Session 51

Jim Kapinos

FL. Dept. of Transportation - District 2

US-98 Impacts and Countermeasures

Topic Description

Hurricane Storm Damage and restoration of US 98 in Okaloosa and Franklin Counties. Compare and contrast damage and permanant repair to two sections of coastal roadway. One barrier island with overtopping and one typical direct storm attack on the mainland. Design options and rationale.

Speaker Biography

FDOT District III District Drainage Engineer.
Education: BS Civil Engineering 1970 Lowell Technological Institute (now UMass Lowell). Master of Engineering in Civil Engineering (Environmental and Water Resources Engineering) 1993 University of South Carolina.

Five years (1993-1998)ENVIRO-PRO-TECH, Environmental Engineering; site, air and landfill permitting, site remediation, petroleum containment systems, general Civil Engineering support to petroleum terminals. Three dimensional Groundwater and contaminant transport Modeling.

FDOT 8 years (1998-2006) Drainage. District Drainage Engineer

US 98 HURRICANE DAMAGE AND RESTORATION

OKALOOSA ISLAND
&
FRANKLIN COUNTY

Jim Kapinos, P.E.
FDOT D3 District Drainage Engineer
Okaloosa Island by Scott Golden, P.E. Asst Dist 3 Design Engineer

US 98
Okaloosa Island

History US 98 Okaloosa Island

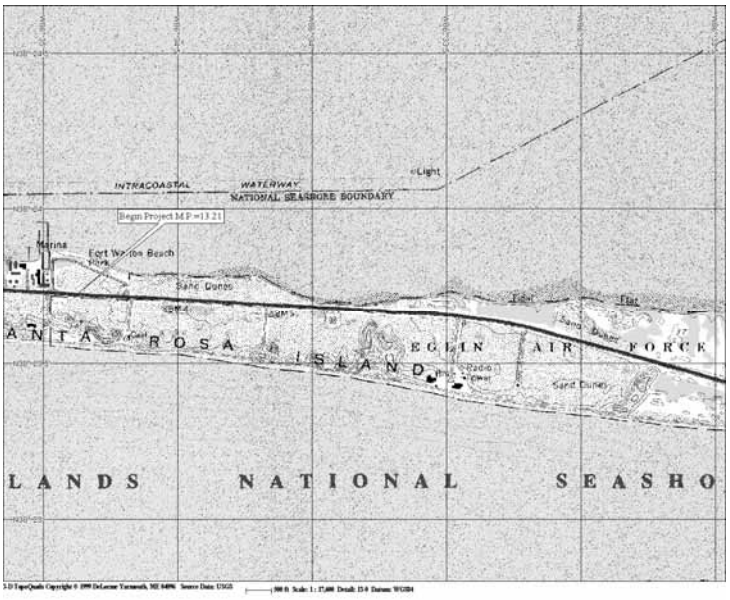
(Design Scott Golden D3 Asst. Design Engineer)

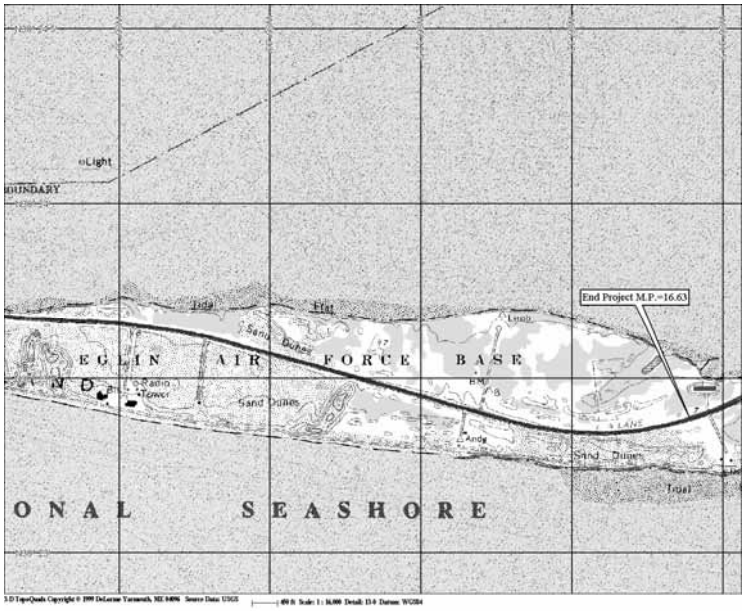
Original 2 lane to 4 lane Construction Late 1960's

