Atlantic Coast of Long Island,
Fire Island Inlet to Montauk Point (FIMP), New York,
Storm Damage Reduction Project, Reformulation Study

HABITAT EVALUATION PROCEDURES (HEP)

FINAL PHASE I REPORT

AUGUST 2006

Prepared by: U.S. Army Corps of Engineers
New York District, Planning Division (CENAN-PL-E)
26 Federal Plaza
New York, New York 10278-0090

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EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers (USACE), New York District (District), is partnering with New York State Department of Environmental Conservation (NYSDEC) to conduct a comprehensive feasibility-level Reformulation Study (Study) of the Fire Island Inlet to Montauk Point (FIMP) Storm Damage Reduction (SDR) Project (Project) along the south shore of Long Island, New York. The Federally authorized project area extends approximately 83 miles along the shoreline of Atlantic Coast of Suffolk County, Long Island, New York, beginning at Montauk Point and extending to the western boundary of Fire Island Inlet (Appendix A, Figure 1).

The purpose of the Reformulation Study is to evaluate a range of possible alternatives to address storm damage risk, including a screening of various alternatives, design of alternatives, design optimization and comparison of alternatives, and selection of a recommended plan for the Project area. The number of alternative projects being assessed is 50, including 16 restoration, 24 SDR, and 10 breach response alternatives. A critical step in the study is the development of site-specific information that will be used to evaluate SDR and restoration alternatives, and no-action alternatives, in order to identify feasible plans of protection and habitat restoration/enhancement for the Project area.

This report is intended to present the results of a Habitat Evaluation Procedures (HEP) analysis performed for the Reformulation Study in the feasibility phase of the FIMP Study. In doing so, this report outlines the methods used by the District in the feasibility phase of the FIMP Study to characterize existing habitat conditions within the Project area and to evaluate the affects of various restoration and proposed FIMP SDR alternatives on those habitats. The philosophy behind HEP is that an area can have various habitats, and that these habitats can have different suitability for species that may occur in that area. In conducting this analysis, the assumption is made that the suitability of those habitats can be quantified (via Habitat Suitability Indices [HSI]) and, that the different habitats have measurable areal extents. The overall suitability of an area for a species can be represented as a product of the areal extents of each habitat and the suitability of those habitats for the species. A HEP study has the capability to model the baseline condition, a “final condition” 50 years from the baseline, and the anticipated effect of a single event. Therefore, the use of HEP for this Project facilitates evaluation of habitat effects resulting from the various Project alternatives and is one of several tools the District is using to evaluate FIMP restoration and project alternatives.

A team of agency personnel and interested parties (HEP Team) developed HEP community-based models specifically designed for evaluating the quality of habitats in the FIMP project areas. To develop the models used in the HEP process, the agency team evaluated six individual HEP communities to determine, based on best professional judgment, “optimum” habitat conditions, and how the quality and characteristics of each might be expected to change over a 50-year period under two scenarios: 1) future no-action, which represents site conditions should no future storm damage reduction measures or restoration activities take place; and, 2) future with-action, which represents conditions should restoration activities and/or proposed District storm damage reduction activities occur.

Data used in the HEP models included GIS cover type map analysis, data from engineering models, and field data measurements. These data were incorporated into HEP habitat suitability curves to generate a numeric output for habitat quality. Field data were collected at 21 transect locations across the barrier island thought to be most representative of habitat conditions in the Project area, and those data were applied to other areas with similar site characteristics.

HEP is intended to provide a consistent approach for use in evaluating proposed actions that will affect habitats, by enabling a comparison both temporally (existing conditions compared to modeled future conditions) and spatially (between sites in the Study area). HEP provides information about the relative value of different habitats at the same point in time, and about the relative value of the same area at future points in time. The numeric output from HEP can be used for comparing future habitat conditions at a location if no-action is taken with future habitat conditions should various actions be undertaken, to help decision-makers to assess if an action should move forward. The method allows for a comparison of habitat quality and quality among sites and for numerous alternatives, and provides a numeric unit of measure that represents the environmental impact or benefit of moving forward with a project. The outputs from HEP can be further evaluated to determine which projects would provide the highest environmental gain for the cost expended, through an incremental cost benefit analysis. Consequently, the HEP model is not intended to be a stand-alone tool for decision-making, but is intended to provide important data and evaluation relating to habitat quality and quantity, for use in the decision-making process.

This report identifies and discusses results of the HEP analysis. These results, however, are only one of several decision-making factors in identifying preferred alternatives. Other factors incorporated into this decision-making include cost, level of agency support, and factors related to other environmental issues (such as coastal geological processes). This report includes a brief presentation of these factors and a brief discussion of the manner in which these factors will be used in future decision-making and project documentation. Discussion regarding the development and application of decision matrices and the integration of these decisions matrices with the HEP model results to evaluate alternatives will be provided in a separate report (i.e., Phase II Report). The selection or recommendation of restoration, SDR, or breach response alternatives, based upon the integration of the HEP model results and the decision matrices, will also be presented in the Phase II report.

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ABBREVIATIONS AND ACRONYMS

2001 dollars	Costs based on 2001 estimates, not adjusted for inflation/depreciation, etc.
AAHU	Average Annualized Habitat Units
BCR	Benefit-Cost Ratio
CHU	Cumulative Habitat Unit
CY	Cubic Yards
DMMP	Dredged Material Management Plan
FIMP	Fire Island to Montauk Point
GIS	Geographic Information System
GPS	Global Positioning System
HEP	Habitat Evaluation Procedures
HSI	Habitat Suitability Indices
HU	Habitat Unit
ICA	Incremental Cost Analysis
LF	Linear Feet
LIDAR	Light Detection And Ranging
LLW	Lower Low Water
NED	National Economic Development
NER	National Ecosystem Restoration
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NYSDEC	New York State Department of Environmental Conservation
SAV	Submerged Aquatic Vegetation
SDR	Storm Damage Reduction
SI	Suitability Index
SRT	Self Regulating Tide
SY	Square Yards
TNC	The Nature Conservancy
TY	Target Year
TY0	Target Year 0 (baseline conditions)
TY1	Target Year 1
TY5	Target Year 5
TY50	Target Year 50
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WOSI	West of Shinnecock Inlet

1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), New York District (District), is partnering with New York State Department of Environmental Conservation (NYSDEC) to conduct a comprehensive feasibility-level Reformulation Study (Study) of the Fire Island Inlet to Montauk Point (FIMP) Storm Damage Reduction (SDR) Project (Project) along the south shore of Long Island, New York. The Federally authorized project area extends approximately 83 miles along the shoreline of Atlantic Coast of Suffolk County, Long Island, New York, beginning at Montauk Point and extending to the western boundary of Fire Island Inlet (Appendix A, Figure 1).

The purpose of the Reformulation Study is to evaluate a range of possible alternatives to address storm damage risk, including a screening of various SDR alternatives and their designs, design optimization, and selection of a recommended plan for the Project area. The Study will result in recommendations that, if implemented, can result in a project that provides New York State and its residents with lower storm damage risks. Concurrent with the development of SDR plans, the District is furthering the Study to include evaluations of existing habitat conditions and habitat restoration and enhancement opportunities within the FIMP Project area. A critical step in the habitat assessment component is the development of site-specific information that will be used to evaluate the impacts of SDR and restoration alternatives, and no-action alternatives, in order to identify feasible plans for SDR and habitat restoration/enhancement for the Project area.

This report outlines the method (Habitat Evaluation Procedures or HEP) used by the District in the feasibility phase of the FIMP Study to evaluate habitat impacts (beneficial and adverse) resulting from various restoration and proposed SDR alternatives. The HEP method, developed by the USFWS (1980) with assistance from the USACE and U.S. Department of Agriculture (USDA) Soil Conservation Service, enables the results of such an evaluation to be incorporated into the decision-making process in a manner that is technically defensible, replicable, and can be applied consistently to a variety of different habitat types.

As part of the Reformulation Study evaluation process, the District identified an interagency Team (HEP Team) to assist the District in evaluating habitat restoration and enhancement opportunities for the FIMP Project, and to assist in developing the HEP methodology. The HEP Team included representatives from the National Park Service (NPS), United States Fish and Wildlife Service (USFWS), and the NYSDEC. Other agencies and organizations, such as the U.S. Environmental Protection Agency (USEPA) and The Nature Conservancy (TNC) participated as review members only.

Consistent with the Project Vision Statement (presented in Appendix C) and the USACE's Environmental Operating Principles, the Study will take an integrated ecosystem approach to maintain and restore essential physical coastal processes, particularly hydrologic and geomorphologic processes, to increase storm damage protection and to reduce risks. Therefore, this report summarizes only one of several tools that will be used in the FIMP Study to evaluate overall affects from proposed activities on the ecosystem.

Federally-funded SDR projects must be justified by demonstrating National Economic Development (NED) benefits that are in excess of Project costs. The formulation and evaluation of a project for Federal cost participation requires preparation of a NED plan, which identifies the plan alternatives that provide NED benefits compared to costs. To meet the USACE objective for restoration components of projects, a National Ecosystem Restoration (NER) plan must also be developed to identify a plan that will maximize ecosystem restoration benefits as compared to costs. The NER plan identification process may identify alternatives that optimize environmental benefits to the Project area, but do not optimize the cost/benefit objectives for the SDR component. However, in evaluating both NED and NER plans, the District's objective is to select NER plan components that advance the SDR objectives of the Project and that consider the ecosystem restoration benefits of restoring physical processes and improved ecosystem function. A combined NED/NER plan will be prepared that meets SDR requirements while maximizing environmental restoration outputs by including consideration of tradeoffs between NED and NER outputs.

Numeric outputs from the HEP analysis are used to quantify benefits in the NED/NER evaluation process and facilitate the comparison of environmental benefits of proposed alternatives relative to economic benefits and alternative costs. This report presents a summary of the HEP study and the conceptual costs associated with various alternatives evaluated using HEP. This report does not include an evaluation of NED/NER. Specifically, this report includes a discussion of HEP model development (Section 2.0), HEP data collection methods (Section 3.0), HEP analysis methods (Section 4.0), and results (Section 5.0).

This report identifies and discusses results of the HEP analysis. These results, however, are only one of several decision-making factors in identifying preferred alternatives for the FIMP Project. Other factors incorporated into this decision-making include cost, level of agency support, and factors related to other environmental issues (such as coastal geological processes). This report includes a brief presentation of these factors and a brief discussion of the manner in which these factors will be used in future decision-making and project documentation. Discussion regarding the development and application of decision matrices and the integration of these decisions matrices with the HEP model results to evaluate alternatives will be provided in a separate report (a Phase II Report). The selection or recommendation of restoration, SDR, or breach response alternatives, based upon the integration of the HEP model results and the decision matrices, will also be presented in the Phase II report. Detailed evaluation of the environmental conditions in the Project area and potential impacts to the environment (including and evaluation of affects on coastal processes) will be presented in the Environmental Impact Statement for the Project.

1.1 STUDY AREA

The study area extends approximately 83 miles from Montauk Point to the western boundary of Fire Island Inlet (Appendix A). The area includes approximately 50 miles of barrier island, approximately 33 miles of oceanfront area that is connected to the mainland of Long Island, adjacent nearshore ocean areas, several bayside areas that are connected to the mainland of Long Island, and the waterbodies and islands of Shinnecock, Moriches, and Great South bays.

The study area is characterized as a low-lying landform consisting of both rocky and sandy beaches, sand dunes, eroding cliffs, saltwater marshes, herbs, shrubs, stunted forests, several natural and man-made islands, and tidal flats. Natural communities in the study area are dynamic and are constantly moving and reshaping in response to storms, sea level changes, and wave action. The study area serves as a buffer against storms and wave action for the coastal mainland and is known to provide essential nesting and feeding areas for many aquatic and terrestrial plants and animals, including rare species.

1.2 HEP Purpose and Intended Use

For the FIMP Study, HEP is used as one of several tools in evaluating restoration and project alternatives. The HEP model is intended to provide a consistent model for evaluating Project alternatives that will affect habitats, by enabling a comparison both temporally (existing conditions compared to modeled future conditions) and spatially (between sites in the Study area).

As presented in this report, the HEP method, variables, and mathematical relationships were prepared originally for restoration design assessment associated with the FIMP SDR project. Accordingly, this report contains 16 restoration designs with complete HEP model assessments; these collectively constitute elements of the National Environmental Restoration (NER) plan. In addition to this Restoration Design/NER plan, the FIMP Project also contains a variety of features designed to optimize storm damage reduction. Collectively, these features are known as the NED plan and include beach fill, dune enhancement, inlet design, non-structural designs and Breach Closure alternatives. The NED plan analysis will identify plans that can be combined with the NER plans to create one, comprehensive, NED/NER plan. Therefore, the application of the HEP models is also associated with all SDR/NED plans. Accordingly, while completing the model process, the HEP Team agreed that this HEP model could appropriately be used for both Restoration/NER and SDR/NED assessment when evaluating project alternatives. The HEP Team has agreed that the model can be applied to all project types noting, again, the original intent and use was for restoration design.

While the HEP analysis and selection of potential projects for HEP analysis, incorporate consideration of coastal geological processes such as sediment transport, it is beyond the scope of the HEP analysis to fully analyze factors such as economic cost, uncertainty of achieving restoration goals, and other factors that are used in ultimately selecting projects for funding and construction. For example, a project with strong potential for providing habitat for endangered species may be deserving of a high level of consideration. Therefore, the HEP model is not intended to be a stand-alone tool for decision-making, but is intended to provide support for the decision-making process.

Consequently, this report does not include final selections or recommendations for Project alternatives, which will be forthcoming in future Project documentation. Other decision matrices presented in this report for informational purposes, such as the natural process evaluation matrices (Appendix B, Tables 7 through 10), and the site ranking matrix (Appendix B, Table 15), will be used in the alternative evaluation and selection process. These matrices incorporate various other factors such as land ownership, support for the project, contribution to natural coastal processes, and other factors that are vital to the successful development and completion of a project. In addition to the results of the HEP analysis, these matrices will be used to assist in determining which alternatives should receive further consideration as restoration alternatives. Discussion regarding the development and application of decision matrices and the integration of these decisions matrices with the HEP model results to evaluate alternatives will be provided in a separate report (i.e., Phase II Report). The selection or recommendation of restoration, SDR, or breach response alternatives, based upon the integration of the HEP model results and the decision matrices, will also be presented in the Phase II report.

With this background and recognized purpose of the HEP analysis, restoration and SDR goals (described below) were considered in selecting alternatives for HEP evaluation.

1.2.1 Restoration Goals

The primary goals of restoration for the FIMP Project are to restore degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition, and to evaluate the feasibility of combining restoration efforts to supplement the proposed SDR project. To assist in this effort, and in support of the Vision Statement (presented in Appendix C) and Environmental Operating Principles, the District identified the following five key processes that should be considered in coastal restoration designs for the Long Island, NY area. Detailed fact sheets for the five processes are available in Appendix C.

1. Longshore sediment transport.
2. Cross-island sediment transport.
3. Dune development and evolution.
4. Bayside shoreline processes.
5. Estuarine processes.

Other important considerations for ecosystem restoration in the Project area have been identified by personnel from agencies associated with the FIMP restoration effort and include:

1. Maximize the benefits, functions, and biodiversity of natural and native habitats.
2. Promote habitats for populations of rare, threatened, and endangered biota.
3. Re-establish natural rates of longshore and cross-island sediment transport, and bayside shoreline processes..
4. Improve estuarine processes into and within the bay.

Following consideration of the above processes, many potential restoration projects were developed for consideration and potential incorporation into the Study, ranging from bulkhead removal to sand placement to vegetation planting. The objective in evaluating conceptual restoration designs with HEP was to assess a broad spectrum of projects that could be carried out at locations across the barrier island, to evaluate various alternatives to such projects (e.g., full restoration versus a reduced area), and to present a range of possible options, costs, etc. Although attempts were made to include at least one restoration option at each site that would meet goals and objective of each HEP Team member, all members of the HEP Team do not necessarily support all of the site locations and alternatives presented herein. In evaluating restoration alternatives, secondary impacts from proposed activities such as sediment movement that may result from an activity are not captured in the designs and HEP analysis for these sites and it is understood that the proposed activity may result in various indirect impacts to the other communities and adjacent areas. However, as discussed at various HEP Team meetings, these indirect and often cumulative impacts are not easily quantified and the HEP Team was unable to identify specific variables or assumptions needed in the HEP method to address these concerns. Despite this, the analysis does serve as a relative comparison of restoration concepts across the Study Area.

1.2.2 Storm Damage Reduction Goals

The goal of the SDR component of the Project is to reduce significant inundation, beach erosion, and wave attack along the densely populated southern coast of Long Island, as well as inundation along the bay shorelines. Continuation of current trends is likely to increase the potential for economic losses and threat to human health and safety. Numerous SDR alternatives are currently being evaluated by the District to address these issues. This report presents the results of HEP analysis of various scenarios for two general SDR measures, as well as restoration actions and breach response measures. For organization purposes, although these latter two actions are considered components of SDR, each are discussed separately throughout the report.

1.2.3 Breach Response Goals

The USACE has defined a breach as "the condition where overflow cuts a channel across the island that permits the exchange of ocean and bay waters under normal tidal conditions. The breach response alternatives evaluated during this study include actions to close breaches in the barrier islands quickly, after they occur, through human intervention. Models of coastal processes were evaluated and breach response sites were selected based on locations most likely to experience breaching. The HEP method was used to help assess the potential habitat effects resulting from breach response activities.

An evaluation of the formation of tidal flats and sandy beaches associated with a breach will be presented in the Phase II Report. The Phase II Report will also include an evaluation of a partial breach, which is defined by the USACE as a storm-induced barrier island cut that has a scoured depth between Mean High Water and Mean Low Water.

1.2.4 HEP in Federal Cost-benefit Analysis

HEP is used as a tool to assist in the evaluation of costs, benefits, and/or impacts, from proposed activities by providing environmental outputs, in the form of Average Annualized Habitat Units (AAHUs), as required by cost-benefit analysis. AAHUs are used to evaluate restoration and SDR alternatives and provide a way to marry NED and NER goals and objectives. The NED/NER evaluation was not part of the scope of work for this project at this time and is therefore not presented in this report. However, the AAHUs generated from this HEP evaluation are a key component of the NED/NER evaluation planned for this project in the future and therefore an overview of NED/NER is presented below.

According to the USACE Planning Guidance Notebook (Engineer Regulation 1105-2-100) "the Federal objective of water and related land resource project planning is to contribute to NED consistent with protecting the Nations environmental, pursuant to national environmental statutes, applicable executive orders, and other Federal Planning requirements (USACE 2000). The goal of NED refers to developing or maintaining economic opportunities through USACE actions, and includes items such as navigation and flood damage reduction. Benefits are economic in nature (e.g., dollars saved from protecting residential, commercial properties and infrastructure from future damage) and are portrayed in dollars in terms of an incremental cost analysis (ICA).

A primary mission of the USACE Civil Works Program is ecosystem restoration, and the USACE objective in ecosystem restoration planning is to contribute NER. NER refers to increasing the net quantity and quality of desired ecosystem resources (USACE 2000). NER benefits are environmental in nature (e.g., improved wetland habitat) and are portrayed in non-monetary forms such as habitat units (i.e., HEP HUs); a dollar value is not assigned to NER benefits. However, similar to NED cost/benefit analysis, NER costs (i.e., costs associated with each restoration alternative) can be compared with benefits (i.e., HUs) to identify a plan that best maximizes benefits compared to costs (i.e., benefit-cost ration or BCR). Impacts to the environment are assumed not to occur (i.e., restoration design should be done to restore, not require mitigation for impacts).

In cases where Project activities and restoration activities occur in the same location, contributions to NED and NER can be combined in project planning and can include trade-offs between NED and NER to maximize the sum of net benefits. Projects that maximize NED and NER benefits offer the best balance between the two Federal objectives, and result in the “best” recommended plan: a combined NED/NER plan (USACE 2000).

Alternatively, site selection for the Project based on economic factors (i.e., NED) can be conducted separately from site selection for restoration based on environmental factors (i.e., NER). In this case, the environmental impacts from the selected Project and proposed restoration are both identified in terms of habitat units through HEP. NED and NER goals can be met through the selection of the “best” Project (in terms of BCR), and offsetting any habitat impacts from the Project, through the selection of restoration sites that provide habitat benefits greater than Project impacts

1.3 SELECTION OF THE HEP METHOD

Early in the process, the HEP Team discussed the use of HEP methodology with a community focus, rather than the species-specific approach which has been more commonly used with the understanding that many wildlife species and ecosystem processes would likely benefit by establishing “optimal” conditions for communities found on the barrier island (see meeting minutes from May 12—14, Appendix D). When developing model variables, the Team considered groups of species, such as those with very specific habitat requirements, low mobility, and documented sensitivity to habitat changes, as well as overall ecosystem processes and the stability of natural features. The HEP Team recognized that the barrier island ecosystem is a spatial and temporal mosaic of communities in varying successional series and geomorphological conditions that can not easily be captured through HEP models. However, despite some limitations, the HEP Team agreed that HEP provided a reasonable method to compare and contrast habitat conditions and potential project impacts, particularly since the HEP Team was unable to identify an alternative evaluation method.

HEP is particularly useful in assisting with the evaluation of current and future habitat conditions because it provides information for two general types of wildlife habitat comparisons: 1) the relative value of different areas at the same point in time; and 2) the relative value of the same area at different points in time. This information is useful in baseline and impact assessments to evaluate proposed actions (such as being considered in this Project) that potentially result in a change in either habitat quantity or quality. Considering the large number of alternatives that are being considered, the many community types present in the Project Area, and the need to assess these alternatives and community types temporally and spatially, HEP provides a suitably robust and consistent method to achieve the goal of evaluating potential habitat effects of Project alternatives.

In addition, through the use of HEP, the relative score of wildlife habitats can be quantitatively assessed through a final numerical output (McCrain 1992) that is technically defensible, replicable, and can be applied consistently in a variety of different habitat types. HEP is based on combining a measure of habitat quantity with an index of habitat quality to determine an overall habitat score (USFWS 1980). The underlying assumption of HEP is that a Habitat Suitability Index (HSI) model can be used to evaluate and describe the quality of a community type or habitat.

As described previously, for this Project, HEP was originally intended to assess restoration design for the various restoration activities planned as part of the project. As the Project progressed, the use of HEP was expanded to include assessments of habitat effects resulting from other aspects of the Project, such as SDR and breach response activities. Therefore, this report presents HEP results for restoration, SDR, and breach response alternatives.

1.4 HEP TEAM

The HEP Team is assisting the District in evaluating habitat restoration and enhancement opportunities for FIMP, including the development of the HEP methodology. Individual HEP Team members, their affiliation, and responsibilities are identified in Appendix B, Table 1.

The HEP Team conducted a number of meetings and conference calls to develop the HEP methodology proposed for FIMP. The dates and emphasis of these meetings were as follows:

- May 12 through 14, 2004 (model selection and building);
- June 28 through July 2, 2004 (site visit and model building);
- August 25 through 27, 2004 (pilot study and model adjustments);
- November 17 through 19, 2004 (baseline and future without restoration results);
- April 21 through 22, 2005 (baseline, future without restoration, and future with restoration results for example transects); and,
- September 23, 2005 (baseline, future without restoration, and future with restoration results)

Copies of all the minutes from meetings and conference calls, HEP Team correspondence, and handouts used in the development of HEP models are provided in Appendix D of this report.

2.0 HEP MODEL DEVELOPMENT

The HEP Team convened on several occasions in 2004 to develop HSI models (notes from these workshops can be found in Appendix D and HEP Model Documentation can be found in Appendix E). The initial products of these efforts were a series of community models, a list of "suggested" ecosystem components, and a list of variables (with suggested sampling protocols) as described in Appendix E.

HSI models can be developed for specific species of interest, guilds of species, and community and habitat types. The HEP Team discussed the advantages and limitations of species-specific models and ultimately chose to develop a series of community-based models that, taken together, would encompass the ecosystem found in the Project area. Although species-specific approaches to HEP are traditional, the HEP Team decided to use a more holistic community-based approach to evaluate the ecosystem rather than species-driven models with the understanding that many wildlife species and ecosystem processes would likely benefit by establishing "optimal" conditions for representative communities found on the barrier island.

In addition, community-based HSI models offer more promise for application to this Project, compared with species-based HSI models, because they are more efficient in capturing those habitat measures necessary for restoring ecosystem integrity and can be compared across a wide range of ecosystems for prioritization purposes. Community-based HSI models indicate relative ecosystem value more inclusively than species-based models because they link habitat more broadly to ecosystem components or functions. In this HEP study, the HEP Team considered groups of species (such as those with very specific habitat requirements, low mobility, and documented sensitivity to habitat changes), overall ecosystem processes, and the stability of natural features when developing HIS model variables.

In developing the HSI models, the HEP Team recognized that all community-based models have limitations, particularly in their ability to capture geomorphololgy and other dynamic variables in the ecosystem. In addition, while the models are capable of capturing broad habitat changes and effects, they are unable to capture many of the processes defined as goals for this project and socio-economic or cultural factors. However, HEP does provide a standardized approach that is useful in comparing and contrasting habitat quality and potential impacts to those habitats across a wide area.

2.1 HEP UNITS OF MEASURE

In HEP methodology, Habitat Suitability Indices (HSIs) are used to determine the suitability (i.e., quality) of a given habitat or community type for a species or group of species. These models include quantifiable environmental variables that influence the species (or group of species) presence, distribution, and/or abundance to determine suitability. The HSI is defined as a score between 0.0 and 1.0, with 1.0 representing the optimum quality of a habitat variable in a defined area at a specific point in time, and assumed to be positively correlated to carrying capacity (USFWS 1980). HSI scores are multiplied by the area of available habitat or community to obtain Habitat Units (HUs).

In order to use HEP as an impact assessment tool, the future conditions of the study area must be evaluated to determine how habitat quality might change with and without a proposed activity. Future HUs are derived by calculating the area of habitat (i.e., community type) and the predicted HSI score (based on future projections of habitat conditions) for the habitat at given points in time (i.e., Target Years [TYs]). For use in the cost-benefit analysis, these HUs are then added across all years in the period of analysis to derive Cumulative Habitat Units (CHUs). The CHUs are then divided by the economic life of the Project or activity to generate the Average Annualized Habitat Units (AAHUs). Calculation of AAHUs permits the analysis to include impacts that may be incurred during the pre-start period of the restoration or SDR activity as well as throughout the life of the Project, while basing the calculation on the same denominator that is used in Federal cost-benefit analysis.

The HEP method selected for this study included a 50-year evaluation horizon to allow for the impacts of a certain event (such as a breach of the barrier island or a restoration project). Therefore, the HEP method includes the capability to assess the baseline condition (TY-0), a "final condition" 50 years from the baseline (TY-50), the anticipated effect of a single event (TY-1), and an additional timeframe (TY-5) intended to provide additional precision to HEP by, for example, capturing the combined effect of breach response activities followed by a restoration project.

2.2 General Assumptions

In developing and using the HEP process in the evaluation of the communities identified for this project, the following assumptions were made by the HEP Team.

- **Assumptions in HEP**

  1. There is a relationship between measurable features of habitat and its carrying capacity for fish and wildlife.
  2. Measurable habitat characteristics can be described as quantity and quality.
  3. Future conditions can be predicted both with and without the proposed project or action being evaluated, as they relate to changes in habitat characteristics.

- **Assumptions for HEP Components**

  1. Quantity can be determined by accurately and meaningfully delineating and classifying habitat.
  2. Quality can be determined when sufficient knowledge and skills are available to construct the quality input to HEP.
  3. Quantity and quality are equally important in determining the HEP output of HUs.
  4. When quantity and quality are multiplied to show HUs, high scores in both components are needed to maximize output, a low score in one or the other will reduce the output, and a zero score in one or the other will provide no output.

5. HSI models each contain their own assumptions.
6. Models have limitations, particularly in their ability to capture geomorpholology and other dynamic variables in the ecosystem.

- **Assumptions in Analysis**

1. Target evaluation elements are appropriate for the evaluation being addressed. In other words, elements are significant resources and meet study objectives.
2. Time periods used in analysis are appropriate for the evaluation elements being evaluated (target years, project life).
3. Errors in study design and in data collection, analysis, and interpretation are sufficiently low to provide the desired rigor of evaluation.

2.3 FIMP COMMUNITY MODELS

The HEP Team reviewed conceptual transects of the Project area and evaluated the cover type information and aerial photography available for each to identify unique communities represented across the Project area. The HEP Team identified six major community types and each of these was developed into a community-based HSI model. Conceptual locations of these community types across the barrier island are shown in Appendix A, Figure 2.

1. OCEANBEACH (ocean nearshore and intertidal zone) – unvegetated area dominated by sand and extending from 30 ft (10 m) depth in the ocean landward to the average daily high tide line (i.e., wrack line).

2. VEGBEACH (ocean upper beach zone) – bare or sparsely vegetated area dominated by sand extending from the average daily high tide line (i.e., wrack line) landward to the toe of the primary (i.e., fore) dune.

3. DUNEGRASS (dune face, dunes, interdunes and swales) – area dominated by sand or herbs and extending from the seaward toe of the primary dune landward to the bayside storm high water mark, or landward to the seaward edge of the upland community. Beach grass is typically the dominant species, but the community often also includes a significant component of vine species. Shrubs, when present are typically stunted and cover less than 20% of this community. The community is well interspersed throughout the island from ocean to bay.

4. UPLANDS (dunes, interdunes and swales dominated by shrub, forest or development) – area with > 20% cover of non-wetland shrubs or trees and extending from the toe of the primary dune landward to the bayside storm high water mark. Herbs and/or vines are also common components of this community, but do not dominate (< 20% cover).

5. BAYBEACH (bay intertidal and bay upper shore zone) – area from the bay lowest-low water (LLW) line landward to the point where the upland or dunegrass (i.e., non-wetland) community is encountered. This community may be dominated by sand, mud, or vegetated with wetland herb and/or wetland shrub communities (e.g., *Spartina*, *Juncus*,

Salicornia, Phragmites, Baccharis, Myrica). This community includes intertidal areas and tidal ponds.

6. BAYSUBSAV (bay subtidal and submergent aquatic vegetation) – area from the bay LLW line bay ward (i.e., areas constantly covered by water). This community is typically dominated by bare sand substrate or submergent aquatic vegetation. The community also may include impounded areas (e.g., ponds) that are constantly covered by water.

The HEP Team used Community Model Builder prototype software to assist in developing HSI models for these six community types. During the work sessions, the HEP Team provided input that included the definition and measurable characteristics (i.e., variables) of the communities, optimal community conditions, sampling techniques, extent of communities, and significance of variable to each community. This information was entered directly into the Community Model Builder prototype database within the intent of producing baseline models and documentation for each model. Appendix E provides detailed model documentation. Copies of the minutes from HEP Team working sessions and meetings are provided in Appendix D.

The models developed for FIMP could be applied to other similar systems and processes. However, the assumption made by the HEP Team is that these models would only apply and be used for the FIMP Project area.

2.3.1 Optimal Conditions

Optimum conditions are those characteristics of a community that are most desirable and are (when present) indicative of a healthy, functional community that will host a diversity of plant and wildlife species. When observed in a community, optimal conditions receive an HSI score of 1.0. The optimum conditions were determined through a series of HEP Team meetings and relied on input from HEP Team members based on their professional opinion and consultation/input from professionals within their agencies. The general optimum conditions defined by the HEP Team for each of the six communities are described below. In all cases, the optimum condition assumes no effects from human-modified shoreline, no human disturbance factors, and no barriers to wildlife passage. Although the HEP Team identified the following "optimal" community conditions from which general assessments of habitat quality can be made, the HEP Team recognized that the barrier island ecosystem is a spatial and temporal mosaic of communities in varying successional series and geomorphological conditions that can not easily be captured through HEP models.

OCEANBEACH – relatively wide (> 2,000 ft) near ocean area extending from 30 ft offshore to the average high tide line, with appropriate species richness, invasive species are absent, area is traversable by wildlife, and lacks manmade structures and human disturbance.

VEGBEACH – relatively wide (> 125 ft) upper beach area extending from the wrack line to the toe of dune and with a shallow slope from 0 to 5%. Herbaceous vegetation present and density is close to 40% cover, no unnatural erosion, invasive species are absent, area is traversable by wildlife, and area lacks manmade structures and human disturbance.

DUNEGRASS – dune face includes a wide zone (> 45 ft) from toe to crest of dune with a slope between 20 and 25%, dune face not sloughing, herbaceous vegetation is present but densities are between 40 and 50% cover, invasive species are absent, area is traversable by wildlife, and area lacks manmade structures and human disturbance.

UPLANDS – a diversity of cover types based on vegetation including high coverage of shrubs and/or trees, any erosion is primarily "natural", area is traversable by wildlife, *Phragmites* or other invasive species are not present, and area lacks invasive species, manmade structures, and human disturbance.

BAYBEACH – a high number of the appropriate species present, invasive species are absent, any erosion is primarily "natural", area is traversable by wildlife, and site lacks manmade structures, and human disturbance.

BAYSUBSAV – a high number of the appropriate species present, including submerged aquatics, invasive species are absent, factors that limit eelgrass growth are absent, and the area lacks manmade structures, and human disturbance.

2.3.2 Model Variables

In defining the HEP communities, the HEP Team identified 13 variables, or measurable characteristics, of each community that could be evaluated to determine the overall quality of each community. Variables were identified and evaluated by the HEP Team throughout a series of HEP meeting (see the meeting minutes in Appendix D and HEP Documentation in Appendix E). Variables were modified, added, or removed as needed to refine the community models. A final list of all of the variables evaluated for each community is presented in Appendix B, Table 2. Variables evaluated included the following:

1. Species Richness (RICHSPP)
2. Presence of non-desirable, invasive, and/or exotic species (INVASIVES)
3. Percent Cover of Submergent Aquatic Vegetation (CANSAVCOV)
4. Average Width of Shoreline or Dune (WIDTH)
5. Average Slope of Shoreline or Dune (SLOPE)
6. Percent Cover of Vegetation (CANVEGCOV)
7. Percent Cover of Shrubs and Trees (CANTRSHRUB)
8. Presence of Human Disturbance (HUMFACTOR)
9. Magnitude of Impact From Human Disturbance (HUMMAGNIT)
10. Impact of Barriers to Wildlife Passage (BARWILDLF)
11. Presence of Erosion (EROSION)
12. Presence of Modified Shoreline (SHOREMOD)
13. Availability of Appropriate Substrate (SUBSTRATE)

See Section 4.0 below for field measurements and activities used in evaluating these variables.

2.4 MODEL DATA PROCESSING

2.4.1 Suitability Indices (SI)

The relationship between a given HSI variable and an estimate of habitat suitability are expressed by mathematical equations and described graphically using suitability index (SI) curves and histograms. These SI curves/histograms were developed by the HEP Team for each community model and are presented in Appendix E. The resulting spreadsheet provides the interface for raw field data entry and baseline variable SI calculations for each variable based on the curves/histograms identified by the HEP Team.

2.4.2 Mathematical Equations

Mathematical functions were created to define the relationships between the individual variables in the models based on input from the HEP Team regarding the "weight" that each variable should have in defining the overall HSI score for a community. For example, a very undesirable condition in a community may be factored into the equations (i.e., weighted) such that the presence of that condition would significantly lower the HSI score. The accuracy and utility of the proposed models were "tested" (i.e., validated and verified) with specific field and planning exercises on the District's ongoing FIMP SDR and ecosystem restoration feasibility study. The equations were evaluated by the HEP Team (see the HEP documentation in Appendix E for details), and were modified as needed based on HEP Team input. The final mathematical equations presented in Appendix B, Table 3, were applied to the output data from the FIMP HEP Curves spreadsheet in order to combine the individual variable SI scores to generate the overall HSI score for each community type.

The HEP Team considered three components when developing variables to facilitate an understanding of how equations are constructed: biota, geomorphology, and human influences. The mathematical functions used to combine variables and the assumptions and logic for decisions on combining and weighting variables within those models are provided in the Model Development section of Appendix B.

3.0 HEP APPLICATION METHODOLOGY

3.1 HABITAT UNIT (HU) CALCULATIONS

The FIMP HEP Equations spreadsheet was used to calculate HUs by multiplying the cover type acreage (*i.e.*, available habitat) by the average HSI score for each community at a given transect or restoration/project site. Simply put, HUs are a numerical representation of habitat quality and habitat quantity where:

Habitat Quality = Habitat Suitability Index (HSI)

Habitat Quantity = Area (i.e., acres)

Therefore

$$\boxed{\textbf{HSI x Acres = HUs}}$$

Acreages for communities at restoration sites were obtained through cover type mapping. Acreages for communities at the shoreline stabilization project locations were obtained by identifying the width of each community from aerial photography then multiplying the width by the length of each community (i.e., potential project area) as identified from shoreline stabilization designs. Data from shoreline stabilization designs were used instead of aerial photography in cases where designs provided both the length and width for a given community (e.g., beach width or foredune width).

3.2 Average Annualized Habitat Unit (AAHU) and Cumulative Habitat Unit (CHU) Calculations

HEP analysis provides the numeric input (i.e., HUs) for use in determining which project or restoration alternatives are cost-effective and/or incrementally justified based on the environmental benefits provided by the action (i.e., HEP HUs), and when combined with costs result in a cost per unit benefit (i.e., cost/HU). Benefits are environmental in nature (e.g., improved habitat) and are portrayed in non-monetary forms.

To evaluate habitat conditions over time, four Target Years (TYs) were identified for the Study and included TY0 (baseline conditions), TY1 (first year that conditions are expected to deviate from the baseline condition), TY5 (to provide additional precision to the Study by enabling the model to capture changes between TY1 and TY50) and TY50 (last year in the period of analysis). The HSI score at TY5 is carried through to TY50 with the assumption that the action occurring between TY1 and TY5 is self sustaining or, if not self-sustaining, management activities will occur to sustain the results of the action. The HUs (HSI score x acres), form the basis for the calculation of the CHUs and AAHUs. CHUs were calculated by using the generalized formula outlined in the HEP Manual (USFWS 1980) and presented below:

$$\text{Cumulative HUs} = (T_2 - T_1)\left[\left(\frac{A_2H_2 + A_1H_1}{3}\right) + \left(\frac{A_2H_1 + A_1H_2}{6}\right)\right]$$

WHERE:

T_1 = first target year of a time interval

T_2 = last target year of a time interval

A_1 = area of available habitat (*i.e.,* cover type) at beginning of the time interval

A_2 = area of available habitat (*i.e.,* cover type) at end of the time interval

H_1 = HSI at beginning of the time interval

H_2 = HSI at end of the time interval

3 and 6 = constants derived from integration of HSI x Area for the interval between any two target years

Habitat gains or losses were annualized by summing CHUs across all target years, and dividing the total by the number of years in the life of the Study to obtain an AAHU value. CHUs and AAHUs were calculated on a per transect/per site basis.

3.3 EVALUATING FUTURE TRENDS

The HEP Team evaluated the six HEP communities to determine how the quality and characteristics of each might be expected to change over a 50-year period under two scenarios: 1) future no-action, which represents site conditions should no future SDR or restoration activities take place; and, 2) future with-action, which represents conditions should restoration activities and/or proposed District SDR activities occur. The HEP Team developed assumptions regarding the future habitat conditions within restoration sites based on HEP Team discussion, professional opinion, and expected results based on previous studies. Future conditions within project location sites were based on the same assumptions identified by the HEP Team for restoration sites as well as data from engineering models.

3.3.1 Future No-Action

The purpose of evaluating No-Action alternatives is to examine changes that are anticipated throughout the area if no actions (i.e., restoration or project activities) were to occur. Conditions with the proposed restoration or project activity are compared to conditions without the action to identify the beneficial and adverse effects of a proposed activity. These comparisons provide the framework for the evaluation of alternative plans. In HEP analysis, projections of with- and without-project conditions consider expected future environmental conditions, especially trends in ecosystem change. The future without-project is defined as the most likely future conditions in the absence of a proposed Federal project. It forms the base condition against which the benefits and impacts of alternative plans are assessed**.**

Factors such as ongoing natural succession, coastal erosion, as well as land and infrastructure development were not fully evaluated and incorporated into the future model due to the challenges of predicting future site conditions with any degree of confidence. However, some general trends (e.g., continued erosion of the bay shoreline and ocean beach/dunes in areas currently experiencing high rates of erosion) were taken into consideration and included in calculations of future conditions. In many cases, communities are expected to shift across the barrier island, whereby decreases in size and/or habitat quality (i.e., downward trend of HUs), would occur in some locations, but increases in size and/or habitat quality (i.e., upward trend of HUs) would offset this change in other locations. For HEP evaluation purposes, some modifications to individual HSI scores were accounted for in the model calculations. The assumptions and future predictions are discussed in the meeting minutes in Appendix D and summarized in Appendix B, Table 4.

