



TOWN OF KILL DEVIL HILLS

Land Where Flight Began

PUBLIC NOTICE

NOTICE IS HEREBY GIVEN that the Town of Kill Devil Hills Street Improvement and Special Projects Committee will hold a meeting on Tuesday, February 22, 2022 at 4:00 p.m. in the Meeting Room of the Administration Building, 102 Town Hall Drive, off Colington Road. The items to be discussed are listed below:

AGENDA

Call to Order

Agenda Approval

Approval of the July 27, 2021 meeting minutes

Public Comment (Time limit of 3 minutes per person; 5 minutes per group)

Ongoing Business

New Business

- 1. Limited Interim Stormwater Management Plan Update.**
- 2. Street Improvement Recommendation for Fiscal Years 2022-23 Fiscal Year (FY) and 2023-24 Plan Year.**

Adjournment

Posted this 16th day of February 2022.

Jennifer Stecher

Administrative Assistant

Copies to: *Street Improvement and Special Projects Committee members in their meeting materials; Mayor & Board of Commissioners; Town Manager; all Town bulletin boards; KDH Sunshine List including all local news media; KDH Electronic Distribution List; website, social media; file*

Minutes of the July 27, 2021, meeting of the Kill Devil Hills Street Improvement and Special Projects Committee (SISPC) held at 4:00 p.m. in the Town Hall meeting room of the Administration Building, 102 Town Hall Drive, Kill Devil Hills.

Members Present: Chair B.J. McAvoy, Kevin Cox, Billy Dorn, Nelson V. “Skip” Jones, Jr., and Ronald Seidman, II

Others Present: Pete Burkheimer, Town Engineer; Steve Albright, Public Services Director; Derek Dail, Assistant Public Services Director; Meredith Guns, Planning Director; Cameron Ray, Assistant Planning Director; and Jennifer Stecher, Clerk to the SISPC

Call to Order

At 4:04 p.m., Commissioner B.J. McAvoy called this meeting of the Kill Devil Hills Street Improvement and Special Projects Committee (SISPC) to order and welcomed everyone present.

Agenda Approval

Mr. Jones moved to approve the agenda for the meeting as presented. Mr. Seidman seconded the motion, which was approved by a unanimous, 5-0, vote.

Approval of the Minutes of the February 9, 2021 Meeting

Mr. Seidman moved to approve the minutes of the February 9, 2021, SISPC meeting as presented. Mr. Dorn seconded the motion, and the minutes were approved as presented, with a unanimous, 5-0, vote.

Public Comment

Ralph Pierce, 2006 Elizabeth City Street – Mr. Pierce has owned his cottage for 30 years and has recently spent \$30,000 to repair flooding related issues. He is concerned for his family and neighbors experiencing health issues such as from mold and contaminated standing water. He notices the new builds adding fill to their lots which causes water from rain events to run-off to his property. Mr. Pierce said it should be illegal for people to put fill on their lots because it will affect the houses around them he would like to see culvert and drainage improvements in the neighborhood.

Alice Jaeger, 401 West Eden Street – A resident and homeowner since 1994, she has experienced occasional pooling of water in the backyard from hurricanes or rain events beginning in 2000. Significant flooding became an issue in 2016 when the lower level of her house was flooded with over 6 inches of water. Her property was constructed in 1977 and the elevation of the home sits below the street level of West Eden and Lee Streets, as well as below the levels of the homes on the south and west side of her property. These homes were constructed under revised building codes with higher house elevations than hers, which creates water run-off from rain and hurricane events right into her yard from the adjacent properties. She discovered that traditional methods used to resolve such problems (such as a French drain) would not resolve her homes flooding issues. She believes the source of the problem has to do with the water table and the expansion of West Aycock, West Palmetto, and West Eden Streets and the construction of new homes and removal of vegetation on those streets. She understands that building codes will be upgraded but feels that it is at the expense of older properties having to receive the run-off when rain or hurricane events occur. She stated that the Town has not offered adequate resolutions to the flooding of her property and other older properties and would like a remedy to the flooding problem.

Thomas Alston of 416 West Aycock Street – Mr. Alston explained that the property at 401 West Aycock Street is below the street elevation and takes on great amounts of water when heavy rain occurs. He also agreed with Ms. Jaeger that the empty lot at West Aycock Street and US 158 (Parcel #: 000478001) now has standing water since many of the trees on the lot have been cut down. Mr. Alston suggested a cost-effective recommendation to alleviate the flooding problems in the neighborhood (Eden Street, Aycock Street, Palmetto Street) by using trenches, culverts and swales to help push any standing water to the Bickett Street canal. He suggested the canal could be dredged so that it can take on more water and Town could send out an inspector during the next heavy rain to verify that Mr. Alston's idea would be useful.

Lyle Bagley, 303 West Durham Street – Mr. Bagley thanked Steve Albright for responding quickly to provide jetting out of some culverts that were congested in his neighborhood. Mr. Bagley described the section that he lives in on Durham Street as a funnel to collect water. The newly built homes are allowed to build up and use fill, in addition to the removal of vegetation and trees, which seem to exacerbate the standing water problem. The rain events that took place on June 11th and 12th created 12 ½ inches of water in his first floor. He stated the water that is sitting over top of septic tanks made him sick as a result of working in the contaminated water to save his property. He and other neighborhood residents became ill and is concerned there is a safety issue with the standing water. He would like to see a two-year plan to include West Durham Street. He would also like to see a continuation of the deepening of the ditches extended to West Durham Street.

Jack Williams, 302 West Durham Street – Mr. Williams thanked Staff for response in jetting the area of West Durham Street but thinks there needs to more of an engineering response to remedy the contaminated water.

Jennifer Gregg, 332 West Eden – Ms. Gregg has owned her property for about 15 years and was very appreciative of Mr. Albright coming out right after the most recent rain event to assess the standing water situation. She stated there is no culvert in her area to relieve standing water.

SISPC members and Staff responded to public comment during New Business 3.

Old Business

1. Street Improvement Request - Indian Drive ROW – Indian Drive to Aztec Street Hendricks Addition Subdivision

Planning Director Meredith Guns presented a request for the Town to allow a private developer to pave and improve a public right-of-way. The plan included improving the Indian Drive right-of-way from the intersection of Seminole Street to Aztec Street, approximately 225 feet of roadway, and included associated drainage, water, and fire apparatus turn around area. Staff recommended forwarding the Indian Drive right-of-way conceptual plan to the Board of Commissioners, recommending approval with the following conditions:

1. Access easement for fire apparatus turn around area shall be reviewed and approved by Town Staff and Town Attorney prior to construction.
2. Public Service Department and Town Engineer will approve final engineering plans prior to construction.
3. All state and local permits will be secured prior to construction.

Mr. Cox asked the about the wall between Indian Drive and Dare Centre. Staff said the Town Attorney and developer are in the process of reaching an encroachment agreement to allow the wall to encroach on a Town right-of-way. The plan is to keep the commercial and residential areas separate, with the house plan currently conceptual and not finalized.

Mr. Jones moved to make a recommend forwarding - Indian Drive ROW – Indian Drive to Aztec Street Hendricks Addition Subdivision with Staff outlined recommendation and forward to the BOC for approval. Mr. Cox seconded the motion, which was approved, with a unanimous, 5-0, vote.

2. Stop Sign Requests – Review of Manual Uniform Traffic Control Devices (MUTCD)

DRAFT Minutes

July 27, 2021

Street Improvement and Special Projects Committee Meeting

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This item is regarding a request by Commissioner John Windley to re-paint a faded stop bar at the West Walker Street and Bay Drive intersection. Following the MUTCD that was adopted by the Board of Commissioners on April 28, 2021, and the Town Engineer's recommendation to follow the MUTCD, Staff recommended not repainting a stop bar at the existing stop sign located at West Walker Street and Bay Drive intersection.

Chairperson McAvoy moved to follow MUTCD guidance and deny the request to repaint a stop bar at the existing stop sign located at West Walker Street and Bay Drive intersection and forward the recommendation to the Board of Commissioners. Mr. Jones seconded the motion. The vote was four in favor and one opposed.

3. Drainage Issues from Rain Events June 2021 – Citizen Requests –

- a. W. Durham Street Neighbors – Lyle & Nancy Bagley, Jack & Jennifer Williams and John Lent**
- b. Edenton Street Neighbors – Carol Koon and multiple owners petition**
- c. Virginia Dare Shores – Megan Delk, Alice Jaeger and Jennifer Gregg**
- d. W. Sportsman Drive – June Duck**

Response to public comment:

Ms. Guns responded to public comment that referred to fill added to new houses being built. She clarified that if a previous property is adversely affected by flooding from a new property then it becomes a civil matter and not a Town issue. Ms. Guns stated the Town is following Federal and State standards on sloping and new lot building.

In response to public comment regarding a significant rain event between June 2 and June 12, 2021, the majority of the drainage complaints received were from property owners in the Virginia Dare Shores and Avalon Beach Subdivisions. The Virginia Dare Shores Subdivision has no formal drainage system where the Avalon Beach Subdivision does have a formal drainage system. Assistant Public Services Director Derek Dail noted that many of the older neighborhoods, such as Virginia Dare Shores, Croatan Shores and Avalon Beach, would greatly benefit from large scale capital drainage projects.

Mr. Burkheimer noted that the rising water table is also a factor when rains come and the use of a sock drain is very effective. When significant rainfall occurs a sock drain helps to keep ground water low so additional rains can be managed. Mr. Burkheimer recommends a cost-effective resolution to decrease drainage problems to incorporate as many sock-drains as possible if the funding is available. Mr. Burkheimer noted road drainage is the main goal but should not create a problem for property owners. He suggested a drainage solution be added to the Third Street project to help out with some of the drainage issues.

Mr. Albright said the Third Street project has been approved and there could be a possibility to expand the project by including the issues of West Durham. Ms. Guns suggested that the Town Engineer and Public Services include these poor drainage areas in the next Capital

Projects update that the SISPC will be reviewing at their next meeting. Staff will need to work out the funding to help with a solid long-term solution to the drainage problems affecting residents and will be responsive to residents' immediate needs as well.

Mr. Cox moved to direct Staff to investigate the Town's ability to resolve the drainage issues discussed in the meeting and the cost estimate to add it to Capital Projects. Mr. Jones seconded the motion, with a unanimous, 5-0, vote.

New Business

Adjournment

There being no other business before the SISPC at this time, Mr. Jones moved to adjourn the meeting. Mr. Seidman seconded the motion, which carried by a unanimous, 5-0 vote, and the meeting adjourned.

The time was 4:55 p.m.

Submitted by:

Jennifer Stecher
Clerk to the SISPC

Director of
Planning and Inspections
MEREDITH GUNS

Building Inspector
MARTY SHAW
CHARLES THUMAN

Code Enforcement Officer
JORDAN BLYTHE



Assistant Director of
Planning and Inspections
CAMERON RAY

Senior Planner
RYAN LANG

Zoning Administrator
DONNA ELLIOTT

THE TOWN OF KILL DEVIL HILLS
NORTH CAROLINA

PLANNING DEPARTMENT

February 22, 2022

Memorandum

To: Street Improvement/ Special Project Subcommittee

From: Meredith Guns, Planning Director 

Subject: Limited Interim Stormwater Management Plan Update

Attached to this memorandum is a Limited Interim Stormwater Management Plan Update. The update was developed by Pete Burkheimer, P.E. with American Engineering who serves as our Town Engineer, to address several recent public comments and other drainage concerns. The update is intended to identify sources of flooding and how/if they can be addressed as well as future stormwater project the Town may want to consider. Also attached to the plan update is a copy of a previous KDH Watershed Map, marked to show progress made on resolving areas of concern and marked aerial maps, prepared by Derek Dail, Assistant Public Services Director, showing conceptual scope of potential stormwater projects based on his Post Dorian drainage report.

Town Staff and the Town Engineers' recommendations to the SISPC and the Board of Commissioners start on page 8 of the report. One of the key recommendations is for the Board of Commissioners to consider adopting the policy under #4(d) which states:

It is the Town's policy to construct, maintain and rehabilitate its streets and roads so that their storm drainage systems (roadside ditches/swales, culverts, enclosed pipe systems, outfalls, etc.) accomplish the following objectives:

- i. Keep the street drained so that it is safely passable to vehicular and pedestrian traffic.
- ii. To the maximum extent practicable, avoid stormwater from the street draining onto private property, except through an easement.
- iii. Receive the surface flow of stormwater from adjacent single-family residential properties.

In addition, in those areas where the Town determines that groundwater management measures are feasible, such a system may be installed and may provide some benefit to adjacent residential properties whose land and/or structures are lower than the elevation of the street. In so doing, the Town is applying a technique which has been shown to promote the three foregoing objectives. The Town welcomes any secondary benefits that such groundwater systems may provide in alleviating a private property

owner's adverse drainage conditions due to being lower than the street, but affirmatively declares that it is under no duty to do so and accepts no liability should any such mitigation be ineffective or not totally effective in any given rainfall event.

