

# COASTAL ENGINEERING ASPECTS OF ARCTIC DREDGING REALIZED FOR THE OIL INDUSTRY:



## TOF SEALIFT OPERATION AT CHAYVO BEACH SAKHALIN, RUSSIA

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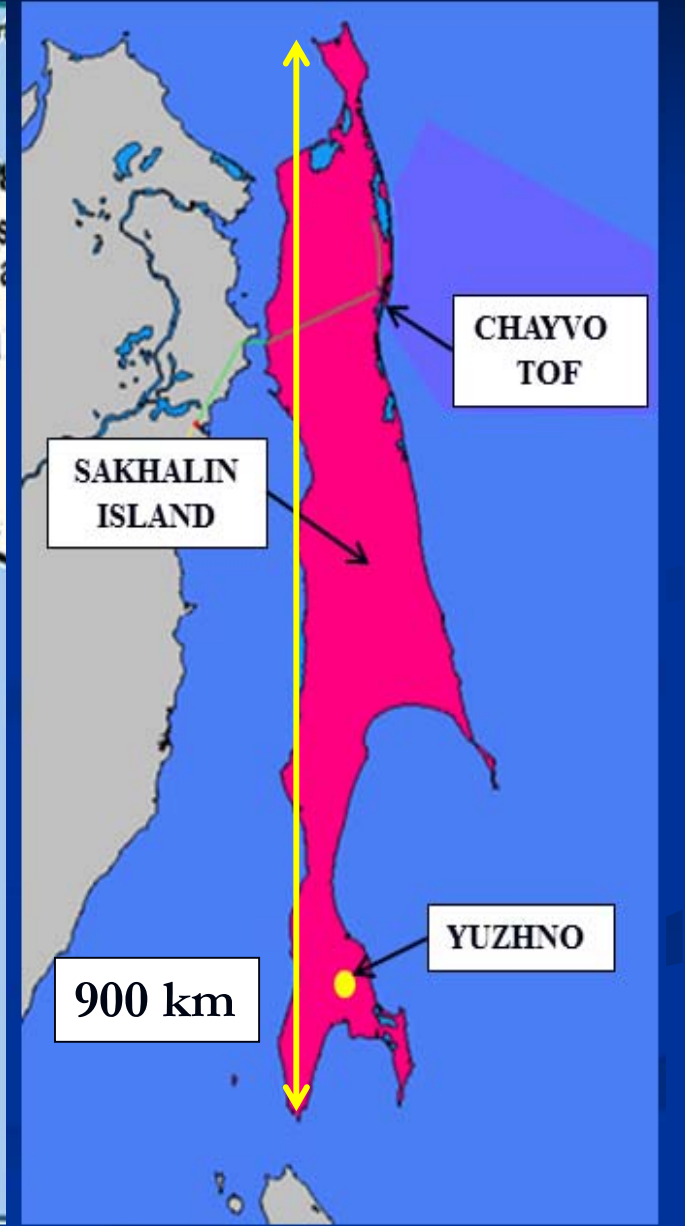
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# TOF Sealift Operation 2012

- Project Location and History
- Purpose and Goal
- Site Conditions
- Coastal Engineering Analysis
- Dredging Design
- Construction
- 2012 Module Delivery