When calculating future no-action conditions for restoration and project alternatives (including breach response), the following assumptions/rules were applied:

1) Baseline habitat quality and quantity at TY0 (i.e., baseline) would be the same as those documented for baseline from 2004 and 2005 field surveys regardless of when TY1 actually occurs;

2) Future habitat conditions at TY50 for restoration sites and SDR project locations were based on application of HEP Team professional judgement regarding changes to the habitat suitability scores over the life of the project (Appendix B, Table 4);
3) Future habitat conditions at TY50 for restoration sites and SDR project locations would be the same as those at TY5; management activities would keep the habitat conditions stable between TY5 and TY50 if necessary; and,
4) At potential breach locations, habitat conditions at TY1 were based on a full breach occurring at the location, and breach impacts would be realized immediately (i.e., at TY1).

3.3.2 Future Trends With-Project or Restoration

The purpose of evaluating future trends with a proposed action (i.e., SDR or restoration) is to determine how habitat quality and quantity are expected to change over time should a proposed activity such as restoration or shoreline stabilization occur. These changes could be positive, negative, or have no affect on a community. When calculating future with restoration or project alternatives (including breach response), the rules/assumptions applied include the following:

1) All changes in habitat conditions for restoration or project activities (excluding breach response scenarios) would be realized in TY5 immediately following the action at TY1, and would remain consistent through TY50;
2) Additional target years to account for a decline in habitat conditions over time or an improvement in conditions due to maintenance activities are not included in the models;
3) Breach response scenarios assume a breach occurs at TY1 and that full closure and associated habitat changes would be realized in TY5 and would remain consistent through TY50;
4) Changes in habitat quality and quantity at TY5 for restoration sites were based on professional judgment, HEP Team input, and an assessment of likely outcomes based on similar restoration efforts;
5) Changes in habitat quality and quantity at TY5 for project sites were based on engineering models of future site conditions, as well as professional judgment, and an assessment of likely outcomes based on similar project efforts; and,
6) Any maintenance activities necessary for the long-term success of the restoration or project activity through TY50 would be carried out over the life of the project; either by the USACE or non-Federal sponsor, or local interested parties. This assumption is only valid with local sponsor buy-in as a result. If these projects are not monitored and managed after being constructed, site conditions could change from natural succession or invasion of non-native species or human disturbances, which could severely limit habitat suitability for target species/communities.
7) There is a need for local sponsor buy-in, for both restoration and SDR projects. If these projects are not monitored and managed after being constructed, site conditions could change from natural succession or invasion of non-native species or human disturbances, which could severely limit habitat suitability for target species/communities.

In addition, as previously noted the HEP Team developed a matrix to evaluate very general anticipated effects from proposed restoration activities on the five coastal processes. This matrix is presented in Appendix B, Tables 7, 8, and 9. This matrix serves as one of several tools that will be expanded upon and used in combination with other tools, such as the ranking matrix (Appendix B, Table 11), during the next phase of HEP restoration/project evaluation. Results of that evaluation will be presented in the Phase II report.

4.0 DATA COLLECTION METHODOLOGY USED TO DETERMINE BASELINE CONDITIONS

The following sections describe the methodology used to collect and analyze the habitat variables necessary to characterize the baseline ecological resources located within the Study area. The sampling effort used GIS cover type map analysis in conjunction with field data measurements to evaluate the HSI variables associated with the six community type models developed by the HEP Team. HEP data were collected at 21 transect locations across the barrier island thought to be most representative of habitat conditions in the Project area (Appendix A, Figure 3). Data from these transects were extrapolated to areas similar in community characteristics for a full evaluation of the 16 restoration, 24 SDR, and 10 breach response locations.

4.1 COVER TYPE MAP PREPARATION

To fully quantify the habitat conditions, the HEP process requires the Study area be divided into manageable sections and quantified in terms of acres. This process, referred to as "cover typing," allows the user to define the differences between vegetative covers (e.g., ocean, beach, shrub, forest, salt marsh, bay), hydrology and topographic characteristics, and clearly delineate these distinctions on a map. The final classification system, based primarily upon dominant vegetation cover, captures "natural" settings and common land-use practices in a specific and orderly fashion that accommodates the USACE Plan Formulation Process.

Cover type maps (depicting the six target HEP communities) were created for the vicinity of each HEP data collection transect based upon data collection and existing data and maps. ARCView® and ARC/INFO® GIS software were used for cover type map preparation and editing (Environmental Systems Research Institute [ESRI] 2000). Several existing cover type maps, aerial photography, and baseline GIS data layers, of varying degrees of coverage, accuracy, and level of detail, were evaluated for potential use as base maps in the HEP evaluation process (NOAA 1998, Marine Sciences Research Center 2002). The best available cover type map data were selected to create individual cover type maps for each HEP transect area and provided the foundation for future cover type map updates and revisions as were needed to refine the maps for use in HEP. For example, maps required consolidation and retyping of vegetated communities for use with the six defined HEP community types (i.e., all upland habitat types were lumped into one upland cover type) and included a disturbed community type to document areas of overall minimal habitat value due to significant modification or disturbance (e.g., roads, parking lots, residential communities, marinas, sites devoid of natural vegetation or characteristics). Color aerial photographs from 2002 and 2004 and standard stereoscopic photo-interpretation methods were also used to assist in the evaluation and refinement of cover type map.

Cover type maps were created for communities in the vicinity of potential restoration or SDR sites and included area within the extent of perceived potential direct impact from either restoration or SDR activities. Therefore, the length and width of the areas mapped for each location varied depending on proposed actions in a given area. In general mapped communities on the barrier island extended from 30 ft depth on the ocean side to 500 ft beyond the LLW mark on the bayside. On the mainland sites, mapped areas extended from 500 ft from the LLW mark bayside landward for 500 ft beyond the point that a contiguous upland community was encountered. All communities on islands and extending up 500 ft beyond the LLW mark of islands were mapped. It is recognized that indirect impacts could occur beyond the mapped area. However, analysis did not include evaluation of potential indirect effects from proposed restoration or project activities. Cover type maps were used to generate acreages for baseline conditions and for the evaluation of restoration and potential SDR actions. Appendix J provides representative photographs of the cover types.

In addition, during data collection activities at each transect, the vicinity of each HEP transect was ground-truthed to confirm the accuracy of existing cover type maps. As a result, some areas required adjustments to polygon boundaries and/or habitat type classifications to improve the accuracy of the maps. A Global Positioning System (GPS) was used to record significant discrepancies between notations on the draft Cover Type Map and field verify conditions.

4.2 TRANSECT LOCATION

HEP survey transects were placed in locations that incorporated the highest number of the six community types identified for HEP and areas that had some restoration potential. The location and direction of sampling transects were identified by the District during site visits to identify potential restoration areas in the FIMP area and in areas deemed most likely in need of SDR activities.

In selecting transect locations, the District conducted a visual evaluation of over 60 potential sites within the Study area, including 24 sites on the barrier island and oceanfront areas of the mainland, 15 dredge disposal islands, 21 dredge disposal sites on the mainland, and areas within Wertheim and Seatuck Wildlife Refuges. The District initially identified restoration sites, and the HEP team developed additional sites with input from outside sources and interested parties. In addition, the HEP Team was provided orthoquad imagery at 1-foot resolution for each area and invited to participate in a field site visit to transect locations.

From the areas evaluated, 21 sites were selected for use in HEP data collection activities and are listed in Table 1 below and shown in Appendix A, Figure 3. Sites were selected based on representative habitat types, accessibility, feasibility of restoration, and the type of restoration likely at each site and included developed and undeveloped areas of the barrier island, the south shore of mainland Long Island, and dredge islands located between the barrier island and the south shore of Long Island. In addition, Appendix J provides representative photographs of the community types found along each of these transect areas.

Table 1. HEP Data Collection Transects

Robert Moses Lot 4	WOSI (west of Shinnecock Inlet)	Democrat Point
Sunken Forest	Ocean Beach	Oak Beach
Reagan Property	Georgica Pond	Ponquogue Spoil
Old Inlet	Ditch Plains Road	Warner (east)
Great Gun	Ranch Road Bluffs	John Boyle
Pikes Breach	Hook Pond	New Made
Tiana	Mastic Community	East Inlet

4.3 FIELD SAMPLING DESIGN

Sampling was conducted within a 250-foot wide area along each HEP transect. A 125-foot area, located on either side of the transect, was evaluated except in cases where sampling procedures called for a larger evaluation area. For example, an area up to 1,000 ft on either side of the transect was evaluated for presence of modified shoreline. A unique data form and set of field variables was utilized for each community. Examples of the field data forms are provided in Appendix F.

One field data form was designed for each unique community type to facilitate data management tasks such as data collection, data entry, and data verification. The HEP data forms contained sections for the documentation of general plot characteristics, HSI and data analysis related variables, and an area to record general notes and/or observations associated with a specific transect. Unique features and examples of the community types encountered along each transect were documented with photographs. To ensure accurate estimates, field members estimated habitat variables independently and recorded the average or came to consensus on the best estimate.

4.4 FIELD MEASUREMENTS

A team of biologists (field team) conducted field data collection activities for HEP during the summer and fall of 2004 and during the spring and summer of 2005. The District determined the methods used in field data collection. The District field-tested the sampling approach, collected data on several pilot study areas, and reviewed preliminary results (both in the–field and at HEP meetings) with the HEP Team. The community models, variables, and data collection methods were revised as needed to address recommendations made by the HEP Team (see the meeting minutes in Appendix D for details).

Data collection activities included field verification of cover type maps, evaluation of potential restoration and SDR sites, HEP transect selection, HEP data collection, and to develop conceptual restoration designs. The objective of data collection efforts was to rapidly acquire adequate general habitat information consistently across all transects and communities and to use that data to populate HEP models for comparative evaluations of habitats across sites. Data were collected at 21 locations along the Project area that were representative of the habitat conditions found along the barrier island and representative of locations where future restoration or project activities might occur (Appendix A, Figure 3). Data were extrapolated from these areas to areas with similar characteristics for a full evaluation of 16 restoration sites, 24 SDR project locations, and 10 potential breach response locations.

The HEP Team agreed that when possible, existing data from previous studies in the area (e.g., benthic, finfish, submergent aquatic vegetation) could be used as surrogates to field data or used in support of field data. Data from other submergent aquatic vegetation and beach invertebrate community studies were included in the analysis as discussed below (USACE 2003, 2004a).

The following text describes how the variables for each community type were measured in the field. All values were based on a qualitative assessment of conditions except for species richness, species abundance, percent cover of eelgrass, number of community types, and width of cover type HSI variables (which were based on quantitative values). Unless otherwise noted, the average condition was recorded for each variable within a 250-foot survey area (125 ft to either side of the transect). Data from these variables were used to produce HSI scores based on the variable suitability indices presented in Appendix E and mathematical formula relationships.

Species Richness (RICHSPP) – total number of unique species of native flora and fauna identified in a given community (the total number of individuals observed was not factored into this score). Several sampling methods were used to collect data for variables relating to species richness including pit fall trapping (small mammals), clam raking (aquatic invertebrates), 1-meter quadrats (vegetation), and seining (fish). All HEP data collection included a one-time sample effort conducted during the summer/fall of 2004 or the spring/summer of 2005. When available, data from previous District studies were used. However, the sampling effort from previous studies was more rigorous (e.g., covered numerous intertidal and upper beach zones) than that conducted for HEP (which only targeted one zone). Therefore, only data from the supra zone were used from the 2003 pit fall data and only data from the mid zone were used from the 2003 benthic core data (USACE 2003) (correct reference?).

Richness for the BAYBEACH community included data from general observations, quadrat sampling, benthic grabs, raking, and pit fall trapping. Pit fall trapping involved the random placement of five 4-inch deep and 3-inch diameter pit fall wells along the 250-foot wide transect just above the mean high water line. Traps were left in place over a 24-hour period. Samples were collected, stored in alcohol solution, identified to unique species and counted. Quadrat sampling included documenting the number and percent cover of plant species from five 1-meter square quadrats randomly dispersed within salt marsh areas of the community. One benthic grab was taken at the mid tide line of each transect. Samples were preserved in formalin, identified to unique species (when feasible), and counted. Raking included documenting species and number of macrofauna collected using a standard clam rake with a 2-foot rake width.

Richness for the BAYSUBSAV community included data from general observations, quadrat sampling, seining, and raking. An area within approximately 500 ft of the survey transect was evaluated for presence of submergent aquatic vegetation (SAV). When found, surveys were conducted within the SAV bed. Alternately, if no SAV was found, surveys were conducted below the LLW line and within the approximately 250-foot wide transect area. Five, 50-foot, seine surveys (using a 50 foot seine net with ¼ inch mesh) were conducted in the BAYSUBSAV communities. All species, and the average number of each species, were recorded. Raking included documenting all species of macrofauna, and the average number of each species, collected using a standard clam rake with a 2-foot rake width. Five, randomly placed 50-foot long areas were surveyed. Quadrat sampling included documenting the number and percent cover of eelgrass from five 1-meter square quadrats randomly dispersed within submergent aquatic vegetation within 500 ft of the transect.

Presence of Non-desirable, Invasive, and/or Exotic Species (INVASIVES) – the average percent cover of invasive species found within a community (based on a visual assessment of the average condition). The HEP Team identified a list of undesirable species, which would indicate an unhealthy, low quality community. Species included common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), and Says mud crab (*Dyspanopeus sayii*). The field team recorded the collective number of undesirable species encountered, and the approximate percent cover, during general observations, quadrat sampling, raking, seining, and pit fall trapping.

Percent Cover of Submergent Aquatic Vegetation (CANSAVCOV) – the average percent cover of eelgrass collected from five randomly placed 1-meter quadrats in each SAV bed. This variable differs from richness in that percent cover is documented. The field team sampled known SAV locations from previous SAV studies by the District when the beds were located within 500 ft of the transect. Otherwise, the field team sampled within the 250-foot wide transect area below the LLW line. If no SAV was found within the 250-foot wide transect, the percent cover of submergent vegetation was recorded as zero.

Average Width of Shoreline or Dune (WIDTH) – the field team measured the linear distance that the centerline of each transect traversed each community type. Suitability scores were based on linear distance and separate suitability indices (e.g., width criterion) were used to evaluate each community. In addition, because beach and dune characteristics can vary greatly over a broader area than that covered by HEP, elevation information from Light Detection and Ranging (LIDAR) data and engineering models were used to further refine the value for the average width of beaches and dunes in the general vicinity of the transect.

Average Slope of Shoreline or Dune (SLOPE) – the field team recorded the average slope of the VEGBEACH community and the average slope of the dune face in the DUNEGRASS community using a clinometer. Suitability scores were based on percent slope and separate suitability indices (e.g., slope criterion) were used to evaluate each community. As was the case with the width variable, information from LIDAR data and engineering models were used to further refine the value for the average slope of beaches and dunes in the general vicinity of the transect.

Percent Cover of Vegetation (CANVEGCOV) – the percent of vegetative cover within each zone of the 250 foot wide transect (based on a visual assessment of the average condition observed throughout the transect area) were recorded for the VEGBEACH and DUNEGRASS community types (in class ranges?). Suitability scores were based on average percent cover throughout the community and separate suitability indices (e.g., percent cover criterion) were used to evaluate each community. All vegetation (e.g., herb, tree, shrub) was included collectively in the estimate of percent cover for these communities.

Percent Cover of Shrubs and Trees (CANTRSSHRUB) – the average percent cover of vegetative cover of shrubs and trees (based on a visual assessment of the average condition observed throughout the transect area) were recorded for the UPLAND community type. This differs from CANVEGCOV in that it applies only to the UPLAND community and did not include herbs.

Presence of Human Disturbance and *Magnitude of Impact From Human Disturbance* (HUMFACTOR + HUMMAGNIT) – the HEP Team identified a list of nine general disturbance factors that when present would reduce the quality of a community type. Disturbance factors included vehicle use, hard structures, major development, minor development, periodic maintenance, trash/debris, sources of pollution, active human use for recreation, and degraded due to filling, excavating or land clearing. The field team tallied the number of disturbance factors observed in each community type and ranked the magnitude of the disturbance. Ranking permitted the field team to account for varying effects from the disturbance. For example, in some areas only one disturbance factor may be noted, but the effects from that disturbance on the community may be severe. Alternately, some areas may have multiple disturbance factors, but the overall impacts are low.

Presence of Impact of Barriers to Wildlife Passage (BARWILDLF) – the HEP Team identified a variety of conditions that when present may restrict access for small to medium-sized wildlife species. Barriers included extremely dense vegetation (that could preclude chicks or terrapins from passage), curbs, walls, fences, development, steep banks, and roadways. The HEP Team tallied the number of barriers observed in each community and ranked the severity of the impact to wildlife as a result of the barriers. The HEP Team recognized that most wildlife species can navigate around structures, so the evaluation area for wildlife barriers was expanded to 500 ft to either side of the transect. For example, a building may cover much of the width of the 250-foot transect. However, species may have complete accessibility to other community types by navigating around the building. In this case, the building was not recorded as a major barrier to wildlife. The building was noted, but ranked as a minor impact. Alternately, a 4-foot tall fence extending for 1,500 ft along the shoreline was noted as a major wildlife barrier.

Presence of Erosion (EROSION) – the field team answered yes or no to this question based on visual evidence of erosion such as slumping banks, undercutting, gullies, obvious runoff or sedimentation observed within the 250-foot transect. The field team made no distinction between erosion resulting from natural or unnatural sources.

Presence of Modified Shoreline (SHOREMOD) – the field team answered yes or no to this question based on visual evidence of hard structures (e.g., groins, jetties, sea walls, bulkheads, marinas, docks) observed within 1,000 ft to either side of the transect.

Availability of Appropriate Substrate (SUBSTRATE) – based on visual observation, the HEP Team answered yes or no regarding the question of whether suitable substrate was present in the evaluation community. When answering, it was assumed that issues such as pavement, asphalt, etc. were addressed by the HUMFACTORS variable. This variable evaluated whether mudflat, sand, and soil substrates were appropriately placed. The intent of this variable was to ensure that an existing substrate type was not changed to a different substrate type as a result of a project (e.g., to avoid an existing area of cobble habitat becoming a sand beach).

5.0 DATA ANALYSIS

The HEP field data were determined to be representative of the typical habitat conditions likely to be encountered in the six community types commonly found across the barrier island and therefore the baseline data from these sites were used to evaluate some additional sites across the island. For example, HEP data collected along transects located in highly developed areas, such as Ocean Beach and Reagan, could be applied to other highly developed areas with similar characteristics such as Davis Park, without having to revisit each location to collect additional HEP data. Therefore, the HEP data collected at the 21 representative locations along the barrier island were used to evaluate 16 restoration sites (Appendix A, Figure 4), and the 24 SDR sites and 10 breach response sites (Appendix B, Figure 5) as described below.

5.1 RESTORATION SITES

The HEP Team identified 16 potential restoration locations in the vicinity of the Project area that were designated as priority restoration areas as shown in Table 2 below and in Appendix A, Figure 4. Sites were initially identified by the District with additional sites developed by the HEP Team with input from various other stakeholders and interested parties. Ten of these sites, highlighted in bold font in the list below, were surveyed as part of the original 21 HEP data collection transects. However, six locations were added in order to evaluate a broader scope of restoration alternatives, site conditions, and locations in the Project area. Kismet-Atlantique-Fair Harbor comprises three locations on the barrier island, but is presented as one site to facilitate the evaluation of the restoration alternative proposed for the area. Cover type maps were created for each location to facilitate the evaluation of restoration sites and development of conceptual restoration designs and are presented in Appendix G.

To facilitate evaluation and modeling efforts, transect nomenclature for those transects from the original 21 transect was carried through. That is, original transect T-1 was not carried through as a potential restoration site, thus there is not a T-1 in the list of restoration sites within the text and appendices of this report. T-2, Sunken Forest, is carried through and references to this restoration sites are made within the report and appendices.

The District compared the characteristics of each community found in the six new sites with those from the original 21 HEP transects to select data from similar community types for use in the HEP analysis. Averages were used in cases where a community at the new site was similar

Table 2. Potential Restoration Site Locations

Sunken Forest	**Georgica Pond**	Davis Park
Reagan Property	**John Boyle Island**	Atlantique to Corneille
Great Gun	**New Made Island**	Kismet-Atlantique-Fair Harbor
Tiana	**East Inlet Island**	Warner Island (south)
WOSI (west of Shinnecock Inlet)	Islip Meadows	
Ocean Beach	Seatuck Refuge	

in characteristics to the same community in more than one HEP transect. Appendix B, Table 9 provides a list of the restoration sites and the associated HEP data that was used to calculate the HSI scores for each. HEP analysis for the 16 restoration sites included baseline conditions, future conditions without restoration, and future conditions with restoration.

5.1.1 Baseline Conditions

When calculating baseline conditions, the raw field data collected in 2004 at the HEP transect locations were entered into the FIMP HEP Curves database, to generate the individual HSI scores for each variable. The resulting HSI variable scores from those HEP transects that corresponded to each restoration site (in accordance with Appendix B, Table 9) were then incorporated into the FIMP HEP Equations database, and scores for HSI variables were combined using the HSI model equations as described in Section 2.2.1 to generate a final HSI score for each community type. Final HUs were calculated by multiplying the total acres at each restoration site (derived from cover type maps) by the average HSI score for each site. Appendix G provides a cover type map depicting baseline conditions for each restoration site.

5.1.2 Future Conditions without Restoration Action

Future conditions were calculated for each site by entering the raw field data into a modified FIMP HEP Curves database to generate the individual HSI scores for each variable in each community type. These HSI scores were then incorporated into a version of the FIMP HEP Equations database which had been modified to reflect HEP Team decisions regarding how a community might change over the 50-year life of the project without a proposed activity as discussed in Section 2.4 and presented in Appendix B, Table 4. Modifications were made to the FIMP HEP model variables if the change in future condition was determined to directly affect the extent or quality of the variable or community.

5.1.3 Future Conditions with Restoration Action

The HEP Team developed numerous potential restoration options for each of the 16 restoration locations shown in Appendix A, Figure 4. The conceptual restoration designs and general description of proposed restoration activities are presented in Appendix G for each site. The options included the following: 1) habitat enhancements that would change HSI scores but not affect acreages; 2) habitat enhancements that would change HSI scores and affect acreages (some projects focus on developing natural processes or habitats that could alter existing HEP communities) or, 3) conversion of disturbed areas (non-HEP communities) into a HEP community. The alternatives proposed are not necessarily supported by all members of the HEP Team and have not been evaluated by entities outside of the HEP Team. They are strictly conceptual in nature and are presented in order to evaluate a full range of possible scenarios that could be implemented to address restoration needs at a given site. The proposed option may or may not be feasible and will be further evaluated during subsequent analysis of options.

Similar to the future without restoration conditions calculations, the future with restoration scenarios were calculated for each site by first entering the raw field data into a modified FIMP HEP Curves database and incorporating the values from appropriate transects into a modified version of the FIMP HEP Equations database. The results were then adjusted based on HEP Team input, professional judgment, and results from related studies, regarding the direct effect that restoration of a given location/community would have on the HSI model variables or community. Modifications were made to the HSI variables as appropriate and were documented directly in the FIMP HEP Equations database for each alternative.

In calculating AAHUs, the changes in habitat quality or quantity anticipated as a result of restoration activities, were applied between TY1 and TY5 and were then assumed to remain constant through TY50. Additional target years to account for a decline in habitat conditions over time or an improvement in conditions due to maintenance activities are not included in the models. In this evaluation, is assumed that any maintenance events needed to ensure the habitat conditions at TY5 are maintained over the 50-year life of the project (i.e., vegetation removal, invasive species control, beach renourishment, minimization of human impacts, etc.) would occur. It is recognized that should maintenance activities not occur, a general decrease in habitat quality would likely occur over time and these conditions are not accounted for in the HEP method under the with-restoration scenario. Although management will be necessary to ensure long-term sustainability of restored sites, it is assumed that management activities will be funded by project sponsors or funded under separate USACE authority.

Three alternatives were presented for each restoration site as described in Appendix G. Proposed restoration could result in a change in habitat quality (i.e., HSI score), a change in the extent of habitat (i.e., acres), or both, and these changes are documented in the FIMP HEP Equations database for each alternative. In some cases, alternatives include options such as marina removal, bulkhead removal, buy-outs, etc. Landowner support for such alternatives would be a large consideration, and landowner support is also considered for all alternatives. If supported, alternatives would be further evaluated relative to their merits for habitat restoration and SDR, and availability of appropriate sources of funding,

5.2 STORM DAMAGE REDUCTION SITES

District engineers evaluated over 375 locations within the Study area as potential sites with SDR needs. SDR alternatives may potentially include a wide range of measures, many of which are being evaluated separately under the FIMP study. For purposes of this HEP evaluation, the SDR activities evaluated are comprised of a one-time event that includes placement of sand on an eroding beach to widen the beach and improve slope, the creation of a design berm that protects the dune from erosion, storm tides, and waves, and restoration of 40% vegetative cover in the upper beach area. Design specifications for slope, width, and initial beach fill quantities are presented in Appendix H.

Generally, in terms of HEP, when compared to baseline conditions, the proposed SDR activities would result in wider beaches and foredunes, higher dunes with stable foredune slopes, and adequate vegetation in the upper beach and foredunes to stabilize the areas. Thus, the proposed SDR activities are applicable to oceanfront shorelines and do not directly apply to uplands and bayside areas in the FIMP study area. It is understood that the proposed activity may result in various indirect impacts to the other communities and adjacent areas. However, as discussed at various HEP Team meetings, these indirect and often cumulative impacts are not easily quantified and the HEP Team was unable to identify specific variables or assumptions needed in the HEP method to address these concerns.

From the 375 locations, 24 were selected by the USACE for further evaluation using HEP as listed in Table 3 below and shown in Appendix A, Figure 5. Through the use of modeling, these sites were determined by the District to be the most significant priorities in terms of meeting the stated SDR goals and objectives. Cover type maps were not created for SDR locations. Instead, acreages for each community within a site were generated based on engineering data for the ocean shoreline communities (provided in Appendix H), and based on a visual assessment of 2004 aerial photography to determine the average length and width (i.e., area) of upland and bayside communities.

To facilitate evaluation and modeling efforts, the nomenclature for the original storm damage reduction sites was carried through on the 24 sites selected for further evaluation in HEP. That is, the SDR site GSB-3B was not carried through as a potential storm damage reduction site for this HEP evaluation, thus although there are options 3B, 3C, etc. presented within this text and in appendices, 3A was excluded.

As with the HEP analysis for the restoration sites, the District compared the characteristics of each community found in the storm damage reduction sites with those from the original 21 HEP data collection transects to select data from similar community types for use in the HEP analysis for the project locations. Four of the proposed SDR project areas, highlighted in bold font in the list above, were located within areas surveyed as part of the original 21 HEP data collection transects, and/or were determined to have similar characteristics throughout the site as the surveyed areas. In these cases, the original HEP data were used for these sites as indicated in Appendix B, Table 10. The remaining 16 locations were determined to have characteristics representative of several of the HEP transects. For these sites, averages were used to characterize sites where a community of the new site was similar in characteristics to the same community in more than one HEP transect as shown in Appendix B, Table 10.

HEP analysis for the 24 SDR project sites included baseline conditions, future conditions without SDR action, and future conditions with SDR action under two scenarios: Small = 13 foot maximum dune height, and Large = 17 foot maximum dune height. Two different baseline conditions were used in order to fully evaluate the two extremes of the full range of alternatives

Table 3. Potential Storm Damage Reduction Project Locations

Robert Moses State Park	Talisman to Water Island	**Westhampton – Pikes Beach**
Fire Island Lighthouse	Water Island	Westhampton – East
Kismet to Lonelyville	Water Island to Davis Park	Sedge Island
Town Beach to Corneille	Davis Park	**Tiana**
Ocean Beach to Seaview	**Old Inlet**	Shinnecock Inlet Park – West
Ocean Beach to Point-O-Woods	Smith Point County Park–West	**WOSI** (W of Shinnecock Inlet)
Cherry Grove	Smith Point County Park–E	Potato Road
Fire Island Pines	Cupsogue	Montauk

under consideration. The small scenario is the landward-most baseline. This scenario involves the smallest volume of sand placement, but provides the least amount of SDR. The large scenario is the seaward-most baseline. This scenario results in the largest volume of sand placement and the most SDR. The reason for evaluating these separately is that the footprint for each area of evaluation differs and average slopes and widths used in the analysis may differ because they are based on different areas of baseline coverage.

Because only the shoreline communities are directly impacted by the proposed action, the habitat quality (HSI) and quantities (acres) were modified based on proposed SDR plans only for the OCEANBEACH, VEGBEACH, and DUNEGRASS communities. Changes in habitat quality and quantity in upland or bayside communities was modified only to account for assumptions made by the HEP Team regarding future conditions (e.g., that habitat quality/size would decrease over time due to development pressures, continued erosion, etc.).

5.2.1 Baseline Conditions

Baseline conditions for the SDR project locations were calculated in the same manner as for the restoration site locations. Raw field data were entered into the FIMP HEP Curves database and the resulting HSI scores from those HEP transects that corresponded to each Project site (in accordance with Appendix B, Table 9) were then incorporated into the FIMP HEP Equations database. The raw HSI values for the six community types were combined in accordance with the HSI model equations as described in Section 2.2.1 to generate a final HSI score for each community type at each potential project location. Final HUs were calculated by multiplying the total acres at each SDR site (derived from engineering models or a visual assessment of aerial photography) times the average HSI score for each site.

5.2.2 Future Conditions Without Storm Damage Reduction

Future conditions were calculated for each SDR site using the same databases and assumptions as were used for calculating future conditions for the restoration scenarios. The general trends of habitat changes identified by the HEP Team for restoration areas (presented in Appendix B, Table 4) apply throughout the study area.

5.2.3 Future Conditions With Storm Damage Reduction

District engineers developed numerous potential SDR options for each of the 24 SDR locations shown in Appendix A, Figure 5. The specifications for proposed SDR activities at each location are presented in Appendix H.

The SDR scenarios included only measures to modify beach and dune areas. Therefore, future with SDR project conditions were calculated based on the assumption that the slope, width, and/or height of the OCEANBEACH, VEGBEACH, and DUNEGRASS communities would be affected by the SDR projects. The HEP methodology does assess all six community types, since the general assumptions for the other three communities (BAYBEACH, BAYSUBSAV, and UPLAND) are included, as discussed in Section 2.4 and presented in Appendix B, Table 4. Raw engineering data for slope/height/width were entered into the FIMP HEP Curves database for the applicable community types as identified in Appendix B, Table 10. The resulting HSI scores from the appropriate HEP transects were then incorporated a version of the FIMP HEP Equations database which had been modified to reflect HEP Team decisions regarding how a community might change (presented in Appendix B, Table 3). The total acreage of a given location before and after the proposed project activity did not change under various SDR options. However, the distribution of the acreages among the OCEANBEACH, VEGBEACH, and DUNEGRASS community types may change under various scenarios, and these changes in the extent of a community were factored into the models as changes in acreages.

In calculating AAHUs, the changes in habitat quality or quantity anticipated as a result of project activities were applied between TY1 and TY5 and were then assumed to remain constant through TY50 (i.e., 50-years). That is, additional target years to account for a decline in habitat conditions over time or an improvement in conditions due to maintenance activities are not included in the models. In this evaluation, is assumed that any maintenance events needed to ensure the habitat conditions at TY5 are maintained over the 50-year life of the project (i.e., vegetation removal, invasive species control, beach renourishment, minimization of human impacts, etc.) would occur. It is recognized that should maintenance activities not occur, a general decrease in habitat quality would likely occur over time and these conditions are not accounted for in the HEP method under the with-project scenario. Although management will be necessary to ensure long-term sustainability of restored sites, it is assumed that management activities will be funded by project sponsors or funded under separate USACE authority.

5.3 BREACH RESPONSE ALTERNATIVE EVALUATION

Of the 24 sites originally evaluated for SDR actions and shown in the Table 4 below, 10 sites were deemed most susceptible to breaching and were selected for further evaluation of project activities that would include breach response. These sites are highlighted in bold font in the list below and shown in Appendix A, Figure 5. For breach response evaluation purposes the Old Inlet site was evaluated as two separate sites (Old Inlet East and Old Inlet West). HEP analysis for the 10 breach response project sites included baseline conditions (pre-breach conditions), future conditions without breach response action (post-breach conditions), and future conditions with breach response action (i.e., breach closure). It is understood that the proposed activity may result in various indirect impacts to the other communities and adjacent areas. However, as

Table 4. Potential Breach Response Project Locations

Robert Moses State Park	**Talisman to Water Island**	Westhampton – Pikes Beach
Fire Island Lighthouse	Water Island	Westhampton – East
Kismet to Lonelyville	Water Island to Davis Park	**Sedge Island**
Town Beach to Corneille	**Davis Park**	**Tiana**
Ocean Beach to Seaview	**Old Inlet (East & West)**	Shinnecock Inlet Park – West
Ocean Beach to Point-O-Woods	Smith Point County Park–W	**WOSI (W of Shinnecock Inlet)**
Cherry Grove	**Smith Point County Park–E**	Potato Road
Fire Island Pines	Cupsogue	Montauk

discussed at various HEP Team meetings, these indirect and often cumulative impacts are not easily quantified and the HEP Team was unable to identify specific variables or assumptions needed in the HEP method to address these concerns.

5.3.1 Baseline Conditions

The process used to calculate HSI scores for breach response sites is the same as that used to calculate HSI scores for restoration and project locations as described in Sections 5.1.3 and 5.2.3.

5.3.2 Future Conditions With Breach, but Without Breach Response

Future no-action conditions were calculated for each site based on the assumption that a full breach would occur at TY1 and would result in the conversion of HEP communities to open water. Half of the acreage of terrestrial and intertidal HEP communities were converted to OCEANBEACH and half to BAYSUBSAV. Additional adjustments to the HSI scores and acreage were made in the FIMP HEP Equations database to account for changes likely to occur as a result of the full breach. The effect of the breach are incorporated into models at TY1 and carried through TY50.

5.3.3 Future Conditions With Breach and With Breach Response

District engineers provided future with-action conditions for the breach response sites based on the assumption that within one year of a full breach, the topography of the breached area would be restored to recreate pre-beach HEP communities. For evaluation purposes, it was assumed that human disturbance factors in the breached area would be eliminated as a result of the breach and would not be restored. Future slope, width, and/or height of the OCEANBEACH, VEGBEACH, and DUNEGRASS communities were provided by engineers. Raw engineering data for slope/height/width were entered into the FIMP HEP Curves database for the applicable community types as identified in Appendix B, Table 10.

Additional adjustments to the HSI scores (to account for a reduction in invasive species, wildlife barriers, human factors, etc.) were made in the FIMP HEP Equations database to account for changes likely to occur when the breached area is restored. The resulting HSI scores from the appropriate HEP transects were then incorporated into a modified version of the FIMP HEP Equation database where equations (presented in Appendix B, Table 3) were used to combine the HSI data. The total acreage of each community was assumed to be the same as pre-breach baseline conditions. In addition, unlike the SDR analysis, future with-action conditions at breach response sites were calculated for a single scenario in which the dune height is 13 ft (breach response designs are presented in Appendix I).

As with restoration and SDR sites, in calculating AAHUs, the changes in habitat quality or quantity anticipated as a result of breach response activities were applied asa gradual improvement in conditions between TY1 and TY5 and were then assumed to remain constant through TY50. Additional target years to account for a decline in habitat conditions over time or an improvement in conditions due to maintenance activities are not included in the models and it is assumed that any maintenance events needed to ensure the habitat conditions at TY5 are maintained over the 50-year life of the project (i.e., vegetation removal, invasive species control, beach renourishment, minimization of human impacts, etc.) would occur.

5.3.4 Future Conditions With Breach Response and Restoration

In addition to evaluating baseline, future no-action, and future with breach response conditions, the HEP Team developed potential restoration alternatives for areas located near two of the 10 BCP sites (Tiana and Smith Point County Park) in order to evaluate HSI, HU, and AAHUs for restoration that may be linked to future breach response actions at a site. These restoration designs were evaluated and are presented separately from the restoration designs because they would only be considered in the event of a full breach of the sites. Three conceptual restoration designs were developed at each site, and HEP was used to evaluate baseline, future no-action, and future with restoration alternatives following the same process as described for restoration sites. Although the sites evaluated in the breach restoration evaluation are in close proximity to two of the sites evaluated for BCP, the baseline conditions for these specific areas are based on the HSI values from HEP data transects deemed most similar to these specific locations and based on different sized communities than those presented for breach response.

Scenarios evaluated assume that a full breach occurs at these locations at TY1, and that the site is restored to the conditions presented under each alternative as shown in Appendix I. As with breach response site evaluation, the restoration is applied between TY1 and TY5 and the resulting change from breached condition to restored condition is then maintained over the life of the project to TY50. As previously noted, additional target years must be considered in the models in order to evaluate immediate restoration impacts following a breach condition. Cover type maps were created based on existing site conditions for each location to facilitate the evaluation of project impacts and the development of conceptual restoration and mitigation designs. Cover type maps, conceptual designs, and general description of proposed restoration activities at these locations are presented in Appendix I.

5.4 COST ESTIMATES

Conceptual cost estimates were developed for the conceptual restoration designs, shoreline stabilization designs, and breach response restoration options, and are presented in Appendix K. Implementation costs for each restoration alternative and the restoration component of breach response sites were calculated based on general estimates of removal, regrading, fill material, well relocation, structure installation, excavation and material movement, invasive species control, planting and bioengineering, and other miscellaneous project costs. Some of the alternatives evaluated at each site are distinctly different in scope, while others are inclusive of components from several proposed restoration alternatives at a given site. For example, at Sunken Forest, alternatives 1 and 2 present two different approaches to restoration (one addressing beach components and the other addressing bay components), while alternative 3 includes marina removal and components of both alternatives 1 and 2.

Costs for SDR and breach response site activities were based on general estimates of regrading, beach fill material, dune enhancement, and dune planting. These same activities are proposed for all sites, thus cost estimates for these sites are driven by the size of the proposed action.

Real estate costs for buy-out of houses or commercial property are not currently included in the total cost, but will be evaluated as part of phase II of this study. All costs were adjusted to a "per acre" or "per each" cost, with notes and assumptions stated in the table. Costs were adjusted to acres to facilitate future cost-benefit analysis and incremental cost analysis for project and restoration options. The following describes the derivation of cost estimates used in the calculation of costs. Costs were derived from RS Means (2001) and based on previous assessments and restoration designs for USACE projects in New York and New Jersey (USACE 1998, 2001, 2003, 2004b, 2006).

Removal costs include costs associated with removal and disposal of bulkheads, rubbish/debris, sod/plant material, building demolition, fencing, pavement, and riprap/groins.

