STATE OF DELAWARE
DELAWARE ARMY NATIONAL GUARD
JOINT FORCE HEADQUARTERS
250 AIRPORT ROAD
NEW CASTLE, DELAWARE 19720-1502

NGDE-IEZ-ENV

April 21, 2020

MEMORANDUM FOR G9 Installations and Environment, National Guard Bureau, 111 S. George Mason Drive, Arlington, Virginia 22204-1382

SUBJECT: Compliance with Executive Order 11988 (Floodplain Management), Barracks, Bethany Beach Training Site, Delaware

1. The Delaware Army National Guard (DEARNG) is requesting authority under Executive Order (EO) 11988 from the National Guard Bureau to build a two-story Barracks of approximately 13,240 square feet at the Bethany Beach Training Site (BBTS) in a known 100-year floodplain. In 2018, the United States Army Corps of Engineers completed the enclosed Documentation of Compliance with EO 11988 for the construction of a Physical Fitness Center at BBTS. This documentation found that the entire BBTS is within the Federal Emergency Management Agency's 100-year floodplain, Zone AE, with 100-year flood elevations ranging from 5.9 to 7.0 feet. Consistent with this finding, the DEARNG considers the 2018 study to be applicable for the proposed Barracks.

2. The DEARNG has determined that no practical alternative exists to locating the Barracks outside of the 100-year floodplain due to mission requirements and that the entire BBTS is located in the 100-year floodplain. The DEARNG is working with all State and local agencies to ensure that all floodplain rules and regulations are followed in order to mitigate any potential impacts in the event of flooding.

3. Point of contact for this action is Mr. Brian Nichols, (302) 326-7489 or brian.s.nichols2.nfg@mail.mil.

Encl

BRIAN S. NICHOLS
DEARNG
Environmental Program Manger

DOCUMENTATION OF COMPLIANCE WITH EXECUTIVE ORDER 11988 (FLOODPLAIN MANAGEMENT)

PHYSICAL FITNESS CENTER
BETHANY BEACH TRAINING SITE, DELAWARE

Prepared for:
Headquarters, Delaware National Guard
First Regiment Road
Wilmington, Delaware 19808-2191

Prepared by:
Planning Division
U.S. Army Corps of Engineers, Baltimore District
2 Hopkins Plaza
Baltimore, Maryland 21201

OCTOBER 2018

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OCTOBER 2018

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2. Record Environmental Consideration, Bethany Beach Training Site Physical Fitness Center, April 2018

3. University of Delaware, and others, Coastal Hazards and Community Resiliency in Delaware, undated.

4. BBTS Concept Plan with supporting documentation from DEARNG.

5. State of North Carolina, Coastal Flood Studies Fact Sheet, March 2004.

6. Federal Emergency Management Agency, Fact Sheet No. 1.2, Summary of Coastal Construction Requirements and Recommendations, December 2010.

7. Woods Hole Sea Grant, and others, Model Bylaw, Effectively Managing Coastal Floodplain Development, December 2009.

1 INTRODUCTION

1.1 PURPOSE

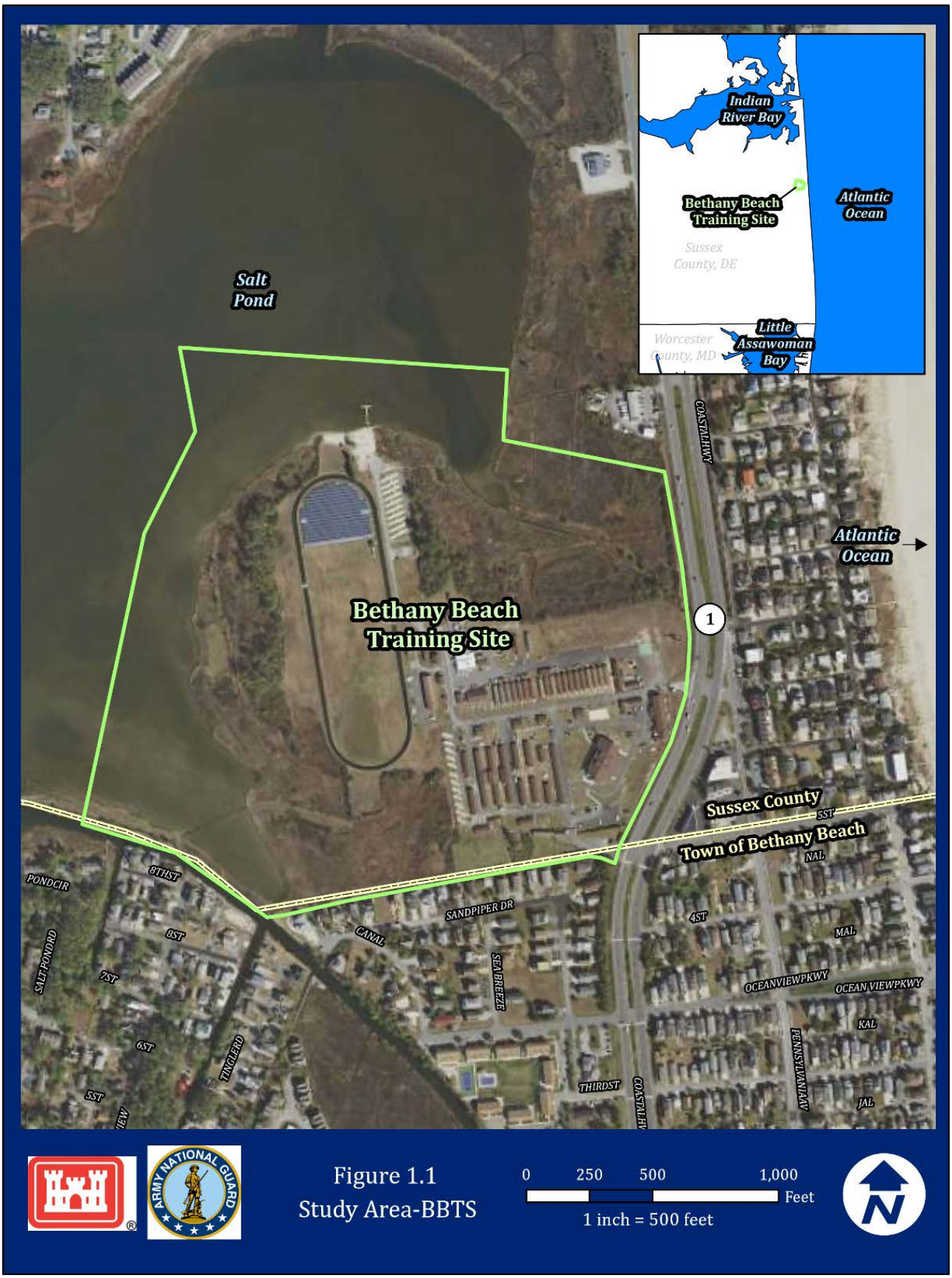
The purpose of this report is to document compliance with Executive Order (EO) 11988, Floodplain Management, for the construction of the proposed action, a new Physical Fitness Center (Physical Fitness Center) at the Delaware Army National Guard (DEARNG) Bethany Beach Training Site (BBTS) in Sussex County, Delaware. The intent of this documentation is to provide information to request authority under EO 11988 from the National Guard Bureau (NGB) to execute a military construction project in a known 100-year floodplain. This documentation was prepared as part of the Record Environmental Consideration (REC) completed for the project in accordance with the National Environmental Policy Act (NEPA) and implementing regulations issued by the Council on Environmental Quality (CEQ) and 32 Code of Federal Regulations (CFR) Part 651.

1.2 STUDY AREA

The new Physical Fitness Center will be located at the BBTS in the unincorporated areas of Sussex County, Delaware. BBTS is a 99-acre facility that has been owned by the State of Delaware since 1927 and is currently occupied by DEARNG. The site is located just north of the corporate limits of the Town of Bethany Beach. The BBTS facility is important to the State of Delaware and to the National Guard because it houses the Guard's Officer Training School, training for noncommissioned officers, instructional courses for recruiters before they enter basic training and is available to other military missions for training facilities. BBTS is also important because it is the only place nationally that offers advanced communications courses to military and civilian responders (Reference 1 and Reference 2).

The BBTS is bordered by the Coastal Highway (Route 1) to the east, Sandpiper Drive in Bethany Beach to the south, and Salt Pond, a tidal area hydraulically linked to Indian River Bay and Little Assawoman Bay, to the west and north.

Coastal storms are the primary cause of flooding along the Delaware shoreline. There are two types of coastal storms-tropical systems and noreasters. While tropical storm season runs from June 1 through November 30th, noreasters are a year-round threat to coastal Delaware. Since records have been collected, the state has never experienced a direct hurricane hit, but tropical storm systems have passed over and near Delaware annually, usually accompanied by high waves and heavy rainfall. While not as powerful as hurricanes, noreasters occur more frequently in Delaware. Because they cover a larger area and are typically slow moving storms, noreasters usually affect a large portion of the coast and exert significant impacts on beaches, dunes, buildings, boardwalks and roads over several successive tides (Reference 2).