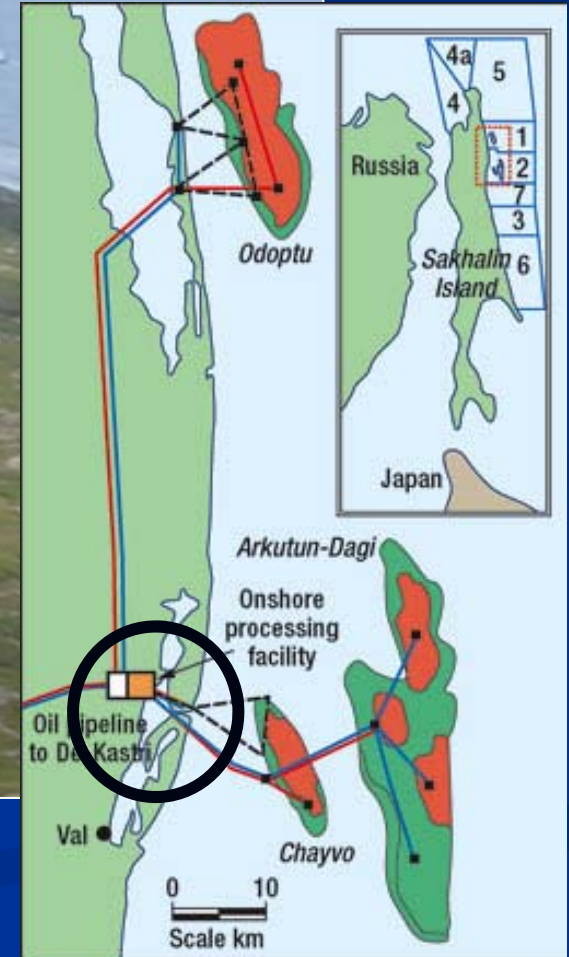
# Project Location





# Site Location

2002



# Site History - 2002



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# Site History - 2002



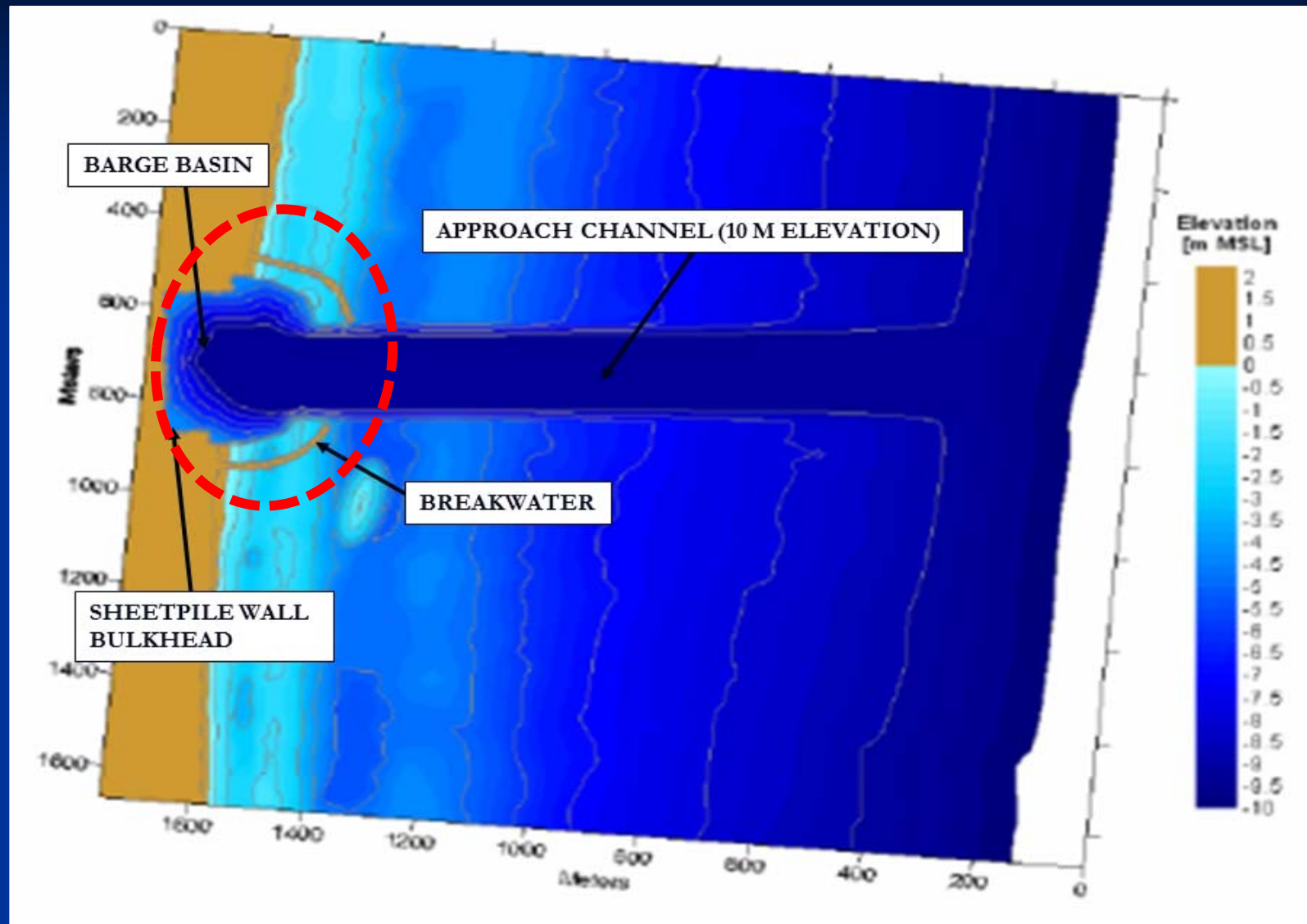
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# Site History - 2005



# Site History - July 2005



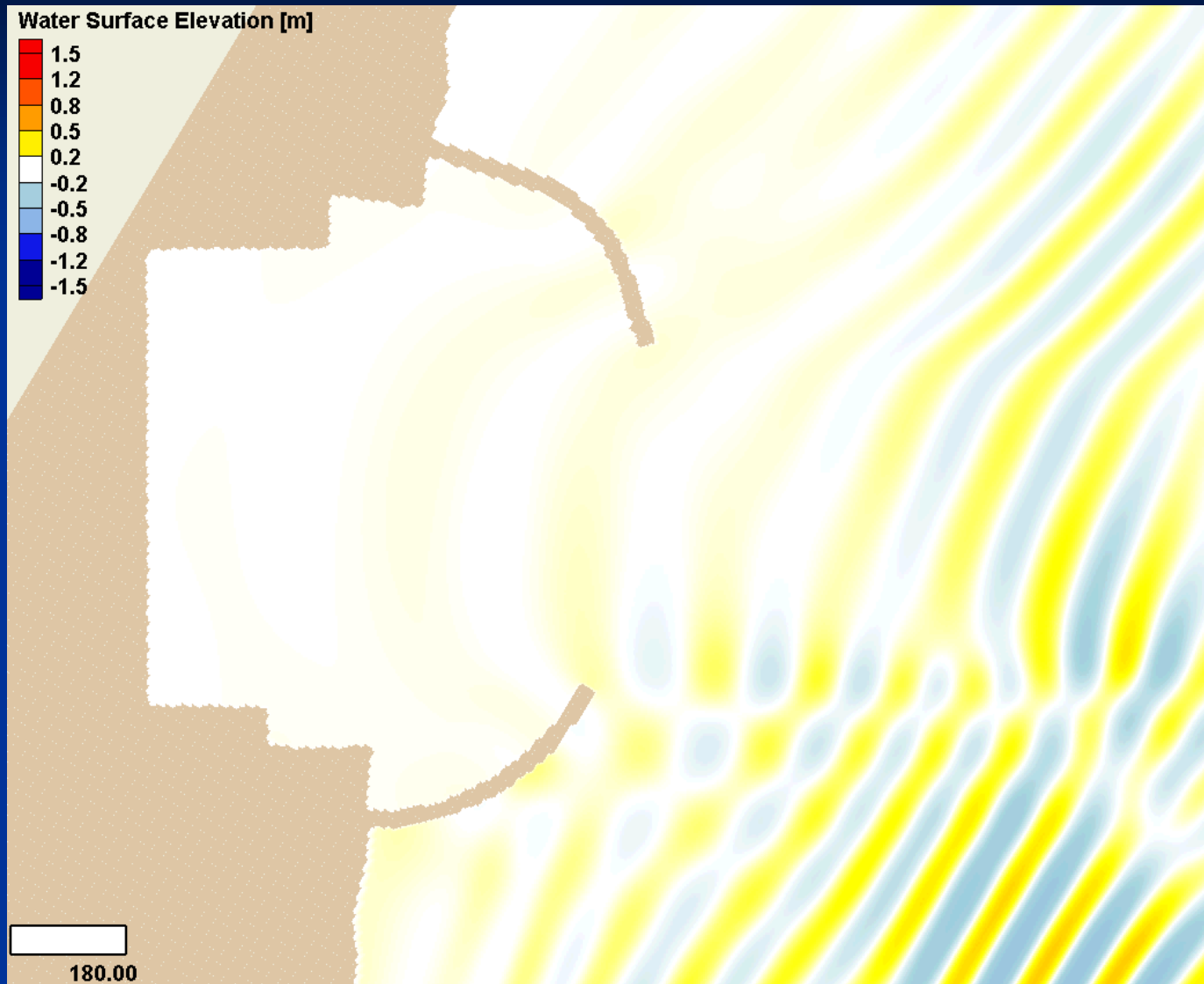
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# CHE Hydrodynamic Modeling



# Site History - July 2005



**2006 Module delivery**





# Site History - December 2005



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# Site History - December 2005



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# Site History - December 2005



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# CHE - 2010



# 2012 Project Goal



- Limited timeframe for 2012 work
- Modules ready by late spring
- Dredging complete by June
- Fully functional by mid August



