

SANITARY SEWER MASTER PLAN

And

INFLOW/INFILTRATION STUDY

FOR THE

CITY OF WILDWOOD SEWER UTILITY

CAPE MAY COUNTY, NEW JERSEY

REMINGTON, VERNICK & WALBERG ENGINEERS

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I. PURPOSE

The City of Wildwood Sanitary Sewer Master Plan & Inflow/Infiltration Study has been combined to provide a comprehensive report for the short and long range sanitary sewer system improvement plan. The Sanitary Sewer Master Plan element analyzes the capacity of the existing sanitary sewer system based on the City's Comprehensive Master Plan and the Land Development Ordinance for the City of Wildwood. The recommended improvements are based on the goals and objectives of these planning resources to insure meeting the purposes, goals and objectives outlined in the two documents.

The Wildwood Master Plan establishes a vision of the City as re-establishing its former pre-eminence as a seaside resort, taking advantage of its location and building on the existing compact urban form.

The Land Development Ordinance was adopted pursuant to the New Jersey Municipal Land Use Law (N.J.S.A. 40:55D-1 et seq.) in order to promote and protect the public health safety, morals and general welfare of the residents, commercial operators and visitors to the City of Wildwood and in the furtherance of the related and more specific objectives as established in N.J. S.A. 40:55D-2.

The development of the Tourist Entertainment (T/E), Hotel/Motel (HM/HM-1) and Boardwalk Amusement (BA) districts will result in the need for the development of additional housing units. This need will encourage the conversion of non-conforming less dense existing housing structures into higher density structures as allowed by the Land Use Ordinance. Therefore, future development can be visualized throughout all zoning districts. Additional housing units encourage additional commercial development with residential units above and so on.

The City sanitary sewer infrastructure must be capable of supporting future development to provide the City with an increased grand list.

The Sanitary Sewer Master Plan element analyzes the capacity of the existing system to convey future (2050) flows to the Spicer Avenue Pump Station. The Spicer Avenue Pump Station is owned and operated by the Cape May County Municipal Utilities Authority.

The Inflow/Infiltration Study element analyzes the source of inflow and infiltration into the existing sanitary sewer system. Excessive inflow and infiltration causes wastewater treatment facilities to be taxed beyond their specified capacities. Public health and safety issues are adversely impacted and the environmental impact is increased as the treatment of the plant's effluent falls below the regulated treatment standards. Economically, the treatment costs are significantly increased as a treatment plant is treating both wastewater and water from inflow and infiltration.

II. DESIGN CRITERIA

A. General

The 2007 Comprehensive Master Plan Update recognized the fully developed urban nature of the City of Wildwood. The City has little available privately owned vacant properties for development. The Master Plan Update's main objective is to transform the City from a seasonal resort to a year-round destination. The Land Use Plan reinforces the integrity of the residential districts while permitting an increased intensity of development in the City's tourism zones. Intensive tourist development will result in the

need for additional housing to provide for the growth in local employment. As little vacant land is available, it is realistic to project the loss of single and two family dwelling units in the High Density Residential (R-3) and the Residential Multi-Family (RM) districts to make way for increased density as allowed by the Land Use Ordinance.

The Master Plan Update includes building height in the General Commercial districts to allow above ground floor residential units.

The standard design life for sanitary sewers is 50 years. Analyzing the existing development, along with the Comprehensive Master Plan Update, it is reasonable to conclude the City would be developed to its maximum intensity by the year 2050.

B. Design Parameters

The City of Wildwood Land Development Ordinance Section 400, adopted April 15, 2008 (Ordinance No. 728-08) was used in determining the maximum allowable density of future development.

Projected design flows were calculated using the maximum allowable density, the maximum allowable principal building coverage and a typical unit size of three (3) bedrooms/unit.

1. Projected Average Daily Flow Per Acre

A projected design flow factor in gallons per square foot was calculated. The flow factor was then multiplied by the total area of the drainage area, multiplied by 80% to reflect the undevelopable area (publics right-of-way), and then multiplied by 80% to reflect the total number of acres developed to maximum density. The resultant is the Projected Average Daily Flows in gallons/day/acre for each zoning district. (See Exhibit #1).

2. Development Factor

A Development Factor was calculated to determine the project gallons per square foot generated by each zoning district at maximum density. The basis of the calculation can be found in Exhibit #2.

3. Projected Flow Criteria

The projected flow generated by each "type of establishment" was in accordance with "NJDEP 7:14A-23.3 Projected flow criteria." These values are shown on Exhibit #3.

4. Analysis of Existing Pipe Capacity

The City of Wildwood has little grade deviations throughout the island. Field surveys completed for recent (within the last ten years) sanitary, storm, water and roadway projects verify the relatively flat surface grades and minimal slopes on the existing sanitary sewer and storm drain systems. Therefore, in evaluating the existing system capacity, the pipe size was analyzed using the minimum allowable

slopes in accordance with NJDEP 7:14A-23.6 Sanitary Sewer Design. The pipe sizes and allowable minimum slopes for PVC pipe are shown on Exhibit #4.

Further, the pipe was analyzed to carry at least twice the estimated average projected flows when flowing half full per Section 7:14A-23.6 (b.)

5. Age of Sewers

The map entitled "Age Map" indicates the approximate age of each sewer reach. This information was derived from various past maps, reports and interviews with Sewer Utility staff. It can be reasonably stated the majority of sewers 25 years old and older, should be monitored on a regular basis. The asbestos concrete pipes have likely outlived their design life. Therefore, the City should perform television inspection of these sewers whenever the City plans to reconstruct the street pavements. If necessary, these pipes should be replaced as part of the street reconstruction.

C. Analysis of the Collection System

1. General

The proposed sewer replacement program is based on an analysis of the existing flow patterns, age and structural condition of the pipe. All sanitary sewers flow to the Cape May County Municipal Utility Authority (CMCMUA) Pump Station located at the intersection of Park Boulevard and Spicer Avenue. From there it is pumped down Park Boulevard and up Rio Grande Avenue to the CMCMUA treatment plant. As the proposed sanitary sewer replacement will be phased over several years, it is recommended to maintain the existing flow patterns wherever possible to maintain the integrity of the overall systems. Therefore, proposed replacement will be either in the same location, or immediately parallel to the existing sanitary sewer. This will insure the proper connection of all existing sanitary laterals to the main sewer.

2. General Sewer Classifications

There are four classifications of existing sewers:

- a.) Interceptor Sewer – the sewer which collects flow from all drainage areas and conveys these flows to the CMCMUA.
- b.) Major Collector – the sewer which collects flow from two or more major sub-drainage areas.
- c.) Collector – the sewer which collects flow from a single major sub-drainage area.
- d.) Local Collector – the sewer, part of a major sub-drainage area, which collects flow from one or more individual streets.

3. System Classifications

Generally, the existing sanitary sewers fall into the following categories:

- a.) Interceptor Sewer
 - 1.) Park Boulevard from Cresse Avenue to Juniper Avenue.

b.) Major Collector Sewers

- 1.) Spencer Avenue from the Boardwalk to Park Boulevard.
- 2.) Wildwood Avenue from Park Boulevard to Atlantic Avenue.
- 3.) Atlantic Avenue from Rio Grande Avenue to Spencer Avenue.

c.) Collector Sewers

- 1.) Magnolia Avenue from New Jersey Avenue to Park Boulevard
- 2.) Wildwood Avenue from New Jersey Avenue to Park Boulevard
- 3.) Artic Avenue from Cresse Avenue to Lincoln Avenue

d.) Local Collectors make up the remaining system network.

The "Existing Sanitary Sewer System Map" shows the complete system including size, type of material and direction of flow.

III. INFLOW/INFILTRATION

A. Introduction

Inflow and infiltration or I & I are terms used to describe the ways that groundwater and stormwater enter into dedicated sanitary sewer systems. Dedicated sanitary sewers are pipes located in the street or on easements that are designed strictly to transport wastewater from sanitary fixtures inside your house or place of business. Sanitary fixtures include toilets, sinks, bathtubs, showers and lavatories.

