MUNICIPAL STORMWATER MANAGEMENT PLAN
MASTER PLAN ELEMENT

BOROUGH OF WEST LONG BRANCH
MONMOUTH COUNTY, NEW JERSEY

PREPARED FOR:

BOROUGH OF WEST LONG BRANCH
PLANNING BOARD

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INTRODUCTION

As required by the Municipal Stormwater Regulations (N.J.A.C. 7:14A-25), the Borough of West Long Branch has developed this Municipal Stormwater Management Plan (MSWMP) to outline their approach to addressing the impacts resulting from stormwater related issues associated with future development, redevelopment, and land use changes. The MSWMP addresses groundwater recharge, stormwater quantity, and stormwater quality impacts through the incorporation of stormwater design and performance standards for new development and redevelopment projects that disturb one or more acres of land. The standards are intended to minimize negative or adverse impacts of stormwater runoff such as decreased water quality, increased water quantity and reduction of groundwater recharge that provides base flow to the Borough's receiving bodies of water. In addition to minimizing these impacts, the MSWMP provides long term operation and maintenance measures for existing and proposed stormwater management facilities.

The MSWMP provides recommendations for ordinance modifications in order to expedite the implementation of stormwater management strategies. The MSWMP also includes mitigation strategies to permit the Borough to grant variances or exemptions from proposed design and performance standards set forth by the Municipal Stormwater Regulations (N.J.A.C. 7:8-5.5).

GOALS AND OBJECTIVES

The goals of this MSWMP are:

1. Reduce flood damage, including damage to life and property;
2. Minimize, to the extent practical, any increase in stormwater runoff from any new development;
3. Reduce soil erosion from any development or construction project;
4. Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
5. Maintain groundwater recharge;

6. Prevent, to the greatest extent feasible, an increase in nonpoint pollution;
7. Maintain the integrity of stream channels for their biological function, as well as for drainage;
8. Minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water;
9. Protect public safety through the proper design and operation of stormwater basins.
10. Increase public awareness of stormwater management through public education.

According to the Borough's March 1997 *Master Plan and Reexamination Report*, the Borough has the following additional goals:

1. Protect and preserve environmentally sensitive areas remaining in the Borough, including lands which are subject to flooding and those which are identified as wetlands.
2. Establish standards for effective buffering and screening in transition areas between conflicting land uses, such as residential and commercial development.

To achieve these goals, the MSWMP outlines specific stormwater design and performance standards for new development and proposes stormwater management controls for addressing impacts from existing developments. Preventive and corrective maintenance strategies are also included to ensure the long-term effectiveness of stormwater management facilities and the MSWMP outlines safety standards for stormwater infrastructure to be implemented to protect public safety.

STORMWATER DISCUSSION

HYDROLOGIC CYCLE

The hydrologic cycle or water cycle (Figure 1) is the continuous circulation of water between the ocean, atmosphere, and the land. The driving force of this natural cycle is the sun. Water, stored in oceans, depressions, streams, rivers, waterbodies, vegetation and even land surfaces, constantly evaporates due to solar energy. This water vapor then condenses in the atmosphere to form clouds and fog. After water condenses, it precipitates, usually in the form of rain or snow, onto land surfaces and waterbodies. Precipitation falling on land surfaces is often intercepted by vegetation. Plants and trees transpire water vapor back into the atmosphere, as well as aid in the infiltration of water into the soil. The vaporization of water through transpiration and evaporation is called evapo-transpiration. Infiltrated water percolates through the soil as groundwater, while water that flows overland is called surface water. Water flows across or below the surface to reach major water bodies and aquifers and eventually flows to the Earth's seas and oceans. This constant process of evapo-transpiration, condensation, precipitation, and infiltration comprises the hydrologic cycle.

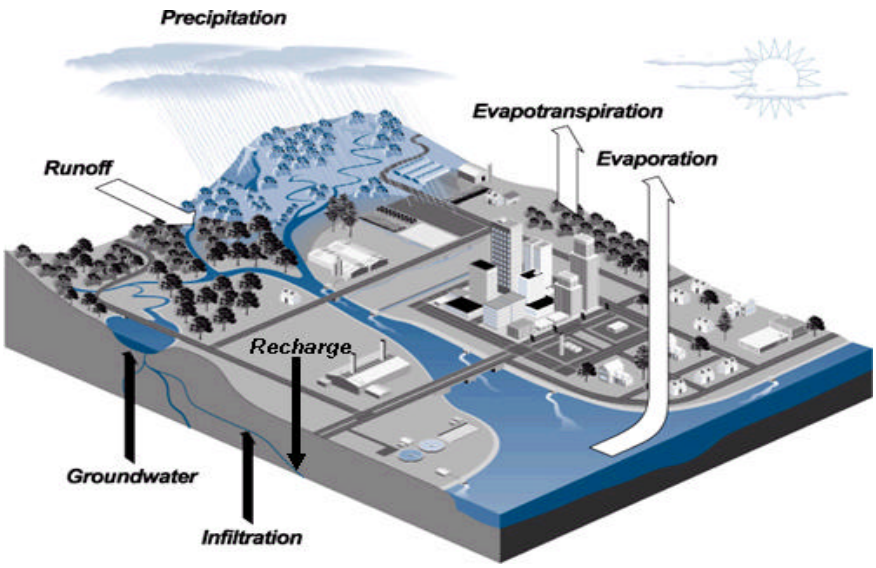
IMPACTS OF STORMWATER

As towns and cities develop from rural agricultural communities, the landscape is altered in dramatic ways. Both residential and non-residential development on former agricultural fields and pastures have a great impact on the hydrologic cycle for the specific site. Localized impacts to the hydrologic cycle will ultimately impact the hydrologic cycle of the entire watershed encompassing the development site.

