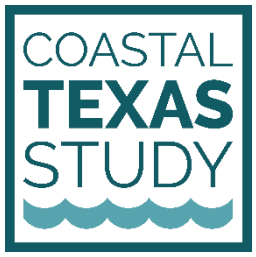

Coastal Texas Protection and Restoration Feasibility Study

Final Feasibility Report

Appendix E-2:

Economics for the South Padre Island Beach Nourishment and Sediment Management Feature

August 2021

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CONTENTS

South Padre Island CSRM Economics Appendix

INTRODUCTION

DEMOGRAPHICS

The city of South Padre Island lies on Padre Island in South Texas and is within the boundaries of Cameron County. According to the 2012-2016 American Community Survey published by the U.S. Census Bureau, the estimated population of South Padre Island is 2,888, which is less than one percent of the total county population of 418,875. The population is 52% female and 48% male for both the city and the county. For the city, 96.4% of the population is White, 1% Black, and 2.9% identified as other race. For the county, 93.8% is White, 0.7% Black, 0.8% Asian, and 5.2% identified as some other race. The median age for South Padre Island is 60 years and 31 for the county. The unemployment rate for South Padre Island was 1.8% and 9.4% for the county. The median household income for South Padre Island is $42,825, while for the county it is $34,578. In the city of South Padre Island, 18.8% of the population had incomes below the poverty level, and for Cameron County, the ratio is 33%.

HISTORICAL EVENTS

While South Padre Island has not been the target of a significant number of storms, two storms of significance were Beulah in 1967 that caused 15 death in Texas and $217 million in damages in the region; and Dolly in 2008, which cause storm surges ranging from 2-4 feet along the mid and southern Texas coast. Damages specific were to South Padre Island were not reported.

EXISTING CONDITIONS AND FUTURE WITHOUT PROJECT CONDITIONS

The coastal engineering modeling for the future without and future with project is presented in detail in Economics Appendix E-2, Annex 1 (ERDC_SPI_Analysis). Early in the analysis, based preliminary engineering assessments, the study area for the South Padre Island area was defined as the first tier of structures along the beach within the city of South Padre Island, with the western boundary defined as Gulf Boulevard. A windshield survey of the area was done to collect occupancy type, construction materials, and finished floor elevations. Preliminary values were obtained from county appraisal district information, and a sample was evaluated using Marshall & Swift Estimation software to derive depreciated replacement values.

SUMMARY OF THE STRUCTURE INVENTORY

A site visit was conducted and the physical attributes of the structures were collected, including first floor elevation, number of stories, and occupancy type (residential, commercial, high-rise condominiums/hotels). Structure valuations were based on a comparison of Marshall and Swift residential and commercial values to the improvement values from the county appraisal district. There were 206 structures in the study area. Of these, 121 pile foundation with enclosed ground level areas, including single family residences and multifamily residences. There were 74 beach front high rises, which included resorts, hotels and multifamily residences. There were five two story residential structures, five commercial non engineered structures, primarily restaurants and clubs, and one pile foundation with an open ground level area. The depreciated replacement value of the structures ranged from $8,000 to $45,056,363, with a total structure valuation of $640,018,157. Total value of structures and contents was estimated at $852,276, 536. The uncertainty related to the structure values, content values, elevation values and time to rebuild values are captured in the Beachfx analysis by drawing samples from a triangular distribution for each of the successive iterations. Triangular distributions require a minimum, most likely, and maximum value for each of the variables. The most likely values are taken from the point estimates collected during the site visit and review of Marshall Swift and appraisal data. The minimum and maximum values are based on percentages of the most likely values. These percentages were adopted from other coastal studies and best professional judgment.

FUTURE WITHOUT-PROJECT DAMAGES

The study area was divided into 7 reaches, as show in Figure 1. Reach 6_Park contained no damage elements. Depth damage curves were adopted from the North Atlantic Comprehensive Study, January 2015, and included Pile Foundation Enclosure, Pile Foundation Open, Beach High Rise, Single Story Residence (No Basement), Two Story Residence (No Basement), and Commercial Non-Engineered Structure. A summary of the depth damage functions and uncertainty parameters displayed at the end of this appendix in Table 20.

FUTURE WITHOUT PROJECT CONDITION MODEL ASSUMPTIONS

The modeling parameters set in Beachfx for these runs are:

Start Year – 2034
Base Year – 2035
Period of Analysis – 50 years
FY2018 Federal Discount Rate – 2.75%
Damage Element Condemnation Ratio – 50% – maximum damage a Damage Element can receive from a single storm event before becoming condemned and removed from the inventory. Once a Damage Element is removed from the inventory, it can no longer receive further damages during that life cycle.
Number of Rebuilds – 99 – maximum number of repairs a Damage Element can undergo during the project life cycl 100% of structure value).
Time to Rebuild – This is a triangle distribution denoting time necessary to complete a structure rebuild (minimum number of days, most likely, maximum): Pile Foundation Enclosure (128, 173, 218), two story residential (320,364,410), Pile Foundation Open (75,180,410), Commercial Non Engineered (99,168, 213) and Beach High Rise (462,489, 533).
Control Line Offset – 0 feet – this variable controls the threshold distance measured from the centroid of the Lot to the seaward toe of the dune at which Lots in the Reach will be marked

condemned and Damage Elements in the Lot will be prohibited from being rebuilt. The PDT decided to keep the control line offset at 0 feet due to the fact that the majority of lots on seaward side of the island do not have land behind the structures. The PDT feels that a control line offset of 0 is the most feasible option

Applied Erosion Rates – Profile specific – feet per year of erosion or accretion to calibrate the expected historic erosion rate. Erosion rates supplied by Engineering.

Berm Width Recovery Factor – 90% - percent of storm-induced berm width change that is restored due to post-storm recovery processes

Storm Recovery Period – 6 days – number of days before post-storm recovery processes are applied

Lot Armor – None – refers to seawalls, bulkheads, etc.

Back Bay Flooding – Off – Inundation flooding from low lying surrounding areas

Iterations – 300 iterations – sufficient for model results to reach

Using a discount rate of 2.75% and a period of analysis of 50 years, Beachfx computed the present value of damages for 300 iterations of storm events. The average of those 300 iterations, along with number of damage elements and an annual average of damages is presented in Table 1.

Table 1. Number of Damage Elements and Average of Present Value Damages and Annual Average Damages by Reach, 50 Year Period of Analysis, 2.75% Discount Rate, 300 Iterations

Future Without Project Damages							
	Reach 1	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 5**	**Reach 6**	**Total**
Number of Damage Elements	2	29	53	36	53	33	206
Average of Present Value of Damages	$56,442	$4,920,927	$16,856,174	$32,906,063	$66,984,336	$22,282,889	$144,006,831
Annual Average Damages	$2,091	$182,276	$624,368	$1,218,871	$2,481,161	$825,379	$5,334,145

Figure 1. Damage Reaches

FUTURE WITH-PROJECT CONDITIONS

PRELIMINARY SCREENING OF ALTERNATIVES

For preliminary screening analysis, 18 dune and berm templates were evaluated. For each of the 18 resulting templates, a Beach-fx simulation occurred in which the entire study area (R1-R6; excluding the park) was renourished on an "as-needed" basis. A relative benefit-to-cost ratio was computed for each reach that did not consider mobilization costs (Figure 2). It should be emphasized that the relative BCR is not reflective of the actual BCR in each reach, but rather allows the reaches that benefit the most from implementation of a renourishment project to be identified. In Figure 2, the darker hues indicate a higher relative BCR. It can be seen that reaches R3, R4, and R5 returned the largest relative BCRs. Note that although Reach R5 returned the largest damages, it did not receive the largest relative BCRs due to the high cost of renourishing.

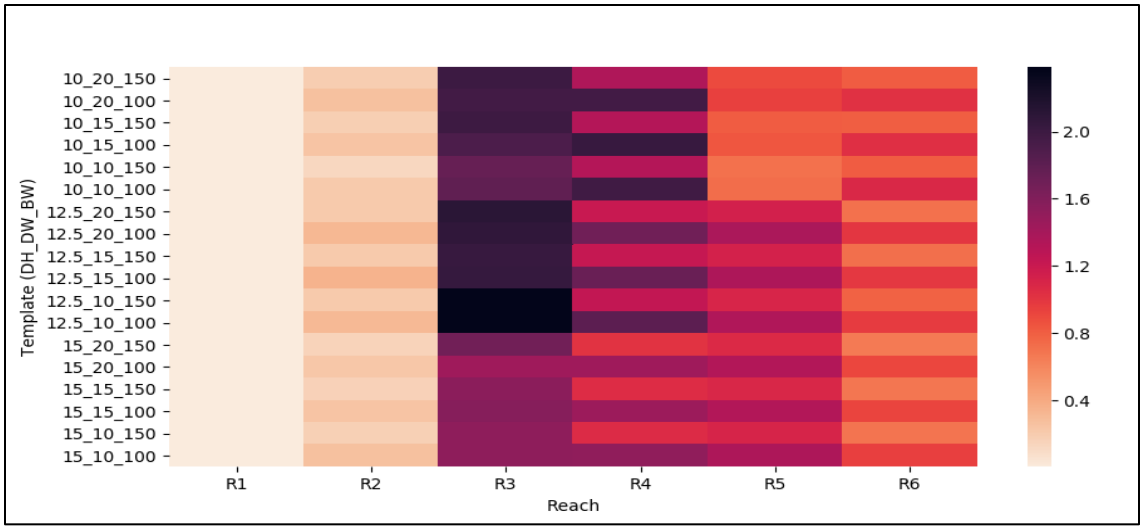

Figure 2. Heat map of relative benefit-to-cost ratios

Of the 18 original nourishment templates, eight were considered for further analysis by running additional Beach-fx simulations. For these simulations, cost assumptions were a $3 million mobilization cost and $40 per cubic yard for placement of planned nourishment material. One set of simulations considered renourishing only reaches R3 and R4, whereas the other considered reaches R3, R4, and R5. Similar to the previous simulations, Beach-fx was configured to be renourished on an "as-needed" basis. The resulting average BCRs across 300 lifecycles are shown in Table 2 and Table 3. The results show that simulations in which reach R5 is included, result in a 13-43% reduction in the average BCR. As previously discussed, this is due to the high cost of renourishing reach R5. From it can be seen that the template corresponding to a dune height of 12.5 ft., a dune width of 20 ft., and a berm width of 100 ft. returned the largest BCR. This template was considered for further analysis.

Table 2. Cost, Damages Reduced and Net Benefits for Nourishment of Reaches 3, 4 and 5 (2.75% Discount Rate, 50 Year Period of Analysis, 300 Iterations)

	Reaches 3, 4, and 5										
Alternate	Present Value Planned Mobilization Cost	Present Value Planned Placement Cost	Present Value Total Cost	Present Value Without Project Damages	Present Value With Project Damages	Average Annual Cost	Annual Average Without Project Damages	Annual Average With Project Damages	Annual Average Benefits	Net Benefits	Benefit to Cost Ratio
15_15_100	$57,832,840	$46,457,424	$104,290,264	$144,006,831	$73,939,919	$3,863,007	$5,334,145	$2,738,803	$2,595,343	-$1,267,664	0.67
15_10_100	58,570,908	45,289,121	103,860,029	144,006,831	74,372,697	3,847,071	5,334,145	2,754,833	2,579,312	-1,267,759	0.67
12.5_20_100	47,526,820	39,618,378	87,145,198	144,006,831	77,914,596	3,227,938	5,334,145	2,886,028	2,448,117	-779,821	0.76
12.5_15_100	48,321,492	40,175,437	88,496,929	144,006,831	77,230,410	3,278,008	5,334,145	2,860,685	2,473,460	-804,548	0.75
12.5_10_150	64,462,888	46,651,262	111,114,150	144,006,831	82,125,343	4,115,770	5,334,145	3,041,998	2,292,147	-1,823,623	0.56
12.5_10_100	47,647,621	38,672,525	86,320,146	144,006,831	78,228,402	3,197,378	5,334,145	2,897,652	2,436,493	-760,884	0.76
10_20_100	23,975,541	24,513,763	48,489,304	144,006,831	108,009,876	1,796,088	5,334,145	4,000,785	1,333,360	-462,728	0.74
10_15_100	18,919,748	22,987,924	41,907,672	144,006,831	112,205,026	1,552,299	5,334,145	4,156,177	1,177,968	-374,331	0.76

Table 3. Cost, Damages Reduced and Net Benefits for Nourishment of Reaches 3 and 4 (2.75% Discount Rate, 50 Year Period of Analysis, 300 Iterations)