Inflow is stormwater that enters into sanitary sewer systems. Various sources contribute to the inflow, including through manhole covers, footing/foundation drains, roof drains or leaders, downspouts, drains from window wells, outdoor basement stairwells, drains from driveways and groundwater/basement sump pumps. These sources are typical improperly or illegally connected to sanitary sewer systems, via either direct connections or discharge into sinks or tubs that are directly connected to the sewer system. An improper connection lets water from sources other than sanitary fixtures and drains to enter the sanitary sewer system. That water should be entering the stormwater sewer system or allowed to soak into the ground without entering the sanitary sewer system.

Improper connections can be made in either residential homes or businesses and can contribute a significant amount of water to sanitary sewer systems. Eight inch sanitary sewer pipes can adequately move the domestic wastewater flow from up to 200 homes, but only eight sump pumps operating at full capacity or six homes with downspouts connected to the sanitary sewer pipe will overload the capacity of the same eight inch sewer pipes. A single sump pump can contribute over 7,000 gallons of water to sanitary sewer systems in a 24 hour period, the equal of the average daily flow from 26 homes.

Infiltration is groundwater that enters sanitary sewer systems through cracks and/or leaks in the sanitary sewer pipes. Cracks or leaks in sanitary sewer pipes or manholes may be caused by age related deterioration, loose joints, poor design, installation or maintenance errors, damage or root intrusion. Groundwater can enter these cracks or leaks wherever sanitary sewer systems lie beneath water tables or the soil above the sewer systems becomes saturated. Average sewer pipes are designed to last about 20-50 years,

depending on what type of material is used. Often sanitary sewer system pipes along with the lateral pipes attached to households and businesses have gone much longer without inspection or repair and are likely to be cracked or damaged.

Inflow and infiltration water is called "clean water" (although it may be dirty) to distinguish normal sanitary sewage water in the sewer system. Inflow and infiltration add clear water to sewer systems increasing the load on the systems. Clear water belongs in stormwater sewers or on the surface of the ground, and not in the sanitary sewers. When clear water enters sanitary sewer systems, it must be transported and treated like sanitary waste water. During dry weather, the impact of inflow and infiltration can vary from minimal impact to a significant portion of the sewer pipe flow. Wet weather and above normal tides magnify existing inflow and infiltration sources. As a rain or tidal event begins, the inflow and infiltration sources start filling the sanitary sewer systems with clear water, eventually filling the sewer systems to capacity. Once the sanitary sewer systems have reached capacity and become overloaded, wastewater flows at much higher water level than normal and if sanitary fixtures or drains are below this overload level, water will flow backward through the sanitary pipe, flooding basements or households and causing manholes to pop open releasing waste onto the street.

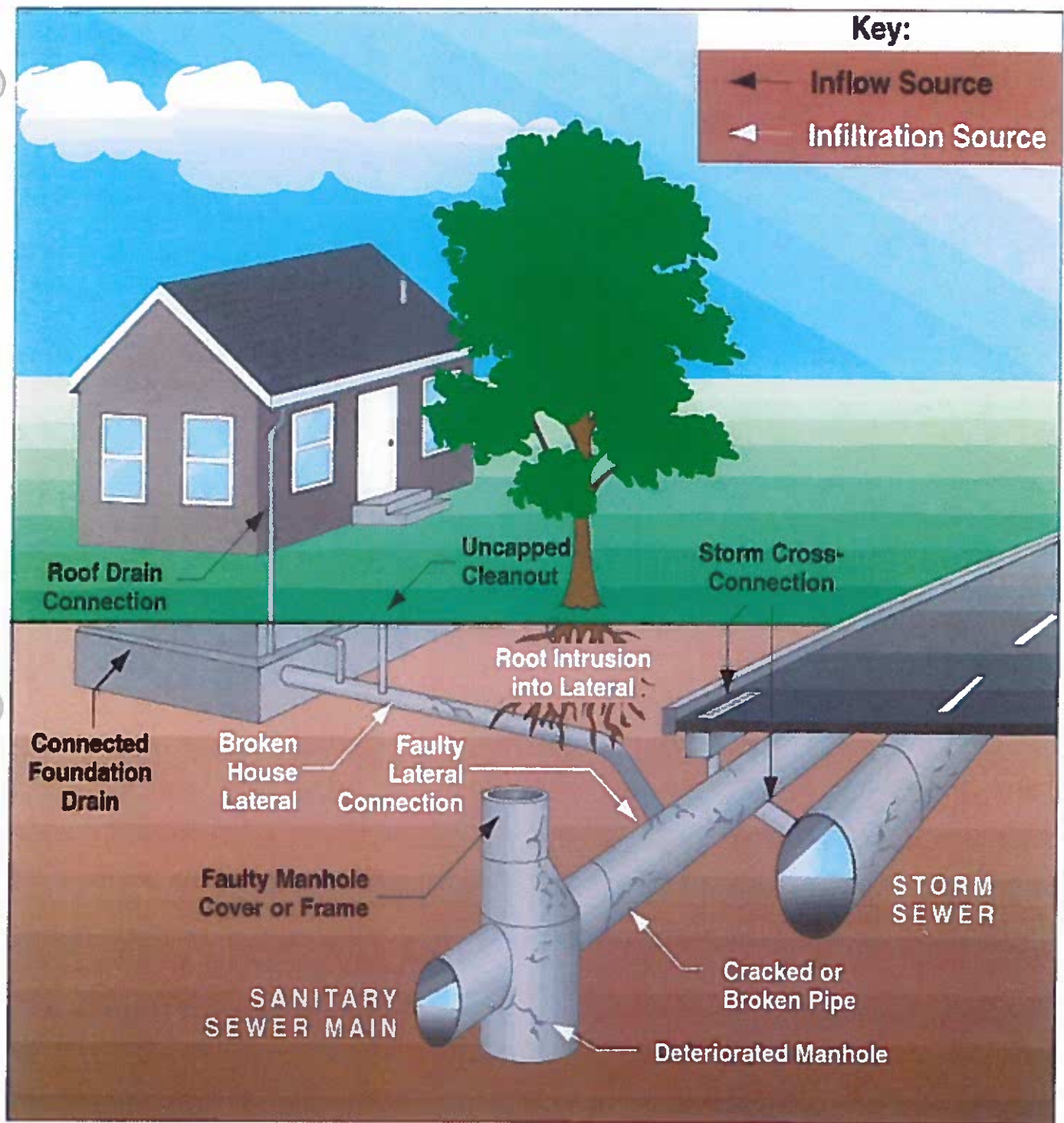
Overflow occurrences put public health at risk and violate state and federal environmental regulations. Sanitary sewer overflows release wastewater and potential pathogens onto streets into waterways, and basements increasing potential health risks. As wastewater overflows into the street, it is collected by the storm sewer system and outlets into the bay or ocean, it contaminates the water and all creatures/plants coming in contact with the polluted water. Sewer overflows also contribute to beach advisories and closures due to contamination.

Inflow and infiltration reduce the ability of sanitary sewer systems and treatment facilities to transport and treat wastewater. As a result of the inflow and infiltration, wastewater treatment processes are disrupted and poorly treated wastewater is discharged to the environment.

Eventually, new homes or businesses may not be allowed to connect to the sanitary sewer system if the inflow and infiltration issues are not corrected, increasing costs to residents as new sanitary sewer systems are installed or potentially lowering housing values due to the inability to develop land for future growth.

Inflow and infiltration costs water treatment facilities and consumers large amounts of money in water treatment operating expenses. All water entering a water treatment facility must be treated as wastewater causing an increase in operating costs proportional to the amount of clean water entering the sanitary sewer system due to inflow and infiltration. Costs associated with processing the added clean water from inflow and infiltration eventually passed back to the consumer in the form of rate increases. By reducing inflow and infiltration, capital and operating costs can be lowered. Minimizing inflow and infiltration can increase the lifetime-capacity of a treatment facility and wastewater transportation system. The pumps that are involved with wastewater treatment and transport operate 24 hours a day seven days a week; however they must work harder as the sewer system's water level load increases. This puts an unneeded strain on the pumps and shortens the life expectancy of these expensive pumps.

The following illustration identifies the common sources of inflow and infiltration.



