

# 2016 ShoreZone Protocol Revisions: Part II

Original ShoreZone Unit - 04/01/2000/0

New CUSP Shoreline

04/01/2000/0/A

04/01/2000/0/B

04/01/2000/0/C

04/01/2000/0/D

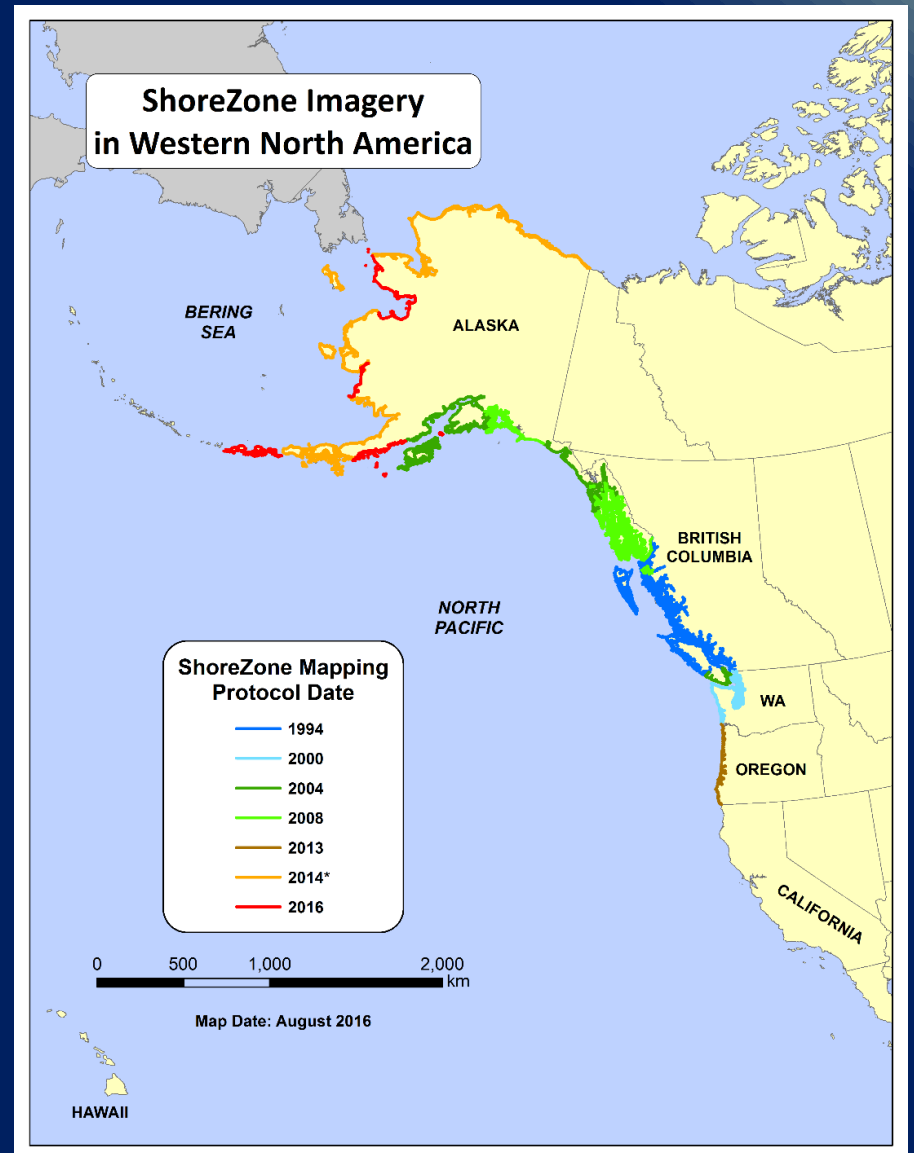
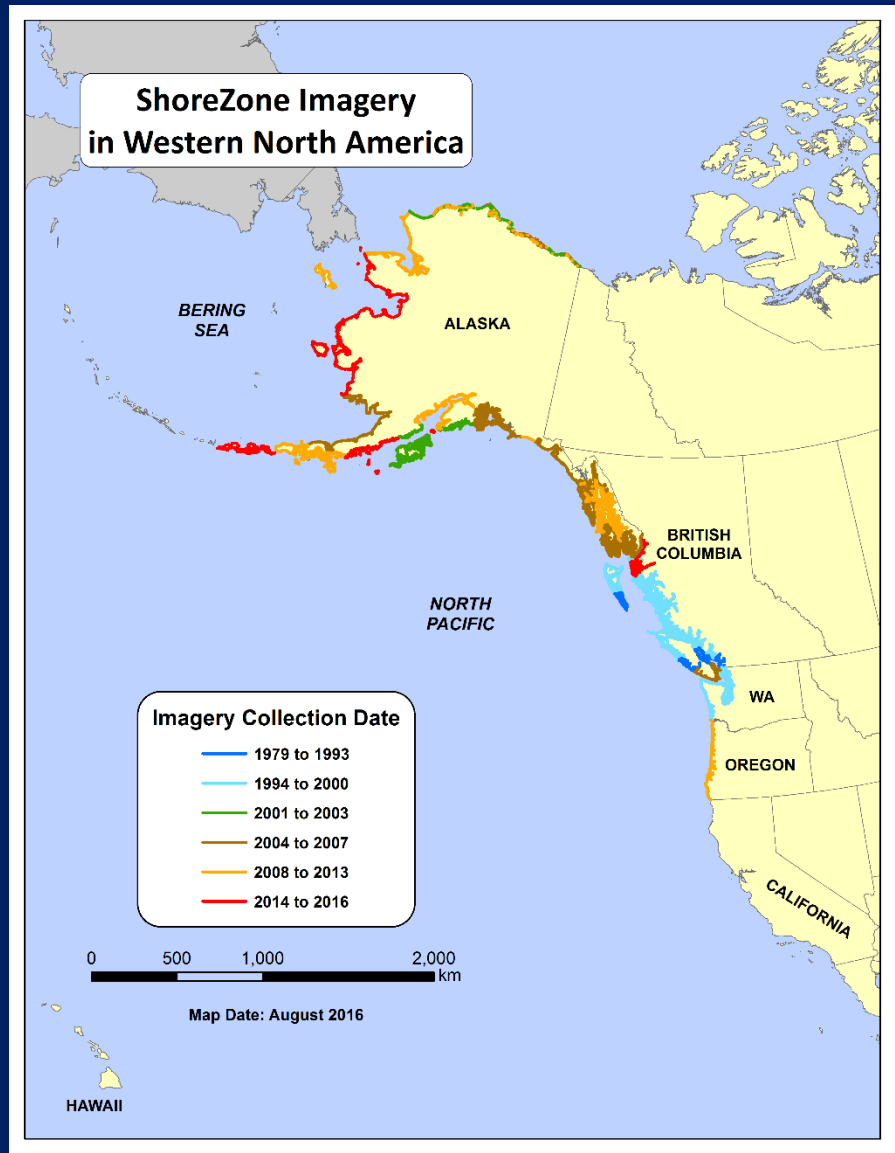
04/01/2000/0/E

