

WATERSHED-BASED IMPLEMENTATION PLAN
an Addendum to the
WRECK POND BROOK WATERSHED
REGIONAL STORMWATER MANAGEMENT PLAN

Prepared by
Najarian Associates
for the
Wreck Pond Brook Watershed Technical Advisory Committee

Under the Authority of
Wreck Pond Brook Watershed
Regional Stormwater Management Plan Committee

Lead Planning Agency: Monmouth County Planning Board



Monmouth County Planning Board
Hall of Records Annex
1 East Main Street
Freehold NJ 07728

SEPTEMBER 2011

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1 INTRODUCTION

The Wreck Pond Brook Watershed Regional Stormwater Management Plan (RSWMP) has been developed to address stormwater quantity and quality concerns within the watershed. The Plan has been developed in accordance with Subchapter 3 (Regional Stormwater Management Planning) of the New Jersey Department of Environmental Protection (NJDEP) Stormwater Management regulations (NJAC 7:8). The regional stormwater planning process is designed to address stormwater issues that are best managed on a regional, not a state or local basis.

The RSWMP was initiated in 2004 and submitted to NJDEP in 2008. This Plan Addendum is designed to demonstrate compliance with the requirements for a Watershed-Based Implementation Plan. The USEPA has developed a framework for such plans, requiring nine separate elements which have been incorporated herein to the extent possible. However, since the study was initiated prior to 2007, NJDEP only requires plans to meet the following elements to be certified as an implementation plan:

- Are regional/areawide in scope (i.e. not a study of one location)

The Wreck Pond Brook Watershed Regional Stormwater Management Plan is regional because it considers the entire watershed, including four separate municipalities. The Plan considers all inputs to Wreck Pond.

- Detail specific projects or management measures to be implemented in order to achieve the goals of the plan; and

The Plan and this addendum set forth specific management measures. The Plan provides details on many of the project and management measures already implemented or currently in process. This Addendum clarifies the goals, objectives, targets and management measures for the Plan.

- Set forth prioritization of the projects or management measures identified

Section 4 of this Addendum sets forth the priority list of projects.

The Regional Plan studies were initiated with funding from NJDEP and with Monmouth County Planning Board as the lead planning agency. The Wreck Pond Brook Watershed Regional Stormwater Management Plan committee (hereafter the Regional Plan Committee) was then formed and developed the plan with technical work provided by the Wreck Pond Brook Watershed Regional Stormwater Management Plan Technical Advisory Committee (TAC). Further details on Plan development can be found in the RSWMP.



1.1 Watershed Description

Book 1 of the RSWMP provides a detailed description of the watershed, including hydrology, geology, soils and other features. This section summarizes the watershed characteristics.

Wreck Pond Brook extends from its headwaters in Wall Township near Allaire Airport and flows east-southeast, joined by its major tributary Hannabrand Brook at Old Mill Road, to discharge into Wreck Pond as shown on Figures 1 and 2. Wreck Pond is located on the boundary between the boroughs of Spring Lake and Sea Girt in Monmouth County, New Jersey. Wreck Pond is approximately 73 acres in size and a portion of it is tidally influenced. The eastern end of the Pond contains an outfall structure that exchanges water with the Atlantic Ocean. The watershed includes several ponds in the upstream area.

The Wreck Pond Brook watershed was identified as a watershed of concern by the NJDEP. Outflow from Wreck Pond to the Ocean during storm events has been identified as the cause of swimming beach closings in Spring Lake and Sea Girt. Dredging was identified by NJDEP as a possible solution to the bacteria issues and other water quality concerns in the Pond. However, a stormwater management plan was required for the watershed to control future sedimentation prior to further analysis of the feasibility of dredging. Thus, the original RSWMP scope primarily was concerned with sediment control. Over time, the scope was expanded to consider control of many stormwater-related issues including bacteria, nutrient loads, stream flows, flood control and water quality and aesthetic issues in watershed ponds. Also, NJDEP extended the outfall structure and dredged a small area of the Pond during the study process.

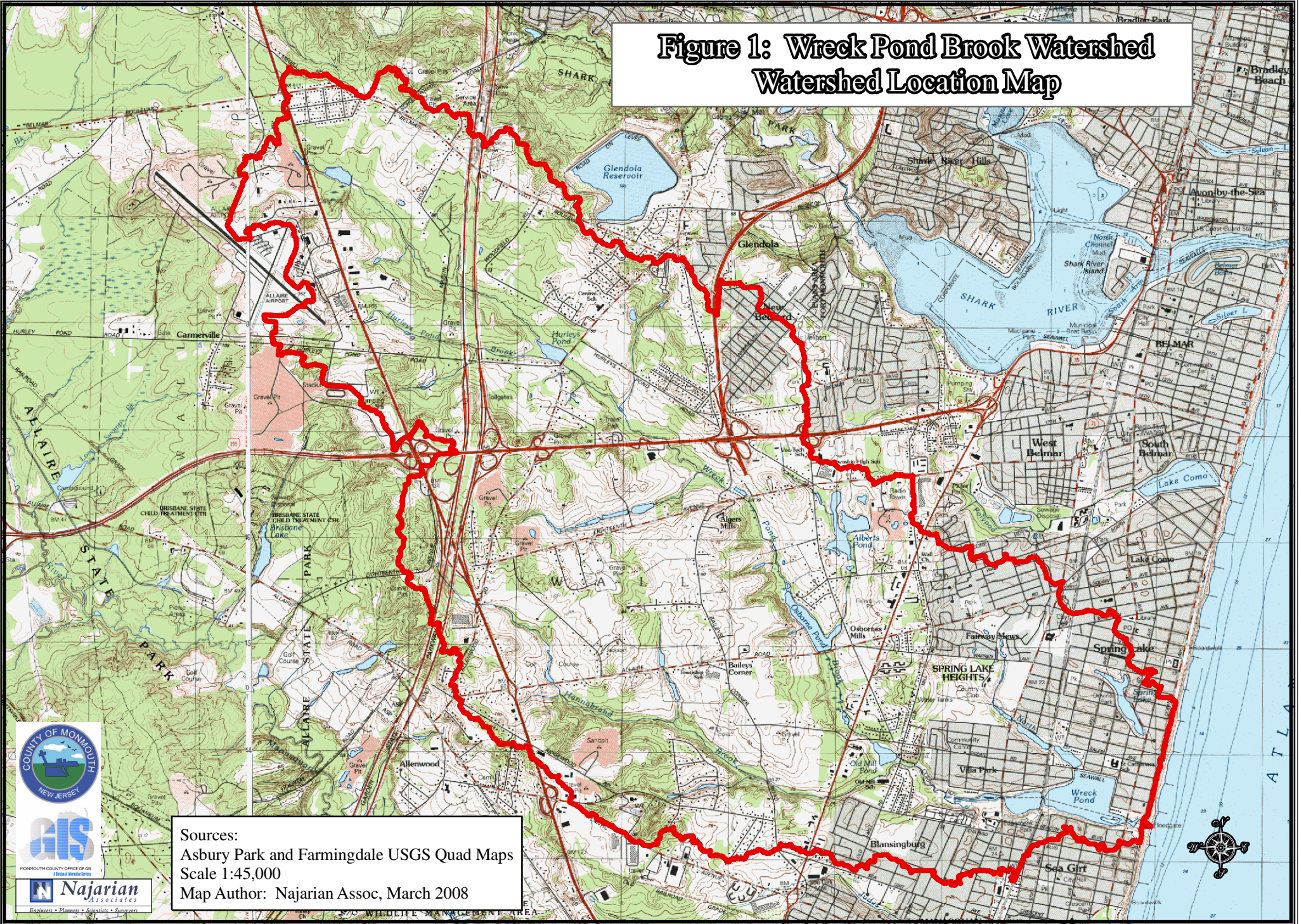
A Wreck Pond Brook Watershed RSWMP Committee and a Technical Advisory Committee (TAC) were set up to develop the Plan. These Committees were chaired by Monmouth County Planning Board staff and included representatives of NJDEP, NJ Department of Agriculture, Rutgers Cooperative Extension, Monmouth County Health Department, Monmouth County Engineering, Monmouth County GIS, Monmouth University, representatives of each municipality within the watershed, Najarian Associates, residents and other interested parties. These committees continue to meet monthly.