Indian River Bay
Bethany Beach Training Site
Atlantic Ocean
Sussex County, DE
Worcester County, MD
Little Assawoman Bay
Salt Pond
COASTALHWY
Atlantic Ocean
Bethany Beach Training Site
1
Sussex County
Town of Bethany Beach
5ST
NAL
PONDCIR
8THST
SANDPIPER DR
4ST
MAL
8ST
CANAL
SEA BREEZE
SALT POND RD
7ST
OCEANVIEWPKWY
OCEAN VIEWPKWY
KAL
6ST
TINGLE RD
PENNSYLVANIAAV
5ST
THIRDST
COASTALHW
JAL
Figure 1.1
Study Area-BBTS
0 250 500 1,000
Feet
1 inch = 500 feet

Along the shoreline, storm surge is the principal cause of flooding and inundation during a coastal storm event. Storm surge is the abnormal rise of water generated by a storm, over and above the predicted tide level. Storm surge is caused by the low atmospheric pressure at the center of a storm and the pulling/pushing of water onto the shoreline by accompanying winds. The elevated water levels resulting from storm surge move ashore and flood adjacent land areas. Storm surge and coastal flooding exposes coastal residents, structures and public infrastructure to significant risks from standing water, high-velocity flows and waterborne debris (Reference 2). Potential wave action on top of the storm tide (tide level plus storm surge) and erosion further increase the risk. Storm surge from the Salt Pond and the Atlantic Ocean shoreline is the primary flood risk for the BBTS and neighboring communities.

A secondary flood risk at BBTS and neighboring communities is stormwater related flooding. Both tropical systems and northeasters can bring rain in large volumes and long duration, which may cause extensive flooding as a result of exceeding stormwater infrastructure capacity. The flooding can be even worse during higher tides and storm surge events when stormwater outfalls are submerged. The risk is greater in more urbanized areas, where there is more impervious area that can cause greater runoff volumes.

1.3 EXECUTIVE ORDER 11988

EO 11988 was enacted on May 24, 1977 to assure that Federal actions avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modifications of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. 44 CFR Part 9 defines a Federal actions (or activity) as: (a) Acquiring, managing and disposing of Federal lands and facilities; (b) providing federally undertaken, financed or assisted construction and improvements; and (c) conducting Federal activities and programs affecting land use, including, but not limited to, water and related land resources, planning, regulating and licensing activities. The proposed action, the new Physical Fitness Center, is considered a federally undertaken, finance or assisted construction project.

44 CFR Part 9 also outlines an eight-step decision making process for compliance with EO 11988. The numbering of Steps 1 through 8 does not firmly require that the steps be followed sequentially. As information is gathered throughout the decision- making process and as additional information is needed, reevaluation of lower numbered steps may be necessary. The eight steps outlined in 44 CFR Part 9 are:

1. **Determine if a proposed action is in the base floodplain (or 100-year floodplain, that area which has a one percent or greater chance of flooding in any given year).** For critical facilities such as hospitals, schools, and firehouses, the determination should be based upon the 500-year floodplain (that area which has a 0.2-percent or greater chance of flooding in any given year).

2. **Conduct early public review, including public notice.**

3. **Identify and evaluate practicable alternatives to locating in the base floodplain, including alternative sites outside of the floodplain.** This includes the "no action" alternative, and if a practicable alternative exists outside the floodplain, the action must be located there.
4. **Identify impacts of the proposed action.**
5. **If impacts cannot be avoided, develop measures to minimize the impacts and restore and preserve the floodplain, as appropriate.**
6. **Reevaluate alternatives.**
7. **Present the findings and a public explanation.**
8. **Implement the action.** The post-implementation phases of the proposed action should ensure that all the requirements are fully implemented.

Section 3 of this document outlines the eight step process taken for the proposed action, the new Physical Fitness Center, to assure compliance with EO 11988. A copy of the entire EO 11988 is located in Appendix A.

2 PROPOSED ACTION

The purpose of the proposed design and construction of DEARNG's new Physical Fitness Center is to provide a new required National Guard Physical Fitness Center. As of June 2016 the Army has implemented the Occupational Physical Assessment Test (OPAT). The test is required to be taken by all new Soldiers and Soldiers transferring MOS. Since the Delaware Guard does not have a structure available on BBTS nor within the local community, it is the intent to provide this critical facility at DEARNG.

The new Physical Fitness Center will be of standard design and will include a multipurpose space that incorporates the Interval Aerobic Run lanes which requires a 20 meter long and 2 meter wide dry, flat non slip surface. Five (5) lanes, totaling 3,675 sf along with circulation space are required to meet the needs of the testing during inclement weather, which is historically five (5) months out of the year for the geographic location. The building will also have administrative space, locker room and latrines for support staff and troops. The new facility will allow DEARNG to meet its current and future mission requirements by increasing the operational capability in support and testing of assigned units. (Reference 1 and Reference 2).

For the purposes of this document, the area of the proposed action on the BBTS is defined as the "Area of Impact". The area of impact is an approximately 0.42-acre portion of the BBTS where the proposed action will occur. The proposed action, the construction of the Physical Fitness Center, will include the following within the Area of Impact:

- The demolition of one existing building at BBTS, building 109.
- The removal of sanitary, water, and stormwater utility pipes.
- The removal of concrete pads, pavement and sidewalks.
- Approximately 1-2 feet of compacted earthen fill over a 0.25 acre area.
- Construction of a new 6,020 square feet building,
- Construction of new sanitary, water, and stormwater utility pipes
- Construction of new roadway and sidewalks.
- Installation of lawn area and grass filter strips surrounding the new building.

Appendix B contains a concept plan with supporting documentation that provides additional detail on the proposed action (Reference 3). Figure 2.1 shows a general layout of the Area of Impact and the proposed action.

Figure 2.1
Area of Impact and Proposed Action

3 COMPLIANCE

Section 1.3 of this document lists the eight steps that should be carried out as part of the decision-making on projects that have potential impacts to or within the floodplain. Following these eight steps represents compliance with EO 11988. Listed below is a detailed evaluation of the eight-step decision making process for the proposed action, the new Physical Fitness Center building.

STEP 1: Determine if proposed action is in the base (100-year) floodplain

EO 11988 states that this determination shall be made according to a Department of Housing and Urban Development (HUD) floodplain map or a more detailed map of an area, if available. Since the time of the publishing of EO 11988, the Federal Emergency Management Agency (FEMA) has become the producer of flooplain maps for the United States. FEMA publishes Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies (FISs) to assist with determining flood risk, as a tool for floodplain management, and to determine if flood insurance is required on non-federal lands with any federally backed loan under the National Flood Insurance Program (NFIP).

Based upon the effective FEMA FIRM for Sussex County, Delaware and incorporated areas, FEMA FIRM No. 10005C0516K, dated March 7, 2017, ***the proposed action is located in the 100-year floodplain. The proposed action is located in a coastal Zone AE, with a 100-year flood elevation of 5.9 feet North American Vertical Datum of 1988 (NAVD88)*** (Figure 3.1). The entire BBTS is within the FEMA 100-year floodplain, Zone AE, with 100-year flood elevations ranging from 5.9 to 7.0 feet.

There are two detailed FEMA coastal flood zones, Zone AE and Zone VE. Zone VE are areas subject to inundation by the 100-year flood event with additional hazards due to storm-induced velocity wave action. The "V" stands for "velocity wave action", indicating that waves in these areas will be powerful enough to break the wall panel of a residential structure away from the floor to which it has been nailed. The waves in V zones are greater than 3 feet high (Reference 4). Coastal flood areas with wave heights less than three feet are mapped as Zone AE.

The zone designation in a coastal area becomes important because buildings constructed in Zone VE are subject to more stringent regulatory requirements than buildings constructed in Zone AE. At a minimum, the bottom of the lowest horizontal structural members supporting the lowest floor of a residential or commercial building must be elevated to or above the 100-year flood elevation in Zone VE. No enclosed area is allowed below the lowest floor unless it is constructed of breakaway walls that will not damage the rest of the building if they are detached by storm waves. And, there is no option to flood proof a Zone VE non-residential building instead of elevating it. There are also specific foundation requirements for structures in Zone VE. Buildings must be supported on pile, post, or column foundations. Fill material cannot be used for structural support because of the

Figure 3.1
FEMA 100-year Floodplain at BBTS

severe potential for erosion. The foundation and the attached structure must be designed to resist the combined forces imposed by winds and water during the 100-year storm. A registered professional engineer or architect must certify that the design and methods of constructions for Zone VE structures are in accordance with accepted standards of practice for meeting the above provisions.

Because the proposed action is located in a Zone AE, the construction of the building is not subject to the more stringent requirements. FEMA Fact Sheet No. 1.2, Summary of Coastal Construction Requirements and Recommendations (Reference 5), outlines the requirements for construction in a coastal Zone AE. The requirements include:

- Compacted structural fill can be used to elevate, if compacted.
- Open foundations are recommended.
- Top of lowest floor must be at or above the 100-year flood elevation of 5.9 feet.
- Freeboard is recommended. *(Note, some communities require freeboard)*
- Space below the Base Flood Elevation must be used for parking, building access, and storage.