Prior to any land development, native vegetation often intercepts precipitation directly or absorbs infiltrated runoff into their roots. Development often replaces native vegetation with lawns or impervious cover, such as pavement or structures, thereby reducing the amount of evapo-transpiration and infiltration. Regrading and clearing of lots disturbs the natural topography of rises and depressions that can naturally capture rainwater and allow for infiltration and evaporation. Construction activities often compact soil, thereby decreasing its permeability or

ability to infiltrate stormwater. Development activities also generally increase the volume of stormwater runoff from a given site.

Figure 1: The Hydrologic Cycle



Definitions:
Runoff – water that travels over the ground surface to a channel
Groundwater flow – movement of water through the subsurface
Infiltration – penetration of water through the ground surface
Recharge – water that reaches saturated zone

Source: Kern River Connections http://www.creativille.org/kernriver/watershed.htm

Connected impervious surfaces and storm sewers (such as roof gutters emptying into a paved parking lot that drains into a storm sewer) allows the runoff to be transported downstream more rapidly than natural areas. This shortens travel time and increases the rainfall- runoff response of the drainage area, causing downstream waterways to peak higher and quicker than natural areas, a situation that can cause or exacerbate downstream flooding, and sedimentation in stream channels. Furthermore, connected impervious surfaces do not allow pollutants to be filtered, or for infiltration and ground water recharge to occur prior to reaching the receiving waters. Increased volume combined with reduced base flows results in a greater fluctuation between normal and storm flows causing greater channel erosion. Additionally, reduced base flows, increased fluctuation, and soil erosion can affect the downstream hydrology of the watershed,

impacting ecological integrity.

Water quantity impacts, combined with land development, often adversely impacts stormwater quality. Impervious surfaces collect pollutants from the atmosphere, animal wastes, fertilizers and pesticides, as well as pollutants from motor vehicles. Pollutants such as hydrocarbons, metals, suspended solids, pathogens, and organic and nitrogen containing compounds, collect and concentrate on impervious surfaces. During a storm event, these pollutants are washed directly into the storm sewers (Figure 2). In addition to chemical and biological pollution, thermal pollution can occur from water collected or stored on impervious surfaces or in stormwater impoundments, which has been heated by the sun. Additionally, large amounts of impervious coverage can result in "heat islands" where the surface temperatures are up to 10 degrees warmer than the surrounding areas. Thermal pollution can affect aquatic habitats, adversely impacting cold water fish. Removal of shade trees and stabilizing vegetation from stream banks also contributes to thermal pollution.

Figure 2: Connected Impervious Surfaces

Rainwater is intercepted by roofing and collected into gutters. The water then discharges the downspout onto a paved driveway and flows to the gutter and storm drain inlets. Alternatively, the collected water is piped underground directly to the storm sewer.
Photograph source: Titan Gutters

Proper stormwater management will help to mitigate the negative impact of land development and its effect on stormwater. This Plan outlines the Township's plan to improve stormwater quality, decrease stormwater quantity, and increase groundwater recharge. By managing stormwater, the Township will improve the quality of aquatic ecosystems and restore some of the natural balance to the environment.

BACKGROUND

The Borough of West Long Branch encompasses 2.91 square miles or 1,862 acres of Monmouth County, New Jersey. The Borough is primarily a residential community, which has evolved from a community of 18th Century pioneer farmhouses. The Borough is bounded by the City of Long Branch to the East, and Eatontown Borough to the west. To the south, the Borough shares Whale Pond Brook with Ocean Township, and shares the Turtle Mill Brook to the North with Oceanport Borough. Figure 3 delineates the Borough boundaries on a United States Geological Survey (USGS) quadrangle map.

DEMOGRAPHICS AND LAND USE

Over the past 40 years the population of West Long Branch has steadily increased from 6,848 in 1970 to 7,380 in 1980, to 7,690 in 1990 and again in 2000 to 8,256 people. The Borough has grown over four and one half times in size since 1930.

Table 1 : Historical Population Growth 1930 – 2000

Year	*Borough of West Long Branch*		*Monmouth County*		*New Jersey*	
	Total Population	*Average Annual Growth Rate Over the Prior 10-year Period*	*Total Population*	*Average Annual Growth Rate Over the Prior 10-year Period*	*Total Population*	*Average Annual Growth Rate Over the Prior 10-year Period*
1930	1,686	–	147,209	–	4,041,334	–
1940	2,030	2.4%	161,238	0.9%	4,160,165	0.3%
1950	2,739	3.5%	225,327	4.0%	4,835,329	1.6%
1960	5,337	9.5%	334,401	4.8%	6,066,782	2.6%
1970	6,845	2.8%	461,849	3.8%	7,171,112	1.8%
1980	7,380	0.8%	503,173	0.9%	7,364,823	0.3%
1990	7,690	0.4%	553,124	1.0%	7,730,118	0.5%
2000	8,256	0.7%	615,305	1.1%	8,414,350	0.9%

Source: United States Census

Figure 3: Topographic Map

With this population increase, came an increase in development from 1,755 housing units in 1970 to 2,535 housing units in 2000.

