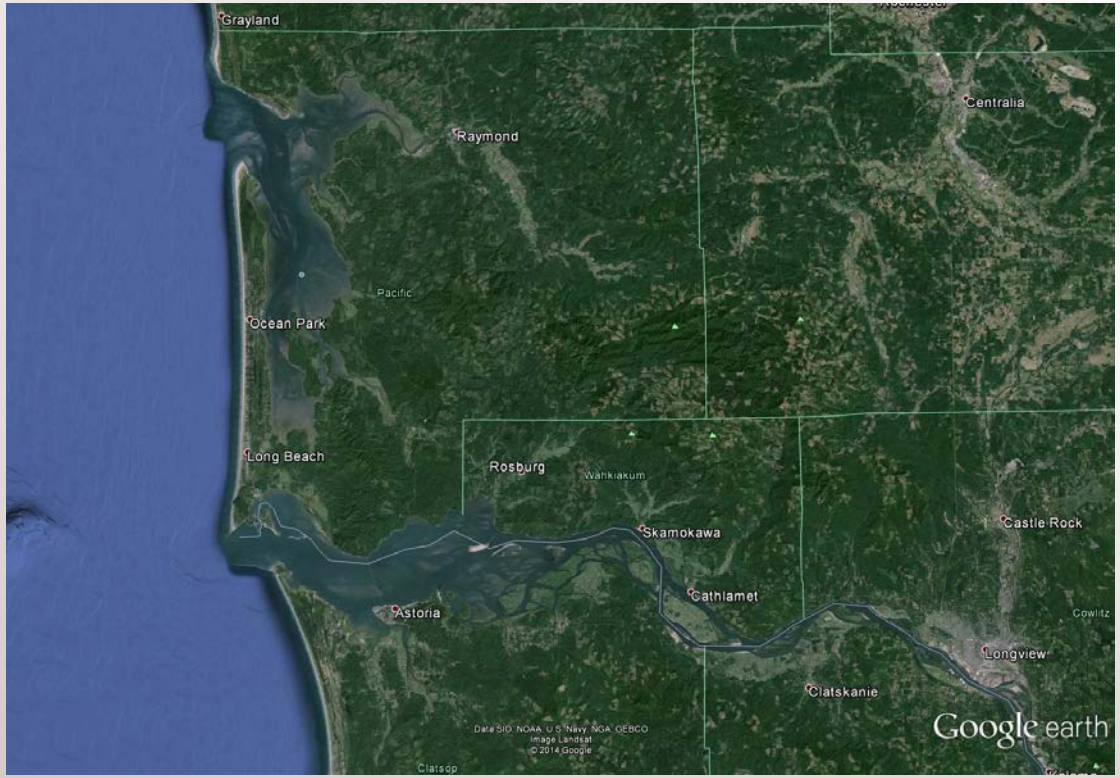
Shoalwater Bay Shorline Erosion Dredging

ROSS ISLAND SAND & GRAVEL CO.