- Bulkhead removal costs are based on bulkhead installation costs, with the assumption that material and disposal costs would be roughly equivalent. Bulkhead removal costs per acre assume 208.71 linear ft (LF) per acre (i.e., 208.71 LF is the distance across one square acre, or the square root of 43,560 square ft in an acre).
- Debris removal costs include rubbish/debris handling, machine loading into a dump truck, hauling up to 2 miles to the dump, and dumping fees. This cost assumes 250 cubic yards (CY) of rubbish per acre.
- Plant removal costs include removal of material by hand, hand loading into a dump truck, hauling up to 2 miles to the dump, and dumping fees. This cost assumes that a 1-foot of depth of plant material would need to be removed per acre, or 4,840 square yards (SY) (i.e., 1,613.33 CY per acre). Assuming 3 CY per ton, 537.78 tons of plant material would be removed and require disposal per acre.
- Building demolition and disposal costs include costs to demolish and load building materials from a two family, two story, wooden frame house, haul materials up to 25 miles, and dispose of materials. This cost is per building demolished, and assumes 500 CY of building materials would be produced per building.
- Fence removal costs are based on hand removal of wooden fencing, 4 to 6 ft high. This cost includes hand loading removed fencing into a dump truck, hauling up to 2 miles to the dump, and dumping fees. Fence removal costs assume there would be 208.71 LF of fencing per acre. Assuming a 6-foot high fence, that would equal 1,252.26 cubic ft per acre, or 46.38 CY per acre. Assuming 3 CY per ton, 15.46 tons of fencing would be removed and require disposal per acre.
- Pavement removal costs include removal of pad sites and disposal, with up to a 5-mile haul. This cost assumes that the pavement is 1-foot deep, and is based on the fact that there are 4,840 SY per acre, or 1,613.33 CY per acre.
- Groin/riprap removal costs are based on riprap placement costs, with the assumption that material and disposal costs would be roughly equivalent. Groin removal costs (per each) assume that an average groin is 5-ft wide, 30-ft long, and 20-ft deep (i.e., 3,000 cubic ft, or 111.11 CY).

Regrading costs are for grading of new material or regrading of existing material. This cost is based on the fact that there are 1,613.33 CY per acre and assuming a 1-foot depth of regrading).

Fill material costs are based on data provided in the Dredged Material Management Plan for the Port of New York and New Jersey (DMMP) (USACE 2006).

- Sand fill is projected to be used for beach/dune bird habitat creation. Sand fill costs are based on the DMMP projections for placement costs for the beneficial use of dredge material in bird habitat creation. This cost assumes the placement of a depth of 1-foot of material, and is based on the fact that there are 1,613.33 CY per acre.
- Loam fill is projected to be used for salt marsh creation/restoration. Loam fill costs are based on the DMMP projections for placement costs for the beneficial use of dredge material in marsh creation. This cost assumes that a combination of cap/cover and subfill material would be required.

Relocation costs are for the relocation of a domestic water supply well. This cost assumes that the relocated water supply well has a 24-inch diameter casing and 18-inch diameter screen, includes the gravel and casing, and is gravel packed to 40-ft deep.

Installation costs are included for culverts, tide gates, sand fences, and boardwalks.

- Culvert/headwall costs are based on installing a cast-in-place, 48-inch diameter, concrete culvert, with 4–6 foot long wing walls. Costs are per each culvert/ headwall set-up, and include installation of headwalls on both ends of the culvert.
- Flap gate costs are for the installation of one, 48-inch diameter, aluminum, hydraulic flap gate. Costs are per each unit installed.
- Self-regulating tide (SRT) gate costs are included for both a 24-inch and a 36-inch diameter SRT gate. Costs are per each unit installed.
- Sand fencing costs are based on cost estimates from previous District projects involving work in a coastal/dune environment (USACE 1998, 2001, 2003, 2004b). Sand fencing installation costs assume there will be 208.71 LF of sand fence installed per acre (i.e., 208.71 LF is the distance across one square acre, or the square root of 43,560 square ft in an acre).
- Boardwalk/recreation access costs are based on cost estimates from previous District projects involving work in a coastal/dune environment (USACE 1998, 2001, 2003, 2004b). Costs are per each unit installed.

Excavation and material movement costs are included for creation of emergent/salt marsh habitat and subtidal/tidal creek habitat. These costs are based on tidal and subtidal excavation and material movement costs from a previous District project, and all costs include an additional 10% for the operating contractors overhead and profit. Costs are presented for both onsite and offsite disposal of excavated material.

- Costs are based on 2001 estimates (2001 dollars) and have not been adjusted to account for inflation, depreciation, etc.
- Costs for creation of tidal elevations with offsite disposal are based on a base cost of $18/CY (2001 dollars), and assumes that an average of 1 foot of thatch material is removed and requires offsite disposal.
- Costs for creation of subtidal elevation with offsite disposal are based on a base cost of $18/CY (2001 dollars) assumes that an average of 3.7 ft of material is removed and requires offsite disposal.
- Costs for creation of tidal/salt marsh elevations with onsite use of material are based on $5/CY excavation, $3/CY hauling, and $2/CY grading costs (2001 dollars). This cost assumes that 1.1 ft of material is excavated and used onsite for filling old channels and plugging ditches.
- Costs for creation of subtidal/tidal creek elevations with onsite use of material are based on $5/CY excavation, $3/CY hauling, and $2/CY grading costs (2001 dollars). This cost assumes that 3.7 ft of material is excavated and used onsite for filling old channels and plugging ditches.

Invasive species control costs include herbicide and manual removal treatments to control common reed (*Phragmites australis*).

- Herbicide treatment costs are based on use of a glyphosate-based herbicide, such as Rodeo®, which is applied through a variety of means, potentially including broadcast aerial spraying from a helicopter, spraying from a low ground pressure (LGP) vehicle, and backpack-type sprayers.
- Manual removal costs assume the removal of an average of 1 foot of thatch material with offsite disposal of removed material. This cost is based on a base cost of $18/CY (2001 dollars) for thatch removal and offsite disposal.

Planting and bioengineering costs are based on contact with nursery and forestry suppliers with species-specific experience, and based on a review of pertinent literature.

- Dune grass costs are based on information obtained from Pinelands Nursery & Supply for planting desirable dune grass species. Costs are based on planting 2–3 inch diameter plugs, 24-inches on center (i.e., 10,890 plants per acre).
- Upland costs are based on information obtained from Pinelands Nursery & Supply, New England Wetland Plants, Inc., and Sylva Native Nursery and Seed Co. for planting desirable upland shrubs. Costs are based on planting seedlings that are 6–24 inches high, 10-ft on center (i.e., 436 plants per acre).
- Bay Beach – Emergents costs are based on information obtained from Pinelands Nursery & Supply for planting desirable emergent vegetation. Costs are based on planting 2-inch diameter plugs, 18-inch on center (i.e., 19,360 plants per acre).
- Bay Beach – Shrubs costs are based on information obtained from Pinelands Nursery & Supply for planting desirable shrubs. Costs are based on planting seedlings that are 6–24 inches high, either 6-ft or 10-ft on center (i.e., 1,210 or 436 plants per acre).

- BaySub submerged aquatic vegetation (SAV) costs are based on published literature on harvesting eelgrass from a donor bed and transplanting it in a project site.
- Bioengineering costs are based on using BioD-Mat 70 mats, measuring 13.1-ft wide by 83-ft long (120 square yards) to stabilize soils and minimize erosion. This cost assumes that 5 BioD-Mat 70 mats would be required to stabilize one acre, covering an area 26-ft wide by 208.71-ft long.
- Supporting products include metal stakes for holding the bioengineering mats in place. This cost assumes that three boxes of 500 stakes will be needed to stabilize the mats per acre.

Other costs include mobilization and demobilization, contingency, and engineering and design (E&D) and supervision and administration (S&A) costs.

- Mobilization and demobilization costs are the costs for the initiation and cessation of activities at the site, including obtaining and transporting equipment, and the removal of temporary site features and equipment upon completion of the Project. Mobilization and demobilization costs are estimated to be 2% of the total project cost.
- Contingency costs are calculated as 20% of the total project cost, to account for uncertainty in the final design and/or implementation of the restoration alternatives.
- Engineering and design (E&D) and supervision and administration (S&A) costs are calculated as 15% of the total project cost, including mobilization and demobilization, and contingency costs.

6.0 RESULTS

This section presents the results of the HEP study. An example of the HEP process leading to the results is presented first, followed by baseline HSI and HU results at the restoration sites, shoreline stabilization sites, and the breach response sites in Section 6.2. Section 6.3 includes HSI and HU results for the future-no action alternative at restoration sites, shoreline stabilization sites, and breach response sites. Following that section, HIS and HU results are presented in Section 6.4 for the various proposed alternatives (i.e., actions) at restoration, shoreline stabilization, and breach response sites. Section 6.6 presents AAHU results for all sites, followed by a summary of cost estimates.

The HSI and HU scores presented below provide the numeric values needed in AAHU calculations to determine net AAHU's gained or lost at a given site as a result of a proposed action. HSI scores and HUs are a direct reflection of a number of individual variables, including the baseline quality of a habitat, habitat size, anticipated future factors that may positively or negatively affect an area, and the type and magnitude of an activity proposed for an area. Therefore, because these factors vary by site and alternative, direct comparisons between HEP results at sites, without consideration of these underlying variables, run the risk of an "apples and oranges" type of comparison. However, HEP results are useful in showing which sites have overall highest or lowest current habitat conditions and changes in habitat quality and quantity anticipated at a given site over time should no action be taken. In addition, the future with-project HSI and HU scores do provide an indication of which alternatives could yield a higher overall gain (or loss) in habitat quality and quantity. But, it should be kept in mind that the restoration and project alternatives vary significantly in terms of the level of habitat impact/improvement, types of restoration, and size. For example, some of the alternatives presented are additive (i.e., a combination of several alternatives). Thus, as expected, overall HU's for these additive alternatives are often far greater than other alternatives. As discussed previously, these baseline, future no-action, and future with-action are used in calculating net AAHU (net environmental benefit) and those numbers are combined with costs to determine which alternatives would provide the highest overall improvement to habitat quality and quantity for the level of costs expended.

Summaries of results for the restoration sites are provided in Appendix G, shoreline stabilization results are in Appendix H, and the breach response results can be found in Appendix I. HSI results presented below are based on the average HSI score for each site (i.e., raw HSI score for all communities combined/number of communities). Acreages are based on the total acres of all communities in a given area. AAHU's are based on raw (i.e., not weighted, or averaged) HSI and HU values.

6.1 EXAMPLE AAHU CALCULATION

AAHUs provide the numeric output that shows the gain or loss in habitat quality and quantity over time (i.e., from baseline conditions to 50 years) and is calculated for two scenarios; 1) **future no-action** - assuming that no action is taken at a site; and, 2) **future with-action** - assuming that a proposed action is taken. In the case of this evaluation, the action includes various restoration or storm damage reduction alternatives. Net AAHUs are produced by combining AAHU values for each community into an overall AAHU value for a proposed activity (with-action), and comparing this value to the no-action overall AAHU score. The Net AAHU score for each site represents the change in habitat quality and quantity at a site if a proposed action takes place. For example, generally speaking, according to the HEP models used in this study, the bay shoreline in some areas will continue to erode at a rapid rate and thus the BAYBEACH community's HSI and HU scores will decrease over time and would result in a relatively low AAHU. However, should the shoreline be stabilized and additional measures taken to improve the site conditions (i.e., plantings), under a proposed restoration action, the erosion would be minimized and habitat quality would be expected to improve and also would remain relatively stable over time. This would be expected to yield a relatively high AAHU. When comparing the no-action condition against the with-action condition, the resulting Net AAHU would show an improvement for this site. That is, habitat quality and quantity would be improved by taking the action to stabilize the shoreline versus taking no action at the site.

Calculation of AAHUs begins with the input of field data that describes each community according to the variables identified for each community model (as identified in Appendix B, Table 2). For example, the OCEANBEACH community includes field data related to six variables (described previously in Section 3.4): Presence of Modified Shoreline; Width of Cover Type (ft); Impact of Barriers to Wildlife Passage; Presence of Human Disturbance Factors; Magnitude of Impact From Human Disturbance (%); Suitability of Substrate for Given Area.

Data for these seven variables was incorporated into the HEP community model for OCEANBEACH to produce individual HSI scores for each variable, then combined using the equations presented in Appendix B, Table 3 to produce and overall HSI score for the OCEANBEACH community.

HSI Scores for each Model Variable

As an example, the baseline OCEANBEACH community data at Sunken Forest results in HSI scores as follows for each of the six variables (the range is 0.0 to 1.0, with 1.0 being highest):

Presence of Modified Shoreline: 1.00
Width of Cover Type (ft.): 0.60
Impact of Barriers to Wildlife Passage: 1.00
Presence of Human Disturbance Factors: 0.90
Magnitude of Impact from Human Disturbance (%): 0.70
Suitability of Substrate for Given Area: 1.0

Using the OCEANBEACH community equation from Appendix B, Table 3, the overall HSI score for the OCEANBEACH community at Sunken Forest, baseline condition, is 0.54.

HSI Scores for Each Transect

This process of incorporating raw data into community models was repeated for each of the community types at each of the restoration, shoreline stabilization, and breach response sites, to arrive at community HSI scores for each community at each site. This process was repeated for baseline conditions, future without project conditions, and future with project conditions.

Continuing the example for Sunken Forest, **baseline condition**, community HSI scores are as follows:

OCEANBEACH: 0.54
VEGBEACH: 0.57
DUNEGRASS: 0.69
BAYBEACH: 0.20
BAYSUBSAV: 0.64
UPLANDS: 0.78

Applying this same process at Sunken Forest for the **future (in other words, after 50 years) with restoration alternative 1**, conditions results in community HSI scores as follows:

OCEANBEACH: 0.54
VEGBEACH: 0.57
DUNEGRASS: 0.79
BAYBEACH: 0.55
BAYSUBSAV: 0.64
UPLANDS: 0.78

The difference in HSI scores between the baseline and future with restoration alternative 1 conditions for the DUNEGRASS and BAYBEACH communities reflect the anticipated effects of the Restoration activities at the Sunken Forest site, which include enhancing the eroding bayside shoreline and intertidal zone and removing approximately 210 linear feet (lf) of bulkhead material located west of the marina. Soft bioengineering structures and plantings would be utilized to stabilize the 900 lf of shoreline and minimize further erosion and loss of habitat (see Appendix G for a more detailed description of restoration activities proposed under this alternative). Therefore, the future HSI scores for the DUNEGRASS and BAYBEACH communities at this site with the project are greater than the baseline scores.

Raw HSI scores for each community are incorporated into AAHU calculations (that is, averages or weighted scores were not used). However, average HSI scores are presented below and in Appendices to provide an overall assessment and comparison of habitat quality between sites. Baseline HSI scores are presented below in Section 5.2.1 for restoration sites, Section 5.2.2 for shoreline stabilization sites, and Section 5.2.3 for breach response sites. Future no action HSI scores are presented below in Section 5.3.1 for restoration sites, Section 5.3.2 for shoreline stabilization sites, and Section 5.3.3 for breach response sites. Future with action HSI scores are presented below in Section 5.4.1 for restoration sites, Section 5.4.2 for shoreline stabilization sites, and Section 5.4.3 for breach response sites.

Habitat Units (HU)

HSI scores represent habitat quality. To develop habitat unit scores (HUs), which incorporate habitat quantity, the HSI scores were multiplied by the acreages of each community type. For the Sunken Forest baseline condition, this results in a baseline of 32 Habitat Units for the OCEANBEACH community (HSI score of 0.54 multiplied by 59 acres). These HU calculations were repeated for each community type at each of the restoration, shoreline stabilization, and breach response sites, for the baseline conditions, future without project conditions, and future with project conditions. For the Sunken Forest future with restoration alternative 1 condition, this results in an HU value also of 32, which is expected since for the OCEANBEACH community the HSI score is the same and the acreage is as well.

Average HU scores are presented below and in Appendices to provide an overall assessment and comparison of habitat quality combined with habitat quantity between sites. Averages or weighted HU scores were not used in calculating AAHUs. However, Baseline HU data is presented below in Section 5.2.1 for restoration sites, Section 5.2.2 for shoreline stabilization sites, and Section 5.2.3 for breach response sites. Future no action HU scores are presented below in Section 5.3.1 for restoration sites, Section 5.3.2 for shoreline stabilization sites, and Section 5.3.3 for breach response sites. Future with action HU scores are presented below in Section 5.4.1 for restoration sites, Section 5.4.2 for shoreline stabilization sites, and Section 5.4.3 for breach response sites.

Average Annual Habitat Units (AAHU)

For each community type, HU scores were then integrated over the time period being assessed (i.e., 50 years) to develop cumulative HUs, and then annualized to determine Average Annual

HUs. Net AAHUs are produced by combining AAHU values for each community into an overall AAHU value for a proposed activity (with-action), and comparing this value to the AAHUs under the no-action scenario. Net AAHU's provide the environment input needed to conduct a cost-benefit analysis of project impacts and benefits, and thus are a key output of the HEP analysis.

Continuing the example at Sunken Forest, the without-project AAHU values (i.e., habitat conditions assuming existing trends in habitat quality and quantity continue uninterrupted over 50 years) and future with restoration alternative 1 AAHU values are presented in Table 5. The Net AAHU values for each community are also presented, with a total net AAHU gain of 10.2 resulting from implementation of restoration alternative 1 at Sunken Forest. This gain is because of several factors:

- Beach erosion at the site in the without project condition, lowering the HU value of OCEANBEACH community because of smaller acreage and lower HSI value compared to the with-restoration condition. The HU value of the VEGBEACH community is also similarly lower because of a slightly lower HSI value.
- Enhanced DUNEGRASS and BAYBEACH HU values because of higher HSI values stemming from the proposed activities in restoration alternative 1, described above and in Appendix G.
- An lower HU value in the without project condition of the UPLANDS community because of a degradation in the HSI value over the 50-year time period of the analysis.

Restoration AAHU results are provided in Section 6.5.1; shoreline stabilization results are provided in Section 6.5.2; and breach response AAHU results are provided in Section 6.5.3.

6.2 BASELINE RESULTS (EXISTING CONDITIONS)

Baseline scores represent the habitat quality (HSI) and quantity (HSI x acres) at each location at the time of field data collection. These values represent TY0 in the HEP method. For this evaluation, it is assumed that these baseline habitat conditions represent the year before the

Table 5. AAHU Values at Sunken Forest, Without Project and Future with Restoration Alternative 1.

Community	Without Project AAHU	Future with Restoration Alternative 1 AAHU	Net AAHU
OCEANBEACH	29	32	3
VEGBEACH	2.6	2.8	0.2
DUNEGRASS	4	7	3
BAYBEACH	0	1	1
BAYSUBSAV	14	14	0
UPLANDS	9	12	3
TOTAL	58.6	68.8	10.2

Projects targeted year of construction and that conditions at the time of construction will be similar to baseline conditions as evaluated in 2004 and 2005. Table 6 presents the results of the HEP analysis for baseline conditions for the 16 potential restoration sites, 24 shoreline stabilization sites, 10 breach response sites, and 2 locations for breach response restoration.

Table 6. Baseline HSI and HU Scores for Restoration, Storm Damage Reduction, and Breach Response Sites.

Site	HSI		Acres		HU
RESTORATION SITES					
Sunken Forest	0.569		118		67.30
Reagan Property	0.440		89		41.45
Great Gunn	0.466		119		57.31
Tiana	0.584		103		59.81
WOSI	0.512		138		102.09
East Inlet Island	0.310		165		82.42
John Boyle Island	0.310		107		53.52
Ocean Beach	0.293		184		31.34
New Made Island	0.288		43		20.89
Georgica Pond	0.483		1,706		343.70
Islip Meadows	0.313		69		42.00
Seatuck Refuge	0.313		234		139.96
Davis Park	0.374		329		143.75
Atlantique to Corneille	0.374		159		70.50
Kismet, Atlantique, Fair Harbor	0.374		253		95.63
Warner Island East	0.235		30		16.09
STORM DAMAGE REDUCTION SITES	**HSI (Small Scenario)**	**HSI (Large Scenario)**	**Acres**	**HU (Small Scenario)**	**HU (Large Scenario)**
Robert Moses State Park	0.489	0.489	1,853	864	864
Fire Island Lighthouse Tract	0.470	0.470	583	272	272
Kismet to Lonelyville	0.383	0.379	982	402	403
Town Beach to Corneille	0.343	0.461	446	167	231
Ocean Beach to Seaview	0.349	0.461	405	139	232
Ocean Beach Park to Point of Woods	0.348	0.461	819	327	434
Cherry Grove	0.343	0.455	234	105	130
Fire Island Pines	0.352	0.463	605	258	344
Talisman to Water Island	0.384	0.498	618	301	335
Water Island	0.338	0.395	96	44	48
Water Island to Davis Park	0.389	0.501	479	220	261
Davis Park	0.268	0.380	386	93	130
Old Inlet	0.666	0.666	1,684	1,072	1,072

Table 6. Baseline HSI and HU Scores for Restoration, Storm Damage Reduction, and Breach Response Sites.

Site	HSI (small scenario)	HSI (large scenario)	Acres	HU (Small scenario)	HU (Large scenario)
Smith Point County Park-TWA	0.485	0.485	192	95	95
Smith Point County Park	0.491	0.488	1,277	667	666
Cupsogue	0.532	0.532	232	135	134
Westhampton Pikes Beach	0.573	0.569	1,088	634	635
Westhampton East	0.410	0.410	994	328	328
Sedge Island	0.557	0.557	582	331	331
Tiana	0.573	0.573	336	189	189
Shinnecock Inlet Park-West	0.542	0.542	713	481	481
WOSI	0.515	0.510	375	287	285
Potato Road	0.306	0.302	245	70	70
Montauk	0.285	0.285	290	93	93
BREACH RESPONSE	**HSI**		**Acres**		**HU**
FILT	0.470		157		74
Town Beach to Corneille	0.447		154		80
Talisman to Water Island	0.502		124		67
Davis Park	0.381		135		46
Old Inlet (EAST)	0.669		163		104
Old Inlet (WEST)	0.667		68		104
Smith Point County Park	0.485		93		36
Sedge Island	0.567		78		53
Tiana	0.586		76		44
WOSI	0.508		163		57
BREACH RESTORATION					
Tiana	0.401		128		60
Smith Point County Park	0.656		213		123

6.2.1 Baseline Conditions at Restoration Sites

Table 6 presents the baseline HSI scores for each of the 16 restoration sites. When considering habitat quality (HSI scores) WOSI, Tiana, and Sunken Forest have the best habitat quality while Warner Island East, Ocean Beach, and New Made Island have the lowest overall habitat quality. However, the results for overall habitat unit scores (HSI x acres) identify Seatuck, Davis Park, and WOSI as the sites with highest habitat units. Although two of these sites did not score highest in habitat quality, the quantity of the habitat available offsets this.

6.2.2 Baseline Conditions at Storm Damage Reduction Sites

Old Inlet, Tiana, and Westhampton Pikes Beach have the highest quality habitats and Davis Park, Montauk, and Water Island have the three lowest HSI scores for the SDR small scenario (Table 6). When acreages are factored into the evaluation to generate HUs, as indicated in Table 6, under the small scenario the results are similar to the HSI results. However, Water Island replaces Davis Park as one of the three lowest scoring sites, and the three highest scoring sites include Old Inlet, Robert Moses State Park, and Smith Point County Park.

Typically, in a HEP evaluation, two different baseline conditions would not be evaluated. However, the HEP method was applied in this manner for the SDR sites only, in order to incorporate data from engineer models of two hypothetical shoreline conditions in a given area. Despite some minor changes in HSI sores as shown in Table 6, under the large scenario Old Inlet, Tiana, and West Hampton Pikes Beach are still the three sites with highest HSI scores. However, the three lowest scoring sites does change under the large scenario with Potato Road, Kismet to Lonelyville, and Montauk as the three lowest. When acreages are accounted for, the sites with the three highest and three lowest HUs for the large scenario are the exact same as with the small scenario, although the actual HU scores vary as shown in Table 6.

6.2.3 Baseline Conditions at Breach Response Sites

Although the breach response sites are located within the SDR project locations, they occur within a sub-set of the project site. Thus, the baseline conditions are based on the average condition of a smaller overall area and as a result, baseline shoreline conditions (from engineer models) at breach response sites can be different than at the SDR project sites. Baseline conditions at the breach response sites were evaluated on the large scenario. Based on HSI scores at breach response locations (Table 6), Old Inlet East, Old Inlet West, and Tiana, have the highest quality habitats, and Davis Park, Town Beach to Corneille, and Fire Island Lighthouse have the lowest HSI scores. When acreages are factored into the evaluation to generate HUs for breach response sites. Old Inlet East, Old Inlet West, and Town Beach to Corneille, have the three highest HU scores and Smith Point County Park, Tiana, and Davis Park, have the three lowest.

As indicated previously, two additional areas were evaluated for use as potential restoration sites in the event of a breach. These sites were not included in the restoration site evaluation because these would only move forward in the event of a breach in the area. The areas are close to the breach response sites identified above, but differ enough that treatment as a separate site was warranted, thus separate baseline conditions are presented. When comparing baseline conditions at the two Breach Response restoration sites, Tiana's is 0.401 and Smith Point County Park's HSI score is 0.656. When acres are factored into the evaluation, Tiana has 60 Hus and Smith Point County Parks has 123.

6.3 FUTURE NO-ACTION CONDITIONS

The following sections present the results of the HEP analysis for the 16 potential restoration sites, 24 shoreline stabilization sites, and 10 breach response sites should no action be taken at these site (Table 7). That is, future habitat conditions are applied to baseline conditions at TY5 through TY50 years, and in accordance with future assumptions presented in Appendix B, Table 4, which include factors such as continued shoreline erosion, human disturbance, loss of vegetative cover, loss of dune and beach, etc.. These results represent what is expected to happen to the baseline habitat quality (HSI) and quantity over a 50-year period assuming no intervention in the processes and factors currently affecting sites.

Table 7. Future No-action HSI and HU Scores for Restoration, Storm Damage Reduction, and Breach Response Sites.

Site	HSI		Acres		HU
RESTORATION SITES					
Sunken Forest	0.408		111.73		49.30
Reagan Property	0.287		83.62		29.62
Great Gunn	0.323		109.75		40.43
Tiana	0.401		95.35		40.37
WOSI	0.345		128.69		65.62
East Inlet Island	0.171		163.54		55.90
John Boyle Island	0.171		106.87		35.94
Ocean Beach	0.195		175.74		26.64
New Made Island	0.168		41.95		13.27
Georgica Pond	0.334		1706.20		246.32
Islip Meadows	0.214		67.37		29.74
Seatuck Refuge	0.214		226.40		92.88
Davis Park	0.276		309.35		115.31
Atlantique to Corneille	0.276		147.48		54.15
Kismet, Atlantique, Fair Harbor	0.276		239.30		75.92
Warner Island East	0.067		30.46		10.53
STORM DAMAGE REDUCTION SITES	**HSI (Small Scenario)**	**HSI (Large Scenario)**	**Acres**	**HU (Small Scenario)**	**HU (Large Scenario)**
Robert Moses State Park	0.343	0.343	1,692	541	541
Fire Island Lighthouse Tract	0.318	0.318	534	145	145
Kismet to Lonelyville	0.282	0.278	901	280	280
Town Beach to Corneille	0.326	0.331	412	158	158
Ocean Beach to Seaview	0.332	0.332	371	151	151
Ocean Beach Park to Point of Woods	0.331	0.331	749	303	303
Cherry Grove	0.326	0.326	215	94	94
Fire Island Pines	0.335	0.333	552	242	242
Talisman to Water Island	0.355	0.357	566	247	247
Water Island	0.258	0.258	89	35	35
Water Island to Davis Park	0.347	0.347	444	188	188

Table 7. Future No-action HSI and HU Scores for Restoration, Storm Damage Reduction, and Breach Response Sites.

Site	HSI (Small Scenario)	HSI (Large Scenario)	Acres	HU (Small Scenario)	HU (Large Scenario)
Davis Park	0.261	0.261	349	95	95
Old Inlet	0.542	0.542	1,565	885	885
Smith Point County Park-TWA	0.343	0.343	175	67	67
Smith Point County Park	0.356	0.353	1,185	511	511
Cupsogue	0.404	0.404	221	114	114
Westhampton Pikes Beach	0.407	0.403	987	450	450
Westhampton East	0.307	0.307	922	253	253
Sedge Island	0.417	0.417	551	248	248
Tiana	0.390	0.390	306	121	121
Shinnecock Inlet Park-West	0.367	0.367	649	315	315
WOSI	0.348	0.343	349	186	186
Potato Road	0.211	0.206	245	40	40
Montauk	0.183	0.183	290	51	51
BREACH RESPONSE	**HSI**		**Acres**		**HU**
FILT	0.102		143		45
Town Beach to Corneille	0.101		142		55
Talisman to Water Island	0.122		113		50
Davis Park	0.057		124		25
Old Inlet (EAST)	0.137		154		71
Old Inlet (WEST)	0.128		63		27
SPCP	0.120		88		34
Sedge Island	0.116		71		28
Tiana	0.154		70		39
WOSI	0.137		154		71
BREACH RESTORATION	**HSI**		**Acres**		**HU**
Tiana	0.117		128		47
Smith Point County Park	0.137		213		81

6.3.1 Future No-action Conditions at Restoration Sites

Based on HSI scores alone (Table 7), if no future action is taken at the 16 restoration sites evaluated, Warner Island East, New Made, East Inlet, and John Boyle Islands would have the lowest HSI scores after 50 years. Similar to baseline conditions, WOSI, Tiana, and Sunken Forest would continue to have the highest scores.

6.3.2 Future No-action Conditions at Storm Damage Reduction Sites

Should no future action be taken at the project sites, at the end of the 50-year period under the small scenario Montauk, Potato Road, and Water Island will have the three lowest HSI scores and Old Inlet, Westhampton Pikes Beach, and Sedge Island will have the highest scores as shown in Table 7. Table 7 presents the results when acreages are factored into the evaluation to generate HUs for the small scenario, after the 50-year project period if no future action is taken. The rankings are the same as the HSI score rankings.

6.3.3 Future No-action Conditions at Breach Response Sites

Table 7 presents the HSI scores at Breach Response locations, if no future action is taken. Old Inlet East, Old Inlet West, and WOSI have the highest quality habitats, and Davis Park, Town Beach to Corneille, and the Fire Island Lighthouse Tract have the lowest HSI scores after the 50-year project life. When acres are factored in, after 50-years if no future action is taken, WOSI, Old Inlet East, and Town Beach to Corneille, will have the highest HU's, Old Inlet West, Sedge Island, and Davis Park will have the lowest (Table 7).

Should no future action be taken at the two Breach Response restoration sites, after 50-years, the Tiana HSI score will be 0.117 and Smith Point County Park will be 0.137. After 50 years, HU scores at the Breach Response restoration sites will be 47 at Tiana and 81 at Smith Point County Park and

6.4 FUTURE CONDITIONS WITH ACTIONS

The following sections present the future with-action results of the HEP analysis for the 16 potential restoration sites, 24 shoreline stabilization sites, and 10 breach response sites (Table 8). For this evaluation future habitat conditions were applied to baseline conditions at TY5 through TY50, and in accordance with anticipated changes based on professional judgment regarding anticipated affects on habitat quality from proposed actions, and data from field surveys and engineering models. Restoration and project designs are conceptual and intended only for use in HEP and for general comparisons of sites and various restoration and project alternatives. Conceptual restoration designs and conceptual SDR and breach response designs are provided in Appendices G, H, and I.

Table 8. Future With-action HSI and HU Scores for Restoration, Storm Damage Reduction, and Breach Response Sites.

Site	HSI			Acres	HU		
RESTORATION SITES	**Alternative 1**	**Alternative 2**	**Alternative 3**		**Alternative 1**	**Alternative 2**	**Alternative 3**
Sunken Forest	0.645	0.645	0.766	118	68.76	72.67	82.77
Reagan Property	0.514	0.564	0.525	89	42.45	46.08	42.26
Great Gunn	0.504	0.583	0.667	119	59.46	66.60	75.27
Tiana	0.712	0.769	0.629	103	65.71	67.90	64.83
WOSI	0.619	0.613	0.603	138	108.44	107.66	106.66
East Inlet Island	0.382	0.411	0.453	165	86.39	93.02	99.45
John Boyle Island	0.413	0.461	0.451	107	60.19	60.99	67.24
Ocean Beach	0.371	0.462	0.462	184	42.81	46.12	46.44
New Made Island	0.368	0.410	0.448	43	21.64	22.02	22.33
Georgica Pond	0.510	0.510	0.632	1,706	365.57	365.57	411.91
Islip Meadows	0.321	0.321	0.333	69	44.17	43.93	47.31
Seatuck Refuge	0.321	0.327	0.337	234	147.94	150.65	157.45
Davis Park	0.382	0.461	0.445	329	144.51	148.91	146.96
Atlantique to Corneille	0.374	0.374	0.467	159	68.42	68.42	76.01
Kismet, Atlantique, Fair Harbor	0.452	0.464	0.464	253	99.16	99.85	100.35
Warner Island East	0.319	0.350	0.319	30	15.85	16.39	15.85
STORM DAMAGE REDUCTION SITES	**HSI (Small Scenario)**		**HSI (Large Scenario)**	**Acres**	**HU (Small Scenario)**		**HU (Large Scenario)**
Robert Moses State Park	0.490		0.550	1,853	863		904
Fire Island Lighthouse Tract	0.471		0.545	583	272		287
Kismet to Lonelyville	0.385		0.440	978	397		411
Town Beach to Corneille	0.466		0.521	445	230		238
Ocean Beach to Seaview	0.461		0.521	406	232		236
Ocean Beach Park to Point of Woods	0.461		0.521	813	429		444
Cherry Grove	0.455		0.504	234	130		133

Table 8. Future With-action HSI and HU Scores for Restoration, Storm Damage Reduction, and Breach Response Sites.

Site	HSI (Small Scenario)		HSI (Large Scenario)	Acres	HU (Small Scenario)		HU (Large Scenario)
Fire Island Pines	0.466		0.521	604	340		350
Talisman to Water Island	0.502		0.555	618	336		345
Water Island	0.408		0.461	96	49		50
Water Island to Davis Park	0.501		0.553	479	261		266
Davis Park	0.381		0.440	380	129		136
Old Inlet	0.674		0.719	1,684	1,079		1,100
Smith Point County Park-TWA	0.488		0.525	192	95		98
Smith Point County Park	0.498		0.535	1,277	670		683
Cupsogue	0.534		0.572	232	135		138
Westhampton Pikes Beach	0.576		0.614	1,084	636		650
Westhampton East	0.410		0.459	994	328		343
Sedge Island	0.567		0.601	582	333		337
Tiana	0.579		0.612	336	190		192
Shinnecock Inlet Park-West	0.543		0.600	713	478		489
WOSI	0.523		0.600	378	288		297
Potato Road	0.311		0.360	245	74		79
Montauk	0.279		0.325	290	98		106
BREACH RESPONSE	**HSI**			**Acres**			**HU**
FILT	0.724			157			104
Town Beach to Corneille	0.761			154			109
Talisman to Water Island	0.728			124			76
Davis Park	0.713			135			64
Old Inlet (EAST)	0.745			163			111
Old Inlet (WEST)	0.734			68			42
Smith Point County Park	0.724			93			64
Sedge Island	0.745			78			49
Tiana	0.780			76			65

Table 8. Future With-action HSI and HU Scores for Restoration, Storm Damage Reduction, and Breach Response Sites.

	HSI			**Acres**	**HU**		
WOSI	0.744			163			111
BREACH RESTORATION	**Alternative 1**	**Alternative 2**	**Alternative 3**		**Alternative 1**	**Alternative 2**	**Alternative 3**
Tiana	0.486	0.516	0.600	128	62	63	65
Smith Point County Park	0.722	0.719	0.722	213	137	134	140

6.4.1 Future With-action Conditions at Restoration Sites

Table 8 presents future with-action HSI scores at restoration sites under alternative 1. Should future restoration activities include alternative 1, Warner Island East would still have the lowest HSI score, but Islip Meadows, Seatuck and Ocean Beach would be the lowest scoring sites. Highest scoring sites would continue to include WOSI, Tiana, and Sunken Forest. The highest and lowest ranked sites are similar for Alternatives 2 and 3, except under alternative 3, Georgica Pond and Great Gun replace Tiana and WOSI as the highest scoring sites (Table 8).

Table 8 includes the HU results produced when acreages are factored into the evaluation for alternatives 1, 2, and 3, respectively, under future conditions. Results indicate similar ranking as the baseline and no-action scenarios for the sites with highest HUs and include Georgica Pond, Seatuck Refuge, and Davis Park. Under the scenarios for alternative 1, Warner Island East, New Made Island, and Reagan Property have the lowest HUs. Results for alternative 2 are similar and include Warner Island East and New Made Island, but Islip Meadows replaces the Reagan Property as one of the three lowest scoring sites (Table 8). The rankings for three lowest scoring sites under alternative 3 are the same as with alternative 1 (Table 8).

6.4.2 Future With-action Conditions at Storm Damage Reduction Sites

Actions to maintain beach conditions at the SDR sites under the small project scenario would result in the same sites ranked as the three highest and three lowest scoring sites in terms of HSI (Table 8). However, the HSI values would differ slightly from the baseline condition. For the large scenario, the ranking of sites for the with project action evaluation are the same as for the baseline conditions evaluation, except that an additional site is included in the list of lowest scoring sites due to a tie in HSI scores (Table 8).

If action is taken to protect the shoreline, after the 50-year project period the rankings for HUs under the small scenario are similar to the baseline HU scores (Table 8). Potato Road and Water Island continue to be the lowest scoring sites, but Smith Point County park-TWA replaces Montauk as one of the lowest scoring sites. The sites scoring the highest HU scores remain consistent between baseline, future no-action, and future with-action evaluations. Under the large scenario, the HU rankings are the same as the small scenario, although the actual HU scores differ slightly (Table 8).

6.4.3 Future With-action Conditions at Breach Response Sites

Based on HSI scores at breach response locations as presented in 31, if breach closure action is taken in the future, Davis Park, Fire Island Lighthouse, Sedge Island, and Talisman to Water Island rank lowest and Old Inlet West, Tiana, Town Beach to Corneille, and WOSI rank highest. After 50-years, if breach closure action is taken, the ranking of sites based on HU scores will be the same as with baseline and future no-action conditions, although the scores themselves will increase (Table 8).

When comparing baseline conditions at the two breach response restoration sites, Smith Point County Parks HSI scores are consistently higher than Tiana for all alternatives evaluated (Table 8). Specifically, alternative 1 = 0.722, alternative 2 = 0.719, and alternative 3 = 0.722, compared to Tiana alternative 1 = 0.486, alternative 2 = 0.516, and alternative 3 = 0.600. When acres are factored into the evaluation, again Smith Point County Park's scores are consistently higher than Tiana for all alternatives evaluated. Specifically, alternative 1 = 137 HUs, alternative 2 = 134, and alternative 3 = 140, compared to Tiana alternative 1 = 62, alternative 2 = 63, and alternative 3 = 65. However, as previously noted, outputs are directly related to the magnitude of restoration proposed and size of the area, so direct comparisons are not appropriate.

6.5 AVERAGE ANNUALIZED HABITAT UNITS (AAHUS)

AAHUs provide the environmental input needed to conduct a cost-benefit analysis of project impacts and benefits and are presented in Table 9. AAHUs are essentially the average increase in habitat units realized by implementing restoration or a project/breach response action (i.e., difference between baseline and future no-action conditions compared to baseline and future with action conditions). AAHUs are essentially the gain or loss of habitat realized by implementing the proposed activity (i.e., restoration, shoreline stabilization, breach closure, breach restoration).

Table 9. Net AAHUs for Restoration, Storm Damage Reduction, and Breach Response Sites.

	Net AAHU		
Site	**Alternative 1**	**Alternative 2**	**Alternative 3**
RESTORATION SITES			
Sunken Forest	10	12	18
Reagan Property	7	13	6
Great Gunn	9	16	25
Tiana	15	16	14
WOSI	23	22	21
East Inlet Island	16	26	37
John Boyle Island	14	15	21
Ocean Beach	12	19	13
New Made Island	4	5	5
Georgica Pond	64	64	115
Islip Meadows	8	7	11
Seatuck Refuge	29	31	38
Davis Park	14	18	16
Atlantique to Corneille	5	7	13
Kismet, Atlantique, Fair Harbor	11	13	13
Warner Island East	2	3	1
STORM DAMAGE REDUCTION SITES	**Net AAHU (Small Scenario)**		**Net AAHU (Large Scenario)**
Robert Moses State Park	148		186
Fire Island Lighthouse Tract	59		72
Kismet to Lonelyville	52		64
Town Beach to Corneille	63		39
Ocean Beach to Seaview	81		41
Ocean Beach Park to Point of Woods	106		69
Cherry Grove	29		20
Fire Island Pines	84		44
Talisman to Water Island	57		50
Water Island	9		8
Water Island to Davis Park	53		38
Davis Park	32		21
Old Inlet	92		100
Smith Point County Park-TWA	13		18
Smith Point County Park	74		87
Cupsogue	15		12
Westhampton Pikes Beach	86		99
Westhampton East	35		49
Sedge Island	40		44
Tiana	17		35
Shinnecock Inlet Park-West	74		84

Table 9. Net AAHUs for Restoration, Storm Damage Reduction, and Breach Response Sites.