This policy outlines a clear statement as to primary objectives and goals of the Town's capital projects that include drainage/stormwater work which is to protect the Town infrastructure and safety. The Town's goal to manage stormwater, however, it is important to understand the drainage and stormwater project are designed primarily to protect Town rights-of-ways while providing some secondary benefits (to varying degrees) to adjacent private properties.

Staff recommends forwarding the Limited Interim Stormwater Management Plan Update to the Board of Commissioners for consideration and further recommend formal adoptions of the above policy statement as it relates to street/stormwater capital projects.

Limited, Interim Update to the
Kill Devil Hills, NC

Master Stormwater Plan

January 28, 2022



American Engineering Associates
830 Greenbrier Circle, Suite 110
Chesapeake, VA 23320

PURPOSE. This Update document is prepared for the Kill Devil Hills (KDH) Town staff, Street Improvement and Special Projects Committee (SISPC) and Board of Commissioners (BOC) to consider the **historical and town-wide context** of potential future Stormwater Projects, or broader projects including Stormwater elements, being recommended by Town Engineer at SISPC’s February 22, 2022 meeting.

This Update gives a broad overview of past “Master Stormwater” plans and studies, provides a status of some projects and efforts proposed under those past studies, and points out some policy and strategy matters that should be considered. It IS NOT a new edition of the Kill Devil Hills Master Stormwater Plan, as no such effort has been commissioned by the Town. It may be appropriate to do so, since the last full Master Stormwater Plan was prepared almost exactly 12 years ago.

1. **BACKGROUND.** Consideration of Town-wide storm drainage and stormwater infrastructure has been ongoing in Kill Devil Hills at least as far back as the catastrophic Ash Wednesday flooding event of March, 1962.
 - a. Prior to that time, storm drainage infrastructure, especially outside of Department of Transportation road rights of way, was generally grossly inadequate or lacking altogether.
 - b. Although the Ash Wednesday flooding was primarily tidal, as opposed to stormwater-driven, it pointed out the need to establish effective outfalls. Notable among these are the NCDOT Canal which passes through the Wright Brothers Memorial and what we now know as First Flight Village.
 - c. In the 1980’s, McDowell & Associate prepared an early master drainage study and plan, with a subsequent effort by Overman & Associates. Funding for some of these early efforts came from Coastal Area Management Act (CAMA) grants. Among other things, these early efforts identified “Adverse Drainage” areas and recommended some capital improvements .
 - d. Albemarle & Associates, LLC, serving as Town Engineer, updated those earlier efforts in 2004 (the 2004 Plan). In 2005, Engineering Services of Virginia, Inc. (ESVI), acquired in 2014 by American Engineering Associates, became Town Engineer. Environmental Professionals, Inc (EPI) teamed with ESVI to prepare the latest “Town of Kill Devil Hills Stormwater Management Plan, 2010.” (the 2010 Plan)
 - e. A marked copy of a map from the 2004 Plan (provided with this Update) shows that many of the Adverse Drainage areas have been resolved or at least mitigated in the subsequent 18 years. Also provided is a copy of mapping prepared by KDH Public Services staff, showing currently-identified drainage projects areas after the occurrence of Tropical Storm Dorian in 2019.
2. **WHAT CAUSES “FLOODING” IN KDH?** There are two primary types of flooding, Tidal and Stormwater. The following brief notes apply to Tidal Flooding, as it is not the primary topic of this Update. Tidal Flooding can occur dynamically, when large ocean waves breach the dune structure and overwash onto public roads and private property or when large waves on the sound overwash similarly. Or, Tidal

Flooding can occur statically, when the relatively still waters of the sound and/or ocean rise and back up via ditches, canals, culverts/pipe systems or overland and affect public roads and private property. Most of the stormwater management/storm drainage measures discussed in this Update and previous Plans offer no mitigation of Tidal Flooding. There is little that can feasibly be done to defend against it in a lower-density context such as KDH. It is also noteworthy that above-normal tide events can provide an abnormal back pressure or “tailwater” effect on outfall pipes, ditches and canals causing the flooding effects of a Stormwater Flooding event to be worse than they would otherwise be during a normal tide.

The remainder of this paragraph 2 will focus on the causes of Stormwater Flooding.

- a. **Abnormal Rainfall RATE.** Rainfall Rate is, broadly, how “hard” it is raining. It is measured in inches of rain volume per hour (in/hr). A higher Rainfall Rate (in/hr) in a given location will result in a higher rate of Stormwater Runoff in cubic feet per second (cfs), all other factors being equal. Of particular interest is Instantaneous Rainfall Rate. For example, if 4 inches of rain fall at a constant rate over a 4-hour period, that’s a 1 in/hr Average Rain Rate, and the Instantaneous Rain Rate is also 1 in/hr throughout that storm. Actually, the Instantaneous Rain Rate varies throughout the storm; during the worst 10 minute of that storm, 2 inches of rain may fall, or 12 in/hr, with lighter rain ranging from zero to 1-2 inches per hour during the less severe parts of the storm.

A 10-acre watershed in a KDH residential area might respond to an Instantaneous Rain Rate of 5 inches per hour might generate 5-10 cfs of Stormwater Runoff, depending on things like what percentage of the watershed is covered with rooftops, driveways and roads and whether or not previous rainfalls have caused the groundwater to rise up close to the surface.

The US National Oceanic and Atmospheric Administration (NOAA) maintains, for all points in the country, a statistically-derived database (see their online Precipitation Frequency Data Server, or PFDS) that tells us how probable it is that we will have a rain of a certain intensity, lasting for a certain duration. This is called an Intensity-Frequency-Duration table. For the middle of KDH, say, at the Dare Center, for example, the 10-year, 15-minute rainfall intensity is 5.64 inches per hour, or 1.41 inches of rain in that ¼ hour. That means that over 200 years, if you cataloged all the 15-minute periods of rain, you’d have about 20 events ($200 \div 10$) whose “worst” 15 minutes had 5.64 in/hr or harder rain.

One of the problems in using the PFDS for planning Stormwater Management infrastructure is that the data is slowly changing. 50 years ago, the 50-year, 24-hour total rain volume was about 6-7 inches; now in KDH it’s 8.92 inches. This is probably related to climate change. Without the precision of the PFDS, most of us know that we are getting larger rain events more frequently; Hurricane Matthew sent KDH 13.7 inches in a 24-hour period spanning October 8-9, 2016, and 13 of those inches fell in the worst 6 hours of Matthew. Although it requires extrapolating from the PFDS (it only goes up to a 1,000-year interval), that works out to about the 2,000-year, 6-hour rainfall!

It is intuitive that whatever standard we design to (such as a 50-year, 24-hour rain or a 10-year, 2 hour rain), Nature can always send us something worse—sometimes much worse. But we can’t spend boundless amounts of money on infrastructure that’s used at capacity once every 100 years, either. As a compromise, we select a “Design Storm” for stormwater improvements. Generally, the larger and/or more critical the area served, the higher (more intense) the Design Storm is set.

But, to summarize, an **excessively hard rain can generate stormwater runoff at a rate higher than the capacity of the existing ditch or pipe which is trying to carry it away.** This is the most direct, most common cause of Stormwater Flooding.

- b. **Elevation is too LOW.** The road, property or structure floods because it is built at too low an elevation. (This, of course, is also a very common cause of Tidal Flooding.) Even if there is a ditch, culvert, pipe or canal system to carry the Stormwater Runoff caused by the Design Storm, if the adjacent road, lawn or house floor is lower than the elevation of the surface of the water flowing in the system, it obviously will flood.

As noted in paragraph 1.a above, in the early years of development on the NC Outer Banks, little thought was typically paid to storm drainage, and little stormwater infrastructure was built. In many cases, homes and some businesses were built on lower-elevation properties, with slab-on-grade construction. Perhaps the original owner/builder used floor coverings which could tolerate flooding once or twice a decade and didn't think it was worth the effort for a couple of extra courses of block and loads of fill sand. Subsequent owners, perhaps without investigation or deep thought on the subject, began to install more valuable floor coverings, furnishings, etc., lulled by a multi-year break since the last problematic flooding.

An all-too-common version of this problem in KDH is the cottage whose main living floor is 9-10' above the ground, far above the reach of Tidal or Stormwater flooding. But there is a concrete parking area underneath, and a small "utility room," perhaps for some light storage and maybe a washer/dryer set up on a platform. This works well for a generation, but someone decides to expand the utility room, often without permits, enclosing more of the low area and making living space out of it. In KDH there limitless variations on this story. In the best case, the lowest floor elevation is high enough relative to the street, the drainage system and surrounding property that no flooding occurs. At the other extreme is the cottage whose lower slab elevation is "in a hole," 4' lower than the street and 2' lower than the lowest point in any nearby drainage system.

When these types of situations are done without permit, or originally represented as "storage or utility space" and later converted to occupancy, a serious public policy question unfolds: These are "self-inflicted wounds," caused by unwise and often illegal actions by property owners who may or may not be the current owners. To what extent, if any, should the Town spend limited public funds to figuratively and literally "bail out" such situations? Is it fair to the majority of owners who have followed the rules and used sound design principles to see some of their tax money used for such? More discussion on this point follows a little later in this update.

A variation on the "too low" situation just discussed is somewhat more poignant. 60 years ago, an owner builds his cottage on a relatively low lot in a relatively low subdivision, and he/she is one of the first on the block to do so. This owner is somewhat sensitive to the potential for flooding, so he/she sets the lowest slab elevation 6" higher than the average surrounding ground, and 3" higher than the edge of pavement of the fronting Town street. The street, developed in the 1960's, has no drainage. But, for the first 15 years, there are only 3-4 heavy rains that cause ponded stormwater to rise up within 1" to 2" of that lower slab elevation. Then, there's a building boom. Surrounding lots are bought up and built upon. But new standards for keeping septic drainfields above the water table, and a heightened concern about flooding, cause the new, nearby owners to raise their lots up 1' to 2'. Plus, now it seems those heavier rains are coming a little more frequently. Now that original owner is getting 1" to 3" of water on his lower slab 2-3 times per decade, in part because the water can't spread out equally

over all the lots. Some are higher than the older ones, and the flooding is worse on the lower lot. This is not quite the “self-inflicted wound” mentioned in the previous paragraph.

From a public policy standpoint, it is also worth noting that a Town street can be built “too low,” relative to its own drainage system, or to the elevation of the sound or ocean. While there is some fair debate about the extent to which the public body should help out where a house is unwisely built too low, there is no debate about whether the Town or the State should build and operate their roads and streets so that they are not flooded and remain passable in all but very extreme rain events.

In summary, when a house, or store, or street is **built too low** (relative to the ground or to the serving drainage system, if any), **it will flood** unless and until it is either raised or the drainage system is lowered (if that is even possible).

- c. **Abnormal Long-Term Rain VOLUME.** This cause of Stormwater Flooding is a cousin of Abnormal Rain RATE, discussed in 1.a above. But in this case, there is no single, extremely hard or intense rain event generating an excessive rate of Stormwater Runoff which exceeds the capacity of the receiving drainage system. Instead, this problem develops over a period of several weeks or even a couple of months. For example, over an 4 week period, there may be 15 different rain events, none worse than 3 inches in a day in volume nor any greater than 1 in/hr in rate, but the total rain during that period is 19” —nearly half of a normal year’s rain. None of these events cause a significant problem, but they cause a steady rise in the elevation of the groundwater, until at the end of the 4 weeks, it’s lurking just below the surface. Then, a 3-4” rain event occurs during a thunderstorm, but the sandy soil is full of groundwater and none of the rain can soak in. It ALL runs off, as if the whole watershed were hard-surface, like a shopping center parking lot. A prime example of this is the flooding, notably in the Ocean Acres and Whispering Pines subdivisions, during and after the Veterans Day storm of 2009, nicknamed “Nor’Ida” as it resulted from the merger of Tropical Storm Ida with a nor’easter storm. In November and December, 2009, over 17” of rain fell. Flooding aggravated by the resulting high water table persisted well into the winter of 2010, giving rise to an emergency storm drainage/stormwater management project, which will be discussed further.

In summary, a different kind of drainage problem occurs when a **long-term pattern of moderate-intensity rains steadily raises the groundwater** essentially to the surface, then little of the next storm’s runoff can infiltrate into the soil.

3. WHAT ARE THE SOLUTIONS TO STORMWATER FLOODING?

- a. For many decades up until about 40-50 years ago, in traditional urban and suburban settings, preventing stormwater-caused flooding was called “Storm Drainage.” The basic philosophy, called “Direct Runoff,” was this:
- Pick a Design Storm for the area you’re serving...the bigger the area, the heavier the storm. For example, one nearby City used to use the 5-year 20-minute rain rate for designing pipe systems serving up to 75 acres.
 - Calculate the size of a pipe system big enough to carry the Design Flow generated by the Design Storm. For a 75 acre subdivision of average size lots, this might result in a flow rate exiting the project of 120 cfs. That might result in a 60” diameter concrete pipe laid at 0.21% slope; or, if a ditch could work at the same slope, it might have a 6’ wide bottom, 2:1 side slopes and flow 33” deep.

