

Climate Resilient Infrastructure at NASA Coastal Facilities

Center Status Update

**Goddard Space Flight Center
Wallops Flight Facility**





Wallops Flight Facility





WFF Land Use



Three Major Parcels 6000 Acres

- **Wallops Main Base 1900 Acres**
- **Administrative & Technical Offices**
- **Tracking & Data Acquisition**
- **Range Control Center**
- **Ordnance Storage/Processing**
- **R&D, Processing Facilities**
- **Research Airport**
- **Navy Administration/Housing**
- **Coast Guard Housing**
- **Wallops Island 1400 Acres**
- **Launch Sites**
- **Blockhouses**
- **Radar**
- **Processing Facilities**
- **Dynamic Spin Balance**
- **Navy Operational Facilities**
- **Wallops Mainland 100 Acres**
- **Tracking & Data Acquisition**
- **Marshland 2800 Acres**



Wallops Island is Critical for GSFC and NASA Mission

First and Foremost, WFF Provides Access to Space

- WFF mission is to provide the Agency sounding rocket, balloon, airborne science, special orbital payload, and launch range services for a variety of NASA, DoD, and commercial programs
- NASA's only wholly owned Space Launch Range
- Unlike many other federal installations, a Space Launch Range requires specialized infrastructure and National Range safety requirements necessitate coastal locations for ground, flight and public safety

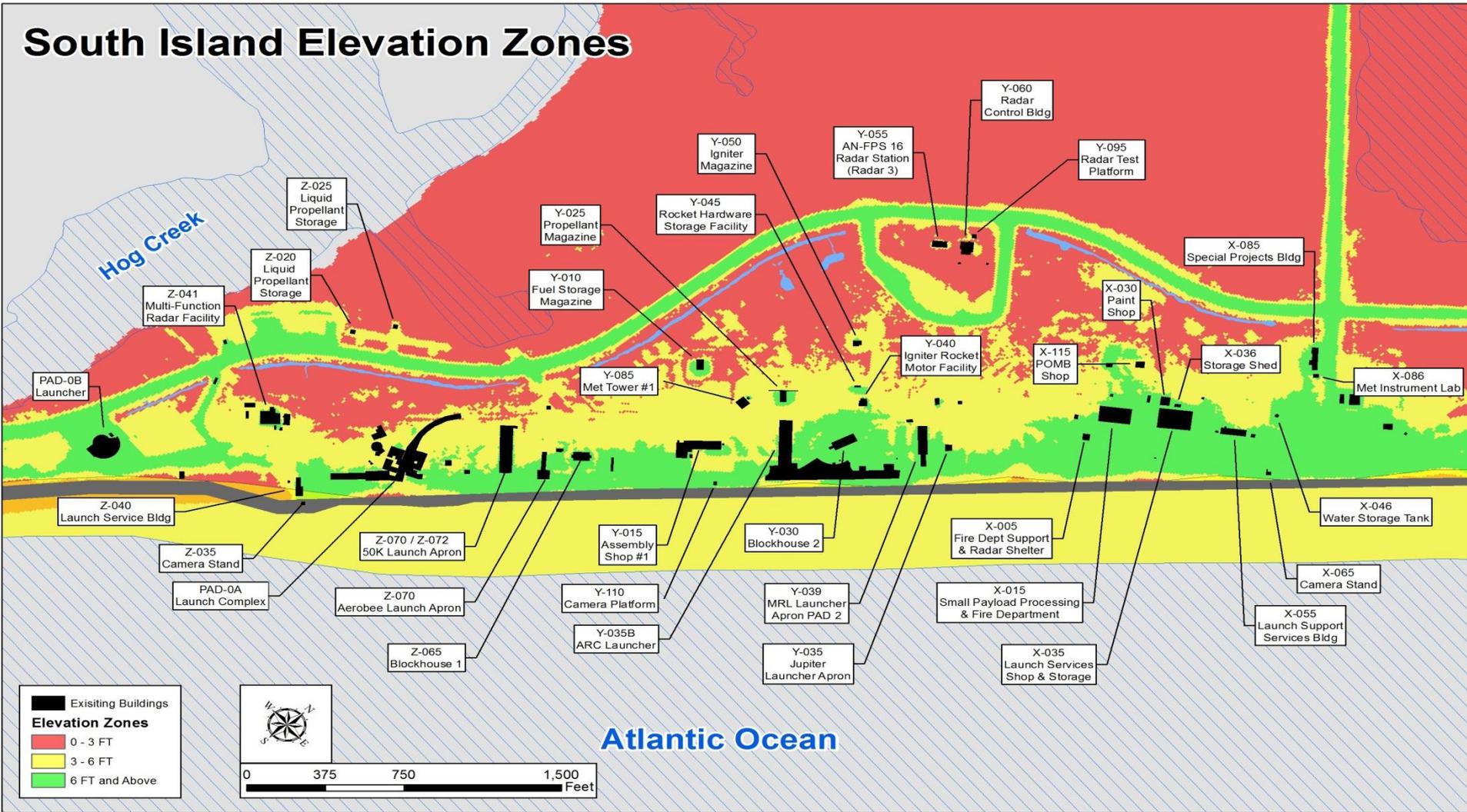
Process for Assessing Climate Risks to Center Assets