Wildwood Infiltration and Inflow

B. Inflow and Infiltration Investigations

1.) General

Several investigative actions were undertaken in an effort to determine the location of the points and magnitude of inflow and infiltration into the City of Wildwood's sanitary sewer system. The actions included:

1. Interviews were conducted with various personnel of the City of Wildwood Sewer Utility;
2. Review of previous studies and reports;
3. Review of recent sanitary sewer improvement projects undertaken of the last ten years;
4. Monitoring of dry and wet weather flows at selected system manholes;
5. Observation of areas of frequent flooding caused by significant rainfall events;
6. Television inspection of selected reaches of the sanitary sewer system; and
7. Field observation of roadway surface deficiencies indicative of pipe failure.

The City of Wildwood is unique in the natural factors impacting the rate of inflow and infiltration. Being a low-lying island, the City's sanitary sewer system is impacted by the daily fluctuation of groundwater levels caused by rising tides and surface flooding caused by excessive high tides. The backing up of wastewater due to the overloading of the sanitary sewers has resulted in wastewater bubbling out of manhole as observed during periods of surface flooding.

2.) Interviews

The City of Wildwood Sewer Utility staff was interviewed and provided valuable information concerning the existing piping network, history of problem areas and recent corrective actions, whether permanent or temporary, undertaken by the Sewer Utility. This information was used in conjunction with the research and all inspections performed as part of this Inflow/Infiltration Study.

3.) Age of Overall System

A gathering of plans of sanitary replacement projects undertaken by the City along with information from previous overall City sanitary sewer system maps by various engineering companies were used to prepare the map entitled "Age Map of Sanitary Sewers". The ages are classified as:

1. 2001-2009 (8 years of service)
2. 1994-2001 (15 years of service)
3. 1984-1994 (25 years of service)
4. Pre-1984 or date unknown (over 25 years of service)

Sanitary sewers have an average life span of 20 to 50 years depending on the pipe material and if installed properly. A look at the map clearly indicates the majority of the sanitary sewers are less than 25 years of age. The City's aggressive sanitary sewer replacement programs have eliminated what can be classified as sewers which have outlived their expected life span. Sanitary sewers considered a source of infiltration as

has been verified by the December, 2009 and January, 2010 television inspection program.

4.) Previous Inflow Infiltration Study

The Cape May County Municipal Utilities Authority completed an inflow infiltration study in July, 1979. The study identified:

1. Manholes with Inflow Problems
2. Manholes with Infiltration Problems
3. Manholes with Inflow and Infiltration Problems
4. Sewer reach with Inflow and/or Infiltration Problems

There has been a significant amount of installation of sanitary sewers throughout the City since July, 1979. A comparison of the problem locations with the post-July 1979 sanitary sewer improvement projects was made. The sewer reaches with inflow and infiltration problems not replaced since completion of the 1979 I/I Study are shown on the map entitled "Sewer Reach with Inflow and/or Infiltration Problems".

The map entitled "Sanitary Sewer Manhole Inventory" shows the manholes with inflow and/or infiltration problems based on individual inspections conducted in 2008 and 2009.

The television inspection program was conducted in December, 2009 and January, 2010. The results of the television inspection program are shown on the map entitled "Sewer Reach with Inflow and/or Infiltration Problems".

5.) Monitoring of Wet and Dry Weather Flows

The monitoring of wet and dry weather flows was conducted along with the individual manhole inspections. The wet weather flows were conducted during and immediately following the rain events. Flow rates were also observed during periods of localized street flooding due to high tides.

Metering conducted by the CMCMUA at the Spicer Avenue Pump Station indicates extremely high amounts of infiltration and inflow during periods of heavy rain coupled with high tides causing surface flooding, as well as, periods of only surface flooding. Rainfall without concurrent high tides shows a significantly lower amount of inflow/infiltration.

Flow records for the Spicer Avenue CMCMUA Pump Station had flow readings as follows:

Tuesday	September 8	1.272 MGD	September 9, 10 & 11, 2009
Wednesday	September 9	1.328 MGD	Total Rainfall 2.4 Inches
Thursday	September 10	4.802 MGD	Above Normal Tide Levels
Friday	September 11	4.475 MGD	
Saturday	September 12	2.648 MGD	
Sunday	September 13	2.173 MGD	
Monday	September 14	1.803 MGD	

Tuesday	September 22	1.355 MGD	September 23, 2009
Wednesday	September 23	1.582 MGD	Total Rainfall 0.49 Inches
Thursday	September 24	1.508 MGD	Slightly Above Normal Tide Levels

Wednesday	October 14	0.98 MGD	October 15 & 16, 2009
Thursday	October 15	2.035 MGD	Total Rainfall 0.56 Inches
Friday	October 16	3.005 MGD	Above Normal Tide Levels
Saturday	October 17	3.082 MGD	
Sunday	October 18	2.742 MGD	
Monday	October 19	1.432 MGD	

6.) Manhole Inventory

There are approximately four hundred ninety known manholes within the City of Wildwood's sanitary sewer system. Each and every accessible sanitary sewer manhole was inspected. The inspection reports included time of day, tide level, current weather, type of manhole cover, type of material, i.e., precast concrete, brick or block, pipe sizes and depth of flow. The information has been summarized on the map entitled "Sanitary Sewer Manhole Inventory." The map shows the general condition of each manhole as good, fair or poor. The factors used to classify each manhole included the condition of the manhole walls, manhole stairs, invert channels, wall penetration of pipes and the manhole frame and cover.

The classification reflects the ability of the manhole structure to minimize the amount of infiltration. The classification factors include the degree of porosity of the manhole walls, the condition of a waterstop around the perimeter of all pipes entering and exiting from the manhole, the condition of the invert channel and the condition of any pipe ends protruding beyond the manhole wall into the invert channel.

A classification of "good" would reflect little to no sources of infiltration. A classification of "fair" reflects the existence of one condition allowing infiltration. A classification of "poor" reflects the existence of two or more sources of infiltration.

7.) Surface Flooding of Public Rights-of-Way

The City of Wildwood, being a low-lying island, is subject to tidal conditions causing local street flooding. The worst case scenario occurs during high tides accompanied by rainfall or from extreme high tides which crest over the existing bulkheads, embankments and revetments. The street flooding is the cause of significant inflow into the sanitary system through the existing manhole covers. At times the sanitary system becomes overloaded and backs up into the streets through the same manhole covers which allowed the inflow in the first place.

The sanitary sewer manhole inventory included a description of the manhole cover. The classifications were "vented" (more than two holes through the cover), "semi-vented" (two or less holes through the cover) and "solid" (only pick holes on the edge of the solid cover). When street flooding occurs, the manhole covers are submerged allowing significant inflow into the sanitary sewer system. The map entitled "Sanitary Sewer

Manhole Inventory” indicates the limits of flooding observed during the storm events of September 9 and 10 and October 16, 2009. These areas were compared with the limits of flooding determined during the preparation of the City of Wildwood Storm System Master Plan. The areas of frequent flooding are significant and are generally along:

- a. Pacific Avenue from Cresse Avenue to Garfield Avenue;
- b. Park Boulevard from Oak Avenue to Twenty Sixth Avenue and Youngs Avenue to Spicer Avenue;
- c. Hudson Avenue from Spicer Avenue to Twenty Sixth Avenue;
- d. Avenues between Park Boulevard and Lake Avenue between Pine Avenue and Twenty Sixth Avenue;
- e. Avenues between Park Boulevard and Susquehanna Avenue between Spicer Avenue and Wildwood Avenue;
- f. Dock Road and Montgomery Avenue between Otten’s Harbor and Youngs Avenue;
- g. Susquehanna Avenue, Hudson Avenue and Burk Avenue between Hand Avenue and Mediterranean Avenue; and
- h. Various isolated intersections.

8.) Television Inspection

A television inspection program of selected lengths of sanitary sewers was completed in December, 2009 and January, 2010. The purpose of the program was to determine the structural integrity of the pipe and the possible illegal connections between storm water facilities and the sanitary sewer. The results of the television inspection program have been summarized on the map entitled “Sewer Reach with Inflow and/or Infiltration Problems.”

9.) Roadway Surface Inspection

Each street, within the City of Wildwood, was visually inspected for signs of sewer pipe failure. For example, pavement depressions over the sewer pipe indicates the loss of trench backfill material thorough either open pipe joints, cracked pipe or structural failure of a section of sewer pipe. The more defined the depression the more severe the deterioration of the pipe or pipe joint. If left untreated the depression will increase causing a safety hazard. Television inspection results for the areas of concern are included on the map entitled “Sewer Reaches with Inflow and/or Infiltration Problems”.