	Reaches 3 and 4										
Alternate	Present Value Planned Mobilization Cost	Present Value Planned Placement Cost	Present Value Total Cost	Present Value Without Project Damages	Present Value With Project Damages	Annual Average Cost	Annual Average Without Project Damages	Annual Average With Project Damages	Annual Average Benefits	Net Benefits	Benefit to Cost Ratio
15_15_100	$14,537,392	$26,797,867	$41,335,259	$144,006,831	$99,878,312	$1,531,096	$5,334,145	$3,699,585	$1,634,561	$103,465	1.07
15_10_100	15,642,314	26,322,523	41,964,837	144,006,831	100,440,542	1,554,416	5,334,145	3,720,410	1,613,735	59,319	1.04
12.5_20_100	**8,433,632**	**19,817,285**	**28,250,917**	**144,006,831**	**106,930,051**	**1,046,440**	**5,334,145**	**3,960,787**	**1,373,358**	**326,918**	**1.31**
12.5_15_100	8,704,075	19,165,900	27,869,975	144,006,831	107,727,530	1,032,330	5,334,145	3,990,327	1,343,819	311,489	1.30
12.5_10_150	12,416,326	24,854,508	37,270,834	144,006,831	104,004,970	1,380,546	5,334,145	3,852,440	1,481,706	101,160	1.07
12.5_10_100	9,097,668	18,519,168	27,616,836	144,006,831	109,253,715	1,022,953	5,334,145	4,046,858	1,287,287	264,334	1.26
10_20_100	2,976,623	9,744,826	12,721,449	144,006,831	132,855,867	471,214	5,334,145	4,921,103	413,042	-58,172	0.88
10_15_100	2,561,406	8,213,454	10,774,860	144,006,831	134,756,282	399,111	5,334,145	4,991,497	342,649	-56,462	0.86

EVALUATION OF FINAL REACHES

For the final evaluation of Reaches 3 and 4, the "renourishment as need" assumption was dropped and various renourishment intervals were considered. In total, 10 renourishment intervals were considered (1, 2, 3, 4, 5, 7, 10, 12, 15, and 20 years), and both the BCR and net benefits were computed for each lifecycle (300 lifecycles). The results of these runs are presented in Table 4. From the analysis, the 10 year renourishment cycle was identified as the recommended configuration. While a 15 year cycle presented greater net benefits, from an engineering perspective, it was felt the waiting time was too great to be a practical consideration, given the greater potential for damages.

OPTIMIZATION OF FINAL REACHES

In an attempt to best validate and optimize the engineering assumptions for the Beach-fx runs, several discussions were held with subject matter experts, both within the Corps and from the private section. The outcome of those discussions led the PDT to consider altering settings related to depth of closure.

Within Beach-fx, these two values dictate how nourishment material is placed, as well as how much material is eroded due to sea level change. The depth of closure and width of active profile were originally specified as 30ft. and 4000ft. respectively. These values were updated to 23ft. and 3000ft. A depth of closure of 23ft. was selected to be consistent with the depth of closure implemented in the volume calculations. Furthermore, WIS data at the South Padre Island indicates a depth of closure of 19-23ft. The width of active profile was determined from the submerged profile data based on the updated depth of closure.

Whereas the updated depth of closure and width of active profile resulted in negligible changes to the FWOP conditions, the FWP conditions saw more significant changes.

Renourishment cycles of 5, 10, and 15 years were re-simulated and the results shown in Table 5. It can be seen that the BCR and net benefits resulting from the new depth of closure increase regardless of the renourishment interval. Additionally, it can be seen that there is little variation in the FWP Damages, but that the change in BCR and net benefits are caused by a reduction in project costs. The larger variation between the FWP costs are attributed to the decreased depth of closure. Within Beach-fx, the volume (and costs) are proportionately related to the depth of closure. Therefore, a decreased depth of closure results in a decreased cost. For all three simulations, the resulting BCRs increase between 18-20%, and the rank ordering of the BCRs are the same as that of the original runs. It is expected that regardless of the plan or renourishment interval selected, the increase in BCR will remain the same (~20%). Consequently, it is not necessary to rerun all of the simulations. Rather, the originally selected TSP remains the selected plan, although there are changes to the economic values.

The NED plan for the South Padre Island component, based on this analysis would be the 12.5-20-100 template alternative with a 10 year renourishment cycle. The average annual net benefits are $82,614, with a benefit-to-cost ratio of 1.07.

Table 4. Cost, Damages Reduced and Net Benefits for Nourishment of Reaches 3 and 4, Alternative 12.5_20_100 with Varying Nourishment Cycles (2.75% Discount Rate, 50 Year Period of Analysis, 300 Iterations)

	Reaches 3, 4, Alternative 12.5_20_100										
Nourishment Cycle (Yearly Interval)	Present Value Planned Mobilization Cost	Present Value Planned Placement Cost	Present Value Total Cost	Present Value Without Project Damages	Present Value With Project Damages	Annual Average Cost	Annual Average Without Project Damages	Annual Average With Project Damages	Annual Average Benefits	Net Benefits	Benefit to Cost Ratio
1	$57,490,927	$58,787,600	$116,278,527	$144,006,831	$99,705,105	$4,307,064	$5,334,145	$3,693,169	$1,640,977	-$2,666,087	0.38
2	29,080,589	67,484,035	96,564,624	144,006,831	100,571,334	3,576,842	5,334,145	3,725,255	1,608,891	-1,967,952	0.45
3	19,752,753	70,176,689	89,929,442	144,006,831	101,643,730	3,331,069	5,334,145	3,764,977	1,569,168	-1,761,901	0.47
4	15,030,771	66,869,654	81,900,425	144,006,831	102,912,854	3,033,667	5,334,145	3,811,987	1,522,159	-1,511,508	0.50
5	11,716,899	55,585,658	67,302,557	144,006,831	103,634,456	2,492,949	5,334,145	3,838,716	1,495,430	-997,519	0.60
7	9,046,952	48,796,562	57,843,514	144,006,831	105,213,049	2,142,577	5,334,145	3,897,188	1,436,957	-705,620	0.67
10	**5,771,000**	**32,838,513**	**38,609,513**	**144,006,831**	**109,239,669**	**1,430,132**	**5,334,145**	**4,046,338**	**1,287,808**	**-142,324**	**0.90**
12	5,480,095	35,262,351	40,742,446	144,006,831	110,365,051	1,509,138	5,334,145	4,088,023	1,246,122	-263,015	0.83
15	4,258,940	29,610,978	33,869,918	144,006,831	112,619,297	1,254,573	5,334,145	4,171,522	1,162,623	-91,950	0.93
20	3,145,493	23,273,952	26,419,445	144,006,831	119,693,419	978,601	5,334,145	4,433,554	900,591	-78,009	0.92

Table 5. Cost, Damages Reduced and Net Benefits for Nourishment of Reaches 3 and 4, Alternative 12.5_20_100 with Varying Nourishment Cycles (2.75% Discount Rate, 50 Year Period of Analysis, 300 Iterations), 23 foot depth of closure

	Reaches 3, 4, Alternative 12.5_20_100, 23 foot depth of closure										
Nourishment Cycle (Yearly Interval)	Average of Present Value Planned Mobilization Cost	Average of Present Value Planned Placement Cost	Present Value Total Cost	Average of Present Value Without Project Damages	Average of Present Value With Project Damages	Annual Average Cost	Annual Average Without Project Damages	Annual Average With Project Damages	Annual Average Benefits	Net Benefits	Benefit to Cost Ratio
5	11,718,029	44,211,660	55,929,689	144,200,580	103,874,211	2,071,687	5,341,322	3,847,596	1,493,726	-577,961	0.72
10	**5,778,624**	**26,693,957**	**32,472,581**	**144,200,580**	**109,497,650**	**1,202,814**	**5,341,322**	**4,055,894**	**1,285,428**	**82,614**	**1.07**
15	4,258,940	24,353,178	28,612,118	144,200,580	112,973,620	1,059,819	5,341,322	4,184,647	1,156,675	96,856	1

ADDITIONAL REFINEMENTS

Following technical reviews and public comments, some of the underlying model assumptions were revisited and additional analysis was conducted. These refinements included:

1. The original planform rates were based on the fill placement creating a 100 ft offset from the adjacent shoreline. These rates were revised to reflect a 20 ft offset. The reduction in planform rates from the prior analysis of fill in reaches 3 and 4 results in an increase in benefits and a reduction in costs.
2. The cost per cubic yard of material was reduced from $40 to $27 based on a review of other project costs
3. Evaluation of planned renourishment periods of 10 and 15 year cycle
4. Consideration of 80 and 120 foot berm widths
5. Sea Level Change (SLC) Sensitivity

Through all of the simulations, Beachfx did not trigger nourishments in reaches 1,2, and 6. As a result, only reaches 3,4, and 5 were set for nourishment in the model moving forward. Two combinations were considered, just reaches 3 and 4 as previously identified, and reaches 3,4 and 5. The original 12.5 foot dune height and 20 foot dune width were maintained, and 80, 100 and 120 foot berm widths were modeled for the 15 year nourishment cycle. Professional judgement was applied to limit the berm width to 120 foot to balance the sediment needs and the risk reduction goal. The study waiver of time and cost provided that the study would not optimize features. Rather, the feasibility would assess cost effective scale and develop a comprehensive plan. The costs to maintain a wider berm were considered adequate reason to not consider berms wider than 120 foot. The results of those runs are shown in Table 6. As shown in the table, the reach/profile combinations with the highest net benefits are those that include reaches 3,4 and 5, and those net benefits are fairly close. Of those, the 120 foot berm width on reaches 3,4 and 5 have the highest net benefit, with a present value of $7 million.

Table 6. 15 Year Planned Nourishment - Intermediate SLC Damages and Benefits ($1,000, 2.75% Interest Rate, October 2017 Prices) Template - 12.5 DH_20 DW, Various Berms

Berm Width	Reaches	Without Project Damages (PV)	With Project Damages (PV)	Damages Avoided (PV)	Nourishment Cost (PV)	Net Benefits (PV)	Benefit to Cost Ratio
80	3,4	$144,275	$130,480	$13,795	$8,968	$4,827	1.5
80	3,4,5	144,275	126,089	18,186	$11,490	$6,696	1.6
100	3,4	144,275	130,246	14,029	$9,249	$4,780	1.5
100	3,4,5	144,275	122,969	21,306	$15,077	$6,229	1.4
120	3,4	144,275	129,444	14,831	$9,830	$5,001	1.5
120	3,4,5	144,275	120,602	23,673	$16,710	$6,963	1.4

Nourishment Cost includes interest during construction for the initial placement

With reach 3,4,5 showing the highest net benefits, the model was rerun with a 5 year and 10 year nourishment cycle and 100 and 120 foot berm widths for those reaches. The results are shown in Table 7. The 15 year, 120 foot berm from Table 6 for comparison. As can be seen, the 120 foot berm with a 10 year nourishment cycle over reaches 3,4 and 5 has the highest net benefits, in present value terms, of $11,697. The two 5 year nourishment cycles have very similar net benefits, but they do have higher costs for those similar benefits. Based on these results, the 120 foot berm with a 10

year nourishment cycle was selected as the plan to carry forward and develop detailed costs. Additional detail of this plan, by reach, is shown in Table 8.

Table 7. 5 and 10Year Planned Nourishment, Reaches 3,4 and 5 - Intermediate SLC Damages and Benefits ($1,000, 2.75% Interest Rate, October 2017 Prices) Template - 12.5 DH_20 DW, Various Berms

Nourishment Cycle	Berm Width	Without Project Damages (PV)	With Project Damages (PV)	Damages Avoided (PV)	Nourishment Cost (PV)	Net Benefits (PV)	Benefit to Cost Ratio
5	100	$144,275	$98,466	$45,809	$34,724	$11,085	1.3
5	120	144,275	97,198	47,077	$36,509	$10,568	1.3
10	100	144,275	116,774	27,501	$19,108	$8,393	1.4
10	120	144,275	111,331	32,944	$21,247	$11,697	1.6
15	120	144,275	120,602	23,673	$16,710	$6,963	1.4

Nourishment Cost includes interest during construction for the initial placement

Table 8. 10 Year Planned Nourishment - Intermediate SLC Damages and Benefits ($1,000, 2.75% Interest Rate, October 2017 Prices) Template - 12.5 DH_20 DW_120 Berm-Reach 3,4 and 5 Nourishment, Half Planform Rate

Reach	Annual Erosion (ft.)	Without Project Damages (PV)	With Project Damages (PV)	With Project Damages Avoided (PV)	Nourishment Costs (PV)	Net Benefits (PV)	Benefit-to-Cost Ratio	Average Number Nourishments over 50 Planning Horizon	Average Material per Event (1,000 CY)
R1	-3.8	$53	$52	$1	$0	$1			
R2	-2.6	4910	4,234	676	0	676			
R3	1.7	16904	3,779	13,125	3,637	9493	3.6	2.7	94
R4	-4.2	32856	25,111	7,745	3,490	4260	2.2	1.3	217
R5	-5.7	67040	55,982	11,058	4,733	6331	2.3	1	192
R6	-7.7	22512	22,173	339	0	339			
R6 Park	-7.7	0	0	0	0	0			
Mobilization					9,374	-9,374			
Total		$144,275	$111,331	$32,944	21,234	$11,710	$1.55		

Nourishment Cost includes interest during construction for the initial placement

SEA LEVEL CHANGE SENSITIVITY

In order to be consistent with other components of the Coastal Texas study, all of the plan formulation, including the recommended plan, were done using an intermediate level of sea change (SLC). However, this is an element of uncertainty in evaluating the alternatives. This section looks to provide a sensitivity analysis using low and high sea level rise parameters in comparison to the intermediate sea level rise. As shown in Table 9, the net benefits for high sea are significantly lower than the intermediate assumption. While damages increased under the high SLC, more material was required at each nourishment, causing costs to outpace the benefits. For the low SLC, only a few runs were made, showing little to moderate differences between the intermediate SLC results. In terms of sensitivity, a low SLC will likely not change net benefits. However, under a high SLC, we would expect a significant reduction in net benefits.