No Storm Damage Prior to Opal (1995)

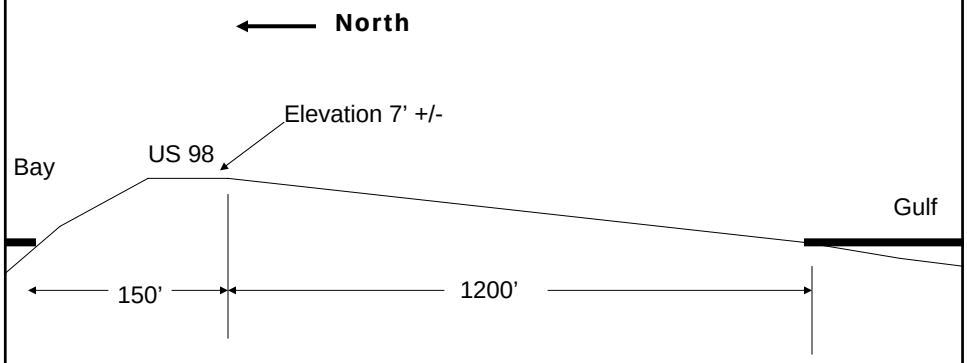
Ivan (September 2004)

Dennis (July 2005)

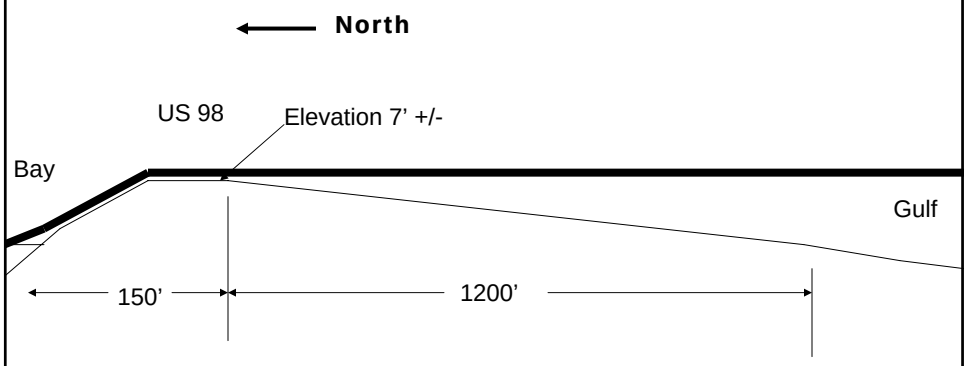




Typical Section Through Okaloosa Island (typical tidal cycle)



Typical Section Through Okaloosa Island (storm surge)