04/01/2000/0/F

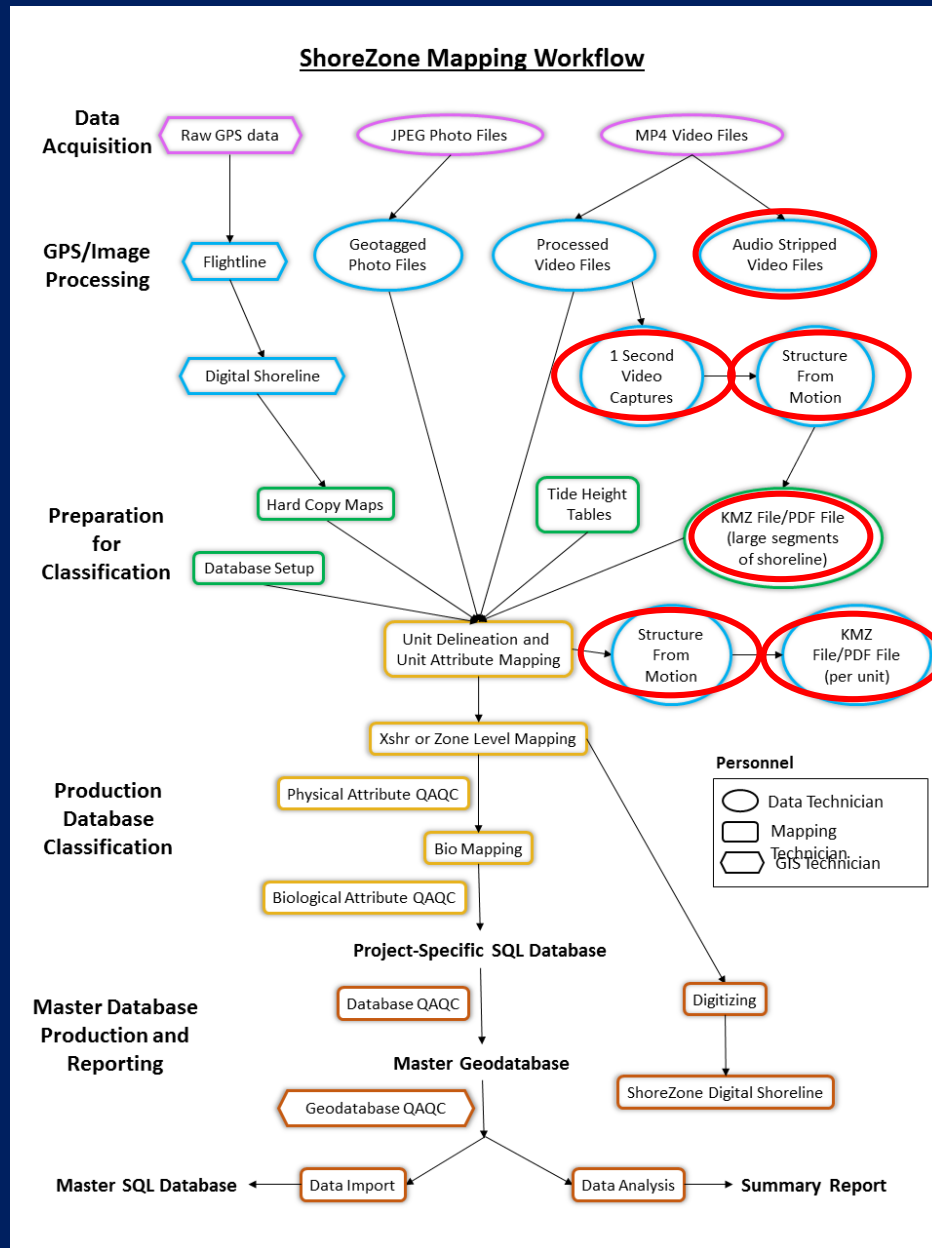
New ShoreZone Zone Mapping

**Carl Schoch**  
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# ShoreZone Surveys & Protocols



# ShoreZone Workflow



# ShoreZone Nested Spatial Scales

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**Level 1: Biogeographic Region**

# ShoreZone Nested Spatial Scales

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**Level 1: Biogeographic Region**

**Level 2: Marine Domain**

**Level 2: Marine Domain**

# ShoreZone Nested Spatial Scales

**Level 1: Biogeographic Region**

**Level 2: Marine Domain**

**Level 2: Marine Domain**

**3: Seascape**

**3: Seascape**

**3: Seascape**

**3: Seascape**

**3: Seascape**

**3: Seascape**

# ShoreZone Nested Spatial Scales

## Level 1: Biogeographic Region

### Level 2: Marine Domain

### Level 2: Marine Domain

3: Seascape

3: Seascape

3: Seascape

3: Seascape

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# ShoreZone Nested Spatial Scales

## Level 1: Biogeographic Region

### Level 2: Marine Domain

### Level 2: Marine Domain

3: Seascape

3: Seascape

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# ShoreZone Nested Spatial Scales

## Level 1: Biogeographic Region

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3: Seascape

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# ShoreZone Nested Spatial Scales