Table 2: General Housing Characteristics

	1990		2000		Change
	Number	Percent	Number	Percent	Number
Occupancy Status					
Total Housing Units	2,528	100	2,535	100	7
Occupied Housing Units	2,449	96.9	2,448	96.6	-1
Vacant Housing Units	79	3.1	87	3.4	8
Tenure					
Occupied Housing Units	2,449	100	2,448	100	1
Owner- Occupied Housing Units	2,064	84	2,077	84.8	13
Renter- Occupied Housing Units	385	16	371	15.2	-14
Vacancy Status					
Vacant Housing Units	79	100	87	100	13
Population	7,690	100	8,258	100	568
Households	2,449	100	2,448	100	1
Family Household	1,926	78.6	1,860	76.0	-68
1 Person Household	467	19.1	522	21.3	55
Persons/ Household	2.8		3.25		0.45

Source: 1990, 2000 US Census

It should be noted though that according to the December 2003 *Borough of West Long Branch Master Plan Re-Examination Report* the Borough is nearly fully developed and has very little land available for development that is not impacted by environmental constraints (less then 350 acres). There are 1,512 acres of developed land within the 1,862-acre area encompassed by the Borough, which means the Borough is currently over 80% developed.

Table 3: Existing Land Use

Usage	Area (Ac)	% of Developed Area	% of the Borough
Vacant/ Developable	41	0	2.2
Single Family Residential	904	59.8	48.5
Multi-Family Residential	22	1.4	1.2
Senior Housing	16	1.1	0.9
Commercial	232	15.3	12.5
Industrial	2	0.1	0.1
Public Parks/ Open Spaces	113	3.9	6.1
Borough Facilities	11	0.7	0.6
Schools	60	4.0	3.3
Monmouth University	132	8.7	7.1
House of Worship	14	0.9	0.8
Streets	255	0	13.7
Cemetery	60	4.0	3.2
Total	1,862	100	100

Source: *West Long Branch Borough Master Plan Re-examination Report*, 2003.

WATERWAYS

The North Coast Subwatershed area of Watershed Management Area 12 encompasses the Borough of West Long Branch. Included in this subwatershed are tributaries feeding the Shrewsbury River upstream of its confluence with the Navesink River, including Little Silver Creek, Town Neck Creek, Parkers Creek, Oceanport Creek, Wampum Brook, Husky Brook, Troutmans Creek, Manhassett Creek and Jims Creek. The Borough's waterways include the Turtle Mill Brook/Branchport Creek, Whale Pond Brook, and Franklin Lake. Figure 4 illustrates the waterways of the Borough.

WATER QUALITY

The Ambient Biomonitoring Network (AMNET) was established by the New Jersey Department of Environmental Protection (NJDEP) to monitor and document the health of New Jersey's

Figure 4: Borough Waterbodies

waterways. AMNET currently has 820 sites in five drainage basins that it monitors for benthic macro-invertebrates on a five-year cycle. Waterways are scored based on the data to generate the New Jersey Impairment Score (NJIS) and then categorized as severely impaired, moderately impaired, and non-impaired. The NJIS is based on biometrics and benthic macro-invertebrate health. (http://www.state.nj.us/dep/wmm/bfbm/). Whale Pond Brook at Larchwood Avenue has been included in the AMNET reports and is listed as severely impaired with a score of 6.

In addition to biological health, chemical data are gathered by the NJDEP and other organizations, and used to determine the health of waterways. The water quality data are used by NJDEP to develop Total Daily Maximum Loads (TMDL). A TMDL is the quantity of a pollutant that can enter a waterbody without exceeding water quality standards or interfering with the ability to use the waterbody for its designated usage. Point and non-point pollution, surface water withdrawals and natural background levels are included in the determination of a TMDL, as required by Section 303(d) of the Clean Water Act. Point source pollution includes, but is not limited to NJPDES permitted discharges, while non-point source pollution can include stormwater runoff from agricultural lands or impervious surfaces. TMDLs determine the allowable load from each source, with a factor of safety, for the pollutant entering the waterbody. TMDLs are used to either prevent further deterioration of waterbodies, or to improve current water quality.

Some of the strategies of TMDL implementation may include, the identification of various sources of pollution, stormwater treatment, implementation of updated ordinances, restriction of impervious surfaces, retrofitting stormwater systems, disconnection of impervious surfaces, and other use of other BMPs. The following table indicates the waterbodies within or flow through the Borough that are listed on New Jersey's 2004 Integrated List of Waterbodies, Sublists 1 and 5 (http://www.state.nj.us/dep/wmm/sgwqt/wat/ index.html).

There are TMDLs established for some of the above listed waterbodies. Franklin Lake has an established TMDL for Phosphorous. Franklin Lake is considered to be a eutrophic lake by the NJDEP. Whale Pond Brook at Rt. 35 in Eatontown is also listed as having a TMDL for fecal

coliform. This stream is listed as impaired for 3.7 river miles. While Eatontown is upstream of West Long Branch, this TMDL could affect the Borough. According to the Division of Watershed Management of the NJDEP, these are not stormwater specific TMDLs, and as such are not covered under this Plan.