Table 9. Net Benefits for Planned Nourishment High, Intermediate and Low Sea Level Rise (Benefits ($1,000, 2.75% Interest Rate, October 2017 Prices)

Sea Level Rise	R 3-4 N -15 yr. 12.5-20-80	R 3-5 N -15 yr. 12.5-20-80	R 3-4 N -15 yr. 12.5-20-100	R 3-5 N -15 yr. 12.5-20-100	R 3-4 N -15 yr. 12.5-20-120	R 3-5 N -15 yr. 12.5-20-120
High	$3,252	$1,762	$2,794	$1,866	$2,506	$1,772
Intermediate	4,847	6,723	4,801	6,2623	5,023	7,001
Low			4,338	2,876		

RECOMMENDED PLAN WITH REFINED ESTIMATE OF COSTS

Using quantities estimated by Beachfx, USACE Cost Engineering developed a schedule of costs for the plan carried forward. For this analysis, the first nourishment is in year 2034, a base year, where benefits begin to accrue, is 2035, and the period of analysis is 50 years. The schedule of these costs, including present value and average annual cost is shown in Table 10.

Table 10. Schedule of Nourishment Costs and Average Annual Cost ($1,000, October 2019 Price Level 2.75% Interest Rate)

Year	Nourishment	PED	Construction Management	Cultural	Lands and Damages	In House Real Estate	IDC	Total Construction Cost	Present Value of Costs
2034	$9,007	$1,351	$540	$185	$18,300	$710	$205	$30,298	$30,298
2044	9,007	1,351	540				76	$10,974	8,367
2054	9,007	1,351	540				76	$10,974	6,379
2064	9,007	1,351	540				76	$10,974	4,863
2074	9,007	1,351	540				76	$10,974	3,708
Totals								$74,194	$53,615
Average Annual Cost									$1,986

Using the benefits estimated in Beachfx updated to the October 2019 and the costs from Table 10, the net benefits and benefit-to-cost ratios (BCR) were calculated, and shown in Table 11. Values are shown in both present value and average annual terms. With refined cost and updated price levels, the CSRM plan has net benefits of -3,572 and a benefit-to-cost ratio of 0.91. While not economically justified on CSRM benefits along, the benefits needed to reach a BCR of 1.0 allow recreation benefits can be considered towards that justification.

Table 11. Benefits and Costs Expressed as Present Value and Average Annuals ($1,000, 2.75% Interest Rate, October 2019 Prices)

Cost Terms	Without Project Damages	With Project Damages	Damages Avoided	Costs	Net Benefits	Benefit-to-Cost Ratio
Present Value	$150,046	$115,784	$34,262	$53,615	-$3,572	0.64
Average Annual Values	$5,558	$4,289	$1,269	$1,986	-$131	0.64

RECREATION

USACE policy provides for the consideration of incidental recreation benefits for project economic justification as outlined in ER-11-5-2-100:

> *Shore protection projects are formulated to provide hurricane and storm damage reduction. Recreation is incidental. The Corps participates only in those projects formulated exclusively for hurricane and storm damage reduction, and justified (BCR ≥ 1.0) based solely on damage reduction benefits, or a combination of damage reduction benefits plus (at most) a like amount of incidental recreation benefits. In other words, recreation benefits useable to establish Corps participation may not be more than fifty percent of the total benefits required for justification, which in turn means they may not exceed an amount equal to fifty percent of costs. If the criterion for participation is met, then all recreation benefits are included in the BCR.*

For the South Padre Island CSRM component of the Coastal Texas Study, formulation for shoreline protection was done for the entirely reduction of storm risk, as measured in a reduction in expected annual damages. However, given the importance of recreation benefits to users of the Padre Island beach and the regional economic development, recreation benefits are considered along with the CSRM benefits for justification.

As previously described, the study area for CSRM protection includes the shoreline within the City of South Padre Island. This includes six miles of beach, from the southern tip of Padre Island to the northern city limits. All of the beach is open to the public, and there is a mix of large hotels, high-rise condominium rentals, and smaller single and multi-family beach house rentals along this stretch, and some commercial shops, restaurants, and taverns intermixed. The study area was divided into five reaches. Based on information from the city, Reaches 1, 2, 5 and 6 contain the majority of the full-service properties and approximately 25 percent of select service properties. Reaches 3 and 4 are comprised of about 75 percent of the select service properties. A full service property is classified as offering hotel sleeping rooms, meeting space and a catering restaurant with a full menu. A select service hotel only has sleeping rooms. This would be indicative that Reaches 1,2,5 and 6 would have the highest concentration of beach visitors given their immediacy to properties with higher occupancy capacities.

BEACH ACCESS

Access to the beach at South Padre Island is free. There are numerous public access points, most with dune walkovers, including:

- Beach Circle
- Moonlight Circle
- Neptune Circle (handicap)
- Aurora Circle (stairs)
- Seaside Circle (handicap)
- Bougainvillea Circle
- Starlight Circle
- Good Hope Circle
- Blue Water Circle (handicap)
- Poinsettia Circle
- Aquarius Circle
- Fantasy Circle
- Treasure Island Circle
- Surf Circle
- Gulf Circle
- Harbor St. Circle

In addition to public access points, most of the hotels are condominium rentals offer beach access to their guests. Free public parking is available designated areas along streets near the beach access points. Additional for fee parking is available in Reach 1 at Isla Blanca Park and in Reach 6 at Andy Bowie County Park.

METHODOLOGY

Recreation benefits were developed using the unit day value approach, as outlined in Economic Guidance Memorandum 20-03, Unit Day Values for Recreation for Fiscal Year 2020. Recreation criteria for the with- and without project condition are assigned points based on judgment factors, as shown in Table 12.

Two categories of outdoor recreation days, general and specialized, may be differentiated for evaluation purposes. "General" refers to a recreation day involving primarily those activities that are attractive to the majority of outdoor users and that generally require the development and maintenance of convenient access and adequate facilities. "Specialized" refers to a recreation day involving those activities for which opportunities in general are limited, intensity of use is low, and a high degree of skill, knowledge, and appreciation of the activity by the user may often be involved. For this analysis, general values are assumed. Points from worksheet in Table 13 are summed and then compared to point values in Table 12 to convert the points to a monetary value. This unit day value is then multiplied by the number of annual visitors to the beach to determine the annual recreation benefit.

Table 12. Conversion of Point Values to Monetary Values

Point Values	General Recreation Values[1]	General Fishing and Hunting Values[1]	Specialized Fishing and Hunting Values[2]	Specialized Recreation Values Other Than Fishing and Hunting[2]
0	$ 4.21	$ 6.06	$ 29.49	$ 17.12
10	5.00	6.85	30.28	18.17
20	5.53	7.37	30.81	19.49
30	6.32	8.16	21.60	21.07
40	7.90	8.95	32.39	22.38
50	8.95	9.74	32.55	28.28
60	9.74	10.80	38.71	27.91
70	10.27	11.32	41.08	33.71
80	11.32	12.11	44.24	39.24
90	12.11	12.38	47.40	44.77
100	12.64	12.64	50.04	50.04

[1] Values from Assigning Points for General Recreation

[2] Values from Assigning Points for Specialized Recreation

Table 13. Worksheet for Assigning Point Values for General Recreation

Criteria	Judgment Factors				
Recreation Experience[1] Total Points: 30	Two general activities[2]	Several general activities	Several general activities: one high value activity[3]	Several general activities; more than one high quality activity	Numerous high quality value activities; some general activities
Point Value Range	0-4	5-10	11-16	17-23	24-30
Point Value					
Availability of oportunity[4] Total Points: 18	Several within 1 hr. travel time; a few within 30 min. travel time	Several within 1 hr. travel time; none within 45 min. travel time.	One or two within 1 hr. travel time; none within 45 min travel time	None within 1 hour. travel time	None within 2 hour travel time.
Point Value Range	0-3	4-6	7-10	11-14	15-18
Point Value					
Carrying Capcity[5] Total Points: 14	Maximum facility for development for public health and safety	Basic facility to conduct activity(ies)	Adequate facilities to conduct without deterioration of the resource or activity experience	Optimum facilities to conduct activity at site potential	Ultimate facilities to achieve intent of selected alternative
Point Value Range	0-2	3-5	6-8	9-11	12-14
Point Value					
Accessibility Total Points: 18	Limited access by means to site or within site	Fair access, poor quality roads to site, limited access within site	Fair access, fair road to site; fair access, good roads within site	Good access, good roads to site; fair access, good roads within site	Good access, high standard road to site; good road access within site
Point Value Range	0-3	4-6	7-10	11-14	15-18
Point Value					
Environmental Quality Total Points: 20	Low aesthetic factors[6] that significantly lower quality[7]	Average aesthetic quality; factors exist that lower quality to minor degree	Above average aesthetic quality, any limiting factors can be reasonably rectified	High aesthetic quality; no factors exist that lower quality	Outstanding aesthetic quality, no factors exist that lower quality
Point Value Range	0-2	3-6	7-10	11-15	16-20
Point Value					

[1] Value for water-orientated activities should be adjusted if significant seasonal water level changes occur

[2] General activities include those that are common to the region and that are usually of normal quality. This includes picnicking, camping, hiking, riding, cycling, and fishing and hunting of normal quality.

[3] High quality value activities include those that are not common to the region and/or Nation, and usually of high quality.

[4] Likelihood of success at fishing and hunting.

[5] Value should be adjusted for overuse.

[6] Major aesthetic qualities to be considered include geology and topography, water, and vegetation.

[7] Factors to be considered to lowering quality include air and water pollution, pests, poor climate, and unsightly adjacent areas.

In March 2020, a group of five representatives from the South Padre Island community participated in developing point values for the criteria presented above. The panel included members of the City of South Padre Island, Cameron County, the South Padre Island Chamber of Commerce and business owners related to beach recreation. For the without project condition, the panel considered each of the criteria and assigned values based on the judgement factors and their professional judgment as local officials and business persons. They assumed the beaches were not renourished and would continue to diminish by erosion. For the with project condition, and using the factor judgments and their local knowledge of the beach and beach recreation, they assigned values with the assumption the beach would continue to be renourished similar to past nourishments. Their assignments of point values for the five criteria are shown in Table 14.

Table 14. Summary of the Community Assigned Point Values

Criteria	Point Values	
	Without Project	With Project
Recreation Experience	9	27
Availability of Opportunity	1	18
Carrying Capacity	3	9
Accessibility	15	15
Environmental Quality	2	15
Total	**42**	**84**

The key criteria are recreation experience, availability of opportunity and carrying capacity. A number of unique events, in addition to the natural conditions of the beach, were identified for higher with project values, and include:

- Watercross (JetSki Racing Competition)
- USLA National Lifeguard Championships
- Annual Sand Crab 5k and 10k Beach Run
- Annual Sandcastle Days Festival and Competition
- Texas International Fishing Tournament
- Parasailing
- Kiteboarding
- Windsurfing
- Kayaking

The without project point value of 42 translated into a unit day value of $7.90 and the with project point value of 84 translates to a unit day value of $11.32. Current policy limits the unit day value to a maximum of 750,000 visitors. Based on information provided by the local chamber of commerce, the annual visitation to South Padre Island is around 5.2 million visitors.

The recreation benefits based on both of these visitation numbers is presented in Table 15. Based on visitation of 750,000, the annual net recreation benefit (with project less without project) is $2.6 million. Based on the total estimated visitation of 5.2 million, the annual benefit is $18 million. If the storm damage reduction benefits can increase to a BCR of 0.5 or greater after review of the real estate costs and material placement, these recreation benefits can be added to the storm benefit for economic justification.