Based on the Flood Insurance Rate Maps for the Delaware Coast, revised March 7, 2017 the 100-year flood elevation at the location of the proposed action, the Physical Fitness Center is 5.9 feet. The updated maps are based on high resolution topographic data, a new storm surge analysis conducted by the U.S. Army Corps of Engineers, and a new wave height analysis conducted by FEMA. The 2017 FIRM update shows that the site is not within the area known as the Limit of Moderate Wave Action (LiMWA). The site fully lies within Zone AE. Details of the flood zone limits can be seen on Figure 3.1.

STEP 2: Conduct public review and public notice

No impacts to floodplains are anticipated therefore no mitigation measures were created for the new Physical Fitness Center. DEARNG has determined that no public review or public notice is necessary for compliance with EO 11988.

STEP 3: Identify and evaluate practical alternatives to locating in the base floodplain

This documentation is being prepared as a component of the REC for the proposed action. The entire BBTS is located in the FEMA 100-year floodplain, any on- site action would be located in the 100-year floodplain. The only alternative that would not impact a floodplain would be the "no action" alternative or locating the new Physical Fitness Center at a different DEARNG site. Neither the no action alternative nor relocation is considered practical because the mission of the DEARNG would be compromised. *DEARNG has determined that this project is critical to the State of Delaware's National Guard as it does not currently have a facility that meets the size requirements to support the required*

Occupational Physical Assessment Test (OPAT). The current facility is of inadequate size and does not offer the basic requirements of a locker room or toilet space.

Because of the mission requirements and that the entire BBTS is located in the 100-year floodplain, no practical alternative exists to locating the proposed action outside the 100-year floodplain.

STEP 4: Identify impacts of the proposed action

There are two possible entities that could be impacted by the proposed action being located in the 100-year floodplain, the new Physical Fitness Center building itself and the surrounding community, including residential and commercial structures within the Town of Bethany Beach as well as the Coastal Highway. There will be impacts to the new Physical Fitness Center building by locating it in the floodplain. The risk of flooding for a building is much higher within the 100-year floodplain than outside of it. Measures to be taken to minimize the impacts to the building itself will be discussed in Step 5. More importantly, however, the proposed action must not negatively impact the adjacent community.

Flooding is a natural event whose adverse impacts are exacerbated by human development. Any construction in the floodplain will alter the land surface and interfere to varying degrees with floodwater flow, oftentimes causing unanticipated adverse impacts to the developed and natural environment. Alteration of land surfaces in floodplains could change drainage characteristics that could cause increased flood damage on adjacent properties (Reference 6). As part of this document, analyses were completed in order to determine any negative impacts to the adjacent community as a result of the proposed action. This analysis focused on floodplain storage and hydraulic factors such as the potential increases in 100-year floodplain elevations and potential changes in flow patterns/velocities that could negatively impact adjacent property. A brief discussion of impacts to stormwater-related flooding is also included.

Floodplain Storage

Storage of floodwaters will decrease slightly with the proposed action. There is one existing building within the Area of Impact that will be demolished as part of the proposed action. Current ground elevation at the site is elevation 4.0 ft and the 100-yr floodplain as reported by FEMA is 5.9 ft, building demolition is 1,069 sf which equates to 0.05 ac-ft (2,031 cf) of floodwater storage. The proposed structure is 6,020 sf equating to 0.26 ac-ft (11,438 cf), an increase of 0.21 ac-ft or approximately 9,400 cf of floodplain storage reduction.

Hydraulic Factors

The determination of potential increases in floodplain elevations and potential change is in flow patterns/velocities with the proposed action was made using the FEMA-approved, two-dimensional model FLO-2D. The FLO-2D model can be used to simulate ocean storm

surge and is particularly effective in urban areas where buildings, obstructions and streets can affect the flood wave progression. Two separate FLO-2D models were prepared to reflect existing-conditions and conditions after the proposed action (proposed-conditions). A comparison of the results of the two models was completed at several locations around the Area of Impact to determine any changes to floodplain elevations or flow patterns/velocities. The FLO-2D model confirms that there are no increases to flood elevation, flood depth, velocity, and several other factors to neighboring properties as a result of the proposed action. Appendix C contains a detailed technical summary of the FLO-2D modeling and the results of the modeling.

Stormwater Flooding

As discussed in Section 1.2 of this report, a secondary flood risk at BBTS and neighboring communities is stormwater related flooding. The amount of impervious area as well as adequate stormwater infrastructure is the determining factors in if an area will receive stormwater related flooding. Stormwater quantity controls are typically required at development sites to assure that the project is not increasing runoff and causing increased flooding. For the proposed action, the amount of impervious area as a result of the improvements is increasing. Within the 0.42 acre Area of Impact, the existing-conditions land cover contains 0.045 acres of impervious land (rooftops, roads, sidewalks, and parking) and 0.375 acres of pervious land (lawns and sand volley ball court). Under the proposed action, the amount of impervious land increases to 0.158 acres, a net increase of 0.113 acres of impervious.

According to Section 3.2.2 of Title 7. 5000, 5101 of the Natural Resources & Environmental Control of the Delaware Administrative Code, "*a project may be eligible for a waiver or variance of stormwater management for water quantity control if the applicant can demonstrate that the proposed project will not generate an increase in the 2-year post-development peak discharge rate of more than ten (10) percent above the 2-year pre-development peak discharge rate and will have no adverse impact on the receiving wetland, watercourse, or waterway*." Because there is an increase in impervious area with the proposed action, stormwater quantity control may be required for the proposed action. Additional analysis will be needed to verify impacts to the 2-yr event.

The proposed action will contain stormwater management measures that will help with reducing runoff rates and conveying stormwater away from the site properly. The proposed action will contain vegetated strips which will promote infiltration of stormwater into the ground. Stormwater infrastructure such as inlets and pipes will be placed at the site to convey stormwater properly away from the site and not impact adjacent properties or roadways.

Based upon the analyses presented in this section, the proposed action will have no negative impacts to the neighboring community, including residential and commercial properties in the Town of Bethany Beach as well as the Coastal Highway during a 100-year flood event. The new Physical Fitness Center building (and fill pad) will occupy an additional 0.21 ac-ft of floodplain storage over the existing conditions, but does not alter

the hydraulic factors, such as increasing flood elevations or alter flow patterns, and stormwater flooding will not increase as a result of the proposed-action.

STEP 5: If impacts cannot be avoided, develop measures to minimize the impacts and restore and preserve the floodplain, as appropriate

There will be impacts to the new Physical Fitness Center building by locating it in the floodplain. The risk of flooding for a building is much higher within the 100-year floodplain than outside of it. However, the design of the proposed building is being completed in a manner to (1) meet FEMA and local requirements for building within a 100-year floodplain and (2) minimize the risk of flood damages.

The proposed action will be constructed to meet local non-residential construction requirements outlined in the Sussex County Code, Article XXV, Section 115-189, which requires non-residential buildings to be elevated to the level or above the level of the 100-year flood, aligned to offer minimum resistance or obstruction to the flow of 100-year floodwaters, and meet other requires such as minimizing hydrostatic pressure and anchoring utilities.

Two options for construction can be considered. 1). The building will be elevated on compacted fill, with the top of the lowest floor one foot above the 100-year flood elevation, which is an additional one foot higher than the local/FEMA minimum. 2). The building can be designed at the current ground elevation but will have to be designed in accordance with the more stringent regulatory requirements. The FLO-2D model confirms that the siting of the proposed action will have no impact on the flow of 100-year floodwaters. An open foundation will be in place and there will be no building space below the 100-year flood elevation, meeting local and FEMA requirements. The one foot of freeboard will not only lower the risk of flooding to the building, but will account for any changes in 100-year flood elevations with the publication of a new FEMA study and provide a degree of safety for potential sea level rise.

Although the impact of constructing the proposed action in the 100-year floodplain, thus subjecting it to the risk of flooding, cannot be avoided, ***significant measures will be taken to minimize the impacts to the new Physical Fitness Center, these include either elevating above the 100-year flood elevation with 1 foot of freeboard, or designing at the current elevation in accordance with the more stringent requirements to meet local and FEMA requirements. These measures will significantly reduce the risk of flooding and damages to the proposed Physical Fitness Center.***

STEP 6: Reevaluate alternatives

The reevaluation of alternatives for the proposed action is not required. To meet mission objectives, the proposed action must be located within the FEMA 100-year floodplain. As discussed in Steps 4 and 5 of this document, there is no negative impact to

the adjacent community and the building is being constructed in a manner to minimize the risk of flood damages to the maximum extent possible.

STEP 7: Present the findings and a public explanation

This documentation is being prepared as a component of the REC for the proposed action. The impact analysis provided in Step 4 of this document far exceeds the requirements of the EO. This information will be valuable to provide to the local officials or the public if there is concern that the proposed action will negatively impact buildings, property, or roadways within the neighboring community.

STEP 8: Implement the action

The construction of the proposed action will be implemented with several "check-points" in place to assure that the new Physical Fitness Center is compliant with local and FEMA requirements as well as the EO. DEARNG will assure that the building is being constructed, as proposed, and a building permit will be required from Sussex County. The process of obtaining the building permit will also assure the implementation of this action is compliant with the intent of the EO.

