow. Gut is FAIRLY well defined with side slopes & vegetated surface. HDPE pipe did appear To be clogged on the discharge End w/ vegetation & debris.

Additional Notes and/or Sketch Information:

There were Two other conduits discharging To the HDPE culvert. One was SAID To be From the RO water system For the WATER TANKER Fill port the other is unknown. In the Rear of the Buildings The gut Forks From the LAUNDRY Bld. into one gut. Both sides appeared To be accepting Sewage From the FACILITIES. The western gut has a white PVC pipe that had delayed discharges typical To Screen. The discharge From the Bovoni culvert Appeared clean

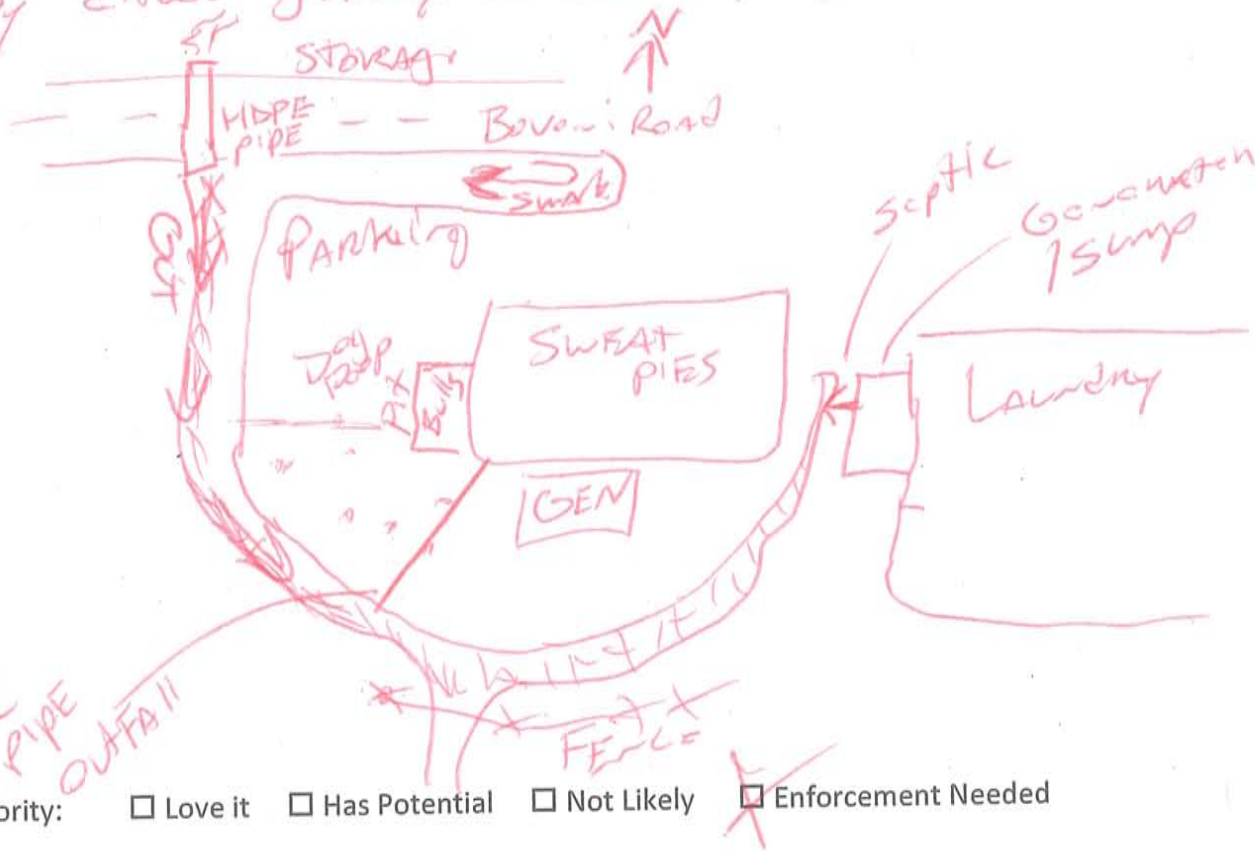
Description of Proposed Project:

Liquid, However The closer To The said discharge the gut had signs of heavy Algae. After the PVC discharge. The gut WATER WAS cloudy & had signs of Toilet waste. Also smelled like sceptic. The owner of Sweat PIES SAID it was From his generator containment (not likely).

The gut From the Laundry HAD soap & what appeared To be toilet debris. Flow was coming From A portion of the building that housed the generator. The owner of Laundry Bld said his pump died yesterday (unlikely from visible signs with the gut)

Both Buildings ARE Adjacent To Screen In Bovoni Road & could easily Discharge by either quality of small pump.

Additional Notes and/or Sketch Information:




Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

Date: 1/30/2013

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: Bovoni

Site Name: Unregulated Dump site (West of Landfill) BO-13

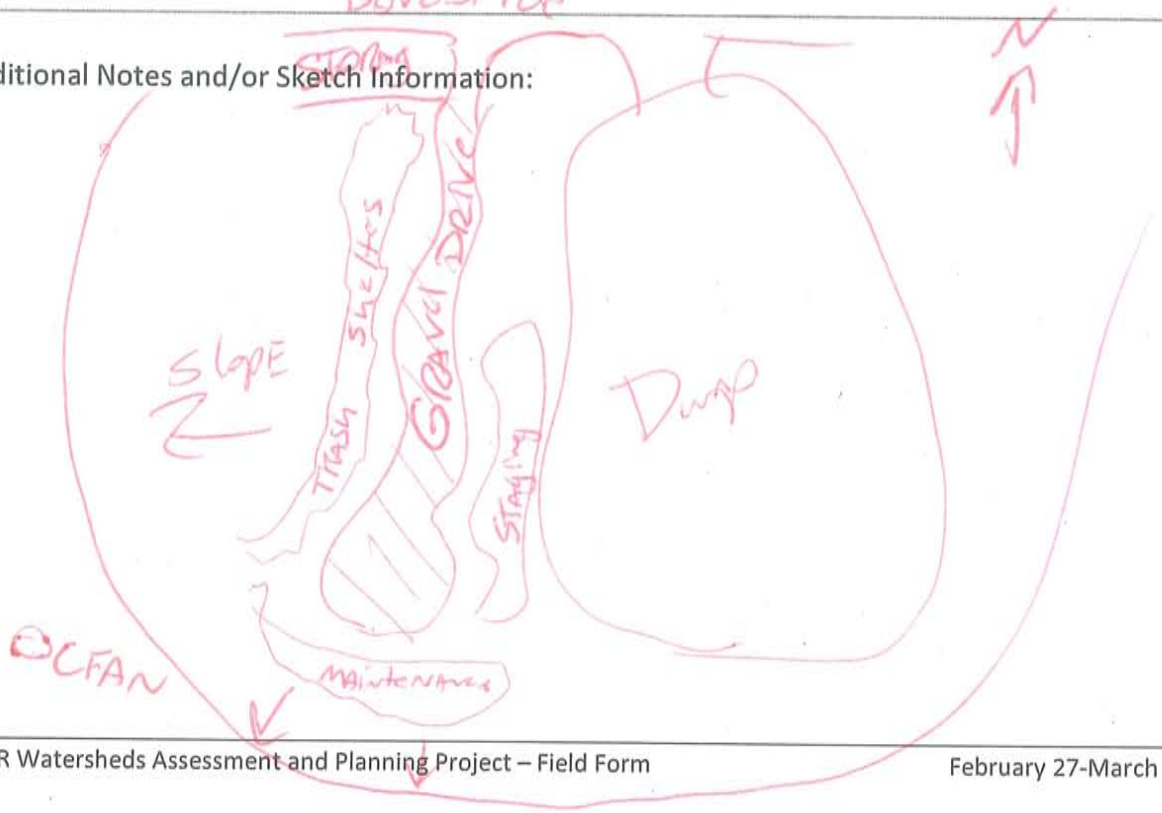
Description of Existing Conditions:

Access To site is by dirt Road EAST of Storage Facility south of Bovoni Rd. Small pocket wetland has Formed Along Rd prior To culvert From Runoff directed From Storage Facility i From the gut that Flows From the wooded AREA To The North (Dog Fighting) AREA HAS VARIOUS dump sites & vehicle/construction equipment maintenance AREAS. Vehicle byproducts (oil/etc) ARE everywhere and spills ARE visible. AREA is Also used For SQUATTING AS shelters have been constructed in various locations. Makeshift cisterns were observed

Appears AREA is Also used Extensively For Construction STAGING

Bovoni Rd

Additional Notes and/or Sketch Information:



Description of Proposed Project:

Extensive cleanup, most likely SuperFund.

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☒ Enforcement Needed

# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [x] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [x] Other Enforcement.

Subwatershed: Bovoni

Site Name: LANDFILL (BO-14)

Description of Existing Conditions:

Under consent decree there are a number of requirements prior to closure

- monitoring
- wetland restoration
- stormwater
- Pollution prevention.
- Leachate interception or treatment

STEER NOTES ON CONSENT DECREE AND CLOSURE PLAN

Additional Notes and/or Sketch Information:

HW NOTES

## Bovoni Landfill Mitigation Requirements

USA vs. Government of the U.S. Virgin Islands, Virgin Islands Waste Management Authority, Virgin Islands Port Authority, Joseph and Zulma Hodge

### Charges

- Landfill must submit annual reports to the EPA regarding emissions of non-methane organic compounds (NMOCs). If reports exceed annual limits, the landfill must design, construct, and operate a gas collection and control system (GCCS).

  *EPA's regulations issued under the CAA require that each landfill built before 1991 and that has a capacity greater than a certain threshold must submit annual reports to EPA regarding emissions of non-methane organic compounds ("NMOCs"); that if any NMOC report shows that the annual emissions of these landfill gases exceed a specified threshold quantity, the landfill must design, construct, and operate, according to certain deadlines, a gas collection and control system ("GCCS") that captures and combusts gases generated within the landfill. Effective January 2004, the CAA regulations also require each such landfill to develop and implement a start-up, shutdown and malfunction ("SSM") plan for the GCCS.*

- Bovoni must install a ground water monitoring system and implement a storm water pollution prevention plan.

  *EPA made findings that Bovoni was being operated in a manner that may present an "imminent and substantial endangerment to health and the environment" and, pursuant to RCRA Section 7003(a), issued an administrative order on consent ("Bovoni RCRA AOC") that requires that GVI and WMA, inter alia, pursuant to an approved schedule, award contracts by August 2006 to install a ground water monitoring system and to implement a storm water pollution prevention plan at Bovoni.*

- Joseph and Zulma Hodge must removal scrap tires adjacent to Bovoni.

  *The United States filed an amended complaint ("Complaint") in this action, that added two defendants, Joseph and Zulma Hodge (the "Hodges"), and a claim that the GVI, WMA, and the Hodges failed to comply with an EPA administrative order (Docket No. RCRA-022008-7307 (October 4, 2008) ("Bovoni Tire AOC"), issued pursuant to RCRA Section 7003(a), requiring the removal of scrap tires adjacent to Bovoni.*

### Civil Penalties

- Defendants shall jointly pay $50,000 as a civil penalty. Payment of the principal amount shall be made in four equal annual installments of $12,500 (plus interest).

- WMA shall submit a revised GCCS design plan that conforms with the 2012 Closure Plan.

  *The GCCS as constructed deviates from the WMA's design plan for the GCCS dated May 2010 which EPA approved in March 2011, and WMA's 2012 Closure Plan (as provided under Paragraph 21.a) will require further changes to the GCCS. Accordingly, WMA shall, by the deadline specified in Appendix A, submit a revised GCCS design plan. The revised plan shall describe modifications required to conform the GCCS to the modifications to the Landfill proposed in the 2012 Closure Plan, and shall comply with the Federal Plan and the Landfill MACT.*

- WMA shall submit to EPA an initial performance test report of the GCCS within 45 days after completion of the initial performance test.

  *Within 30 days after the Effective Date, WMA shall submit for EPA approval a revised protocol for performance testing of the control system that incorporates EPA's comments. WMA shall, by the deadline specified in Appendix A or within 90 days after EPA's approval of the revised protocol, whichever is later, complete the initial performance test of the control system. WMA shall perform the initial performance test of the control system using the test methods specified in 40 C.F.R. § 60.754(d) and (e), the test procedures specified in 40 C.F.R. § 60.754(b), and in accordance with the EPA-approved protocol. WMA shall submit to EPA an initial performance test report within 45 days after completion of the initial performance test. The report shall satisfy the specifications of 40 C.F.R. §§ 60.8, 60.757 and 60.758.*

- WMA shall, within 60 days after the completion of the initial performance test or 120 days after the Effective Date, whichever is later, submit a proposed GCCS Operation and Maintenance ("O&M") Plan to EPA for its review and comment.

- WMA shall operate the GCCS at all times. *During periods of SSM WMA shall operate the GCCS in accordance with an EPA reviewed SSM Plan.*

- WMA shall submit required information to the EPA by May 31, 2012 to enable EPA to make a determination on the request for relief from EPA's Clean Water Act Consent Order No. II-CWA-98-125.

  *WMA requested relief from EPA's Clean Water Act Consent Order No. II-CWA-98-125 regarding buried metal and other material in the wetland in and adjacent to the Landfill. WMA shall by May 31, 2012, submit to EPA information to enable EPA to make a determination in the matter.*

- Until Closure, WMA shall operate the Landfill in accordance with the Decree and the federal municipal solid waste landfill operating criteria, including:
  a. Implement a groundwater monitoring program;

b. Implement and maintain a program for detecting and preventing disposal of regulated hazardous wastes;
c. Apply adequate cover material;
d. Control disease vectors;
e. Control explosive gases;
f. Ensure that no open burning of solid wastes occurs;
g. Control access to the Landfill;
h. Control storm water run-on and run-off;
i. Ensure that the Landfill does not cause discharges of pollutants into waters of United States that violate CWA requirements; and
j. Ensure that bulk or non-containerized liquid wastes are not placed in the Landfill except when allowed.

*Until Closure, WMA shall operate the Landfill in accordance with the Decree and the federal municipal solid waste landfill operating criteria set forth at 40 C.F.R. § 258.20-29, including:*

*a. WMA shall implement a program for groundwater monitoring, as provided in 40 C.F.R. § 258.51-55. WMA may seek EPA's approval, for purposes of this Decree only, for WMA to conduct monitoring less frequently than, or conduct monitoring of fewer parameters than, is provided under 40 C.F.R. § 258.54;*
*b. WMA shall implement and maintain a program for detecting and preventing the disposal of regulated hazardous wastes as provided in 40 C.F.R. § 258.20;*
*c. WMA shall apply adequate cover material as provided in 40 C.F.R. § 258.21;*
*d. WMA shall control disease vectors as provided in 40 C.F.R. § 258.22;*
*e. WMA shall control explosive gases as provided in 40 C.F.R. § 258.23;*
*f. WMA shall ensure that no open burning of solid waste occurs as provided in 40 C.F.R. § 258.24;*
*g. WMA shall control access as provided in 40 C.F.R. § 258.25;*
*h. WMA shall control run-on and run-off as provided in 40 C.F.R. § 258.26;*
*i. WMA shall ensure that the Landfill does not cause discharges of pollutants into waters of the United States that violate CWA requirements, as provided in40 C.F.R. § 258.27; and*
*j. WMA shall ensure that bulk or non-containerized liquid wastes are not placed in the Landfill except as provided in 40 C.F.R. § 258.28.*

- WMA shall perform an assessment for groundwater corrective action, select a remedy and implement the remedy.

  *WMA shall perform an assessment for groundwater corrective action, select a remedy and implement the remedy if required by and in accordance with 40 C.F.R. § 258.56-58.*

- WMA shall, by the deadline specified in the Closure Schedule, submit for EPA approval a revised closure plan for the Landfill ("2012 Closure Plan").

- If WMA, after consulting with the EPA, determines that the Landfill will reach its approved limits of waste at a different date than set forth in the Closure Schedule, new

deadlines may be established for accepting waste, completing stabilization and storm water control, and for complete Closure.

*WMA may, after consulting with EPA, make a determination that the Landfill's physical contours and slopes will reach their approved limits at a different date than the deadline to permanently cease accepting waste set forth in the Closure Schedule. In that event, WMA shall establish, after consulting with EPA, new deadlines to permanently cease accepting waste at the Landfill, to complete slope stabilization and storm water control in the East areas, and to complete Closure. WMA shall notify EPA of the new deadlines and shall prepare a modified Closure Schedule.*

- WMA shall: (a) within 21 months after the Effective Date, remove all scrap tires from Area A (as that area is described in the Bovoni Tire AOC); and (b) within 18 months after the Effective Date, remove all scrap tires from the Incidental Areas (as those areas are described in the Bovoni Tire AOC). *These scrap tires shall be transported outside the Territory in accordance with applicable transport rules and management requirements of the receiving jurisdiction, or used in accordance with the Beneficial Reuse Plan under Paragraph 26.*

- WMA shall implement mosquito control measures for temporarily stored tires until all tires have been removed.

  *WMA shall, for Area A, the Incidental Areas and any areas where the scrap tires are stored pending beneficial reuse under Paragraph 26, implement mosquito control measures in accordance with the requirements of the Virgin Islands Department of Health until all tires have been removed.*

- WMA shall implement the Waste Diversion Program. *(see page 17-18 of CD)*

- WMA shall submit to EPA quarterly reports regarding its compliance with the requirements of the CAA regulations and the CAA provisions of the Consent Decree.

- WMA shall comply with the reporting and recordkeeping requirements specified in 40 C.F.R. §§ 60.757 and 60.758. *(see page 21-23)*

- *The GVI has represented: (i) that it does not have sufficient funds on hand to implement the Closure Work and a Significant Groundwater Corrective Action; (ii) that it must obtain such funding through various means including the sale of bonds.*

- GVI and WMA shall seek and use reasonable efforts to secure approval for the prospective imposition of a solid waste fee.

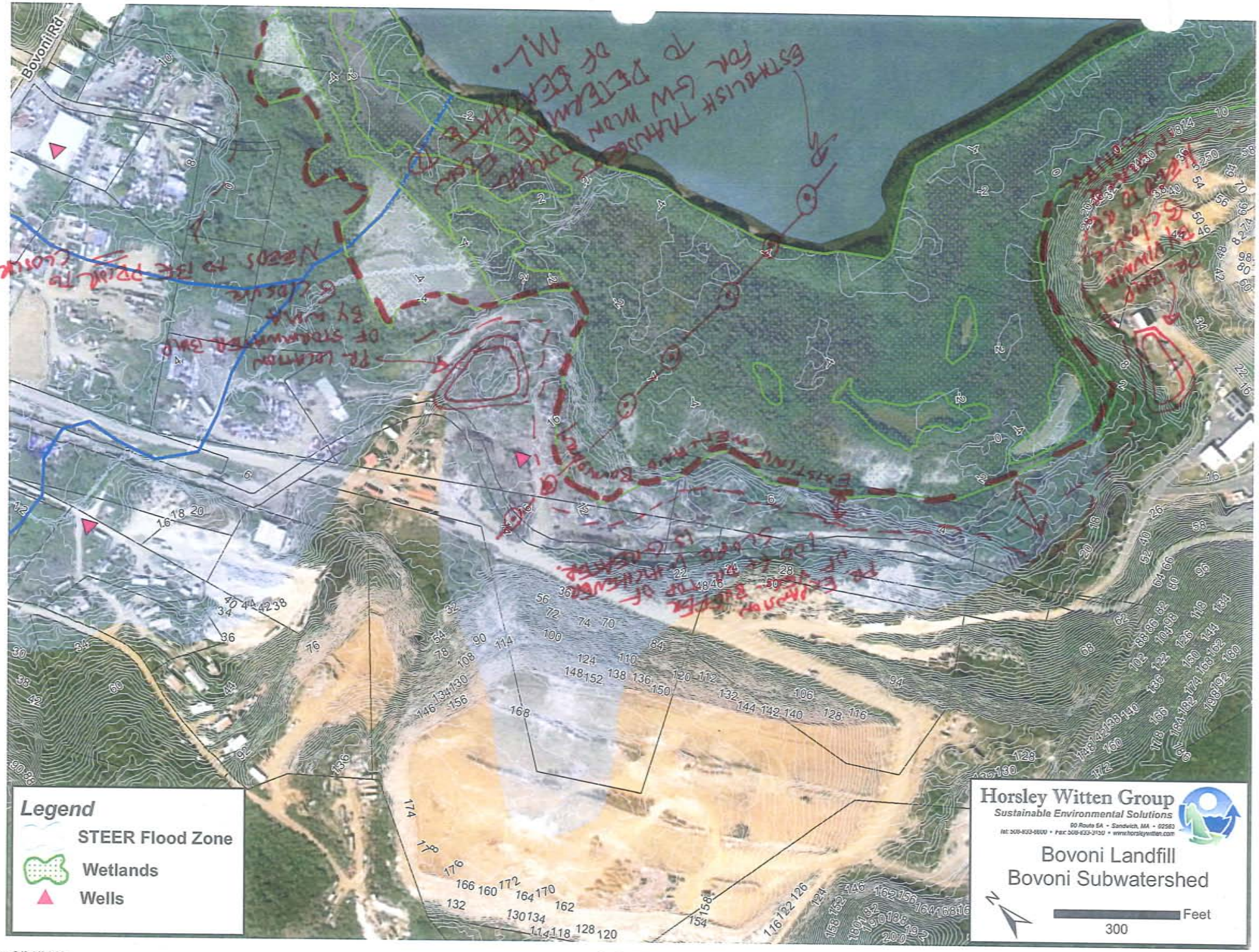
  *By the end of 2014, GVI and WMA, as applicable, shall seek, and shall use reasonable efforts to secure, approval by the Legislature of the Virgin Islands or the Virgin Islands Public Services Commission, as applicable, for the prospective imposition of a solid*

*waste fee, if and to the extent that such approval is necessary for the imposition of such fee.*

**GCCS/LCCS**

Research yielded two alternatives for implementing a GCCS and LCCS:

- Install a combination GCCS/LCCS that relies upon drilled wells for both gas and leachate extraction and collection; or
- Install a GCCS that relies up drilled wells for gas extraction and collection and install a separate LCCS that involves primarily a gravity, perimeter trench system that directs leachate to a treatment facility.
- Data found suggests that a combination GCCS/LCCS system may be the most cost-effective alternative provided that an existing trench LCCS system isn't already in place.

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☒ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☒ Other WWTP

Subwatershed: ~~Bovoni~~ Mangrove Lagoon (BO-15)

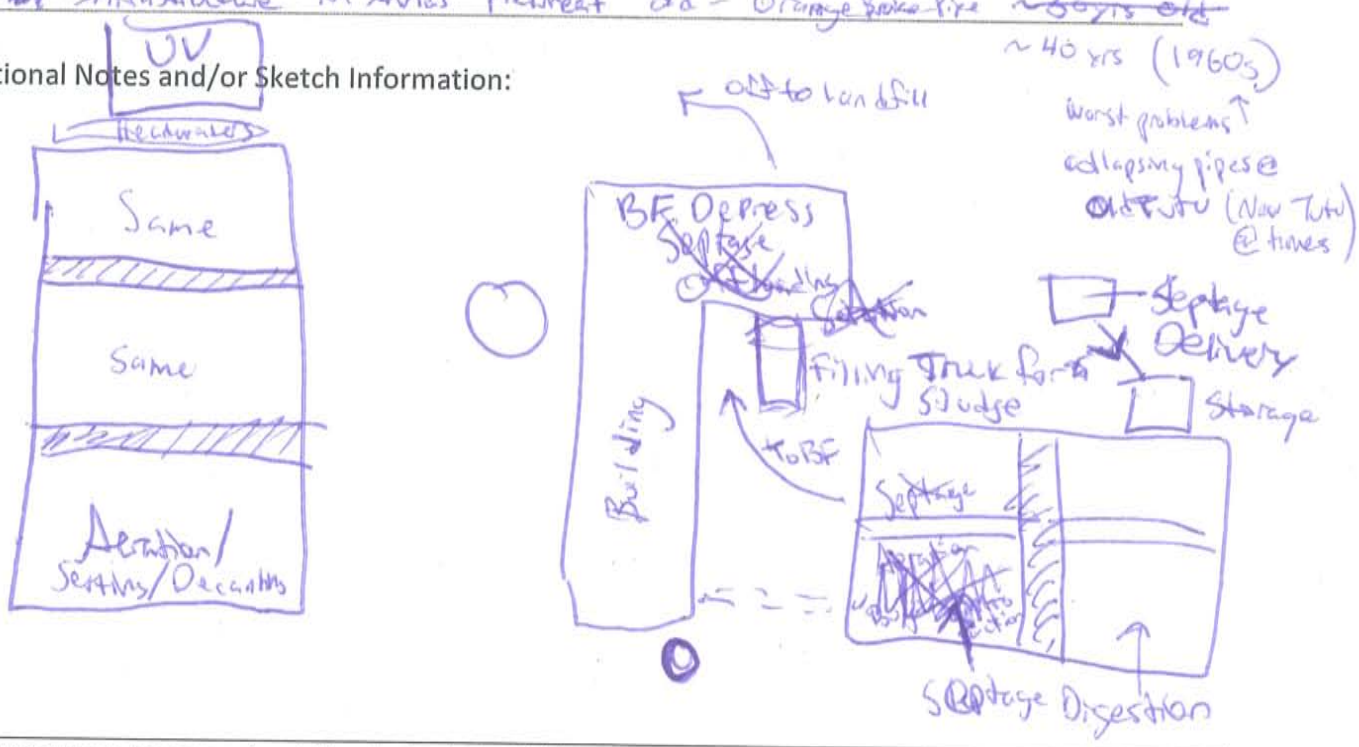
Site Name: ~~Bay~~ Mangrove Lagoon WWTP

Description of Existing Conditions:

Jessy Ryan - Operator of smaller plant for that handles Septage

- 750,000 GPD Design / 400,000 GPD TYP. / 500,000 gpd right now
- Increased ~~to~~ 1.2 MGD during rain events
- Septage handled at smaller plant where "bugs" are reintroduced and "diluted" prior to sending to main treatment facility
- Plant catches up on waste treatment during 8 hr workday
  - ↳ plant does not operate at night unless there is a significant (2"-3") rainfall expected then it runs 24 hrs / day
- Treatment plant ~~built~~ on-line in 2002/2003
- Ft. Mylnar WWTP should be going off-line and will hook up to WWTP
- Ex pumpstation in Bovoni Neighborhood ~~near recreation~~ will be offline in a matter of weeks. New pumpstation to come online.
- WW Infrastructure in Annas Retreat old - Orange Broke Pipe ~~~30 yrs old~~ ~40 yrs (1960s)

Additional Notes and/or Sketch Information:




Worst problems ↑ collapsing pipes @ old Tutu (New Tutu @ times)

Description of Proposed Project:

- Repune Vista - own new WWTP
- Design for pipeline for new development near Ft Mylnar + Home Depot, Repune 3

- VESSUP WWTP
- When house w/in 60' of sewer - resident should connect
- Ask about % capacity
- Check Heavy Materials Connection to WWTP
- Racetrack connected to sewer - Humain Society
- small station about $0.5 mil

- Downspout connections into manholes
- Manholes/pipes leak during rainfall - groundwater infiltration during extended rainfall period

Additional Notes and/or Sketch Information:

- Blockages in Old/New Tuto ends up in Pond/Cat systems
- Priorities - Control runoff from landfill
  - $11 mil for landfill cover
- Gas energy plant for landfill - will power WWTP
- Leachate Collection - not there now but is in design now
- Alpine shut down
- Slag/metals in mangrove - restoration plan in place - public report
- 3:1 slopes/detention ponds for closure landfill - $38 mil
- SBR WWTP / Bar screen Aeration/Settling/Decanting

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

- UV disinfection



- belt filter press - Polymers added to sludge
- Oils - 5 sal/person
- HH Haz Waste - light bulbs/paints/house chemicals

Steve's picks ⇒ Horsetrack → sw runoff; horse waste...
⇒ wetland mitigation

# FIELD ASSESSMENT NOTES

Horsley Witten Group

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

⇒ improvement of existing systems
⇒ I&I in key areas up top
⇒ $ for leachate
⇒ change watershed line
⇒ marina row
⇒ develick vessels (CZM)

FHWA money
EPA & DOI
↳ Puerto Rico & New York
DOT ↳ painting lines marking

Subwatershed: _____

Site Name: ~~COMPASS PT SALT POND~~ ML. WWTP MEETING
STEVE, & GRUM B

Description of Existing Conditions:

JANUARY LOOKING @ 3 SITES
REDHOOK SALT POND, CPSP, SECOND FALSE ENTRANCE

#1 ORTHORECTIFY AERIALS HISTORICAL CONDITIONS
#2 FIELD ASSESSMENT TO PRIORITIZE 3 SITES
BATHYMETRIC TO ESTIMATE DREDGING CAPACITY
CONTAMINANT SAMPLING - ORGANIC & INORGANIC
WATER MODELING - FLUSHING RATE
#3 IMPLEMENT TOP PRIORITY

Motor oil: mechanics & homeowners. 5 gallons/month
VI Regulated Waste
can burn @ WAPA..
coolants & breakfluids.. bad!

recycle center: HHW ~~Waste~~ (once/qt.), bulbs
open 3 times/wk
paints & chemicals

Additional Notes and/or Sketch Information:

CWNS → they have a closure plan to be finalized by end of year
Landfill - runoff control - top cover $11 million

Leachate collection system, pretreatment, then come to WWTP
Consent decree order → restore wetlands where scrap metal encroachment.
kick road out 100-50 ft.

Methane system installed... build gas to energy plant.
↳ power MLTP, rest piped back to WAPA

plasma, gasification, puerto rico

SBR aeration & settling & decanting in each cell → disinfection basin
UV trough

greasetraps hard to deal with. ML don't accept.

waste to energy



plant not designed for salt or for grease
bilge will be bad!
sludge pump in each tank
belt filter press → sludge cake → truck to landfill. water recycled back into system

AR & New Tutu R built in the 1960's

Description of Proposed Project:

Broken lines
old Tutu area & new tutu ← more in AR

combined in some places
not alot of storm infrastructure in old Tutu - just a few places
downspouts
① leaking manholes & bad joints
(no IDDE inv. done)
② I&I high ground water, saw spikes in volume for months!!

1/2 million for a small pump station.

if you add, have to increase ex: pump station size.

pain in the butt to do maintenance behind people home.

Additional Notes and/or Sketch Information:

2002-2003 ML WWTP built.

extension?
cost u less → they have a preliminary design
$1 million

- property line within 60 ft homeowner supposed to connect.

- all piping has to be replaced in AR & New Tutu Valley
partial CWN survey.

backups in old system in new Tutu, backs up into the gut.

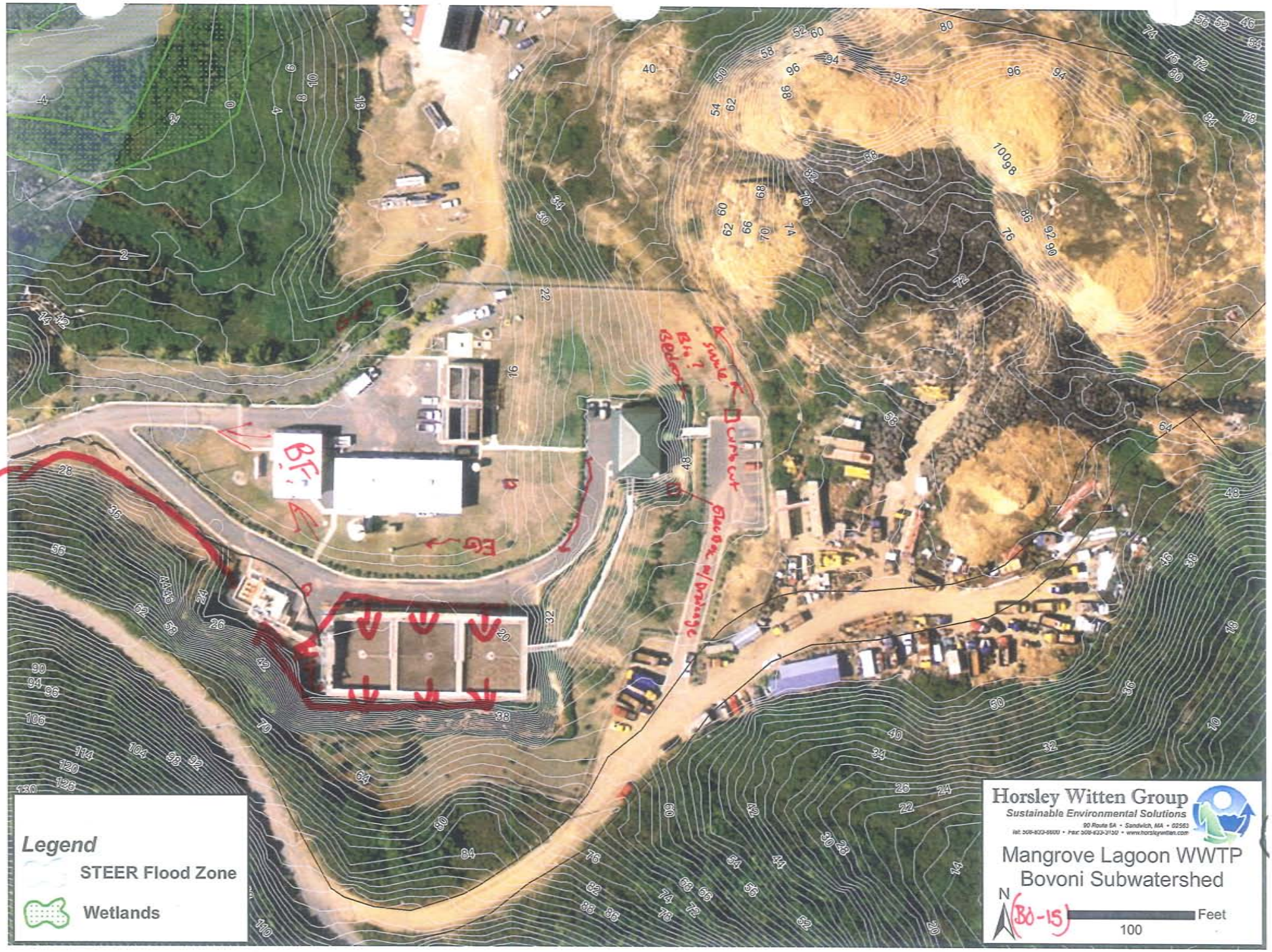
- Vessup can take more capacity.

- would need to put pump station by tropical marine
west to ML. connect to bridge to nowhere
everything east Vessup if pump station by food station come to ML then to Vessup.

force main

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

- going to replace Vessup

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☑ Other _____

Subwatershed: Turpentine Run

Site Name: Whispering ~~Woods~~ Hills (TR-4) & Flag Hill (TR-1)

Description of Existing Conditions:

Visited by Frank Baldo –

New affrable housing development project. Cutting roads, some use of ESC practices

Pull permit and make sure they are installing proper post construction stormwater controls.

- Enforcement to keep eye on ESC

Additional Notes and/or Sketch Information:

Flag Hill – Evidence of sedimentation at guard house. Investigate permit associated w road/ development project. Unpaved road may need additional stabilization if to be permanent. Runoff discharge across entrance from Red-roofed apartments.

7/20/2012
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FLAG HILL
or
SIGNAL HILL
* FRANK GARDO
INVESTIGATION
Image © 2012 GeoEye
1250 ft
2002
lat 18.331308° lon -64.906252° elev 517 ft

# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: Turpentine Run

Site Name: Seventh Day Adventist (TR-2)

Description of Existing Conditions:

ENTIRE PARCEL IS PAVED.

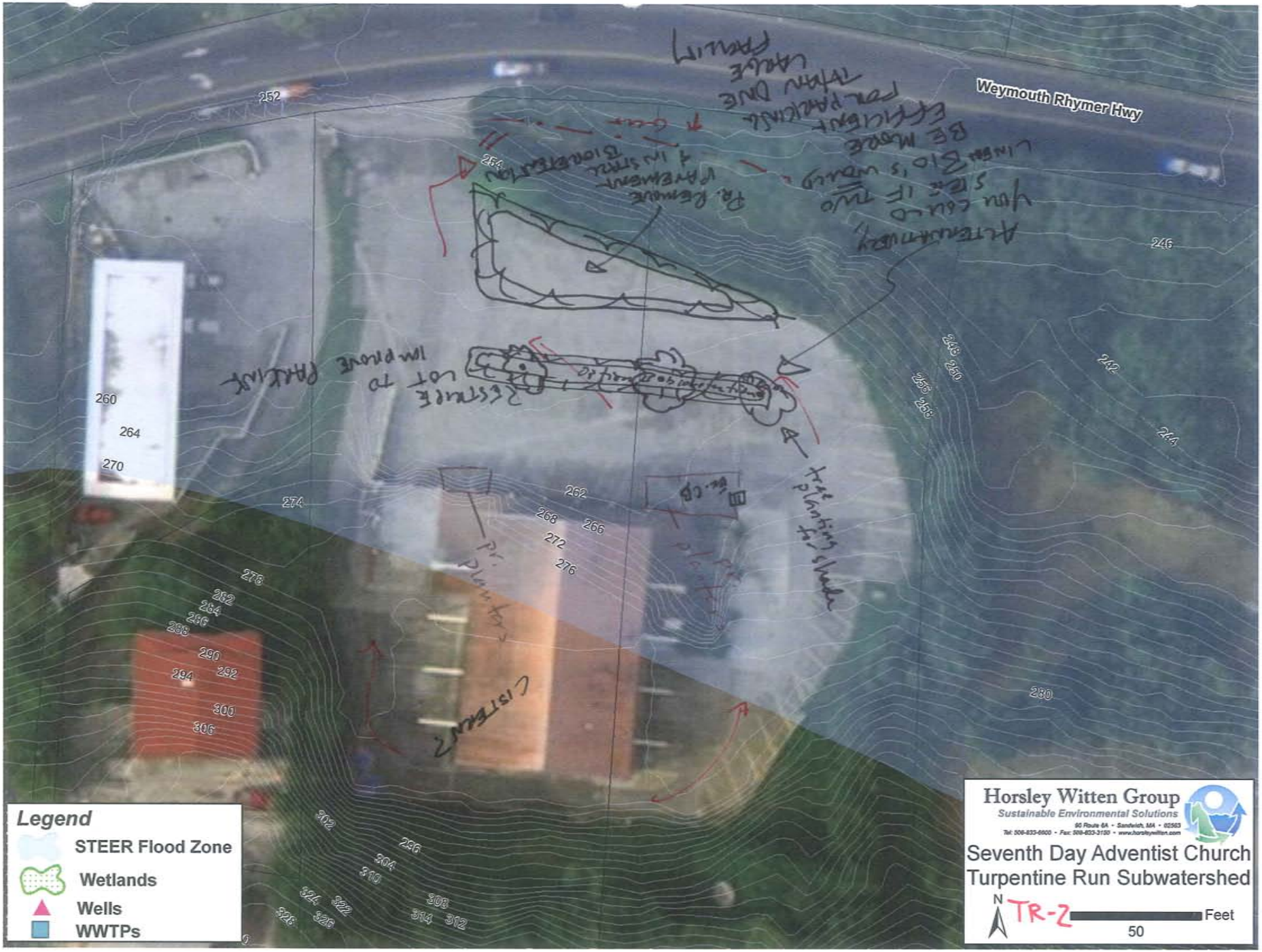
ALL DRAINAGE GOES DIRECTLY TO CUT IN FRONT.