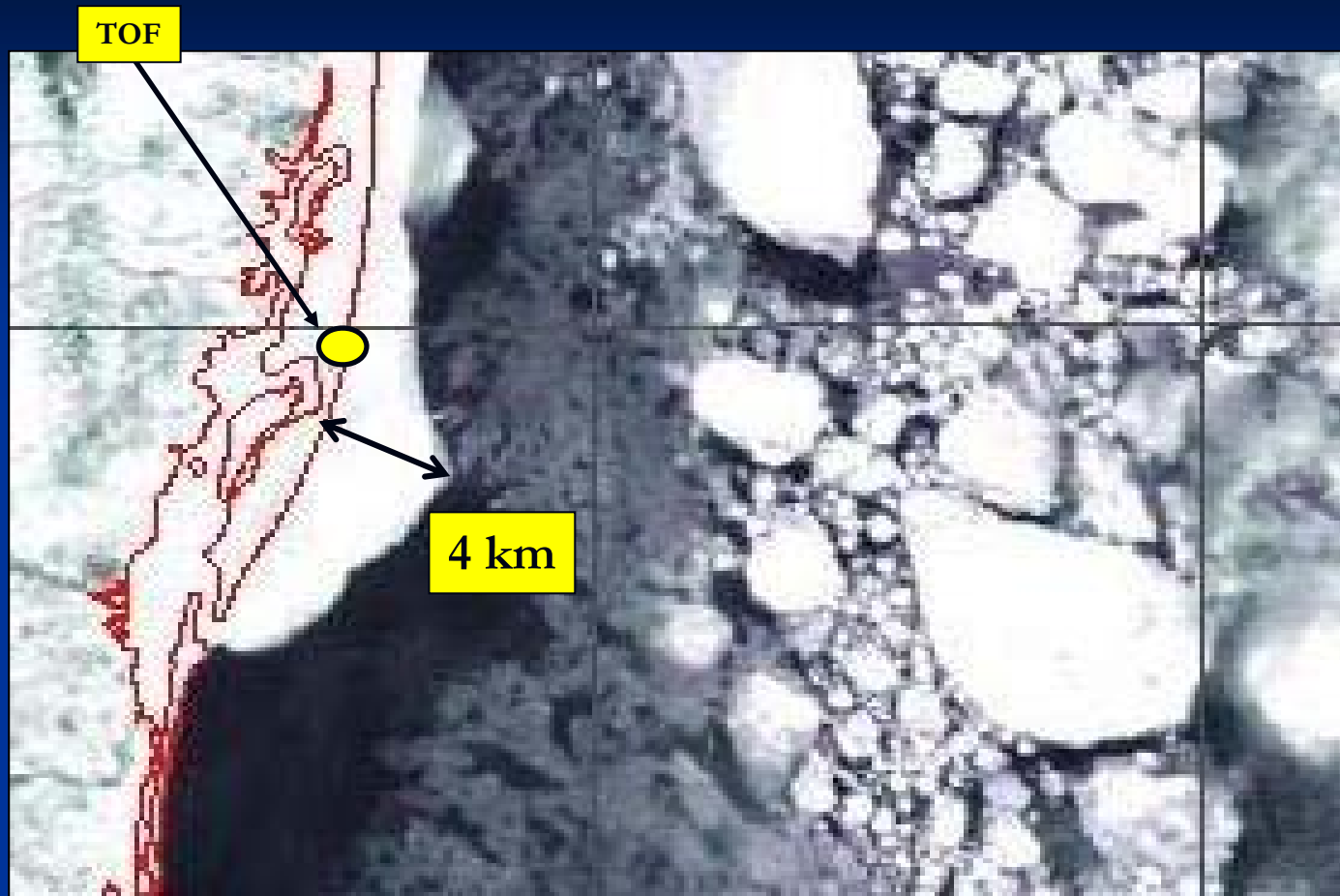
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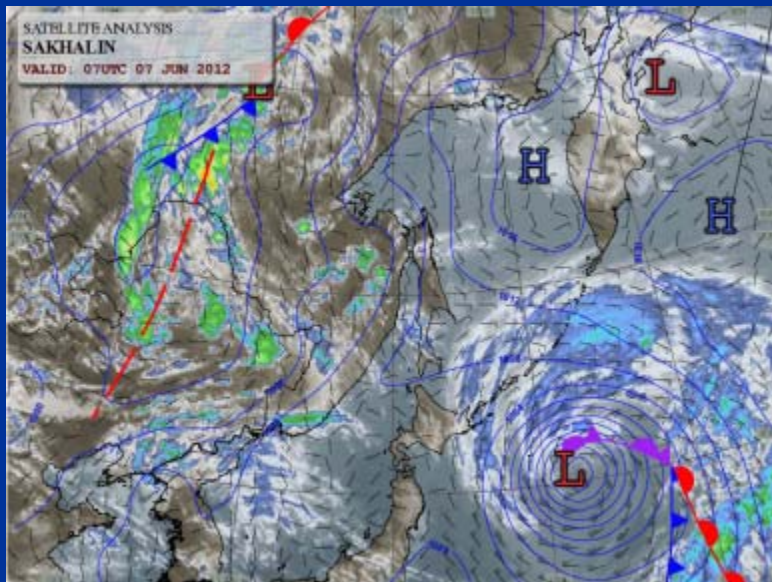
# Ice Conditions



- Fast Ice and Hummocking – December through March
- Spring Ice Floes – Forcasted through June 10th

# Wave Conditions

- Limited Data Resources
- GROW wave data
- Weibull Extremal Distribution



SUMMER (1 MAY-30 SEP)				WINTER (1 OCT-30 APR)			
Return Period (Yr)	Direction (DEG T)			Return Period (Yr)	Direction (DEG T)		
	45	90	135		45	90	135
	Significant Wave Height (m)				Significant Wave Height (m)		
1	0.94	1.48	1.23	1	1.53	2.37	1.21
2	1.45	2.44	1.99	2	2.24	2.99	2.23
5	1.92	2.96	2.40	5	2.65	3.33	2.78
10	2.23	3.26	2.64	10	2.89	3.53	3.10