Table 15. Recreation Benefits

Annual Visitation	Recreation Benefits		Annual Net Recreation Benefit
	Without Project ($7.90)	With Project ($11.32)	
750,000	$5,925,000	$8,490,000	$2,565,000
5,200,000	41,080,000	58,864,000	17,784,000

RECOMMENDED PLAN

The combined CSRM and Recreation benefits are shown in Table 16. Using the assumption of 750,000 annual visitors, total average annual benefits are $3.8 million. This yields $1.8 million in annual net benefits and BCR of 1.9. Assuming 5.2 million annual visitors, annual net benefits are $17.1 million with a BCR 9.6.

Table 16. Combined CSRM and Recreation Benefits, ($1,000, October 2019 Prices, 2.75% Interest Rate)

Recreation Benefits	CSRM Net Benefits	Recreation Benefit	Total Average Annual Benefits	Average Annual Costs	Net Benefits	Benefit-to-Cost Ratio
Assuming 750,000 visitors	$1,269	$2,565	$3,834	$1,986	$1,848	1.9
Assuming 5.2 million visitors	$1,269	$17,784	$19,053	$1,986	$17,067	9.6

Given that the BCR is greater than 1.0 under both assumptions, the CSRM feature at South Padre Island, when combined with recreation, is economically justified and would be part of the study's overall recommended plan.

RECOMMENDED PLAN UPDATED TO 2021 PRICE LEVELS AND INTEREST RATE

Following technical reviews there were slight changes in the project first costs and price levels were expressed at October 2020 levels. CSRM benefits were likewise updated to October 2020 price levels and annualized at the FY2021 interest rate of 2.5%. Updated recreation unit day values for FY 2021 have not been published, and have not been changed. For this analysis, the first nourishment is in year 2034, a base year, where benefits begin to accrue, is 2035, and the period of analysis is 50 years.

Table 17 shows the updated schedule of nourishment costs expressed, present value of the nourishment costs and the average annual cost of the recommended plan. The updated average annual cost is approximately $1.9 million.

Table 17.Schedule of Nourishment Costs and Average Annual Cost ($1,000, October 2020 Price Level 2.5% Interest Rate)

Year	Nourishment	PED	Construction Management	Cultural	Lands and Damages	In House Real Estate	IDC	Total Construction Cost	Present Value of Costs
2034	$8,793	$1,319	$528	$182	$18,328	$648	$203	$30,001	$30,001
2044	8,793	1,319	528				72	$10,712	8,368
2054	8,793	1,319	528				72	$10,712	6,537
2064	8,793	1,319	528				72	$10,974	5,107
2074	8,793	1,319	528				72	$10,712	3,989
Totals								$73,111	$54,002
Average Annual Cost									$1,904

Table 18 shows derivation of annual benefits expressed in October 2020 prices and using the FY2021 interest rate of 2.5%. Annual benefits are approximately $1.3 million, annual costs are approximately $1.9 million, yielding net benefits of -$610 and a benefit-to-cost ration of 0.68. As previously discussed, ancillary recreation benefits can be considered for economic justification, as long as they make up no more than 50% of the benefits.

Table 18. Average Annual Benefits and Costs ($1,000, 2.5% Interest Rate, October 2020 Prices)

Cost Terms	Without Project Damages	With Project Damages	Damages Avoided	Costs	Net Benefits	Benefit-to-Cost Ratio
Average Annual Values	$5,569	$4,375	$1,294	$1,904	-$610	0.68

Table 19 shows the recreation benefits combined with the CSRM annual benefits and costs expressed in October 2020 prices. Under the assumption of 750,000 annual visitors, the net benefits are approximately $2.0 million and a benefit-to-cost ratio of 2.03. With an assumption of 5.2 million visitors, the net benefits are $17 million, with a benefit-to-cost ratio of 10.02.

Table 19. Combined CSRM and Recreation Benefits, ($1,000, October 2020 Prices, 2.5% Interest Rate)

Recreation Benefits	CSRM Net Benefits	Recreation Benefit	Total Average Annual Benefits	Average Annual Costs	Net Benefits	Benefit-to-Cost Ratio
Assuming 750,000 visitors	$1,294	$2,565	3,894	$1,904	$1,955	2.03
Assuming 5.2 million visitors	$1,294	$17,784	$19,078	$1,904	$17,174	10.02

DEPTH DAMAGE FUNCTIONS

The following depth damage functions and uncertainty parameters, taken from the North Atlantic Coast Comprehensive Study, January 2015, and used for the analysis on South Padre Island.

Table 20. Depth Damage Functions

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
OneStory/NoBasement/Inundation/Structure	-1	0	0	0
OneStory/NoBasement/Inundation/Structure	-0.5	0	0	0
OneStory/NoBasement/Inundation/Structure	0	0.03	0.1	0.14
OneStory/NoBasement/Inundation/Structure	0.5	0.1	0.16	0.22
OneStory/NoBasement/Inundation/Structure	1	0.16	0.25	0.38
OneStory/NoBasement/Inundation/Structure	2	0.23	0.35	0.45
OneStory/NoBasement/Inundation/Structure	3	0.39	0.43	0.6
OneStory/NoBasement/Inundation/Structure	5	0.52	0.6	0.75
OneStory/NoBasement/Inundation/Structure	7	0.59	0.68	0.85
OneStory/NoBasement/Inundation/Content	-1	0	0	0
OneStory/NoBasement/Inundation/Content	-0.5	0	0	0
OneStory/NoBasement/Inundation/Content	0	0.01	0.04	0.1
OneStory/NoBasement/Inundation/Content	0.5	0.05	0.14	0.23
OneStory/NoBasement/Inundation/Content	1	0.11	0.28	0.34
OneStory/NoBasement/Inundation/Content	2	0.29	0.45	0.58
OneStory/NoBasement/Inundation/Content	3	0.45	0.6	0.73
OneStory/NoBasement/Inundation/Content	5	0.62	0.81	0.9
OneStory/NoBasement/Inundation/Content	7	0.96	1	1
OneStory/NoBasement/Erosion/Structure	0	0	0	0
OneStory/NoBasement/Erosion/Structure	10	0.03	0.16	0.3
OneStory/NoBasement/Erosion/Structure	20	0.18	0.31	0.5
OneStory/NoBasement/Erosion/Structure	30	0.38	0.55	0.75
OneStory/NoBasement/Erosion/Structure	40	0.52	0.75	1
OneStory/NoBasement/Erosion/Structure	50	0.73	0.88	1
OneStory/NoBasement/Erosion/Structure	60	0.96	0.98	1
OneStory/NoBasement/Erosion/Structure	70	1	1	1
OneStory/NoBasement/Erosion/Structure	80	1	1	1
OneStory/NoBasement/Erosion/Structure	90	1	1	1
OneStory/NoBasement/Erosion/Structure	100	1	1	1
OneStory/NoBasement/Erosion/Content	0	0	0	0
OneStory/NoBasement/Erosion/Content	10	0	0.08	0.18
OneStory/NoBasement/Erosion/Content	20	0.15	0.25	0.4
OneStory/NoBasement/Erosion/Content	30	0.28	0.4	0.58

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
OneStory/NoBasement/Erosion/Content	40	0.4	0.6	0.8
OneStory/NoBasement/Erosion/Content	50	0.58	0.81	1
OneStory/NoBasement/Erosion/Content	60	0.95	0.95	1
OneStory/NoBasement/Erosion/Content	70	1	1	1
OneStory/NoBasement/Erosion/Content	80	1	1	1
OneStory/NoBasement/Erosion/Content	90	1	1	1
OneStory/NoBasement/Erosion/Content	100	1	1	1
OneStory/NoBasement/Wave/Slab/Structure	-1	0	0	0
OneStory/NoBasement/Wave/Slab/Structure	0	0	0	0.1
OneStory/NoBasement/Wave/Slab/Structure	1	0.05	0.25	0.325
OneStory/NoBasement/Wave/Slab/Structure	2	0.25	0.375	0.65
OneStory/NoBasement/Wave/Slab/Structure	3	0.375	0.9	1
OneStory/NoBasement/Wave/Slab/Structure	5	0.5	1	1
OneStory/NoBasement/Wave/Slab/Content	-1	0	0	0
OneStory/NoBasement/Wave/Slab/Content	0	0	0.035	0.1
OneStory/NoBasement/Wave/Slab/Content	1	0.175	0.3	0.375
OneStory/NoBasement/Wave/Slab/Content	2	0.3	0.5	1
OneStory/NoBasement/Wave/Slab/Content	3	0.5	0.9	1
OneStory/NoBasement/Wave/Slab/Content	5	0.715	1	1
OneStory/NoBasement/Wave/ExtendedFoundationWall/Structure	-2	0	0	0
OneStory/NoBasement/Wave/ExtendedFoundationWall/Structure	-1	0	0	0.075
OneStory/NoBasement/Wave/ExtendedFoundationWall/Structure	0	0	0.125	0.275
OneStory/NoBasement/Wave/ExtendedFoundationWall/Structure	1	0.1	0.3	0.475
OneStory/NoBasement/Wave/ExtendedFoundationWall/Structure	2	0.2	0.7	1
OneStory/NoBasement/Wave/ExtendedFoundationWall/Structure	3	0.3	1	1
OneStory/NoBasement/Wave/ExtendedFoundationWall/Structure	5	0.5	1	1
OneStory/NoBasement/Wave/ExtendedFoundationWall/Content	-2	0	0	0
OneStory/NoBasement/Wave/ExtendedFoundationWall/Content	-1	0	0	0
OneStory/NoBasement/Wave/ExtendedFoundationWall/Content	0	0.075	0.2	0.275
OneStory/NoBasement/Wave/ExtendedFoundationWall/Content	1	0.25	0.425	0.55
OneStory/NoBasement/Wave/ExtendedFoundationWall/Content	2	0.475	0.6	1
OneStory/NoBasement/Wave/ExtendedFoundationWall/Content	3	0.75	1	1
OneStory/NoBasement/Wave/ExtendedFoundationWall/Content	5	0.9	1	1
ThreeStories/NoBasement/Inundation/Structure	-1	0	0	0
ThreeStories/NoBasement/Inundation/Structure	-0.5	0	0	0
ThreeStories/NoBasement/Inundation/Structure	0	0	0.05	0.08
ThreeStories/NoBasement/Inundation/Structure	0.5	0.05	0.08	0.12
ThreeStories/NoBasement/Inundation/Structure	1	0.07	0.2	0.25
ThreeStories/NoBasement/Inundation/Structure	2	0.1	0.28	0.29

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
ThreeStories/NoBasement/Inundation/Structure	3	0.18	0.28	0.3
ThreeStories/NoBasement/Inundation/Structure	5	0.2	0.38	0.44
ThreeStories/NoBasement/Inundation/Structure	7	0.35	0.46	0.5
ThreeStories/NoBasement/Inundation/Structure	10	0.35	0.5	0.6
ThreeStories/NoBasement/Inundation/Content	-1	0	0	0
ThreeStories/NoBasement/Inundation/Content	-0.5	0	0	0
ThreeStories/NoBasement/Inundation/Content	0	0.01	0.02	0.08
ThreeStories/NoBasement/Inundation/Content	0.5	0.05	0.1	0.15
ThreeStories/NoBasement/Inundation/Content	1	0.08	0.15	0.2
ThreeStories/NoBasement/Inundation/Content	2	0.15	0.2	0.25
ThreeStories/NoBasement/Inundation/Content	3	0.2	0.25	0.3
ThreeStories/NoBasement/Inundation/Content	5	0.25	0.3	0.32
ThreeStories/NoBasement/Inundation/Content	7	0.3	0.35	0.4
ThreeStories/NoBasement/Inundation/Content	10	0.37	0.45	0.5
CommercialEngineered/Inundation/Structure	-1	0	0	0
CommercialEngineered/Inundation/Structure	-0.5	0	0	0
CommercialEngineered/Inundation/Structure	0	0	0.05	0.09
CommercialEngineered/Inundation/Structure	0.5	0.05	0.1	0.17
CommercialEngineered/Inundation/Structure	1	0.12	0.2	0.27
CommercialEngineered/Inundation/Structure	2	0.18	0.3	0.36
CommercialEngineered/Inundation/Structure	3	0.28	0.35	0.43
CommercialEngineered/Inundation/Structure	5	0.33	0.4	0.48
CommercialEngineered/Inundation/Structure	7	0.43	0.53	0.6
CommercialEngineered/Inundation/Structure	10	0.48	0.58	0.69
CommercialEngineered/Inundation/PerishableContent	-1	0	0	0
CommercialEngineered/Inundation/PerishableContent	-0.5	0	0	0
CommercialEngineered/Inundation/PerishableContent	0	0	0.05	0.08
CommercialEngineered/Inundation/PerishableContent	0.5	0.05	0.18	0.28
CommercialEngineered/Inundation/PerishableContent	1	0.17	0.35	0.5
CommercialEngineered/Inundation/PerishableContent	2	0.28	0.39	0.58
CommercialEngineered/Inundation/PerishableContent	3	0.37	0.43	0.65
CommercialEngineered/Inundation/PerishableContent	5	0.43	0.47	0.65
CommercialEngineered/Inundation/PerishableContent	7	0.5	0.7	0.9
CommercialEngineered/Inundation/PerishableContent	10	0.5	0.75	0.9
CommercialEngineered/Inundation/NonPerishableContent	-1	0	0	0
CommercialEngineered/Inundation/NonPerishableContent	-0.5	0	0	0
CommercialEngineered/Inundation/NonPerishableContent	0	0	0.02	0.05
CommercialEngineered/Inundation/NonPerishableContent	0.5	0.04	0.1	0.15
CommercialEngineered/Inundation/NonPerishableContent	1	0.1	0.13	0.22

