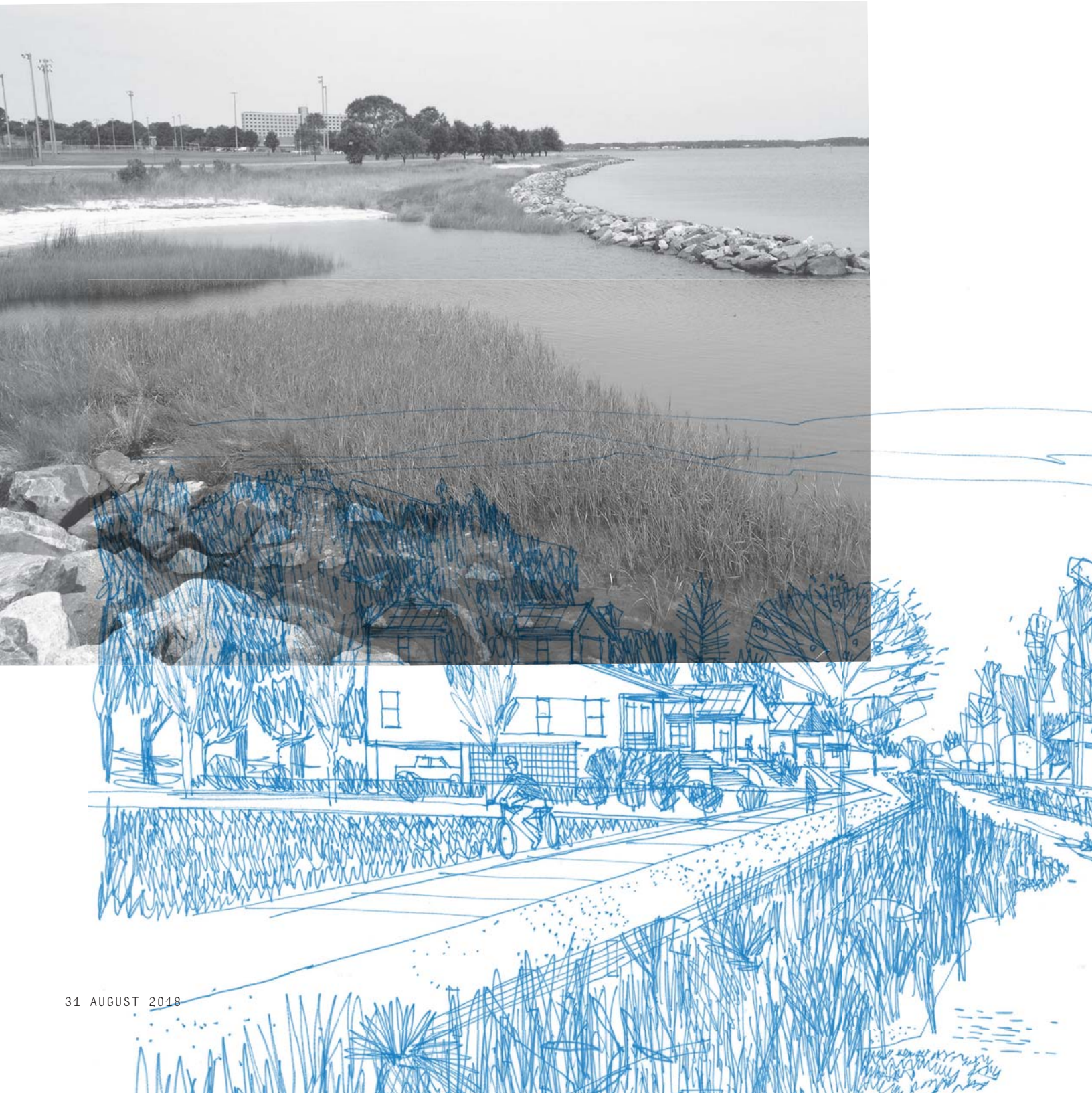
Hampton-Langley Air Force Base Joint Land Use Study Addendum: Resiliency and Adaptation



31 AUGUST 2018

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REPORT PREPARED BY
WAGGONNER & BALL
ARCHITECTURE/ENVIRONMENT
2200 PRYTANIA STREET
NEW ORLEANS, LA 70130
+1 504 524 5308
WBAE.COM

PROJECT TEAM
WAGGONNER & BALL
MOFFATT & NICHOL
ARCADIS

THE CITY OF HAMPTON
JBLE-LANGLEY

ALL IMAGES ARE CREDITED TO THE PROJECT TEAM UNLESS OTHERWISE NOTED

Executive Summary

Introduction

For over 100 years, Hampton has been home to Joint Base Langley-Eustis Langley Air Force Base (JBLE-Langley), a critical part of the social and economic vitality of the city and region, as well as a national defense asset. This addendum to the 2010 Joint Use Land Study (JLUS) will help solidify a path forward for the City of Hampton and JBLE-Langley to implement resilience strategies that support the base's mission operations as it faces a changing climate. Resilience is building on the strengths of a community to make it easier to recover from extreme events, and relieve everyday stresses. The Hampton Roads region is one of the most vulnerable areas in the country for impacts from sea level rise and recurrent flooding. Mission operations at JBLE-Langley will be at increased risk in the future because of the base's low-lying waterfront location. Further, the Department of Defense Office of Economic Adjustment, along with United Facilities Criteria 3-201-01 from April 2018, support this statement.

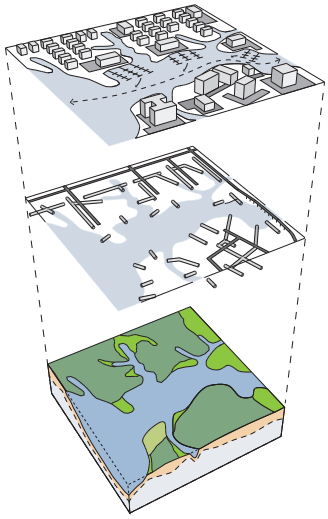
Above:
The edge of a tidal inlet branching off the Back River, to the south of JBLE-Langley.

This JLUS addendum identifies what work the City of Hampton, in partnership with JBLE-Langley, should undertake; it is not to propose design projects. This report supplements the 2010 JLUS by addressing **resilience and adaptation**, with a focus on how a changing climate has and will continue to impact the base, how the base can become more resilient, and how the City of Hampton can collaborate with JBLE-Langley to support the implementation of strategies that will create multiple and long-term benefits. Developed through a process with the project team, this report identifies risks, defines goals and measures of success, and develops strategies for implementation. These are highlighted throughout the document, with specific recommendations at the end, which include information on cost, timeline, roles and responsibilities. An outline of recommendations is at the end of this chapter.

Above:
Staff from the City of Hampton, JBLE-Langley, and the consultant team discuss existing water management infrastructure and coastal edge protection on site at the base.

This JLUS Addendum also builds upon the **Resilient Hampton** initiative, an ongoing effort that assesses the multiple forces of water, incorporates community principles and values, and recommends solutions driven by unique neighborhood characteristics. The city is uniquely poised to tackle these issues, and lead the way to a resilient future. Hampton has a very close cultural connection to water, and a desire to work with the water, not simply attempt to shut it out. Further, Hampton has a long history of education and innovation, with multiple organizations that are equipped to partner with the City. Improving resilience is critical to Hampton's future success, and the City is committed to the Resilient Hampton effort by understanding water as an asset.

Below:
A holistic and layered approach to planning



Throughout the document, the principles and values of Resilient Hampton are referenced to frame specific opportunities and recommendations, so that this JLUS Addendum is connected back to the larger initiative. A set of guiding principles will assist in decision making: **Create Value-Driven Solutions**, **Reinforce Assets**, **Layer Public Benefits**, **Strengthen Partnerships**, **Use Best Data**, and **Share Knowledge and Resources**. Similarly, the Resilient Hampton values reflect the character of the community, and the aspirations for the recommendations: **Safe**, **Equitable**, **Natural**, **Heritage**, **Integrated**, **Sufficient**, **Nimble**, and **Innovative**.

The City seeks to support JBLE-Langley's goal of maintaining mission readiness while improving resilience. As a partner, the City of Hampton can support JBLE-Langley by planning improvements off the base that would yield multiple benefits. While JBLE-

Langley will manage efforts on base independently from the City and other non-military partners, the City and other agencies and localities can support JBLE-Langley outside of the base. This JLUS Addendum identifies these initiatives.

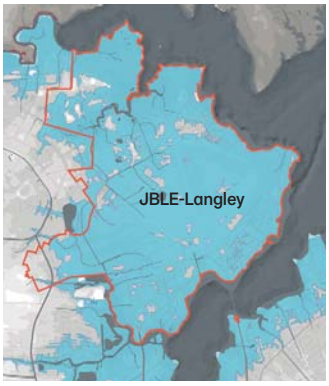
When planning for the future, integrating resilience requires understanding how different layered systems interact, and how they create a complex balance. Water is an integral part of Hampton's history, culture, and livelihood. The primary reason JBLE-Langley was located on its present site was for aircraft to take off over the water. Creating a strong and resilient city and base requires increased coordination, knowledge sharing, and collaboration across planning, design and construction, and management.

Above:
An existing slab on grade building, adjacent to the Back River near the N. King St. bridge.

Forces of Water

In Hampton, multiple forces of water affect the City and JBLE-Langley. Those forces include **storm surge**, wave action, and high water levels associated with storms and low pressure weather systems; **tidal action**, the fluctuation of water levels between low and high tide; **stormwater**, water generated from rain and storms that can be difficult to infiltrate due to impervious surfaces, and can lead to runoff; and **groundwater**, the water that lies below the surface of ground, and which can impact the ability of the soil to infiltrate stormwater if the groundwater level is high.

The City and JBLE-Langley also face major challenges with a changing climate and rising seas. Chronic stresses that impact resilience are regularly occurring, such as minor flooding during a typical rainstorm, while extreme events, such as a hurricane, occur infrequently. Both the frequency and intensity of storms are increasing, as are the impacts on both JBLE-Langley and the city of Hampton. Relative sea level rise, which is rising waters combined with subsidence, poses a double threat to JBLE-Langley and Hampton.



Above:
The area shown in blue indicates the extents of the FEMA 100-year floodplain, or the area that has a 1% annual chance of inundation, which corresponds with the National Flood Insurance Program. The majority of JBLE-Langley is within the floodplain elevation equivalent.

Natural Systems and Environment

The primary natural systems at JBLE-Langley include both tidal and non-tidal wetlands, two branches of the Back River, and numerous small creeks and inlets. These features encompass a range of opportunities such as the potential to restore wetland ecosystems, and alleviate flooding. More than half of the JBLE-Langley site is surrounded by tidal wetlands, a characteristic ecosystem of the Hampton Roads region. A partnership opportunity exists for the City to work with JBLE-Langley to support strengthening the ecological edges of base. At the same time, JBLE-Langley seeks to reduce Bird Aircraft Strike Hazards (BASH) which can increase when bird habitat, such as wetlands or other surface water, are nearby. Thus, it is important that the City and JBLE-Langley work together to identify compatible locations for such restoration.

Improving natural systems and managing stormwater also create opportunities for economic development and reinforcing local culture. Developing a stormwater management plan would benefit both the City of Hampton and JBLE-Langley. A strategic evaluation of existing land, waterways, and drainage systems would help alleviate flooding, reduce subsidence, and create a range of ecological benefits. Offshore, waters that surround the base have potential as sites for aquaculture and restoration.

Above:
A pelican flies along the southwestern edge of the base.

Character and Place

As one of the oldest air force bases in the country, JBLE-Langley has a strong character and sense of place that is unique and valuable. The base hosts a number of historic buildings, primarily in the southeast and northeast sections of the base, which are more prone to flooding. Though JBLE-Langley coordinates with the State Historic Preservation Office, the base does not maintain a preservation plan.

Above:
The N. King St. entry gate and adjacent residential and commercial development.

JBLE-Langley is part of the city, and the majority of personnel live off-base in Hampton or surrounding jurisdictions. This close integration could encourage compatible development around the base that serves both JBLE-Langley staff and neighboring residents. Coordinated among the City, business owners, and the base, strategic development would create multiple benefits. Nodes should occur at important intersections, or underused sites along primary corridors.

The approach of "base oriented development" is a strategy to take advantage of existing land, demand for services, and opportunities to improve adjacent neighborhoods. This builds upon a local precedent for investment: the recently completed multi-use path, bioswale, and landscape improvements in the public right of way along N. King St. near a base entry gate.

JBLE-Langley's inherent identity is a coastal base, with miles of waterfront that host a dynamic environment which changes throughout the year. Potential projects between the City and the base must reinforce this unique waterfront condition, and connect to JBLE-Langley's rich history as a coastal place.

Inside the Base: Critical Facilities and Mission Protection

While the focus of this JLUS addendum is to recommend strategies for implementation that primarily occur off the JBLE-Langley base, assessing existing vulnerabilities on the base will help frame what is currently at risk. The edges of the base, both coastal and on land, are the first line of protection. These areas are at risk for subsidence as well as flooding, since they are low in elevation. Access points into the base are at risk for flooding, including bridges and entry gates. On the base, certain infrastructure and buildings are vulnerable to these potential threats, though JBLE-Langley has already begun to address some of these locations. Transportation networks are susceptible to flooding and winter weather, which impact personnel commuting to and from JBLE-Langley, and supply deliveries.

Top:
Power generation systems and buildings are located close to the water, but are elevated.

While JBLE-Langley faces a range of risks, it is worth noting that many of its existing systems already work well, and are not of concern in the near future. JBLE-Langley has minimal concern with its systems for food service, natural gas, sewer system, and fuel delivery. JBLE-Langley's relationship with its neighbor NASA LaRC Research Center (NASA LaRC) has been successful, and no significant coordination or compatibility issues have been identified thus far. NASA LaRC is a logical partner to assist with implementation of specific recommendations.

The range of utilities and other support systems that serve JBLE-Langley are generally resilient, though opportunities exist for additional redundancy and coordination.

JBLE-Langley has already adapted its more vulnerable utilities, and continues to implement capital projects that protect equipment, systems, and buildings. Critical nodes and corridors on the base serve as an opportunity to improve resilience by grouping systems in a strategic way. Regional utility providers and government agencies need to regularly coordinate current systems, identify vulnerabilities, and plan upgrades.

Above:
The N. King St. bridge is a vulnerable structure because of its low elevation, and also has utility systems directly attached that have frozen before.

JBLE-Langley receives utility services from a range of regional and national providers, with varying degrees of redundancy. They include: land based telecommunications, data and internet, natural gas, drinking water, solid waste and treatment, transportation planning, and power. The project team held a series of meetings and conference calls with each utility provider to understand the existing systems and how they serve the base; each is described in more detail in the chapter Inside the Base: Critical Facilities and Mission Readiness. However, overarching vulnerabilities emerged that tend to impact multiple utilities.

Vulnerable systems can be made more resilient through a few key strategies. Decoupling removes utilities that are attached to potentially vulnerable structures. In conjunction with decoupling, hardening of existing vulnerable systems should be pursued. Depending on the utility, elevating or adapting structures or facilities both on and off base that serve JBLE-Langley is feasible. Resilience can also be improved through communication. With a wide range of utility providers servicing JBLE-Langley, some systems rely on others to function properly, but are still managed independently. Currently, the communications and power providers each manage their respective systems, and could benefit from greater internal coordination.

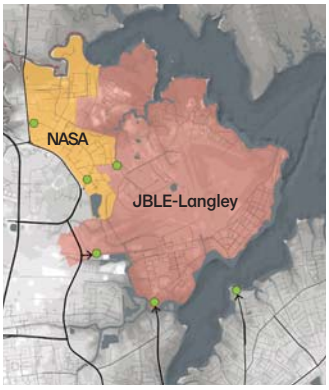
Above:
Utility equipment that has recently been elevated on concrete pads.

Boundaries

As a major military installation, the boundaries of the base on land are fixed and secure, yet JBLE-Langley's waterfront edges are dynamic, shifting a few feet with each tidal cycle. This relationship creates new opportunities for modifying edges, sharing resources, and increasing flexibility. Together, NASA LaRC, development, roads, wetlands, and water make up the boundaries of JBLE-Langley.

The landward edges of the base, while running up against roads and development, are actually more flexible than the wetland and water edges. There is opportunity to move facilities and services off-base to share between personnel living both on- and off-base, as well as the greater Hampton community. Another possibility is to expand the boundaries of JBLE-Langley itself, initiating the relocation of critical facilities landward.

Wetland and water edges create challenges for JBLE-Langley with BASH concerns, flooding, and storms. However, this also presents the opportunity for unique solutions, including emergency water access, and creation of wetlands in compatible areas to reduce impacts of flooding.



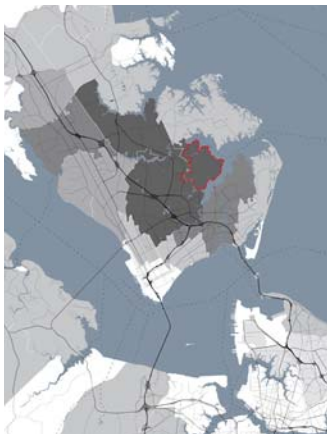
Above:
NASA's campus occupies the remainder of the peninsula that is shared with JBLE-Langley. The boundary of NASA has more roadway frontage, but only two primary entry gates, represented as green circles.

NASA LaRC has shared a border with JBLE-Langley for most of their joint existence, which creates opportunities for effective redundancy. For example, one of the base's entry gates is accessible only by entering NASA LaRC's campus. Since NASA LaRC operates on a more traditional work schedule, there may be an opportunity to direct greater

JBLE-Langley traffic through those roads during off-hours.

Access and Transportation

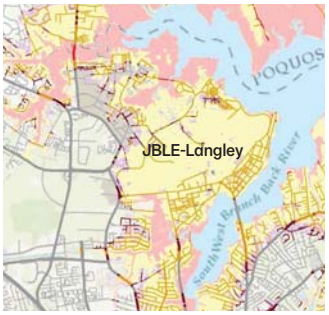
Transportation and circulation systems are perhaps the most important networks to study in order to improve resilience for the base. Personnel and supply deliveries use a range of different modes of transit, both to access the base and to move around it. To reach JBLE-Langley's access and entry points, as well as a range of connection areas, the primary mode of inter- and intra-base transit is automobile. With an auto-dependent transportation system, the base is vulnerable to traffic interruptions if roadways are impassable. On the base, personnel also commute by vehicle; no intra-base transportation system, such as a shuttle, exists.



Above:
Map showing density of JBLE-Langley personnel who commute to the base, by five digit zip code.

Traffic issues could be improved with a modified entry gate design and circulation, redistributing vehicles to other gates, and supporting alternative routes through adjacent areas. To improve traffic flow off the base, designated routes should be used as occasional and short term cut-throughs, specifically during rush hour or an emergency. Each of the entry gates also has existing conditions which limit adaptation, potentially becoming vulnerabilities in the future.

Inclement weather, such as storms, rain, and snow, creates barriers to access the base for deliveries and personnel commuting. Maintaining transportation corridors is a key concern for creating a resilient Hampton. Roadway flooding and drainage is currently a minor concern, but will likely increase with sea level rise and more extreme weather. All of JBLE-Langley's entry gates are located within the equivalent elevation of the FEMA 100-year (1% annual chance) floodplain, as is the majority of the base. Snow is the most frequent threat to access, and is the most common cause of airfield closure. Coordinating a regional snow emergency plan among the City of Hampton, VDOT, and neighboring municipalities would better serve JBLE-Langley.



Above:
Map from "Sea Level Rise and Storm Surge Impacts to Roadways in Hampton Roads" HRTPO report showing roads that would be submerged with 2.0 feet of relative sea level rise and a 2% annually recurring chance (50 year) storm surge.

When addressing vulnerabilities to existing access and transportation, the City and JBLE-Langley have a range of opportunities to make these systems more resilient. In the event of a base closure or limited access on roadways, communication between the installation and JBLE-Langley staff is critical. Maintaining dry egress and ingress, which is access from and to the base that does not flood, will become increasingly important to JBLE-Langley as increasing extreme weather and sea level rise advance. Taking advantage of the primary reason the base was established at its location – proximity to water – is another strategy to support its land-based transportation system as well. New water based transit, such as a ferry, could serve as a shuttle system as well as a detour route, or for evacuation if roadways were impacted during an event.

Recommendations

The JLUS Addendum Implementation Plan describes specific recommendations for strategies and actions that have been developed collaboratively between the City of Hampton, JBLE-Langley Air Force Base, the consultant team, and other agencies. Inherently, design and implementation serve as a catalyst for future development in the city, while also building momentum, and creating further funding opportunities.

Recommendations are also intended to reference and reinforce the values and principles of the Resilient Hampton effort, as well as to test strategies from the initiative.

These recommendations are intended to guide smarter collaboration, planning, and development within a range of time and cost scales. Items are organized into the following categories: **Policy**, **Emergency and Recovery Planning**, **Data Collection and Analysis**, **Utilities**, **Land Use**, **Transportation**, and **Water**.

Each category contains multiple recommendations with specific actions. Each implementation action includes time priorities, responsible entities, and a rough order of magnitude (ROM) cost estimate.

The categories and recommended strategies are listed below:

Policy
1. Establish and implement regional design standards for sea level rise
2. Expand coordination and partnerships among agencies
3. Enact policies to better coordinate studies and projects
4. Incorporate the JLUS Addendum into the Resilient Hampton effort
5. Incorporate JLUS implementation as a responsibility of the Hampton Resiliency Partnership

Emergency and Recovery Planning
6. Promote a shared culture of preparedness among all partners
7. Develop enhanced multimedia emergency notifications and warnings
8. Establish and implement emergency management and recovery plans

Data Collection and Analysis
9. Determine data needs for collection and monitoring, and establish systems
10. Continue to expand partnerships with innovative research entities
11. Assess vulnerability, and create a plan for key assets on JBLE-Langley and off base

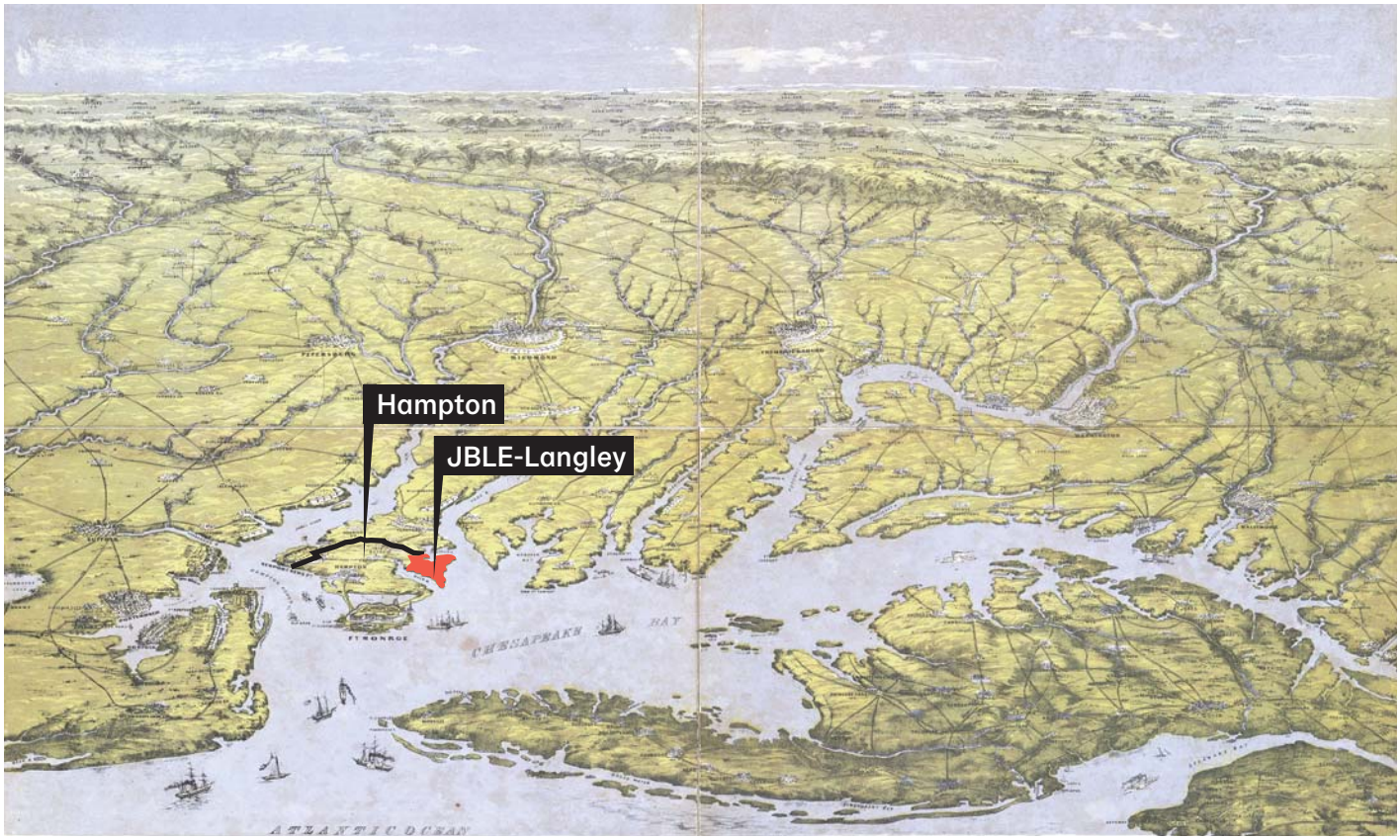
Utilities
12. Establish regular coordination among regional utility providers
13. Identify interdependencies among utilities
14. Secure infrastructure located off base or in airfield safety zones
15. Decouple or harden utilities

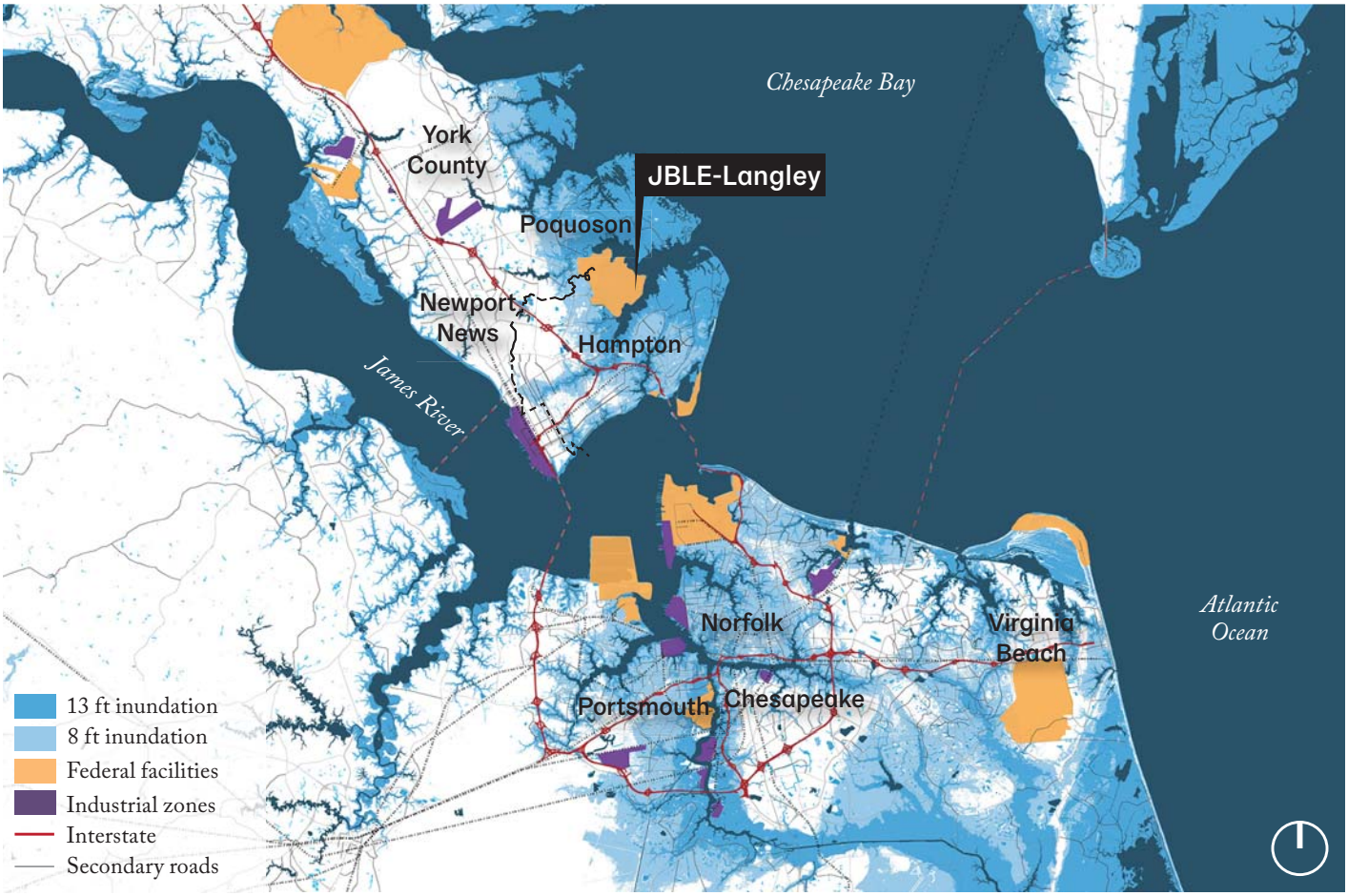
Land Use
16. Re-zone parcels adjacent to aircraft approach zones
17. Explore compatible land uses in aircraft approach zones
18. Establish support for strategic relocation to higher ground
19. Acquire remaining land in airfield safety zone and adjacent parcels, and transfer to JBLE-Langley
20. Identify and support compatible community redevelopment

Transportation
21. Determine which roadways are designated as high priorities for JBLE-Langley
22. Establish a plan to maintain access of key corridors
23. Use data collected to report traffic and access issues
24. Add new route to a new base entry gate
25. Redesign N. Armistead Avenue gate with complete streets standards
26. Create a network of circular transit

Water
27. Develop a stormwater management plan
28. Manage stormwater off the base in City owned land
29. Coordinate ecological improvements with base development

Introduction


Hampton
JBLE-Langley
CHESAPEAKE BAY
ATLANTIC OCEAN


Chesapeake Bay
York County
JBLE-Langley
Poquoson
Newport News
Hampton
James River
Norfolk
Virginia Beach
Atlantic Ocean
Portsmouth
Chesapeake
13 ft inundation
8 ft inundation
Federal facilities
Industrial zones
Interstate
Secondary roads

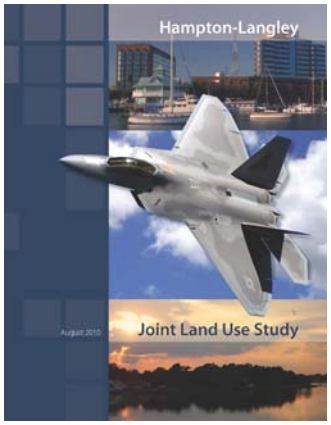
Purpose of Addendum

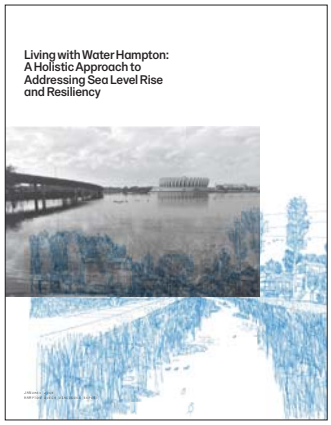
For over 100 years, Joint Base Langley-Eustis Langley Air Force Base (JBLE-Langley) has been a critical part of the social and economic vitality of Hampton. In operation since 1917, JBLE-Langley is one of the oldest continuously active air bases in the world. In the face of sea level rise and recurrent flooding, the City of Hampton and JBLE-Langley agree there is work to be done to ensure the base's continued operation. Further, the Department of Defense (DoD) has directed planning efforts to include strategies for resilience. The DoD Office of Economic Adjustment along with United Facilities Criteria 3-201-01 from April 2018 support this statement. Resilience is building on the strengths of a community to make it easier to recover from extreme events and relieve everyday stresses. This addendum to the 2010 Joint Use Land Study (JLUS) will help solidify a path forward for the City of Hampton and JBLE-Langley to identify and implement resilience strategies that support continued feasibility of base operations.

This effort identifies work the City of Hampton, in partnership with JBLE-Langley, should undertake; it does not propose specific design projects. This JLUS Addendum builds upon the **Resilient Hampton** effort, which is the City's initiative to address ongoing stresses, such as nuisance flooding from higher tides, and prepare for future shocks from large weather events through a place- and asset-based approach to resiliency. This JLUS Addendum is part of Phase I of Resilient Hampton, which culminated in *Living with Water Hampton: A Holistic Approach to Addressing Sea Level Rise and Resiliency,* which assesses the multiple forces of water, incorporates community principles and values, and recommends solutions driven by unique local characteristics.

To understand both the internal and external risks to the base, this report seeks to reinforce the **mutually supportive partnership** between the City of Hampton and JBLE-Langley. According to the JBLE-Langley Economic Impact Analysis for Fiscal Year 2016, the military installation created over 6,200 jobs and had a total economic impact of $2.1 billion. Identifying overlaps in risks to the base and the city provides a more robust picture of challenges and opportunities to the Hampton community at large. The City and the base benefit from each other, and must work together.

Building upon work already undertaken by JBLE-Langley and the City over the past several decades, this JLUS Addendum will strengthen the position of the Hampton Roads region as a **leader in military-municipal relationships**. This report is the result of an unprecedented effort. With a primary focus on collaboration and a long term strategy for adaptation and improving resiliency in the face of a changing climate and rising seas, this collaboration between the City of Hampton and JBLE-Langley will serve as a model of how federal installations and their neighbors can partner together to create a better future for the entire community.





Top:
Cover of the 2010 Joint Land Use Study

Above:
Cover of the Living With Water Hampton report

Opposite, top:
An 1861 view of the Chesapeake Bay during the Civil War illustrates Hampton's strategic location at the mouth of the James River. The present day city is outlined in black, and JBLE-Langley is in red.
Image source: David Rumsey Historical Map Collection

Opposite, bottom:
The Hampton Roads region is an important natural port and strategic area for national defense. Measures must be taken to protect assets which are currently at risk, including JBLE-Langley.

Background

As highlighted in the Resilient Hampton effort, the Hampton Roads region is one of the most vulnerable areas in the country for impacts from climate change, sea level rise, and recurring flooding. As members of the same coastal community, JBLE-Langley and the City of Hampton have experienced the impacts of storms, and are aware of the challenges they face. Mission interruption, repetitive loss from flooding, and lack of safe routes to and from the base are all concerns for the military.