How We Assess Center Assets to Determine Climate Risks:

- WFF has been assessing the impact of sea level rise and other coastal dynamics and applying a variety of mitigation strategies on Wallops Island for 50 years.
 - Seawall, berms, groins, and beach prisms
 - Hardening and raising (11 feet AMSL) Island infrastructure
- Historic Analysis of shoreline change from daily coastal dynamics and moderate storm activity by WFF and the Corps of Engineers as part of Master Planning and shoreline protection project modeling and design
- As a result of November 2012 Agency Climate Change workshop, use Goddard Institute for Space Studies (GISS)-supplied climate prediction data and discipline-specific CASI Workshop process as a model.
 - NASA ROSES project (Agency wide survey that will be performed at WFF mid-May to conduct a LiDAR survey of Wallops, including buildings and natural features)
- Consider draft Policy for NASA Land Management provided by HQ

Process for Assessing Climate Risks To Center Assets (Planning Tool Example)

South Island Elevation Zones



Process for Assessing Climate Risks to Center Assets (cont.)

The Effort is Ongoing:

- Shoreline protection project includes long term adaptive management (50 year project life)
 - Monitoring, modeling, beach renourishment
- WFF has been granted separate CASI status to develop tools to aid facility planners to update the WFF Master Plan of the Center Master Plan (Lead Investigator: Dr. Tiffany Moisan)
 - Development of WFF CASI decision making products
 - Assigning risk to Wallops Island infrastructure under high resolution wind, storm surge, sea level rise model
 - Mitigation of weather events on launch range operations and infrastructure

How We Prioritized Our List of Assets at Risk:

- Our priority is all Island assets as Wallops Launch Range has major Agency responsibility supporting station resupply, Agency SMD science objectives and technology development initiatives