IV. RECOMMENDATIONS

A. General

The Sanitary Sewer Master Improvement Plan indicates the proposed system wide improvements reflecting the need to replace portions of the existing system. The factors used to determine the need to replace included:

- 1.) Physical Condition (Televising Inspections)
- 2.) Degree of Infiltration (Television Inspection)
- 3.) Capacity
- 4.) Age
- 5.) Type of Material

6.) Maintenance Records

The City of Wildwood has been very aggressive in the replacement and repair of their existing sanitary sewer system, especially over the past ten (10) years.

The City has used USDA Sewer and Water grant/loan programs. Several projects leveraged NJDOT and County funding. The City's methodology has been to insure replacement/repair of sanitary sewers be included in roadway improvement projects.

The first recommendation is to continue to leverage grant/loan funds to replace/repair sanitary sewers. The City should include the cost of television inspection of sanitary sewers in all design contracts to determine the need to replace or repair in conjunction with all roadway improvement projects. Although a segment of the existing system may not appear on the Sanitary Sewer Master Improvement Plan, that segment should be inspected as the infrastructure continues to age and wear.

The proposed sewer replacement program is based on an analysis of the existing flow patterns, age and condition of the pipe. It is recommended to maintain the existing flow patterns wherever possible. The major future development areas are along Ocean and Atlantic Avenues to the east and along the Bay to the west. The interceptor sewers carry large quantities of flow. The replacement of these lines in their existing locations may require continuous by-pass pumping. Options to replacing in place are to run a parallel sewer, within the existing right-of-way or to install a new sewer in a parallel street where only local flows would have to be by-passed. These options should be analyzed during the design process.

Wherever an existing sewer may be in good condition, but does not have the capacity to carrying the projected flows, changes in the existing flow pattern should be analyzed to install a parallel sewer to replace a parallel sanitary sewer which may be in poor condition and in need of replacement.

B. Sanitary Sewer and Manhole Improvements

1. General

The manhole inspections, television inspections and wet/dry weather flow monitoring indicates the sanitary sewer system is subjected to both inflow and infiltration. The Key factor of inflow is surface flooding. There was no evidence of significant illegal connections. However, with each sanitary sewer replacement project, all service laterals should be observed/investigated to insure no illegal connections, such as, sump pumps, roof leaders and the like exist.

There were various degrees of infiltration through pipe joints and manhole walls observed during the preparation of this report. The major contributing sewers and manholes are identified on the "Sanitary Sewer Manhole Inventory" and "Sanitary Sewer Master Improvement Plan."

2. Manholes

It is recommended the City make the replacement/rehabilitation of all manholes a priority in their Capital Improvement Plan. A schedule for replacement/rehabilitation should be phased with the manholes rated "poor" having the first priority. Upon completion of

addressing the "poor" manholes, the City shall reinspect the manholes rated "fair" as the conditions at the time of the inspections may have worsened.

It is recommended the City make the installation of watertight manhole covers and frames a priority. The quantity of inflow due to surface flooding is the major source of inflow into the sanitary sewer system. During heavy rains this inflow quickly overloads the system resulting in bubbling up of the system onto the surface. These efforts should be concentrated on the "areas of frequent flooding."

The priority of manhole replacement/renovation shall be as follows:

- a. Replacement of all vented and semi-vented manhole covers located in frequently flooded areas, with "watertight frames and covers."
- b. All manholes classified as in "poor" condition shall be replaced in total. "Poor" manholes have a least two of the following manhole deficiencies: cracks in the walls, no waterstops around the entering and exiting pipes, loss of mortar in the joints of brick and/or block manholes, deteriorated manhole steps, deteriorated frames and/or covers and settlement. There are a total of sixty-two (62) [12.6% of all manholes] existing manholes meeting the characteristics of "poor."
- c. All manholes classified as in "fair" condition shall be renovated addressing the points of inflow/infiltration. The renovations may include one or more of the following actions: repair of structure walls, installation of waterstops around pipes, installation of new manhole steps and replacement of frame and/or cover. There are a total of ninety-four (19%) existing manholes meeting the characteristics of "fair."
- d. All manholes classified as in "good" condition located in areas of frequent flooding and equipped with vented and semi-vented manhole covers shall be equipped with "watertight frames and covers".
There are forty-three (43) existing manholes classified as "good" which have vented and semi-vented manhole covers contributing to system inflow. Ten (10) of these manholes are located in areas of frequent flooding.
- e. There are seventy-five (75) "good" manholes, thirty-six (36) "fair" manholes and twenty-two (22) "poor" manholes located in areas of frequent flooding.

3. Sanitary Sewers

It is recommended the sanitary sewers subject to excessive infiltration be included in the City's Capital Improvement. Those sanitary sewers subject to excessive infiltration and which do not have the capacity to accommodate anticipated future flows should be given the top priority for replacement. Sanitary sewers identified as having excessive infiltration, but not ample capacity for future flows should be the second priority.

4. Boardwalk Sanitary Sewer

The City is in the process of replacing the Boardwalk from the Convention Center to Poplar Avenue. The portion between Schellenger Avenue and Oak Avenue has been completed.

The existing sanitary sewer is in poor condition and should be replaced in conjunction with the Boardwalk Replacement Program. Should the replacement program not continue on a yearly basis, the replacement of the sanitary sewer should be undertaken as a separate project. The priority area is from Spicer Avenue to Schellenger Avenue. The second priority area is from Oak Avenue to Poplar Avenue.

During the preparation of this report, significant amounts of grease deposits have been observed in manholes and within the sewer lines. The grease deposits adversely impact the flow of effluent resulting in the "ponding" of low flows creating a septic environment. A complete survey of all grease/oil separators currently tied into the Boardwalk sanitary sewer system is recommended. The survey should identify the location, size and responsible party. Further, all sinks and floor drains shall be dye tested to insure they pass through the separator prior to entering the sanitary sewer. The separator should be inspected to insure it is functioning. A record of the dates on which the owner had the separators pumped out should be provided to the City's inspector during each inspection. It is recommended the inspection take place between April 1 and May 15 and again during the month of August to insure continued effective operation.

5. Park Boulevard

- a. The Park Boulevard sewer serves as the main interceptor sewer collecting flow from the east and west sides of the City and conveying the flow to the County's Pump Station, located on Spicer Avenue.
- b. Northerly Branch – The existing 24" to 21" diameter sewer, from Garfield Avenue to Wildwood Avenue, is in very poor condition and undersized for the projected flows and requires replacement. The existing 18" diameter sewer from Wildwood Avenue to Maple Avenue is also in very poor condition and requires replacement. The existing 15" diameter sewer from Magnolia Avenue to Juniper Avenue is also in very poor condition and requires replacement.
- c. Southerly Branch – The existing 36" to 24" PVC was recently replaced from Rio Grande Avenue to Spicer Avenue from 2006 through 2008. This section has capacity to convey the future projected flows. The section from Rio Grande Avenue to Cresse Avenue also has capacity to convey the future projected flows.

6. Spencer Avenue

- a. Park Boulevard to Atlantic Avenue – The existing sanitary sewer collects the flow from Atlantic Avenue, Ocean Avenue and the entire Boardwalk. The majority of the drainage area is comprised of Hotel/Motel (HM & HM-1), Tourist Entertainment (T/E), Boardwalk Amusement (BA) and General Commercial (GC). This area has the highest potential for future development. The City's Land Use Ordinance allows for the highest allowable density in the T/E, BA and HM/HM-1 zoning districts.

There are two (2) existing sewers within the street right-of-way. There is an 8" to 12" diameter high level sewer picking up local laterals. The main sewer 24" to 14" diameter carries the flows from the Atlantic Avenue, Ocean Avenue and Boardwalk drainage areas.

Due to the poor physical condition of the lower line, along with its inability to convey future flows, it is recommended to replace the two sewers with a single 27" diameter PVC from Park Boulevard to Atlantic Avenue.

7. Wildwood Avenue

- a. Park Boulevard to New Jersey Avenue – The existing 20" PVC has adequate capacity for the projected flows. Replacement of the existing 20" PVC is not warranted to accommodate the future development.