Over the past 100 years, both the base and the surrounding communities have experienced, and adapted to, a range of extreme weather events. Major disasters, most recently Hurricane Isabel in 2003, brought extensive flooding and damage on the base as well as throughout Hampton Roads. Since then, a series of nor'easters, heavy rainstorms, and snow events have caused JBLE-Langley to close. As described further in the next chapter, these events are occurring more frequently, and with greater intensity, than in the past.

Water has always been an integral part of Hampton's history, culture, and livelihood, a key concept of the Resilient Hampton initiative. This program is the first phase in a multi-step effort that grew from the Dutch Dialogues Virginia workshops in 2015, described at the end of this chapter. A range of goals, principles, and values that were developed in partnership with residents serve as a guide to make Hampton a more resilient place, which includes JBLE-Langley. This requires increased coordination, knowledge sharing, and collaboration across planning, design and construction, and management. This addendum to the JLUS is a logical progression, the first step in a long term implementation plan between the City, the base, and other partners.

Top and Center:
Flooding from Hurricane Isabel in 2003 overtopped the edges of the base, and inundated low lying areas, such as parking lots and slab on grade buildings.

Bottom:
JBLE-Langley airfield with F-22 plane during a snowstorm.

Image sources: Joint Base JBLE-Langley-Eustis

History of JBLE-Langley

The history of JBLE-Langley began in 1915, at the start of World War I, when Congress established the National Advisory Committee for Aeronautics (NACA). In 1916, because of its relatively flat topography and proximity to the coast, the federal government selected a site along the Back River for aircraft to take off over the water and practice the earliest attempts at aerial bombing. In 1917, JBLE-Langley became one of the first military sites in the world constructed for flight. Adjacent to the base, Langley Memorial Aeronautical Laboratory became the nation's first civilian facility dedicated to researching flight. This was later renamed NASA, the National Aeronautics and Space Administration. A century later, JBLE-Langley is one of the oldest continually active air bases in the world, and is the oldest airfield in Virginia. In 2010, it joined with Fort Eustis to form Joint Base Langley-Eustis.

Now entering its second century, JBLE-Langley continues to provide "mission-ready expeditionary Airmen to combatant commanders in support of joint and combined operations worldwide." For the past 100 years, Hampton's proud community has supported this world-class national defense installation. JBLE-Langley's primary focus includes: providing operations, planning and execution support to major commands and theater air and space operation centers; conducting imagery, cryptologic, and measurement and signature intelligence activities; and delivering F-22 Air Power worldwide on short notice to support Combatant Commander taskings.

In 2010 the current Joint Land Use Study was issued, which identified issues with compatible land use and policies that affect mission readiness, and thus, national defense objectives. Comprehensively, JLUS priorities include promoting the health, safety, and welfare of the military and civilian personnel living and working at or near the military installation, and preserving the ability of the installation to expand or adapt its mission to changing conditions.

This report focuses on how a changing climate may impact the base, how the base can become more resilient, and how the base and the City of Hampton can collaborate to implement strategies that will create multiple and long-term benefits.

Top:
Aerial view of the Langley Airfield in 1920s, looking north from the N. King St. bridge and entrance to the base.
Image source: Wikipedia

Center:
Langley Airfield, c. 1930, looking southeast towards the N. King St. bridge to the Back River.
Image source: NASA

Bottom:
Airplane on runway in front of airfield hangars, c. 1930. Some of these historic hangar buildings remain in operation today.
Image source: NASA

Goals

Innovative Partnership

JLUS ADDENDUM ON RESILIENCE AND ADAPTATION

THIS DOCUMENT REPRESENTS AN IMPORTANT EFFORT BETWEEN A MUNICIPALITY AND A MILITARY INSTALLATION WORKING TOGETHER TO CREATE A LONG TERM VISION AND IMPLEMENTATION PLAN THAT IMPROVES RESILIENCE, BOTH ON THE BASE AND IN THE SURROUNDING COMMUNITY. THE CITY OF HAMPTON AND JBLE-LANGLEY HAVE COLLABORATED ON PREVIOUS EFFORTS SINCE THE INSTALLATION WAS ESTABLISHED, BUT HAVE NEVER BEFORE FOCUSED ON RESILIENCE. THIS INNOVATIVE STRATEGIC WORK IS GROUNDBREAKING.

A JOINT LAND USE STUDY (JLUS) IS COMMON PRACTICE FOR THE UNITED STATES MILITARY TO CREATE WITH COMMUNITIES THAT SURROUND AN INSTALLATION, BUT ADDRESSING RESILIENCE AND ADAPTATION HAVE NOT BEEN A PRIMARY DRIVER. THIS ADDENDUM BUILDS UPON THE 2010 JLUS BETWEEN THE CITY OF HAMPTON AND JBLE-LANGLEY TO FOCUS ON CLIMATE CHANGE AND RISING SEAS, AND WITH SPECIFIC RECOMMENDATIONS TO BE EXPLORED AND IMPLEMENTED. THIS REPORT ALSO ADVANCES RECENT EFFORTS BY THE DEPARTMENT OF DEFENSE TO SURVEY EACH MAJOR MILITARY BASE IN ORDER TO UNDERSTAND HOW CLIMATE-RELATED VULNERABILITIES IMPACT MISSION OPERATIONS. THIS JLUS ADDENDUM IS A MODEL, AND SETS A NEW STANDARD FOR HOW TO CREATE POTENTIAL SOLUTIONS THROUGH PROJECTS, PARTNERSHIPS, AND POLICY.

BELOW: STAFF FROM THE CITY OF HAMPTON, JBLE-LANGLEY, AND THE CONSULTANT TEAM DISCUSS EXISTING WATER MANAGEMENT INFRASTRUCTURE AND COASTAL EDGE PROTECTION ON SITE AT JBLE-LANGLEY DURING A TOUR OF THE BASE.

Working Together Towards Resilience

Critical mission operations at JBLE-Langley will be at increased risk of interruptions in the future because of the base's low-lying waterfront location. In addition to natural forces such as flooding, wind, and snow, the consequences of interrupted utilities, failed infrastructure, and displaced staff and supplies also impact mission readiness. Goals for a resilient JBLE-Langley are primarily to maintain flight operations and associated mission utilities service during an event, and to expedite recovery.

Practically, continued mission readiness may permit a brief closure to the base, as JBLE-Langley may have canceled flights or other mission critical items in advance of a storm approaching. This impacts mission readiness, so the goal is to reduce the number of closures and time closed. Recovery after an event prioritizes access to and from base for personnel, and that JBLE-Langley is operational upon their arrival.

To achieve resilience goals, three distinct realms are considered for improvement: **broad** concerns that are shared by both JBLE-Langley and the City of Hampton, opportunities **inside the base** that JBLE-Langley manages, and ways to improve resilience **outside the base** that the City leads.

For example, a broad concern that is beneficial to both JBLE-Langley and the City is to agree on regional design standards for sea level rise, and create policies that allow for better coordination of local, regional, and federal projects. This helps ensure projects will be built to shared standards, and will not become obsolete in the face of changing climate conditions and sea level rise. Over time, this partnership must also monitor the scientific progress as projections become more certain, and consider the higher ranges of SLR as extremes, but certainly as possibilities.

On the base, JBLE-Langley independently manages the planning, design, construction, operations, and maintenance of its systems. The Inside the Base recommendations are suggestions for JBLE-Langley to consider implementing in their process.

Off the base, the City of Hampton and other relevant institutions would lead recommendations that are within their jurisdiction. For example, these recommendations include maintaining compatible land use, land ownership, and zoning of parcels around JBLE-Langley and aircraft approach zones, and maintaining access on high priority transportation corridors.

Together, these goals of improving resilience and promoting adaptation will serve as the basis for recommendations, found in the last chapter of this document. Below is a summary list that is divided into the three categories previously described. Broad indicates a larger scale effort that is relevant to both JBLE-Langley and the City of Hampton, Inside the Base is relevant to JBLE-Langley, and Outside the Base is to be led by the City of Hampton and other relevant institutions.

Broad

- Establish and implement regional design standards for sea level rise
- Expand coordination and partnerships among government agencies
- Enact policies to better coordinate studies and projects
- Incorporate the JLUS Addendum into the Resilient Hampton effort
- JLUS implementation as a responsibility of the Hampton Resiliency Partnership
- Promote a shared culture of preparedness across jurisdictions and agencies
- Assess vulnerability, and create a plan for key assets on JBLE-Langley and off base
- Establish regular coordination among regional utility providers
- Identify interdependencies among utilities
- Establish support for strategic relocation to higher ground
- Identify and support compatible community redevelopment
- Add a new route to a new entry gate
- Coordinate ecological improvements with base development

Inside the Base

- Secure infrastructure off base or in airfield safety zones
- Decouple or harden utilities
- Redesign N. Armistead Avenue entry gate with complete streets standards
- Create a network of circular transit

Outside the Base

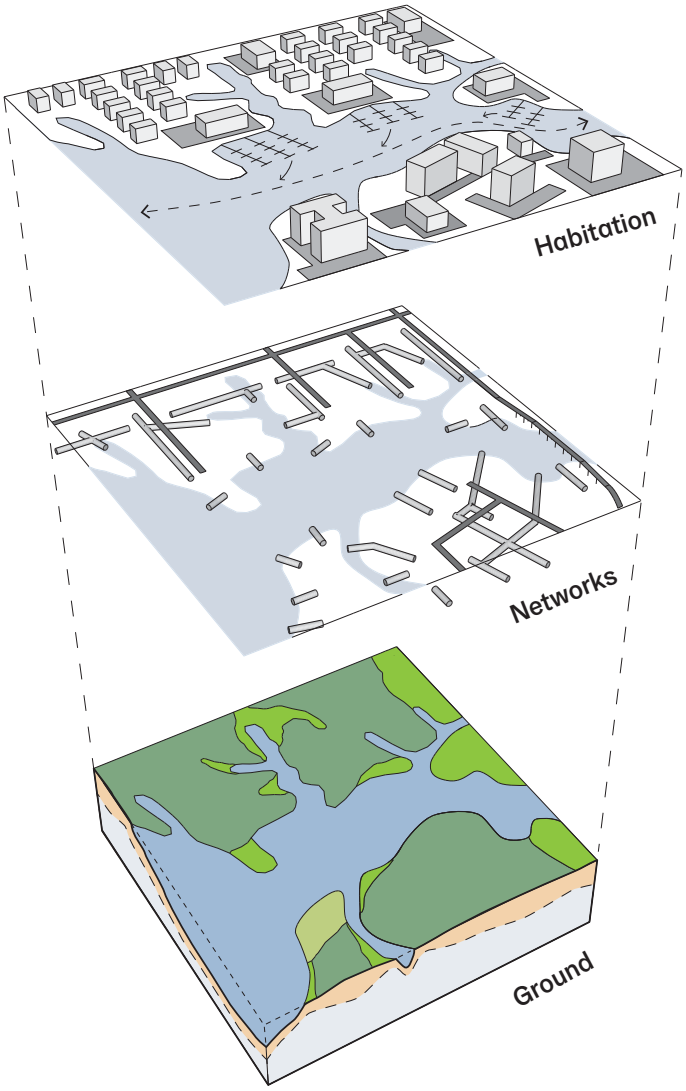
- Develop enhanced multimedia emergency notifications and warnings
- Establish and implement emergency management and recovery plans
- Determine data needs for collection and monitoring, and establish systems
- Expand partnerships with innovative research entities
- Secure infrastructure off base or in airfield safety zones
- Re-zone parcels adjacent to aircraft approach zones
- Explore compatible land uses in aircraft approach zones
- Acquire remaining land in airfield safety zone and adjacent parcels
- Determine which roadways are designated as high priorities for JBLE-Langley
- Establish a plan to maintain access of key corridors
- Use data collected to communicate traffic access issues
- Develop a stormwater management plan
- Manage stormwater off the base in City owned land

Approach to Planning

Hampton and JBLE-Langley understand the value of pre-disaster mitigation, as they have weathered a number of significant storms over the years – notably Hurricane Isabel in 2003. Both entities also have the advantage of approaching resilience planning by learning from other post-disaster recovery efforts before a potentially larger disaster occurs. In contrast, cities such as New Orleans post-Katrina or New York City post-Sandy were forced to plan after the event. Addressing the complex challenges and threats facing the City and JBLE-Langley will require a new approach: new ways of thinking, working, and learning. Single purpose solutions no longer justify the investment made in them. Instead, resilient solutions will require a holistic approach which includes environmental, social, and financial inputs. This document is the first step towards building a resilience strategy for the City to support JBLE-Langley by identifying potential threats, opportunities, and community values in Hampton.

In 2015, the cities of Hampton and Norfolk held a five-day workshop called **Dutch Dialogues Virginia: Life at Sea Level**. The Dutch Dialogue approach to "living with water" is an innovative method that first emerged in the aftermath of Hurricane Katrina in the New Orleans region. A partnership between Waggonner & Ball and the Royal Netherlands Embassy brought together a team of experts from the Netherlands with local professionals to assist in New Orleans' efforts to better prepare its community post-Katrina.

To begin this resilient design process, the City of Norfolk, the City of Hampton, the Hampton Roads Planning District Commission, and various other partners brought the Dutch Dialogues approach to Hampton Roads. Hampton and Norfolk were chosen as the "pilot" cities around which the workshop was focused. At the conclusion of this five-day session, the Mayors and City Managers of Hampton and Norfolk pledged to continue the momentum and work together to lead the region toward a more resilient future.



Layered Planning
A holistic new approach outlines principles for water management, regional planning, and urban design that are specific to Hampton, developed out of a process that considers local soils, water, and biodiversity, as well as infrastructure networks and land use.

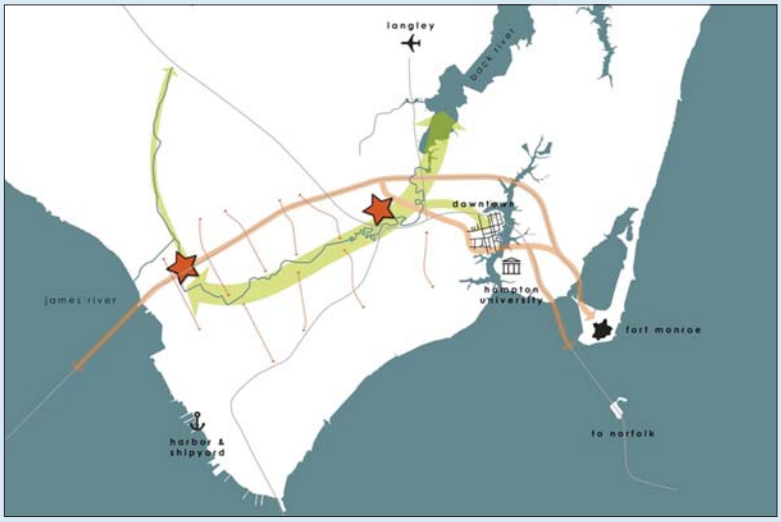
The Resilient Hampton effort frames the approach to integrated resilience planning by first emphasizing the need to understand how different layered systems interact. As the foundation, soils and water are the basis for planning and designing infrastructure networks, which then shape the urban fabric and human activity. Human intervention and policy change the shape of the land and the flow of water and nutrients across the landscape. These interactions create a complex, delicate balance; it is critical that the City and JBLE-Langley understand and coordinate these systems.

Throughout the document, the principles and values of Resilient Hampton are referenced to frame opportunities, connecting back to the larger initiative. Principles will assist to guide decision making: **Create Value-Driven Solutions**, **Reinforce Assets**, **Layer Public Benefits**, **Strengthen Partnerships**, **Use Best Data**, and **Share Knowledge and Resources**. Values reflect the character of the community and the aspirations for recommendations, and will help measure the benefits of proposed work: **Safe**, **Equitable**, **Natural**, **Heritage**, **Integrated**, **Sufficient**, **Nimble**, and **Innovative**.

Dutch Dialogues Virginia: Life at Sea Level

DUTCH DIALOGUES WORK FOCUSED ON UTILIZING NEWMARKET CREEK AS A CONNECTIVE ELEMENT THROUGHOUT HAMPTON. MERCURY BOULEVARD - WHICH LOOSELY PARALLELS NEWMARKET CREEK - CONTAINS MANY OF THE CITY'S ECONOMIC ASSETS. AT HINGE POINTS WHERE THE CREEK AND THE BOULEVARD INTERSECT (SHOWN AS STARS IN THE DRAWING TO THE RIGHT), THERE ARE OPPORTUNITIES FOR REDEVELOPMENT.

IN MANY AREAS OF THE CITY, NEWMARKET CREEK IS SEEN AS A BACKYARD CONDITION, OVERLOOKED AND NEGLECTED AT THE REAR OF PROPERTIES. THE TEAM ALSO LOOKED AT USING GREEN INFRASTRUCTURE INSERTED INTO NEIGHBORHOODS TO CREATE ACCESS POINTS FOR THE CREEK. AS AREAS AROUND THE CREEK ARE REDEVELOPED, NEW LOW IMPACT DEVELOPMENT COULD FACE THE CREEK, USING IT AS AN ASSET INSTEAD OF REGARDING IT AS A THREAT.



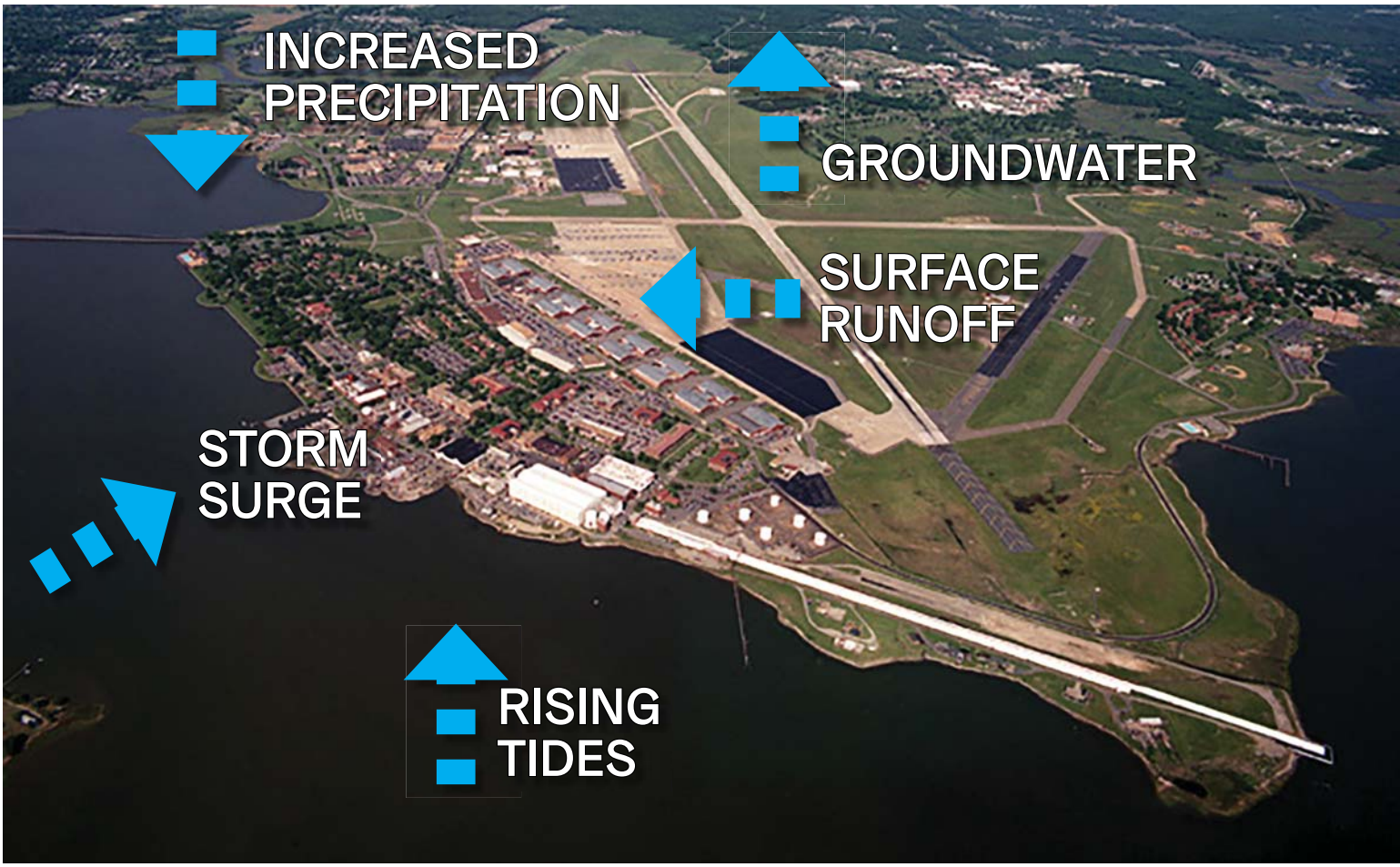
Forces of Water

Interrelationships

A key point from the Resilient Hampton effort, the Hampton Roads region is recognized as a highly vulnerable area in the country, at risk for major impacts from climate change, relative sea level rise, and recurring flooding. This condition threatens the local economy, culture, and community of Hampton. Major assets of national importance, from JBLE-Langley to historic sites, will become more vulnerable over time.

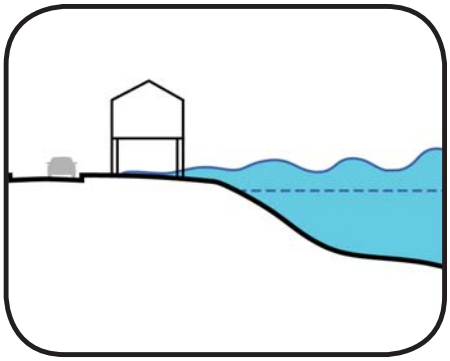
Located on a peninsula at the convergence of two branches of the Back River, JBLE-Langley is surrounded by multiple forces of water. The primary forces are storm surge, tidal action (which impacts rivers and creeks as well), stormwater, and groundwater. Like the rest of Hampton and neighboring communities, JBLE-Langley is highly exposed to hazards, including hurricanes and nor'easters. These events also bring high surge, waves, extreme rain, and winds. High water can bring flooding along with erosion, which can exacerbate damage and reduce protection in the future. Different combinations of the forces of water impact JBLE-Langley and Hampton in a range of ways over time; increasing flooding has shown a recent shift in awareness and concern from local citizens. To implement resilience planning, each force of water must be understood, along with how they are related to the other forces.

Multiple Forces Of Water
Understanding how these complex and differing forces interact and compound is a crucial first step to addressing resiliency. Below, an aerial photo of JBLE-Langley.
Image source: Wikimedia Commons



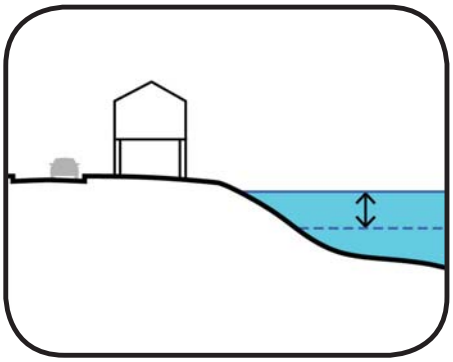
Forces of Water

Storm surge, with its accompanying wave action and high water levels, is destructive and sudden, and is different from other forces of water that threaten Hampton and JBLE-Langley. As sea levels rise, higher water will bring higher waves and more flooding. Wave action against the shore will also cause greater erosion, further exacerbated by deeper waves from higher water. These higher waves and water levels will also spread inland, reaching properties that were previously above flood levels, such as farther onto the base. Storms also bring high winds, which cause damage farther inland than flooding, and can affect a greater number of properties and infrastructure.



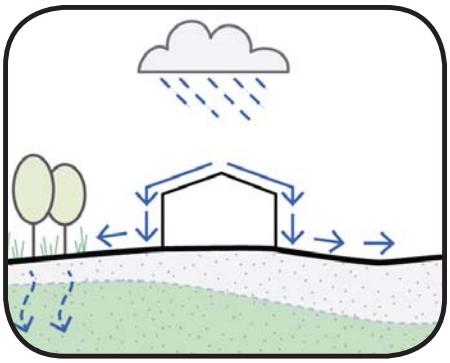
Storm Surge

Tidal action, the process of water levels fluctuating between low and high tides, is perhaps the most important influence on other forces of water. Storm surge or intense rainfall during low tide results in very different impacts compared to those events occurring at high tide. When storms hit during high tide, they are more intense; higher water levels bring higher waves, and water spreads farther inland. Stacking tides, or high tides that aggregate over several cycles, can occur during rainstorms or extreme events, and can cause more flooding when stormwater has nowhere to drain. In Hampton, tidal action affects both coastal zones as well as inland areas situated close to the rivers, creeks, and inlets throughout the city, such as JBLE-Langley. The local tidal range is 2.75 feet. This impacts the drainage system as well. During high tide, water can backflow into drainage outfalls. In some areas of the city, this means that stormwater cannot flow out into waterways and becomes backed up, creating ponds at full catch basins, or backs up and out of manholes.



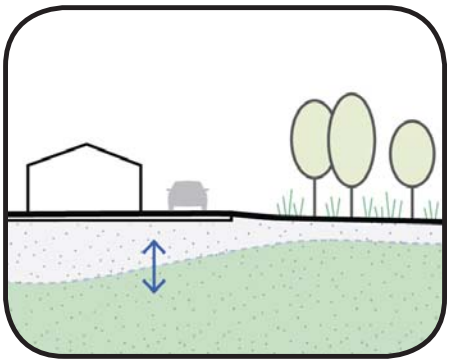
Tidal Action

Stormwater is a challenging force to manage in any city, and places stress on the existing drainage system. Some water from rainstorms is absorbed by the ground, but much of Hampton is developed or paved with surfaces that prevent water from infiltrating into the soil, such as the runways, roads, and parking lots at JBLE-Langley. This condition creates runoff, which flows across impervious surfaces, and can easily overload parts of the drainage system. Even higher inland areas, while away from the coast, can face the threat of flooding if high tides prevent the discharge of stormwater into surrounding waterways.



Stormwater

Groundwater, an invisible force, impacts the subsurface foundation of the city. Much of Hampton has high, or shallow, groundwater levels, meaning the depth to the water table is only a few feet below the surface of the ground. This includes the low-lying site of JBLE-Langley. The distance between groundwater and the ground surface is a determining factor for how much water soils can store. When seas rise, groundwater levels rise as well, creating areas that are regularly wet and cannot absorb stormwater. At the same time, impervious areas that do not allow water to infiltrate can cause subsidence, which is the gradual drying out, compaction, and sinking of hydric soils. Subsidence leads to increased flood risk as grounds continue to sink over time. Conversely, high groundwater levels, combined with poorly infiltrating soils, can prevent temporary water storage, exacerbating flooding.



Groundwater

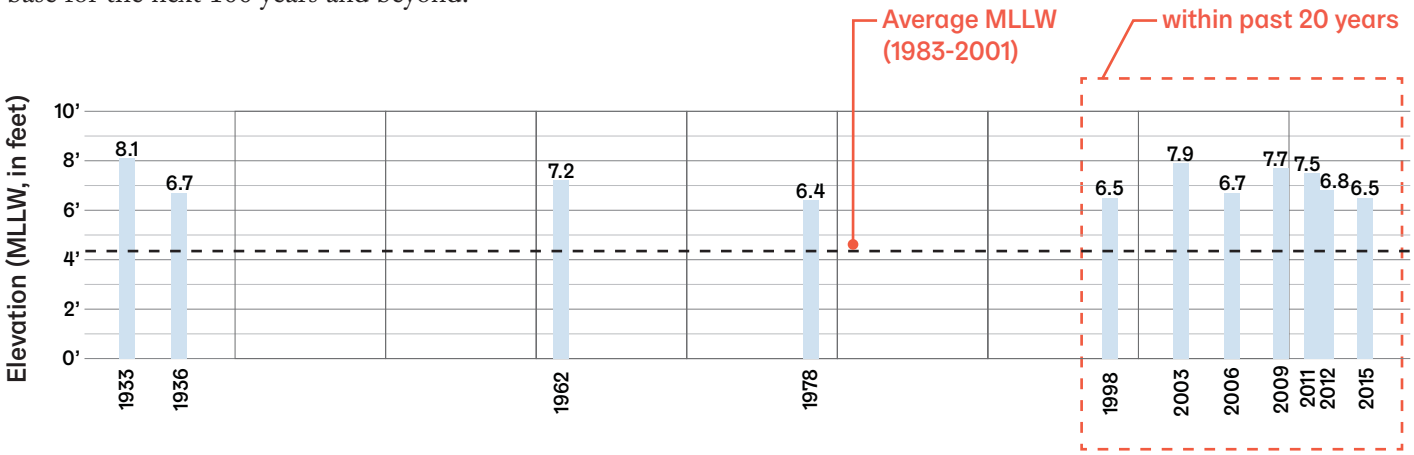
Challenges

Climate Change

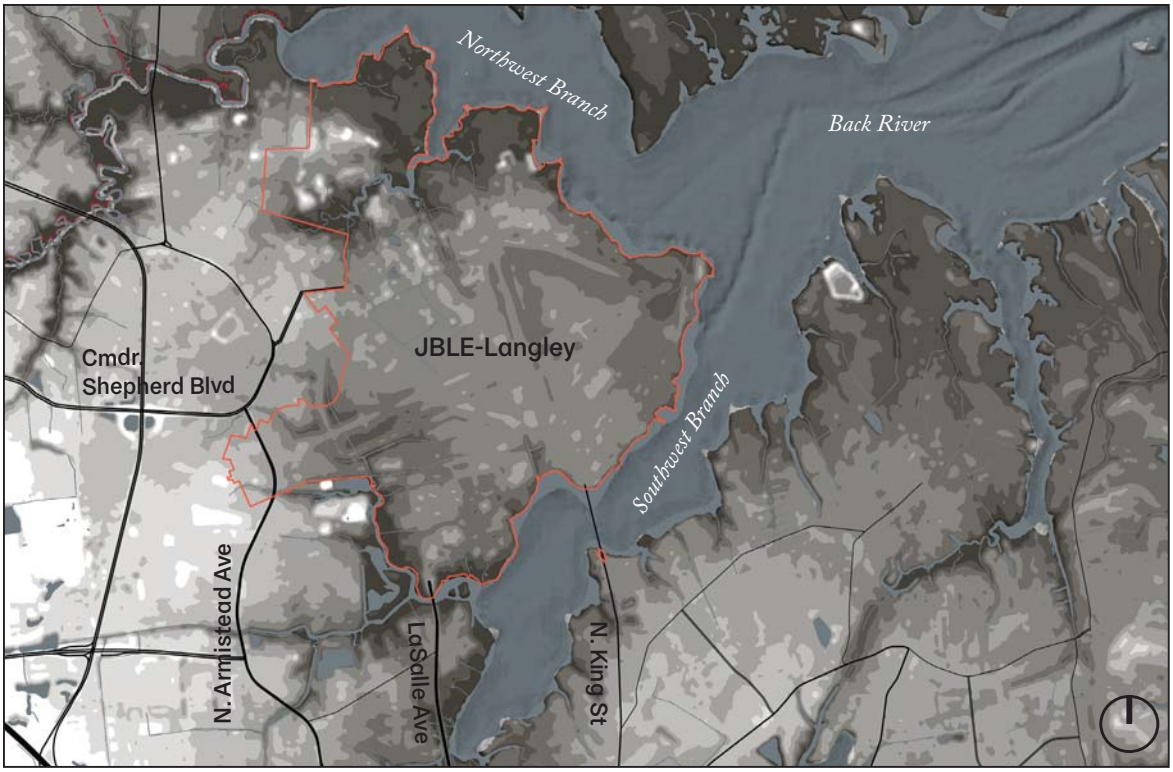
Chronic stresses that impact resilience are regularly occurring, such as minor flooding during a typical rainstorm, while extreme events occur infrequently, such as a hurricane. Both the frequency and intensity of storms are increasing, as are the impacts on both JBLE-Langley and Hampton. Over the past 80 years, seven of the eleven highest storm surges have occurred in the last 20 years. Certain hurricanes and nor'easters have significantly impacted JBLE-Langley. While preparing for major storms has historically been a way of life in Hampton, intense rainstorms are also more frequent than before, and cause minor levels of flooding. These more regular, chronic events also impact JBLE-Langley operations, particularly when they occur during high tide. With advance notice of a storm, flight schedules must be delayed or canceled to accommodate for events such as winter weather and high water impact. As a result, mission readiness is interrupted, sometimes for several days.

In order to plan for adaptation, it is necessary to establish a baseline from which to project a time horizon for future conditions. The majority of the base is within the equivalent elevation of the FEMA 100-year (1% annual chance) floodplain. In the past 20 years, the average time between major storms has been less than 3 years. JBLE-Langley typically closes the airfield during these extreme events, and often will stop scheduling missions in advance of inclement weather. Airfield closure due to the base being unable to support flight operations is rare, occurring only a few days per year at the most. More often, the airfield will close because flights are not planned for the coming days, and also to allow personnel to travel home before a storm.

Hampton and the base exist because of their proximity to water, and their early development occurred in relationship to the water. Today, the base's location on the edge of a low peninsula is a potential threat to its mission, infrastructure, and personnel. With increased sea level rise and extreme weather events, JBLE-Langley will need to continue its effort to adapt the base for the next 100 years and beyond.