The RSWMP includes several major elements:

1. Description of Watershed Conditions, including the natural and built environment
2. Data collection and technical studies
3. Hydrologic and water quality modeling
4. Synthesis of data and models to identify existing problems and major sources
5. Engineering, management and administrative measures to improve water quality and alleviate flooding and secure funding for specific mitigation projects and future management efforts.



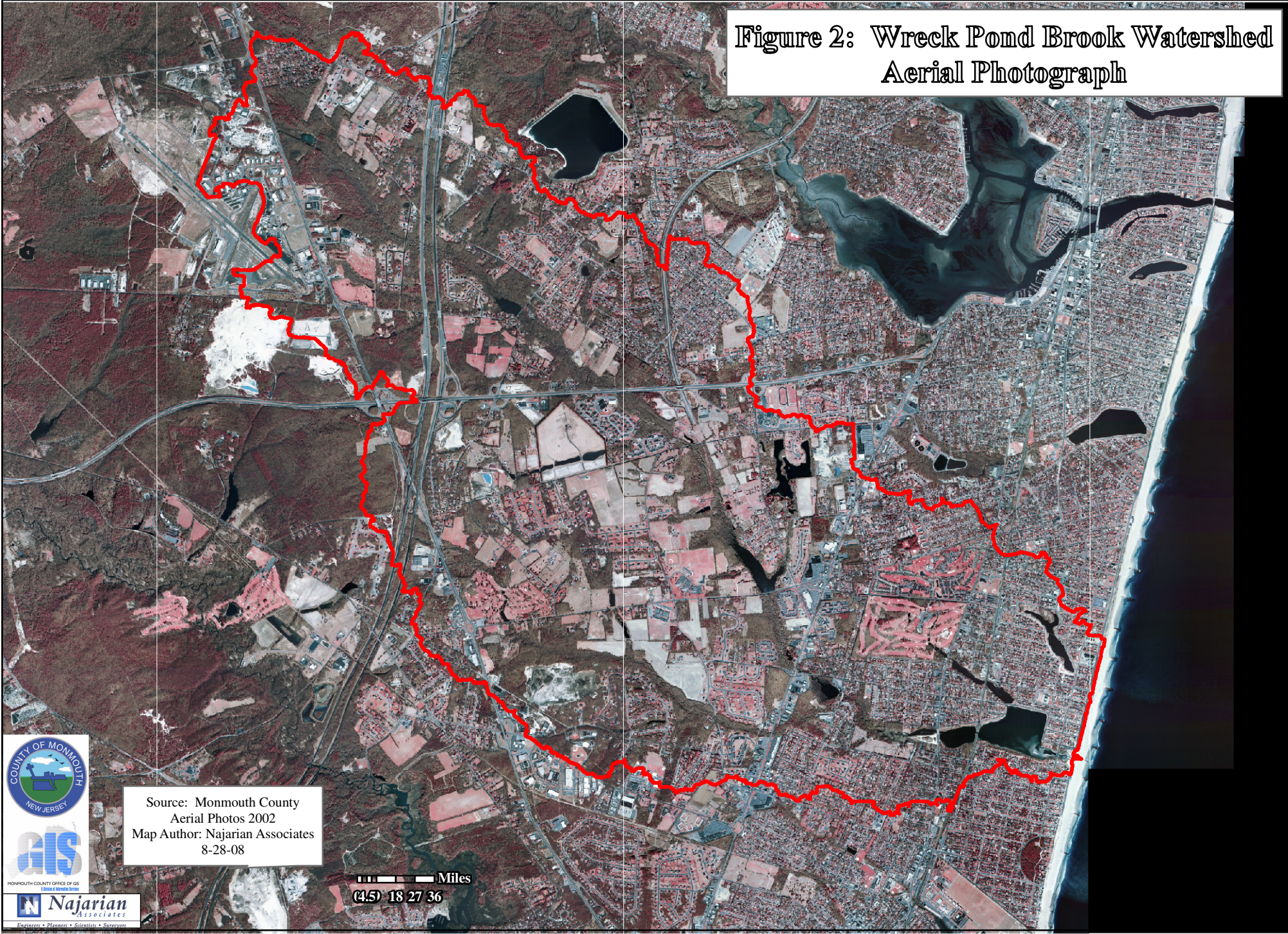
**Figure 1: Wreck Pond Brook Watershed
Watershed Location Map**



Sources:
Asbury Park and Farmingdale USGS Quad Maps
Scale 1:45,000
Map Author: Najarian Assoc, March 2008



Figure 2: Wreck Pond Brook Watershed
Aerial Photograph



Source: Monmouth County
Aerial Photos 2002
Map Author: Najarian Associates
8-28-08



0 1 2 Miles
(45) 18 27 36

Watershed characterization was conducted using existing studies and available Geographic Information System (GIS) data from both NJDEP and the Monmouth County Office of GIS. Field studies were conducted, including data collection. These data were used to provide an overview of watershed conditions including hydrology, topography, soils, land use, and other features.