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
CommercialEngineered/Inundation/NonPerishableContent	2	0.22	0.28	0.35
CommercialEngineered/Inundation/NonPerishableContent	3	0.27	0.37	0.44
CommercialEngineered/Inundation/NonPerishableContent	5	0.33	0.44	0.5
CommercialEngineered/Inundation/NonPerishableContent	7	0.44	0.5	0.55
CommercialEngineered/Inundation/NonPerishableContent	10	0.48	0.55	0.7
CommercialEngineered/Erosion/Sturcture	0	0	0	0
CommercialEngineered/Erosion/Sturcture	10	0.03	0.1	0.15
CommercialEngineered/Erosion/Sturcture	20	0.1	0.2	0.28
CommercialEngineered/Erosion/Sturcture	30	0.23	0.45	0.58
CommercialEngineered/Erosion/Sturcture	40	0.38	0.65	0.73
CommercialEngineered/Erosion/Sturcture	50	0.5	0.7	0.8
CommercialEngineered/Erosion/Sturcture	60	0.6	0.8	1
CommercialEngineered/Erosion/Sturcture	70	0.75	0.96	1
CommercialEngineered/Erosion/Sturcture	80	1	1	1
CommercialEngineered/Erosion/Sturcture	90	1	1	1
CommercialEngineered/Erosion/Sturcture	100	1	1	1
CommercialEngineered/Erosion/PerishableContent	0	0	0	0
CommercialEngineered/Erosion/PerishableContent	10	0	0	0.05
CommercialEngineered/Erosion/PerishableContent	20	0	0.13	0.23
CommercialEngineered/Erosion/PerishableContent	30	0.1	0.25	0.29
CommercialEngineered/Erosion/PerishableContent	40	0.18	0.36	0.43
CommercialEngineered/Erosion/PerishableContent	50	0.4	0.5	0.85
CommercialEngineered/Erosion/PerishableContent	60	0.63	0.85	1
CommercialEngineered/Erosion/PerishableContent	70	0.9	1	1
CommercialEngineered/Erosion/PerishableContent	80	1	1	1
CommercialEngineered/Erosion/PerishableContent	90	1	1	1
CommercialEngineered/Erosion/PerishableContent	100	1	1	1
CommercialEngineered/Erosion/NonPerishableContent	0	0	0	0
CommercialEngineered/Erosion/NonPerishableContent	10	0	0.03	0.05
CommercialEngineered/Erosion/NonPerishableContent	20	0.05	0.08	0.14
CommercialEngineered/Erosion/NonPerishableContent	30	0.1	0.17	0.29
CommercialEngineered/Erosion/NonPerishableContent	40	0.15	0.28	0.43
CommercialEngineered/Erosion/NonPerishableContent	50	0.28	0.45	0.65
CommercialEngineered/Erosion/NonPerishableContent	60	0.5	0.7	1
CommercialEngineered/Erosion/NonPerishableContent	70	0.75	0.96	1
CommercialEngineered/Erosion/NonPerishableContent	80	0.9	0.97	1
CommercialEngineered/Erosion/NonPerishableContent	90	0.95	0.99	1
CommercialEngineered/Erosion/NonPerishableContent	100	1	1	1
CommercialEngineered/Wave/Structure	-1	0	0	0

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
CommercialEngineered/Wave/Structure	0	0	0	0.01
CommercialEngineered/Wave/Structure	1	0.05	0.09	0.2
CommercialEngineered/Wave/Structure	2	0.13	0.2	0.3
CommercialEngineered/Wave/Structure	3	0.25	0.33	0.5
CommercialEngineered/Wave/Structure	5	0.4	0.55	0.7
CommercialEngineered/Wave/Structure	7	0.48	0.65	0.81
CommercialEngineered/Wave/Structure	10	0.55	0.82	0.9
CommercialEngineered/Wave/PerishableContent	-1	0	0	0
CommercialEngineered/Wave/PerishableContent	0	0	0.03	0.08
CommercialEngineered/Wave/PerishableContent	1	0.1	0.18	0.28
CommercialEngineered/Wave/PerishableContent	2	0.23	0.3	0.45
CommercialEngineered/Wave/PerishableContent	3	0.33	0.41	0.7
CommercialEngineered/Wave/PerishableContent	5	0.43	0.75	1
CommercialEngineered/Wave/PerishableContent	7	0.5	0.95	1
CommercialEngineered/Wave/PerishableContent	10	0.5	0.95	1
CommercialEngineered/Wave/NonPerishableContent	-1	0	0	0
CommercialEngineered/Wave/NonPerishableContent	0	0	0.02	0.05
CommercialEngineered/Wave/NonPerishableContent	1	0.09	0.12	0.23
CommercialEngineered/Wave/NonPerishableContent	2	0.11	0.23	0.29
CommercialEngineered/Wave/NonPerishableContent	3	0.23	0.36	0.55
CommercialEngineered/Wave/NonPerishableContent	5	0.35	0.58	1
CommercialEngineered/Wave/NonPerishableContent	7	0.5	0.65	1
CommercialEngineered/Wave/NonPerishableContent	10	0.5	0.77	1
CommercialNonEngineered/Inundation/Structure	-1	0	0	0
CommercialNonEngineered/Inundation/Structure	-0.5	0	0	0.1
CommercialNonEngineered/Inundation/Structure	0	0	0.05	0.15
CommercialNonEngineered/Inundation/Structure	0.5	0.05	0.12	0.2
CommercialNonEngineered/Inundation/Structure	1	0.1	0.2	0.3
CommercialNonEngineered/Inundation/Structure	2	0.15	0.28	0.42
CommercialNonEngineered/Inundation/Structure	3	0.2	0.35	0.55
CommercialNonEngineered/Inundation/Structure	5	0.28	0.45	0.65
CommercialNonEngineered/Inundation/Structure	7	0.35	0.55	0.75
CommercialNonEngineered/Inundation/Structure	10	0.4	0.6	0.78
CommercialNonEngineered/Inundation/PerishableContent	-1	0	0	0
CommercialNonEngineered/Inundation/PerishableContent	-0.5	0	0	0
CommercialNonEngineered/Inundation/PerishableContent	0	0	0.02	0.1
CommercialNonEngineered/Inundation/PerishableContent	0.5	0.05	0.15	0.35
CommercialNonEngineered/Inundation/PerishableContent	1	0.09	0.3	0.54
CommercialNonEngineered/Inundation/PerishableContent	2	0.15	0.42	0.65

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
CommercialNonEngineered/Inundation/PerishableContent	3	0.23	0.64	0.84
CommercialNonEngineered/Inundation/PerishableContent	5	0.3	0.71	0.95
CommercialNonEngineered/Inundation/PerishableContent	7	0.35	0.8	0.99
CommercialNonEngineered/Inundation/PerishableContent	10	0.41	0.87	1
CommercialNonEngineered/Inundation/NonPerishableContent	-1	0	0	0
CommercialNonEngineered/Inundation/NonPerishableContent	-0.5	0	0	0
CommercialNonEngineered/Inundation/NonPerishableContent	0	0	0.01	0.04
CommercialNonEngineered/Inundation/NonPerishableContent	0.5	0.03	0.08	0.18
CommercialNonEngineered/Inundation/NonPerishableContent	1	0.07	0.12	0.28
CommercialNonEngineered/Inundation/NonPerishableContent	2	0.13	0.18	0.38
CommercialNonEngineered/Inundation/NonPerishableContent	3	0.2	0.25	0.49
CommercialNonEngineered/Inundation/NonPerishableContent	5	0.3	0.39	0.64
CommercialNonEngineered/Inundation/NonPerishableContent	7	0.4	0.5	0.72
CommercialNonEngineered/Inundation/NonPerishableContent	10	0.45	0.6	0.9
CommercialNonEngineered/Erosion/Structre	0	0	0	0
CommercialNonEngineered/Erosion/Structre	10	0.03	0.1	0.17
CommercialNonEngineered/Erosion/Structre	20	0.11	0.2	0.3
CommercialNonEngineered/Erosion/Structre	30	0.23	0.45	0.63
CommercialNonEngineered/Erosion/Structre	40	0.38	0.65	0.85
CommercialNonEngineered/Erosion/Structre	50	0.5	0.75	1
CommercialNonEngineered/Erosion/Structre	60	0.6	0.85	1
CommercialNonEngineered/Erosion/Structre	70	0.77	1	1
CommercialNonEngineered/Erosion/Structre	80	1	1	1
CommercialNonEngineered/Erosion/Structre	90	1	1	1
CommercialNonEngineered/Erosion/Structre	100	1	1	1
CommercialNonEngineered/Erosion/PerishableContent	0	0	0	0
CommercialNonEngineered/Erosion/PerishableContent	10	0	0.05	0.13
CommercialNonEngineered/Erosion/PerishableContent	20	0	0.2	0.43
CommercialNonEngineered/Erosion/PerishableContent	30	0.15	0.44	0.55
CommercialNonEngineered/Erosion/PerishableContent	40	0.3	0.6	0.65
CommercialNonEngineered/Erosion/PerishableContent	50	0.5	0.75	1
CommercialNonEngineered/Erosion/PerishableContent	60	0.63	1	1
CommercialNonEngineered/Erosion/PerishableContent	70	0.9	1	1
CommercialNonEngineered/Erosion/PerishableContent	80	1	1	1
CommercialNonEngineered/Erosion/PerishableContent	90	1	1	1
CommercialNonEngineered/Erosion/PerishableContent	100	1	1	1
CommercialNonEngineered/Erosion/NonPerishableContent	0	0	0	0
CommercialNonEngineered/Erosion/NonPerishableContent	10	0	0.03	0.13
CommercialNonEngineered/Erosion/NonPerishableContent	20	0.08	0.15	0.28

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
CommercialNonEngineered/Erosion/NonPerishableContent	30	0.18	0.29	0.4
CommercialNonEngineered/Erosion/NonPerishableContent	40	0.25	0.38	0.5
CommercialNonEngineered/Erosion/NonPerishableContent	50	0.4	0.5	1
CommercialNonEngineered/Erosion/NonPerishableContent	60	0.6	0.8	1
CommercialNonEngineered/Erosion/NonPerishableContent	70	0.75	1	1
CommercialNonEngineered/Erosion/NonPerishableContent	80	0.9	1	1
CommercialNonEngineered/Erosion/NonPerishableContent	90	0.95	1	1
CommercialNonEngineered/Erosion/NonPerishableContent	100	1	1	1
CommercialNonEngineered/Wave/Structure	0	0	0	0
CommercialNonEngineered/Wave/Structure	1	0.025	0.125	0.245
CommercialNonEngineered/Wave/Structure	2	0.09	0.3	0.5
CommercialNonEngineered/Wave/Structure	3	0.25	0.49	0.8
CommercialNonEngineered/Wave/Structure	5	0.45	0.75	0.95
CommercialNonEngineered/Wave/Structure	7	0.5	1	1
CommercialNonEngineered/Wave/Structure	10	0.65	1	1
CommercialNonEngineered/Wave/PerishableContent	-1	0	0	0
CommercialNonEngineered/Wave/PerishableContent	0	0	0.025	0.075
CommercialNonEngineered/Wave/PerishableContent	1	0.1	0.2	0.35
CommercialNonEngineered/Wave/PerishableContent	2	0.2	0.4	0.61
CommercialNonEngineered/Wave/PerishableContent	3	0.325	0.6	0.95
CommercialNonEngineered/Wave/PerishableContent	5	0.5	0.95	1
CommercialNonEngineered/Wave/PerishableContent	7	0.7	1	1
CommercialNonEngineered/Wave/PerishableContent	10	0.8	1	1
CommercialNonEngineered/Wave/NonPerishableContent	-1	0	0	0
CommercialNonEngineered/Wave/NonPerishableContent	0	0	0.025	0.065
CommercialNonEngineered/Wave/NonPerishableContent	1	0.075	0.22	0.3
CommercialNonEngineered/Wave/NonPerishableContent	2	0.125	0.275	0.45
CommercialNonEngineered/Wave/NonPerishableContent	3	0.29	0.45	0.9
CommercialNonEngineered/Wave/NonPerishableContent	5	0.4	0.7	1
CommercialNonEngineered/Wave/NonPerishableContent	7	0.65	1	1
CommercialNonEngineered/Wave/NonPerishableContent	10	0.775	1	1
UrbanHighRise/Inundation/Structure	-8	0	0	0
UrbanHighRise/Inundation/Structure	-5	0.005	0.065	0.1
UrbanHighRise/Inundation/Structure	-3	0.0175	0.09	0.125
UrbanHighRise/Inundation/Structure	-1	0.035	0.13	0.16
UrbanHighRise/Inundation/Structure	-0.5	0.035	0.1325	0.1775
UrbanHighRise/Inundation/Structure	0	0.055	0.1375	0.185
UrbanHighRise/Inundation/Structure	0.5	0.0675	0.1425	0.1925
UrbanHighRise/Inundation/Structure	1	0.08	0.155	0.2