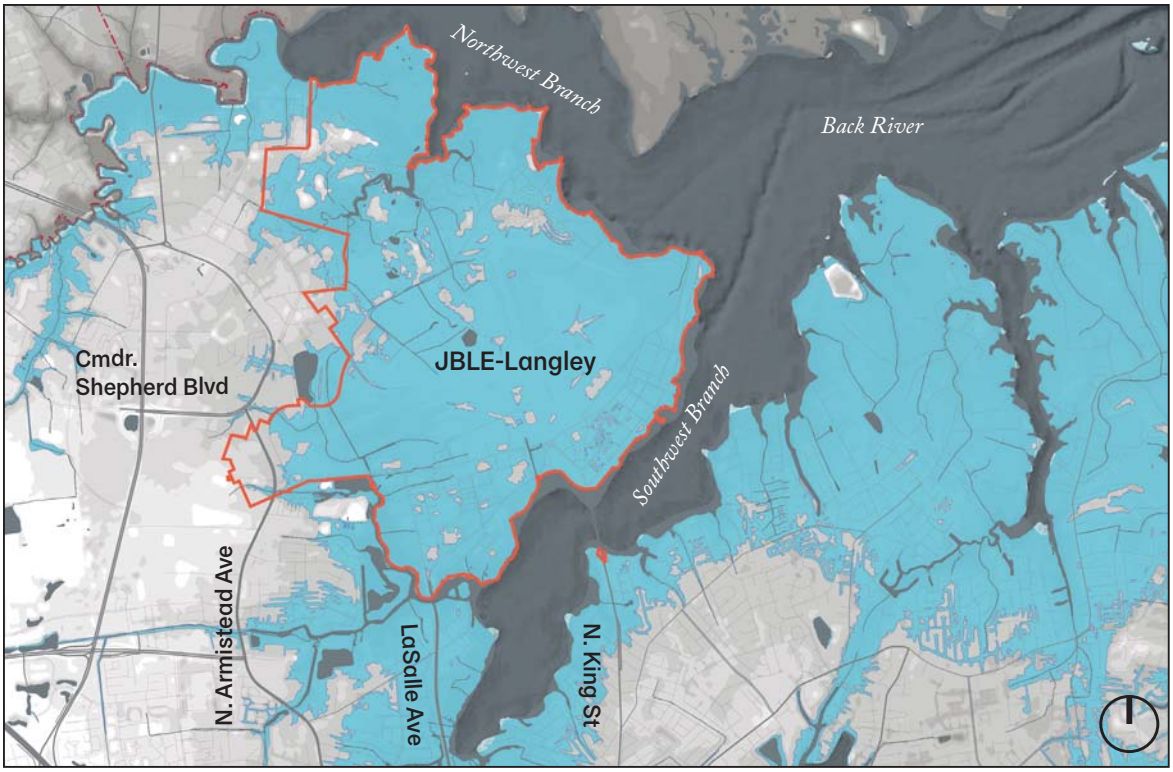
Increasing Storm Events
The timeline above shows the storm surge during major area events from the 1930s through the 2010s. Seven of the eleven highest storm surges have occurred in the last twenty years. (Source: NOAA Sewell's Point Tide Gauge Norfolk)



Elevation

The topography of Hampton has a significant amount of low elevations near water, the cause of many flooding issues. Much of JBLE-Langley sits between 5-8' in elevation. Surrounding low wetlands with proximity to the bay and higher ground nearby allow for varied shore conditions and types of access to water.

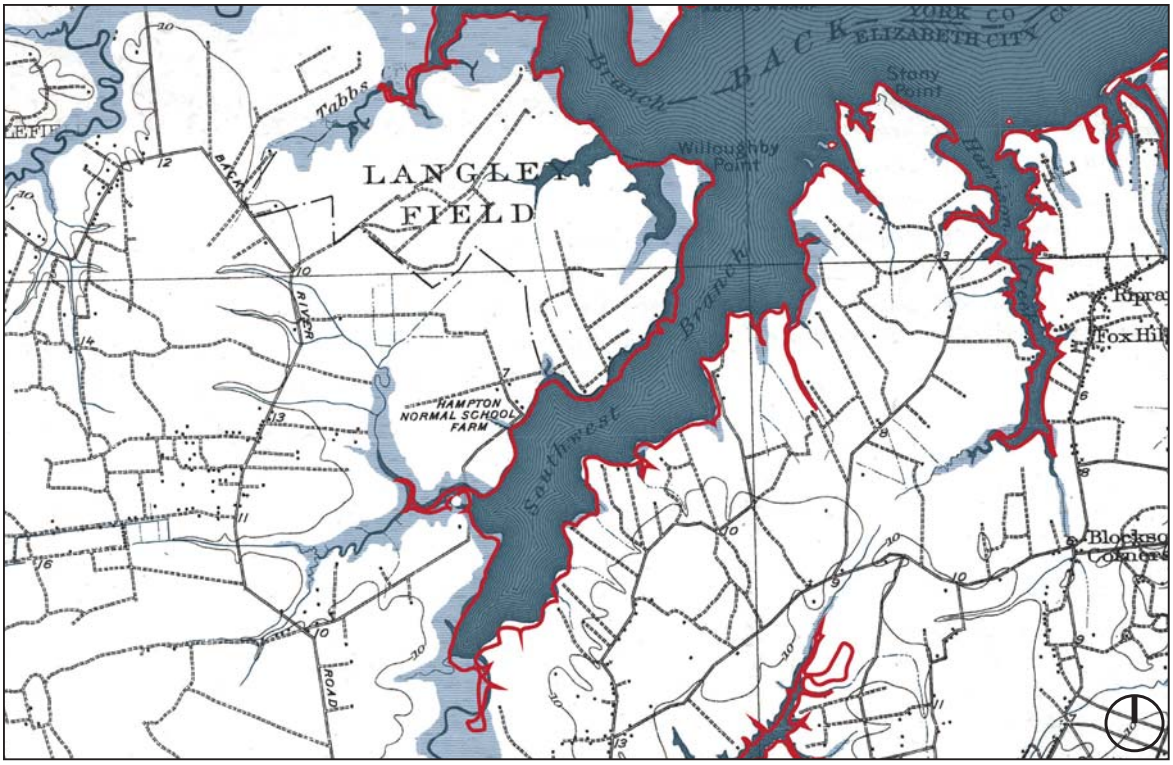
-1'- 0'	5'-6'	11'-12'
1'- 2'	7'-8'	13'-14'
3'-4'	9'-10'	15'+



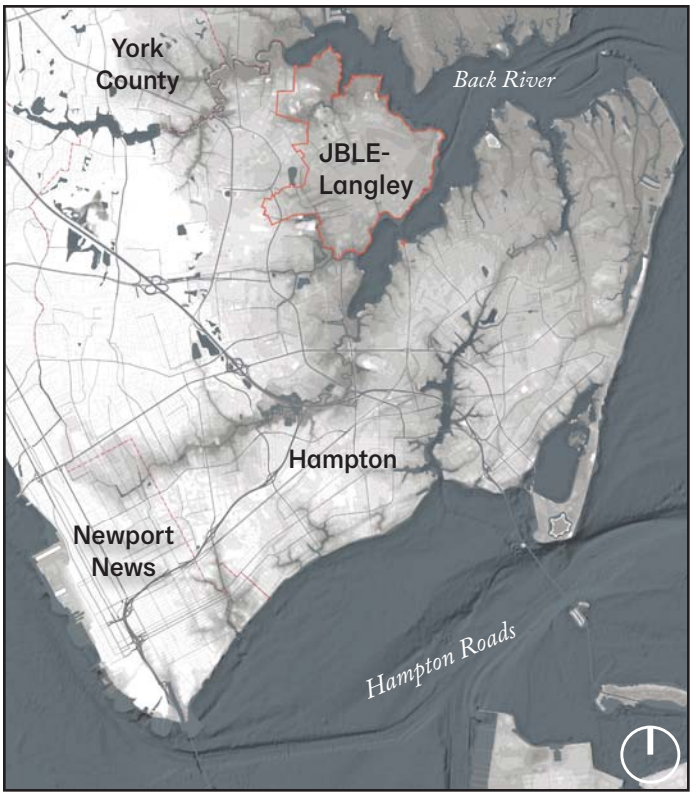
FEMA 100-Year (1% Annual Chance) Floodplain

The area shown in blue indicates the extents of the 100-year floodplain, or the area that has a 1% annual chance of inundation, which corresponds with the National Flood Insurance Program. Most of JBLE-Langley is within the floodplain equivalent elevation.

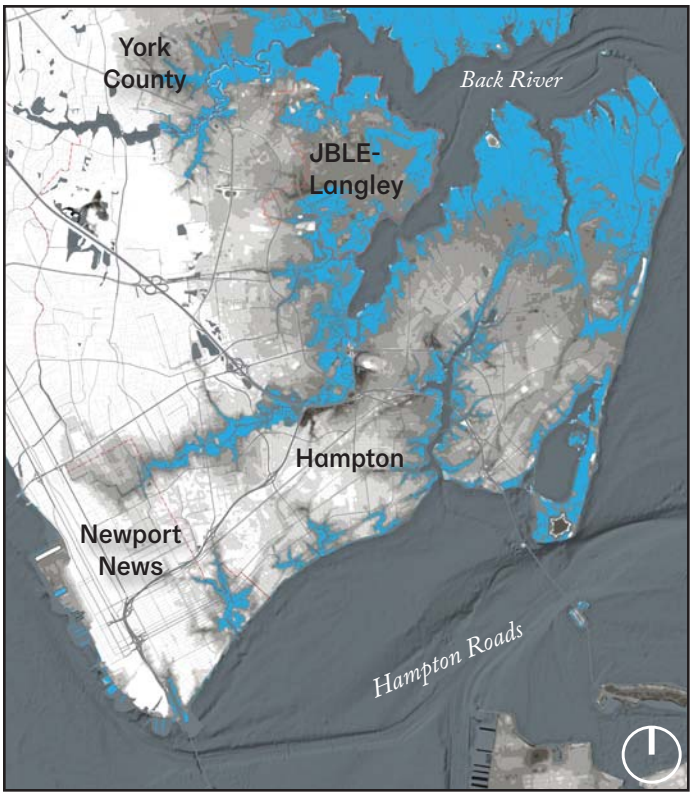
100-Year (1% annual chance) Floodplain (or equivalent)



Historic Shoreline
The overlaid current shoreline, shown in red, indicates either the areas filled for human occupancy or lost to erosion. Many of the historic wetlands surrounding the city, shown above in 1907, have been manipulated to extend the shoreline or harbor into the water. Today, the city of Hampton has an incredible 124 miles of navigable waterfront.



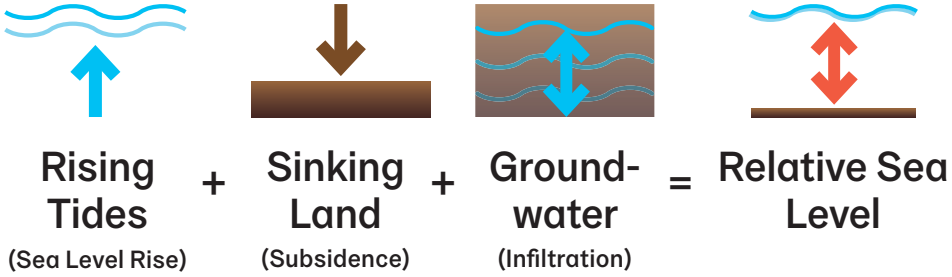
Shoreline Condition, 2017
Current condition.

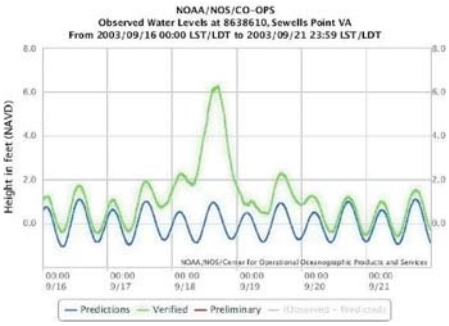


Shoreline Condition, 2100
Illustrating a predicted 5' of sea level rise at high tide.

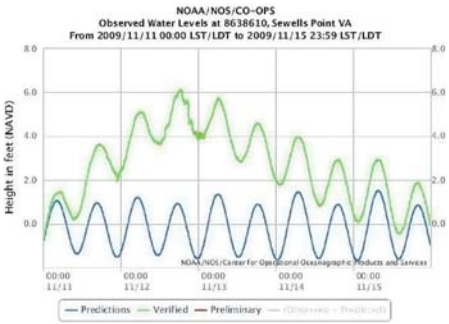
Relative Sea Level Rise

Relative sea level rise, which is rising waters combined with other factors such as subsidence, poses a double threat to JBLE-Langley and Hampton. Subsidence is the process of soil drying out, compacting, and sinking. Increasing water levels bring higher high tides, and subsidence results in lower land. These dual processes mean that flooding will reach higher elevations at a faster rate.





Hurricane Isabel Surge, 2003



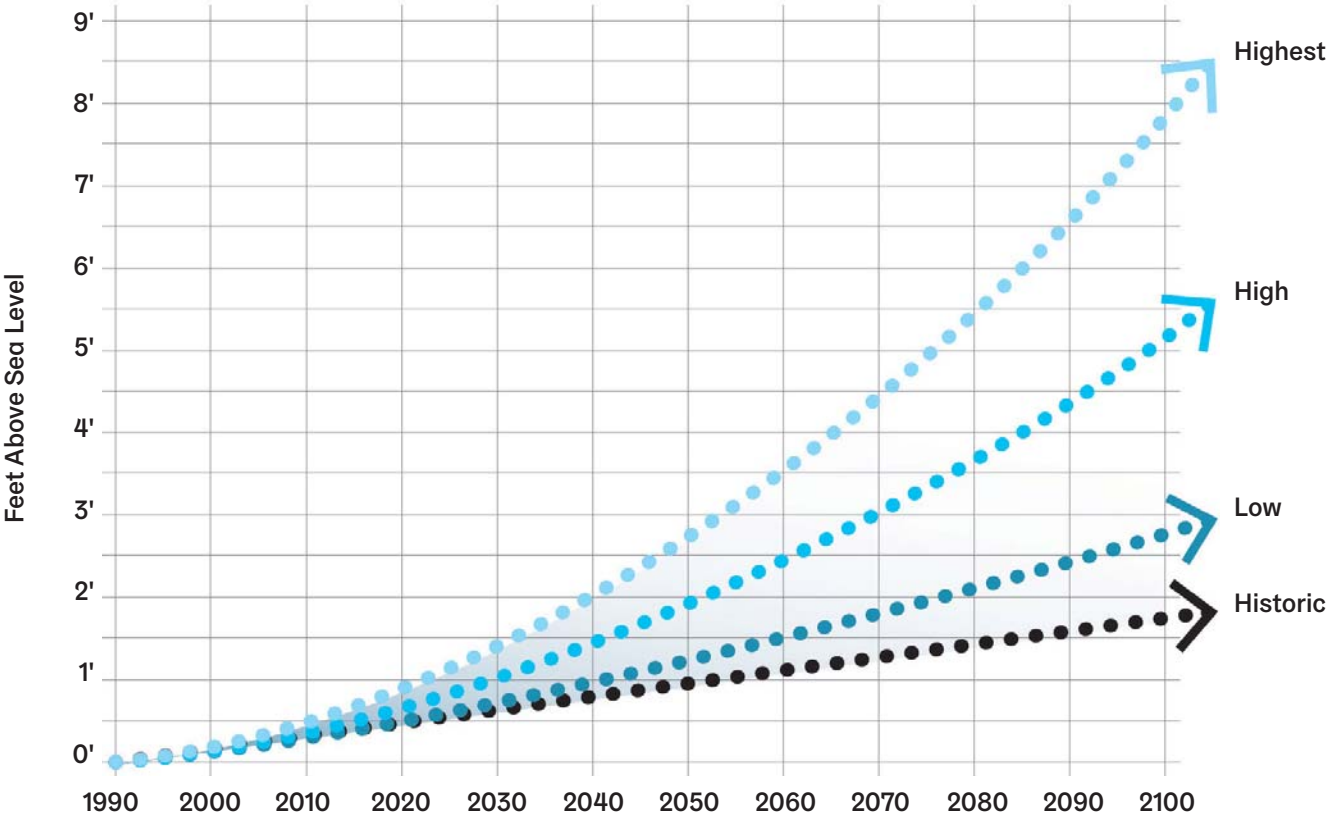
Stacking Nor'easter Tide, 2009

Stacking tides
The duration of a nor'easter can be much longer than a hurricane. Instead of a spike in surge - as seen during Hurricane Isabel - nor'easters last for several more tide cycles, with high tides building over days.
Source: NOAA Sewell's Point Tide Gauge Norfolk

A local example of relative sea level rise is just across the James River from Hampton. The NOAA tide gauge at Sewell's Point in Norfolk had a relative sea level rise of 1.45 feet over the past 100 years, one of the largest documented changes in the world. Part of JBLE-Langley was built on filled in wetlands, and is especially vulnerable to subsidence. Relative sea level rise is a significant threat to the future of the base.

Intense rain is also occurring more frequently than in the past. Hampton and JBLE-Langley have recently experienced fairly frequent 100-year flooding events, or those with a 1% chance of occurring each year. In 2016, Hurricane Matthew caused 1,000-year flooding locally, which has a 0.1% annual chance. What was once a "100-year storm," or a storm with a 1% annual chance, might now occur once every ten years.

Crucial to resilient adaptation is shifting to prepare for more regular and intense rain events. JBLE-Langley and the City of Hampton have been conditioned to prepare for major storm events as an inherent part of being in a coastal community. However, "nuisance" flooding from high tides or rain events - or a combination of the two - and the increased frequency of these events, has been more difficult to adapt to.



Projecting Sea Level Rise

The Virginia Institute of Marine Science has developed four scenarios of sea-level rise that also account for projected land subsidence in southeastern Virginia. These were developed in reference to other sea level rise projections from the National Oceanic and Atmospheric Administration (NOAA) and US Army Corps of Engineers (USACE). The scenarios represent trajectories based on a combination of factors:

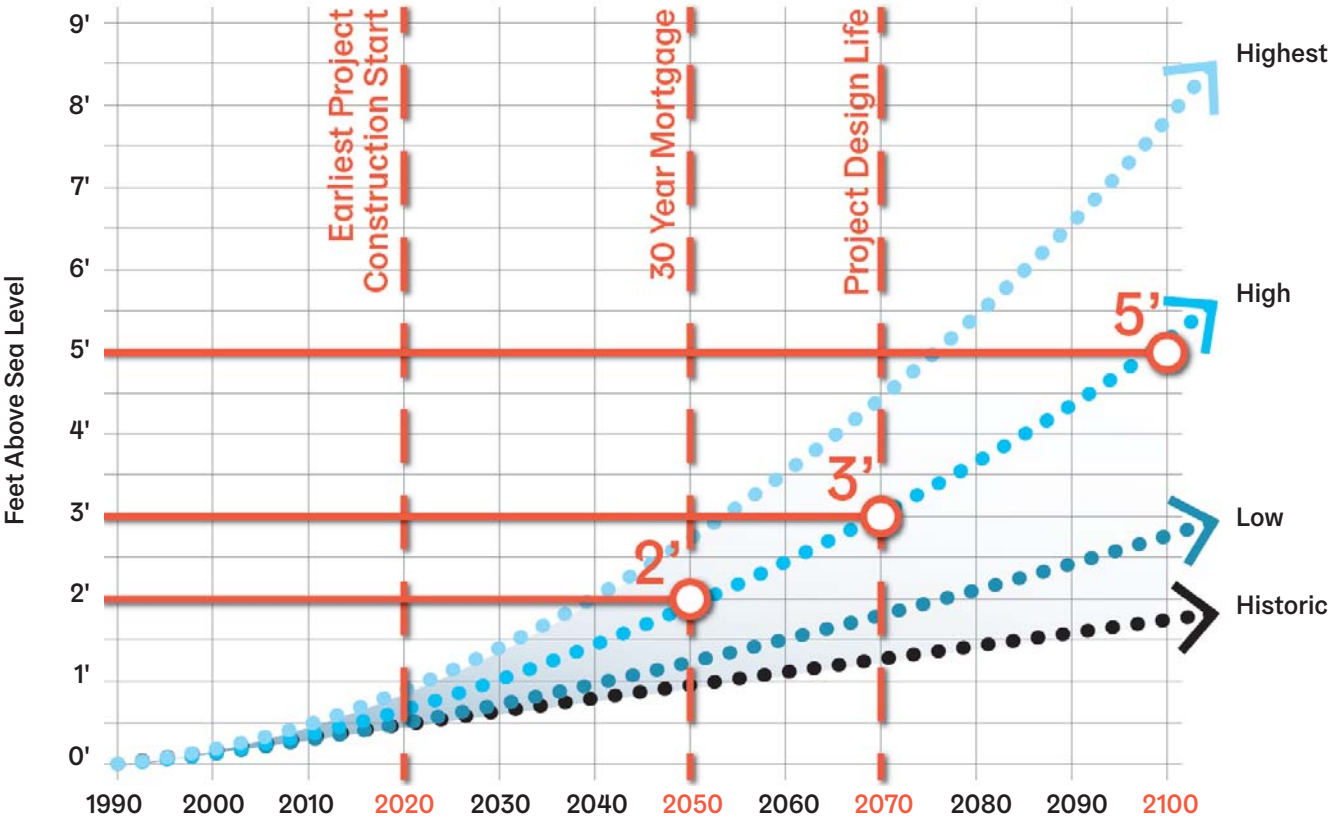
- **Historic:** Based on long-term (100 years or more) rates of sea level rise and not incorporating acceleration.
- **Low:** Based on Intergovernmental Panel on Climate Change (IPCC) model with conservative estimates of future greenhouse gas emissions.
- **High:** Based on upper-end sea level rise projections using relationships between sea level observations and air temperature.
- **Highest:** Based on maximum possible glacial melting and ice-sheet loss combined with estimated consequences of global warming.

(Source: VIMS Relative Sea Level Rise Projection for Southeast Virginia)

Data in the Living With Water Hampton report from the Resilient Hampton effort references the "high" scenario, which accounts for upper-end sea level rise projections combined with projected subsidence, a significant factor in the Hampton Roads region.

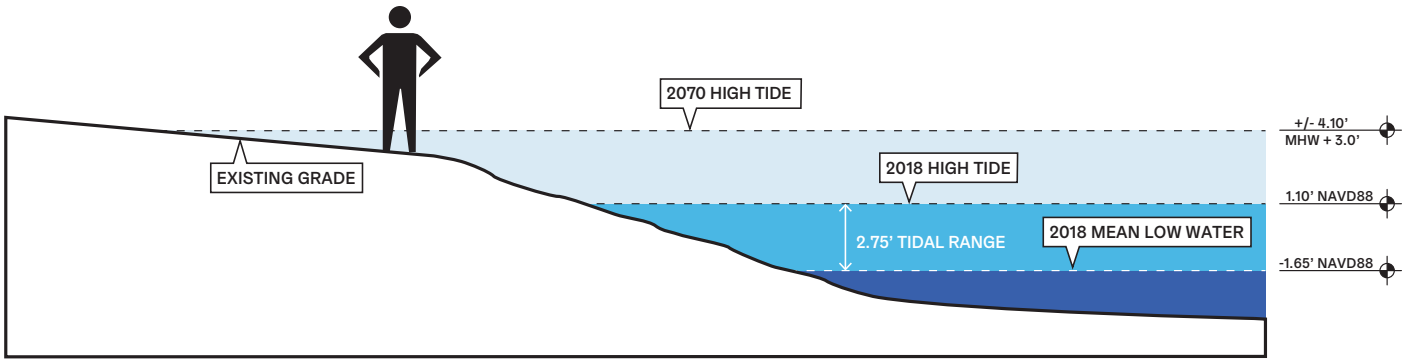
Establishing Regional Design Standards

While a range of sea level rise projections exist, JBLE-Langley currently has not adopted standards for future design and construction on the base. Similarly, the City of Hampton and surrounding municipalities refer to a range of other elevations in their respective building codes, such as FEMA flood maps and associated base flood elevations (BFE). Further, other federal installations like NASA JBLE-Langley use their own elevation standard. To improve coordination and consistent adaptation, regional design standards for sea level rise that include a range of future projections and construction conditions, along with the ability to customize scenarios, are needed. Refer to Recommendations 1, 2, and 3 for more details.



Planning Horizons for Sea Level Rise

While sea level rise projections have some level of variability over time, looking at the life span of a potential project relative to sea level rise can help determine the return on investment for the project. The graphic shows the importance of planning infrastructure investments early to account for anticipated future water levels.
(Source: VIMS Relative Sea Level Rise Projection for Southeast Virginia)



Designing for Future Water Levels

The diagram above illustrates the mean high water level projected in 2070 with 3' of relative sea level rise, the "high" curve in the top graphs. This change is slightly more than the current tidal range of 2.75 feet, which is lower than other coastal places further north. An increase in high tide will increase the frequency of tidal flooding as well as compromised infrastructure.

Natural Systems and Environment

UNITED

Systems

The primary types of natural systems at JBLE-Langley include both tidal and non-tidal wetlands, two branches of the Back River, and small creeks and inlets. These features encompass a range of opportunities and challenges related to resilience. Opportunities include the potential to restore wetland ecosystems, alleviate flooding, and encourage compatible economic development. The tidal wetlands that surround the base could be healthier, better functioning ecosystems that would also serve as edge protection for the base by buffering storm surge. However, a competing challenge is to facilitate a functional waterside for military operations. JBLE-Langley also needs to minimize the amount of wildlife on or near the base, particularly birds, as they present a hazard for collision with aircraft. In this section, these competing interests are discussed in more detail.

Wetlands

More than half of the JBLE-Langley site is surrounded by tidal wetlands, a characteristic ecosystem of Hampton Roads. The wetlands at the edge of the base include mudflats exposed at low tide, rocky shores, and salt and brackish marshes. These areas are periodically flooded by tides, some daily, and some only by storm surge. Wetlands serve a wide range of functions, including water storage, shoreline stabilization, storm and wave buffer, groundwater recharge, water filtration, and habitat, including vegetation, waterfowl, and aquatic life. Due to waterside development and construction, dredging and filling, and reinforcement of edges with rip rap or walls, much of the former wetlands at JBLE-Langley have been lost.

Restoring the base's tidal wetlands would yield multiple benefits, and would make the installation's edges more resilient. Inherently, the goals of the City and JBLE-Langley could potentially conflict. Nevertheless, prioritizing wetland restoration as well as maintaining a functional edge for mission operations, including hardened edge protection and waterside development, is possible to implement. In partnership, the City must work with JBLE-Langley to support strengthening the ecological edges of base, as well as opportunities for water based transportation and development.

Top: Maritime forest with wetlands near the edge of the Back River in the Fox Hill - Grandview area of Hampton.

Center: Wetlands near the mouth of Newmarket Creek, in between downtown Hampton and JBLE-Langley.

Bottom: Edge condition at JBLE-Langley along the Back River, with rip rap and stormwater outfalls.

Birds and Wildlife

Another environmental concern is in the sky, where birds may collide with aircraft. At JBLE-Langley, birds present a greater risk to mission operations than wildlife on the ground. The 2010 JLUS includes a section on types of land use that may attract birds, increasing the potential for a Bird Aircraft Strike Hazard (BASH). Areas likely to attract birds include the adjacent undeveloped, forested parcels to the west and southwest of the base, as well as open areas on the base such as the golf course, along with the installation's wetland edges. Nearby, parks, golf courses, and nature preserves also draw resident and migratory species.

Thus, temporarily holding water on the base or nearby to alleviate flooding inherently conflicts with reducing the potential for a BASH. The City should work with the base to locate BASH compliant strategies to better manage water, perhaps in City owned parcels that are farther away from the airfield, but that would still positively impact the base. Potential solutions to reduce runoff and pollution that integrate natural systems, such as wetlands, rain gardens, or a living shoreline, may cause other sets of challenges to mission operations, but should be evaluated and considered.

Top: The dynamic coastal edge along the Back River, across from JBLE-Langley, with exposed tidal mudflats.

Middle: A pelican flies along the southwestern edge of the base.

Bottom: Map showing a 5 mile radius off JBLE-Langley, with land uses that present concerns regarding BASH prevention. Image Source: Hampton-Langley Joint Land Use Study, August 2010

Opportunities

Edge Restoration and Protection

Environmental restoration can be phased in a way to achieve ecosystem goals while also coordinating future waterside development. One strategy is to restore the wet marsh zones first, and then integrate raised edge protection. By designing with natural systems, wetlands can be modified to create a stronger storm buffer for the base. Edge restoration would also improve water quality and aquatic habitat. Pilot projects located in visible areas would create additional support, and serve as an educational example to base personnel and local citizens. This could also create a model for other coastal bases. It will be important for the City to work with JBLE-Langley to determine which areas present the lowest BASH risk. There may also be an opportunity to create new wetlands further away from the main base to reduce the potential for BASH.

Stormwater Management Plan

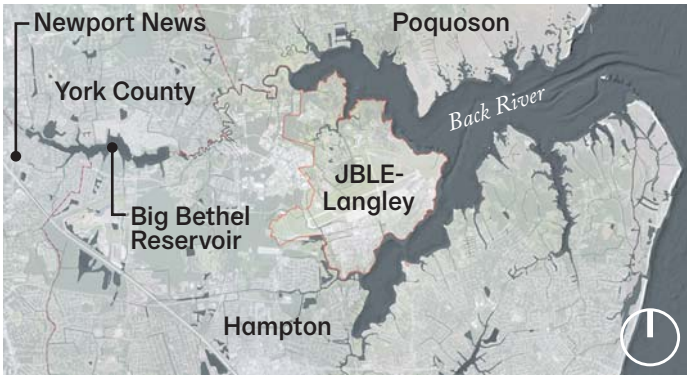
A comprehensive plan to manage stormwater throughout the City of Hampton, and identify opportunity sites in partnership with JBLE-Langley, would benefit both entities, and provide a range of benefits. Integrating resilient planning and design principles, a holistic plan for sustainable stormwater management will help alleviate flooding, reduce subsidence, and reduce the burden on existing drainage systems, both on and off base. Opportunity sites for temporarily holding onto stormwater must benefit JBLE-Langley by reducing runoff to the base, and should specifically target parcels that are adjacent to the airfield safety zone.

Another major site is the existing Big Bethel Reservoir. No longer in use for drinking water storage, the reservoir will require a study in order to determine appropriate implementation strategies for modifications, including impacts downstream and upstream. The existing dam system also needs to be evaluated to confirm condition, and options for modification or removal. Re-creating a more natural edge along parts of the reservoir would improve water quality and create habitat. The study also must confirm whether or not modifying the reservoir to hold additional stormwater would reduce the burden on the existing drainage system and alleviate flooding. Last, the coordination of ownership extent and regulatory requirements will include three municipalities that intersect at the reservoir: the City of Hampton, the City of Newport News, and York County.

Top:
Initiated by the Chesapeake Bay Foundation, Booker Elementary school fifth graders from Hampton build an oyster reef in the Back River next to JBLE-Langley Marina.
Image source: JBLE-Langley-Eustis

Above:
The Big Bethel Reservoir is a large water body that should be studied to determine if it could be improved to function in a more natural way, and alleviate local flooding while restoring habitat.
Image source: Google Maps

Below:
Map showing the location of the reservoir in relation to the base.



Aquaculture

Offshore, waters that surround the base are primarily used for occasional shipping and recreational boating, with little aquaculture, such as oyster harvesting. In conjunction with edge restoration and protection projects, revitalizing oyster harvesting and other water farming would create compatible economic opportunity, environmental quality, and cultural benefit.

Recently, the Chesapeake Bay and Hampton Roads region have seen a gradual increase in the health and subsequent harvest of oyster stocks. Historically, the Hampton Roads area of Virginia was a major oyster center until over-harvesting and disease nearly destroyed local stocks. Near Hampton, the main areas of public fishing are in the James River and York River.

Creating space to establish oyster stocks near JBLE-Langley generates opportunities for scientific research, perhaps by NASA Langley, of the water, weather, and other conditions that affect oysters. Offshore activity near the base would need to be coordinated with mission operations, such as the airfield safety zones, as well as clearances for the barges delivering fuel to the pier. This would also require coordination with other entities, including state and federal agencies, to manage the fisheries and navigation access.

Aquaculture also creates eco-services benefits from shoreline protection and restoration for storm event mitigation, along with community benefits. Economically, local harvesters would earn income. An additional joint benefit is improved water quality for both JBLE-Langley and the city of Hampton, while improving the larger scale health of Chesapeake Bay, a major regional effort.

Top:
Locally harvested oysters that were installed in the reef adjacent at the marina at JBLE-Langley.
Image source: JBLE-Langley-Eustis

Above:
Crab traps in the Hampton River near downtown.

Character and Place

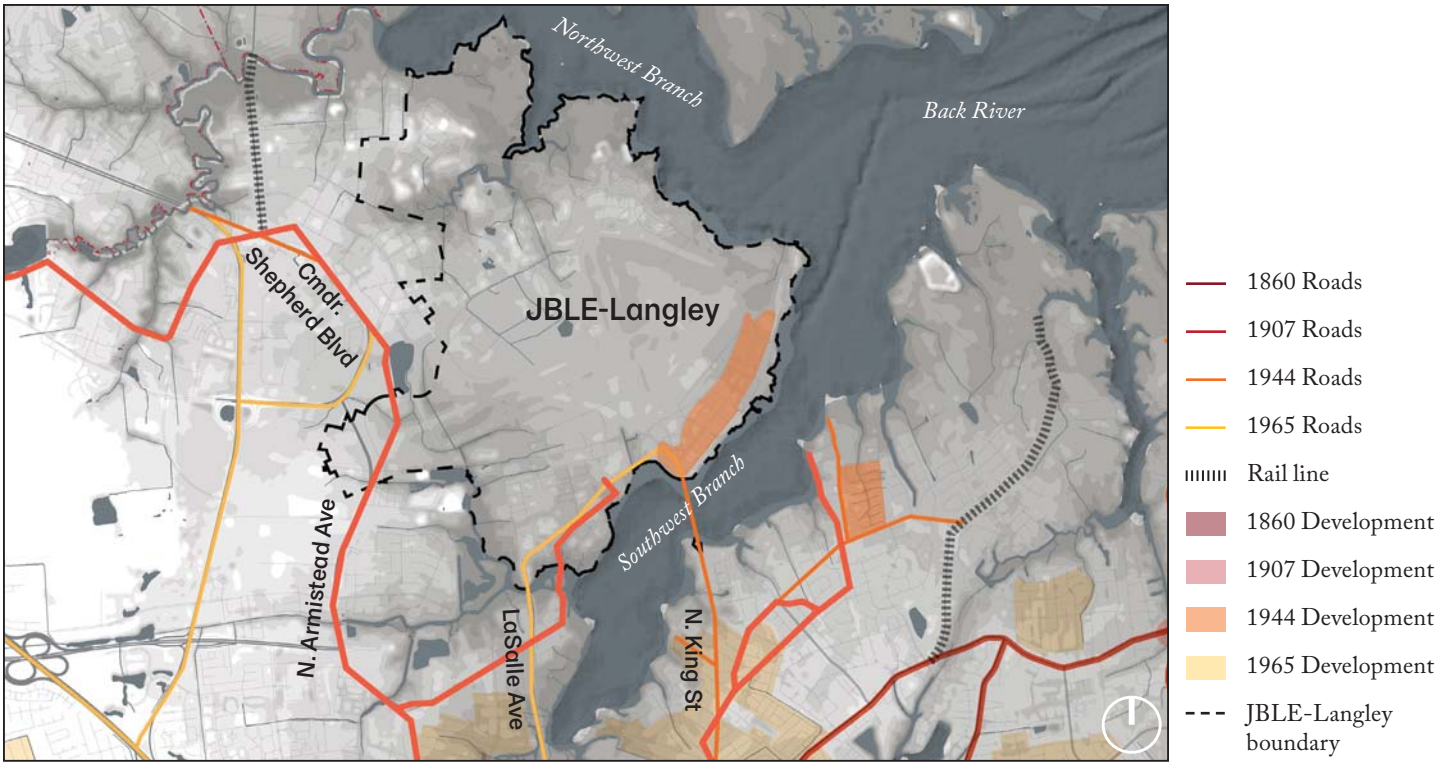
WARNING

Cultural and Community Assets

As the oldest active air force base in the country, JBLE-Langley has a strong character and sense of place. The base is part of the city, with several neighborhoods adjacent to the entry gates, and the majority of personnel live off base in Hampton or the surrounding communities. At the same time, JBLE-Langley also contains facilities on base that support the mission of maintaining morale, welfare, and recreation for personnel. A library, pools, child development center, and a large commissary are among the amenities that currently exist on base. These facilities are a legacy of a model that assumed military personnel would live on site because the installation was in a remote location. As Hampton has grown towards the base, and Hampton Roads has become a better connected region, the majority of personnel now live off the base, with less need for services on the installation site. Some of these amenities may not be necessary to maintain inside the base boundary in the future. If closed or relocated, this approach would save JBLE-Langley resources while potentially making real estate available for more resilient redevelopment.