PROPOSE ALTERNATIVE PARKING LAYOUT THAT INTEGRATES LANDSCAPE FEATURES FOR STORMWATER

Consider large bioretention at bottom of lot adjacent to stream. Overflow spillway to stream will require re-striping of parking spaces to be more efficient.

Additional Notes and/or Sketch Information:

An alternative parking lot design could incorporate landscape island bioretention w/ shade trees and/or planters along the building to capture roof top runoff.

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☒ Residential Stewardship
- ☑ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: TRUN

Site Name: HUMANE SOCIETY (TR-3)

Description of Existing Conditions:

INNOVATIVE WWTP ; ~~not~~ LID application possibly in the parking lot. Native plants.

would be a good site for edveation & watershed Signage.

Check back in once construction is completed

→ ownership Hernhutt Pond. possible buffer protection / enhancement discussion w owner.

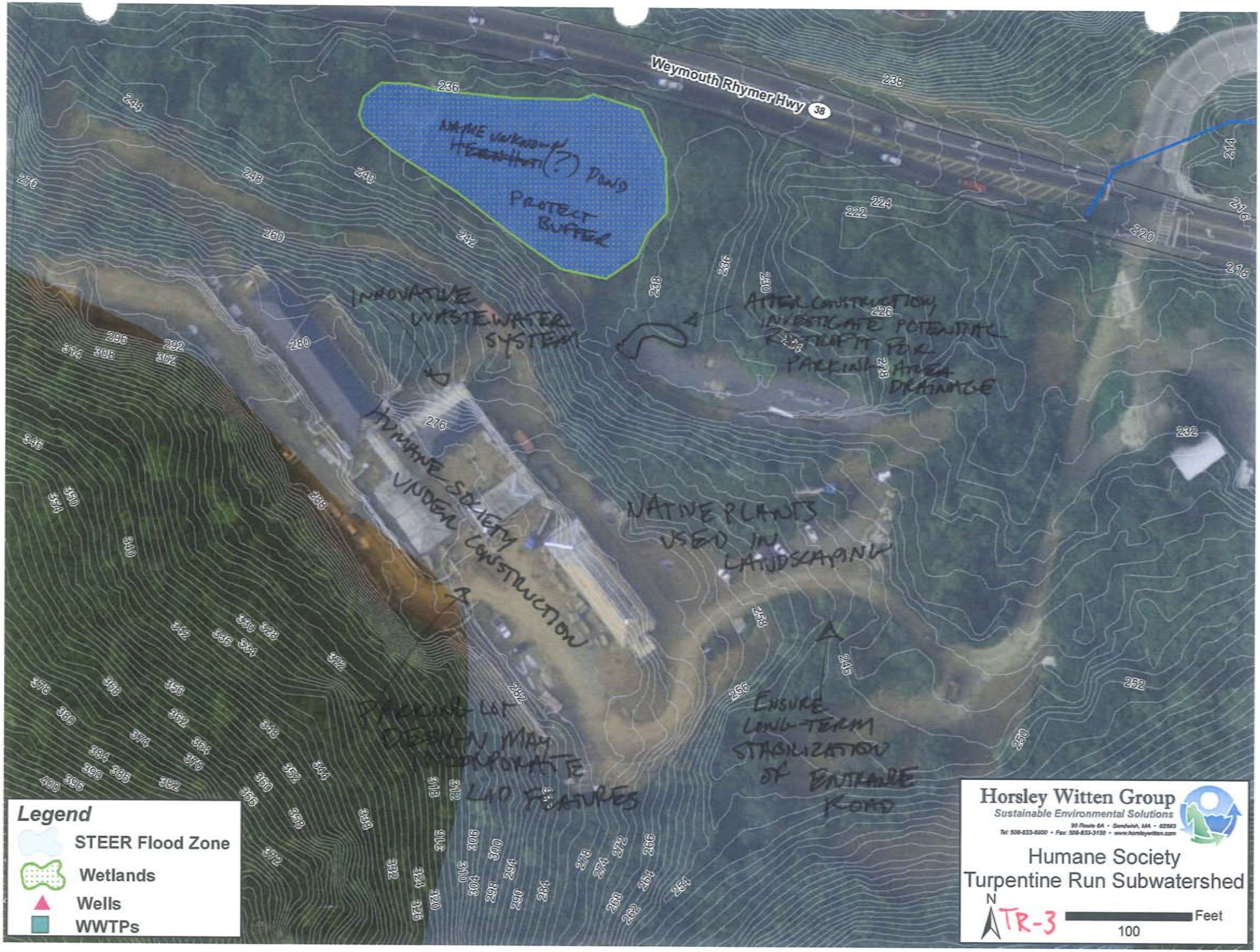
→ keep an eye on entrance road erosion. possible installation of water bars, etc.

Additional Notes and/or Sketch Information:

HUMANE SOCIETY of St. Thomas
PAWS TO CARE
www.hsstt.com

Jose Corbin Ortega
New York: 917.566.1420
St. Thomas: 340.998.4726
E-mail: josecorbinortega@yahoo.com

P.O. Box 8150
St. Thomas, VI 00801
Phone: 340.775.0599
Fax: 340.775.4455




Date: 2/22/2012

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [x] Infrastructure Repair
- [x] Illicit Discharge
- [ ] Other _____

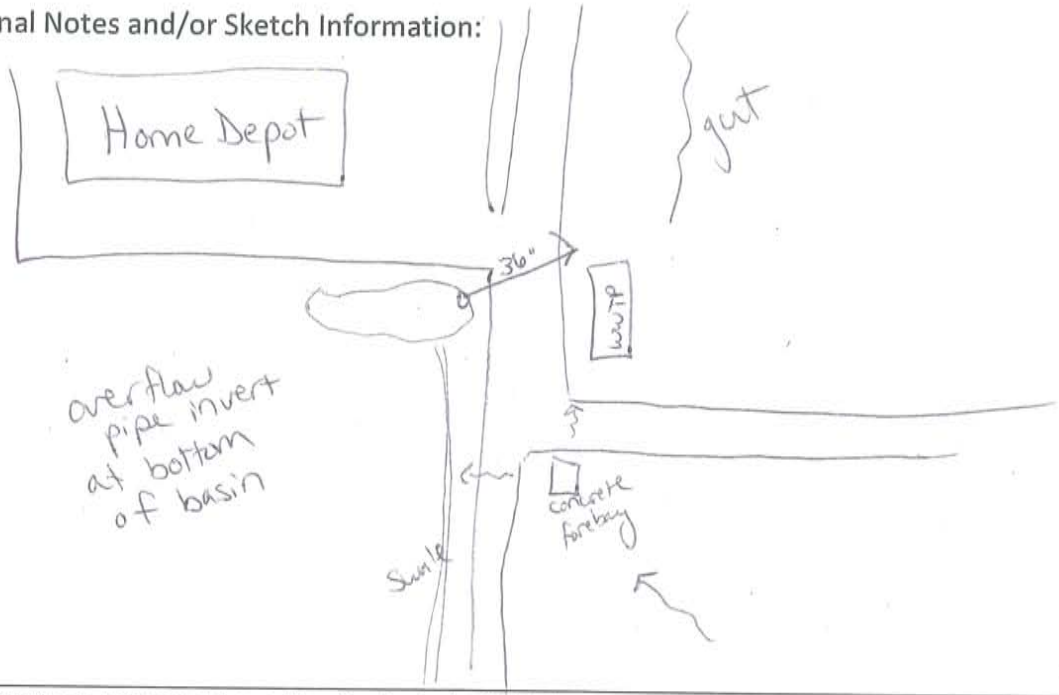
Subwatershed: Turpentine

Site Name: Cost U Less TR-5

Description of Existing Conditions:

No existing infrastructure - all surface flow. Half of lot flows into a concrete swale that leads to a new detention basin. Basin is in very good condition; may not see much stormwater. There is a curb cut under sidewalk that may not be effective. Back half of lot flows into very steep swales that lead to a detention basin near Home Depot. Some dry weather flow observed — dumping of washwater from back of Cost U Less. There is one concrete sediment basin near intersection of entrance road and loading dock driveway — dirt has been bermed there to prevent overflows down into the package plant area. The package plant seemed to be working, but the generator needs maintenance. Any overflows here go straight into the gut.

Additional Notes and/or Sketch Information:



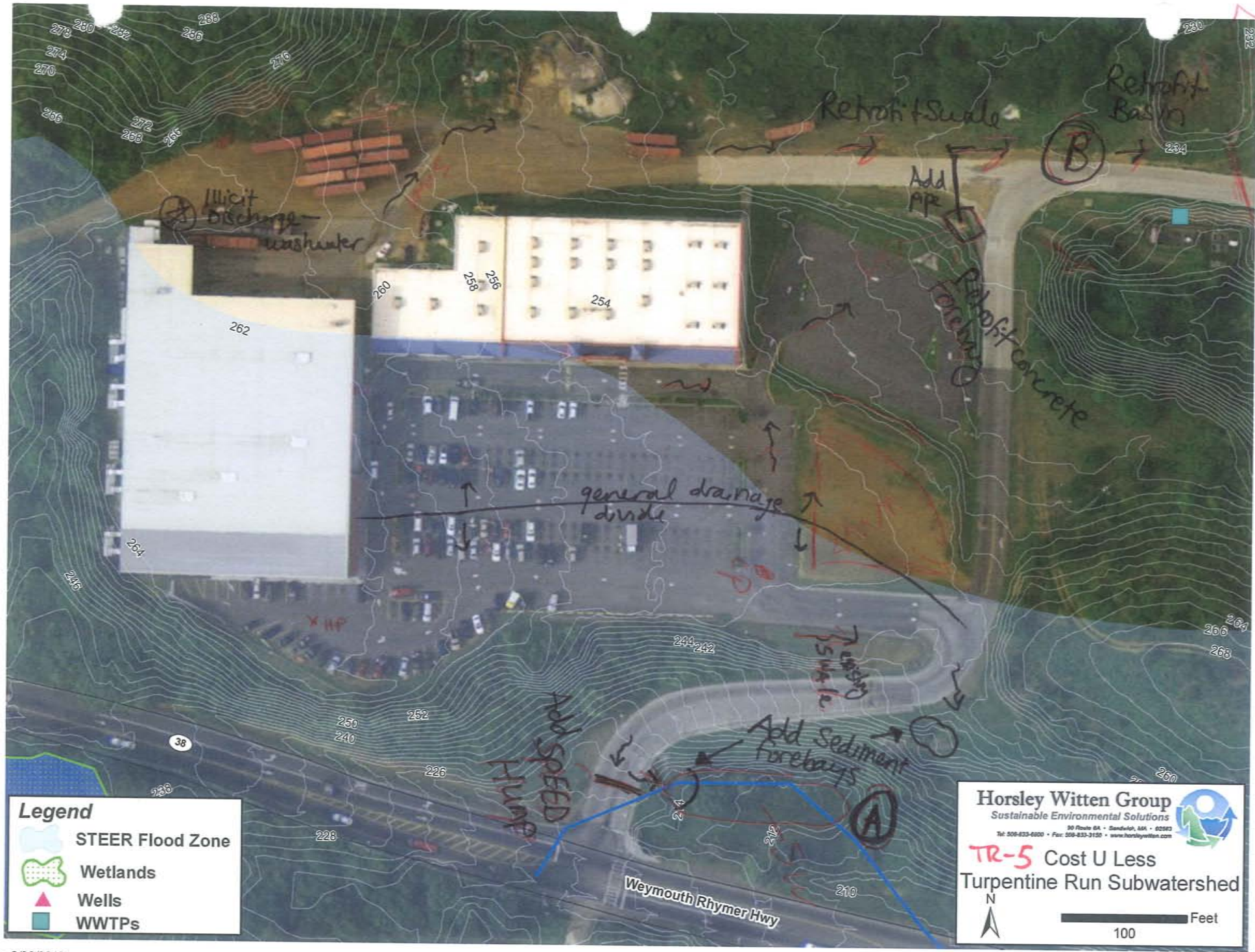
Description of Proposed Project:

A. New detention basin — direct more runoff into basin with a speed hump near the major intersection. Add sediment forebays for easier maintenance.

B. Basin near Home Depot — retrofit with sediment forebays and a 90° bend on outlet pipe to detain more water here, perhaps get some infiltration. Basin could be planted with more vegetation. Swales should be converted to more gentle side slopes, and add some check dams to reduce velocities. Retrofit concrete forebay with pipe to swales. Educate Cost U Less about wastewater dumping. Make sure WWTP is regularly maintained.

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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# FIELD ASSESSMENT NOTES

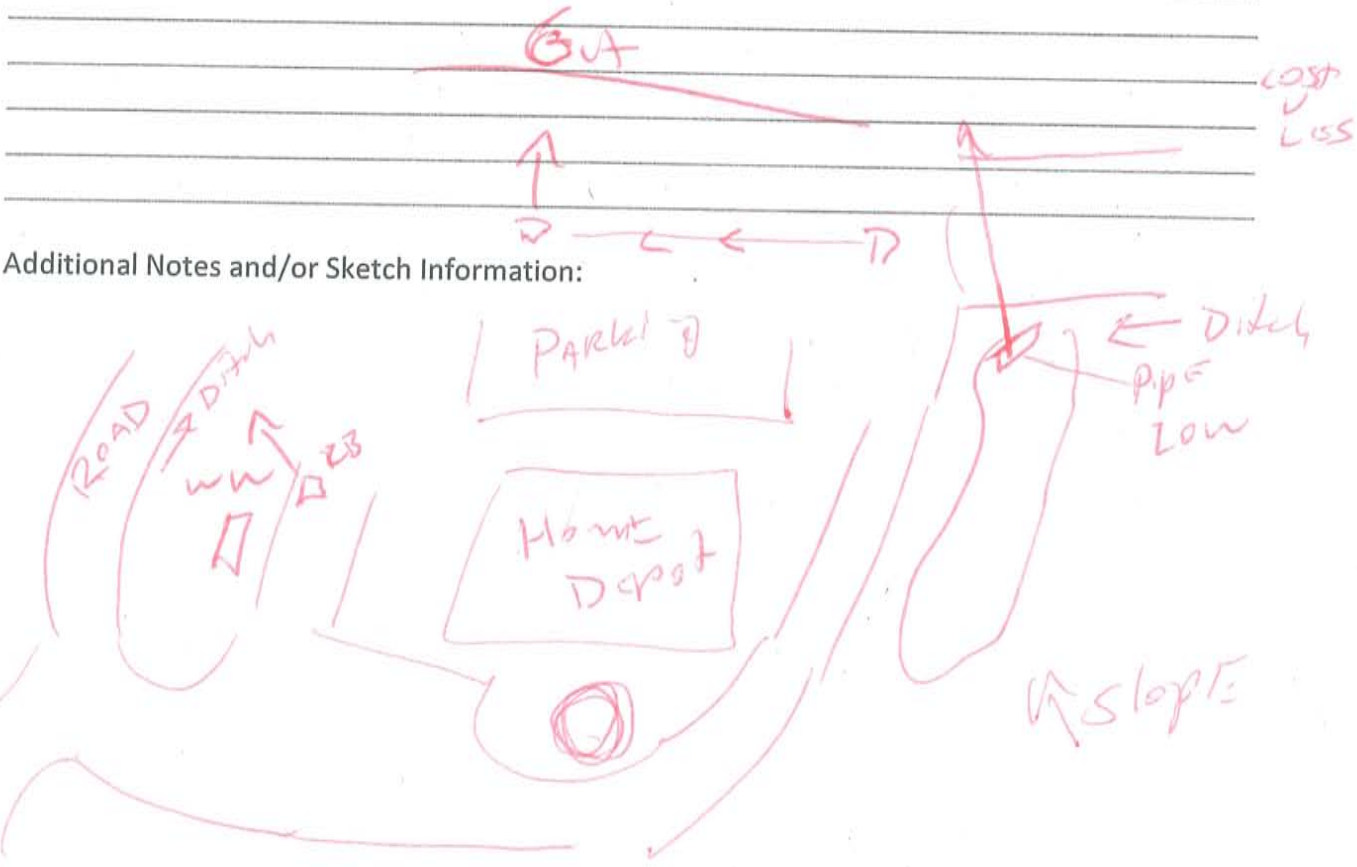
- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: Home Depot (TR-6)

Site Name: _____

Description of Existing Conditions:

CBs → Discharge to STORM swale/Ditch
Parking is Larger than needed
28' DRIVE Aisles
CURBED Islands → Potential Bios
Have wastewater TREATMENT → small system
out Back that Looks like it discharges
to A SAS under parking AREA.
WATER HARVEST system For FIRE protection
with LARGE STORAGE TANK Fed From
Looks like Roof




Additional Notes and/or Sketch Information:

Description of Proposed Project:

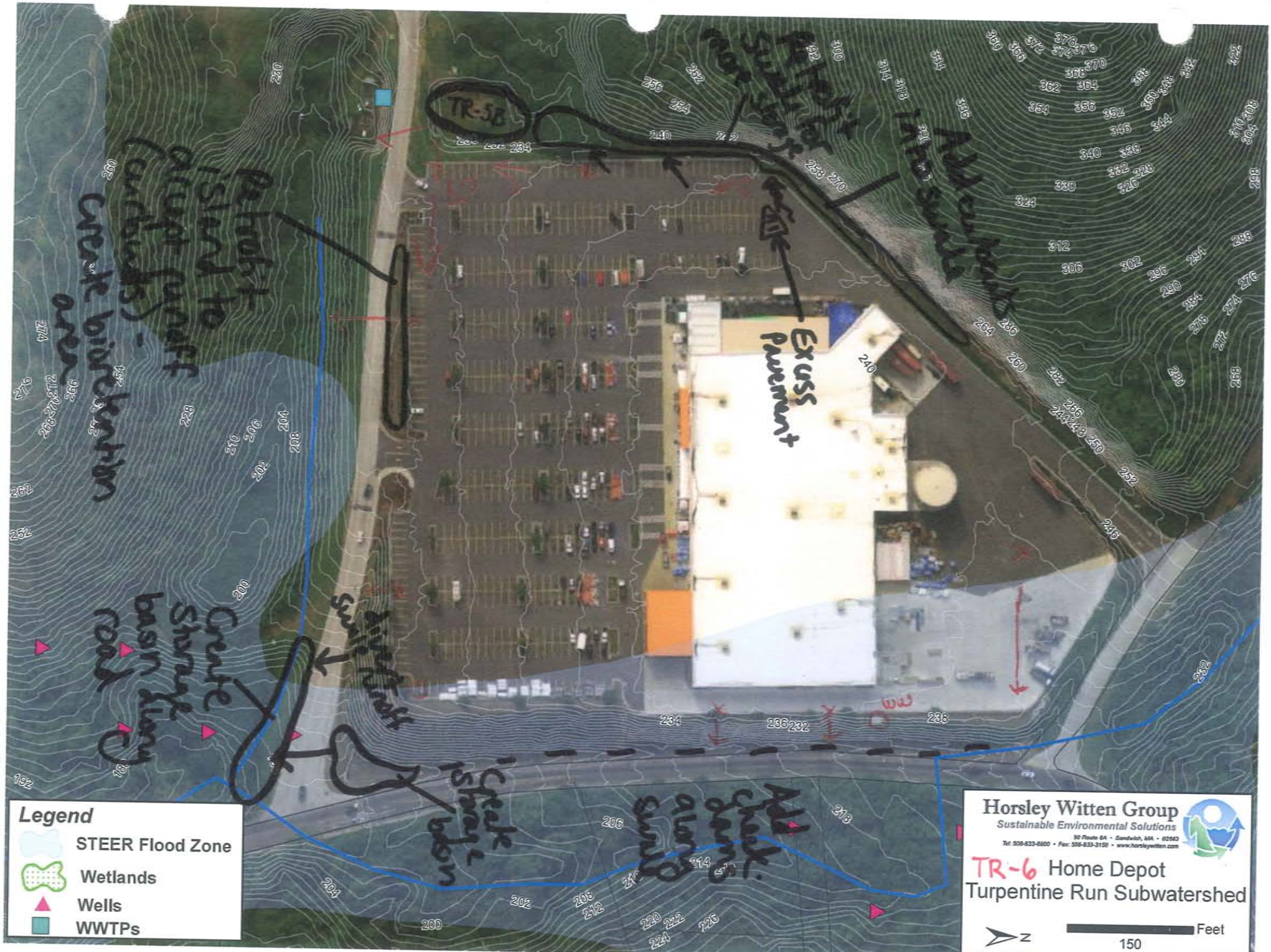
Possible Retrofit Cost v Less Detention pond w/ Riser To capture/ Attenuate more / SW.

CBS could be equipped w/ Hoods and/or WQ units downstream

CIRB cuts in Islands To Accept Runoff.

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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# FIELD ASSESSMENT NOTES

- [ ] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [x] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [x] Other _____

Subwatershed: Raphine Vista Turps

Site Name: TR-7

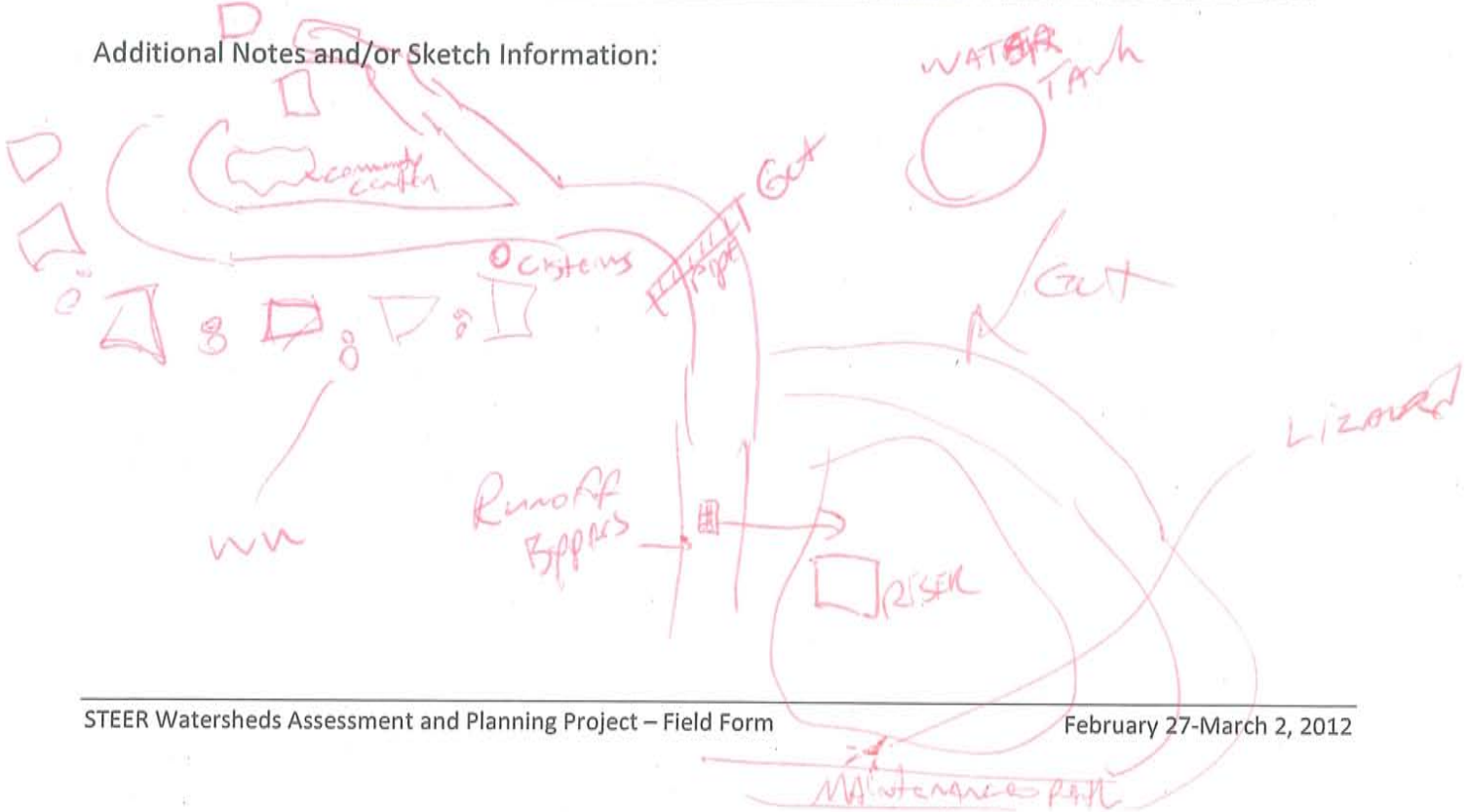
Description of Existing Conditions:

Onsite WW → Looks like Bioclean systems
Drainage → Collect CBS (ADS) &
Through Drains To Discharge To Out.
Houses equipped w/ cisterns From Roof
Runoff.
Road 16-17' wide
Solar Lighting
Community Pavilion
Municipal water

Fairly nice

Detention Pond near start of Subdivision
→ Does not look like it is getting
much Runoff

Additional Notes and/or Sketch Information:



Description of Proposed Project:

SPEED Hump To Get more Runoff To Ex. Detention Basin

Possible Relinquishment For Education

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

TR-7 Raphune Vista.

* NEED TO GET COPIES OF PLAN & BMP CALCS *
EASY RETROFIT

# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [x] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [x] Other ESC & Enforcement

Subwatershed: TR-8

Site Name: GRAND VIEW CONSTRUCTION

Description of Existing Conditions:

SOME GOOD EXAMPLES OF ESC — SLOPE STABILIZATION COIR FIBER ROLLS, BUT failing silt FENCE AND LACK OF ESC PRACTICES TO PROTECT GUTS

- ON SEWER / LINE JUST INSTALLED AND OPEN!! NEEDED TO COVER
- ROOFS ON CISTERNS - REUSE NONPOTABLE EXCEPT FOR TOILETS
- OUTFALLS NUMEROUS; APPEARS TO BE NO STORMWATER MANAGEMENT
- ASK ANITA FOR STORMWATER PLANS FROM SITE

Additional Notes and/or Sketch Information:

HOW DID THIS GET PERMITTED W NO POST CONSTRUCTION STORMWATER?

DRAINS TO TUTU RESERVOIR; COULD BE CONTRIBUTING TO WQ PROBLEMS & SEDIMENTATION IN RESERVOIR

Description of Proposed Project:

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☒ Enforcement Needed

# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [x] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [x] Illicit Discharge
- [ ] Other _____

Subwatershed: Turpentine TR-9 / TR-8

Site Name: Alvin MacBean Rec Center / TR-10 Gut Restoration

Description of Existing Conditions:

The Rec Center ⊗ has catch basins for drainage in various places. However it is experiencing flooding issues due to clogged inlet + ~~[illegible]~~ lack of curbing along the road that is upgradient of the rec center. The runoff flows down the steep slope onto tennis courts + eventually ponds in playground area where there is a yard drain and openings in the wall; but the yard drain is too high to take the runoff and the wall openings get clogged with leaves debris. Some roof drains in this area discharge to impervious surfaces. Also the DPW land across the street has some great open grassy areas that could help provide SW treatment / storage. There's evidence of dumping and uncovered maint. and storage of DPW vehicles in that area, which is directly adjacent to the gut / Tufts Reservoir. Also, when we were there, a sewer line appeared to be under construction and several manholes were left uncovered directly adjacent to gut. Trash and old cars were left in this area, too.

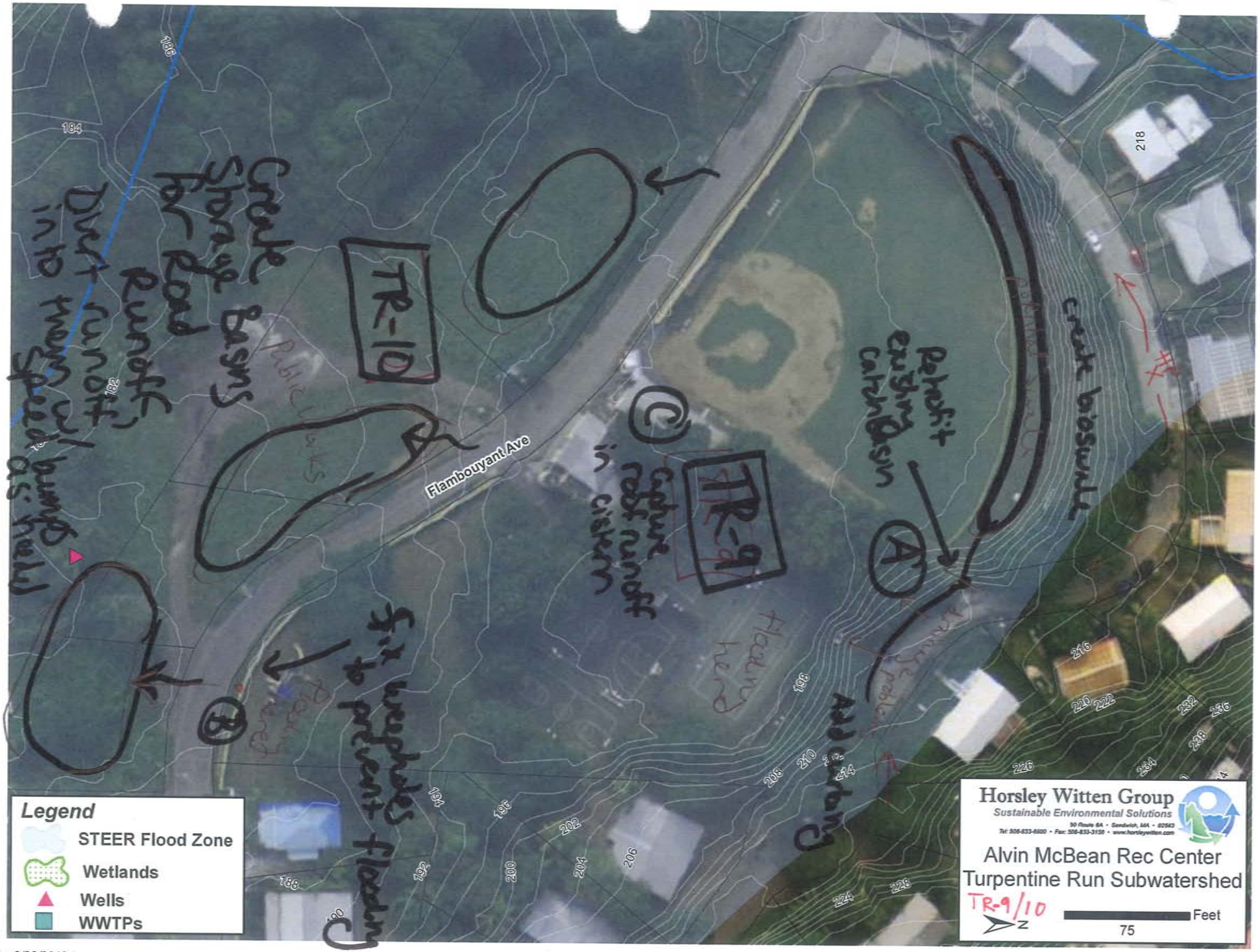
Additional Notes and/or Sketch Information:

Description of Proposed Project:

The existing catchbasin along the road above rec center should be cleaned out + redirected to discharge to a SW swale along ball fields. Curbing should be installed to ensure flow is captured + prevent it from flowing down the slope to the tennis courts. Signage should be installed about SW + watershed issues. Rooftop runoff should be disconnected, and the playground area should be retrofit to prevent flooding. The open areas on the DPW land should be converted to accept runoff from roadway - great location for signage - bins + trash should be removed. Such system should be covered + maintained regularly to ensure no overflows into the gut.

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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# FIELD ASSESSMENT NOTES

- [ ] Stormwater Retrofit
- [x] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [x] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: TR-11

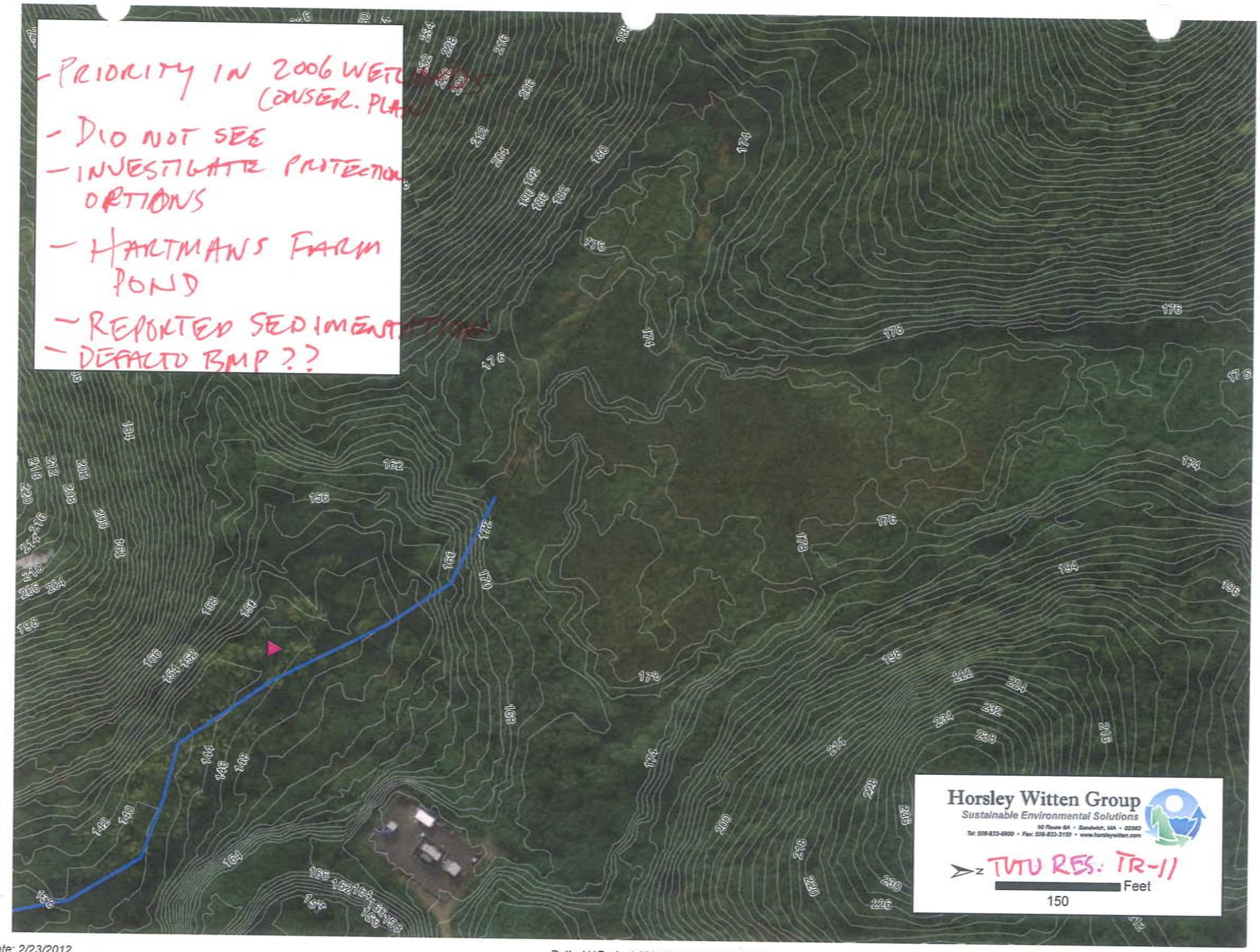
Site Name: TUTV RESERVOIR / HARTMAN'S FARM POND (TILAPIA, full of lilies, sediment deposition)

Description of Existing Conditions:

- Called out in DFW as important wetland
- serving as defacto regional stormwater facility (Grandview & TVtn)
- DID NOT SEE

① CONTACT OWNER
② INVESTIGATE RESTORATION & CONSERVATION OPS.
③ MONITOR SED. DEPOSITION HABITAT/BIO PARAMETERS WQ
④ CHECK DAM INTEGRITY & ~~OUTFLOW~~ OUTLET STRUCTURE

Additional Notes and/or Sketch Information:

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [x] Stream/Wetland Restoration
- [x] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: Turpentine

TR-12

Neighborhood / Anna's Retreat

Site Name: Anna's Retreat Community Center

Description of Existing Conditions:

Anna's retreat is an extremely large, dense neighborhood constructed on steep slopes with narrow, windy roads. Stormwater is conveyed through a series of paved swales, culverts, inlet structures, etc. - some of which run under / through buildings. Retrofitting this road system would be extremely costly + difficult as there is very little open space available. Some residential education could be useful on pollution prevention activities such as dumping things into drainage network + car maintenance. Demo projects at the two Community Centers would be a good way to reach people.