Saving the Tokeland Penninsula

Willapa Bay & Tokeland Penninsula

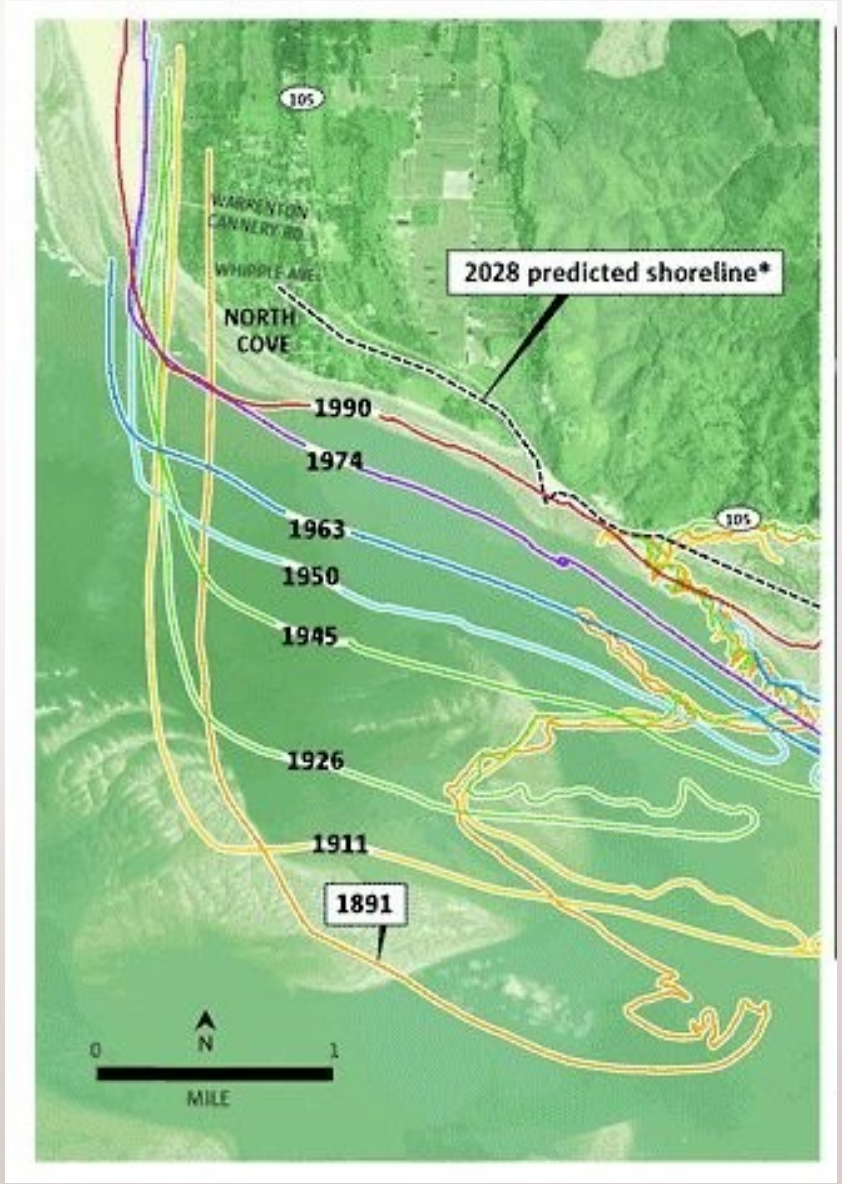
Southwestern Washington Coast



Ross Island Sand & Gravel Co.

Shoalwater Bay Historic View

- **Settlements and Grazing Lands established by Early 1900's in the North Cove Area**
- **Private Rip Rap Protections Installed in 1950's near Lower Peninsula and "Cannery Area" at Private Cost**
- **Frequent Storm Surge Events Occur Throughout the 1990's at North Penninsula Tribal Center Area and North of Cannery.**
- **1998 SR 105 Reconstuctions totaled $24MM through 2011.**



Ross Island Sand & Gravel Co.