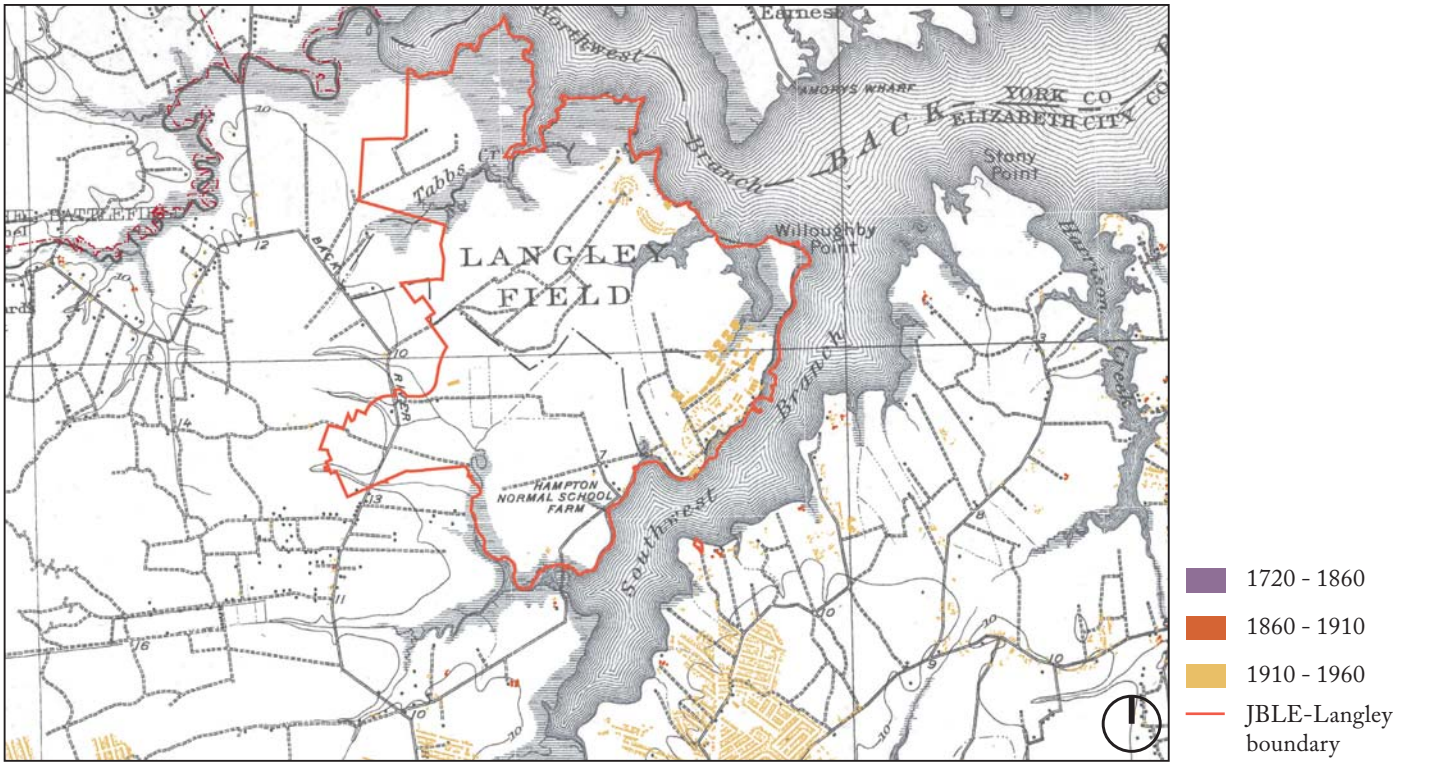
JBLE-Langley has a range of cultural and community assets on the installation site, many of which are architecturally significant. Historic buildings, some dating from the when the base opened in 1917, are primarily located near the water in the southeast and northeast corners, in the original, smaller footprint of the installation. These areas are also at a higher risk for flooding. A group of stately brick buildings with large industrial windows was designed by renowned American architect Albert Kahn, and still remain in good condition. Other important historic architecture includes a group of officer's houses and the original aircraft hangars along the runway. JBLE-Langley coordinates projects with the State Historic Preservation Office (SHPO), but does not have a preservation plan.

Bottom:
Group of historic buildings with ornamental brickwork and large industrial windows, designed by architect Albert Kahn, located in the oldest part of the base.



Historic Corridors and Development Patterns

This map illustrates the development pattern of the city over time, moving first along the coast, then inland and north. All three primary routes to access JBLE-Langley were constructed by the mid 1940s, with Lasalle Avenue replacing an older bridge. Initially, the main access points onto the base were on the southern edge.



Historic Structures

This map shows the expansion of the city through building age. Following the overall pattern of Hampton, early development at JBLE-Langley began at a strategic coastal area. The oldest buildings on the base - from the late 1910s - are along the southern edge, with a cluster at the northeast corner following decades later.

JBLE-Langley as a Neighbor

The close integration of JBLE-Langley and surrounding neighborhoods could encourage mutually beneficial development around the base that serves both JBLE-Langley staff and the greater community, while also strengthening the local economy. New services, strategically located near base entries, could be appropriately scaled for the neighborhood. These commercial services that have potential demand would build upon recent investments made by the City. Development adjacent to JBLE-Langley could also reduce the burden of providing services on-base for a small population of residents.

Community Development

Supporting community development includes identifying which services both JBLE-Langley staff and neighboring residents would like to see, coordinating among the City, business owners, and the base. To determine which uses would be successful, existing development should be surveyed and compared to businesses already on the base. Proximity to entry gates would be convenient for JBLE-Langley staff, and would also revitalize buildings and sites in the city that are vacant or underused. To facilitate this type of effort, JBLE-Langley has a Community Development Liaison who is working to explore and implement these partnerships.

Neighborhood Scale

To be successful, compatible community development must be used by both JBLE-Langley staff and the surrounding neighborhood. Smaller scaled businesses and services, rather than large commercial that is sized for a district or city, would become embedded in the community. Additionally, locally owned businesses and institutions should be supported. As described earlier, another option is to relocate existing development on the base to be immediately adjacent.

Base Oriented Development

One strategy is to concentrate new development and redevelopment of existing properties in underused areas near JBLE-Langley entry gates. This "base oriented development" approach targets infill of existing land, increases density and activity on corridors that JBLE-Langley staff already use, and creates places that will serve both the base and surrounding neighborhoods. Development opportunities can be larger or smaller sites, and on the major thoroughfares that lead to base entry gates or on nearby routes that connect to other primary roadways, such as potential detours. Refer to pages 78-79 for more information. Also confirm compatibility within accident potential zones.

At right, a range of potential sites are identified that should successfully accommodate strategic community development near the base. Two larger areas could be completely redeveloped into mixed use, and smaller areas may have just a few key buildings or lots available. Existing areas of more intensive commercial use could be strengthened with new development and land uses, in order to attract JBLE-Langley staff off the base and into the adjacent community. Proposed sites must also reference the Hampton Future Land Use Plan for compatibility.

Strategic Community Development
Locating new development or redevelopment of existing properties near JBLE-Langley entry gates creates opportunities for mixed use that would serve the base as well as the surrounding neighborhoods. Areas for redevelopment are at important intersections or at underused sites along primary corridors that lead to the base. A potential greenway linking JBLE-Langley and NASA Langley to a tidal inlet is an opportunity for recreational development on existing publicly owned land.

Northwest Branch
Back River
Wythe Creek Rd
NASA
LaRC
Cmdr Shepard Blvd
JBLE-Langley
Southwest Branch
Magruder Blvd
N. Armistead Ave
Butler Farms Rd
Tide Mill Ln
LaSalle Ave
N. King St
W. Mercury Blvd
Proposed Greenway
Proposed Development
Entry Gate

Local Example

A strong local precedent for this type of investment is the recently completed multi-use path and bioswale in the right of way along N. King St. that, when completed, will go almost to the base entrance gate. On one side of the street, a wide multi use path accommodates pedestrians and bicyclists, and is buffered from the road by a bioswale, with trees and other plants in front of existing residences. The right of way on the opposite side of the street is smaller, but still accommodates a new, wider sidewalk with a buffer of trees and lower vegetation. The sidewalks and landscape pass in front of existing commercial land use, primarily from the mid-twentieth century, and makes accessing those properties safer for people on foot, on bike, and in car.

This simple project yields multiple benefits: improving multimodal access, reducing pollution from driving vehicles, improving safety, alleviating flooding by slowing down runoff, improving water and air quality, creating habitat, revitalizing older commercial structures, creating an aesthetic for a neighborhood corridor through landscape design, and improving property values. This momentum will likely encourage further local investment.

Coastal Identity and Co-Benefits

JBLE-Langley's inherent identity is a coastal base, with miles of waterfront interacting with a dynamic environment that changes throughout the year. Potential projects between the City and the base could reinforce this unique condition to build upon JBLE-Langley's rich history as a place on the water. Further described in the Recommendations chapter, proposed initiatives that reinforce this coastal identity include water based transportation, improving edge conditions and access, and coordinating ecological improvements with base development.

The base has a range of edge conditions, from seawalls to rip rap to marsh, but access to be near the water is limited. This could be improved by planning resilient development closer to the edge. If JBLE-Langley created a circular transportation network on base, a type of shuttle system, then including water based transit takes advantage of its most abundant resource. Coordinating base development with ecological improvements is another opportunity to integrate wetland restoration and water quality enhancement with capital projects.

Top, and above:
Recently completed right of way improvements on N. King St. which improve safety and stormwater management, while creating a visual identity and encouraging investment.

Above:
The edge of a tidal inlet branching off the Back River, to the south of JBLE-Langley.

Historic Resources

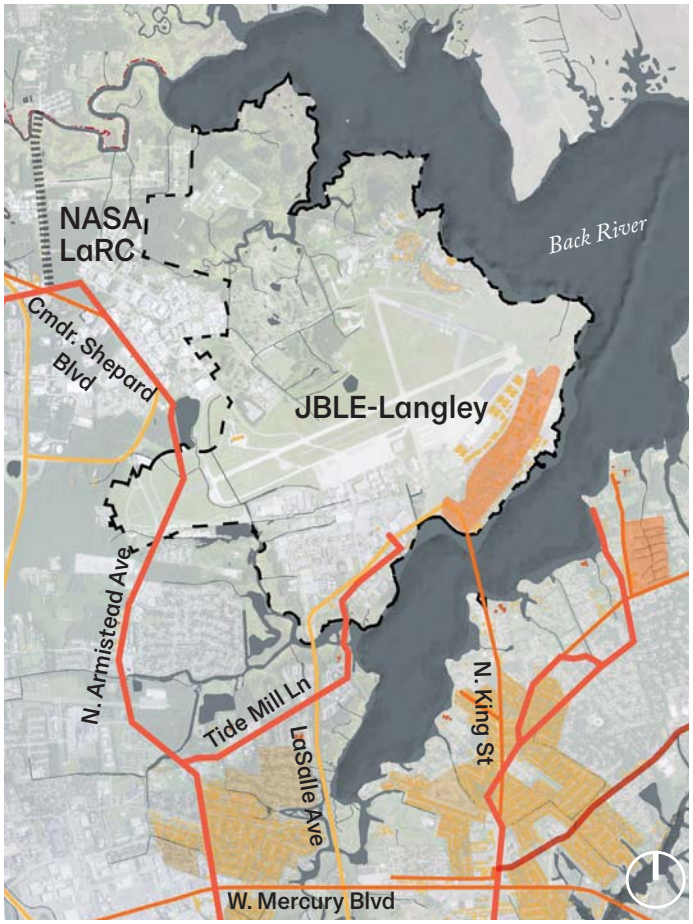
Before the establishment of JBLE-Langley, development patterns in Hampton outside the historic core were primarily based on water access and agriculture. After opening, JBLE-Langley drove development nearby, especially to the south of the base.

By the mid 20th century, N. King St. became a significant mixed use corridor that also served the primary entry gate to JBLE-Langley. Development along the road and in the adjacent neighborhoods was automobile-focused, more suburban and less dense than older areas of Hampton. Both residential subdivisions and commercial properties existed on the corridor, with large front setbacks. Since the majority of development occurred from the 1940s through 1950s, the area is now considered historic.

Historic development patterns vary near the other entry gates to JBLE-Langley, with different opportunities. Mid 20th century development also exists near the Lasalle Ave entry gate, while to the west and north of the base the character is more semi-rural and less developed. Tide Mill Lane was also developed primarily around the same time as N. King St., though is a shorter corridor. N. Armistead Ave. and Commander Shepard Blvd. still have fields and trees adjacent, reminiscent of the historic agricultural land use. This character should be retained.

Resilient planning values and reinforces local assets such as historic character and future potential. The N. King St. corridor is still mostly intact as an example of mid 20th century development, semi-suburban in character, with opportunities for redevelopment. Large lots include mature trees and established landscape, which provide space for green infrastructure, or multi-modal transportation - exemplified in the recently completed multi-use bike and pedestrian path with stormwater management. These parcels, along with vacant land, can also accommodate infill development. Many buildings are in need of renovation due to their age, and property is still generally affordable while being close to the city center.

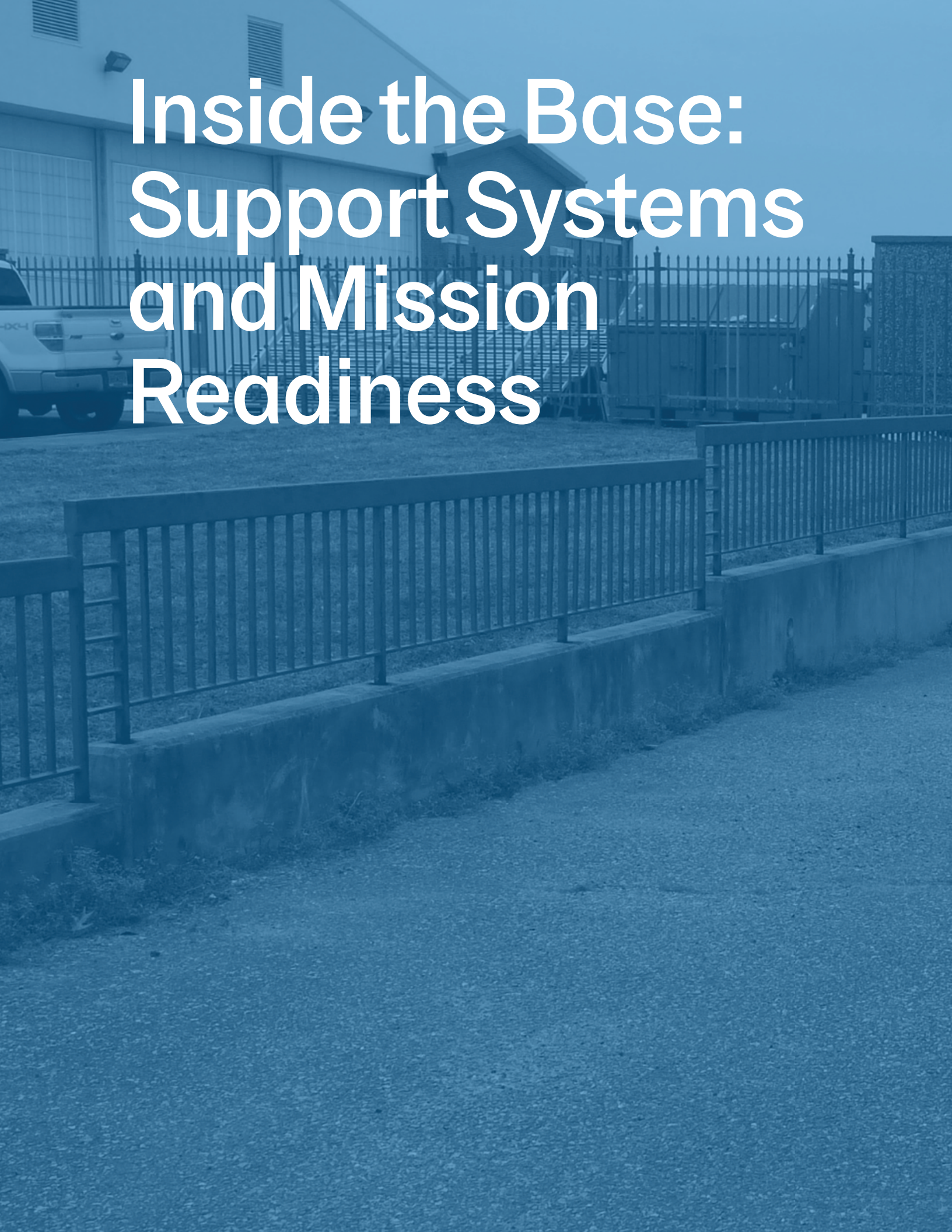
To protect and maintain historic character, the N. King St. neighborhood is a candidate to become a historic district. This designation brings recognition of its unique qualities, while also attracting funding opportunities for redevelopment projects, both public and private.



Map showing historic roadways and development primarily south of the JBLE-Langley, especially along the N. King St. corridor and near Tide Mill Ln. and N. Armistead Ave. Red-orange indicates development in 1944, and yellow indicates development in 1965. The aerial photo also shows existing fields and forested areas to the north and west of the base.

Unique historic resources along the N. King St. corridor include early suburban style housing with large setbacks, open space for surface drainage, and mature trees, including areas of maritime forest.

Inside the Base: Support Systems and Mission Readiness



What's at Risk

Scales of Impact

JBLE-Langley is a critical piece of military infrastructure that is a major **national security** asset. Langley AFB's primary mission is rapid deployment to maintain air sovereignty and wartime defense. JBLE-Langley's primary focus includes: providing operations, planning and execution support to major commands and theater air and space operation centers; conducting imagery, cryptologic, and measurement and signature intelligence activities; and delivering F-22 Air Power worldwide on short notice to support Combatant Commander taskings. As such, the base is home to a range of important units, and continues to use the newest aviation technology and planes, such as the F-22 fighters, in its missions.

While the focus of this JLUS addendum is to recommend strategies for implementation that primarily occur off the JBLE-Langley base, assessing existing vulnerabilities inside the base helps frame what is currently at risk for flooding or extreme weather. Staff from JBLE-Langley, the City of Hampton, and the project team met several times to discuss what impacted mission readiness in the past, and what could be improved.

Meetings with local and regional utility providers also clarified existing vulnerabilities in their systems, as well as their respective plans for improving resilience and emergency response. Results from the meetings identified key utilities that may be more at risk than others. JBLE-Langley also noted a range of sites and systems that are vulnerable, potentially jeopardizing mission readiness and critical base functions. It is also clear that impacts of a compromised JBLE-Langley are great from the national to the local level.

Top:
Storm surge from Hurricane Isabel overtopped the base's edge protection, flooding adjacent land. Image source: Joint Base JBLE-Langley-Eustis

Center:
Floodwaters from Hurricane Isabel reached into the base, covering roadways and access to infrastructure.
Image source: Joint Base JBLE-Langley-Eustis

Bottom:
Existing rip rap along the eastern edge of the base at Back River.

The edges of the base, both coastal and on land, are the first line of protection. Most of the installation is bounded by water, and much of that consists of former wetlands that were filled in to create additional land for construction. These areas are at risk for subsidence as well as flooding, since they are low in elevation. Today, the majority of the base's edges are reinforced by rip rap made of rock or concrete; only the northern portion of the installation that is less developed has a more natural edge condition. The rip rap helps prevent erosion and also absorbs wave action, but does not prevent waves from overtopping onto land.

Access points into the base are also at risk. The N. King St. bridge is the oldest connection to the installation, and is also the lowest. A storm surge during high tide may potentially flood the bridge, which is inside the base, owned and maintained by JBLE-Langley. With sea level rise, the entire structure and connected roadways may need to be elevated. Utilities are also directly attached to the bridge, and are vulnerable to flooding and wave action, as well as freezing in the winter.

On the base, certain infrastructure and **buildings** are at risk, though JBLE-Langley has already begun to address some of these vulnerabilities. These efforts are discussed at the end of this chapter.

Transportation networks are also at risk. As previously noted, personnel commuting to and from JBLE-Langley may not be able to travel on critical corridors to access the base or go home. Supply deliveries would also be impacted if roadways were impassable.

Top:
An existing slab on grade building, on low-lying ground adjacent to the Back River near the N. King St. bridge.

Center:
Mechanical and electrical equipment that has been elevated on concrete pads, in front of an elevated loading dock.

Bottom:
N. King St. bridge, looking south from the base.

What Works

While JBLE-Langley faces a range of risks, many of its existing systems already work well, and are not of concern in the near future. Some of these systems have recently been upgraded, or are in the progress of being improved. Others are less complex, and have not yet experienced a failure. Below, existing conditions are organized by whether they are inside JBLE-Langley boundaries, or outside of the base.

Inside the Base

Food Service

The base has minimal concern with the existing food supply chain and delivery service. Food is trucked in to JBLE-Langley, where it is served at the main commissary and a few small cafés. Because the base is a 24 hour facility, food availability is critical. The longest interruption in food delivery was two days, though this did not cause major problems. This interruption occurred due to multiple impacts, such as inclement weather creating an essential personnel situation limiting hours of the Large Vehicle Inspection Station (LVIS), limited local road safety due to icy conditions, and food service disruption due to limited employee access to their facility.

To improve the resilience of food service, JBLE-Langley could source from nearby vendors, which would also support local businesses. Currently, the base is exploring opportunities to partner with local food providers as part of its community development program. This initiative could then help the City of Hampton with potentially distributing food supplies during an emergency or recovery.

Natural Gas

The natural gas system on the base is also not a concern. JBLE-Langley has not experienced an interruption in service, and the provider, Virginia Natural Gas, has a flexible and up to date system on base, along with an emergency plan. Flooding and sea level rise are not anticipated to significantly impact the current system.

Sewer System

Sewer service at JBLE-Langley is generally stable, and could be more resilient with improvements. HRSD (Hampton Roads Sanitation District) maintains the system, which has only experienced interruptions during emergencies. In these rare situations, typically less than once a year, the base is able to transport waste via truck to the City of Hampton's collection system. JBLE-Langley does have concerns that tank and pump stations are too close to the flight path; this infrastructure could be relocated elsewhere on the base.

Fuel Delivery

The base currently receives fuel delivery via truck, but is pursuing a more resilient transport system. The fuel sent to JBLE-Langley is primarily diesel, and is used by jets. A truck inspection station is across the street from the N. Armistead Avenue gate, which first reviews vehicles before allowing them to proceed to the gate. Transporting fuel during emergencies can be challenging, particularly if roads are impassable, gate access to the base is limited, or inspection personnel are understaffed. For these reasons, JBLE-Langley is in the process of constructing a new pier that will accommodate fuel delivery via barge. The pier could be configured to accept other shipments in the future.

Outside the Base

NASA Langley Research Center

JBLE-Langley's relationship with its neighbor NASA Langley Research Center (NASA LaRC) has been successful, and no significant coordination or compatibility issues have been identified thus far. Compared to JBLE-Langley, NASA LaRC has the innate advantage of being located on land that is at a slightly higher elevation, and farther inland. Currently, NASA LaRC has not identified major vulnerabilities or risks relative to the focus of this JLUS addendum. Looking ahead, NASA LaRC could serve as a potential partner to assist with implementation of specific recommendations. Refer to the Boundaries chapter for additional information on NASA LaRC and its relationship with JBLE-Langley.

Below, left:
Fuel delivery pier under construction, as seen from across the Back River.

Below, right:
Drainage outfall at the edge of the base along the Back River.

Existing Systems

Utilities and support systems that serve JBLE-Langley are generally resilient, though opportunities exist for additional redundancy and coordination between regional providers and government agencies. They include land based telecommunications, data and internet, natural gas, drinking water, solid waste and treatment, transportation planning, and power. Currently, JBLE-Langley interfaces directly with the range of utility companies, though most of the service providers do not coordinate with each other.

A key policy improvement is to create a structure to regularly coordinate services between JBLE-Langley, the City of Hampton, the utility providers, and other municipalities and military installations in the region. Staff from JBLE-Langley, the City of Hampton, and Waggonner & Ball held a series of meetings and conference calls with each utility provider to understand the existing systems and how they serve the base. This type of regular checking in improves knowledge of existing systems, and creates a more effective process for implementing future projects and upgrades by reducing redundancy.

Top:
Power generation infrastructure and buildings are located close to the water, but are elevated.

Above, left:
Utility equipment that has recently been elevated on concrete pads.

Above, right:
Entrance to the base after crossing the N. King St. bridge, where drivers can access two main roadways.

Left:
Door dam frame installed on a low-lying building adjacent to the Back River.

Vulnerabilities and Redundancy

Data

Data utilities are provided by Cox Communications, who supplies a relatively redundant system to JBLE-Langley. The base is supplied by four main commercial feeds from the north, west, and south sides of the installation. The main feed that runs below N. King St. is underwater, so flooding and sea level rise is not a concern. Still, if this feed were damaged then JBLE-Langley would not be able to complete missions, and the base would only be able to communicate internally, not with the City of Hampton. Cox currently has a six hour backup if their system loses power, but after that the entire system is impacted. JBLE-Langley has power backup for Command Control, and prioritizes redundancy for mission connection. The base would like to make the N. King St. feed secondary, and also update to entirely fiber optic service.

Telecommunication

Land based telecommunication service, carries more of the mission-related load, is supplied by Verizon. The base is fed from three points, and is all underground fiber optic cable. Similar to Cox Communications, one of the Verizon feeds follows the N. King St. bridge, and would compromise mission readiness if it failed. During Hurricane Floyd in 1999, water entered vents and caused outages.

Air based telecommunications service is provided by Motorola. Since this utility is almost entirely in the realm of JBLE-Langley and not the City of Hampton, the JLUS Addendum project team did not contact Motorola.

Natural Gas

Natural gas is supplied by Virginia Natural Gas, and JBLE-Langley had no concerns about the overall system or redundancy. Two pressure regulating stations that feed distribution to the base are currently off site and do not have video surveillance, which is a potential security issue. An option to relocate the regulators onto the installation or provide additional security would be at the expense of JBLE-Langley.

Water

Drinking water is provided by Newport News Water Works, who services the larger peninsula area. JBLE-Langley stated that the overall system functions well, but noted that the route of drinking water from reservoirs upstream to the base is unknown. The base requested additional data on security.

An existing connection that primarily provides backup for the fire protection system is attached to the N. King St. bridge, and is at risk for freezing. This line froze in early 2018, and previously froze three years earlier. The base also has concerns about water in the line becoming stagnant. JBLE-Langley would like to remove this line and revise the fire protection system on base, although have noted this issue does not impact mission readiness.

Sanitary Waste

The sanitary waste system is provided by HRSD, and is able to withstand significant interruption without forcing the base to close. A force main break occurred in the past, which is about the worst event that could affect the system, and the base was still operational. JBLE-Langley has collected and trucked sanitary waste to the City of Hampton collection system in the past through an individual case basis. This emergency trucking and disposal occurs rarely; less than once a year, at the most. JBLE-Langley and the City of Hampton have discussed establishing a formal agreement to establish a clear process.

The base is also implementing a program to reduce stormwater and saltwater intrusion into the sanitary system as part of a consent order with the utility. Groundwater infiltration into older lines is a significant issue on the base for sanitary waste. Additional study and coordination to mitigate groundwater infiltration is necessary between JBLE-Langley and HRSD.

Power

Dominion Energy restructured the system that serves JBLE-Langley in the early 2000s. Since then, no major outage has occurred. JBLE-Langley has also connected its critical systems to generators. The base receives power from two feeds, which can be switched between to provide redundancy. Still, concern exists because the switch is manual, and the open point is located on the edge of base near water. In an emergency, Dominion employees typically take 40 minutes to an hour to reach the base to fix issues, which JBLE-Langley has stated is too long. Equipment on the base is raised, and Dominion and JBLE-Langley both use an elevation standard of 10 feet above sea level for the bottom of equipment or finished floor level.

Plans to improve resiliency include a new gas powered generator to provide additional support to the system, which is expected to be completed in the coming years. JBLE-Langley also plans to provide six acres of land for a Dominion Energy power plant that serves the base. Dominion plans to modernize their overall power grid to support renewable energy that is fed back into the grid. In the future, JBLE-Langley could pursue owning renewable systems to offset energy costs.

Opportunities

Decoupling and Hardening

Decoupling is a strategy to remove utilities that are attached to potentially vulnerable structures in order to reduce risk. For example, a critical piece of a utility system, such as a line or connection, that is directly attached to a low-lying building has a greater chance of being damaged by flooding. Similarly, components of utilities that are linked to structures that are exposed to wind, rain, or freezing temperatures are also at risk for compromised performance.

Decoupling the water line that is attached to the N. King St bridge is an example of this approach. This water line primarily supplies a backup fire protection system, and has frozen twice in between 2015 and 2018. If the line were removed from the bridge and installed underground, it would be far more resilient. Other locations for decoupling include utilities that are attached to buildings, or multiple services on a platform that could be separated. Decoupling also simplifies maintenance and access for each utility provider.

In conjunction with decoupling, hardening of existing vulnerable systems should be pursued. This means that utilities at risk for a range of hazards would be better protected. Strategies include elevating, enclosing, or protecting with a screen. Converting rigid elements or connections in a system to be more flexible and resilient is another approach, and vice versa.

Below:
The N. King St. bridge is a vulnerable structure, and has utility systems directly attached.

Network Interdependencies

With a wide range of utility providers servicing JBLE-Langley, some systems rely on others to function properly, but are still managed independently. To improve resilience, regular coordination of network interdependencies with utility providers is recommended. For example, the existing communications systems require power to function. While the system has short term backup power, in a longer outage the base could lose connection, which impairs mission readiness.

A resilient communications network is critical so that base personnel can update staff that are off base. Currently, the communications and power providers each manage their respective systems, rather than working together to support the base. Dominion Energy plans to install new generators at JBLE-Langley, but is doing without coordination between other utilities. If the regional utility providers coordinated among each other, as well as with the base and the City of Hampton, greater redundancy, efficiency, and resiliency for all entities could be more easily achieved.

Elevation

One broadly relevant strategy is to elevate critical corridors well above projected flood and storm surge levels in order to maintain access to and from the base. If the major roadways at JBLE-Langley were elevated, planned utility upgrades could be installed below the roadway in an easily accessible utility trench. This integrated approach yields multiple benefits: creating dry egress, facilitating construction of system improvements, and enabling easier repairs or modifications in the future. Refer to page 77 for a drawing of a proposed raised corridor.

Resilient Progress

It is important to recognize that JBLE-Langley has already made good progress towards resiliency. Of note, JBLE-Langley has implemented additional measures to cover or protect specific equipment in advance of a storm. To eliminate the time consuming, labor intensive, and waste-generating process of placing sandbags around low lying buildings, the base has installed door dams to prevent flooding at vulnerable buildings. Before a storm, JBLE-Langley personnel deploy sealed pieces of metal that fit into frames, forming a watertight barrier. The base now has a system to strategically deploy door dams to prevent flooding at these locations. Installing door dams has saved a significant amount of money and staff resources by alleviating flood damage through fast and simple deployment.

The airfield, at the core of the base's mission, has new hangar buildings that are elevated several feet higher than the adjacent historic structures. Low-lying buildings, such as ones that were built on grade, have flooded in major storm events. Low-lying infrastructure, including mechanical and electrical equipment, has also flooded in the past. The most vulnerable elements have been elevated, and have remained undamaged during recent storm events.

Practical Planning

In seeking solutions, the City of Hampton and JBLE-Langley together must anticipate future shocks from large events while addressing ongoing stresses, such as increasing nuisance flooding from higher tides and more frequent intense rainfalls. Hampton and JBLE-Langley understand the value of pre-disaster mitigation, as they have weathered a number of significant storms over the years – notably Hurricane Isabel in 2003. Both entities also have the advantage of approaching resilience planning by learning from other post-disaster recovery efforts before a potentially larger disaster occurs.

Addressing the complex threats facing JBLE-Langley and the City of Hampton will require new ways of thinking, working, and learning. Single-purpose solutions no longer justify the investment made in them. Instead, resilient solutions will require a holistic approach which accounts for environmental, social, and financial inputs. This document seeks to create a strategy for a resilient city and base by identifying threats and vulnerabilities, and how to implement actions to alleviate them while yielding multiple benefits.

Below:
The low, waterside location of JBLE-Langley places the installation at risk for the impacts of rising seas and extreme weather, but the base is implementing measures to improve the resilience of the facility and safety of staff.
Image source: JBLE-Langley-Eustis

To strategically plan for resilience, identifying what will be at risk, and when, is critical. This approach could help prioritize projects that are more urgent. Anticipating when and where a particular building, utility service, or piece of infrastructure is nearing the end of its useful life, and whether or not it is better to relocate rather than replace, uses resources more effectively.

For example, it might be more logical to relocate an aging structure that routinely floods rather than rebuild it in the same place. The new structure could move to a higher or better part of the base, or to another nearby parcel in Hampton. Planning for smart relocation can occur on an individual basis to take advantage of rebuilding in a better location nearby as the opportunity arises, instead of moving multiple projects at once. The strategy is of gradual and practical transition. Based on existing vulnerabilities and future sea level rise projections, key elements of the base that could be relocated in the near future should be identified, as well as their potential new sites.

Below, left:
A snowstorm hits the JBLE-Langley airfield, which is well prepared to address winter weather.
Image source: JBLE-Langley-Eustis

Below, right:
Recently repaired rip rap at the base's edge reduces erosion and limits the impact of low waves from storm surge.

Boundaries

Edges, Sharing, Flexibility

As a major military installation, the boundaries of the base on land are fixed and secure, yet JBLE-Langley's waterfront edges are dynamic, shifting a few feet with each tidal cycle. JBLE-Langley could strengthen this dual nature of "fluid and fixed" to its advantage. Reinforcing the apparently oppositional relationship as a strategy for flexibility creates new opportunities for the base to be more productive, effective, and resilient.

Communities

JBLE-Langley is unique compared to the majority of other US military bases because it is embedded in a city, while also supporting a community of residents on the base itself. Personnel live outside JBLE-Langley, and within it. The dynamic of having staff who commute to and from the base, and staff who stay on base create two different experiences, which require varied needs and resources. This condition can result in redundancy, duplication, and additional cost. A near term challenge for JBLE-Langley will be to determine where to focus resources, and how to prioritize strategic investment.