## Level 1: Biogeographic Region

### Level 2: Marine Domain

3: Seascape

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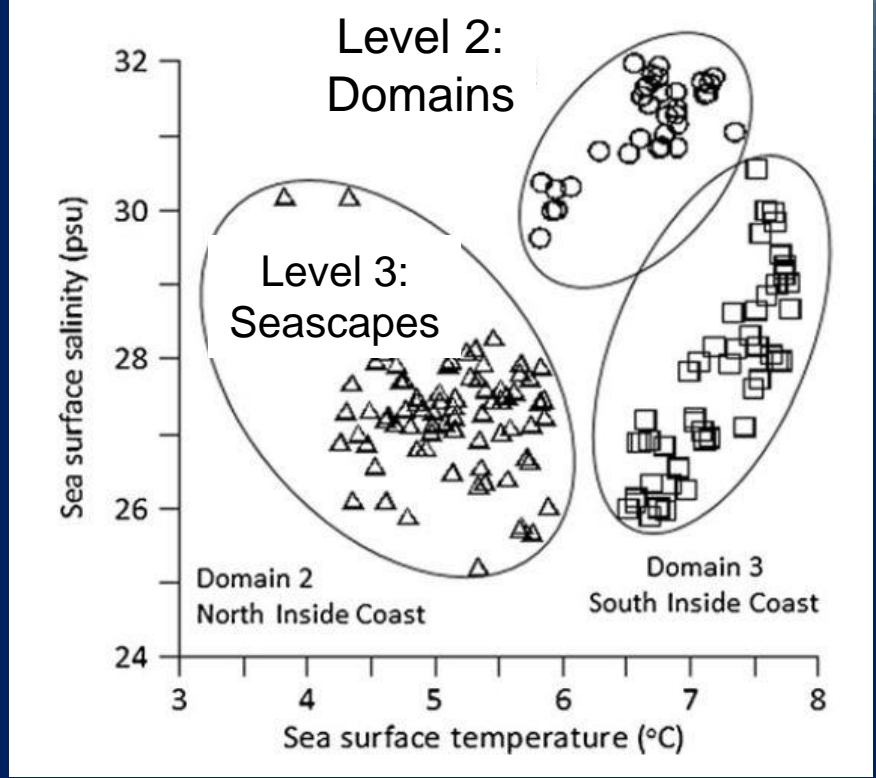
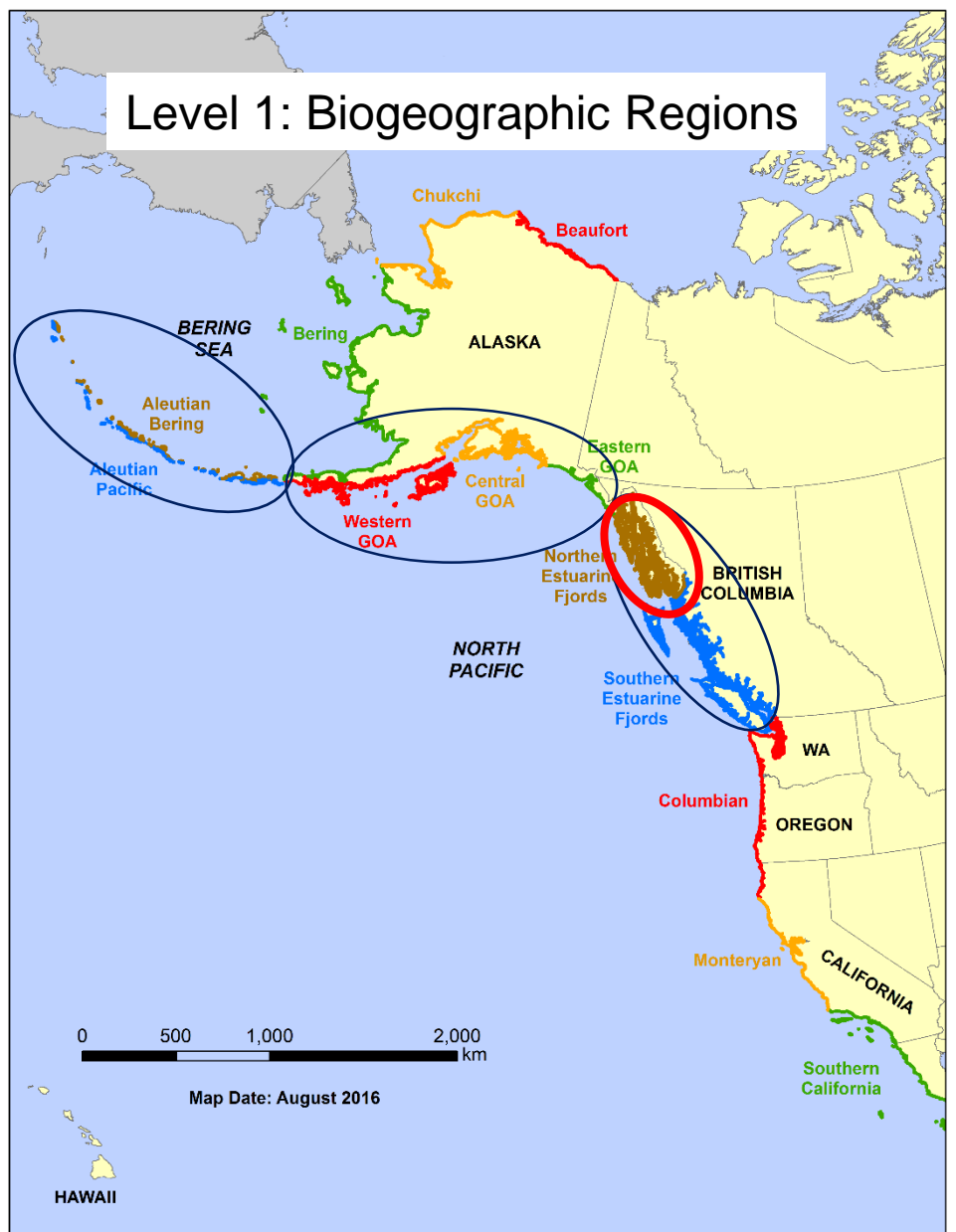
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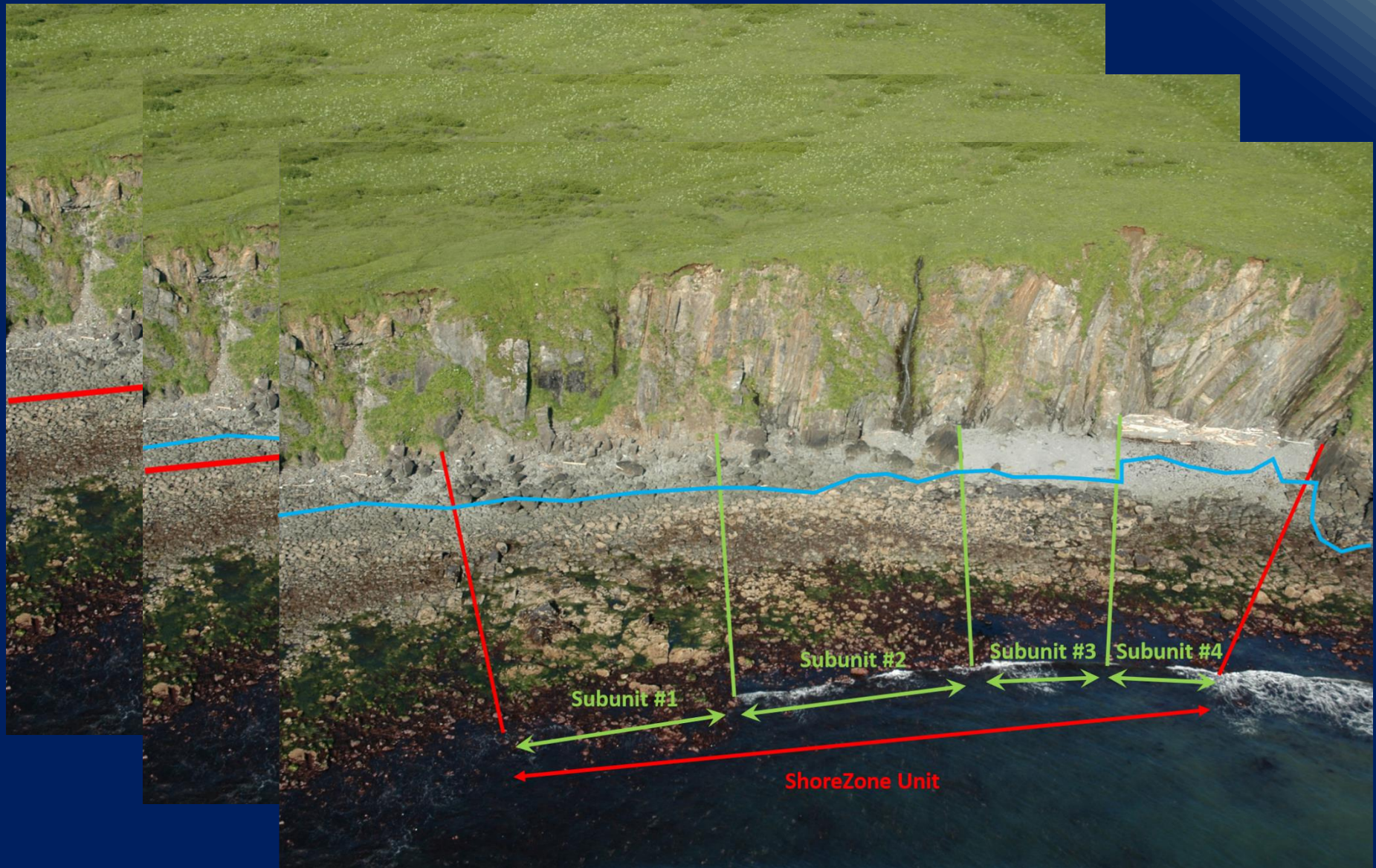
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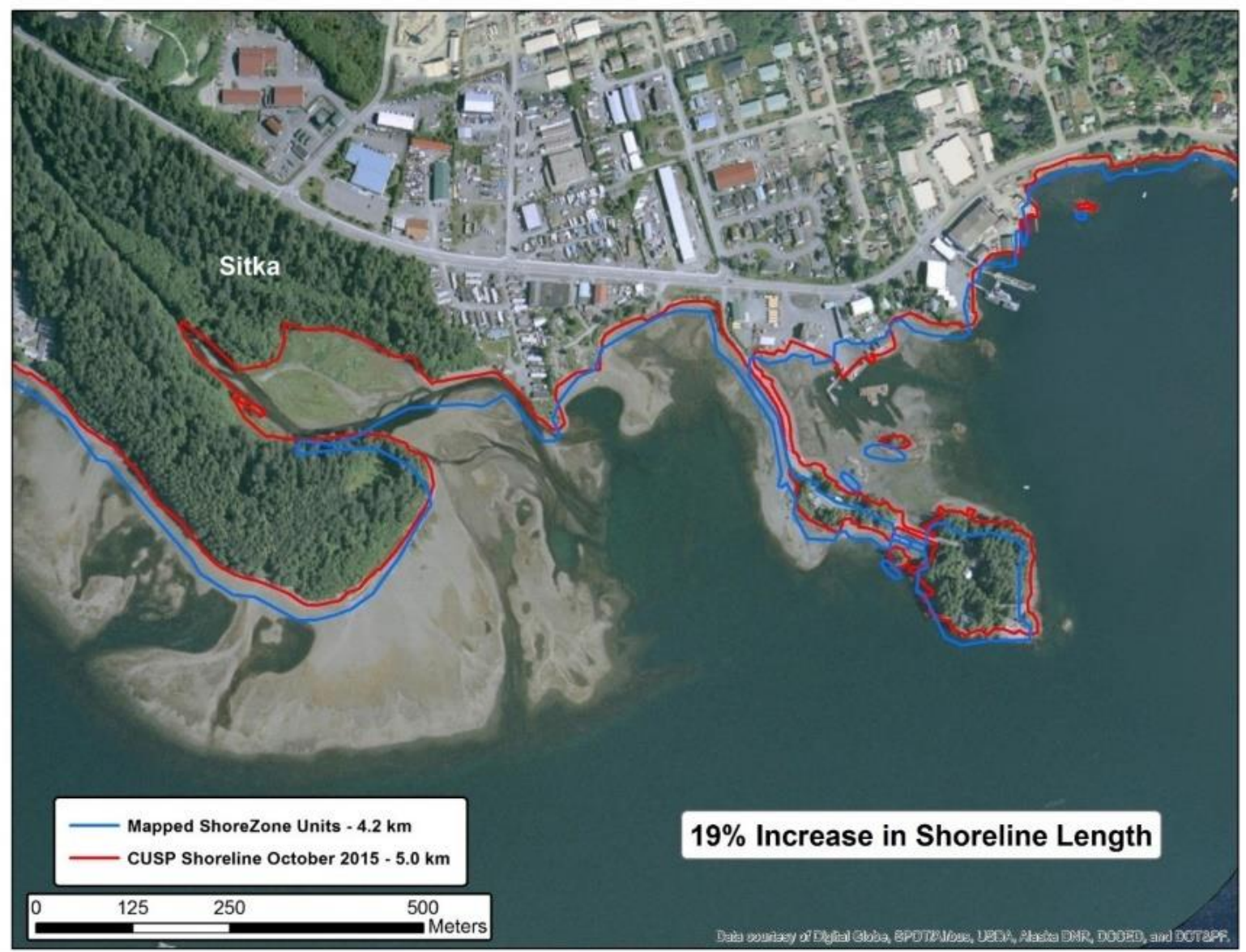
# ShoreZone Nested Spatial Scales