- In other words, gather up the large QUANTITY of stormwater as fast as it arrives and push it to the river or ocean as quickly as you can. This is very expensive, and turns out to be somewhat environmentally insensitive.
 - The size of the ditch or pipe increases as the available slope decreases. In other words, Direct Runoff systems are especially expensive in areas too flat to get a decent slope. Unsurprisingly, the Outer Banks, including KDH, fits this description.
- b. Roughly coinciding with the federal Clean Water Act of 1972, an emphasis on improving water QUALITY began, in addition to processing the large QUANTITY of Direct Runoff. The term “Stormwater Management” came into favor, to describe both slowing down the peak discharge rate and applying some measure(s) to remove from the runoff pollutants such as sediment, chemical contaminants, hydrocarbons, etc. The more effective of such measures began to be refined and standardized as “Best Management Practices,” or BMP’s.
- Stormwater retention or detention was one of the first and most effective BMP’s to be identified. In “Wet Detention,” stormwater flows into a lake or pond at a high rate, causes the pond elevation to rise, then flows out the other side of the pond at a dramatically reduced rate, which is not as erosive or damaging to the downstream receiving waters. As a bonus, pollutants settle out of the flow stream, cleaning the outflow waters. The pond behind the movie theater in KDH is an example of a Wet Pond.
 - In “Dry Detention,” the functionality is similar, except stormwater is stored or detained on top of a grass or sandy bottom instead of on top of the water normally in the Wet Pond. Most of the commercial sites built in KDH over the last 25 years employ one or more Dry Ponds to meet their detention requirements under the Town Code. As a bonus, where the bottom of a Dry Pond is above the groundwater, Infiltration can occur, which is one of the most efficient, effective and highly rated Water Quality BMP’s, as discussed below.
 - There are numerous forms and variants on Infiltration Systems. In common, they all try to direct at least the potentially pollutant-laden “first flush” of runoff from a site into a setting where it can soak into, or infiltrate, into the soil. Just as wastewater from a septic system is treated and cleaned up by filtering through the soil, and by the action of microbes and plant systems in the soil, an infiltrative BMP cleans up the stormwater system. As a bonus, even when the arrival rate of stormwater, in cfs, is too great for ALL to be infiltrated, there is at least SOME reduction in discharge rate. In KDH, sites are required to “manage”—usually by infiltration—the runoff from a 4.3” rain, roughly a 10-year, 2-hour Design Storm.
 - It is important to note that infiltration works best when the media—usually meaning the soil into which infiltration is occurring—is highly permeable. Less permeable soils work less well and require larger areas; when the soil permeability drops below a certain threshold, it just can’t be used at all as an infiltrative BMP. So, in KDH we finally have some good news to offset the “bad news” that our flat terrain makes Direct Runoff very expensive: Our sandy soils are incredibly well suited and effective for infiltration. This is why almost all new commercial sites in KDH infiltrate their stormwater runoff into the sand beside, or sometimes underneath, their parking lots.
- c. So, which of these three solutions noted above are the best for us to use in solving, or at least mitigating, KDH’s stormwater challenges?

- As noted above, infiltration via small dry ponds works best for most of our commercial sites. Occasionally, where a very high percentage of site coverage is used, special arch-shaped underground chambers can be used to direct the runoff into the sand soils underneath the parking lots. Generally speaking, KDH does not have a problem with these recently developed commercial sites and their infiltration systems.
- There are relatively few areas in KDH which are being developed into new subdivisions of single family lots. Two recent examples are the Water Oak subdivision off West First Street and the extensions of Eden Street and Palmetto Street westward to Bay Drive. Both of these employed infiltration, using roadside swales somewhat as “linear dry ponds” to allow stormwater runoff to build up as it infiltrates into the soil below.
- So the primary remaining challenge is existing older residential subdivisions, with nonexistent or ineffective drainage systems, and/or systems whose infrastructure is at the end of its useful life. Drilling down, what can we do that meets all these requirements?
 - Cost-effective in the use of the Town’s limited funding for capital projects.
 - Environmentally responsible, providing Water Quality benefits.
 - Able to keep our streets passable in all but the most extreme rain events.
 - Protective of our street pavement surface and base, prolonging their life.
 - Compact in size, so as to better coexist in our crowded street rights of way with the road pavement, sometimes sidewalks, our own water mains, and communications and electric utility lines.
 - And finally, able to solve, or at least mitigate, flooding damage to private properties adjacent to our streets, to the extent that the BOC determines that it is sound public policy to do so.
- The primary solution we have developed for stormwater management in existing residential settings is to manage the groundwater, keeping it drawn down by relatively small-diameter perforated pipe encased in a drainage filter fabric “sock.” “Sock drains,” as these pipes are called, operate in several ways:
 - They are installed as deep as practical, to achieve the maximum groundwater-lowering effect. As the groundwater rises, it gets above the level of the holes in the “sock drain” and flows in, rather than continuing to rise. Over a few days time, the groundwater lowering effect of a sock drain can reach out laterally up to 200’ or more. This can allow “sock drain” in one street to provide some degree of groundwater management in the next block over. Our broad goal is to keep the groundwater at least 2.5’, or 30”, below the surface.
 - Oversimplified, if the groundwater is 30” below the surface in a flat area, and the sand is 33% porous, even the entire volume of a 10” rain can be infiltrated into the ground. This is much more effective, cost-effective and environmentally friendly than trying to rush untreated stormwater to the sound.

- Now if some of that 10" rain arrived very quickly, say, at a rate of 1-2 in/hr, it may not infiltrate into the ground as quickly as it falls, resulting in localized, short-term ponding. We provide for that by gently sloping roadside swales, where stormwater can accumulate until the soil can absorb it into the groundwater.
- During the height of the 10" rain event, stormwater is also being conveyed by the pipe toward the sound. But, by keeping the diameter of the pipe small and its longitudinal slope relatively flat, the velocities are slow. Early in the storm, some of the water in the sock drain will actually exfiltrate out through its perforations and into the drier soil. As the rain ends, the pipe "gets busy" drawing down the groundwater table to re-establish the "bank" of available dry storage in the pores of the soil and getting ready for the next rain event.
- "Sock drain" is relatively cheap. Until the recent inflation/supply chain problems, we were getting 12" – 15" diameter "sock drain" furnished and installed for about \$40-\$45 per linear foot. This is about half the cost of the larger pipe it would take to accomplish a similar level of service with Direct Runoff.
- Small-diameter "sock drain" is light and relatively easy to install, even in our roadside situations where the ground is full of main lines and service drops for water, electric power, CATV and telephone.
- Keeping the groundwater managed down is good for the subgrade, base and surface of our roadway pavements. It helps prevent freeze-thaw damage such as that which destroyed over a block of E Martin Street about 4 years ago.
- While the primary mission of "sock drain" is to drain and protect the roadway, when it manages the groundwater down to, say, 30" below the ground surface, it can bring huge relief to the adjacent property owner whose lower slab elevation is a foot or so too low to surface-drain out to the street. **Obviously, for the owner in a deep "hole," "sock drain" may reduce the severity and/or duration of the flooding problem, but it cannot prevent the problem altogether.**
- "Sock Drain" has a track record of success in KDH. We began using it to a modest degree in 2006-2010. It was absolutely the key to fixing the long-standing flooding in Ocean Acres (2010 and 2012) and Whispering Pines (2018). As may be seen from our project-tracking spreadsheet, all of our "street projects" from 2010 forward have included sock drain work. It is working.
- It must also be noted that there is a role in the overall KDH storm drainage system for larger "trunk lines." The existing NCDOT Canal through First Flight Village is a major trunk. As an extension of it, in 2015, we replaced undersized and structurally failing drive culverts under Asheville Drive, Prospect Avenue and Lowell Avenue, then along Woodmere Avenue and many blocks of N Memorial Boulevard. This route is now a trunk line of 48" smooth-wall pipe. Ultimately, the Memorial system will be projected southward all the way to Carolyn Drive, gradually reducing from 48" diameter to 42", then 36" and finally 30". This will finish relieving the long-standing, long-duration flooding in the Memorial and Wrightsville areas, which have already seen notable improvement due to the 2015 project. Another example of a relatively large "trunk" system is the Raymond Avenue/Bickett Street ditch/culvert system in the northern portion of KDH.

- An exciting prospect to enhance greatly the Memorial Boulevard trunk, discussed in the previous bullet, is the subject of the Town’s pending application for a “Building Resilient Infrastructure and Communities” (BRIC) Grant from the Federal Emergency Management Agency (FEMA). If approved, KDH’s BRIC Grant will fund the southern (Wrightsville Boulevard) extent of the Memorial Boulevard trunk, then develop a major additional outfall route westward along Goddard Avenue, under US 158, between the Dare County water and recreation facilities, through the school complex along Veterans Drive, then offsetting to the property line between Bermuda Bay and the school property and discharging to the sound. Consistent with the “R” (Resilience) in “BRIC,” this adds a new, strong westerly outfall to Memorial trunk, taking some of the burden now shared by the northern outfall to the NCDOT canal and the temperamental 3 ocean outfalls. The resulting overall system would be more robust and reliable than anything KDH could achieve for many years with the limits of local funding.

4. WHAT DO KDH STAFF & TOWN ENGINEER RECOMMEND TO SISPC & BOC, REGARDING STORMWATER?

- a. Continue funding capital improvement projects as we have been recommending for the last 12 years. We are unsure whether street, drainage, water and sidewalk costs will ever recover to pre-2021 levels, or what the rate of cost inflation will be, but expect a vigorous program, holistic and integrated with all 4 infrastructure areas, to continue costing around \$2 million annually, averaging about half from the Water Fund.
- b. All infrastructure areas are important. Certainly, let us not fall behind on rebuilding our “Poor”-rated streets. The next rating will be later this year, and some Fair2 and Fair3 streets will undoubtedly be found to have dropped to Poor. Drainage/Stormwater are important, but they must not come at the expense of street work. If a street is allowed to deteriorate too far, a \$300,000 per mile overlay can become a \$1,000,000 per mile reconstruction.
- c. Let’s continue to seek out alternate/supplemental funding. The FEMA BRIC Grant application is a good example. We leave it to the BOC’s wisdom as to whether the current state of stormwater needs is urgent enough to warrant an accelerated program funded by borrowed money or we continue to “pay as we go.”
- d. KDH probably should make a clear policy statement as to our objectives when we do capital improvement projects that include drainage/stormwater management work, as it relates to solving problems on private property. The following could be a starting point for such a policy statement:

It is the Town’s policy to construct, maintain and rehabilitate its streets and roads so that their storm drainage systems (roadside ditches/swales, culverts, enclosed pipe systems, outfalls, etc.) accomplish the following objectives:

- i. Keep the street drained so that it is safely passable to vehicular and pedestrian traffic.
- ii. To the maximum extent practicable, avoid stormwater from the street draining onto private property, except through an easement.
- iii. Receive the surface flow of stormwater from adjacent single-family residential properties.

In addition, in those areas where the Town determines that groundwater management measures are feasible, such a system may be installed and may provide some benefit to adjacent residential properties whose land and/are structures are lower than the elevation of the street. In so doing, the Town is applying a technique which has been shown to promote the

three foregoing objectives. The Town welcomes any secondary benefits that such groundwater systems may provide in alleviating a private property owner's adverse drainage conditions due to being lower than the street, but affirmatively declares that it is under no duty to do so and accepts no liability should any such mitigation be ineffective or not totally effective in any given rainfall event.

- e. It is probably time for a full Stormwater Master Plan update; the last was done in 2010. Such an update should, at a minimum, result in an updated Townwide map showing all but the smallest components of the drainage system. Other potential elements could include:
 - i. Condition rating of all components.
 - ii. Capacity rating.
 - iii. A more precisely-determined list of capital improvement projects.
 - iv. Incorporation of the mapping rating elements of the plan into a Town-wide GIS system, which could also include water distribution, streets and other infrastructure.

Director of
Planning and Inspections
MEREDITH GUNS

Building Inspector
MARTY SHAW
CHARLES THUMAN

Code Enforcement Officer
JORDAN BLYTHE



Assistant Director of
Planning and Inspections
CAMERON RAY

Senior Planner
RYAN LANG

Zoning Administrator
DONNA ELLIOTT

THE TOWN OF KILL DEVIL HILLS
NORTH CAROLINA

PLANNING DEPARTMENT

February 22, 2022

Memorandum

To: Street Improvement/ Special Project Subcommittee

From: Meredith Guns, Planning Director *JRB*

Subject: Street Improvement Recommendation 2022-23 Fiscal Year (FY) and 2023-24 Plan Year

Attached is a memorandum and spreadsheet dated February 5, 2022 from Pete Burkheimer, P.E. with American Engineering and Town Engineer. The spreadsheet outlines street recommendations for 2022-2023 FY, 2023-2024 plan year and beyond. Additionally, the accompanying spreadsheet summarizes the past several years of projects and the remaining Fair 3 and Poor Streets.

