Economic Analysis of the Delaware Bay Shoreline: Briefing

DRAFT

May 11, 2012

Foundation

- What do we do with these beaches?
- Future larger question
  - How does this affect our “communities”?
- Will actions/recommendations be sustainable
- What information is needed to make decisions?

DRAFT

DNREC CHARGE

Determine the:

- **Distribution and**
- **Benefits of different management**
- **Scenarios.**

DRAFT

How: Conduct Multi-Value Economic Analysis

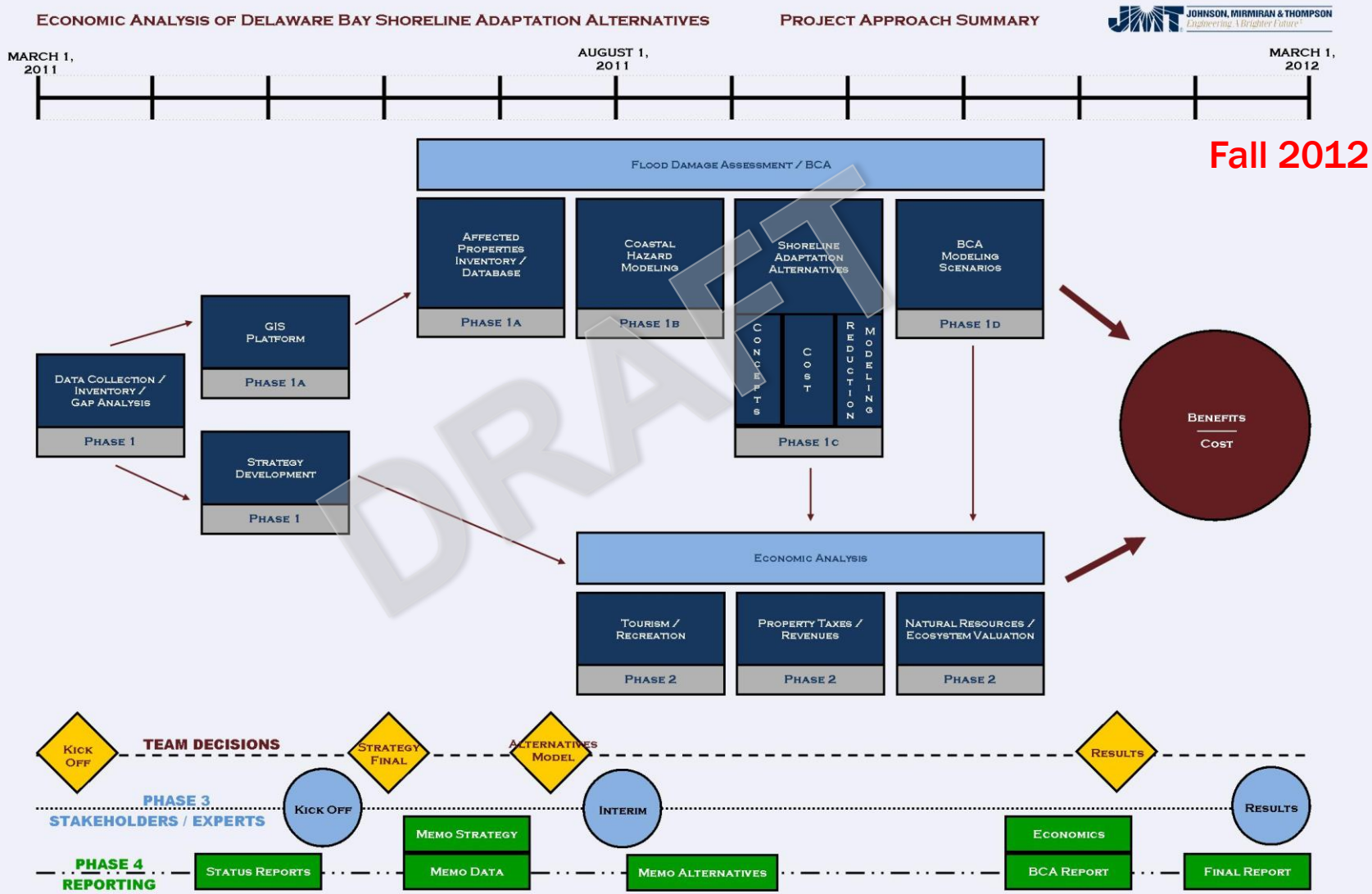
Foundation

- Key Elements/Components of Study
  - Study Areas – 7 Communities
    - Additional Question – Reaches in between
  - Data Collection/Processing
  - Resources/Values to Evaluate
  - Beach Management Scenarios
  - Cost Estimation
  - Benefits Estimation

- *Many Assumptions Necessary for analysis*

DRAFT

Approach/Status



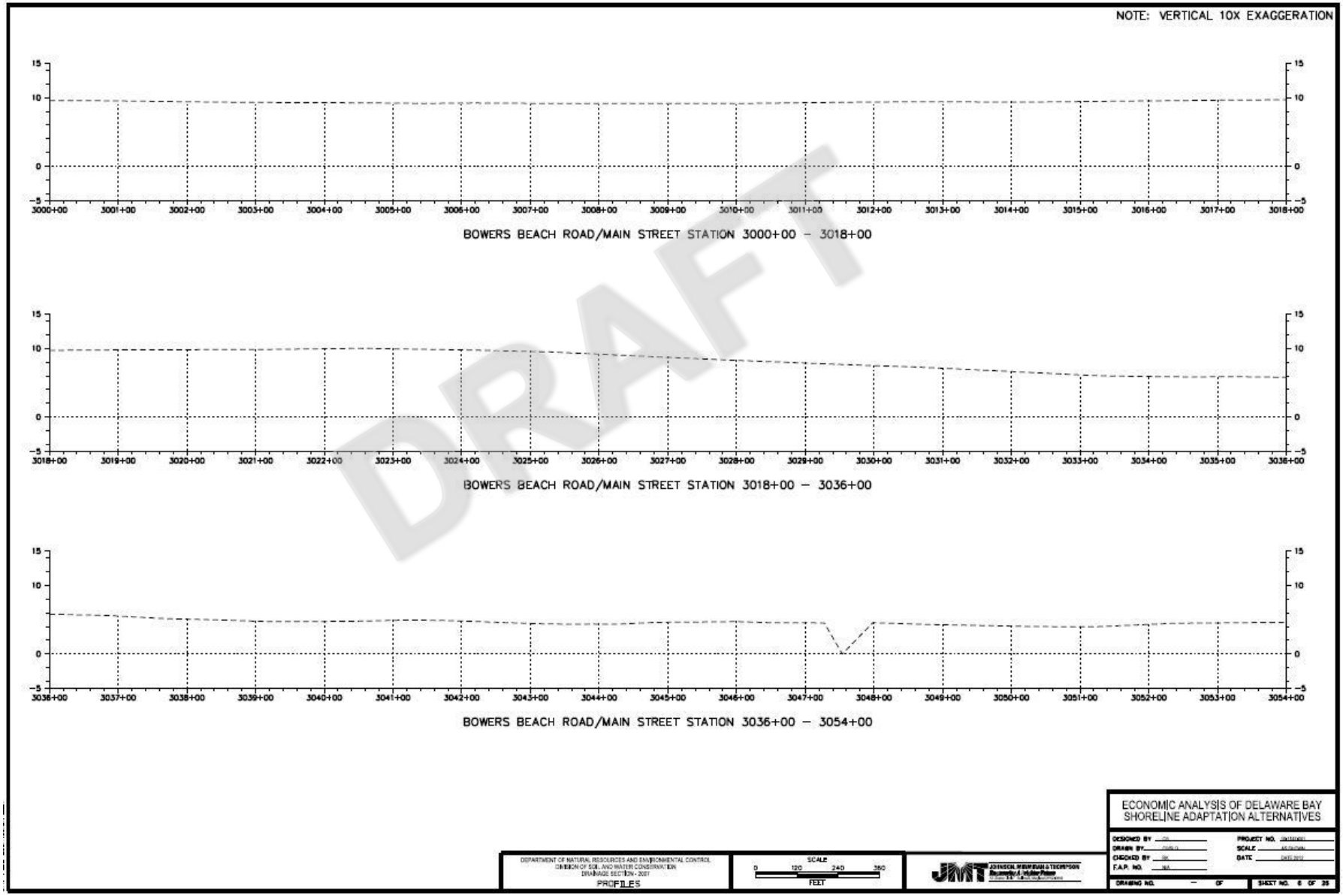
Study Area/Communities

Pickering Beach LiDAR Coverage

Kitts Hummock LiDAR Coverage Map

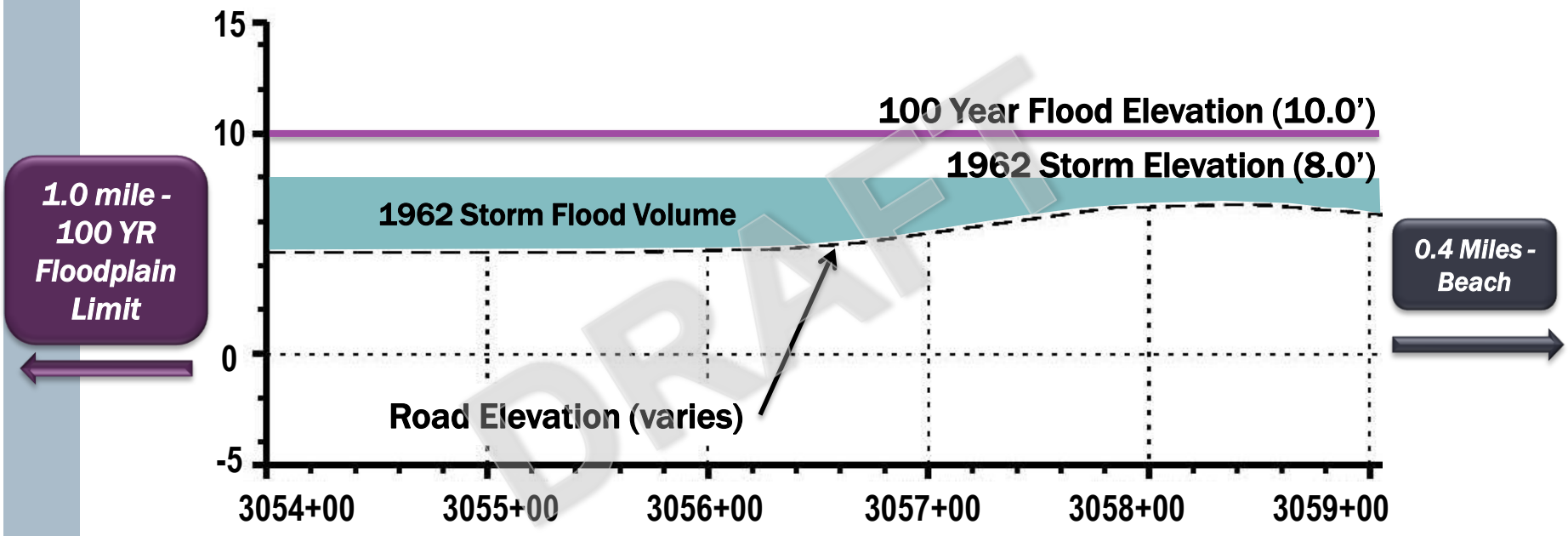
Bowers Beach LiDAR Coverage Map

Bowers


NOTE: VERTICAL 10X EXAGGERATION
BOWERS BEACH ROAD/MAIN STREET STATION 3000+00 – 3018+00
BOWERS BEACH ROAD/MAIN STREET STATION 3018+00 – 3036+00
BOWERS BEACH ROAD/MAIN STREET STATION 3036+00 – 3054+00
DRAFT
ECONOMIC ANALYSIS OF DELAWARE BAY SHORELINE ADAPTATION ALTERNATIVES
PROFILES
SCALE
FEET

ROAD PROFILES UNDER VARIOUS FLOODING CONDITIONS

BOWERS BEACH



MAIN STREET PROFILE (Portion)

Database

Attributes of DE_Bay_Bldgs

OBJECTID	SHAPE *	JMTID	ParcelID_PIN	St_Address	City	County	Community
981	Polygon Z	BK1759	235-3.12-26.00	6 NEW MEXICO AV	BROADKILL BEACH	Sussex County	Broadkill Beach
1840	Polygon Z	BK1796	235-3.12-103.00	3 MISSISSIPPI AV	BROADKILL BEACH	Sussex County	Broadkill Beach
992	Polygon Z	BK1881	235-8.00-134.00	IVY CT	BROADKILL BEACH	Sussex County	Broadkill Beach
991	Polygon Z	BK1880	235-8.00-139.00	IVY CT	BROADKILL BEACH	Sussex County	Broadkill Beach
990	Polygon Z	BK1879	235-8.00-138.00	IVY CT	BROADKILL BEACH	Sussex County	Broadkill Beach
989	Polygon Z	BK1878	235-8.00-136.00	IVY CT	BROADKILL BEACH	Sussex County	Broadkill Beach
988	Polygon Z	BK1768	235-3.12-10.01	1402 N BAY SHORE DR	BROADKILL BEACH	Sussex County	Broadkill Beach
987	Polygon Z	BK1767	235-3.12-67.00	2 TEXAS AV	BROADKILL BEACH	Sussex County	Broadkill Beach
986	Polygon Z	BK1765	235-3.12-30.00	7 ARIZONA AV	BROADKILL BEACH	Sussex County	Broadkill Beach
994	Polygon Z	BK1883	235-8.00-132.00	IVY CT	BROADKILL BEACH	Sussex County	Broadkill Beach
983	Polygon Z	BK1762	235-3.12-11.00	12 ARIZONA AV	BROADKILL BEACH	Sussex County	Broadkill Beach
1008	Polygon Z	BK286	235-9.00-28.00	TURKLE POND	BROADKILL BEACH	Sussex County	Broadkill Beach
980	Polygon Z	BK1758	235-3.12-29.01	5 ARIZONA AV	BROADKILL BEACH	Sussex County	Broadkill Beach
979	Polygon Z	BK1757	235-3.12-25.00	4 NEW MEXICO AV	BROADKILL BEACH	Sussex County	Broadkill Beach
978	Polygon Z	BK1756	235-3.12-13.00	8 ARIZONA AV	BROADKILL BEACH	Sussex County	Broadkill Beach
977	Polygon Z	BK1755	235-3.12-24.00	2 NEW MEXICO AV	BROADKILL BEACH	Sussex County	Broadkill Beach
976	Polygon Z	BK1754	235-3.12-23.00	1 ARIZONA AV	BROADKILL BEACH	Sussex County	Broadkill Beach
975	Polygon Z	BK1751	235-3.12-12.00	9 CALIFORNIA AV	BROADKILL BEACH	Sussex County	Broadkill Beach
974	Polygon Z	BK1750	235-3.12-22.00	3 ARIZONA AV	BROADKILL BEACH	Sussex County	Broadkill Beach
973	Polygon Z	BK1749	230-24.00-3.00	8 CALIFORNIA AV	BROADKILL BEACH	Sussex County	Broadkill Beach
984	Polygon Z	BK1763	235-3.12-66.00	1 NEW MEXICO AV	BROADKILL BEACH	Sussex County	Broadkill Beach
1026	Polygon Z	BK305	235-9.00-7.00	BROADKILL RD	BROADKILL BEACH	Sussex County	Broadkill Beach
1056	Polygon Z	BK336	235-10.00-38.00	2821 S BAY SHORE DR	BROADKILL BEACH	Sussex County	Broadkill Beach
1055	Polygon Z	BK335	235-10.00-13.00	2806 S BAY SHORE DR	BROADKILL BEACH	Sussex County	Broadkill Beach
1053	Polygon Z	BK333	235-10.00-37.00	2819 S BAY SHORE DR	BROADKILL BEACH	Sussex County	Broadkill Beach