2 POLLUTANT CHARACTERIZATION AND SOURCES

The Wreck Pond Brook Watershed RSWMP provides detailed analysis of the results of the technical studies conducted in the watershed. The studies included ambient monitoring of the streams and pond, storm event sampling, stream assessment, agricultural land assessment, hydrologic/hydraulic modeling, pollutant loading assessments, and bacteria source tracking. The following sections summarize the results of the study related to pollutant identification and sources.

2.1 Pollutants

The environmental health of Wreck Pond and the watershed are of concern in several ways. First, outflow from Wreck Pond during storm events can cause bacteria levels at Ocean bathing beaches to exceed standards, causing beach closings. In addition, concerns regarding bacteria levels from the Pond have led to required precautionary beach closings.

Second, the Pond does not support the aquatic life or primary contact recreation designated uses. Water quality data reveal elevated levels of bacteria, nutrients, and chlorophyll a. Algal blooms occur and the proportion of blue-green algae, indicative of polluted conditions, make up a high proportion of the algal biomass. Dissolved oxygen levels (DO) also violated standards. The Pond, along with the ponded portion of Black Creek and other watershed Ponds, have been subject to long-term deposition of high sediment and nutrient loads and are now shallow and mucky. The current condition of the Pond precludes recreational use and has likely reduced flushing, as well as impaired aesthetics and aquatic life.

Further, the streams and ponds within the rest of the watershed are impaired for both designated uses noted above as per the NJDEP water quality standards and for overall environmental health.

The results of the various water quality monitoring programs and information from the NJDEP, Integrated Water Quality Monitoring and Assessment Report (NJDEP, 2010) were used to characterize the status of the ponds and streams within the watershed. The Integrated Report results were used to update the findings from the previous studies.

The 2010 report lists 2 assessment units for the watershed: Wreck Pond Brook above Route 35 and Wreck Pond Brook below Route 35. The report combines both lakes and streams within each assessment unit. There is no separate listing for Hannabrand Brook.

The 2010 listing states that both segments do not support aquatic life due to phosphorus and primary contact recreation due to bacteria.



Other water quality data reveal that the Pond is also impaired for DO and sediment, which also impact aquatic life. In the Wreck Pond Brook watershed, sediment has clogged Wreck Pond, the impounded portions of Black Creek and other ponds in the watershed. Wreck Pond is now only about 1 to 1.5 feet deep under normal water level conditions, and is very shallow during low flow periods, with dry conditions on the Pond edge at certain times. The shallow water would be expected to impair fish movement and health, reduce mixing and increase temperature. This can cause DO levels to drop or to have large diurnal swings.

The TSS data in the streams indicate occasional levels above 40 mg/l, the standard for freshwater. Both the weekly data collected by Monmouth County and the one-year ambient monitoring conducted for the Borough study demonstrate that TSS levels sometimes exceeded the standard. However, in the case of sediment load, most of the load is transported during flooding events. Thus, the general water quality monitoring done for this or other studies did not quantify these loadings. The high levels of mucky sediments within the ponds of the watershed indicate excessive sediment loading which is a water quality issue.

Phosphorus levels in the Pond exceeded the water quality standard. Wreck Pond was found to be eutrophic based on phosphorus and chlorophyll a data.

2.2 Pollutant Sources

The results of the watershed modeling, agricultural survey, stream assessments, and bacteria source tracking did not identify one particular source of highest importance. For each pollutant group, identified sources are noted below. Given that there are no point sources within the watershed, all of the pollutants are generated from watershed processes, including:

- Urban and agricultural runoff
- Stream Erosion
- Waterfowl and other wildlife
- Infrastructure (possibly)
- In-stream or in-pond processes

Nutrients: Nutrients, in particular phosphorus, are elevated in the watershed leading to eutrophic conditions in Wreck Pond and other water bodies. This lead to algal blooms and to low DO under certain conditions. Nutrient loadings are from developed land uses, agricultural lands, fertilizer application, and wildlife. Stream erosion also adds nutrients.

The storm event monitoring results for this study demonstrated that total phosphorus was correlated with TSS (sediment) at two of the three stations. The third station also supported this finding as both the TSS and the phosphorus did not increase as much as



at the other stations. This station is downstream of a pond which is acting to remove TSS and associated phosphorus from the system, further supporting that finding that stream erosion is an important component in sediment and nutrient loads to Wreck Pond. The sediment and associated phosphorus is then deposited into downstream ponds, including Wreck Pond and the impounded portion of Black Creek where it can become biologically available.

Bacteria: Bacteria levels are of particular concern as a source of beach closings. Bacteria levels are of heightened concern if humans are the source. Developed land use, manure management in farmlands, waterfowl, possibly compromised infrastructure, wildlife, pets, and over-growth or release from Pond sediments are possible bacteria sources.

Sediment: Wreck Pond and other water bodies within the watershed contain significant accumulations of sediment. Sources may include developed lands, agricultural land, un-vegetated uplands, construction sites, stream erosion, and re-suspension of pond sediments.

2.3 Mitigation Approach

As noted above, the sources of pollutants in this watershed are varied and primarily from stormwater runoff, including associated stream erosion. The watershed is currently a mix of a highly developed lower portion and an upper portion which includes suburban uses as well as some agricultural lands and open space. The stream corridors are generally wooded, but vary in width and vegetative cover.

Finally, although not related to water quality, flooding in the lower portions of the watershed has been occurring with increasing frequency.