8. Atlantic Avenue

- a. Spencer Avenue to Davis Avenue – This section of the sanitary sewer system ranges in size from 12" to 16" diameter. Due to the age and deterioration, as well as its inability to convey future flows, this subdrainage area conveys flows from the T/E, HM/HM-1 and RM. This sewer should be replaced.

The projected future flow requires the installation of an 18" diameter PVC. This improvement will also replace the asbestos concrete pipes which have likely outlived their useful life.

V. CONCLUSION

A. Summary

The City has secured a commitment of \$7,400,000.00 for the improvement of various sanitary sewers included in this report. The monies are part of a USDA grant and loan program. It is recommended the City complete these improvements in an expeditious manner. These improvements are shown on the map entitled "Proposed Sanitary Sewer Improvements USDA."

The City should develop a five (5) year sanitary sewer system Capital Improvement Plan to address the recommended improvements contained in this Plan. The Plan should be coordinated with the City's Roadway Reconstruction Program.

Once the City has developed their Capital Improvement Plan, opinions of probable construction costs should be developed reflecting the construction environment at the time of the preparation of the Plan.

There are several sewers throughout the City needing to be replaced or repaired. Some sewers may require more attention than another. However, the priority should be the repair/replacement of the interceptor sewers first, major collectors second, collectors third and local collectors fourth. Although a local collector may be in worse condition, the impact of an interceptor sewer, in need of repair/replacement, failing will result in a much greater threat to public health and safety.

The City's resources should be directed toward the major replacements with yearly capital improvement allocations appropriated for emergency repairs.

B. Opinion of Probable Construction Costs

The Master Plan Sanitary Sewer Improvement Plan identifies the specific locations for replacement or repair of the existing sanitary sewers and manholes. The priority improvements are outlined in the City's \$7,400,000.00 USDA Phase 3 and Phase 4 Sanitary Sewer Improvement grant/loan project. These improvements represent a significant capital investment in the sanitary sewer system infrastructure. It is anticipated the improvements will be constructed between 2010 and 2015.

The Opinion of Probable Construction Costs for Phase 3A, Phase 3B and Phase 4, as presented in the USDA application are found in Exhibit 5.

The remaining proposed improvements should be incorporated in the Wildwood Sewer Utility's long term capital improvement plan. Opinions of probable construction costs, representing the appropriate bidding environment, should be developed at the time the projects are identified for inclusion in the capital improvement plan. The opinions of probable construction cost should be prepared by a licensed engineer, experienced with estimating in the Cape May County bidding environment existing at the time of preparation of the estimate.

EXHIBITS

Exhibit #1

Projected Average Daily Flow Per Acre

District		Gallons/Acre/Day (unadjusted)	Projected Average Daily Flow Gallons/Day/Acre (rounded to nearest one hundred gallons)
R1	Low Density Residential	2,600	1,700
R2	Moderate Density Residential	3,900	2,500
R3	High Density Residential	3,500	2,200
RM	Residential Multi-Family	3,500	2,200
WR	Waterfront-Residential	1,800	1,200
WR-1	Waterfront Residential 1	2,600	1,700
GC	General Commercial		
	General	6,500	4,200
	Pacific Avenue	9,200	5,900
HM & HM-1	Hotel-Motel & Hotel-Motel 1	16,500	10,600
LI	Light Industrial	3,500	2,200
MC-R	Marine Commercial-Residential	20,900	13,400
MC-T	Marine Commercial-Tourist	6,500	4,200
PO	Professional Office		
	General	6,500	4,200
	Pacific Avenue	10,500	6,700
BA	Boardwalk Amusement	7,000	4,500
T/E	Tourist Entertainment	17,500	11,200
BSRA	Bayside Redevelopment Area	7,000	4,500
P	Piers	10,500	6,700

EXHIBIT #2

DEVELOPMENT FACTOR

Basis of Calculations

I. Projected Gallons/Square Feet

- A. Residential Component (R-1, R-2, R-3, RM, WR, WR-1, BSRA, MC-T)
Allowable Maximum Density (sf/du) times 300 gallons/day/dwelling unit
times Allowable Maximum Building Coverage (%) = DF
- B. Residential Component (HM, HM-1, MC-R, T/E, BA)
1 SF times FAR (10) x Allowable Maximum Building Coverage (75%)
times 300 gallons/day/dwelling unit times percentage of total acres
to be developed as R.D.E. (25%)
- C. Restaurant Component
100 seats/acre times 35 gallons/seat times percentage of total acres
to be developed as restaurant (10%)
- D. Office Component (GC, PO)
1sf times 0.1 gallons/sf times Allowable Maximum Building Coverage
(50%)
- E. Piers
 - 1.) 300 seats (restaurant)/acre times 35 gallons/seat
 - 2.) 1 employee/500 sf x 10 gallons/employee.
- F. LI Component
1 employee/500 sf times 3 stores times gallons/employee (25) times
Allowable Maximum Building Coverage (50%)

II. Projected Average Daily Flow

Development Factor times 80%* times 80% **

* 80% total acres developable (20% is public right-of-way)

** 80% of total acres will be developed to maximum density

EXHIBIT #3 – PROJECTED FLOW CRITERIA

Type of Establishment	Measurement Unit	Gallons per day
Residential Dwellings (single family home, duplex units, townhouses, condominiums, apartments)		
1 bedroom unit	Per Dwelling	150
2 bedroom unit	Per Dwelling	225
3 bedroom unit or larger	Per Dwelling	300
Transit dwelling units		
Hotels	Bedroom	75
Lodging houses and tourist homes	Bedroom	60
Motels and tourist cabins	Bedroom	60
Boarding houses (max. permitted occupancy)	Boarder	50
Camps		
Campground/mobile rec. vehicle/tent	Site	100
Parked mobile trailer site	Site	200
Children's camps	Bed	50
Labor camps	Bed	40
Day camps – no meals	Person	15
Restaurants (including washrooms and turnover)		
Average restaurant	Seat	35
Bar/cocktail lounges	Seat	20
Fast food restaurant	Seat	15
24 hour service restaurant	Seat	50
curb service/drive-in restaurant	Car space	50
Clubs		
Residential	Member	75
Nonresidential	Member	35
Racquet Club	(Per court per hour)	80
Bathhouse with shower	Person	25
Bathhouse without shower	Person	10
Institutions (includes staff)		
Hospitals	Bed	175
Other Institutions	Bed	125
Schools (includes staff)		
No shower or cafeteria	Student	10
With cafeteria	Student	15
With cafeteria & showers	Student	20

With cafeteria, showers & laboratories Boarding	Student	25
	Student	75
Automobile service stations	Per filling position	125
Service bays	Per bay	50
Mini-market	Sq. Ft.	0.100
Miscellaneous		
Office buildings (gross area)	Sq. Ft.	0.100
Stores & shopping centers (gross area)	Sq. Ft.	0.100
Factories/warehouses (add process wastewater)	Employee	25
With showers (add process wastewater)	Employee	40
Laundromats	Per machine	580
Bowling Alleys	Alley	200
Picnic Parks (restrooms only)	Person	10
Picnic Parks with showers	Person	15
Fairgrounds (based upon average attendance)	Person	5
Assembly halls	Seat	3
Airports (based on passenger use)	Passenger	3
Churches (worship area only)	Seat	3
Theater (indoor)	Seat	3
Dinner Theater	Seat	20
Catering/Banquet Hall	Person	20
Sports Stadium	Seat	3
Visitor Center	Visitor	5

EXHIBIT #4

PIPE CAPACITY CHART

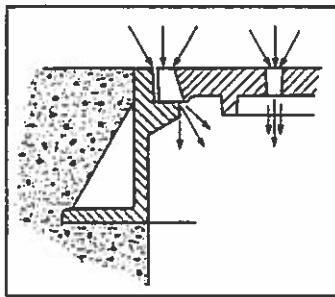
PVC Pipe (Polyvinylchloride) Pipe diameter (based on Kutter's or Manning's formula with $n = 0.01$)	Fall in feet per 100 feet of sewer
8 inches	0.30
10 inches	0.20
12 inches	0.15
14 inches	0.12
15 inches	0.10
16 inches	0.09
18 inches	0.075
20 inches	0.065
21 inches	0.06
24 inches	0.05
27 inches	0.042
30 inches	0.035
36 inches	0.028