The Anna's Retreat Community Center is built in the gut particularly the new ~~tennis~~ Bball Courts. During the field visit, road work was underway; the stockpile of materials was placed directly in the gut. Upstream culvert is damaged, causing flooding over the road.

Additional Notes and/or Sketch Information:

Description of Proposed Project:

The Community Center should be retrofit to: provide a rain garden for parking lot runoff and restore capacity in the gut. This may include removing Bball courts? This would be a great location to try to get additional offline storage if possible. Education should be provided on what a gut is and why it should be preserved. Upstream culvert capacity should be restored.

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [x] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other Education of Students

Subwatershed: Turpentine TR-13

Site Name: Faith Christian Fellowship Church

Description of Existing Conditions:

This church/school is near the headwaters of the gut that flows to the Curriculum center/Fire Station, just upstream of the gut confluence at Tutu High Rise II. The gut is conveyed through a 24" ~~cmp~~ pipe behind the buildings, down along the property line before it discharges through a (6' x 4') box culvert under the road. In addition, site runoff from the gravel parking lot and long paved driveway is conveyed via a brand-new paved swale (and ditch on other side) that appears to be undersized. Rooftop runoff is stored in a cistern that appears to be in use. Large areas of open lawn are available on site. Woody debris is clogging the downstream culvert.

Additional Notes and/or Sketch Information:

Description of Proposed Project:

Utilize open grassy area as storage for gut flow during large storms. Formalize existing eroding swale along driveway + direct runoff from paved surface into it. Use signage to educate students + public, ensure that box culvert does not become clogged. Restore gut w/ natural stream features

Additional Notes and/or Sketch Information:

Site Priority: ☒ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [x] Stream/Wetland Restoration
- [x] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

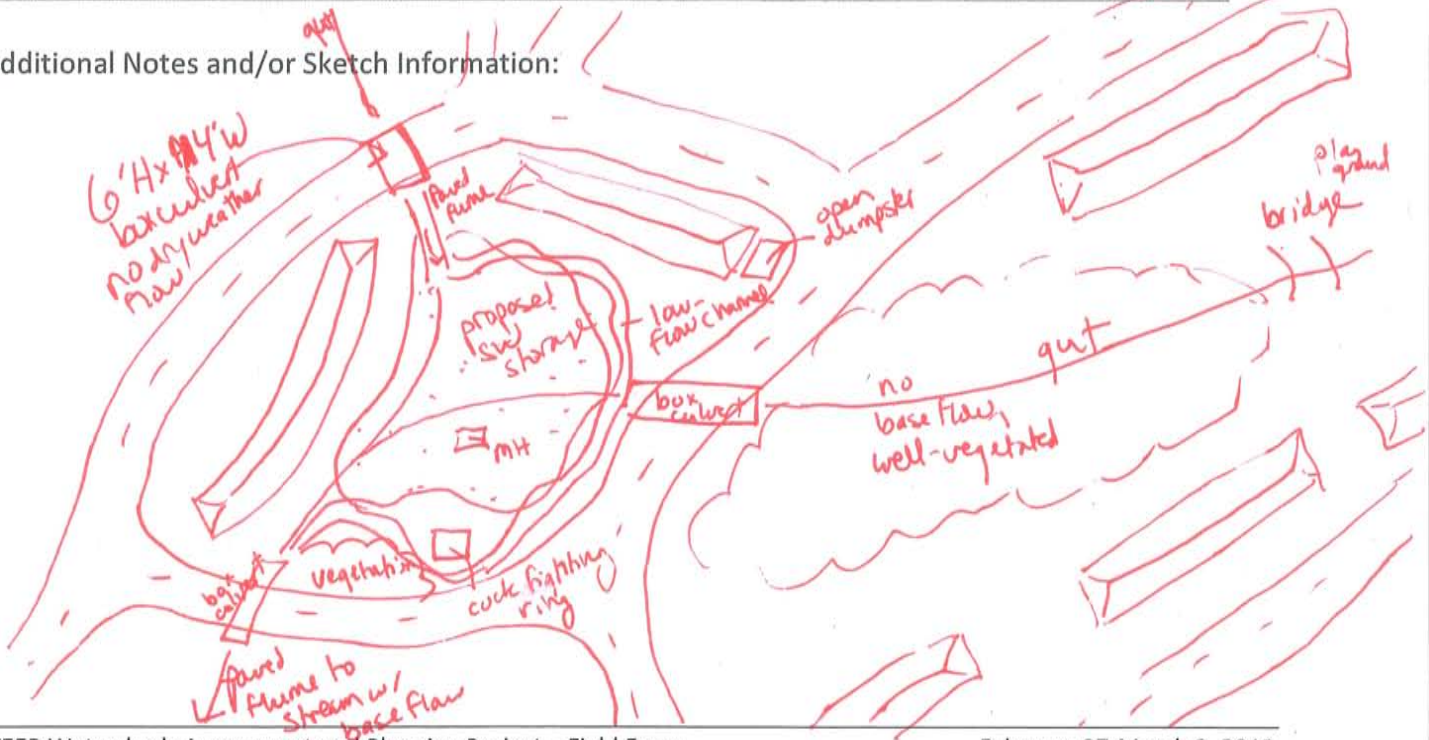
Subwatershed: Turpentine

Site Name: Neighborhood 13 - Tuhs High Rises 1 Gut Confluence | TR-14

Description of Existing Conditions:

Open, flat area at gut confluence that is currently mown. Doesn't seem to be used for recreation other than the cock fighting ring (e.g., no courts, playgrounds, etc.) Trash was observed, and the dumpsters on site were not covered. The gut to the east was well-vegetated. To the north, see other retrofit form. To the south the gut has a base flow as it flows towards the Curriculum Center and fire station. Paved flumes and box culverts are used to direct runoff, as well as some catchbasins on the road. Currently, the outlet box culvert is set at grade, only detaining at high flows when capacity is exceeded.

Additional Notes and/or Sketch Information:



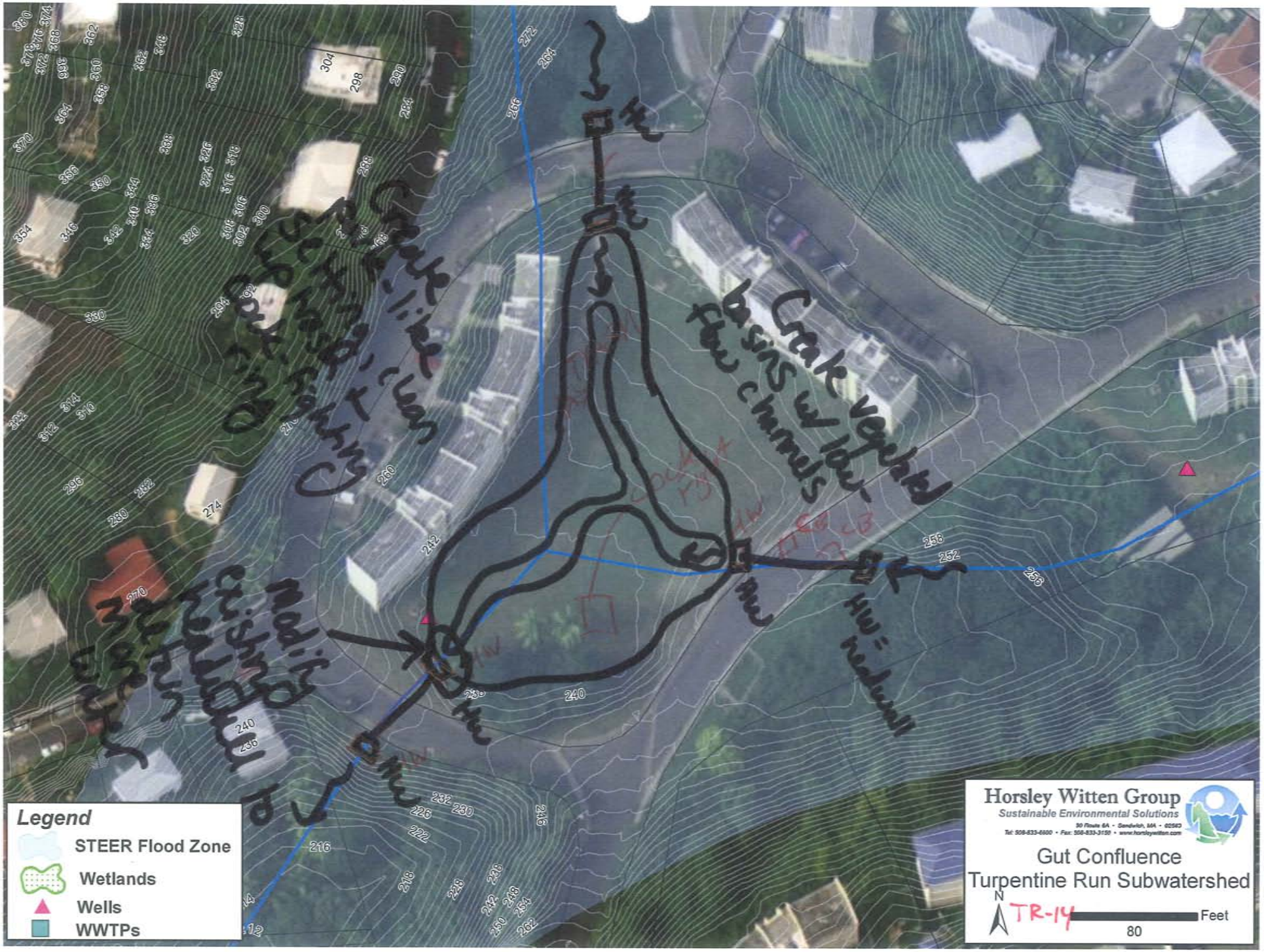
Description of Proposed Project:

try to do an offline storage system for the gut?

Re-grade the open area for formalized vegetated channels and increased storage. Adjust the area near the outlet to provide more detention / infiltration / evaporation before any outflow occurs. Cover dumpsters, clean up trash + provide signage other education for homeowners. Need to get housing authority on board.

Additional Notes and/or Sketch Information:

Site Priority: ☒ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [x] Stream/Wetland Restoration
- [x] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: TURPENTINE RUN

Site Name: JOSEPH A GOMEZ ELEM. SCHOOL (TR-15)

Description of Existing Conditions:

School buildings divided by an intermittent gut. There are bridges over gut and ballfield in valley. There appears to be issues with drainage around the building on top of slope, but solutions are challenging given terrain. Concrete swales run on the East side of each building, carrying runoff to the north end and discharge to gut.

gut is grassed/vegetated along ball field.

new parking lot constructed in/adjacent to gut downstream of ballfield.

Additional Notes and/or Sketch Information:

See aerial

Description of Proposed Project:

retrofit → start w simple rain gardens on west side of gut near basketball court.

install bioretention along concrete swale at eastern-most building.

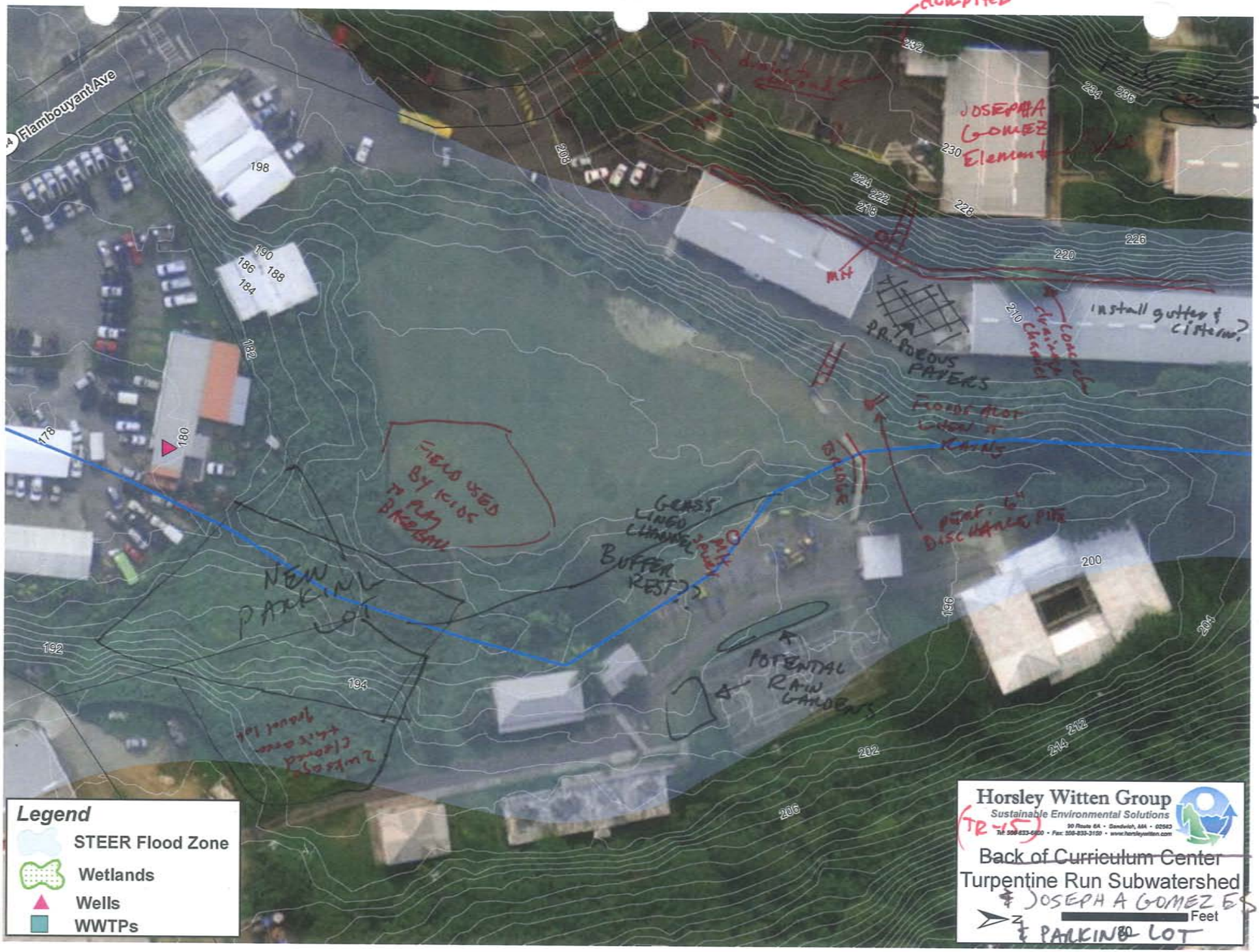
capture rooftop runoff ~~off of~~ on second building where no grassed area available for treatment.

Consider buffer and gut restoration work ~~to expand~~.

Avoid visibility & education potential.

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☒ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☒ Other Enforcement

Subwatershed: Turpentine Run

TR-16

Site Name: New parking lot behind Curriculum Center

Description of Existing Conditions:

Installation of new gravel parking lot (?) in and adjacent to gut behind curriculum center. In stream channelization and impoundments.

Follow up w̄ ~~pen~~ DPNR on permits.

How is runoff from lot managed?

Where is buffer protection?

This lot is in floodplain.

Additional Notes and/or Sketch Information:

If fined/mitigation consider retrofitting in conjunction w̄ Joseph A Gomez Elem. School projects.

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [x] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [x] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: Turpentine TR-17 / TR-16

Site Name: Fire Station / Gut behind Curriculum Center

Description of Existing Conditions:

The fire station is located between the Curriculum Center and the Texaco near intersection of 384 and 38. Road runoff is conveyed with a shallow paved swale to a large inlet just downgradient of fire station, which takes runoff directly to Turpentine Run. During large storm events, runoff flows from the paved road swale (not enough capacity) into the fire station property. The french drain in the parking lot takes this runoff and directs it around and through the building with a paved swale. This swale discharges into the large inlet in the road, but through a very small opening, causing flooding here.

Adjacent car dealership built a new parking lot next to the gut and filled in the gut itself with large riprap and small D.I. culverts. This will reduce gut capacity during storm events and needs to be restored.

Additional Notes and/or Sketch Information:

Description of Proposed Project:

Retrofit the road swale to keep runoff from flowing into fire station. Do onsite disconnection to max extent practical and convert paved swale to vegetated channel. (might need to be lined due to superfund issues). Enlarge opening into road inlet / add trash rack.

Restore capacity of gut behind curriculum center, address runoff from parking lot as possible

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

Smith Bay Rd
Legend
STEER Flood Zone
Wetlands
Wells
WWTPs
Horsley Witten Group
Sustainable Environmental Solutions
Fire Station/Curriculum Center
Turpentine Run Subwatershed
TR-17
Feet
60
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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: Turpentine

Site Name: VI Housing Authority (TR-18)

Description of Existing Conditions:

Lower Parking AREA HAS A Vehicle Maintenance AREA (Shelter → Roof) that could be A Source of pollution. Have Two oil Storage containers For Maintenance. Have A Temp Dump site. Possible BMP near Garage but directing the Runoff there may be Tricky/Expensive.

FAIRLY Large/steep Imp AREA To the South-East of main Building seems UNNECESSARY! Seldom USED.

UPPER Parking Collects in DRIVE AISLE in Two channels & Flows To the Unnecessary parking → Possible BMP Location would be First DRIVE AISLE To the Left when you DRIVE IN which MAY be SACRIFICED.

Additional Notes and/or Sketch Information:


Jennifer Laslovich
*Deputy Executive Director*
Executive Office
#402 Estate Anna's Retreat
P.O. Box 7668
St. Thomas, VI 00801
Ph: (340) 715-7340 • Fax: (340) 775-0832
jlaslovich@vihousing.org


VIHA
VIRGIN ISLANDS HOUSING AUTHORITY
*Housing the People of Paradise*

Description of Proposed Project:

Non-structural = cover dumpsters & oil storage areas; clean up maintenance area & dumping

structural retrofits =
① potential bioretention & ② bioswale to collect roof runoff
③ pavement removal

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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# FIELD ASSESSMENT NOTES

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- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: Tunpentine Run

Site Name: Holy Family church (TR-19)

Description of Existing Conditions:

Site is Mostly Impervious. Building has A Lower Level cistern that was Over Flow At Time of Inspection (Light Rain).

Two upper level CB Typestructures that discharge To the Lower parking Lot And down To Smith Bay Rd

Could direct Runoff From parking Lot To A grassed AREA in the Eastern side of parking Lot. Not great Value

Additional Notes and/or Sketch Information:

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- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [x] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: TR-20

Site Name: FOUR WINDS PLAZA

Description of Existing Conditions:

It appears that all of parking lot drains to large open outfall at south end of lot.

Opportunities to create landscape features in parking lot using lined bioretention & planters along building. Plaza could also use retrofit / large trees

Superfund groundwater monitoring wells exist throughout the site - limit infiltration

Consider underground ~~storage for drainage~~ sand filters & O/G separators ~~protection & bios for~~ for WQ ~~or O/G sep~~.

Make sure car wash drains going to sanitary system.

Additional Notes and/or Sketch Information:

What ~~are~~ is happening w rooftop drainage. Cistern?

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# FIELD ASSESSMENT NOTES

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- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: Turp. Run

Site Name: TUTU PARK MALL (TR-21)

Description of Existing Conditions:

Complex site – cisterns for some of roof drainage.

Half of parking lot drains to a large detention pond in the back of mall. Investigate facility for retrofit potential. Need to see as-built plans.

Some opportunities for bioretention in Western portion of lot near Plaza Extra.

Convert lower lot near MacDonalds into grass-pavers for overflow parking.

Potential bio on road-ROW by McD's

Additional Notes and/or Sketch Information:

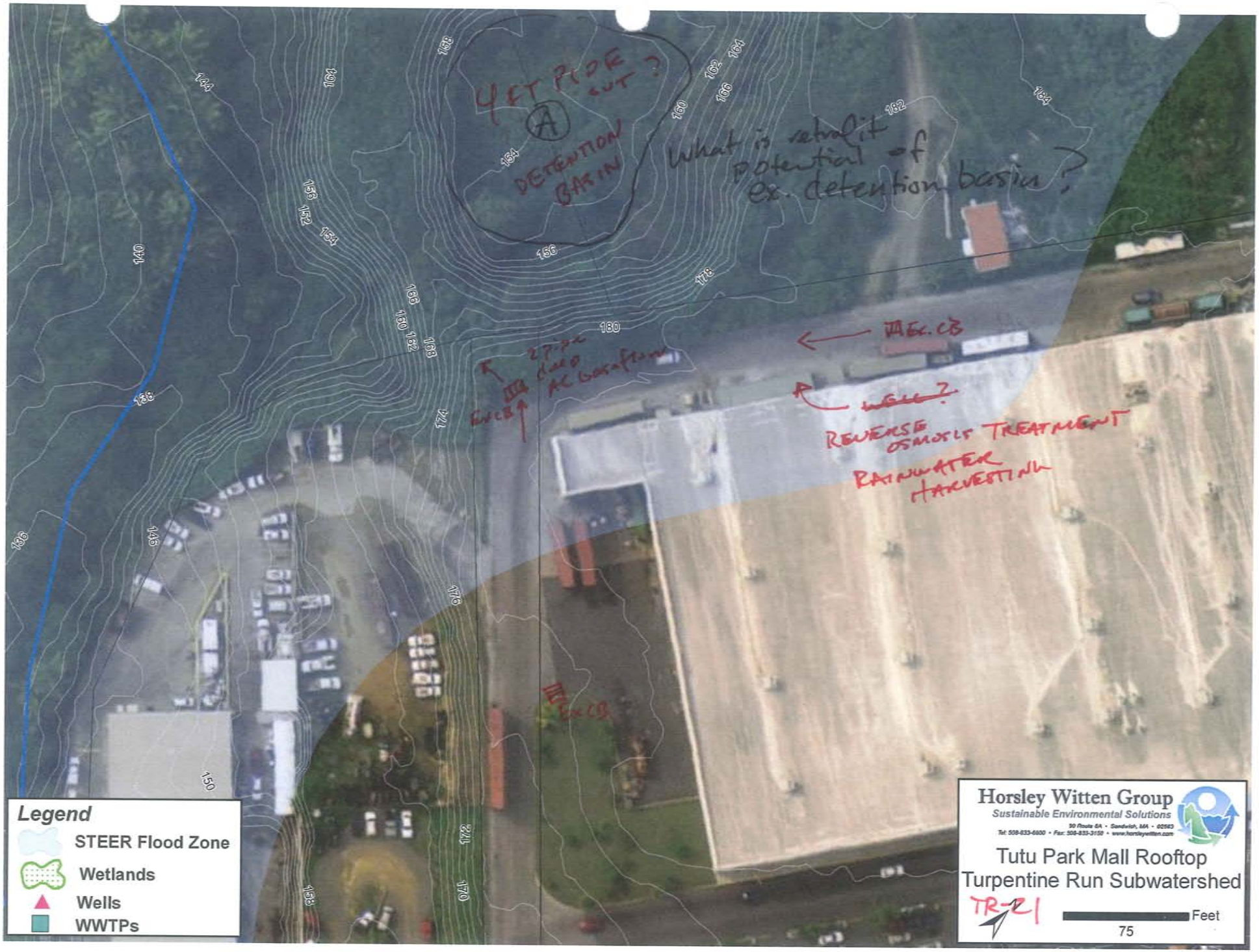
You could spend all Day here retrofitting..

4605 Tutu Park Mall • Suite 254 • St. Thomas, US Virgin Islands 00802-1736

Tutu Park Mall

Carlton Duncan
Maintenance Director

Mail: 340-777-7144 • Office: 340-775-4658 • FAX: 340-775-4688 www.tutuparkmall.com

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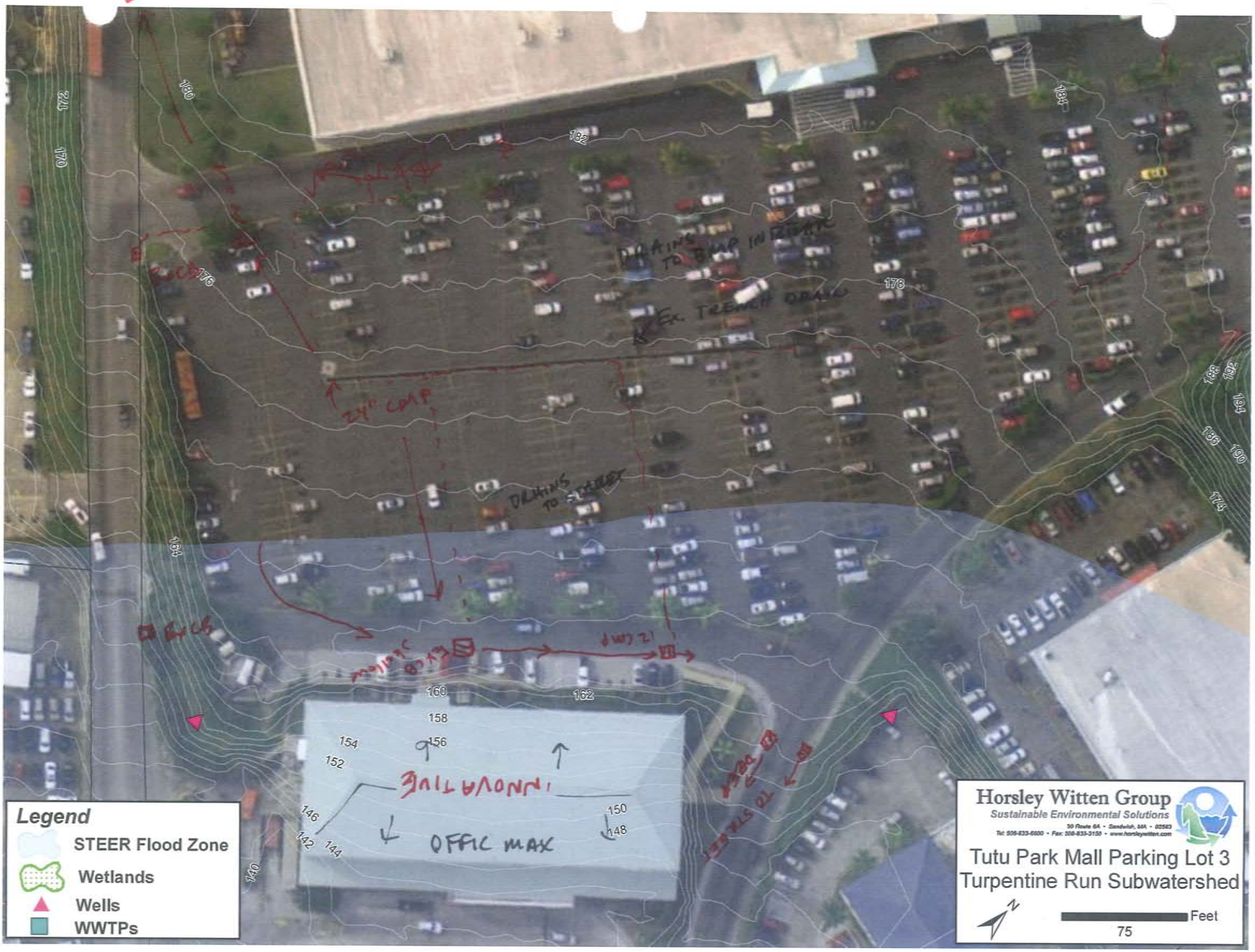


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- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: TR.

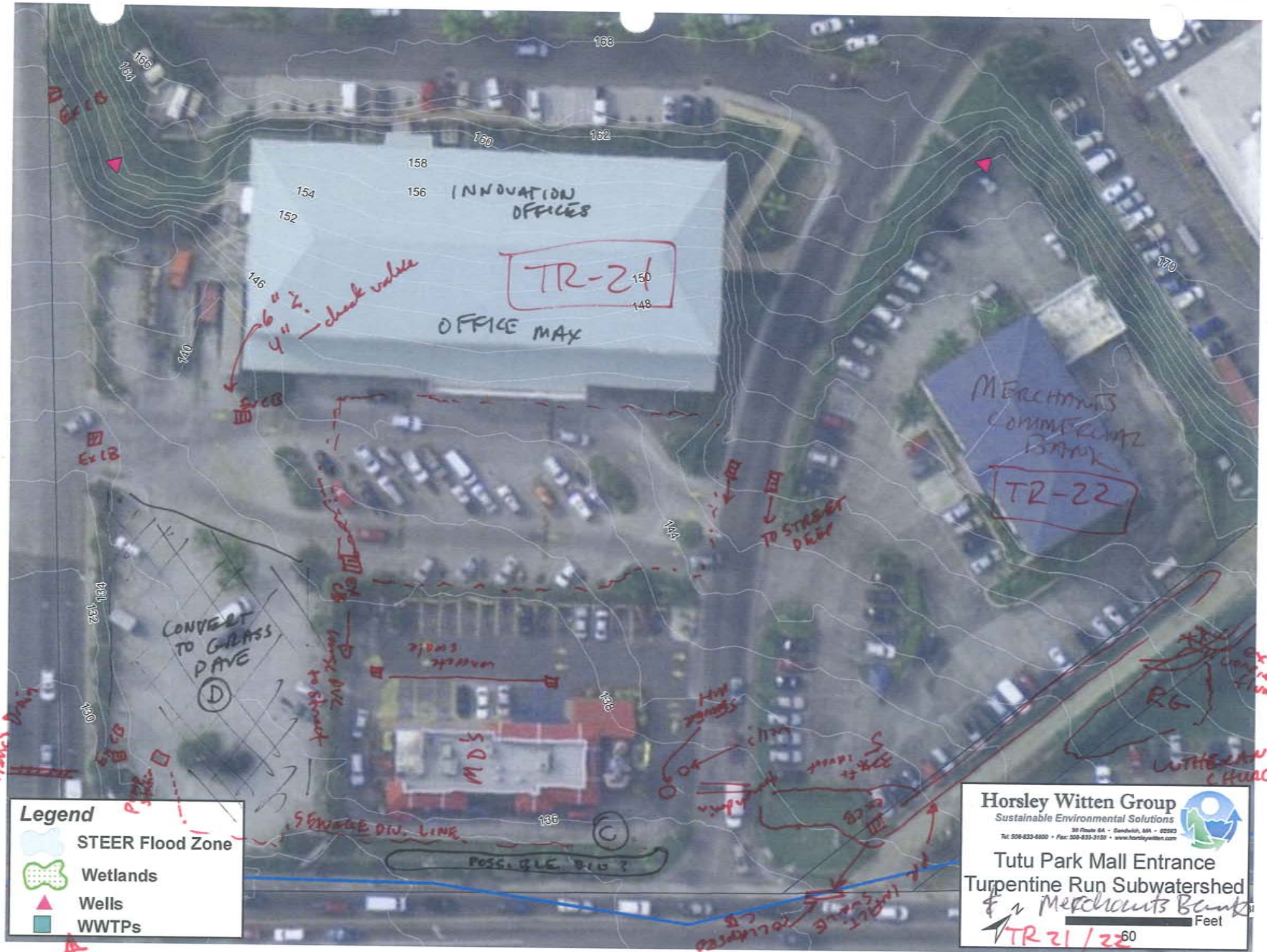
Site Name: MERCHANTS COMMERCIAL BANK (TR-22)

Description of Existing Conditions:

Parking lot and adjacent road drain to ~~Bottom~~ south corner of lot. Convert ex. pervious area in corner to bioretention. Install a veg. swale along ROAD ROW.

T,R overflow into ex. catchbasin.

Additional Notes and/or Sketch Information:

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- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: TURPENTINE RUN

Site Name: LUTHERAN CHURCH (TR-23)

Description of Existing Conditions:

Concrete swale conveys upland runoff around church and to road.

Intercept runoff in a large rain garden next to church & Parking lot. Overflow can go to Street via existing Swale.

Additional Notes and/or Sketch Information:

Description of Proposed Project:

Additional Notes and/or Sketch Information:

This is a good site and the church may be interested in a low cost project that helps w drainage & improves aesthetics.

Site Priority: ☐ Love it ☑ Has Potential ☐ Not Likely ☐ Enforcement Needed

Date: 1/25/2013

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [x] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: Turpentine Run

Site Name: Innovation Parking lot TR-24 / TR-25 & HOTSPOT AUTO/TIRE SHOPS

Description of Existing Conditions:

TR-24 Large gravel and paved parking lot draining to CB in southeast corner of lot. Some of the roof also drains to paved lot. This is parking for innovative fleet vehicles and outdoor storage of wire rolls and other supplies. Discharge off revetment into stream valley.

TR-25 TIRE repair and automotive yards - high exposure of fluids, metals, etc to stormwater runoff. Do a hotspot inventory and recommend pollution prevention measures.

Additional Notes and/or Sketch Information:

See aerial

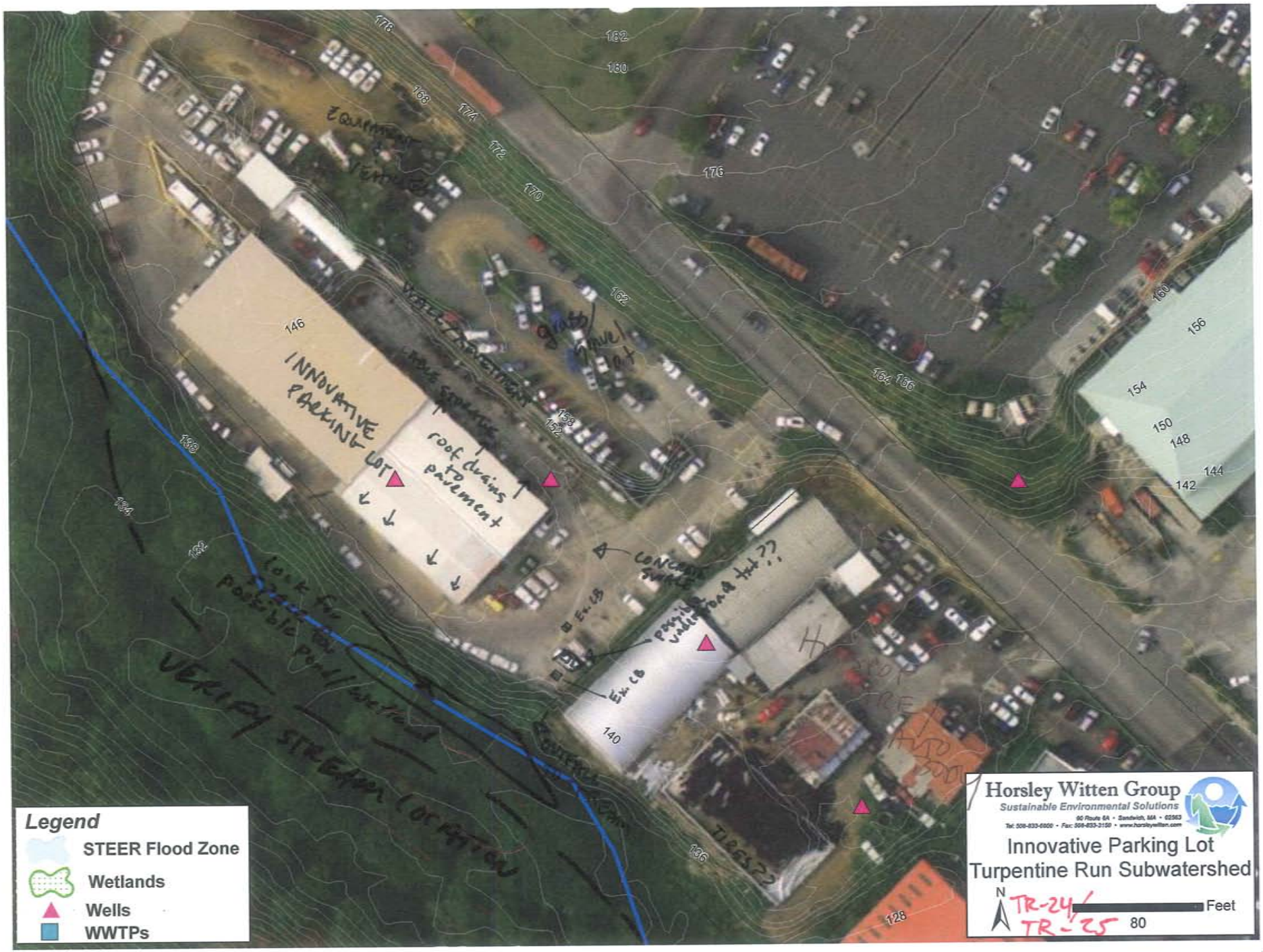
Description of Proposed Project:

FOR INNOVATIVE, CONSIDER.

1. UNDERGROUND O/G SEPARATOR & SANDFILTER IN BOTTOM CORNER
2. CISTERN OR PLANTERS FOR ROOFTOP RUNOFF
3. LOOK FOR STORAGE CAPACITY & TREATMENT OUTSIDE OF STREAM CORRIDOR
4. PERMEABLE PAVERS W UNDERDRAIN IN UPPER LOT.