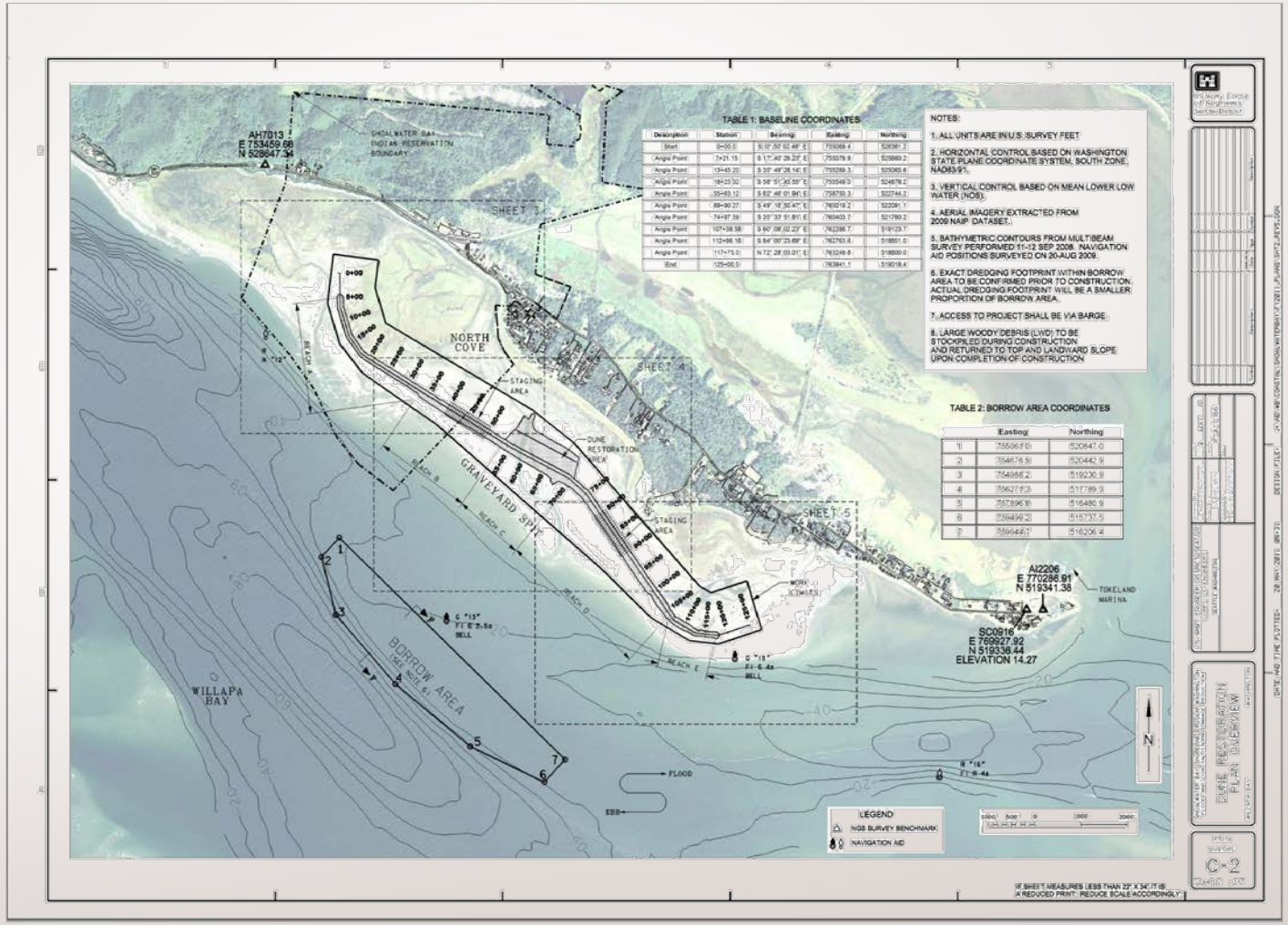
Project Determining Factors

- 1999 Storm Breach of Offshore Dune
- USACE Study of Preservation Options
- 2009 Determination that Construction of a Barrier Dune is the Most Cost Effective Solution to Penninsula Erosion

Ross Island Sand & Gravel Co

Design and Contracting

- Berm Design to Stop Dune Breaches and Promote Tidal Channel Flows
- Borrow Site Chosen on a Localized & Quantitative Basis for the Dune Design Quantity
- 719,000 Cubic Yards to be Dredged and Placed



Ross Island Sand & Gravel Co.

2012 Mobilization

- Ross Island Dredge #7
- Dredge Tender Santiam
- 8,000 LF 24" O.D. HDPE Discharge Pileline
- Landing Barge UB-4
- Submersible ABS Transport Barge RISS-9
- Upland Equipment (Dozers & Loader)