- Pacific Typhoons

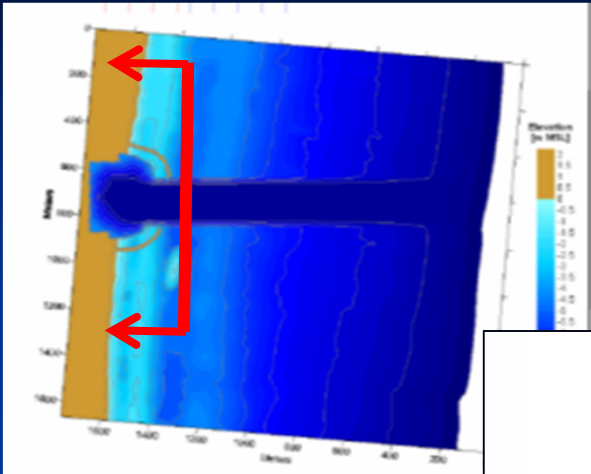
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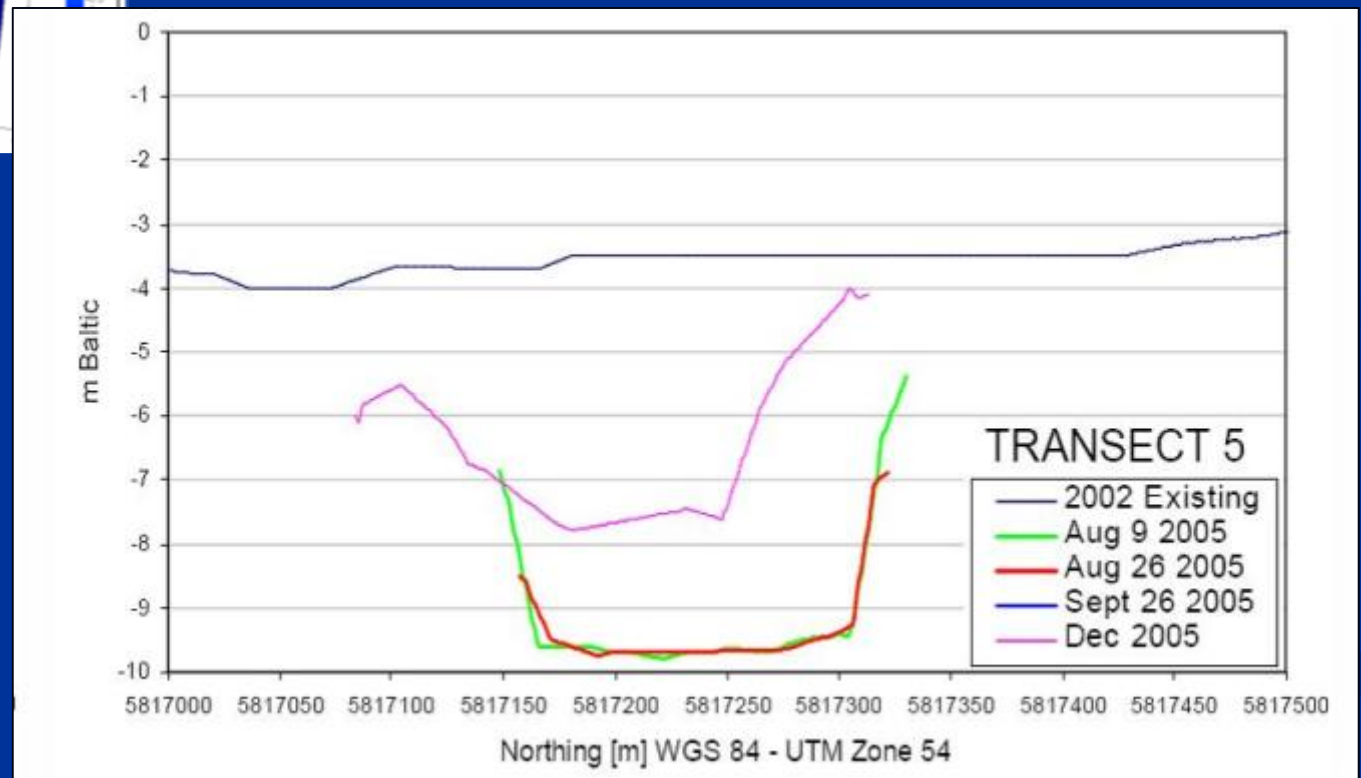
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# Sediment Transport



- Minimal transport during summer
- Dominant direction from north in winter





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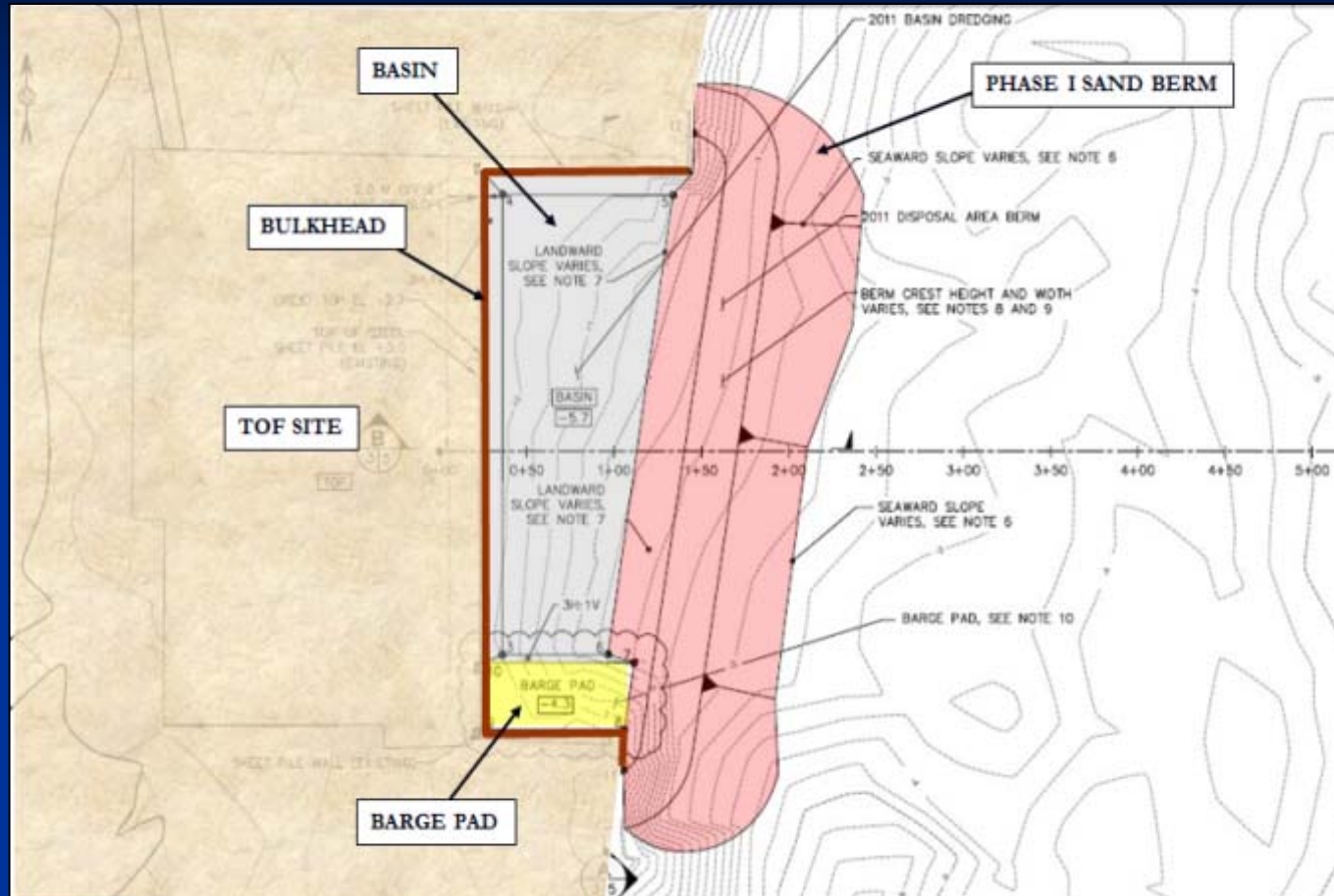