An analysis of projected future land use changes was conducted for the Wreck Pond Brook RSWMP. The analysis was based on zoning, coupled with the identifications of wetlands and buffers that would not be subject to future development. The results indicate that most of the area is zoned for lower density residential development. This, coupled with current NJDEP requirements for stormwater management, infiltration, and riparian zone preservation, indicate that future development will have less impact on flows and water quality than existing developed areas. Thus, mitigation measures and management projects in existing developed areas are a critical component for improving water quality and flow.



3 SPECIFIC WATER PLAN OBJECTIVES

The Wreck Pond Brook Watershed RSWMP set forth a series of objectives and management measures. Since the Plan was developed, certain projects have been developed and additional information has been obtained. This section sets forth an updated list of Plan objectives, with regard to the framework suggested by the USEPA for implementation plans.

Initially, the RSWMP planning process focused on reducing sediment loads in support of NJDEP's plan at that time to dredge Wreck Pond. In addition, the early phase of the plan focused on eliminating or greatly reducing Ocean bathing beach closures due to bacteria flows from the Wreck Pond outfall. As Plan development proceeded, additional objectives were identified as a result of detailed data collection and input from local stakeholders. Objectives were expanded to include measures to reduce flooding, improve wildlife habitat, control water fowl, improve overall water quality and aesthetics of local waters and enhance recreational opportunities.

Specific water quality and quantity objectives for the Plan are to reduce pollutant loading levels and remove accumulated pollutants to allow attainment of all designated uses that are not limited by natural conditions. In particular, the goals are:

- Reduce bacteria levels in Wreck Pond and tributary streams to meet standards and attain the designated uses
- Eliminate or greatly reduce beach closings due to outflow from Wreck Pond or other watershed sources
- Reduce sediment loads to Wreck Pond and other ponds from both existing sources and new development.
- Reduce phosphorus loads and concentrations to meet standards, reduce eutrophication of ponds, reduce algal blooms and attain the designated uses.
- Reduce nitrogen loads to reduce eutrophication and algal blooms
- Improve the water quality, ecological health and aesthetics of Wreck Pond, Black Creek, other Ponds and the overall watershed
- Identify key areas within the watershed that have a beneficial or negative impact on stream flow dynamics or stream processes and flooding



3.1 Objectives and Indicator Targets

The goals present above are general goals. The following sections set forth specific goals for the Plan, including indicator parameters, causes of impairments, objective and target. The general framework is based on the USEPA guidance.

3.1.1 Aquatic Life: Support Designated Use

Goal: Support aquatic life designated use in Ponds and streams, reduce low DO

Indicators: DO, sediment, phosphorus

Cause: Sediment load in ponds causing mucky bottom, reduced flushing and reduced water depth. Elevated phosphorus causing algal growth and decreased DO.

Management Objective: Reduce sediment and phosphorus loads from stream erosion and from stormwater flows from developed and agricultural lands.

Target: Meet DO minimum standard of 4 mg/l in the Pond at all times and meet phosphorus standard as appropriate; restore Pond depth and reduce muck on bottom.

3.1.2 Flooding

Goal: Reduce flooding from Wreck Pond onto lower watershed lands.

Indicators: Pond water elevations, stream flow, stormwater volume and peak flows

Cause: Tidal influence on pond outflow, lack of storage in upstream ponds, lack of adequate stormwater management.

Management Objective: Minimizing flooding by increasing storage within Wreck Pond and upstream ponds. Improve flood control at individual developments or facilities by retrofit of older stormwater management systems. Improve outflow from Pond during storm events by pumping or outfall modifications.

Target: Increase pond storage, install pumping system, and increase storage in upper ponds.

3.1.3 Beach Closings

Goal: Reduce or eliminate closures of ocean bathing beaches. Meet water quality standards for enterococcus bacteria in adjacent bathing beaches.

Indicators: Bacteria levels in Pond and at bathing beaches



Cause: Multiple including stormwater runoff from developed and agricultural lands, water fowl, other animal species, possibly compromised infrastructure and bacteria growth in pond.

Management Objective: Reduce beach closings through reduced loading and improved monitoring. Reduce bacteria concentrations within the Pond by controlling sources. Reduce bacteria-laden flow into bathing beach waters by modifying outflows structure to reduce low flows.

Target: Meet bacteria standard in Wreck Pond for E. Coli of geometric mean of 126/100 ml or a single sample maximum of 235/100 ml. Meet bathing beach standard in ocean beaches of 104/100 ml for enterococcus bacteria. Implement use of rapid testing methods as appropriate and available.

3.1.4 Pond Ecologic Health

Goal: Restore ecologic health of the Pond and of the impounded portion of Black Creek to meet primary recreation designated use and improve aesthetics.

Indicators: Sediment, nutrients, bacteria, algal growth, chlorophyll a

Cause: Sediment in Pond has reduced depth, flushing clarity, impacting recreational use. Nutrient loads have caused algal blooms, which also impact aquatic life and designated use. Bacteria levels do not meet recreational designated use.

Management Objective: Reduce loadings of sediment and nutrient from streams by controlling stream erosion and from upland lands by improving stormwater management through retrofit of older systems or installation of new facilities, such as manufactured stormwater treatment devices. Reduce bacteria levels by controlling water fowl and improving stormwater management within the watershed.

Target: Meet water quality standard for bacteria (as above) and phosphorus of 0.05 mg/l or site specific standard as set by state. Reduce fine sediment and muck in pond bottom. Reduce chlorophyll a to 20 ug/l or less.

3.1.5 Restore Stream and Riparian Habitat

Preliminary Goal: Improve habitat within the streams and associated riparian zones

Indicators: Stream condition (bank stability, riparian zone condition), erosion potential, sediment load.



Cause: Development and use of upland areas leading to increased stream flows and erosion potential. Natural conditions within stream .

Management Objectives: Enhance bank and stream stability and stream vegetation in eroding sections. Maintain or improve riparian zone conditions. Improve stormwater facilities as needed.

Target: Reduce TSS loading during storms to extent possible.



4 PRIORITY PROJECTS

The WPB Watershed RSWMP demonstrated that the source of pollutants within the watershed are varied and non-point source in nature. Both land use and stream erosion are likely sources, as well as possible infrastructure issues for bacteria.

The build-out analysis indicated that the undeveloped lands within the watershed are primarily zoned for low-intensity residential development. In addition, a substantial portion of the undeveloped portions of the watershed is either in open space or is wetlands and associated transition area. Further, current NJDEP regulations require a higher level of stormwater management than in the past.