Site	Net AAHU (Small Scenario)		Net AAHU (Large Scenario)
WOSI	48		58
Potato Road	17		22
Montauk	23		31
BREACH RESPONSE	**Net AAHU**		
FILT	55		
Town Beach to Corneille	50		
Talisman to Water Island	18		
Davis Park	79		
Old Inlet (EAST)	39		
Old Inlet (WEST)	14		
SPCP	28		
Sedge Island	20		
Tiana	24		
WOSI	38		
	Net AAHU		
BREACH RESPONSE RESTORATION	**Alternative 1**	**Alternative 2**	**Alternative 3**
Tiana	14	15	17
Smith Point County Park	53	49	55

6.5.1 AAHUs at Restoration Sites

Table 9 presents the net AAHUs for future conditions at each restoration site, which are calculated by subtracting the AAHUs for each community without restoration activities from the AAHUs for each communitywith restoration. Sites with the highest number of net AAHUs gained from Alternative 1 include Georgica (64 AAHUs), Seatuck (29 AAHUs), and WOSI (23 AAHUs)), CHU and AAHU summaries for restoration sites are also presented in Appendix G.

Highest AAHUs for Alternative 2 (Table 9) include Georgica (64 AAHUs), Seatuck (31 AAHUs), and East Inlet Island (26 AAHUs). CHU and AAHU summaries for restoration sites are also presented in Appendix G.

Highest AAHUs for Alternative 3 (Table 9) include Georgica (115 AAHUs), Seatuck (38 AAHUs), and East Inlet Island (37 AAHUs). CHU and AAHU summaries for restoration sites are also presented in Appendix G.

6.5.2 AAHUs at Storm Damage Reduction Project Sites

Table 9 presents the net AAHUs for future conditions at each SDR site, which are calculated by subtracting the AAHUs for each community without SDR project from the AAHUs for each community with SDR. Sites with the highest number of net AAHUs gained from the small scenario include Robert Moses State Park (148 AAHUs), Ocean Beach to Point of Woods (106 AAHUs), and Old Inlet (92 AAHUs). Highest AAHUs for the large scenario include Robert Moses State Park (186 AAHUs), Westhampton Pikes Beach (99 AAHUs), and Old Inlet (100 AAHUs). CHU and AAHU summaries for SDR sites are presented in Appendix H.

6.5.3 AAHUs at Breach Response Sites

Table 9 presents the net AAHUs at each breach response site for future conditions, which are calculated by subtracting the AAHUs for each community type without breach response activities from the AAHUs for each community with breach response. Sites with the highest number of net AAHUs gained from the action include Davis Park (79 AAHUs), Fire Island Lighthouse Tract (55 AAHUs), and Town Beach to Corneille (50 AAHUs). CHU and AAHU summaries for breach response sites are presented in Appendix I.

When comparing net AAHUs for future conditions with restoration activities at breach closure locations against net AAHUs for the future conditions with restoration at breach closure sites, both sites have highest AAHU gains under restoration alternative 3 (Tiana 17, and Smith Point 55 AAHUs), as expected because alternative 3 includes both alternatives 1 and 2. Alternative 3 excluded, AAHU gains are highest for Tiana with Alternative 2 (15 AAHUs), and highest for Smith Point County Park with Alternative 1 (52 AAHUs). CHU and AAHU summaries for breach response sites are presented in Appendix I.

6.6 COSTS

A thorough analysis of costs has not been conducted for this portion of the study, however a full cost-benefit analysis will be conducted as part of the next phase of the study. Costs are conceptual in nature and were developed for use in a broad scale evaluation of proposed alternatives. Summaries of costs for restoration, shoreline stabilization, and breach response sites, are provided in Appendix K and discussed below.

6.6.1 Restoration Costs

Cost estimates developed for conceptual designs are presented in Appendix K. Restoration generally is least expensive on sites such as the dredge islands where restoration activities include primarily enhancement of existing conditions, fill material can be obtained at a low cost, and excavated materials can be reused on site. Real estate costs associated with restoration in developed areas are not included in these cost estimates. Cost estimates for sites requiring buy-outs of houses/marinas/etc. (i.e., Sunken Forest, Gun, Ocean Beach, Davis Park, Kismet, Atlantique, Fair Harbor) will likely increase significantly once real estate costs are considered.

6.6.2 Storm Damage Reduction Costs

Actions proposed for the 24 SDR project locations are the same at each location (i.e., regrade, fill, plant), therefore, costs are driven exclusively by the size of the beach fill/dune enhancement area. Thus, beach fill/dune enhancement activities are most costly at large sites such as Robert Moses State Park and Old Inlet and least expensive at Water Island and Cupsogue. A summary of costs for beach fill/dune enhancement SDR costs is provided in Appendix K.

6.6.3 Breach Response Costs

As with the SDR sites, the actions proposed for each of the breach response locations are the same and include regrading, filling, and planting. Costs are directly proportional to the size of the breach closure area. Thus, activities to close off breached areas are most costly at large sites such as Fire Island Lighthouse, Old Inlet West, and Talisman to Water Island and least expensive at Old Inlet East and Smith Point County Park. A summary of costs for breach closure activities is provided in Appendix K.

Two additional conceptual cost estimates were prepared for evaluation of breach response restoration sites, to evaluate costs for three restoration alternatives at locations near the breach closure site and are presented in Appendix K. When evaluating restoration options at the two breach response sites selected for restoration activities, alternative 3 at both sites is the most expensive (because it includes activities for both alternatives 1 and 2). Excluding alternative 3, alternative 2 at Smith Point is most expensive and alternative 2 at Tiana is least expensive. Cost estimates do not include buy-outs. Costs for sites requiring buy-outs will likely increase significantly once real estate costs are considered.

7.0 CONCLUSION

Although HEP has some shortcomings as previously discussed, HEP is a useful tool in evaluations of net impacts to habitat quality and quantity over time when comparing future no-action conditions and future conditions with a proposed activity. While the optimal conditions presented in the suitability curves to define high quality habitat may be disputed based on personal judgment, agency directives, etc., the models as developed by the HEP Team, are functioning as developed. That is, although one might disagree with restoration alternatives that include measures such as beach widening or improving dune height, the resulting beach and dune system has characteristics that, as defined by the HEP suitability curves, can be of relatively high overall habitat value for a wide suite of species and provide a diversity of functions in coastal processes. These results, in combination with additional tools, matrices, and a cost benefit analysis, that will be included in future evaluation of sites and alternatives in Phase II of this Project, will provide a thorough evaluation of impacts and benefits (beyond the scope of HEP) of actions and will aid in the selection of sites and alternatives.

The net AAHUs presented above indicate that restoration activities at Georgica Pond would result in the highest net gain in AAHUs for all three alternatives evaluated, and Warners Island East would yield the least (for all three alternatives). All proposed SDR beach widening and dune restoration activities, including breach response activities, would result in a net gain in

AAHUs from those activities. Adding restoration to breach response would provide additional net gains in AAHUs, with the highest gains at Smith Point County Park regardless of the alternative proposed.

As mentioned previously, these scores reveal something about which alternatives will yield a higher net AAHU. But, it should be kept in mind that the restoration and project alternatives vary significantly in terms of the magnitude of habitat impact/improvement, habitats affected, types of restoration or SDR activity, whether alternatives are additive, and the size of the area impacted. Georgica Pond happens to be the largest restoration site and Warners Island East is the smallest. As discussed previously, the utility of HEP is in combining these outputs (net environmental benefit) in a cost-benefit analysis to determine which alternatives would provide the highest overall improvement to habitat quality and quantity for the level of costs expended. Results of cost-benefit analysis may actually show that although Georgica may provide the highest net gain in habitat units, it may be too cost-prohibitive to actually implement the restoration activity. Alternatively, other restoration activities may not yield a high net AAHU, but the cost benefit ratio is much higher than at Georgica and would be a preferred plan in terms of improvements to habitat quality/quantity.

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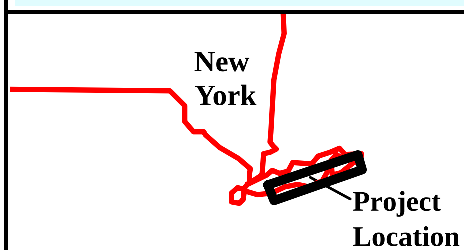
Appendix A

Contents



Source: ESRI Data and Maps, 2005.

LEGEND

Major Highway

Major Road

10 5 0 10 20 30

Miles

Figure 1. Site Location for Fire Island to Montauk Point, NY Habitat Evaluation Procedures Study.

Prepared By: Department of the Army New York District Corps of Engineers

Date: 08/06

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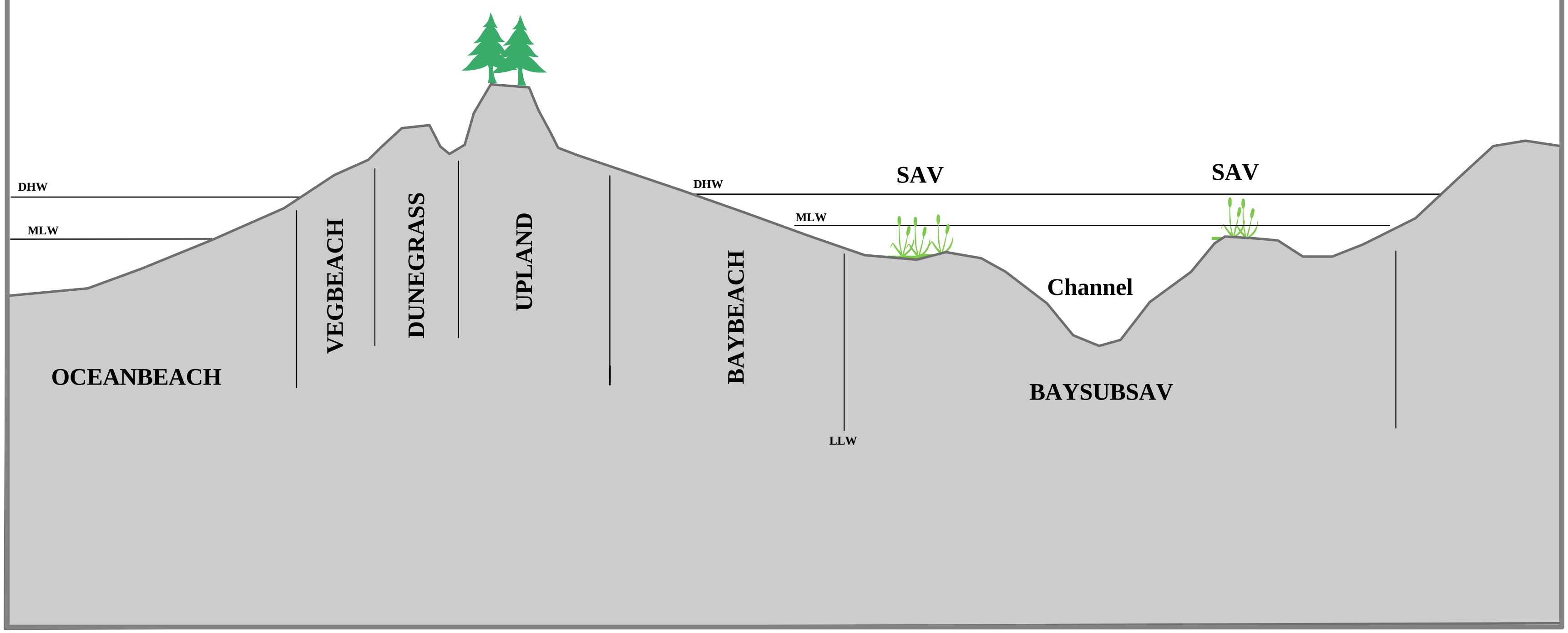


Drawing Not to Scale

LEGEND

OCEANBEACH - 10m to Daily High Water (Wrack Line)

VEGBEACH - MHW to Toe of Dune

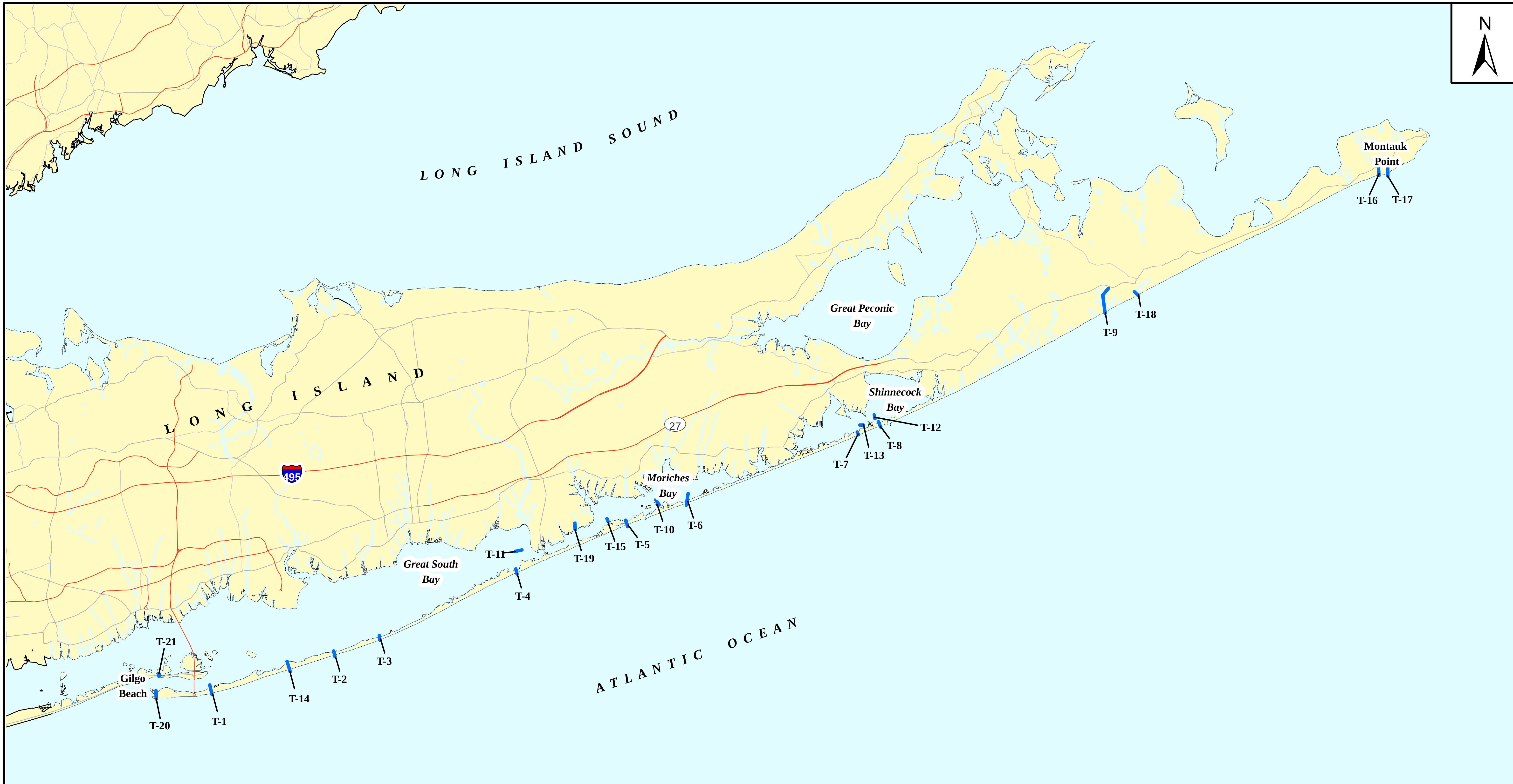
DUNEGRASS - Toe of Dune to Upland

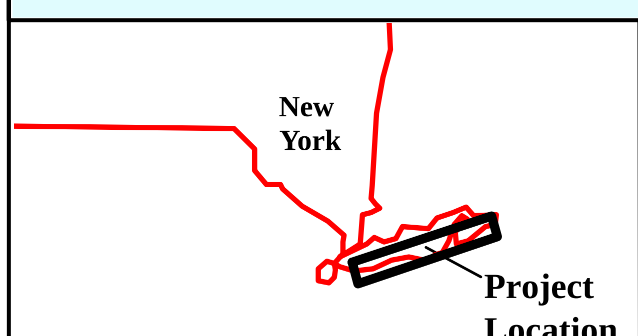
UPLAND - Dominated by >20% Shrub/Tree

BAYBEACH - Upalnd Edge to Low-Low Water

BAYSUBSAV - Permanantly Inundated

Figure 2. Idealized Transect of Ecosystems for Fire Island to Montauk Point, NY Habitat Evaluation Procedures Study.





Source: ESRI Data and Maps, 2003; USACE, 2004?

LEGEND

HEP Survey Location

Major Highway

Major Road

HEP Survey Location Names

T-1 - Robert Moses
T-2 - Sunken Forest
T-3 - Reagan Property
T-4 - Old Inlet
T-5 - Great Gun
T-6 - Pikes Breach
T-7 - Tiana
T-8 - WOSI
T-9 - Georgica Pond
T-10 - East Inlet Island
T-11 - John Boyle Island
T-12 - Warner Island
T-13 - Ponquogue Spoil Island
T-14 - Ocean Beach
T-15 - New Made Island
T-16 - Ditch Plains Road
T-17 - Ranch Road (Bluffs)
T-18 - Hook Pond
T-19 - Mastic Community
T-20 - Democrat Point
T-21 - Oak Beach

10 5 0 10 20
Miles

Figure 3. HEP Data Collection Locations for Fire Island to Montauk Point, NY Habitat Evaluation Procedures Study.

Prepared By: **Department of the Army New York District Corps of Engineers**

Date: 08/06

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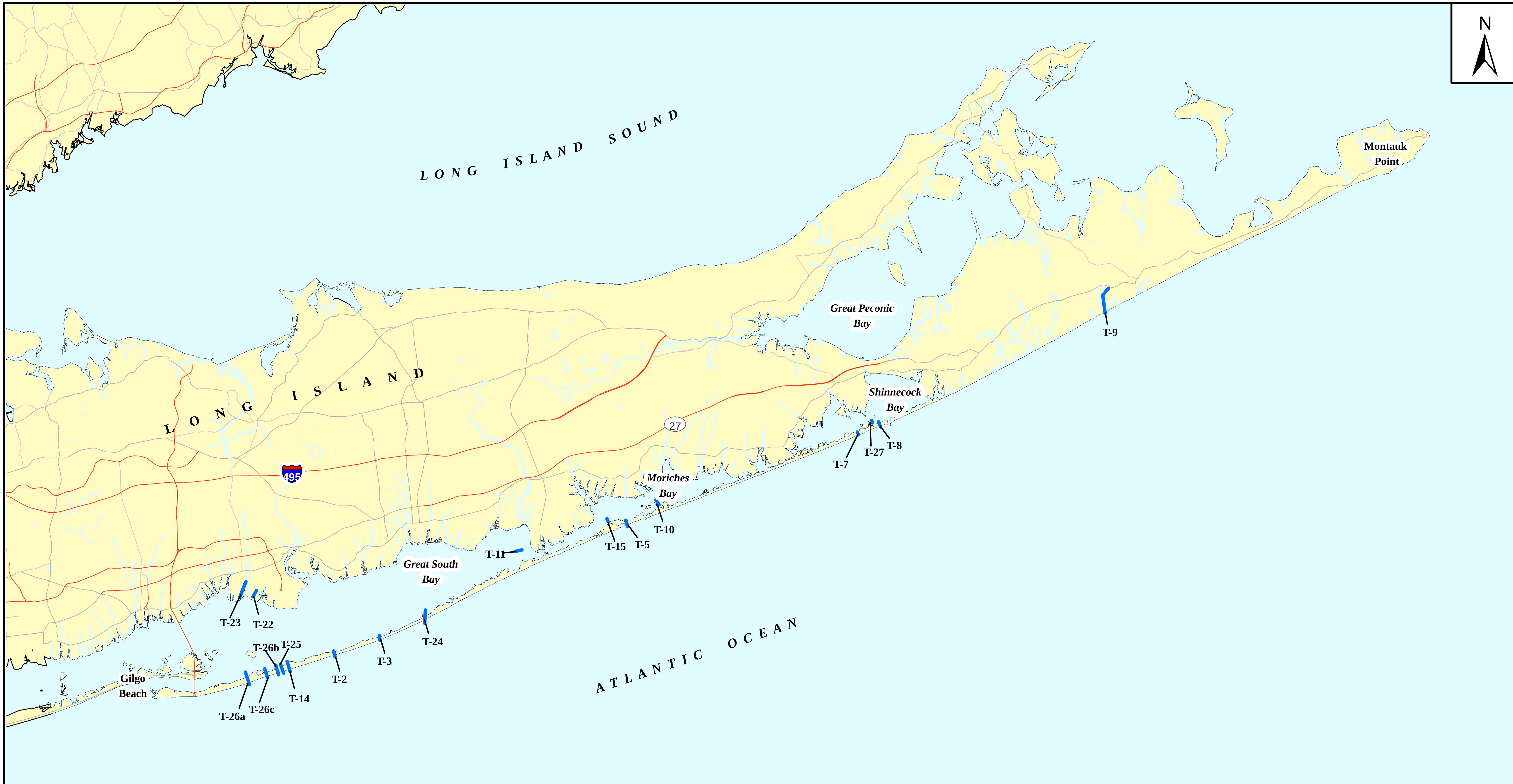

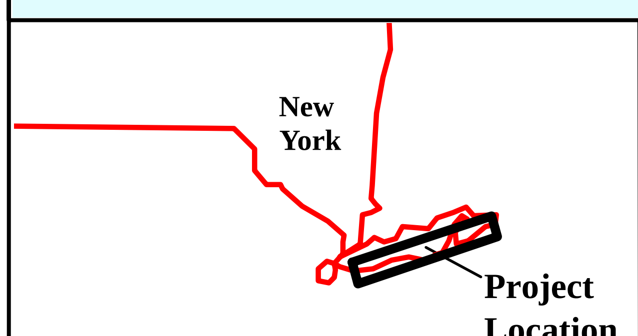

Source: ESRI Data and Maps, 2003;
USACE, 2004?

LEGEND

- Restoration Location
- Major Highway
- Major Road

Restoration Location Names

T-2 - Sunken Forest	T-10 - East Inlet Island	T-24 - Davis Park
T-3 - Reagan Property	T-11 - John Boyle Island	T-25 - Atlantique to Corneille
T-5 - Great Gun	T-14 - Ocean Beach	T-26a - Kismet
T-7 - Tiana	T-15 - New Made Island	T-26b - Atlantique
T-8 - WOSI	T-22 - Islip Meadows	T-26c - Fair Harbor
T-9 - Georgica Pond	T-23 - Seatuck Refuge	T-27 - Warner Island South

10 5 0 10 20
Miles

Figure 4. Restoration Site Location for Fire Island to Montauk Point, NY Habitat Evaluation Procedures Study.

Prepared By: Department of the Army New York District Corps of Engineers

Date: 08/06

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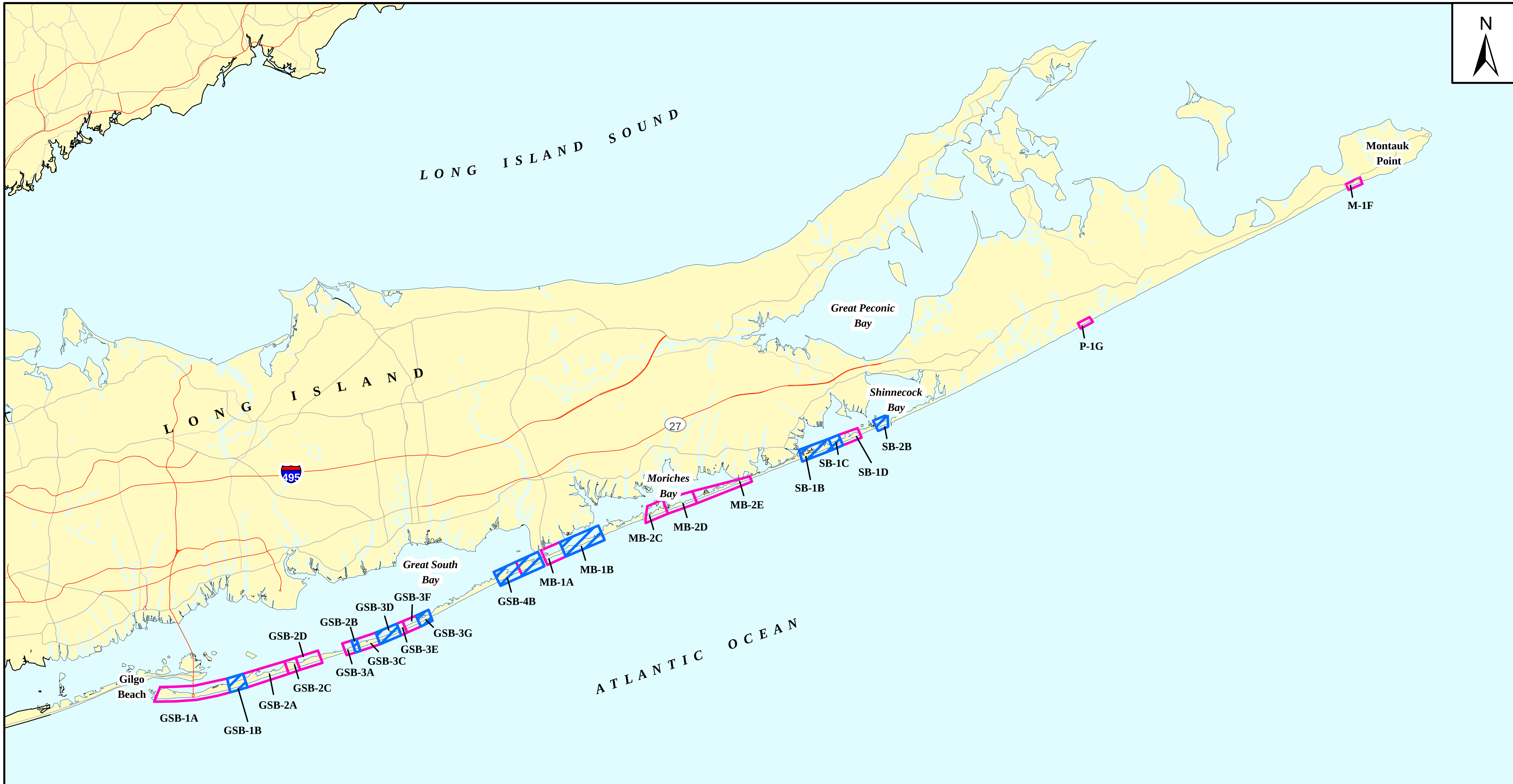

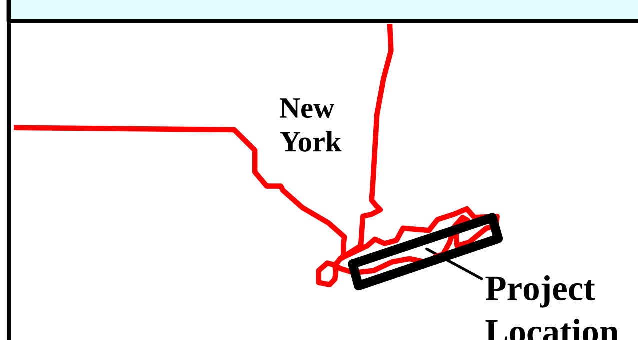

Source: ESRI Data and Maps, 2003; USACE, 2004?

LEGEND

Major Highway

Major Road

Project Design Reach

Design Reach Selected for BCP

10 5 0 10 20

Miles

Figure 5. Shoreline Protection Project and Breach Response Site Locations for Fire Island to Montauk Point, NY Habitat Evaluation Procedures Study.

Prepared By: **Department of the Army New York District Corps of Engineers**

Date: 08/06

z:/projects/fimp-hep-rest/maps2005/figures/ProjectLocation.mxd

Appendix B

Contents

Table 1. Interagency Team Members for FIMP Habitat Evaluation.

Team Member	Affiliation	Responsibility
Pamela Lynch	USACE	Advisory Team, USACE Biologist
Robert Smith	USACE	Advisory Team, USACE Biologist
Karen Graulich	NYSDEC	Advisory Team
Jean O'Neil	USACE/ERDC	Advisory Team (non-voting member)
Kelly Burks-Copes	USACE/ERDC	Advisory Team (non-voting member)
Patricia Rafferty	USNPS	Advisory Team
Steve Sinkevich	USFWS	Advisory Team
Norb Psuty	Rutgers University	Advisory Team
Stacie Grove	USACE Consultant	Advisory Team, NEA Project Manager (non-voting member)

Table 2. List of HSI Variables Sampled for HEP Community Models (see HEP Report, Section 3.4 for additional information on variables).

HSI Variables	ACRONYM	TOPIC	OCEANBEACH	VEGBEACH	DUNEGRASS	UPLANDS	BAYBEACH	BAYSUBSAV
Percent Cover of Submergent Aquatic Vegetation (%)	CANSAVCOV	Biota						x
Percent Cover of Vegetation (%)	CANVEGCOV	Biota		x	x			
Percent Cover of Shrubs and Trees (%)	CANTRSHRB	Biota				x		
Presence of Non-desirable, Invasive, and/or Exotic Species	INVASIVES	Biota			x	x	x	x
Species Richness of Desirable Plant and Animal Species	RICHSPP	Biota					x	x
Presence of Erosion	EROSION	Geomorph					x	
Presence of Modified Shoreline	SHOREMOD	Geomorph	x	x			x	
Average Slope of Dune and Shoreline	SLOPE	Geomorph		x	x			
Width of Cover Type (ft)	WIDTH	Geomorph	x	x	x			
Suitability of Substrate for Given Area	SUBSTRATE	Geomorph	x	x	x	x	x	x
Impact of Barriers to Wildlife Passage	BARWILDLF	Human	x	x	x	x	x	
Presence of Human Disturbance Factors	HUMFACTORS	Human	x	x	x	x	x	x
Magnitude of Impact From Human Disturbance (%)	HUMMAGNIT	Human	x	x	x	x	x	x

x indicates that the variable is applicable to this community.

Table 3. Final Mathematical Functions and Equations Used in the FIMP Study

HEP Community Model	Equation Used in Model
OCEANBEACH	HSI = minimum of SUBSTRATE or (WIDTH*((SHOREMOD+(((HUMFACTORS*HUMMAGNIT)+BARWILDLF)/2))/2))
VEGBEACH	HSI - minimum of SUBSTRATE or (((((WIDTH*SLOPE)^(1/2))*CANVEGCOV)+SHOREMOD+(((HUMFACTORS*HUMMAGNIT)+BARWILDLF)/2))/3)
DUNEGRASS	(((((WIDTH*SLOPE)^(1/2))*CANVEGCOV)+INVASIVES+(((HUMFACTORS*HUMMAGNIT)+BARWILDLF)/2))/3)
UPLAND	(INVASIVES+CANTRSHRUB+(((HUMFACTORS*HUMMAGNIT)+BARWILDLF)/2))/3
BAYBEACH	Minimum of SUBSTRATE or ((((RICHSPP*INVASIVES)^(1/2))+SHOREMOD+EROSION+(((HUMFACTORS*HUMMAGNIT)+BARWILDLF)/2))/4)
BAYSUBSAV	Minimum of SUBSTRATE or ((((RICHSPP*INVASIVES)^(1/2))+CANSAVCOV+(HUMFACTORS*HUMMAGNIT))/3)

Table 4. Future Conditions - Assumptions Without Restoration or Shoreline Stabilization Actions Incorporated into HSI models.

TRANSECT	OCEANBEACH	VEGBEACH	DUNEGRASS	UPLAND	BAYBEACH	BAYSUBSAV
Applied to ALL Sites (Restoration, Shoreline Protection, and Breach Response)						
Transect 1 (R. Moses)	loss of width 10%	loss of width 20%	loss of width 20%	loss of SI	no change	no change
	2000 ft to 1800, SI = .8	width to 52', SI = .3	SI = .1	dec by .1		
Transect 2 (Sunken)	loss of width 10%	none	none	loss of SI		gain in acres
	1500 ft to 1350, SI = .6			dec by .1		
Transect 3 (Reagan)	loss of width 10%	loss of width 20%	loss of width 20%	loss of SI		gain in acres
	1600 ft to 1440, SI = .6	width to 132', SI =1.0	SI = .1	dec by .1		
Transect 4 (Old Inlet)	loss of width 10%	none	none	loss of SI	gain in acres	loss in acres
	1600 ft to 1440, SI = .6			dec by .1	10% change in acres	10% change in acres
Transect 5 (Great Gun)	loss of width 10%	none	none	loss of SI	loss in acres	
	1800 ft to 1620, SI = .6			dec by .1	10% change in acres	inc by .1
Transect 6 (Pikes Breach)	loss of 20% width	loss of width 20%	loss of width 20%	loss of SI	loss in acres	gain in acres
	2600 ft to 2080, SI = 1.0	width to 165', SI =1.0	width to 17.5', SI = .3	dec by .1	10% change in acres	inc by .1
Transect 7 (Tiana)	loss of 20% width	none	none	loss of SI	loss in acres	gain in acres
	1900 ft to 1520, SI = .7			dec by .1	.05% change in acres	inc by .1
Transect 8 (WOSI)	loss of 20% width	none	none	loss of SI		no change
	2100 ft to 1680, SI = .8			dec by .1		
T-10 East Inlet Island	na	na	loss of width 30%	loss of SI	no change	no change
			SI = .1	dec by .1		

Table 4. Future Conditions - Assumptions Without Restoration or Shoreline Stabilization Actions (continued)

TRANSECT	OCEANBEACH	VEGBEACH	DUNEGRASS	UPLAND	BAYBEACH	BAYSUBSAV
T-11 John Boyle Island	na	na	loss of width 30%	loss of SI	no change	no change
			SI = .1	dec by .1		
T-12 Warner Island	na	na	loss of width 30%	loss of SI	no change	no change
			SI = .1	dec by .1		
T-13 Ponqougue Spoil Island	na	na	loss of width 30%	loss of SI	no change	no change
			SI = .1	dec by .1		
T-14 (Ocean Beach)	loss of 20% width	loss of width 40%	loss of width 40%	loss of SI		no change
	2300 ft to 1840, SI = .9	width to 36, SI =.1	width to 28', SI to .7	dec by .1		
T-15 New Made Island	na	na	loss of width 30%	loss of SI	no change	no change
			SI = .1	dec by .1		
Breach Response Sites Only (to account for full breach of area)						
All Breach Response Sites	no change	Complete overwash	Complete overwash	Complete overwash	Complete overwash	Complete overwash
		some SI gains, some losses	some SI gains, some losses	some SI gains, some losses	some SI gains, some losses	some SI gains, some losses

Table 4. Future Conditions - Assumptions Without Restoration or Shoreline Stabilization Actions (continued).

Assumptions Made When Calculating Future Conditions

Baysubsav - gain throughout area due to sea level rise and erosion of BAYBEACH

Baybeach - loss throughout area due to erosion

Upland - loss throughout area due to increased development pressures, erosion, and shifting of DUNEGRASS community

Dunegrass - loss in developed areas where dune evolution is restricted, communities will shift in location (loss in some areas/gain in others) with no net loss project wide

Vegbeach - loss in developed areas where dune evolution is restricted, communities will shift in location (loss in some areas/gain in others) with no net loss project wide

Oceanbeach -loss throughout area; eastern 1/2 of area (except rocky area near Montauk) will lose sand 2-3x's faster than the west

Oceanbeach width decrease will be 10% west and 20% east

Vegbeach and Dunegrass width decrease will be 20% sites 1, 3, 6, and 40% site 14 (sites where dune evolution is restricted)

Dunegrass width decrease will drop sites 10 and 11 which were at 10' and SI of .2. Sites 12, 13, 15 were already at the lowest SI

Upland showed an overall decrease in SI of .1; plus loss of 10% acres on islands plus 35% loss of upland areas

All types - Invasives will all decrease in SI by two classes, i.e., .8 to .4 and then to .2

All types - the three Human variables will all decrease in SI by one class

No change in Canvegcov, Cantreeshrb, Richspp, Slope, Shoremod

Baybeach - assume no change in Richspp without change in community

Baybeach on islands increased by 5% acres

AREA - in the first four, decreased acres by 10% from baseline to refelect loss of material to the west and away from these transects

Exception - in the islands, decreased area by 25% in the DUNEGRASS

Trasnsect 4 BAYBEACH acres increased by 10%

Transects 5, 6, 7 BAYBEACH decreased acres 10%

BAYSUBSAV transects 2 and 3 increased acres 1%

BAYBEACH 5, 6, 7 stopped reduction of HSIs by .1

BAYSUBSAV 4,5,6,7 stopped increased in HSIs.

Under Breach Response scenario breach results in complete overwash of dune and deposition of sand across all habitats, acreage changes NOT addressed

Breach will result in some SI impovements while others will be negatively impacted

Table 5. HEP Transects Used to Generate HSI Scores for Restoration Areas

RESTORATION LOCATION	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	COMMENTS
Sunken Forest	T-2	T-2	T-2	T-2	T-2	T-2	HEP T-2
Reagan Property	T-3	T-3	T-3	T-3	T-3	T-3	HEP T-3
Great Gunn	T-5	T-5	T-5	T-5	T-5	T-5	HEP T-5
Tiana	T-7	T-7	T-7	T-7	T-7	T-7	HEP T-7
WOSI	T-8	T-8	T-8	T-8	T-8	T-8	HEP T-8
East Inlet Island	T-10	T-10	T-10	T-10	T-10	T-10	HEP T-10, transcomm HSI = 1.0 when 4 communities are present
John Boyle Island	T-11	T-11	T-11	T-11	T-11	T-11	HEP T-11, transcomm HSI = 1.0 when 4 communities are present
Ocean Beach	T-14	T-14	T-14	T-14	T-14	T-14	HEP T-14
New Made Island	T-15	T-15	T-15	T-15	T-15	T-15	HEP T-15, transcomm HSI = 1.0 when 4 communities are present
Georgica Pond	T-9	T-9	T-9	T-9	T-9	T-9	HEP T-9
Islip Meadows	na	na	na	avg T-2, 3, 5	T-19	T-2	Setting of T-19, T-2, or average of T-2, 3, 5, except that hummfact, hummdist, barriers = average T-10, T-11, erosion = T-5, and shoremod is assigned a .8 (has minor modifications but minimal impact overall and less impact than found at other example areas). Transcomm HSI on mainland = 1.0 when 4 communities are present.

Table 5. HEP Transects Used to Generate HSI Scores for Restoration Sites (continued)

RESTORATION LOCATION	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	COMMENTS
Seatuck Refuge	na	na	na	avg T-2, 3, 5	T-19	T-2	Setting of T-19, T-2, or average of T-2, 3, 5, except that hummfact, hummdist, barriers = avg T-10, T-11, erosion = T-5, and shore-mod is assigned a .8 (minor modifications, minimal impact overall and less impact than at other example areas). Transcomm HSI on mainland = 1.0 when 4 communities are present.
Davis Park	T-3	T-14	T-14	T-14	T-14	T-14	T-14, also account for lack of groins in OB by using T-3
Atlantique to Corneille	T-3	T-14	T-14	T-14	T-14	T-14	T-14, also account for lack of groins in OB by using T-3
Kismet, Atlantique, Fair Harbor	T-3	T-14	T-14	T-14	T-14	T-14	T-14, also account for lack of groins in OB by using T-3
Warner Island East	na	na	na	T-6	avg T-10, T-11, T-15	na	Only 2 communities present, BAYSUB = average of T-10, 11, and 15, BAYBEACH = T-6 except for hummfact and humdist which = average of T-10, 11, and 15

Notes:

T-1 Robert Moses
T-2 Sunken Forest
T-3 Reagan Property
T-4 Old Inlet
T-5 Great Gun
T-6 Pikes Breach
T-7 Tiana
T-8 WOSI
T-9 Georgica Pond
T-10 East Inlet Island
T-11 John Boyle Island
T-12 Warner Island
T-13 Ponquogue Island
T-14 Ocean Beach
T-15 New Made Island
T-16 Ditch Plains Road
T-17 Ranch Road (Bluffs)
T-18 Hook Pond
T-19 Mastic Community
T-20 Democrat Point
T- 21 Oak Beach
* - Breach Response Site

At modeled sites that did not include site transects, assumptions from "parent" sites were assigned to the modeled sites.