# CEA and Dredging Design

- 825,000 cubic meters of material
    - Barge approach channel
    - Basin
    - Barge pad
  - Timeframe – 16 days in 2012 (ice forecast to module delivery)
  - Sedimentation – Summer to Summer
  - Potential delays
- 
- Phased Approach to dredging design
    - Phase I - 2011
    - Phase II - 2012



# Phase I - Design



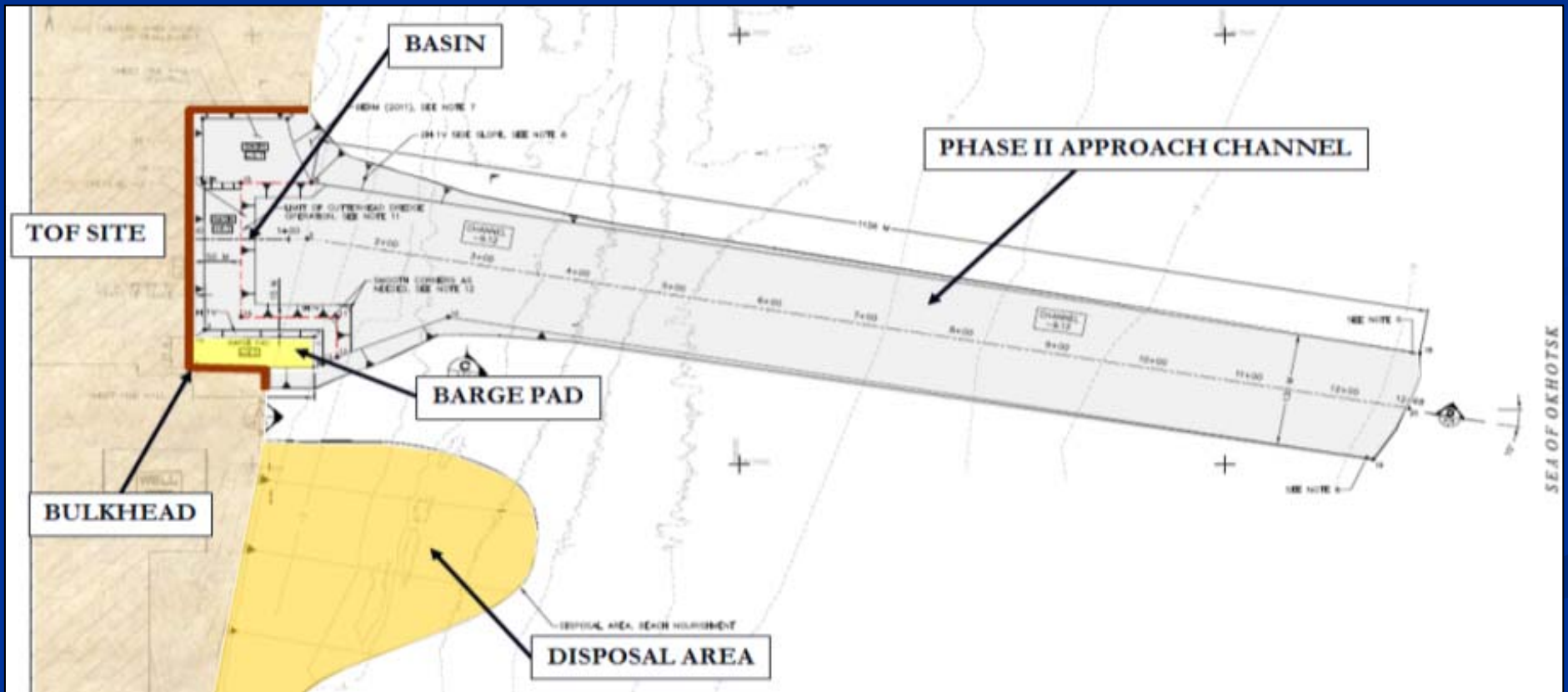
## Sacrificial Berm



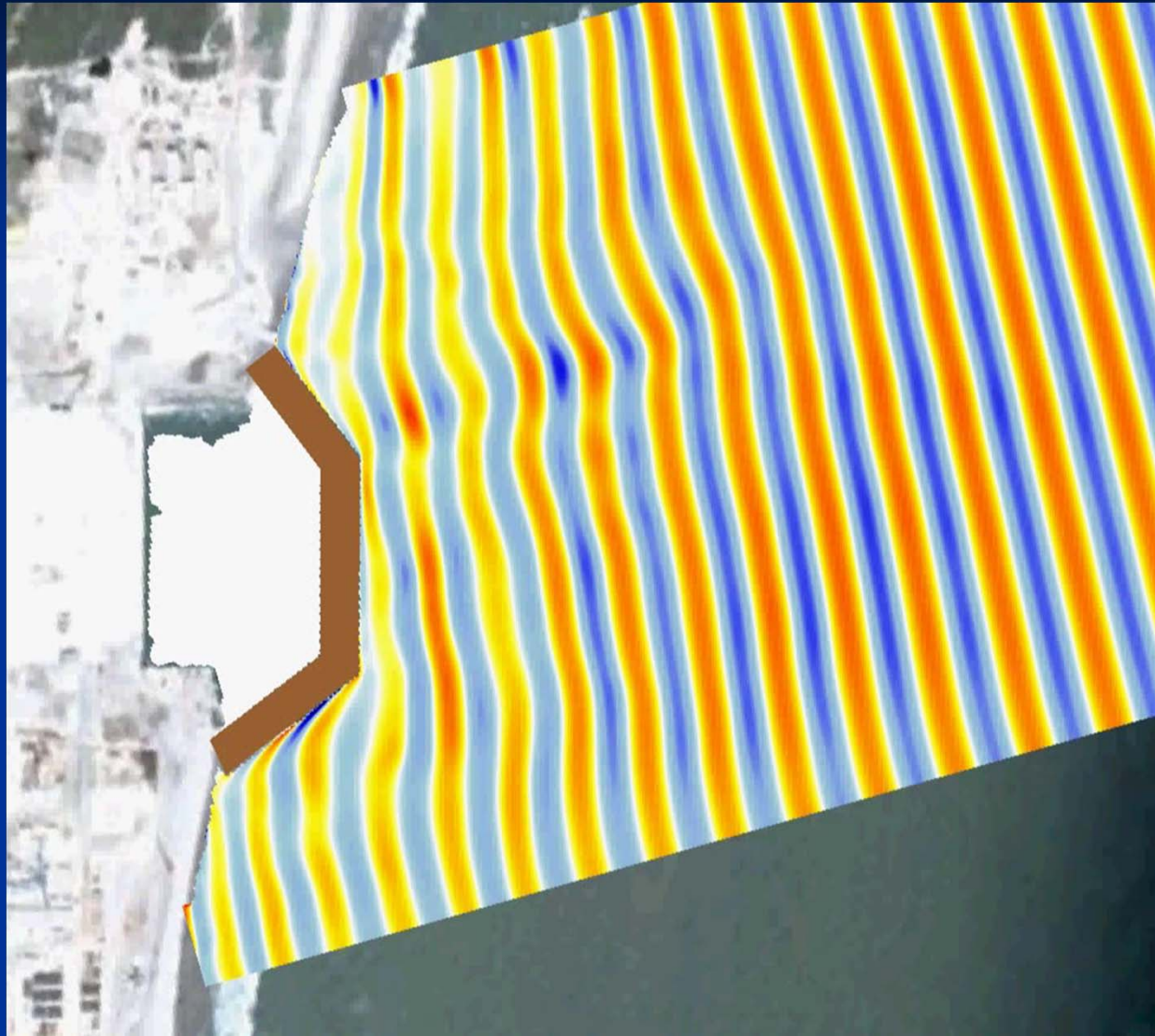
# Phase II - Design



- Phase I: 215,000 cubic meters
- Phase II: 630,000 cubic meters