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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# FIELD ASSESSMENT NOTES

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- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: TR-26

Site Name: MR. RODRIGUEZ / TOTAL GAS

Description of Existing Conditions:

Large culvert goes under buildings & Auto Shop

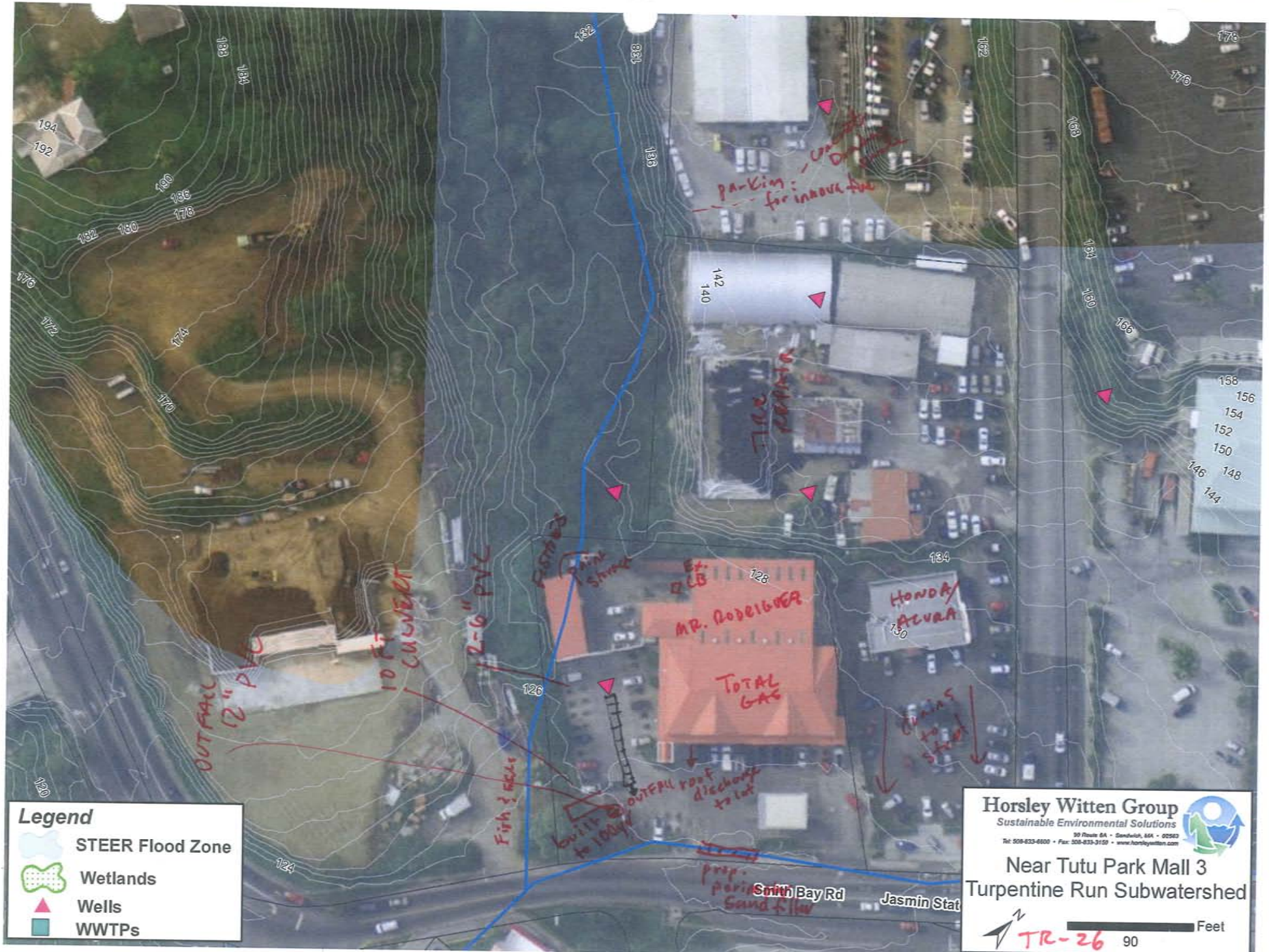
Rooftop and parking lot drainage goes directly to ~~stree~~ gut ~ no treatment.

Perimeter sand filter & entrance to gas station prior to discharge to road drain line, and down central isle of Auto Shop.

Conduct pollution prevention eval. of auto shop. to assist w Secondary containment, storage, & waste managment to reduce pollutants.

Additional Notes and/or Sketch Information:

Tough site.

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# FIELD ASSESSMENT NOTES

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- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: TR-27

Site Name: 1st BANK

Description of Existing Conditions:

Across from McD's at TVtr Plaza

Good example of using landscaped area to collect runoff. (there is one ex. curb cut into landscape)

- investigate potential retrofit to enhance landscape area to provide WQ treatment for entire parking lot via more curb cuts.

highly visible site.

Additional Notes and/or Sketch Information:

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# FIELD ASSESSMENT NOTES

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- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [x] Other EDUCATION

Subwatershed: TURPENTINE RUN

Site Name: CHURCH SCHOOLS TR-28

Description of Existing Conditions:

STEEP!! WHOLE AREA DRAINS TO EX DI AT BASE OF ROAD — DIRECT DISCHARGE INTO TURPENTINE RUN AT ~36" CMP

Additional Notes and/or Sketch Information:

Description of Proposed Project:

Direct portion of flow into grassed areas in a few locations – but not easy.
- bottom of hill (A)
- (B) into basketball court area (redirect to concrete flume)
- (C) open grassed area adjacent to driveway

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☒ Not Likely ☐ Enforcement Needed

Date: 2/22/2012

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- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: TURP. RUN

Site Name: TR-29 HERNNHUT POND

Description of Existing Conditions:

- called out in DFW Wetlands Conservation Plan for protection
- Consider land conservation options.
- drainages to POND should be protected from future development.

Additional Notes and/or Sketch Information:

# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: TURPENTINE RUN

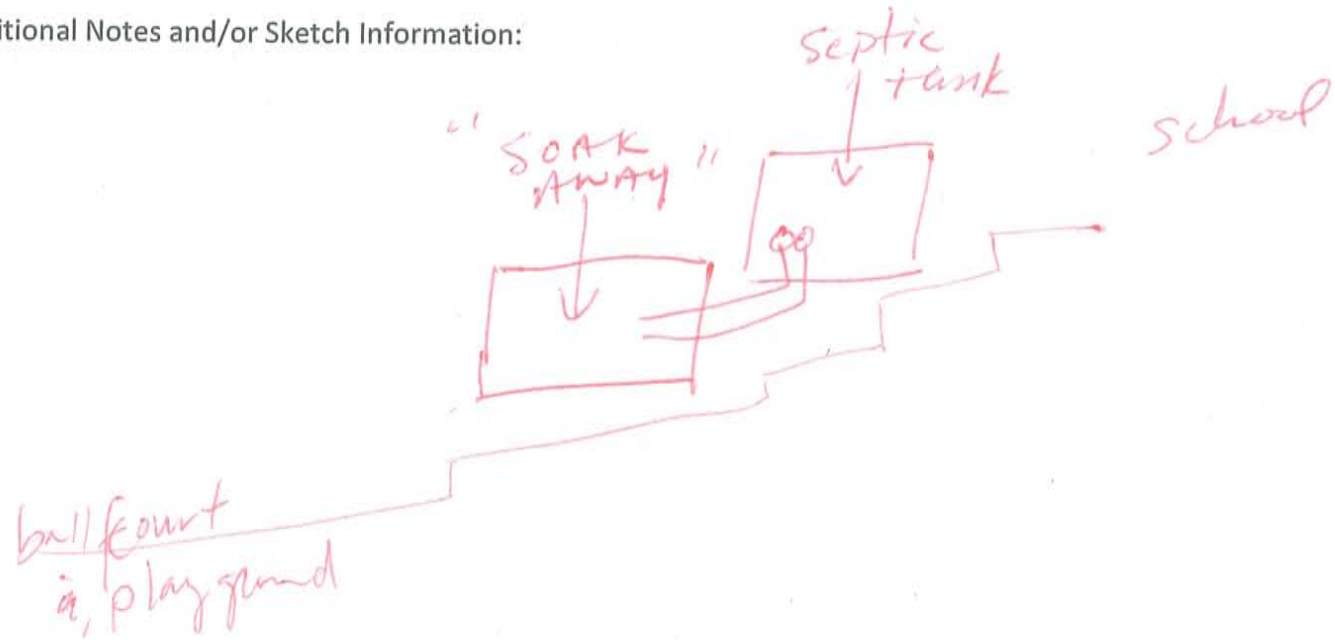
Site Name: EDITH WILLIAMS ALTERNATIVE ACADEMY (TR-30)

Description of Existing Conditions:

School has no real drainage issues, parking lot in front drains to road. Some roofs are directed to cisterns. Gut runs behind school / fence - has a wooden buffer. Some trash. School is on septic.

- have had to pay money to fill up cistern w purchased water

Additional Notes and/or Sketch Information:



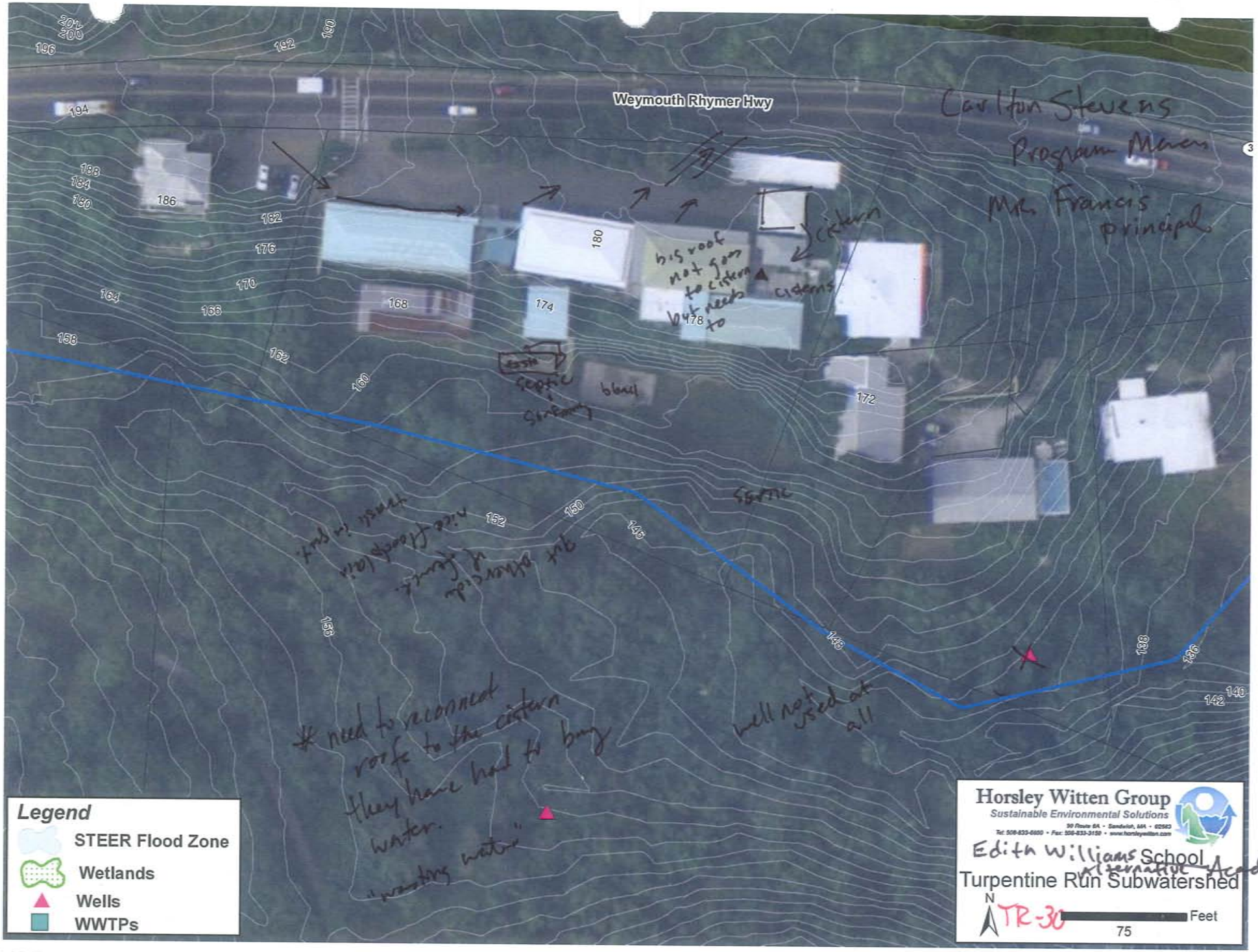
Description of Proposed Project:

- Hook up rest of roofs to the cistern.
- saves $
- tight space, not much opportunity for stormwater retrofits of parking lot.

Additional Notes and/or Sketch Information:

DR. LEONARD RICHARDSON
ASSISTANT PRINCIPAL

Site Priority: ☒ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: TR-31

Site Name: SMITHBAY RD / FT. MYLNER PLAZA

Description of Existing Conditions:

OPEN AREA ADJACENT TO FT. MYLNER PLAZA AND PRICESMART DRIVE THAT COULD BE EXPANDED TO MANAGE HIGH FLOWS FROM GUT AND TREAT RUNOFF FROM SMITHBAY RD.

- NEED TO DELINEATE EX. WETLAND BOUNDARY

- CONCEPT IS TO DIVERT SMITHBAY RD DRAINAGE VIA NEW CATCHBASINS AND CONCRETE SWALES ON ROAD INTO A STORMWATER WETLAND.

Additional Notes and/or Sketch Information:

OVER FLOWS TO DISCHARGE TO GUT.
May be possible depending on space available, to divert high flows from gut into wetland also.

★ NEED TO CONFIRM EX. WETLAND BOUNDARY AND PROPERTY OWNERSHIP.

Description of Proposed Project:

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☒ Has Potential ☐ Not Likely ☐ Enforcement Needed

# TR-31. Price Smart / Smith Bay Road — Stormwater Retrofit

## Site Description

Immediately south of the entrance to Price Smart grocery, there is a vacant parcel that currently accepts a portion of the runoff from Smith Bay Road. The runoff that currently flows onto the vacant property is untreated and reaches it through an existing curb cut along the southern side of Smith Bay Road. The vacant lot consists of wetland areas and the western branch of Turpentine Run. This area is frequented by local residents because it abuts a popular outdoor market, as well as the Fort Mylner Plaza. This site offers opportunities for public education about stormwater management and resource area protection.

## Proposed Concepts

A stormwater treatment facility is proposed in the vacant lot, south of Smith Bay Road. Depending on the depth to the groundwater table, either a constructed wetland or bioretention facility is recommended. Even though the majority of Smith Bay Road is super-elevated away from the vacant lot, there appears to be adequate gradient to capture the roadway runoff in a below-grade drainage system and pipe it to the proposed practice. The remaining drainage area will drain to the practice via the existing curb cut. A drainage easement may be required from the owner of the vacant parcel in order to construct such a facility but it is possible that the system could be over-sized to accommodate runoff from any future development on the lot.

## Practice Sizing/Design Considerations

The constructed wetland would be sized to treat up to the first 1.25 inch of runoff from the contributing impervious area. The total drainage area to the site would be approximately 2.0 acres, with 0.7 acres of that total being impervious surface. Available surface area for the proposed practice is about 3,000 SF, sufficient for effective water quality treatment. The outflow from the system would be designed to limit discharge rates and down-gradient channel erosion of Turpentine Gut.

## Pollutant Removal

Constructed wetlands are expected to remove 85% TSS; 48% TP; 30% TN; and 60% bacteria (RI Manual, 2010). This assumes the full design treatment volume is provided.

## Next steps

- Complete a topographic survey of the area. Determine if there are any site utility conflicts and delineate existing wetland;
- Conduct test pits to verify subsurface soil conditions and depth to groundwater;
- Contact property owner to investigate willingness to participate in design discussions; and
- Map existing resource area boundaries and buffers.

| Site ID | Drainage Area (ac) | % Impervious | Design Treatment Volume (cf)* | Practice Area Required (sf)* | Practice Area Available (sf)* |
|---|---|---|---|---|---|
| TR-31 | 2.0 | 35 | 3,200 | 1,300 | 3,000 |

*Design Treatment Volume: Constructed Wetlands, 0.015*DA; DA = drainage area (sf)

*Practice Area Required is calculated based on practice-specific design assumptions.

*Practice Area Available is estimated from available mapping. Actual practice area may be adjusted as needed during pre-construction.

Hartman T-H Leasing, Inc.
Commercial Property
Available For Lease
For more information Call
340-775-0527

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- [ ] Land Conservation
- [x] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: TURPENTINE RUN

Site Name: PRICESMART TR-32

Description of Existing Conditions:

- CLEAN UP DEBRIS / TRASH / CARTS, ETC
- REMOVE PAVEMENT - POSSIBLE PERVIOUS PAVERS
  * PLANT SHADE / CANOPY COVER
  * INSTALL LINEAR BIOS
  * INVESTIGATE EX. FACILITY. RETROFIT POTENTIAL.
- OPEN AREA - THERE ANY WAY TO TAKE ADDITIONAL RUNOFF FROM ROAD ?

Additional Notes and/or Sketch Information:

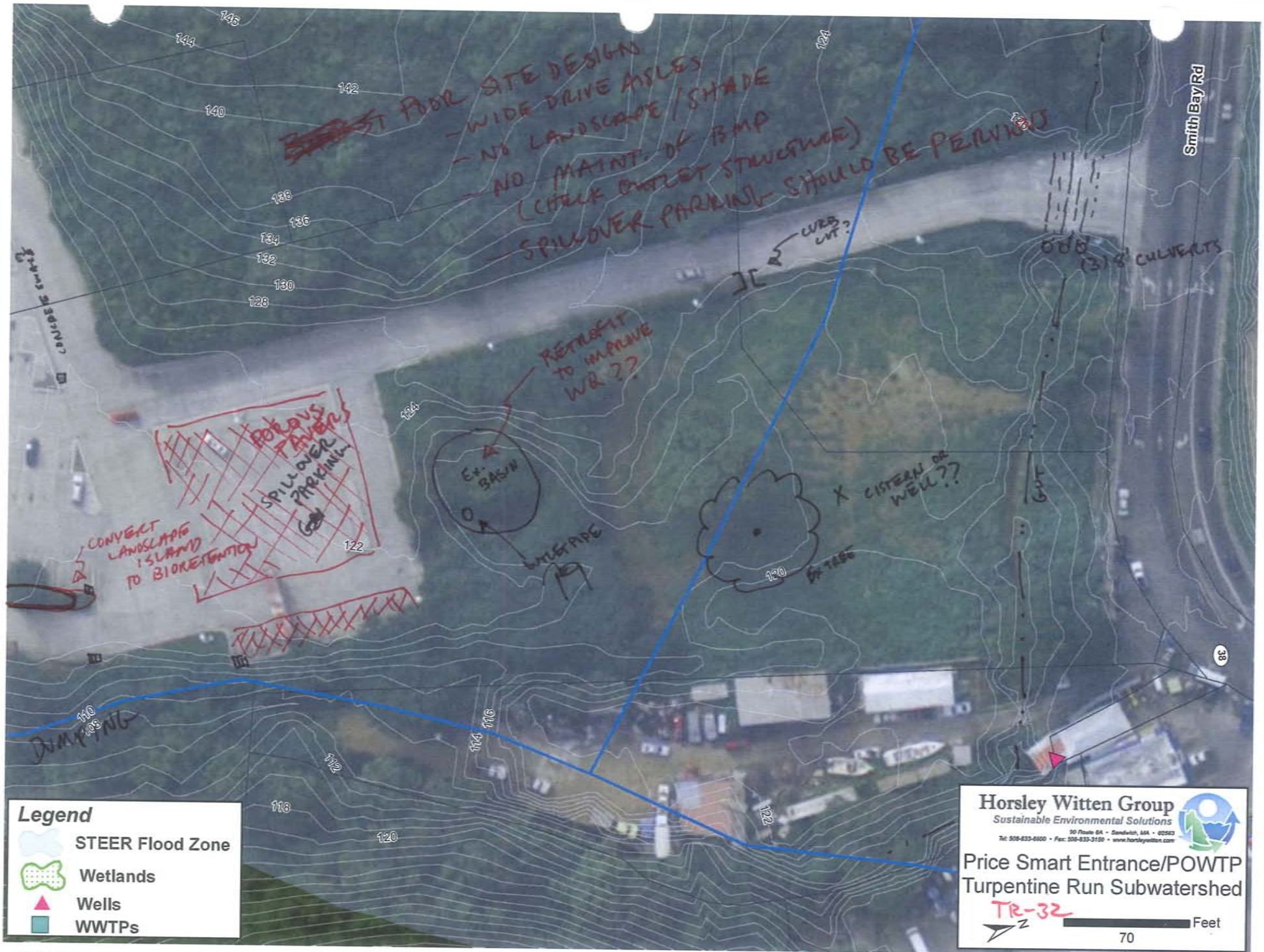
PRIVATE PROPERTY.

MAY BE EASY RETROFIT OF EX. FACILITY TO IMPROVE W.Q. TREATMENT. NEED TO GET PLANS.

Description of Proposed Project:

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☒ Not Likely ☐ Enforcement Needed

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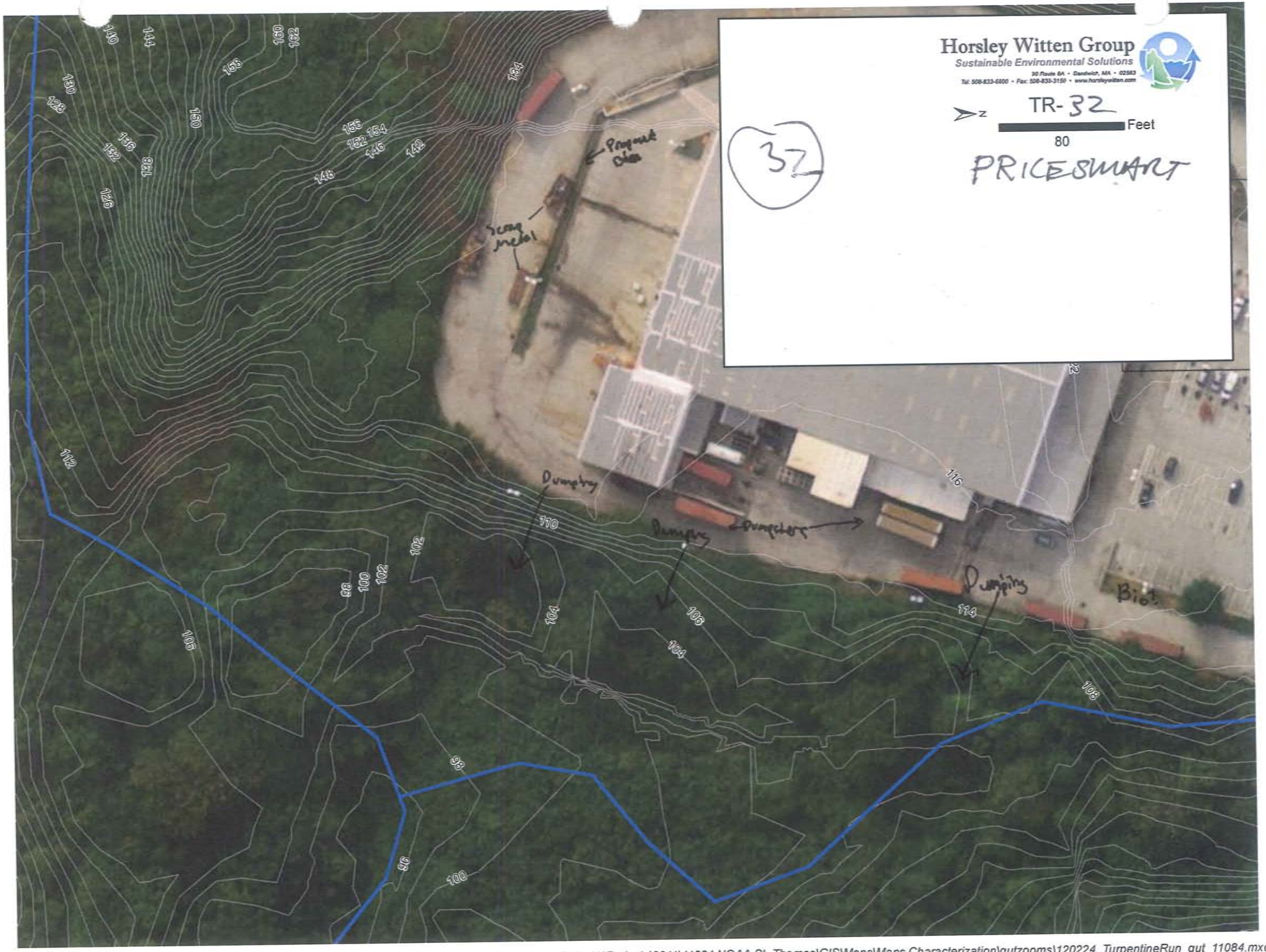


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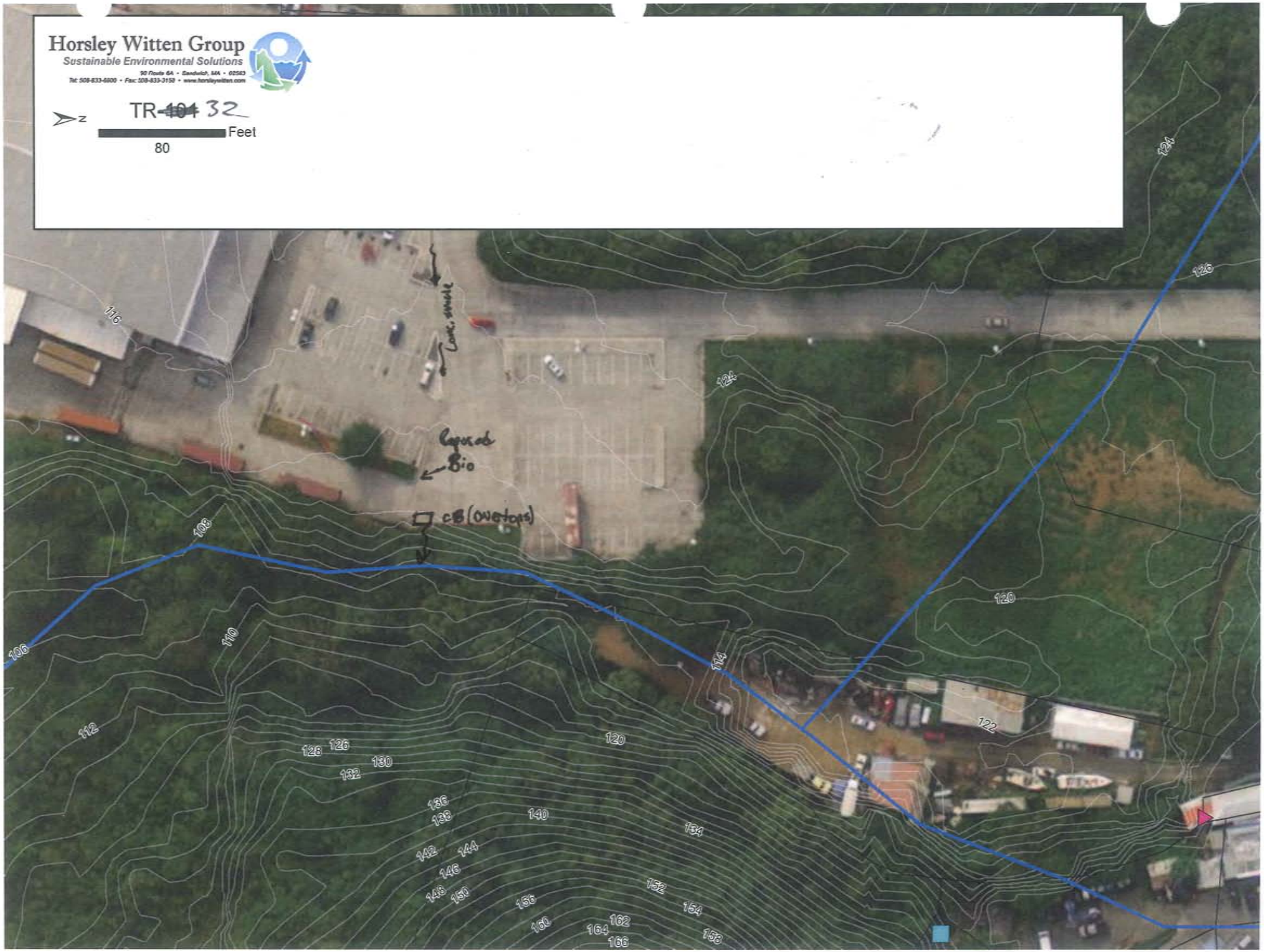


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- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [x] Other EDUCATION

Subwatershed: TURPENTINE RUN

Site Name: E. B. OLIVER ELEMENTARY SCHOOL

TR-33

Description of Existing Conditions:

- USED TO BE WATER PLANT??
- FLOODING IN BUILDINGS ON SLOPES
- PTA CURRENTLY PLANTING TO DO A COMMUNITY GARDEN IN CENTRAL POD

- RUNOFF COMES DOWN FROM SIDE OF MAIN BUILDING ADDS TO LOAD IN CENTRAL GREEN EXISTING DRAIN INLET, DISCHARGES ON HILLSLOPE

-ASK MR LIBURD ABOUT HISTORIC CISTERN OR LOCATION FOR DISCHARGE FROM EXIST. IN CENTRAL ISLAND CUL-DE-SAC

-SCHOOL IS ON SEWER.

Additional Notes and/or Sketch Information:

Emanuel Benjamin Oliver Elementary

JAMON E. LIBURD jliburd@sttj.k12.vi

Assistance Principal

340-775-2000

x2102

Government of the United States Virgin Islands
DEPARTMENT OF EDUCATION
St. Thomas - St. John District
JAMON E. LIBURD
Assistant Principal
Emanuel Benjamin Oliver Elementary
1834 Kongens Gade
St. Thomas, V. I. 00802
Phone: 340-775-2000 ext. 2102
Cell: 340-642-6246
Fax: 340-775-4357
Email: jliburd@sttj.k12.vi

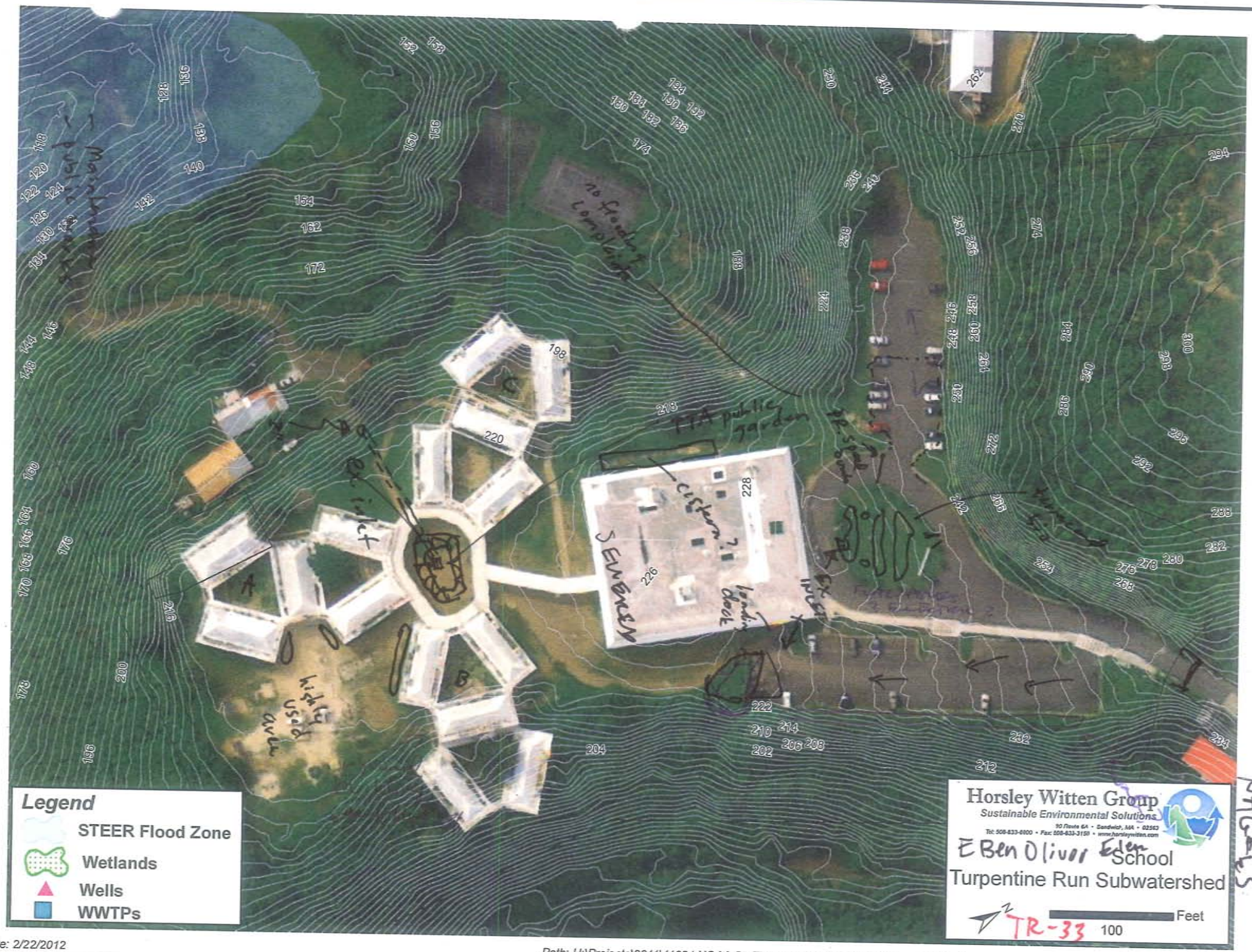
Description of Proposed Project:

THERE ARE A NUMBER OF OPPORTUNITIES

- RAIN GARDEN IN CENTRAL AREA
- BIO / TERRACED IN FRONT CUL-DE-SAC TO CAPTURE ~~PART~~ PORTION OF PARKING LOT AND ENTRANCE
- BIO AT LOWER LOT 5 LOADING DOCK SWALE ALONG BACK LOT LINE.

Additional Notes and/or Sketch Information:

Site Priority: ☒ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed


Legend
STEER Flood Zone
Wetlands
Wells
WWTPs
Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com
EBen Oliver Eden School
Turpentine Run Subwatershed
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- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [x] Other Education

Subwatershed: TERPENTINE

Site Name: Community Center Willy George TR-34

Description of Existing Conditions:

Ponding to East of Entrance → Possible AREA For BMP Retrofit.
To West of Entrance SW From Parking AREA Collects Along Ditch midway in Parking Aisle & Flows over wall (4-5' High) then down A-Slope To A grass AREA along Building And Vegetation behind Building (Thick). Possible swale or Stepped System.

SW System Retrofits would be more educational then WATERSHED WQ Enhancement AS Property is in the Upper Reaches of the WATERSHED.

Additional Notes and/or Sketch Information:

Date: 2/22/2012

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- ☒ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: TURPENTINE RUN

Site Name: TR-3S TURP. ROAD CULVERT (UPPER)

Description of Existing Conditions:

The biggest complaint received by public is flooding at road crossings on Turpentine Run. At this location is a box culvert that appears to be undersized for the amount of area draining to it.

Confluence of two major guts occurs at this location.

There is not a lot of space available for larger culverts probably need to replace with a bridge.

See write up & aerial

Additional Notes and/or Sketch Information:

Culvert approx. 4x8 but unable to measure adequately at the time ≈ 18" to road surface from top of culvert. Not much room to make larger vertically → have to widen

# TR-35, 37, & 40. Turpentine Run Road Culverts—
## Drainage Improvements

### Site Description

Turpentine Run Road parallels and crosses Turpentine Run for much its length and as a result, the condition of the roadway and the gut can be intertwined. For instance, undersized drainage infrastructure will contribute to erosion of the receiving channel. When that receiving channel abuts the street it is servicing, the erosion can jeopardize the integrity of the roadway. This scenario is occurring in many locations along Turpentine Run Road, several of which have created flooding and public safety hazards.

### Proposed Concepts

Approximately one-half mile north of the main entrance to Heavy Materials, Turpentine Run flows beneath Turpentine Run Road. There is a box culvert at this location (TR-35) that is reportedly overwhelmed during significant rain events. At the public meetings that were held in February 2012, many residents commented on the observed roadway flooding at the site. The culvert is approximately 4'x8'which is not sufficient for handling large storm flows given the hydrology of the gut. Increasing the culvert size or constructing a bridge in its place would offer the most improvement for flow capacity and for better managing the flooding. One significant design constraint is the elevation of Turpentine Run Road at the culvert location. There is only ~18" above the culvert to the top of the roadway, therefore limiting the improvements to options that create a wider channel cross-section. Installing a bridge would be the least flow restrictive option but it will likely be the most expensive to construct and cause the longest traffic delays. An alternative to a bridge would be to target better floodplain drainage by installing multiple small culverts adjacent to the existing culvert. This option may provide a reasonable balance between effectiveness and cost.

About one-quarter mile south, near the northern entrance to Heavy Materials, Turpentine Run crosses Turpentine Run Road again through a 48-inch diameter corrugated metal pipe (CMP) at TR-37. Velocities at the downstream end of the culvert are so great that a large scour pool has formed and the culvert is protruding 10-15 feet from the roadway embankment. Lack of and deteriorating roadway drainage infrastructure has exacerbated the problem. An incomplete concrete channel has caused an erosion gully to form leading into the gut. Sedimentation in the gut is a problem, both from erosion and from the dirt driveway leading to Heavy Materials. Design improvements should include: (1) upgrading and properly sizing the culvert beneath Turpentine Run Road, (2) stabilizing the stream bank and bed downstream of the culvert, (3) and repairing the concrete drainage channel that empties into the gut and providing adequate energy dissipation.