The RSWMP process also found that the municipalities within the watershed have adopted the required ordinances to control many existing stormwater pollutants, including pet waste and litter ordinances. The municipalities have taken steps to control water fowl. Further, the state recently passed requirements for the use of low-phosphorus fertilizer for most residential situations.

Based on these findings, the key mitigation projects are those that focus on developed areas. The projects were prioritized as to those that:

- Reduce sediment and associated pollutant and bacteria loads from developed areas
- Reduce stream erosion by stabilizing banks and enhancing riparian buffers
- Remove existing sediment from Ponds
- Reduce sources of bacteria
- Control peak flow and stormwater volumes.

These projects are designed to achieve or partially achieve the water quality objectives and targets set forth in Section 3. The exact reduction in loadings will be quantified as part of the specific planning projects as this will depend on the scope and nature of the projects.

The RSWMP Committee, Monmouth County, NJDEP and the municipalities have already undertaken a number of projects to meet the objectives of the RSWMP. These are outlined in Section 4.1. Section 4.2 presents the prioritization process while Section 4.3 sets forth the proposed priority projects.

4.1 Projects Completed or in Process

NJDEP allocated funds for several projects designed to provide best management practices or mitigate existing stormwater concerns. These projects are listed in Table



1. Details on these projects can be found in the Wreck Pond Brook watershed RSWMP. Other projects, not included in that Plan, are described in the following sections.

Table 1: Funded Projects List				
Project Name	Location	Concerns Addressed	Funding Amount (\$)	Current Status
Installation of Stormwater Treatment Devices	Vicinity of Wreck Pond	Sediments and associated pollutants, Floatables	1,200,000	Funded device installation COMPLETE; monitoring proposed; additional units designed.
Restoration of Old Gravel Pit, Ridgewood Rd, Wall	Headwaters of Hannabrand Brook	Flows, sediment/erosion, nutrients, bacteria	500,000	Permits issued
Restoration of abandoned sand wash water pond (Kellers Pond)	Wreck Pond Brook Headwaters	Flows, sediment/erosion, nutrients, bacteria		Awaiting NJDEP permits
Restoration of Golf Course Ponds and Weir at Route 71	West of Route 71 at SL Golf Course	Flood Control, Sediment	200,000 (plus SLGC funds)	COMPLETE
Wreck Pond Brook Headwaters Restoration	Adjacent to Route 34	Flow, Sedimentation & Erosion		Waiting for permits
Rain Gardens	Various Locations in Watershed	Flow and General Water Quality	\$24,000	Most have been installed and are successful, one more to be installed
Total Allocated Funds			\$1,924,000	



4.1.1 Monmouth County Engineering – Dredging Pilot Project

Monmouth County Engineering is undertaking a pilot project on dredging a small area of Wreck Pond just upstream of Route 71. The project will be conducted using County personnel and equipment. The material will be processed on the Green Acres parcel located just northwest of the Route 71 crossing of the Pond. The County submitted the appropriate applications to NJDEP and is currently awaiting permit approval. The County is planning to undertake this work in the fall of 2011.

4.1.2 Infrastructure Investigation and Improvements

The NJDEP is working with the local municipalities to investigate the sources of high concentrations of bacteria in the lower watershed. NJDEP monitoring identified several storm water lines with elevated bacteria levels in the lower end of the watershed. The municipalities have cooperated with NJDEP to evaluate the stormwater and sewer lines in Spring Lake and Sea Girt. Sanitary sewer system investigations included televising and dye testing as well as smoke testing of certain storm drainage lines. Smoke testing revealed a small number of storm manhole intersections that were not draining properly and some that were not draining at all, which could cause stagnant water to become super heated, which can promote bacterial growth, then flushed into the stormwater lines and ultimately into Wreck Pond during heavy storms. Two crushed spots in the sanitary lines were found which were causing exfiltration of sewage, which may have entered groundwater that discharges into Wreck Pond. These have been repaired. Further, Spring Lake Borough recently redirected the outfall from Spring Lake that previously discharged to Wreck Pond out to the Ocean. Thus far, no sources have been identified for the high concentrations of bacteria in specific stormwater lines identified, however that is not uncommon for non-point sources.

NJDEP anticipates that there will be additional sewer lines in the vicinity of Wreck Pond that need to be re-lined due to the predominantly aging terra cotta sewage collection lines. It is expected that any raw sewage that may be indirectly connected to the groundwater system flowing into Wreck Pond will continue to be reduced with each additional re-lined section of pipeline. Additionally, investigations of previously abandoned, no longer in use sewer lines are planned.

NJDEP and the municipalities are continuing their investigations. NJDEP has indicated they anticipate expanding the area of study to include upstream areas within the watershed.

4.1.3 Flood Pumping System

The Borough of Spring Lake recently received a flooding mitigation grant to install a permanent pumping system within Wreck Pond and possibly raise the sides of the Pond. Detailed engineering design and permitting will now be undertaken.



4.2 Prioritization Process for Future Projects

The top priority for the Wreck Pond Brook Watershed Regional Stormwater Management Plan Committee is to implement cost-effective projects that will achieve the Plan objectives to reduce or eliminate beach closings, improve the water quality and overall ecologic health of Wreck Pond, Black Creek and the other waters in the basin, and to mitigate flooding. The key projects to achieve these goals are those that target pollutant loadings, stream stability, and stormwater management. In addition, the prioritization process considered:

- Expected benefits
- Level of goal to be achieved by the project or measure, including area served and importance of problem solved
- Pollutant Target and anticipated removal rate
- Costs
- Likelihood of implementation in the near term (projects which are designed and ready to be implemented have higher priority)
- Constraints on project implementation including accessibility
- Availability of local partners, including future maintenance requirements
- Ease of implementation
- Local support or concerns.

As would be expected, projects with the highest priority are those that will provide a high level of expected benefits and will go a long way toward achieving a Plan goal. However, certain projects, while likely to provide good benefits come with significant costs or other constraints, meaning their priority is lower. For example, dredging of Wreck Pond and other ponds, while highly desirable, is ranked lower on the priority list as the cost and logistical considerations make this project unlikely to be implemented in the near term.

Section 4.3 presents the proposed future projects, with priority noted.