Early Project Delays

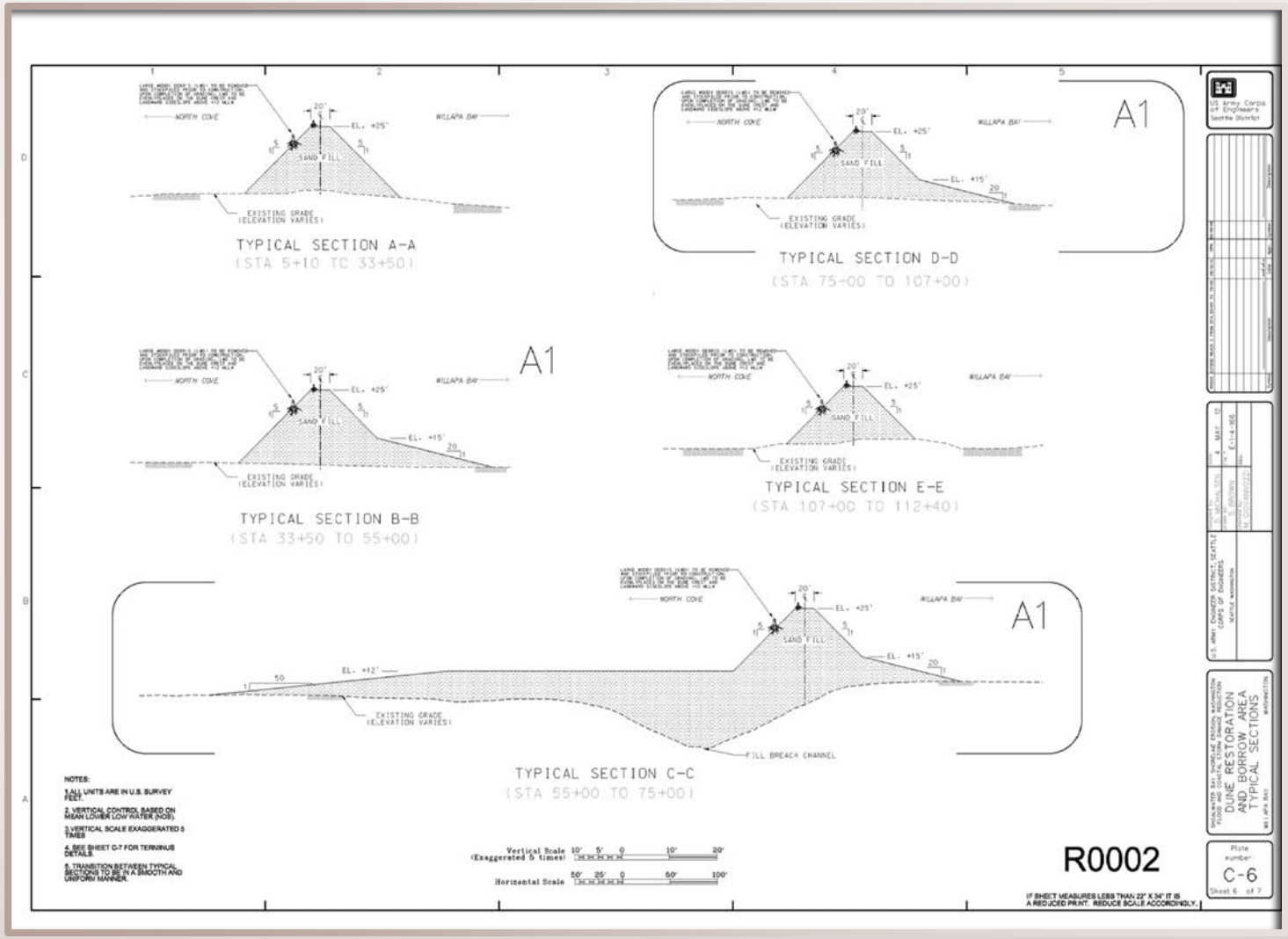
- Western Snowy Plover
- Nests Found Within Berm Template

- Dredge Commencement August 9, 2012
- Borrow Site B.C. Survey Shows Deeper Than in Specifications

- Tidal Currents Stronger Than Projected - (400,000 cfs. Twice the flow from the Columbia River at the Dalles Dam)

Dune Breach Channel Re-Design

- Breach Channel Had Extended Southward Prior to Construction
- Re-Design Provided Additional Materials Be Placed to Extend Wide (+12’ Bench & 50:1) Portion of Berm South to Close Recently Shifted Breach



Ross Island Sand & Gravel Co.