The 2022-23 recommendation is **Seminole Street, Indian Drive and US158 Drainage** (page 5 of the attached memo). This project was originally part of the current 2021-22 project, however it was deferred to expand this year project to include improvements to the entire length of West Third Street and sidewalks. The 2023-24 project will include a four block section of Indian Drive and all of Seminole Street, and expand the previous drainage project on US158 to extend from West Third Street north to West Durham Street. The project will also include replacement of some of the AC water main. Estimated cost of the project is \$1,390,000 (\$886,000 streets, \$504,000 water fund)

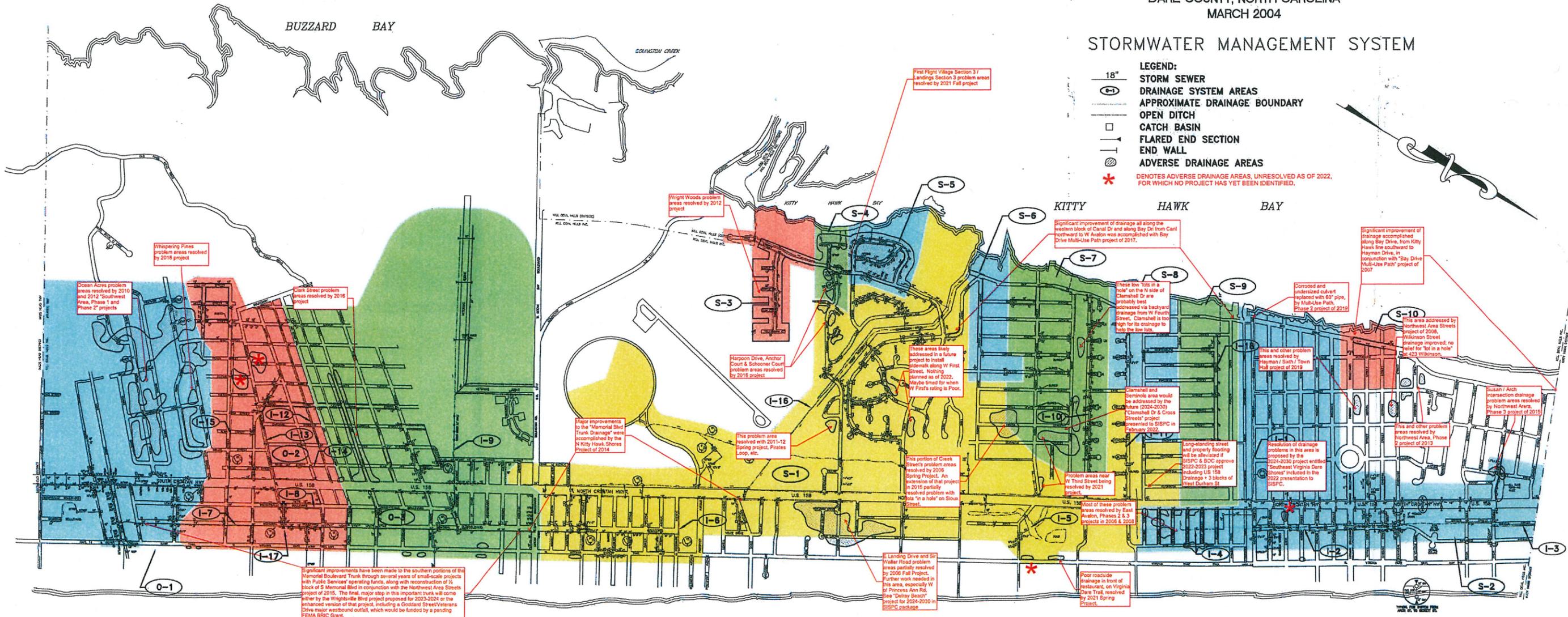
The 2023-24 plan year includes **Wrightsville Boulevard** from Goddard Street to Carolyn Drive (Ramada). The project proposed resurfacing of the roadway and establish a medium size storm drainage line as a major branch of the Memorial Blvd drainage system. This will dramatically improve the efficiency of the drainage system in this area. The project will also replace AC water mains in the project area. Estimated project cost is \$2,265,000 (\$1,271,000 streets and \$994,000 water funds).

The memorandum also outlines future projects includes projects that address some drainage complaints that the subcommittee was made aware of in July 2021. Staff recommends forwarding the 2022-23 street recommendation Seminole Street, Indian Drive and US158 Drainage as well as the 2023-24 plan year recommendation, Wrightsville Boulevard, to the Board of Commissioners with a favorable recommendation.

TOWN OF
KILL DEVIL HILLS
 DARE COUNTY, NORTH CAROLINA
 MARCH 2004

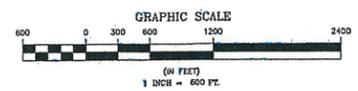
STORMWATER MANAGEMENT SYSTEM

- LEGEND:**
- 18" STORM SEWER
 - DRAINAGE SYSTEM AREAS
 - - - APPROXIMATE DRAINAGE BOUNDARY
 - - - OPEN DITCH
 - CATCH BASIN
 - ┌┐ FLARED END SECTION
 - └└ END WALL
 - ⊗ ADVERSE DRAINAGE AREAS
- * DENOTES ADVERSE DRAINAGE AREAS, UNRESOLVED AS OF 2022, FOR WHICH NO PROJECT HAS YET BEEN IDENTIFIED.



THE INFORMATION SHOWN HEREON DERIVED FROM PREVIOUSLY IDENTIFIED STORM DRAINAGE IMPROVEMENTS AND AMENDED TO SHOW IMPROVEMENTS SINCE LAST ASSESSMENT.

ATLANTIC OCEAN





11/2019

Seminole St

Peter Ln

Newport News St

Aztec St

Dolby St

Giam Shell Dr

Fil Ln

David Ln

W. DURHAM ST.
US158 TO NEWPORT NEWS ST.
ESTIMATE = \$90,000

158

US 158
W. THIRD STREET TO W. DURHAM ST.