Table 4: 2004 West Long Branch Borough Vicinity Impaired Water Bodies

Sublist	Station Name/Waterbody	Site ID	Impairment Parameters	Data Source
1	Branchport Creek-Tidal	45, R05	Dissolved Oxygen	Monmouth Co HD, NJDEP Coastal Monitoring
5	Branchport Creek-Tidal	45, R05	Fecal Coliform	Monmouth Co HD, NJDEP Coastal Monitoring
5	Franklin Lake-12	Franklin Lake	Phosphorous	NJDEP Clean Lakes
5	Whale Pond Brook at Larchwood Ave in Ocean	AN0477	Benthic Macroinvertebrates	NJDEP AMNET
1	Whale Pond Brook at Route 35 in Eatontown	01407617, 31	Phosphorus, Temperature, Dissolved Oxygen, Nitrate, Dissolved Solids, Total Suspended Solids, Unionized Ammonia	NJDEP/USGS Data, Monmouth Co HD
4	Whale Pond Brook at Route 35 in Eatontown	01407617, 31	Fecal Coliform	NJDEP/USGS Data, Monmouth Co HD
5	Whale Pond Brook at Route 35 in Eatontown	01407617, 31	pH	NJDEP/USGS Data, Monmouth Co HD

Sources: <http://www.state.nj.us/dep/wmm/bfbm/> Sub-list 1-5, New Jersey's 2004 Integrated List of Water Bodies, dated June 22, 2004

In addition to State monitoring, The Monmouth County Planning Board has compiled a list of issues within the North Coast Subwatershed. In their 2001 report, the County Planning Board noted that the region suffered from lack of maintenance along stream corridors, lack of groundwater recharge, high fecal coliform and nutrient loadings, lack of wetlands protection, overgrowth of invasive and non-native plant species, and lack of stormwater volume control to shellfish beds.

The Monmouth County Health department also has ambient monitoring sites for the Whale Pond Brook, in Eatontown, and Branchport Creek in Long Branch. These sites are monitored on average of four times per year for fecal coliform, pH, phosphorous, ammonia, TSS, and turbidity. Branchport Creek routinely has ammonia and phosphorous readings well above standard, and well as frequent seasonal, above standards highs for fecal coliform. Whale Pond Brook, also has

above standard ammonia levels, and frequent above standards, seasonal highs for fecal coliform. Whale Pond Brook has also had a range of pH levels throughout the past three years, ranging from 9.2 in June 2002, and 4.2 in October of the same year. Branchport Creek, however, has a fairly steady neutral pH over the same time period.

WATER QUANTITY

The Borough experiences some flooding during storm events. There are two areas in the vicinity of Whale Pond Brook prone to flooding. The first area is located where the stream corridor runs along Whale Pond Road. This is believed to be a pipe and conveyance capacity issue. The second area is located along Norwood Avenue. It is believed that flooding is caused by downstream back-ups of the storm drainage system. Both of these areas can handle average rainfall events, but flood in storms more sever than the 25-year storm.

GROUNDWATER RECHARGE

Increases in development of vacant sites have increased impervious surface areas. Impervious surface areas are portions of the development site covered with either structure and/or pavement that prevents the underlying soil from absorbing rainwater. Instead of entering the soil, rainwater from rooftops and pavement flows onto the adjacent ground, where it is partially absorbed into the ground (depending upon hydraulic soil classifications) or into drainage facilities and streams. The greater the amount of impervious surface, the greater volume of stormwater runoff that drains away from a given site. Greater volumes of stormwater can result in high water elevations in some locations along streams and can exacerbate streambed erosion, and potentially cause downstream siltation. These dynamics alter the floodplain and have negative impacts on both the stream and river ecosystems.

The Borough's water is provided by New Jersey American Water Company. Figure 5 illustrates the Borough’s groundwater recharge areas. Figure 6 delineates the Borough's wellhead protection areas.

Figure 5: Groundwater Recharge Areas

Figure 6: Wellhead Protection Areas

DESIGN AND PERFORMANCE STANDARDS

The Borough should adopt applicable design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to reduce the negative impact of stormwater runoff on water quality and quantity, and loss of groundwater recharge in receiving waterbodies. The section of this MSWMP, entitled Stormwater Management Strategies, indicates actions appropriate for various types of development in West Long Branch. Ultimately, design and performance standards will be created to contain the necessary language to maintain stormwater management measures consistent with the applicable stormwater management rules, N.J.A.C. 7:8-5.8 - Maintenance Requirements. This includes language for safety standards consistent with N.J.A.C. 7:8-6 - Safety Standards for Stormwater Management Basins. Ordinances must be submitted to the Monmouth County Planning Board for review and approval within 12 months of adoption of the MSWMP.

A number of structural and nonstructural strategies require water to be retained for long periods of time. These requirements may increase the promulgation of mosquito breeding habitats. New development and redevelopment activities should be coordinated with the Monmouth County Mosquito Extermination Commission so that proposed structural and nonstructural strategies are properly maintained.