First Glimpse at Adverse Weather

- Pipeline Broken Early and Often

- 60 MPH Winds in August
- 8’+ Seas over 6’ Swells

- Propose New Borrow Site in Protected Waters
- Vibracore Sampling Performed but Ultimately Denied Due to Fears of Nearshore Erosion

Ross Island Sand & Gravel Co.

Dredge Modifications and Storm Avoidance

- Borrow Site Deeper Than Represented In Specification
- Remove 47’ Ladder & Reinstall 87’ Digging Ladder
- Result: Can Keep Material In Pipe
- From Mid September to Early October - 17 Days of Dredging Were Possible Due to Adverse Weather
- 2012 Dredging Did Not Proceed After 11/11/12
- 180,000 Cubic Yards Dredged and Placed in 2012

Ross Island Sand & Gravel Co.

2012 Winter Mitigation Measures

- Construct 12’ Dozer Berm Across Historic Breach to Prevent More Breach Damage to Shoreline Tribal & Private Properties

- Relatively Succesful - South Breach Re-Formed and Required Later Closure

2013 Re-Mobilization

Lessons Learned

- Current
- Pipeline Exposure
- Anchoring System
- Timing of Anchor Movement
- Multiple Dredge Tenders

2013 Contractor Adjustments

- Utilize a "Static" Pipeline from Borrow Site to Landing Point
  - Opposing 3000# Anchors every 300' of Pipeline
- Majority of Pipeline Stays at Berm Toe, But Creates Pumping Distances Up to 12,000 lf
  - Multiple Dredge Tenders to Maximize Pipeline Launch/Connect and All Pipeline Anchor Moves With Given 1 to 1.5hr Slack Water Tides

2013 Plover Mitigation Measures

- In Excess of 6,300 Linear Feet of Orange Plastic Construction Fencing Placed in 100' Segments Parallel to Prevailing Wind Direction in Effort to Disturb Plover Lines of Sight and Thus, Nesting.
  - Fencing Placed May 2013
- Plovers Nested North of Fence Placement Area
- However, Would Dredge Berm Advance Encroach?

Ross Island Sand & Gravel Co.

2013 Mobilization & Startup

- Plovers Nested to North
- Re-Commencement of Dredging 7/11/13
- Dredged Completion of Original Breach Berm
- Dredge Placement Advance North to Limits of Plover Buffer by 8/19/13
- Dredging & Placement Advance Up to 300 linear Feet Per Day.
- Dune Constructed Hydraulically, with Minimal Mechanical Grading to Top +25 Elevation

Ross Island Sand & Gravel Co.

Dune Placement Flexibility

- Snowy Plover Remain Nested at North Portion of Dune Placement Area by the Time Containment Dikes Would Have Advanced to Those Areas