Chief Climate Impacts of Concern

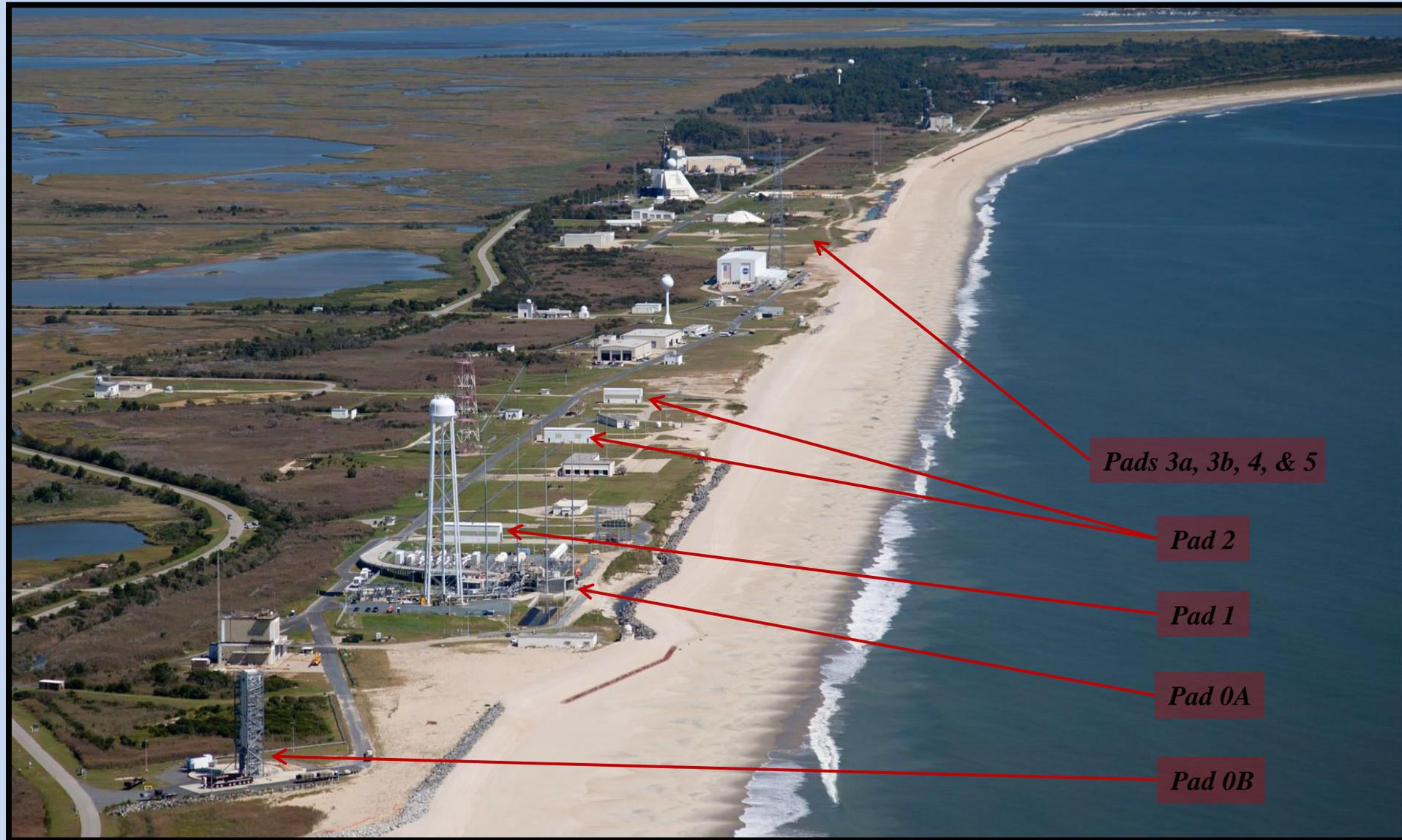
Sea Level Rise-Storm Events

- **Risk:** Mission interruption and cost due to damage/destruction of launch pads, UAS airstrip, spacecraft and vehicle processing and project support buildings, lack of readiness and reliability of all horizontal infrastructure (power and communications)
- **Timeframe:** Today

Rising Temperatures

- **Risk:** HVAC systems will require upgrade
- **Timeframe:** 2020's

Specific Risks on Wallops Island



Pads 3a, 3b, 4, & 5

Pad 2

Pad 1

Pad 0A

Pad 0B



Wallops Island Gate

Boat Basin

I&T Facilities

Navy Facilities

Range Instrumentation

Blockhouse
Wallops Island

I&T Facilities

NASA Pad 5
(Currently Inactive)

Project Support

NASA Pad 4
(Targets/Suborbital)

Blockhouses

NASA Pad 3
(Targets/Suborbital)