Record: 0 Show: All Selected Records (0 out of 1790 Selected) Options

DRAFT

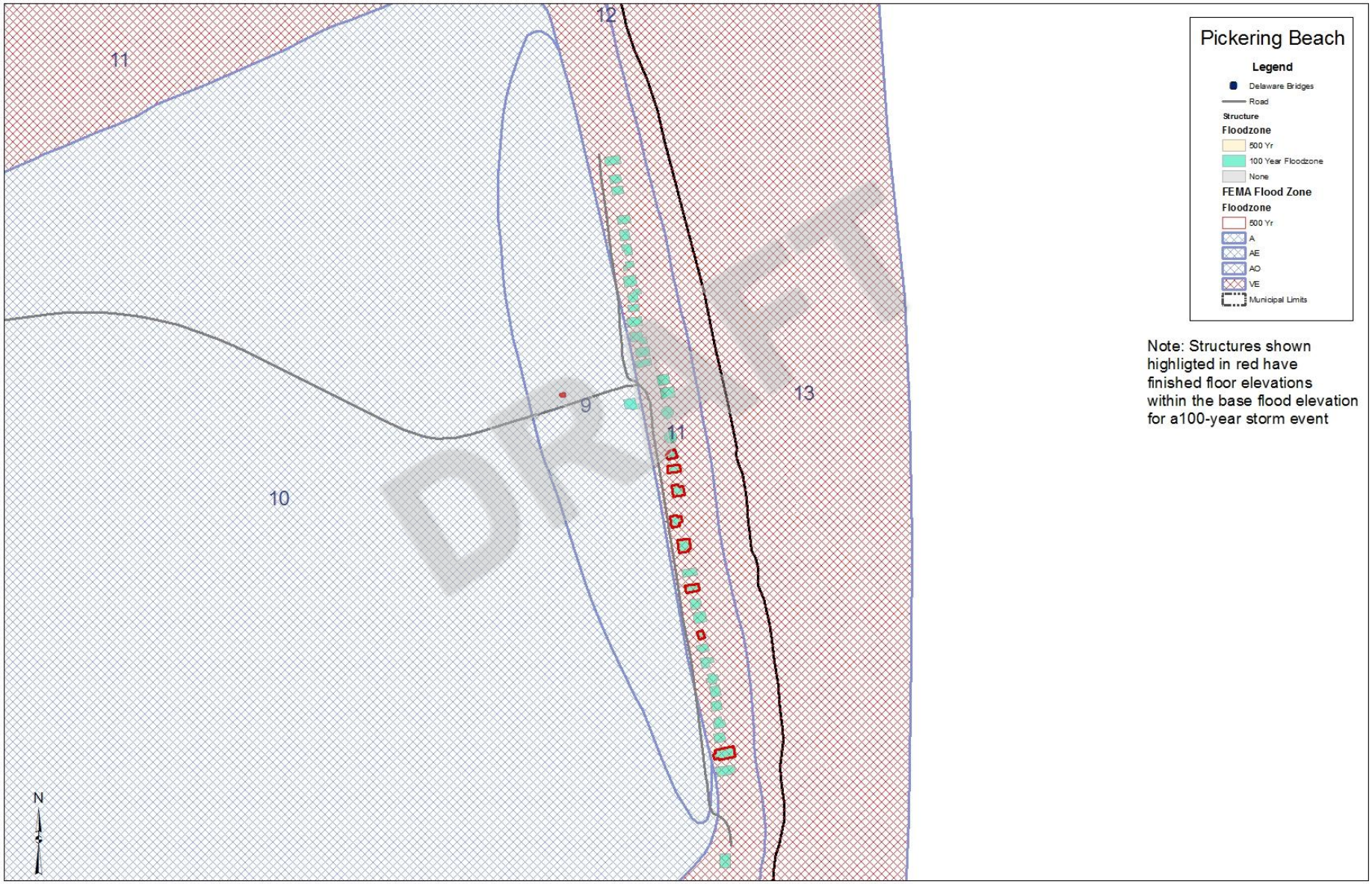
Database

Attributes of DE_Bay_Bldgs

Kent Fo	FF_SQFT	Bldg_SQFT	Kent Sq F	Tax_Value	Building	Land T	Misc Tax	LS_Valu	BRV	FFE	GFE	delta_elev	FEMA_Fldzn	Sewer	Wa
none	2754.5252	2754.525224	0	89200	0	7200	82000	<Null>	<Null	<Null>	6	<Null>	AE	No	On S
none	22889.056	22889.05678	0	89200	0	7200	82000	<Null>	<Null	<Null>	6	<Null>	AE	No	On S
none	858.64762	858.647623	0	89200	0	7200	82000	<Null>	<Null	<Null>	6	<Null>	AE	No	On S
none	22819.923	22819.92394	0	89200	0	7200	82000	<Null>	<Null	<Null>	6	<Null>	AE	No	On S
none	3294.9498	6589.89972	0	139700	109900	6700	23100	<Null>	<Null	8.830113	6	2.830113	AE	Yes	On S
none	2110.6893	4221.378792	960	87300	41600	25300	20400	<Null>	<Null	10.749926	10	0.749926	AE	Yes	On S
none	5165.9426	5165.942666	960	87300	41600	25300	20400	<Null>	<Null	10.670082	8	2.670082	AE	Yes	On S
none	5710.3564	5710.356455	960	87300	41600	25300	20400	<Null>	<Null	<Null>	8	<Null>	AE	Yes	On S
none	1181.9932	1181.993226	960	87300	41600	25300	20400	<Null>	<Null	11.63967	8	3.639669	AE	Yes	On S
none	938.30406	938.30406	960	87300	41600	25300	20400	<Null>	<Null	12.419742	8	4.419742	AE	Yes	On S
none	873.23167	873.231673	960	87300	41600	25300	20400	<Null>	<Null	12.14983	8	4.14983	AE	Yes	On S
none	1883.2370	1883.237084	960	87300	41600	25300	20400	<Null>	<Null	11.919713	8	3.919713	AE	Yes	On S
none	3899.8461	3899.846113	960	87300	41600	25300	20400	<Null>	<Null	<Null>	8	<Null>	AE	Yes	On S
CRL	1185.6661	1185.666161	1864	61100	36900	8400	15800	<Null>	<Null	9.26	6	3.26	VE	No	On S
CRL	765.28937	765.289375	1864	61100	36900	8400	15800	<Null>	<Null	<Null>	8	<Null>	VE	No	On S
CRL	2712.4936	2712.493652	1864	61100	36900	8400	15800	<Null>	<Null	11.219923	10	1.219923	VE	No	On S
CRL	3098.5760	6197.152182	3740	69300	35700	20500	13100	<Null>	<Null	14.210289	14	0.210289	AE	No	On S
CRL	2751.9106	5503.821282	3061	73500	53000	9200	11300	<Null>	<Null	12.920012	10	2.920012	VE	No	On S
CRL	1052.8709	2105.741824	3061	73500	53000	9200	11300	<Null>	<Null	<Null>	8	<Null>	VE	No	On S
CRL	2199.8710	4399.742099	3061	73500	53000	9200	11300	<Null>	<Null	<Null>	8	<Null>	VE	No	On S
none	1149.8745	1149.874557	980	30300	12200	10000	8100	<Null>	<Null	7.630012	4	3.630012	AE	Yes	On S
none	1044.5678	2089.135675	980	30300	12200	10000	8100	<Null>	<Null	<Null>	6	<Null>	AE	Yes	On S
CRL	1942.4763	3884.952667	1145	41600	27800	6500	7300	<Null>	<Null	7.439911	8	-0.560089	AE	Yes	On S
CRL	1393.6417	2787.283485	1145	41600	27800	6500	7300	<Null>	<Null	9.7598	8	1.7598	AE	Yes	On S
BMT	2142.4935	2142.493545	1120	39500	23100	9200	7200	<Null>	<Null	8.38022	6	2.38022	AE	No	On S

Record: 0 Show: All Selected Records (0 out of 1790 Selected) Options

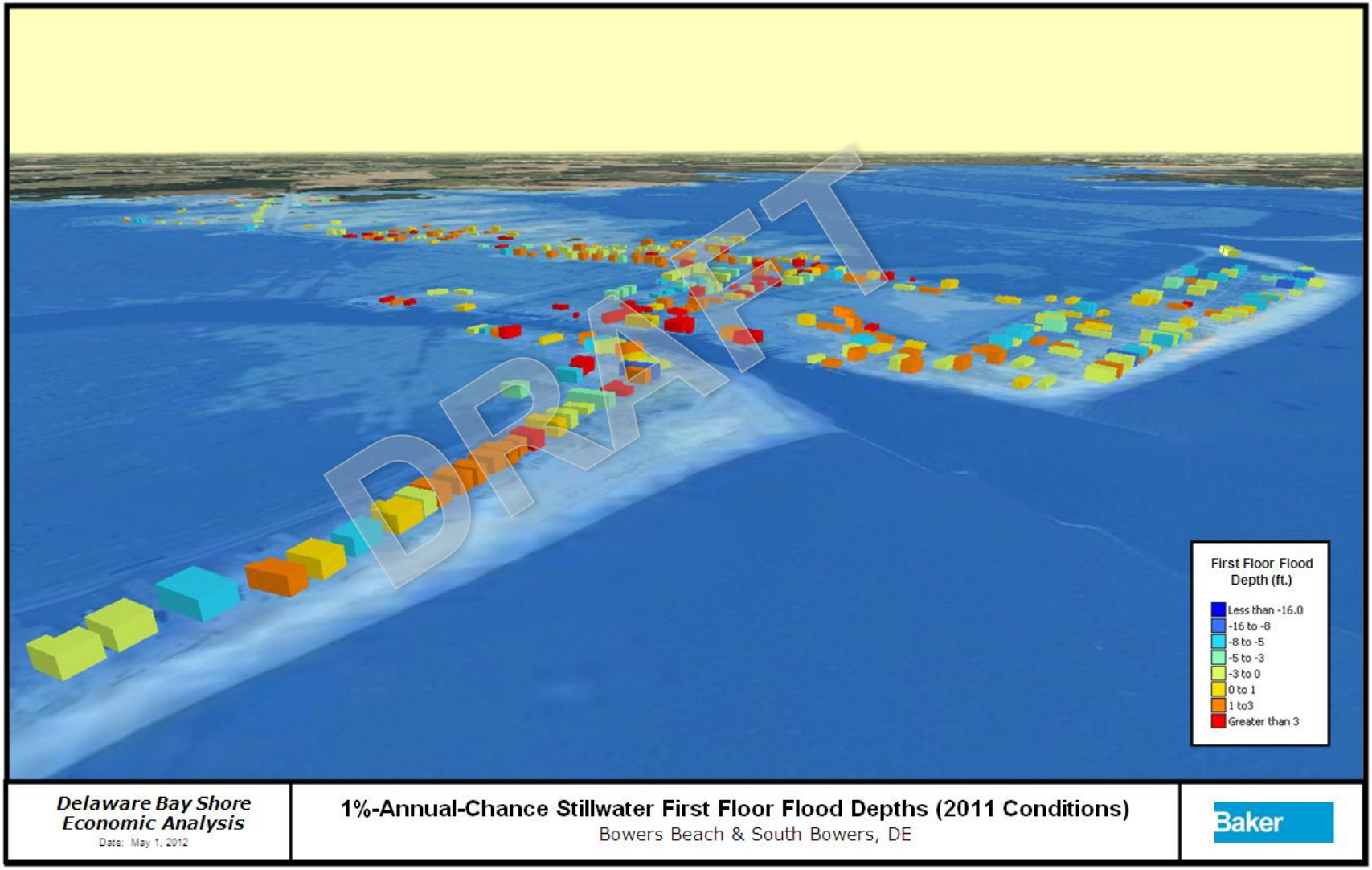
Pickering Beach Floodzone Map



Note: Structures shown highligted in red have finished floor elevations within the base flood elevation for a100-year storm event