Table 6. HEP Transects Used to Generate HSI Scores for Project Areas

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	Features Different from HEP
GSB-1A	RMSP	T-1, T-20	T-1, T-20	T-1, T-20	T-1, T-20	T-1, T-20	T-1, T-20	
GSB-1B	FILT*	T-1	T-1	T-1	T-1	T-1	T-1	
GSB-2A	Kismet to Lonelyville*	T-3	T-14	T-14	T-14	T-14	T-14	developed like Ocean Beach but no groins, bulkhead (used Reagan for Ocean to account for lack of groins, and changed only the shoreline mod variable for VEGBEACH, no need to change dunegrass because OB has lowest HSI which accounts for highly developed dune in these areas **APPLIES to GSB 2a thru 3C**
GSB-2B	Town Beach to Corneille*	T-3	T-14	T-14	T-14	T-14	T-3	developed like Ocean Beach but no groins, bulkheaded
GSB-2C	Ocean Beach to Seaview	T-3	T-14	T-14	T-14	T-14	T-3	developed like Ocean Beach but no groins, bulkheaded and marina
GSB-2D	OBP to POW	T-3	T-14	T-14	T-14	T-14	T-3	developed like Ocean Beach but no groins, bulkheaded
GSB-3A	Cherry Grove	T-3	T-14	T-14	T-14	T-14	T-3	developed like Ocean Beach but no groins, bulkheaded and marina
GSB-3C	Fire Island Pines	T-3	T-14	T-14	T-14	T-14	T-3	developed like Ocean Beach but no groins, bulkheaded and marina
GSB-3D	Talisman to Water Island*	T-3	T-3	T-3	Avg T-3, T-4	Avg T-3, T-4	T-3	eroding shoreline in some areas, but no active marina or bulkhead, used average for T3 and T4
GSB-3E	Water Island*	T-3	T-3	T-3	T-3	T-3	T-3, T-4	Small marina and is similar to Reagan
GSB-3F	Water Island to Davis Park*	T-3	T-3	T-3	T-4, T-14	T-3	T-3	marina
GSB-3G	Davis Park*	T-14	T-14	T-14	T-14	T-14	T-3	bulkheaded and marina
GSB-4B	Old Inlet*	T-4	T-4	T-4	T-4	T-4	T-4	
MB-1A	SPCP-TWA	T-5	T-5	T-5	T-5, T-8	T-5, T-8	T-8	

Table 6. HEP Transects Used to Generate HSI Scores for Project Areas

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	Features Different from HEP
MB-1B	SPCP*	T-5	T-5	T-5	T-4,T-5	T-4	T-5	
MB-2C	Cupsogue*	T-6	T-5	T-6	T-4	T-4	T-6	
MB-2D	WHPTIN Pikes	T-6	T-6	T-6	T-6	T-6	T-6	
MB-2E	WHPTIN East	T-14	T-14	T-14	T-4	T-4	T-6	
SB-1B	Sedge Island*	T-7	T-7	T-7	T-4	T-4	T-6	
SB-1C	Tiana*	T-7	T-7	T-7	T-7	T-7	T-7	
SB-1D	Shinnecock Inlet Park-West*	T-7, T-8	T-7, T-8	T-7, T-8	T-7, T-8	T-7, T-8	T-7, T-8	
SB-2B	WOSI*	T-8	T-8	T-8	T-8	T-8	T-8	
P-1G	Potato Road	T-18	T-18	T-18	na	na	T-9	no bay community
M-1F	Montauk	T-16, T-18	T-16, T-18	T-16, T-18	na	na	T-16, T-18	no bay community

Notes:

T-1 Robert Moses
T-2 Sunken Forest
T-3 Reagan Property
T-4 Old Inlet
T-5 Great Gun
T-6 Pikes Breach
T-7 Tiana
T-8 WOSI
T-9 Georgica Pond
T-10 East Inlet Island
T-11 John Boyle Island
T-12 Warner Island
T-13 Ponquogue Island
T-14 Ocean Beach
T-15 New Made Island
T-16 Ditch Plains Road
T-17 Ranch Road (Bluffs)
T-18 Hook Pond
T-19 Mastic Community
T-20 Democrat Point
T- 21 Oak Beach
* - Breach Response Site

At modeled sites that did not include site transects, assumptions from "parent" sites were assigned to the modeled sites.

Table 7. Effect of Alternative 1 on Coastal Processes at Restoration Sites.

Restoration Site	Longshore Sediment Transport	Cross-island Sediment Transport	Dune Development and Evolution	Bayside Shoreline	Estuarine	Benefit T & E Species	Total +	Total -
T-2 Sunken Forest	0	0	0	++	+	0	2	0
T-3 Reagan Property	0	0	0	++	+	0	2	0
T-5 Great Gun	0	0	0	0	++	0	1	0
T-7 Tiana	0	-	+	+	+	0	3	1
T-8 WOSI	0	0	0	0	++	0	1	0
T-10 East Inlet Island	0	0	0	+	+	y	1	0
T-11 John Boyle Island	0	0	0	0	0	y	0	0
T-14 Ocean Beach	++	0	0	0	0	0	1	0
T-15 New Made Island	0	0	0	0	0	y	0	0
T-9 Georgica Pond	0	0	0	0	++	0	1	0
T-22 Islip Meadows	0	0	0	0	++	0	1	0
T-23 Seatuck Refuge	0	0	0	0	++	0	1	0
T-24 Davis Park	0	-	+	0	0	0	1	1
T-25 Atlantique to Cornielle	0	+	0	++	0	0	2	0
T-26 Kismet, Atlantique, Fair Harbor	++	0	0	0	0	0	0	0
T-27 Warner Island East	0	0	0	++	0	y	1	0

Key:
+ = net positive effect
++ = singnificant net positive effect
- = net negative effect
- - = significant net negative effect
0 = no/minimal net effect

Table 8. Effect of Alternative 2 on Coastal Processes at Restoration Sites.

Restoration Site	Target Coastal Processes					Benefit T & E Species	Total +	Total -
	Longshore Sediment Transport	Cross-island Sediment Transport	Dune Development and Evolution	Bayside Shoreline	Estuarine			
T-2 Sunken Forest	+	-	+	0	0	0	2	1
T-3 Reagan Property	+	0	+	0	0	0	2	0
T-5 Great Gun	0	- -	++	0	0	0	1	1
T-7 Tiana	0	-	+	+	+	0	3	1
T-8 WOSI	0	-	+	++	0	0	2	1
T-10 East Inlet Island	0	0	0	++	+	y	2	0
T-11 John Boyle Island	0	0	0	++	+	0	2	0
T-14 Ocean Beach	++	0	+	0	0	0	2	0
T-15 New Made Island	0	0	0	+	+	y	2	0
T-9 Georgica Pond	0	0	0	0	++	0	1	0
T-22 Islip Meadows	0	0	0	0	+	0	1	0
T-23 Seatuck Refuge	0	0	0	0	++	0	1	0
T-24 Davis Park	0	-	++	0	0	0	1	1
T-25 Atlantique to Cornielle	0	++	0	++	0	0	2	0
T-26 Kismet, Atlantique, Fair Harbor	++	0	0	0	0	0	1	0
T-27 Warner Island East	0	0	0	++	0	y	1	0

Key:
+ = net positive effect
++ = singnificant net positive effect
- = net negative effect
- - = significant net negative effect
0 = no/minimal net effect

Table 9. Effect of Alternative 3 on Coastal Processes at Restoration Sites.

Restoration Site	Target Coastal Processes					Benefit T & E Species	Total +	Total -
	Longshore Sediment Transport	Cross-island Sediment Transport	Dune Development and Evolution	Bayside Shoreline	Estuarine			
T-2 Sunken Forest	++	++	++	++	++	0	5	0
T-3 Reagan Property	0	0	0	++	++	0	2	0
T-5 Great Gun	++	++	++	++	++	0	5	0
T-7 Tiana	0	0	0	0	++	0	1	0
T-8 WOSI	0	-	+	++	0	0	2	1
T-10 East Inlet Island	0	0	0	++	+	y	2	0
T-11 John Boyle Island	0	0	0	++	+	0	2	0
T-14 Ocean Beach	++	0	+	0	0	0	2	0
T-15 New Made Island	0	0	0	++	+	y	2	0
T-9 Georgica Pond	++	0	+	0	++	0	3	0
T-22 Islip Meadows	0	0	0	0	++	0	1	0
T-23 Seatuck Refuge	0	0	0	+	++	0	2	0
T-24 Davis Park	0	- -	++	0	0	0	1	1
T-25 Atlantique to Cornielle	0	-	++	0	0	0	1	1
T-26 Kismet, Atlantique, Fair Harbor	++	0	0	0	0	0	1	0
T-27 Warner Island East	0	0	0	++	0	y	1	0

Key:
+ = net positive effect
++ = singnificant net positive effect
- = net negative effect
- - = significant net negative effect
0 = no/minimal net effect

Table 10. Effect of Alternatives on Coastal Processes at Breach Response Plus Restoration Sites

Breach Response Restoration Site	Target Coastal Processes					Benefit T & E Species	Total +	Total -
	Longshore Sediment Transport	Cross-Island Sediment Transport	Dune Development and Evolution	Bayside Shoreline	Estuarine			
Alternative 1								
Tiana				++	+	n	2	0
Smith's Point County Park				++	++	n	2	0
Alternative 2								
Tiana	+	-	+			n	2	1
Smith's Point County Park		+		++	++	n	3	0
Alternative 3								
Tiana	+	-	+	++	+	n	4	1
Smith's Point County Park		+		++	++	n	3	0

Key:
+ = net positive effect
++ = significant net positive effect
- = net negative effect
- - = significant net negative effect
0 = no/minimal net effect

Table 11. Conceptual Ranking Matrix for Evaluating Restoration Alternatives and the No-Action Plan.

Restoration Alternative & Description

INDICATES CATEGORY IDENTIFIED BY HEP TEAM

			No-Action					Restoration Alternative 1					Restoration Alternative 2					Restoration Alternative 3				
Acres Oceanbeach																						
Acres Vegbeach																						
Acres Dunegrass																						
Acres Upland																						
Acres Bayintertidal																						
Acres Baysubsav																						
Total Acres Restored																						
Cost (Million $)																						
Benefits (AAHUs)																						
Cost per Acre (Thousand $)																						
Cost per HU (Thousand $)																						
		RANKING	**1**	**2**	**3**	**4**	**Avg**	**1**	**2**	**3**	**4**	**Avg**	**1**	**2**	**3**	**4**	**Avg**	**1**	**2**	**3**	**4**	**Avg**
THREATENED AND ENDANGERED SPECIES	Likelihood that the proposed activity would benefit Federal or state-listed species or species of special concern	low = 1 high = 5																				
LAND OWNERSHIP	Likelihood that the landowner will support the proposed activity	low = 1 high = 5																				

Table 11. Conceptual Ranking Matrix for Evaluating Restoration Alternatives and the No-Action Plan.

Restoration Alternative & Description

			No-Action					Restoration Alternative 1					Restoration Alternative 2					Restoration Alternative 3				
NATURAL SUSTAINABILITY	Likelihood that the habitats created from the proposed activity are sustainable (at least 50 years)	low = 1 high = 5																				
NATURALNESS	Degree that proposed activity supports naturally occurring conditions in the general project area	low = 1 high = 5																				
MAINTENANCE and MANAGEMENT	Likelihood that a project sponsor would assume responsibility for long-term mainteneance/ management	low = 1 high = 5																				
ANTHROPOGENIC EFFECTS	Likelihood that activity would help to reduce the overall affects of human activities on the environemnt/nature	low = 1 high = 5																				
COMBINED APPROACH	Likelihood that proposed activity would support a combined project + restoration effort	low = 1 high = 5																				
LONGSHORE SEDIMENT TRANSPORT PROCESSES	Likelihood that the proposed activity would support natural movement of sediment along the ocean side shoreline	low = 1 high = 5																				

Table 11. Conceptual Ranking Matrix for Evaluating Restoration Alternatives and the No-Action Plan.

Restoration Alternative & Description

			No-Action	Restoration Alternative 1	Restoration Alternative 2	Restoration Alternative 3
CROSS-ISLAND SEDIMENT TRANSPORT PROCESSES	Likelihood that activity would support the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay	low = 1 high = 5				
DUNE DEVELOPMENT and EVOLUTION PROCESSES	Likelihood that activity would support the natural process of sand transport and recovery associated with natural dune growth and formation	low = 1 high = 5				
BAYSIDE SHORELINE PROCESSES	Likelihood that activity will support the natural process of longshore currents along the bay shorelines and the natural creation of narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes, and eelgrass beds	low = 1 high = 5				
ESTUARINE PROCESSES	Likelihood that activity would support the circulation of water and the movement of sediments, in support of natural ecological functioning of the habitats and species within the estuary	low = 1 high = 5				

Table 11. Conceptual Ranking Matrix for Evaluating Restoration Alternatives and the No-Action Plan.

Restoration Alternative & Description

			No-Action	Restoration Alternative 1	Restoration Alternative 2	Restoration Alternative 3
INSTITUTIONAL RECOGNITION	The importance of the environmental resource as evidenced by existing laws, plans, and policy statements from international, national, regional, state, local and tribal entities.	low = 1 high = 5				
PUBLIC RECOGNITION	The importance of the environmental resource as evidenced by the general public's interest, participation and funding of resource related groups and activities.	low = 1 high = 5				
TECHNICAL RECOGNITION	The importance of the environmental resource as evidenced by the scientific knowledge and understanding of critical characteristics of the resource, such as its scarcity, representativeness, status of disturbance, level of biodiversity, use for RTE animals and plants, etc. (current vs. future conditions).	low = 1 high = 5				

Table 11. Conceptual Ranking Matrix for Evaluating Restoration Alternatives and the No-Action Plan.

Restoration Alternative & Description

			No-Action	Restoration Alternative 1	Restoration Alternative 2	Restoration Alternative 3
ACCEPTABILITY	Is the plan acceptable to Federal and state resource agencies, and local government?	low = 1 high = 5				
EFFECTIVENESS	Does the plan make a significant contribution to addressing the specified restoration problems or opportunities?	low = 1 high = 5				
RELATIVE UNCERTAINTY	What level of uncertainty is associated with the estimation of ecological outputs (FCUs)?	high = 1 low = 5				
		TOTAL:				

Ranking Completed by: 1 = USACE, 2 = NPS, 3 = USFWS, 4 = NYSDEC

Appendix C

Contents

Fire Island to Montauk Point (FIMP)
Reformulation Study

Preface: The purpose of the FIMP Vision Statement is to articulate the goals and strategies of the Reformulation Study so that all decision-makers, stakeholders, and study team members may share a common understanding in this multi-faceted study. It is hoped that the FIMP Reformulation Study will serve as a model for addressing similar coastal issues elsewhere on Long Island, the Northeast, and the United States as a whole.

Vision Statement

The vision for the Fire Island to Montauk Point Reformulation Study is to prepare an implementable, comprehensive, and long-term regional strategy for the 83 mile portion of the south shore of Suffolk County, Long Island, New York that will reduce risks to human life and property, while maintaining, enhancing, and restoring ecosystem integrity and coastal biodiversity. This will require an assessment of at risk properties within the 71 square mile floodplain, present and future sea level rise, restoration and protection of important coastal landforms and processes, and important public uses of the area. The Reformulation Study will lead to a project that provides New York State and its residents with lower storm damage risks and a full range of future options for coastal zone management.

The Reformulation Study is taking an innovative approach using the best available analyses tools for addressing coastal storm risk reduction and pre- and post-storm shoreline management along both barrier and mainland shorelines. The U.S. Army Corps of Engineers and the State of New York, in their lead project planning and cost sharing roles, are developing innovative management and restoration measures working with a wide range of stakeholders to establish comprehensive, consensus-based solutions. The final plan will recommend measures for implementation by federal agencies, New York State, Suffolk County and local governments through the exercise of all applicable governmental authorities to the maximum extent practical to achieve national, state and local objectives.

- No plan can reduce all risks. On-going monitoring will evaluate the effectiveness and impacts of implemented policies. The monitoring results will serve as the basis for adaptations and adjustments to improve the project's effectiveness and respond to the dynamic nature of the FIMP study area.

- Collection, analysis, and independent technical review of scientific data will be conducted to improve understandings of complex and dynamic, regional hydrologic, geomorphic, and ecological factors and interrelationships while simultaneously facilitating the building and sharing of an integrated scientific, economic, and social knowledge base.

- Efforts will be undertaken to reduce mainland and barrier island flooding through site specific measures that address the variety of causes of flooding throughout the study area, consistent with applicable agency laws and missions.

- Priority will be given to measures that reduce risks and provide protection to human life and property, restore and enhance coastal processes and ecosystem integrity, and are environmentally sustainable.

- Preference will be given to measures that protect and restore coastal landforms and natural habitats, aid in recovery of threatened and endangered species, enhance public recreation and use, and ensure perpetuation of essential physical and biological processes.

- Measures that avoid or minimize adverse environmental impacts and adequately address long-term demands for public resources will be used wherever and whenever appropriate and required, while continuing to accept and embrace governmental responsibility and accountability under the law.

- Dune and beach replenishment will be optimized to balance storm damage reduction and environmental considerations. Sand nourishment will be considered where it will create conditions suitable for restoration of natural processes and where appropriate to protect important uses. Active intervention will be considered where it is possible to achieve balance and synergy between human development, economic activities, and natural systems.

- Existing shore stabilization structures, inlet stabilization measures, dredging practices, and other coastal area modifications past and present, including bay and estuarine shorelines, will be assessed to examine their impacts and, as appropriate, recommended to be altered, mitigated or removed to help restore important physical and biological processes.

The FIMP Web Page:
http://www.nan.usace.army.mil/fimp/index.htm

FIRE ISLAND INLET to MONTAUK POINT

Reformulation Study

Fire Island to Montauk Point (FIMP)
Reformulation Project

Restoration Framework

Restoring important coastal physical processes and natural protective features which include barrier islands and spits, shallow nearshore areas, beaches, dunes, and wetlands will strengthen the protective capabilities of Long Island's south shore barrier islands, estuaries/bays, and mainland shoreline which will reduce risks to human life and property from coastal flood, wave attack, and erosion hazards. Key ecosystem processes are littoral transport, overwash, breaching, and inlet formation, natural dune building, intertidal and subtidal flats, and wetland establishment and growth.

The Vision for Fire Island to Montauk Point (FIMP) project is to use the Army Corps' authority for Storm Damage Reduction to reduce risks to human life and property by restoring the important structural, functional, and dynamic integrity of Long Island's south shore barrier islands, other natural protective features, and coastal ecosystem. Actions undertaken through implementation of FIMP project will advance necessary measures that allow conditions for natural processes to become restorative forces. Re-establishing the natural functioning and self-regulating attributes of the system will maximize the high protective qualities and values of natural protective features and processes, their self-sustainability and ability to protect more landward areas from flooding and erosion hazards, minimize need for costly future intervention, and enhance ecosystem integrity and coastal biodiversity.

The entire study area, which includes the mainland, estuaries/bays, inlets, barrier islands, and offshore, operates as an integrated system subject to the influence of global scale processes. It is a dynamic sandy coastal system that must be able to move and respond to winds and waves plus major storms and long-term sea level rise. On a large-scale, these processes drive the net transport of sand along shore, while hurricanes and nor'easters, through the processes of breaching and overwash, influence the gradual south-to-north movement of the barrier islands and the exchange of ocean water with the bays. These processes maintain a shifting mosaic of inter-related ecosystems, such as Atlantic Ocean nearshore areas, barrier islands, bluffs, beaches and dunes, salt marshes, sand and mud flats, and eelgrass beds. The ecosystem(s) contained within the study area are therefore adapted to frequent change. The resilience and sustainability of the essential ecosystem depends upon the perpetuation of important coastal processes. Therefore, the FIMP study will take an ecosystem approach to maintain and restore essential physical coastal processes, particularly the hydrological and geomorphological regimes.

Development and shoreline alterations of the last 75 years have affected the south shore's coastal system. It is now recognized, the ability of the system to sustain itself and its important natural protective capabilities over time has been compromised. Jetties, groins, seawalls, bayside bulkheads, barrier island infrastructure, shoreline and other human activities associated with development have directly and indirectly resulted in adverse effects on coastal processes, water quality, natural habitats, and fish and wildlife abundance and diversity. Creating the conditions for landscape-scale restoration and self-sustainability entails correcting these causes of degradation.

The five key physical processes that need to be sustained, restored, or enhanced to re-establish protective features are:

1. Longshore sediment transport
2. Cross-shore sediment transport
3. Dune growth and evolution
4. Bayside shoreline processes
5. Circulation and water quality

Fact sheets for each of the 5 key processes are under preparation.

The FIMP Web Page:
http://www.nan.usace.army.mil/fimp/index.htm

27 April 2005

Longshore Sediment Transport Fact Sheet

Sediment is moved along the coast by the daily conditions of waves and currents interacting with tides. Storm events, such as hurricanes and nor'easters, move greater quantities of sediment in short periods and cause pulses within the pattern of longshore transfers. In the study area, longshore sediment transport is primarily from east to west, with local as well as temporary reversals in direction. Sediment is eroded from the cliffs and bluffs of Montauk to create the sandy barriers and islands to the west. Sediment is also contributed to the longshore conveyor from onshore, and offshore sources and from human actions such as beach nourishment. The relative amount of sediment coming in from the east, onshore, and offshore compared to the amount exiting to the west is the sediment budget. The sediment budget helps to identify if the area is expected to be erosional, stable, or accretional over the long-term. Longshore transport provides material that contributes to a natural development of the barrier island profile, including the formation of offshore bars, beach slopes, beach berm, foredunes, dunes, and backdune areas.

Inlets serve as sediment sinks, where sediment may be sequestered in broad shoals to form flood-tide and ebb-tide deltas, or sediment may move through the inlet into the bay. While inlets are naturally occuring interruptions in the longshore conveyor system, the inlets have been dredged and stabilized for navigation, thus further interrupting the magnitude of sediment transported. Groin fields and jetties are interuptions that block and redirect longshore flows, resulting in the accumulation of material on the updrift side of these structures. The long-term impact of these structures varies based upon localized sediment transport regimes, and the size, effectiveness, and integrity of the structure. Whereas the structures that influence longshore transport are localized, their impacts can be both localized and regional in effect.

Longshore sediment transport contributes to creating and maintaining protective features on the oceanfront. Balanced longshore sediment transport allows for natural evolution of the beach and dune features, which serve as natural protective features. Restoring a more natural magnitude of the longshore sediment transport will also benefit key habitats and species (both directly and indirectly) linked to this process:

1. Coastal Marine Habitat, Sandy Nearshore and Sandy Intertidal: Longshore transport is necessary for larval transport. In addition, coastal marine and nearshore habitats provide feeding areas for finfish (bluefish), baitfish (silversides), and piscivorous birds (osprey, least tern, common tern roseate tern, mergansers, sea ducks, loons, gannets, pelicans). Sandy intertidal habitat is important for benthic and bottom dwelling invertebrates.

2. Barrier Island Habitat, Sandy Beach: The lower beach is habitat for a variety of burrowing worms, crustaceans (sand crabs), and migratory shorebirds (sanderlings, piping plovers). Higher beach areas provide nesting habitat for birds, including piping plovers, oystercatchers, and black skimmers. Plant species adapted to high salinity and shifting sands, such as seabeach amaranth, as well as numerous beetle and insect species are also dependant upon this habitat.

Restoration of longshore transport will provide sediment for the more natural development of the shoreline as well as the cross-island response of the project area. Restoration of longshore sediment transport will also reduce long-term erosion rates caused by artificial disruptions in the system (sediment transport deficits). In addition, longshore transport of sediment allows for the development of habitats that are important for wildlife, commercial and recreational fishing, recreation, and aesthetic values.

27 April 2005

Cross-Island Sediment Transport Fact Sheet

Cross-island sediment transport is the natural movement of sand back and forth across the barrier island, between the offshore bar, beach face, berm, dune, island core, bayshore, and bay. The movement of sand through the inlets also significantly contributes to this process. Cross-island transport is influenced by daily and seasonal conditions that govern exchange of material between the beach face and nearshore area; episodic storm events that can remove sand from the beach, as well as push large amounts of sand from the beach, over the dunes, and sometimes into the bays; and sea level rise that results in long-term evolution of the barrier island system. Cross-island processes also include the aeolian (wind blown) transport of fine sand. Cross-island sediment transport is observable in:

- Beach erosion/scarping and beach recovery;
- Dune erosion/scarping and dune rebuilding (through littoral and aeolian transport);
- Dune / island overwash (movement of sand and water across dunes and islands)
- Barrier island breaching (cutting of a new channel across spit or island), inlet formation, and shoal evolution at inlets.

Along the south shore of Long Island the amount of net cross-island transport (1000's of CY/yr of sand) is overshadowed by the amount of longshore sediment transport (100,000's CY/yr), but cross-island sediment transport or lack thereof, however, has a dramatic effect on the barrier island habitats and the long-term geomorphic response of the islands.

Cross-island sediment transport is complex and varies in amount and location year to year, and is strongly influenced by the longshore transport processes occurring in an area. Cross-island processes can appear destructive in the short run, such as when a dune is knocked down by waves or a salt marsh is buried under overwash sediments. Over time, this process can help the beaches and barrier islands build height, volume and width.

Cross-shore processes functions vary in winter and summer, changing the profile of beaches. In the winter, the beach typically becomes narrow and steep as the sand moves into offshore bars. In the summer, the beach tends to widen with the onshore movement of material. The sand that is carried by winds and waves across the barrier island can, over time build the island’s volume, dune height and width. Breaching and inlet dynamics create flood tidal deltas or sand flats that, over time, can also widen the bayside of barrier islands making them less susceptible to future breaching. This process, in conjunction with longshore transport, can over the long-term build and maintain critical protective features that help the coastal system adjust to rising sea levels.

Inlets exchange flows and sediments between the ocean and the bays, and also serve as important corridors for finfish, including adults, juveniles and larvae. Sand builds up at each end of the inlets creating tidal deltas (flood tidal on the bayside and ebb tidal deltas on the oceanside). These tidal deltas control the volume of water that enters the bays. In a naturally evolving inlet, undisturbed flood tidal deltas tend to close the inlet, and create sand flats and platforms for new salt marsh growth, which over time helps widen these areas of the barrier islands, making these areas less susceptible to breaching.

Cross-island sediment processes are tightly linked to natural communities and coastal biodiversity. The shallows and sand flats associated with the tidal deltas and bayside overwash fans support a host of worms, crustacea, and other invertebrates which attract finfish, such as silverside, kingfish, and bluefish, during high tide and many species of shorebirds during low tide. A federally protected shorebird species, piping plover, appears to benefit from bayside flats for nesting and feeding. From year to year, they tend to congregate in overwash areas for nesting and feeding, but leave once vegetation becomes too dense.

The intertidal flats and low wet areas behind the dunes can support *Spartina* growth and salt marsh development, so long as the wave environment is suitable. These areas attract a great variety of wading birds, shorebirds, waterfowl, finfish, and crustacea. Horseshoe crabs and diamond-backed terrapins rely on sandy portions of marsh habitats for nesting and feeding.

The subtidal portions of overwash fans may serve as platforms for eelgrass meadows, if the surrounding conditions are suitable for eelgrass growth, including currents, wave climate, depth, turbidity, and water quality. The underground stems (rhizomes) of eelgrass may also help to stabilize shoreline sediments. In addition, the grasses (leaves) serve to slow water flow and promote the deposition of suspended particles and larvae. Scallop larvae are dependent upon eelgrass, as are many fish and crustacea, for refuge.

Human activities can directly and indirectly affect the scale and location of cross-island transport. In general, groin construction, breach closures, inlet stabilization, and beach and dune nourishment change the amount of cross-island sediment transport. Other human activities that affect cross-island sediment transport include dune enhancement and construction - through trucking of sand, beach scraping, and sand fencing, dune removal to enhance water views, structures, and cuts in dunes for vehicles and access paths. Disruptions to cross-island sediment processes have local and immediate impacts as well as regional and long-term impacts. In most instances these measures reduce the amount of transport, but in some instances, measures such as groin construction and inlet stabilization can result in areas of increased cross-shore transport, outside the immediate footprint of the project. This affects the on-going creation of barrier island and bayshore habitats and changes habitat succession patterns throughout the area.

Restoration of the cross-island processes will allow for a more natural mosaic of habits consistent with the variability of responses across the project area.

27 April 2005

Dune Development and Evolution Fact Sheet

Coastal dunes are part of the Dune-Beach sand-sharing system. These dunes (referred to as the foredune or primary dune) are an accumulation of sand at the upper margin of the beach. Their growth is largely a product of wind transport, although water may also contribute to the accumulation during storms. Dune development occurs when sand is transported inland across the bare sand beach to gather in areas of vegetation uniquely adapted to surviving in this harsh habitat (salt, heat, drought, abrasion, nutrient deficiency). This pioneer vegetation is the elemental component in trapping sediment and stabilizing the dune form. Dune development and evolution is largely related to the conditions of the shoreline. If the beach is stable, sand continues to accumulate in the foredune and it increases in width and height. Along the south shore, foredunes generally achieve heights in the range of 15-30 ft above mean water level. If the shoreline is eroding, the foredune is intermittently scarped and lowered, sand is transported offshore, or inland over the crest, and the dune ridge shifts inland. If the shore is accreting, the foredune may widen or, more likely, a new foredune area will develop and strand the older foredune in the landscape (old foredune lines).

Foredunes are dynamic features in the sand-sharing system. They are often scarped during storm events and lose some of their sand to wave erosion. In association with the storm or afterwards, sand may be transported to the dune crest as well as inland of the dune crest. In the post-storm period, the dune face will receive new sand and will revegetate over time. Together, these transport and recovery processes allow the foredune to re-develop from storm events and to maintain its morphology even while being displaced.

Dunes serve an important ecological function. They provide a unique habitat at the transition (ecotone) between the exposed beach and the sheltered landward portion of the barrier island. The foredune toe habitat with sparse vegetation density is the site of runners and rhizomes of the pioneer vegetation, clumps of seabeach amaranth and seabeach knotweed, and nesting sites for a variety of shorebirds. The dune face and crest is more thoroughly colonized by dune grass, seaside goldenrod, and dusty miller, providing cover and feeding for birds and insects. The leesides of dunes offer protection and are occupied by shrubs and bushes and salt-pruned trees which support insects, birds, and small mammals. Often, low areas to the lee of the foredunes are poorly drained and these dune slacks are home to freshwater pond/marsh habitats.

Dunes also have a topographical function. They constitute a storage bank of sand and they diminish the effects of erosion during extreme events by contributing sand to the total transport. They also serve as a barrier against storm surge, and wave penetration. In providing these several functions, dunes are an important buffer between the very active beach and the more stable interior areas.

In the past, human activities have been undertaken which affect the dune development. Some foster sand accumulation and dune growth, such as erection of sand fencing, and planting of beach grass. These programs usually focus on trapping of sand on and/or in front of the foredune. On the other hand, the presence of houses within the foredune or primary dune interferes with vegetation cover, the opportunity for sand accumulation, and the creation of habitat. Access paths and dune cuts also result in breaches of the natural dune system, and buildings and other structures alter wind flow and the pattern of wind transport. On a larger scale, the aeolian transport of sand is also affected by disruptions in the alongshore transport of sand, because disruptions to the beach reduce the amount of material that is available within the system to allow for natural dune growth and recovery. Severe interruptions in sediment availability will lead to breaks in the foredune ridge, blowouts, and will compromise the continuity of the foredune ridge form and function.

Maintaining the natural dune process(es) supports the presence of a unique landform at the transition between the very dynamic beach and the more stable interior landscape. The foredune is part of the buffer that absorbs and diminishes the effects of storms. It provides a myriad of habitats because of its windward and leeward exposure and protection.

BAYSIDE SHORELINE PROCESSES

The natural shore of the bays is characterized by narrow sandy beaches, tidal creeks, mud and sand tidal flats, salt marshes and eelgrass beds. These beaches, tidal wetlands and shallows are natural features that contribute to barrier island integrity, buffer the upland from bay wave action and are integral to maintenance of the diversity of the natural system in the face of rising sea level.

Waves, winds, and wave- and tidally-generated longshore currents are responsible for the characteristics of the bay shorelines. Areas of higher energy tend to establish beaches, while more sheltered areas tend to establish salt marshes and eelgrass beds. The beaches tend to be erosive, and migrate up with rising sea level. The process that creates and sustains marshes and tidal flats is primarily slow currents which allow for deposition of fine-grained sediment. Organic detritus trapped in the saltmarsh contributes to its upward growth and maintenance to maintain the marsh elevation relative to rising sea levels. Eelgrass establishes itself in clear waters, primarily in the shallows adjacent to the barrier islands. On the bayshores of the barrier islands, this gradual sedimentation process is punctuated by cross-island processes of breaching and overwash (as described in the cross-island transport), which deposit significant amounts of sediment on the bayside, and provide essential sources of sediment that allow for the creation of tidal flats, marshes, and eelgrass beds.

Because of the infinite volume of seawater during storm events, tidal marshes can do little to reduce coastal flooding during storms, unlike their riverine counterparts. However, they can provide an important buffer against erosion of the shore from storm waves on the bay. On the barrier islands, tidal wetlands also form a bayside “platform” which effectively widens the barrier island, making it less susceptible to breaching. Breaches are less likely to occur, and the flooding impact may be less severe where the bayside of the barrier island has a wide salt marsh, tidal flats, and very shallow waters. In addition, these broad tidal flats and wetlands help the barrier island maintain its integrity by serving as the platform on which washover deposits delivered by ocean waves build up the barriers, helping them migrate up and landward during rising sea levels.

These bay shoreline processes establish habitats which are essential to the overall system functioning. Bayside beaches, tidal flats, salt marshes, and SAV beds provide fish and wildlife nursery, spawning, and feeding habitat. These habitats support diverse populations of fish and wildlife and support most life stages of fish, crabs, and other invertebrates which are essential components of the food web. These habitats also support migratory and resident shorebirds and wading birds, diamond-backed terrapins, horseshoe crabs, hard and soft shell clams, prey fish such as mummichugs and other killifish, shrimp, northern puffers, and recreationally and commercially important finfish species. Marshes also contribute to water quality, by providing filtration services, absorbing nutrients and capturing pollutants from the uplands.

Human activities have directly and indirectly impacted the bay shoreline processes and habitats, and have impaired the ability of beaches, marshes, tidal flats, and eelgrass to function as natural and protective features. These changes are primarily a result of dredging and placement of material, and through stabilization of the bay shorelines.

Navigational dredging can result in direct degradation, removal or burial of tidal wetlands. In addition, dredging can alter bay circulation patterns, and influence the natural processes of sediment deposition and scour. In many instances, in the dredging of the bayside channels, the dredged sediment is placed either in the ocean or in an upland location, which further impacts the bay processes by removing this material from the system. Channels in proximity to the bayside of the barrier island can also increase both the likelihood of breaching and the flooding impacts into the bay as a result of a breach. As well, channels through the barrier islands can increase tidal range in the bays adversely affecting flooding and tidal wetlands. The presence of channels can also further alter the natural processes by allowing for greater wave energy in proximity to the shoreline, due to both deeper water and the waves from vessels which utilize the channels.

Bulkheads and other hard structures associated with marina facilities can increase the amount of scour near them and result in the re-distribution of material into the bay. Shoreline hardening also can trap material and alter the alongshore distribution of material. Finally, shoreline hardening prevents sediment landward of the structures from entering the bayside littoral system, resulting in the direct loss or alteration of bayside beaches, tidal flats, and salt marshes. As sea level increases within the bays, these shore stabilization structures prevent the landward and upward migration of these natural features, thus resulting in their long term loss or impairment.

In general, the cumulative impact of the above threats has gradually led to the degradation of bayside beaches, tidal flats and salt marshes and their function. Restoration of the bay shoreline processes will serve to restore these habitats both as natural protective features, and as critical bayside habitat.

27 April 2005

Estuarine Processes Fact Sheet

Estuaries are places of transition from land to sea and from fresh to salt water. Estuarine processes can be characterized by the circulation of water, and the movement of sediments as it relates to the ecological functioning of the habitats within the estuary.

The movement of water within estuaries is influenced by the magnitude of freshwater input, the bathymetry (topography of the bottom) of the bays, exchange of water through the inlets, and wind. Wind-driven currents are dependent on the direction and strength of the wind and on fetch. The movement of water from the mainland, into the bay, and through the inlets serves to flush the system and helps to maintain water quality. Salinity and temperature are characteristics of estuarine water quality that are affected by circulation. Water quality is also influenced by surface and ground water, point and non-point sources, variability in precipitation events, and regional changes in ocean circulation patterns. Storms can alter estuarine circulation through surges into the bay and by breaching of the barrier islands. Breaches of the barrier islands alter circulation patterns and salinity distribution by changing the location and amount of ocean water entering the bay.

The movement of sediment in the bay is also connected with the day-to-day movement of water, punctuated by storm events that can result in large infusions and redistribution of sediment.

The circulation and sediment movement are (both directly and indirectly) linked to key habitats and species, as follow:

1. Open Bay: Estuarine circulation, in the form of currents and mixing, affect the distribution patterns of plankton species including the larvae of benthic species. Phytoplankton, tiny single-celled algae, are the foundation of the estuarine food web.

2. Bay Bottom: The bay bottom provides habitat for shellfish, and finfish.

3. Shoals: Many commercially valuable marine organisms depend upon estuaries during some point of their development. Shoals provide spawning and feeding habitat for clams and other shellfish, finfish, and horseshoe crabs. These shallow areas are also important feeding habitat for wading birds.

4. Eelgrass beds: Eelgrass habitats provide forage, breeding, and nursery areas for shellfish, crustaceans, and fish. The main function of eelgrass beds is to produce detritus (decaying plant matter). Bacteria, worms, and crabs feed on detritus and are then eaten by other animals in the food web.

The estuary also serves as an important area for recreation, including fishing, boating, swimming, and bird watching. As the demands imposed on the estuary have increased, so has the importance of restoring and protecting this resource for its ecological and aesthetic values. Restoring estuarine processes and improving water quality will enhance commercial, recreational and ecological functions within the estuary.

As human population density has increased, land clearing, application of fertilizers, discharge of sewage and cesspool systems, and other activities have increased the delivery of nutrients such as nitrogen and phosphorus to the estuary. The introduction of these materials has altered the composition of the sediment on the surface of the bay bottom. Another effect of excessive nutrient loading into the bays can be observed as brown tides.

Simultaneously, the inlets have been modified and stabilized to provide reliable navigation and to increase the exchange of water between the ocean and bays. Dredging for the creation of navigable channels has altered the bottom composition, the bottom topography (through both dredging and placement) and salinity distribution in the bays by increasing the amount of ocean water entering the bay. The dredging of inlets has also moderated the amount and distribution of flow that comes through the inlets. This increase in salinity has shifted the historically dominant shellfish species from oysters to clams.

The magnitude of human changes within the estuary, and the complexity of the interaction between the physical processes and the environment make it difficult to identify a clear objective for the restoration of estuarine circulation processes. Alternately, the topographic and bathymetric changes within the estuaries can provide clear opportunities for habitat restoration.