OPTION 1: CONTINUOUS PIPE W. THIRD
TO W. FOURTH, PIPE UNDER 5TH
ESTIMATE = \$340,000

OPTION 2: PIPE ONLY UNDER
DRIVEWAYS AND STREET
ESTIMATE = \$150,000

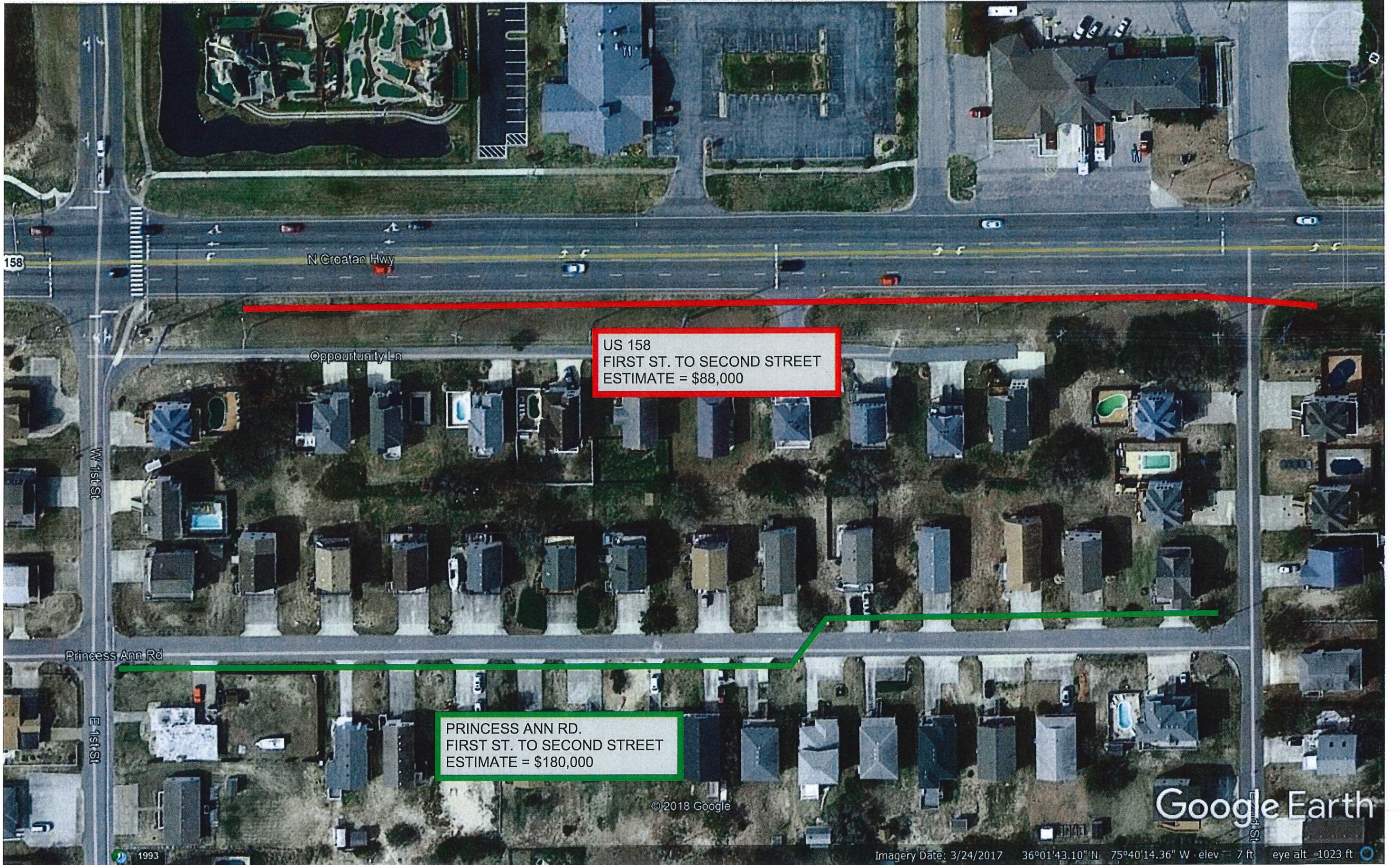
N Croatan Hwy

1463

Google Earth

Imagery Date: 3/24/2017 36°02'01.67" N 75°40'31.71" W elev 19 ft eye alt 2023 ft

1993



N Croatan Hwy

Opportunity Ln

Princess Ann Rd

US 158
FIRST ST. TO SECOND STREET
ESTIMATE = \$88,000

PRINCESS ANN RD.
FIRST ST. TO SECOND STREET
ESTIMATE = \$180,000

W 1st St

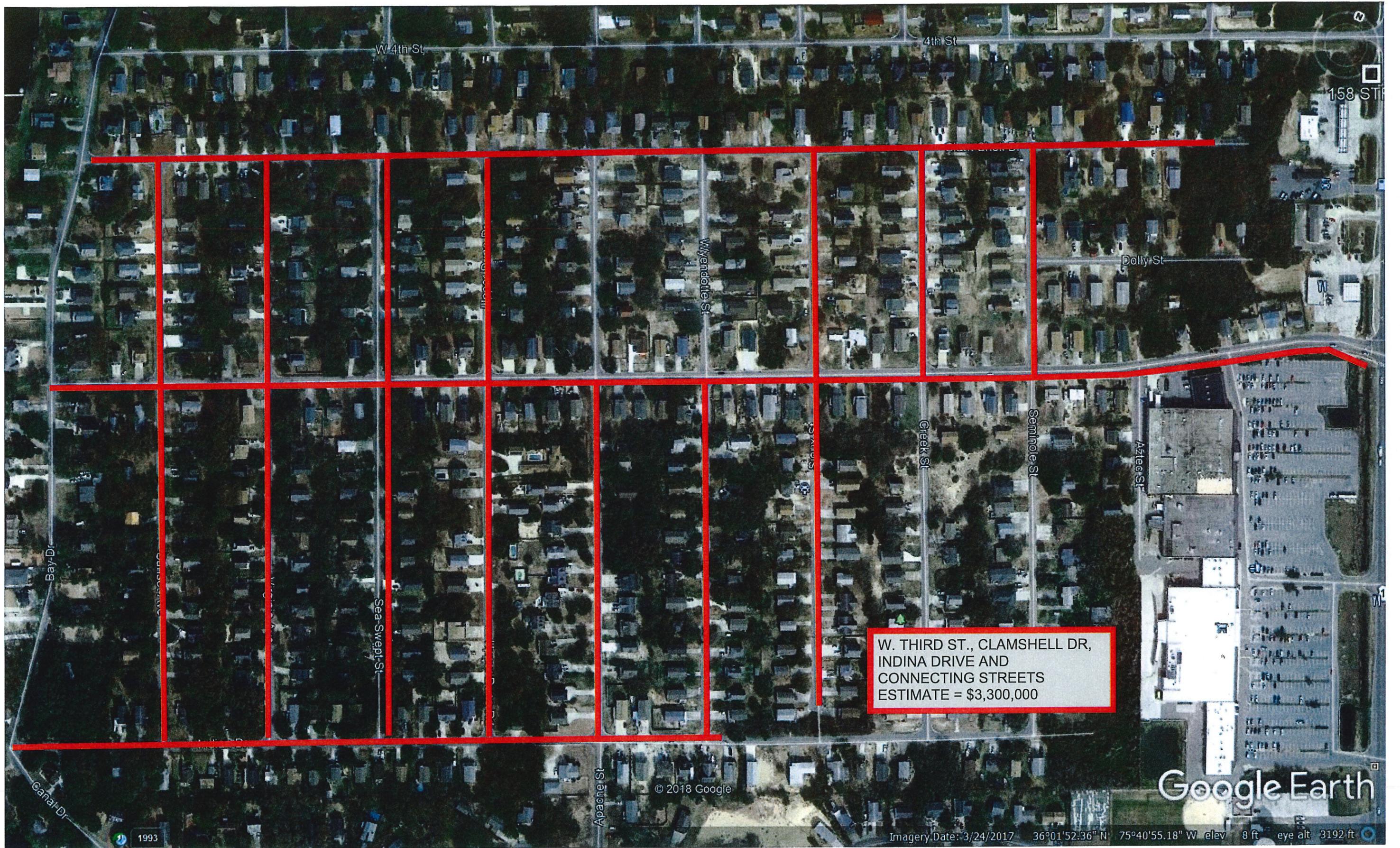
E 1st St

©2018 Google

Google Earth

1993

Imagery Date: 3/24/2017 36°01'43.10" N 75°40'14.36" W elev 7 ft eye alt 1023 ft



W. THIRD ST., CLAMSHELL DR,
INDINA DRIVE AND
CONNECTING STREETS
ESTIMATE = \$3,300,000

Google Earth

© 2018 Google

Imagery Date: 3/24/2017 36°01'52.36" N 75°40'55.18" W elev 8 ft eye alt 3192 ft

1993

W. SPORTSMAN DR.
ENTIRE STREET
ESTIMATE = \$500,000

W. AVALON DR.
ENTIRE STREET
ESTIMATE = \$500,000

W. DURHAM ST.
PHOEBUS ST. TO HAMPTON ST.
ESTIMATE = \$52,000

W. DURHAM ST.
US158 TO NEWPORT NEWS ST.
ESTIMATE = \$90,000

W. DURHAM ST.
HAMPTON ST. TO BAY DR.
ESTIMATE = \$89,000

© 2018 Google

Google Earth

Imagery Date: 3/24/2017 36°02'15.76" N 75°41'04.08" W elev 6 ft eye alt 3172 ft

11/2019

VIRGINIA DARE SHORES
LEE AVENUE AND SURROUND STREETS
WITH DRAINAGE REPORTS
ESTIMATE = \$430,000

W Sportsman Dr

W Bickett St

W Palmetto St

W 1st St

Lee Ave

W Avenue St

W Walk Jr St

W Hayman Blvd

W Sothel St

Columbia Ave

Ocean Park

COLUMBIA AVENUE ALTERNATIVE FOR
DEEP DRAINAGE OUTLET

Google Earth

1993

Imagery Date: 3/24/2017 36°02'35.89" N 75°40'57.22" W elev 7 ft eye alt 2023 ft

S. WRIGHTSVILLE BLVD. INTERCEPTOR AND
GODDARD DITCH REDIRECTION CONCEPT
ESTIMATE = \$3,300,000

S. MEMORIAL BLVD.
CAROLYN DR. TO E. BAUM ST.
COMPLETE DRAINAGE UPGRADES PER
AMERICAN ENGINEERING PLANS
ESTIMATE = \$1,300,000

Google Earth

75°39'56.91" W elev 12 ft eye alt 11903 ft

Director of
Planning and Inspections
MEREDITH GUNS

Building Inspector
MARTY SHAW
CHARLES THUMAN

Code Enforcement Officer
JORDAN BLYTHE



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NORTH CAROLINA

PLANNING DEPARTMENT

February 22, 2022

Memorandum

To: Street Improvement/ Special Project Subcommittee

From: Meredith Guns, Planning Director *MBG*

Subject: Street Improvement Recommendation 2022-23 Fiscal Year (FY) and 2023-24 Plan Year

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February 5, 2022

The Kill Devil Hills Street Improvement and Special Projects Committee,
c/o Ms. Meredith Guns, Planning Director
Ms. Debora P. Diaz, Town Manager
P. O. Box 1719
Kill Devil Hills, NC 27948

By **e-mail**

Subject: **Project ID V21200 "B" – 2022/23 (and beyond) Street/Drainage Projects Recommendations**

Dear Committee Members, Ms. Diaz and Ms. Guns:

This is our annual update on your capital projects program and our recommendation looking forward. This year, it also includes a focus on Storm Drainage/Stormwater Management.

In the following points, we'll recap some recent accomplishments and note some other points that are influencing our thinking for the future:

What have we been doing since last meeting?

1. 2021 has been another productive year—and a remarkable one:
 - a. **2020/21 Fall and Spring Bid Packages**: This was FOUR projects in TWO packages, bid and awarded as ONE contract. The construction work was successfully completed late this spring. All elements are working well. Below, as a reminder, are brief summaries of the Fall and Spring packages.
 - i. **Fall Bid Package**: Project 1 is First Flight Village, Section 3, consisting of Cedar Drive's loop west of West First Street, plus one more block of Cedar Drive ending slightly beyond its intersection with Dogwood Lane; Captains Lane is also included. Project 2 is Landings, Section 3, consisting of all of Teakwood Lane and all of Captains Circle. This work addressed the poor condition of those streets and poor drainage in those areas.
 - ii. **Spring Bid Package**: Project 3 consisted of Briggs Street from East Arch Street toward/to East Helga Street; East Helga Street from US 158 to NC 12, and the short block of East Fourth Street from NC 12 to its end. Project 4 consisted of all of East Martin Street, from US 158 to NC 12 and the short block of East Dean Street from US 158 through Wrightsville Boulevard. The Spring Package (plus Alternate work) included rehabilitating the streets, providing improved drainage and, in the cases of East Helga, West Helga and East Martin, making needed pedestrian improvements.

- b. **2021-22 Project: West Third Street**: You will recall that , partway through the design of this project, we realized the need to extend the street and water main work all the way west to Bay Drive. You and the Board of Commissioners approved this change in the Spring, we completed the additional design work, received bids, and the contract was awarded by the BOC to Fred Smith Company in September.

This is a large project, which is replacing the existing 8" asbestos-cement (AC) water main from US 158 west to Bay Drive, providing upgraded storm drainage/stormwater management for the entire length, replacing all of the concrete sidewalk and curb & gutter from Creek Street eastward, and finally providing a 3" asphalt pavement overlay for the entire 3,525' length.

As we worked through the bidding phase of West Third Street, we new that the "supply chain disruption" and other effects of the COVID-19 pandemic would have major impacts. We experienced pricing more than 25% higher than expected and material delay factors of 3 to 6 times longer than past experience. As an example, ordinary, small-diameter HDPE "sock drain" pipe which we usually see arrive 2 weeks or so after order, hasn't yet even arrived at the jobsite, and is expected now to arrive 10-12 weeks after order. Fortunately, our Contractor and Subcontractor were able to procure enough PVC water main pipe to get that work under way about 5 weeks into the Contract Time, only a couple of weeks later than normal. As of this date, water main installation work, along the north side of West Third Street, has progressed from Bay Drive eastward to Creek Street. Branch mains at the intersections have been installed now from Bay Drive through Wyandotte Street and that section has just been placed in service, after pressure testing and disinfection. Finally, necessary storm drain materials have been received; that work is proceeding, west to east.

This work involves considerable potential for disruption of traffic and inconvenience to residents along the corridor. Town Engineer and Town staff are working with the Contractor and his Subcontractors in an effort to keep this to a minimum. The project should attain Substantial Completion in late Spring.

The current strained market conditions include not only supply chain issues but also inflation. In fact, inflation of construction costs is significantly worse than the 6%± rate now being experienced. It is uncertain to what extent these conditions are transitory. We are staying in close touch with the contracting community on this.

- c. **Other projects not tracked through the SISPC Process**: Although SISPC is not directly involved in these, several other capital projects have been recently completed or are under way:

- The new 400,000-gallon Old Town Hall Elevated Water Tank was completed 18 months ago, but the related installation of a third pump in our pump station was not completed until this past Spring. A major renovation was also done on the nearby 500,000-gallon ground tank.
- Work to restore and enhance Meekins Field, which had to be taken out of service for the Tank project, has made major progress, with the renovation and expansion of the parking lots in the area being complete. A new restroom building has been bid and rebid, and we are now negotiating with the low bidder to get the price down further. Supply chain problems have delayed installation of some key below-ground tanks and pumping equipment. We still plan to open, at least in a partially-complete state, this Spring.
- A small soundside access, with a few parking spaces, sidewalk and a timber pier with kayak launch platform, was completed this past Summer. Some CAMA funding was provided.

What are the goals and principles of our capital projects?

1. As we always note in these reports, our long-held goal of is to fix our Poor streets. Over the next 3-4 years, we expect to transition to more and more resurfacing of streets and less total reconstruction, as we bring the older streets up to a more durable standard of construction. After that, we will want to be resurfacing our streets right when they need it; in other words, there won't be any more Poor streets, or, they won't be on the Poor list very long. The next round of Street Condition Rating will be later this year; the last was in 2017.
2. Another goal, as noted before, is the gradual replacement of asbestos-cement (AC) water mains throughout town. We have just completed the decennial update of our Water System Master Plan. Recently presented to and adopted by BOC, it includes a multi-year recommended program in increments of about \$2 million at intervals of 2 or 3 years for AC main replacement, as well as considerable funding for above-ground work at our two water storage and pumping facilities. As we consider street or street and drainage projects, we are always looking for the opportunity to replace AC water mains at the same time, which is more cost effective and causes less overall disruption to our residents. This "holistic" approach to improvement projects will be evident in subsequent portions of this report.

Especially over the last 12 or so years, we have made great progress in improving storm drainage and stormwater management in a number of areas. There are still many areas with drainage challenges. The 2015 project was a giant step on our ongoing Memorial Boulevard Backbone effort, but we'll need to push southward in the future (see the Wrightsville Boulevard project, the next big part of that effort, now hopefully only a year and a half out). Elsewhere, when we do a street project, we almost always probably include drainage work, using our "sock drain" strategy in most cases. For example, the recently completed Whispering Pines project as well as Hayman Boulevard include continuous sock drain for most of their length,

which will provide significantly improved drainage service to these lower-elevation areas, as did the even-more-recently finished Fall and Spring Bid Packages.

As you will recall, however, from the last SISPC meeting—specifically focusing on drainage—there are several areas which have become areas of acute concern due to drainage challenges. These were highlighted in the Hurricane Dorian event of September, 2019, which included a close passage of the Hurricane, whose rains raised up the water table and caused some flooding, followed only three days later by a 3-inch thunderstorm. This event triggered a flurry of drainage complaints, many in the West Avalon and Virginia Dare Shores areas. Staff prepared an analysis, with recommendations, of these and other areas. With this report, we have incorporated them into a series of “holistic” projects, most of which include street and water main improvements as well.

In view of the interest this cycle on storm drainage and stormwater management, we have also prepared a separate report, entitled “**Limited, Interim Update** to the Kill Devil Hills, NC **Master Stormwater Plan.**” We will refer to it as the Stormwater Plan Update, for short. A copy of it is being provided to you. It provides context for the two projects described in detail below for fiscal years 2022-23, 2023-24 and five or six more potential projects for subsequent years.

3. Considering the goals noted above, we reiterate the following points made in previous year’s reports, which lay out our strategic goals and factors summarize what drives our recommendations with respect to future street and drainage projects:
 - a. Having completed the well-received Multi-Use Path program, our attention has returned to repairing poor streets as noted below, as well as smaller-scale pedestrian projects and stormwater/drainage work.
 - b. Fixing our Poor streets before they deteriorate to where a moderately-expensive overlay becomes an expensive reconstruction is just good stewardship. Your staff completed in 2017 a complete re-inspection of Town-maintained road and streets. These inspections occur about every 5 years, with the next one due in 2022. The rating system is based on a point system, considering pavement condition and storm drainage service (or the lack of it). The rating categories are Excellent, Good, Fair1, Fair2, Fair3 and Poor. Before the 2017 rating, we only had about 2.6 miles of the Town’s 63 miles of road in Poor Condition. Per the 2017 inspection, another 3.77 miles dropped to Poor, bringing the Poor total up to 6.4 miles. The work of the last several years, plus what we just bid, have whittled the Poor street total back down to 2.97 miles, most of which we expect to address with the projects recommended for FY 22-23 and FY 23-24.
 - c. We have, as noted, been making great progress in renewing our Poor streets, and we still have done so in recent years. However, inflation has eroded our buying power somewhat over the last five years since the recession passed. The Board of Commissioners has recognized

this and supported increased funding levels in recent years. This inflationary trend has, as noted earlier, spiked severely due to the labor and supply-chain crises associated with COVID-19. How transitory the current inflation may be is quite unclear.