4.3 Future Projects

This section describes the priority projects to achieve the objective outlined in Section 3, based on the prioritization process outlined above. Table 2 summarizes the proposed projects which are defined in more detail in the following sections.



TABLE 2: PROPOSED PRIORITY PROJECTS
1. Installation of Manufactured Stormwater Treatment Devices – Phase 2
2. Stream Stabilization and Riparian Buffer Enhancement and Preservation
3. Stormwater Management Facility Mitigation and Retrofit
4. Rain Gardens and Rain Barrels
5. Public Works Yards Restoration
6. Dredging of Wreck Pond
7. Dredging of other Ponds
8. Pond Outfall Modifications
9. Public Education
10. Water Fowl Management
11. Bacteria Monitoring and Beach Closing Model Modification

4.3.1 Installation of Manufactured Stormwater Treatment Devices

The lower watershed discharges directly into Wreck Pond, the impounded portion of Black Creek, or the lower reaches of Wreck Pond Brook. The area is primarily single-family homes, with small pockets of commercial development and public buildings with very limited undeveloped areas. There is limited to no potential for installation of stormwater basins or regional stormwater facilities. Thus, a key mitigation measure is to retrofit existing stormwater outfall structures.

During the summer and fall of 2010, 14 manufactured stormwater treatment devices (MSTDs) were installed throughout the lower portion of the watershed. The highly developed nature of the lower watershed indicates that these were the best option to improve stormwater quality. The devices were fully operational in January of 2011. At this time, the NJDEP is undertaking a monitoring program to evaluate the effectiveness of these devices for removal of sediment, nutrients and possibly bacteria. Based on the manufacturer’s specifications, it is anticipated that these devices will improve stormwater quality.

As part of the first project, initial engineering was conducted for installation of 13 additional MSTD’s at stormwater outfalls to Wreck Pond. Installation of these additional devices would cost approximately \$729,000. Thus, this project has high priority, assuming the monitoring results are positive, because it is designed and ready to implement.

Goal targeted: *Reduction of sediment and nutrient loads directly to Wreck Pond*

Effectiveness: *Currently awaiting monitoring results, low to moderate*

Priority: *High, additional MSTDs are already designed. Project is easy to implement with funding. Municipalities are willing to accept responsibility for devices and maintenance.*



4.3.2 Stream Stabilization and Riparian Buffer Enhancement and Preservation

Two primary pollutants of concern within the watershed are sediment and phosphorus, with phosphorus noted as a cause of non-attainment of the aquatic life designated use. The modeling and study results determined that stream erosion is a source of both sediments and phosphorus. Thus, unstable and eroding sections of the streams flowing into Wreck Pond are of concern.

Further, these pollutants, plus bacteria are also generated from the varied lands uses within the watershed. In addition to ecologic benefits, wide, well-vegetated riparian corridors along stream can serve to reduce loadings of sediment and pollutants if stormwater flows through these buffers prior to entering the stream.

Riparian buffers are protected to some extent from vegetative removal by current NJDEP regulations. However, in this watershed these protections are generally limited to a width of 50 feet. Preservation of larger buffers through purchase would provide water quality and flood control benefits throughout the watershed.

As part of the RSWMP, the Freehold Soil Conservation District conducted a Stream Assessment Analysis. This analysis was done by walking the streams and assessing each section in accordance with a checklist in relation to a “reference site”, which is a high quality site within the watershed. Various factors of the reach are recorded, including bank stability, vegetative cover, and riparian zone width. However, the assessment also includes items such as flow, stream sinuosity, and channelization.

The scores for each reach were used to categorize each reach as optimal, sub-optimal, marginal or poor. Most of the stream segments were found to be sub-optimal. However, given the combination of factors the overall score could be within the sub-optimal category and still require mitigation for

Thus, the results were re-evaluated to determine segments with low scores on:

1. Bank Stability
2. Bank Vegetative Protection
3. Riparian Zone

For example, a segment of Wreck Pond Brook just downstream of Hurley’s Pond received an overall score of 127, which is sub-optimal. However, within that score the bank stability score is 3 for the left bank and 2 for the right bank. This falls into the “unstable” range which includes score from 0 (worst) to 5 and is defined as:

Unstable; many eroded areas; “raw” areas frequent along straight sections and bends; obvious bank sloughing; 60-100% bank has erosional scars.

This section also has low scores for vegetative protection of the banks, even though the riparian zone width is wide. The scores indicate that about 40% of the bank is not vegetated and that there is obvious disruption of the vegetation with patches of bare soil



or closely cropped vegetation common and that less than 50% of the potential plant stubble height remains. This would be a segment that could benefit from mitigation.

Thus, even segments designated as sub-optimal, areas may require remediation to reduce the potential for soil erosion. Further, the studies by FCSD were done in around 2004 to 2005, prior to the large flood event in October 2005 and the recent impact of Hurricane Irene. Re-inspection of the stream segments is needed.

The following tasks are proposed:

- Task 1. Using FCSD or volunteers, re-survey the stream segments using the same protocol. Identify stream segments that have been downgraded or otherwise changed over the last 6 years. The priority segments would be those that were not previously identified and those that had low scores for bank stability, vegetation and/or riparian zone.
- Task 2. Using the above analysis, also identify areas of high quality and wide riparian zones
- Task 3. Using the results of Task 1, identify stream segments that have low scores for bank stability, bank vegetation
- Task 4. Prioritize the segments identified in Task 2 and conduct site-specific analysis including ownership and any issues related to implementation. For example, is future development proposed for the lands along each segment must be considered
- Task 5. Design specific projects using green engineering techniques to the extent possible
- Task 6. Implement projects
- Task 7. Conduct post-project monitoring to ensure projects function as expected and replace vegetation as needed.
- Task 8. Using results of Task 2, identify areas of high quality riparian zone vegetation and zones wider than 50 feet
- Task 9. Prioritize riparian zones for protection
- Task 10. Identify mechanisms for protection and/or preservation of these zones including funding for purchase

The project would reduce erosion of the stream banks, which would reduce sediment and nutrient loads to the streams and ponds within the watershed.