Proper inspection and maintenance are critical components for the successful performance of a stormwater management system. The Borough is presently preparing a Stormwater Pollution Prevention Plan (SPPP) to address inspection and maintenance for existing stormwater infrastructures throughout the Borough. Also included in the SPPP plan is the development of a Local Public Education Program to educate property owners on methods to reduce nonpoint stormwater pollution such as proper waste disposal, solids and floatable controls, fertilizer and pesticide use, etc. New Development and redevelopment projects will be required to develop and submit a detailed operation and maintenance plan for each best management practice (BMP) established in accordance with the N.J.A.C. 7:8 - 5.8. Recommendations for proper maintenance procedures are available in the NJDEP's *Best Management Practices (BMPs) Manual.* Copies of the maintenance plan(s) will be filed with the Borough Department of Public Works.

During construction, Borough personnel will observe construction of the project to ensure that the appropriate stormwater management measures are constructed and function as designed. Borough personnel will conduct periodic inspections after significant storms to ensure the system is functioning properly and to identify maintenance needs, if any. After this, annual checks will be done to identify any additional maintenance needs required. This may include clearing of blockages from inlets and/or outlet structures, removal of unhealthy vegetation or accumulated debris/materials.

Borough ordinances should indicate that the inspection of systems is permissible on private property, provided the necessary easements are in place, upon giving reasonable notice. Ordinances should also indicate a time frame for maintenance procedures to occur upon receiving notice from the Borough that maintenance is required.

PLAN CONSISTENCY

REGIONAL STORMWATER MANAGEMENT PLANS

Currently, there are no adopted Regional Stormwater Management Plans (Regional Plans) developed for waterbodies located "within" the Borough's boundaries. This plan will be updated to be consistent with any Regional Plans that are established in the future. West Long Branch will take part in the development of any proposed Regional Plans that may affect waterbodies within or adjacent to the Borough.

TOTAL MAXIMUM DAILY LOADS

Franklin Lake currently has established a non-point source pollution TMDL for Phosphorous. Also, Whale Pond Brook in Eatontown has an established TMDL for Fecal Coliform. According to the Division of Watershed Management of the NJDEP, this is not a specific stormwater TMDL, and as such is not governed by this MSWMP. This plan will be updated to be consistent with any future stormwater TMDL established by the NJDEP.

RESIDENTIAL SITE IMPROVEMENT STANDARDS (RSIS)

This Municipal Stormwater Management Plan is consistent with regulations established under the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21, and will be updated to remain consistent with any future updates of RSIS. Additionally, the Borough will use the latest update of RSIS during its reviews of residential area development for stormwater management.

SOIL CONSERVATION

The Borough's Stormwater Management Control Ordinance will require that all new development and redevelopment projects comply with the Soil Erosion and Sediment Control Standards of New Jersey. In cooperation with the Freehold Soil Conservation District, Borough personnel will observe on-site soil erosion and sediment control measures as part of the construction site inspections.

All development and redevelopment projects shall use the most recent DelMarVa unit hydrograph for stormwater calculations. In addition the Freehold Soil Conservation District requires the use of the most recent design storm rainfall data for stormwater calculations. The National Oceanographic and Atmospheric Administration (NOAA), the agency that develops statistical estimates of rainfall amounts, has increased its estimates for the majority of storm events, particularly the larger events. The following table indicates the old and new twenty-four hour rainfall amounts in inches for Monmouth County.

Table 5: NRCS 24 Hour Design Storm Rainfall Depth (inches) – September 2004

Storm Period	1 yr.		2 yr.		5 yr.		10 yr.		25 yr.		50 yr.		100 yr.	
	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New
Monmouth County	2.8	**2.9**	3.4	**3.4**	4.4	**4.4**	5.3	**5.2**	6.0	**6.6**	6.5	**7.7**	7.5	**8.9**

Source: NOAA

STORMWATER MANAGEMENT STRATEGIES

The Borough has reviewed its Master Plan (2003), and its pertinent development ordinances for consistency with the new stormwater regulations. Based on its review the Board finds that the following sections must be modified in order to incorporate the NJDEP's nonstructural strategies for stormwater management. It should be noted that the Borough is fully developed and minimal "major development[1]" is anticipated.

- **Chapter 18-7.4 Parking:** This section defines the Borough's parking regulations and ratios. Currently, there is no minimum stall length. This section should be revised to allow for a minimum stall length of eighteen feet and allow for a reduction of the stall length, particularly if vehicles are allowed to overhang into vegetated areas. The Borough should also review the reduction of stall ratios, if possible. Additionally, they should investigate establishing a landscape or buffer ordinance associated with the parking ordinance to encourage the disconnection of impervious surfaces.

- **Chapter 18-13.17 Design Standards:** This section describes the Borough's required design standards. This section should be modified to comply with the design, performance and safety standards described in the MSWMP.

- **Chapter 18-13.18 Design of Improvements:** Sidewalks and Curbing: This section should be modified to encourage the use of permeable paving systems for sidewalks where appropriate.

- **Chapter 18-13.19 Storm Drain Facilities:** This section describes the design and requirements for storm drainage in the Borough. This section should be updated to comply with the design, performance and safety requirements described in this MSWMP. This section may be revised or superceded by future NJDEP required municipal stormwater control ordinance.

[1] Major Development – means any development that provides for ultimately disturbing one or more acres of land or increases impervious surface by one-quarter acre or more. Disturbance for the purpose of this rule is the placement of impervious surface or exposure and/or movement of soil or bedrock or clearing, cutting, or removing of vegetation. Projects undertaken by any government agency which otherwise meet the definition of 'major development' but which do not require approval under the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq., are also considered "major development."