4 CONCLUSION

The purpose of this report is to document compliance with EO 11988, for the construction of the proposed action, a new Physical Fitness Center at the DEARNG BBTS in Sussex County, Delaware. The intent of this documentation is to provide information to request authority under EO 11988 from the NGB to execute a military construction project in a known 100-year floodplain.

The eight-step decision making process identified in 44 CFR Part 9 for compliance with EO 11988 for the proposed action has been presented in this report. It is concluded that:

- The proposed action is located in the 100-year floodplain. The proposed action is located in a coastal Zone AE, with a 100-year flood elevation of 5.9 feet NAVD88.

- Because of the mission requirements of the proposed action and that the entire BBTS is located in the 100-year floodplain; there are no practical alternatives to locating the proposed action outside the 100-year floodplain based upon documentation in the REC.

- The proposed action will have no negative impacts to the neighboring community, including residential and commercial properties in the Town of Bethany Beach as well as the Coastal Highway, during a 100-year storm event.

- Significant measures will be taken to minimize the impacts to the new Physical Fitness Center, such as elevating to the 100-year flood elevation with 1 foot of freeboard, or designing at the current elevation in accordance with the more stringent requirements to meet local and FEMA requirements. These measures will significantly reduce the risk of flooding and damages to the proposed Physical Fitness Center.

- The proposed construction of the Physical Fitness Center increases the impervious area on the site by 0.113 acres and may require stormwater management.

- The reevaluation of alternatives for the proposed action is not required.

- The construction of the proposed action will be implemented with several "check-points" in place to assure that the new Physical Fitness Center is compliant with local and FEMA requirements as well as the EO.

The documentation presented in this report indicates that the proposed action is in compliance with EO 11988 and provides justification for NGB to authorize DEARNG to construct the proposed action within a known 100-year floodplain.

APPENDIX A

Executive Order 11988, Floodplain Management

THE PRESIDENT

Executive Order 11988
May 24, 1977
FLOODPLAIN MANAGEMENT

By virtue of the authority vested in me by the Constitution and statutes of the United States of America, and as President of the United States of America, in furtherance of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 *et seq*.), the National Flood Insurance Act of 1968, as amended (42 U.S.C. 4001 *et seq*.), and the Flood Disaster Protection Act of 1973 (Public Law 93-234, 87 Stat. 975), in order to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative, it is hereby ordered as follows:

Section 1. Each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating,and licensing activities.

Sec. 2. In carrying out the activities described in Section 1 of this Order, each agency has a responsibility to evaluate the potential effects of any actions it may take in a floodplain; to ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management; and to prescribe procedures to implement the policies and requirements of this Order, as follows:

(a)(1) Before taking an action, each agency shall determine whether the proposed action will occur in a floodplain for major Federal actions significantly affecting the quality of the human environment, the evaluation required below will be included in any statement prepared under Section 102(2)(C) of the National Environmental Policy Act. This determination shall be made according to a Department of Housing and Urban Development (HUD) floodplain map or a more detailed map of an area, if available. If such maps are not available, the agency shall make a determination of the location of the floodplain based on the best available information. The Water Resources Council shall issue guidance on this information not later than October1, 1977.

(2) If an agency has determined to, or proposes to, conduct, support, or allow an action to be located in a floodplain, the agency shall consider alternatives to avoid adverse effects and incompatible development in the floodplains. If the head of the agency finds that the only practicable alternative consistent with the law and with the policy set forth in this Order requires siting in a floodplain, the agency shall, prior to taking action, (i) design or modify its action in order to minimize potential harm to or within the floodplain, consistent with regulations issued in accord with Section 2(d) of this Order, and (ii) prepare and circulate a notice containing an explanation of why the action is proposed to be located in the floodplain.

(3) For programs subject to the Office of Management and Budget Circular A-95,the agency shall send the notice, not to exceed three pages in length including a location map, to the state and area wide A-95clearinghouses for the geographic areas affected: The notice shall include: (i) the reasons why the action is proposed to be located In a floodplain; (ii) A statement indicating whether the action conforms to applicable state or local floodplain protection standards and(iii) a

list of the alternatives considered. Agencies shall endeavor to allow a brief comment period prior to taking any action.
(4) Each agency shall also provide opportunity for early public review of any plans or proposals for actions in floodplains, in accordance with Section 2(b)of Executive Order No. 11514, as amended, including the development of procedures to accomplish this objective for Federal actions whose impact is not significant enough to require the preparation of an environmental impact statement under Section 102(2)(C) of the National Environmental Policy Act of 1969, as amended.
(b) Any requests for new authorizations or appropriations transmitted to the Office of Management and Budget shall indicate, if an action to be proposed will be located in a floodplain, whether the proposed action is in accord with this Order.
(c) Each agency shall take floodplain management into account when formulating or evaluating any water and land use plans and shall require land and water resources use appropriate to the degree of hazard involved. Agencies shall include adequate provision for the evaluation and consideration of flood hazards in the regulations and operating procedures for the licenses, permits, loan or grants-in-aid programs that they administer. Agencies shall also encourage and provide appropriate guidance to applicants to evaluate the effects of their proposals in floodplains prior to submitting applications for Federal licenses, permits, loans or grants.
(d) As allowed by law, each agency shall issue or amend existing regulations and procedures within one year to comply with this Order. These procedures shall incorporate the Unified National Program for Floodplain Management of the Water Resources Council, and shall explain the means that the agency will employ to pursue the nonhazardous use of riverine, coastal and other floodplains in connection with the activities under its authority. To the extent possible, existing processes, such as those of the Council on Environmental Quality and the Water Resources Council, shall be utilized to fulfill the requirements of this Order. Agencies shall prepare their procedures in consultation with the Water Resources Council, the Federal Insurance Administration, and the Council on Environmental Quality, and shall update such procedures as necessary.
Sec. 3. In addition to the requirements of Section 2, agencies with responsibilities for Federal real property and facilities shall take the following measures:
(a) The regulations and procedures established under Section 2(d) of this Order shall, at a minimum, require the construction of Federal structures and facilities to be in accordance with the standards and criteria and to be consistent with the intent of those promulgated under the National Flood insurance Program. They shall deviate only to the extent that the standards of the Flood Insurance Program are demonstrably inappropriate for a given type of structure or facility.
(b) if, after compliance with the requirements of this Order, new construction floodplain, accepted flood proofing and other flood protection measures shall be applied to new construction or rehabilitation. To achieve flood protection, agencies shall, wherever practicable, elevate structures above the base flood level rather than filling in land.
(c) If property used by the general public has suffered flood damage or is located in an identified flood hazard area, the responsible agency shall provide on structures, and other places where appropriate, conspicuous delineation of past and probable flood height in order to enhance public awareness of and knowledge about flood hazards.
(d) When property in floodplains is proposed for lease, easement, right-of-way,or disposal to non-Federal public or private parties, the Federal agency shall (1) reference in the conveyance those uses that are restricted under identified Federal, State or local floodplain regulations; and

(2) attach other appropriate restrictions to the uses of properties by the grantee or purchaser and any successors, except where prohibited by law; or (3) withhold such properties from conveyance.

Sec. 4. In addition to any responsibilities under this Order and Sections202 and 205 of the Flood Disaster Protection Act of 1973, as amended (42 U.S.C. 4106 and 4128), agencies which guarantee, approve, regulate,or insure any financial transaction which is related to an area located in a floodplain shall, prior to completing action on such transaction, inform any private parties participating in the transaction of the hazards of locating structures in the floodplain.

Sec. 5. The head of each agency shall submit a report to the Council on Environmental Quality and to the Water Resources Council on June 30, 1978, regarding the status of their procedures and the impact of this Order on the agency's operations. Thereafter, the Water Resources Council shall periodically evaluate agency procedures and their effectiveness.

Sec. 6. As used in this Order:

(a) The term "agency" shall have the same meaning as the term "Executive agency " in Section 105 of Title 5 of the United States Code and shall include the military departments; the directives contained in this Order, however, are meant to apply only to those agencies which perform the activities described in Section 1 which are located in or affecting floodplains.

(b) The term "base flood" shall mean that flood which has a one percent or greater chance of occurrence in any given year.

(c) The term "floodplain" shall mean the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Sec. 7. Executive Order No. 11296 of August 10, 1966, is hereby revoked. All actions, procedures, and issuances taken under that order and still in effect shall remain in effect until modified by appropriate authority under the terms of this Order.

Sec. 8. Nothing in this order shall apply to assistance essential to save lives and protect property and public health and safety, performed pursuant to Sections 305 and 306 of the Disaster Relief Act of 1974 (88Stat. 148, 42 U.S.C. 5145 and 5146).

Sec. 9. To the extent the provisions of Section 2(a) of this Order are applicable to projects covered by Section 104(h) of the Housing and Community Development Act of 1974, as amended (88 Stat. 640, 42 U.S.C. 5304(h)), the responsibilities under those provisions may be assumed by the appropriate applicant, if the applicant has also assumed, with respect to such projects, all of the responsibilities for environmental review decisionmaking, and action pursuant to the National Environmental Policy Act of 1969, as amended.