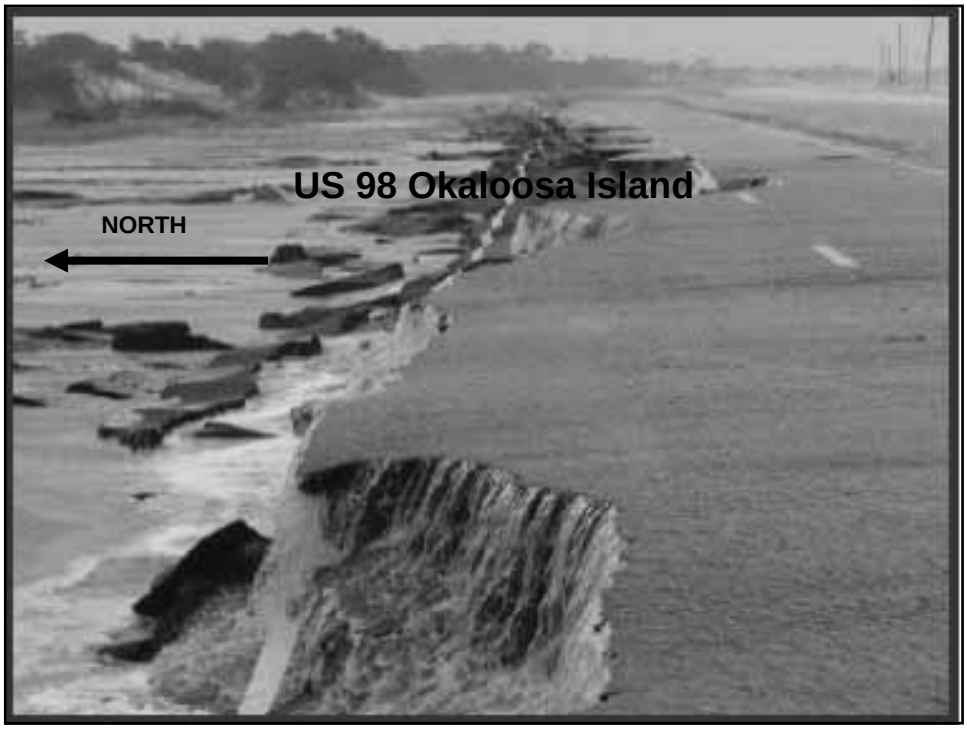


Causes of Failures US98 Okaloosa

Roadway Overtopping from Storm Surge

Roadway Becomes a Spillway

Erosion Occurs from North to South


US 98 Okaloosa Island
NORTH

7/11/05

Alternatives & Solutions Okaloosa

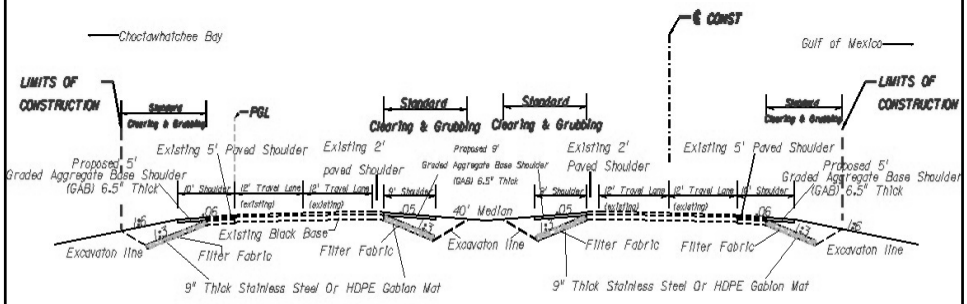
Protection & Retaining Systems
- Gabion Systems
- Sheet Pile Systems

Land Bridge

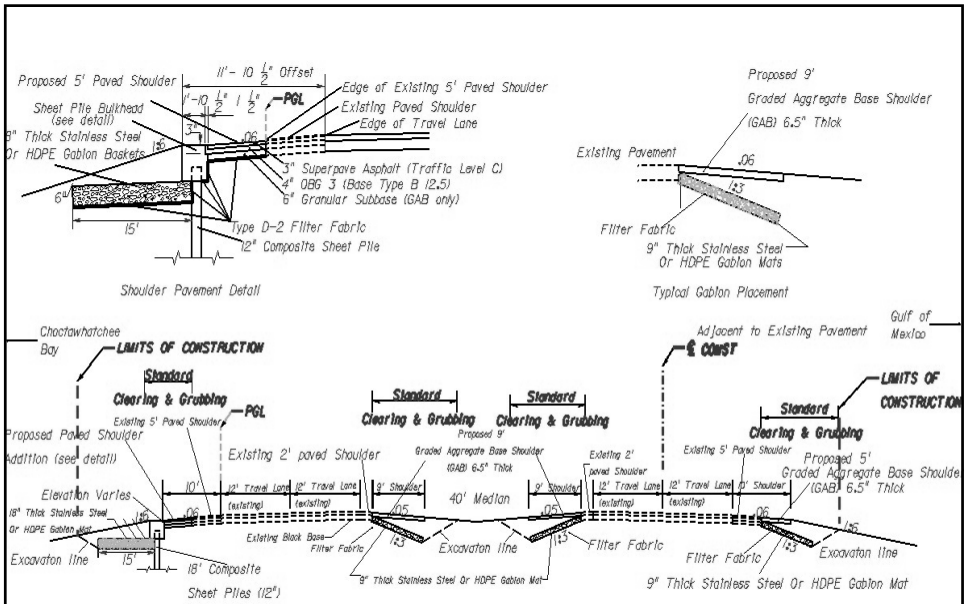
Armoring Systems (Rubble Rip Rap)