I&T Facilities

NASA Pad 2
(Suborbital)

NASA UAS Runway

NASA Pad 1
(Suborbital)

MARS Pad 0A
(ELV)

MARS Pad 0B
(ELV)



Major Wallops Island Facilities

Other Important Non-Infrastructure Risks

Natural Resources

- Tidal marshes west of Island inundated by 2030
- Leaves Island western shore vulnerable to flooding, erosion and marsh migration
- Expands endangered species and habitat management



Socio Economic Value to the Region

- NASA and its Partners on Wallops Island are the largest economic engine for a 3 State region on the Eastern Shore

Information Gathering or Other Efforts to Assess Risk or Plan Adaptation

What We're Doing Now, Partnering with:

- Accomack County
 - Comprehensive Plan and zoning updates to protect WFF ability to operate today and in the future
 - (and DoD) for first Non-DoD site Joint Land Use Study (JLUS)
- US Army Corps of Engineers (USACE) to evaluate beach morphology, erosion, and shoreline adaptation
- US Fish and Wildlife Services (USFWS) to monitor marsh sediment accretion rates
- College of William and Mary, University of Virginia, University of Delaware, University of MD ESSIC, The Nature Conservancy, and US Fish and Wildlife
 - GSFC is leading a team of local/regional stakeholders in DE, MD and VA to form a Coastal Zone Institute that will be a world class multi discipline capability to understand, model, and predict Mid Atlantic climate change and test adaptation strategies for both the natural and human environments in our “Living Laboratory”

Current and Proposed Adaptation Strategies

Short-Term Adaptation Strategy (now + 10 years):

- Island Land Use: No new NASA or tenant construction on Wallops Island unless essential launch range function and island location dependent
- Mainland Land Use: Reserved for infrastructure which is launch range critical support but doesn't need to be on island (but must be adjacent to Island)
- Renourish Wallops Island beach as primary part of overall adaptive management strategy to maintain primary warring surface of shoreline protection system
- Develop asset repair by replacement relocation plan within Wallops Island for more effective land use
- Elevation 11 feet AMSL of horizontal and vertical infrastructure where critical/and cost effective
- De-commission/demolish Island assets that do not meet above criteria
- Update planning with latest LiDAR/survey data, inundation models, construction guidelines
- Develop funding/financial model/budget cost-benefit analysis of options
- Include all of above, and other climate considerations in GSFC/WFF Master Plan Update



North View

Wallops Island looking north. Photo taken on 4-20-2012



North View

Wallops Island looking north. Photo taken on 8-17-2012.

Current and Proposed Adaptation Strategies (cont.)

Mid-term adaptation strategy (10-50 years):

- Evaluate relocating support facilities from island to mainland as they are repaired by replacement
- Explore asset relocation, adjacent land use, and other management strategies in current Wallops general locations
- Continue decommission/demolish

Challenges and Accomplishments

Our Biggest Challenges Thus Far Have Been:

- Upgrading NASA's only Space Launch Range to meet the Agency's increasing mission requirements on a barrier island
- Establishing a Working Capital Fund (or comparable funding stream) for Wallops Island Partners (NASA, Navy, and Mid Atlantic Regional Spaceport) to contribute ongoing funding to renourish Wallops Island beach protection

Our Best Accomplishments Thus Far Have Been:

- Completed the initial construction phase of the Shoreline Restoration Project to reduce risk to Wallops Island assets and missions
 - Repair and expansion of seawall and placement of “new” beach
- Upgrade of horizontal infrastructure to provide enhanced readiness and reliability to keep pace with significant Agency, State, and private sector investment on Wallops Island
 - Installation of two 3000kW generators **off Island** to provide Island back-up power
 - 2 Coff Projects to upgrade 50 year old electrical distribution system
 - Elevation of Island telecom hub
- Partnership commitment of external stakeholders to sustain Mid-Atlantic barrier island system for its natural and economic value to the region