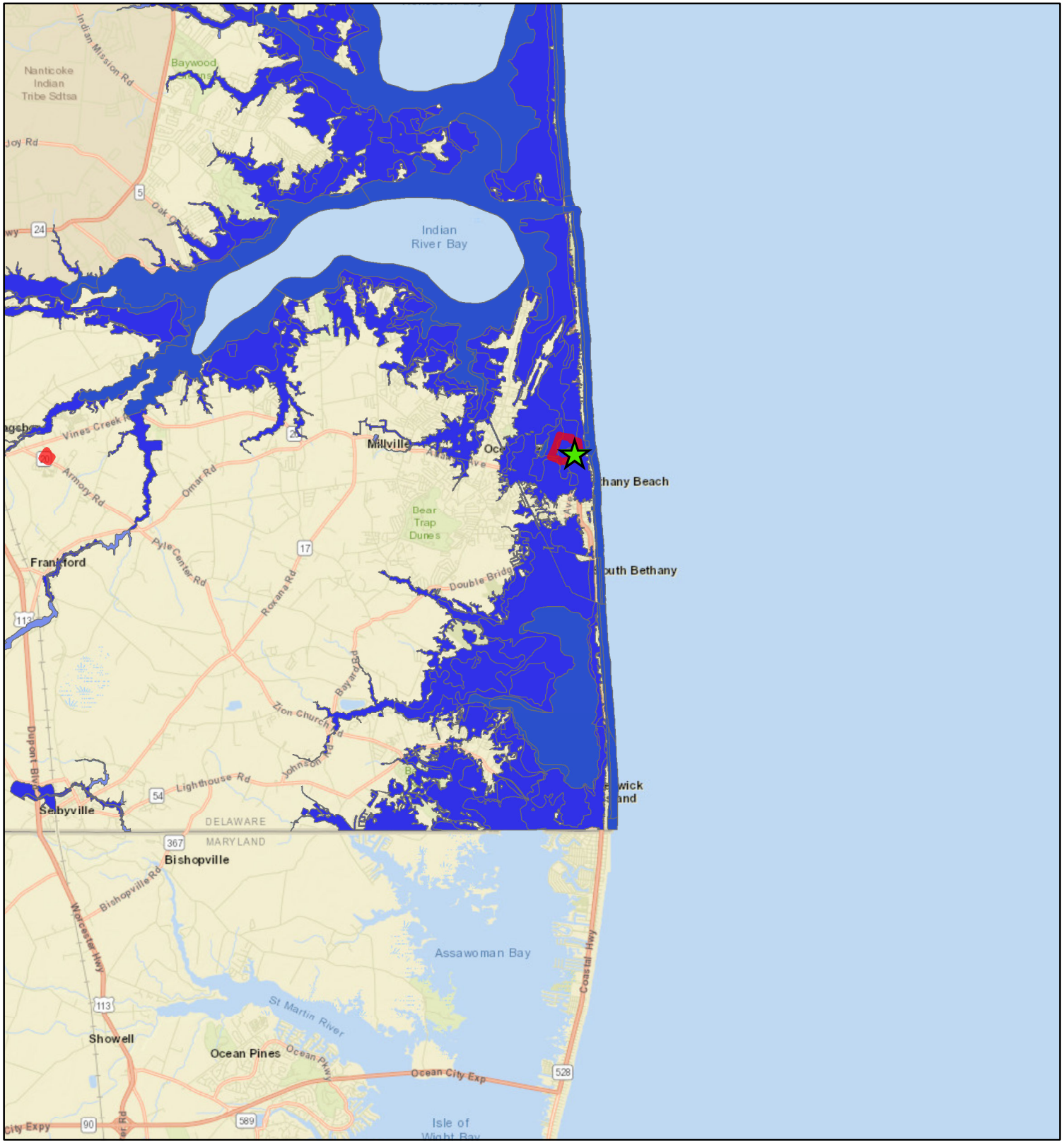
[signed Jimmy Carter]

THE WHITE HOUSE,
May 24, 1977

Federal Register, Vol. 42, No. 101 - Wednesday, May 25, 1977
(FR Doc. 77-15121 Filed 5-24-77;1:42 pm)

APPENDIX B

Concept Plans and Floodplain Map for Proposed Action



Vicinity Sketch

Project 100097

Site: 10A05 - Bethany Beach Training Site

Version 1

County: SUSSEX State: DE

Address: 163 Scannell Boulevard Zipcode: 19930

Scale 1:150,000	1 inch = 12,500 feet

0 40 80 160 240 320 Miles

N W E S

Project Location

Site Boundary

Flood_Zone

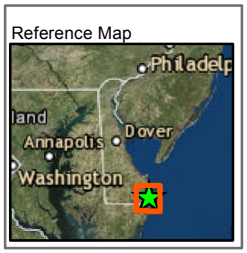
FLD_ZONE

A

AE

VE

Date Published: 4/11/2017
Image Date: 2011
Coordinate System:
NAD83 2011 StatePlane Delaware



This illustrative conceptual plan is not intended as a design document.

Location Map
Project 100097
Site: 10A05 - Bethany Beach Training Site

Version 1

County: SUSSEX State: DE

Address: 163 Scannell Boulevard Zipcode: 19930

Scale 1:24,000	1 inch = 2,000 feet

0 750 1,500 3,000 Feet

Project Location

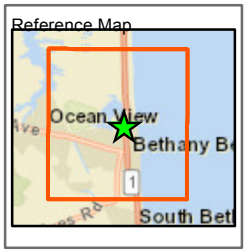
Site Boundary

100-Year Floodplain

500-Year Floodplain

N W E S

Date Published: 4/11/2017
Image Date: 2011
Coordinate System:
NAD83 2011 StatePlane Delaware



This illustrative conceptual plan is not intended as a design document.

Project 100097

Site: 10A05 - Bethany Beach Training Site

Version 1

County: Sussex | State: DE

Address: 163 Scannell Boulevard | Zipcode: 19930

Scale 1:500 | 1 inch = 42 feet | Date: 4/11/2017

0 — 75 — 150 Feet

- FutureProjects_Building
- Area of Disturbance
- ATFP
- Site Boundary
- Fencing and Gates
- Buildings
- Roads
- Parking
- Sidewalks
- Environmental Restriction
- Environmental Restriction

Outline Explanation

- FutureProjects_Building
- Area of Disturbance
- Existing Feature Outline/Color

N W E S

Project Statistics: Existing/Additional Proposed

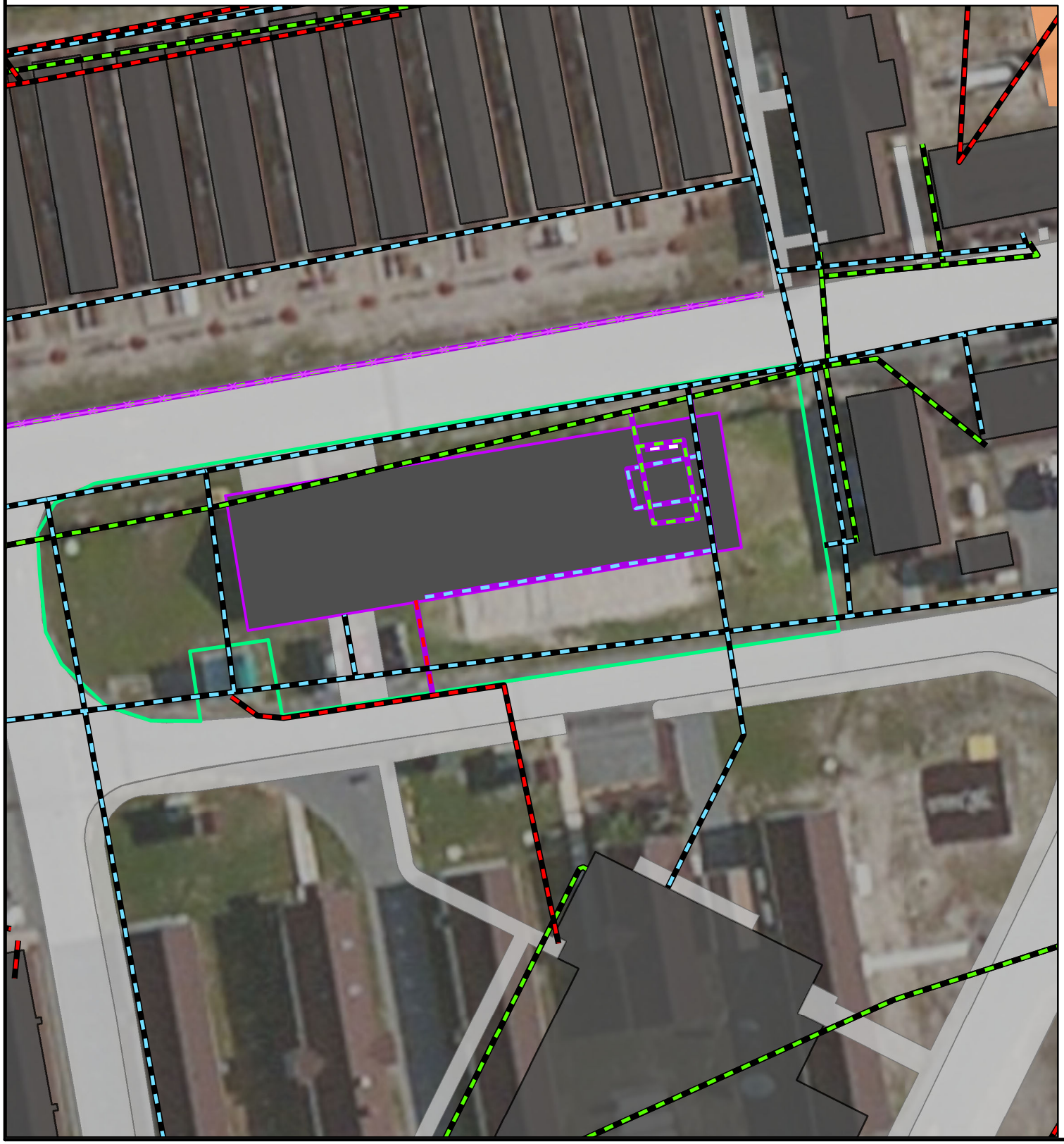
Fencing:	3721 /0	LF	GOV Parking:	8152 /0	SY
Walkways:	1904 /100	SY	POV Parking:	1396 /0	SY
Roads:	15139/0	SY	Total Parking:	9548 /0	SY