Across from the main entrance to Heavy Materials is a third location where inadequate drainage infrastructure has caused severe impacts to Turpentine Road (TR-40). Here runoff from the steep roads of the Mariendahl neighborhood collects and flows underneath Turpentine Road through a 24-inch diameter CMP. Due in part to the likely undersized culvert, poor channel alignment, and high velocity storm flows, undermining of the roadway has occurred. This has created a safety hazard not only to vehicles but also pedestrians. Pedestrians now have to walk into the roadway to maneuver around the resulting scour hole. Design improvements may include a combination of increasing the culvert size, relocating it to provide better channel alignment, and providing runoff energy dissipation up-gradient of the culvert.

Stormwater should be managed strategically throughout the Mariendahl neighborhood to attenuate the high energy flows before they reach Turpentine Run Road. When velocities are reduced, erosion potential also decreases.

## Practice Sizing/Design Considerations

When feasible, culverts should be sized to adequately pass at least the relevant design recurrence interval storm. In the case of the two culverts discussed that serve the main Turpentine Run channel, consideration should be given to balancing both high and low flows for environmental reasons versus simply installing the largest culvert possible. Traffic management (both vehicular and pedestrian) is likely to be the most challenging obstacle to overcome during the design and construction phases. All proposed designs should be coordinated with the DPW or DOT to make sure the concepts fit with any long-term goals that may exist.

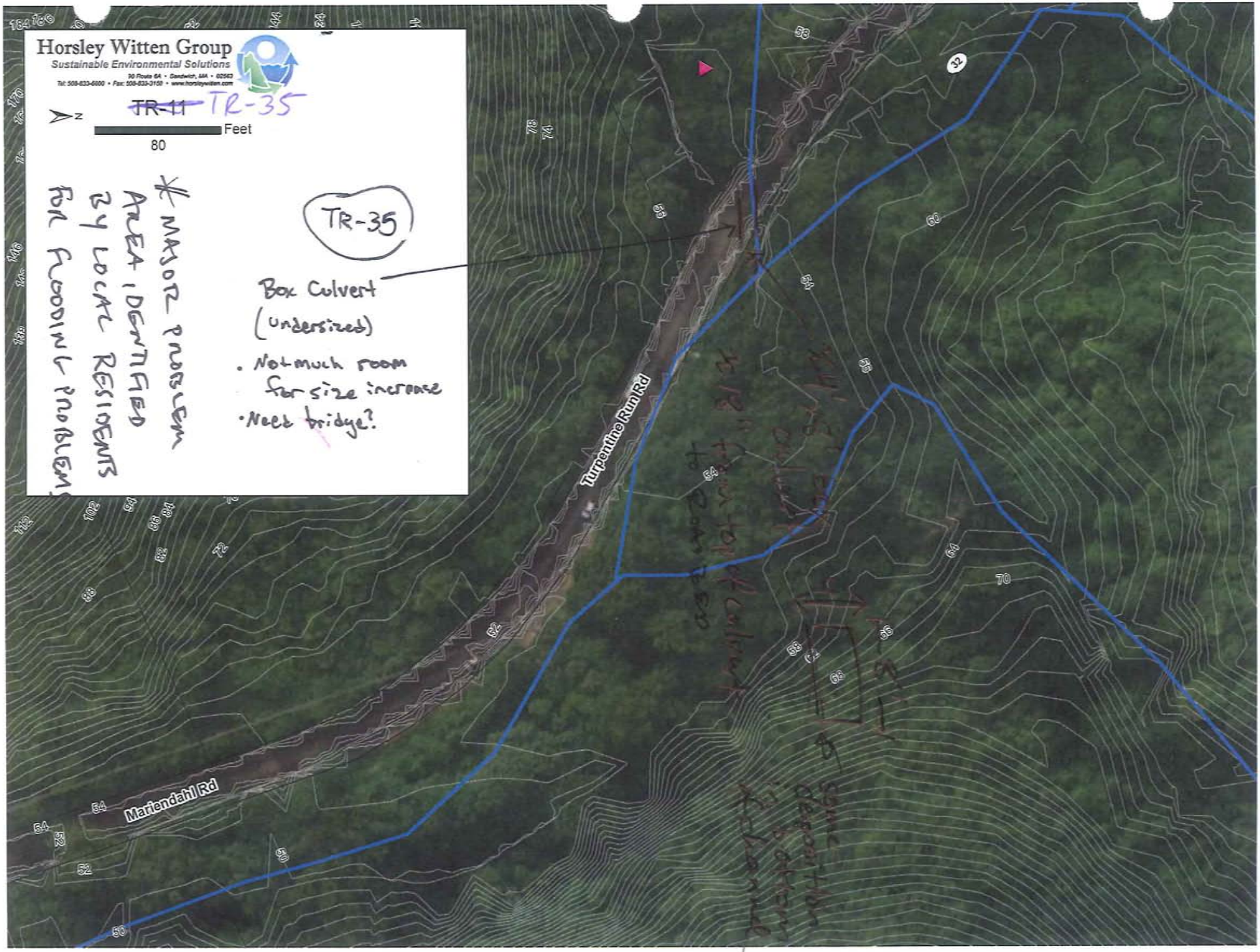
## Next steps

- Complete a topographic survey of the area. Determine if there are any site utility conflicts;
- Determine contributing drainage areas and size new culverts accordingly;
- Conduct in-stream flow monitoring for use in the calibration of stream simulation models;
- Investigate contributing watersheds to identify possible up-gradient drainage controls to reduce channel flows;
- Discuss design concepts with the DPW.

TR-35 culvert. USGS gauging station is upstream from here.

TR-40 showing hazardous conditions below Mariendahl neighborhood.

Concrete channel and scour downstream of culvert at TR-37.

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☒ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: TURTLENNERUN

Site Name: TR-36 AUTO SALVAGE

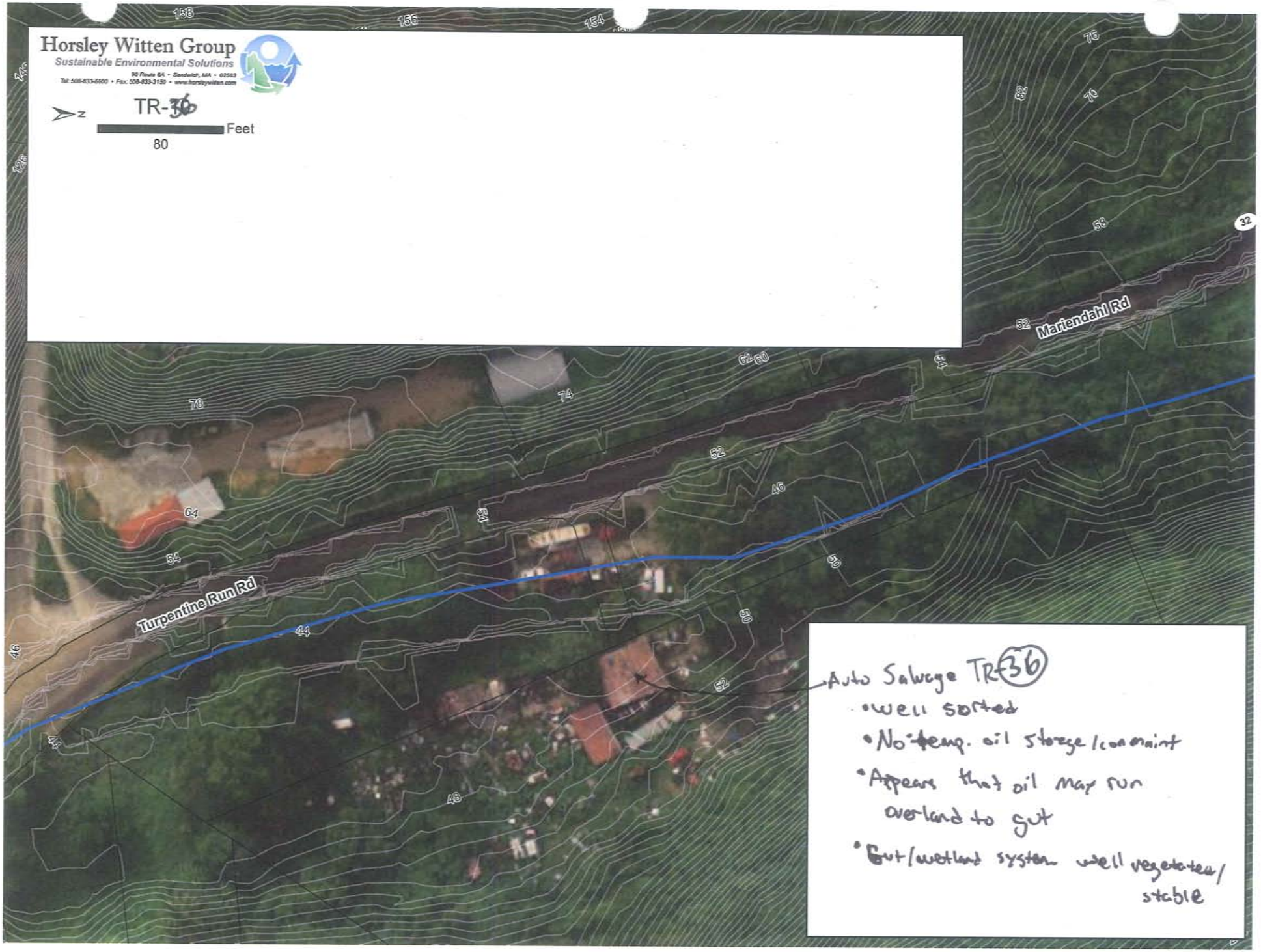
Description of Existing Conditions:

Area is well-sorted and organized. There appears to be no secondary containment for oil. There is a cut that runs thru the property but appears to be fairly stable & vegetated.

*Consider pollution prevention planning & make sure veg. buffer is protected.

Additional Notes and/or Sketch Information:

see aerial

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- ☒ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: TURP. RUN

Site Name: TR-37 TURP. RD. CULVERT (M10)

Description of Existing Conditions:

- Piped culvert of ≈ 48" diameter CMP
- large scour pool evident downstream
- concrete channel from road is incomplete and erosion is occurring above culvert.
- sediment loading to cvt evident from erosion & possibly from sed. transport from quarry.

High priority.

Additional Notes and/or Sketch Information:

# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [x] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: TURPENTINE RUN

Site Name: TR-39 BEST CARWASH/BEST TIRES

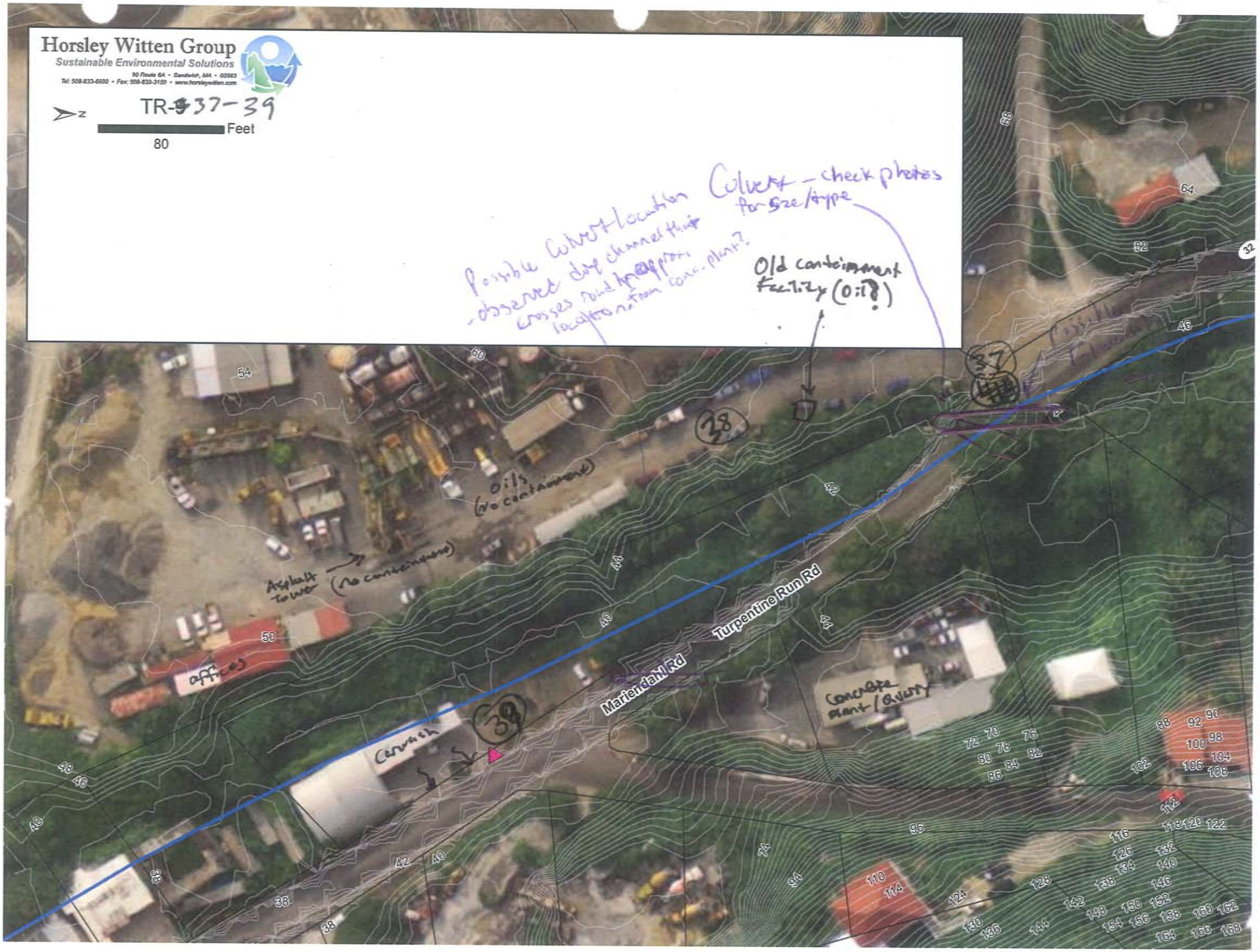
Description of Existing Conditions:

Carwash drains to road/out carrying soaps & cleaning fluids along with oils and automotive fluid.

Recommend providing formal washing area (with berms) and drains to sewer.

- O/W separator ??

Additional Notes and/or Sketch Information:

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [x] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

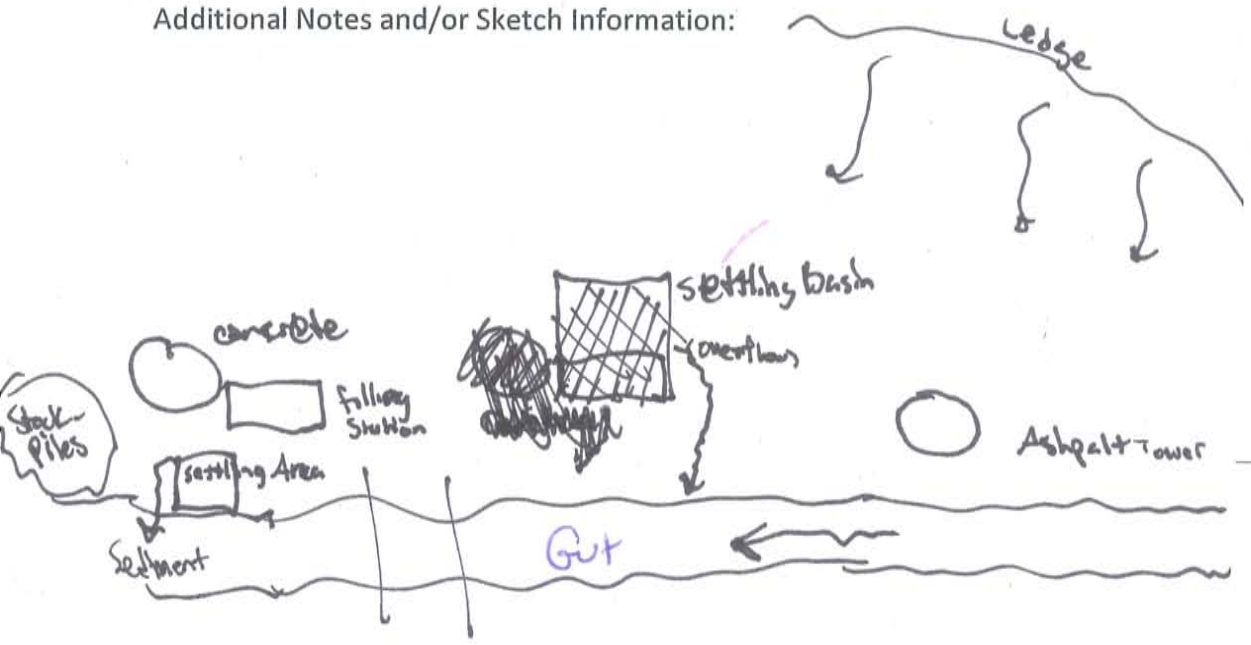
Subwatershed: Turpentine Run

Site Name: Heavy Materials TR-38

Description of Existing Conditions:

- No stormwater management
- Direct discharges from concrete truck filling station
- leaking septic pipes / septic discharges
- Human waste area along ghut bank
- Heavy sedimentation in ghut from stockpiles/runoff
- Settling basin overtops (very turbid) and flows overland to ghut. only silt fence protecting ghut (currently filled in).
- No containment for asphalt/oil facilities
- Major Earth change activities

Additional Notes and/or Sketch Information:

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HEAVY MATERIALS

# TR-38. Heavy Materials Quarry — Retrofit / Pollution Prevention

## Site Description

Heavy Materials, LLC operates a quarry facility on Turpentine Run Road that supplies construction aggregates, masonry blocks, and ready-mix concrete. It is one of the largest facilities of its kind in the U.S.V.I. The quarry consists of approximately 23 acres of disturbed land. The magnitude of the operation alone gives it the potential for significant impact to surrounding resource areas. All precipitation that runs off the site ultimately travels northeast to Turpentine Run. Erosion control and runoff management practices on the property were found to be either poorly maintained or non-existent. Numerous opportunities for site improvements were observed that would help to reduce sediment and pollutant discharges.

## Proposed Concepts

Water is commonly used in the production of aggregate and concrete products. For this reason, at least four settling ponds can be found on the Heavy Materials property for removing sediment particles from the facility process water. In order for the settling ponds to be effective, they must be sized appropriately according to influent flow rates and desired settling times. The ponds must also be periodically maintained to remove accumulated sediments. At the time of the site walk, the most down-gradient settling pond was observed to be overtopping its banks and was flowing across the access drive to its ultimate discharge point in Turpentine Run. Proposed strategies for preventing pond overtopping include increasing the available storage within the setting pond and modifying the pond outlet control system to handle the appropriate flow rate. Furthermore, settling ponds do little for removing the fine, suspended particles from water. Consequently, filtration and/or flocculation processes are recommended in conjunction with the existing settling strategies.

Proper sediment containment was also lacking at the concrete truck filling stations on the Heavy Materials property. The process for producing concrete involves mixing water with cement and aggregate. During the filling process, water was allowed to spill from the truck, creating a stream of cement slurry that was flowing directly into Turpentine Run with little or no treatment. A small containment bay was observed in one location near ghut but the flow of slurry at the time of observation was much greater than the capacity of the bay. Impacts from this process were observed in Turpentine Run at and downstream of the truck filling station, including cement deposits and highly turbid stream flows.

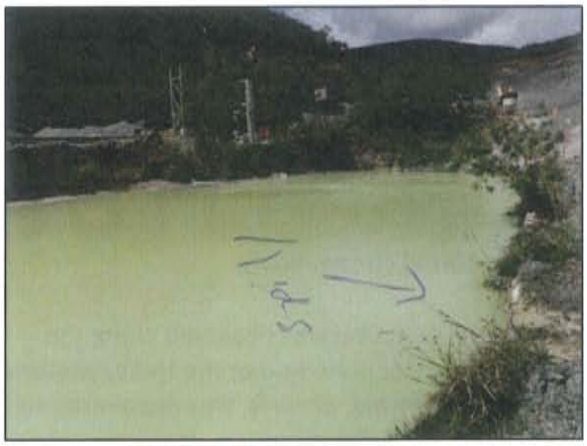
Bacterial pollution was observed along the banks of Turpentine Run at the Heavy Materials facility. A latrine, of sorts, was discovered near concrete truck filling station. Human waste was present along the banks of Turpentine Run in close proximity to the cement slurry flows.

## Practice Sizing/Design Considerations

In order to reduce the long-term environmental impacts of the Heavy Materials facility, a more complete investigation of the operational processes and planning measures is necessary. Only then can a complete set of future goals and strategies be developed. However, small steps can be taken in the near-term to reduce the extent of the untreated discharges currently entering Turpentine Run. At a minimum, erosion control practices and properly sized sediment containment bays could be installed. Sizing of the proposed treatment or containment practices, either in the long- or near-term, might also consider future site expansion and increased material production.

## Next steps

- Meet with the facility operations manager to discuss the current and future plant processes;
- Develop goals and strategies to adequately manage and treat the facility process water;
- Develop a plan and schedule for construction and installation of agreed-upon management strategies;
- Educate the Heavy Materials staff on the importance of protecting the sensitive resource areas that abut the property.



# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: TR-40

Site Name: Mariendal Neighborhood / TURP. ROAD CULVERT (lower)

Description of Existing Conditions:

Very steep roads. no drainage infrastructure. Drainage flows down roads to intersection w Turpentine Run Rd. where it results in gut erosion and road flooding at undersized culverts. ROAD IS being undermined.

~~TATS~~

24" culvert is undersized and misaligned.

DEAD/DYING GOAT

Additional Notes and/or Sketch Information:

Description of Proposed Project:

High priority to address flooding per Stakeholder Meeting recommendations

→ need to go back into neighborhood and look for opportunities to disconnect runoff.

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☒ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: TURPENTINE RUN

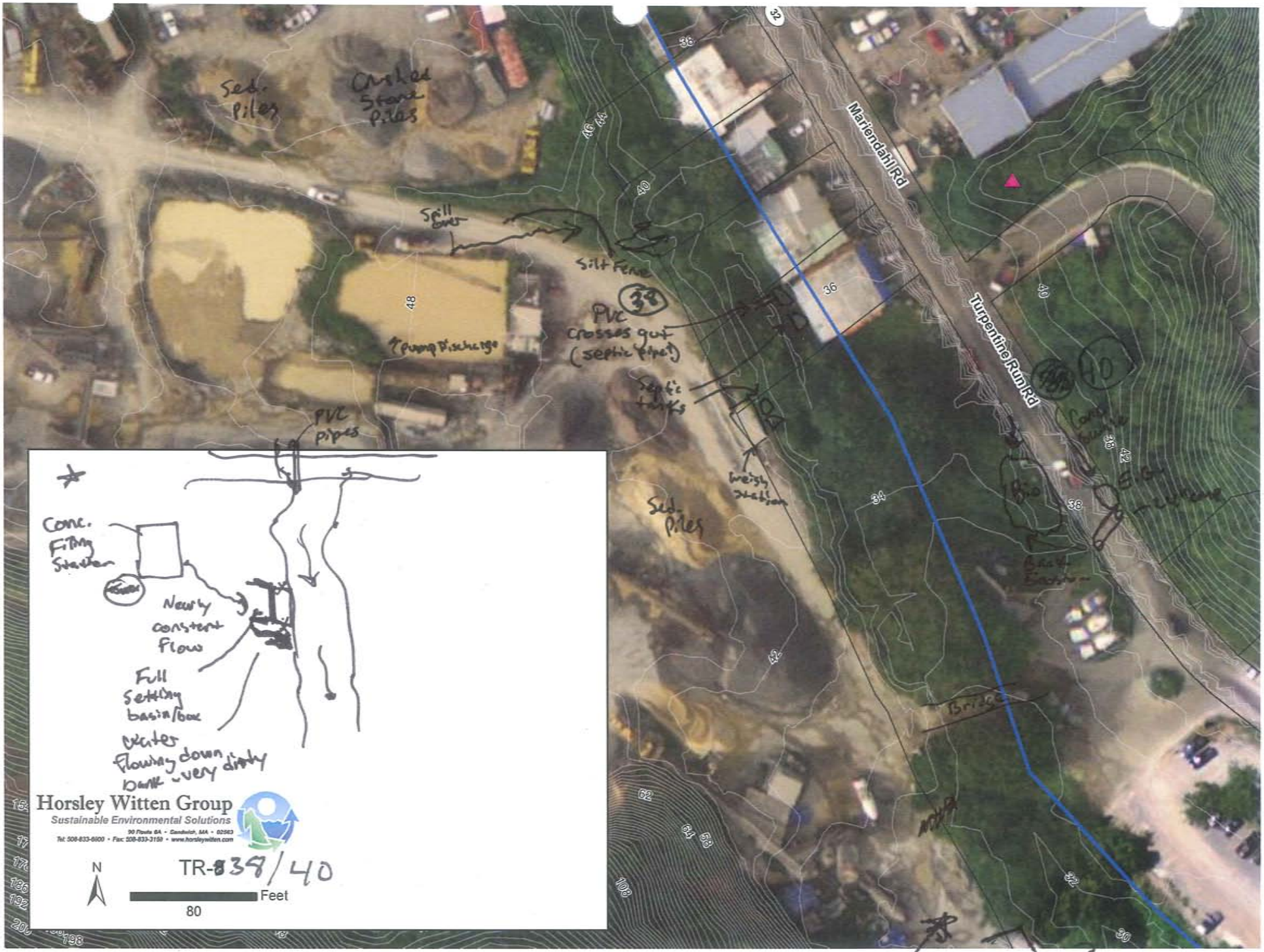
Site Name: TR-41 EQUIPMENT STORAGE

Description of Existing Conditions:

This is a dumping area and area of outdoor storage. Lots of trash & debris dumped near gut. Material stockpiles w no ESC. Barrels of oil sitting open were observed.

- Need to clean up & prevent further dumping
- take used oil to Bovoni for recycling
- cover stockpiles.

Additional Notes and/or Sketch Information:

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: Turpentine Run

Site Name: TR-42 (Dumpsters) / TR-43 Cheyenne's Exc.

Description of Existing Conditions:

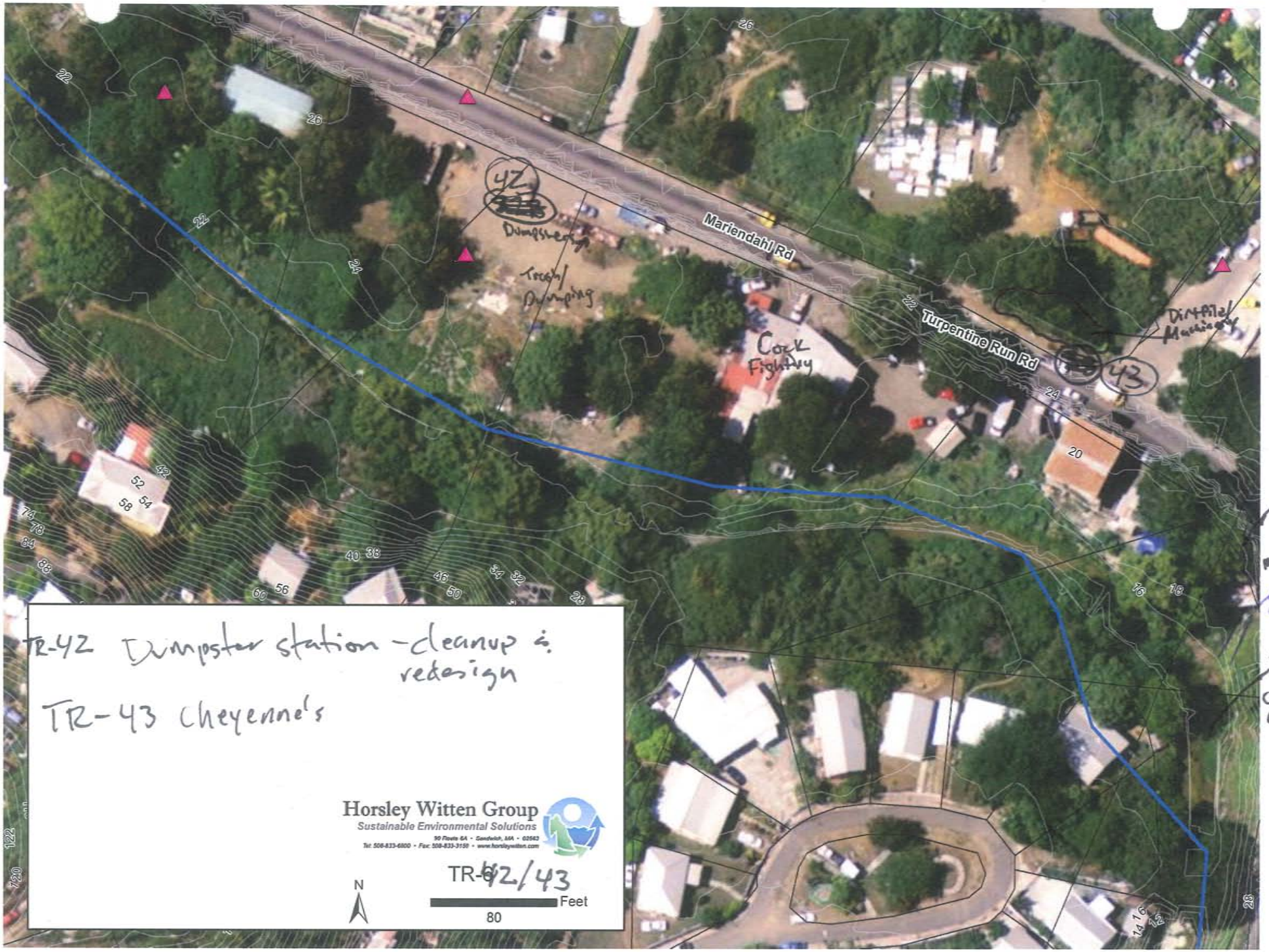
There are a number of places along road where dumping of materials and sediment along cut is evident.

TR-42 Dumpster / collection stations should be retrofitted to provide covered storage and containment to prevent dumping in buffer / cut.

TR-43 – Consider providing stabilized construction entrance (rock pad) and silt fence along perimeter to prevent sediment from discharging off-site.

Additional Notes and/or Sketch Information:

Soil stockpiles in parking area should be stabilized (e.g. covered or with silt fence perimeter)

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [x] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [x] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: Turpentine Run

Site Name: TR-44 NADIR BRIDGE PARK "BRIDGE TO NOWHERE" / TR-55 Truck disposal area

Description of Existing Conditions:

SEE WRITE UP

Additional Notes and/or Sketch Information:

SEE AERIAL

# TR-44. Nadir Bridge Park — Drainage Improvements & Gut/Floodplain Restoration

## Site Description

Nadir Bridge Park is a popular recreational site that serves many purposes for the surrounding community. The park offers a location for residents to play sports, barbeque, and organize for a variety of social events. These activities are hampered during rain events due to poor drainage and standing water. The park currently accepts untreated runoff from Mariendahl Road and the surrounding neighborhoods. The runoff causes flooding in the park because it is isolated from Turpentine Run by a two-three foot high flood-control concrete wall. The lack of drainage infrastructure creates a pond in the park until the water evaporates or infiltrates. Moreover, the concrete wall is part of a ¼ mile long concrete lined segment that acts as a barrier to fish passage and eliminates any natural connection between the ghut and the floodplain. Nadir Bridge Park offers opportunities for restoring the Turpentine Run riparian corridor while also enhancing public interest and recreation.

## Proposed Concepts

Nadir Bridge Park is approximately two acres in size. Although much of the park is used for recreation, a significant portion is either unutilized or poorly controlled. With better control of traffic patterns in the park, drainage improvements such as bioretention areas could be installed to treat runoff from Mariendahl Road and the park. By converting the travel lanes and parking areas to pavement or gravel, soil erosion could be minimized. There is also ample space near the ghut to restore floodplain connectivity and vegetation if the eastern-face of the concrete channel were removed. The bottom of the concrete channel could also be removed to provide deeper flows and improved fish passage.

## Practice Sizing/Design Considerations

The bioretention areas would be sized to treat up to the first 1.25 inches of runoff from the contributing impervious area. The available surface area at this location is approximately 6,000 SF which substantially exceeds the minimum surface area recommended for effective treatment. Any additional runoff that enters the bioretention areas will pass through an overflow structure and discharge into the gut.

An important consideration for the ghut & floodplain restoration components is the stability of the concrete wall on the western bank of the ghut if the existing concrete channel is modified. A footing for the wall will have to be designed that can withstand scour from the flow of the gut.

Any proposed improvements to the park area should be coordinated directly with the roadway design plans for the new Nadir Bridge. The drainage improvements and gut restoration features should be sited to avoid potential conflicts with the future roadway traffic patterns. It is also important to engage the community in the park design so there is a complete understanding of how the park is currently used and what the key features are for all stakeholders.

## Pollutant Removal

Bioretention areas are expected to remove 90% TSS; 30% TP; 55% TN; and 70% bacteria (RI Manual, 2010). This assumes the full design treatment volume is provided.

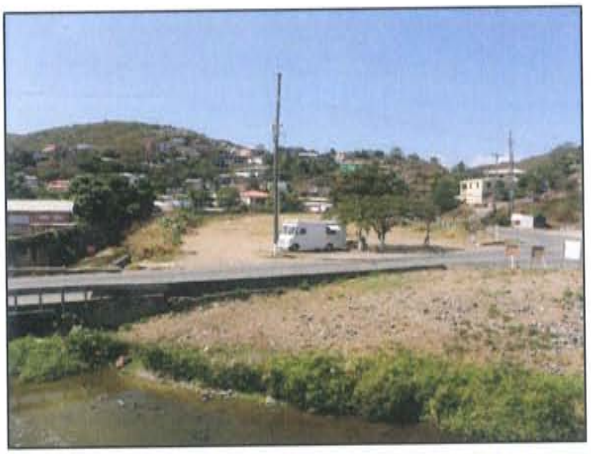
## Next steps

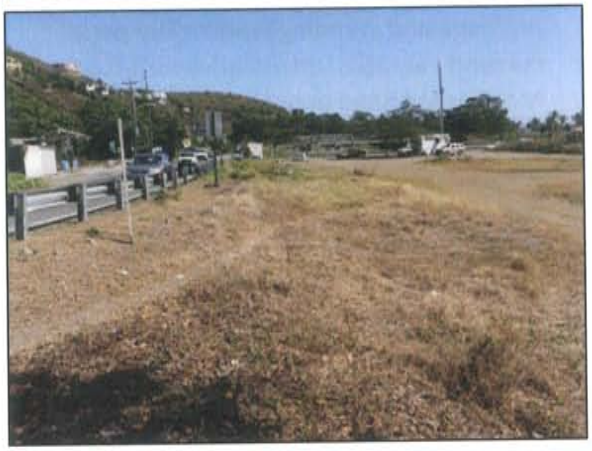
- Review the existing design plans for the Nadir Bridge intersection. Site proposed drainage improvements and

park amenities to accommodate the future road layout;

- Complete a topographic survey of the area. Determine if there are any site utility conflicts;
- Conduct test pits to verify subsurface soil conditions and depth to groundwater;
- Engage the community for input of the proposed park design and layout.

Nadir Bridge Park, 3/22/2012
(Source: Frank Galdo)





| Site ID | Drainage Area (ac) | % Impervious | Design Treatment Volume (cf)* | Practice Area Required (sf)* | Practice Area Available (sf)* |
|---|---|---|---|---|---|
| TR-44 | 3.1 | 40 | 5,600 | 5,600 | 6,000 |

*Design Treatment Volume: Tv (cf) = (1.25")(I)/12; I = impervious area (sf)

*Practice Area Required is calculated based on practice-specific design assumptions.

*Practice Area Available is estimated from available mapping. Actual practice area may be adjusted as needed during pre-construction.

Date: 2/23/2012

* Geotextile purchased for Bridge project

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: TURPENTINE RUN

Site Name: LIMA PROPERTY (TR-46)

Description of Existing Conditions:

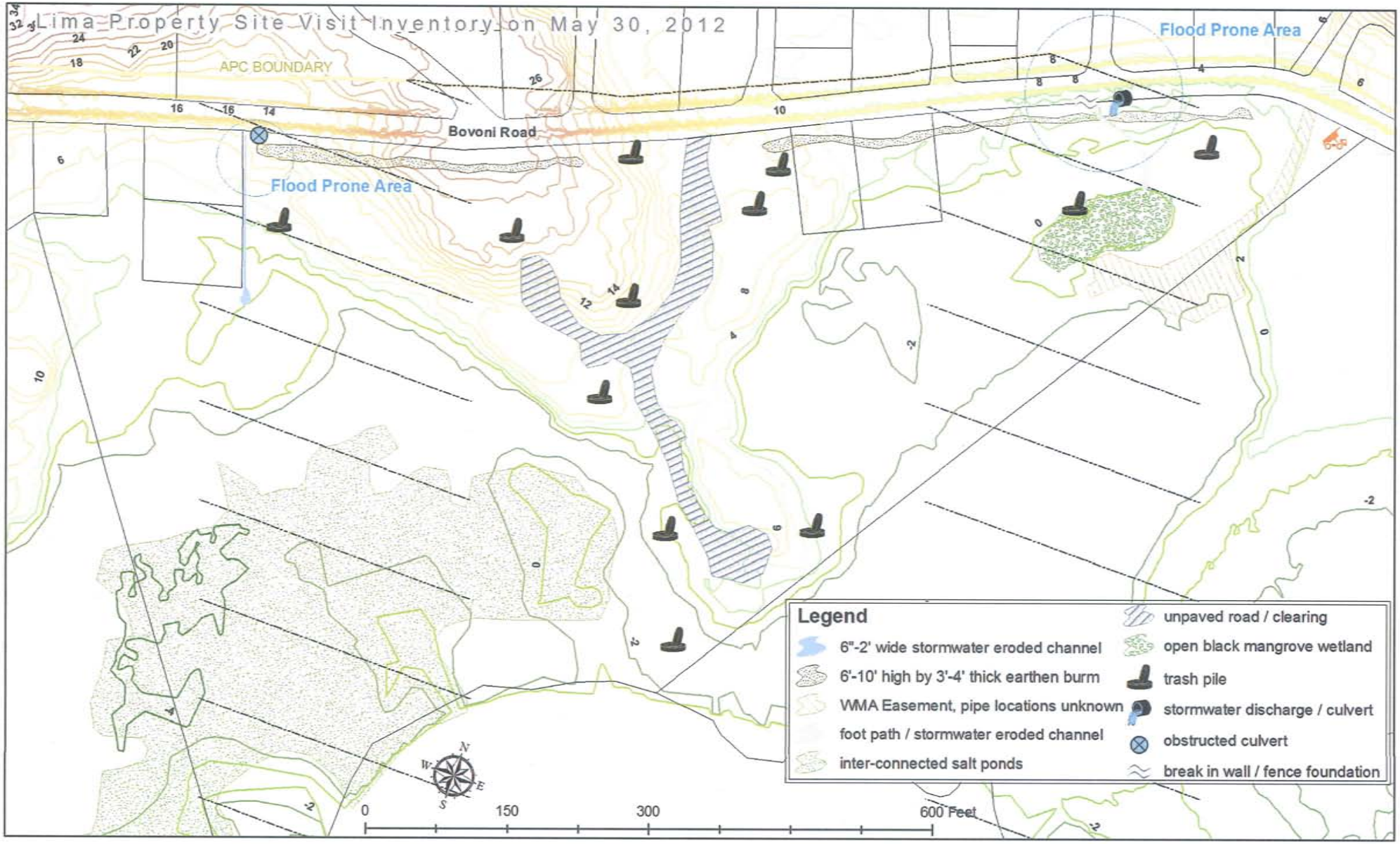
ACROSS STREET FROM BOVONI (6) NEIGHBORHOOD IS AN OPEN PARCEL FULL OF TRASH.