# Phase I – Coastal Engineering Analysis



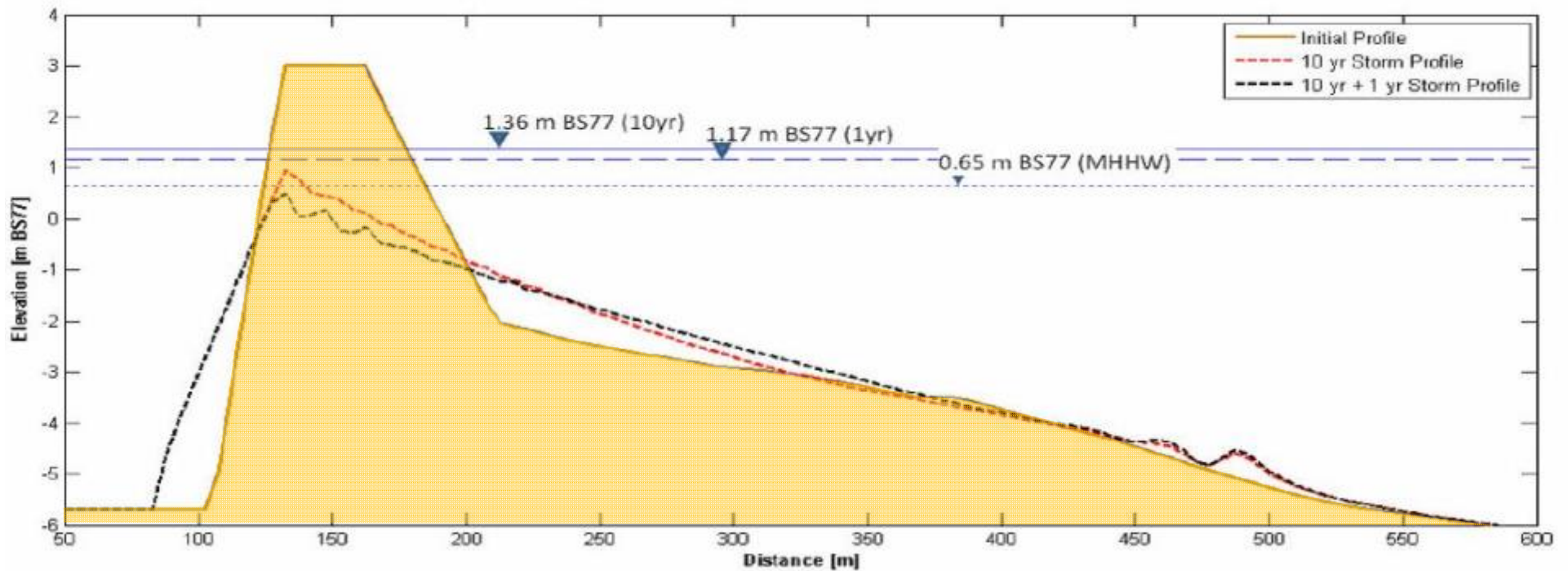
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# Phase I – Coastal Engineering Analysis





# Phase I - 2011 Construction

•Jan De Nul Group



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# Phase I - 2011 Construction

• Jan De Nul Group



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# Phase I - 2011 Construction

•Jan De Nul Group



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# Phase I - 2011 Construction