- **Chapter 18-13.28 Offtract Improvements:** the stormwater section of this ordinance should be revised to comply with the design, safety, and performance standards in this MSWMP.

- **Chapter 18-13.32 Site Maintenance During Construction:** This section should be modified to include the standards described in this plan.

Revisions of the ordinances identified above will allow the incorporation of the non-structural strategies. Drafts of the updated ordinances will be submitted to the County for review and approval within12 months of the MSWMP adoption.

NONSTRUCTURAL STRATEGIES

The MSWMP recommends the practical use of the following nonstructural strategies for all major developments[1] in accordance with the NJDEP *Best Management Practices (BMPs) Manual*:

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.
2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.
3. Maximize the protection of natural drainage features and vegetation.
4. Minimize the decrease in the pre-construction "time of concentration."
5. Minimize land disturbance including clearing and grading.
6. Minimize soil compaction.
7. Provide vegetated open-channel conveyance systems that discharge into and through stable vegetated areas.
8. Provide preventative source controls.

In addition, the NJDEP's *BMP Manual* further requires an applicant seeking approval for a major development[2] to specifically identify which and how these nonstructural strategies have been

incorporated into the development's design. Finally, for each of those nonstructural strategies that were not able to be incorporated into the development's design due to engineering, environmental, or safety reasons, the applicant must provide a basis for this contention.

Recommended Measures

Recommendations in the BMP manual may be implemented through the use of:

- **Vegetated Filter Strips**

  Vegetated filter strips are best utilized adjacent to a buffer strip, watercourse or drainage swale since the discharge will be in the form of sheet flow, making it difficult to convey the stormwater downstream in a normal conveyance system (swale or pipe).

- **Stream Corridor Buffer Strips**

  Buffer strips are undisturbed areas between development and the receiving waters. There are two management objectives associated with stream and valley corridor buffer strips:

  - To provide buffer protection along a stream and valley corridor to protect existing ecological form and functions; and
  - To minimize the impact of development on the stream itself (filter pollutants, provide shade and bank stability, reduce the velocity of overland flow).

  Buffers only provide limited benefits in terms of stormwater management; however, they are an integral part of a system of best management practices.

- **The Stabilization of Banks, Shoreline and Slopes**

  The root systems of trees, shrubs and plants effectively bind soils to resist erosion. Increasing the amount of required plant material for new and redeveloped residential and non-residential sites should be encouraged throughout the Borough. Planting schemes should be designed by a certified landscape architect to combine plant species that have complementary rooting characteristics to provide long-term stability.

- **Deterrence of Geese**

  Maintaining or planting dense woody vegetation around the perimeter of a pond or wetland is the most effective means of deterring geese from taking over and contaminating local lakes and ponds. Minimizing the amount of land that is mowed will also limit the preferred habitat for geese. Other methods and/or actions should also be investigated.

- **Fertilizers**

  The use of fertilizers to create the "perfect lawn" is an increasingly common problem in many residential areas. Fertilizer run-off increases the level of nutrients in water bodies and can accelerate eutrophication in the lakes and rivers and continue on to the coastal areas. The excessive use of fertilizer causes nitrate contamination of groundwater. Good fertilizer maintenance practices help in reducing the amount of nitrates in the soil and thereby lower its content in the water. Initially, the Borough should work with the NJDEP to educate homeowners of the impacts of the overuse of fertilizers. This discussion should include other techniques to create a "green lawn" without over fertilizing. Almost as important as the use of fertilizer, is the combination of over fertilizing and over watering lawns. In many cases this leads to nutrient rich runoff, which ultimately migrates to a nearby stream, lake or other water body. If fertilizer is applied correctly, the natural characteristics of the underlying soils will absorb or filter out the nutrients in the fertilizer.

STRUCTURAL STORMWATER MANAGEMENT[3]

In Chapter 9 of its *Stormwater Management Best Management Practices* (BMP) *Manual,* the Department of Environmental Protection identifies several structural stormwater management options. The Borough recommends the following structural devices. These structural methods should only be used after all non-structural strategies are deemed impracticable or unsafe. Specifically, the Borough encourages the use of structural stormwater management systems in a manner that maximizes the preservation of community character:

[3] Definitions provided in the NJDEP – Stormwater Best Management Practices Manual at: http://www.njstormwater.org/tier_A/ bmp_manual.htm

- **Bioretention Systems**

  A bioretention system consists of a soil bed planted with native vegetation located above an underdrained sand layer. It can be configured as either a bioretention basin or a bioretention swale. Stormwater runoff entering the bioretention system is filtered first through the vegetation and then the sand/soil mixture before being conveyed downstream by the underdrain system. Runoff storage depths above the planting bed surface are typically shallow. The adopted Total Suspended Solids (TSS) removal rate for bioretention systems is 90%.

- **Constructed Stormwater Wetlands**

  Constructed stormwater wetlands are wetland systems designed to maximize the removal of pollutants from stormwater runoff through settling and both uptake and filtering by vegetation. Constructed stormwater wetlands temporarily store runoff in relatively shallow pools that support conditions suitable for the growth of wetland plants. The adopted removal rate for constructed stormwater wetlands is 90%.