- Sand Discharge Diverted to South Dune Portion on 8/13/13

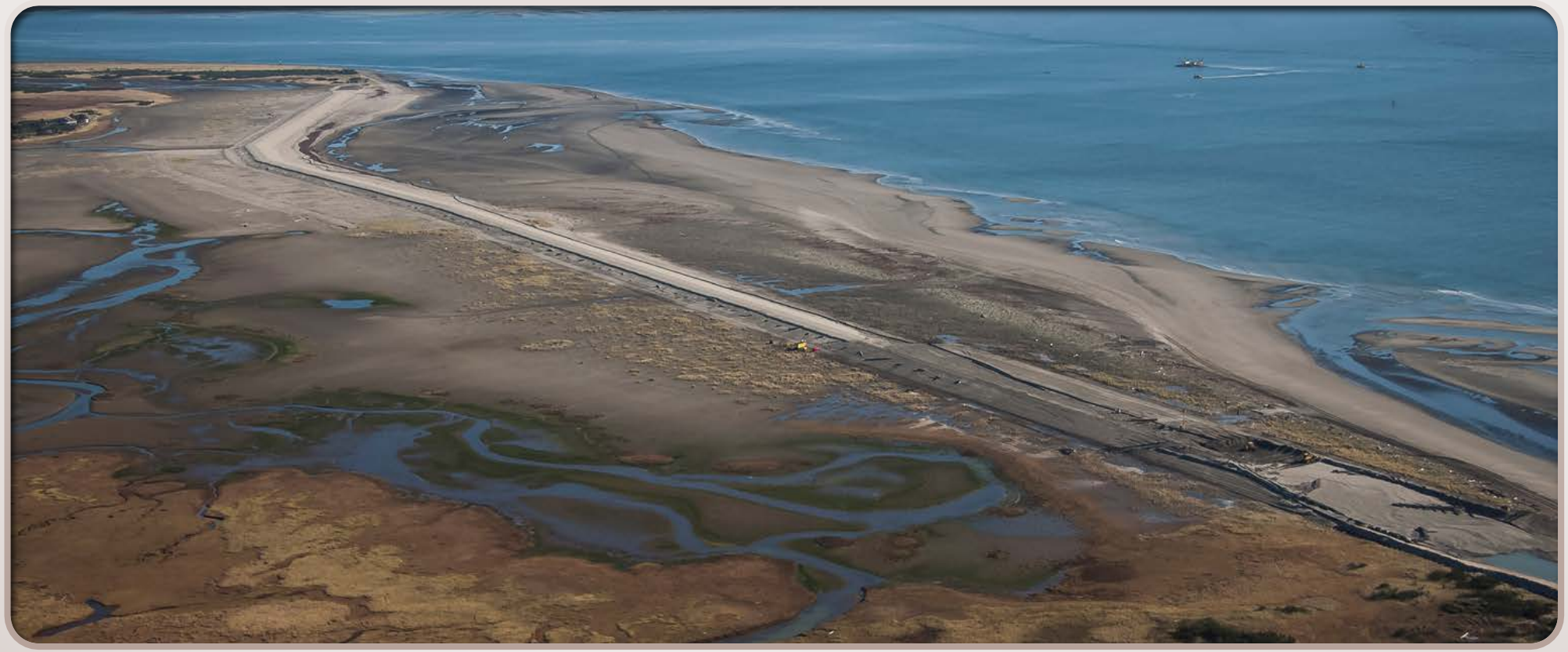
- Washington Department of Fish and Game Determined Povers Fledged 8/19/14

- Dredging Diverted Again to the North

Complete the North Dune Terminous

- North Berms Routed Around Critical Habitat
- Equipment & Personnel Transit Via Crest of Constructed Dune

- North Terminus Widening
  - Berm Shortened 1,200' But Widened to 200' Wide Bench for a 1,400' Thickened Terminus



North Dune Completed Late-October 2013

Only 50,000 Cubic Yards Remain At the South Terminous

Ross Island Sand & Gravel Co.

Adverse November Weather Arrives

- Dangerous Swells and Seas Linger through November 22
- Weather Broke for 5 Days!
- Dredging Completed Thursday November 28, 2013
  A Happy Thanksgiving Indeed
- Significant Storm Erosion Had Already Occurred By End of Dredging

Demobilization

- High Winds, Driving Rain, Snow, a Week-Long Cold Snap Encountered
- All 13,000 Linear Feet of 20” Pipeline Trucked From Site
- Dredge Loaded Atop RISS-9, But Another Weather Window Necessary to Transit the Willapa and Columbia River Bars
- Dredge #7, Dredge Tenders, and Ramp Barge Towed from Willapa Bay to Portland on January 4, 2014

Ross Island Sand & Gravel Co.

Follow-Up Activities

- Contract Funded Capacity Remained Before Close-Out
- LIDAR Aerial Topo Survey Performed by RIS&G and Supplied to Corps in Mid-June 2014
- Dune Generally Held Up To a Relatively Mild Winter, Other Than North & South Termini
- Wind Erosion Significant in Places +/- 3 Feet Scour From Top of Dune
- Sand Generally Relocated Immediately In-Shore of Dune

Questions?

Ross Island Sand & Gravel Co.

Randall H. "Randy" Steed

Executive Vice President & General Manager

PO Box 82249 Portland, OR 97282-0249

Office (503) 239-5504 randysteed@ridredge.com