- d. Even though we need to press hard on the core mission of repairing Poor streets, while doing so we should continue bringing drainage relief to problem areas and to move toward the very successful program of sock drain and roadside swales.
- e. Where feasible, we should combine road improvement, drainage improvement and water main replacement into one project. This “holistic” approach saves money and disturbs our citizens less.
- f. To continue with the progress made during the last 16 years in renewing our streets and improving our drainage systems, we will need to sustain levels of street and drainage funding at \$1 million to \$1.3 million per year, at least until we have all of our streets brought up to sound structural condition and provided with a proper stormwater management system. These recommended funding levels are over and above water system funding and sidewalk funding which may be applicable. For comparison’s sake, once all of our poor streets have been brought to modern standards, all water lines have been replaced with modern materials and all areas have effective drainage installed, street maintenance will become essentially milling and overlaying 2.5 to 3 miles of street every year, about \$500,000 to \$600,000 at current prices.

What is recommended for the next two years?

With those guiding principles established, we offer the following project-specific recommendations on the attached spreadsheet. Let’s consider the various portions of this spreadsheet:

Page 1: This contains the most important information. (The project awarded last fall are shown on Page 3 under Completed Projects.) [As noted earlier, the separate Stormwater Plan Update provides additional context for the stormwater elements of these projects.](#)

FY 2022-23: The upcoming year’s candidate project is shown with **salmon shading**. Most of this project—Seminole Street and US 158 Drainage—was originally to be included in the 2021-22 West Third Street now under construction. When we found we needed to extend the West Third street and water main work all the way to Bay Drive, these peripheral projects had to be postponed a year. Now it’s “their turn,” and we’re adding a four-block section of Indian Drive. Seminole’s pavement is Poor, and Indian is Fair3, likely to fall to Poor with the impending 2022 Rating.

The US 158 Drainage Project was always going to build upon our major “trunk drainage” improvements at the Fire Station and in front of the Dare Centre, by removing restrictive culverts from West Third Street upstream (north) to West Fifth Street. We’re now recommending to continue one block upstream to West Durham Street, then three blocks upstream (west) along West Durham. This will be a major step to address the long-standing concerns of West Durham residents, which you heard well spoken at your last meeting. It is also noteworthy that, while some of the streets we heard from at the last SISPC had lot flooding, West Durham actually has frequent flooding of the street itself. This fact makes it a higher priority among the problem neighborhoods.

Seminole Street and Indian Drive will include replacing their asbestos-cement water mains with modern PVC lines and overlay of the street pavement. “Sock drain” will be installed along most of Seminole and part of Indian.

In the case of the US 158 Drainage/West Durham Street portion of the project, US 158 will be mainly drainage, but one section of AC water main will be replaced (from Fourth Street north to West Durham Street); no street improvement will be made to the NCDOT-maintained Bypass itself. The three blocks of West Durham will get drainage improvements and a pavement overlay, as well as replacement of its 6” AC water main with 6” PVC.

The estimated total cost of this project is \$1,390,000, of which about **\$886,000** represents street and drainage funding; the remaining \$504,000 is water funding.

FY 2023-24: The area with **blue shading** is intended to show the next year out, FY 2023-24, in which we recommend the design and bidding of a major project on a one-mile section of **Wrightsville Boulevard**, from Goddard Street all the way south to Carolyn Drive. This project would renew the surface, which is in Poor condition, but also establish a medium-size storm drainage line as a major branch of the Memorial Boulevard storm drainage system. This will not only benefit Wrightsville Boulevard but will take pressure off the parallel portion of Memorial Boulevard, by (a) intercepting more than half the flow that part of the Memorial System is trying to carry and (b) lowering the groundwater in the whole area through the “sock drain” effect discussed above.

Nearly half of the cost of this overall project is expected to be water distribution system improvements. Portions of the water lines in Wrightsville are undersized, or asbestos-cement lines, and/or may need adjustment to make room for the storm drains. Water line adjustments associated with a street and drainage project typically involve multiple water service shutoffs. Thus, we are proposing, while we are doing pipe work in the area, to replace old, existing asbestos-cement water mains in four streets running between US 158 and NC 12.

The total cost for this project is anticipated to be \$2,265,000, of which \$1,271,000 is street and drainage funding and the remaining \$994,000 is water funding.

While this project is proposed for FY 23-24, Staff is making a strong effort to secure grant funding for a larger stormwater management/storm drainage project which would include this work. The funding sought is a “Building Resilient Infrastructure in Communities” (BRIC) Grant, a program funded by the Federal Emergency Management Agency (FEMA) and administered by the North Carolina Division of Emergency Management (NCEM). We will keep SISPC and BOC apprised of progress on the BRIC Grant.

The remaining elements of the BRIC-funded larger project would include developing a totally new outfall, intercepting much of the northbound and eastbound flow up South Memorial Boulevard and Wrightsville Boulevard and directing them westward to the Sound, via new culvert and pipe improvements under US 158 at Goddard Street, along the Town and County properties, under Veterans Drive, alongside the High School campus, along the south boundary of Bermuda Bay to the Sound. This would provide excellent drainage “between the highways” south of Ocean Bay Boulevard, and the same north of Ocean Bay, by reducing the burden on the new (2015) 48” culvert system in that North Kitty Hawk Shores area.

FY 2024 and beyond: In past years, we have provided a third project (this year, it would have been the FY 2024-25) project. Instead, we are presenting you with a list of not one but five projects—or six if you split West Avalon Drive/West Sportsman Drive, as we think is likely. Without recommending a specific order, we will discuss each of them. Before doing so, we reiterate that most of these include a specific amount of AC Water Main Replacement work, resulting in a “holistic” project that minimizes the number of times in a generation that we inconvenience a neighborhood and enables the Water Fund to share in some of the common costs, such as pavement patching and overlay, driveway reworks, etc. As noted above, this approach is also reflected in the current Water System Master Plan’s Capital Projects planning effort.

These five or six “Out-Year” projects follow. The order and timing of these projects will be influenced by the results of the upcoming 2022 Street Condition Rating and by the availability of funding, as determined by the Board of Commissioners.

Southeast Virginia Dare Shores: This project addresses a number of the streets which gave rise to drainage complaints at the last SISPC meeting. A total of 7,350 linear feet of street are involved, or about 1.4 miles. Small-diameter “sock drain” will be installed, outfalling to the existing Bickett Street ditch at the southern boundary of the area; this will “manage” the groundwater elevations, so that dry sand is able to soak up most of the runoff from a heavy, intense rain event. Also, all of the streets, including Palmetto, Eden, Aycok, Walker, Archdale and Lee, contain AC water mains, which will be replaced with PVC. In this area, the streets are in “Good” or better condition, so we expect just to patch the streets where they need to be cut for water and storm “cross lines.” Alternatively, a thin asphalt overlay may be applied. The estimated total cost of this project is **\$1,987,000**, of which \$614,000 is street and drainage funding and the remaining \$1,373,000 is water funding.

West Sportsman Drive and West Avalon Drive: These projects may be lumped together, but more likely will be done separately, due to their length. The scope of these projects is similar to the others: sock drain will be provided full length and the existing AC water mains will be replaced with the same size PVC main. West Avalon has an asphalt surface and will receive a 3" overlay in two lifts. West Sportsman is a concrete street with an asphalt overlay, with a pavement width of only 16' lying within a 40' wide right of way. The pavement width will be increased to the Town's standard. The estimated total cost of this project is **\$2,446,000**, of which \$1,532,000 is street and drainage funding and the remaining \$915,000 is water funding. If the two streets are done separately, the costs for each will be about half of the total. The combined length of the streets is about 6,100 feet.

Clamshell Street and Cross Streets: This is another rather large project, making street, drainage and, in most cases, water main improvements to the Sea Holly Ridge and High View/Hendrix Addition subdivisions. This work will extend branches from the drainage "trunk" system being installed by the current West Third Street project, further projecting the sock drain/groundwater management system throughout the area. The streets included are the lower (in elevation) portions of Clamshell Street, the north side of Seminole Street and the south sides of Sioux, Wyandotte, Upper Dune, Sunset and Virginia Streets. Most of the streets are in Fair1 condition; a one-or two-lift overlay will likely be provided, depending on (1) findings as to the existing pavement section and (2) how late in the decade this work is done, with further pavement deterioration. Assuming a 2-lift overlay, the estimated total cost of this project is **\$2,421,000**, of which \$1,176,000 is street and drainage funding and the remaining \$1,245,000 is water funding. A total of 7,280 feet, or about 1.4 miles, of street are included.

Delray Beach: Smallest of these projects is Delray Beach, a project driven primarily by drainage concerns. As a drainage trunk line, it will extend a 24" and 18" line southerly along the eastern right of way of US 158, from north of Second Street southward to First Street. Sock drain will be extended up First Street, replacing old, corrosion-prone corrugated metal pipe, and some sock drain in portions of the other streets, which include Princess Ann Road, Sir Walter Road, Landing Drive, Yardarm Drive and Cove Court. AC water mains will be replaced in all roads. Some streets in this area were rebuilt in the 2006 Street Project and will only receive single-lift overlays. . The estimated total cost of this project is **\$1,175,000**, of which \$622,000 is street and drainage funding and the remaining \$554,000 is water funding. The total length is 5,950 linear feet, or about 1.1 mile.

Ocean Acres: Ocean Acres got storm drainage improvements on an urgent basis in two phases, 2010 and 2012, with significant drainage improvements noted immediately. Those projects were the flagships for our "sock drain" program. By the time this project is done, probably later in the decade, most of the streets will likely have deteriorated to Poor. Also, all street with water mains have AC mains, which will need to be replaced with PVC. The estimated total cost of this project is **\$2,624,000**, of which \$905,000 is street and drainage funding and the remaining \$1,720,000 is water funding. This large project includes 12,870± linear feet of street, or about 2.4 miles.

Mentioned briefly in the "FY 2030-31 and beyond" box are the Memorial Boulevard Drainage Trunk, Phase 2 and Dock Street. Memorial Drainage may prove to be unnecessary after the Wrightsville Boulevard project is accomplished in 2023-24, whether via the BRIC Grant or otherwise; there is already a somewhat-helpful non-sock system along this part of Memorial, and the Wrightsville sock drain a block a way will influence the water table eastward to Memorial while sharing the drainage conveyance function. Dock Street is a minor, concrete cross street which, while in quite poor condition, carries little traffic. It likely will remain a low priority.

As important as storm drainage/stormwater management is, we must give highest priority to repairing and resurfacing our streets promptly when their condition falls to "Poor." The next condition rating is schedule for this year, and we're sure that some current "Fair2" and "Fair 3" streets have deteriorated to "Poor."

All of Pages 2 and 3: This is a recap of the accomplishments of the last 15 years' projects. It is provided to help the Committee and others see our recommendation in its historical context.

All of Page 4: This page accomplishes two things:

In the **Drainage Only** sections, we note past projects completed in the past 15 years.

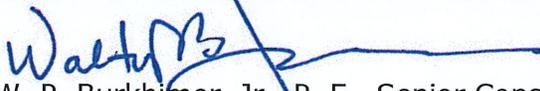
In the block after that is a list of drainage projects still remaining from the Town's 2005 Multi-Year Drainage Plan. Especially notable among these, **Memorial Avenue Ditch**, is discussed above.

In the final block, **POOR Streets Remaining**, we note the streets with a condition rating of 50 or lower, making them "Poor." This is a relatively short list, which will no doubt increase with the 2022 Street Inspection Report, as noted above. Those which are recommended to be done in the next two years are shaded with the color to match each year's recommendations

Thank you for your careful consideration of our recommendations. We'll see you at the February 22, 2022 SISPC meeting, at 4:00 p.m. in the Board of Commissioners' Meeting Room.

Very truly yours,

AMERICAN ENGINEERING ASSOCIATES, P.A.