# ShoreZone Units: Level 4 & 5

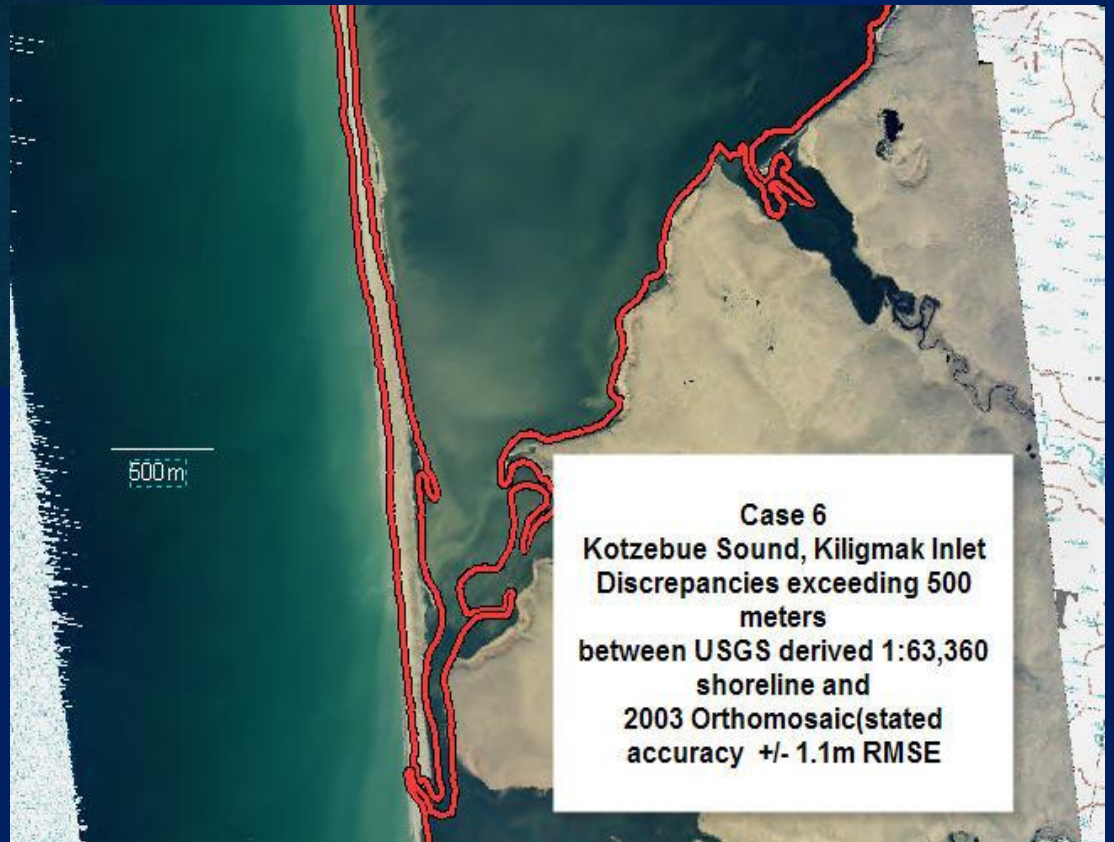


# ShoreZone Digital Shoreline



# ShoreZone Digital Shoreline

Case 1 - 1950's shoreline vs.  
IKONOS ORTHO  
Harris Moraine, Northwestern  
Lagoon, Kenai Fjords  
Yellow control points (1meter/xy  
GPS) within 1 meter of photoid  
Ikonos imagery.  
Ikonos imagery and 1:63,360  
shoreline discrepancies shown



Case 6  
Kotzebue Sound, Kiligmak Inlet  
Discrepancies exceeding 500  
meters  
between USGS derived 1:63,360  
shoreline and  
2003 Orthomosaic(stated  
accuracy +/- 1.1m RMSE

# ShoreZone Unit Delineation



# ShoreZone Unit Delineation



# ShoreZone Forms and Materials

## A = Anthropogenic

- a dolphin
- b breakwater
- c log dump
- d derelict shipwreck
- f float
- g groin
- i cable/ pipeline
- j jetty
- k dyke
- m marinas
- n ferry terminal
- o log booms
- p port facility
- q aquaculture
- r boat ramp
- s seawall
- t landfill, tailings
- w wharf
- x outfall or intake
- y intake

## B = Beach

- b berm (intertidal or supratidal)
- c washover channel
- f face
- i inclined (no berm)
- m multiple bars / troughs
- n relic ridges, raised
- p plain
- r ridge (single bar; low to mid intertidal)
- s storm ridge (occurs as marine influence; supratidal)
- t low tide terrace
- v thin veneer over rock (also use as modifier)
- w washover fan

## C = Cliff

- stability/geomorphology
- a active/eroding
- p passive (vegetated)
- c cave
- slope
- i inclined (20°-35°)
- s steep (>35°)

[continued]

## Cliff continued

- height
- l low (<5m)
- m moderate (5-10m)
- h high (>10m)
- modifiers (optional)
- f fan, apron, talus
- g surge channel
- t terraced
- r ramp

## D = Delta

- b bars
- f fan
- l levee
- m multiple channels
- p plain (no delta, <5°)
- s single channel