• Jan De Nul Group



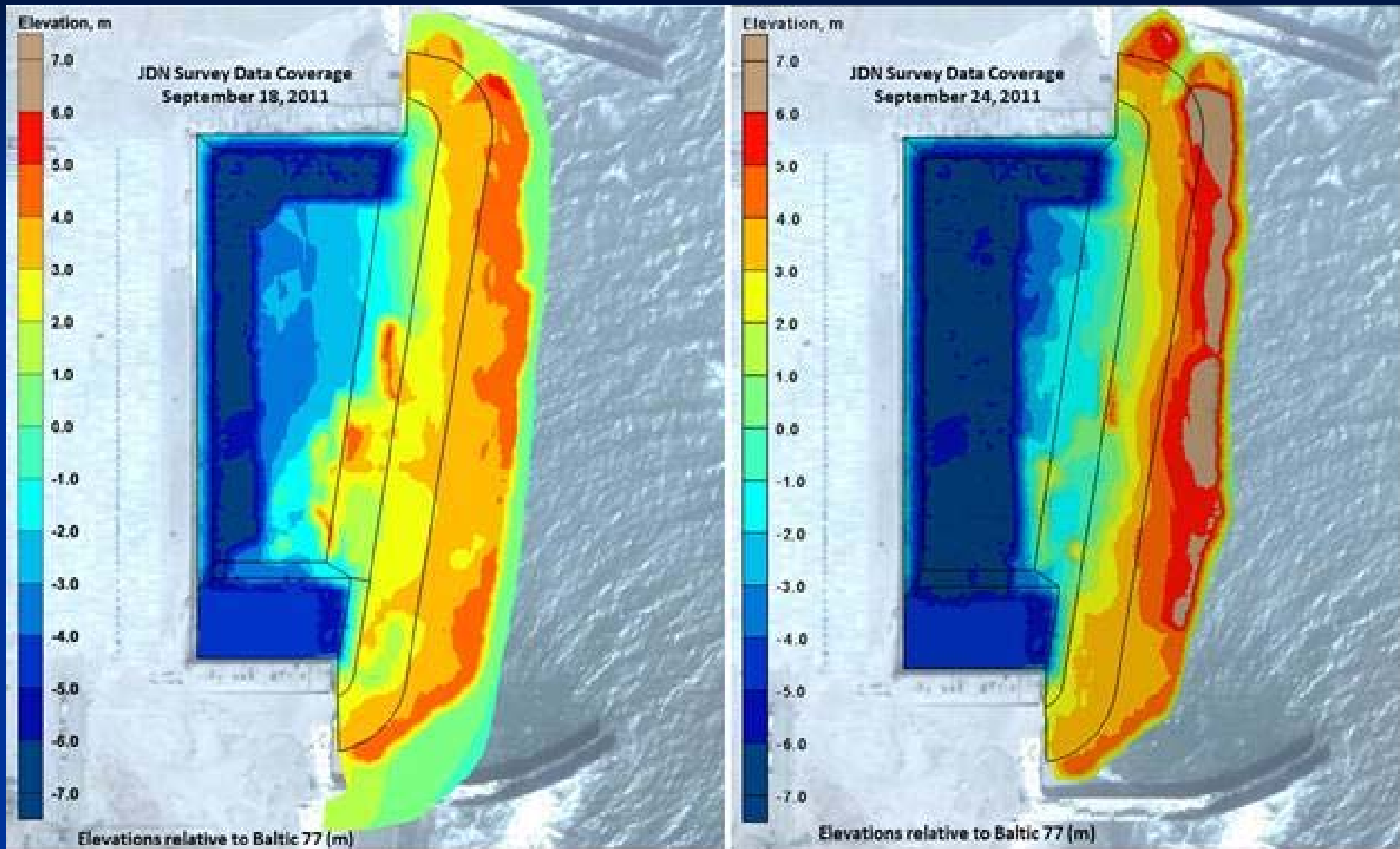
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# Phase I - 2011 Construction



# Phase I - 2011 Construction



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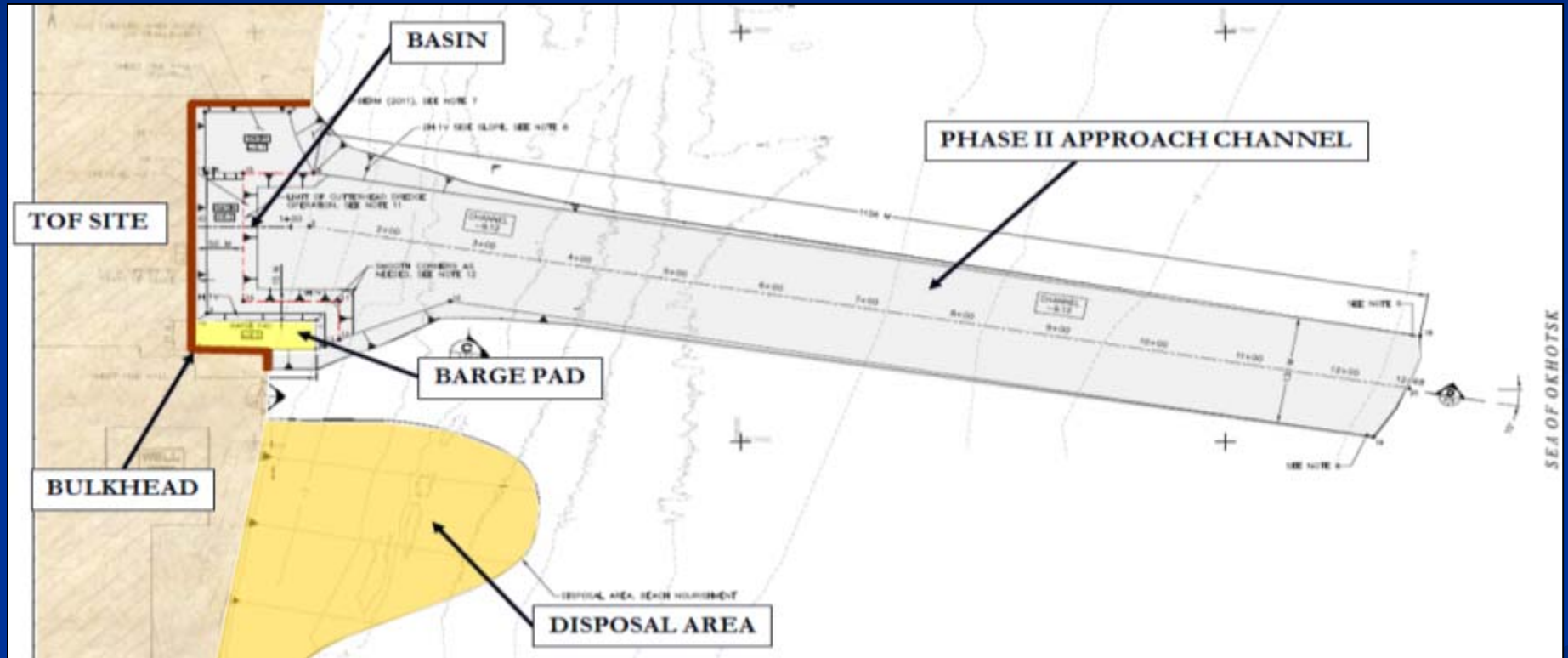
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# Phase II - Design

- Approach Channel: -9.12m (1,300m length)
- TOF Basin: -6.2m
- Barge Pad: -4.0m



- Coastal Engineering Analysis
- Disposal area to provide wave sheltering

# Phase II – MORPHO Modeling

- Disposal location critical to success





# Phase II – 2012 Construction



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# Phase II – 2012 Construction



- Challenges
  - Long-Shore Currents
  - Dredge Material Management and BMPs
  - Debris

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# Phase II – 2012 Construction



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# Phase II – 2012 Construction



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# Phase II – 2012 Construction



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# Phase II – 2012 Construction