One strategy is to create a more shared boundary, exploring which facilities and services could be relocated elsewhere on the base, or even off site. Maintaining security is necessary, so mission critical systems would remain largely as is. An opportunity to shift less significant spaces and systems to other parts of the base, or outside of JBLE-Langley but nearby, could make real estate for more critical items available. This strategy might allow vulnerable buildings or infrastructure to relocate on safer ground, whether away from flood prone areas, outside of the airfield safety zones, or to improve efficiency in base operations.

Below left:
The N. King St. entry gate and adjacent residential and commercial development.

Below right:
Community development off base could strengthen investments made by the City in adjacent neighborhoods, such as right of way improvements along N. King St. near the entry.

Redevelopment and Shared Facilities

When considering existing land use and future changes, JBLE-Langley has the potential to implement a range of redevelopment opportunities. One example is to move commercial services that are currently on base for personnel to an adjacent neighborhood. This would strengthen an economic relationship with the surrounding city while supporting community development opportunities. The businesses would be able to serve the public instead of just base personnel, and would create more commercial options for JBLE-Langley staff. If JBLE-Langley led compatible economic development in the communities adjacent to the base, personnel would also be more ingrained in the fabric of the city.

Developing or redeveloping housing closer to the base is another option. This approach is similar to the historic relationship between the Hampton neighborhood of Phoebus that is adjacent to Fort Monroe. No longer an active army base, Fort Monroe converted historic buildings on the installation site into housing. This unique mixed use community is architecturally significant, is along or close to the water, and is connected to an existing urban neighborhood.

In addition to shifting commercial activity off base, JBLE-Langley could also shared the use of existing public recreational facilities. The military prioritizes supporting the health and welfare of its staff; joint use of recreational facilities in the city is a logical partnership. JBLE-Langley personnel could have a pass that would allow them to access services off base that are currently on base, but could potentially be redeveloped or closed, such as a golf course, bowling alley, and swimming pool. With this approach the base would eventually save money and resources, along with creating available real estate. Security of personnel off base is a concern, as a concentration of military staff could be a potential target for terrorism. Shared access to facilities would be best for uses with lower density, such as a bowling alley, aquatics center, or a golf course.

Below left:
A person walks their dog through the rampart wall at Fort Monroe.

Below right:
Athletic facilities on site at JBLE-Langley include several baseball fields.

NASA Langley Research Center

In 1917, a year before World War I ended, Langley Memorial Aeronautical Laboratory was established near the northeastern edge of Hampton along the Back River at the same time as the airfield. This became the nation's first civilian facility dedicated to researching flight. After four decades of innovation and development, the program shifted to space research, becoming NASA, the National Aeronautics and Space Administration. The NASA Langley Research Center (LaRC) campus is adjacent to JBLE-Langley.

Today, NASA LaRC drives work related to study the planet's changing climate. With the Atmospheric Science Data Center, NASA LaRC is responsible for processing, archiving, and distributing earth science data about radiation, clouds, aerosols, and tropospheric compositions. DEVELOP is a program that works with the institution's Applied Science branch to partner with the public on research, data collection, and decision making. These resources uniquely situate NASA LaRC as a research partner for the City of Hampton, for future collaboration to study climate data that informs critical infrastructure decisions.

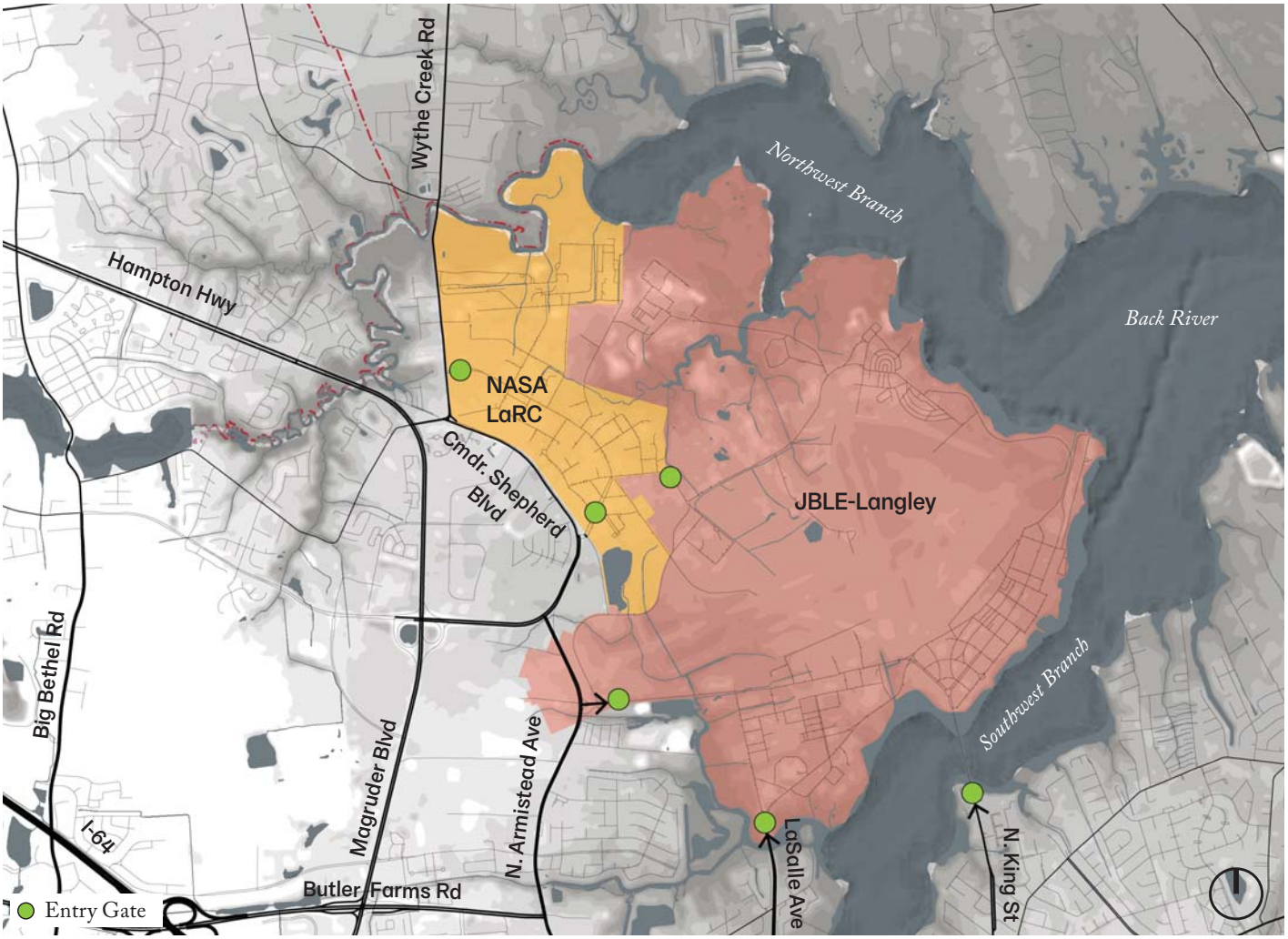
Access and Circulation

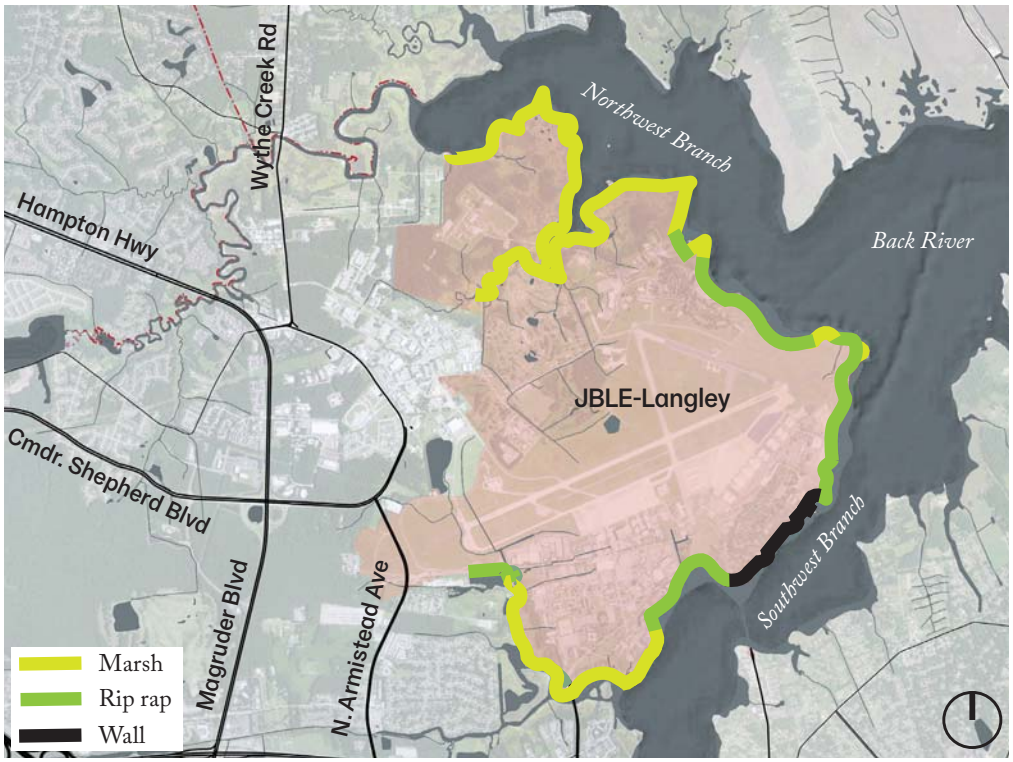
Accessing the NASA LaRC campus follows almost the same patterns as traveling to JBLE-Langley. The NASA LaRC site occupies the northwestern corner of the same peninsula, and is primarily bordered by roadways and JBLE-Langley, with a large buffer of trees in between the buildings and roads. These roadways are the same that JBLE-Langley personnel use to commute to the base. In contrast, the NASA LaRC campus is relatively dense compared to JBLE-Langley, with most facilities grouped closely together. A large testing area occupies the northern edge of the site, along the water.

Because NASA LaRC and JBLE-Langley differ in use and personnel type, circulation at NASA LaRC is more concentrated by location and varied by type. Two main entry gates control traffic, which operates on a civilian workday schedule. An entry gate into JBLE-Langley is between both sites, and receives the least amount of traffic among the base's four gates. NASA LaRC also has alternative transportation, such as bicyclists and carpools. Electric shuttle vehicles operate across the site, which were free as part of a grant.

Resilience

Resilient design has become a priority for NASA LaRC, both on site and adjacent to the campus. Compared to JBLE-Langley, NASA LaRC has the inherent advantage of being at a slightly higher elevation, and slightly more inland. While many of the campus buildings are in lower lying areas near tidal inlets, it appears that the majority of critical facilities are on higher ground along Commander Shepard Blvd. NASA LaRC has a higher design elevation standard as well, +12.45 ft NAVD88. Wythe Creek Road, the primary roadway to the campus from the north, is being elevated by VDOT.

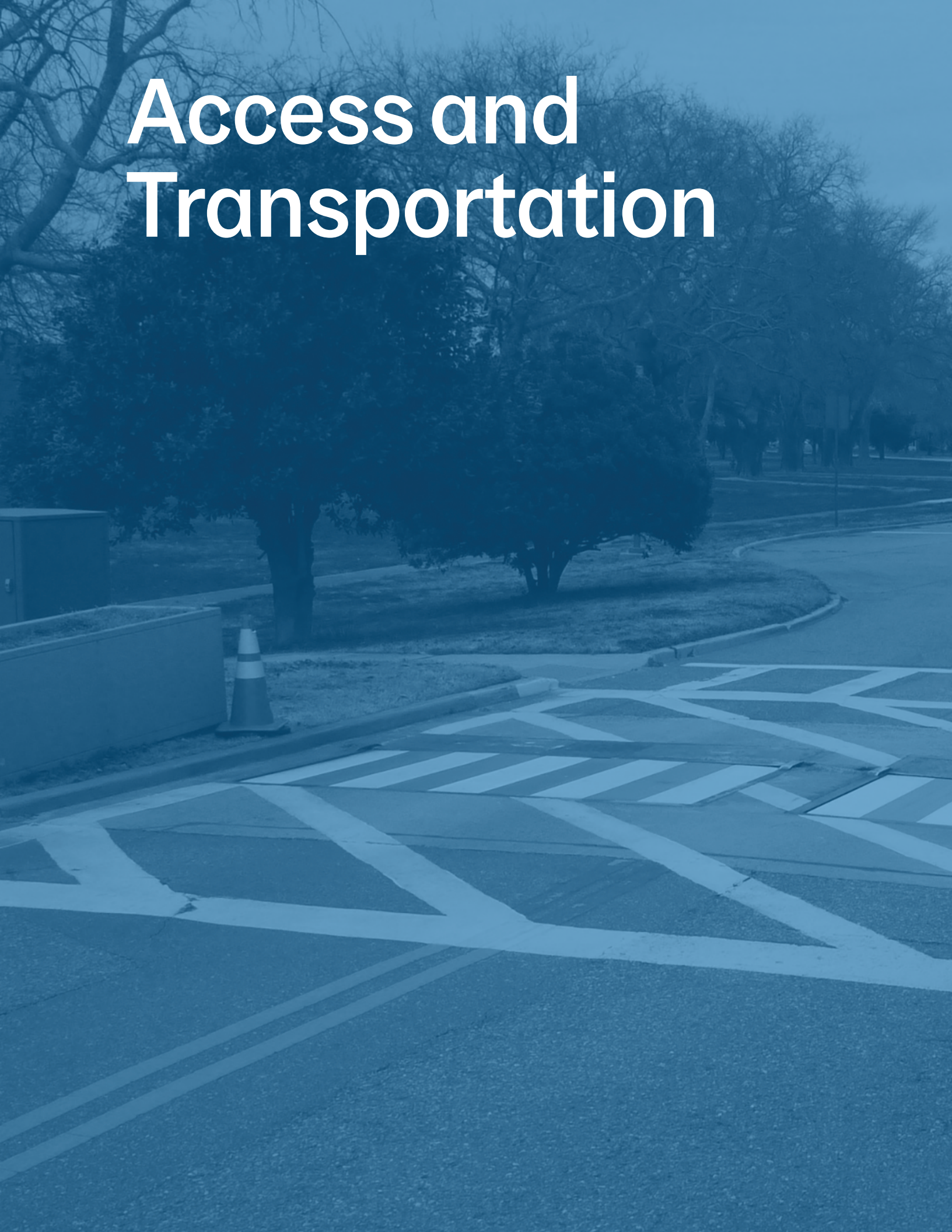




Above:
NASA's campus occupies the remainder of the peninsula that is shared with JBLE-Langley. The boundary of NASA has more roadway frontage, but only two primary entry gates, represented as green circles.

Left:
The range of edge conditions where JBLE-Langley meets the water varies, from concrete walls and marinas to rip rap to marsh and open wetlands. These edge types will help identify where to locate future projects.

Access and Transportation



WELCOME
LANGLEY AIR FORCE BASE VA
HOME OF
AIR COMBAT COMMAND

Transportation Systems

Scales, Networks, Co-Benefits

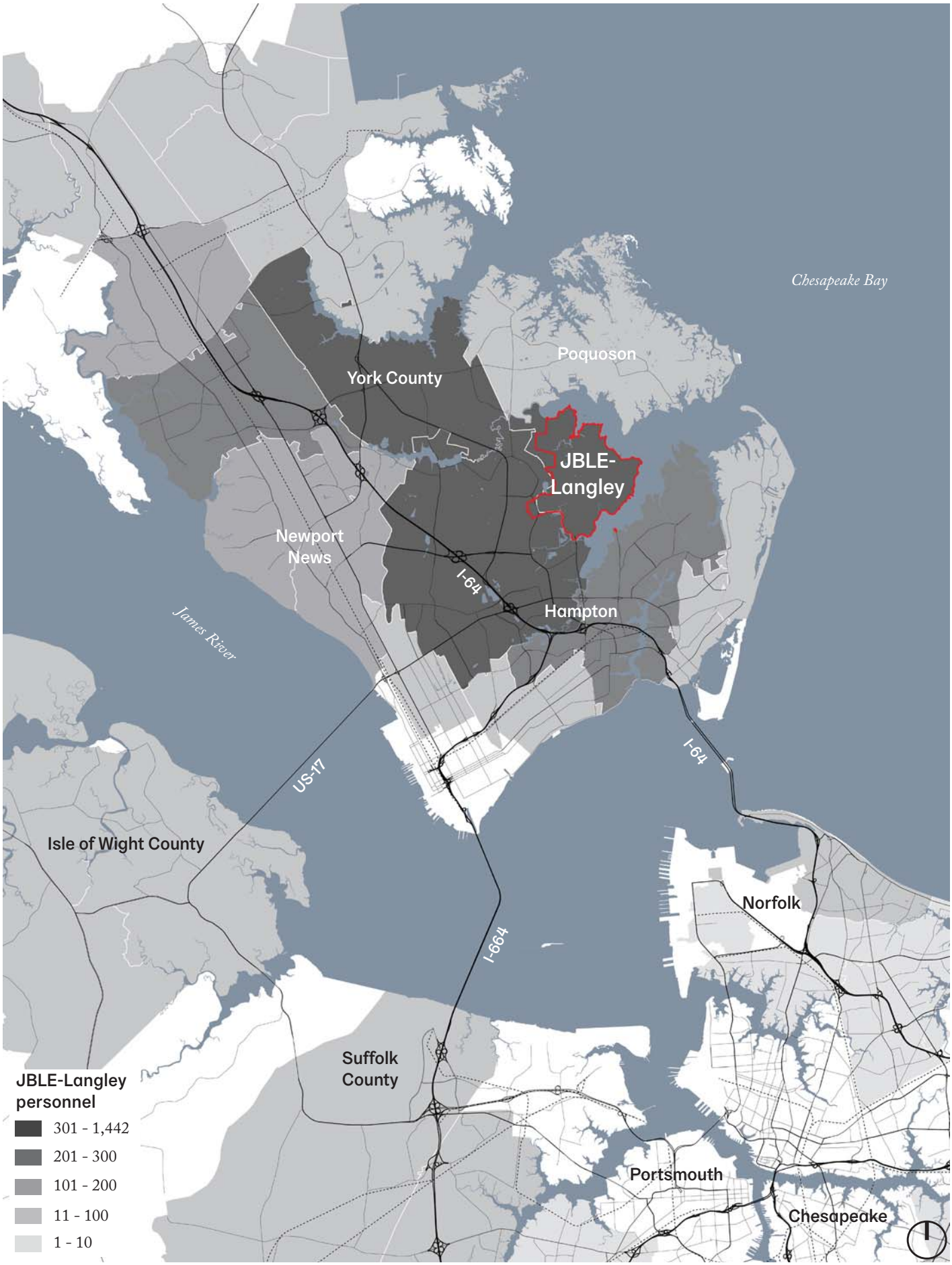
Transportation and circulation are perhaps the most important systems to study in order to improve resilience. Personnel and supply deliveries use a range of modes of transit, both to reach the base and to move around the base. The majority of JBLE-Langley staff commute by car, while supply deliveries are primarily by truck, and the new pier will receive fuel deliveries by barge. Transfer nodes, places of connection, and entry points are critical for the military installation to function, and some may be vulnerable to flooding and other threats. Existing entry gates present opportunities for improvement, as well as exploring redundant circulation through adjacent areas.

During inclement weather, such as heavy rain or snow, JBLE-Langley personnel and supplies may experience challenges to reach the base. These scenarios occasionally cause the installation to close or suspend mission operations. Understanding the elevations of access corridors and related infrastructure would help identify locations for improvement. Exploring water-based connections is another possibility for layered and redundant circulation, in conjunction with the new fuel delivery pier that is currently under construction. In addition to the fuel pier, more water access at JBLE-Langley would also reinforce the base's historic connection to its coastal edges.

Reaching the Base

To reach JBLE-Langley's access and entry points, as well as a range of connection areas, the primary mode of inter- and intra-base transit is automobile. At the largest scale, the interstate highway system connects drivers from Hampton to locations north in the peninsula, and across the James River to the south via bridge-tunnels. The primary north-south corridor is I-64, while I-664 branches off near downtown Hampton to the southwest. I-64 exits link to suburban style arterial roads, which then intersect roads with less traffic that lead to the base entry gates. According to data from Hampton Roads Transportation Planning Organization (HRTPO), the highest concentration of JBLE-Langley personnel traveling to the base is from the southwest, west, and northwest. A map showing this data is on the opposite page. The second highest concentration of commuters come from zip codes to the southeast and farther northwest.

Opposite:
Map showing density of JBLE-Langley personnel who commute to the base, by five digit zip code. Number of commuters within each zip code color is listed in the legend.


Chesapeake Bay
Poquoson
York County
JBLE-
Langley
Newport
News
I-64
Hampton
James River
US-17
I-64
Isle of Wight County
Norfolk
I-664
Suffolk
County
Portsmouth
Chesapeake
JBLE-Langley
personnel
301 - 1,442
201 - 300
101 - 200
11 - 100
1 - 10

Traffic, Commuting, and Entries

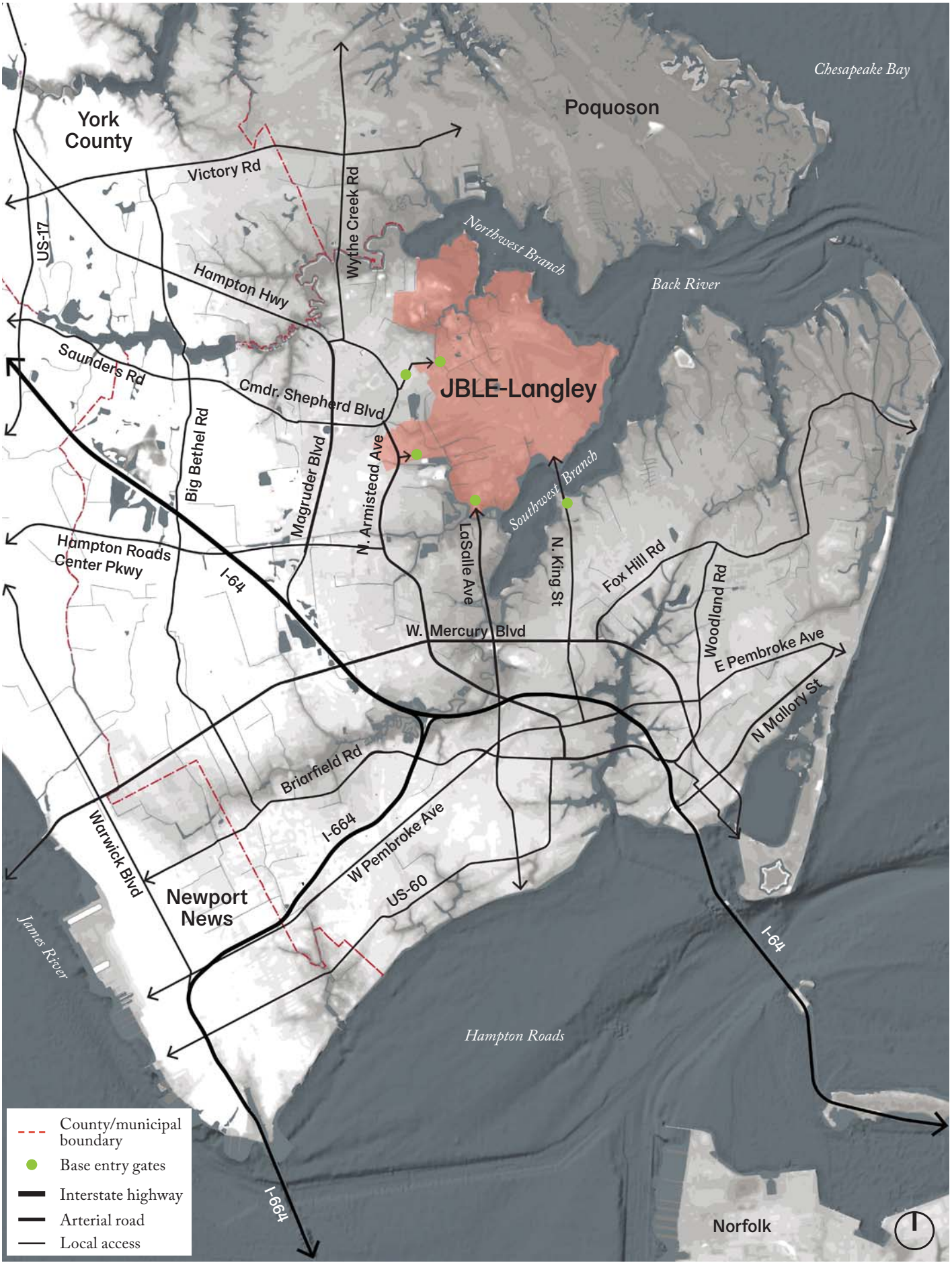
Because the base is directly served by only three roadways, traffic backup can occur, especially at the western gate off N. Armistead Ave. JBLE-Langley staff observe very little alternative transportation, such as bicycling, carpooling, or walking. The on-base public transit provided by Hampton Roads Transit ended as of May 2018.

Many JBLE-Langley personnel travel on a limited number of roadways, and thus have few options if certain roads are closed. The majority of JBLE-Langley staff drive on the interstate or arterial roads within Hampton to reach the base. Though a significant number of staff reside at The Landings at Langley, a relatively short drive away, the base does not operate shuttle service to and from this development. Aside from the JBLE-Langley personnel who live on base, the majority of the staff must determine how to best access the base independently on a network of roads that are maintained by different entities, such as the City of Hampton and VDOT. During snow events, JBLE-Langley is able to provide sufficient access within the installation, and continue mission readiness, but commuters may be unable to reach the base.

Single Purpose System

With an auto-dependent transportation system, the base is vulnerable to interruptions if roadways are impassable. Further, the roadways are designed for cars only, and not pedestrians or bicyclists. On the base, personnel also commute by vehicle; no intra-base transportation system exists. JBLE-Langley last had shuttle service in approximately 2009, though staff have noted that it would be beneficial to resume. A robust shuttle may also better move personnel during inclement weather or emergencies. Next door, NASA LaRC recently acquired free electric shuttle vehicles, which may be an opportunity for JBLE-Langley as well.

Opposite:
Diagram of major roadways to JBLE-Langley, from interstate highways to arterial roads, to local access streets.


Chesapeake Bay
Poquoson
York County
Victory Rd
Wythe Creek Rd
US-17
Northwest Branch
Back River
Hampton Hwy
Saunders Rd
Cmdr. Shepherd Blvd
JBLE-Langley
Big Bethel Rd
Magruder Blvd
N. Armistead Ave
Southwest Branch
LaSalle Ave
N. King St
Fox Hill Rd
Woodland Rd
Hampton Roads Center Pkwy
I-64
W. Mercury Blvd
E Pembroke Ave
N Mallory St
Briarfield Rd
I-664
W Pembroke Ave
Warwick Blvd
Newport News
US-60
James River
Hampton Roads
Norfolk
County/municipal boundary
Base entry gates
Interstate highway
Arterial road
Local access

Entries to the Base

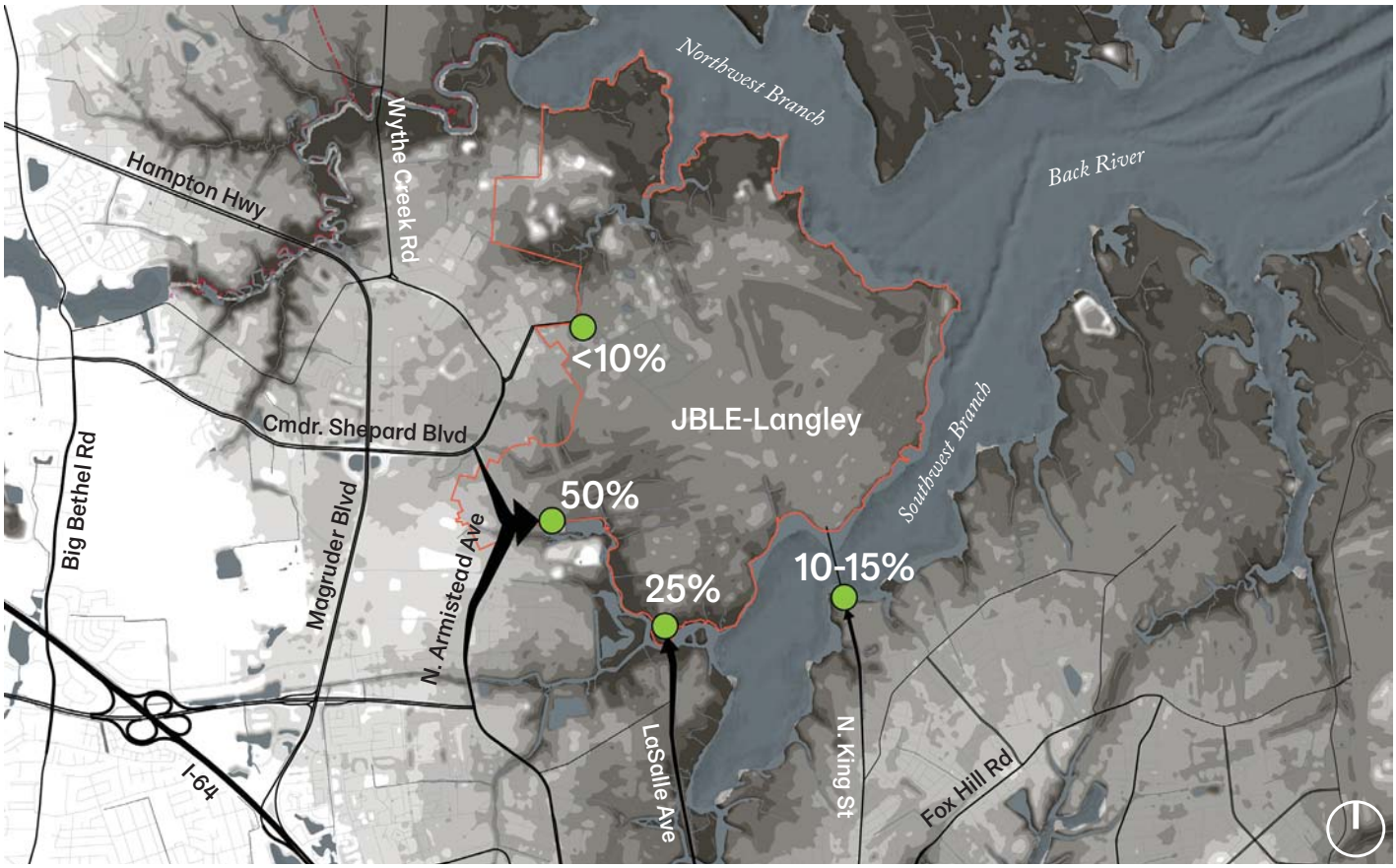
As the primary link to the base, entry gates organize circulation to and around the different zones of the installation. The N. King St. gate is the oldest, and is located on the south side of the Back River immediately before the bridge. This condition is unique; vehicles are checked and then proceed north to cross the bridge, which JBLE-Langley owns and maintains. The N. King St. gate accommodates approximately 10-15% of total traffic, the least amount among the primary three entries.

To the west, the Lasalle Avenue gate was recently expanded to be several lanes wide, and can accommodate any type of truck that would come to the base. The Lasalle Avenue entry is across the water, after a bridge, and on the same side as the installation. It accommodates approximately 25% of total traffic.

Farther north and west is the primary entry gate off N. Armistead Avenue. This entry is fully on land, and hosts the vehicle inspection station. The N. Armistead Avenue gate is located on the side of the base with more recent development, as well as closer access to I-64 and other arterial roads. This proximity is likely why the gate receives about 50% of the total traffic for the base.

A fourth entry is off the NASA LaRC installation at the northwest corner of JBLE-Langley, and is used infrequently because it is farther away from most of the base activity, and is considerably smaller.

Below:
Diagram showing primary entrances into JBLE-Langley, with roadway network that provides access to the base entrance gates, whose relative traffic volumes are indicated with arrows of different thicknesses and percentages.



Nodes and Connections

Upon arriving at the base, drivers can access multiple nodes and places of connection. The vehicle inspection station is currently across the street from the N. Armistead Avenue gate, which inspects delivery trucks. Once a vehicle is cleared it can proceed to the gate and enter the base. On base, large parking lots are past each of the three gates. After the parking lots, each road connects to the base's street grid as soon as space allows so drivers can transfer to their intended route. JBLE-Langley is served by a large loop road around the base that connects to the main clusters of buildings and infrastructure at the southwest, southeast, and northeast corners, as well as to NASA LaRC at the northwest.

Vulnerabilities

Each of the entry gates has existing limitations, which could become potential vulnerabilities in the future. The N. King St. gate and bridge cannot accommodate major trucks, and is the smallest of the three main entries. This location is likely most at risk for flooding with sea level rise, and already faces challenges in cold weather. The Lasalle Ave. gate is relatively new, but is across a bridge that could also become vulnerable to rising seas and storm surge. The gate and adjacent area slope down into the base, which could be flooded.

Much more frequently occurring, traffic jams leading up to the gates cost time, energy, and other resources. This is a particular problem at the N. Armistead Ave. gate, which about half of JBLE-Langley's traffic uses. Backup is a general issue for commuters, and also presents safety concerns. Re-routing traffic due to flooding would need to be planned for deployment, and possibly put drivers at risk for passing through or near inundated areas.

All of the base's entry points were designed for access control, with the sole purpose of accommodating vehicles, and not with complete streets design principles. Arrivals to JBLE-Langley via public transportation, bicycle, or walking face safety and accessibility challenges. The small gate adjacent to NASA LaRC is a minor concern, as it is infrequently used and arrivals have already been checked through the main gate into NASA LaRC.