Bowers Beach Floodzone Map

Database/GIS Product - Current



Management Scenarios

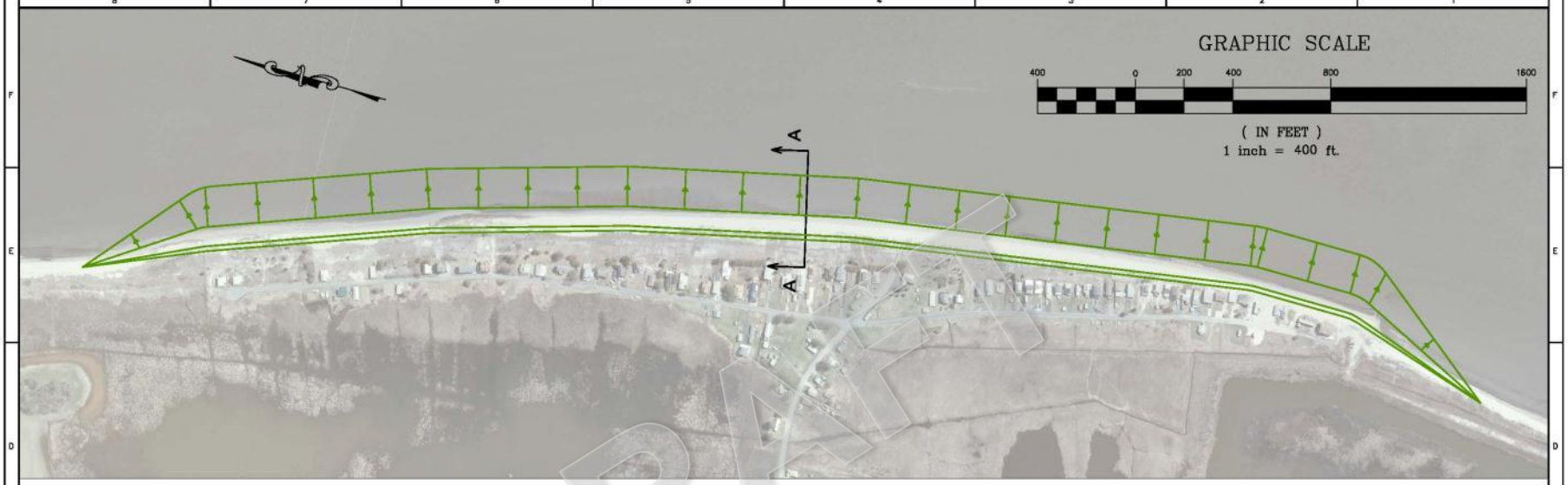
Vetted/Agreed to by Team

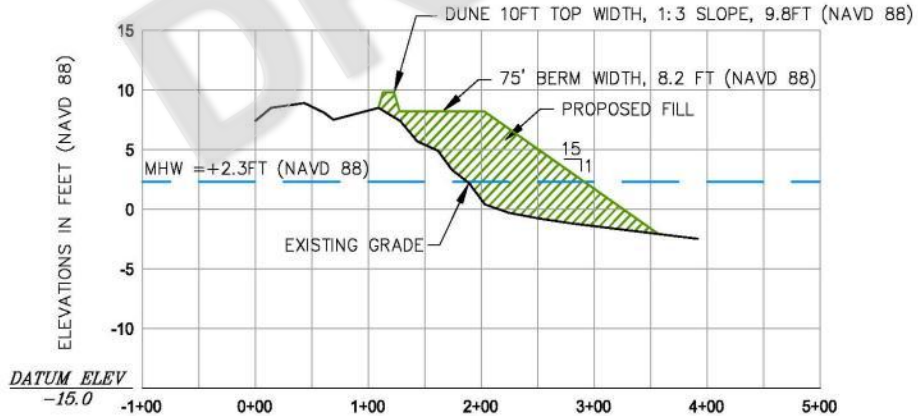
- Scenario 1: Beach Nourishment
- Scenario 2: Enhanced Retreat
- Scenario 3: Basic Retreat
- Scenario 4: Do Nothing

Clarifications on Assumptions for Evaluation

DRAFT

Beach Nourishment - Defined





VERTICAL SCALE: 1" = 10'
HORIZONTAL SCALE: 1" = 100'

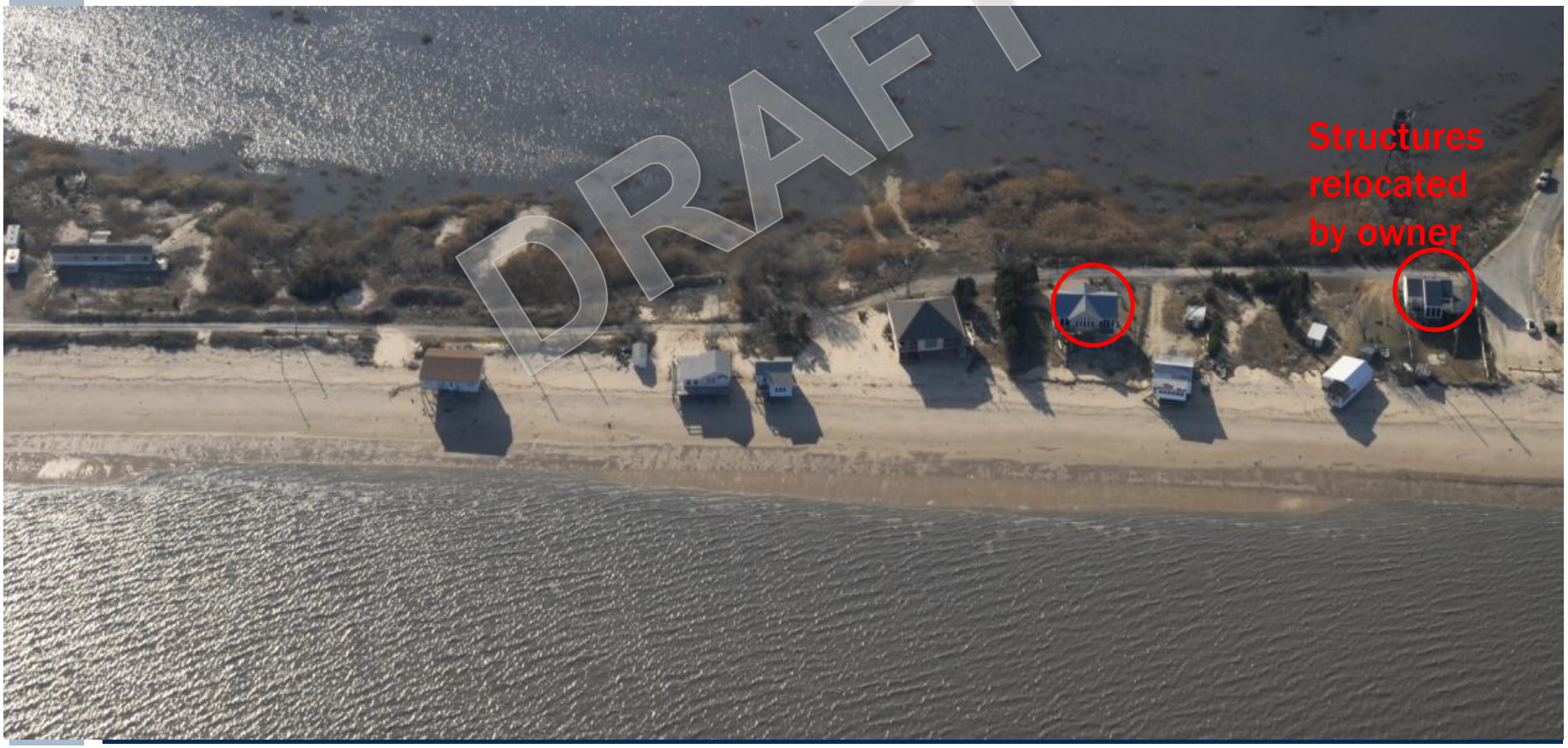
TYPICAL CROSS-SECTION A-A

DRAFT

PBSJ	CLIENT: DELAWARE DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENTAL CONTROL	PROJECT: KITTS HUMMOCK	TASK: 10 YEAR SCENARIO	FIGURE 7.18

Do Nothing - Defined

This alternative involves no action on the part of state shoreline managers. No beach fill or beach enhancement will occur, historic shoreline migration will cause increasing damage to structures. Houses will be destroyed or removed.

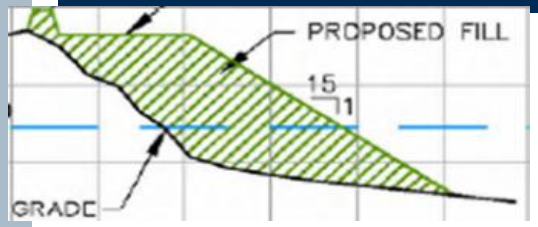


DRAFT

Do Nothing - Defined

This alternative involves no action on the part of state shoreline managers. No beach fill or beach enhancement will occur, historic shoreline migration will cause increasing damage to structures. Houses will be destroyed or removed.

Enhanced Retreat - Defined



Initially remove structure to allow a beach/dune width equal to the recommended beach nourishment templates for each community.

As additional erosion/shoreline migration occurs, additional structures are removed to maintain this beach width

DRAFT

Basic Retreat - Defined

Initially remove structures to allow a beach/dune width equal to the current widths in each community.

Where existing structures occupy the beach, initial removal occurs .

As additional erosion/shoreline migration occurs, additional structures removed to maintain this beach width.

DRAFT

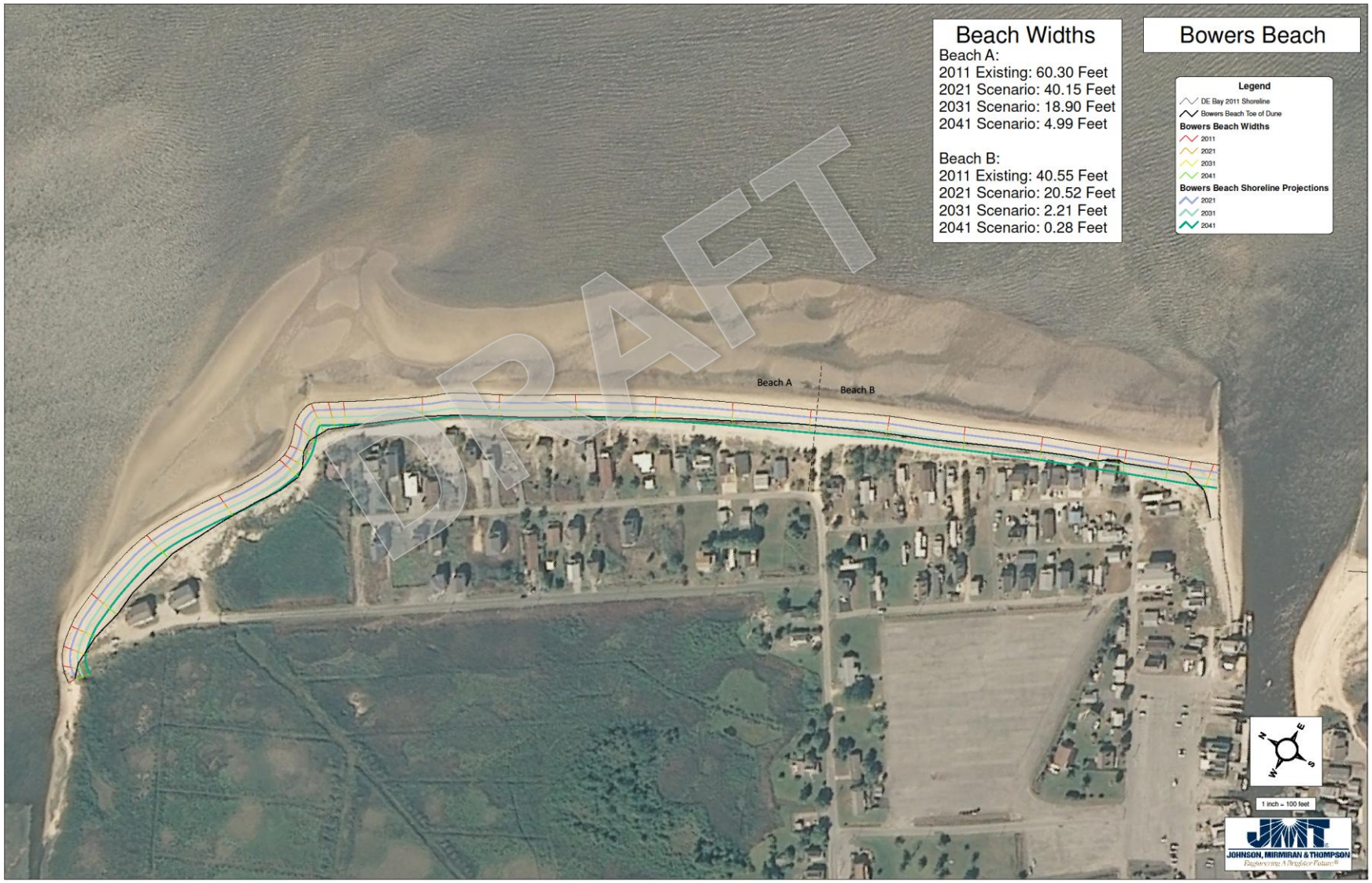
Resources Evaluation

Matrix of Resource Identification/Evaluation

- Vetted in Workshops
- Comprehensive Inventory of Potential Values/Benefi
- Evaluated against management scenarios
- Identified those values/benefits that could be quantified and change due to management
  - Recreational Uses
  - Hazard Damage Reduction
    - Erosion
    - Flood – Wave, Stillwater
  - Revenue Benefits - Taxes

DRAFT

Projected Shorelines/Beach Widths



Recreational Use Beach Width

SCENARIO 1 Beach Nourishment

				Shoreline Projection											
		Baseline		2011 Projected Width			2021			2031			2041		
Beach Community	Number of Community Structures	2011 Existing Conditions Width (Dry) - Feet	2011 Existing Conditions Width (Wet) - Feet	2011 Beach Width (Dry) - Feet	2011 Beach Wdith (include Wet) - Feet	2011 No. of Structures Lost	2021 Beach Width (Dry) - Feet	2021 Beach Wdith (include Wet) - Feet	2021 No. of Structures Lost	2031 Beach Width (Dry) - Feet	2031 Beach Wdith (include Wet) - Feet	2031 No. of Structures Lost	2041 Beach Width (Dry) - Feet	2041 Beach Wdith (include Wet) - Feet	2041 No. of Structures Lost
Pickering Beach	44	38	73	174	209	0	174	209	0	174	209	0	174	209	0
Kitts Hummock	122	29	49	163.5	183.5	0	163.5	183.5	0	163.5	183.5	0	163.5	183.5	0
Bowers Beach 'A'	354	60	88	150	178	0	150	178	0	150	178	0	150	178	0
Bowers Beach 'B'		41	69												
South Bowers 'A'	84	31	78	125	172	0	125	172	0	125	172	0	125	172	0
South Bowers 'B'		37	84												
Slaughter Beach 'A'	372	13	47	109	143	0	109	143	0	109	143	0	109	143	0
Slaughter Beach 'B'		40	74												
Slaughter Beach 'C'		53	87												
Slaughter Beach 'D'		40	74												
Primehook Beach 'A'	195	21	69	108	156	0	108	156	0	108	156	0	108	156	0
Primehook Beach 'B'		41	89												
Primehook Beach 'C'		20	68												
Broadkill Beach 'A'	592	82	135	123	176	0	123	176	0	123	176	0	123	176	0
Broadkill Beach 'B'		62	115												
Broadkill Beach 'C'		27	80												
Broadkill Beach 'D'		59	112												
Broadkill Beach 'E'		76	129												