Pollutants Targeted: *Sediment and Nutrients*

Effectiveness: *Moderate to High*

Priority: *High to moderate. Project to stabilize or enhance stream sections and buffers will have many benefits and is not expected to have negative consequences. Project can be designed and implemented relatively easily as the streams are considered waters of the State. Project to preserve wider riparian zones may be costly and would have to consider property owner and municipal concerns.*



4.3.3 Stormwater Facility Mitigation and Retrofit

As discussed, the vast majority of the existing development within the watershed occurred at least 25 years ago. This was determined by comparing the 1986 land use layer to the 2006 land use layer. Thus, much of the existing development was installed when fewer regulations were in place regarding stormwater runoff management, particularly sediment load reduction. Detention basins that met earlier standards in many cases would not meet the 80% TSS reduction currently required.

In addition to structural methods to control the peak flow and volume of runoff from a developed site, current stormwater management rules require infiltration and non-structural design methods that serve to minimize connected impervious area and direct stormwater runoff and improve water quality.

There are numerous stormwater management basins throughout the watershed. These basins serve a variety of development types, primarily residential neighborhoods. However, there are also basins associated with local schools, commercial and industrial facilities and government buildings. The measures consist primarily of stormwater basins that vary in design. The permitting dates for these basins extend from the late 1970's through the 1980s.

The initial phase of this project would be to inventory older development sites, as to the type of stormwater facilities; the size and nature of on-site development, and the potential to retro-fit or otherwise upgrade the stormwater management facilities. The initial review will target facilities that are owned or operated by governmental agencies or schools. The sites will be examined to:

- Evaluate the type of stormwater management facility including the existing condition, size of site and amount of stormwater managed and the nature of the discharge points
- Investigate the size and nature of the site to determine if there are opportunities to enhance stormwater management through non-structural means such as disconnecting impervious areas, adding bioswales or constructing a rain garden
- Evaluate the potential impact on future expansion on the existing facility.
- Evaluate maintenance requirements and ensure maintenance responsibility

Constraints to this project would include finding appropriate stormwater facilities and willing landowners.

The stormwater facilities will be prioritized as to possible projects.

Goal Targeted: *Reduction of sediment load, reduction of nutrient load, reduction of bacteria load, reduction of flooding.*

Effectiveness: *Locally, high effectiveness. Overall watershed effect will depend on specific projects to be implemented.*



Priority: High to moderate. Although the improvement to stormwater management is a high priority, additional work is needed to identify specific projects and determine the costs, benefits and constraints associated with each project.

4.3.4 Rain Gardens and Rain Barrels

Rutgers Cooperative extension successfully developed rain gardens within the watershed as demonstration projects, at publicly owned properties. Expansion of this project would include other public locations as well as individual homeowners. The projects could be integrated with the stormwater facilities projects in some cases to further enhance stormwater management. The project could also be expanded to include rain barrels for public use. This project would also be part of the public education component.

Goal Targeted: Reduction of sediment load and pollutant loads

Effectiveness: Effectiveness depends on the number of rain gardens implemented.

Priority: Moderate. Rain gardens and rain barrels are easy and inexpensive to implement. However, a large number of homeowners would be required to participate to provide improvements at the watershed level.

4.3.5 Public Works Yards Restoration

The Spring Lake Borough Public Works Yard is located along the banks of Black Creek, east of the NJ Transit railroad tracks. The majority of the sub-drainage area drains into roadways, into a stormwater collection system and into Black Creek. The lower portion of the yard discharges via overland flow to Black Creek. In recent years, the Borough constructed an earthen berm to encourage collection and infiltration of stormwater runoff from this lower portion of the yard.

Similarly, the Spring Lake Heights Public Works Yard is located on the western side of the NJ transit tracks, along the banks of Black Creek. The yard is fairly well contained however a storm sewer discharge pipe drains into a ditch running between the yard and the tracks and empties directly into Black Creek, a few feet upstream of the culvert under the tracks. Evidence of erosion within the ditch and sediment deposition at the ditch outlet was visible in the past.

Wreck Pond Brook Watershed RSWMP Committee members met with representatives from both municipalities in February 2008 to identify potential locations for the installation of structures to control and mitigate runoff, nutrients and bacteria from both maintenance yards. A project under consideration is the construction of a bio-retention basin at each yard. The basins would provide for filtering of surface runoff, infiltration and controlled discharge to the creek. It is anticipated that nutrient and sediment loads



delivered to the creek from these sites may be significantly reduced. Considerations include space needed to construct basins of sufficient size and the grading required to direct runoff to the basins. Other options may also be considered to manage the stormwater.

Goal Targeted: *Reduction of sediment load, reduction of nutrient load, reduction of bacteria load.*

Effectiveness: *Locally, high effectiveness. Overall watershed effect will depend on specific measures employed/*

Priority: *High to moderate. Local commitment and support required.*

4.3.6 Dredging of Wreck Pond

Dredging of Wreck Pond, including the ponded portion of Black Creek, is a priority. Removal of the sediment in the Pond would reduce the muck and improve the overall water quality. This would enhance the opportunities to meet the aquatic life and recreation designated uses as well as allow the public to use the Pond. Removal of pond sediments may also reduce nutrient and bacteria levels in the Pond.

Constraints to implementation of this measure are primarily cost and logistics. Additional investigation may be needed to determine if there is a cost-effective way to dredge the pond.

Goal Targeted: *Enhance Pond ecology, meet aquatic life and primary and secondary recreation designated uses, enhance Pond aesthetics, and increase pond storage volume in conjunction with pumping system for flood events.*

Effectiveness: *Highly effective.*

Priority: *High for achieving goal if removing sediment and increasing possible storage (with pumping), but low due to cost, and significant constraints that must be overcome to implement this project, thus giving it a lower likelihood of success.*

4.3.7 Dredging of Other Ponds

Water quality data and modeling efforts within the watershed demonstrate the importance of many of the ponds in regulating flows and allowing settling of sediment and associated water pollutants. Some ponds are known to contain significant quantities of sediment and are in need of dredging. Shoreline improvements and modifications, including the use of wetland plantings, would be introduced where needed in order to maintain/improve habitat, reduce geese populations and improve water quality features. The following projects were recommended by the Committee.