IMAGE DATE:
2016 ESRI World Imagery
PROJECTION: UTM Zone18

Reference Map

DELAWARE NATIONAL GUARD 1655

This illustrative conceptual plan is not intended as a design document.



Utility Plan

Project 100097

Site: 10A05 - Bethany Beach Training Site

Version 1

County: SUSSEX State: DE

Address: 163 Scannell Boulevard Zipcode: 19930

Scale 1:500	1 inch = 42 feet

0 15 30 60 Feet

N W E S

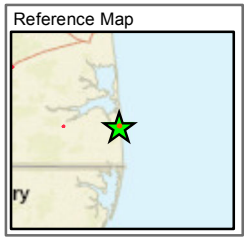
- WaterUtilitySegment
- ElectricalUtilitySegment
- WastewaterUtilitySegment
- UG Electric Line
- Sanitary Sewer
- Water Line
- Fencing and Walls
- Area of Disturbance
- FutureProjects_Building
- Buildings
- Roads
- Parking
- Sidewalks

Project Statistics: Existing / Additional Proposed

OH Elect Lines:	0 / 0	LF	UG Elect Lines:	0 / 192	LF
Gas Pipelines:	0 / 0	LF	Sanitary Sewer:	0 / 468	LF
Water Lines:	0 / 600	LF	Storm Sewer:	0 / 800	LF
OH Comm Lines:	0 / 0	LF	Ung Comm Lines:	0 / 200	LF

Date Published: 4/11/2017
Image Date: 2011
Coordinate System:
NAD83 2011 StatePlane Delaware

Reference Map



This illustrative conceptual plan is not intended as a design document.

APPENDIX C

FLO-2D Model Technical Summary

TECHNICAL SUMMARY OF FLO-2D MODELING FOR DOCUMENTATION OF COMPLIANCE EXECUTIVE ORDER 11988 (FLOODPLAIN MANAGEMENT) PHYSICAL FITNESS CENTER BETHANY BEACH TRAINING SITE, DELAWARE

FLO-2D was used to determine the potential impacts to hydraulic factors such as flood elevations and flow patterns/velocities of the construction of the Physical Fitness Center at the Bethany Beach Training Site (BBTS). FLO-2D, a FEMA approved model for flood analysis, is a simple two-dimensional volume to conservation model that distributes a flood hydrograph over a system of square grid elements (tiles). It numerically routes a flood hydrograph or storm surge while predicting the area of inundation and floodwave attenuation. FLO-2D is widely used for urban, overland flooding, as well as storm surge analysis and mapping.

A FLO-2D model was prepared for the construction of the Regional Technical Institute on BBTS in November 2011. This model was used as a starting point for the evaluation of the impact of the current proposed action, the Physical Fitness Center.

The three critical components of a two-dimensional model such as FLO-2D is an accurate representation of the ground surface of the project area, an estimation of flow during the desired storm event over the ground surface, and control specification for the simulation.

REPRESENTATION OF GROUND SURFACE

Elevation data for the area of the proposed action and surrounding areas was obtained from a digital elevation model (DEM) dated 2010. The DEM was obtained from the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) coastal mapping program. The DEM is considered high resolution, having a grid size (resolution) of 1-meter (3.2 ft. by 3.2 ft.) The DEM was obtained in two formats, bare earth and raw. The bare earth DEM has the buildings removed while the raw DEM has the building included. The raw DEM was used for the FLO-2D model because the buildings have a significant effect on the flow of floodwaters in the area. The FLO-2D model has the capability with a bare earth DEM to model the effects of buildings using Area reduction factors (ARFs) and width reduction factors (WRFs). These are coefficients used in the FLO-2D model that modify the individual grid element surface area and flow widths. ARFs are used to reduce the flood volume storage on grid elements due to buildings, and WRFs are assigned to any of the eight flow directions in a grid element and can partially or completely obstruct flow paths. To save time, the raw DEM was used in lieu of assigning ARFs and WRFs within the FLO-2D model.

Two separate FLO-2D models were prepared. The first represents the existing-conditions at the time of this study, which is the condition of the ground surface prior to the construction of the Fitness Center. The second model represents the proposed-conditions or the condition of the ground surface after the construction of the Fitness Center.

Grid

The first step in development of a FLO-2D model is the establishment of a grid overlaying the project area. After several iterations it was determined that a grid element size of 10

feet by 10 feet is appropriate for the study area. This gives a high level of detail on a simulation that runs in about two to four hours, depending on the specific computer. Using a smaller grid element size causes the model to take several hours for the simulation without increasing the accuracy, and a larger grid element size would reduce the accuracy of the model. Grid elements were assigned a random sequential number by the FLO-2D program (Figure C.1).

Figure C.1: Grid Elements near Proposed Action

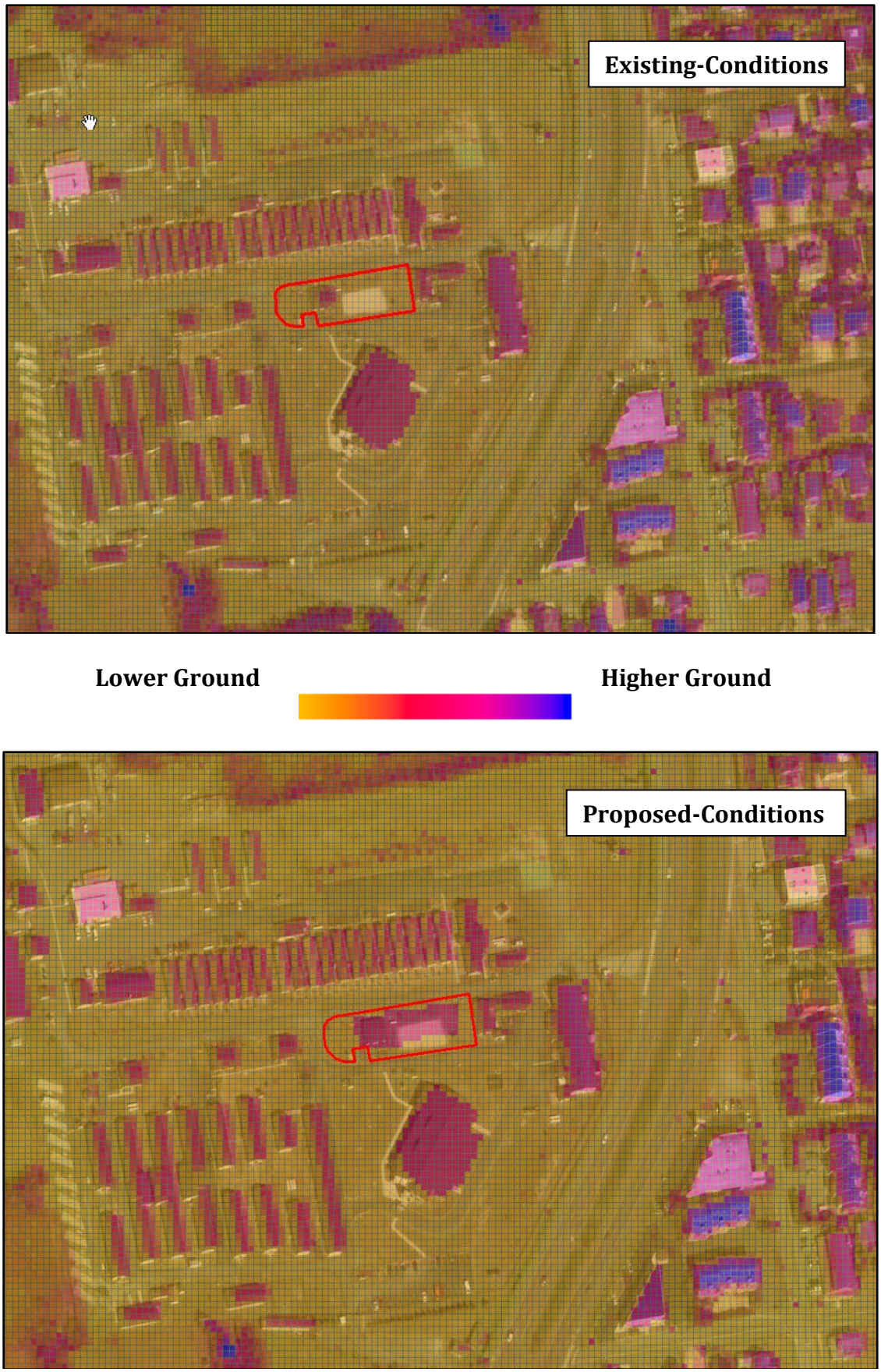
Elevations

Each grid element in the FLO-2D model was assigned an elevation. For the existing-conditions model, the proposed-conditions grid from the RTI FLO-2D model was used. This reflects the current existing-conditions. For the proposed-conditions model, the elevation changes as a result of the proposed action were manually adjusted based upon grading plans. All elevations are referenced to NAVD88 vertical datum (Figure C.2).