Impacts from Weather

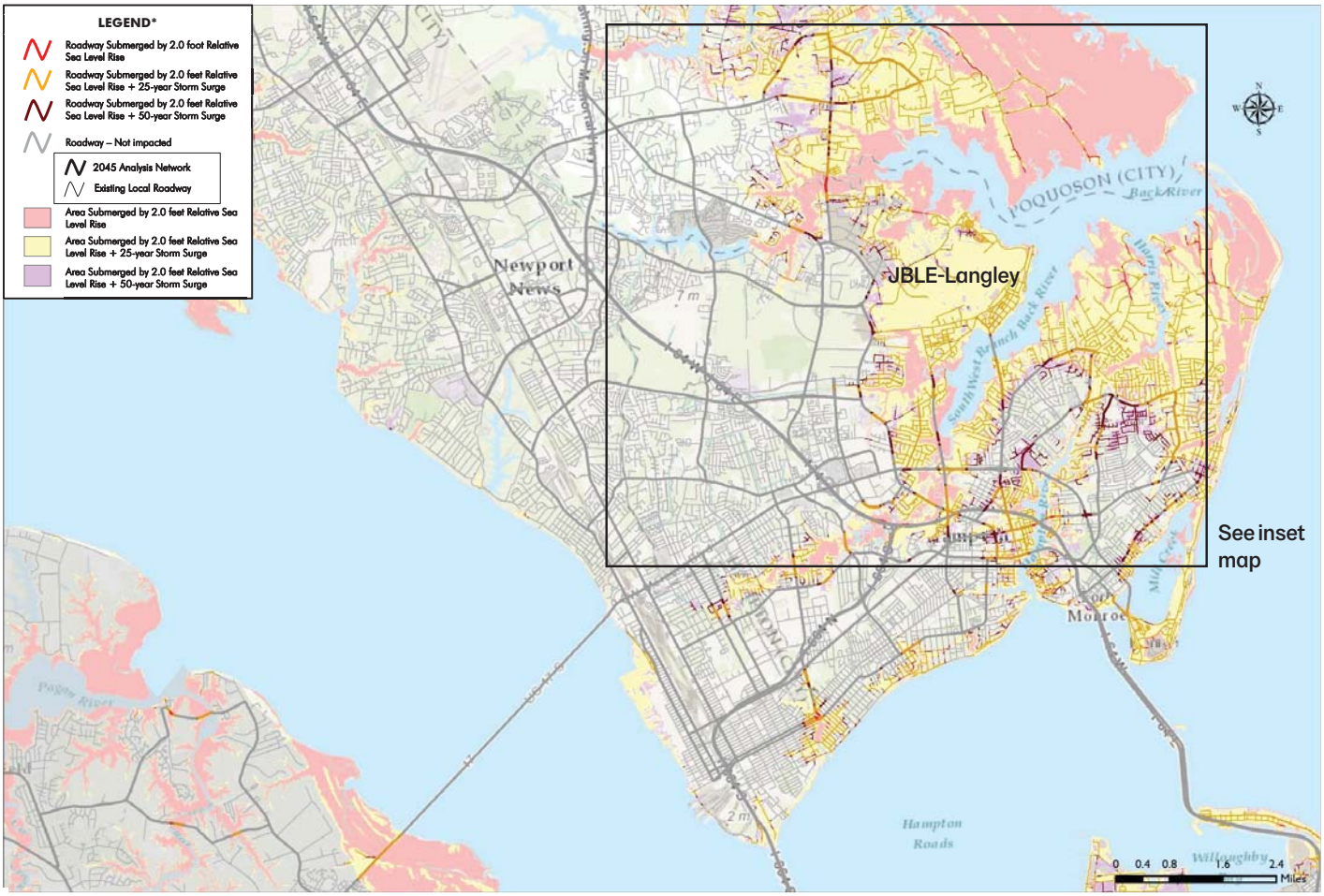
Flooding

Roadway flooding and drainage is currently a minor concern, but will increase with sea level rise and more extreme weather. All of JBLE-Langley's entry gates are located within the FEMA 100-year floodplain equivalent elevation, as is almost the entire base. The N. King St. gate is at the lowest elevation, followed by the N. Armistead gate. The Lasalle gate was rebuilt to a higher elevation, but gradually slopes down into the base.

The Hampton Roads Transportation Planning Organization (HRTPO) reports "Hampton Roads Military Transportation Needs Study: 2018 Update" from 2018 and "Sea Level Rise and Storm Surge Impacts to Roadways in Hampton Roads" from 2016 indicate which roadways are at risk for flooding under 3 scenarios of relative sea level rise (2.0 feet) and storm surges (25-year and 50-year). Off the base, portions of King St. near the entry gate, parts of Mercury Blvd. in between Lasalle Ave. and King St, and Tide Mill Lane as it intersects Lasalle Ave. are all listed as submerged for the two higher flooding scenarios. On the base, the majority of roads, including those intersecting all primary entry gates, would also be submerged for the two higher flooding scenarios.

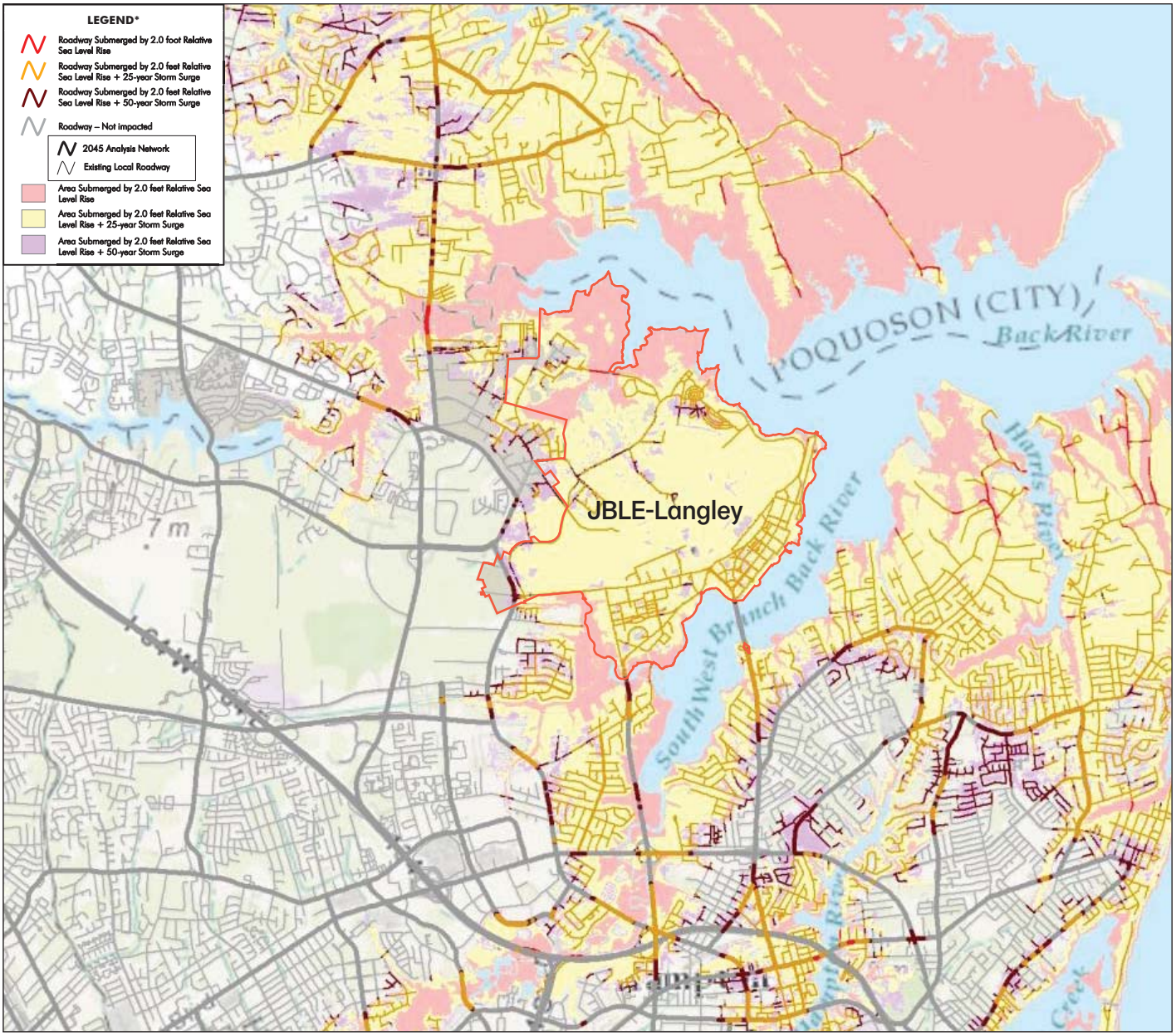
Below:
Map from "Sea Level Rise and Storm Surge Impacts to Roadways in Hampton Roads" HRTPO report showing roads that would be submerged with 2.0 feet of relative sea level rise and a 2% annually recurring chance (50 year) storm surge.

Opposite:
The same map, enlarged to show the area around JBLE-Langley in more detail.



Prepared by: HRTPO Staff, October 2015

Data source for projected flooded areas: HRPDC Staff, October 2015


LEGEND*
Roadway Submerged by 2.0 foot Relative Sea Level Rise
Roadway Submerged by 2.0 feet Relative Sea Level Rise + 25-year Storm Surge
Roadway Submerged by 2.0 feet Relative Sea Level Rise + 50-year Storm Surge
Roadway – Not impacted
2045 Analysis Network
Existing Local Roadway
Area Submerged by 2.0 feet Relative Sea Level Rise
Area Submerged by 2.0 feet Relative Sea Level Rise + 25-year Storm Surge
Area Submerged by 2.0 feet Relative Sea Level Rise + 50-year Storm Surge
POQUOSON (CITY)
Back River
JBLE-Langley
South West Branch Back River
Harris River

Snow

Snow is the most frequent threat to base access, and is the most common cause of airfield closure. Due to ice forming on the bridges, the N. King St gate closes first and the Lasalle gate closes second. When a snow event impacts the base, personnel begin a full time snow removal program in order to maintain mission flights. JBLE-Langley staff are confident in the base's ability to clear snow, but are concerned about the City of Hampton's capacity to keep the roadways leading to JBLE-Langley clear. This is a regional concern that requires coordination; state roads are maintained by VDOT, and other roads are managed by different municipalities.

Traffic to JBLE-Langley may pass through several different jurisdictions, each with a different way of managing snow. The City has improved their process with addressing snow; the Public Works department shifts into full time snow removal mode. VDOT has a range of emergency response plans depending on the type of situation, such as snow or flooding. Coordinating a regional snow emergency plan among the City of Hampton, VDOT, and neighboring municipalities would better serve JBLE-Langley.

Below, left:
Snow plows clear the JBLE-Langley airfield.
Image sources: JBLE-Langley-Eustis

Below, right:
JBLE-Langley begins snow removal operations on the base airfield.

Base Closure and Impacts

To better understand how the City of Hampton could assist JBLE-Langley as a partner, it may be helpful to describe scenarios in which the base would close, and what the potential impact would be. Knowing the effects on mission operations when the base closes could help improve mitigation before an event, and recovery after. According to staff, JBLE-Langley typically closes for one or two days per year, with the exception of a major event such as a hurricane. Identifying the sequence of events, and explaining what is affected, where, and how, would also indicate opportunities for specific systems or sites to become more resilient.

An example description of a scenario where JBLE-Langley would close would include:

- Event description
- What is impacted first?
- How?
- Where?
- What is affected as a result?
- Backup/redundancy
- System modification
- Operations
- Event end
- Recovery/Resume normal operations
- Identifying opportunities for improvement

Example Scenario Description

A rainstorm at high tide brings about 6 inches of flash flooding, which forces the closure of the N. King St. entry gate. Personnel from the base are deployed to redirect traffic to Lasalle Ave. A few hours later, the Lasalle Ave. gate closes. Personnel from there redirect traffic to the N. Armistead Ave. entry. Since almost all vehicles are entering at N. Armistead Ave., traffic is backed up. NASA LaRC remains open, so JBLE-Langley personnel redirect some traffic to the NASA LaRC gate, which eventually leads to the small entry to JBLE-Langley at the shared boundary. Additional staff work at this gate to reduce backup at the N. Armistead Ave. gate. An hour later, water ponding at this gate and at the N. Armistead Ave. gate forces a complete closure of vehicular traffic. JBLE-Langley notifies all staff via email and text message. Personnel work to secure all entry gates, and to reduce flooding until the storm passes. Only mission critical staff remain on base. After the storm ends six hour laster, the N. Armistead gate reopens, followed by the Lasalle gate a few hour later, and N. King St hours after that.

Opportunities

Resilient Communications

In the event of a base closure, or limited access on roadways, communication between the installation and JBLE-Langley staff is critical. This has been identified as a consistent challenge for commuters who may not know the current situation on base, or of their typical route to travel there. The impact on JBLE-Langley personnel, especially those with families, requires additional planning and coordination. Staff with children must plan around travel, school closures, bus access, or day care.

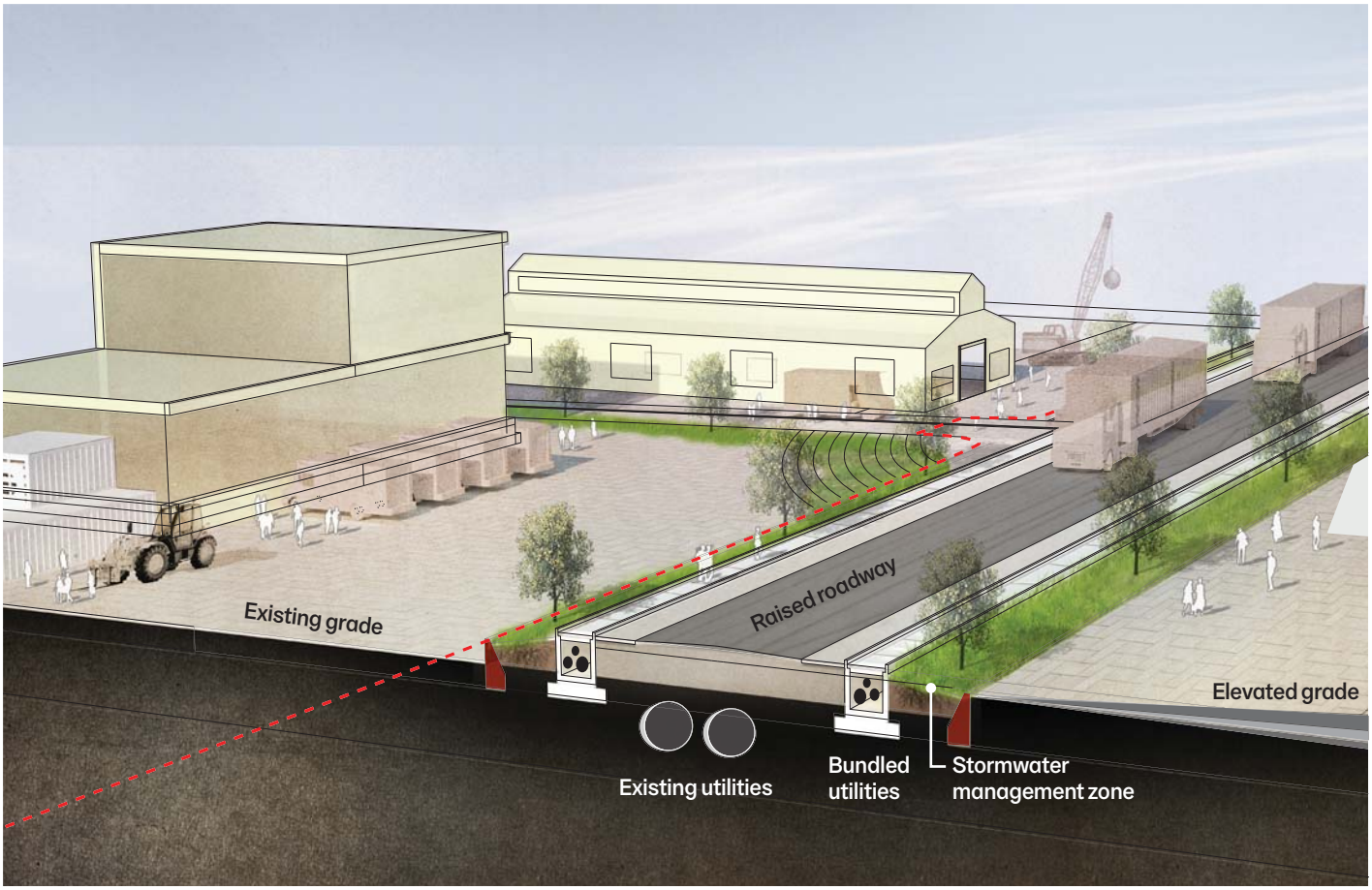
Establishing a resilient communications system, even during a power outage, would be a major improvement. Currently, a text and email notification system does exist at JBLE-Langley. However, it does not include information about installation access via local roadways; that is a potential addition to be implemented with cooperation with the City of Hampton. A network that monitors key roadways in real-time and provides updates to JBLE-Langley staff would also be worth exploring.

Dry Egress and Ingress

Maintaining dry egress from the base, as well as ingress to the base, that does not flood will become increasingly important to JBLE-Langley as storms and sea level rise advance. The primary access gates into the base, as well as their respective roads, are at a range of elevations. Some will be at risk sooner than others. In an emergency situation, this may delay or prevent access for commuters, emergency responders, or delivery of critical supplies to and from the base. Lower elevations of roads, land, and infrastructure adjacent to the entry gates could also impair access or mission readiness.

A design standard for a minimum elevation of roadways, entries, and their associated infrastructure would establish reliable paths in and out of the base. The opposite page shows a drawing of a raised roadway that provides dry egress, serves as protection, and integrates resilient elements such as stormwater management and accessible utilities.

Multifunctional Street Design
Making roadways more resilient would layer benefits of improving utilities, transportation, and flood risk reduction. Below is a raised egress with adjacent existing development, from the Resilient Bridgeport project by Waggonner & Ball.



Base Traffic

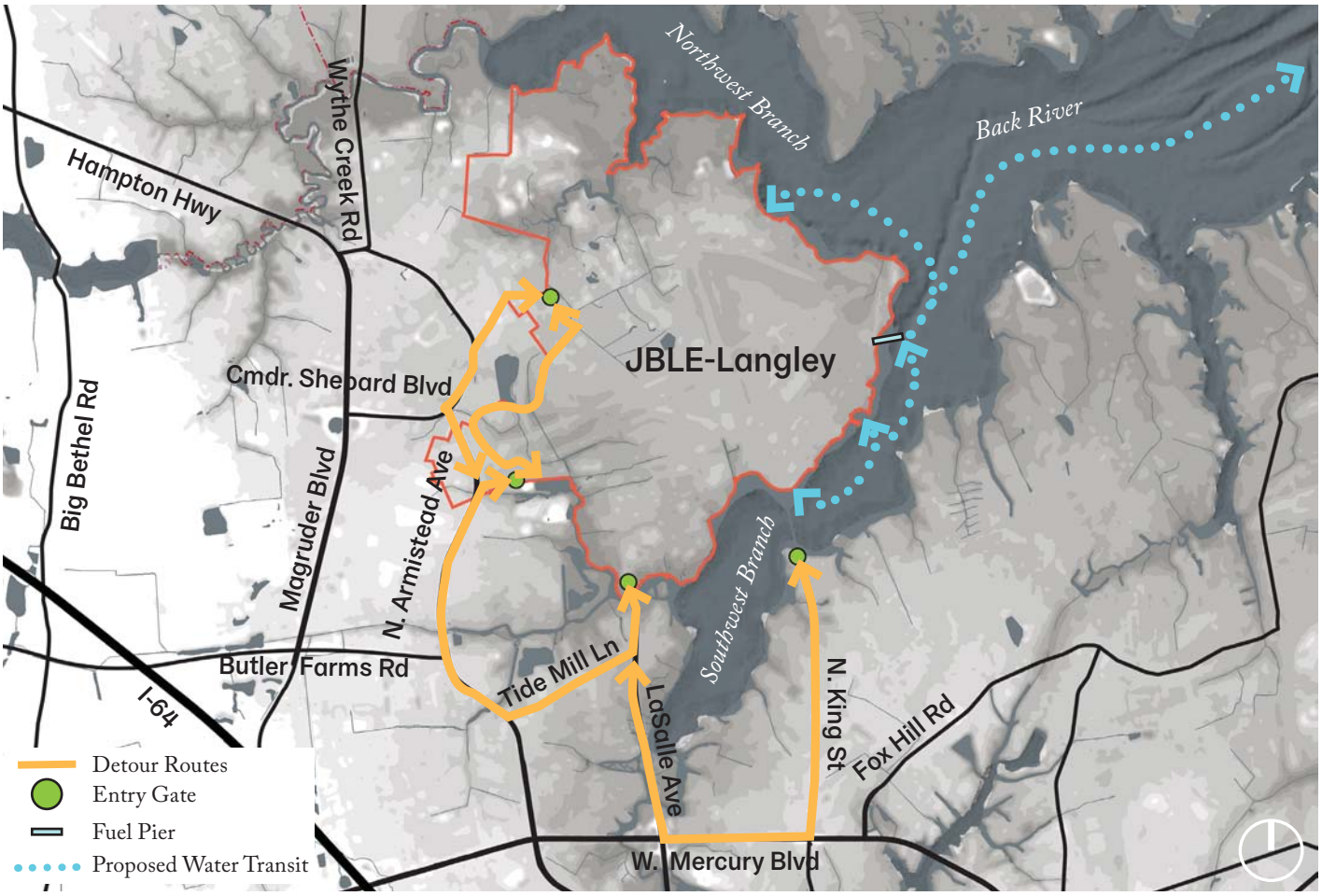
To facilitate traffic redistribution off the base, designated routes through adjacent areas could be used as occasional and short term cut-throughs, specifically during rush hour or an emergency. See the map on the opposite page for alternate vehicular routes and detours.

The City should support this redundant circulation by designating these roadways as high priority routes. This focuses funding for improvements to these roadways first, along with maintaining access during an emergency, and re-routing traffic during peak periods, such as rush hour or during an event. The existing roads that directly lead to gates, or that could serve as alternate routes, are in good condition and have primarily commercial land use. These include, as shown on the opposite page, N. King St, Lasalle Ave, N. Armistead Ave, Commander Shepard Blvd, and Wythe Creek Rd. Smaller thoroughfares that are useful for temporary detours, such as Butler Farms Rd or Tide Mill Lane, have more residential land use, and may experience challenges with increased traffic. A primary access road from the north, Wythe Creek Rd, has a bridge that is currently being elevated by VDOT.

Water Based Transportation

Another strategy to support a land-based transportation system is by taking advantage of the primary reason the base was established at its location – proximity to water. Over the long term, a network of waterside connections might be able to relieve pressure off limited access points into the base on land, and may also be more resilient. The new fuel pier, currently under construction, is intended to accept deliveries via barge. This significant investment could also function as a new gate into the base. JBLE-Langley staff stated a need for intra-base circulation; a water taxi or shuttle system that uses the fuel pier would be able to ferry passengers around the base to other points, such as smaller piers located near key facilities. Traveling to other military installations may also be faster via water than land.

Water based transit also serves as a detour route or for evacuation if roadways were impacted during an event. Water craft are inherently more flexible than land vehicles since they do not have to stay on fixed roadways. This creates opportunities for the base to connect to more multimodal transit options for commuters. JBLE-Langley staff stated a concern for security, since boats are more difficult to inspect than vehicles. This is understandable, and an effective security process would have to be developed. New piers, water taxis, and flexible alternatives to vehicular access would layer functions at the edges of the base. JBLE-Langley is poised to take advantage of the valuable resource that surrounds it – creating a dynamic relationship with its coast, and reconnecting its people to the water.



Detours and Alternative Transit

On the map above, blue lines with arrows show alternate routes and detours to access the different existing entry gates to JBLE-Langley in case one or more of the four are closed. The City of Hampton should prioritize maintaining access to these roads in a range of scenarios, from inclement weather, to emergencies, to heavy traffic. Proposed water transit routes are shown in dotted blue lines.

New Entry Gate

Existing traffic issues could be improved with modified entry gate design and circulation, redistributing vehicles to other gates, and supporting alternative routes through adjacent areas. To remedy the existing traffic backup at the heavily used N. Armistead Ave. gate, JBLE-Langley has planned to redesign and rebuild the entry in the coming years.

Redistributing traffic to other gates is another option, particularly when the gates are relatively close to each other. A logical rerouting would be from the N. Armistead gate into NASA LaRC, and then into the small gate that leads into JBLE-Langley. This approach would require drivers to circumnavigate about half of the base in order to reach the concentration of buildings and infrastructure along the southern edge, and may cause a need to expand the small gate. NASA LaRC is not a 24 hour facility like JBLE-Langley, which may offer the base flexibility if additional entry gate capacity is needed outside standard workday hours.

Ultimately, this option may not save drivers time over simply waiting at the N. Armistead gate. Redistributing traffic from the N. Armistead gate to the Lasalle gate would likely be accommodated with minimal challenges since the Lasalle gate is the largest. The disadvantage to this option is an approximately ten minute drive to the Lasalle gate. JBLE-Langley staff have stated that leaving the base during rush hour through the N. Armistead gate is also challenging. During a traffic jam, vehicles could be rerouted through the base and down to the Lasalle gate.

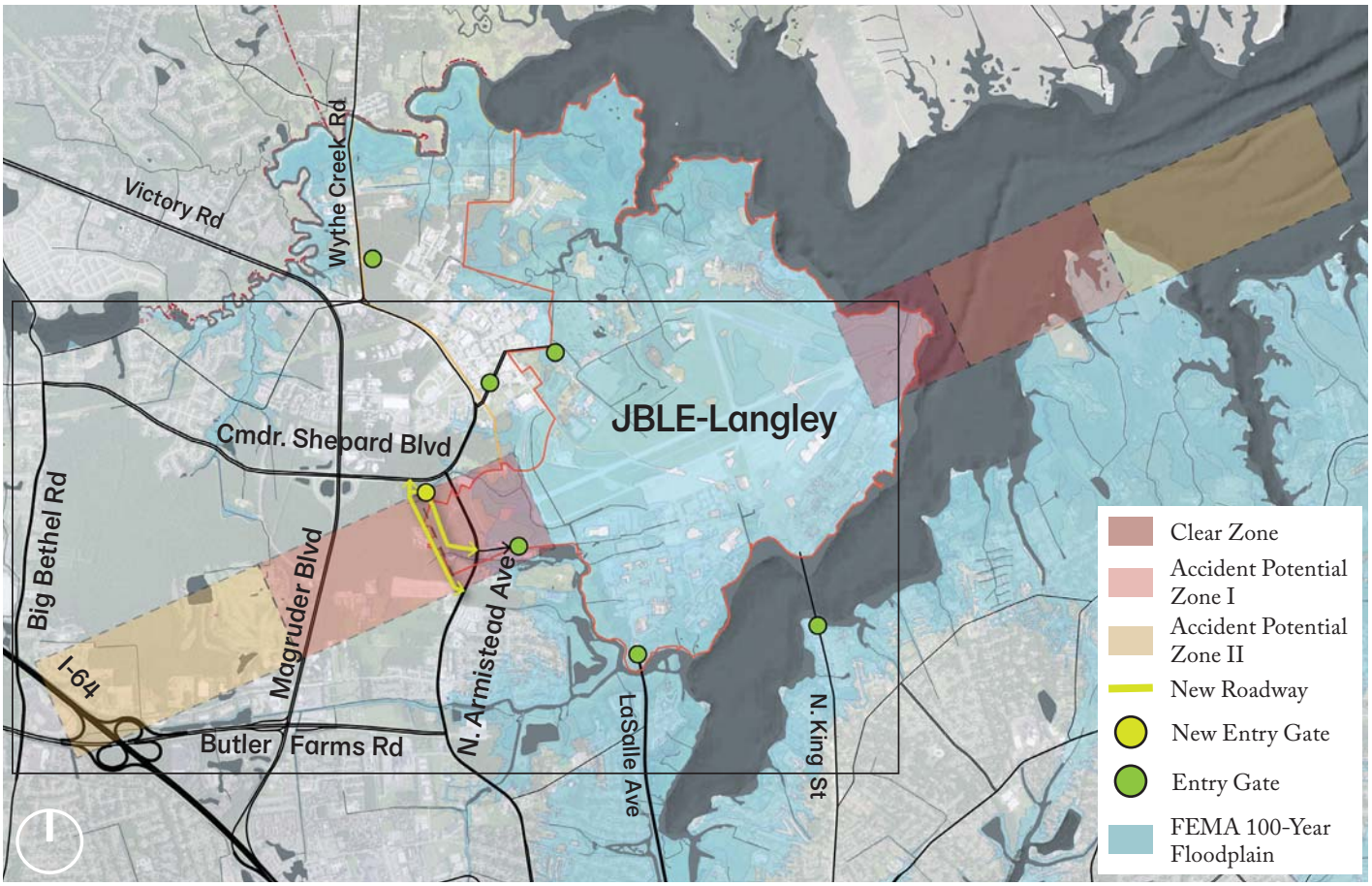
Relocating Armistead Ave Roadway and Entry

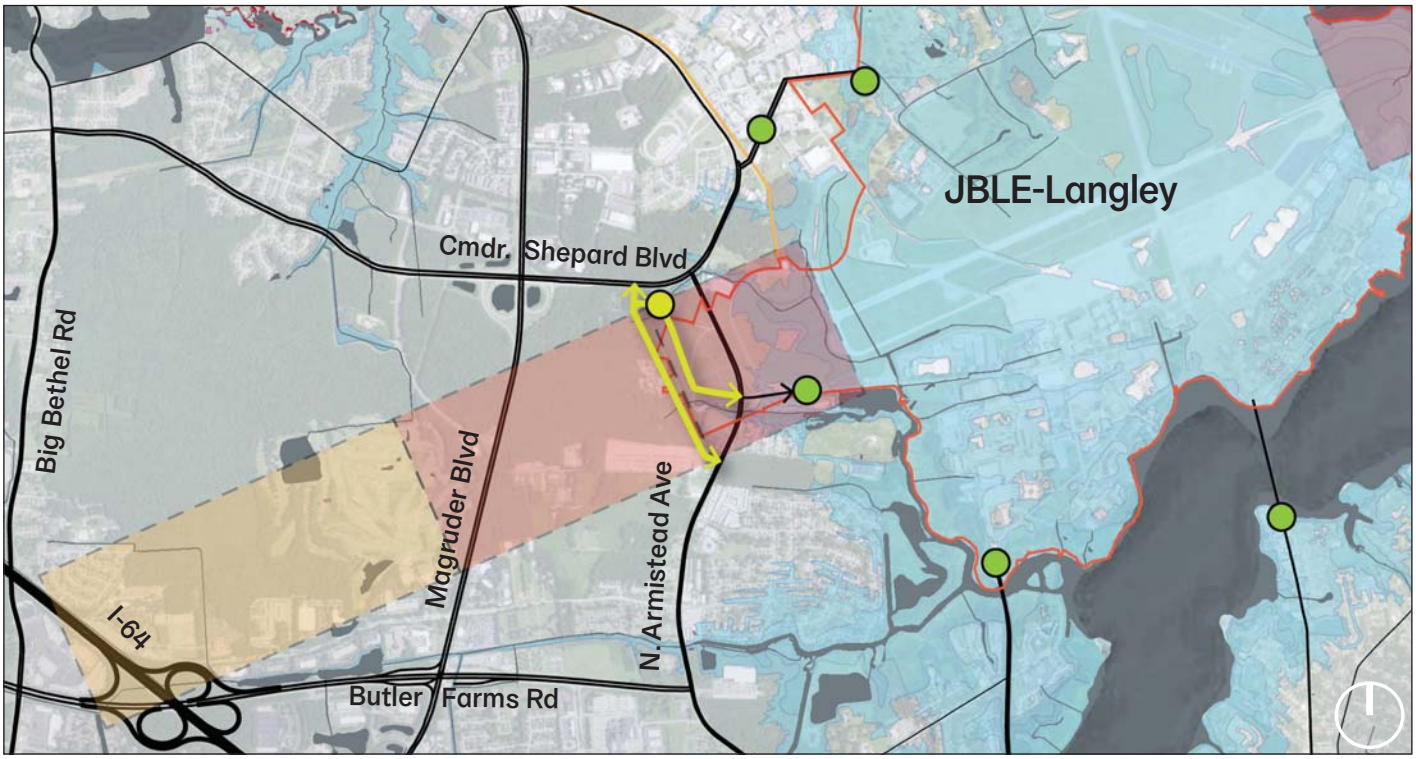
A longer term, more resilient option is to relocate the N. Armistead Ave entry gate entirely, and create a new roadway that leads to it. The goals of this approach are to save commuter time by alleviating traffic congestion, improve safety by moving the entry gate out of the floodplain and the Clear Zone (CZ), improve accessibility by designing the new gate to complete streets standards, and invest in a solution that will better accommodate frequent use, since the existing gate processes about half of JBLE-Langley's traffic.

To achieve these goals, relocating the N. Armistead gate off a new roadway would also initiate the resilient movement of JBLE-Langley farther inland to the higher ground to the west of the base. The new gate would be redesigned to be larger than the existing facility, and to accommodate a wider range of users and modes of transportation. Relocating the gate to outside of the CZ (as indicated on the diagrams, opposite) would require a new roadway to reach it. A new extension of N. Armistead Ave could extend as shown, branching off the existing roadway, and extending outside of the CZ until intersecting Commander Shepard Blvd. While this strategy would require property acquisition, these goals ultimately create smarter and safer circulation. Designing the new gate and roadway to complete streets standards provides safe access to all users and transit types. These goals ultimately create a safe and resilient investment that will serve JBLE-Langley well into the future.

Relocated N. Armistead Ave Gate

The maps on the opposite page show a proposed location for a new portion of N. Armistead Ave that would lead to a new base entry gate, outside of both the Clear Zone and the equivalent elevation of the FEMA 100-Year (1% annual chance) Floodplain. Once inside the base, traffic could be routed in a range of ways not shown.


Victory Rd
Wythe Creek Rd
JBLE-Langley
Cmdr. Shepard Blvd
Big Bethel Rd
Magruder Blvd
N. Armistead Ave
I-64
Butler Farms Rd
LaSalle Ave
N. King St
Clear Zone
Accident Potential Zone I
Accident Potential Zone II
New Roadway
New Entry Gate
Entry Gate
FEMA 100-Year Floodplain


JBLE-Langley
Cmdr. Shepard Blvd
Big Bethel Rd
Magruder Blvd
N. Armistead Ave
I-64
Butler Farms Rd

Recommendations

Implementation Plan

This chapter describes specific recommendations for strategies and actions that have been developed collaboratively between the City of Hampton, JBLE-Langley, the consultant team, and other agencies. Results from the planning process seek to create a way for the City to improve resilience while also maintaining the base's mission. Inherent in these recommendations is the idea of design implementation as a catalyst for future development in the city, building momentum, and creating further funding opportunities. The process for implementation centers on the JLUS Addendum Implementation Committee presenting specific action items for the City to pursue.

Recommendations are intended to reinforce the values, principles, and tools of the Resilient Hampton effort. Implementing these recommendations create opportunities to test strategies from the Phase I Living With Water Hampton report, and measure them with the Evaluation Tool. These recommendations are intended to guide smarter collaboration, planning, and development. In this approach, is it also important to include who would benefit from each of the recommendations in order to prioritize implementation, clarify partnerships, and create potential funding opportunities.