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
UrbanHighRise/Inundation/Structure	2	0.0875	0.175	0.225
UrbanHighRise/Inundation/Structure	3	0.095	0.19	0.24
UrbanHighRise/Inundation/Structure	5	0.1025	0.215	0.25
UrbanHighRise/Inundation/Structure	7	0.115	0.225	0.255
UrbanHighRise/Inundation/Structure	10	0.125	0.235	0.265
UrbanHighRise/Inundation/Content	-8	0	0	0
UrbanHighRise/Inundation/Content	-5	0	0.0025	0.005
UrbanHighRise/Inundation/Content	-3	0	0.0025	0.0125
UrbanHighRise/Inundation/Content	-1	0	0.005	0.025
UrbanHighRise/Inundation/Content	-0.5	0	0.015	0.035
UrbanHighRise/Inundation/Content	0	0	0.04	0.05
UrbanHighRise/Inundation/Content	0.5	0.015	0.05	0.06
UrbanHighRise/Inundation/Content	1	0.026	0.05	0.08
UrbanHighRise/Inundation/Content	2	0.04	0.07	0.11
UrbanHighRise/Inundation/Content	3	0.055	0.075	0.135
UrbanHighRise/Inundation/Content	5	0.065	0.1	0.16
UrbanHighRise/Inundation/Content	7	0.08	0.11	0.2
UrbanHighRise/Inundation/Content	10	0.09	0.12	0.2
BeachHighRise/Inundation/Structure	-8	0	0	0
BeachHighRise/Inundation/Structure	-5	0	0	0
BeachHighRise/Inundation/Structure	-3	0	0	0
BeachHighRise/Inundation/Structure	-1	0	0	0
BeachHighRise/Inundation/Structure	-0.5	0	0	0
BeachHighRise/Inundation/Structure	0	0	0	0
BeachHighRise/Inundation/Structure	0.5	0.0075	0.0225	0.0425
BeachHighRise/Inundation/Structure	1	0.02	0.045	0.075
BeachHighRise/Inundation/Structure	2	0.035	0.07	0.12
BeachHighRise/Inundation/Structure	3	0.045	0.0775	0.14
BeachHighRise/Inundation/Structure	5	0.055	0.115	0.15
BeachHighRise/Inundation/Structure	7	0.065	0.1275	0.1725
BeachHighRise/Inundation/Structure	10	0.075	0.165	0.2
BeachHighRise/Inundation/Content	-8	0	0	0
BeachHighRise/Inundation/Content	-5	0	0	0
BeachHighRise/Inundation/Content	-3	0	0	0
BeachHighRise/Inundation/Content	-1	0	0	0
BeachHighRise/Inundation/Content	-0.5	0	0	0
BeachHighRise/Inundation/Content	0	0	0	0.015
BeachHighRise/Inundation/Content	0.5	0.005	0.02	0.05
BeachHighRise/Inundation/Content	1	0.01	0.04	0.055

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
BeachHighRise/Inundation/Content	2	0.015	0.045	0.065
BeachHighRise/Inundation/Content	3	0.02	0.055	0.08
BeachHighRise/Inundation/Content	5	0.02	0.07	0.095
BeachHighRise/Inundation/Content	7	0.02	0.085	0.1
BeachHighRise/Inundation/Content	10	0.025	0.09	0.1
BeachHighRise/Erosion/Structure	0	0	0	0
BeachHighRise/Erosion/Structure	10	0.0005	0.01025	0.025
BeachHighRise/Erosion/Structure	20	0.0015	0.035	0.04
BeachHighRise/Erosion/Structure	30	0.01	0.03	0.05
BeachHighRise/Erosion/Structure	40	0.02	0.045	0.065
BeachHighRise/Erosion/Structure	50	0.03	0.058	0.075
BeachHighRise/Erosion/Structure	60	0.0325	0.065	0.075
BeachHighRise/Erosion/Structure	70	0.035	0.081	0.087
BeachHighRise/Erosion/Structure	80	0.035	0.083	0.09
BeachHighRise/Erosion/Structure	90	0.04	0.09	0.1
BeachHighRise/Erosion/Structure	100	0.04	0.095	0.11
BeachHighRise/Erosion/Content	0	0	0	0
BeachHighRise/Erosion/Content	10	0	0	0.005
BeachHighRise/Erosion/Content	20	0.005	0.01	0.0225
BeachHighRise/Erosion/Content	30	0.005	0.0175	0.045
BeachHighRise/Erosion/Content	40	0.005	0.047	0.055
BeachHighRise/Erosion/Content	50	0.0075	0.048	0.065
BeachHighRise/Erosion/Content	60	0.0075	0.05	0.08
BeachHighRise/Erosion/Content	70	0.0075	0.0725	0.09
BeachHighRise/Erosion/Content	80	0.01	0.0785	0.1
BeachHighRise/Erosion/Content	90	0.02	0.08	0.11
BeachHighRise/Erosion/Content	100	0.035	0.08	0.11
BeachHighRise/Wave/Structure	-2	0	0	0
BeachHighRise/Wave/Structure	-1	0	0	0
BeachHighRise/Wave/Structure	0	0	0.015	0.025
BeachHighRise/Wave/Structure	1	0.0175	0.05	0.1
BeachHighRise/Wave/Structure	2	0.025	0.075	0.135
BeachHighRise/Wave/Structure	3	0.0325	0.11	0.17
BeachHighRise/Wave/Structure	5	0.045	0.14	0.215
BeachHighRise/Wave/Structure	7	0.05	0.16	0.27
BeachHighRise/Wave/Structure	10	0.05	0.195	0.31
BeachHighRise/Wave/Content	-2	0	0	0
BeachHighRise/Wave/Content	-1	0	0	0
BeachHighRise/Wave/Content	0	0	0.0125	0.02

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
BeachHighRise/Wave/Content	1	0.0125	0.025	0.05
BeachHighRise/Wave/Content	2	0.0175	0.05	0.06
BeachHighRise/Wave/Content	3	0.02	0.06	0.09
BeachHighRise/Wave/Content	5	0.02	0.08	0.1
BeachHighRise/Wave/Content	7	0.02	0.08	0.1
BeachHighRise/Wave/Content	10	0.035	0.09	0.11
SingleStoryResident/NoBasement/Inundation/Structure	-1	0	0	0
SingleStoryResident/NoBasement/Inundation/Structure	-0.5	0	0	0.05
SingleStoryResident/NoBasement/Inundation/Structure	0	0	0.01	0.1
SingleStoryResident/NoBasement/Inundation/Structure	0.5	0.06	0.1	0.2
SingleStoryResident/NoBasement/Inundation/Structure	1	0.1	0.18	0.3
SingleStoryResident/NoBasement/Inundation/Structure	2	0.16	0.28	0.4
SingleStoryResident/NoBasement/Inundation/Structure	3	0.2	0.33	0.45
SingleStoryResident/NoBasement/Inundation/Structure	5	0.3	0.42	0.6
SingleStoryResident/NoBasement/Inundation/Structure	7	0.42	0.55	0.94
SingleStoryResident/NoBasement/Inundation/Structure	10	0.55	0.65	1
SingleStoryResident/NoBasement/Inundation/Content	-1	0	0	0
SingleStoryResident/NoBasement/Inundation/Content	-0.5	0	0	0
SingleStoryResident/NoBasement/Inundation/Content	0	0	0	0.05
SingleStoryResident/NoBasement/Inundation/Content	0.5	0.05	0.2	0.3
SingleStoryResident/NoBasement/Inundation/Content	1	0.18	0.4	0.6
SingleStoryResident/NoBasement/Inundation/Content	2	0.34	0.6	0.84
SingleStoryResident/NoBasement/Inundation/Content	3	0.6	0.8	1
SingleStoryResident/NoBasement/Inundation/Content	5	0.8	0.9	1
SingleStoryResident/NoBasement/Inundation/Content	7	1	1	1
SingleStoryResident/NoBasement/Inundation/Content	10	1	1	1
SingleStoryResident/NoBasement/Erosion/Structure	0	0	0	0
SingleStoryResident/NoBasement/Erosion/Structure	10	0	0.1	0.15
SingleStoryResident/NoBasement/Erosion/Structure	20	0.15	0.3	0.3
SingleStoryResident/NoBasement/Erosion/Structure	30	0.3	0.5	0.58
SingleStoryResident/NoBasement/Erosion/Structure	40	0.43	0.6	1
SingleStoryResident/NoBasement/Erosion/Structure	50	0.6	0.85	1
SingleStoryResident/NoBasement/Erosion/Structure	60	0.7	0.89	1
SingleStoryResident/NoBasement/Erosion/Structure	70	1	1	1
SingleStoryResident/NoBasement/Erosion/Structure	80	1	1	1
SingleStoryResident/NoBasement/Erosion/Structure	90	1	1	1
SingleStoryResident/NoBasement/Erosion/Structure	100	1	1	1
SingleStoryResident/NoBasement/Erosion/Content	0	0	0	0
SingleStoryResident/NoBasement/Erosion/Content	10	0	0	0.1

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
SingleStoryResident/NoBasement/Erosion/Content	20	0.05	0.1	0.2
SingleStoryResident/NoBasement/Erosion/Content	30	0.15	0.2	0.3
SingleStoryResident/NoBasement/Erosion/Content	40	0.25	0.3	0.45
SingleStoryResident/NoBasement/Erosion/Content	50	0.5	0.5	1
SingleStoryResident/NoBasement/Erosion/Content	60	0.6	0.8	1
SingleStoryResident/NoBasement/Erosion/Content	70	0.8	1	1
SingleStoryResident/NoBasement/Erosion/Content	80	0.8	1	1
SingleStoryResident/NoBasement/Erosion/Content	90	1	1	1
SingleStoryResident/NoBasement/Erosion/Content	100	1	1	1
SingleStoryResident/NoBasement/Wave/Slab/Structure	0	0	0	0
SingleStoryResident/NoBasement/Wave/Slab/Structure	1	0.2	0.3	0.5
SingleStoryResident/NoBasement/Wave/Slab/Structure	2	0.3	0.5	0.8
SingleStoryResident/NoBasement/Wave/Slab/Structure	3	0.4	0.9	1
SingleStoryResident/NoBasement/Wave/Slab/Structure	5	0.7	1	1
SingleStoryResident/NoBasement/Wave/Slab/Content	0	0	0	0
SingleStoryResident/NoBasement/Wave/Slab/Content	1	0.15	0.4	0.5
SingleStoryResident/NoBasement/Wave/Slab/Content	2	0.35	0.6	1
SingleStoryResident/NoBasement/Wave/Slab/Content	3	0.5	1	1
SingleStoryResident/NoBasement/Wave/Slab/Content	5	0.6	1	1
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Structure	-2	0	0	0
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Structure	-1	0	0.05	0.1
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Structure	0	0.05	0.1	0.2
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Structure	1	0.15	0.4	0.58
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Structure	2	0.3	0.7	0.94
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Structure	3	0.5	0.9	1
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Structure	5	0.8	1	1
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Content	-2	0	0	0
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Content	-1	0	0	0.05
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Content	0	0.05	0.1	0.25
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Content	1	0.12	0.3	0.6
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Content	2	0.4	0.6	1
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Content	3	0.5	1	1
SingleStoryResident/NoBasement/Wave/ExtendedFoundationWall/Content	5	0.75	1	1
TwoStoryResident/NoBasement/Inundation/Structure	-2	0	0	0
TwoStoryResident/NoBasement/Inundation/Structure	-1	0	0	0.02
TwoStoryResident/NoBasement/Inundation/Structure	-0.5	0	0.01	0.03
TwoStoryResident/NoBasement/Inundation/Structure	0	0	0.05	0.08
TwoStoryResident/NoBasement/Inundation/Structure	0.5	0.05	0.1	0.1
TwoStoryResident/NoBasement/Inundation/Structure	1	0.09	0.15	0.2