- **Dry Wells**

  A dry well is a subsurface storage facility that receives and temporarily stores stormwater runoff from roofs of structures. Discharge of this stored runoff from a dry well occurs through infiltration into the surrounding soils. A dry well may be either a structural chamber and/or an excavated pit filled with aggregate. Due to the relatively low level of expected pollutants in roof runoff, a dry well cannot be used to directly comply with the suspended solids and nutrient removal requirements contained in the NJDEP Stormwater Management Rules at N.J.A.C. 7:8. However, due to its storage capacity, a dry well may be used to reduce the total stormwater quality design storm runoff volume that a roof would ordinarily discharge to downstream stormwater management facilities. Care should be taken with the location and size of drywells due to potential impacts on basements and foundations.

- **Extended Detention Basins**

  An extended detention basin is a facility constructed through filling and/or excavation that

provides temporary storage of stormwater runoff. It has an outlet structure that detains and attenuates runoff inflows and promotes the settlement of pollutants. An extended detention basin is normally designed as a multistage facility that provides runoff storage and attenuation for both stormwater quality and quantity management. The adopted TSS removal rate for extended detention basins is 40 to 60%, depending on the duration of detention time provided in the basin.

- **Infiltration Basins**

  An infiltration basin is a facility constructed within highly permeable soils that provides temporary storage of stormwater runoff. An infiltration basin does not normally have a structural outlet to discharge runoff from the stormwater quality design storm, but may require an emergency overflow for extraordinary storm events. Instead, outflow from an infiltration basin is through the surrounding soil. An infiltration basin may also be combined with an extended detention basin to provide additional runoff storage for both stormwater quality and quantity management. The adopted TSS removal rate for infiltration basins is 80%.

- **Manufactured Treatment Devices**

  A manufactured treatment device is a pre-fabricated stormwater treatment structure utilizing settling, filtration, absorptive/adsorptive materials, vortex separation, vegetative components, and/or other appropriate technology to remove pollutants from stormwater runoff. The TSS removal rate for manufactured treatment devices is based on the NJDEP certification of the pollutant removal rates on a case-by-case basis. Other pollutants, such as nutrients, metals, hydrocarbons, and bacteria can be included in the verification/certification process if the data supports their removal efficiencies.

- **Pervious Paving Systems**

  Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. This reduction is achieved primarily through the infiltration of a greater portion of the rain falling on the area than would occur with conventional paving.

This increased infiltration occurs either through the paving material itself or through void spaces between individual paving blocks known as pavers. Pervious paving systems are divided into three general types. Each type depends primarily upon the nature of the pervious paving surface course and the presence or absence of a runoff storage bed beneath the surface course. Porous paving and permeable paver with storage bed systems treat the stormwater quality design storm runoff through storage and infiltration. Therefore, these systems have adopted TSS removal rates similar to infiltration structures. Care must be taken with the use of pervious systems to avoid subgrade instability and frost related deterioration. Pervious paving systems also require significant maintenance to maintain their designed porosity.

- **Sand Filters**

  A sand filter consists of a forebay and underdrained sand bed. It can be configured as either a surface or subsurface facility. Runoff entering the sand filter is conveyed first through the forebay, which removes trash, debris, and coarse sediment, and then through the sand bed to an outlet pipe. Sand filters use solids settling, filtering, and adsorption processes to reduce pollutant concentrations in stormwater. The adopted TSS removal rate for sand filters is 80%.

- **Vegetative Filters**

  Vegetated filter strips are engineered stormwater conveyance systems that treat small drainage areas. Pollutants suspended in the runoff or attached to the suspended soil particles are removed by filtration, absorption and gravity sedimentation.

  A vegetative filter is an area designed to remove suspended solids and other pollutants from stormwater runoff flowing through a length of vegetation called a vegetated filter strip. The vegetation in a filter strip can range from turf and native grasses to herbaceous and woody vegetation, all of which can either be planted or indigenous. It is important to note that all runoff to a vegetated filter strip must both enter and flow through the strip as sheet flow. Failure to do so can severely reduce and even eliminate the filter strip's pollutant removal capabilities. The total suspended solid (TSS) removal rate for vegetative filters will depend upon the vegetated cover in the filter strip.

- **Wet Ponds**

  A wet pond is a stormwater facility constructed through filling and/or excavation that provides both permanent and temporary storage of stormwater runoff. It has an outlet structure that creates a permanent pool and detains and attenuates runoff inflows and promotes the settlement of pollutants. A wet pond, also known as a retention basin, can also be designed as a multi-stage facility that also provides extended detention for enhanced stormwater quality design storm treatment and runoff storage and attenuation for stormwater quantity management. The adopted TSS removal rate for wet ponds is 50 to 90% depending on the permanent pool storage volume in the pond and, and the length of the retention time provided by the pond.

Each of these structures has advantages and disadvantages to manage stormwater. As previously noted, West Long Branch is a fully developed community and anticipates the majority of new construction as residential infill development that will disturb less than 1 acre of land.

LAND USE/ BUILD-OUT ANALYSIS

The Borough has approximately 350 acres of developable land (see Table 3). As the Borough of West Long Branch has less than one (1) square mile of developable or vacant land, it is exempt from the NJDEP regulations requiring the development of a build-out analysis, which would indicate the potential for development within the Borough. Refer to Figure 7 for a copy of the Borough's Existing Land Use Map and Figure 8 for the zoning map. Figure 9 illustrates the Hydrologic Units (HUC-14s) within the Borough and Figure 10 shows the environmental constrained lands.