W. P. Burkheimer, Jr., P. E., Senior Consultant

Cc: Mr. Steve Albright, Public Services Director
Ms. Meredith Guns, Planning Director

KILL DEVIL HILLS -- Street and Drainage Improvements Recommendations

2/5/22

FY 2022-23						Preliminary Cost (Including design and construction administration. All costs in \$000.)			
	<u>Condition</u>	<u>Rating</u>	<u>Length</u>	<u>Remarks</u>	<u>Street</u>	<u>Drainage</u>	<u>WM</u>	<u>Total</u>	
Seminole St/Indian Dr & US 158 Drainage									
Indian Dr (Seminole-Apache), St, Dr, WM	Fair3	58	870	AC WM	\$246	\$640	\$504	\$1,390	
Seminole St (W Third-Indian) St, Dr, WM	Poor	46	930	AC WM	\$94	\$20	\$131	\$244	
US 158 Drainage (W Third-W Durham)				replace 7 culverts w/36" & 30"; regrade ditch; 6" PVC WM	\$84	\$84	\$140	\$307	
W Durham St (US 158-Newport News St)	Fair2	64	760	18"/15" sock	\$68	\$82	\$114	\$264	
			2,560	0.48 miles Poor-ish					
				Street & Drainage Funding Required (Total above, minus WM):				\$886	

FY 2023-24						Preliminary Cost (Including design and construction administration. All costs in \$000.)			
	<u>Condition</u>	<u>Rating</u>	<u>Length</u>	<u>Remarks</u>	<u>Street</u>	<u>Drainage</u>	<u>WM</u>	<u>Total</u>	
Wrightsville Blvd									
Goddard to Carolyn; overlay, 30" sock drain; upgrade 60% of WM	Poor	46	5,340		\$577	\$694	\$994	\$2,265	
Neptune Drive, replace AC WM, 6"	Fair2	65.4	940	patch; overlay later	\$577	\$694	\$481	\$1,752	
E Atlantic Street, replace AC WM, 8"	Good	81.4	940	patch; overlay later			\$141	\$141	
E Clark Street, replace AC WM, 8"	Fair1	73.4	950	patch; overlay later			\$141	\$141	
E Baum Street, replace AC WM, 6"	Fair2	65	590	patch; overlay later; W blk Exc			\$143	\$143	
			5,340	1.01 miles Poor-ish			\$89	\$89	
				Street & Drainage Funding Required (Total above, minus WM):				\$1,271	

Would be included in BRIC project, if grant approved.

Potential Projects for Subsequent Years are Presented Below In No Particular Priority Order. Their Order May Be Influenced By the Results of the 2022 and 2027 Street Condition Ratings

						Preliminary Cost (Including design and construction administration. All costs in \$000.)			
	<u>Condition</u>	<u>Rating</u>	<u>Length</u>	<u>Remarks</u>	<u>Street</u>	<u>Drainage</u>	<u>WM</u>	<u>Total</u>	
Southeast Virginia Dare Shores									
Total Length			7,350		\$0	\$614	\$1,373	\$1,987	
US 158, Sportsman to Hayman			1,690	Replace 8" AC WM with PVC			\$270	\$270	
Palmetto St, US 158 to Lee	Excellent	92.4	1,230	6" AC WM to PVC; 12" sock		\$111	\$185	\$295	
Eden St, US 158 to Lee	Good	87.2	1,230	6" AC WM to PVC; 12" sock		\$111	\$185	\$295	
Aycock St, US 158 to Lee	Good	83.8	1,230	6" AC WM to PVC; 12" sock		\$111	\$185	\$295	
Walker St, US 158 to Lee	Good	90.2	1,230	6" AC WM to PVC; 12" sock		\$111	\$185	\$295	
Archdale St, US 158 to Lee	Good	87.8	1,230	6" AC WM to PVC		\$63	\$185	\$248	
Lee Avenue, Bickett to Archdale	Excellent	91.8	1,200	6" AC WM to PVC; 15" sock		\$108	\$180	\$288	
			0	0.00 miles Poor					
				Good cross-cut patches; no overlay with this project				Street & Drainage Funding Required (Total above, minus WM): \$614	

						Preliminary Cost (Including design and construction administration. All costs in \$000.)			
	<u>Condition</u>	<u>Rating</u>	<u>Length</u>	<u>Remarks</u>	<u>Street</u>	<u>Drainage</u>	<u>WM</u>	<u>Total</u>	
W Sportsman/W Avalon									
Total Length			6,097		\$983	\$549	\$915	\$2,446	
W Sportsman, replace AC WM, 12" sock	Poor	46.0	2,997	6" PVC WM, tie to Avalon @ 407	\$713	\$549	\$450	\$1,712	
W Avalon, replace AC WM, 15" sock	Fair1	71.7	3,100	replace AC WM with PVC	\$270	\$270	\$465	\$1,004	
			6,097	1.15 miles Poor-ish					
				Likely split into two separate projects, or W Avalon bid as alternate.				Street & Drainage Funding Required (Total above, minus WM): \$1,532	

						Preliminary Cost (Including design and construction administration. All costs in \$000.)			
	<u>Condition</u>	<u>Rating</u>	<u>Length</u>	<u>Remarks</u>	<u>Street</u>	<u>Drainage</u>	<u>WM</u>	<u>Total</u>	
Clamshell Dr & Cross Streets									
Total Length			46	8,200	\$655	\$521	\$1,245	\$2,421	
Clamshell, 200' S of Seminole to Sioux	Fair1	74.1	820	6" AC to PVC, 12" sock	\$74	\$74	\$155	\$302	
Clamshell, Upper Dune to Bay	Fair1	74.1	1,030	6" AC to PVC, 12"/15" sock	\$93	\$93	\$185	\$370	
Clamshell, remainder	Fair1	74.1	1,230	6" AC to PVC	\$111		\$78	\$189	
Seminole, W Third to Clamshell	Fair1	80.4	520	2" PVC to 6" PVC, 12" sock	\$47	\$47	\$138	\$232	
Sioux, W Third to Indian	Fair1	75.1	920	12" sock, tie old sys @ 1707	\$83	\$61	\$138	\$282	
Wyandotte, W Third to Indian	Fair2	70	920	2" PVC to 6" PVC, 12" sock	\$83	\$83	\$138	\$304	
Upper Dune, W Third to Indian	Excellent	94.2	920	2" to 6" PVC N 400', 12" sock		\$36	\$138	\$174	
Virginia, W Third to Indian	Fair2	68.4	920	2" PVC to 6" PVC, 12" sock	\$83	\$83	\$138	\$304	
Sunset, W Third to Indian	Fair1	72.4	920	2" to 6" PVC S 500', 12" sock	\$83	\$45	\$138	\$266	
			7,280	1.38 miles Poor-ish					
				Probably don't overlay Upper Dune if still Good or better.				Street & Drainage Funding Required (Total above, minus WM): \$1,176	

						Preliminary Cost (Including design and construction administration. All costs in \$000.)			
	<u>Condition</u>	<u>Rating</u>	<u>Length</u>	<u>Remarks</u>	<u>Street</u>	<u>Drainage</u>	<u>WM</u>	<u>Total</u>	
Delray Beach									
Total Length			5,950		\$289	\$332	\$554	\$1,175	
US 158, N of Second St to First St				Extend 24"/18" Sock	\$0	\$156	\$156	\$156	
E First St, US 158 to NC 12	Fair3	58.0	940	Replace 15" CMP w/sock	\$56	\$85	\$101	\$242	
Princess Ann Rd, Camellia to Second	Good	87.0	940		\$56	\$63	\$105	\$224	
Sir Walter Rd, E Landing to Second	Good	89.6	2,000		\$120		\$300	\$420	
E Landing Dr, US 158 to NC12	Good	81.6	940	Repl 6" AC SW-NC12; thin OL	\$56	\$29	\$48	\$133	
Yardarm Dr, E Landing to S end	Fair1	79.8	380		\$23	\$52	\$57	\$132	
Cove Court, E Landing to Yardarm	Good	83.8	750		\$45		\$113	\$158	
			940	0.18 miles Poor-ish					
				Thin Overlay, all Town streets (most rebuilt or overlaid 2006)				Street & Drainage Funding Required (Total above, minus WM): \$622	

KILL DEVIL HILLS -- Street and Drainage Improvements Recommendations

	<u>Condition</u>	<u>Rating</u>	<u>Length</u>	<u>Remarks</u>	Preliminary Cost (Including design and construction administration. All costs in \$000.)			
					<u>Street</u>	<u>Drainage</u>	<u>WM</u>	<u>Total</u>
Ocean Acres	Total Length		12,870		\$771	\$133	\$1,720	\$2,624
Ocean Acres Dr, US 158 to Bell	Fair2	69.6	1,790		\$107		\$269	\$376
Ocean Acres Dr, Bell to begin gravel	Fair2	69.6	2,080		\$125		\$312	\$437
Ocean Acres Dr, gravel to Nat. Cons. FH	gravel		1,385		\$0		\$208	\$208
Gunas Dr, OA to Bell	Fair3	53.4	1,765		\$159		\$265	\$424
Burns Dr, OA to OA	Poor	41.4	3,700		\$222	\$83	\$437	\$742
Harrington Ave, Gunas to Burns	Good/Poor	81/50	615		\$37			\$37
Bell Ave, Lake to Burns	Fair3	57.4	555		\$33	\$50	\$83	\$167
Copley Dr, OA to OA	Fair2	65.4	980		\$88		\$147	\$235
11,178 2.12 miles Poor-ish								
Decide whether to pave from top of hill to Conservancy on OA.					Street & Drainage Funding Required (Total above, minus WM): \$905			

	<u>Condition</u>	<u>Rating</u>	<u>Length</u>	<u>Remarks</u>	Preliminary Cost (Including design and construction administration. All costs in \$000.)			
					<u>Street</u>	<u>Drainage</u>	<u>WM</u>	<u>Total</u>
Memorial Blvd Drainage Trunk, Phase 2			3,250		\$309	\$445	\$50	\$804
Carlton, Corrigan, Clark, DW's, "SOD"; overlay Mem. F1, F2, P								
Made low priority with parallel work on Vvnghtsville								
Dock Street			549		\$93	\$22	\$26	\$141
Dock Street	Poor	26.6	549		\$93	\$22	\$26	
Minimal traffic; almost like a driveway.								

Blocks Below Summarize Previous Years' Projects

Note: Older project printed small to save space; more recent ones larger on next page.

2005 Fall Project	(May 2003)	Poor Streets Fixed This Season: 400 ft		Cumulative Length, Poor Streets Fixed
Street	Street Condition	Length	Status	
Eighth Ave (Martin to Airstrip)	Semi-improved	450	Completed	
Ninth Ave (Martin to Airstrip)	Poor	400	Completed	400
Culvert repairs	Not applicable		Completed	
2006 Spring Project	(May 2003)	Poor Streets Fixed This Season: 380 ft		Cumulative Length, Poor Streets Fixed
Street	Street Condition	Length	Comments	
West Baum St	Unimproved	600	No Award Spring 05, Fall 05, Spring 06	
W. Fresh Pond/ W. Lake Drive Connector	Poor	380	Completed	780
Creek St (Third to Indian)	Drainage	600	Completed	
Cardinal St (800 Block)	Drainage	425	Completed	
2006 Fall Project	(May 2003)	3,650	Poor Streets Fixed This Season: 3,650 ft	Cumulative Length, Poor Streets Fixed
Street	Street Condition	Length	Comments	
Sir Walter Rd	Poor	1,920	Completed	2,700
Princess Anne Dr (Camellia to First)	Poor	720	Completed	3,420
Camellia Dr (Sir Walter to Princess Anne)	Poor	350	Completed	3,770
East Landing Dr (Cove to US 158)	Poor	660	Completed; overlay	4,430
2007 Spring Project	(2007 rating)	3,520	Poor Streets Fixed This Season: 3,520 ft	Cumulative Length, Poor Streets Fixed
Street	Street Condition	Length	Comments	
Seagate Ct	Poor	100	Completed	4,530
Sea Village La	Poor	500	Completed	5,030
Sea Wing Ct	Poor	100	Completed	5,130
Raymond Ave (Wilkinson to Arch)	Poor	1,625	Completed	6,755
Raymond Ave (Arch to Town Line)	Fair 3	600	No Award Spring 07, built 2013	
E. Chowan St (NC 12 to Raymond)	Poor	595	Completed	7,350
E. Sothel St (NC 12 to Raymond)	Poor	600	Completed	7,950
2007-08 Project	(2007 rating)	3,650	Poor Streets Fixed This Season: 2,350 ft	Cumulative Length, Poor Streets Fixed
Street	Street Condition	Length	Comments	
Bay Dr (Nixonton to Town Line)	Poor	2,350	Includes Multi-Purpose Trail	10,300
Bay Dr (Hayman to Nixonton)(Drainage)	Good	1,300	Drainage only; future trail	
Various Drainage Projects	(also listed Drainage Only below)			
2008-09 Project	(2007 rating)	6,482	Poor Streets Fixed This Season: 4,140 ft	Cumulative Length, Poor Streets Fixed
Street	Street Condition	Length	Comments	
St. Louis St (Susan to Bay)	Poor	41.4	1,426 Completed	11,726
Wallace St (Susan to Lee)	Poor	22.6	717 Completed	12,443
Truxton St (Lee to Bay)	Poor	43.8	744 Completed	13,187
Wilkinson St (Lee to Bay)	Poor	44.4	1,253 Completed	14,440
Lee Ave (Wilkinson to Cameron)	Fair3	54.0	2,342 Completed	
Palmetto St (Lee to Bath)	Poor	22.0	529 No Award Winter 08, built 2014	
E Avalon Drainage, Phase 3	(also listed Drainage Only below)		Complete; New Bern Street portion not awarded Winter 08	
2009-10 Project	(2007 rating)	4,126	Poor Streets Fixed This Season: 2,362 ft	Cumulative Length, Poor Streets Fixed
Street	Street Condition	Length	Comments	
W First St (Canal to Ketch)	Poor	50.6	566 w/MP Trail; Completed	15,006
W First St (Ketch to Landing)	Excellent	97.1	1,764 w/MP Trail; Completed	
W First St (Landing to south end)	Poor	46.1	1,796 w/MP Trail; Completed	16,802