Manning's Roughness Values

The study area contains two basic ground surface types, concrete (or asphalt) and average grass cover associated with lawns, roadway medians, or commercial landscaping. Based upon Table 2 of FLO-2D User's Manual, the roughness value for both these ground surfaces range from .02-.05; therefore, a conservative roughness value of .04 was used for all grid elements within the project area.

Figure C.2: Elevation Assignments for Grid Elements near Proposed Action



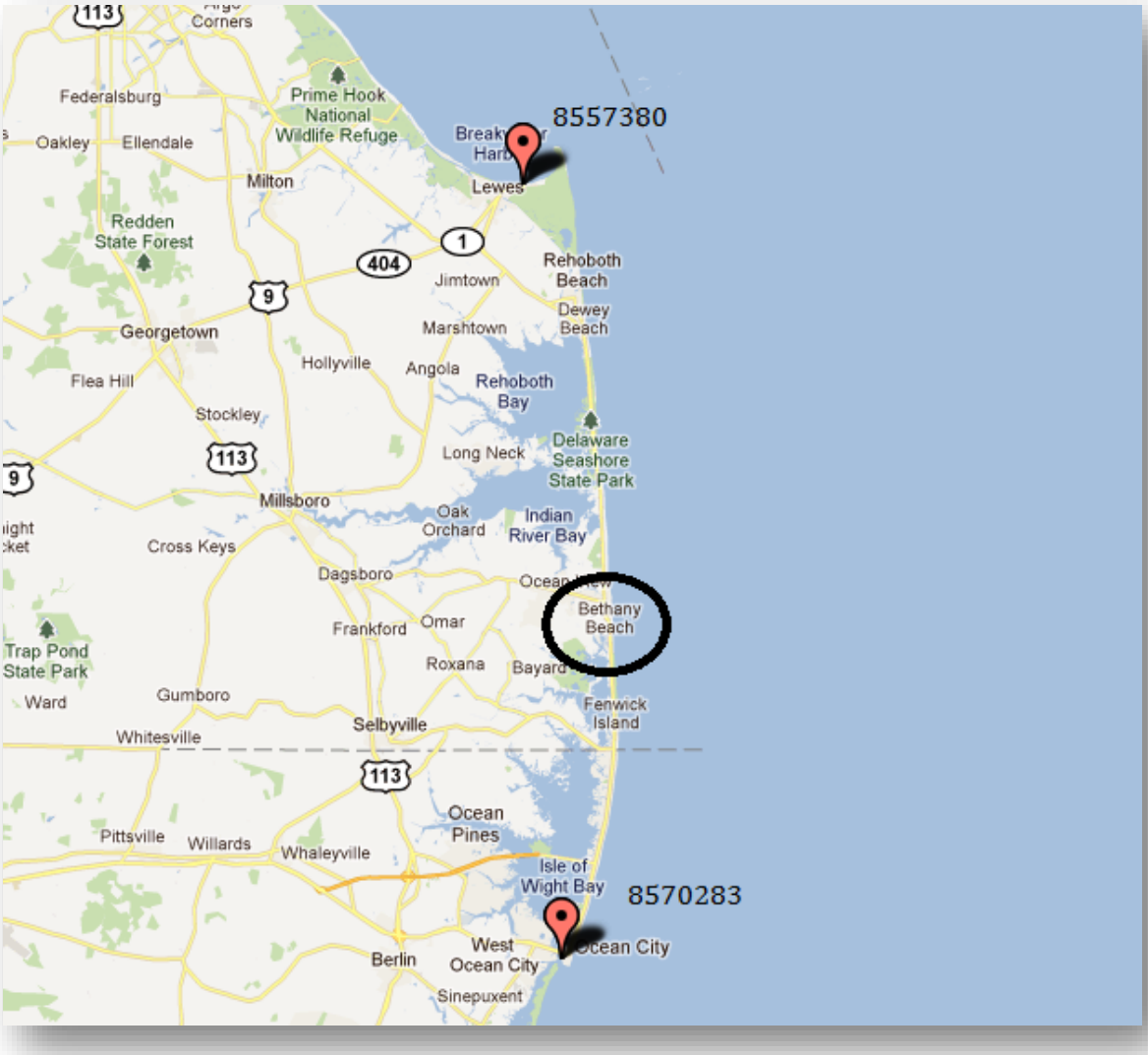
Inflow Points and Outflow Points

Inflow and outflow points were assigned along the Atlantic Ocean coastline and the tidal Salt Pond coastline. By placing the inflow and outflow points on adjacent grids, the flood wave will enter into the model area, and flow back out, just as a tidal flow would.

ESTIMATION OF FLOW

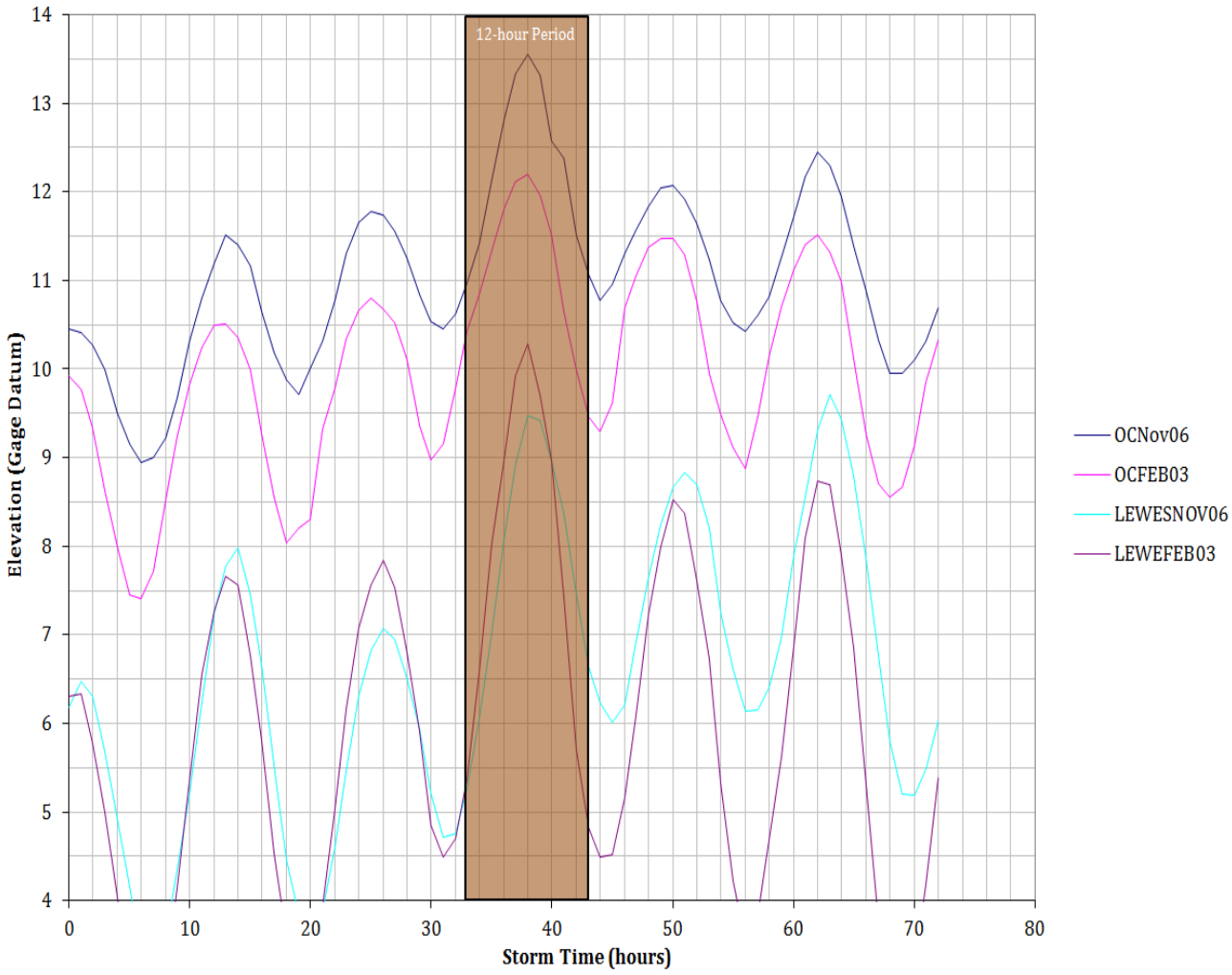
The inflow for the FLO-2D model is a representation of a storm surge event. Because the subject of EO 11988 is the 100-year floodplain, a reasonable stage vs. time curve was developed to simulate a 100-year event storm surge event. This was done by using measured storm surge data for several recent storms at two tidal gages operated by the National Oceanic and Atmospheric Administration (NOAA) that straddle the BBTS: 8557380 in Lewes, DE and 8570283 in Ocean City, MD (Figure C.3).