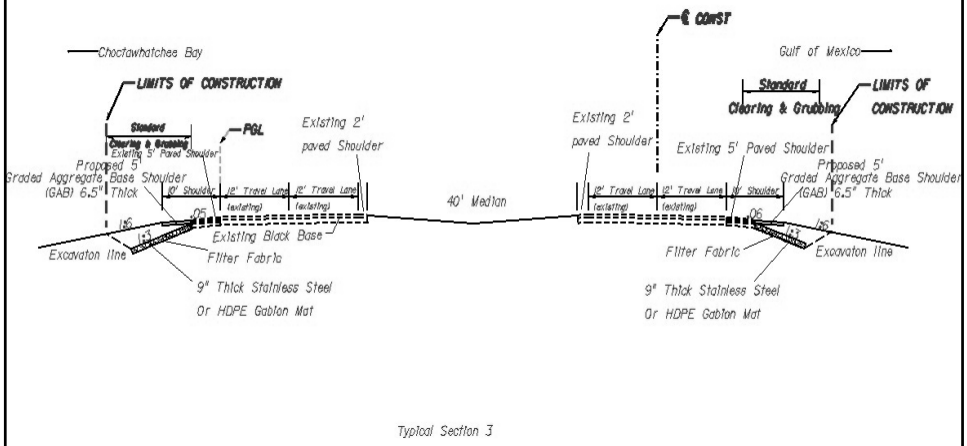
Raising or Lowering the Roadway

VE Study validated the design



Typical Section 1





Typical Section 3

FEB 6 200

FEB 21 2006

FEB 14 2006

February 14, 2006
AW installing gabion
baskets RT Median 186+87
to 193+11.

CASE
JAN 16 2006

US 98
FRANKLIN COUNTY

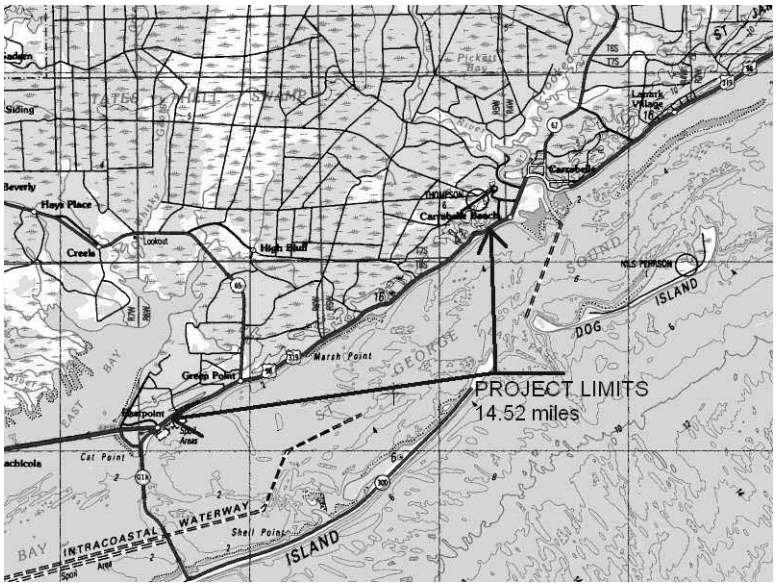
US 98 Franklin Co.