EXHIBIT #5

Heavy Duty Watertight Manhole Frames and Covers

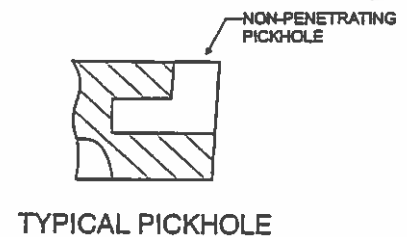
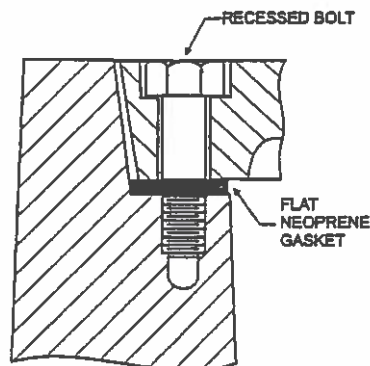
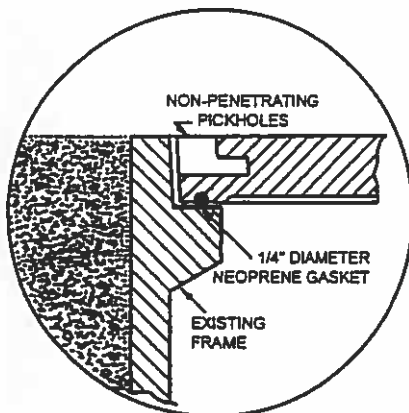
Bolted type units are made watertight by bolting and gasketing the cover to the frame with recessed stainless steel hex head bolts. The number of bolts used is determined by the size of the cover. A watertight seal is accomplished with non-penetrating pickholes in the cover and by fitting a flat neoprene gasket to the seat of the frame.

Many manhole covers in service today allow large volumes of unwanted storm water to flow into the sanitary system. As evidenced in the illustrations above, storm water can and does penetrate at the cover's pickholes, vent holes and at the bearing seat of the frame. This water cannot be separated and must be treated at the sewerage treatment plant. This becomes a very costly process.



"Flow-Seal" Covers have two basic features:

1. Non-Penetrating pickholes
2. A 1/4" diameter neoprene gasket (ASTM D2000 BC 608) fitted into a machined groove on the underside of the manhole cover.



DETAILS

TYPICAL METHOD

EXHIBIT #6

**RV
& W** REMINGTON, VERNICK AND WALBERG ENGINEERS
ENGINEER'S ESTIMATE

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 3A - Spencer Avenue
(From the Boardwalk to Atlantic Avenue)

PROJECT NUMBER:

05-14-U-044

CLIENT:

City of Wildwood

Sept. 21, 2009

#	DESCRIPTION	UNITS	ESTIMATE QUANTITY	EST. UNIT PRICE	AMOUNT
SEWER					
1	SANITARY SEWER MAIN, PVC	LF	450	\$120.00	\$54,000.00
2	SANITARY SEWER SERVICES, PVC	UNIT	13	\$850.00	\$11,050.00
3	SANITARY SEWER MANHOLES, 4' DIAMETER	UNIT	2	\$5,000.00	\$10,000.00
4	CONNECT TO EXISTING SANITARY SEWER	UNIT	2	\$1,000.00	\$2,000.00
5	DENSE GRADED AGG. BASE COURSE, 8" THICK	SY	855	\$12.00	\$10,260.00
STORM SEWER					
11	STORM INLETS	UNIT	2	\$3,500.00	\$7,000.00
12	STORM MANHOLES	UNIT	1	\$6,000.00	\$6,000.00
13	STORM PIPE	LF	85	\$150.00	\$12,750.00
ROAD RECONSTRUCTION					
14	PULVERIZED SOIL AGG. BASE COURSE, ROAD MIXED, 8" THICK	SY	1,850	\$10.00	\$18,500.00
15	HOT MIX ASPHALT BASE COURSE, MIX 1-2, 2" THICK	TON	255	\$65.00	\$16,575.00
16	HOT MIX ASPHALT SURFACE COURSE, MIX 1-5, 3" THICK	TON	385	\$68.00	\$26,180.00
17	CONCRETE GUTTER, 8" THICK	LF	800	\$25.00	\$20,000.00
18	CONCRETE VERTICAL CURB	LF	800	\$20.00	\$16,000.00
19	CONCRETE SIDEWALK	SY	380	\$60.00	\$22,800.00
20	CONCRETE DRIVEWAY, 6" THICK	SY	260	\$70.00	\$18,200.00
21	DETECTABLE WARNING SURFACES	SY	6	\$350.00	\$2,100.00
TOTAL					\$253,415.00

**RV
& W** REMINGTON, VERNICK AND WALBERG ENGINEERS
ENGINEER'S ESTIMATE

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 3A - Spencer Avenue
(From the Boardwalk to Atlantic Avenue)

PROJECT NUMBER:

05-14-U-044

CLIENT:

City of Wildwood

Sept. 21, 2009

	COST	SUMMARY
SANITARYSEWER ESTIMATED CONSTRUCTION COST:		\$87,310.00
15% CONTINGENCY:		\$13,070.00
SANITARY SEWER TOTAL ESTIMATED COST:		\$100,380.00
STORM SEWER ESTIMATED CONSTRUCTION COST:		\$25,750.00
15% CONTINGENCY:		\$3,862.50
STORM SEWER TOTAL ESTIMATED COST:		\$29,612.50
ROAD RECONSTRUCTION ESTIMATED CONSTRUCTION COST:		\$140,355.00
15% CONTINGENCY:		\$21,053.25
ROAD RECONSTRUCTION TOTAL ESTIMATED COST:		\$161,408.25
TOTAL ESTIMATED CONSTRUCTION COST:		\$253,415.00
15% CONTINGENCY:		\$37,905.50
TOTAL ESTIMATED COST:		\$291,320.50
45% USDA GRANT AMOUNT:		-
55% SEWER UTILITY SHARE:		\$160,226.28

**RV
& W** REMINGTON, VERNICK AND WALBERG ENGINEERS
ENGINEER'S ESTIMATE

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 3A - Park Boulevard
(From Garfield Ave to Wildwood Ave)

PROJECT NUMBER:

05-14-U-044

CLIENT:

City of Wildwood

Sept. 21, 2009

#	DESCRIPTION	UNITS	ESTIMATE QUANTITY	EST. UNIT PRICE	AMOUNT
SEWER					
1	SANITARY SEWER MAIN, P.V.C.	LF	1,130	\$120.00	\$135,600.00
2	SANITARY SEWER SERVICES, P.V.C.	UNIT	12	\$850.00	\$10,200.00
3	SANITARY SEWER MANHOLES, 4' DIAMETER	UNIT	17	\$4,000.00	\$68,000.00
4	CONNECT TO EXISTING SANITARY SEWER	UNIT	2	\$1,000.00	\$2,000.00
5	DENSE GRADED AGG. BASE COURSE, 8" THICK	SY	3,710	\$12.00	\$44,520.00
STORM SEWER					
11	STORM INLETS	UNIT	15	\$3,500.00	\$52,500.00
12	STORM MANHOLES	UNIT	5	\$6,000.00	\$30,000.00
13	STORM PIPE	LF	1,035	\$150.00	\$155,250.00
ROAD RECONSTRUCTION					
14	PULVERIZED SOIL AGG. BASE COURSE, ROAD MIXED, 8" THICK	SY	8,040	\$10.00	\$80,400.00
15	HOT MIX ASPHALT BASE COURSE, MIX 1-2, 2" THICK	TON	1,040	\$65.00	\$67,600.00
16	HOT MIX ASPHALT SURFACE COURSE, MIX 1-5, 3" THICK	TON	1,560	\$68.00	\$106,080.00
17	CONCRETE GUTTER, 8" THICK	LF	800	\$25.00	\$20,000.00
18	CONCRETE VERTICAL CURB	LF	800	\$20.00	\$16,000.00
19	CONCRETE SIDEWALK	SY	650	\$60.00	\$39,000.00
20	CONCRETE DRIVEWAY, 6" THICK	SY	200	\$70.00	\$14,000.00
21	DETECTABLE WARNING SURFACES	SY	41	\$350.00	\$14,350.00
				TOTAL	\$855,500.00