KILL DEVIL HILLS -- Street and Drainage Improvements Recommendations

Previous Years' Projects (continued from previous page)

2010-11 Project		(2007 rating)	3,655	Poor Streets Fixed This Season: 0 ft	Cumulative Length, Poor Streets Fixed
Phase 1A completed, stormwater only, on urgent basis					
Street	Street Condition	Length	Comments		
Ocean Acres Dr (158 to Copley W)	Fair3	59.0	2,800 Stormwater infiltration only		16,802
Harrington Lane (OA to Burns)	Good	89.0	250 Stormwater infiltration only		3.18 miles
Bell Avenue (OA to Burns)	Fair1	71.0	250 Stormwater infiltration only		
Gunas Dr (portion n of OA)	Fair1	75.0	135 Stormwater infiltration only		
Burns Dr (short portions)	Fair3	59.0	220 Stormwater infiltration only		
Fall FY 2011-2012 Project				Poor Streets Fixed This Season: 950 ft	Cumulative Length, Poor Streets Fixed
SW AREA (Ocean Acres) Stormwater, Phase 2					
Ocean Acres Drive	Fair3	59.0	3,050 1.5" Overlay only		17,602
Ocean Acres Drive	Poor	49.0	800 2" Overlay only		
Burns Drive	Fair3	60.4	900 stormwater only		
Harrington Ave (Burns-Gunas)	Fair2	67.0	250 stormwater only		
Gunas Drive	Fair1	75.0	700 stormwater only		
Copley Drive	Fair1	77.0	400 stormwater only		17,752
Jones Court	Poor	43.0	150 2" Overlay only		3.36 miles
Adjust WM and remove 9 "jumpers"			6,250		
Spring FY 2011-12 Project				Poor Streets Fixed This Season: 1,252 ft	Cumulative Length, Poor Streets Fixed
Pirates Loop					
	Poor	47.0	709 full reconstruction; grade change		18,461
Coral Drive					
	Poor	48.4	302 full reconstruction		18,763
Harpoon Drive					
	Poor	48.4	241 overlay		19,004
			1,252		3.6 miles
Fall FY 2012-13 Project				Poor Streets Fixed This Season: 1,579 ft	Cumulative Length, Poor Streets Fixed
Parkwood Area (road reconstruction & drainage)					
Parkwood Dr	Poor	50.4	1,352 full reconstruction		20,356
Maple Ct	Fair2	70.0	223 overlay		
Myrtle Ct	Poor	48.4	227 overlay		20,583
Elm Ct	Fair3	52.4	245 overlay		3.9 miles
Telegraph Ct	Fair3	52.4	400 overlay		
			4,951		
Spring FY 2012-13 Projects				Poor Streets Fixed This Season: 0 ft	Cumulative Length, Poor Streets Fixed
Bay Drive Multi-Use Path, Phase 2					
Bay Drive (Avalon to Wilkinson)	Good	86.2	2,555 full reconstr., first 2 blocks		20,583
Bay Drive (Wilkinson to Nixonton)	Fair2	41.7	415 overlay		3.9 miles
Raymond Ave (Arch to Town Line)	Fair3	54.0	600		
			3,570		
FY 2013-14 Project: NW Area 2					Cumulative Length, Poor Streets Fixed
Nixonton Street	Poor	42.0	1,039		
Bath Street	Poor	40.4	948		
Mary Hill Court	Poor	46.0	367		26,666
Columbia Avenue	Poor	37.4	777		5.05 miles
Jean Court	Poor	46.0	374		
Shiloh Street	Poor	42.0	1,159		
Truxton Street	Poor	50.0	890		
Wilkinson St (Columbia to 158)	Fair1	73.0	725		
Palmetto St (Lee to Bath)(Alternate?)	Poor	22.0	529		
			6,808	6,808 ft poor	
FY 2014-15 Project: N K HShores					Cumulative Length, Poor Streets Fixed
Memorial Blvd. (Wright-Woodmere)	Poor	29.2	1,965		
Memorial Blvd. (48" pipe replacing ex. culverts)			1,080	1,080' is part of 1,965'	
Aviation Avenue	Excellent	95.6	550		28,631
Pinehurst Avenue	Fair1	73.6	550		5.42 miles
Sutton Avenue	Good	81.4	550		
Carlow Avenue	Good	90.8	550		
Raleigh Avenue	Fair2	68.4	945 158 to NC12		
Baker Avenue	Excellent	95.6	550		
Ferris Avenue	Fair1	71.2	550		
			2,910	1,965 ft poor	
FY 2015-16: Northwest Area, Phase 3, Wrightsville, Memorial, Sioux Drainage and E & W Eighth					Cumulative Length, Poor Streets Fixed
Memorial Blvd. (Baum - halfway to Corrigan)	Poor	37.4	200 bid Sep 14; not awarded		
Wrightsville Blvd (Eighth to north end)	Poor	38.6	738 bid Sep 14; not awarded		32,596
Cameron Street	Poor	45.4	1,865		6.17 miles
Susan Drive	Poor	48.4	1,160		
E Eighth Street	Fair3	54.6	1,025 Nags Head 50% share: \$0		
W Eighth St	Fair2	67.0	1,417 Nags Head 50% share: \$100		
			6,405	3,965 ft poor	
FY 2016-17: Clark/Blue Jay St, Mustian St, Carlton Ave, Cooke Pl, Anchor Ct, Schooner Ct					Cumulative Length, Poor Streets Fixed
W Clark Street	Poor	48.0	1,396	begin Dec 16, complete Apr 17	
Blue Jay Street				begin Dec 16, complete Apr 17	36,561
Mustian Street	Poor	43.8	1,625	begin Dec 16, complete Apr 17	6.92 miles
W Carlton Ave	Poor	43.8	401		
Cooke Place	Poor	42.0	262	begin Dec 16, complete Apr 17	
Anchor Court	Poor	44.4	79	begin Dec 16, complete Apr 17	
Schooner Court	Fair2	56.4	200	begin Dec 16, complete Apr 17	
			3,963	3,965 ft poor	
FY 2017-18: Bay Drive Multi-Use Path, Phases 3 & 4					Cumulative Length, Poor Streets Fixed
Canal Dr, W First to Indian	Good	81.0	1,325		36,561
Bay, Indian to Avalon	Fair3	58.2	4,275		6.92 miles
			5,600	0 ft poor	
FY 2018-19: Whispering Pines					Cumulative Length, Poor Streets Fixed
Pine Gove Trail	Poor	46.3	2,170		42,721
Quail Lane	Poor	42.0	3,160		8.09 miles
Goldie Street	Fair3	56.4	150		
Harrington Lane (Burns to Pine Grove)	Poor	38.3	510		
Shay Street (Quail to Dean)	Poor	41.0	320		
Pine Cone Court	Fair3	54.0	180		
Pine Needle Court	Poor	42.3	180		
Heather Lane	Poor	46.0	320		
			6,990		
			6,160	1.17 miles Poor	

KILL DEVIL HILLS -- Street and Drainage Improvements Recommendations

Previous Years' Projects (continued from previous page)

FY 2019-20: Hayman / Town Hall / Sixth				Cumulative Length, Poor Streets Fixed
	<u>Condition</u>	<u>Rating</u>	<u>Length</u>	<u>Remarks</u>
Hayman Blvd & Plymouth Ave				
Hayman Cir W to Bay; drainage; overlay	Poor	43.0	3,260	
Plymouth Ave, overlay	Poor	39.4	180	
			2,370	
Sixth Avenue & Town Hall Drive				
Town Hall Dr, overlay; drain	Poor	45.4	1,030	
Sixth Av (Airstrip to Baum), overlay & drain	Poor	46.6	1,340	overlay fabric
			5,810	
			5,810	1.10 miles Poor

FY 2020-21: Fall and Spring Bid Packages				Cumulative Length, Poor Streets Fixed
	<u>Condition</u>	<u>Rating</u>	<u>Length</u>	<u>Remarks</u>
First Flight Village 3 / Landings 3				
Cedar Dr, Captains La&Cir, Teakwood Ln	F3 - Poor	48.0	3,460	
			3,570	
Helga, Briggs, 4th, Martin, Dean				
Briggs St	Poor	47.8	1,030	
East Helga St	Poor	53	1,340	narrow width after water project
East Fourth St	Fair1	74	200	bad drainage @ intersection
East Martin St	Poor	50.1	900	22 w of Memorial
East Dean St	Poor	50.0	300	0.06 miles Poor
			7,030	1.33 miles Poor

FY 2021-22: West Third Street				Cumulative Length, Poor Streets Fixed
	<u>Condition</u>	<u>Rating</u>	<u>Length</u>	<u>Remarks</u>
W Third St (US 158 to Bay Drive)				
drainage, overlay, WM, SW (158-Creek)	Poor	43.3	1,194	
drainage, overlay, WM, SW (Creek-Bay)	Fair3	58.6	2,587	
			3,781	0.72 miles Poor

Drainage Only Areas Completed

(per Albemarle & Associates 2005 Multiyear Drainage Plan)

<u>Street or Area</u>	<u>Nature of Problem</u>	<u>Comments</u>
06-07, East Avalon, Phase 1	Residential property Flooding	Avalon Street ONLY, not whole project; Completed Fall 04
07-08, Cardinal St	Residential property Flooding	Completed Spring 06
07-08, Creek St	Residential property Flooding	Completed Spring 06
07-08, Cedar Dr	Residential property Flooding	Completed Spring 06
06-07, East Avalon, Phase 2	Residential property Flooding	Completed Winter 07-08
Second St / Princess Anne Dr	Residential property Flooding	Completed Winter 07-08
Martin St / Blue Jay St	Commercial property flooding	Completed Winter 07-08
Baum St / Memorial Ave	Failing CMP, roadway damage	Completed Winter 07-08
East Fresh Pond Dr	Residential property Flooding	Completed Winter 07-08
East Holly St	Open ditch; safety issues	Completed Winter 07-08
08-09, East Avalon, Phase 3	Residential property Flooding	Completed Winter 08-09, except New Bern St
10-11, Southwest Area, Phase 1A	Residential property Flooding	Completed Summer 10
10-11, Southwest Area, Phase 2	Residential property Flooding	Completed Fall 11
14-15, NKHS, Memorial Ditch Phase 1	Failing CMP; develop backbone	Completed Spring 15
15-16, Sioux Street Drainage	Residential property Flooding	Completed Winter 15-16; owners provided easements
18-19, Quail La / Shay / Dean St	Residential property Flooding	Completed w/Whispering Pines Project, 2019

07-08, denotes Plan Year (FY) per Albemarle & Assoc. 2005 Multiyear Drainage Plan; ND = Not Determined

Drainage Only Areas Remaining

(per Albemarle & Assoc. 2005 Multiyear Drainage Plan & Public Services' Post-Dorian Plan)

<u>Street or Area</u>	<u>Nature of Problem</u>	<u>Comments</u>
Memorial Ave Ditch, Phases 2 & 3	Flooding; culvert failure	Continue 2-mile Master Plan; ocean outfall reliever. Ph. 1 done 14-15.

POOR Streets Remaining

(after completion of 2021/22)

			Type (C ollector or L ocal A ccess)
In "Poor Streets Remaining," streets highlighted with the following colors of shading are recommended on the first page for the following Fiscal Year:			
		FY 2023-2024 & beyond	
		FY 2022-2023	
RANDOM ST (Concrete)	POOR	512	LA
W. SPORTSMAN DR	POOR	2,997	LA
DOCK ST (Concrete)	POOR	549	LA
SEMINOLE ST (W Third to Indian)	POOR	930	LA
WRIGHTSVILLE BLVD (Goddard to Carolyn)	POOR	5,340	LA
MEMORIAL BLVD (1228 S to Martin)	POOR	1,540	C
BURNS DR	POOR	3,660	LA
POND ST	POOR	152	LA
Poor (2017) Streets After 21-22 Project	2.97 miles	15,680 ft	<i>Not accurate since 2022 rating is imminent</i>