DRAFT

Recreational Use Beach Width

SCENARIO 2 Enhanced Retreat

				Shoreline Projection											
		Baseline		2011 Projected Width			2021			2031			2041		
Beach Community	Number of Community Structures	2011 Existing Conditions Width (Dry) - Feet	2011 Existing Conditions Width (Wet) - Feet	2011 Beach Width (Dry) - Feet	2011 Beach Wdith (include Wet) - Feet	2011 No. of Structures Lost	2021 Beach Width (Dry) - Feet	2021 Beach Wdith (include Wet) - Feet	2021 No. of Structures Lost	2031 Beach Width (Dry) - Feet	2031 Beach Wdith (include Wet) - Feet	2031 No. of Structures Lost	2041 Beach Width (Dry) - Feet	2041 Beach Wdith (include Wet) - Feet	2041 No. of Structures Lost
Pickering Beach	44	38	73	174	209	38	174	209	1	174	209	0	174	209	0
Kitts Hummock	122	29	49	163.5	183.5	52	163.5	183.5	10	163.5	183.5	9	163.5	183.5	1
Bowers Beach 'A'	354	60	88	150	178	35	150	178	4	150	178	2	150	178	2
Bowers Beach 'B'		41	69												
South Bowers 'A'	84	31	78	125	172	8	125	172	2	125	172	1	125	172	1
South Bowers 'B'		37	84												
Slaughter Beach 'A'	372	13	47	109	143	5	109	143	5	109	143	14	109	143	21
Slaughter Beach 'B'		40	74												
Slaughter Beach 'C'		53	87												
Slaughter Beach 'D'		40	74												
Primehook Beach 'A'	195	21	69	108	156	63	108	156	0	108	156	0	108	156	0
Primehook Beach 'B'		41	89												
Primehook Beach 'C'		20	68												
Broadkill Beach 'A'	592	82	135	123	176	92	123	176	24	123	176	39	123	176	24
Broadkill Beach 'B'		62	115												
Broadkill Beach 'C'		27	80												
Broadkill Beach 'D'		59	112												
Broadkill Beach 'E'		76	129												

DRAFT

Recreational Use Beach Width

SCENARIO 3 Basic Retreat

				Shoreline Projection											
		Baseline		2011 Projected Width			2021			2031			2041		
Beach Community	Number of Community Structures	2011 Existing Conditions Width (Dry) - Feet	2011 Existing Conditions Width (Wet) - Feet	2011 Beach Width (Dry) - Feet	2011 Beach Wdith (include Wet) Feet	2011 No. of Structures Lost (NET)	2021 Beach Width (Dry) - Feet	2021 Beach Wdith (include Wet) - Feet	2021 No. of Structures Lost (NET)	2031 Beach Width (Dry) - Feet	2031 Beach Wdith (include Wet) - Feet	2031 No. of Structures Lost (NET)	2041 Beach Width (Dry) - Feet	2041 Beach Wdith (include Wet) - Feet	2041 No. of Structures Lost (NET)
Pickering Beach	44	38	73	38	73	0	38	73	10	38	73	27	38	73	1
Kitts Hummock	122	29	49	29	49	0	29	49	9	29	49	18	29	49	24
Bowers Beach 'A'	354	60	88	60	88	0	60	88	4	60	88	5	60	88	8
Bowers Beach 'B'		41	69	41	69		41	69		41	69		41	69	
South Bowers 'A'	84	31	78	31	78	0	31	78	1	31	78	4	31	78	2
South Bowers 'B'		37	84	37	84		37	84		37	84		37	84	
Slaughter Beach 'A'	372	13	47	13	47	0	13	47	0	13	47	0	13	47	4
Slaughter Beach 'B'		40	74	40	74		40	74		40	74		40	74	
Slaughter Beach 'C'		53	87	53	87		53	87		53	87		53	87	
Slaughter Beach 'D'		40	74	40	74		40	74		40	74		40	74	
Primehook Beach 'A'	195	21	69	21	69	0	21	69	1	21	69	6	21	69	5
Primehook Beach 'B'		41	89	41	89		41	89		41	89		41	89	
Primehook Beach 'C'		20	68	20	68		20	68		20	68		20	68	
Broadkill Beach 'A'	592	82	135	82	135	2	82	135	53	82	135	36	82	135	25
Broadkill Beach 'B'		62	115	62	115		62	115		62	115		62	115	
Broadkill Beach 'C'		27	80	27	80		27	80		27	80		27	80	
Broadkill Beach 'D'		59	112	59	112		59	112		59	112		59	112	
Broadkill Beach 'E'		76	129	76	129		76	129		76	129		76	129	

DRAFT

Recreational Use Beach Width

SCENARIO 4 Do Nothing

				Shoreline Projection											
		Baseline		2011 Projected Width			2021			2031			2041		
Beach Community	Number of Community Structures	2011 Existing Conditions Width (Dry) - Feet	2011 Existing Conditions Width (Wet) - Feet	2011 Beach Width (Dry) - Feet	2011 Beach Wdith (include Wet) - Feet	2011 No. of Structures Lost (NET)	2021 Beach Width (Dry) - Feet	2021 Beach Wdith (include Wet) - Feet	2021 No. of Structures Lost (NET)	2031 Beach Width (Dry) - Feet	2031 Beach Wdith (include Wet) - Feet	2031 No. of Structures Lost (NET)	2041 Beach Width (Dry) - Feet	2041 Beach Wdith (include Wet) - Feet	2041 No. of Structures Lost (NET)
Pickering Beach	44	38	73	38	73	0	0	35	2	0	35	14	0	35	22
Kitts Hummock	122	29	49	29	49	0	0	20	0	0	20	13	0	20	18
Bowers Beach 'A'	354	60	88	60	88	0	40	68	0	19	47	2	5	33	2
Bowers Beach 'B'		41	69	41	69		21	49		2	30		0	28	
South Bowers 'A'	84	31	78	31	78	0	30	77	0	28	75	1	26	73	2
South Bowers 'B'		37	84	37	84		11	58		1	48		0	47	
Slaughter Beach 'A'	372	13	47	13	47	0	0	34	0	0	34	0	0	34	0
Slaughter Beach 'B'		40	74	40	74		20	54		3	37		0	34	
Slaughter Beach 'C'		53	87	53	87		33	67		13	47		0	34	
Slaughter Beach 'D'		40	74	40	74		20	54		2	36		0	34	
Primehook Beach 'A'	195	21	69	21	69	0	6	54	0	1	49	0	1	49	4
Primehook Beach 'B'		41	89	41	89		41	89		41	89		41	89	
Primehook Beach 'C'		20	68	20	68		20	68		20	68		20	68	
Broadkill Beach 'A'	592	82	135	82	135	0	52	105	4	22	75	12	0	53	33
Broadkill Beach 'B'		62	115	62	115		31	84		4	57		0	53	
Broadkill Beach 'C'		27	80	27	80		5	58		0	53		0	53	
Broadkill Beach 'D'		59	112	59	112		29	82		3	56		0	53	
Broadkill Beach 'E'		76	129	76	129		46	99		16	69		0	53	

DRAFT

Structure Losses

Methodology

- **Considered a loss if the projected shoreline is in contact with the structure**
- **The structure counted as a loss only one time per Scenario**
- **Counted as a loss in the earliest (2011, 2021, etc.) projection that touches the structure**

DRAFT

Structure Losses By Scenario

Projected Net Structure Losses in Scenario 2: Strategic Retreat							
Beach Community	Baseline Total Structures	Unaffected	Affected	2011	2021	2031	2041
Pickering Beach	43	4	39	38	1	0	0
Kitts Hummock	114	42	72	52	10	9	1
Bowers Beach	325	282	43	35	4	2	2
South Bowers Beach	69	57	12	8	2	1	1
Slaughter Beach	310	265	45	5	5	14	21
Prime Hook	185	122	63	63	0	0	0
Broadkill Beach	583	404	179	92	24	39	24
Total	**1629**	**1176**	**453**	**293**	**46**	**65**	**49**

Projected Net Structure Losses in Scenario 3: Basic Retreat							
Beach Community	Total Structures	Unaffected	Affected	2011	2021	2031	2041
Pickering Beach	43	5	38	0	10	27	1
Kitts Hummock	114	63	51	0	9	18	24
Bowers Beach	325	308	17	0	4	5	8
South Bowers Beach	69	62	7	0	1	4	2
Slaughter Beach	310	306	4	0	0	0	4
Prime Hook	185	173	12	0	1	6	5
Broadkill Beach	583	467	116	2	53	36	25
Total	1629	**1384**	**245**	**2**	**78**	**96**	**69**

Projected Net Structure Losses in Scenario 4: Do Nothing							
Beach Community	Baseline Total Structures	Unaffected	Affected	2011	2021	2031	2041
Pickering Beach	43	5	38	0	2	14	22
Kitts Hummock	114	83	31	0	0	13	18
Bowers Beach	325	321	4	0	0	2	2
South Bowers Beach	69	66	3	0	0	1	2
Slaughter Beach	310	310	0	0	0	0	0
Prime Hook	185	181	4	0	0	0	4
Broadkill Beach	583	534	49	0	4	12	33
Total	**1629**	**1500**	**129**	**0**	**6**	**42**	**81**

DRAFT

Major Assumptions/Considerations

Sea Level Rise

Future Growth Rates

Scenarios do not affect back bay flooding

Conservative Perspective

DRAFT

Different Types of Benefits

Recreational Beach Use

Flood/Erosion Hazard Damage Reductions

Revenues – Taxes

Natural Resources – not quantifiable

Other – MATRIX

DRAFT

Recreational Values

- Beach width and housing loss projections provided by JMT for each beach, under four management scenarios, for 2011, 2021, 2031 and 2041.
  - Scenario 1—Beach Nourishment
  - Scenario 2—Managed Retreat
  - Scenario 3—Basic Retreat
  - Scenario 4—Do Nothing
- Distinguishes home owner values/visitor values
- Recreation demand analysis of Parsons et al. (2012), "A Contingent Behavior Model for Valuing Beach Width: An Application to Recreation Use on Delaware's Bay Beaches."
  - Estimates annual recreational benefits for each beach at: (1) current average width, (2) 25% of current width, (3) 200% of current width.

DRAFT

Recreation Values
Sample Results from Parsons et al. (2012)

Table 3. Predicted 2010 Total Access Value to Delaware Bay Beaches

Beach and Visitor Type	2010 Access Value Day Trips	2010 Access Value Short Overnight Trips	2010 Access Value Long Overnight Trips
Bowers (owners)	$118,488.77	$25,690.54	$8,563.51
Bowers (non-owners)	$38,225.82	$42,817.56	$0.00
Broadkill (owners)	$149,308.89	$246,865.05	$163,243.02
Broadkill (non-owners)	$92,442.92	$99,546.23	$19,925.25
Primehook (owners)	$19,276.02	$64,797.12	$43,205.64
Primehook (non-owners)	$43,391.29	$37,807.77	$10,795.74
Slaughter (owners)	$170,532.03	$78,668.29	$29,964.98
Slaughter (non-owners)	$50,150.05	$48,703.31	$3,755.83
Pickering (owners)	$18,515.90	$8,887.96	$2,964.13
Pickering (non-owners)	$7,934.82	$2,964.13	$0.00
Kitts Hummock (owners)	$7,617.77	$12,799.25	$0.00
Kitts Hummock (non-owners)	$11,426.66	$4,266.42	$0.00
South Bowers (owners)	$37,669.02	$9,738.35	$19,476.69
South Bowers (non-owners)	$5,793.50	$6,489.42	$0.00

DRAFT

Recreation Values
Sample Results from Parsons et al. (2012)

Table 4. Predicted Change in Total Access Value to Delaware Bay Beaches at 25% Width

Beach and Visitor Type	2010 Access Value Day Trips	2010 Access Value Short Overnight Trips	2010 Access Value Long Overnight Trips
Bowers (owners)	-$17,014.51	-$3,690.49	-$1,230.16
Bowers (non-owners)	-$5,489.07	-$6,150.82	$0.00
Broadkill (owners)	-$21,440.16	-$35,462.63	-$23,450.16
Broadkill (non-owners)	-$13,274.43	-$14,300.00	-$2,862.30
Primehook (owners)	-$2,767.96	-$9,308.23	-$6,206.57
Primehook (non-owners)	-$6,230.82	-$5,431.16	-$1,550.83
Slaughter (owners)	-$24,487.71	-$11,300.85	-$4,304.53
Slaughter (non-owners)	-$7,201.35	-$6,996.32	-$539.53
Pickering (owners)	-$2,658.81	-$1,276.77	-$425.80
Pickering (non-owners)	-$1,139.41	-$425.80	$0.00
Kitts Hummock (owners)	-$1,093.88	-$1,838.64	$0.00
Kitts Hummock (non-owners)	-$1,640.82	-$612.88	$0.00
South Bowers (owners)	-$5,409.12	-$1,398.93	-$2,797.86
South Bowers (non-owners)	-$831.92	-$932.22	$0.00

DRAFT

Steps in the Analysis

- Using these inputs, the model predicts recreational value for all beaches, under each management scenario, for all years between 2011 – 2041.
- Model adjusts for both width and structure changes.
- All values are discounted at a 4% annual discount rate.
- The sum of discounted benefits over all time periods (2011 to 2041) is defined as the net present value.
- The benefit of each scenario is presented relative to a hypothetical baseline in which the 2011 width is maintained for each beach until 2041.