Figure C.3: Location of Tide Gages



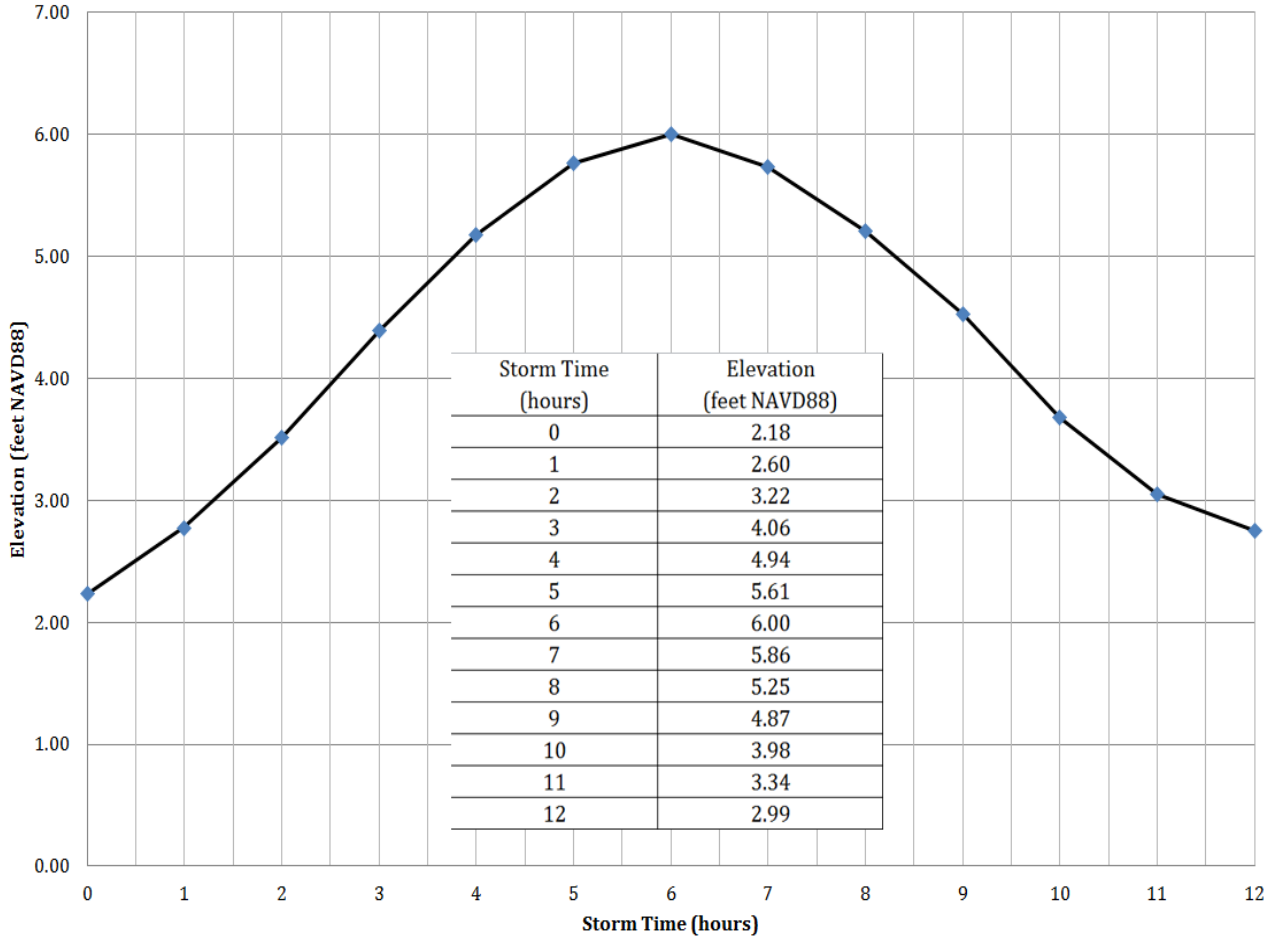
Data obtained from NOAA for these locations indicate moderate storm surges occurred in February 2003 and November 2006. A generalized curve for a 12-hour period (tidal cycle) was developed using the observed data from these storms (Figure C.4).

Figure C.4: Storm Surge Curve for Various Observed Events



Using a peak of 6.0 feet (NAVD88) to match the existing 100-year flood elevation at the BBTS and the generalized curve, a hypothetical 100-year storm surge curve was generated for the site (Figure C.5). The intent was to develop a reasonable curve to simulate a 100-year storm surge across the project area. The accuracy of the curve is not critical because inaccuracies will be equal for both existing and proposed conditions. The purpose is to determine impacts from the proposed action as it pertains to flood elevations and flow patterns/velocities. Regardless of height and timing of the flood wave over the land surface, differences between the existing and proposed ground surfaces can easily be identified regardless of the accuracy of the flood wave. The curve shown in Figure C.5 was entered into the FLO-2D model to represent the estimation of flow over the ground surface.

Figure C.5: Hypothetical 100-year Storm Surge for BBTS



Storm Time (hours)	Elevation (feet NAVD88)
0	2.18
1	2.60
2	3.22
3	4.06
4	4.94
5	5.61
6	6.00
7	5.86
8	5.25
9	4.87
10	3.98
11	3.34
12	2.99

CONTROL SPECIFICATIONS

A storm duration of 12-hours was used for the FLO-2D simulation to be consistent with the hypothetical stage-time estimation of flow curve. After several iterations it was determined that the appropriate time increment to use in the FLO-2D simulation is 15-minutes.

RESULTS

To compare the results and determine impacts of the proposed action, eight grid elements were identified as “comparative points”. These locations were chosen to show impacts to adjacent residential and commercial properties, existing buildings on the BBTS, and the Coastal Highway. The locations of these comparative points are shown in Figure C.6.

Figure C.6: Comparative Points for FLO-2D Models

The existing and proposed conditions FLO-2D models were run and results were compared to determine potential impacts of the proposed action. At each comparative point, the following results were noted and compared: water elevation, flood depth, velocity, impact force, specific energy, and static pressure. The results are summarized in Table C.1. As shown on Table C.1, there are no significant negative impacts as a result of the proposed action. All variables remain unchanged between the existing and proposed conditions. **The results of the FLO-2D modeling confirm that there are no negative impacts to the adjacent neighborhood as a result of the proposed action.**

Table C.1: FLO-2D Results Comparison

FLO-2D		Near residential property on Sandpiper Drive	At existing building on BBTS to the West	At existing building on BBTS to the North	Near South entrance to BBTS	On Coastal Highway Southbound	At Helicopter near BBTS entrance	Near North entrance to BBTS on Coastal Highway	Intersection of 5th and Pennsylvania in Bethany Beach
Hydraulic Variable	Grid Element	13388	13951	14155	16220	20341	22023	23629	27745
Water Elevation (feet NAVD88)	Existing	5.5	5.5	5.6	5.5	5.3	5.3	5.4	3.4
	Proposed	5.5	5.5	5.6	5.5	5.3	5.3	5.4	3.4
	Difference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flood Depth (feet)	Existing	1.6	0.5	0.3	1.6	0.2	0.8	0.3	1.3
	Proposed	1.6	0.5	0.3	1.6	0.2	0.8	0.3	1.3
	Difference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Velocity (feet per second)	Existing	0.2	0.4	0.1	0.6	0.3	0.4	0.1	0.9
	Proposed	0.2	0.4	0.1	0.6	0.3	0.4	0.1	0.9
	Difference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Impact Force	Existing	0.0	0.1	0.0	1.1	0.1	0.2	0.0	0.6
	Proposed	0.0	0.1	0.0	1.1	0.1	0.2	0.0	0.6
	Difference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Specific Energy	Existing	1.5	0.6	0.2	1.7	0.3	0.9	0.3	1.5
	Proposed	1.5	0.6	0.2	1.7	0.3	0.9	0.3	1.5
	Difference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Static Pressure	Existing	74.3	10.8	0.8	84.1	2.2	25.8	2.9	68.3
	Proposed	74.3	10.8	0.8	84.1	2.2	25.8	2.9	68.3
	Difference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0