## E = Dune

- b blowouts
- i irregular
- n relic
- o ponds
- r ridge/swale
- p parabolic
- v veneer
- w vegetated

## F = Reef

- (no vegetation)
- f horizontal (<2°)
- i irregular
- r ramp
- s smooth

## I = Ice

- g glacier

## L = Lagoon

- o open
- c closed

## M = Marsh

- c tidal creek
- d dead from saltwater inundation of tundra
- e levee
- f drowned forest
- h high
- l mid to low | (discontinuous)
- o pond
- s brackish, supratidal

## O = Offshore Island (not reefs)

- b barrier
- c chain of islets
- t table shaped
- p pillar/stack
- w whaleback
- elevation
- l low (<5m)
- m moderate (5-10m)
- h high (>10m)

## P = Platform

- (slope ~20°)
- f horizontal
- g surge channel
- h high tide platform
- i irregular
- l low tide platform
- r ramp (5-19°)
- t terraced
- s smooth
- p tidepool

## R = River Channel

- a perennial
- i intermittent
- m multiple channels
- s single channel

## T = Tidal Flat

- b bar, ridge
- c tidal channel
- e ebb tidal delta
- f flood tidal delta
- l levee
- p tidepool
- s multiple tidal channels
- t flats
- w plunge pool

## U = Tundra

- g ground ice slump
- i inundated
- o isolated thaw ponds
- p plain or level surface
- r ramp

## A = Anthropogenic

- a metal (structural)
- c concrete (loose blocks)
- d debris (man-made)
- f fill, undifferentiated mixed
- o concrete (solid cement blocks)
- r rubble, rip rap
- t logs (cut trees)
- w wood (structural)

## B = Biogenic

- c coarse shell
- f fine shell hash
- g grass on dunes
- l dead trees (fallen, not cut)
- o organic litter
- p peat
- t trees (living)
- z permafrost

## C = Clastic

- a angular blocks (>25cm diameter)
- b boulders (rounded, subrounded, >25cm)
- c cobbles
- d diamictum (poorly-sorted sediment containing a range of particles in a mud matrix)
- f fines/mud (mix of silt/clay, <0.063 mm diameter)
- k clay (compact, finer than fines/mud, <0.0039 mm diameter)
- p pebbles
- r rubble (boulders>1 m diameter)
- s sand (0.063 to 2 mm diameter)
- t tephra (volcanic pumice and ash)
- § silt (0.0039 to 0.063 mm)
- x angular fragments (mix of block/rubble)
- v sediment veneer (used as modifier)
- z permafrost

## I = Ice

- i ice (e.g., ice wedges in permafrost)

## R = Bedrock

- rock type:
- i igneous
- m metamorphic
- s sedimentary
- v volcanic

## rock structure:

- 1 bedding
- 2 jointing
- 3 massive

## SEDIMENT TEXTURE

- (Simplified from Wentworth grain size scale)
- GRAVELS**
- boulder > 25 cm diameter
  - cobble 6 to 25 cm diameter
  - pebble 0.5 cm to 6 cm diameter

## SAND

- very fine to very coarse:
- 0.063 mm to 2 mm diameter

## FINES ("MUD")

- includes silt and clay
- silt 0.0039 to 0.063 mm
- clay <0.0039 mm

## TEXTURE CLASS BREAKS

- sand / silt 63 to 2000 (0.063 mm)
- pebble / granule 0.5 cm (5 mm)
- cobble / pebble 6 cm
- boulder / cobble 25 cm

## SHORE MODIFICATIONS

- WB wooden bulkhead
- BR boat ramp
- CB concrete bulkhead
- LF landfill
- SP sheet pile
- RR riprap

% are 0-10 (default value 0)

Note: The 'Material' descriptor consists of one primary term code, followed by codes for associated modifiers (e.g. Cbc). If only one modifier is used, the material described comprises 75% of the volume of the layer (e.g. Cb); if more than one modifier is used, they are ranked in order of volume.

A surface layer can be described by prefix V for veneer, followed by Material descriptor for the veneer, with a slash (/) over the underlay Material code (e.g. vCs/R).

# ShoreZone Unit Delineation



# ShoreZone Unit Delineation



# ShoreZone Unit Aspect

Attribute	Unit Boundary Criteria
<b>Minimum Mapping Unit</b>	Either 10 m or 50 m based on the feature size resolved by the digital shoreline.
<b>Aspect</b>	If the orientation of the beach (90 degrees to shore normal at the waterline) changes by more than 45 degrees for an alongshore unit length greater than the minimum mapping length (Fig. 7).



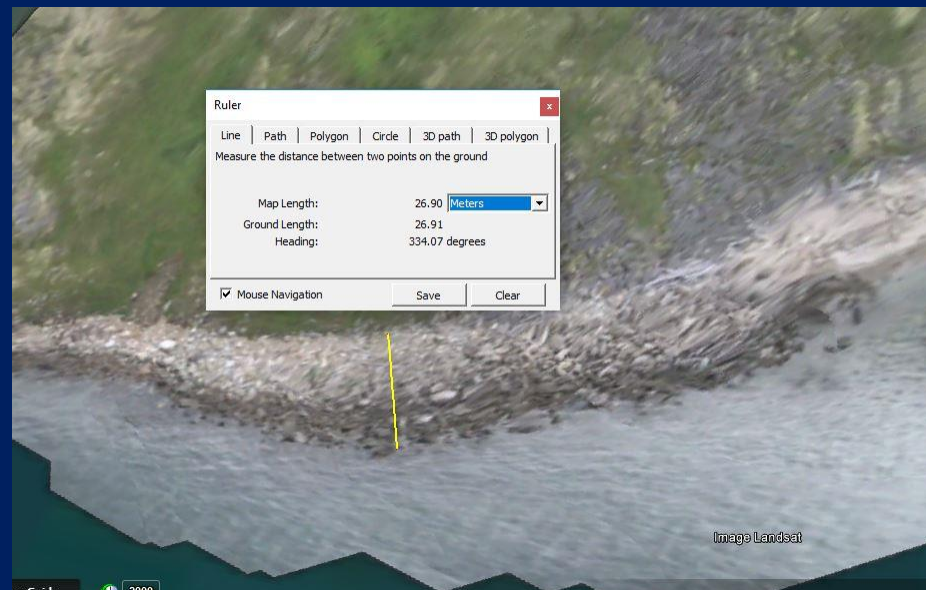
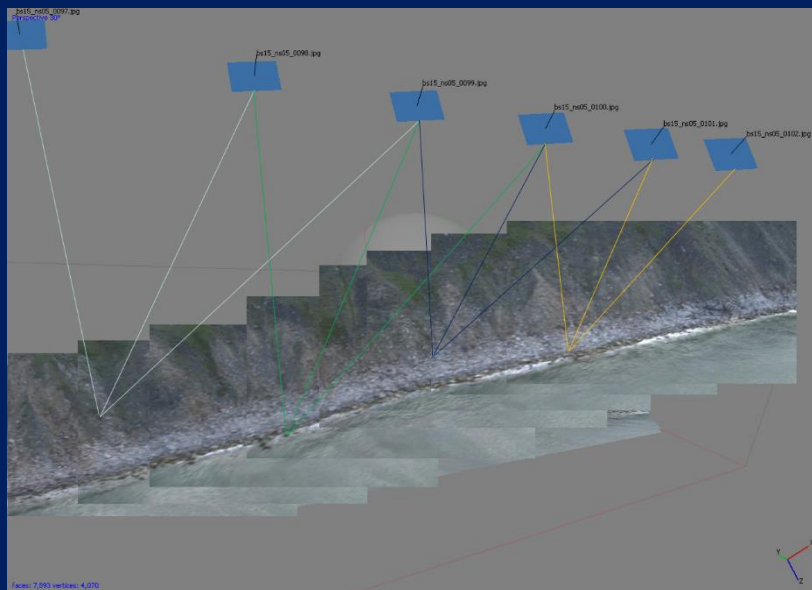
# ShoreZone Unit Substrate