DRAFT

Preliminary Recreation Estimated Values – Summary of Results

Table 7. Net Present Recreational Value of Beach Management Alternatives, 2011-2041 (compared to Scenario 4—Do Nothing)

Beach and Visitor Type	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Bowers (owners)	$400,223.63	$229,321.54	$187,090.56	$0.00
Bowers (non-owners)	$771,184.19	$771,184.19	$400,420.00	$0.00
Bowers (total)	$1,171,407.82	$1,000,505.73	$587,510.56	$0.00
Broadkill (owners)	$1,080,985.57	$238,505.95	$470,291.57	$0.00
Broadkill (non-owners)	$2,688,120.83	$2,688,120.83	$2,102,884.20	$0.00
Broadkill (total)	$3,769,106.40	$2,926,626.78	$2,573,175.77	$0.00
Primehook (owners)	$492,298.53	-$208,941.89	$24,250.24	$0.00
Primehook (non-owners)	$596,357.54	$583,276.77	$69,384.77	$0.00
Primehook (total)	$1,088,656.07	$374,334.89	$93,635.01	$0.00
Slaughter (owners)	$650,898.79	$550,751.59	$424,725.61	$0.00
Slaughter (non-owners)	$1,740,705.57	$1,735,947.11	$1,161,274.18	$0.00
Slaughter (total)	$2,391,604.36	$2,286,698.70	$1,585,999.80	$0.00
Pickering (owners)	$174,482.46	-$38,470.69	$54,003.63	$0.00
Pickering (non-owners)	$482,431.19	$482,431.19	$333,757.33	$0.00
Pickering (total)	$656,913.65	$443,960.50	$387,760.97	$0.00
Kitts Hummock (owners)	$272,032.70	$80,492.38	$135,927.37	$0.00
Kitts Hummock (non-owners)	$353,933.63	$353,933.63	$224,392.93	$0.00
Kitts Hummock (total)	$625,966.33	$434,426.01	$360,320.30	$0.00
South Bowers (owners)	$61,730.66	$31,139.46	$10,417.21	$0.00
South Bowers (non-owners)	$328,787.17	$328,787.17	$83,907.07	$0.00
South Bowers (total)	$390,517.83	$359,926.63	$94,324.28	$0.00
TOTAL ALL BEACHES	**$10,094,172.47**	**$7,826,479.24**	**$5,682,726.69**	**$0.00**

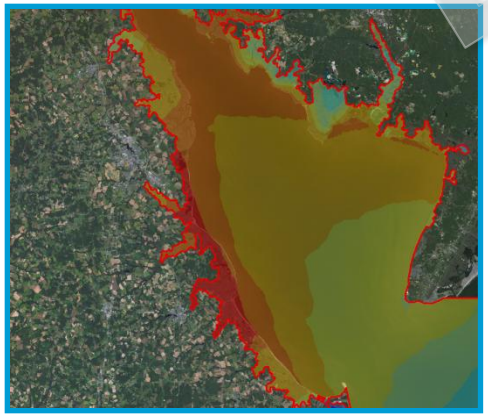
DRAFT

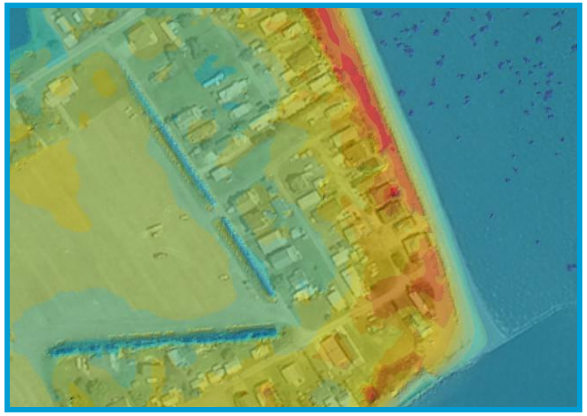
Flood Impact Assessment

Methodology Overview

- **Key Datasets:**
  - **1643 Structures: Structure Inventory Database**
  - **0.2%-, 1%-, 2%-, and 10%-Annual-Chance Stillwater Elevations: 2011 Draft Storm Surge Study Data**
  - **Aerial Imagery: 2011 NAIP Data**
  - **Topography: Delaware Coastal Program LiDAR**
    - Kent: Collected March 31 – April 7, 2007
    - Sussex: Collected March 1 – March 31, 2005
  - **Others Including:** Historical Erosion Rates, Sea Level Rise Projections, 2011 Damage Frequency Functions

DRAFT

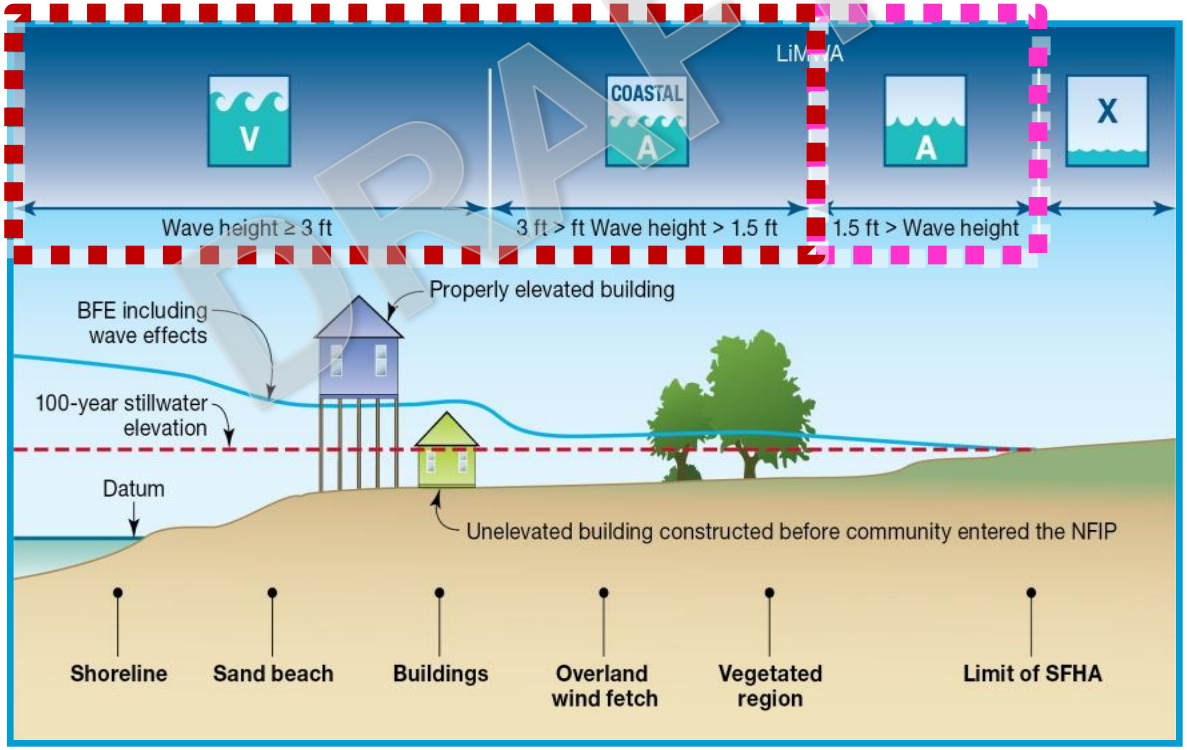




Flood Impact Assessment

Methodology Overview

- **Wave Modeling**
  - **Performed 1-dimensional wave modeling**
  - **Constructed 27 coastal transects across all 7 communities**
  - **Designated each structure with wave hazards of <1.5 ft. vs. ≥ 1.5 ft.**