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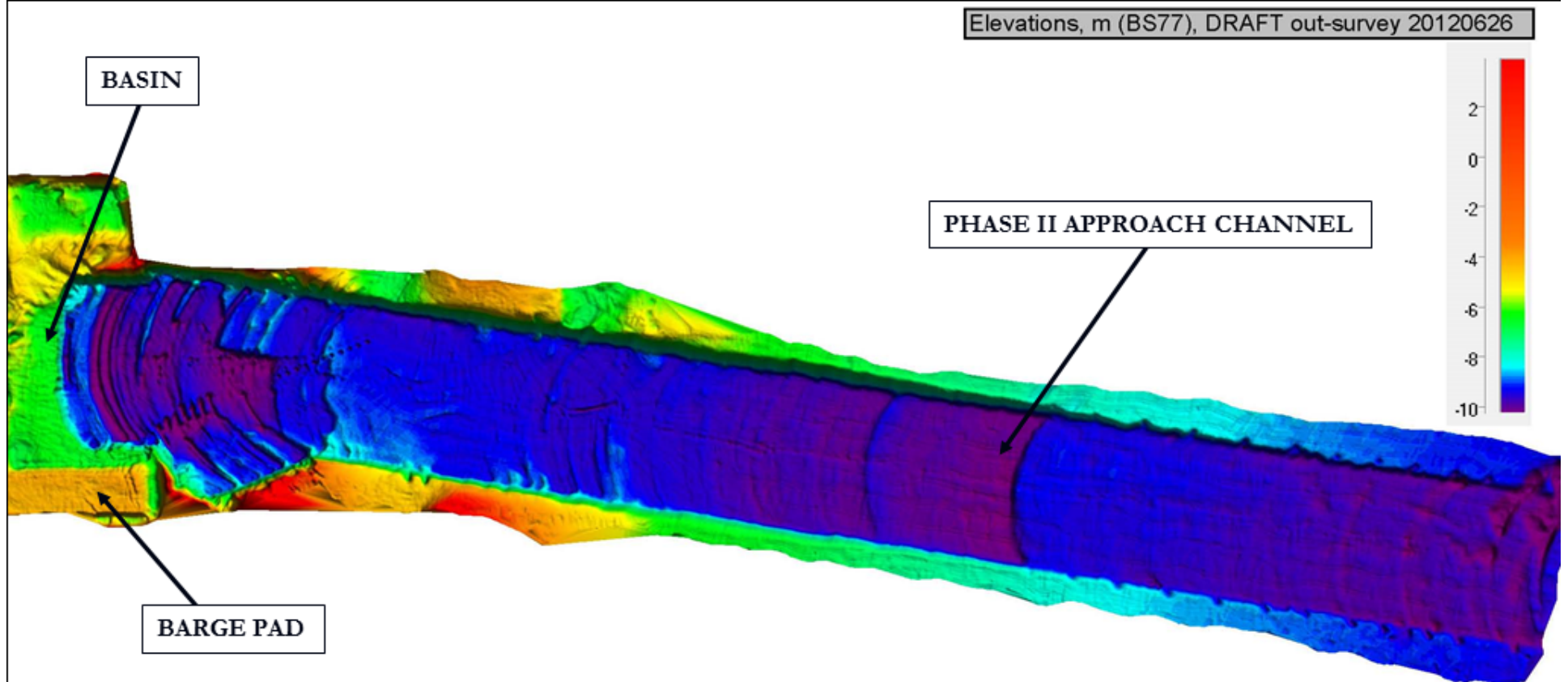


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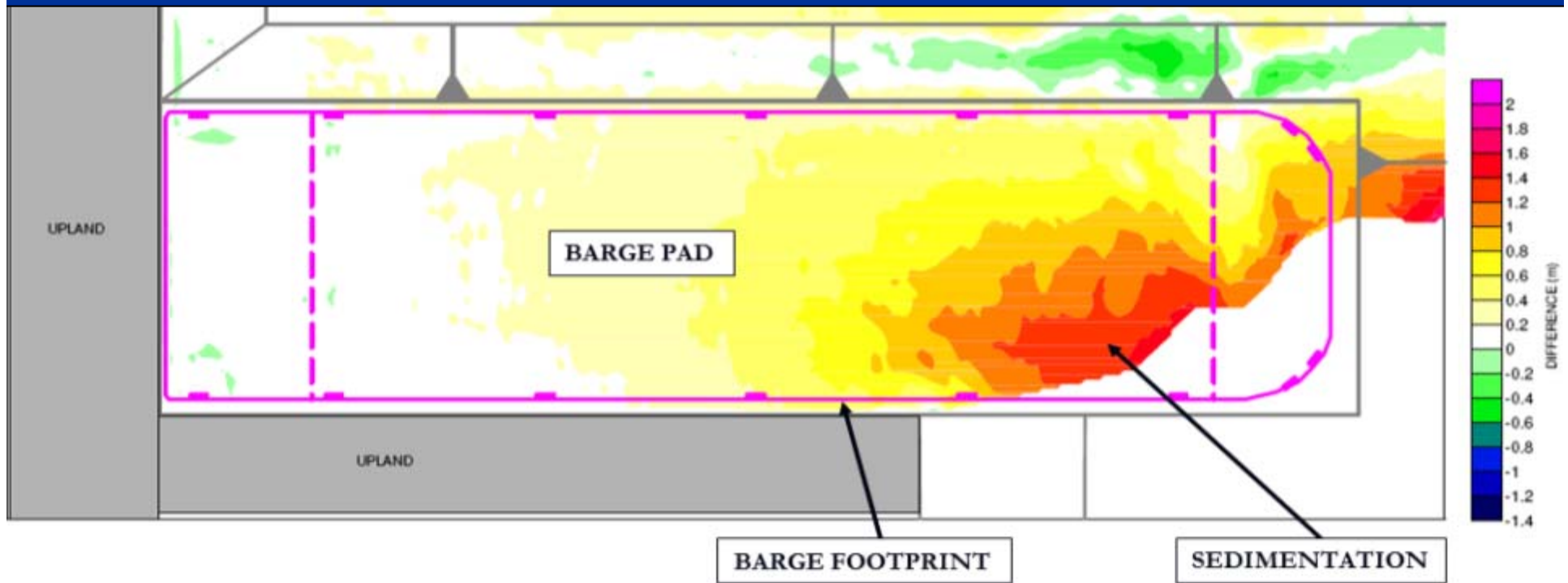
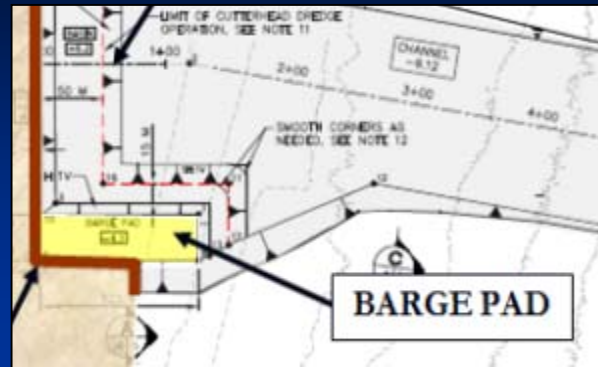


# Phase II – 2012 Construction

- Dredging completed – June 26



# Phase II – 2012 Maintenance



# Phase II – 2012 Maintenance



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# 2012 Module Delivery



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# 2012 Module Delivery



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# 2012 Module Delivery



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# Modules to the Facility



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# Future Operations





# QUESTIONS?



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