Older 2 Lane roadway some without Paved Shoulders

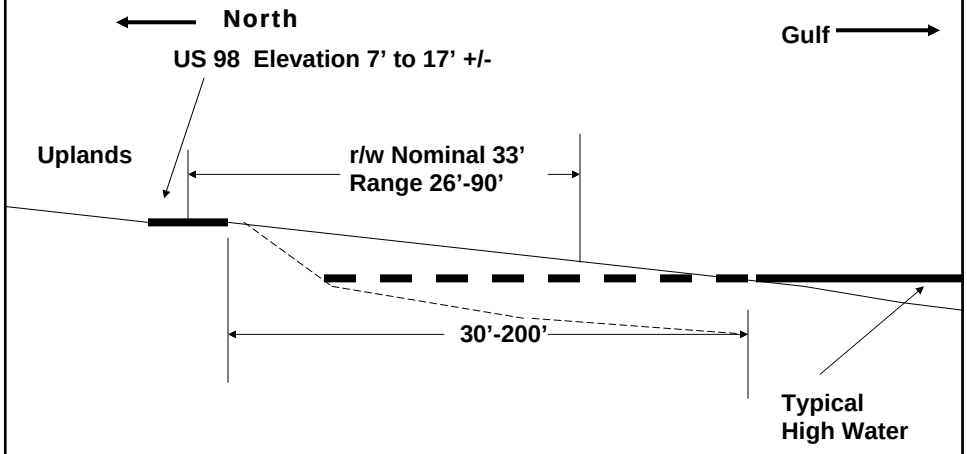
Increasing Frequency of Storm Damage

Beach Line Erosion Reducing Natural Protection

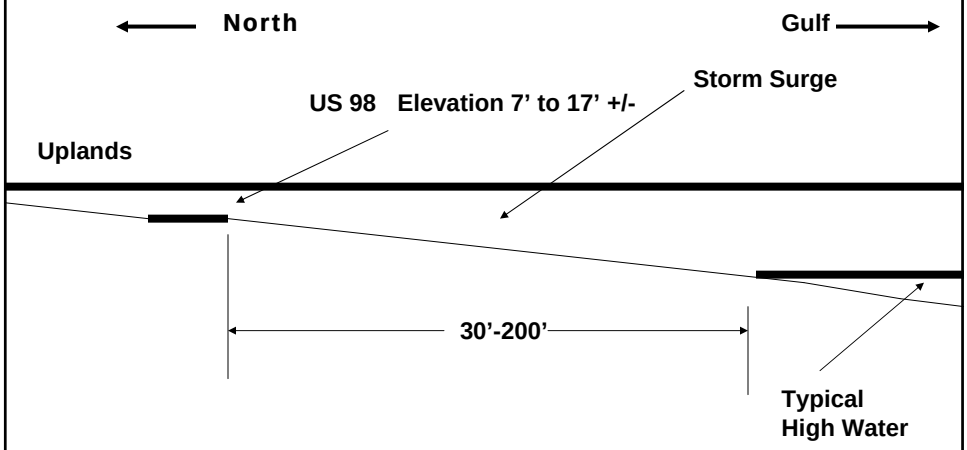
6+ Miles of Roadway Damaged During Dennis (July2005)



Typical Section Through US 98 Franklin Co.



Typical Section Through US 98 Franklin Co. (storm surge)



Comparison US 98 Okaloosa & Franklin Counties

	rd el.	Extent of Damage	r/w	Property Ownweship	Lanes
OK.	7'	2 mi.	200'	USAF/Local	4
Damage to north side of roadway.					
Frank.	7'-17'	6 /14 mi.	66' Nom.	250 mostly Priv.	2
Damage to south side of roadway.					

r/w = 33' off c/l

Causes of Failures US98 Franklin Co.