DPW IS DOING ROADWORK AND POTENTIAL CONSTRUCTED WETLAND AT THIS SITE COULD TREAT ROAD RUNOFF AND SERVE AS STORMWATER BMP FOR NEIGHBORHOOD

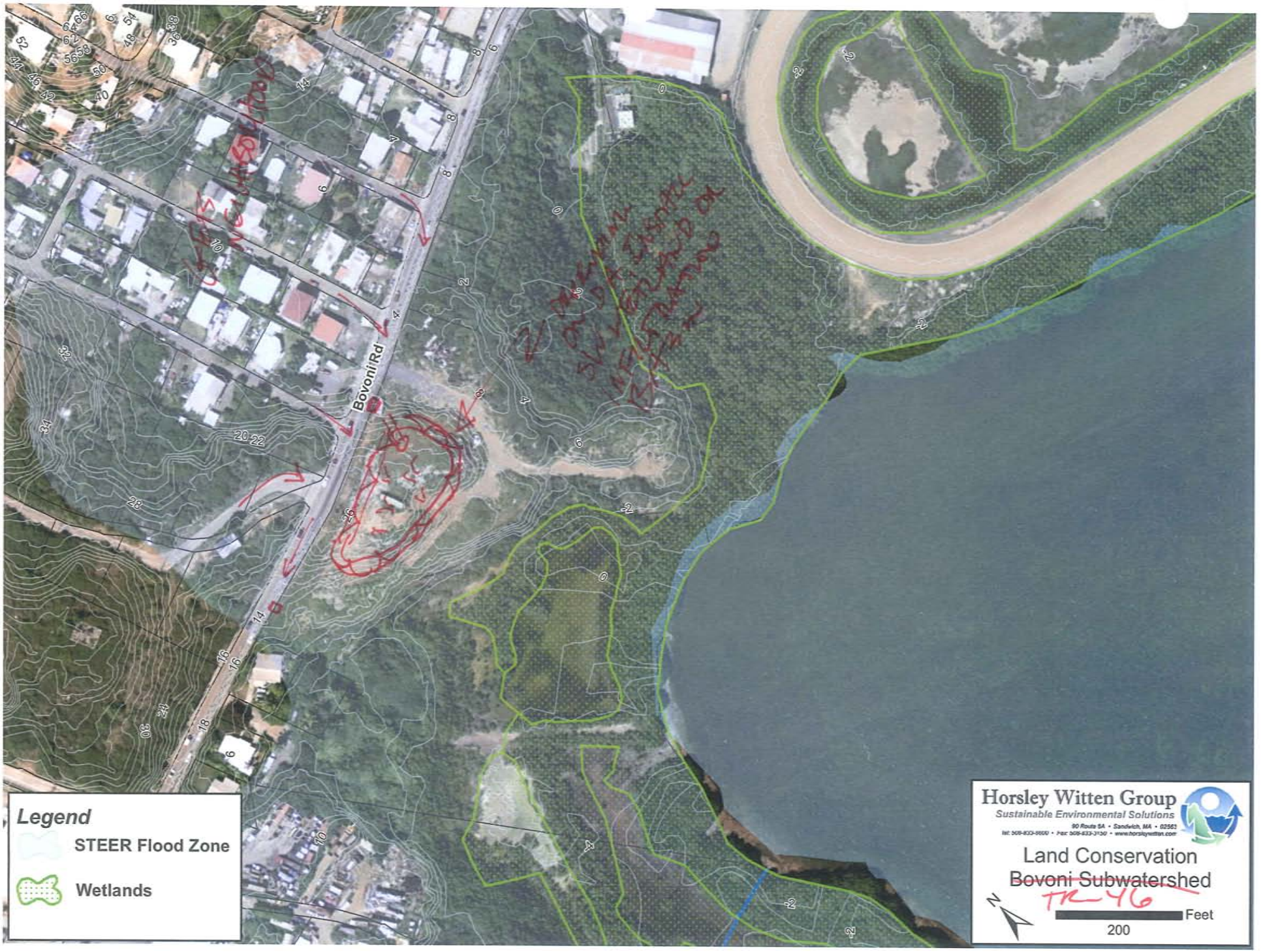
REPORTEDLY, PROPERTY OWNER HAS BEEN INTERESTED IN CONS. EASEMENT FOR PARCEL.

COULD TURN INTO A PARK?

Additional Notes and/or Sketch Information:


Lima Property Site Visit Inventory on May 30, 2012
APC BOUNDARY
Bovoni Road
Flood Prone Area
Flood Prone Area
Legend
6"-2' wide stormwater eroded channel
6'-10' high by 3'-4' thick earthen burm
VMA Easement, pipe locations unknown
foot path / stormwater eroded channel
inter-connected salt ponds
unpaved road / clearing
open black mangrove wetland
trash pile
stormwater discharge / culvert
obstructed culvert
break in wall / fence foundation
N
W
E
S
0
150
300
600 Feet

TR-46
LIMA

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2696092.5 sqft

TR-46 Lima

# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [x] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: Turpentine Run

Site Name: CLINTON PHIPPS RACETRACK TR-47

Description of Existing Conditions:

Active horse track - ~~regular~~ center of track is wetland area, sediment ~~and~~ folding from track into central wetland. Piles of horse waste observed at disposal site to east of track.

~~3 x 30"~~

Propose:

① Conduct pollution prevention investigation. Find stormwater permit SWPPP for confined animal operations → particularly waste disposal

② Investigate potential to use interior of track as const. stormwater wetland to manage area across road. Include sediment forebays along outer edge.

Additional Notes and/or Sketch Information:

③ options for smaller practices in the upland portion of site.

SEE AERIAL

Date: 2/22/2012

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: TR-48

Site Name: TRASH COLLECTION / DUMP STATION

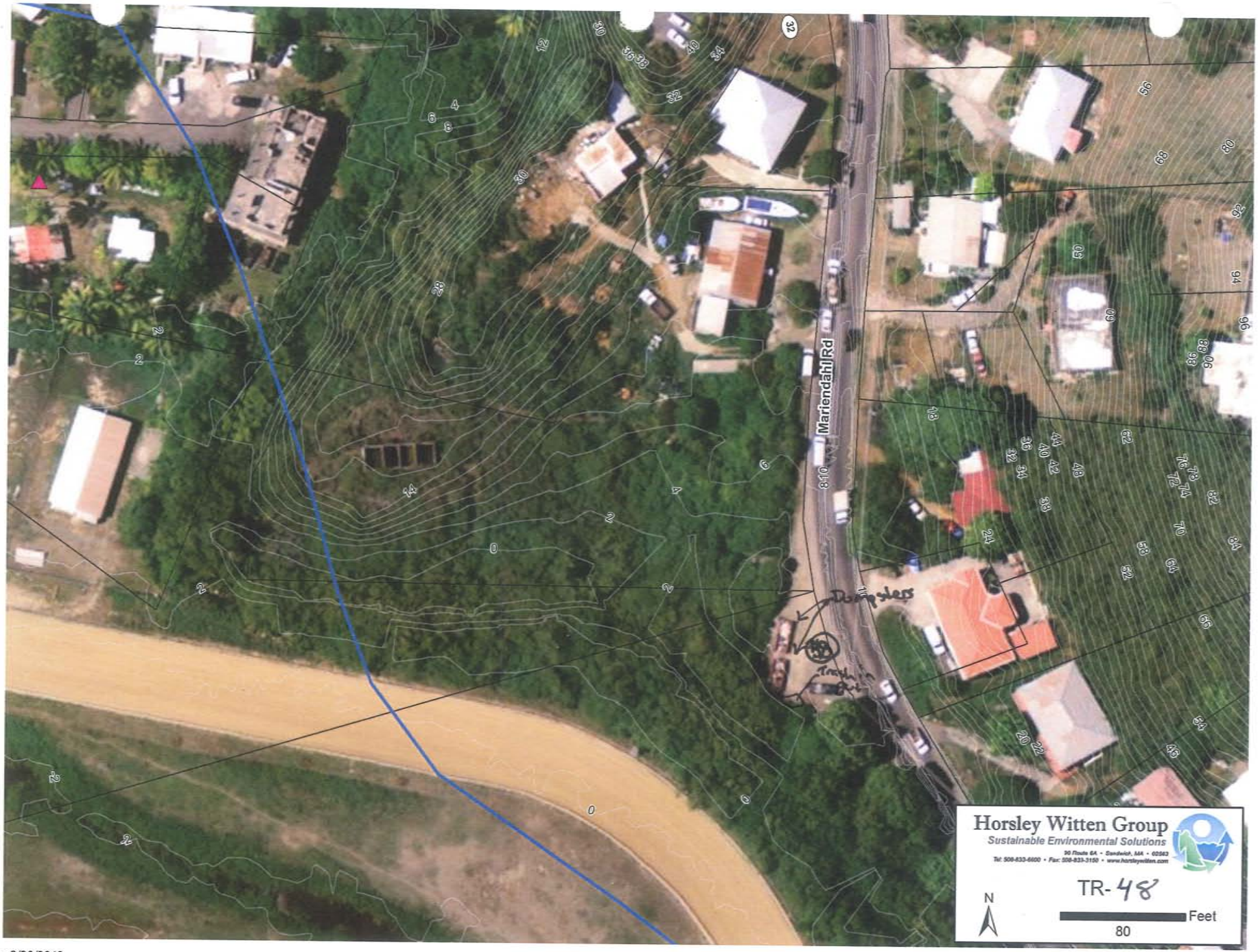
Description of Existing Conditions:

This site is constant source of trash dumping / and being blown by wind into mangroves/wetlands behind dumpsters.

IT would make a highly visible site to showcase alternative collection station design-

- fencing in back to prevent wind blow/overflow
- covered area for rollaways to reduce rain / trash contact.
- posting of signage for special collection days or recycling efforts of VIWMA

Additional Notes and/or Sketch Information:

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: TR-49

Site Name: KAYAK TOURS

Description of Existing Conditions:

Parking area and building are in the floodplain. not good site for retrofitting - coisider pollution prevention activities

- oil & grease
- marine debris
- vessel removal

* good location for watershed-related signage (although audience is primarily tourists)

Additional Notes and/or Sketch Information:

Date: 2/23/2012

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☒ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☒ Other Enforcement?

Subwatershed: Nadir

Site Name: Elm Rd/GUT NG-1

Description of Existing Conditions:

erosion observed along unvegetated slopes of gut, lots of trash, not maintaining vegetated buffer, goat farm in buffer/gut building walls in adjacent to gut w/no ESC
- recomend that a residential stewardship program to:

1. SEDIMENT CONTROL
2. Maintaining 35 ft veg. buffer
3. dumping prevention & clean up

Additional Notes and/or Sketch Information:

* Ex. where homes are built basically in the gut.

Date: 2/23/2012

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [x] Pollution Prevention
- [x] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: NADIR

Site Name: GOLD HILL RD/ELM RD Xing (NG-2)

Description of Existing Conditions:

Trash and debris in gut to be removed.

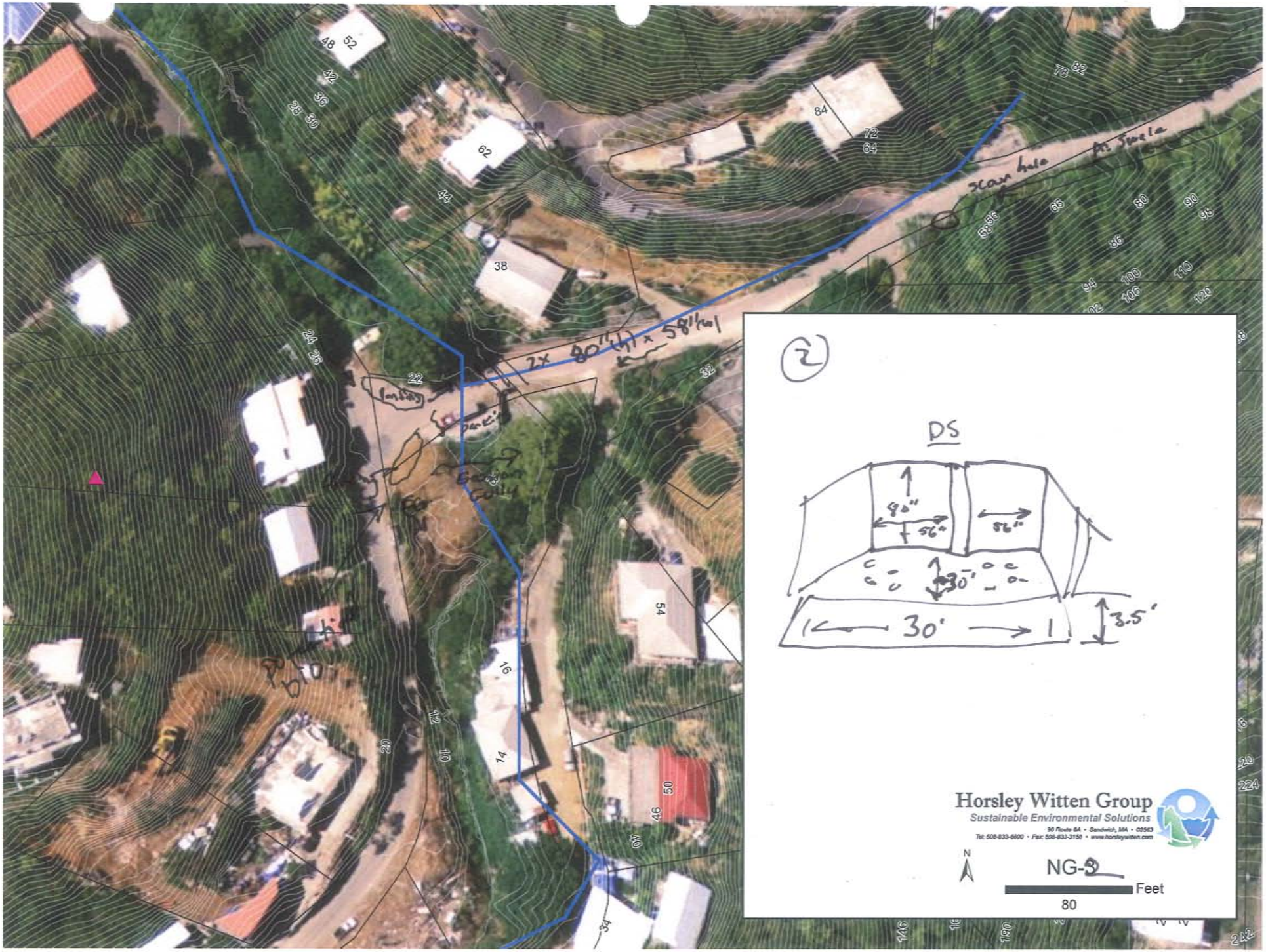
Runoff from uphill road network could be managed in a roadside bioretention/or swale (but would be expensive for the benefit)

~~The gut is the~~ scour hole

There is a ~~head cut~~ forming at the culvert splash pad - it appears that energy dissipators at this location may be helpful

- small bios/rain gardens at intersection to reduce flooding of roadway.

Additional Notes and/or Sketch Information:

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [x] Pollution Prevention
- [ ] Infrastructure Repair
- [x] Illicit Discharge
- [ ] Other _____

Subwatershed: NADIR

Site Name: NADIR BALLFIELD | NB-3

Description of Existing Conditions:

SEE WRITE UP

AND AERIAL

Additional Notes and/or Sketch Information:

# NG-3. Nadir Ballpark — Retrofits

## Site Description

Nadir Ballpark is a recreational facility that offers residents a field for baseball, a court for basketball, and a playground for young children. The parking area for the facility currently accepts untreated runoff from Elm Road and the surrounding neighborhoods. A portion of the runoff temporarily ponds in the dirt parking area where is picks up sediment and then spills, untreated, into Nadir Ghut. Ghut encroachment is also a significant problem in this area with many examples of unauthorized clearing of vegetation and solid waste disposal. Nadir Ballpark offers opportunities for public education about stormwater management and resource area protection.

## Proposed Concepts

Two stormwater treatment facilities are proposed at Nadir Ballpark to treat runoff from Elm Road and the surrounding residences, one bioretention area and one constructed wetland facility. Runoff from the roadway will be directed to the treatment facilities via paved flumes and/or drainage swales. Sediment forebays will be included in the design to provide runoff pretreatment.

The bioretention area is proposed along the road shoulder, north of the basketball court. This practice could treat runoff from the 2.6 acre drainage area and reduce erosion in the dirt parking area.

A constructed wetland is proposed to capture and treat runoff from the southern portion of Elm Road. The practice is proposed in the ballpark property near the intersection of Elm Road and Red Hook Road. There is currently a 5,000 SF existing wetland in the proposed treatment location that has formed due to an elevated outlet pipe and likely high groundwater. Minor alteration to the existing wetland would be necessary to enhance pretreatment and pollutant removal capabilities. This would involve installation of a stabilized drainage inlet or paved flume, construction of a sediment forebay, and modification of the existing outlet. There is currently a roadside drainage swale that discharges into the wetland which could be expanded and enhanced. The swale could be converted to wet swale to provide an additional 1,500 SF of treatment area. Improved management of the influent stormwater is paramount because severe erosion along the road shoulder has comprised the integrity of the roadway.

For any of the proposed management strategies, it is also important to engage the community in the design process so there is a complete understanding of how the ballpark is currently used and what the key features are for all stakeholders.

## Practice Sizing/Design Considerations

The bioretention area and constructed wetland would be sized to treat up to the first 1.25 inches of runoff from the contributing impervious area. The available surface area at each location is 1,600 SF and 6,500 SF, respectively, which is sufficient for meeting the minimum surface area requirements for effective treatment. Any additional runoff that enters the facilities will pass through an overflow structure or culvert and discharge into the ghut.

## Pollutant Removal

Bioretention areas are expected to remove 90% TSS; 30% TP; 55% TN; and 70% bacteria. Constructed wetlands are expected to remove 85% TSS; 48% TP; 30% TN; and 60% bacteria (RI Manual, 2010). This assumes the full design treatment volume is provided.

## Next steps

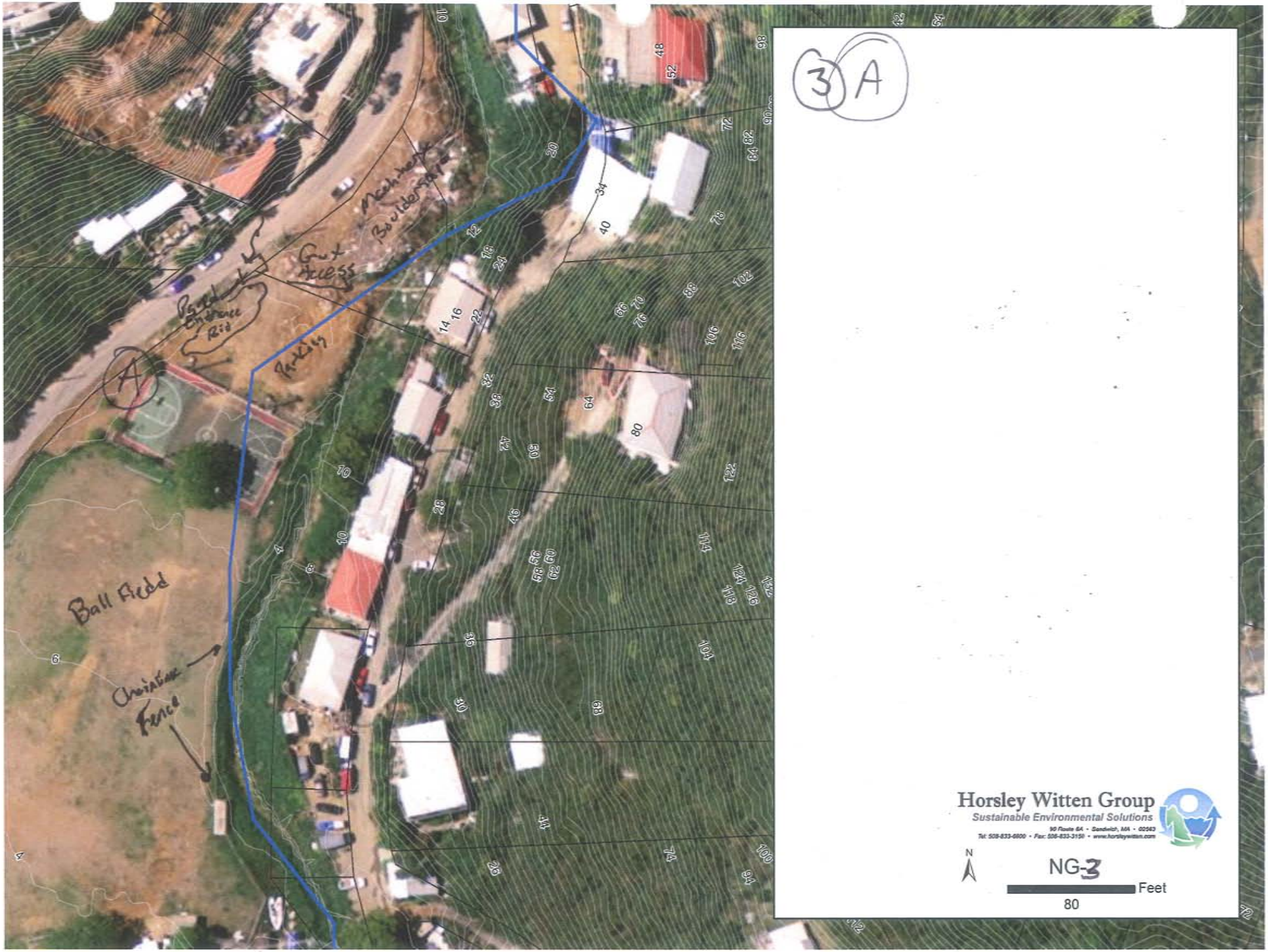
- Complete a topographic survey of the area. Determine if there are any site utility conflicts;
- Conduct test pits to verify subsurface soil conditions and depth to groundwater;
- Engage the community for input of the proposed design and layout.

| Site ID | Drainage Area (ac) | % Impervious | Design Treatment Volume (cf)* | Practice Area Required (sf)* | Practice Area Available (sf)* |
|---|---|---|---|---|---|
| NG-3A | 2.6 | 20 | 2,400 | 1,000 | 1,600 |
| NG-3B | 15.9 | 20 | 14,400 | 10,400 | 6,500 |

*Design Treatment Volume: Bioretention Areas, Tv (cf) = (1.25")(I)/12; I = impervious area (sf); Constructed Wetlands, 0.015*DA; DA = drainage area (sf)

*Practice Area Required is calculated based on practice-specific design assumptions.

*Practice Area Available is estimated from available mapping. Actual practice area may be adjusted as needed during pre-construction.

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [x] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [x] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: NADIR

Site Name: TROPICAL MARINE NG-4

Description of Existing Conditions:

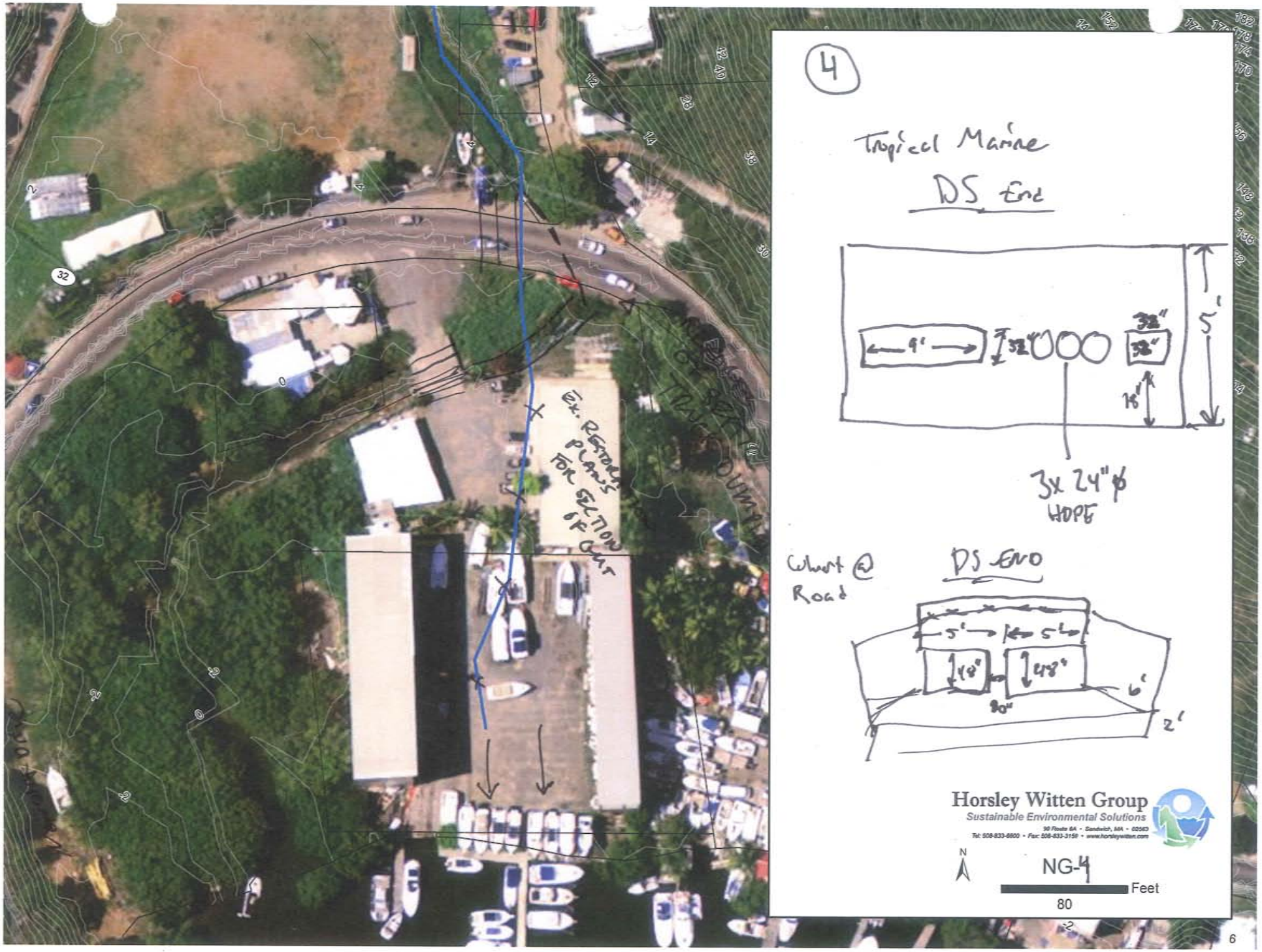
- gut takes a right angle turn to go under road culvert. There is an existing set of plans for a proposed stream restoration project here.
- Reports that septic pump out vehicles discharge at this culvert location
- Surface of boat yard drains directly to bay without treatment.
- Consider pollution prevention opportunities such as
  ① paving for areas where fluids are drained.

Additional Notes and/or Sketch Information:

② trench drain to O/W separator
③ or sand filter

- consider rainwater harvesting @ roof that drains to "the patch"

* SEE Ex. DESIGN plans for gut restoration

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| DATE | REVISION | BY |
|---|---|---|
| 12/20/90 | REDRAWN | RFH |

# Road & Drainage Improvements
## Route 32
## St. Thomas, Virgin Islands

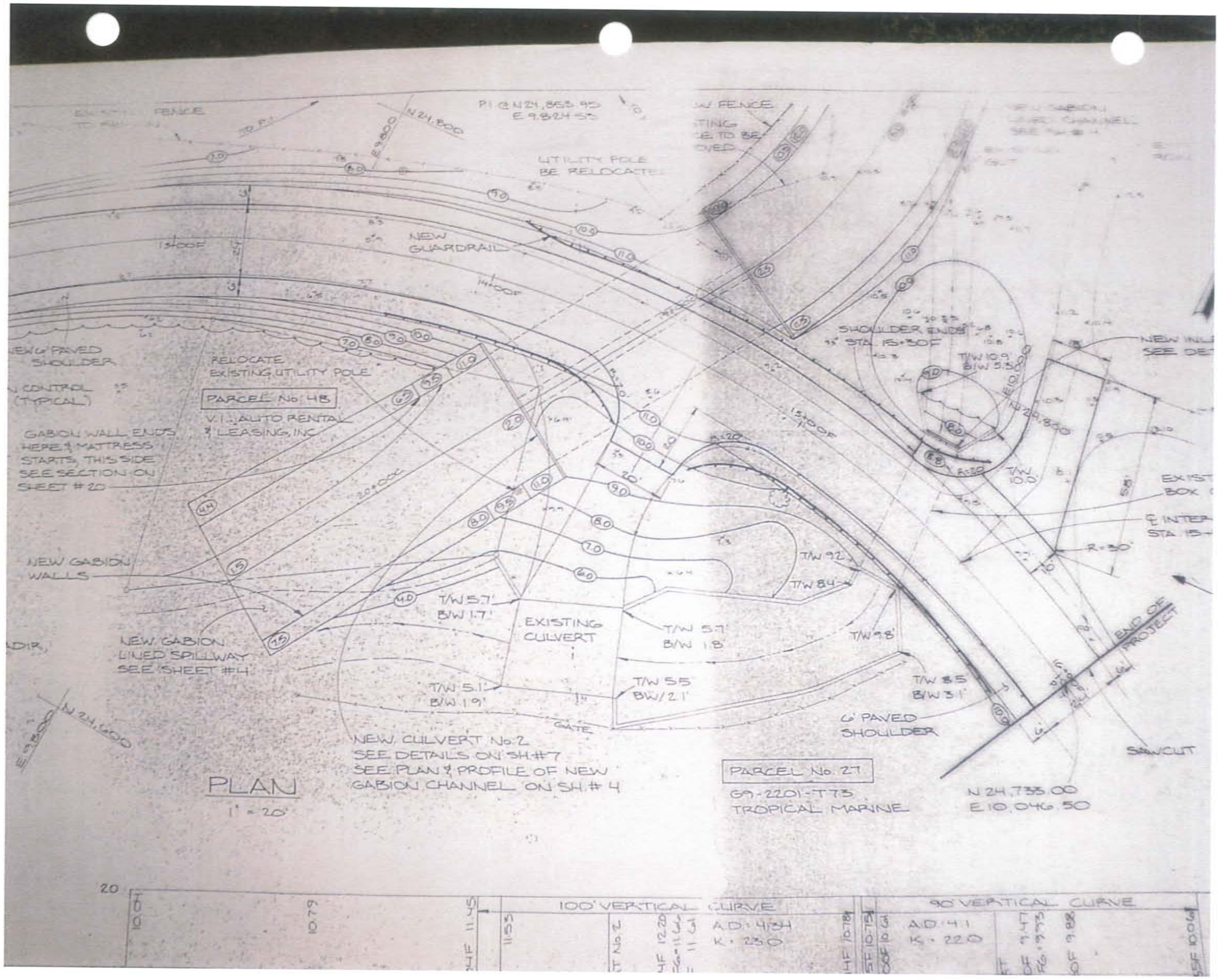
# PLAN & PROFILE
# BALLPARK ROAD
# Sta. 10+00F to 16+00F

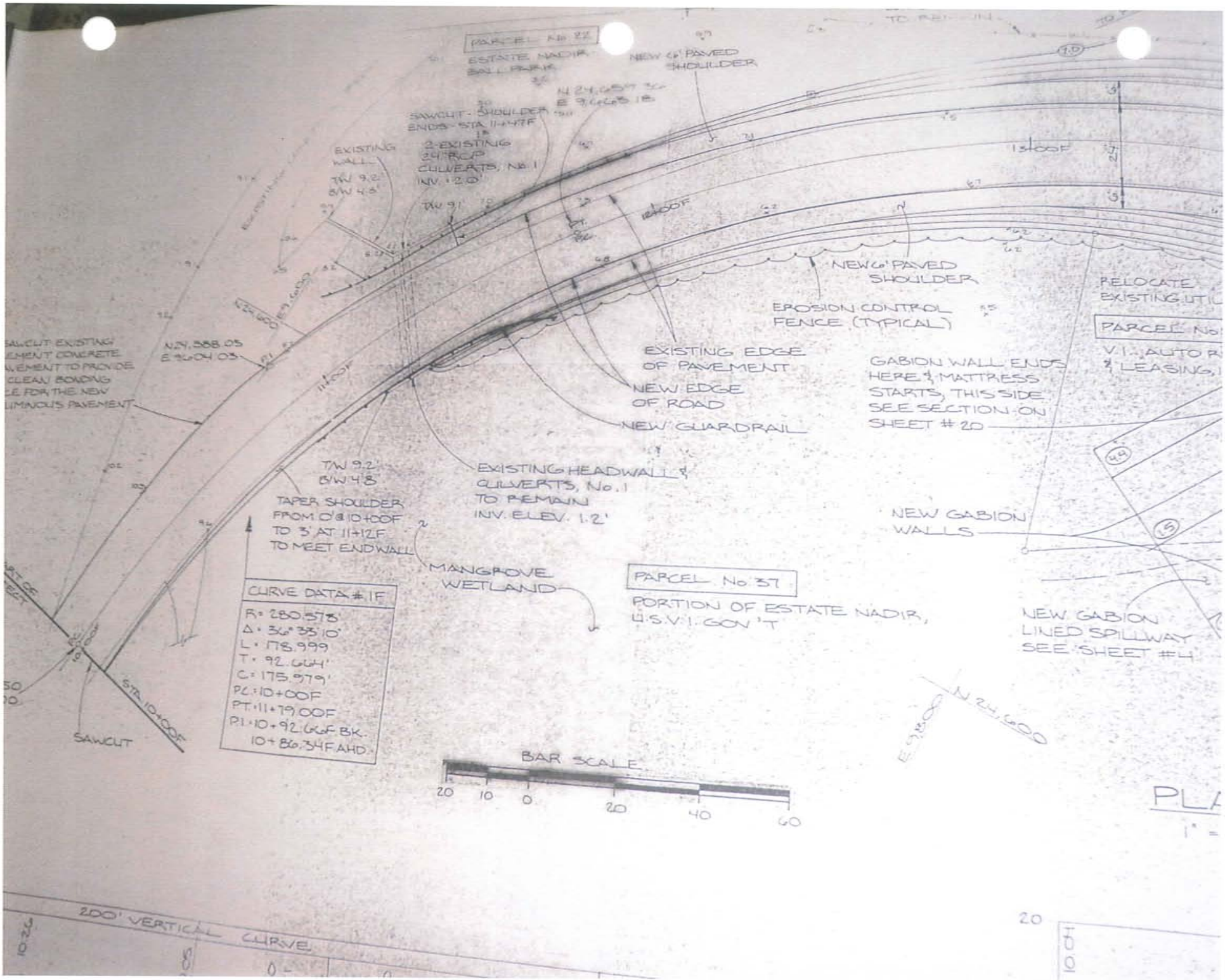
| | |
|---|---|
| SURVEY | CAH |
| DESIGN | WW/EA |
| DRAWN | LAC |
| CHECKED | RFH WW |

Donald L. Hamlin

CONSULTING ENGINEERS, INC
St. Thomas, U.S. Virgin Islands

| | |
|---|---|
| SCALE | SHOWN |
| DATE | 10-7-88 |
| DRW NO | 2 |
| JOB NO | 88-001 |
| FILE | |


PI @ N 24,853.95
E 9,824.55
N 24,800
E 9800
UTILITY POLE TO BE RELOCATED
NEW GUARDRAIL
13+00 OF
14+00 OF
EXISTING PAVED SHOULDER
CONTROL (TYPICAL)
GABION WALL ENDS HERE & MATTRESS STARTS, THIS SIDE SEE SECTION ON SHEET #20
RELOCATE EXISTING UTILITY POLE
PARCEL No. 48
V.I. AUTO RENTAL & LEASING, INC.
20'-00C
NEW GABION WALLS
T/W 5.7'
B/W 1.7'
EXISTING CULVERT
T/W 5.7'
B/W 1.8'
T/W 9.2'
T/W 8.4'
T/W 9.8'
NEW GABION LINED SPILLWAY SEE SHEET #4
T/W 5.1'
B/W 1.9'
T/W 5.5
B/W 2.1'
T/W 8.5
B/W 3.1'
GATE
NEW CULVERT No. 2
SEE DETAILS ON SH. #7
SEE PLAN & PROFILE OF NEW GABION CHANNEL ON SH. # 4
PLAN
1" = 20'
SHOULDER ENDS STA. 15+30 OF
T/W 10.9
B/W 5.5
T/W 10.0
R=30'
END OF PROJECT
6' PAVED SHOULDER
SAWCUT
PARCEL No. 27
69-2201-T73
TROPICAL MARINE
N 24,735.00
E 10,046.50
20
100' VERTICAL CURVE
A.D. 4.84
K = 23.0
90 VERTICAL CURVE
A.D. 4.1
K = 22.0