RV REMINGTON, VERNICK AND WALBERG ENGINEERS
& W ENGINEER'S ESTIMATE

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 3A - Park Boulevard
 (From Garfield Ave to Wildwood Ave)

PROJECT NUMBER:

05-14-U-044

CLIENT:

City of Wildwood

Sept. 21, 2009

	COST	SUMMARY
SANITARYSEWER ESTIMATED CONSTRUCTION COST:		\$260,320.00
15% CONTINGENCY:		\$39,048.00
SANITARY SEWER TOTAL ESTIMATED COST:		\$299,368.00
STORM SEWER ESTIMATED CONSTRUCTION COST:		\$237,750.00
15% CONTINGENCY:		\$35,662.50
STORM SEWER TOTAL ESTIMATED COST:		\$273,412.50
ROAD RECONSTRUCTION ESTIMATED CONSTRUCTION COST:		\$357,430.00
15% CONTINGENCY:		\$54,669.50
ROAD RECONSTRUCTION TOTAL ESTIMATED COST:		\$412,099.50
TOTAL ESTIMATED CONSTRUCTION COST:		\$855,500.00
15% CONTINGENCY:		\$129,380.00
TOTAL ESTIMATED COST:		\$984,880.00
45% USDA GRANT AMOUNT:		\$443,196.00
55% SEWER UTILITY SHARE:		\$541,684.00

**R V
& W** REMINGTON, VERNICK AND WALBERG ENGINEERS
ENGINEER'S ESTIMATE

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 3A - Burk Avenue
(From Park Blvd. to Hudson Avenue)

PROJECT NUMBER:

05-14-U-044

CLIENT:

City of Wildwood

Sept. 21, 2009

#	DESCRIPTION	UNITS	ESTIMATE QUANTITY	EST. UNIT PRICE	AMOUNT
SEWER					
1	SANITARY SEWER MAIN, PVC	LF	520	\$120.00	\$62,400.00
2	SANITARY SEWER SERVICES, PVC	UNIT	3	\$850.00	\$2,550.00
3	SANITARY SEWER MANHOLES, 4' DIAMETER	UNIT	1	\$5,000.00	\$5,000.00
4	CONNECT TO EXISTING SANITARY SEWER	UNIT	2	\$1,000.00	\$2,000.00
5	DENSE GRADED AGG. BASE COURSE, 8" THICK	SY	1,400	\$12.00	\$16,800.00
STORM SEWER					
11	STORM INLETS	UNIT	0	\$3,500.00	\$0.00
12	STORM MANHOLES	UNIT	0	\$6,000.00	\$0.00
13	STORM PIPE	LF	0	\$150.00	\$0.00
ROAD RECONSTRUCTION					
14	PULVERIZED SOIL AGG. BASE COURSE, ROAD MIXED, 8" THICK	SY	1,400	\$10.00	\$14,000.00
15	HOT MIX ASPHALT BASE COURSE, MIX I-2, 2" THICK	TON	170	\$65.00	\$11,050.00
16	HOT MIX ASPHALT SURFACE COURSE, MIX I-5, 3" THICK	TON	260	\$68.00	\$17,680.00
17	CONCRETE GUTTER, 8" THICK	LF	710	\$25.00	\$17,750.00
18	CONCRETE VERTICAL CURB	LF	710	\$20.00	\$14,200.00
19	CONCRETE SIDEWALK	SY	150	\$60.00	\$9,000.00
20	CONCRETE DRIVEWAY, 6" THICK	SY	10	\$70.00	\$700.00
21	DETECTABLE WARNING SURFACES	SY	4	\$350.00	\$1,400.00
				TOTAL	\$174,530.00



REMINGTON, VERNICK AND WALBERG ENGINEERS
ENGINEER'S ESTIMATE

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 3A - Burk Avenue

(From Park Blvd. to Hudson Avenue)

PROJECT NUMBER:

05-14-U-044

CLIENT:

City of Wildwood

Sept. 21, 2009

	COST	SUMMARY
SANITARYSEWER ESTIMATED CONSTRUCTION COST:		\$88,750.00
15% CONTINGENCY:		\$13,312.50
SANITARY SEWER TOTAL ESTIMATED COST:		\$102,062.50
STORM SEWER ESTIMATED CONSTRUCTION COST:		\$0.00
15% CONTINGENCY:		\$0.00
STORM SEWER TOTAL ESTIMATED COST:		\$0.00
ROAD RECONSTRUCTION ESTIMATED CONSTRUCTION COST:		\$85,780.00
15% CONTINGENCY:		\$12,867.00
ROAD RECONSTRUCTION TOTAL ESTIMATED COST:		\$98,647.00
TOTAL ESTIMATED CONSTRUCTION COST:		\$174,530.00
15% CONTINGENCY:		\$26,179.50
TOTAL ESTIMATED COST:		\$200,709.50
45% USDA GRANT AMOUNT:		\$90,319.28
55% SEWER UTILITY SHARE:		\$110,390.23

**RV
& W** REMINGTON, VERNICK AND WALBERG ENGINEERS
ENGINEER'S ESTIMATE

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 3B - Spencer Avenue
(From Atlantic Avenue to Park Boulevard)

PROJECT NUMBER:

05-14-U-044

CLIENT:

City of Wildwood

Sept. 21, 2009

#	DESCRIPTION	UNITS	ESTIMATE QUANTITY	EST. UNIT PRICE	AMOUNT
SEWER					
1	SANITARY SEWER MAIN, PVC	LF	2,500	\$120.00	\$300,000.00
2	SANITARY SEWER SERVICES, PVC	UNIT	77	\$850.00	\$65,450.00
3	SANITARY SEWER MANHOLES, 4' DIAMETER	UNIT	10	\$5,000.00	\$50,000.00
4	CONNECT TO EXISTING SANITARY SEWER	UNIT	10	\$1,000.00	\$10,000.00
5	DENSE GRADED AGG. BASE COURSE, 8" THICK	SY	5,030	\$12.00	\$60,360.00
STORM SEWER					
11	STORM INLETS	UNIT	10	\$3,500.00	\$35,000.00
12	STORM MANHOLES	UNIT	4	\$6,000.00	\$24,000.00
13	STORM PIPE	LF	470	\$150.00	\$70,500.00
ROAD RECONSTRUCTION					
14	PULVERIZED SOIL AGG. BASE COURSE, ROAD MIXED, 8" THICK	SY	11,150	\$10.00	\$111,500.00
15	HOT MIX ASPHALT BASE COURSE, MIX 1-2, 2" THICK	TON	1,445	\$65.00	\$93,925.00
16	HOT MIX ASPHALT SURFACE COURSE, MIX 1-5, 3" THICK	TON	2,160	\$68.00	\$146,880.00
17	CONCRETE GUTTER, 8" THICK	LF	4,650	\$25.00	\$116,250.00
18	CONCRETE VERTICAL CURB	LF	4,650	\$20.00	\$93,000.00
19	CONCRETE SIDEWALK	SY	1,965	\$60.00	\$117,900.00
20	CONCRETE DRIVEWAY, 6" THICK	SY	1,480	\$70.00	\$103,600.00
21	DETECTABLE WARNING SURFACES	SY	30	\$350.00	\$10,500.00
				TOTAL	\$1,408,865.00

**RV
& W** REMINGTON, VERNICK AND WALBERG ENGINEERS
ENGINEER'S ESTIMATE

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 3B - Spencer Avenue
(From Atlantic Avenue to Park Boulevard)

PROJECT NUMBER:

05-14-U-044

CLIENT:

City of Wildwood

Sept. 21, 2009

	COST	SUMMARY
SANITARYSEWER ESTIMATED CONSTRUCTION COST:		\$485,810.00
15% CONTINGENCY:		\$72,871.50
SANITARY SEWER TOTAL ESTIMATED COST:		\$558,681.50
STORM SEWER ESTIMATED CONSTRUCTION COST:		\$129,500.00
15% CONTINGENCY:		\$19,425.00
STORM SEWER TOTAL ESTIMATED COST:		\$148,925.00
ROAD RECONSTRUCTION ESTIMATED CONSTRUCTION COST:		\$793,555.00
15% CONTINGENCY:		\$118,838.50
ROAD RECONSTRUCTION TOTAL ESTIMATED COST:		\$912,393.50
TOTAL ESTIMATED CONSTRUCTION COST:		\$1,408,865.00
15% CONTINGENCY:		\$211,135.00
TOTAL ESTIMATED COST:		\$1,620,000.00
45% USDA GRANT AMOUNT:		\$729,000.00
55% SEWER UTILITY SHARE:		\$891,000.00