DRAFT

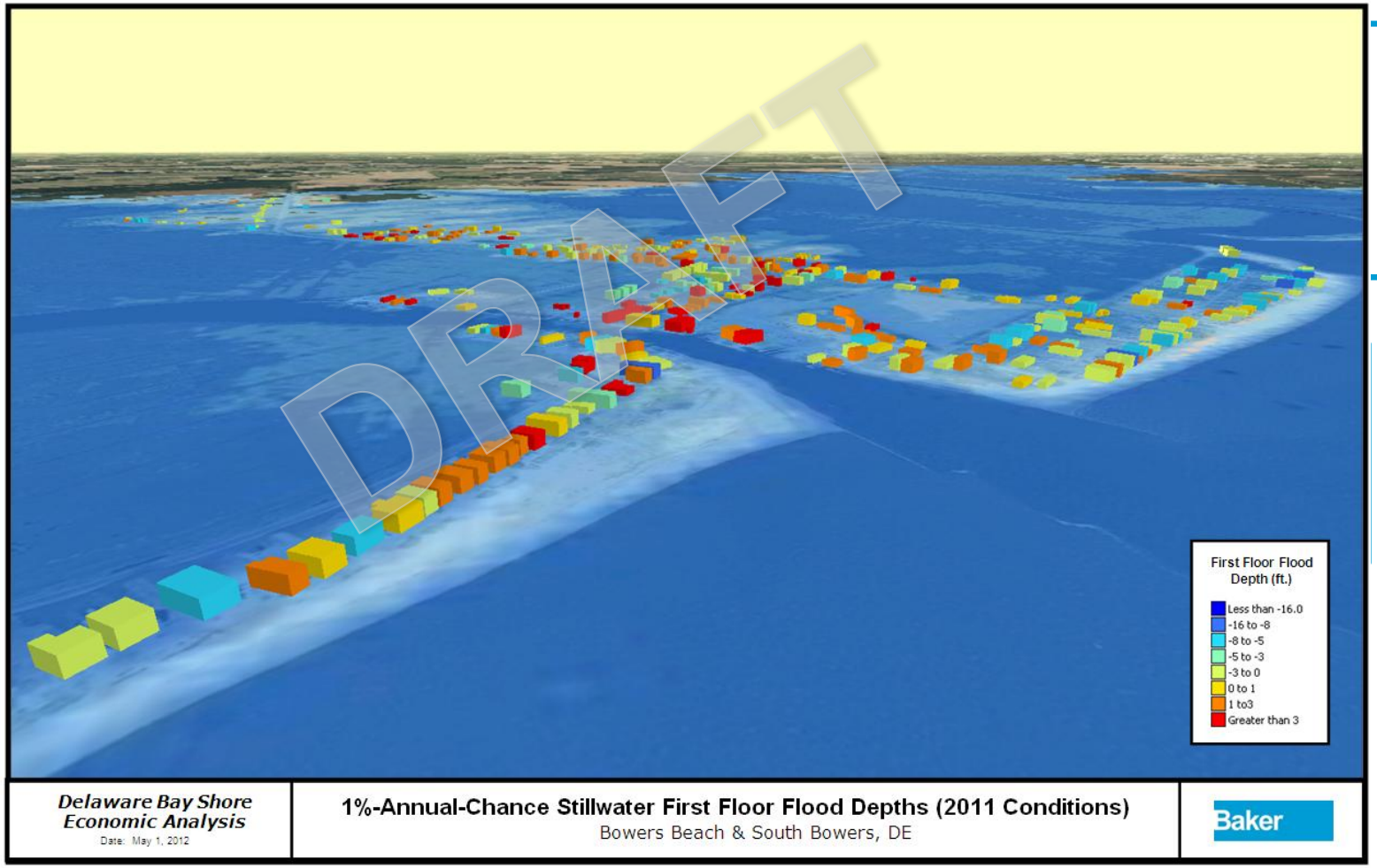
Flood Impact Assessment

Methodology Overview

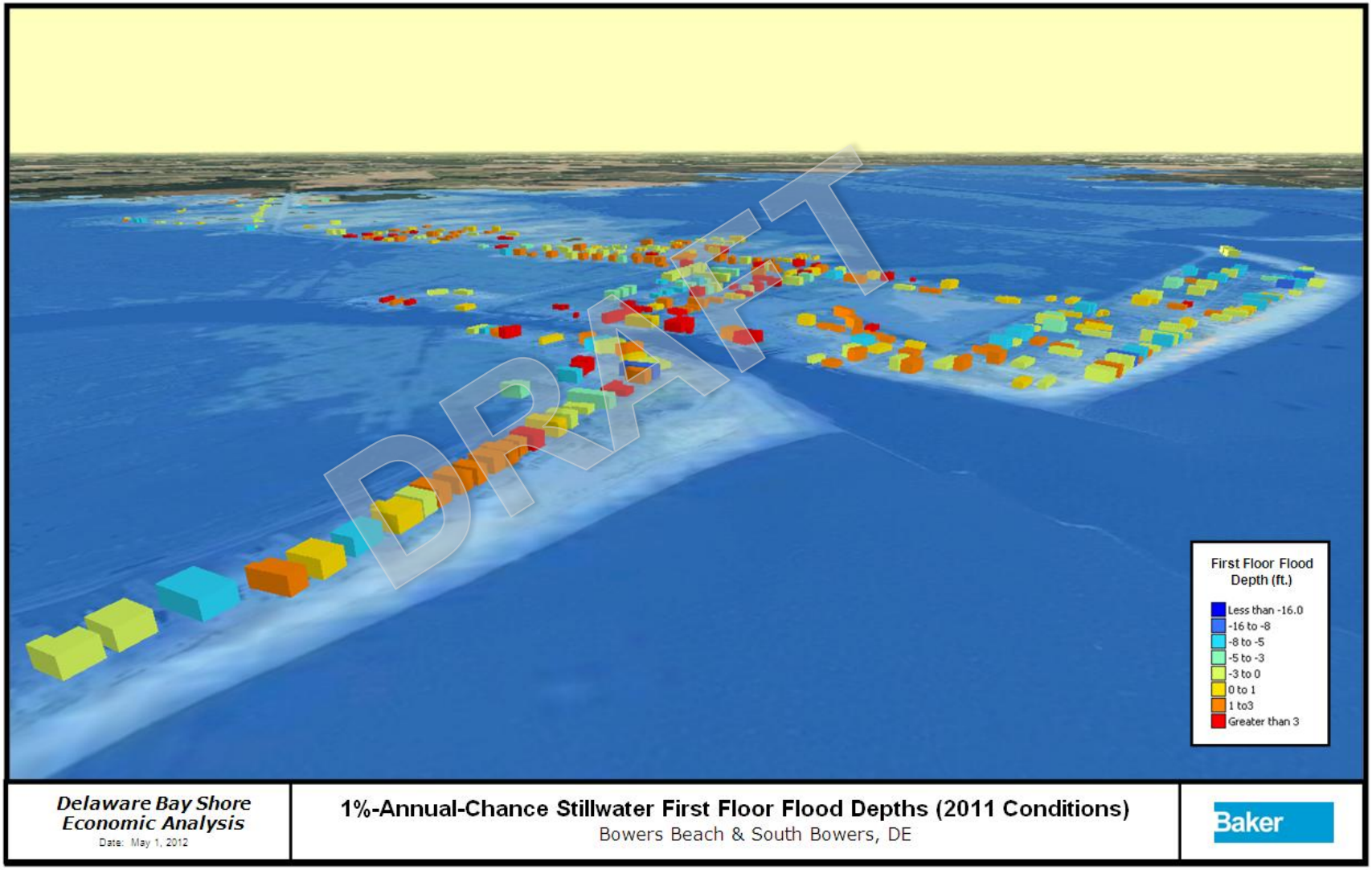
- **Flood Damage Modeling**

Per S
Per F

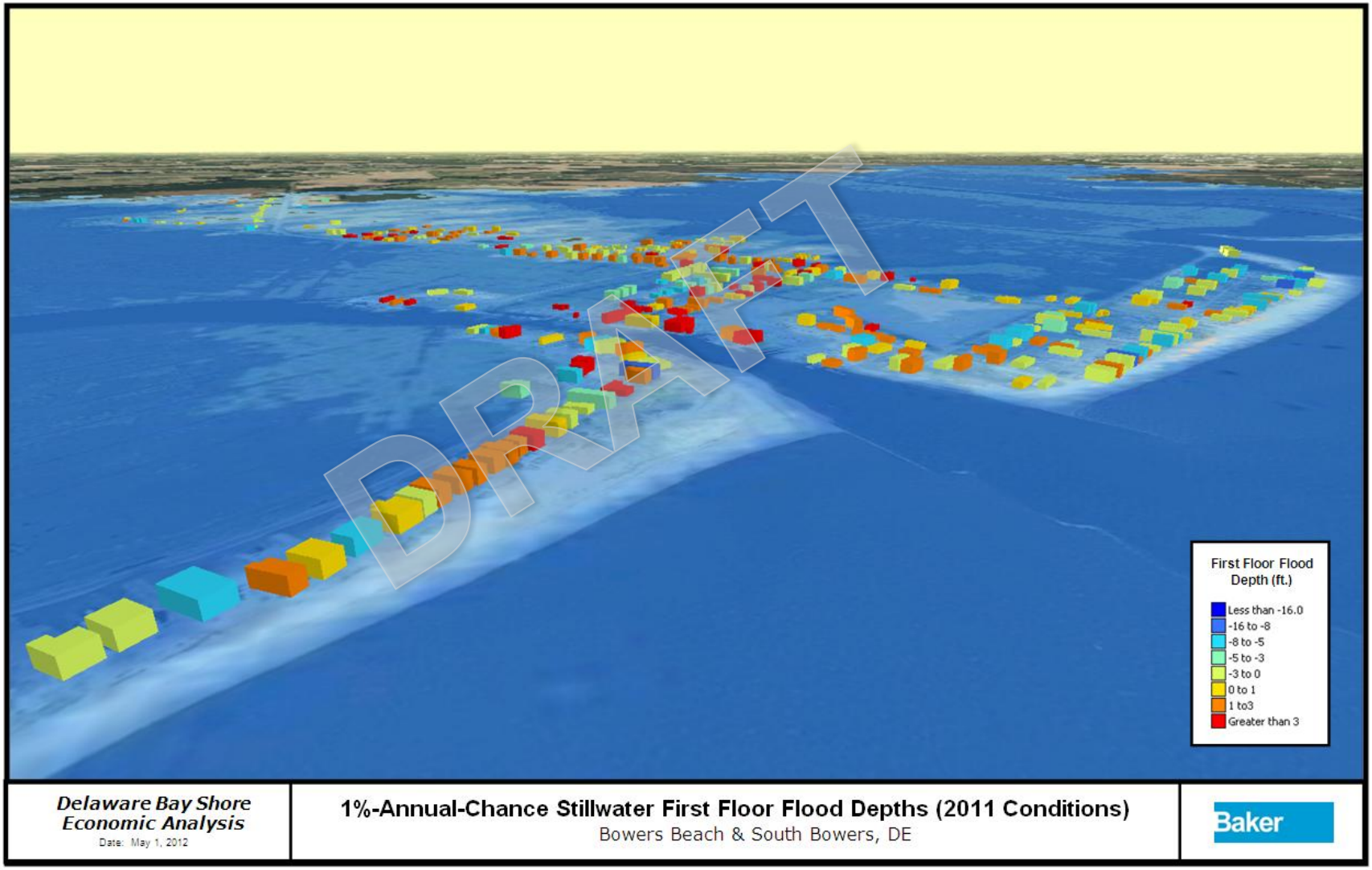
Per M
Alt
Futur



Database/GIS Product - Current

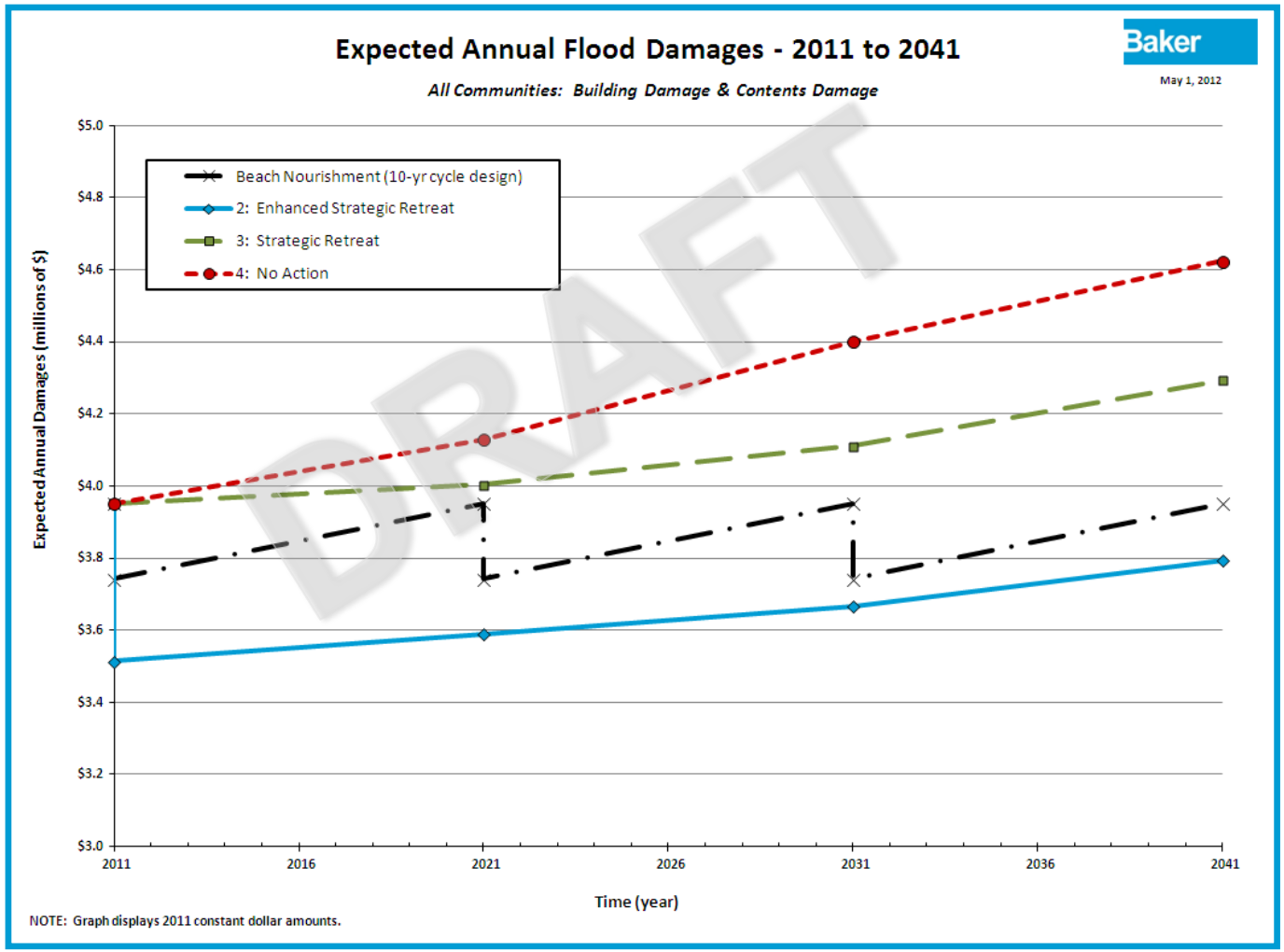


Beach Nourishment



Flood Impact Assessment

Results



Erosion Impact Assessment

Methodology Overview

- **Focused on "lost housing services".**
- **Without erosion, housing services accrue in perpetuity on an annual basis.**
- **With an eroding shoreline, housing services accrue up until the point in time when the parcel is lost.**
- **This effect has been calculated using:**
  - Estimates of today's market value of properties
  - Property projected loss year
  - Discount rate applied
- **The mathematical expression for the loss for each parcel reduces to Sum $M/(1+r)^n$:**
  - M = market value of parcel
  - n = year of loss (n=1 for the 1st year, 2 for the 2nd year, etc.)
  - r = the discount rate (4%, or .04 in this evaluation)

DRAFT

Erosion Impact Assessment

Results

- **Erosion Damages vs. Lost Housing Services**
  - Destruction of Structure & Contents vs. Loss to Property Owner of Property
  - Recognition of overlap, but capturing different effects
- **Results notably affected by number of structures removed**

Who Pays...?

Management Alternative	Year	No. of Structure Acquisitions or Losses	Expected Annual Erosion Damages (constant 2011 millions of $)	Present Value of Erosion Damages (millions of $)	Present Value of Lost Housing Services (millions of $)
1: Beach Nourishment (10-yr cycle design)	2011	0	$0.000	$X.0	$X.0
	2021	0	$0.000		
	2031	0	$0.000		
	2041	0	$0.000		
2: Enhanced Retreat	2011	292	$0.000	$X.0	$X.0
	2021	46	$0.000		
	2031	64	$0.000		
	2041	49	$0.000		
3: Strategic Retreat	2011	2	$0.000	$0.0	$X.0
	2021	78	$0.000		
	2031	96	$0.000		
	2041	68	$0.000		
4: No Action	2011	0	$0.000	$X.0	$X.0
	2021	6	$0.050		
	2031	42	$0.268		
	2041	81	$0.920		

DRAFT

Hazard Benefits Summary

- **Flood Damages, Erosion Damages, and Lost Housing Services Avoided**
- **Housing service losses for Alternatives 2 & 3 exceed losses for Alternative 4 → negative economic benefit for this category**

DRAFT

Management Alternative	Present Value of Avoided Flood Damages (millions of $)	Present Value of Avoided Erosion Damages (millions of $)	Present Value of Avoided Lost Housing Services (millions of $)	Structures Removed…
1: Beach Nourishment (10-yr cycle design)	$	$	$	0
2: Enhanced Retreat	$	$	$	451
3: Strategic Retreat	$	$	$	244
4: No Action	$	$	$	129

Tax Revenue Impacts

- **Percent of government revenues from taxes:**
  - Kent: 23%
  - Sussex: 56%
- **Property taxes account for ~1/5 of total revenues and ~1/2 of all tax revenues**
- **Average tax rates for Kent and Sussex Counties applied to structures removed**

Management Alternative	No. of Properties Acquired or Lost	Total Estimated Annual Property Taxes Revenues	Percent of Total Government Revenue
1	0	$0	0.0%
2	451	$288,000	0.27%
3	244	$156,000	0.15%
4	129	$69,000	0.07%

- **Conclusion: Taxes collected from property owners are used to fund schools, libraries, and other important public services. While estimated lost tax revenues are relatively quite small (<1%), it is nevertheless a negative effect.**

DRAFT

Cost Calculations

Building Replacement Value

Current Market Value

Loss of Housing Services

Demolition

Beach Nourishment

DRAFT

Cost Estimate Scenario 1

- **2011 / 2021**

Delaware Bay Shore Economic Analysis

Management Alternatives: Scenario 1 - Beach Nourishment

Year 2011							
				2010 Study		Current Values*	
Item	Description	Quantity	Unit	Unit Cost	Cost	Unit Cost	Cost
Pickering Beach							
1	Beach Nourishment	138,500	CY	$ 7.00	$ 969,500	$ 13.00	$ 1,800,500
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,419,500		**$ 3,050,500**
Kitts Hummock							
1	Beach Nourishment	196,600	CY	$ 7.00	$ 1,376,200	$ 13.00	$ 2,555,800
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,826,200		**$ 3,805,800**
Bowers							
1	Beach Nourishment	76,000	CY	$ 7.00	$ 532,000	$ 13.00	$ 988,000
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 982,000		**$ 2,238,000**
South Bowers							
1	Beach Nourishment	65,800	CY	$ 7.00	$ 460,600	$ 13.00	$ 855,400
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 910,600		**$ 2,105,400**
Slaughter							
1	Beach Nourishment	476,500	CY	$ 7.00	$ 3,335,500	$ 13.00	$ 6,194,500
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 3,785,500		**$ 7,444,500**
Primehook							
1	Beach Nourishment	176,000	CY	$ 7.00	$ 1,232,000	$ 13.00	$ 2,288,000
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,682,000		**$ 3,538,000**
Broadkill							
1	Beach Nourishment	528,000	CY	$ 7.00	$ 3,696,000	$ 13.00	$ 6,864,000
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 4,146,000		**$ 8,114,000**
Scenario 1 2011 Totals					**$ 14,751,800**		**$ 30,296,200**