Appendix D

Contents

FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
RESTORATION AND HABITAT EVALUATION MEETING SUMMARY
MAY 12 THROUGH 14, 2004
USFWS LONG ISLAND FIELD OFFICE, ISLIP, NY

TO: Pamela Lynch, USACE

FROM: Stacie Grove, NEA

SUBJECT: Summary of FIMPS Team Meeting

DATE: June 21, 2004

CC: Karen Graulich (NYSDEC), Jean O'Neil (WES), John Pavacic (NYSDEC), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA)

In attendance:

Michael Bilecki (NPS) [3]	John Pavacic (NYSDEC) [2]
Lynn Bocamazo (USACE) [3]	Patricia Rafferty (NPS) [1]
Steve Couch (USACE) [3]	Dan Rosenblatt (NYSDEC) [3]
Mary Foley (NPS Boston) [3]	Jeff Zapperi (DES Coastal Program) [3]
Karen Graulich (NYSDEC)[1]	Steve Sinkevich (USFWS) [1]
Stacie Grove (NEA) [2]	Robert Smith (USACE) [2]
Pamela Lynch (USACE) [1]	Norb Psuty (Rutgers) [1]
Jean O'Neil (WES) [2]	Theresa Rotunno (EEA Consulting) [3]

[1] voting member of the FIMP advisory Team
[2] assisting advisory Team, but not a voting member
[3] non team attendee/interested party

All meeting attendees listed above participated in a ½-day meeting on May 12, 2004, which included an overview of Habitat Evaluation Procedures (HEP) and potential application of HEP to evaluate the restoration component of the Fire Island to Montauk Point (FIMP) shore protection and storm damage reduction project (Project) as described below.

I. INTRODUCTION TO HABITAT EVALUATION PROCEDURES (HEP)

Jean O'Neil provided and introduction to HEP. HEP is a method developed by the United States Fish and Wildlife Service (USFWS) for documenting the quality and quantity of available habitat. HEP provides information for two general types of habitat comparisons: 1) the relative score of different areas at the same point in time; and 2) the relative score of the same area at different points in time. This information is useful in baseline and impact assessments to evaluate proposed actions (such as restoration alternatives) that potentially result in a change in either habitat quantity or quality. Through the use of HEP, the relative score of habitats can be quantitatively assessed through a final numerical output that is technically defensible, replicable, and can be applied consistently in a variety of different habitat types. HEP is based on combining a measure of habitat quantity with an index of habitat quality to determine habitat scores.

Habitat Suitability Models (HSI's) are used to determine the suitability (i.e., quality) of a given habitat or community type for a species or group of species. Models include quantifiable environmental variables that are deemed to affect the species' presence, distribution, and/or abundance to determine suitability.

The USACE is proposing that HEP will be used to evaluate the restoration components of the FIMP Project. HEP could also be applied to evaluate impacts, costs, and benefits of flood protection/storm damage reduction components, but at this time the USACE is not planning to use HEP to evaluate Project impacts or alternatives. In some cases, restoration components and Project components may occur in the same area. In this case, HEP data could be used to evaluate the Project.

II. HEP ADVISORY TEAM WORK SESSION

Meeting attendees identified with a superscript of 1 or 2 are members of the FIMP, restoration and habitat evaluation advisory Team (Team). The Team was created to assist the USACE in developing an approach to evaluate restoration opportunities for the FIMP study area. Team members participated in a 2 and ½ day work session from May 12, 2004 through May 14, 2004, in which Team members determined the appropriate habitat evaluation method approach to use for FIMP restoration analysis and began developing appropriate habitat suitability index models for use in the evaluation of restoration alternatives. Specific Team tasks included the following:

- Identify Goal Statements.
- Identify Example Restoration Measures.
- Identify Best Approach to Evaluate Restoration Measures.
- Identify Evaluation Communities or Species.
- Develop Models to Evaluate Communities or Species.

<u>HEP GOALS</u>

Each member of the Team identified his or her restoration goals for FIMP (i.e., the results they are hoping to see from USACE and partners' restoration efforts). Fourteen (14) goals were identified. After Team discussion, 13 of the original 14 goals were consolidated into the following five (5) goals:

1. Maximize the benefits, functions, and biodiversity of natural and native habitats on FIMP

2. Advance the status of populations of rare, threatened, and endangered biota on FIMP.

3. Re-establish natural rates of longshore sediment transport along the ocean and the bay.

4. Improve circulation into and within the back bay.

5. Re-establish natural rates of cross-island sediment transport.

It is assumed that objectives 3-5 are necessary to accomplish objectives 1 and 2. Further, the community types selected for evaluation model development will reflect changes in the system related to the physical processes including implementation of restoration actions.

The non-incorporated objective, *compliment natural processes with active management to support natural processes*, was discussed at length. Some members of the Team expressed concern about including active management as a restoration objective, assuming that whatever restoration was done, would be self-sustaining and would not require long-term active management strategies to ensure success. Others expressed concern about excluding it as an option, indicating that active management may be one of the best options for restoring the area to natural conditions. Although issues may still not be resolved on this, current FIMP ETMG and IRG members, as well as the stakeholders involved, are continuing to address the issue.

RESTORATION MEASURES

Each member of the Team identified some examples of restoration measures that he or she felt might be appropriate for the FIMP study area. This list was created as an exercise to gain consensus within the group regarding the types of restoration that may be considered. Measures identified in the list may or may not be pursued as restoration options for FIMP, and the Team may add additional options if appropriate.

Sixteen (16) measures were identified as follows:

1) Remove dredge spoil to re-establish pre-existing habitats.
2) Increase tidal flow (i.e., wetland extent).
3) Create overwash fans.
4) Bypass dredge channels and/or inlets.
5) Notching groins.
6) Remove hard structures such as groins, bulkheads, jetties.
7) Create open space through land protection, property buy-outs, removal of structures and impervious surfaces).
8) Replant submergent aquatic vegetation (SAV).
9) Reduce direct impacts by restricting access, off-road vehicle use, etc.
10) Restore dunes in order to limit breaks in dunes.
11) Eliminate impediments to natural migration of dunes.
12) Monitor shorebirds and other "target" species.
13) Remove undesirable species (i.e., *Phragmites*) from salt marshes.
14) Erect dune fences.
15) Build embryonic dunes.
16) Create ephemeral pools.

Several of these restoration measures (restrictions to access, long-term monitoring of specific species) may not be appropriate restoration options for the USACE to pursue. However, should the results of the HEP study show that these are viable restoration options, the USACE will identify these as such and would encourage the appropriate local entities (such as local, county) to address them.

EVALUATION APPROACH

The Team discussed the pros and cons of species models, community models, and the combined use of both. The Team agreed that a community-based approach was most appropriate for the FIMP area. Individual species, such as piping plover, may be added at a later date if needed.

EVALUATION COMMUNITIES

The Team reviewed the idealized transects of a barrier island ecosystem identified from the FIMP conceptual model, and evaluated the cover type information available for FIMPS. The Team identified 6 community complexes to be addressed in the FIMPS HEP as follows:

1) Nearshore/sandy intertidal/sandy beach – area from 30 ft (10 m) depth in ocean landward to the seaward toe of the primary dune.

2) Primary dunes and swales – area from seaward toe of primary dune landward to the seaward toe of the secondary dune or upland.
3) Terrestrial uplands – area from the crest of dune bayside to the landward limit of swale.
4) Bay intertidal/bay beach – area from Low-Low Water (LLW) to Storm High Water (i.e., High-High Water) and beach landward to the crest of the bayside dune or upland (includes mainland).
5) Bay islands – all area on islands from LLW landward to include upland.
6) Bay subtidal/submergent aquatic vegetation – area from LLW and below (i.e., areas constantly covered by water).

MODEL DEVELOPMENT

The Team used Community Model Builder software (provided by WES) to assist in model development. During the work session, the Team provided input into model development and information was entered directly into the Community Model Builder database. A printout of each community model including detail regarding assumptions, evaluation variables, weighting factors, mathematical equations, suitability index curves, and general description of model application, will be provided to the Team for review once models are refined by WES.

The models developed for FIMPS *could be* applied to other similar systems and processes. However, the assumption made by the Team is that these models would only apply and be used for the FIMP project. Note: Although issue was not fully addressed, it is the hope of USACE staff that further discussion and correspondence could be possible for use of these models in any other system(s) and/or for any other project. The appropriate methodology etc. would need to be employed, for each new project area and HEP model creation, however if similar conditions and systems exist the USACE would like the opportunity to keep this option available. The following is an overview of the community models developed by the Team. WES and NEA are working to further develop the Community Model database based on input from Team. Therefore, the variables listed for each model below are not all accurate (and are thus highlighted in yellow). Once the database is completed, these will be amended, as needed.

For all models the Project life is assumed to be 50 years, however, target years may be identified for additional analysis throughout the 50-year life of the project. In addition, based on the 2006 WRDA, restoration authorization for the Project, the start of construction is assumed to be 2011.

BAYSUBSAV – Bay Subtidal/Submergent Aquatic Vegetation

Problems: poor water quality, direct disturbance, reduction in availability of suitable substrate for SAV communities.
Indicators: loss of, and/or negative impacts to, SAV and associated species.
Endpoints (how Team will know that conditions have improved): improvements in the health and extent of SAV and associated species.
Evaluation variables: V1 – Species richness, V2 – Abundance of desirable species, V3 – Abundance of undesirable species, V4 – Percent cover of SAV.
Assumptions: date of first known occurrence of SAV (TO BE DETERMINED) will serve as the reference, existing data will be used to develop species lists, no major changes will occur in the FIMP area between baseline and construction date.
Weighting factors: V3 was weighted at half the value of other variables, and may not remain in the model.
Potential outstanding issues: none identified.

NEARBEACH – Nearshore/Sandy Intertidal/Sandy Beach

Problems: hard structures have interfered with normal coastal sediment transport processes.
Indicators: narrower beaches and steeper slopes occurring at faster rates and/or in areas of special concern.
Endpoints: over a landscape scale, the characteristics of the beach and dune system of the FIMP area will more closely resemble that of the Fire Island Wilderness Area where the effects of man-made structures are believed to have not significantly altered the coastal processes.
Evaluation variables: V1 – Distribution of successional stages (i.e., early, transitional, and mature), V2 – Human disturbance (i.e., hard structures, inlets, residential development, and vehicle access), V3 – Average width of beach (?????).
Assumptions: Wilderness area conditions will serve as the reference, proportion variable V1 will be applied to the area of "expected" impacts from restoration (i.e., hard structure removal or modification), no major changes will occur in the FIMP area between baseline and construction date.
Weighting factors: none identified.
Potential outstanding issues: how to address the dynamic nature of this system (baseline conditions will change considerably 50 years from now); USACE Project activities may further restrict the natural processes that we are trying to restore; part of the "natural" process is for sand to be displaced in one area and re-deposited in another, restoration that includes beach re-nourishment would be intervening in this "natural" process; bypass restoration measures could accomplish both restoration and Project goals, there is concern about using a component of restoration to accomplish Project goals. Also, variable 2 seems to skew the model in favor of unnatural, stabilized, wide beaches, which may limit the likelihood of cross island transport. As a result, the model will show significant benefit from beach renourishment.

PRIMDUNES – Dunes and Swales

Problems: hard structures (including houses and infrastructure) have interfered with cross-island transport and dune growth and evolution.
Indicators: loss of dunes or dunes in some unnatural state.
Endpoints: dune growth, evolution and characteristics will more closely follow natural dune systems.
Evaluation variables: V1 – Ratio of "natural" dune crest conditions to "altered dune crest conditions, V2 – Coefficient of variation in dune height and width, V3 – Amount of human disturbance, V4 – Proportions of early, transitional, and mature dune (same variable as Model 2 V1).
Assumptions: 1930's conditions will serve as the reference for V1 through V4, Fire Island wilderness area data will serve as the reference for V4, existing data will be used to develop species lists, no major changes will occur in the FIMP area between baseline and construction date.
Weighting factors: Human impacts to dunes are the most significant factor in negative impacts to dunes and swales and V3 was therefore weighted 2x's higher than all other variables.
Potential outstanding issues: V1 may be a quantity variable rather than quality. The USFWS has proposed to add a variable "cross island access for shorebird broods" to this model.

BAYBEACH – Bay Intertidal/Bay Beach (to include Mainland)

Problems: invasive species, hard structures, and human disturbance have reduced diversity of these areas and altered cross-island and littoral processes.
Indicators: alteration of topography, decreased productivity of commercially valuable species (i.e., clams), loss and/or degradation of natural communities
Endpoints: improvements in the productivity and number of clams, increase in extent of natural communities such as salt marsh, improved conditions/health of desirable communities.
Evaluation variables: V1 – Species richness, V2 – Abundance of desirable species, V3 – Abundance of undesirable species, V5 – ratio of natural conditions of bay beach versus modified condition, V6 – Connectivity across island for terrapin (Fragstats?), V7 – human disturbance.

Assumptions: 1930's conditions will serve as the reference, existing data will be used to develop species lists, no major changes will occur in the FIMP area between baseline and construction date.
Weighting factors: Weight non-desirable species less than desirable species, weight V5 higher than other variables.
Potential outstanding issues: none identified.

ISLANDS – Bayside Islands

Islands have similar community composition as bay intertidal/bay beach. But, the Team determined that these communities were unique enough to be evaluated as a unique community type. Restoration potential for these areas is very high.
Problems: invasive species, hard structures, predators (i.e., gulls), human disturbance have reduced diversity of these areas and have disrupted normal processes for several bird species of concern that are closely linked to protected island habitats.
Indicators: decreased productivity of target bird species (i.e., heron, tern), loss and/or degradation of natural communities.
Endpoints (how will we know conditions have improved): improvements in the productivity and/or number of target bird species, increase in extent of natural communities such as salt marsh, improved conditions/health of desirable communities.
Evaluation variables: V1 – Species richness, V2 – Abundance of desirable species, V3 – Abundance of undesirable species, V4 – connectivity of habitats across island, V5 – human disturbance, V6 – ratio of natural versus modified shoreline conditions.
Assumptions: 1930's conditions will serve as the reference, existing data will be used to develop species lists, no major changes will occur in the FIMP area between baseline and construction date.
Weighting factors: weight V6 higher and V5 lower than other variables.
Potential outstanding issues: none identified.

UPLANDS – Terrestrial Upland

Problems: invasive species, hard structures, human disturbance have reduced diversity of these areas and have disrupted normal cross-shore and cross-island processes.
Indicators: evidence of severe erosion bayside, decreased productivity of target bird species (i.e., plover), loss and/or degradation of natural communities.
Endpoints: improvements in the productivity and/or number of target bird species, increase in extent and/or improvements to the condition/health of natural communities.
Evaluation variables: V1 – Evidence of severe erosion, V2 – connectivity across community for target species such as plover, V3 – evidence of human disturbance.
Assumptions: 1930's conditions will serve as the reference, existing data will be used to develop species lists, no major changes will occur in the FIMP area between baseline and construction date.
Weighting factors: none identified.
Potential outstanding issues: none identified.

The Team identified several indicators of disturbance that may be used in the models as follows:

- Evidence of vehicle/pedestrian use (tracks, ruts, boat access areas, picnic grounds, campsites, picnic tables)
- Hard structures (i.e., groins, jetties, walls, docks, marinas)
- Developed (permanent buildings, fences, bulkheads, paved or unimproved roads and access points)
- Evidence of periodic maintenance such as mowing and cutting
- Trash, debris
- Noise (esp. boat traffic, jet skis)
- Presence of outfall pipes or other potential sources of pollution

- Human activities in close proximity to nest sites or islands (boat traffic, jet skis, vehicles, various beach activities, residential areas)
- Area tilled, filled, logged, cleared, or excavated

III. GENERAL COMMENTS/QUESTIONS REGARDING APPLICATION OF HEP

- Can predictions of "future" conditions account for the periodic catastrophic events that occur on FIMP (i.e., show results of these events with and without the Project)
- Can uncertainty be incorporated into the models? Some options may include Crystal Ball software, sensitivity analysis of data, identifying the most sensitive variables, and weighting variables during model development.
- Can HEP adequately address the dynamic nature of a coastal system? Can the daily and periodic cyclic events that change the system be incorporated into evaluation of habitat characteristics over time? Can predictions of future change be built into the models?
- Can habitat fragmentation, barriers to animal movement, possibly other landscape variables be incorporated into community models?
- The processes of beach overwash, sediment transport from one area to another, widening and narrowing of dunes and beaches, etc., are continuous processes that occur throughout the FIMP study area. The Team is assuming that the locations of these may change, but the rates and average conditions should not change significantly over time across the FIMP landscape. The overall perception is that man-made structures and human activities have negatively affected the rates and occurrences of these processes.
- Concern that storm protection measures may be proposed for areas where we want to allow the natural sediment transport processes that are currently occurring to continue.
- Team questions why HEP was not being used to evaluate impacts from the actual Project.
- Some members of the Team are uncomfortable with the assumption that the Team's efforts will be directed at restoration and not mitigation, because the Project will not have impacts and therefore mitigation will not be required. It is likely that Project activities and even enhancement activities will require negative tradeoffs for other species. All potential impacts must be evaluated and addressed in the EIS for the Project. HEP provides an important framework for evaluating tradeoffs.
- Some members of the Team are uncomfortable with the assumption that restoration efforts can be accomplished by restoring natural processes, and that active management and/or physical alteration of habitats are not desired or necessary.
- Restoration components may or may/not also provide storm protection benefits for the Project.
- The Team does not support using HEP as a way to avoid mitigation responsibilities.
- The USFWS is concerned about long-term future for listed species and would like the USACE to develop a long-term regional comprehensive management plan for listed species.
- Restoration of natural processes is the USFWS's preferred approach to restoration. However, the USFWS is unclear how natural processes can be restored in developed areas in light of the Project that will presumably be designed to protect these same areas. Natural processes will likely only be restored in segmented parcels.
- Should USACE be responsible for ensuring success for the 50-year life of the Project? .

IV. SCHEDULING

Meeting 2 (tentatively to be held on Fire Island, from August 25-27, 2004)

- NEA to present baseline conditions.

Meeting 3 (late summer 2004)

- NEA to present future conditions (without project).
- NEA to present conditions based on each restoration alternative.

Meeting 4 (late fall 2004)

- NEA to present results of restoration cost/benefit analysis and future conditions with restoration.

Meeting 5 (March 2005)

- NEA to present final HEP results.

V. ACTION ITEMS

NEA/WES

- Determine if the ratio variable used in Models 3, 4, and 5 are quality or quantity variables.
- Identify ways to measure connectivity and evaluate how best to apply this variable (i.e., within each model or as a landscape model).
- Determine if a diversity matrix can be used in the models.
- Refine models and prepare model summaries for Team.
- Develop field-sampling methods.

USACE

- Provide NEA/WES with species list from USACE clam, intertidal benthic, and SAV studies for use in developing species lists for Models.
- Identify the time period necessary to determine "high quality" SAV for use in BAYSUBSAV Model.
- Address mainland in cover type mapping and as component in restoration.
- Map/identify islands as separate communities.
- Identify which cover types are considered passable and impassable for the terrapin.
- Define cover types and provide citation for descriptions.

USFWS

- Identify the characteristics of the key successional stages of a beach/dune community (i.e., early, transitional, and mature) for use in NEARBEACH and PRIMDUNES Models.
- Identify any additional target species associated with islands for use in UPLAND Model.

RUTGERS

- Identify the characteristics of natural conditions of ocean side dunes versus displaced dunes for use in PRIMDUNES Model.
- Identify the characteristics of natural conditions of bay side dunes versus displaced dunes for use in BAYBEACH Model.

ALL

- Assist in developing a description of 1930's conditions for use as reference in Models
- Assist in identifying the extent of study areas.

Summary of HEP Onsite Team Meeting June 28 through July 2, 2004

We have split the nearbeach community into nearbeach and vegetated beach, do we also need to split baysubtidal into salt marsh, wetland shrub, or split uplands into shrub, forest, herb? At what point to we lump/split cover types for HEP.

Islands and SAV are own units and will be treated separately from all transects. Does this bias results. Similarly, does the fact that transects may or may not have all community types bias transects?

Issues of reference conditions for what appear to be 3 to 4 unique areas on the island. Are 3 separate references needed? Team agreed that there is a place for all dune types on a dynamic barrier island. However, because we are dealing with very small focused areas, the Team agreed to use 1 standard as the reference condition for all areas. This standard would be determined by Team consensus and would be a condition that is supportive of a diversity of plant and animal species.

4 unique dune types include:

- Robert Moses @ monument
- WOOSI
- Wilderness area
- Gunn

Reference – should it be the best currently available or the best based on 1930's (per-development) conditions?

SAV references might include Gunn or Pomquog East. Worst SAV bed is west of Old Inlet.

Budget stuff, Pam needs an update to plan for benthic analysis.

Barriers, barriers listed are not extensive. Can't critters just go around most obstacles. How does HEP deal with this? Perhaps tally # of "barriers" (obstacles that a chick or terrapin could not go through) along the centerline of the transect. Don't worry about whether it could go around. Just tally hits that a "golf ball" couldn't pass through or over.

Survey area – transect only. 100 feet wide for all variables except disturbance factors.

NPS not in favor of habitat manipulation, but does support manipulation as a tool to promote processes.

USFWS dredge island info:
Breezy Point – best example of shorebird nest island
Would like list of areas evaluated by NEA.
East Inlet – USFWS planted A*mmophola* and *Solidago* in May 2004.

Sunken Forest/Reagan area – USACE and USFWS recommended bio-engineering but NYDEC overrode this indicating forces were too extreme and that bulkheading was the only option. NPS totally opposed to bulkheading area. Original forest was 100 feet further into the bay 30 years ago.

NPS and USFWS has plover data. NPS can provide nesting data for past 3 years. Will help in determining the charachteristics of the areas most productive for plover.

Disagreement between NPS and USFWS regarding overwash area. NPS wants to let natural processes proceed, even if it means wash will revegetate. USFWS would like to see overwash maintained as an overwash due to it's uniqueness and value to wildlife. Especially since landscape wide Projects are preventing overwash, breaching and promoting stability. May be good to maintain these few areas while we have them.

1960's data from Roselle and Joe Vitri's work on Fire Island.

Team wants to see an overall landscape evaluation of the island, but realize that restoration will be very site specific. So, in specific sites, the Team agrees that the approach should be taken to improve the communities in the area to benefit a large suite of species or species that are Rare.

Consider restoration opportunities that may like into the Wertheim project (USFWS refuge). Is a collaborative approach by Suffolk County, Ducks Unlimited, USFWS, NYDEC, etc. for marsh restoration, ditch plugging, mosquito control, *Phragmites* removal, etc. Considerable $$$ and research ongoing. DEC highly supportive of the work. Sue Adamovich (USFWS – Wells, ME) has been assisting on marsh restoration work.

FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
RESTORATION AND HABITAT EVALUATION MEETING SUMMARY
AUGUST 25 THROUGH 27, 2004
WATCH HILL NATIONAL SEASHORE, FIRE ISLAND, NY AND
THE USFWS LONG ISLAND FIELD OFFICE, ISLIP, NY

TO: HEP Team

FROM: **USACE, Pamela Lynch**

SUBJECT: Summary of FIMP (HEP) Team Meeting

DATE: September 23, 2004

To: Karen Graulich (NYSDEC), Jean O'Neil (WES), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA), Steve Couch (USACE)

ATTACHMENT: Table 1 – HSI variables and communities
"Initial" restoration site selection study sites (map)

In attendance:

Jean O'Neil (WES)
Karen Graulich (NYSDEC)
Norb Psuty (Rutgers)
Pamela Lynch (USACE)
Patricia Rafferty (NPS)
Robert Smith (USACE)
Stacie Grove (NEA)
Steve Sinkevich (USFWS)

All Habitat Evaluation Procedures (HEP) meeting attendees listed above (Team) participated in a 1-day meeting/field site visit on Fire Island on August 25, 2004, which included an overview of HEP sampling activities, sampling methodology, Habitat Suitability Index (HSI) model development, and selection of potential restoration sites. The meeting/site visit was followed by a 2-day meeting in Islip on August 26-27, 2004, which included a thorough evaluation of the HSI models, HSI variables, preliminary HSI output data, and applicability of models/variables to the Fire Island to Montauk Point (FIMP) Project area.

I. INTRODUCTION

The USACE provided a summary of restoration site selection and HEP evaluation activities to date as follows:

The USACE has evaluated over 60 potential restoration sites within the FIMP project area, including 24 sites on the barrier island, 36 dredge disposal islands and disposal sites on the mainland, and areas within Wertheim and Seatuck wildlife refuges. Sites were initially identified by the USACE and outside sources such as the USFWS and various other stakeholders and interested parties

Under the current scope of work for USACE restoration activities, 13 sites were selected for further evaluation in the HEP process based on their restoration need, likelihood of restoration success, potential link to future shoreline protection actions, contribution toward restoration of key coastal processes identified by the HEP Team, and based on how well sites represented the types of restoration and community types in need of restoration in the FIMP project area.

The selected sites include Robert Moses Lot 4, Sunken Forest, Reagan Property, Old Inlet, Great Gunn, Pikes Breach, Tiana, WOOSI, Georgica Pond and four dredge islands; Great Gull, Warner's, John Boyle and East Inlet. In addition, the USACE is continuing to evaluate the following additional sites for possible late inclusion in the HEP analysis: Wertheim Refuge, Seatuck Refuge and Orchard Beach. These sites were recommended following HEP data collection activities and will be included in HEP if time and funding permit and if within the scope of USACE restoration activities.

In addition, the USFWS currently is preparing a list of recommended potential restoration sites as part of the Fish and Wildlife Coordination Act requirements for the FIMP flood control Project. This list will include sites identified by numerous Federal, state and local agencies and interested parties. The USACE will not proceed with the evaluation of these sites at this time, but sites may be included in future evaluation if time and funding become available.

The USACE has documented all sites evaluated as possible restoration sites as well as the rationale for inclusion/exclusion in the current HEP analysis process. Many sites that have been excluded from current HEP evaluation, although in need of restoration, are at a scale that exceeds the scope of current USACE restoration authorization. The USACE objective for the current restoration component is to develop HSI community models and to use those models to address restoration needs at sites at a manageable scale. The HSI models currently being developed by the Team may be applied at larger-scale restoration sites in the future as part of the flood protection project.

The Team discussed the current site conditions and restoration need for each of the 13 sites selected for HEP evaluation.

II. SITE VISIT

HEP field sampling activities were completed by the USACE for the 13 restoration sites on August 13, 2004. The Team visited two of the restoration sites (i.e., Sunken Forest and Old Inlet) to discuss the definition of each of the five HSI model community types and to evaluate the HEP field sampling methodology. Recommended modifications to sampling methodology were minor and are discussed in Section IV.

Modifications made to the community type definitions include the following: 1) the addition of the vegbeach community in order to address the unique upper beach habitat found within the

FIMP project area; 2) renaming the dune/swale community as dune/grassland to better reflect the vegetated condition of this community, and revising the community definition to include areas from the crest of the dune to shrub and/or tree-dominated areas; and 3) the elimination of islands as a unique community type because islands contain representative examples of each of the six HSI model communities identified below.

- NEARBEACH (ocean nearshore and intertidal zone) – unvegetated area dominated by sand and extending from 30 ft (10 m) depth in ocean landward to the average daily high tide line (i.e., wrack line).
- VEGBEACH (ocean upper beach zone) – bare or sparsely vegetated area dominated by sand from the average daily high tide line (i.e., wrack line) landward to the crest of the primary (i.e., fore) dune.
- DUNEGRASS (dunes, interdunes and swales dominated by sand or herbs) - area from the crest of the primary dune extending landward to the crest of the bayside dune or bayside storm high water mark. Community is dominated by maritime herb species and often includes a significant component of vine species. Shrubs, when present, are typically stunted and cover less than 20% of this community. This community is well interspersed throughout the island from ocean to bay. Beach grass is the dominant species in this community type.
- UPLANDS (dunes, interdunes and swales dominated by shrub, forest or development) – area from the crest of the primary dune extending landward to the average daily high tide line (i.e., wrack line) of the bayside dune or upland (includes mainland). Maritime shrubs and/or trees dominate this community type. Herbs and/or vines also are common components of this community, but do not dominate (< 20% cover).
- BAYBEACH (bay intertidal and bay upper shore zone) – area from the average daily high tide line (i.e., wrack line) of the bayside dune or upland (includes mainland) extending bayward to the LLW (low-low water mark). Includes unvegetated areas dominated by sand or mud and areas vegetated with wetland herb and/or wetland shrub communities (i.e., salt marsh, *Phragmites, Baccharis, Vaccinium*).
- BAYSUBSAV (bay subtidal and submergent aquatic vegetation) – area from LLW bayward (i.e., areas constantly covered by water). This community is typically dominated by bare sand substrate or submergent aquatic vegetation.

III. EVALUATION OF MODELS AND VARIABLES

Much, not all, of the HEP data has been entered into the HEP database (i.e., FieldKit.xls developed by WES) and preliminary HEP analysis has been conducted for all transects. WES provided some preliminary results to assist with the Team's evaluation of the models. The Team discussed each HSI community model, the sampling methods for each variable in the model, the contribution of each variable to each HSI model, and defined the reference conditions for each variable. A description of proposed changes to the models or variables is provided below. Unless otherwise noted, the Team agreed to keep the variable in the model and did not alter the definition of the variable or the method of data collection or evaluation. See Table 1 for a list of HSI variables and communities.

NEARBEACH

- Presence of a modified shoreline – during data collection this variable was originally evaluated only within the limits of the 240-foot wide (80 m) transect. This variable will be re-evaluated within a 1,000-foot wide transect to capture the effect of any modifications (i.e. jetties, groins).

- Barriers to shorebirds and terrapin – change variable name to "barriers to wildlife" and change database x-axis to read "magnitude of impact to species".
- The Team considered whether to add the variable species richness to this model. However, based on a partial evaluation of data collected as part of HEP and from previous USACE studies, species richness in the NEARBEACH community does not appear to differ significantly within the FIMP project area and therefore species richness may not contribute to the HSI model. Data from prior studies will be further evaluated to determine if species richness will remain as a variable in the model. If excluded, the USACE will provide a statement (with references to prior studies) indicating the rationale for exclusion. Three items are of relevance to the decision: differences in data among transects, to show if data will distinguish among sites; quality or reliability of the data; and, adequacy of the data.
- The NEARBEACH community does not apply to islands and will be excluded from HEP analysis for islands.

VEGBEACH

- Two new variables will be added to this model to address the following: 1) the slope and percent of vegetative cover from the high wrack line (high tide line) to the toe of dune; and, 2) the slope, percent of vegetative cover and height from toe of dune to crest of dune.
- The Team thoroughly discussed how to handle scores for wildlife habitat and for maintenance of other functions, specifically stabilization, in the VEGMEACH community. A chart of potential scores for slope, width, and percent vegetation cover was prepared for consideration in the model as follows:

	Slope	**% cover**	**Width**
Wildlife habitat reference condition = 1	**< 10 %**	**5 – 40 %**	**>100 ft**
Wildlife habitat reference condition = 0.1	**> 10%**	**> 90 %**	**< 10 ft**
Shoreline reference condition = 1	**< 5%**	**> 40%**	**> 150 ft**
Shoreline reference condition = 0.1	**> 10%**	**0**	**< 30 ft**

- Erosion – quantitative information from the linear characterization of the shoreline will be used to evaluate erosion.
- Presence of modified shoreline – extend evaluation area to 1,000 feet.
- Barriers to shorebirds and terrapin – change variable name to "barriers to wildlife" and change database x-axis to read "magnitude of impact to species".

DUNEGRASS

- Erosion – remove variable from model. Erosion is covered within the VEGBEACH model.
- Presence of modified shoreline – remove variable from model. Modified shoreline is covered within the VEGBEACH model.
- Dune morphology – remove variable from model. Dune slope and height will address morphology.

- Barriers to shorebirds and terrapin – change variable name to ”barriers to wildlife” and change database x-axis to read “magnitude of impact to species”.

UPLANDS

- Presence of invasive species – based on field observations, most of the potential invasive/undesirable species identified by the Team for this community (i.e., fox, gulls, crows) were present throughout the entire study area. Phragmites was the only species found in some upland areas and not others. Leave variable in to identify areas of Phragmites growth in uplands.
- An additional variable may need to be added to this model to make results more meaningful. WES will evaluate the feasibility of including a diversity index in the upland model for a mosaic of cover types.
- Presence of modified shoreline – extend evaluation area to 1,000 feet.
- Erosion – quantitative information from the linear characterization of the shoreline will be used to evaluate erosion of upland shoreline.
- Barriers to shorebirds and terrapin – change variable name to ”barriers to wildlife” and change database x-axis to read “magnitude of impact to species”.

BAYBEACH

- Species richness – based on a partial evaluation of data collected as part of HEP and from previous USACE studies, species richness in the BAYBEACH community does not appear to differ significantly within the FIMP project area and therefore species richness may not contribute to the HSI model. The variable will remain in the model and the Team will evaluate the results to determine if species richness will remain as a variable in the model. The Team will consider robustness of data, significance of differences, and will determine if species richness results are indicative of high or low quality community conditions.
- Grain size – possibly use as a surrogate for benthic community.
- Barriers to shorebirds and terrapin – change variable name to ”barriers to wildlife” and change database x-axis to read “magnitude of impact to species”.

BAYSUBSAV

- Barriers to shorebirds and terrapin – remove variable; not applicable to this community type.

IV. EVALUATION OF MATHEMATICAL EQUATIONS

WES provided a summary of the mathematical functions used to define the relationships between variables in the models. The equations were modified as needed based on Team input. Some models will be run using two or more equations so that the Team can evaluate which equation is preferred. In addition, equations will be set up so that scores can be calculated both within communities and across each entire transect.

The Team calibrated the curves for variables in each model to identify HSI scores for optimal (HSI = 1.0) and low quality conditions. Limiting variables were given a low quality HSI score of 0.0 and non-limiting variables were given a low quality HSI score of 0.1.

The Team will revisit the species richness and abundance variables pending the results of the HEP evaluation to determine if the variables will remain in the models, and if so, what the reference conditions will be.

V. MISCELLANEOUS

To help place the restoration in context of the larger Corps picture and to begin model documentation, the following text was prepared:

The Corps mission in ecosystem restoration is stated in regulations as: "The purpose of ecosystem restoration is to restore degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition." Restoration for species of special interest, scarcity of ecological resources, and connectivity of systems are important considerations.

The dynamic environment of FIMP is defined by large-scale physical processes, the presence of many significant ecological resources, and high human pressures, which make it difficult to set and attain restoration objectives. It is well recognized that ecosystem restoration is needed. However, the dynamics of the system make it difficult to determine what restoration measures might be appropriate and at what locations. Conflicts in land use priorities further complicate planning for restoration.

Several ecological communities have been defined and serve to organize thinking and planning for ecosystem restoration in this system. These communities can be described from data on geomorphology and biotic resources. They are each significant because of the functions they perform including their provision of fish and wildlife habitat. Six communities have been defined for FIMP. A community-based HSI model has been constructed to (1) guide restoration planning and (2) provide a metric for decision-makers.

The next meeting is scheduled for November 17th through the 19th, 2004. The agenda will include an evaluation of results and selection of sites for further development of conceptual restoration designs, followed by without-project and with-project trends based on model results for the communities.

VI. ACTION ITEMS

NEA

- Provide Team with a .pdf of HEP restoration site locations.
- Continue with HEP data input and evaluation.
- Provide Team with a summary of HEP sampling methodology.
- Prompt DEC for additional information regarding NEARBEACH and VEGBEACH species if needed.

NEA/WES

- Continue with HSI model building and analysis.
- Provide HSI models and HEP analysis results to Team.

NEA/USACE

- Evaluate data from existing reports to determine if differences occur in species richness in NEARBEACH and VEGBEACH communities.
- Evaluate whether to include grain size as a variable in models.

FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
RESTORATION AND HABITAT EVALUATION MEETING SUMMARY
NOVEMBER 17 THROUGH 19, 2004
THE USFWS LONG ISLAND FIELD OFFICE, ISLIP, NY

TO: Karen Graulich (NYSDEC), Jean O'Neil (WES), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA), Steve Couch (USACE)

FROM: USACE, Pamela Lynch

SUBJECT: Summary of FIMP (HEP) Team Meeting

DATE: December 20, 2004

ATTACHMENTS: Attachment 1. USFWS Comments Regarding FIMP HEP
Attachment 2. Potential Restoration Options for Each Transect

In attendance:

Michael Bilecki (NPS) [3]	John Pavacic (NYSDEC) [2]
Steve Couch (USACE) [3]	Patricia Rafferty (NPS) [1]
Mary Foley (NPS Boston) [3]	Dan Rosenblatt (NYSDEC) [3]
Karen Graulich (NYSDEC)[1]	Steve Sinkevich (USFWS) [1]
Stacie Grove (NEA) [2]	Robert Smith (USACE) [2]
Pamela Lynch (USACE) [1]	Norb Psuty (Rutgers) [1]
Jean O'Neil (WES) [2]	

[1] voting member of the FIMP advisory Team
[2] assisting advisory Team, but not a voting member
[3] non-team attendee/interested party

All meeting attendees listed above participated in a half-day meeting on November 16, 2004, which included an update and overview of engineering and environmental components of the Fire Island to Montauk Point (FIMP) shore protection and storm damage reduction project (Project) as described below. The group also was provided with an overview of HEP, a brief introduction to the HSI models, variables, data, equations, and an overview of proposed restoration sites and restoration options.

I. FIMP UPDATE

Steve Couch provided a status update on the coastal, geological, economic, cultural, and design/planning components of the Project. Pamela Lynch provided a status update for the environmental components including cover type mapping, conceptual model development, restoration, impact assessment, Habitat Evaluation Procedures (HEP), restoration site selection, borrow area surveys, and historical vegetation analysis.

Discussion specifically relating to the use of HEP to evaluate the restoration component of FIMP follows:

HEP is being used to justify restoration and storm damage reduction projects by providing a way to marry National Economic Development (NED) and National Ecosystem Restoration (NER) goals and objectives, and is used as a tool to assist in the evaluation of costs, benefits, and/or impacts, from proposed activities.

NED is a planning document that refers to developing or maintaining economic opportunities through Corps actions, and includes items such as navigation and flood damage reduction. Benefits are economic in nature (e.g., xx dollars saved from protecting residential, commercial properties and infrastructure from future damage) and are portrayed in dollars in terms of a benefit/cost ratio.

NER is a relatively new planning document that refers to restoring structure and function of degraded ecosystems. Benefits are environmental in nature (e.g., improved wetland habitat) and are portrayed in non-monetary forms such as habitat units; they are not shown in dollars and no benefit/cost ratio is developed. Impacts to the environment are assumed not to occur (i.e., restoration design should be done to restore, not require mitigation for impacts).

In cases where Project activities and restoration activities occur in the same location, NED and NER accounts can be combined in project planning by conducting an incremental cost analysis for the proposed Project activities under NED. This analysis helps to identify the most cost-effective plan (based on economic benefit versus cost). Then, an incremental cost analysis can be conducted for those Project locations identified as cost-effective. In this analysis, the cost of each proposed activity is compared with environmental benefit (e.g., habitat units from HEP). In this way both NED and NER objectives are considered by a) identifying those sites that are most cost-effective, and, b) selecting from those sites the site that provides the most environmental benefit for the project cost.

Alternatively, site selection for the Project (based on economic factors) can be conducted separately from site selection for restoration (based on environmental factors). In this case, the environmental impacts from the selected Project and proposed restoration are both are identified in terms of habitat units through HEP. NED and NER goals can be met through the selection of the best Project (in terms of cost-benefit ratio), and offsetting any habitat impacts from the Project, through the selection of restoration sites that provide habitat benefits greater than Project impacts.

Fourteen (14) potential restoration sites are currently being evaluated for FIMP using HEP. Sites were selected for, or eliminated from, consideration as a restoration area based on overall feasibility, restoration need, likelihood of restoration success, potential link to future shoreline protection actions, contribution toward restoration of key coastal processes identified by the HEP Team, and based on how well sites represented the types of restoration and community types in need of restoration in the FIMP project area. Since the last Team meeting (August 25–27, 2004), New Made Island and Ocean Beach were added to the list of potential restoration sites and Georgica Pond was removed from further consideration. Data collection has been completed, preliminary HSI results have been produced, and potential restoration options have been identified for the 14 locations.

The USFWS is preparing a list of recommended potential restoration sites as part of Fish and Wildlife Coordination Act requirements for the FIMP flood control Project, which will include sites identified by numerous Federal, state and local agencies and interested parties. The list includes several sites that are currently being evaluated with HEP. The USACE will not proceed with the evaluation of additional sites at this time, but sites may be included in future evaluation if time and funding become available.

HEP models were originally designed to evaluate restoration options, not shoreline protection Project activities. However, the models provide information on existing conditions, future analysis options, and the opportunity for impact analysis and can likely be used to evaluate both restoration and Project activities. However, under this scope of work, the Team will focus on evaluating the models for restoration activities only. Models may be evaluated for use in Project analysis and modified (if necessary) if funding becomes available.