Roadway Overtopping from Storm Surge & Direct Wave Impact

Erosion of Natural Beach Line Protection

Damage Occurs from South to North

Alternatives & Solutions Franklin Co.

Protection & Retaining Systems

- Traditional Concrete Sheet Pile Systems
- Armoring Systems (Rubble Rip Rap)

"One Size Fits All"

Sheet Pile and Rip Rap

VE Study

Based on the “bare bones” design of sheet pile and rip rap as a starting point.

Coastal Engineer involvement

More time for VE than the design

VE RECOMMENDATION

Soldier Pile Wall

Articulating Concrete Block (open cell)

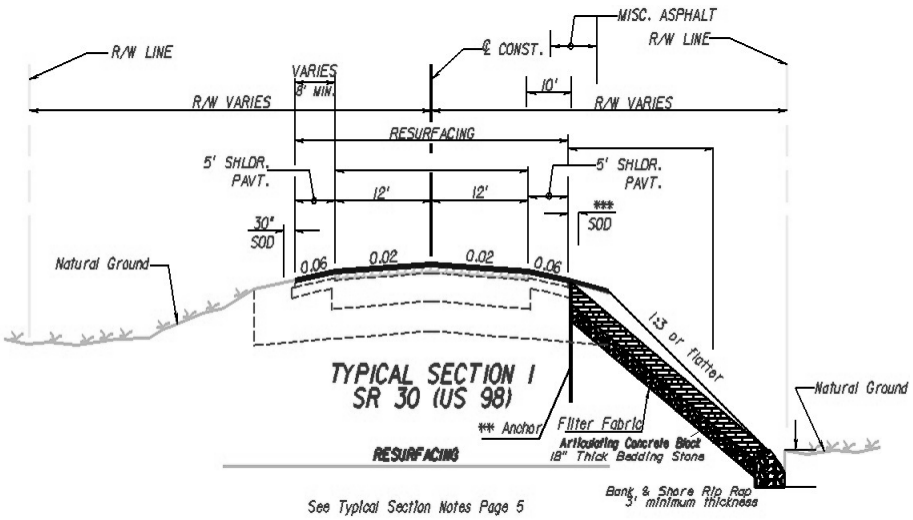
The Good, the Bad, and the Ugly

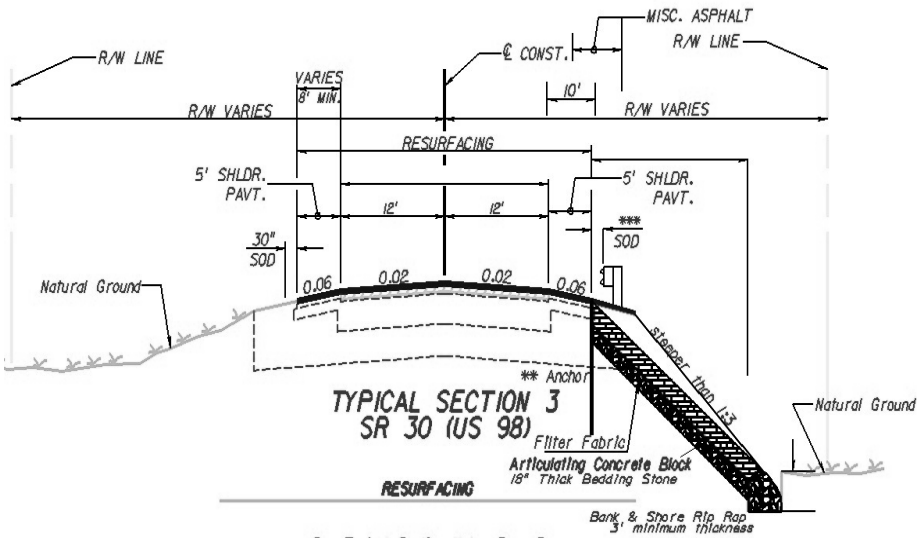
Articulating Concrete Block

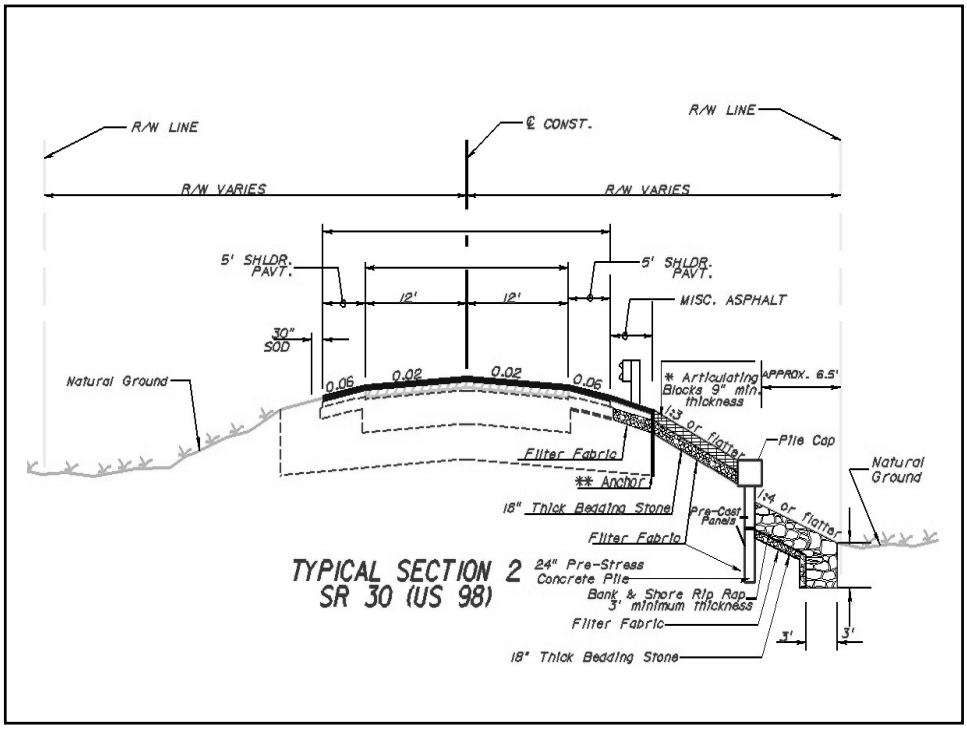
Soldier Pile Wall used where possible

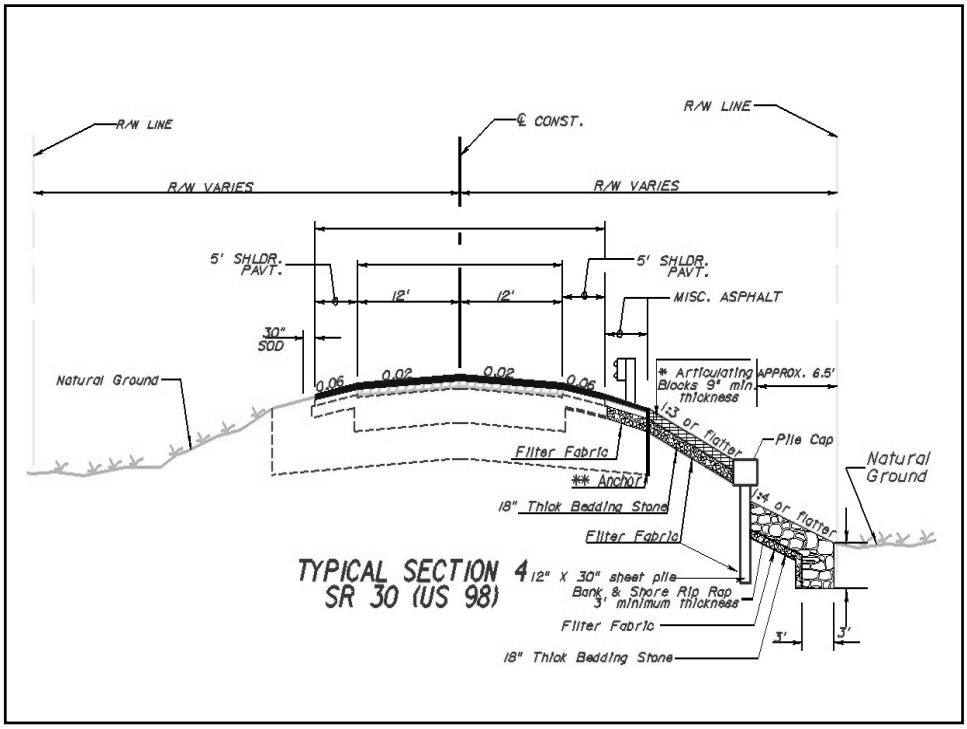
Length of Wall of any type reduced

Soldier Pile Wall not constructable in many locations


MISC. ASPHALT
R/W LINE
R/W LINE
℄ CONST.
VARIES
8' MIN.
10'
R/W VARIES