Recommended action items and their implementation paths were developed from a series of workshops with the project team. Items are organized into the following categories: Policy, Emergency and Recovery Planning, Data Collection, Utilities, Land Use, Transportation, and Water. Each recommendation is described as a brief heading, with a longer explanation of the overall strategy. Applicable principles and values from Resilient Hampton are listed in order to show how the recommendation relates back to the larger program. Next, the agency with the primary responsibility for implementing the item is listed, followed by potential partners who could support the lead agency. Potential partners include, but are certainly not limited to:

Government - State/Federal
- Department of Defense
- JBLE-Langley
- NASA LaRC Research Center (NASA LaRC)
- US Army Corps of Engineers, Norfolk District
- Veterans Affairs Medical Center (VAMC)
- Virginia Department of Emergency Management (VDEM)
- Virginia Silver Jackets

Regional Partners
- Hampton Roads Planning District Commission (HRPDC)
- Hampton Roads Sanitation District (HRSD)
- Hampton Roads Transit (HRT)
- Hampton Roads Transportation Planning Organization (HRTPO)
- Virginia Department of Transportation (VDOT)
- Virginia Port Authority

Government - County / Municipality
- Chesapeake
- Gloucester County
- Isle of Wight County
- James City County
- Newport News

Norfolk
Mathews County
Poquoson
Portsmouth
Suffolk
Williamsburg
Virginia Beach
York County

Institution / Education / NGO

The College of William & Mary
Commonwealth Center for Recurrent Flooding Resiliency
Hampton University
Old Dominion University
RISE
Thomas Nelson Community College
Virginia Coastal Policy Center
Virginia Tech
Virginia Institute of Marine Science (VIMS)
Wetlands Watch
Neighborhood associations and other community organizations

Business Community

Coliseum Central Business Improvement District
Downtown Hampton Development Partnership (DHDP)
Peninsula Housing and Builders Association
Virginia Peninsula Association of Realtors
Virginia Peninsula Chamber of Commerce

Each action item includes the potential costs and timeline for implementation. The estimated rough order of magnitude (ROM) cost is intended to establish whether the action item is relatively affordable or may require a process in order to obtain sufficient funding. The City of Hampton's threshold for Capital Improvement Projects that require authorization is $50,000.

Based on existing conditions and concerns, recommended strategies might be short term goals, or may require a longer duration to achieve. After the ROM, the anticipated priority is listed. This is a range from short term (2018-2020), medium term (2021-2023), or long term (after 2023) based on the urgency and complexity of the recommendation.

Opportunities for potential partnerships and funding are also suggested. Broadly, the Department of Defense (DOD) supports investments that will improve resiliency on US military installations. The National Defense Authorization Act (NDAA) is an important funding opportunity to pursue as adaptations to the base are planned. NDAA's Defense Community Infrastructure Program will also help fund certain recommendations. A broad range of partnerships would ultimately support Implementation Actions. For example, the City has worked in the past with The College of William and Mary to establish a legal tool kit related to resilience, and plans to work with RISE.

Each category contains recommendations with specific associated actions, along with time priorities, responsible entities, and a rough order of magnitude (ROM) cost estimate to implement the strategy. A summary of each recommendation is below. Full descriptions begin on the following page spread.

Policy

1. Establish and implement regional design standards for sea level rise
2. Expand coordination and partnerships among government agencies
3. Enact policies to better coordinate studies and projects
4. Incorporate the JLUS Addendum into the Resilient Hampton effort
5. Incorporate JLUS implementation as a responsibility of the Hampton Resiliency Partnership

Emergency and Recovery Planning

6. Promote a shared culture of preparedness among all partners
7. Develop enhanced multimedia emergency notifications and warnings
8. Establish and implement emergency management and recovery plans

Data Collection and Analysis

9. Determine data needs for collection and monitoring, and establish systems
10. Continue to expand partnerships with innovative research entities
11. Assess vulnerability, and create a plan for key assets on JBLE-Langley and off base

Utilities

12. Establish regular coordination among regional utility providers
13. Identify interdependencies among utilities
14. Secure infrastructure off base or in airfield safety zones
15. Decouple or harden utilities

Land Use

16. Re-zone parcels adjacent to aircraft approach zones
17. Explore compatible land uses in aircraft approach zones
18. Establish support for strategic relocation to higher ground
19. Acquire remaining land in airfield safety zone and adjacent parcels, and transfer to JBLE-Langley
20. Identify and support compatible community redevelopment

Transportation

21. Determine which roadways are designated as high priorities for JBLE-Langley
22. Establish a plan to maintain access of key corridors
23. Use data collected to report traffic and access issues
24. Add new route to a new entry gate
25. Redesign N. Armistead Avenue gate with complete streets standards
26. Create a network of circular transit

Water

27. Develop a stormwater management plan
28. Manage stormwater off the base in City owned land
29. Coordinate ecological improvements with base development

Funding Opportunities

A range of options for funding the JLUS Addendum Recommendations exist, particularly through federal grants. Listed below are different types of programs that fund certain types of efforts, from planning to built projects. Other Recommendations may be eligible for other sources not included in this list. Further, specific Recommendations may be achieved with staff time from the Lead Agencies or partners, and would not require additional funding.

Pre-Disaster Mitigation Grant Program (Project)

FEMA, Project Grant

Authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, this program is designed to assist States, U.S. Territories, Federally-recognized tribes, and local communities in implementing a sustained pre-disaster natural hazard mitigation program. Project subapplications submitted for consideration must be consistent with the goals and objectives identified in the current, FEMA-approved State hazard mitigation plan along with the local hazard mitigation plan for the jurisdiction in which the activity is located. Subapplicants (i.e., local governments) submit mitigation project subapplications to the State during the open application cycle (est. October—February). After reviewing project applications to determine if they meet the program's requirements, the Applicant (i.e., the State) prioritizes and forwards the project applications in a Pre-Disaster Mitigation (PDM) grant application to FEMA. Local governments should contact the State Hazard Mitigation Officer to obtain detailed information on the PDM application process.

https://www.fema.gov/pre-disaster-mitigation-grant-program

Potential option for recommendations

14, 15, 28

Pre-Disaster Mitigation Grant Program (Planning)

FEMA, Planning Grant

Authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, this program is designed to assist States, U.S. Territories, Federally-recognized tribes, and local communities in implementing a sustained pre-disaster natural hazard mitigation program. Planning subapplications submitted for consideration for PDM funding must result in a mitigation plan adopted by the jurisdiction(s) and approved by FEMA. PDM funds mitigation planning to help States, U.S. Territories, Federally-recognized tribes and local governments engage in a planning process that meets the requirements outlined in 44 CFR Part 201 Mitigation Planning. Subapplicants (i.e., local governments) submit mitigation planning subapplications to the State during the open application cycle (est. October—February). After reviewing planning applications to determine if they meet the program's requirements, the Applicant (i.e., the State) prioritizes and forwards the planning applications in a PDM grant application to FEMA. Local governments should contact the State Hazard Mitigation Officer to obtain detailed information on the PDM application process.

Part of the strategy in applying for a PDM-Planning grant may be to explain that the results of the planning effort will be rolled into the next local hazard mitigation plan update as appropriate, so that a connection with a local HMP is evident in the application.

https://www.fema.gov/pre-disaster-mitigation-grant-program

Potential option for recommendations
8, 11, 18, 27

Hazard Mitigation Grant Program
FEMA/VDEM
Authorized by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, this program helps eligible applicants implement hazard mitigation measures following a Presidential Major Disaster Declaration in areas of the state requested by the Governor. The key purpose of this grant program is to enact mitigation measures that reduce the risk of loss of life and property from future disasters. Applications are submitted to the State, which receives Hazard Mitigation Grant Program (HMGP) funds from FEMA.

https://www.fema.gov/hazard-mitigation-grant-program

Potential option for recommendations
14, 15, 28

Flood Mitigation Assistance Program
FEMA
Authorized by Section 1366 of the National Flood Insurance Act of 1968, as amended with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). FMA provides funding to States and local communities for projects and planning that reduces or eliminates long-term risk of flood damage to structures insured under the NFIP. FMA funding is also available for management costs. Funding is appropriated by Congress annually.

Documentation would likely be required to verify that the proposed activity would prevent losses to an NFIP-insured structure(s).

https://www.fema.gov/flood-mitigation-assistance-grant-program

Potential option for recommendations
28

Funding Opportunities (continued)

Emergency Management Performance Grant Program
FEMA/VDEM

Authorized by Section 662 of the Post Katrina Emergency Management Reform Act and the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The Emergency Management Performance Grant (EMPG) program provides Federal funds to States to assist local governments in preparing for all hazards. In terms of emergency management planning, the EMPG program specifically supports hazard identification and risk assessment, emergency operations plans, communications plans, continuity of operations plans, community engagement planning, resource management plans, evacuation plans, and recovery plans.

https://www.fema.gov/emergency-management-performance-grant-program

Potential option for recommendations

6, 7, 8, 22, 26

Coastal Resilience Grants for Coastal Communities
NOAA/NFWF

Communities can use Coastal Resilience Grants to develop projects that save lives, protect property, reduce damage to infrastructure, and benefit ecosystems and the economy. These projects connect agencies and organizations across regions, include a variety of public- and private-sector partnerships, and require a nonfederal dollar match. The grants are structured so that each applicant can request the help most needed by their community.

https://www.coast.noaa.gov/resilience-grant/

Potential option for recommendations

24, 25, and possibly multiple other recommendations

Staff Time and Resources
No Outside Funding Required

Represents the idea that internal activities (such as revising an ordinance or creating a policy) may not require additional funding to implement, or where no external funding is obtainable.

Potential option for recommendations

1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 16, 17, 20, 21, 22, 23, 29

Unassigned Projects

Miscellaneous/Other

The default for this category would likely be City/JBLE-Langley funds, however HMGP does have a category for "Miscellaneous/Other" in terms of eligible activities. Proposed actions for this category of funding would be evaluated on their own merit against program requirements. Projects deemed to be eligible would be approved, provided funding is available.

Potential option for recommendations

19

Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Project Grant program

An annual federal grant program, which in 2018 was authorized by The Consolidated Appropriations Act, 2018. Funding amounts differ from year to year but the general requirements stay the same. The 2018 grant cycle appropriated $1.5 billion to be awarded by the U.S. Department of Transportation (US DOT) for National Infrastructure Investments. Since this program (previously called Transportation Investment Generating Economic Recovery/TIGER grants) was first created, $5.6 billion has been awarded for capital investments in surface transportation infrastructure over nine rounds of competitive grants.

BUILD Transportation Discretionary Grants are for capital investments in surface transportation infrastructure and are awarded on a competitive basis for projects that will have a significant local or regional impact.

To be selected for a BUILD Transportation Discretionary Grant, an applicant must be an Eligible Applicant and the project must be an Eligible Project. Eligible Applicants for BUILD Transportation Discretionary Grants are State, local, and tribal governments, including U.S. territories, transit agencies, port authorities, metropolitan planning organizations (MPOs), and other political subdivisions of State or local governments. BUILD grants are not available to Federal agencies (including JBLE-Langley), so the responsible agency would need to be either individual cities, the Hampton Roads Transportation Planning Organization, or a combination of these partners. Multiple States or jurisdictions may submit a joint application and must identify a lead applicant as the primary point of contact, and also identify the primary recipient of the award. Eligible projects for BUILD Transportation Discretionary Grants are capital projects that include, but are not limited to: (1) Highway, bridge, or other road projects eligible under title 23, United States Code; (2) public transportation projects eligible under chapter 53 of title 49, United States Code; (3) passenger and freight rail transportation projects; (4) port infrastructure investments (including inland port infrastructure and land ports of entry); and (5) intermodal projects.

Funding Opportunities (continued)

Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Project Grant program (continued)

BUILD Transportation Discretionary Grants may not be less than $5 million and not greater than $25 million, except that for projects located in rural areas, where the minimum BUILD Transportation Discretionary Grant size is $1 million.

https://www.transportation.gov/BUILDgrants/about

Potential option for recommendations

24

Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Planning Grant program

An annual federal grant program, which in 2018 was authorized by The Consolidated Appropriations Act, 2018. Funding amounts differ from year to year but the general requirements stay the same. The 2018 grant cycle appropriated $1.5 billion to be awarded by the U.S. Department of Transportation (US DOT) for National Infrastructure Investments. Since this program (previously called Transportation Investment Generating Economic Recovery/TIGER grants) was first created, $5.6 billion has been awarded for capital investments in surface transportation infrastructure over nine rounds of competitive grants.

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The 2018 Act allows for up to $15 million to be awarded as grants for the planning, preparation or design of eligible projects (BUILD Transportation Planning Grants). There is no statutory minimum grant size, regardless of location, for BUILD Transportation Planning grants. Activities eligible for funding under BUILD Transportation Planning Grants are related to the planning, preparation,

or design—including environmental analysis, feasibility studies, and other pre-construction activities—of surface transportation projects. Research, demonstration, or pilot projects are eligible only if they will result in long term, permanent surface transportation infrastructure that has independent utility.

https://www.transportation.gov/BUILDgrants/about

Potential option for recommendations

21, 22, 23

Policy

1. Establish and implement regional design standards for sea level rise

Strategy
Establish regional design standards for sea level rise and groundwater for consistent planning and construction among agencies and municipalities, and coordinate updating standards within a certain increment of time (for example, every five years) to account for future changes and new data.

Resilient Hampton Principles
Strengthen Partnerships, Use Best Data, Share Knowledge and Resources

Resilient Hampton Values
Safe, Nimble, Innovative

Implementation Actions
Action 1.1
Coordinate across scales, from city to state, region, and federal, to determine the appropriate elevations that correspond to a specific sea level rise projection scenario. Include projections of future days per year of tidal flooding. Different agencies currently use a range of elevations based on several projections from NACCS, FEMA, and NOAA. Analyze data on groundwater levels to understand patterns and change over time in relation to rising seas.

Action 1.2
Determine the appropriate design elevation standard for a range of scenarios, including locations, facility types, and operational requirements. Also determine appropriate guidelines that relate to groundwater levels, such as site work and subsurface construction.

Action 1.3
Develop a program to monitor groundwater levels at strategic locations and to analyze data in order to understand patterns and influences. Establish regular intervals (e.g. every six months) to collect, analyze, and report data. Use the data to guide recommendations for Action 1.2.

Action 1.4
Working with partner agencies, the JLUS Implementation Committee is to establish which entities are responsible for enforcing adopted regional design standards.

Lead Agency
City of Hampton, with partners

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	■
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	
Sufficient	
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	
Both	■
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	■
City of Poquoson	■
York County	■
Commonwealth of Virginia	■
JLUS Implementation Commit.	■
HRTPO	■
VDOT	■
NASA	■
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Policy (continued)

1. Establish and implement regional design standards for sea level rise (continued)

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources

Potential Partners
Federal Agencies:
- Department of Defense
- JBLE-Langley
- NASA JBLE-Langley Research Center (NASA LaRC)
- US Army Corps of Engineers, Norfolk District

Municipalities:
- Chesapeake, Gloucester County, Isle of Wight County, James City County, Mathews County, Newport News, Norfolk, City of Poquoson, Portsmouth, Suffolk, Virginia Beach, Williamsburg, York County

Regional Agencies:
- Hampton Roads Planning District Commission (HRPDC)
- Hampton Roads Transportation Planning Organization (HRTPO)
- Virginia Department of Transportation (VDOT)
- Virginia Port Authority

Institution / Education / NGO:
- Commonwealth Center for Recurrent Flooding Resiliency
- Hampton University
- Old Dominion University
- Thomas Nelson Community College
- Virginia Coastal Policy Center
- Virginia Institute of Marine Science (VIMS)
- Virginia Tech
- Wetlands Watch
- The College of William & Mary

For more information, reference pages 16-17, Forces of Water chapter

Policy (continued)

2. Expand coordination and partnerships among agencies

Strategy
Establish strong coordination and partnerships to study and implement improved resiliency efforts among government agencies at all scales, from municipal, to state, regional, and federal.

Resilient Hampton Principles
Strengthen Partnerships, Share Knowledge and Resources

Resilient Hampton Values
Integrated, Nimble, Innovative

Implementation Actions
Action 2.1
Expand existing and create new partnerships to connect and coordinate with a range of government agencies that currently work in, or have the potential to improve, resiliency efforts. Collaborations are intended to promote alignment and reduce duplication. By reaching out to understand related efforts that have been completed, are in progress, or are planned, government entities will learn from each other.

Lead Agency
City of Hampton, with partners

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources

Potential Partners
US Army Corps of Engineers, Norfolk District
Department of Defense
JBLE-Langley
Municipalities:
Chesapeake, Gloucester County, Isle of Wight County, James City County, Mathews County, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Williamsburg, Virginia Beach, York County

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	
Strengthen Partnerships	■
Use Best Data	
Share Knowledge & Resources	■
VALUES	
Safe	
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	■
City of Poquoson	■
York County	■
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	■
NASA	
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

2. Expand coordination and partnerships among agencies (continued)

Regional Agencies:

- Hampton Roads Planning District Commission (HRPDC)
- Hampton Roads Transportation Planning Organization (HRTPO)
- Virginia Department of Transportation (VDOT)
- Virginia Port Authority

For more information, reference pages 16-19, and the chapters: Inside the Base: Critical Facilities and Mission Readiness; Boundaries; Access and Transportation

Policy (continued)

3. Enact policies to better coordinate studies and projects

Strategy
Enact policies to better coordinate studies and projects across government agencies to avoid redundancy and potential conflicts.

Resilient Hampton Principles
Strengthen Partnerships, Share Knowledge and Resources

Resilient Hampton Values
Integrated

Implementation Actions
Action 3.1
Create policies that would improve coordination and communication between specific departments in the relevant municipalities, agencies, and other institutions when another entity plans to engage in a study or project in their jurisdiction, field of study, or mission.

Lead Agency
City of Hampton, with partners

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources

Potential Partners
Federal Agencies:
- Department of Defense
- Joint Base Langley-Eustis
- NASA LaRC Research Center (NASA LaRC)
- US Army Corps of Engineers, Norfolk District

Municipalities:
- Chesapeake, Gloucester County, Isle of Wight County, James City County, Mathews County, Newport News, Norfolk, City of Poquoson, Portsmouth, Suffolk, Virginia Beach, Williamsburg, York County

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	
Strengthen Partnerships	■
Use Best Data	
Share Knowledge & Resources	■
VALUES	
Safe	
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	
Nimble	
Innovative	
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	
Both	■
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	■
City of Poquoson	■
York County	■
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	■
NASA	■
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Policy (continued)

3. Enact policies to better coordinate studies and projects (continued)

Regional Agencies:

- Hampton Roads Planning District Commission (HRPDC)
- Hampton Roads Transportation Planning Organization (HRTPO)
- Virginia Department of Transportation (VDOT)
- Virginia Port Authority

Institution / Education / NGO:

- Commonwealth Center for Recurrent Flooding Resiliency
- Hampton University
- Old Dominion University
- Thomas Nelson Community College
- Virginia Coastal Policy Center
- Virginia Institute of Marine Science (VIMS)
- Virginia Tech
- Wetlands Watch
- The College of William & Mary

For more information, reference pages 16-19, and the chapter Inside the Base: Critical Facilities and Mission Readiness

Policy (continued)

4. Incorporate the JLUS Addendum into the Resilient Hampton effort

Strategy
Include the JLUS Addendum Implementation Recommendations in the ongoing Resilient Hampton effort as further strategies for resiliency and adaptation projects. Test recommendations with the Resilient Hampton Evaluation Tool.

Resilient Hampton Principles
Reinforce Assets, Strengthen Partnerships, Share Knowledge and Resources

Resilient Hampton Values
Integrated, Innovative

Implementation Actions
Action 4.1
Frame the JLUS Addendum through the principles, goals, and values from the Living With Water Hampton report, and determine how to support JBLE-Langley with implementation.

Action 4.2
Test implementation recommendations from the JLUS Addendum by using the Evaluation Tool from the Living With Water Hampton report for potential City projects.

Action 4.3
In the Living With Water Hampton report, incorporate content on JBLE-Langley, the JLUS Addendum process, and implementation of recommendations.

Action 4.4
Integrate the JLUS Addendum with the existing Hazard Mitigation Plan, and in the process of future updates to the Plan.

Lead Agency
City of Hampton

Total ROM Cost
<$50,000

Priority
Short term

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	■
Layer Public Benefits	
Strengthen Partnerships	■
Use Best Data	
Share Knowledge & Resources	■
VALUES	
Safe	
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	
Nimble	
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	
Other (see text)	
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Policy (continued)

4. Incorporate the JLUS Addendum into the Resilient Hampton effort (continued)

Funding
Staff Time and Resources

Potential Partners
JBLE-Langley

For more information, reference pages 13, 16-19

Policy (continued)

5. Incorporate JLUS implementation as a responsibility of the Hampton Resiliency Partnership

Strategy
Utilize the Hampton Resiliency Partnership to establish a JLUS Addendum Implementation Committee that coordinates implementation activities between the City of Hampton and JBLE-Langley as well as potential partners. The Partnership will prioritize recommendations and present an implementation plan to the City of Hampton, JBLE-Langley, and contributing partners. The Partnership will establish a framework of continuing to work on implementing these recommendation.

Resilient Hampton Principles
Strengthen Partnerships, Share Knowledge and Resources

Resilient Hampton Values
Integrated, Sufficient, Innovative

Implementation Actions
Action 5.1
Work with applicable members from the 2010 JLUS Implementation Committee, and add new relevant entities.

Lead Agency
City of Hampton, JBLE-Langley, and contributing partners

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources

Potential Partners
NASA LaRC Research Center (NASA LaRC)
City of Poquoson
York County
Hampton Roads Planning District Commission (HRPDC)
Hampton Roads Transportation Planning Organization (HRTPO)
Virginia Department of Transportation (VDOT)
Regional utility providers

For more information, reference pages 13, 16-19

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	
Strengthen Partnerships	■
Use Best Data	
Share Knowledge & Resources	■
VALUES	
Safe	
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	
Innovative	
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	■
HRTPO	
VDOT	
NASA	
Other (see text)	
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Emergency and Recovery Planning

6. Promote a shared culture of preparedness among all partners

Strategy
Develop and support strategies to mitigate vulnerabilities beforehand so that critical systems will remain in stable operation for emergency response, and negative impacts will be minimized when a major event occurs.

Resilient Hampton Principles
Create Value-Driven Solutions, Share Knowledge and Resources

Resilient Hampton Values
Safe, Equitable, Heritage, Nimble, Innovative

Implementation Actions
Action 6.1
Share responsibility and accountability for risk reduction with neighboring municipalities and other partners, including JBLE-Langley, VDOT, and regional utility providers. Develop and share the data and tools needed to make risk-informed mitigation investments. Organize regular coordination among entities to address specific vulnerabilities as well as planned projects.

Lead Agency
City of Hampton, JBLE-Langley, and contributing partners

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources
Emergency Management Performance Grant Program

Potential Partners
City of Newport News
York County
City of Poquoson
Hampton Roads Planning District Commission (HRPDC)
Hampton Roads Transportation Planning Organization (HRTPO)
Virginia Department of Emergency Management (VDEM)
Virginia Department of Transportation (VDOT)
Regional utility providers

For more information, reference pages 16-19, 84-85

PRINCIPLES	
Create Value-Driven Solutions	■
Reinforce Assets	
Layer Public Benefits	
Strengthen Partnerships	
Use Best Data	
Share Knowledge & Resources	■
VALUES	
Safe	■
Equitable	■
Natural	
Heritage	■
Integrated	
Sufficient	
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	■
City of Poquoson	■
York County	■
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	■
NASA	
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Emergency and Recovery Planning (continued)

7. Develop enhanced multimedia emergency notifications and warnings

Strategy
Inform local residents of emergencies through an integrated yet simple system that uses multiple types of media in order to reach the greatest number of people.

Resilient Hampton Principles
Layer Public Benefits, Use Best Data, Share Knowledge and Resources

Resilient Hampton Values
Safe, Equitable, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 7.1
Create an integrated system of emergency warnings and notifications through a wide range of media, including text message, email, radio, television, roadway signs, and local government and media websites. Include public access to real time data as much as possible. Determine an appropriate target goal of number of people reached, and track data analytics to confirm success. Create a process to coordinate sending notifications and warnings with operators of media listed above. Revise and improve the system after each event, as applicable.

Lead Agency
City of Hampton

Total ROM Cost
<$50,000

Funding
Staff Time and Resources
Emergency Management Performance Grant Program

Priority
Short term

Potential Partners
JBLE-Langley
City of Newport News
York County
City of Poquoson
Virginia Department of Emergency Management (VDEM)
VDOT
Regional utility providers

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	■
Strengthen Partnerships	
Use Best Data	■
Share Knowledge & Resources	■
VALUES	
Safe	■
Equitable	■
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	■
City of Poquoson	■
York County	■
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	■
NASA	
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

For more information, reference page 68

Emergency and Recovery Planning (continued)

8. Establish and implement emergency management and recovery plans

Strategy
Create emergency management and recovery plans between the City of Hampton and JBLE-Langley to anticipate and respond to events.

Resilient Hampton Principles
Layer Public Benefits, Use Best Data, Share Knowledge and Resources

Resilient Hampton Values
Safe, Equitable, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 8.1
Establish communications protocol in emergency situations between the two entities, which including processes, use of facilities, and staffing.

Action 8.2
Establish a snow management plan, including maintenance of critical roadways, and coordinate with JBLE-Langley. This also includes expanding staff and equipment, such as vehicles and plows.

Action 8.3
Establish a process to remove sanitary waste from JBLE-Langley in emergency situations.

Action 8.4
Coordinate JBLE-Langley's emergency management and recovery plans with the City of Hampton, and establish a timeline for regular updates.

Action 8.5
Coordinate and support implementation suggestions from JBLE-Langley After Action Reviews.

Action 8.6
Coordinate long term recovery plans to align goals, strategies, and implementation processes. Coordinate updates to recovery plans.

Lead Agency
JBLE-Langley
City of Hampton

Total ROM Cost
<$50,000

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	■
Strengthen Partnerships	
Use Best Data	■
Share Knowledge & Resources	■
VALUES	
Safe	■
Equitable	■
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	
Both	■
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	■
NASA	
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Emergency and Recovery Planning (continued)

8. Establish and implement emergency management and recovery plans (continued)

Priority
Short term

Funding
Emergency Management Performance Grant Program, Planning Grant

Potential Partners
Cox Communications
Virginia Department of Emergency Management (VDEM)
Verizon

For more information, reference pages 16, 46, 74

Data Collection and Monitoring

9. Determine data needs for collection and monitoring, and establish systems

Strategy
Determine what types of data need to be collected, and develop a system to collect and monitor a this data in order to support JLUS Implementation items. Establish partnerships with other agencies, municipalities, and organizations to collect and monitor. This data will range from roadway flooding, snow, and traffic, to water conditions and weather events.

Resilient Hampton Principles
Strengthen Partnerships, Use Best Data, Share Knowledge and Resources

Resilient Hampton Values
Safe, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 9.1
Deploy sensors in roadways that can monitor pertinent data, such as flood depths, snow, and traffic. Coordinate these locations with high priority routes identified in the 9 digit zip code analysis of JBLE-Langley commuters in Recommendation 22. Develop a system for analyzing this data.

Action 9.2
Deploy sensors on site at JBLE-Langley and in adjacent water to study changing conditions and weather events, including impacts on ecosystems.

Lead Agency
JBLE-Langley
City of Hampton

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources

Potential Partners
City of Hampton
NASA LaRC
VIMS

For more information, reference pages 50-53, 62, 66

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	■
VALUES	
Safe	■
Equitable	■
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	
Both	■
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Data Collection and Monitoring (continued)

10. Continue to expand partnerships with innovative research entities

Strategy
Develop innovative collaborations, and work with organizations and agencies that specialize in resilience and adaptation, who could assist with research and project implementation.

Resilient Hampton Principles
Strengthen Partnerships, Use Best Data, Share Knowledge and Resources

Resilient Hampton Values
Safe, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 10.1
For examples of innovative partnerships, the City of Hampton has worked in the past with The College of William and Mary to establish a legal tool kit related to resilience, and plans to work with RISE on specific projects. Other partnerships include NASA LaRC's DEVELOP program to analyze the appropriate Thematic Application Areas, such as Eco Forecasting, Water Resources, and Transportation & Infrastructure. An effort with NASA LaRC should also include studying Newmarket Creek, which was identified as Phase 2 of the Resilient Hampton effort.

Lead Agency
City of Hampton

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources

Potential Partners
JBLE-Langley
NASA LaRC

For more information, reference pages 16-19, 28-29, 62, 84-85

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	■
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	■
Other (see text)	
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Data Collection and Monitoring (continued)

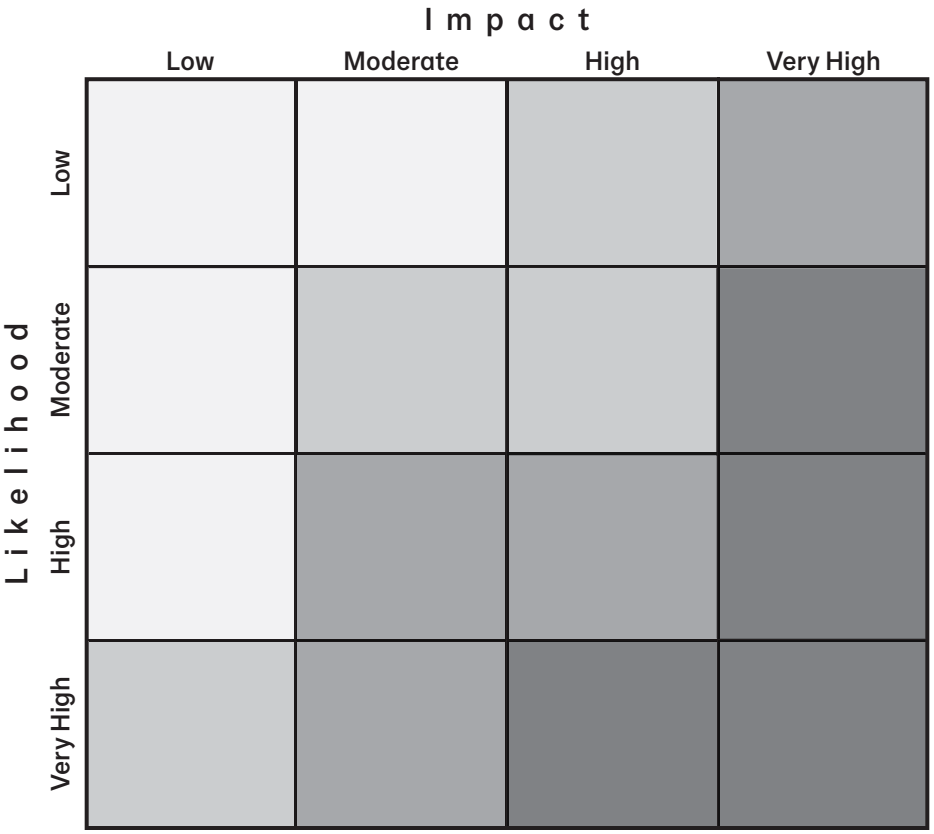
11. Assess vulnerability, and create a plan for key assets on JBLE-Langley and off base

Strategy
Assess structures at JBLE-Langley and rank them according to vulnerability in order to prioritize which facilities should be protected and in which order.

Resilient Hampton Principles
Reinforce Assets, Use Best Data

Resilient Hampton Values
Safe, Heritage, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 11.1
Assess buildings and infrastructure on the base, as well as critical infrastructure off-base, in terms of the likelihood and impact of an extreme event like flooding. Develop a matrix to illustrate how to prioritize the structures based on importance of use and the elevation. Use the matrix below to determine which buildings or infrastructure are most vulnerable, and should be protected first.



PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	■
Layer Public Benefits	
Strengthen Partnerships	
Use Best Data	■
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	
Heritage	■
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	
Both	■
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	■
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Data Collection and Monitoring (continued)

11. Assess vulnerability, and create a plan for key assets on JBLE-Langley and off base (continued)

Lead Agency
JBLE-Langley

Total ROM Cost
<$50,000

Priority
Short term

Funding
Emergency Management Performance Grant Program, Planning Grant
Staff Time and Resources

Potential Partners
City of Hampton
NASA LaRC
USACE
Virginia Department of Emergency Management (VDEM)

For more information, reference pages 44-45, 50-55

Utilities

12. Establish regular coordination among regional utility providers

Strategy
Coordinate plans for emergency responses, upgrades, and designing for future conditions among regional utility providers as they relate to JBLE-Langley and the City of Hampton.

Resilient Hampton Principles
Layer Public Benefits, Strengthen Partnerships, Use Best Data, Share Knowledge and Resources

Resilient Hampton Values
Safe, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 12.1
Establish a process for meeting, review, and communication among JBLE-Langley, the City of Hampton, and all utility providers with the goal of strategic operations and maintenance of systems that serve the base. This builds upon the series of meetings held in Spring 2018 with regional utility providers. Determine how the City can support JBLE-Langley and the utility systems.

Action 12.2
Manage assets in order to prioritize the most critical systems with the most need for optimizing operations and maintenance. Coordinate operations and maintenance plans with the City to schedule utility repairs or upgrades with City projects to effectively group construction work.

Lead Agency
JBLE-Langley
City of Hampton
Utility providers

Total ROM Cost
<$50,000

Priority
Short-Medium term

Funding
Staff Time and Resources

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	■
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	■
City of Poquoson	■
York County	■
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	■
NASA	
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	■
Long Term	

Lead Agency = ■

Utilities (continued)

12. Establish regular coordination among regional utility providers (continued)

Potential Partners

City of Newport News
York County
Poquoson
VDOT

For more information, reference pages 16-17, 52-55

Utilities (continued)

13. Identify interdependencies among utilities

Strategy
Identify interdependencies among utilities serving JBLE-Langley and coordinate resilient upgrades, specifically between power and data.

Resilient Hampton Principles
Layer Public Benefits, Strengthen Partnerships, Use Best Data, Share Knowledge and Resources

Resilient Hampton Values
Safe, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 13.1
Continue existing conversations between utility providers that were begun in Spring 2018, and study how different systems depend on each other, in which scenarios these relationships may fail to maintain mission readiness, and which measures can be implemented to improve overall resilience. Consider systems such as smart grids, microgrids, and renewable energy. Prioritize changes to the most vulnerable systems.

Lead Agency
JBLE-Langley
City of Hampton
Utility providers

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources

Potential Partners
City of Newport News
City of Poquoson
VDOT
York County

For more information, reference pages 52-55

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	■
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	■
Outside JBLE-Langley	
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	■
City of Poquoson	■
York County	■
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	■
NASA	
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Utilities (continued)

14. Secure infrastructure located off base or in arifield safety zones

Strategy
Secure utility systems that serve JBLE-Langley but are located off the base or within the airfield safety zones.