PARCEL No 22
ESTATE NADIR
BAY PARK
NEW 6' PAVED SHOULDER
N 24,685.97
E 9,668.18
SAWCUT - SHOULDER ENDS - STA 11+47F
2-EXISTING 24" RCP CULVERTS, No. 1
INV. 1.2'
EXISTING WALL
TW 9.2'
BW 4.8'
TW 9'
12+00F
NEW 6' PAVED SHOULDER
EROSION CONTROL FENCE (TYPICAL)
RELOCATE EXISTING UTIL
PARCEL No
V.I. AUTO R
& LEASING,
SAWCUT EXISTING PAVEMENT CONCRETE PAVEMENT TO PROVIDE CLEAN BONDING SURFACE FOR THE NEW BITUMINOUS PAVEMENT
N 24,588.05
E 9,604.05
EXISTING EDGE OF PAVEMENT
NEW EDGE OF ROAD
NEW GUARDRAIL
GABION WALL ENDS HERE & MATTRESS STARTS, THIS SIDE SEE SECTION ON SHEET # 20
TW 9.2'
BW 4.8'
TAPER SHOULDER FROM 0' @ 10+00F TO 3' AT 11+12F TO MEET ENDWALL
EXISTING HEADWALL & CULVERTS, No. 1 TO REMAIN INV. ELEV. 1.2'
NEW GABION WALLS
MANGROVE WETLAND
PARCEL No 37
PORTION OF ESTATE NADIR, U.S.V.I. GOV'T
NEW GABION LINED SPILLWAY SEE SHEET #4
CURVE DATA #1F
R = 280.578'
Δ = 36° 35' 10"
L = 178.999
T = 92.664'
C = 175.979'
PC = 10+00F
PT = 11+79.00F
P.I. = 10+92.66F BK.
10+86.34F AHD.
STA. 10+00F
SAWCUT
BAR SCALE
20 10 0 20 40 60
N 24,600
E 9,600
200' VERTICAL CURVE
PLA
1" =

# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: Nadir

Site Name: The Patch NG-5 (Humphrey's owner) * UNPAVED YARD *

Description of Existing Conditions:

- History of gut rerouting around the ball field
- option for small swale down back of Tropic Marine
  - he'd be ok with that, but not to much.
- brackish well & desal plant
  - → wastewater goes into the ground
  - → cesspool "
- wants to dredge where current drainage is.
  - right @ boat landing.
  - average dredging every 3 years
- tropical marine rooftop not collected on cistern

Description of Proposed Project:

Projects:

1. Remove and/or relocate cesspool.
2. pave area designated to collect oils & other boat repair fluids/pollutants
3. direct sediment laden runoff from entrance to swale or other basin
4. consider biosuds along western edge w tropical marine

Additional Notes and/or Sketch Information:

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☑ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: Fry / Compass

Site Name: Saga Haven Marina FC-1

Description of Existing Conditions:

parking area above marina has lots of oil stains / vehicle spills.

include in pollution prevention survey & residential education plan

Additional Notes and/or Sketch Information:

# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

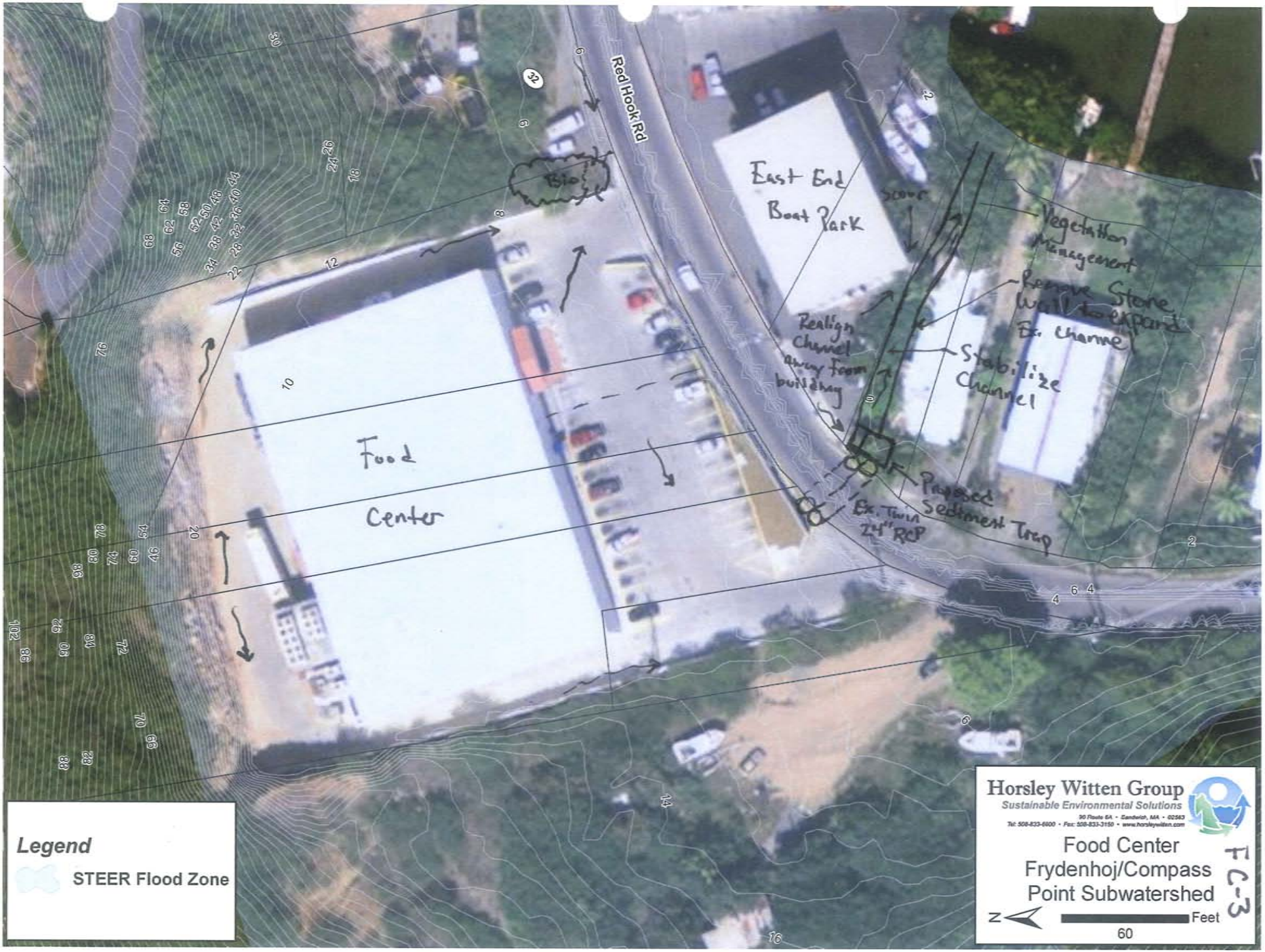
Subwatershed: Fry / Compass

Site Name: Food Center FC-3

Description of Existing Conditions:

- Address erosion and flooding at existing channel adjacent to East End Boat Park building.
- Reconstruct existing stonewall to expand the existing channel capacity
- Stabilize existing channel to prevent erosion,
- Realign existing channel to prevent building foundation scour,
- Install sediment trap at culvert outlet for ease of maintenance.
- Provide vegetation management near harbor to address flow impediment.
- Install a bioretention area at the eastern entrance to Food Center for water quality treatment.

Additional Notes and/or Sketch Information:

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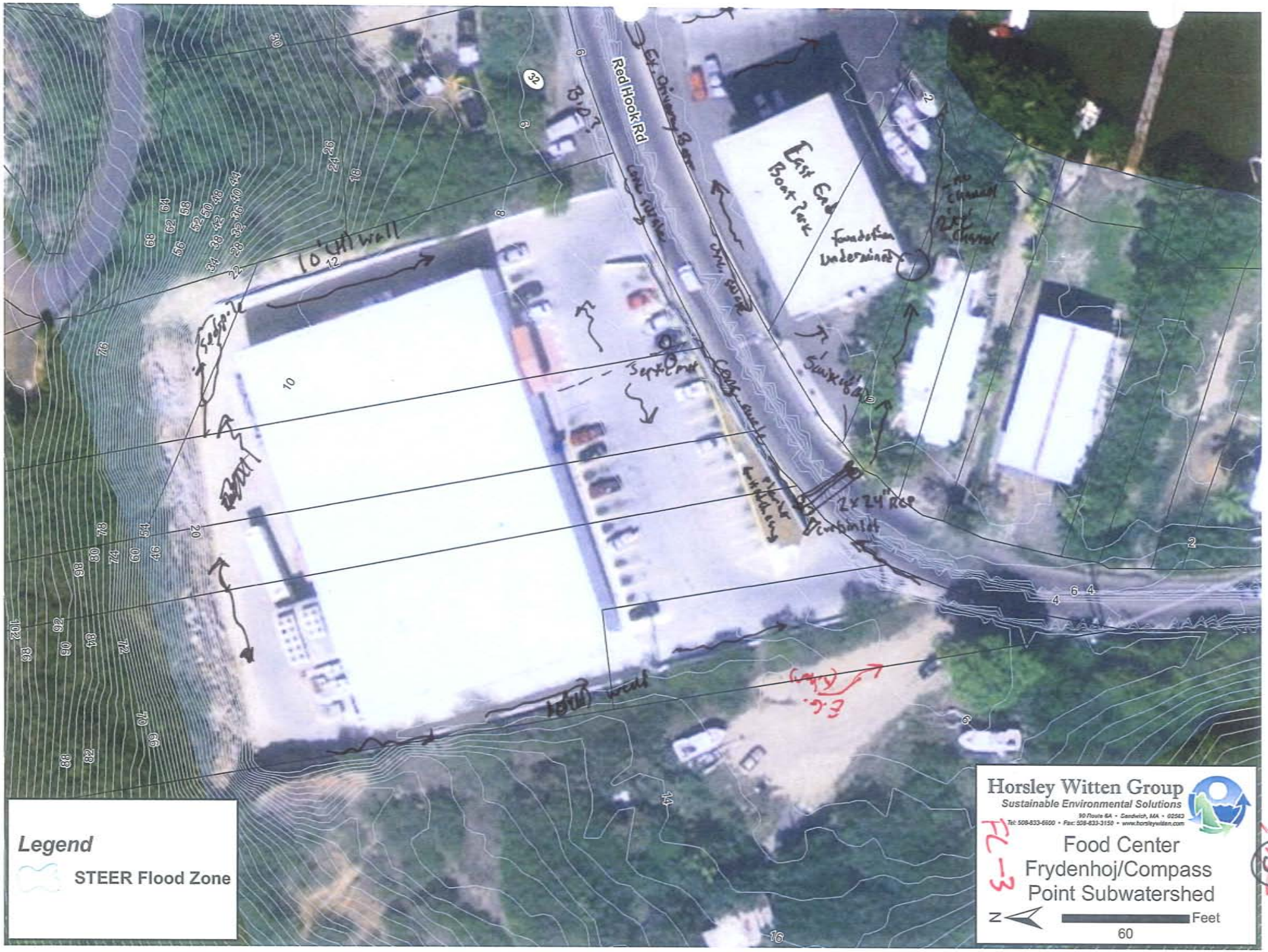


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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: Fry / Compass pt.

Site Name: independent Boat yard FC-4 ~~FC-5~~

Description of Existing Conditions:

new owners are hardcore about
- vaccum paint chips, using tarps, etc
- sediment tanks near slip in progress - have henley's pump it out

→ dust collection systems vacuums for sanding bottoms. highly used NO SANDING WITHOUT THOSE

* SEE OWNER COMMENTS
NEED TO ADDRESS ROAD RUNOFF; possibly divert prior to entering property with berm or catchbasin

Additional Notes and/or Sketch Information:

Jim Kellog Manager of boatyard

INDEPENDENT BOATYARD

Additional Notes and/or Sketch Information:

→ Flow coming in at entrance - french drain? drop inlet. raised speed bump.

→ DOT main road. - drop inlet; retrofit culvert out

culvert clogged

# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: FRY/COMP. PT/

Site Name: FC-5 GUT CROSSING - CULVERT @ RT 32

Description of Existing Conditions:

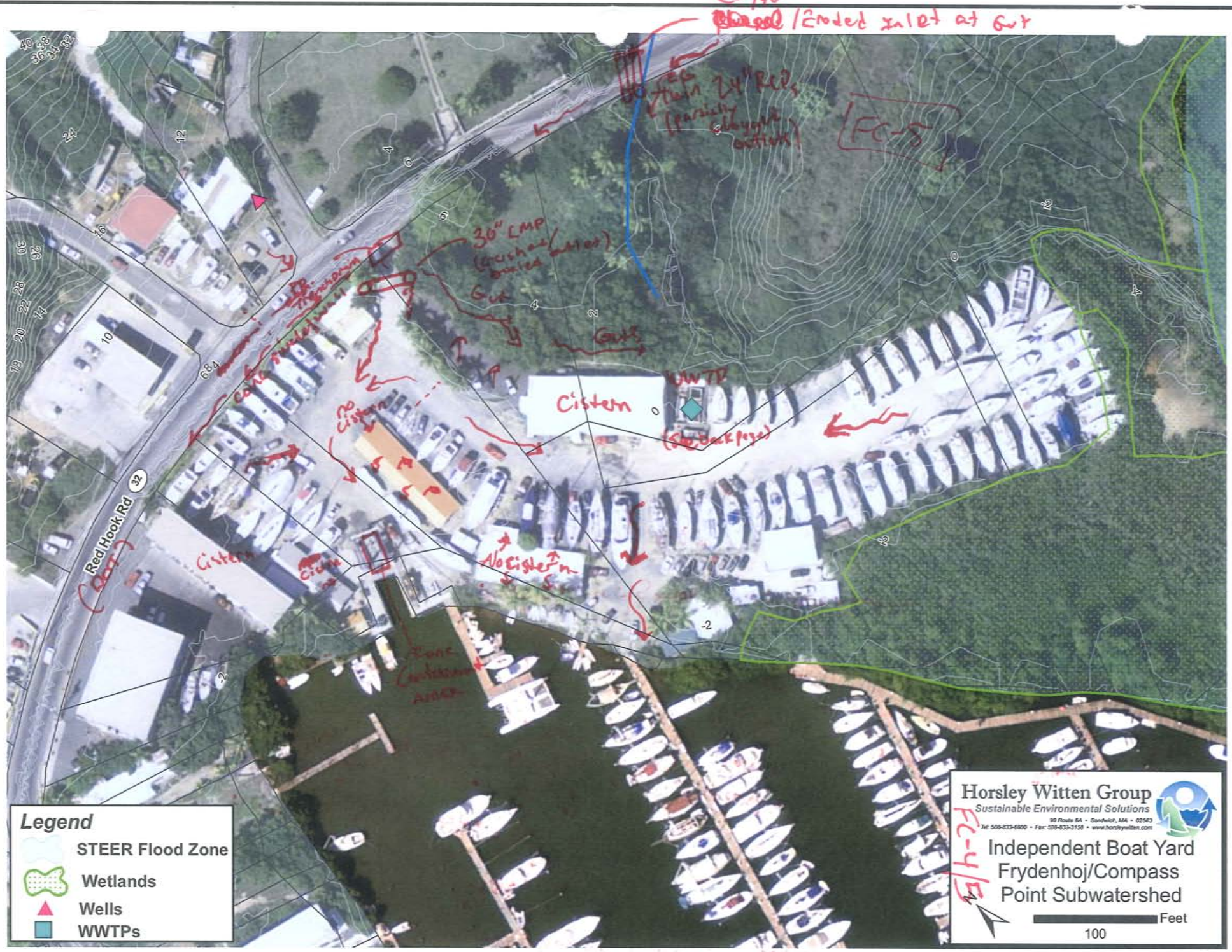
FC-4

- Eliminate runoff from entering Independant Boat Yard
- Runoff currently flows west on Red Hook Road and into Independant via the driveway. Reported flooding occurs.
- Install a trench drain and paved flume to capture road runoff.
- Install a sediment trap at the outlet of the existing culvert and proposed practices for ease of maintenance.

FC-5

- Maintain existing culverts
- Remove sediment and debris.
- Provide vegetation management to clear obstructions.
- Consider increasing culvert size to address flooding and road overtopping.
- Stabilize erosion gullies leading to gut.

Additional Notes and/or Sketch Information:

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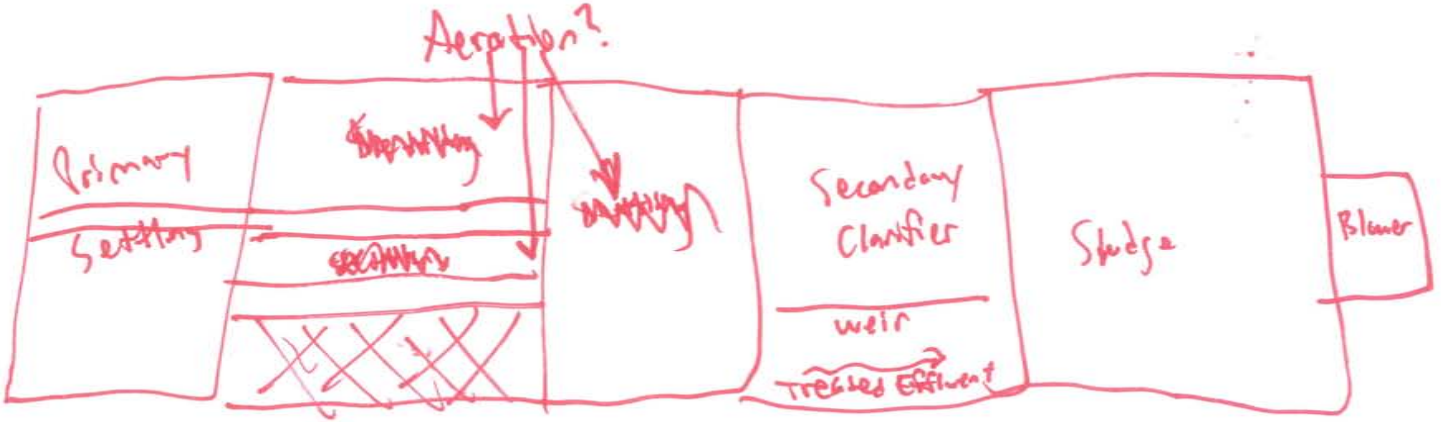
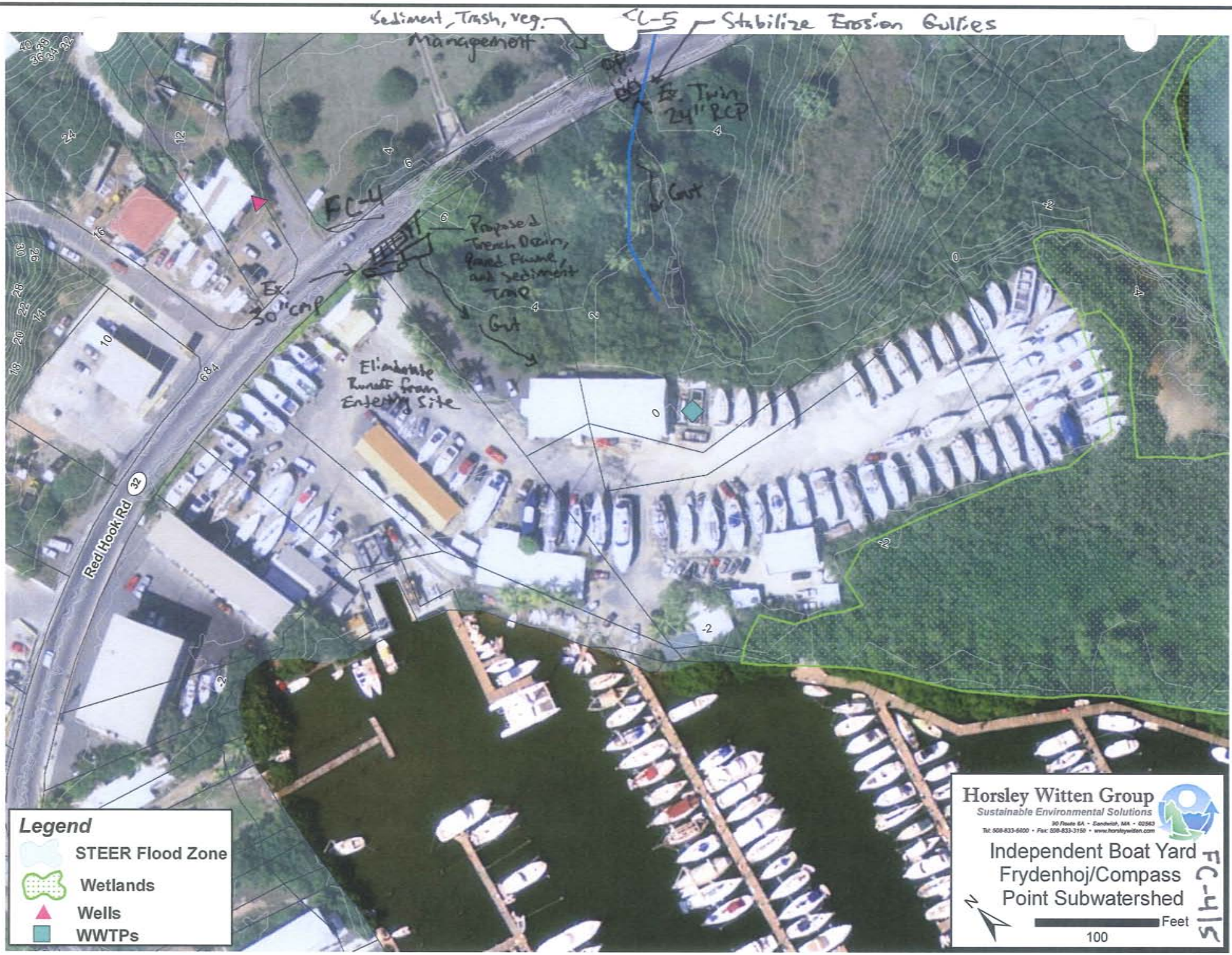
Bathrooms/Showers/Budget Marine




- Used for irrigation / No chlorination

~ 6000 gpd

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☒ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: FRY / CP

Site Name: BENNETT BAY / MARINA FC-7

Description of Existing Conditions:

IBY has recommended sediment removal in area near slip where highest TBT values have been recorded. They suggested Disposal in a lined pit located on Compass Pt. marina property.

See Jim Kellog notes --

Additional discussions with NOAA OPAR, ACOE should be had to determine feasibility and benefit.

Additional Notes and/or Sketch Information:

## Anne Kitchell

**From:** Anne Marie Hoffman [ahoffman@TNC.ORG]
**Sent:** Tuesday, January 29, 2013 7:21 PM
**To:** Anne Kitchell
**Subject:** Independent Boat Yard and Compass Point

Hey Anne-

FYI – Jim Kellogg, manager of Independent Boatyard supplied the following regarding 1. Remediating contaminated sediments and 2. limiting flooding/stormwater that sheet flows down from the light where my house is, heading west and ends up flowing into Independent Boat Yard. Including #2 in the Watershed Plan would be a good idea, if you agree with the concepts.

I also talked to him briefly about a rain garden in the Compass Point parking lot and he said that it is saltwater intrusion, not freshwater that floods the parking lot. Things that make you go hmmm...

Also, I know I owe you a photo!

Thanks,
Anne Marie

---

**From:** jim kellogg [mailto:kelloggvi@yahoo.com]
**Sent:** Friday, January 25, 2013 11:13 AM
**To:** Anne Marie Hoffman
**Subject:** Remediation

Ann Marie,

Regarding what we discussed today:

(1) Remediation of TBT located off the IBY slipway. Propose removing all sediment containing the highest concentration of TBT and placing it in a plastic lined basin on adjacent property owned by Compass Point Marina where we would aerate it with a roots blower thru a grid of pvc pipe laid in the plastic lined basin until the TBT has broken down. Estimate a period of some months of blower operation.

(2) Re runoff in front of IBY property, suggest some help with permitting would be helpful, and we would bear the cost of concrete swale across our entrance to divert runoff into the gut for settlement. Additionally, need cooperation of public works to correct the current crown in the road to facilitate diverting runoff from the hill to the gut it used to run into. Can be accomplished by creating in essence a 3 inch rise in the road surface over a distance of say 50 to 75 feet.

Regards Jim Kellogg

# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: FRY / COMPASS

Site Name: COMPASS PT. SALT POND FC-6

Description of Existing Conditions:

JANUARY LOOKING @ 3 SITES
RED HOOK SALT POND, CPSP, SECOND FALSE ENTRANCE

#1 ORTHO RECTIFY AERIALS HISTORICAL CONDITIONS
#2 FIELD ASSESSMENT TO PRIORITIZE 3 SITES
BATHYMETRIC TO ESTIMATE DREDGING CAPACITY
CONTAMINANT SAMPLING - ORGANIC & INORGANIC
WATER MODELING - FLUSHING RATE
#3 IMPLEMENT TOP PRIORITY

Additional Notes and/or Sketch Information:

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: Frydenhoj / Compass Pt.

Site Name: Compass Pt. Marina FC-8

Description of Existing Conditions:

Consider potential for expanding landscape areas in parking lot to provide shallow bios for water quality treatment. Would be a great, highly visible location for demo project.

Maybe could be funded by mitigation for unpermitted gravel parking lots. (FC-9)

Additional Notes and/or Sketch Information:

Date: 2/21/2012

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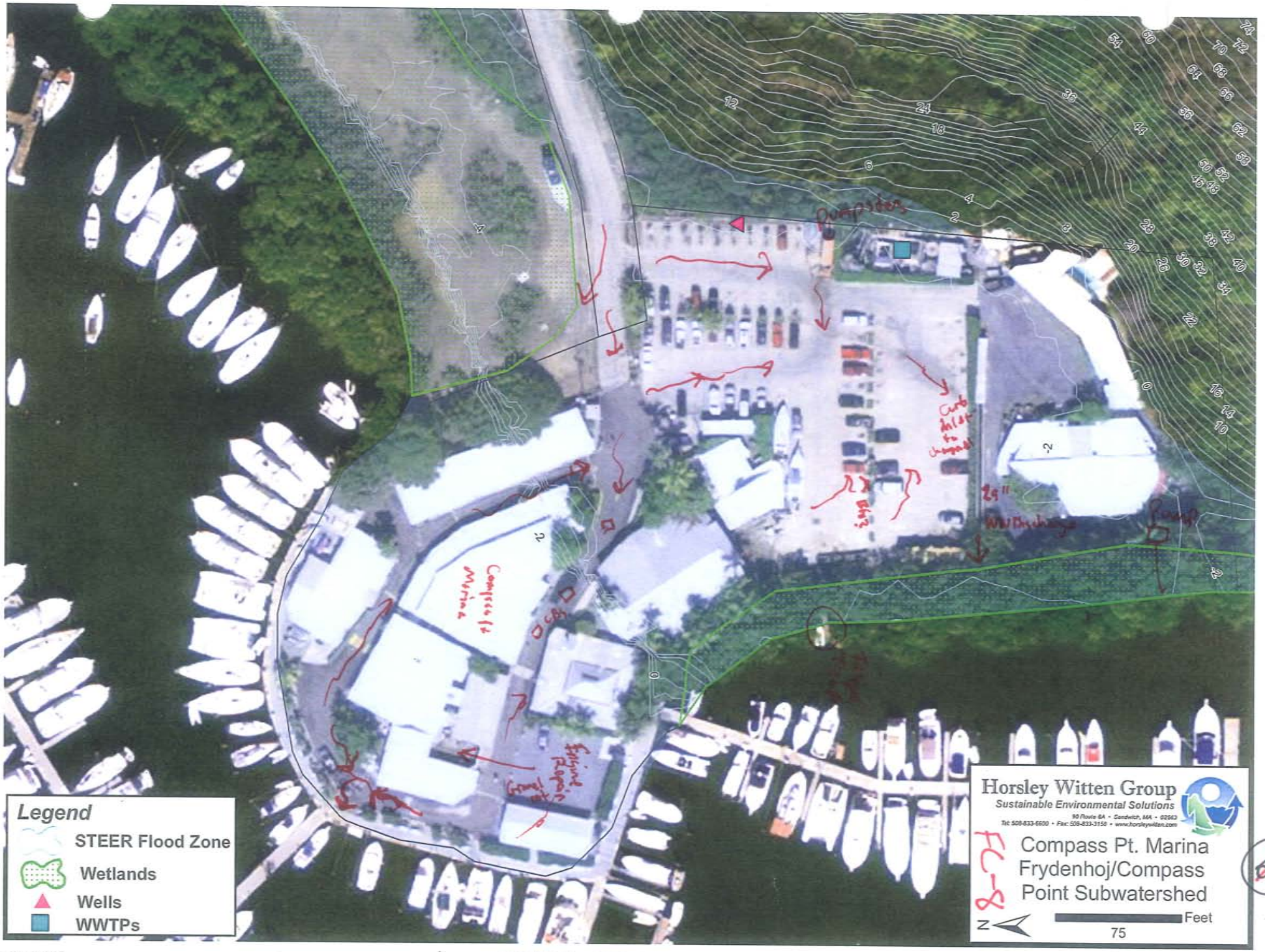


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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [x] Other _____

Subwatershed: ~~[illegible]~~ FRYDENHOJ/COMPASS PT

Site Name: ~~[illegible]~~ NEW PARKING LOTS

FC-9

Description of Existing Conditions:

Enforcement action. follow-up.
Two new parking lots cut into hillside - gravel/stone lots.

Additional Notes and/or Sketch Information:

Description of Proposed Project:

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☒ Enforcement Needed

# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☒ Other _____

Subwatershed: NAZARETH

Site Name: DOLPHIN COVE / SECRET HARBOR ESTATES

Description of Existing Conditions: NZ-1 NZ-2

New development projects here need to ensure full compliance w ESC and other dev. regulations.

Given location at STEER, consider requiring stormwater facilities to provide WQ treatment for 1.25" of runoff.

Additional Notes and/or Sketch Information:

Date: 2/21/2012

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: NAZARETH BAY

Site Name: SECRET HARBOR BEACH RESORT

NZ-3

Description of Existing Conditions:

Potential for a number of bioretention to be installed to treat parking lot runoff (north end of upper lot and near main building).

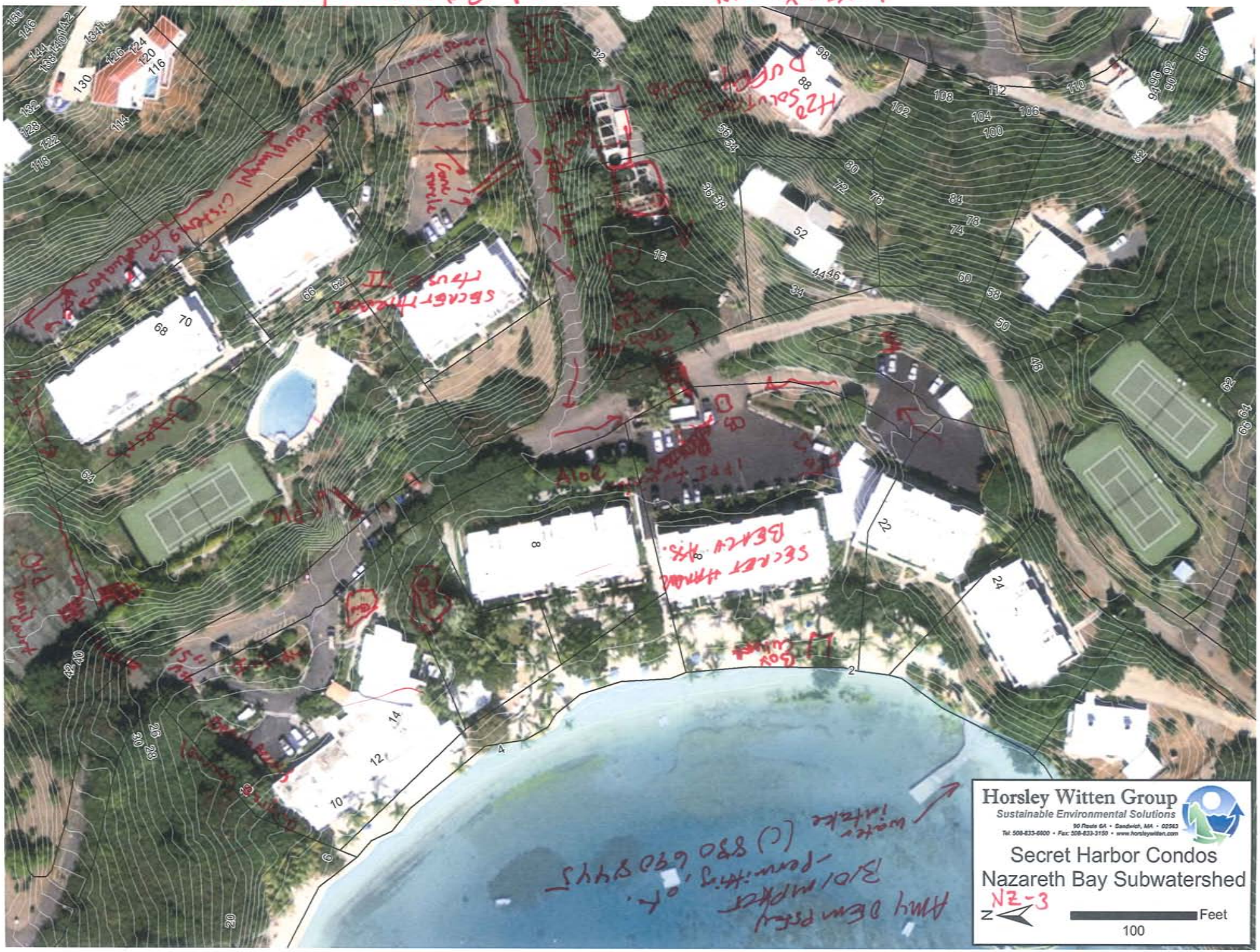
low priority

Additional Notes and/or Sketch Information:

SECRET HARBOUR
BEACH RESORT
SAINT THOMAS USVI

HARVEY DUNBAR
General Manager

6280 Estate Nazareth . St. Thomas . US Virgin Islands 00802–1104
(340) 775–6550 . Fax (340) 775–1501 . Reservations 800–524–2250
hdunbar@chrco.com

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: COWPET

Site Name: ANCHORAGE CB-1

Description of Existing Conditions:

Drainage above yacht Club/Ancorage comes down an causes flooding by the boathouse at Yacht Club. Drain (informal) was created to divert onto Ancorage property northwest of tennis courts.

- Consider creating small constructed wetland or shallow bio ~~of~~ in grassy area at Anchorage and formalize drainage from yacht club to be diverted into the retrofit.

* good location for watershed signage

Additional Notes and/or Sketch Information:

Description of Proposed Project:

- Eliminate culvert from Yacht Club leading to Anchorage.
  - ↳ Runoff should be managed on each individual property
- Consider a bio swale type system on Yacht Club lot on north side of existing concrete wall. Vegetation removal and replacement will be required. Boat storage will have have to be relocated slightly north.
- Install a bioretention area or constructed wetland type system on Anchorage property to manage and treat their site runoff prior to discharge at beach.
- Install a second constructed wetland system south of tennis courts on Anchorage site to treat runoff from the southern half of the property.