Figure 7: Existing Land Use Map

Figure 8: Zoning Map

Figure 9: Hydrologic Units - HUC-14s

Figure 10: Environmental Constraints

MITIGATION PLAN

This mitigation plan is provided for proposed development or redevelopment projects that seek a variance or exemption from the stormwater management design and performance standards set forth in this MSWMP and N.J.A.C. 7:8-5.

MITIGATION PROJECT CRITERIA

To grant a variance or exemption from the stormwater regulations, new development and redevelopment plan applications must propose a mitigation project located within the same drainage basin as the proposed development/redevelopment. Proposed mitigation projects must provide for additional groundwater recharge benefits, protection from stormwater runoff quantity or quality from previously developed property that does not currently meet the design and performance standards outlined in this MSWMP. Mitigation projects should also be as close in terms of hydrology and hydraulics to the proposed development/redevelopment as possible.

Projects must be proposed on an equivalent basis. Developers must propose a mitigation project similar in kind to the variance or exemption being requested. Proposed mitigation projects cannot adversely impact the existing environment.

DEVELOPER MITIGATION PLAN REQUIREMENTS

Proposed mitigation projects shall have Mitigation Plans submitted to the Borough for review and approval prior to granting final approval for site development. Developers should include the following in a Mitigation Plan:

- Mitigation Project Name, Owner name and address, Developer name and address, Mitigation Project Location, Drainage Area, Cost Estimate;
- Proposed mitigation strategy and impact to sensitive receptor. What is being impacted, mitigated, and how;
- Legal authorization required for construction and maintenance;
- Responsible Party including: required maintenance, who will perform the maintenance, proposed cost of maintenance, and how it will be funded;

- All other permits required for construction of the mitigation project;
- Cost estimate of construction inspection; and
- Reason a waiver or exemption is requested and supporting evidence.

Due to the lack of vacant or developable land, it is anticipated that the majority of the mitigation projects proposed will result in retrofitting/rehabilitation of existing stormwater facilities and natural infrastructures. More detailed information may be available from the Borough or the Borough Engineer's office. It is the developer's responsibility to provide a detailed study of any proposed mitigation project, and provide the Borough with a proposed mitigation plan for review and approval.

RECOMMENDATIONS

The following are additional recommendations associated with this Stormwater Management Plan Element of the *Master Plan*:

- ***Recommendation A: Review and update the existing Zoning Regulations to implement the principals of non-structural and structural stormwater management strategies to reduce stormwater quantity, improve stormwater quality and to maintain or increase groundwater recharge.***

  Portions of the existing Zoning Regulations are inconsistent with recently adopted New Jersey Department of Environmental Protection (NJDEP) Stormwater Management Regulations and the NJDEP *Best Management Practices for the Control of Non-Point Source Pollution from Stormwater Manual*. Some of these inconsistencies are identified in Stormwater Management Strategies section above. The Borough should update their existing regulations to be in conformance with these regulations and to minimize inconsistencies or conflicts.

- ***Recommendation B: Educate residents on the impacts of the overuse of fertilizers and good fertilizer maintenance practices.***

  As stated in the Stormwater Management Strategies section above, the overuse of fertilizers has a significant detrimental impact on surface water bodies and groundwater. The Borough should work with the NJDEP to educate residents on these impacts and encourage residents to use techniques to create a "green lawn" without over- fertilizing and/or to convert lawn areas to other kinds of vegetation that do not require fertilization and other chemical treatments including pesticides. Many lawn services also "overspray" fertilizer onto roadways and adjacent properties. The Borough should investigate methods to minimize the application of fertilizers beyond property lines.

- ***Recommendation C: Educate residents on techniques to deter geese.***

  Geese population can take over and contaminate local water bodies. The planting of vegetation around the perimeter of a waterbody is an effective means of deterring geese.

- ***Recommendation D: Seek to ensure the proper inspection, monitoring, and maintenance of all stormwater management facilities and develop strategies for all existing and future maintenance and improvements.***

  Stormwater facilities require regular maintenance to ensure effective and reliable performance. Failure to perform the necessary maintenance can lead to diminished performance, deterioration and failure. In addition, a range of health and safety problems, including mosquito breeding and the potential for drowning, can result from improperly maintained facilities. To minimize these risks, the Borough should implement a procedure for regular inspection, monitoring, and maintenance of Borough owned stormwater facilities.

  Additionally, there are a number of privately maintained stormwater facilities within the Borough. The Borough should work with the various property owners, residents and business owners to identify maintenance and/or improvements needs and develop strategies for regular inspection and maintenance of these facilities.

  The Borough should also encourage the use of low impact design methods and non-structural strategies that require less maintenance.

- ***Recommendation E: Encourage existing storm drains to be replaced with bicycle safe grates and Campbell Foundry Model #_____ inlet heads (or approved equal) to prevent floatable and solid debris from entering the storm water conveyance system.***

  Typical roadway debris, such as bottles and cans, can easily enter stormwater conveyance systems through typical inlet openings. This debris is then transported downstream into the

receiving water bodies. By replacing existing storm drain inlets with new inlet grates and inlet heads, which have a maximum opening size of 2-inches by 4-inches, the amount of debris entering the stream can be reduced, improving water quality.

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