R/W VARIES
RESURFACING
5' SHLDR. PAVT.
5' SHLDR. PAVT.
12'
12'
30" SOD
*** SOD
Natural Ground
0.06
0.02
0.02
0.06
1:3 or flatter
TYPICAL SECTION 1
SR 30 (US 98)
Natural Ground
** Anchor
Filter Fabric
Articulating Concrete Block
18" Thick Bedding Stone
RESURFACING
Bank & Shore Rip Rap
3' minimum thickness
See Typical Section Notes Page 5


MISC. ASPHALT
R/W LINE
R/W LINE
℄ CONST.
VARIES
8' MIN.
10'
R/W VARIES
R/W VARIES
RESURFACING
5' SHLDR. PAVT.
5' SHLDR. PAVT.
12'
12'
30" SOD
*** SOD
Natural Ground
0.06
0.02
0.02
0.06
steeper than 1:3
** Anchor
TYPICAL SECTION 3
SR 30 (US 98)
Natural Ground
Filter Fabric
Articulating Concrete Block
18" Thick Bedding Stone
RESURFACING
Bank & Shore Rip Rap
3' minimum thickness
See Typical Section Notes Page 5


R/W LINE
℄ CONST.
R/W LINE
R/W VARIES
R/W VARIES
5' SHLDR. PAVT.
5' SHLDR. PAVT.
12'
12'
MISC. ASPHALT
30" SOD
Natural Ground
0.06
0.02
0.02
0.06
* Articulating Blocks 9" min. thickness
APPROX. 6.5'
1:3 or flatter
Pile Cap
Filter Fabric