Resilient Hampton Principles
Reinforce Assets, Layer Public Benefits, Strengthen Partnerships

Resilient Hampton Values
Safe, Nimble, Innovative

Implementation Actions
Action 14.1
Secure Virginia Natural Gas regulators, and install video surveillance that can be monitored remotely. Identify other potentially vulnerable utility locations that are off base, and plan and implement additional security measures for those as well.

Action 14.2
Move Hampton Roads Sanitation Department (HRSD) infrastructure out of JBLE-Langley's flight path.

Lead Agency
JBLE-Langley
Hampton Roads Sanitation Department (HRSD)
Virginia Natural Gas
Utility providers

Total ROM Cost
>$50,000

Priority
Medium term

Funding
Emergency Management Performance Grant Program, Project Grant
Hazard Mitigation Grant Program

Potential Partners
City of Hampton
Virginia Department of Emergency Management (VDEM)

For more information, reference pages 50-51

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	
Sufficient	
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	
Other (see text)	■
ROM COST	
< $50,000	
> $50,000	
> $1,000,000	■
PRIORITY	
Short Term	
Medium Term	■
Long Term	

Lead Agency = ■

Utilities (continued)

15. Decouple or harden utilities

Strategy
Decouple utilities from structures that are vulnerable or at risk in certain scenarios, such as flooding or winter weather, or harden utilities to improve protection.

Resilient Hampton Principles
Reinforce Assets, Layer Public Benefits, Strengthen Partnerships

Resilient Hampton Values
Safe, Nimble, Innovative

Implementation Actions
Action 15.1
Remove existing Newport News Water Works lines that serve JBLE-Langley from the N. King Street bridge, and reinstall in a more resilient manner at a different location.

Action 15.2
Evaluate other infrastructure that serves JBLE-Langley, identify potential vulnerabilities, and decouple or harden.

Lead Agency
JBLE-Langley
Newport News Water Works

Total ROM Cost
>$50,000

Priority
Medium term

Funding
Emergency Management Performance Grant Program, Project Grant
Hazard Mitigation Grant Program

Potential Partners
City of Hampton
Virginia Department of Emergency Management (VDEM)

For more information, reference pages 52-53

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	
Sufficient	
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	■
Outside JBLE-Langley	
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	
Other (see text)	■
ROM COST	
< $50,000	
> $50,000	■
> $1,000,000	
PRIORITY	
Short Term	
Medium Term	■
Long Term	

Lead Agency = ■

Land Use

16. Re-zone parcels adjacent to aircraft approach zones

Strategy
Consider comprehensive rezoning of parcels and land use adjacent to the JBLE-Langley aircraft approach zones to prevent incompatible land uses, and strategically focus development that would benefit both the City and the base.

Resilient Hampton Principles
Create Value-Driven Solutions, Reinforce Assets, Layer Public Benefits, Strengthen Partnerships, Use Best Data

Resilient Hampton Values
Safe, Natural, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 16.1
Create a JBLE-Langley Airfield Safety Zone overlay district in the City zoning ordinance. The goals of this overlay district are to primarily prevent incompatible land uses in future development, and to encourage compatible uses. This effort includes promoting land uses that would support JBLE-Langley, such as stormwater storage or green infrastructure on adjacent City owned land that would comply with BASH initiatives. Explore and encourage land uses that could also potentially benefit the City.

Lead Agency
City of Hampton

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources

Potential Partners
JBLE-Langley

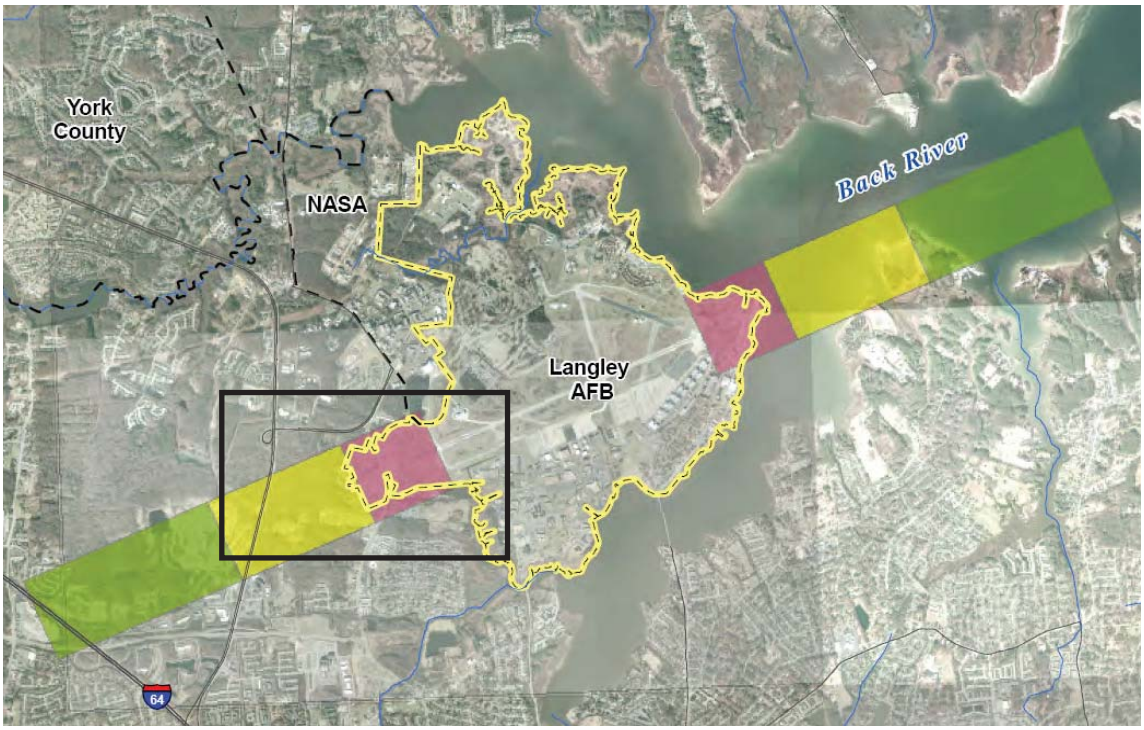
For more information, reference pages 16-17, 33, 34, 54-55, 80-81

PRINCIPLES	
Create Value-Driven Solutions	■
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	■
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	■
Outside JBLE-Langley	
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	
Other (see text)	
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Land Use (continued)

16. Re-zone parcels adjacent to aircraft approach zones (continued)



Left: Air Operations Safety Zones map with outline of area where the City of Hampton is implementing an effort to acquire parcels of land in order to prevent incompatible land use. The City then transfers the land to JBLE-Langley.
Image source: Hampton-Langley Joint Land Use Study, 2010

Legend

Safety Zones

- Clear Zone
- APZ I
- APZ II
- Jurisdictional Boundary
- Langley AFB
- parcel acquisition area

Land Use (continued)

17. Explore compatible land uses in aircraft approach zones

Strategy
Explore opportunities to make undeveloped sites in the JBLE-Langley aircraft approach zones into productive and compatible land uses.

Resilient Hampton Principles
Create Value-Driven Solutions, Reinforce Assets, Layer Public Benefits, Strengthen Partnerships, Use Best Data

Resilient Hampton Values
Safe, Natural, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 17.1
Study existing conditions, including soils, drainage, vegetation, utilities, and relationships to adjacent parcels to determine if parcels where buildings are not compatible per JBLE-Langley may be candidates for other compatible uses, such as agriculture, stormwater storage, or renewable energy infrastructure.

Lead Agency
City of Hampton

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources

Potential Partners
JBLE-Langley

For more information, reference pages 16-17, 33, 34, 54-55, 80-81

PRINCIPLES	
Create Value-Driven Solutions	■
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	■
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	■
Outside JBLE-Langley	
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	
Other (see text)	
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Land Use (continued)

18. Establish support for strategic relocation to higher ground

Strategy
Plan for JBLE-Langley's strategic relocation or expansion of structures, utilities, circulation, and other systems to recently acquired City owned parcels that are on higher ground or that have lower groundwater levels. Reduce potential conflicts with the locations of existing utility systems and JBLE-Langley's mission readiness, including airfield safety zones.

Resilient Hampton Principles
Reinforce Assets, Layer Public Benefits, Strengthen Partnerships

Resilient Hampton Values
Safe, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 18.1
Create a process for ongoing collaboration between the City and JBLE-Langley to determine which components of the base would be candidates for relocation or expansion, to which parcels, and how that would be implemented. Potential projects should be coordinated with utility service providers to yield multiple benefits. Use the matrix that describes the vulnerability of each structure on JBLE-Langley from Recommendation 11.

Lead Agency
City of Hampton
JBLE-Langley
JLUS Implementation Committee

Total ROM Cost
<$50,000

Priority
Short term

Funding
Emergency Management Performance Grant Program, Planning Grant

Potential Partners
Utility providers
Department of Defense
JBLE-Langley
NASA LaRC
Virginia Department of Emergency Management (VDEM)

PRINCIPLES	
Create Value-Driven Solutions	■
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	■
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	
Both	■
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	■
HRTPO	
VDOT	
NASA	■
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

For more information, reference pages 16-17, 54-55, 80-81

Land Use (continued)

19. Acquire remaining land in airfield safety zone and adjacent parcels, and transfer to JBLE-Langley

Strategy
Complete implementing the land acquisition program as described in the 2010 JLUS.

Resilient Hampton Principles
Create Value-Driven Solutions, Reinforce Assets, Layer Public Benefits, Strengthen Partnerships, Use Best Data

Resilient Hampton Values
Safe, Natural, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 19.1
Prioritize purchasing remaining parcels that are identified in the City of Hampton's land acquisition plan for the JBLE-Langley aircraft approach zone. Additional parcels that are adjacent to the aircraft approach zone are also advantageous to acquire per the overlay district in Recommendation 16. Use the Readiness and Environmental Protection Integration (REPI) program as a process and source of funding to acquire these parcels.

Lead Agency
City of Hampton
JLUS Implementation Committee

Total ROM Cost
>$1,000,000

Priority
Medium term

Funding
Unassigned Projects

Potential Partners
JBLE-Langley
Virginia Department of Emergency Management (VDEM)

For more information, reference pages 114-117

PRINCIPLES	
Create Value-Driven Solutions	■
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	■
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	■
Outside JBLE-Langley	
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	■
HRTPO	
VDOT	
NASA	
Other (see text)	
ROM COST	
< $50,000	
> $50,000	
> $1,000,000	■
PRIORITY	
Short Term	
Medium Term	■
Long Term	

Lead Agency = ■

Land Use (continued)

20. Identify and support compatible community redevelopment

Strategy
Identify and support locations for strategic and equitable community development near JBLE-Langley.

Resilient Hampton Principles
Create Value-Driven Solutions, Reinforce Assets, Layer Public Benefits, Strengthen Partnerships, Use Best Data

Resilient Hampton Values
Equitable, Heritage, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 20.1
Locate existing properties or parcels that are adjacent to, or near, entry gates at JBLE-Langley, or adjacent to key corridors that personnel would use. Identify commercial or service needs that could be located, or relocated from on the base, to these areas. Prioritize locally owned businesses and services that would also benefit the adjacent community. Also prioritize equitable development or redevelopment that would benefit more marginalized communities. Support this effort within the City's regulatory process, such as through amending existing zoning districts.

Lead Agency
City of Hampton

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources

Potential Partners
JBLE-Langley
JLUS Implementation Committee

For more information, reference pages 40-43

PRINCIPLES	
Create Value-Driven Solutions	■
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	
VALUES	
Safe	
Equitable	■
Natural	
Heritage	■
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	■
HRTPO	
VDOT	
NASA	
Other (see text)	
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Transportation

21. Determine which roadways are designated as high priorities for JBLE-Langley

Strategy
Determine which roadways should be designated as high priorities to maintain and improve by analyzing which routes JBLE-Langley staff use most frequently when commuting to reach and leave the base.

Resilient Hampton Principles
Layer Public Benefits, Strengthen Partnerships, Use Best Data

Resilient Hampton Values
Safe, Sufficient, Innovative

Implementation Actions
Action 21.1
Partner with the Hampton Roads Transportation Planning Organization to collect 9 digit zip code data, which provides a more detailed layer of information than the currently available 5 digit zip code data, which is at a larger scale. Determine which routes are most often used, and select roadways that are most critical to JBLE-Langley commuters. Make a plan to maintain, and improve if necessary, these high priority roads.

Lead Agency
City of Hampton
HRTPO

Total ROM Cost
<$50,000

Priority
Short term

Funding
Staff Time and Resources
Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Planning Grant

Potential Partners
JBLE-Langley
City of Newport News
City of Poquoson
VDOT
York County

For more information, reference pages 66-74, 78, 80-81

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	
Sufficient	■
Nimble	
Innovative	■
LOCATION	
Inside JBLE-Langley	■
Outside JBLE-Langley	
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	■
City of Poquoson	■
York County	■
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	■
NASA	
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Transportation (continued)

22. Establish a plan to maintain access of key corridors

Strategy
Establish a plan to coordinate maintaining access of key corridors that serve JBLE-Langley, particularly during emergency situations.

Resilient Hampton Principles
Layer Public Benefits, Strengthen Partnerships, Use Best Data

Resilient Hampton Values
Safe, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 22.1
Identify primary roadways that lead to JBLE-Langley, and create a plan to prioritize maintaining access of those roadways during a range of potential scenarios where access is partially or completely impacted, such as from flooding, to snow, or traffic backup. The plan should also include a process to coordinate among neighboring municipalities, agencies, and VDOT.

Lead Agency
City of Hampton
City of Newport News
City of Poquoson
VDOT
York County

Total ROM Cost
<$50,000

Priority
Short term

Funding
Emergency Management Performance Grant Program
Staff Time and Resources
Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Planning Grant

Potential Partners
JBLE-Langley
Other adjacent municipalities
Virginia Department of Emergency Management (VDEM)

For more information, reference pages 66-74, 78

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	■
Outside JBLE-Langley	
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	■
City of Poquoson	■
York County	■
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	■
NASA	
Other (see text)	
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	■
Medium Term	
Long Term	

Lead Agency = ■

Transportation (continued)

23. Use data collected to report traffic and access issues

Strategy
Use the data collected in the previously described monitoring system to report traffic access issues with the City of Hampton and JBLE-Langley, such as flooding, snow, or an accident.

Resilient Hampton Principles
Layer Public Benefits, Strengthen Partnerships, Use Best Data

Resilient Hampton Values
Safe, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 23.1
Establish a process where data sensors notify the City of Hampton and JBLE-Langley when and where a traffic access issue is occurring, and what type, and to what extent. This system could also prioritize traffic signals on key routes in order to create consecutive green lights that would accommodate an effective flow of vehicles. Improving traffic movement is particularly important for JBLE-Langley during morning and evening rush hours.

Lead Agency
JBLE-Langley
City of Hampton

Total ROM Cost
>$50,000

Priority
Medium term

Funding
Staff Time and Resources
Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Planning Grant

Potential Partners
City of Newport News
HRTPO
Poquoson
VDOT
York County

For more information, reference pages 68, 71, 72, 74, 76, 78

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	■
City of Poquoson	■
York County	■
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	■
VDOT	■
NASA	
Other (see text)	
ROM COST	
< $50,000	
> $50,000	■
> $1,000,000	
PRIORITY	
Short Term	
Medium Term	■
Long Term	

Lead Agency = ■

Transportation (continued)

24. Add a new route to a new base entry gate

Strategy
Create a new entry gate with access and services from new or improved City roadways to alleviate traffic backup and improve safety.

Resilient Hampton Principles
Reinforce Assets, Layer Public Benefits, Strengthen Partnerships

Resilient Hampton Values
Safe, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 24.1
Add new, or improve existing, City streets to create a new route to a new gate that would be designed to be flood-secure and for daily use, similar in capacity to the Armistead Avenue entry. Locate the new route and gate where existing issues with heavy traffic and backup could be alleviated. Designed the new gate and access roadway with complete streets standards.

Lead Agency
JBLE-Langley
City of Hampton

Total ROM Cost
>$1,000,000

Priority
Medium-Long term

Funding
Coastal Resilience Grants for Coastal Communities
Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Project Grant

Potential Partners
VDOT
Utility providers

For more information, reference pages 80-81

PRINCIPLES	
Create Value-Driven Solutions	
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	■
NASA	
Other (see text)	■
ROM COST	
< $50,000	
> $50,000	
> $1,000,000	■
PRIORITY	
Short Term	
Medium Term	■
Long Term	■

Lead Agency = ■

Transportation (continued)

25. Redesign N. Armistead Avenue gate with complete streets standards

Strategy
Incorporate complete streets design standards at the N. Armistead Avenue entry gate, along with other entry gates and access points, to be safer and to better interface with City roads and multimodal transit options.

Resilient Hampton Principles
Create Value-Driven Solutions, Reinforce Assets, Layer Public Benefits, Strengthen Partnerships

Resilient Hampton Values
Safe, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 25.1
Coordinate the planned redesign of the Armistead Avenue entry gate to better accommodate all types of vehicular traffic, and access routes for pedestrians, bicyclists, and public transit riders, including a bus stop. Determine if relocating the N. Armistead Avenue entry gate is more beneficial than redesigning in its current location. Consider redesigning the other existing JBLE-Langley entry gates to similar standards.

Lead Agency
JBLE-Langley

Total ROM Cost
>$50,000

Priority
Medium term

Funding
Coastal Resilience Grants for Coastal Communities

Potential Partners
City of Hampton
Utility providers

For more information, reference pages 70-71

PRINCIPLES	
Create Value-Driven Solutions	■
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	
Both	■
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	
Other (see text)	■
ROM COST	
< $50,000	
> $50,000	■
> $1,000,000	
PRIORITY	
Short Term	
Medium Term	■
Long Term	

Lead Agency = ■

Transportation (continued)

26. Create a network of circular transit

Strategy
Create a circular transit network on JBLE-Langley that effectively moves personnel, and connects to multimodal transit options off the base, including potential water based options.

Resilient Hampton Principles
Create Value-Driven Solutions, Reinforce Assets

Resilient Hampton Values
Safe, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 26.1
Design and implement a shuttle system to effectively move personnel across the base to key locations, as well as to minimize vehicular traffic and congestion. This intra-base transit could include park and ride, express shuttles between specific locations, a loop around the base, a water taxi, and additional capacity during inclement weather or other occasional events. Explore funding sources to pilot innovative technologies, such as the electric shuttles that NASA LaRC received for free. Also include an outreach strategy in order to encourage drivers to use the shuttle more instead of their cars.

Action 26.2
Study the feasibility of water based transportation that uses the new fuel pier on the base as the first in a network of waterside connections. A water taxi or shuttle system that uses the fuel pier would be able to ferry passengers around the base to other points, such as smaller new piers located near key facilities. Water based transit would potentially serve as a detour route or for evacuation if roadways were impacted during an event. Establish an effective security process for watercraft and passengers in order to maintain safety.

Lead Agency
JBLE-Langley

Total ROM Cost
>$50,000

Priority
Medium term

Funding
Emergency Management Performance Grant Program

PRINCIPLES	
Create Value-Driven Solutions	■
Reinforce Assets	■
Layer Public Benefits	
Strengthen Partnerships	
Use Best Data	
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	■
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	■
Outside JBLE-Langley	
Both	
RESPONSIBILITY	
City of Hampton	
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	
Other (see text)	■
ROM COST	
< $50,000	
> $50,000	■
> $1,000,000	
PRIORITY	
Short Term	
Medium Term	■
Long Term	

Lead Agency = ■

Transportation (continued)

26. Create a network of circular transit (continued)

Potential Partners

Department of Defense
Department of Energy
Hampton Roads Transportation Planning Organization
Virginia Department of Emergency Management (VDEM)

For more information, reference pages 68, 78-79

Water

27. Develop a stormwater management plan

Strategy
Create a plan to manage stormwater throughout the City of Hampton, and identify opportunity sites.

Resilient Hampton Principles
Create Value-Driven Solutions, Reinforce Assets, Layer Public Benefits, Strengthen Partnerships, Share Knowledge and Resources

Resilient Hampton Values
Safe, Natural, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 27.1
Develop a plan to manage stormwater in ways that benefit both the City of Hampton and JBLE-Langley. Opportunity sites include parcels that are adjacent to the airfield compatible use zones, which are prioritized in Recommendations 16 and 17. Big Bethel Reservoir is another site that may be able to hold a significant amount of stormwater to alleviate flooding downstream.

Action 27.2
Study and determine appropriate implementation strategies for modifications of Big Bethel Reservoir, including impacts downstream and upstream. Evaluate the existing dam system to confirm their condition, and how they might be modified or removed. Evaluate if recreating a more natural edge along the reservoir would improve water quality and create habitat. Confirm that modifying the reservoir to hold additional stormwater would reduce the burden on the existing drainage system and alleviate flooding.

Action 27.3
Determine the ownership extent and respective regulatory requirements of each of the three municipalities that intersect at the reservoir, including the City of Hampton, the City of Newport News, and York County.

Lead Agency:
City of Hampton

Total ROM Cost
>$50,000

Priority
Medium term

PRINCIPLES	
Create Value-Driven Solutions	■
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	
Share Knowledge & Resources	■
VALUES	
Safe	■
Equitable	
Natural	
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	■
Both	
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	
Other (see text)	■
ROM COST	
< $50,000	
> $50,000	■
> $1,000,000	
PRIORITY	
Short Term	
Medium Term	■
Long Term	

Lead Agency = ■

Water (continued)

27. Develop a stormwater management plan (continued)

Funding
Emergency Management Performance Grant Program, Planning Grant

Potential Partners
JBLE-Langley
City of Newport News
Virginia Department of Emergency Management (VDEM)
Virginia Department of Environmental Quality
York County

For more information, reference pages 32, 35

Water (continued)

28. Manage stormwater off the base in City owned land

Strategy
Explore opportunities to manage stormwater off the base in adjacent City owned land to alleviate flooding on or near JBLE-Langley.

Resilient Hampton Principles
Create Value-Driven Solutions, Reinforce Assets, Layer Public Benefits, Strengthen Partnerships, Share Knowledge and Resources

Resilient Hampton Values
Safe, Natural, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 28.1
Minimize the potential for BASH by locating areas for stormwater storage away from the JBLE-Langley airfield safety zones.

Action 28.2
Strategically locate sites for stormwater storage in coordination with the previously described zoning overlay district to avoid incompatible land use, and to plan with potential future development. Also survey potential sites for groundwater levels, soil types, and existing utilities.

Action 28.3
Design and construct stormwater management pilot projects on City owned land that is adjacent to JBLE-Langley airfield safety zones. Study the impacts to determine where benefits are achieved. Create an operations and maintenance plan and leverage funding sources to implement. Develop a plan to design and construct additional stormwater management projects on other City owned sites.

Lead Agency
City of Hampton

Total ROM Cost
>$50,000

Priority
Medium term

PRINCIPLES	
Create Value-Driven Solutions	■
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	
Share Knowledge & Resources	■
VALUES	
Safe	■
Equitable	
Natural	■
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	
Both	■
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	
York County	
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	
Other (see text)	
ROM COST	
< $50,000	
> $50,000	■
> $1,000,000	
PRIORITY	
Short Term	
Medium Term	■
Long Term	

Lead Agency = ■

Water (continued)

28. Manage stormwater off the base in City owned land (continued)

Funding

Emergency Management Performance Grant Program, Project Grant
Hazard Mitigation Grant Program
Flood Mitigation Assistance Program

Potential Partners

JBLE-Langley
Virginia Department of Emergency Management (VDEM)

For more information, reference pages 32-35, 116

Water (continued)

29. Coordinate ecological improvements with base development

Strategy
Coordinate wetlands and coastal edge restoration and other ecological improvements with waterside base development.

Resilient Hampton Principles
Create Value-Driven Solutions, Reinforce Assets, Layer Public Benefits, Strengthen Partnerships, Use Best Data

Resilient Hampton Values
Safe, Natural, Integrated, Sufficient, Nimble, Innovative

Implementation Actions
Action 29.1
Create a process to communicate planned projects and coordinate the City of Hampton's ecological goals with JBLE-Langley's mission readiness. Edge restoration projects at the base, such as living shorelines or oyster reefs, provide multiple co-benefits by buffering waves and reducing erosion, in addition to improving ecosystem functions.

Action 29.2
Coordinate with JBLE-Langley on projects and other initiatives that restore wetlands edges. These efforts include establishing new wetlands further away from the base to make up filling on-base, determining locations on-base that would be suitable to host enhanced wetlands while complying with BASH policies, and prioritizing ecological improvements in general.

Action 29.3
Continue to support aquaculture in Hampton's waters, and explore potential locations for oyster leases and ocean farming in the Back River near JBLE-Langley. Aquaculture near JBLE-Langley is intended primarily for ecological benefit to improve water quality, but if coordinated with base operations, has the potential for compatible economic development as well.

Action 29.4
Coordinate potential aquaculture activities, including leases, access, and harvesting, with JBLE-Langley's operations, such as water based traffic, waterside access, and planned development. Also coordinate navigation requirements and agency regulation.

Lead Agency
JBLE-Langley
City of Hampton

PRINCIPLES	
Create Value-Driven Solutions	■
Reinforce Assets	■
Layer Public Benefits	■
Strengthen Partnerships	■
Use Best Data	■
Share Knowledge & Resources	
VALUES	
Safe	■
Equitable	
Natural	■
Heritage	
Integrated	■
Sufficient	■
Nimble	■
Innovative	■
LOCATION	
Inside JBLE-Langley	
Outside JBLE-Langley	
Both	■
RESPONSIBILITY	
City of Hampton	■
JBLE-Langley	■
City of Newport News	
City of Poquoson	■
York County	■
Commonwealth of Virginia	
JLUS Implementation Commit.	
HRTPO	
VDOT	
NASA	
Other (see text)	■
ROM COST	
< $50,000	■
> $50,000	
> $1,000,000	
PRIORITY	
Short Term	
Medium Term	■
Long Term	

Lead Agency = ■

Water (continued)

29. Coordinate ecological improvements with base development (continued)

Total ROM Cost
<$50,000

Priority
Medium term

Funding
Staff Time and Resources

Potential Partners
US Army Corps of Engineers
Virginia Department of Environmental Quality
Other environmental science organizations

For more information, reference pages 32-35, 42, 45

Recommendation Summary

Recommendation	Number	Lead Responsible Agency
Policy		
Establish & implement regional design standards for sea level rise	1	City of Hampton, with partners
Expand coordination and partnerships among agencies	2	City of Hampton, with partners
Enact policies to better coordinate studies and projects	3	City of Hampton, with partners
Incorporate JLUS Implementation into Resilient Hampton effort	4	City of Hampton
Incorporate JLUS implementation as a responsibility of Hampton Resiliency Partnership	5	JLUS Addendum Implementation Committee
Emergency and Recovery Planning		
Promote a shared culture of preparedness among all partners	6	City of Hampton
Develop enhanced multimedia emergency notifications & warnings	7	City of Hampton
Establish & implement emergency management & recovery plans	8	JBLE-Langley and City of Hampton
Data Collection and Analysis		
Determine data needs for collection & monitoring, establish systems to collect	9	JBLE-Langley and City of Hampton
Continue to expand partnerships with innovation research entities	10	City of Hampton
Assess vulnerability, and create a plan for key assets on JBLE-Langley and off base	11	JBLE-Langley
Utilities		
Establish regular coordination among regional utility providers	12	JBLE-Langley, City of Hampton, and Utility Providers
Identify interdependencies among utilities	13	JBLE-Langley, City of Hampton, and Utility Providers
Secure infrastructure located off base or in airfield safety zones	14	JBLE-Langley, Utility providers, and Virginia Natural Gas
Decouple or harden utilities	15	JBLE-Langley and Newport News Water Works
Land Use		
Re-zone parcels adjacent to aircraft approach zones	16	City of Hampton
Explore compatible land uses in aircraft approach zones	17	City of Hampton
Establish support for strategic relocation to higher ground	18	JBLE-Langley and JLUS Implementation Committee
Acquire remaining land in airfield safety zone and adjacent parcels	19	City of Hampton and JLUS Implementation Committee
Identify and support compatible community redevelopment	20	City of Hampton
Transportation		
Determine which roadways are designated as high priorities for JBLE-Langley	21	City of Hampton and Hampton Roads Transportation
Establish a plan to maintain access of key corridors	22	Cities of Hampton, Newport News, Poquoson, VDOT, York County
Use data collected to report traffic and access issues	23	JBLE-Langley and City of Hampton
Add new route to a new base entry gate	24	JBLE-Langley and City of Hampton
Redesign N. Armistead Avenue gate with complete streets standards	25	JBLE-Langley
Create a network of circular transit	26	JBLE-Langley
Water		
Develop a stormwater management plan	27	City of Hampton
Manage stormwater off the base in City owned land	28	City of Hampton
Coordinate ecological improvements with base development	29	JBLE-Langley and City of Hampton

Next Steps

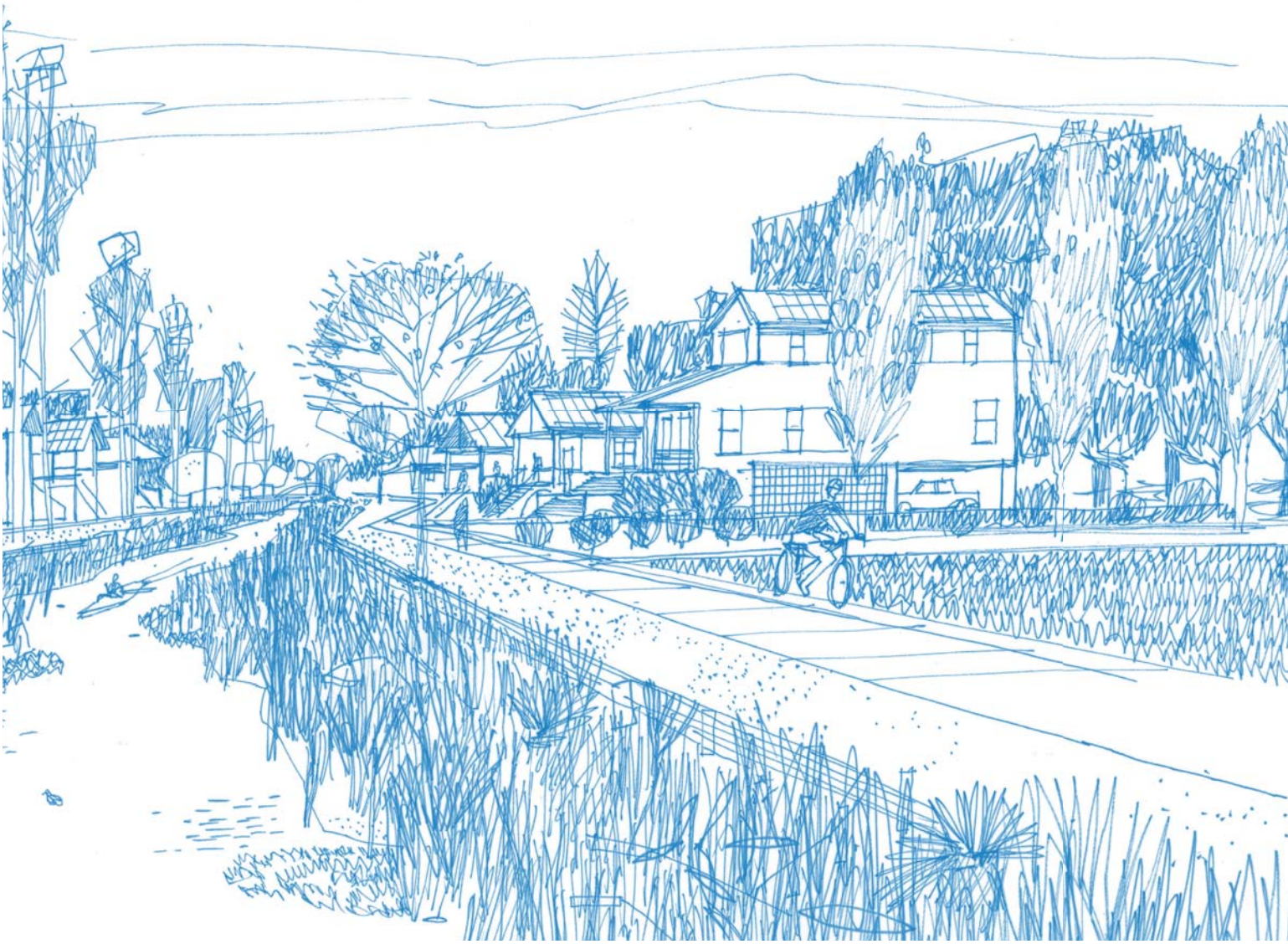
As the City of Hampton continues to evolve and move forward with its Resilient Hampton initiative, it will be critical to our success for our key community partners to join us in this effort. JBLE-Langley and the City of Hampton have a long history of mutual support and collaboration; it's no surprise that the first joint resiliency effort, Resilient Hampton Phase I Report, was successfully adopted by City Council in January 2018.

Residents of Hampton, together with City staff and the consultant team, discuss during a Resilient Hampton community engagement event.

This latest document represents the next step in this partnership to help define how JBLE-Langley and the City of Hampton will work together to achieve our mutual resiliency goals. With adoption and implementation of the Joint Land Use Study Addendum, the City of Hampton has a remarkable opportunity to support JBLE-Langley and to prioritize resilient design as a catalyst for future, smarter development in the city and across other Department of Defense facilities. Hampton can serve as a role model to other coastal cities in the Virginia and the country, and also to itself. Implementing action items from this JLUS Addendum create an unprecedented chance to pursue projects that yield multiple benefits well into the future. In the face of a changing climate and increasing risks, Hampton has great potential to become a safer, smarter, and more resilient city that builds upon its centuries of innovation, education, and a culture of living with water.

Upon adoption of this Joint Land Use Study Addendum, the City of Hampton will embark on making any necessary changes to the *Hampton Community Plan* (2006 as amended) as well as any appropriate changes to our zoning ordinance. Beyond those initial actions, the City and JBLE-Langley should continue to reinforce their long standing partnership to insure the policies, projects and initiatives identified in this report remain priorities and are implemented in a collaborative fashion. JBLE-Langley should become an integral member of the Hampton Resiliency Partnership recommended in the Resilient Hampton Phase I report. This provides an organizational structure for information sharing and collaboration as we move forward with becoming a more resilient community. The Hampton Resiliency Partnership also assists in integrating the Resilient Hampton vision, values and goals into the mindset of all of our community partners to the extent practical.

A view from the N. King St. bridge heading towards JBLE-Langley represents the primary challenge for the base and the city of Hampton, as well as their greatest asset - water.

Threats posed by sea level rise and other natural risks will become more apparent and frequent. However, the strong culture of collaboration between the City of Hampton and JBLE-Langley provide a solid foundation for addressing these challenges in a proactive manner that will ensure not only the future of JBLE-Langley but also the future of the City of Hampton as a progressive and forward thinking community poised to withstand chronic and acute risks.

Hampton-Langley Air Force Base Joint Land Use Study Addendum