* - Current Values based on 2011 dollars

Year 2021							
				2010 Study		Current Values*	
Item	Description	Quantity	Unit	Unit Cost	Cost	Unit Cost	Cost
Pickering Beach							
1	Beach Maintenance	83,100	CY	$ 7.00	$ 581,700	$ 13.00	$ 1,080,300
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,031,700		**$ 2,330,300**
Kitts Hummock							
1	Beach Maintenance	117,960	CY	$ 7.00	$ 825,720	$ 13.00	$ 1,533,480
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,275,720		**$ 2,783,480**
Bowers							
1	Beach Maintenance	45,600	CY	$ 7.00	$ 319,200	$ 13.00	$ 592,800
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 769,200		**$ 1,842,800**
South Bowers							
1	Beach Maintenance	39,480	CY	$ 7.00	$ 276,360	$ 13.00	$ 513,240
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 726,360		**$ 1,763,240**
Slaughter							
1	Beach Maintenance	285,900	CY	$ 7.00	$ 2,001,300	$ 13.00	$ 3,716,700
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 2,451,300		**$ 4,966,700**
Primehook							
1	Beach Maintenance	105,600	CY	$ 7.00	$ 739,200	$ 13.00	$ 1,372,800
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,189,200		**$ 2,622,800**
Broadkill							
1	Beach Maintenance	324,000	CY	$ 7.00	$ 2,268,000	$ 13.00	$ 4,212,000
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 2,718,000		**$ 5,462,000**
Scenario 1 2021 Totals					**$ 10,161,480**		**$ 21,771,320**

DRAFT

Cost Estimate Scenario 1

- **2031 / 2041**

Delaware Bay Shore Economic Analysis

Management Alternatives: Scenario 1 - Beach Nourishment

Year 2031							
				2010 Study		Current Values*	
Item	Description	Quantity	Unit	Unit Cost	Cost	Unit Cost	Cost
Pickering Beach							
1	Beach Maintenance	83,100	CY	$ 7.00	$ 581,700	$ 13.00	$ 1,080,300
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,031,700		**$ 2,330,300**
Kitts Hummock							
1	Beach Maintenance	117,960	CY	$ 7.00	$ 825,720	$ 13.00	$ 1,533,480
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,275,720		**$ 2,783,480**
Bowers							
1	Beach Maintenance	45,600	CY	$ 7.00	$ 319,200	$ 13.00	$ 592,800
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 769,200		**$ 1,842,800**
South Bowers							
1	Beach Maintenance	39,480	CY	$ 7.00	$ 276,360	$ 13.00	$ 513,240
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 726,360		**$ 1,763,240**
Slaughter							
1	Beach Maintenance	285,900	CY	$ 7.00	$ 2,001,300	$ 13.00	$ 3,716,700
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 2,451,300		**$ 4,966,700**
Primehook							
1	Beach Maintenance	105,600	CY	$ 7.00	$ 739,200	$ 13.00	$ 1,372,800
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,189,200		**$ 2,622,800**
Broadkill							
1	Beach Maintenance	324,000	CY	$ 7.00	$ 2,268,000	$ 13.00	$ 4,212,000
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 2,718,000		**$ 5,462,000**
Scenario 1 2031 Totals					**$ 10,161,480**		**$ 21,771,320**

* - Current Values based on 2011 dollars

Year 2041							
				2010 Study		Current Values*	
Item	Description	Quantity	Unit	Unit Cost	Cost	Unit Cost	Cost
Pickering Beach							
1	Beach Maintenance	83,100	CY	$ 7.00	$ 581,700	$ 13.00	$ 1,080,300
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,031,700		**$ 2,330,300**
Kitts Hummock							
1	Beach Maintenance	117,960	CY	$ 7.00	$ 825,720	$ 13.00	$ 1,533,480
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,275,720		**$ 2,783,480**
Bowers							
1	Beach Maintenance	45,600	CY	$ 7.00	$ 319,200	$ 13.00	$ 592,800
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 769,200		**$ 1,842,800**
South Bowers							
1	Beach Maintenance	39,480	CY	$ 7.00	$ 276,360	$ 13.00	$ 513,240
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 726,360		**$ 1,763,240**
Slaughter							
1	Beach Maintenance	285,900	CY	$ 7.00	$ 2,001,300	$ 13.00	$ 3,716,700
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 2,451,300		**$ 4,966,700**
Primehook							
1	Beach Maintenance	105,600	CY	$ 7.00	$ 739,200	$ 13.00	$ 1,372,800
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 1,189,200		**$ 2,622,800**
Broadkill							
1	Beach Maintenance	324,000	CY	$ 7.00	$ 2,268,000	$ 13.00	$ 4,212,000
2	Mobilization	1	EACH	$450,000	$ 450,000	$1,250,000	$ 1,250,000
					$ 2,718,000		**$ 5,462,000**
Scenario 1 2041 Totals					**$ 10,161,480**		**$ 21,771,320**

DRAFT

Cost Estimate Scenario 2

- **2011 / 2021**

Delaware Bay Shore Economic Analysis

Management Alternatives: Scenario 2 - Enhanced Retreat

Year 2011					
				Current Values*	
Item	Description	Quantity	Unit	Unit Cost	Cost
Pickering Beach					
1	Market Value Purchase	1	LS	$ 5,750,062	$ 5,750,062
2	Structure Demolition	57,175	SQ FT	$ 7.00	$ 400,228
					$ 6,150,289
Kitts Hummock					
1	Market Value Purchase	1	LS	$ 8,487,902	$ 8,487,902
2	Structure Demolition	97,572	SQ FT	$ 7.00	$ 683,001
					$ 9,170,903
Bowers					
1	Market Value Purchase	1	LS	$ 8,378,315	$ 8,378,315
2	Structure Demolition	71,571	SQ FT	$ 7.00	$ 501,000
					$ 8,879,315
South Bowers					
1	Market Value Purchase	1	LS	$ 1,799,354	$ 1,799,354
2	Structure Demolition	29,480	SQ FT	$ 7.00	$ 206,362
					$ 2,005,716
Slaughter					
1	Market Value Purchase	1	LS	$ 2,983,469	$ 2,983,469
2	Structure Demolition	18,002	SQ FT	$ 7.00	$ 126,017
					$ 3,109,486
Primehook					
1	Market Value Purchase	1	LS	$42,262,777	$ 42,262,777
2	Structure Demolition	189,622	SQ FT	$ 7.00	$ 1,327,352
					$ 43,590,129
Broadkill					
1	Market Value Purchase	1	LS	$55,714,672	$ 55,714,672
2	Structure Demolition	187,000	SQ FT	$ 7.00	$ 1,309,000
					$ 57,023,672
Scenario 2 2011 Totals					**$ 129,929,511**

* - Current Values based on 2011 dollars

Year 2021					
				Current Values*	
Item	Description	Quantity	Unit	Unit Cost	Cost
Pickering Beach					
1	Market Value Purchase	1	LS	$ 80,997	$ 80,997
2	Structure Demolition	1,439	SQ FT	$ 7.00	$ 10,073
					$ 91,070
Kitts Hummock					
1	Market Value Purchase	1	LS	$ 1,755,606	$ 1,755,606
2	Structure Demolition	24,381	SQ FT	$ 7.00	$ 170,668
					$ 1,926,274
Bowers					
1	Market Value Purchase	1	LS	$ 625,270	$ 625,270
2	Structure Demolition	5,325	SQ FT	$ 7.00	$ 37,272
					$ 662,542
South Bowers					
1	Market Value Purchase	1	LS	$ 547,551	$ 547,551
2	Structure Demolition	6,562	SQ FT	$ 7.00	$ 45,931
					$ 593,482
Slaughter					
1	Market Value Purchase	1	LS	$ 1,720,689	$ 1,720,689
2	Structure Demolition	17,127	SQ FT	$ 7.00	$ 119,888
					$ 1,840,578
Primehook					
1	Market Value Purchase	-	LS	$ 1.00	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Broadkill					
1	Market Value Purchase	1	LS	$12,971,579	$ 12,971,579
2	Structure Demolition	52,152	SQ FT	$ 7.00	$ 365,062
					$ 13,336,641
Scenario 2 2021 Totals					**$ 18,450,588**

DRAFT

Cost Estimate Scenario 4

- **2021 / 2031 / 2041**

Delaware Bay Shore Economic Analysis

Management Alternatives: Scenario 4 - Do Nothing

Year 2021

Item	Description	Quantity	Unit	Unit Cost (Current Values*)	Cost (Current Values*)
Pickering Beach					
1	Structure Demolition	4,232	SQ FT	$ 7.00	$ 29,624
					$ 29,624
Kitts Hummock					
1	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Bowers					
1	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
South Bowers					
1	Structure Demolition		SQ FT	$ 7.00	$ -
					$ -
Slaughter					
1	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Primehook					
1	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Broadkill					
1	Structure Demolition	7,037	SQ FT	$ 7.00	$ 49,260
					$ 49,260
Scenario 4 2021 Totals					**$ 78,884**

Year 2031

Item	Description	Quantity	Unit	Unit Cost (Current Values*)	Cost (Current Values*)
Pickering Beach					
1	Structure Demolition	18,648	SQ FT	$ 7.00	$ 130,534
					$ 130,534
Kitts Hummock					
1	Structure Demolition	18,893	SQ FT	$ 7.00	$ 132,251
					$ 132,251
Bowers					
1	Structure Demolition	5,624	SQ FT	$ 7.00	$ 39,370
					$ 39,370
South Bowers					
1	Structure Demolition	4,036	SQ FT	$ 7.00	$ 28,251
					$ 28,251
Slaughter					
1	Structure Demolition		SQ FT	$ 7.00	$ -
					$ -
Primehook					
1	Structure Demolition		SQ FT	$ 7.00	$ -
					$ -
Broadkill					
1	Structure Demolition	15,402	SQ FT	$ 7.00	$ 107,816
					$ 107,816
Scenario 4 2031 Totals					**$ 438,222**

Year 2041

Item	Description	Quantity	Unit	Unit Cost (Current Values*)	Cost (Current Values*)
Pickering Beach					
1	Structure Demolition	34,296	SQ FT	$ 7.00	$ 240,070
					$ 240,070
Kitts Hummock					
1	Structure Demolition	29,815	SQ FT	$ 7.00	$ 208,707
					$ 208,707
Bowers					
1	Structure Demolition	4,269	SQ FT	$ 7.00	$ 29,881
					$ 29,881
South Bowers					
1	Structure Demolition	6,179	SQ FT	$ 7.00	$ 43,252
					$ 43,252
Slaughter					
1	Structure Demolition		SQ FT	$ 7.00	$ -
					$ -
Primehook					
1	Structure Demolition	16,574	SQ FT	$ 7.00	$ 116,020
					$ 116,020
Broadkill					
1	Structure Demolition	66,039	SQ FT	$ 7.00	$ 462,270
					$ 462,270
Scenario 4 2041 Totals					**$ 1,100,202**

* - Current Values based on 2011 dollars

DRAFT

Cost Estimate Scenario 2

- **2031 / 2041**

Delaware Bay Shore Economic Analysis

Management Alternatives: Scenario 2 - Enhanced Retreat

Year 2031					
				Current Values*	
Item	Description	Quantity	Unit	Unit Cost	Cost
Pickering Beach					
1	Market Value Purchase	-	LS	$ 1.00	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Kitts Hummock					
1	Market Value Purchase	1	LS	$ 1,553,334	$ 1,553,334
2	Structure Demolition	18,879	SQ FT	$ 7.00	$ 132,154
					$ 1,685,488
Bowers					
1	Market Value Purchase	1	LS	$ 405,744	$ 405,744
2	Structure Demolition	3,629	SQ FT	$ 7.00	$ 25,405
					$ 431,149
South Bowers					
1	Market Value Purchase	1	LS	$ 120,361	$ 120,361
2	Structure Demolition	2,486	SQ FT	$ 7.00	$ 17,402
					$ 137,763
Slaughter					
1	Market Value Purchase	1	LS	$ 5,063,572	$ 5,063,572
2	Structure Demolition	40,257	SQ FT	$ 7.00	$ 281,801
					$ 5,345,373
Primehook					
1	Market Value Purchase	-	LS	$ 1.00	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Broadkill					
1	Market Value Purchase	1	LS	$ 20,623,771	$ 20,623,771
2	Structure Demolition	70,403	SQ FT	$ 7.00	$ 492,821
					$ 21,116,592
Scenario 2 2031 Totals					**$ 28,716,365**

* - Current Values based on 2011 dollars

Year 2041					
				Current Values*	
Item	Description	Quantity	Unit	Unit Cost	Cost
Pickering Beach					
1	Market Value Purchase	-	LS	$ 1.00	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Kitts Hummock					
1	Market Value Purchase	1	LS	$ 106,735	$ 106,735
2	Structure Demolition	439	SQ FT	$ 7.00	$ 3,071
					$ 109,806
Bowers					
1	Market Value Purchase	1	LS	$ 407,258	$ 407,258
2	Structure Demolition	4,138	SQ FT	$ 7.00	$ 28,969
					$ 436,228
South Bowers					
1	Market Value Purchase	1	LS	$ 143,827	$ 143,827
2	Structure Demolition	2,539	SQ FT	$ 7.00	$ 17,773
					$ 161,600
Slaughter					
1	Market Value Purchase	1	LS	$ 10,082,323	$ 10,082,323
2	Structure Demolition	59,783	SQ FT	$ 7.00	$ 418,480
					$ 10,500,803
Primehook					
1	Market Value Purchase	-	LS	$ 1.00	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Broadkill					
1	Market Value Purchase	1	LS	$ 11,161,349	$ 11,161,349
2	Structure Demolition	43,512	SQ FT	$ 7.00	$ 304,585
					$ 11,465,934
Scenario 2 2041 Totals					**$ 22,674,371**

DRAFT

Cost Estimate Scenario 3

- **2011 / 2021**

Delaware Bay Shore Economic Analysis

Management Alternatives: Scenario 3 - Basic Retreat

Year 2011

				Current Values*	
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Cost**
Pickering Beach					
1	Market Value Purchase	-	LS	$ -	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Kitts Hummock					
1	Market Value Purchase	-	LS	$ -	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Bowers					
1	Market Value Purchase	-	LS	$ -	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
South Bowers					
1	Market Value Purchase	-	LS	$ -	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Slaughter					
1	Market Value Purchase	-	LS	$ -	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Primehook					
1	Market Value Purchase	-	LS	$ -	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Broadkill					
1	Market Value Purchase	1	LS	$661,115	$ 661,115
2	Structure Demolition	4,097	SQ FT	$ 7.00	$ 28,682
					$ 689,796
Scenario 3 2011 Totals					**$ 689,796**