Substrate					
Attribute	Genesis	Category	Type/Size	% Cover	
Minimum Map Unit	Lithogenic	Rock	Rock	<5%	
Aspect			Block	5-25%	
Substrate		Sediment	Boulders	25-50%	
			Cobbles	50-75%	
			Pebbles	75-95%	
			Sand (Coarse)	>95%	
Silt (Fine)					
Slope		Biogenic	Organics	Mud/Ooze	
Wave Exposure				Peat	
				Shell	
	Wood				
	Coral				
	Other				
	Impermeable			Metal	
				Concrete	
				Wood	
				Other	
		Permeable	Concrete		
	Wood				
	Plastic				
	Miscellaneous debris				
	Other				
	Obscured	NA	Vegetated		
			Other		

olved by the digital  
 e normal at the  
 an alongshore unit  
 (Fig. 7)  
 in size in either the  
 length greater than  
 for an alongshore  
 (Fig. 17).  
 n alongshore  
 length. See Table 17

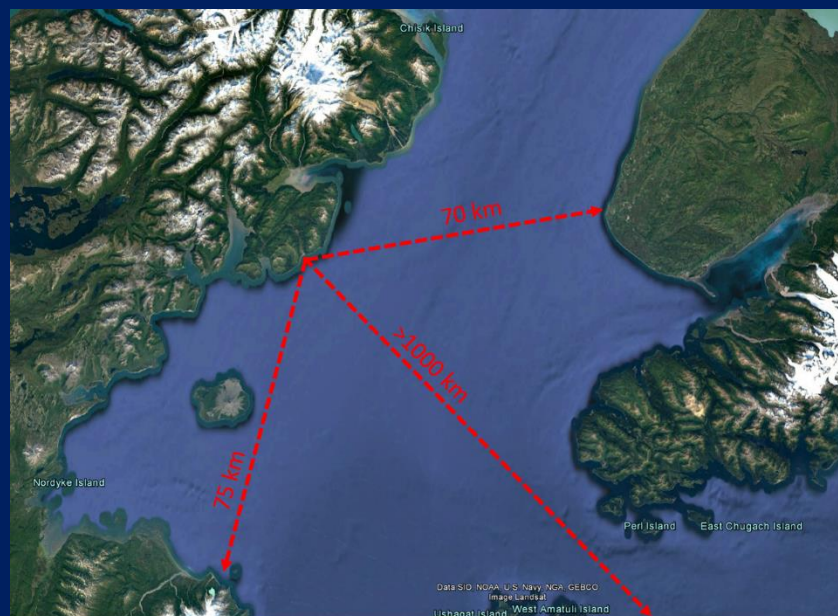
# ShoreZone Unit Slope

Attribute	Unit Boundary Criteria
<b>Minimum Mapping Unit</b>	Either 10 m or 50 m based on the feature size resolved by the digital shoreline.
<b>Aspect</b>	If the orientation of the beach (90 degrees to shore normal at the waterline) changes by more than 45 degrees for an alongshore unit length greater than the minimum mapping length (Fig. 7).
<b>Substrate</b>	A change of one category in substrate type or grain size in either the primary or secondary substrate for an alongshore length greater than the minimum mapping distance (Fig. 24).
<b>Slope</b>	If the intertidal zone slope changes by a category for an alongshore length greater than the minimum mapping length (Fig. 17).
<b>Wave Exposure</b>	If the wave exposure changes by a category for an alongshore length greater than the minimum mapping unit length. See Table 17 for definitions of wave exposure categories.

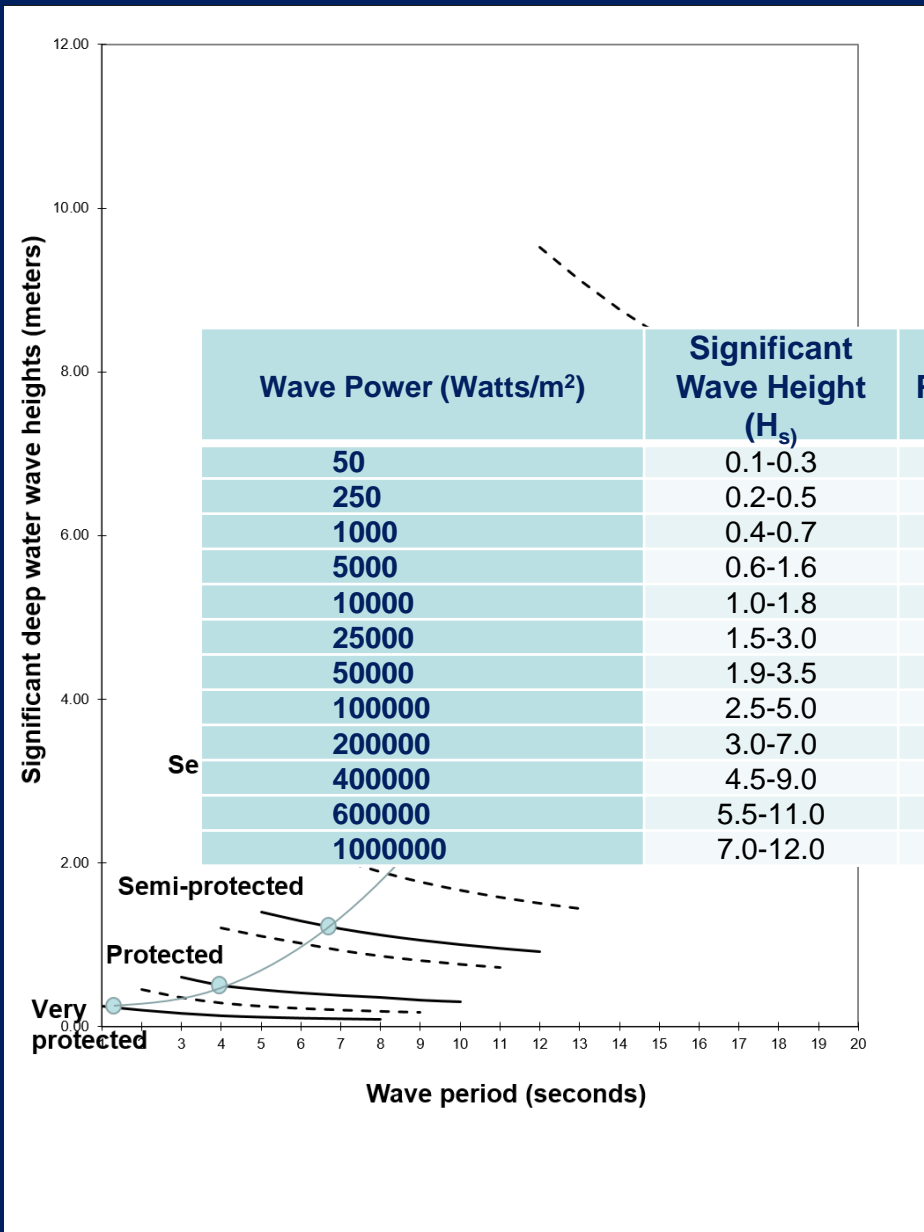


# ShoreZone Unit Exposure

Attribute	Unit Boundary Criteria
<b>Minimum Mapping Unit</b>	Either 10 m or 50 m based on the feature size resolved by the digital shoreline.
<b>Aspect</b>	If the orientation of the beach (90 degrees to shore normal at the waterline) changes by more than 45 degrees for an alongshore unit length greater than the minimum mapping length (Fig. 7).
<b>Substrate</b>	A change of one category in substrate type or grain size in either the primary or secondary substrate for an alongshore length greater than the minimum mapping distance (Fig. 24).
<b>Slope</b>	If the intertidal zone slope changes by a category for an alongshore length greater than the minimum mapping length (Fig. 17).
<b>Wave Exposure</b>	If the wave exposure changes by a category for an alongshore length greater than the minimum mapping unit length. See Table 17 for definitions of wave exposure categories.