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
TwoStoryResident/NoBasement/Inundation/Structure	2	0.15	0.2	0.25
TwoStoryResident/NoBasement/Inundation/Structure	3	0.2	0.25	0.3
TwoStoryResident/NoBasement/Inundation/Structure	5	0.25	0.3	0.4
TwoStoryResident/NoBasement/Inundation/Structure	7	0.4	0.5	0.55
TwoStoryResident/NoBasement/Inundation/Structure	10	0.5	0.6	0.7
TwoStoryResident/NoBasement/Inundation/Content	-1	0	0	0
TwoStoryResident/NoBasement/Inundation/Content	-0.5	0	0	0.03
TwoStoryResident/NoBasement/Inundation/Content	0	0	0.05	0.08
TwoStoryResident/NoBasement/Inundation/Content	0.5	0.05	0.12	0.2
TwoStoryResident/NoBasement/Inundation/Content	1	0.15	0.25	0.3
TwoStoryResident/NoBasement/Inundation/Content	2	0.25	0.35	0.4
TwoStoryResident/NoBasement/Inundation/Content	3	0.32	0.45	0.6
TwoStoryResident/NoBasement/Inundation/Content	5	0.4	0.55	0.8
TwoStoryResident/NoBasement/Inundation/Content	7	0.5	0.7	1
TwoStoryResident/NoBasement/Inundation/Content	10	0.6	0.8	1
TwoStoryResident/NoBasement/Erosion/Structure	0	0	0	0
TwoStoryResident/NoBasement/Erosion/Structure	10	0	0.15	0.15
TwoStoryResident/NoBasement/Erosion/Structure	20	0.15	0.3	0.45
TwoStoryResident/NoBasement/Erosion/Structure	30	0.3	0.5	0.75
TwoStoryResident/NoBasement/Erosion/Structure	40	0.5	0.72	1
TwoStoryResident/NoBasement/Erosion/Structure	50	0.8	1	1
TwoStoryResident/NoBasement/Erosion/Structure	60	1	1	1
TwoStoryResident/NoBasement/Erosion/Structure	70	1	1	1
TwoStoryResident/NoBasement/Erosion/Structure	80	1	1	1
TwoStoryResident/NoBasement/Erosion/Structure	90	1	1	1
TwoStoryResident/NoBasement/Erosion/Structure	100	1	1	1
TwoStoryResident/NoBasement/Erosion/Content	0	0	0	0
TwoStoryResident/NoBasement/Erosion/Content	10	0	0.08	0.12
TwoStoryResident/NoBasement/Erosion/Content	20	0.1	0.2	0.3
TwoStoryResident/NoBasement/Erosion/Content	30	0.2	0.25	0.38
TwoStoryResident/NoBasement/Erosion/Content	40	0.4	0.45	0.8
TwoStoryResident/NoBasement/Erosion/Content	50	0.6	0.85	1
TwoStoryResident/NoBasement/Erosion/Content	60	0.8	0.9	1
TwoStoryResident/NoBasement/Erosion/Content	70	0.84	1	1
TwoStoryResident/NoBasement/Erosion/Content	80	0.96	1	1
TwoStoryResident/NoBasement/Erosion/Content	90	1	1	1
TwoStoryResident/NoBasement/Erosion/Content	100	1	1	1
TwoStoryResident/NoBasement/Wave/Structure	-3	0	0	0
TwoStoryResident/NoBasement/Wave/Structure	-2	0	0	0.05

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
TwoStoryResident/NoBasement/Wave/Structure	-1	0	0.1	0.15
TwoStoryResident/NoBasement/Wave/Structure	0	0.05	0.2	0.25
TwoStoryResident/NoBasement/Wave/Structure	1	0.1	0.36	0.5
TwoStoryResident/NoBasement/Wave/Structure	2	0.3	0.5	0.6
TwoStoryResident/NoBasement/Wave/Structure	3	0.4	0.86	0.94
TwoStoryResident/NoBasement/Wave/Structure	5	0.6	1	1
TwoStoryResident/NoBasement/Wave/Content	-2	0	0	0
TwoStoryResident/NoBasement/Wave/Content	-1	0	0.05	0.12
TwoStoryResident/NoBasement/Wave/Content	0	0.05	0.2	0.25
TwoStoryResident/NoBasement/Wave/Content	1	0.15	0.35	0.4
TwoStoryResident/NoBasement/Wave/Content	2	0.3	0.45	0.7
TwoStoryResident/NoBasement/Wave/Content	3	0.4	0.94	1
TwoStoryResident/NoBasement/Wave/Content	5	0.75	1	1
SingleStoryResident/Basement/Inundation/Structure	-9	0	0	0
SingleStoryResident/Basement/Inundation/Structure	-8	0	0.01	0.02
SingleStoryResident/Basement/Inundation/Structure	-5	0	0.03	0.1
SingleStoryResident/Basement/Inundation/Structure	-3	0.01	0.05	0.15
SingleStoryResident/Basement/Inundation/Structure	-1	0.03	0.1	0.18
SingleStoryResident/Basement/Inundation/Structure	-0.5	0.04	0.12	0.21
SingleStoryResident/Basement/Inundation/Structure	0	0.05	0.18	0.3
SingleStoryResident/Basement/Inundation/Structure	0.5	0.1	0.3	0.35
SingleStoryResident/Basement/Inundation/Structure	1	0.15	0.3	0.43
SingleStoryResident/Basement/Inundation/Structure	2	0.25	0.35	0.5
SingleStoryResident/Basement/Inundation/Structure	3	0.3	0.4	0.55
SingleStoryResident/Basement/Inundation/Structure	5	0.5	0.7	0.84
SingleStoryResident/Basement/Inundation/Structure	7	0.64	0.9	0.94
SingleStoryResident/Basement/Inundation/Structure	10	0.85	0.95	1
SingleStoryResident/Basement/Inundation/Content	-9	0	0	0
SingleStoryResident/Basement/Inundation/Content	-8	0	0	0.05
SingleStoryResident/Basement/Inundation/Content	-5	0.03	0.03	0.14
SingleStoryResident/Basement/Inundation/Content	-3	0.05	0.05	0.25
SingleStoryResident/Basement/Inundation/Content	-1	0.05	0.15	0.3
SingleStoryResident/Basement/Inundation/Content	-0.5	0.05	0.15	0.4
SingleStoryResident/Basement/Inundation/Content	0	0.1	0.15	0.48
SingleStoryResident/Basement/Inundation/Content	0.5	0.15	0.3	0.6
SingleStoryResident/Basement/Inundation/Content	1	0.3	0.45	0.8
SingleStoryResident/Basement/Inundation/Content	2	0.52	0.64	0.9
SingleStoryResident/Basement/Inundation/Content	3	0.66	0.8	0.97
SingleStoryResident/Basement/Inundation/Content	5	0.8	1	1

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
SingleStoryResident/Basement/Inundation/Content	7	1	1	1
SingleStoryResident/Basement/Inundation/Content	10	1	1	1
SingleStoryResident/Basement/Erosion/Structure	0	0	0	0
SingleStoryResident/Basement/Erosion/Structure	10	0.05	0.17	0.3
SingleStoryResident/Basement/Erosion/Structure	20	0.15	0.3	0.4
SingleStoryResident/Basement/Erosion/Structure	30	0.3	0.4	0.5
SingleStoryResident/Basement/Erosion/Structure	40	0.4	0.5	0.6
SingleStoryResident/Basement/Erosion/Structure	50	0.5	0.86	0.96
SingleStoryResident/Basement/Erosion/Structure	60	0.9	0.94	1
SingleStoryResident/Basement/Erosion/Structure	70	0.92	0.98	1
SingleStoryResident/Basement/Erosion/Structure	80	1	1	1
SingleStoryResident/Basement/Erosion/Structure	90	1	1	1
SingleStoryResident/Basement/Erosion/Structure	100	1	1	1
SingleStoryResident/Basement/Erosion/Content	0	0	0	0
SingleStoryResident/Basement/Erosion/Content	10	0	0.15	0.2
SingleStoryResident/Basement/Erosion/Content	20	0.1	0.18	0.4
SingleStoryResident/Basement/Erosion/Content	30	0.2	0.25	0.5
SingleStoryResident/Basement/Erosion/Content	40	0.4	0.5	0.6
SingleStoryResident/Basement/Erosion/Content	50	0.5	0.66	0.8
SingleStoryResident/Basement/Erosion/Content	60	0.6	0.8	1
SingleStoryResident/Basement/Erosion/Content	70	0.8	0.9	1
SingleStoryResident/Basement/Erosion/Content	80	0.88	1	1
SingleStoryResident/Basement/Erosion/Content	90	1	1	1
SingleStoryResident/Basement/Erosion/Content	100	1	1	1
SingleStoryResident/Basement/Wave/Structure	-3	0	0	0
SingleStoryResident/Basement/Wave/Structure	-2	0	0.04	0.05
SingleStoryResident/Basement/Wave/Structure	-1	0.04	0.1	0.15
SingleStoryResident/Basement/Wave/Structure	0	0.1	0.2	0.34
SingleStoryResident/Basement/Wave/Structure	1	0.15	0.35	0.54
SingleStoryResident/Basement/Wave/Structure	2	0.48	0.6	0.75
SingleStoryResident/Basement/Wave/Structure	3	0.6	0.88	1
SingleStoryResident/Basement/Wave/Structure	5	0.94	1	1
SingleStoryResident/Basement/Wave/Content	-3	0	0	0
SingleStoryResident/Basement/Wave/Content	-2	0	0	0.05
SingleStoryResident/Basement/Wave/Content	-1	0	0.15	0.28
SingleStoryResident/Basement/Wave/Content	0	0.1	0.35	0.44
SingleStoryResident/Basement/Wave/Content	1	0.2	0.5	0.74
SingleStoryResident/Basement/Wave/Content	2	0.5	0.8	1
SingleStoryResident/Basement/Wave/Content	3	0.6	1	1

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
SingleStoryResident/Basement/Wave/Content	5	1	1	1
TwoStoryResident/Basement/Inundation/Structure	-9	0	0	0
TwoStoryResident/Basement/Inundation/Structure	-8	0	0	0.03
TwoStoryResident/Basement/Inundation/Structure	-5	0	0.03	0.08
TwoStoryResident/Basement/Inundation/Structure	-3	0.01	0.07	0.1
TwoStoryResident/Basement/Inundation/Structure	-1	0.03	0.1	0.15
TwoStoryResident/Basement/Inundation/Structure	-0.5	0.04	0.12	0.17
TwoStoryResident/Basement/Inundation/Structure	0	0.05	0.15	0.2
TwoStoryResident/Basement/Inundation/Structure	0.5	0.07	0.2	0.3
TwoStoryResident/Basement/Inundation/Structure	1	0.15	0.25	0.3
TwoStoryResident/Basement/Inundation/Structure	2	0.17	0.3	0.35
TwoStoryResident/Basement/Inundation/Structure	3	0.27	0.35	0.4
TwoStoryResident/Basement/Inundation/Structure	5	0.4	0.5	0.55
TwoStoryResident/Basement/Inundation/Structure	7	0.5	0.6	0.65
TwoStoryResident/Basement/Inundation/Structure	10	0.62	0.7	0.8
TwoStoryResident/Basement/Inundation/Content	-9	0	0	0
TwoStoryResident/Basement/Inundation/Content	-8	0	0	0.02
TwoStoryResident/Basement/Inundation/Content	-5	0.02	0.03	0.1
TwoStoryResident/Basement/Inundation/Content	-3	0.05	0.05	0.25
TwoStoryResident/Basement/Inundation/Content	-1	0.05	0.15	0.25
TwoStoryResident/Basement/Inundation/Content	-0.5	0.05	0.15	0.28
TwoStoryResident/Basement/Inundation/Content	0	0.1	0.2	0.34
TwoStoryResident/Basement/Inundation/Content	0.5	0.15	0.3	0.4
TwoStoryResident/Basement/Inundation/Content	1	0.2	0.35	0.5
TwoStoryResident/Basement/Inundation/Content	2	0.3	0.4	0.6
TwoStoryResident/Basement/Inundation/Content	3	0.4	0.5	0.7
TwoStoryResident/Basement/Inundation/Content	5	0.5	0.6	0.72
TwoStoryResident/Basement/Inundation/Content	7	0.6	0.7	0.9
TwoStoryResident/Basement/Inundation/Content	10	0.72	0.9	1
TwoStoryResident/Basement/Erosion/Structure	0	0	0	0
TwoStoryResident/Basement/Erosion/Structure	10	0.05	0.15	0.2
TwoStoryResident/Basement/Erosion/Structure	20	0.15	0.2	0.3
TwoStoryResident/Basement/Erosion/Structure	30	0.3	0.4	0.5
TwoStoryResident/Basement/Erosion/Structure	40	0.4	0.5	0.6
TwoStoryResident/Basement/Erosion/Structure	50	0.5	0.86	0.96
TwoStoryResident/Basement/Erosion/Structure	60	1	1	1
TwoStoryResident/Basement/Erosion/Structure	70	1	1	1
TwoStoryResident/Basement/Erosion/Structure	80	1	1	1
TwoStoryResident/Basement/Erosion/Structure	90	1	1	1