- i) Dredge and restore Old Mill Pond in Wall Township to improve habitat and provide better stormwater management functions. Removal of sediments and outlet modification will be needed to increase stormwater flood control and enable future maintenance
- ii) Dredge and restore the impounded portion of Black Creek (aka North Branch of Wreck Pond) in its entirety between Route 71 and Ocean Road in Spring Lake and in the segment just west of the Route 71 Bridge.
- iii) Dredge and restoration of Hurley's Pond, at Hurley's Pond Road. The pond is privately owned. It would require dredging from an existing average depth of about 2.5 feet to possibly 6 feet. The outlet weir under the road may also require modification.

As with the dredging of Wreck Pond, the anticipated cost and identification of management and disposal options are impediments to implementation.

Goal Targeted: *Enhance ecology of individual ponds, meet aquatic life and primary and secondary recreation designated uses, enhance pond aesthetics, possibly reduce flooding by allowing additional storage in ponds, reduce loadings of sediment to Wreck Pond*

Effectiveness: *Highly effective.*

Priority: *High for achieving goal, but low due to cost, and significant constraints that must be overcome to implement this project, thus giving it a lower likelihood of success.*

4.3.8 Outfall Modifications

The outfall from Wreck Pond to the Ocean flows during the lower tide portion of the tidal cycle. Pond water can not flow out during high tide, which is extended particularly during storm tides.

The outfall structure is of concern as it permits bacteria laden water to flow from the Pond to the bathing beaches and can impact bacteria concentrations at the beaches. Currently, the rainfall provisional ban is in effect after 0.1 inch of rain.

Further, the tide does not allow the pond to drain effectively during large storm events, particularly when the Ocean high tide is at storm high tide.

The Borough of Spring Lake has received a grant to install pumps that will serve to remove some Pond water prior to storm events. Pond storage would be enhanced if the ocean water could be kept from the pond prior to an anticipated major storm event.

The outfall structure was constructed with plates in certain sections to control the inflow and outflow of water. However, these are no longer in place.



Thus, modifications could be made to the outfall structures to:

1. Reduce the outflow of pond water during small rainstorms to that discharged at the level of rainfall provisional ban, but not to restrict high tide flows into the Pond.
2. Allow the outfall to be closed to high tide inflows prior to large storm events.

The constraints associated with this project are that the hydraulics of the Pond and Ocean connection have yet to be studied in detail. Too much restriction of tidal flows would impact flushing and thus water quality in the Pond and operations could impact flooding due either to tidal storms or fluvial events.

Further, the interaction of stormwater, pond level and Ocean tides is complex and weather is unpredictable. Thus, appropriate operational management of the system will be difficult and procedures to modify the operations quickly based on changing storm conditions are essential to success.

Goals Targeted: *Reduce flooding, reduce beach closings*

Effectiveness: *Highly effective for the circumstance for which the project is designed; effectiveness under other scenarios would have to be determined.*

Priority: *Moderate, as additional study is needed to determine cost, benefits, constraints and probability of success.*

4.3.9 Public Education

The RSWMP Committee is undertaking a public education campaign designed to inform the public regarding the conditions in Wreck Pond and the watershed and to provide steps the public can take to minimize pollutant loadings. This project may be stand-alone, but also could be integrated into other projects including the Rain Garden project and stormwater facilities projects.

Goal Targeted: *Reduce overall pollutant loadings*

Effectiveness: *Low to moderately effective.*

Priority: *Moderate, as the effectiveness in achieving overall Plan goals is not high.*

4.3.10 Waterfowl Management

The municipalities have conducted efforts to inform citizens to not feed water fowl and have implemented some management measures. However, the presence of large



numbers of waterfowl is an area-wide problem that is difficult to solve. Ongoing efforts should continue and the municipalities should consider other means of controlling water fowl. Constraints include relatively low effectiveness of local control attempts and public concerns about plantings or methods to reduce adult populations.

Goal Targeted: *Reduce bacteria concentrations*

Effectiveness: *Low.*

Priority: *Moderate, successful water fowl management would go a long way toward reducing bacteria loadings to Wreck Pond. However, current methods are not highly effective, thus benefit level may not be high.*

4.3.11 Bacteria Monitoring and Beach Closing Model Modification

Currently, most of the bathing beach closures for beaches in the vicinity of Wreck Pond are based on rainfall provisional ban and not on actual measurements. Monitoring during and following actual rainfall events could allow refinement of the provisional rainfall ban.

Measurements of bacteria levels generally require a 24-hour turnaround. Thus, results generally tell what the water quality was on the previous day. Faster methods are under development, including qPCR and others, although there are still technical issues with these methods. NJDEP conducted a pilot study of one such method in Ocean County during the summer of 2011. If this is successful, the use of these methods at the beaches adjacent to Wreck Pond would allow much better understanding of the water quality profile during and after storm flows. This may allow modification to the .rainfall ban, allow more rapid re-opening of the bathing beaches following a rain event, or indicate other parameters to be considered for a provisional beach closing.

As Wreck Pond is an area of concern for beach closings, a pilot study of rapid bacteria measurements should be implemented here in 2012, assuming the technique is shown to work. It must be noted that the Health Department is responsible for the beach closing provisions.

Goal Targeted: *Enhance information on bacteria levels at bathing beaches; reduce number and length of beach closures*

Effectiveness: *Unknown and will depend on the methods effectiveness and monitoring results. Could results in additional closings.*

Priority: *Moderate: rapid monitoring will assist in developing an appropriate beach closing model and in understanding the degree to which the Pond impacts bacteria levels at the beaches. However, this will not achieve the goal of reducing bacteria loads to the Pond and to the beaches.*



5 CONCLUSION

This report is an Addendum to the Wreck Pond Brook Watershed Regional Stormwater Management Plan and provides information required to have the plan and this addendum certified as a Watershed-based Implementation Plan by NJDEP. The RSWMP and this Addendum conforms to the requirements for such a plan set forth by NJDEP. The Plan:

- Is regional in nature
- Details specific projects or management measures to be implemented in order to achieve the goals of the plan; and
- Sets forth prioritization of the projects or management measures identified

Certification of the Plan, with this Addendum, as a Watershed-based Implementation Plan, will allow the Wreck Pond Brook Watershed Regional Stormwater Management Plan Committee, the County and the local stakeholders to apply for grants and other funding sources to achieve the objectives of reducing beach closings and improving watershed health.



6 REFERENCES

USEPA, *Handbook for Developing Watershed Plans to Restore and Protect Our Waters*, March 2008, EPA 841-B-08-002.