* - Current Values based on 2011 dollars

Year 2021

				Current Values*	
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Cost**
Pickering Beach					
1	Market Value Purchase	1	LS	$ 1,426,161	$ 1,426,161
2	Structure Demolition	14,460	SQ FT	$ 7.00	$ 101,221
					$ 1,527,382
Kitts Hummock					
1	Market Value Purchase	1	LS	$ 1,616,921	$ 1,616,921
2	Structure Demolition	13,383	SQ FT	$ 7.00	$ 93,681
					$ 1,710,602
Bowers					
1	Market Value Purchase	1	LS	$ 1,181,654	$ 1,181,654
2	Structure Demolition	9,865	SQ FT	$ 7.00	$ 69,056
					$ 1,250,710
South Bowers					
1	Market Value Purchase	1	LS	$ 216,498	$ 216,498
2	Structure Demolition	4,036	SQ FT	$ 7.00	$ 28,251
					$ 244,749
Slaughter					
1	Market Value Purchase	-	LS	$ 1.00	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Primehook					
1	Market Value Purchase	1	LS	$ 1,025,250	$ 1,025,250
2	Structure Demolition	4,939	SQ FT	$ 7.00	$ 34,576
					$ 1,059,826
Broadkill					
1	Market Value Purchase	1	LS	$30,519,185	$ 30,519,185
2	Structure Demolition	101,535	SQ FT	$ 7.00	$ 710,742
					$ 31,229,927
Scenario 3 2021 Totals					**$ 37,023,196**

DRAFT

Cost Estimate Scenario 3

- **2031 / 2041**

Delaware Bay Shore Economic Analysis

Management Alternatives: Scenario 3 - Basic Retreat

Year 2031					
				Current Values*	
Item	Description	Quantity	Unit	Unit Cost	Cost
Pickering Beach					
1	Market Value Purchase	1	LS	$ 4,205,811	$ 4,205,811
2	Structure Demolition	41,508	SQ FT	$ 7.00	$ 290,553
					$ 4,496,364
Kitts Hummock					
1	Market Value Purchase	1	LS	$ 2,379,962	$ 2,379,962
2	Structure Demolition	30,876	SQ FT	$ 7.00	$ 216,129
					$ 2,596,091
Bowers					
1	Market Value Purchase	1	LS	$ 1,355,761	$ 1,355,761
2	Structure Demolition	11,130	SQ FT	$ 7.00	$ 77,910
					$ 1,433,670
South Bowers					
1	Market Value Purchase	1	LS	$ 682,044	$ 682,044
2	Structure Demolition	12,399	SQ FT	$ 7.00	$ 86,791
					$ 768,835
Slaughter					
1	Market Value Purchase	-	LS	$ 1.00	$ -
2	Structure Demolition	-	SQ FT	$ 7.00	$ -
					$ -
Primehook					
1	Market Value Purchase	1	LS	$ 4,704,592	$ 4,704,592
2	Structure Demolition	23,952	SQ FT	$ 7.00	$ 167,665
					$ 4,872,258
Broadkill					
1	Market Value Purchase	1	LS	$24,946,263	$ 24,946,263
2	Structure Demolition	83,554	SQ FT	$ 7.00	$ 584,875
					$ 25,531,139
Scenario 3 2031 Totals					**$ 39,698,357**

Year 2041					
				Current Values*	
Item	Description	Quantity	Unit	Unit Cost	Cost
Pickering Beach					
1	Market Value Purchase	1	LS	$ 118,090	$ 118,090
2	Structure Demolition	1,208	SQ FT	$ 7.00	$ 8,453
					$ 126,543
Kitts Hummock					
1	Market Value Purchase	1	LS	$ 4,279,063	$ 4,279,063
2	Structure Demolition	51,048	SQ FT	$ 7.00	$ 357,336
					$ 4,636,399
Bowers					
1	Market Value Purchase	1	LS	$ 858,422	$ 858,422
2	Structure Demolition	9,924	SQ FT	$ 7.00	$ 69,465
					$ 927,886
South Bowers					
1	Market Value Purchase	1	LS	$ 738,061	$ 738,061
2	Structure Demolition	8,987	SQ FT	$ 7.00	$ 62,910
					$ 800,971
Slaughter					
1	Market Value Purchase	1	LS	$ 2,337,278	$ 2,337,278
2	Structure Demolition	15,001	SQ FT	$ 7.00	$ 105,010
					$ 2,442,288
Primehook					
1	Market Value Purchase	1	LS	$ 4,051,753	$ 4,051,753
2	Structure Demolition	19,035	SQ FT	$ 7.00	$ 133,246
					$ 4,184,999
Broadkill					
1	Market Value Purchase	1	LS	$ 14,236,379	$ 14,236,379
2	Structure Demolition	50,939	SQ FT	$ 7.00	$ 356,574
					$ 14,592,954
Scenario 3 2041 Totals					**$ 27,712,040**

* - Current Values based on 2011 dollars

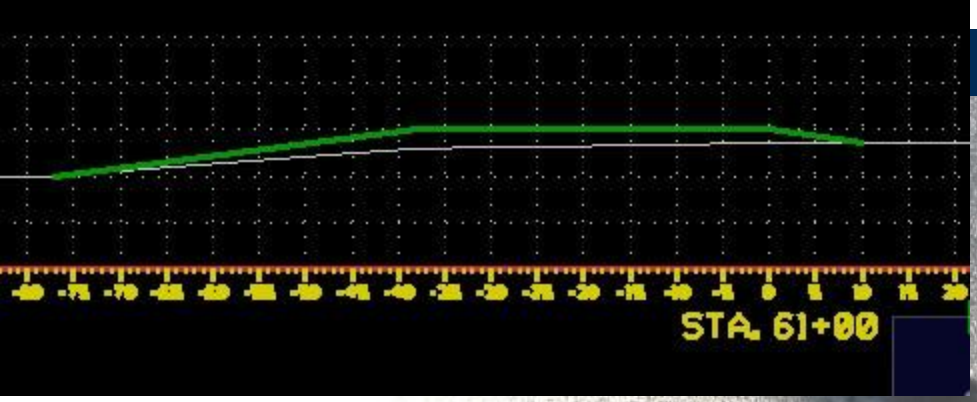
DRAFT

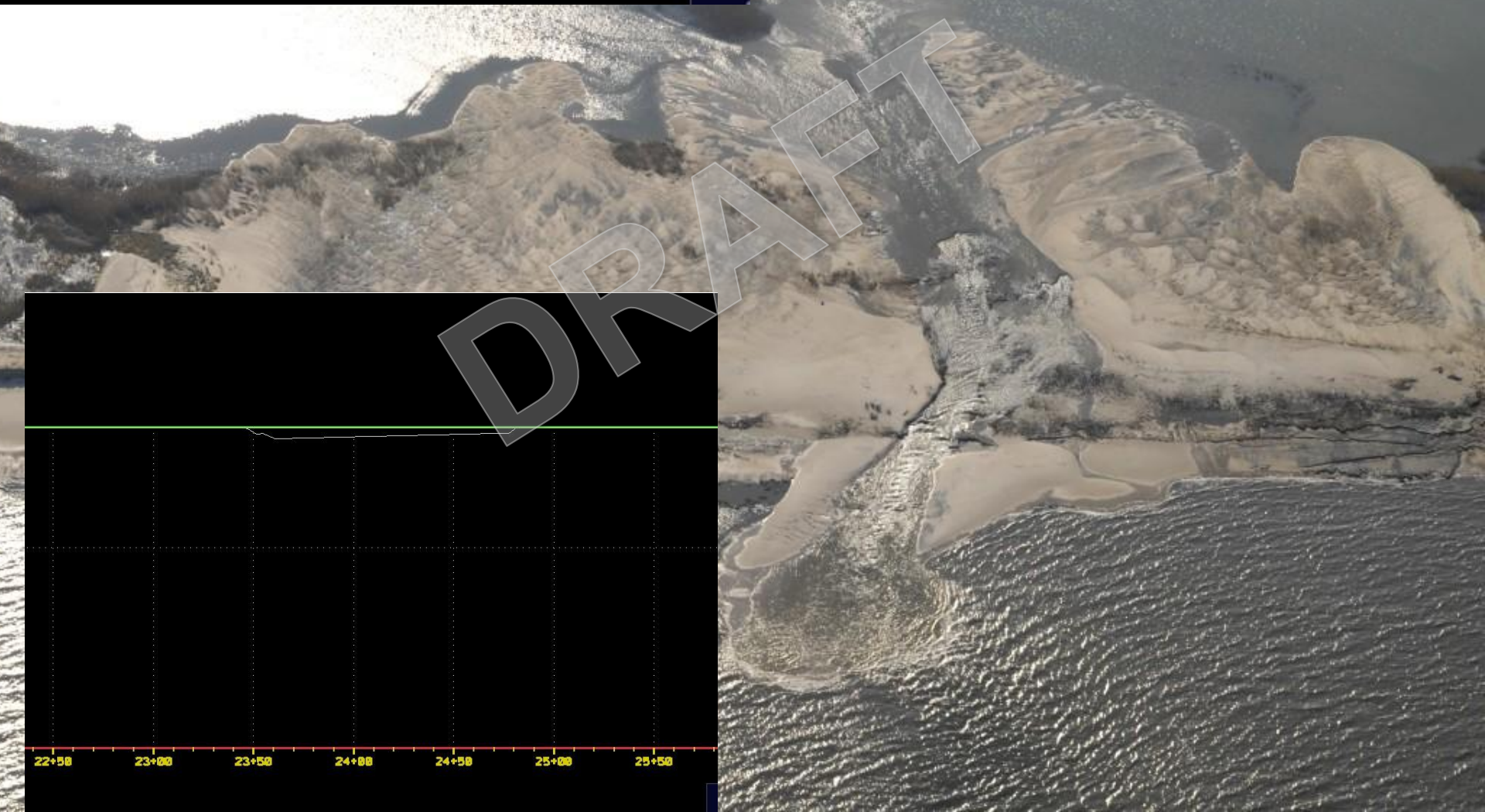
Cost Estimate Summary

Scenario Cost Estimates - Current Value*				
Beach Community	**Scenario 1: Beach Nourishment**	**Scenario 2: Enhanced Retreat**	**Scenario 3: Basic Retreat**	**Scenario 4: Do Nothing**
Pickering Beach	$ 10,041,400	$ 6,241,362	$ 6,150,289	$ 400,228
Kitts Hummock	$ 12,156,240	$ 12,892,471	$ 8,943,092	$ 340,959
Bowers Beach	$ 7,766,400	$ 10,409,235	$ 3,612,267	$ 69,251
South Bowers Beach	$ 7,395,120	$ 2,898,561	$ 1,814,555	$ 71,503
Slaughter Beach	$ 22,344,600	$ 20,796,240	$ 2,442,288	$ -
Prime Hook	$ 11,406,400	$ 43,590,130	$ 10,117,083	$ 116,020
Broadkill Beach	$ 24,500,000	$ 102,942,839	$ 72,043,816	$ 619,346
Total Cost of Scenario	**$ 95,610,160**	**$ 199,770,838**	**$ 105,123,389**	**$ 1,617,307**

*- Current Value based on 2011 dollars

DRAFT





DRAFT

Beach Breach Assessment Results

Refer to Two Images and Spreadsheet Summary

DRAFT

Beach / Reach / Breach Comparison

Beach Community Nourishment**				Reach Nourishment***					Breach Fill Only****			
Beach	10-Year Fill (CY)	10-Year Typical Section Fill Cost ($13/CY)	Total Cost*	Beach Reach	1962 Fill (CY)	10-Year Fill (CY)	1962 Typical Section Fill Cost* ($13/CY)	10-Year Typical Section Fill Cost* ($13/CY)	Breach	Plug Fill Volume	Plug Fill Cost ($13/CY)	Total Cost Per Reach*
Pickering Beach	138,500	$ 1,800,500	$ 3,050,500									
				Reach 1	158,737	362,039	$ 3,313,582	$ 5,956,504	Breach 1A	10,864	$ 141,235	$ 1,391,235
Kitts Hummock	196,600	$ 2,555,800	$ 3,805,800									
				Reach 2	159,694	307,738	$ 3,326,023	$ 5,250,600	Breach 2A	3,957	$ 51,442	$ 1,301,442
Bowers Beach	76,000	$ 988,000	$ 2,238,000									
South Bowers	65,800	$ 855,400	$ 2,105,400									
				Reach 3	607,829	858,376	$ 9,151,782	$ 12,408,884	Breach 3A	1,921	$ 24,978	$ 1,848,266
									Breach 3B	11,526	$ 149,843	
									Breach 3C	4,975	$ 64,675	
									Breach 3D	13,179	$ 171,331	
									Breach 3E	10,818	$ 140,637	
									Breach 3F	3,600	$ 46,803	
Slaughter	476,500	$ 6,194,500	$ 7,444,500									
				Reach 4	568,171	490,478	$ 8,636,217	$ 7,626,219	Breach 4A	32,808	$ 426,505	$ 1,834,178
									Breach 4B	12,129	$ 157,673	
Primehook Beach	176,000	$ 2,288,000	$ 3,538,000									
				Reach 5	478,011	545,490	$ 7,464,139	$ 8,341,366	No Observed Breaches			
Broadkill Beach	528,000	$ 6,864,000	$ 8,114,000									
Beach Nourishment Total			**$ 30,296,200**	**Reach Nourishment Total**				**$ 39,583,572**	**Breach Plug Only Total**			**$ 6,375,121**

*includes $1.25M mobilization cost per Beach or Reach
** - Beach Nourishment costs represent a one time fill of the 10 year typical fill section
*** - Reach Nourishment between Beach areas (includes breach plug)
**** - Breach Plug includes filling breach areas to match elevation of adjacent un-breached area

DRAFT

Discussion

- Data collection, processing and preliminary analysis completed

- Integrated results are being developed, by community and in aggregate and will be provided Fall 2012

- Recommendations will be developed

- This analysis covered specific communities, the broader bayshores management not addressed – but could generate broader range of benefits

DRAFT