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: COWPET BAY

Site Name: YACHT CLUB CB-2

Description of Existing Conditions:

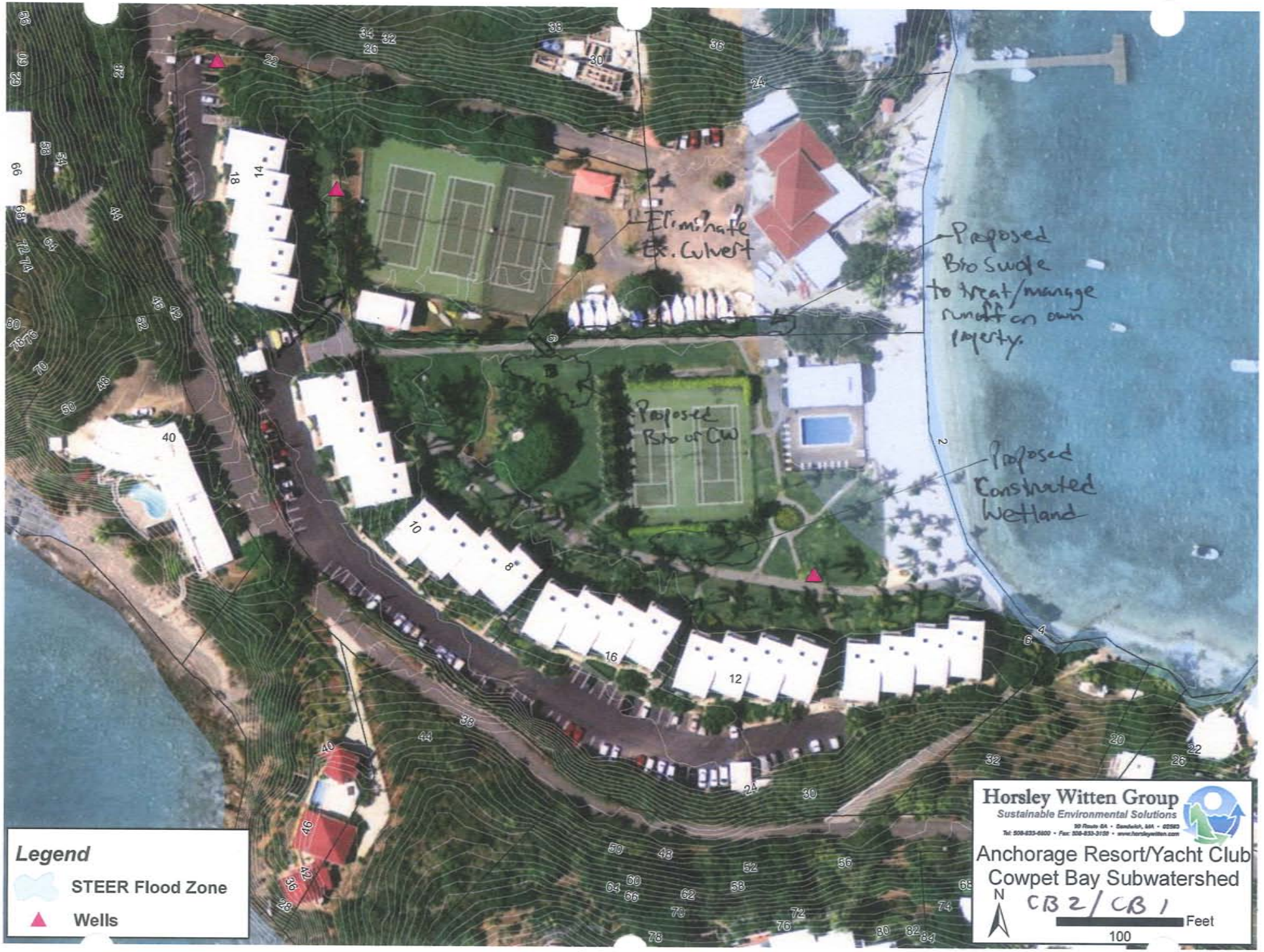
Water comes down from condo parking lot and from road. Saturates tennis court and area to shed. Once wall was constructed, the water could no longer drain.

There used to be a salt pond in grassed area adjacent to tennis courts at anchorage

Yacht club installed drain pipe, but it gets blocked by Anchorage. French drain system to discharge on beach.

Yacht Club pumps wastewater to Anchorage, which then is pumped uphill.

Additional Notes and/or Sketch Information:

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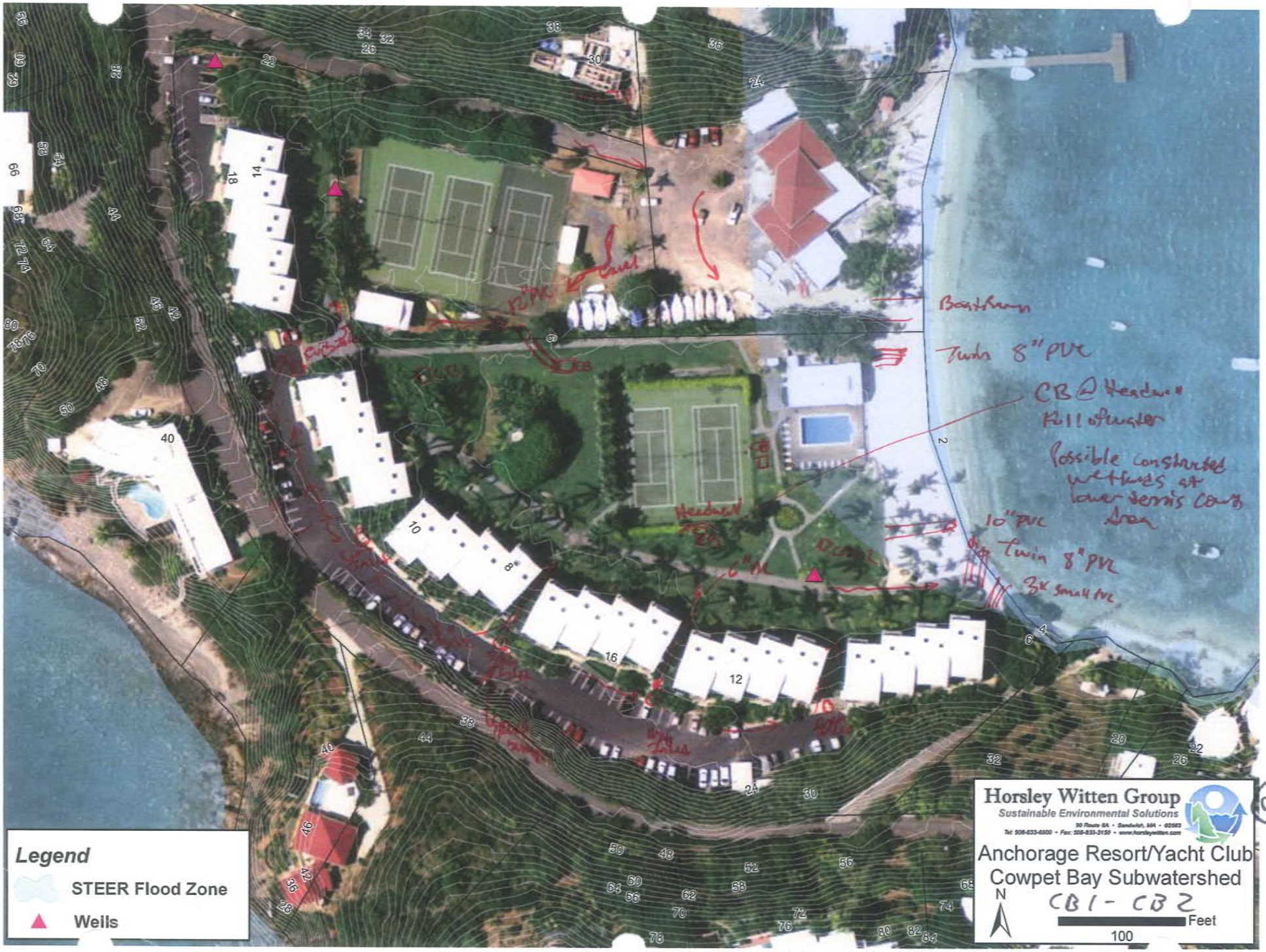


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# FIELD ASSESSMENT NOTES

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- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: COWPET BAY

Site Name: COWPET WEST (CB-3)

Description of Existing Conditions:

Manager mentioned no issues w drainage high density condo area, no BMPs parking lots are used for some residential vehicle maintenance.

drain inlets and pipes appear to discharge primarily to "rock channels" on sides of property

Some room in parking lot islands to demo a raingarden — or porous pavers in parking spots; however this is a low priority.

Additional Notes and/or Sketch Information:

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# FIELD ASSESSMENT NOTES

- [x] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [ ] Land Conservation
- [ ] Pollution Prevention
- [x] Infrastructure Repair
- [ ] Illicit Discharge
- [x] Other _____

Subwatershed: COWPET

Site Name: ELYSIAN (CB-4)

Description of Existing Conditions:

The east edge of Elysian accepts runoff from Cowpet East down steep concrete channel

Clogged CB at tenis courts. Lower lot drains to curb cut and outlet pipe near restrant entrance

The Upper lot drains to 32" CMP on western property line and discharges at beach (some photos show open pipe) drainage crosses into Cowpet West.

*Retrofit options exist at (A) western loop of parking area when boat trailers are stored; (B) parking lot island near restrant/tennis court; (C) at curb cut area near restrant (could expand and include sediment forbag.

Additional Notes and/or Sketch Information:

highly visible location for signage, part. since discharge pipes are right on the beach.

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# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: Cowpet Bay

Site Name: Cowpet Bay East (CB-5) (1)

Description of Existing Conditions:

- Contact - Alan LaPlace
- WWTP (Package Plant) services All condos
  - discharges approx. 10 gpm (or 14400 gal/day)
- RO facility produces ~20 gpm of product water
  - ↳ drinking water stored in cisterns
  - ↳ Roof runoff kept in cisterns w/ RO product and all treated w/ chlorine — 9 cisterns total
- WW used for irrigation + toilet flushing
- Beach nourishment (sand) reqd once per year
  - ↳ about 200 tons requested annually
    - ↳ comes from TNT? (company from Bermuda)

All runoff flows downhill to Elysian Beach Resort and is discharged at main outfall near Elysian Restaurant

- RO discharge near restaurant (see photos)
- WWTP across road from Ritz Plant. Same location as Elysian WWTP.

Additional Notes and/or Sketch Information:

Subwatershed: Great Bay

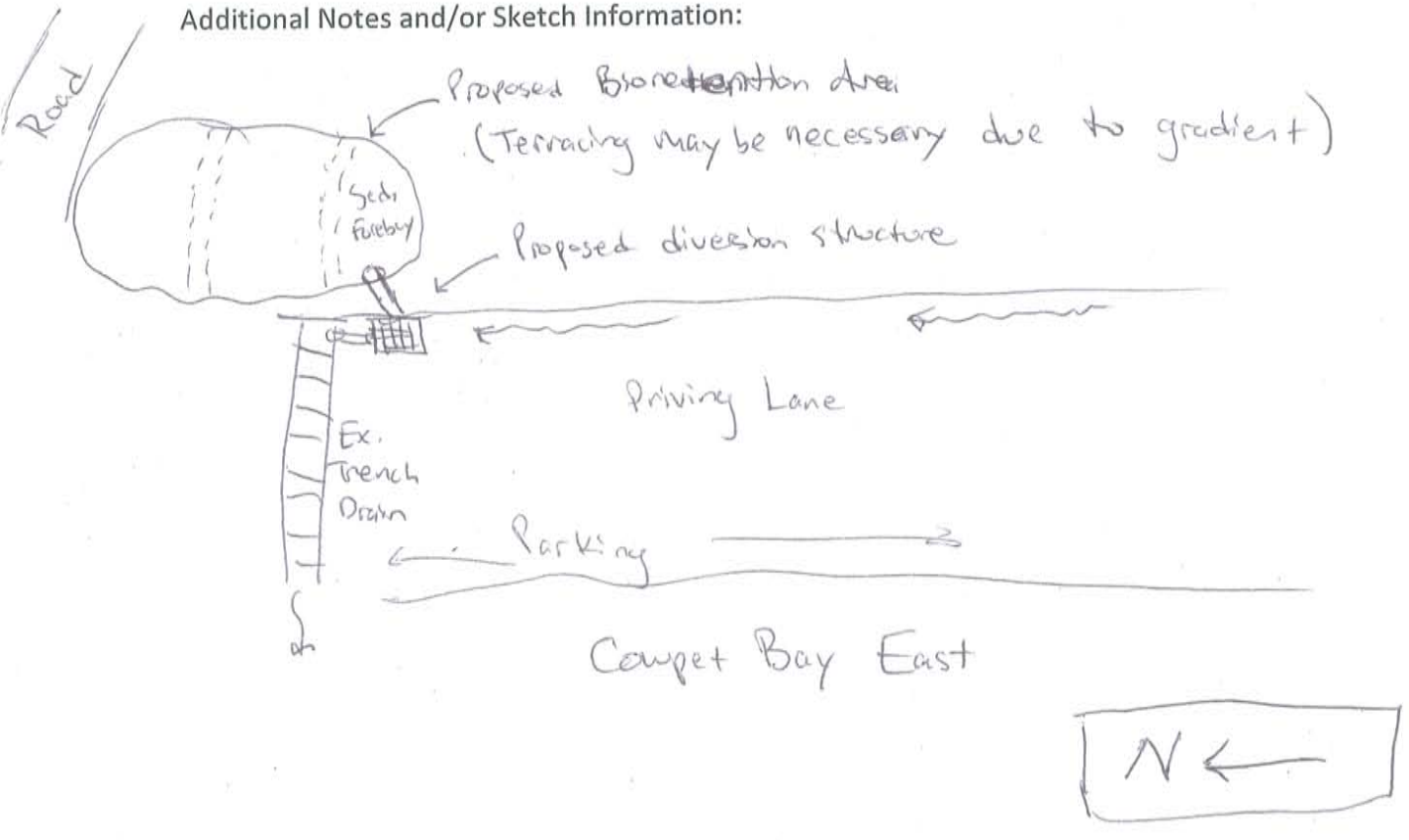
Site Location: Ritz Carlton

Description of Proposed Project: ~~Existing Conditions~~

- Contractor: Mr. Kuhler (GM); Dave Gebo (Dir. of Eng); Lester Nichlos (Asst Eng.); Dudley (Runs WWTP)
- Ritz is a Blue Flag rated resort
- WWTP

- Construct a bioretention area to treat runoff from easternmost parking lot
- Install a curb cut of diversion structure to redirect runoff from parking lot into bio area.
  - Currently a trench drain directs flows away from proposed bio.
- Possible opportunities for pavement removal at eastern most parking lot

Additional Notes and/or Sketch Information:




Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

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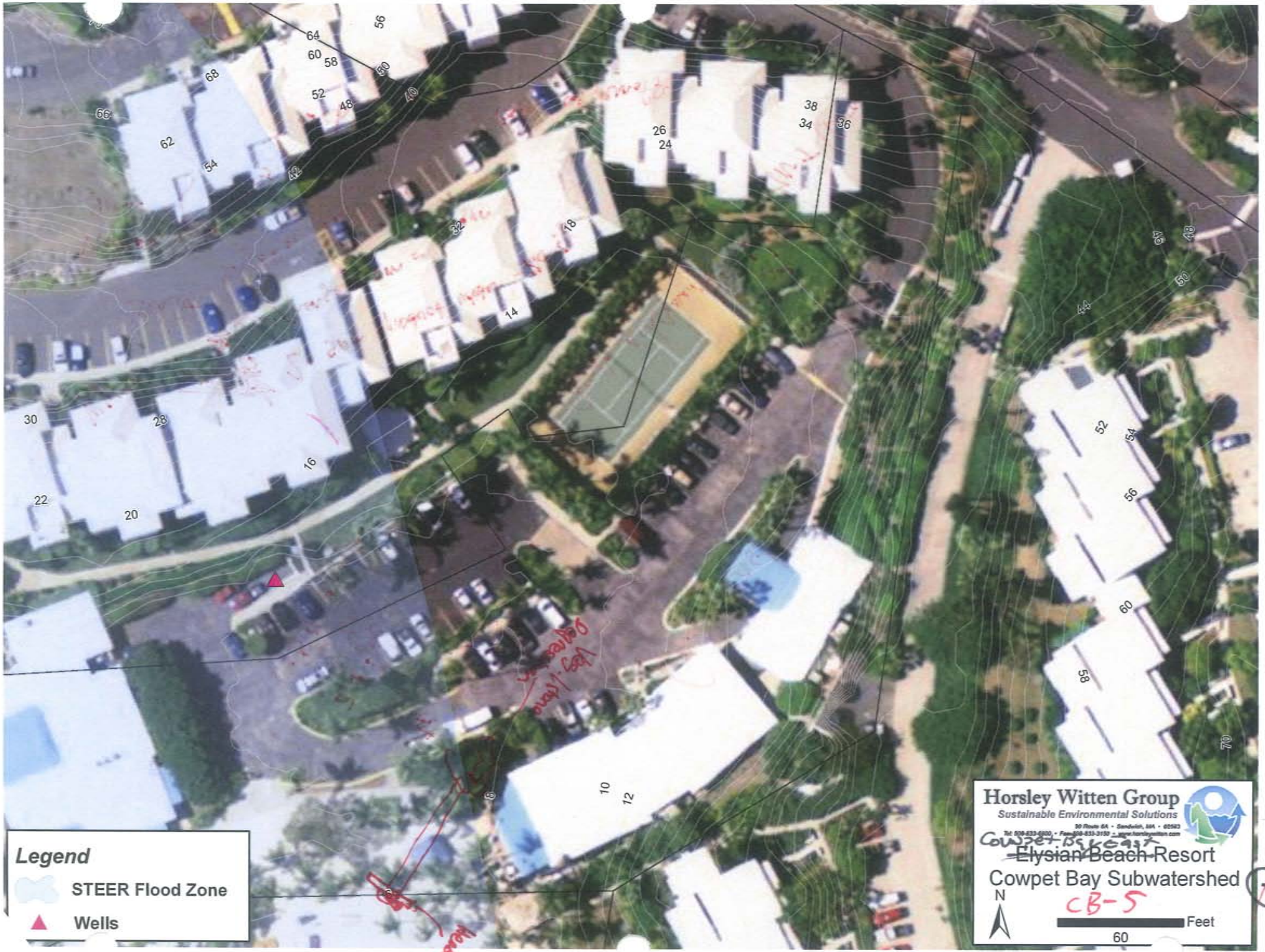


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Cowpet East

10 gal / min | 60 min / 1 HR | 24 HR / DAY

240 × 60 = 14400 gal/day

WWTP → 20 gpm / product water → RO ?

discharge gpm = 10 gpm

Used for irrigation / toilet flushing

Drinking water { 9 cisterns - filled w/ RO + roof runoff

↳ chlorinated

Beach nourishment - 1/yr

200 tons

- TNT (Bermuda)

# FIELD ASSESSMENT NOTES

- ☐ Stormwater Retrofit
- ☐ Stream/Wetland Restoration
- ☐ Residential Stewardship
- ☐ Land Conservation
- ☐ Pollution Prevention
- ☐ Infrastructure Repair
- ☐ Illicit Discharge
- ☐ Other _____

Subwatershed: Great Bay

Site Name: Ritz Carlton

GB-2

Description of Existing Conditions:

- Contacts: Mr Kuhler (GM) ; Dave Gebo (Dir of Eng); Lester Nichols (Asst. Eng); Dudley — [Manager of WW/WT Plants]
- Ritz is a Blue Play resort
- Treated RO water is used for toilet flushing
- Roof runoff is not used - flows overland to wetlands
- Restaurant often floods out when wetland overtops
  - ↳ nearly every year -
  - ↳ beach erosion is also an issue when pond overtops - no ex. pond outlet

- Engineers were previously discussing adding an outlet to the wetland to stop overtopping
  - ↳ they are concerned that beach erosion may result if an outlet (pipe) is installed on the beach

Additional Notes and/or Sketch Information: ~~Lester Engineering Dept Supervisor~~

Dudley X8500 - Ritz Main # - Manager WW/WT Facilities

140,000 gpd capacity - Peak season ~90%

RO plant - cleanses to 500 ppm conductivity

Two Storage Cisterns for RO intake

WW Effluent chlorinated and used strictly for irrigation
- ↳ Irrigation not supplemented

- 2 Ponds/wetlands receive all runoff / flood yearly (overtop)
- WW plant runs both hotel and condos

Description of Proposed Project:

- Consider bioretention area installations in the upper parking lot islands.
  - Islands will need to be converted from raised beds to depressions.
  - Significant tree and vegetation removal would be necessary for bio installations.
- Install culvert at southeast parking lot corner / driveway location to prevent pavement deterioration.
- Existing wetland retrofit – see Site Description memo.

Additional Notes and/or Sketch Information:

Site Priority: ☐ Love it ☐ Has Potential ☐ Not Likely ☐ Enforcement Needed

# GB-2. The Ritz-Carlton Resort — Drainage Improvements

## Site Description

The Ritz-Carlton Resort is located in the Great Bay subwatershed. It lies on an approximate 15 acre beach-front lot. The primary resort facilities such as the lobby, guest rooms, and beach-front restaurant are centrally located around an interior wetland. The majority of the runoff from the immediate surrounding area discharges into this wetland. Ritz-Carlton employees have reported that during large storm events, or about 1-2 times per year, the capacity of the wetland to manage stormwater is exceeded. When this occurs, the wetland overtops and floods the downgradient restaurant. Field investigations suggest that the wetland lacks a primary outlet structure or pipe. Therefore, when the approximate 3-4 feet of storage is exceeded, water spills over the wetland embankment and flows onto and underneath a nearby footpath. Since the restaurant is below the footpath, runoff can easily flow into it.

The northeastern portion of the resort has a small denention pond/constructed wetland and a few Stormceptor systems, which collect parking lot runoff and discharge to to Muller Bay (outside the watershed).

## Proposed Concepts

Ritz-Carlton managers were receptive to possible retrofits that would help to reduce the number of instances the restaurant was flooded and consequently closed. To solve this problem, an outlet structure could be installed within the wetland to manage most storm events. Discharges would then flow through an outlet pipe adjacent to the restaurant and ultimately discharge on the beach. Utilizing an outlet structure over a culvert helps to reduce susceptibility to clogging. In addition to this retrofit, opportunities for flow reduction to the wetland should be considered. Options may include up-gradient recharge, attenuation, and/or rainwater harvesting.

## Practice Sizing/Design Considerations

The wetland outlet structure should be sized to accommodate flows for up to the 25-year recurrence interval storm event. The total drainage area to the site is approximately 10.5 acres with 35% impervious surface. The wetland currently offers about 5,000 cubic feet of volume for attenuation. A primary design consideration for this project is where to locate the proposed outfall. It will have to be placed in a location that is effective for drainage and will not contribute to beach erosion. Resort managers are also likely to want it placed in a hidden location, away from beach goers.

## Next steps

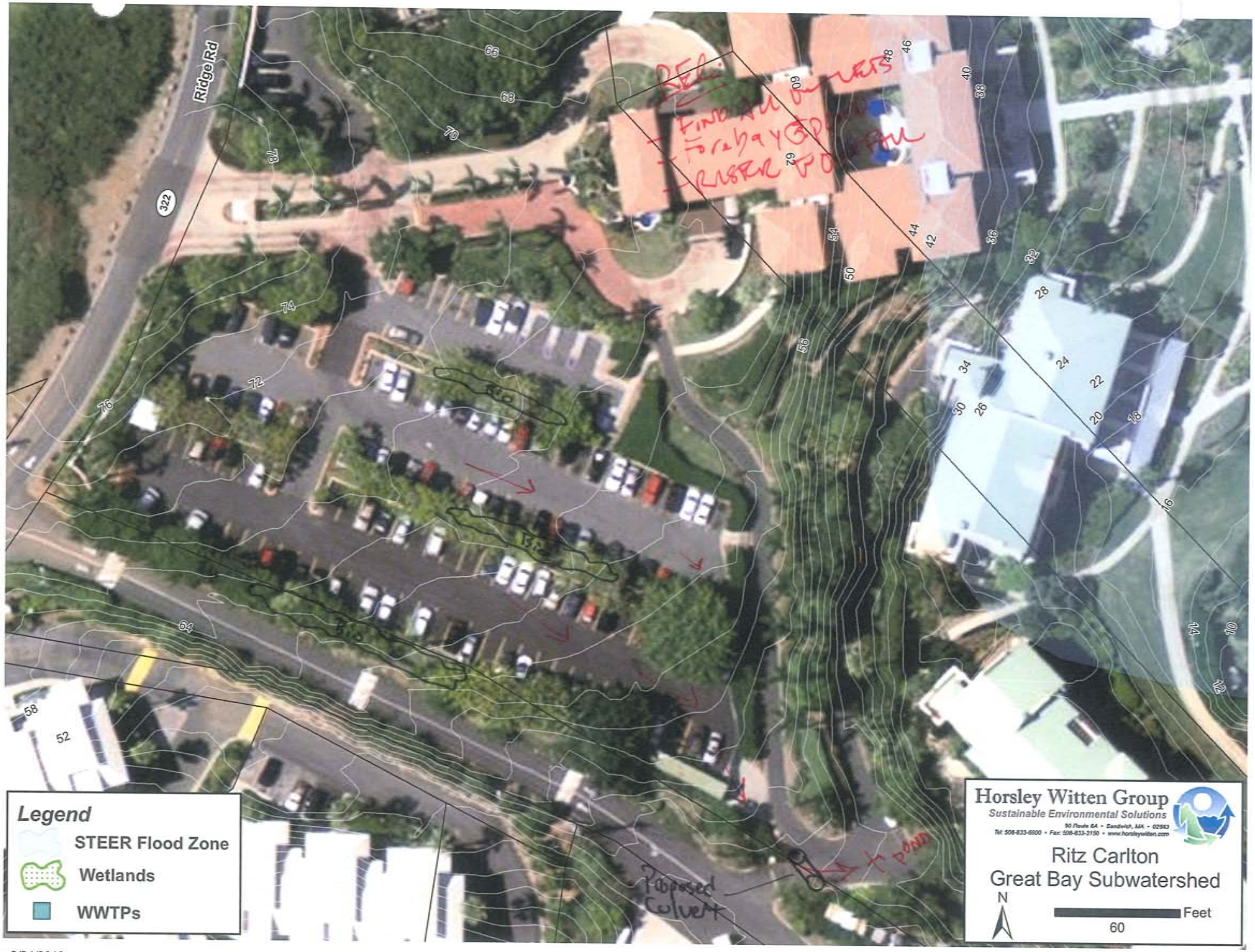
- Complete a topographic survey of the area. Determine if there are any site utility conflicts;
- Contact property owner to gauge project interest, discuss potential funding, and provide input on the design;
- Map existing resource area boundaries and buffers; and
- Check maintenance status of existing BMPs on site to ensure that they are functioning properly and not impacting existing wetlands.

| Site ID | Drainage Area (ac) | % Impervious | Design Storm (yrs) | Practice Volume Required (sf)* | Practice Volume Available (cf)* |
|---|---|---|---|---|---|
| GB-2 | 10.5 | 35 | 25 | 5,100 | 4,900 |

*Design Treatment Volume: Tv (cf) = (1.25")(I)/12; I = impervious area (sf)

*Practice Area Required is calculated based on practice-specific design assumptions.

*Practice Area Available is estimated from available mapping. Actual practice area may be adjusted as needed during pre-construction.

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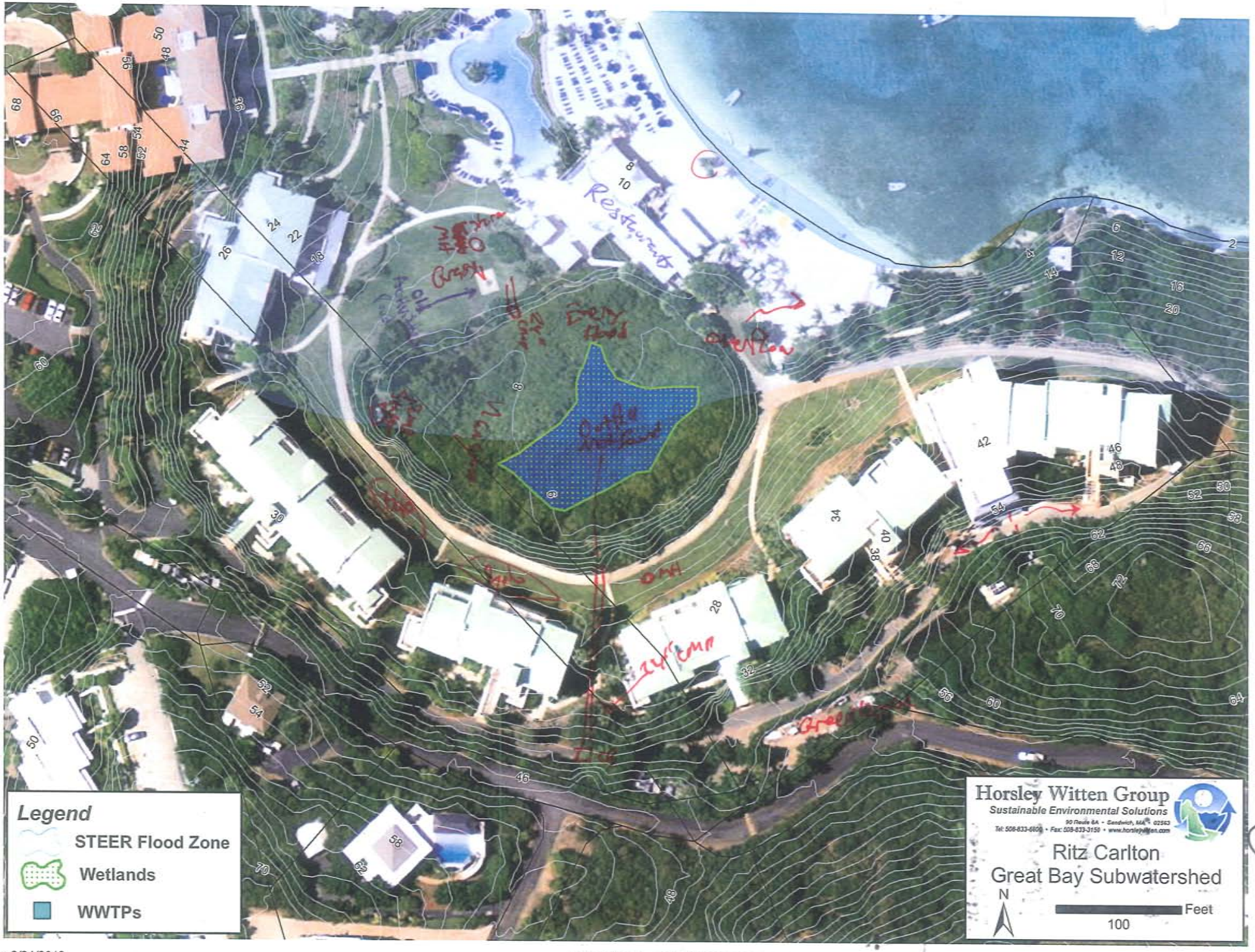


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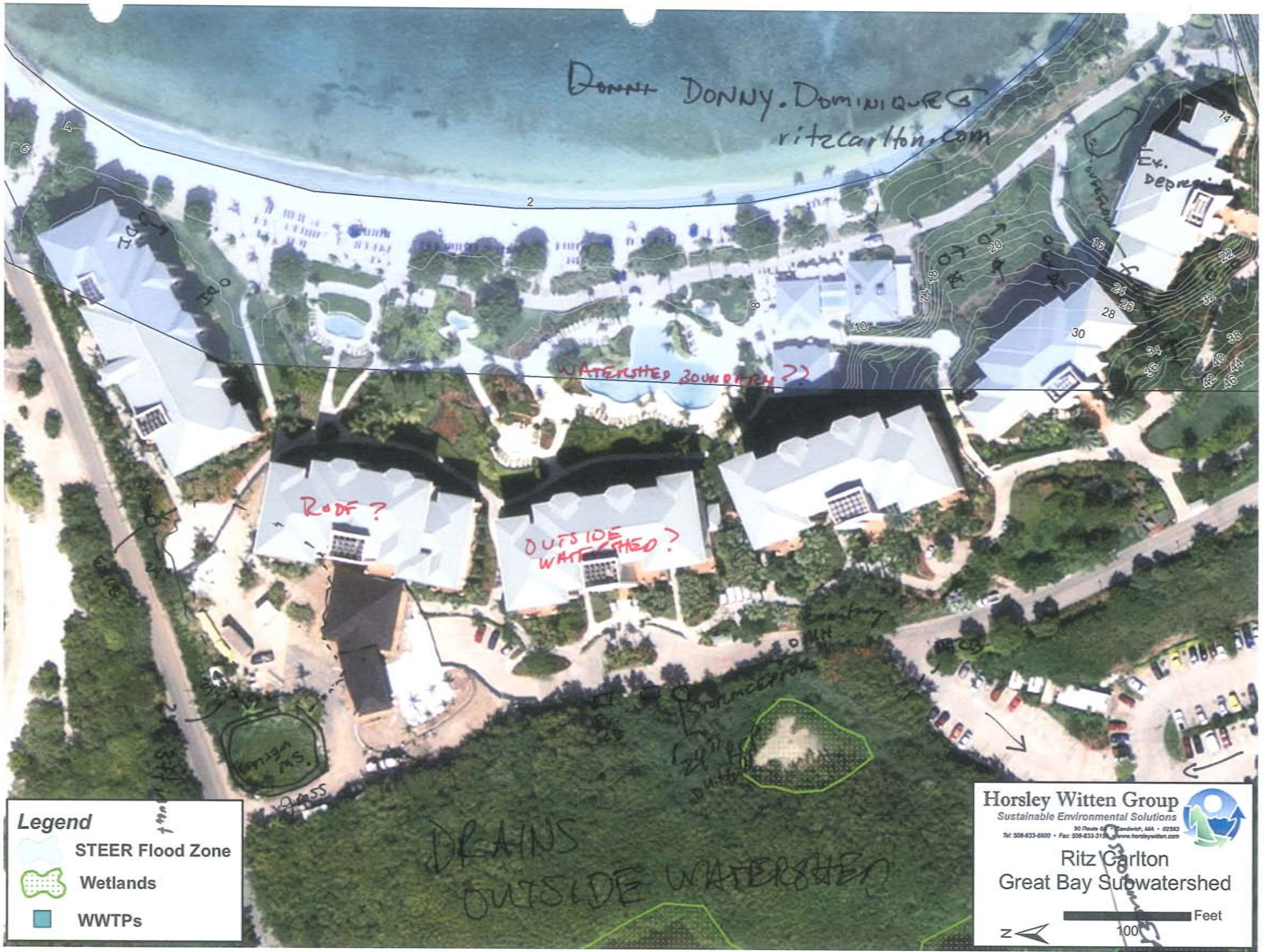
GM Kuhler

- Blueflag Resort
- Cisterns
- 110,000 gpd hotel/condo irrigation
- RO plant
  - Potable use/toilets

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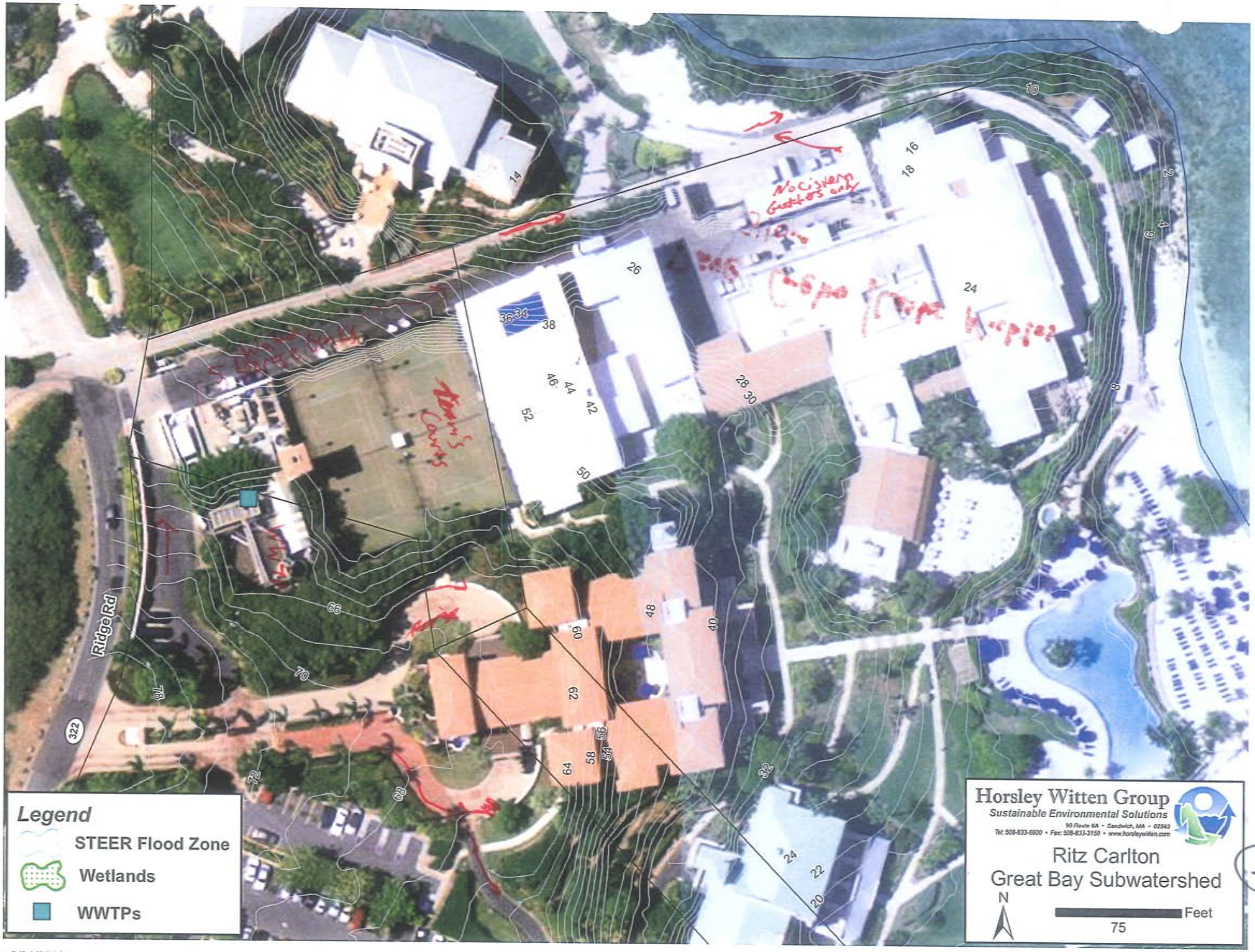


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# FIELD ASSESSMENT NOTES

- [ ] Stormwater Retrofit
- [ ] Stream/Wetland Restoration
- [ ] Residential Stewardship
- [x] Land Conservation
- [ ] Pollution Prevention
- [ ] Infrastructure Repair
- [ ] Illicit Discharge
- [ ] Other _____

Subwatershed: GREAT BAY

Site Name: CABRILLA PT. SALT POND GB-3

Description of Existing Conditions:

Called out in DPW Wetlands Conservation Plan — one of last remaining salt ponds that hasn't been impacted.

(1) investigate land acquisition options
(2) apply WQ criteria for new dev.
(3) enforce addtnl buffer req.

Additional Notes and/or Sketch Information:

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