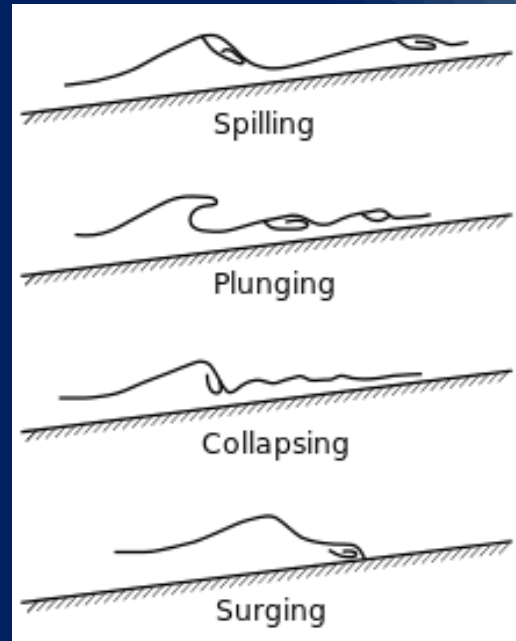
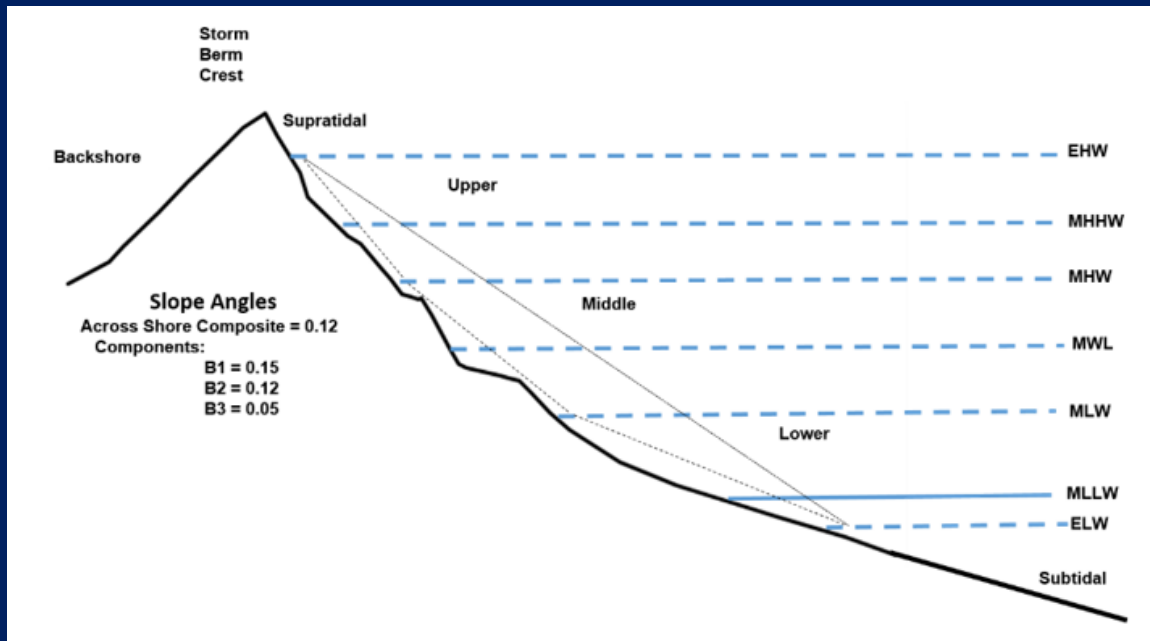


# ShoreZone Unit Wave Energy



Wave Power (Watts/m <sup>2</sup> )	Significant Wave Height (H <sub>s</sub> )	Wave Period (T)	Wave Length (L)	Wind (km/hr)	Exposure (km)	ShoreZone Exposure Category
50	0.1-0.3	0.5-3	1-15	10	1	Very protected
250	0.2-0.5	1-5	2-40	20	5	Protected
1000	0.4-0.7	2-7	6-75	20	10	
5000	0.6-1.6	2-9	6-125	30	25	
10000	1.0-1.8	3-11	15-175	30	50	Semi-protected
25000	1.5-3.0	3-12	15-225	35	100	Semi-exposed
50000	1.9-3.5	4-14	25-300	35	200	
100000	2.5-5.0	4-16	25-400	35	300	
200000	3.0-7.0	4-20	25-600	40	500	Exposed
400000	4.5-9.0	5-20	40-600	50	700	Very exposed
600000	5.5-11.0	5-20	40-625	60	1000	
1000000	7.0-12.0	7-20	75-650	70	>1000	

# ShoreZone Unit Energy Dissipation



Slope	Exposure category						Iribarren category
	Vp	P	Sp	Se	E	Ve	
<1	0.03	0.04	0.05	0.05	0.06	0.06	Dissipative < .2
2-5	0.15	0.21	0.30	0.32	0.34	0.37	Plunging > 0.2 < 1
6-10	0.35	0.50	0.70	0.74	0.79	0.86	Collapsing/Surging > 1 < 3.3
11-20	0.70	0.99	1.40	1.49	1.58	1.72	Reflective > 3.3
21-45	1.63	2.30	3.25	3.45	3.66	3.98	
>45	2.60	3.68	5.20	5.52	5.85	6.37	

# ShoreZone Oil Residency Index

Slope	Rock (or Anthropogenic Impermeable)						Block (and riprap)					
	Vp	P	Sp	Se	E	Ve	Vp	P	Sp	Se	E	Ve
<1	3	3	3	2	2	2	5	5	5	5	5	5
2-5	3	3	2	1	1	1	4	4	4	3	3	3
6-10	2	2	2	1	1	1	3	3	3	3	3	3
11-20	2	2	1	1	1	1	3	3	3	3	3	3
21-45	2	1	1	1	1	1	3	3	2	2	2	2
>45	1	1	1	1	1	1	3	3	2	2	2	2

Slope	Boulder						Cobble					
	Vp	P	Sp	Se	E	Ve	Vp	P	Sp	Se	E	Ve
<1	5	5	5	4	4	4	5	5	5	4	4	4
2-5	4	4	3	3	3	3	4	4	3	3	3	3
6-10	3	3	3	3	3	3	3	3	3	2	2	2
11-20	NA	NA	NA	NA	2	2	NA	NA	NA	NA	NA	NA
21-45	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	NA
>45	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Slope	Pebble						Sand					
	Vp	P	Sp	Se	E	Ve	Vp	P	Sp	Se	E	Ve
<1	5	5	4	4	3	3	4	4	4	3	3	3
2-5	4	4	3	3	2	2	3	3	2	2	2	2
6-10	3	3	2	2	1	1	2	2	2	1	1	1
11-20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
21-45	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>45	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