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
TwoStoryResident/Basement/Erosion/Structure	100	1	1	1
TwoStoryResident/Basement/Erosion/Content	0	0	0	0
TwoStoryResident/Basement/Erosion/Content	10	0	0.15	0.2
TwoStoryResident/Basement/Erosion/Content	20	0.1	0.2	0.3
TwoStoryResident/Basement/Erosion/Content	30	0.2	0.4	0.5
TwoStoryResident/Basement/Erosion/Content	40	0.4	0.5	0.6
TwoStoryResident/Basement/Erosion/Content	50	0.58	0.75	0.8
TwoStoryResident/Basement/Erosion/Content	60	0.74	0.9	1
TwoStoryResident/Basement/Erosion/Content	70	0.8	1	1
TwoStoryResident/Basement/Erosion/Content	80	0.9	1	1
TwoStoryResident/Basement/Erosion/Content	90	1	1	1
TwoStoryResident/Basement/Erosion/Content	100	1	1	1
TwoStoryResident/Basement/Wave/Structure	-3	0	0	0
TwoStoryResident/Basement/Wave/Structure	-2	0	0.02	0.05
TwoStoryResident/Basement/Wave/Structure	-1	0.04	0.1	0.18
TwoStoryResident/Basement/Wave/Structure	0	0.1	0.2	0.34
TwoStoryResident/Basement/Wave/Structure	1	0.15	0.35	0.54
TwoStoryResident/Basement/Wave/Structure	2	0.35	0.6	0.8
TwoStoryResident/Basement/Wave/Structure	3	0.6	0.8	1
TwoStoryResident/Basement/Wave/Structure	5	0.7	1	1
TwoStoryResident/Basement/Wave/Content	-3	0	0	0
TwoStoryResident/Basement/Wave/Content	-2	0	0	0.1
TwoStoryResident/Basement/Wave/Content	-1	0	0.12	0.25
TwoStoryResident/Basement/Wave/Content	0	0.1	0.35	0.44
TwoStoryResident/Basement/Wave/Content	1	0.25	0.55	0.8
TwoStoryResident/Basement/Wave/Content	2	0.5	0.75	1
TwoStoryResident/Basement/Wave/Content	3	0.6	1	1
TwoStoryResident/Basement/Wave/Content	5	0.85	1	1
OpenPileFoundation/Inundation/Structure	-9	0	0	0
OpenPileFoundation/Inundation/Structure	-8	0	0	0.02
OpenPileFoundation/Inundation/Structure	-5	0.01	0.02	0.1
OpenPileFoundation/Inundation/Structure	-3	0.02	0.04	0.12
OpenPileFoundation/Inundation/Structure	-1	0.02	0.12	0.2
OpenPileFoundation/Inundation/Structure	-0.5	0.06	0.16	0.25
OpenPileFoundation/Inundation/Structure	0	0.07	0.2	0.32
OpenPileFoundation/Inundation/Structure	0.5	0.12	0.28	0.35
OpenPileFoundation/Inundation/Structure	1	0.3	0.35	0.55
OpenPileFoundation/Inundation/Structure	2	0.35	0.4	0.7
OpenPileFoundation/Inundation/Structure	3	0.4	0.6	0.8

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
OpenPileFoundation/Inundation/Structure	5	0.5	0.7	1
OpenPileFoundation/Inundation/Structure	7	0.6	0.8	1
OpenPileFoundation/Inundation/Structure	10	0.82	1	1
OpenPileFoundation/Inundation/Content	-8	0	0	0
OpenPileFoundation/Inundation/Content	-5	0	0.01	0.01
OpenPileFoundation/Inundation/Content	-3	0	0.01	0.01
OpenPileFoundation/Inundation/Content	-1	0	0.01	0.05
OpenPileFoundation/Inundation/Content	-0.5	0.01	0.05	0.1
OpenPileFoundation/Inundation/Content	0	0.05	0.1	0.17
OpenPileFoundation/Inundation/Content	0.5	0.15	0.25	0.3
OpenPileFoundation/Inundation/Content	1	0.3	0.4	0.5
OpenPileFoundation/Inundation/Content	2	0.5	0.5	0.75
OpenPileFoundation/Inundation/Content	3	0.6	0.8	0.9
OpenPileFoundation/Inundation/Content	5	0.94	0.98	1
OpenPileFoundation/Inundation/Content	7	1	1	1
OpenPileFoundation/Inundation/Content	10	1	1	1
OpenPileFoundation/Erosion/Structure	0	0	0	0
OpenPileFoundation/Erosion/Structure	10	0	0.02	0.08
OpenPileFoundation/Erosion/Structure	20	0.05	0.1	0.15
OpenPileFoundation/Erosion/Structure	30	0.2	0.3	0.5
OpenPileFoundation/Erosion/Structure	40	0.3	0.4	1
OpenPileFoundation/Erosion/Structure	50	0.5	0.9	1
OpenPileFoundation/Erosion/Structure	60	0.92	1	1
OpenPileFoundation/Erosion/Structure	70	1	1	1
OpenPileFoundation/Erosion/Structure	80	1	1	1
OpenPileFoundation/Erosion/Structure	90	1	1	1
OpenPileFoundation/Erosion/Structure	100	1	1	1
OpenPileFoundation/Erosion/Content	0	0	0	0
OpenPileFoundation/Erosion/Content	10	0.01	0.04	0.05
OpenPileFoundation/Erosion/Content	20	0.02	0.08	0.15
OpenPileFoundation/Erosion/Content	30	0.2	0.3	0.5
OpenPileFoundation/Erosion/Content	40	0.3	0.4	1
OpenPileFoundation/Erosion/Content	50	0.5	0.8	1
OpenPileFoundation/Erosion/Content	60	0.9	1	1
OpenPileFoundation/Erosion/Content	70	1	1	1
OpenPileFoundation/Erosion/Content	80	1	1	1
OpenPileFoundation/Erosion/Content	90	1	1	1
OpenPileFoundation/Erosion/Content	100	1	1	1
OpenPileFoundation/Wave/Structure	-8	0	0	0

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
OpenPileFoundation/Wave/Structure	-5	0	0	0.02
OpenPileFoundation/Wave/Structure	-3	0	0.04	0.05
OpenPileFoundation/Wave/Structure	-1	0.05	0.1	0.3
OpenPileFoundation/Wave/Structure	0	0.2	0.5	0.75
OpenPileFoundation/Wave/Structure	1	0.4	0.7	1
OpenPileFoundation/Wave/Structure	2	0.8	1	1
OpenPileFoundation/Wave/Structure	3	0.9	1	1
OpenPileFoundation/Wave/Structure	5	1	1	1
OpenPileFoundation/Wave/Content	-8	0	0	0
OpenPileFoundation/Wave/Content	-5	0	0.05	0.08
OpenPileFoundation/Wave/Content	-3	0.03	0.05	0.1
OpenPileFoundation/Wave/Content	-1	0.05	0.2	0.4
OpenPileFoundation/Wave/Content	0	0.2	0.5	0.75
OpenPileFoundation/Wave/Content	1	0.4	0.75	1
OpenPileFoundation/Wave/Content	2	1	1	1
OpenPileFoundation/Wave/Content	3	1	1	1
OpenPileFoundation/Wave/Content	5	1	1	1
PileFoundationEnclosure/Inundation/Structure	-8	0	0	0.02
PileFoundationEnclosure/Inundation/Structure	-5	0.01	0.02	0.1
PileFoundationEnclosure/Inundation/Structure	-3	0.02	0.04	0.12
PileFoundationEnclosure/Inundation/Structure	-1	0.02	0.12	0.2
PileFoundationEnclosure/Inundation/Structure	-0.5	0.06	0.16	0.25
PileFoundationEnclosure/Inundation/Structure	0	0.07	0.2	0.32
PileFoundationEnclosure/Inundation/Structure	0.5	0.12	0.28	0.35
PileFoundationEnclosure/Inundation/Structure	1	0.3	0.35	0.55
PileFoundationEnclosure/Inundation/Structure	2	0.35	0.4	0.7
PileFoundationEnclosure/Inundation/Structure	3	0.4	0.6	0.8
PileFoundationEnclosure/Inundation/Structure	5	0.5	0.7	1
PileFoundationEnclosure/Inundation/Structure	7	0.6	0.8	1
PileFoundationEnclosure/Inundation/Structure	10	0.82	1	1
PileFoundationEnclosure/Inundation/Content	-8	0	0	0
PileFoundationEnclosure/Inundation/Content	-5	0.01	0.04	0.08
PileFoundationEnclosure/Inundation/Content	-3	0.01	0.07	0.1
PileFoundationEnclosure/Inundation/Content	-1	0.02	0.11	0.2
PileFoundationEnclosure/Inundation/Content	-0.5	0.05	0.2	0.4
PileFoundationEnclosure/Inundation/Content	0	0.05	0.2	0.5
PileFoundationEnclosure/Inundation/Content	0.5	0.15	0.3	0.65
PileFoundationEnclosure/Inundation/Content	1	0.35	0.4	0.75
PileFoundationEnclosure/Inundation/Content	2	0.6	0.75	0.8

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
PileFoundationEnclosure/Inundation/Content	3	0.7	0.85	0.9
PileFoundationEnclosure/Inundation/Content	5	0.9	1	1
PileFoundationEnclosure/Inundation/Content	7	1	1	1
PileFoundationEnclosure/Inundation/Content	10	1	1	1
PileFoundationEnclosure/Erosion/Structure	0	0	0	0
PileFoundationEnclosure/Erosion/Structure	10	0.02	0.05	0.15
PileFoundationEnclosure/Erosion/Structure	20	0.1	0.2	0.3
PileFoundationEnclosure/Erosion/Structure	30	0.25	0.3	0.5
PileFoundationEnclosure/Erosion/Structure	40	0.4	0.45	1
PileFoundationEnclosure/Erosion/Structure	50	0.5	0.9	1
PileFoundationEnclosure/Erosion/Structure	60	0.92	1	1
PileFoundationEnclosure/Erosion/Structure	70	1	1	1
PileFoundationEnclosure/Erosion/Structure	80	1	1	1
PileFoundationEnclosure/Erosion/Structure	90	1	1	1
PileFoundationEnclosure/Erosion/Structure	100	1	1	1
PileFoundationEnclosure/Erosion/Content	0	0	0	0
PileFoundationEnclosure/Erosion/Content	10	0.01	0.04	0.15
PileFoundationEnclosure/Erosion/Content	20	0.02	0.1	0.4
PileFoundationEnclosure/Erosion/Content	30	0.2	0.3	0.54
PileFoundationEnclosure/Erosion/Content	40	0.3	0.4	1
PileFoundationEnclosure/Erosion/Content	50	0.5	0.8	1
PileFoundationEnclosure/Erosion/Content	60	0.9	1	1
PileFoundationEnclosure/Erosion/Content	70	1	1	1
PileFoundationEnclosure/Erosion/Content	80	1	1	1
PileFoundationEnclosure/Erosion/Content	90	1	1	1
PileFoundationEnclosure/Erosion/Content	100	1	1	1
PileFoundationEnclosure/Wave/Structure	-8	0	0	0
PileFoundationEnclosure/Wave/Structure	-5	0.02	0.06	0.1
PileFoundationEnclosure/Wave/Structure	-3	0.02	0.14	0.2
PileFoundationEnclosure/Wave/Structure	-1	0.2	0.4	0.6
PileFoundationEnclosure/Wave/Structure	0	0.25	0.6	0.75
PileFoundationEnclosure/Wave/Structure	1	0.6	0.85	1
PileFoundationEnclosure/Wave/Structure	2	0.85	1	1
PileFoundationEnclosure/Wave/Structure	3	1	1	1
PileFoundationEnclosure/Wave/Structure	5	1	1	1
PileFoundationEnclosure/Wave/Content	-9	0	0	0
PileFoundationEnclosure/Wave/Content	-8	0	0	0.05
PileFoundationEnclosure/Wave/Content	-5	0.02	0.05	0.1
PileFoundationEnclosure/Wave/Content	-3	0.05	0.1	0.2

Damage Function Occupancy type/ Damage Element	Depth	Minimum Percent Damage	Most Likely Percent Damage	Maximum Percent Damage
PileFoundationEnclosure/Wave/Content	-1	0.08	0.4	0.6
PileFoundationEnclosure/Wave/Content	0	0.25	0.5	0.75
PileFoundationEnclosure/Wave/Content	1	0.4	0.75	1
PileFoundationEnclosure/Wave/Content	2	1	1	1
PileFoundationEnclosure/Wave/Content	3	1	1	1
PileFoundationEnclosure/Wave/Content	5	1	1	1