** Anchor
Natural Ground
18" Thick Bedding Stone
Pre-Cast Panels
1:4 or flatter
Filter Fabric
24" Pre-Stress Concrete Pile
Bank & Shore Rip Rap 3' minimum thickness
Filter Fabric
18" Thick Bedding Stone
3'
3'
TYPICAL SECTION 2
SR 30 (US 98)


R/W LINE
℄ CONST.
R/W LINE
R/W VARIES
R/W VARIES
5' SHLDR. PAVT.
5' SHLDR. PAVT.
12'
12'
MISC. ASPHALT
30" SOD
Natural Ground
0.06
0.02
0.02
0.06
* Articulating Blocks 9" min. thickness
APPROX. 6.5'
1:3 or flatter
Pile Cap
Filter Fabric
** Anchor
Natural Ground
18" Thick Bedding Stone
1:4 or flatter
Filter Fabric
12" X 30" sheet pile
Bank & Shore Rip Rap 3' minimum thickness
Filter Fabric
18" Thick Bedding Stone
3'
3'
TYPICAL SECTION 4
SR 30 (US 98)

What to Expect

Accelerated Schedule

Minimum Information for Design

High Level of Public Interest

Impact of Prior Emergency Repairs

Standards and Specifications may not fully address Coastal Protection.

Nature Will Likely Test Your Design

QUESTIONS ?

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