RV & W REMINGTON, VERNICK AND WALBERG ENGINEERS
ENGINEER'S ESTIMATE

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 4 - Park Boulevard
(From Wildwood Ave to Maple Ave and From Magnolia Ave to Juniper Ave)

PROJECT NUMBER:

05-14-U-044

CLIENT:

City of Wildwood

22-Jun-09

#	DESCRIPTION	UNITS	ESTIMATE QUANTITY	EST. UNIT PRICE	AMOUNT
SEWER					
1	SANITARY SEWER MAIN, P.V.C.	LF	1,070	\$120.00	\$128,400.00
2	SANITARY SEWER SERVICES, P.V.C.	UNIT	11	\$850.00	\$9,350.00
3	SANITARY SEWER MANHOLES, 4' DIAMETER	UNIT	16	\$4,000.00	\$64,000.00
4	CONNECT TO EXISTING SANITARY SEWER	UNIT	1	\$1,000.00	\$1,000.00
5	DENSE GRADED AGG. BASE COURSE, 8" THICK	SY	3,640	\$12.00	\$43,680.00
STORM SEWER					
11	STORM INLETS	UNIT	15	\$3,500.00	\$52,500.00
12	STORM MANHOLES	UNIT	5	\$6,000.00	\$30,000.00
13	STORM PIPE	LF	975	\$150.00	\$146,250.00
ROAD RECONSTRUCTION					
14	PULVERIZED SOIL AGG. BASE COURSE, ROAD MIXED, 8" THICK	SY	7,600	\$10.00	\$76,000.00
15	HOT MIX ASPHALT BASE COURSE, MIX I-2, 2" THICK	TON	985	\$65.00	\$64,025.00
16	HOT MIX ASPHALT SURFACE COURSE, MIX I-5, 3" THICK	TON	1,475	\$68.00	\$100,300.00
17	CONCRETE GUTTER, 8" THICK	LF	1,785	\$25.00	\$44,625.00
18	CONCRETE VERTICAL CURB	LF	1,785	\$20.00	\$35,700.00
19	CONCRETE SIDEWALK	SY	820	\$60.00	\$49,200.00
20	CONCRETE DRIVEWAY, 6" THICK	SY	986	\$70.00	\$69,020.00
21	DETECTABLE WARNING SURFACES	SY	39	\$350.00	\$13,650.00
TOTAL					\$927,700.00

RV REMINGTON, VERNICK AND WALBERG ENGINEERS
& W ENGINEER'S ESTIMATE

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 4 - Park Boulevard
(From Wildwood Ave to Maple Ave and From Magnolia Ave to Juniper Ave)

PROJECT NUMBER:

05-14-U-044

CLIENT:

City of Wildwood

22-Jun-09

	COST	SUMMARY
SANITARYSEWER ESTIMATED CONSTRUCTION COST:		\$246,430.00
15% CONTINGENCY:		\$36,975.50
SANITARY SEWER TOTAL ESTIMATED COST:		\$283,405.50
STORM SEWER ESTIMATED CONSTRUCTION COST:		\$228,750.00
15% CONTINGENCY:		\$34,322.50
STORM SEWER TOTAL ESTIMATED COST:		\$263,072.50
ROAD RECONSTRUCTION ESTIMATED CONSTRUCTION COST:		\$452,520.00
15% CONTINGENCY:		\$67,905.00
ROAD RECONSTRUCTION TOTAL ESTIMATED COST:		\$520,425.00
ESTIMATED CONSTRUCTION COST:		\$927,700.00
15% CONTINGENCY:		\$139,203.00
TOTAL ESTIMATED COST:		\$1,066,903.00
45% USDA GRANT AMOUNT:		\$480,106.35
55% SEWER UTILITY SHARE:		\$586,796.65



REMINGTON, VERNICK AND WALBERG ENGINEERS
ENGINEER'S ESTIMATE

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 4 - Various Streets and Manhole Replacements

PROJECT DESCRIPTION:

Sewer Improvements:

Youngs Avenue - Hudson Ave to Park Blvd.

Hudson Avenue - Roberts Ave to Youngs Ave

Arctic Avenue - Hildreth Ave to Bennett Ave

Tacony Road - Park Blvd to Street-end

Dock Street - Park Blvd to Mediterranean

Lincoln Avenue - Ocean Ave to Boardwalk Street-end

Magnolia Avenue - Ocean Ave to Boardwalk Street-end

Replace Manholes at Intersections:

Magnolia Avenue and Lake Avenue

Hand Avenue and Arctic Avenue

Poplar Avenue and Hudson Avenue

Burk Avenue and Mediterranean Avenue

Bennett Avenue and Susquehanna Avenue

Davis Avenue and Arctic Avenue

PROJECT NUMBER:

05-14-U-044

CLIENT:

City of Wildwood

22-Jun-09

#	DESCRIPTION	UNITS	ESTIMATE QUANTITY	EST. UNIT PRICE	AMOUNT
SEWER					
1	SANITARY SEWER MAIN, PVC	LF	5,025	\$120.00	\$603,000.00
2	SANITARY SEWER SERVICES, PVC	UNIT	70	\$850.00	\$59,500.00
3	SANITARY SEWER MANHOLES, 4' DIAMETER	UNIT	19	\$5,000.00	\$95,000.00
4	CONNECT TO EXISTING SANITARY SEWER	UNIT	44	\$1,000.00	\$44,000.00
5	DENSE GRADED AGG. BASE COURSE, 8" THICK	SY	5,195	\$12.00	\$62,340.00
STORM SEWER					
11	STORM INLETS	UNIT	20	\$3,500.00	\$70,000.00
12	STORM MANHOLES	UNIT	5	\$6,000.00	\$30,000.00
13	STORM PIPE	LF	1,400	\$150.00	\$210,000.00
ROAD RECONSTRUCTION					
14	PULVERIZED SOIL AGG. BASE COURSE, ROAD MIXED, 8" THICK	SY	12,174	\$10.00	\$121,740.00
15	HOT MIX ASPHALT BASE COURSE, MIX 1-2, 2" THICK	TON	1,590	\$65.00	\$103,350.00
16	HOT MIX ASPHALT SURFACE COURSE, MIX 1-5, 3" THICK	TON	2,375	\$68.00	\$161,500.00
17	CONCRETE GUTTER, 8" THICK	LF	2,800	\$25.00	\$70,000.00
18	CONCRETE VERTICAL CURB	LF	2,800	\$20.00	\$56,000.00
19	CONCRETE SIDEWALK	SY	1,410	\$60.00	\$84,600.00
20	CONCRETE DRIVEWAY, 6" THICK	SY	865	\$70.00	\$60,550.00
21	DETECTABLE WARNING SURFACES	SY	40	\$350.00	\$14,000.00
				TOTAL	\$1,845,580.00

PROJECT NAME:

USDA Sanitary Sewer Improvements Phase 4 - Various Streets and Manhole Replacements

	COST	SUMMARY
SANITARYSEWER ESTIMATED CONSTRUCTION COST:		\$863,840.00
15% CONTINGENCY:		\$129,576.00
SANITARY SEWER TOTAL ESTIMATED COST:		\$993,416.00
STORM SEWER ESTIMATED CONSTRUCTION COST:		\$310,000.00
15% CONTINGENCY:		\$46,500.00
STORM SEWER TOTAL ESTIMATED COST:		\$356,500.00
ROAD RECONSTRUCTION ESTIMATED CONSTRUCTION COST:		\$671,740.00
15% CONTINGENCY:		\$100,761.00
ROAD RECONSTRUCTION TOTAL ESTIMATED COST:		\$772,501.00
ESTIMATED CONSTRUCTION COST:		\$1,845,580.00
15% CONTINGENCY:		\$276,837.00
TOTAL ESTIMATED COST:		\$2,122,417.00
45% USDA GRANT AMOUNT:		\$955,087.65
55% SEWER UTILITY SHARE:		\$1,167,329.35

MAPS