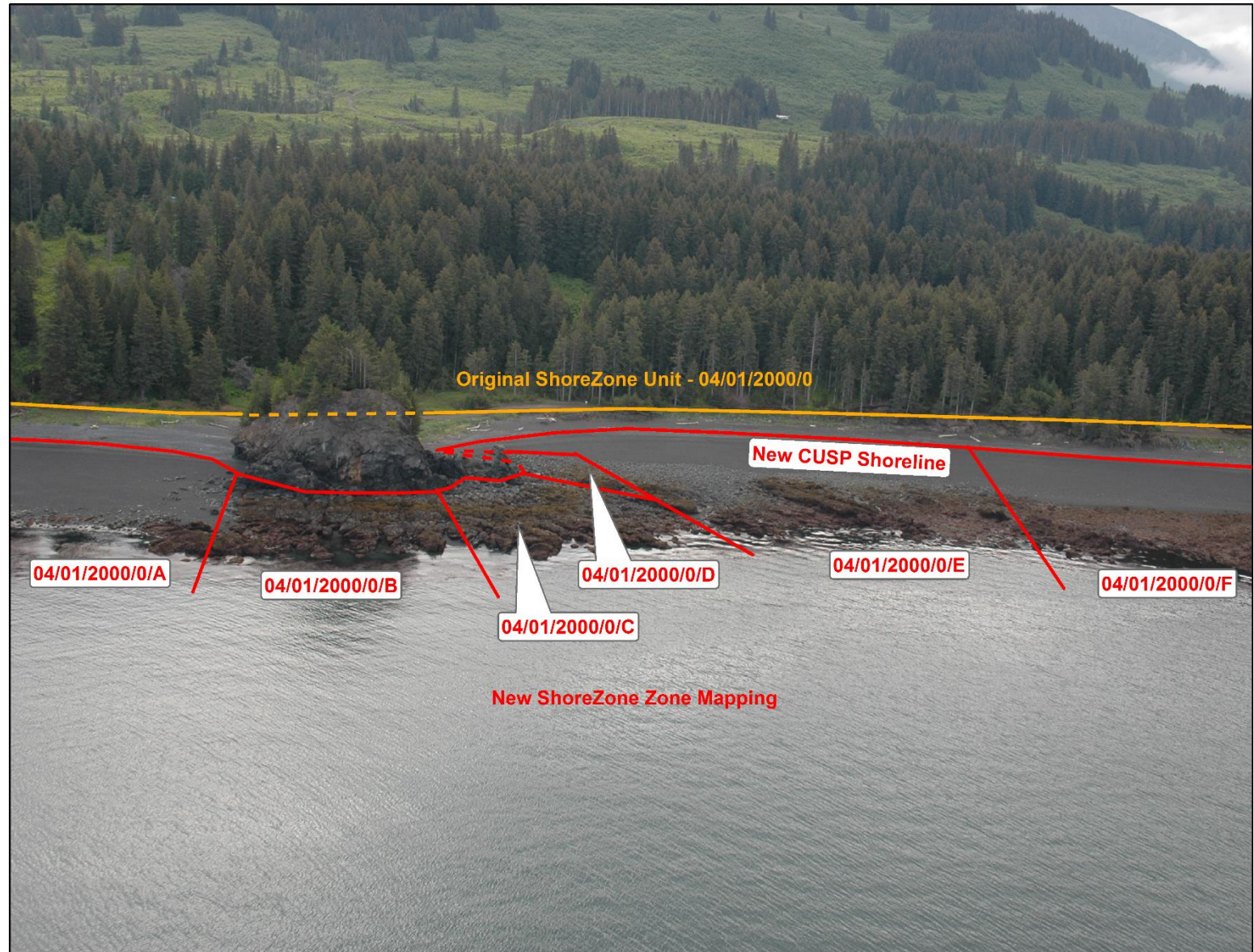
  

Slope	Mixed Sand and Gravel						Silt/Mud					
	Vp	P	Sp	Se	E	Ve	Vp	P	Sp	Se	E	Ve
<1	5	5	4	4	3	2	5	5	4	4	3	3
2-5	4	4	3	3	2	1	4	4	3	3	2	2
6-10	3	3	2	2	1	1	3	3	2	2	1	1
11-20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
21-45	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
>45	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

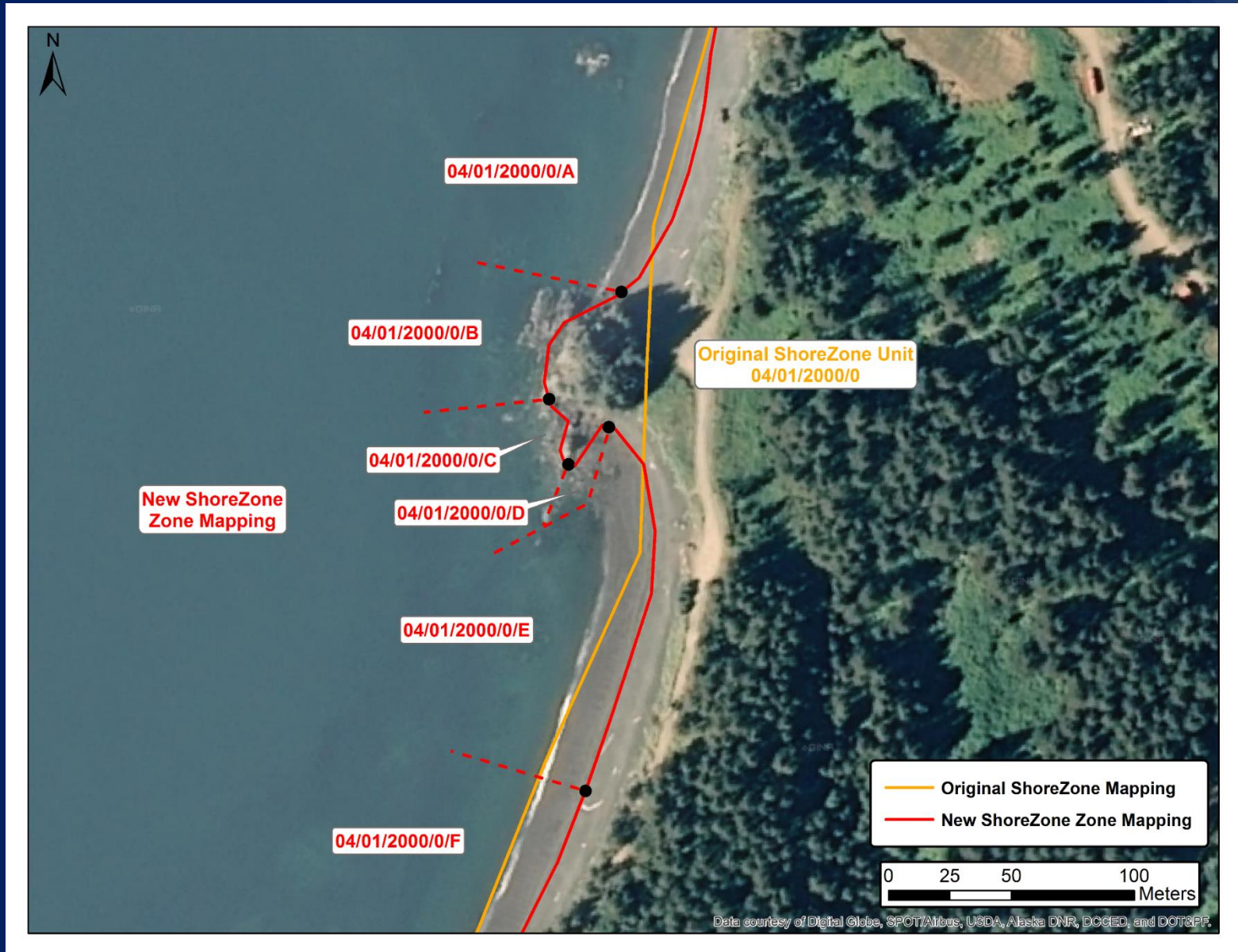
  

Slope	Anthropogenic permeable						Vegetated					
	Vp	P	Sp	Se	E	Ve	Vp	P	Sp	Se	E	Ve
<1	5	5	5	4	4	4	5	5	5	5	4	4
2-5	4	4	3	3	3	3	5	4	4	4	3	3
6-10	3	3	3	3	3	3	4	4	3	3	2	2
11-20	3	3	3	3	3	3	4	3	2	2	1	1
21-45	3	2	2	2	2	2	NA	NA	NA	NA	NA	NA
>45	3	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

# ShoreZone Subunits



# ShoreZone Unit Subunits



# Questions?

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