To clarify the Team's decision to create community models: species-specific approaches to HEP are traditional. However, the Team decided to use a more holistic community-based approach rather than species-driven models with the understanding that many wildlife species and ecosystem processes would likely benefit by establishing "optimal" conditions for communities found on the barrier island. When developing model variables, groups of species, such as those with very specific habitat requirements, low mobility, and documented sensitivity to habitat changes were considered, as were overall ecosystem processes and the stability of natural features.
The Team requested clarification/answers from the USACE on the following items:

1) Are restoration efforts likely to proceed in areas that are not proposed for shoreline protection activities?
2) Can restoration activities be used to mitigate for Project impacts?
3) Will the USACE support restoration activities that do not clearly improve one or more of the five processes (i.e., habitat improvements/enhancements)?
4) Might the USACE build dunes as part of flood protection Project, then count the activity as restoration based on the fact that the site was identified as a possible location to restore/enhance the dune processes?
5) Elaborate on how the Project and restoration activities, HEP results, and the costs associated with each will be presented to justify the Project.
6) Provide a definition of how the USACE interprets the word "restoration". True restoration implies restoring to an unaltered condition. In addition, restoration efforts should target areas that have been altered unnaturally. Some Team members expressed concern about restoring a natural area such as old inlet and calling it restoration.
7) How does restoration link to the processes and does restoration need to benefit a process in order to be considered? Might restoration include actions that are strictly enhancement, habitat improvement?
8) Will restoration be used as mitigation for Project impacts?

II. HEP ADVISORY TEAM WORK SESSION

Meeting attendees identified with a superscript of 1 or 2 are members of the FIMP, restoration and habitat evaluation advisory Team (Team). Team members participated in a 3-day work session from November 16, 2004 through November 19, 2004, in which Team members evaluated and discussed baseline HEP results, HEP models, without project trends, and conceptual restoration options for each site. Specifically the Team addressed the following:

- Baseline results
- Specific model questions
- Relationships among models for communities
- Suggested changes to models
- Verification of target years
- Project trends in communities, variables, and area/extent

- Proposed ecosystem restoration options and activities
- Candidate restoration objectives
- Expected effects to biota, geomorphology, and human influences from restoration
- Rules for area/extent of effects from restoration
- Project trends in communities, variables, and area/extent in time and space

A. GENERAL HEP COMMENTS

Please refer to Attachment 1 of meeting minutes for a disclaimer regarding unresolved issues raised by the USFWS and associated USACE responses. Although the USFWS is a voting member of the HEP team, the USFWS wishes to state that they do not necessary agree with all decisions the team has made.

Additionally, since the USACE personnel were not able to answer all questions raised (specifically regarding NED/NER benefits, restoration vs. storm damage reduction project inclusions, etc.) some of the following discussions are incomplete (as noted in text). However, internal USACE meetings are being held to gather the required information and the team will be provided responses shortly.

General Meeting Minutes

The Team considered whether to remove biological indicators (i.e., *spprich, sppabund)* from models. The extreme variability in the data and 1-time sampling effort has yielded data that are of relatively limited value in drawing conclusions regarding the quality of the habitat. However, the Team decided to leave biotic variables in the models (for most communities) at this time. The Team will revisit the issues following edits to the database and release of revised HSI results.

The island formerly referred to as “Great Gull Island” will heretofore be referred to as “Ponquogue Spoil Island.”

The Team discussed whether to treat islands as a separate entity due to the unique habitat conditions/features and restoration potential of islands. However, the Team determined that the processes and characteristics from the exposed side (i.e., dune) to the protected side (i.e., bay) of islands are similar to the exposed and protected areas of the barrier island. Therefore, all transects (dredge islands and barrier island) will be evaluated similarly. However, NEARBEACH is not applicable to bay environments and will therefore not be evaluated for dredge islands.

The Team determined that the weighted HSI, as currently calculated in the models [i.e., (width of community/total length of transect)*HSI score of community], is not an appropriate way to account for the contribution of a community within a given transect. The Team also decided that it was not appropriate to combine all communities within a given transect when evaluating final HSI scores. Therefore, HSI values will be evaluated by community type on a transect-to-transect basis. Weighting of communities and transects will be addressed once the size of the effect of the activity is determined.

In the original HSI equations, the Team elected to weight human factors twice as much as other variables and to weight presence of invasives half as much. However, after an evaluation of the resulting scores, the Team made the decision to weight all variables equally because the weights work against the intended effect. When conditions are good (e.g., little human disturbance) the resulting HSI score is high. But when conditions are not good (e.g., considerable human disturbance) the score is higher than intended because the low score is doubled. The clearest way to approach the weights is with the choice of mathematic function. Team members will re-evaluate the mathematical functions to determine if any revisions are needed.

The Team recognized that a diversity of community types and conditions (i.e., mosaic) are desirable across the 82 mile project area and would like to promote this diversity within HEP. Currently, HEP establishes an "optimal" condition for each community type and in order to reach the highest HSI value (1.0) through restoration efforts, communities are pushed toward that "optimal" condition. For example, based on the Team's definition for optimal conditions for dunegrass, any dune area currently without a high dune would be targeted for dune enhancement. However, overwash areas (such as the natural former breach area at Old Inlet) are a desirable feature on the landscape. The Team does not want HEP to be perceived as a blanket approach to push toward the reference (i.e., optimal) conditions identified in HEP. Features, conditions, and areas, may be excluded from restoration simply because the feature or condition adds to the diversity of the island. Further, the Team would like restoration efforts to target those areas/processes that have been modified unnaturally.

Closely related to this is the evaluation of the trade-off of processes. For example, dune restoration improves the dune enhancement process but lowers the cross-island transport process. The Team will revisit this topic on a site-by-site basis and will take into consideration the broader mosaic of communities and conditions, specific site conditions, and whether a process was impacted as a result of unnatural modifications.

The Team will consider whether to add a variable to the models, or use a ranking matrix, to assist in evaluating restoration priorities depending on whether a community is on a natural trajectory.

The Team expressed concern that the USACE may attempt to claim that they have provided a benefit to a given process by NOT working in a particular area (e.g., benefit to the cross-island transport process by not building a dune at old inlet). In addition, the Team is concerned that the USACE will perform an activity for shoreline protection (such as increasing the height/width of a dune) and will call it restoration (by claiming it has restored the dune enhancement processes). DEC noted that as the non-Federal sponsor on FIMP, they would not support Project activities that are presented to the public as restoration.

Despite the uncertainty of how HEP may be applied/presented for the Project and restoration, the Team agreed that it would be useful to continue with the HEP process. The sites identified and being evaluated by HEP, are no less important whether the work proposed at each site is for restoration, a Project benefit, or mitigation. HEP is a useful tool to document the current site conditions and to assist in the evaluation of future impacts and/or benefits. The decision whether to allow an action to move forward as restoration, a Project activity, or mitigation, will be made by reviewing agencies and is irrelevant to HEP.

B. EVALUATION OF MODELS AND VARIABLES

HEP data has been entered into the HEP database (i.e., FieldKit.xls developed by WES) and preliminary results were provided to the Team for evaluation of the models, variables and results. The Team discussed the HEP process to date and conducted a review of the preliminary HSI results for each community type and transect. Unless otherwise noted, the Team agreed to keep the variable in the model and did not alter the definition of the variable or the method of data collection or evaluation.

NEARBEACH

- Team determined that MHW to 10 m depth offshore is appropriate for this community because it captures the key coastal processes and would pick up changes to the community from natural processes and any proposed Project and/or restoration activities.

- Rename the community "OCEANBEACH."
- Readjust width variable curve to better represent the current width conditions (i.e., range from 2,000 to 2,800 ft). New curve HSI values 1.0 = 2,100 ft and a value of 0.1 = < 500 ft.
- Remove this community type from HEP evaluation on islands. The BAYBEACH and BAYSUBSAV community types will be used to evaluate all intertidal and subtidal areas around islands.
- Remove species richness variable from the NEARBEACH community. Based on an evaluation of existing USACE data, this variable does not show major differences across the 82-mile project area and species in this community are expected to quickly recover from any impacts from restoration or Project activities.

VEGBEACH

- Redefine the community as the area from MHW (i.e., high wrack line) to toe of dune.
- Re-examine wildlife barriers for VEGBEACH and DUNEGRASS separately.
- When determining the reference conditions for this community, the Team considered the conditions they felt best provided for dune stability, natural processes, RTE species, and a host of wildlife species.
- Remove *erosion* variable from the model. Erosion is addressed through slope and width.
- Scarping at the MHW line is a natural ephemeral process and should not be treated as evidence of erosion. Field data will be reevaluated and HSI values will be adjusted accordingly.
- Re-do the curve for the width variable so that 1.0 = $\geq$ 125 ft and 0.1 = $\leq$ 30 ft.

DUNEGRASS

- Redefine the community to include the area from toe of dune to crest of dune (i.e., dune face). Dunegrass includes the dunes, interdunes and swales that are dominated by sand or herbs and extends from the toe of dune landward to the upland or bayside community.
- When determining the reference conditions for this community the Team considered the conditions they felt best provided for dune stability, natural processes, RTE species, and a host of wildlife species.
- Adjust *slope* curve as follows: 0 – 5% = 0.1, 5 – 10% = 0.2, 10 – 15% = 0.4, 15 – 20% = 0.6, 20 – 25% = 1.0, > 80% = 0.6.
- Adjust *width* curve so that > 45' = 1.0 and divide lower distances into three HSI values.
- Adjust the *vegcover* curve so that the curve is asymmetric with the value on the right side of the curve (i.e., higher % cover) dropping less than the left side (i.e., low % cover). 40-50% cover = 1.0.
- Add the variable *invasives* to this model to account for *Phragmites*.
- Following release of the revised HSI results, the Team will reconsider the need to add the variable *canvegshrub* to this community to capture modifications to vegetation that may occur as part of restoration (i.e., reducing the % cover of vegetation to improve wildlife habitat).

UPLANDS

- Redefine the community to exclude the upper beach zone from this type. BAYBEACH will now include the upper beach zone.
- Remove fox, mud crabs and gulls from consideration as invasive/un-desirable species. Sai mud crabs and *Phragmites* will remain.
- Include the percent cover of *Phragmites* in the evaluation and determination of the HSI score.
- Modify the curve for *canvegcov* % cover so that the minimum value is < 20%. If less than 20%, the community is considered to be dunegrass, not upland. Should say minimum value of shrubs and trees????
- Remove the variables *erosion* and *shoremod* form the model. These are addressed in the BAYBEACH community type.

- The team considered removing the cantreeshrub variable from non-islands. No decision was made. Team should revisit this subject.

- The Team expressed concern that uplands that are in relatively good condition were receiving a very low HSI score due to the erosion factor. The Team will reevaluate these HSI values following edits to the database and release of the HSI results.

BAYBEACH

- Redefine the community to include the area from LLW landward to 20% cover of upland or dunegrass is encountered.
- Remove the variable *slope* from the list of variables assessed for this community. This was a typo.
- The BAYBEACH variables should be evaluated for both ends of transects on islands.
- Check the mathematical equation and curve for *spprich* and *sppabund*. The HSI values may be skewed.

BAYSUBSAV

- Revise the equations/curves for this community to ensure that the HSI result does not = 0 when SAV is not present.
- Most SAV beds are located beyond the 250 ft survey transect and beds with consecutive years of intensive data collection are often > 1 mile from most transects. The Team determined that models would only include data from SAV beds located within 500 ft of transects.
- The Team would like to re-evaluate whether to remove biotic factors from this model following edits to the database and release of revised HSI results.

C. WITHOUT PROJECT TRENDS

HEP communities were evaluated to determine how the quality of each might be expected to change over a 50-year period without restoration (i.e., without restoration activities and without the proposed USACE shoreline protection Project or other major restoration and/or manmade shoreline modifications). Assumptions regarding trends will be re-evaluated and revised as appropriate pending receipt of supporting information from USACE/Moffet-Nichols engineering models.

In many cases, communities are expected to shift, with decreases in size and/or habitat quality (i.e., downward trend) in some locations, and increases in size and/or habitat quality (i.e., upward trend) in others. Typically, however, no net change in the community is expected (i.e., flat) Project area wide. The Team may evaluate data from Moffet-Nichols modeling, and other sources, to try to identify site-specific trends at each transect (which may differ from Project area-wide trends and may be indicative of an un-natural/problem area). In addition, the Team will evaluate sea level rise, population growth, and invasive species information to determine how these may affect trends. For example, the bayside sites may be more sensitive to sea level rise and show more flooding.

NEARBEACH

Flat trend in habitat quality/size in the NEARBEACH community in the Project area over a 50-year cycle. However, it was noted that the Eastern ½ of the island (east of Watch Hill) is expected to erode 2 to 3 times faster than the western half and accretion is expected near inlets in the western section.

VEGBEACH

Downward trend in habitat quality/size of the VEGBEACH community over time, but only in developed areas where beach/dune evolution is restricted. Otherwise, a flat trend in habitat quality/size of the VEGBEACH community is anticipated in undeveloped areas. The community will shift, but there will be no overall net loss of the community throughout the Project area over a 50-year cycle.

DUNEGRASS

Downward trend in habitat quality/size over time in developed areas where beach/dune evolution is restricted and the community will be compressed on both sides by shifts in adjacent communities.

Flat trend in habitat quality/size of DUNEGRASS. The community will shift, but there will be no overall net loss of the community throughout the Project area over a 50-year cycle.

UPLAND

Downward trend in habitat quality/size of the UPLAND community. Uplands will continue to be lost/impacted on the bayside . Increased development pressures may significantly affect the community. However, it is uncertain whether these changes will result in additive impacts.

BAYBEACH

Flat trend in habitat quality/size of the BAYBEACH community. Additional hard structures are expected and water quality may be slightly reduced.

BAYSUBSAV

Flat trend in habitat quality/size of the BAYSUBSAV community. More pressures are expected, but better laws, enforcement, and improvements will offset these. Changes in water quality are uncertain.

D. EVALUATION OF PROPOSED RESTORATION OPTIONS

The Team evaluated various restoration options proposed for each transect. See the attached handout for a summary of the proposed activities. Proposed restoration activities are a one-time event. The USACE will make recommendations regarding the need for long-term maintenance, but the USACE will not revisit restoration areas unless a problem is identified at the site within a 5-year window post-restoration.

Some general concerns/topics discussed by the Team included:

- The NPS cannot support work in NPS wilderness area due to Wilderness Act regulations; actions would take Congressional legislation.
- Agencies in general will not support the use of hard structures in the bay. If used, the structures will not improve bayside processes and in general are not supported by the Team.
- Dune enhancement is supported in areas where the threat of cross-island breaching is due to man-made/artificial dune modifications.
- Uplands are not included in the five key processes that the USACE hopes to target for restoration. Therefore, the USACE will not get credit for improving a process when improving upland conditions. Improvement would be considered strictly a habitat enhancement. USACE/Team to consider adding a process to address uplands.
- The Team supports projects that may improve wildlife habitat even though they may not be directly linked to a process, particularly on islands where the objectives are clearly habitat improvements for particular groups of species.
- To assist in restoration evaluation, the USACE will identify which actions are related to processes, habitat management, or both and will identify those areas that will require periodic maintenance.
- Good opportunities exist for co-operative approaches to restoration with the NPS. Joint projects are more likely to be supported.

The following section presents a summary of discussions relating to each of the proposed restoration sites, including identification of the processes that will likely benefit from the proposed restoration activity. Unless otherwise noted below, the Team agreed to the general restoration options presented in Attachment 2.

Transect 1 – Robert Moses Lot 4

Process – dune development and evolution.
Extent of Effect – unknown. Area for HU calculation would be the footprint.
Other – the Team concluded that the beach widening proposed for restoration in this location (as well as others) would not benefit the long-shore processes over time because restoration is a one-time event that would not include re-nourishment. Long-shore processes will likely not be improved over time unless the proposed activity adds a substantial amount of new sand into the system. Dune development and evolution processes would, however, be improved with restoration proposed for this location.

Transect 2 – Sunken Forest

Process – bayside and upland. But, upland improvements are not accounted for under any of the five processes. In addition, restoration may negatively affect bayside processes if hard structures area used.
Extent of Effect – unknown. However, if the marina is removed or redesigned, the effect would be seen for 800-1000 ft of shoreline.
Other – soft structures are proposed for bay side restoration, but only if the marina is addressed. The marina in this location (as well as others) must be removed or redesigned in order to improve bayside processes. In this, and similar areas, the USACE would not remove hard structures such as bulkheads or marinas. However, the USACE will support and recommend removal or redesign and would perform shoreline restoration using soft structures following marina removal. Team will not accept hard structures as an improvement to bayside processes.

Transect 3 – Reagan Property

Process – dune development and evolution, bayside, and upland. But, upland improvements are not accounted for under any of the 5 processes. Would also negatively affect the cross-island transport process and may negatively affect bayside processes if hard structures area used. The Team will evaluate the trade-offs pending receipt of revised HSI results.
Extent of Effect – unknown.
Other – similar to Transect 2, soft structures are proposed for bay side restoration, but only if the cause of the erosion is addressed (bulkheads are believed to be an issue). Otherwise soft-structures are very likely to fail. Team will not accept hard structures as an improvement to bayside processes.

Replacing/enhancing the dune in this area would reduce the potential for cross-shore transport in this naturally-occurring low-lying area. Team to evaluate the benefit of not enhancing dunes in naturally-occurring potential breach areas.

The NPS will not allow for road closures at this location.

Transect 4 – Old Inlet

The NPS will not approve of any proposed restoration or Project activity in this area due to restrictions defined under the National Wilderness Act.

In addition, the Team expressed concerns about "restoration" of naturally occurring potential breach areas that are also ecologically desirable features in the landscape.

Therefore, despite the restoration opportunity in this location, the USACE will remove this site from future consideration for restoration because of (1) ownership and (2) the option of allowing natural cross-island transport to occur at this site (as one of only a few natural places that it does occur on the island).

Transect 5 – Great Gun

Process – dune development and evolution, Bayside, estuarine, and upland. But, similar to other transects, no process has been identified for the restoration of uplands, restoration would also negatively affect the cross-island transport process and restoration may negatively affect bayside processes if hard structures area used. The Team will evaluate the trade-offs pending receipt of revised HSI results. Draft objective is to restore hydrologic process and improve herbaceous estuarine wetland; restore dune processes
Extent of Effect – 1000 feet to either side of restored area.
Other – modifications to the shoreline are not proposed for this area. However, the USACE will recommend that the causes of erosion are addressed (bulkheads and dock are believed to be an issue). Otherwise soft-structures are very likely to fail. Team will not accept hard structures as an improvement to bayside processes.
Replacing/enhancing the dune in this area would reduce the potential for cross-shore transport in this naturally-occurring low-lying area. However, in this particular case the reason the potential for cross-island transport exists is due to an artificial, man-made cut in the dune. Therefore, dune restoration is warranted.

May need to keep roads open for access to the heli-pad. Roads could be narrowed and re-angled to reduce overflow threat. No restoration of SAV bed needed.

Transect 6 - Pikes Breach

Process – proposed activities do not support any of the processes; they are considered habitat management/enhancement and would require periodic maintenance for long-term success. However, the Team supports projects that may improve wildlife habitat even though they may not be directly linked to a process. Draft Objective – devegetate to early-succession habitat, reduce human access
Extent of Effect – 1000 feet to either side of restored area.
Other – USFWS would prefer not to lower the elevation of the spit and would prefer to see the area devegetated to create potential nesting area for terns and other shorebirds.

Transect 7 - Tiana

Process – estuarine, dune development and evolution.
Extent of Effect – 1000 feet to either side of restored area.
Other – Team concerned about where to re-direct water flow.

Transect 8 - WOSI

Process – estuarine, dune development and evolution. Objective – improve estuarine process (with marsh restoration).

Extent of Effect – 1000 feet to either side of restored area.

Other – the WOSI project currently is proposing dune modifications in proximity to the proposed restoration activities for FIMP. Modifications include lowering of dune to encourage breaching. Check to ensure proposed restoration work does not duplicate and/or conflict with WOSI efforts

USFWS recommended a review the Biological Opinion (BO) for the WOSI project in this area before developing restoration designs to ensure that proposed activities are in line with recommendations made in the BO.

Transect 9 – Georgica Pond

Has been eliminated from further consideration. The area is currently a highly functioning intertidal system, which provides significant breeding and foraging habitat for wildlife. Additional constraints include land ownership, limited restoration opportunities, and low potential for restoration success.

Transects 10, 11, 12, 13 and 15 (Islands)

Process – proposed activities do not support any of the processes. Is considered habitat management.
Extent of Effect – entire island area.
Other – must consider that restoration will eliminate the island from future use as dredge deposition site. Regrading of scarped areas is temporary fix. Erosive forces will quickly re-scarp these areas.

Transect 10 (East Inlet) – historically this island was a tern nesting area, is currently part of a NYDEC restoration project and is currently an active dredge deposition site.
Transect 11 (John Boyle) – a significant gull colony on island must be addressed, USFWS to determine if early or late-successional habitat is preferred for restoration.
Transect 12 (Warner) – is currently an active heron and tern colony. The Team does not support restoration of this site.

Transect 13 (Ponquogue Spoil) – a significant gull colony on island must be addressed, historically this island was a heron/egret colony.
Transect 15 (New Made) – historically a tern, black skimmer colony, terrapins are known to nest on this site.

Transect 14 – Ocean Beach

Process – longshore transport, dune development and evolution.
Extent of Effect – 2,000 feet to the east and 3,000 feet to the west of the restoration area.
Other – consider a joint effort with the NPS (Robin Laporte) to buy-out houses to the SEA-HA line
USACE will recommend bulkhead and marina removal to improve bayside processes, but the option would not be supported by the local community.

We are presently looking at engineering models to address this area and are attempting to determine what groin removal would mean to the nearby homes.

E. Restoration Philosophy

In closing, the Team prepared a statement regarding their philosophy towards restoration efforts under FIMP HEP project as follows:

“We are developing restoration projects with the understanding that no one project or site will completely restore one or more processes. However, development of projects was directed towards those that would contribute to incremental improvement of one or more selected processes. At times, selected projects may improve one process over another. Selections have been directed toward reversing anthropogenic interruption of processes. Additional projects have been identified that do not contribute to selected processes but may provide important habitat restoration or management options and can be recommended for other funding avenues. Other opportunities to restore processes may exist in other locations than our current transects.”

F. SCHEDULE.

January – submit revised documentation for variables, variable codes, variable list, a description of sampling methods, a description of the HSI evaluation, and a list of any supporting references/data sources to Team.

February – submit revised database, equations, HSI results for existing baseline conditions, and preliminary results for the conceptual restoration plans to the Team for review/comment. Solicit names from Team for potential reviewers of the models.

March – conference call to discuss results.

April – send models out for review.

May – 3-day HEP meeting. The agenda will include final presentation of results for existing conditions, draft results for project conceptual designs, and a discussion of comments received from model review by other professionals.

III. ACTION ITEMS

NEA

- Send definitions of variables, variable codes, a description of sampling methods, a description of the HSI evaluation, and a list of any supporting references/data sources to Team.
- Send field data forms to USFWS (task completed at time of release of minutes to Team).
- Modify database and re-enter data as appropriate.
- Re-run HSI models for existing conditions.
- Develop conceptual restoration designs in GIS.
- Re-enter data for future conditions and re-run HSI models.

NEA/WES

- Data variability – conduct sensitivity analysis.
- Modify database, revise equations, curves, etc.
- Revisit the suggestion to remove the cantreeshrub variable from non-islands.

USACE

- Check into availability of population growth models for use in predicting future trends.
- Request 50-year without project trend data for oceanbeach width, vegbeach width and dune slope, width and height from Moffet/Nichol (work ongoing).
- Coordinate with Moffet/Nichol to identify current and future (50-year) potential breach areas (work ongoing).

- USACE/Team to consider adding a process to address uplands.
- Identify which actions are related to processes, habitat management or both and will identify those areas that will require periodic maintenance.
- Follow up on questions posed by the Team in Section I.

NPS/Rutgers

- Identify trends for the impacts that may affect the HEP community types from sea level rise.
- Provide NEA with invasive species report.

ALL

- Locate any documents, data, etc to support the assumptions and decisions made by the Team.
- Evaluate mathematical equations by substituting the name of the variable into the definition for each equation. Provide recommendations regarding changes (if/then statements are not recommended). Evaluate curves, HSI outputs and provide recommendations.
- Identify potential reviewers of the HEP models.

Attachment 1 to HEP mtg. minutes (Nov. 17-19th): An e-mail discussion between FWS personnel (Steve Sinkevich) and USACE personnel (Pamela Lynch) regarding unresolved issues raised at the HEP team meeting.

Pam: I've listed below my interpretation of the HEP team's collective determinations/direction regarding some of the issues that the Service has concerns with, which were discussed during the HEP meetings that occurred on November 17-19. I wanted to be sure that I understood what the team (or a majority of the team) had agreed upon and for you to be clear on what our agency's concerns are.

General Note: The Service has statutory responsibilities under the Endangered Species Act (ESA) and Fish and Wildlife Coordination Act (FWCA) requiring that we assess the affects of federal actions on federally listed species/fish and wildlife resources. Our participation as a member of the HEP team does not preclude/supercede these responsibilities. As such, determinations made in our ESA and FWCA assessments will be independent of, and may not be consistent with, the HEP team determinations, especially in light of our concerns stated below.

ANSWER: Yes, I agree. Please read question above and let me know if you want this cut-n-paste right into the meeting minutes or if a disclaimer (stating the above) is enough.

· The majority of the team wants to remove bay island restoration and early successional habitat restoration projects from consideration because they are considered by the majority of the team to be restoration of habitat and not of processes and that active management would be required to maintain early successional habitat;

ANSWER: Yes, the majority of the team has voted for removal but we are still KEEPING THEM ALL IN to run the HEP models on them to determine what values we would get from restoration. I think the real decisions would be made after the results are in. Also, while they are not linked directly to a process, I am not sure that means we absolutely cannot include it as an option. This is a question I'm actually trying to get answered myself. Regardless, if they are removed from inclusion as restoration locations under the FIMP storm damage reduction project, we still have other authorities (CAP etc.) that we could pursue in the future.

· HEP modeling of restoration activities will proceed prior to landowner consent of proposed projects (As I stated during the meetings, there are several projects proposed that I do not believe the landowner will agree to, especially the closing of dunes @ Robert Moses Field No.4);

ANSWER: Yes, HEP will be run regardless of ownership.

· There are no projects proposed to restore cross island transport (each of the 7 viable projects propose the stabilization of bay shorelines or the closing of dune cuts- actions that may actually reduce the likelihood of cross island transport and have implications during ESA consultation). I believe that several team members stated that allowing for natural processes at Old Inlet should count as restoration. However, nothing is being restored-existing conditions are simply being allowed to remain;

ANSWER: Yes, none of the HEP options include a restoration of cross-island transport. Some of the dune projects, according to Norb, may have slight benefits in that manner but nothing significant enough to claim. Additionally, it was mentioned that leaving areas alone (such as Old Inlet and/or Reagan) would allow for NATURAL cross-island transport to occur. This is NOT restoration but simply allowing a natural process (that is already occuring) to occur. This would not be part of the (restoration) project.

· Projects that may require active management or projects that do not restore one of the five processes will not be considered for restoration under the FIMP (regardless of their potential to improve the ecological value of habitats);

ANSWER: See previous answers above - I'm not sure yet if they MUST involve 1 of the 5 processes to move forward and, regardless, we still have other options to explore under future project authorities. Additionally, we will recommend active management under the HEP/restoration options (is sites where it is relevant) but we (the COE) cannot actually do it (but maybe the non-fed. sponsor and/or land owner and/or stakeholder can?)?

· There are no restoration projects proposed for early-successional and/or bay island communities which are essential for federally and state-listed species (resources that arguably need restoration the most);

ANSWER: I thought some of the dredge islands had the opportunity for early successional habitat? Yes, the islands might be removed all together but NOT yet - I say we still run the HEP and see where that gets us. I think this is one of the larger questions I still need answered from my HQ and FIMP team.

· One of the proposed restoration projects involves restoration (involving the filling-in of man-made breaks in dunes) within the Shinnecock Inlet Interim Project area (another project that the land-owner may not want to agree to). A Biological Opinion was prepared by the Service for this project, which stated that one of the primary concerns was the limiting/prevention of cross island transport. Re-initiation of ESA consultation may be required if this project is selected for construction since it may affect listed species in a manner not previously considered. (This re-initiation of consultation may be in addition to, or part of, the ESA consultation that will be required for any restoration activities proposed as part of the FIMP.)

ANSWER: This is noted in the HEP meeting minutes and, if it does turn out that our restoration is a BAD thing, we simply won't do it. However, the other "restoration opportunity" at that site of wetland creation is still out there as an option - and a good one I think we should seriously consider. That isn't on the beach, doesn't involve manipulation of the dunes and won't interfere w/ the cross-island transport the BO mentions.

· At this time, pending future funding, all restoration efforts and HEP modeling will be limited to the sites located along one of the 15 Corps-identified transects. With the apparent removal of bay islands, Pikes Beach and Old Inlet from consideration, there are therefore a total of seven viable projects. None of the projects/opportunities identified in our Planning Aide Letter are included in these seven projects.

ANSWER: Yes...and no...we are hoping to get additional funding this FY to select a few more sites for the HEP model runs. Nothing is definitie and no sites are determined. We are currently writing a response to your PAL and, in it, it outlines exactly which sites are in and out and which are still "open" to be studied this FY (pending funding). However, from a first thought, SAV is still included (something you mention of value in the PAL), the islands are not completely out, and the rest were removed (for now) because we couldn't link them to a process...

FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
RESTORATION AND HABITAT EVALUATION MEETING SUMMARY
APRIL 21 THROUGH 22, 2005
THE USFWS LONG ISLAND FIELD OFFICE, ISLIP, NY

TO: Karen Graulich (NYSDEC), Jean O'Neil (WES), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA), Steve Couch (USACE)

FROM: USACE, Pamela Lynch

SUBJECT: Summary of FIMP (HEP) Team Meeting

DATE: August 17, 2005

ATTACHMENTS: Attachment 1. Baseline HSI Values
Attachment 2. Restoration HSI Values for Great Gun and New Made Island
Attachment 3. Assumptions and Trends for Future Conditions

In attendance:

Stacie Grove (NEA) [2]	Steve Sinkevich (USFWS) [1]
Pamela Lynch (USACE) [1]	Robert Smith (USACE) [2]
Jean O'Neil (WES) [2] via phone	Norb Psuty (Rutgers) [1]
Patricia Rafferty (NPS) [1]	

[1] voting member of the FIMP advisory Team
[2] assisting advisory Team, but not a voting member

I. FIMP UPDATE

Pamela Lynch provided a status update on the Fire Island Inlet to Montauk Point (FIMP) Reformulation Project, which included an overview of progress to date on Phase I and Phase II efforts. Phase I HEP efforts included HEP meetings, field work, and HEP analysis, conducted in 2004 to address potential impacts (both positive and negative) associated with proposed restoration efforts in the FIMP study area. Phase II includes additional HEP fieldwork and analysis at 5 to 8 sites to address potential impacts (both positive and negative) in proposed project areas. The existing HEP models will be used to evaluate both Project and restoration components and only minor revisions to the existing models will be needed.

Restoration activities will be used to offset any impacts caused by the Project. The USACE objective is no net loss of habitat units as a result of Project activities. At this time, no hard structures are proposed as part of the Project.

In addition, the "Process Fact Sheets" have been revised by the USACE. Copies will be sent to the Team for review and comment. Additionally, the project area for FIMP has been extended an additional 3 miles to the west and now includes areas such as Cedar Beach, Gilgo Beach and Captree Island.

II. GENERAL HEP COMMENTS

The Team noted that the HEP models do not adequately reflect impacts to the “Processes” and recommend adding a component to the HEP process to evaluate these impacts. In addition, there is no “Process Fact Sheet” that addresses uplands.

Models currently favor beach-widening activities. The Team is concerned that the models do not adequately address “big-picture” issues, such as the need to maintain certain processes or characteristics that may not be optimal, but are part of the natural processes in the FIMP study area. For example, wide beaches are not desirable in all areas. Also, severely eroding bluffs located on the eastern end of the island are necessary for the cross-shore transport process. We would not want to propose restoring these areas to the “ideal” condition as “ideal” is currently defined in the HEP models.

Baseline HSI values will be calculated for all 14 potential restoration areas. This information will assist the Team in selecting the “preferred” restoration option and area. The Team will also use the USFWS planning aid letter to assist in selecting the restoration site and will not base selection exclusively on the HSI numbers. In addition, consideration should be given to sites identified for RTE species restoration at meeting between Bob Kurtz, USFWS, M. Belecki (NPS), and town representatives. The USACE will coordinate with Bob Kurtz regarding the meeting.

III. EVALUATION OF FUTURE PREDICTIONS AND ASSUMPTIONS

The general assumptions regarding trends will be edited to state the following:

- BAYSUBSAV – gain throughout area due to sea level rise and erosion of bay beach. However, some areas likely to experience no change or losses as detailed in the futures table or as indicated below.
- BAYBEACH – loss throughout area due to erosion. However, some areas likely to experience no change or gains as detailed in the futures table or as indicated below.
- UPLAND – loss throughout area due to increased development pressures, erosion, and shifting of DUNEGRASS community.
- DUNEGRASS – loss in developed areas where dune evolution is restricted. In other areas, the ecological communities are expected to shift in location (loss in some areas/gain in others); but, no net loss Project area-wide.
- VEGBEACH – loss in developed areas where dune evolution is restricted. In other areas, the ecological communities are expected to shift in location (loss in some areas/gain in others); no net loss Project area-wide.
- OCEANBEACH – loss throughout area. The eastern ½ of the Project area (with the exception of the rocky shoreline near Montauk) will lose sand 2 to 3x’s faster than in areas located to the west.

Future calculation assumptions (over 50 year life of project) will change as follows:

- OCEANBEACH width variable will decrease 10% in the west and 20% in the east.
- VEGBEACH and DUNEGRASS width will decrease by 20% at Transects 1, 3, and 6, and decrease by 40% at Transect 14 (i.e., sites where dune evolution is restricted.).
- Invasive species will decrease the HSI score at all transects by two classes.
- Abundspp variable will be removed from all models, thus the statements regarding species abundance will be deleted.
- An internal diversity variable may be added to the models. The Team will need to determine how this variable may change over time.
- Eelgrowth variable will be removed from all models, thus the statement regarding eelgrass will be deleted.

- The Table will be modified so that OCEANBEACH shows a loss at Transect 1: BAYBEACH shows no change at Transects 1, 10, 11, 12, 13 and 15, gain at Transect 4, and loss at Transects 5, 6, and 7; BAYSUBSAV shows no change at Transects 1, 8, and 10 through 15, gain at Transects 2, 3, 5, 6, and 7, and loss at Transect 4.

IV. MODELS AND BASELINE CONDITIONS

Species included in the BAYBEACH and BAYSUBSAV communities were redefined. BAYBEACH will no longer include the data from the seine surveys that were collected in the intertidal zone. BAYSUBSAV will include seine data collected from within the SAV bed **or** from the seine surveys conducted in the intertidal zone of each transect (whichever is appropriate). For example, the intertidal seine data will be used for islands and other areas where no SAV beds were identified.

The Team discussed the difficulty in using biotic variables such as species richness and abundance due to the extreme variability in community data and low number of sampling event to base the results on. However, the Team agreed that there is value in keeping at least one variable to evaluate species data in the models. Species richness will be kept.

The Team discussed adding a variable called "substrate" to the OCEANBEACH, VEGBEACH and BAYBEACH communities as a way to evaluate conditions. The logic is that diverse substrates (i.e., mix of cobble, sand, gravel, etc.) will result in more desirable species and higher species diversity. However, this approach may be flawed in that a model for this variable would result in a higher HSI score for sand than mudflat, yet each are of high value to certain desirable organisms. One approach may be to add the variable, but call it "availability of appropriate substrate" for each given area. That way, if a town dumped rubble on sand or if sediment covered cobble, a change in the HSI score would result. For baseline conditions though, the rocky shoreline near Montauk, beach areas, and the intertidal mudflat at Democrat Point, would have the same HSI score. The Team will revisit this discussion.

The Team discussed adding limiting factors to models for OCEANBEACH, VEGBEACH, BAYBEACH and BAYSUBSAV. Limiting factors are assumptions or conditions that should never be violated. A violation would automatically drop the HSI value to zero. For example, the team discussed adding a limiting factor that would prohibit a change in substrate in any area. However, while this would ensure that mudflat could not be replaced with sand it would also mean that sand could not be replaced by mudflat to create intertidal marsh. This limiting factor might make work on the islands impossible. The Team will revisit this discussion.

The Team discussed adding an Internal Diversity Index that gives a score to each transect based on the number of desirable habitat features encountered. However, this approach might unfairly assign a higher value to one transect because it has more communities even though those communities may be sub-optimal. Consider how an area with only unvegetated mudflat might compare to an area with salt marsh, upland, shrub. Each is of high value to wildlife. One approach may be to evaluate transects within the broader context. That is, transects would be assigned a score relative to the quality of area surrounding a transect. Highly developed areas would score low, areas in the wilderness would score high. The Team will revisit this discussion.

In addition:

- EELGROWTH was removed as a variable from the BAYSUBSAV model.
- Change the invasive variable to record percent cover rather than high, moderate, low, very low categories.
- Remove the ABUNDSPP variable from all models.

- Remove vegetation species from RICHSPP variable, but keep the variable in the models. Species included as "target species" will be redefined for the BAYBEACH community based on information from Gary Ray at WES. Species will remain the same for the BAYSUBSAV community.
- Change the text describing the ideal conditions for BAYBEACH to indicate that some erosion is acceptable and is part of the natural system.

V. FUTURE WITH RESTORATION HSI/HU CALCULATIONS

The team reviewed baseline and future (with project) tables for Transects 5 and 14. The team discussed the assumptions that were made by NEA regarding changes in HSI values following restoration activities. Where appropriate, table values were modified based on Team input.

VI. SCHEDULE.

The next meeting will be a conference call. Agenda items will likely include a discussion of the revised community and variable definitions, species curves, future assumptions, baseline HSI values, and restoration plans for Great Gun and New Made Island. The team will also evaluate the benthic species list to be provided by WES, discuss the results of the sensitivity equations and discuss the HEP model philosophy as it relates to restoration and project components.

A final meeting will be held to present the HEP process and findings and will be open to a larger audience.

VII. ACTION ITEMS

NEA

- Provide Team with a figure that includes the 8 additional sites that have been added for 2005 HEP sampling.
- Revise baseline and future with restoration HSI/HU tables as needed.
- Modify community descriptions, tables, etc. as necessary to address team comments.
- Extend oceanbeach community out to 30 ft depth when calculating baseline HSI/HU's.

NEA/WES

- Evaluate if a component can be added to the models to address impacts to "Processes".
- Provide Team with summary tables that provide 1) community type definitions, 2) variable definitions, 3) definitions of HSI 1 = good, 0 = bad.
- Identify which species or features to include in the internal diversity index. Determine how this variable may change over time.
- Identify how "management" of restoration sites can be included in models. Particularly in the future projections calculations.
- Conduct sensitivity analysis.
- Revisit the issues/concerns identified in Section IV and present options to the Team.

USACE

- Send revised "Process Fact Sheets" to the Team.
- Investigate whether it is feasible to prepare a Fact Sheet to address uplands.
- Coordinate with Bob Kurtz regarding the RTE species restoration sites identified during Aril 2005 meeting with town representatives, NPA, USFWS, etc. Send minutes from the April 2005 meeting to HEP Team.
- Get a list of target species for the BAYBEACH community from Gary Ray.

FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
RESTORATION AND HABITAT EVALUATION MEETING SUMMARY
SEPTEMBER 23, 2005
USFWS LONG ISLAND FIELD OFFICE, ISLIP, NY

TO: Karen Graulich (NYSDEC), Jean O'Neil (ERDC), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA), Steve Couch (USACE)

FROM: USACE, Pamela Lynch

SUBJECT: Summary of FIMP (HEP) Team Meeting

DATE: December 19, 2005

HANDOUTS (provided prior to or during meeting):

Figure – HEP Transect Locations
Variables Evaluated with HEP Models
HEP Sampling Methodology
Description of Potential Restoration Options
FIMP HEP Curves Database
Future Conditions and Assumptions Table
Baseline, Future No-Action, and Future HSI and HU Scores for 14 Restoration Sites
Baseline and Future No-Action HSI and HU Scores for 7 Additional Sites

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In attendance:

Kelly Burks-Copes (ERDC-EL)[2]	Jean O'Neil (ERDC-EL)[2]
Stacie Grove (NEA)[2]	Patricia Rafferty (NPS)[1]
Roselle Henn (USACE)[3]	Steve Sinkevich (USFWS)[1]
Robin Laporte (NPS)[3]	Robert Smith (USACE)[2]
Pamela Lynch (USACE)[1]	Norb Psuty (Rutgers)[1]

[1] voting member of the FIMP advisory Team
[2] assisting advisory Team, but not a voting member
[3] non-team attendee/interested party (participated in morning session)

I. FIMP UPDATE

Pamela Lynch provided an overview of the Fire Island Inlet to Montauk Point (FIMP) Reformulation Project. To date, there have been two phases of the Habitat Evaluation Procedures (HEP) process that have been designed/used to address two phases of the FIMP project. Phase I HEP included 14 transects established to address potential impacts (both positive and negative) associated with proposed restoration efforts in the 82-mile FIMP study area. Phase II HEP included the evaluation of seven additional transects established to address community types and conditions not previously included in the Phase I effort.

In accordance with National Economic Development Plan (NED) and National Ecosystem Restoration Plan (NER) objectives, the next phase of HEP will use data and results from Phase I and Phase II efforts to evaluate baseline, future no-action, and future with action conditions at the actual proposed shoreline protection and restoration site locations across the 82-mile Project area. In addition, (if necessary) HEP may be used in mitigation analysis and design to offset any potential impacts through restoration/mitigation. However, the USACE is proceeding on the assumption that activities related to the beach renourishment and dune restoration component of the storm damage reduction project will not have adverse negative impacts that would require mitigation.

The current USACE authorization for the FIMP project covers the studies needed to evaluate the proposed project option and does not authorize activities directly associated with storm damage reduction and restoration. The USACE is currently pursuing new authorizations that will likely include the restoration component. Other options for restoration authorization and funding may be pursued under the CAP program or under authorization for projects that support threatened or endangered species.

Non-Federal sponsors cannot pay for a restoration project unless components of the project also provides storm damage reduction. Therefore, the Project will proceed, and will include BOTH shoreline protection and restoration/mitigation components. In some cases, proposed Project alternatives may also serve as restoration.

II. GENERAL DISCUSSION OF MODELS

Model certification and peer review – Kelly will follow up with Roselle to provide recommendations regarding the process as it applies to FIMP HEP. Jean will provide Kelly with additional information after she attends the upcoming meeting on certification. Peer review may be significantly limited due to the project schedule and funding limitations.

ERDC/NEA to determine if it is appropriate to use the average or weighted average when presenting HSI scores.

Project activities may occur anywhere across the 82-mile Project area and until recently the proposed locations were unknown. Therefore, the location of existing HEP transects were selected in order to provide data from representative examples of the types and quality of communities likely to be impacted by restoration or project activities. This baseline HEP data may be extrapolated to evaluate potential impacts to restoration or project locations within the broader study area. Team input will be needed to identify which of the communities already evaluated with HEP would apply to selected project or restoration areas not already surveyed using HEP. Due to limited time and funding, the USACE will not be conducting additional HEP field sampling activities in additional areas.

The team worked on a ranking matrix for use in evaluating and documenting impacts on the ecological processes, and on rare/threatened/endangered species, from proposed activities. This ranking matrix would be used after calculating HSI and HU scores to assist in justifying why activities should or should not be undertaken in a given area. The Team worked through the decision matrix process for several sites and determined it would likely be a useful tool. Decision Matrix symbols: + = supports process; - = negative affect on process; and, 0 = no obvious affect on process. The symbols ++ or - - were used to indicate that the effect on a process would be very high. The effect on RTE species was also included as a decision category in the matrix. However, this category would only be used to move an activity forward when the activity did not strongly support any other processes. This may be a way to elevate the status or importance of island restoration, given that there has not been a process identified to address the upland community.

The TRANSCOMM variable was added to the HEP models to help ensure continuity of communities across the island. However, the team was unable to fully evaluate the usefulness of the TRANSCOMM variable at this meeting.

The Team discussed developing decision rules that would be used to help to determine and document why some sites would be removed from further consideration. The decision rules could be used in a matrix (or combined with the process matrix described above) to assist in selecting or eliminating sites. Categories (or rules) might include raw feasibility, representation of key processes, and National Performance Measures (e.g., connectivity, species of concern, invasive species, partner support). ERDC will suggest how best to incorporate these categories and the process matrix into HEP and the site selection process. ERDC will provide a copy of the performance measures to the Team. (i.e., agency opposed, landowner issue, cost, likelihood of success, etc.).

III. HEP Results

NEA and ERDC presented baseline, future no-action, and future with restoration, HSI and HU values for the 14 Phase I restoration sites to the Team. In addition, baseline and future no-action conditions were presented for the seven, Phase II transects. Copies of all results and HEP databases will be sent to the Team for further evaluation.

The team reviewed the handout of future conditions and assumptions. The Team evaluated each assumption and adjusted them as needed to best represent overall trends expected for acreages or HSI scores in each community over time. ERDC incorporated changes in tables and database as they were being discussed during the meeting.

Future conditions calculations will be revised and resubmitted to the Team. ERDC and NEA will coordinate regarding AAHU calculations over 50 year project life. The team will need to establish target years for AAHU calculations.

IV. Restoration Locations and Alternatives

NPS restated the fact that in accordance with Federal regulations, no activities could be undertaken at Old Inlet (or any other site within the Wilderness Area).

The Team reviewed the handout that described potential restoration options for each of the original 14 transect locations. The options were revised based on comments received from the Team at the previous meeting. On this handout, additional management options that would not to be undertaken by the USACE as part of restoration are presented. Changes in acreages or HSI scores that may result from these non-USACE activities were not included in HSI calculations. However, HSI scores could be adjusted accordingly, if other organizations were to agree to complete the management recommendation.

The USACE will not manage restored areas beyond 5 years. The assumption is that the non-Federal sponsor would take over the management of an area beyond the 5-year period.

Agencies requested the opportunity to propose additional restoration areas and designs to be evaluated with HEP as part of this project. Therefore, by October 24th, each voting agency on the Team will provide the USACE with up to nine restoration site locations and one alternative per each site (potentially 36 different sites) that are supported by their agency. The Team was strongly encouraged to use sites and designs already identified and evaluated using HEP if possible. Designs should be conceptual and should include location, acreages of each community (based on the identified HEP community types), target species, a description of how the HSI scores and processes would be affected, a brief description of the proposed restoration, and text describing the rationale used to prioritize the nine sites.

A conference call will be held the week following submittal of restoration locations and alternatives (week of October 24th, 2005) for the Team to discuss which sites and alternatives the USACE would likely move forward to the next phase of HEP analysis. Time and funding limitations may significantly limit the number of options that the USACE may select. The goal will be to select several options that the Team collectively identifies as priorities. Once the "final" sites are identified, at least three alternatives will be developed per site and would include designs that show the minimum acceptable restoration, best case scenario for restoration, and a scenario that falls somewhere in between. Three design alternatives are needed for each site in order to run the Institute for Water Resources (IWR)-Plan which is used in incremental cost analysis.

V. PROJECT LOCATIONS AND ALTERNATIVES

Based on current estimates of alternatives from enginners at Moffett-Nichol, approximately 24 potential locations and up to three alternatives per site will be evaluated (72 scenarios) with HEP. The assumption is being made for these sites that the proposed project alternatives (i.e., beach renourishment and dune stabilization) will only affect the VEGBEACH and the foredune portion of the DUNEGRASS HEP communities. Therefore, only slope, width, vegetation, and total acreages will be modified for each scenario to produce HSI and HU scores for baseline, future no-action, and future with action conditions in these communities. No other HEP communities will be affected, thus no changes will be realized in the HSI or HU scores for these communities as a result of the project.

Other components of the storm damage reduction project may include modifications to inlets, revetements, and groins. HEP will also be used to evaluate impacts that may result from these activities. Impacts may affect communities other than VEGBEACH and DEUNEGRASS.

Engineer models for various reaches have generated data on average beach and foredune widths and slope across the 82-mile project area. These data will be used instead of field data in the HEP models to ensure consistency across the 82-mile project area. NEA will coordinate with Moffett-Nichol to ensure data are compatible and suitable for use in the HEP models. HEP curves may need to be reevaluated and adjusted for engineer data.

VI. MITIGATION

Standard benefit-cost analysis analysis will be used to determine the NED plan. HEP will be used to generate ecological impacts. Any impacts generated by the proposed design must be offset with mitigation. Mitigation designs must be analyzed using HEP (to generate outputs), and Cost Effectiveness/Incremental Cost Analysis (CE/ICA) to determine the cost-effective, biologically productive solution for full mitigation. For the ecosystem restoration portion of the study, HEP and CE/ICA will be used to determine the NER plan. A combination of both NED and NER components will then be generated to develop a multi-purpose project. These components will then be re-evaluated using both benefit-cost analysis, CE/ICA and HEP in an iterative fashion.

The USACE is proceeding with a new SOW to fund the next phase of work. This phase will include HEP analysis to produce baseline, future no-action, and future with action scenarios for the new restoration sites (to be identified by the Team the week of October 24th) and for many of the potential project sites. NEA will prepare conceptual costs and designs needed for the evaluation of restoration sites and costs will be prepared by the USACE for the evaluation of project sites. The USACE will run the IWR-Plan on project and restoration alternatives and will develop a strategy that provides separable elements and dictates rules for the CE/ICA (i.e., combinabilities, cumulative effects, thresholds, etc.).

It is assumed that for future use of HEP, the USACE will apply the HSI score of the HEP community or communities that have characteristics most similar to the areas that have not actually been evaluated with HEP. For example, Water Island was not surveyed during HEP field data collection. However, the Reagan property was surveyed and the characteristics of the communities in Reagan are similar enough to Water Island to justify using Reagan HSI data in HEP analysis for Water Park

If mitigation for project impacts is needed, future discussions would need to be held to determine if mitigation would be in-kind, out-of-kind, both, etc.

VII. SCHEDULE

- October 24, 2005 – HEP Team to submit lists of priority restoration sites and descriptions to the USACE
- October 26, 2005 – HEP Team conference call to discuss the list of restoration sites
- December 2005 – all engineering data for the project is due to the USACE
- January 2006 – all HEP data for restoration sites and project alternatives due to the USACE
- March 2006 HEP report due to the USACE
- November 2006 – USACE to submit draft EIS to agencies
- November 2006 – Independent Technical Review

VIII. ACTION ITEMS

NEA

- Provide HEP databases and associated tables to the Team
- Prepare cover type maps and conceptual designs for selected additional restoration locations and alternatives provided by the Team (NPS to assist as needed)
- Calculate baseline, future no-action and future with restoration HSI and HU's scores for selected additional restoration locations and alternatives provided by the Team
- Calculate baseline, future no-action and future with project HSI and HU's scores for selected shoreline protection project locations and alternatives provided by Moffett-Nichol

NEA/ERDC

- Continue to assist with any necessary adjustments to models/equations as needed in the next phase of HEP
- Continue advisory role in HEP process
- Provide Team with list of National Performance Measures
- Evaluate how best to incorporate site selection criteria and the process evaluation matrix into HEP and the site selection process

USACE

- Send templates for Team's use in identifying restoration sites (task completed)
- Send revised "Process Fact Sheets" to the Team.
- Prompt the NYSDEC for input of HEP and restoration site selection
- Investigate whether it is feasible to prepare a Fact Sheet to address uplands.
- Provide the Team with a copy of the USACE flowchart that shows the NED/NER process.
- Coordinate with NEA/ERDC for next phase of work
- Roselle to coordinate with ERDC regarding certification on models

USFWS/NPS/NYDEC

- Provide USACE (by October 24, 2005) a list of up to nine restoration locations (1 alternative per location) with descriptions of the proposed restoration, anticipated impacts to communities in terms of HSI values and acreage changes, and provide description of how sites were prioritized. Use template from USACE to facilitate this.

FIRE ISLAND TO MONTAUK POINT (FIMP) REFORMULATION STUDY
MEETING SUMMARY - DRAFT HEP RESULTS AND EVALUATION ASSUMPTIONS
APRIL 18, 2006, 9:00 AM THROUGH 4:00 PM
FIIS RIVER ROOM, 166 WEST AVE, PATCHOGUE, NY

TO: Karen Graulich (NYSDEC), Patricia Rafferty (NPS), Steve Sinkevich (USFWS), Robert Smith (USACE), Norb Psuty (Rutgers), David Santillo (NEA), Steve Couch (USACE)

FROM: USACE, Pamela Lynch

SUBJECT: Summary of April 18, 2006 FIMP (HEP) Team Meeting

DATE: April 25, 2006

HANDOUTS (provided prior to meeting):

Draft HEP Report and Appendices, version dated March 31, 2006

In attendance:

Patricia Rafferty (NPS) [1]	Robert Smith (USACE) [2]
Steve Sinkevich (USFWS) [1]	Stacie Grove (NEA) [2]
Norb Psuty (Rutgers) [1]	Steve Couch (USACE) [3]
Pamela Lynch (USACE) [1]	

[1] voting member of the FIMP advisory Team
[2] assisting advisory Team, but not a voting member
[3] non-Team attendee/interested party

I. MEETING SUMMARY

1) Patty (NPS) requested that "Appendix D" be removed from the document (it contained what she felt to be classified and confidential information). Material will be excluded in future releases/versions of the report.

2) The next version of the report will include an Executive Summary.

3) The Team made note of several other editorial comments on the HEP report, but were asked to provide comments specific to the report to NEA in written format within two weeks.

4) Norb (NPS/Rutgers) requested that a 'flow chart" be generated for inclusion in the reports' introduction. He felt this was necessary to help the common "reader" to understand the process of HEP better. NEA will attempt this "flow chart" in a latter version of the report (if possible).

5) Steve S. (FWS) did not agree w/ the assessment of the FWS's "selected" restoration designs. Steve felt that all of his alternatives were not represented and the alternatives weren't, in some cases, shown correctly. He will address each of these individually, in an e-mail, following the meeting. Patty will do the same (if necessary).

6) Norb requested that a “disclaimer” be added to the beginning section(s) of the report to state that the model is community based (as designed) and thus has significant limitations in geomorphology. Therefore, as assumptions are stated, all limitations should equally be disclosed. The HEP Team will identify any additional limitations or assumptions that need to be added. NEA will add these to future versions of the report.

7) The application of the HEP “Transcomm” variable needs to be re-evaluated. Patty (NPS) illustrated its intended use (as was created in prior meetings), but admits it might not have been used/created properly. She will revisit this variable (as will NEA) and a decision will be reached on how to handle it in future HEP analyses (and, if necessary, to re-compute those from the past).

8) Regardless of what happens w/ the variable, it must be more clearly stated in the report the purpose and application of the variable, any should elaborate on any modifications made to the variable and why.

9) The mis-interpretation of an EIS was clarified. It was incorrectly stated that a “programmatic” EIS would be prepared for FIMP when that is, in fact, not the case.

10) Target Years (0, 1, 50), set as they are now, are OK w/ Team for all calculations. But, it should be clearly stated in report WHY these years were selected and why the Team felt that no other years were needed. This was also highlighted w/ a discussion on the future (HEP) scope of services; it will cover future without project storm events (future change conditions). Accordingly, as the team agreed, because maintenance (management) is required and assumed under the future with project conditions years between 1 and 50 were not need because they’ll be assessed on a trajectory (weighted over time) to show ecological change rather than set with years that “events” are to occur. Similarly, under future change conditions the same types of assumptions will be applied. Rather than placing a storm (or other) event at a set (unknown) year the data will be applied to a trajectory (curve) and weighted over time.

11) The Team requested that text be added to the report to note that the target years and assumptions were selected/identified not because the Team did not feel changes would occur, but because the variables, modeling, and the Teams ability to predict habitat conditions, could not accurately capture the changes at discrete time periods.

12) The Team approved the assumptions for baseline conditions as presented in the HEP report, and agreed that the HEP data from the original 24 transect locations was suitable for extrapolation to other potential project and restoration areas on the barrier island as documented in the report.

13) The Team approved the assumptions for future no-action conditions as presented in the HEP report and in Appendix B, Table 4. No new assumptions or future conditions were added. However, future conditions calculations will be re-calculated such that the end condition at TY50 occurs gradually over the life of the project. Currently, future conditions are incorporated into the mode at TY1 and these same conditions are carried through the 50-year project life.

In addition, the assumptions regarding the future conditions at the BCP locations will need to be reevaluated. The future conditions as currently calculated and presented in the HEP report reflect conditions expected following and overwash event rather than a complete breach (as they were intended). Thus the Team has been instructed to temporarily disregard this section (until edited). The USACE will provide a more thorough description of the BCP component of the project and will work with NEA to document the assumptions and habitat conditions used in BCP analysis. Edited BCP sections and results will be included in the final version of the report.

14) The Team approved the assumptions for future with-action conditions (i.e., with restoration or project activities) as presented in the HEP report. The Team discussed whether conditions following restoration activities would in fact be carried through the entire 50-year life of the project and decided that it was reasonable to assume that the management and maintenance required for entire 50 year life of the project would be a component of the restoration/project otherwise the activity would likely not move forward. The USACE may not actually perform the management/maintenance activity, but it would support the agency or organization that would.

15) Inlet section will not be in next version of this report (but it will be in future versions and completed immediately following the 30 May deadline of this report). Work is ongoing between engineers, USACE, and NEA to develop the assumptions and anticipated future with project and future without project habitat conditions at inlet locations.

16) A matrix was created to further “assess” the 16 restoration options currently “on the table.” The following will be included in the matrix: Land ownership, anthropogenic effects, threatened and endangered species, natural sustainability, maintenance/sponsor availability, suitability of storm damage reduction + restoration combination, and each of the 5 processes (separately). These matrix variables will be weighted as “na” (not applicable) or w/ a numerical rating of 0-5 w/ 0 being lowest and 5 being highest. NEA will further develop the matrix and will submit to the HEP Team within 2 weeks for their input.

17) The Team reviewed the 5 coastal processes to determine which processes would not be applicable (i.e., na) in the 16 restoration sites. The following was determined: on islands the “longshore transport” process is not applicable; on the Seatuck refuge and Islip Meadow sites only the “estuarine” and “bayside shoreline” processes apply. All processes are applicable to the Georgica Pond site.

    The matrix can be used to screen potential sites for further evaluation. The matrix is not needed in order to complete the project incremental cost analysis (to be conducted by the USACE).

18) Another disclaimer is needed in the text to explain our “trade-offs” section. In other words, we had said it was of more value (at a given site, under certain conditions, at a certain time) to have 1 habitat in existence vs. another. That doesn’t mean that the habitat is “more important” or “better” than the other, but that it is more relevant/needed at the site at that time. In all decisions regarding this issue, the report should clearly illustrate and highlight the Teams’ thought process and response for each.

19) NEA will be editing portions of the text and the “future no action” #’s are expected to change.

20) Steve S. (FWS) stated that he still has reservations about the outcome of the models. Steve is concerned that the models show that overwash areas score relatively low and that building a beach and dune increases habitat value. He is concerned that the USACE might use these results to justify beach renourishment projects throughout the area and to support the claim that such activities would result in no adverse impacts. Steve also expressed concern that because HEP models are driven primarily by size (i.e., acres), the results will tend to favor large dune

rebuilding efforts island-wide. These concerns will be articulated in FWS's formal response to the document.

21) Patty (NPS) seemed to exhibit similar concerns (as above, #18). Patty pointed out that "any model, which says that the habitat value for Old Inlet increases dramatically with the construction of a dune is fundamentally flawed." Shoreline stabilization activities alone generally do not show a dramatic increase in HSI scores. However, we were unable to pull this data up to show Patty this result because the "Old Inlet" site has since been removed from further model development. This issue clearly highlighted that NPS is uncomfortable w/ the results. NEA will provide a summary of the HSI results for the original HEP transects to the Team for evaluation.

22) Regarding points #19-20 above; both the Steve (USFWS) and Patty (NPS) do recognize that the Team worked hard to identify appropriate variables and "optimal" habitat conditions within communities, that their input into the model was captured, and that the models were functioning as designed. The models do in fact have limitations in their application (as most models do) and the important point is to identify the assumptions, limitations, and ensure appropriate application of the models. At this point it is not possible, and feasible, to go back and change models to capture all possible scenarios.

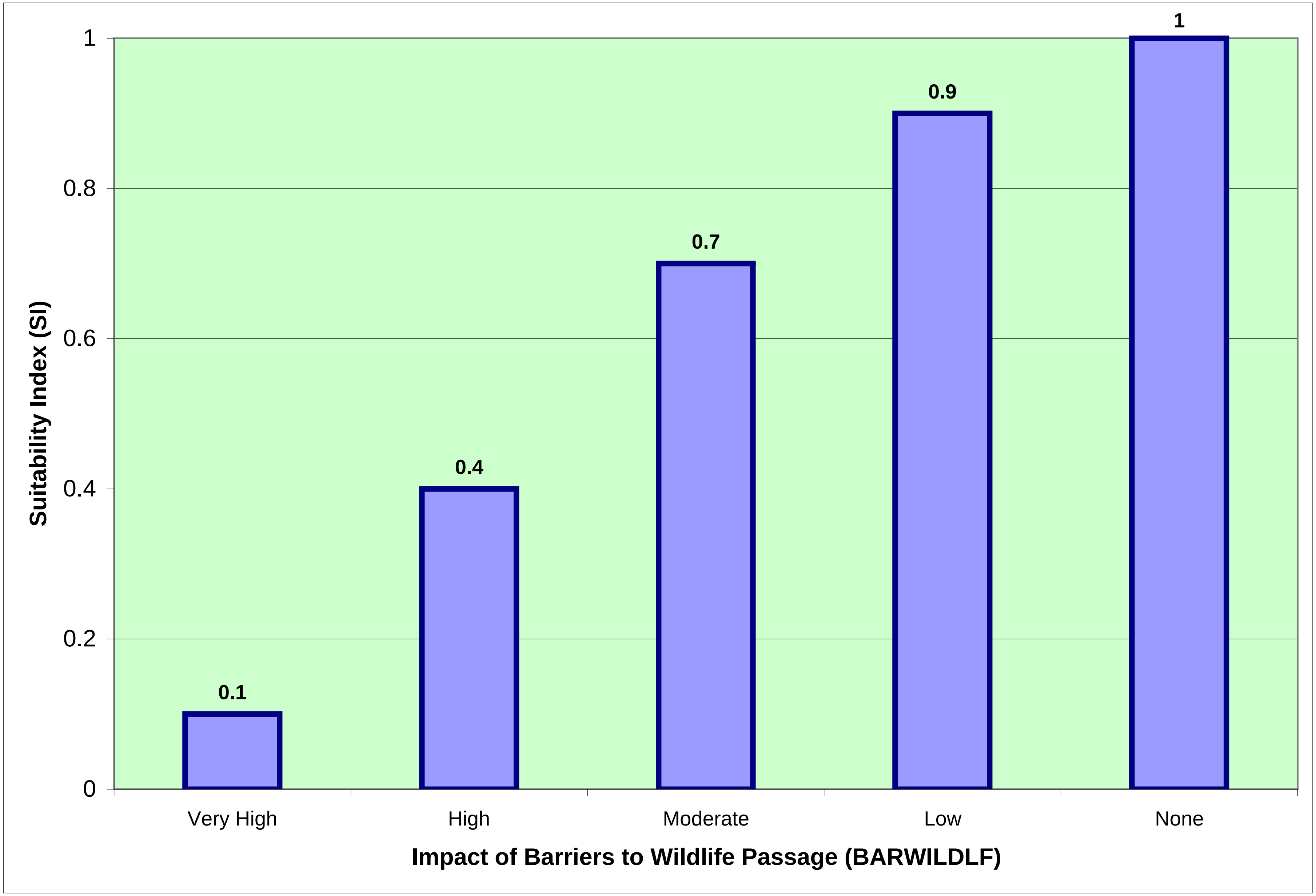
VII. SCHEDULE

- May 3, 2006 – HEP Team to submit comments on draft HEP report (minus the BCP section) to NEA
- May 12, 2006 – NEA will forward the matrix, once completed, from input from the Team. Two weeks will be given as a response time for matrix input from the HEP Team. However, this matrix is needed in FUTURE section of the report/HEP analyses therefore it will not be rushed for inclusion in existing document.
- Mid-May – Steve Couch/Pamela Lynch/Stacie Grove will have a conference call to discuss BCP alternatives and assumptions.
- May 30, 2006 – final report will be released to FWS, NPS and COE.

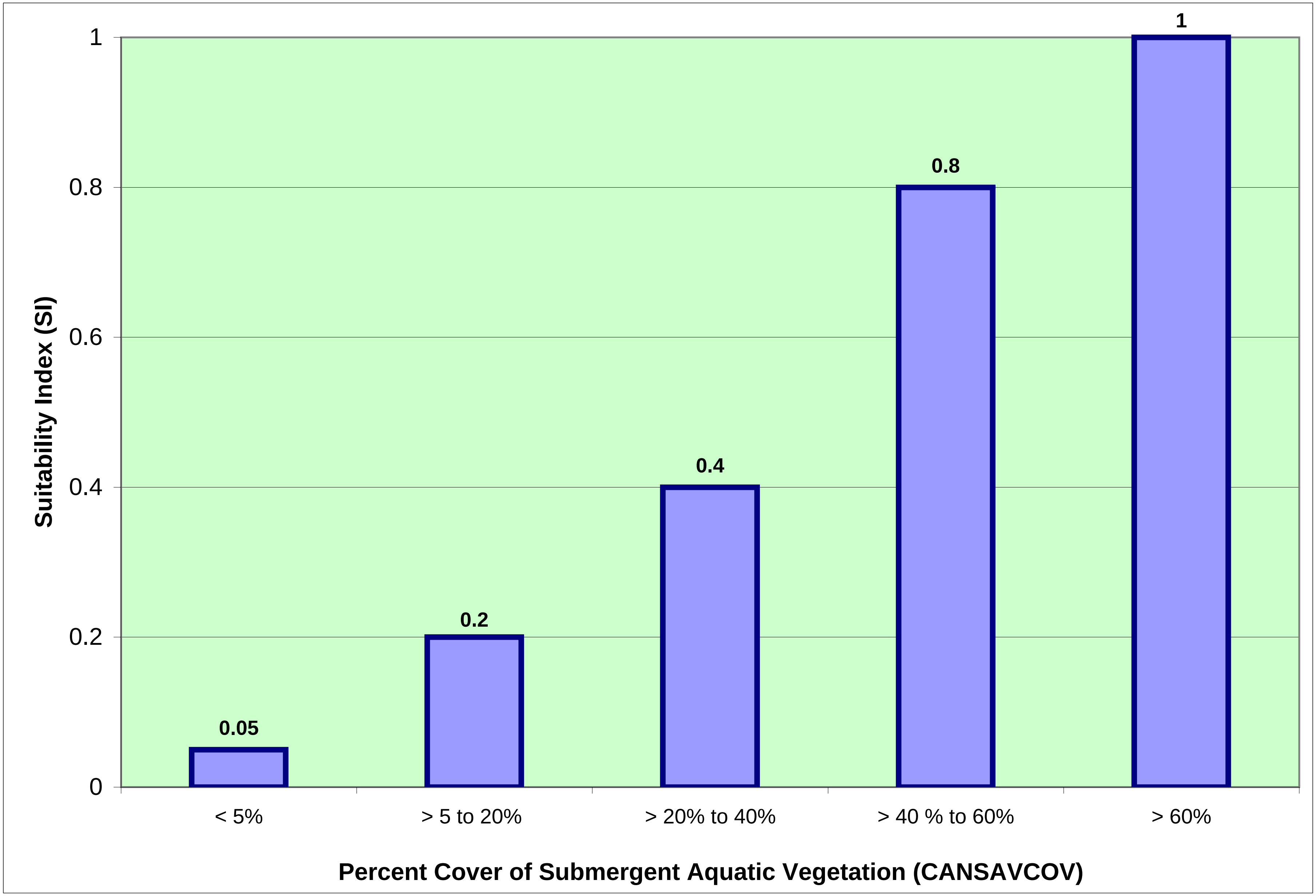
Patty will receive 1 hard copy and the total # of CD's needed for distribution to NPS members (only) she is asking to review. Steve S. will receive 1 hard copy and the total # of CD's needed for distribution to FWS members (only) he is asking to review. Norb will receive 1 CD. Pam and Steve C. (COE) will each receive 1 hard copy and 1 CD (to make the necessary copies). WES will receive 1 copy of this document, at that time, for their official review and input as well (1 hard, 1 CD).

Appendix E

Contents



1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.1
0.4
0.7
0.9
1
Very High
High
Moderate
Low
None
Impact of Barriers to Wildlife Passage (BARWILDLF)


Suitability Index (SI)
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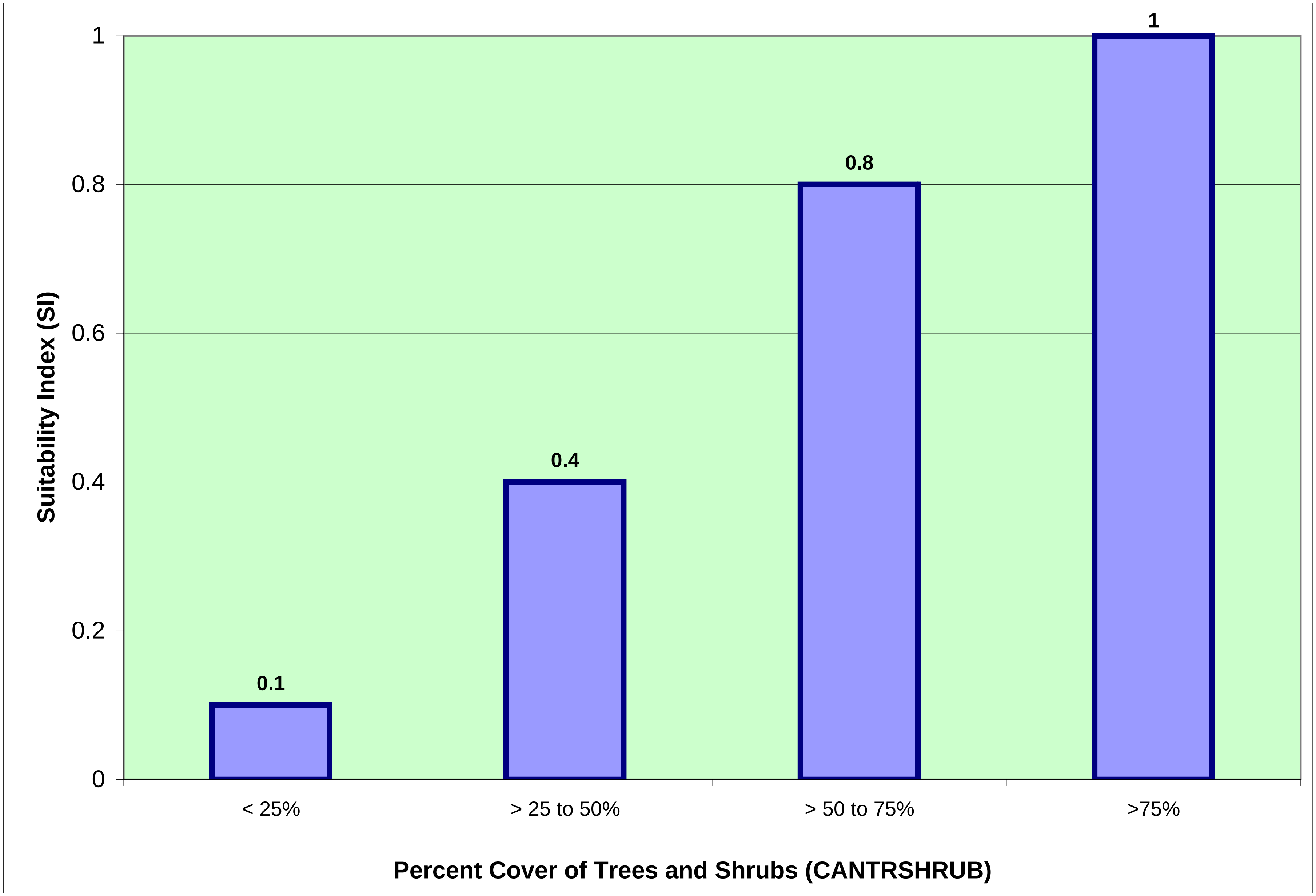
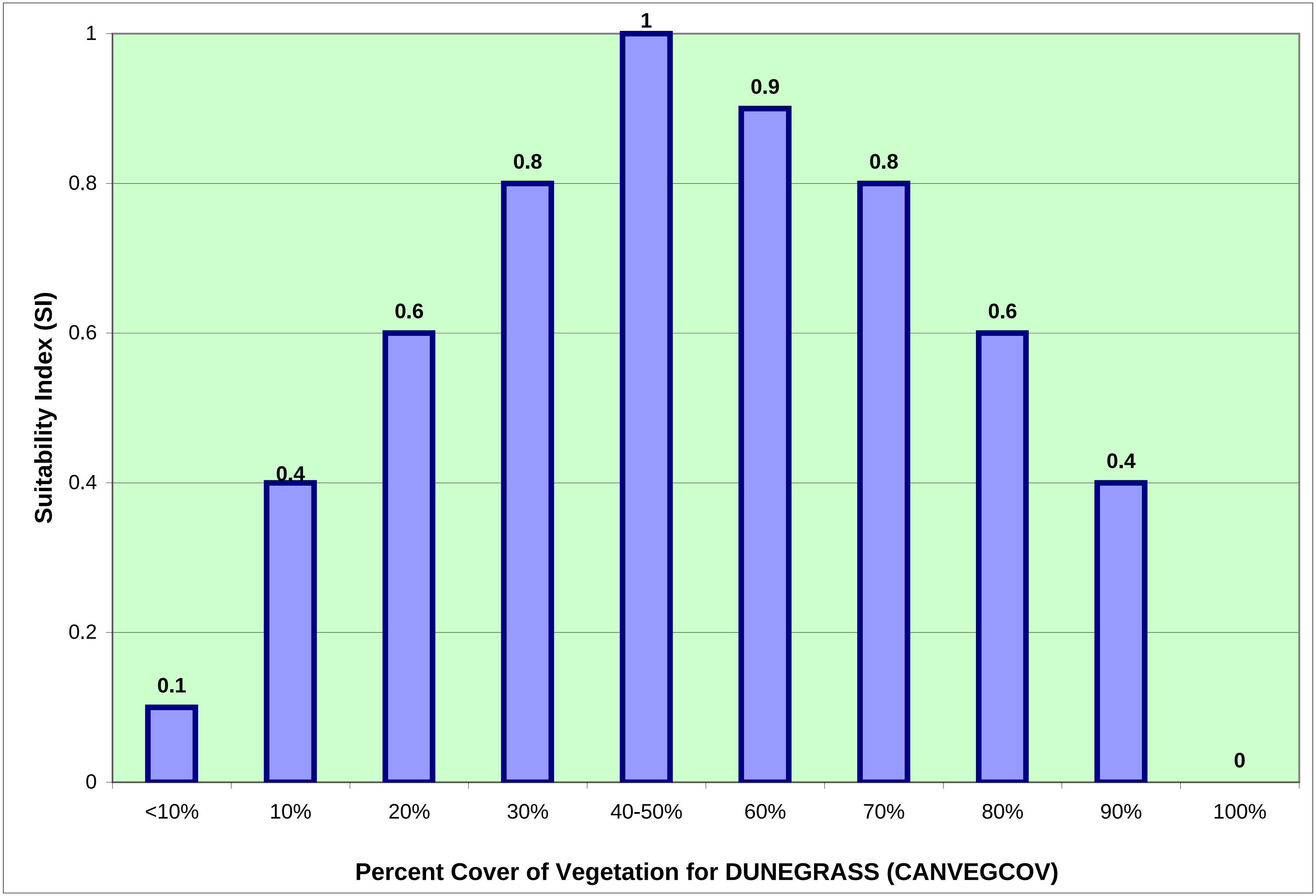
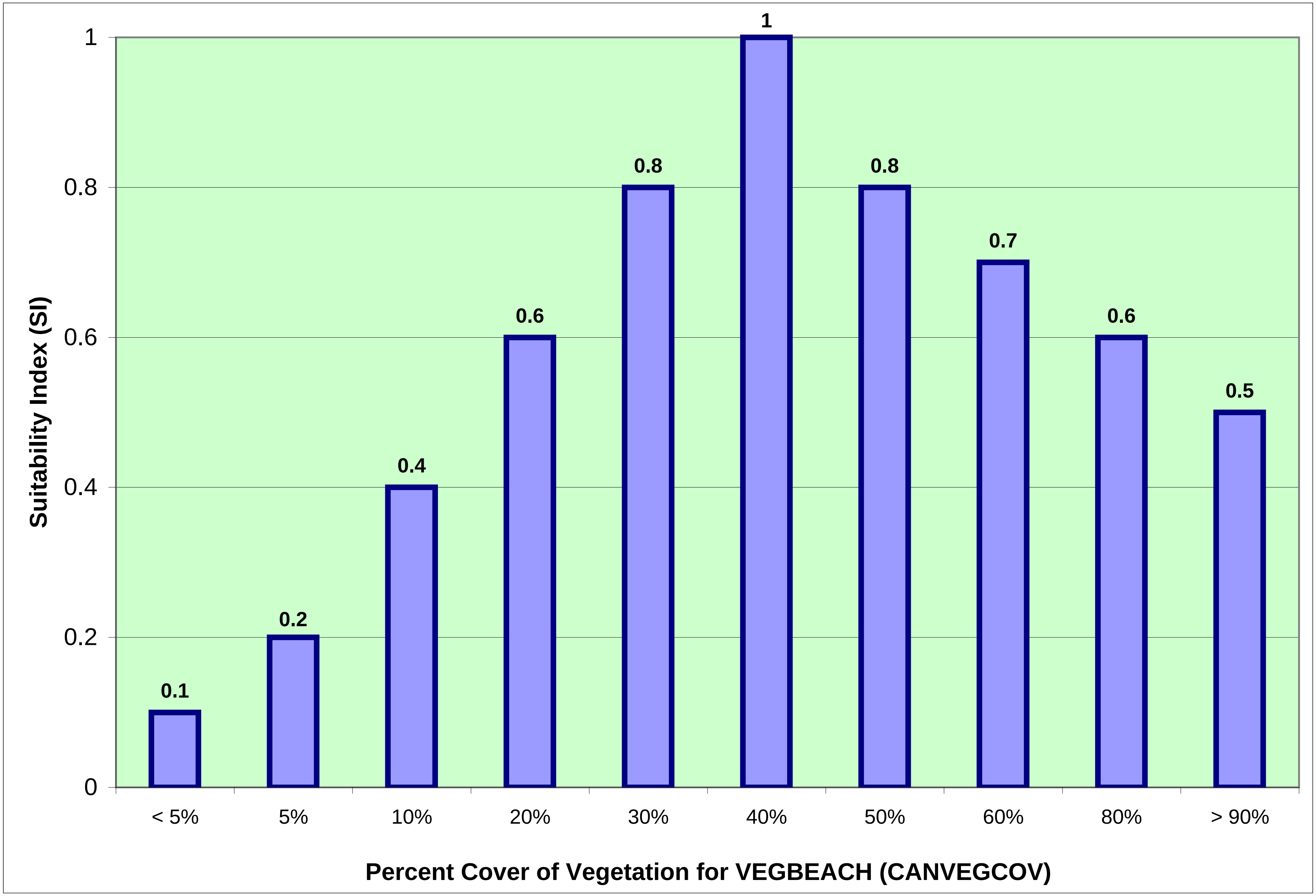
0.8
0.6
0.4
0.2
0
0.05
0.2
0.4
0.8
1
< 5%
> 5 to 20%
> 20% to 40%
> 40 % to 60%
> 60%
Percent Cover of Submergent Aquatic Vegetation (CANSAVCOV)

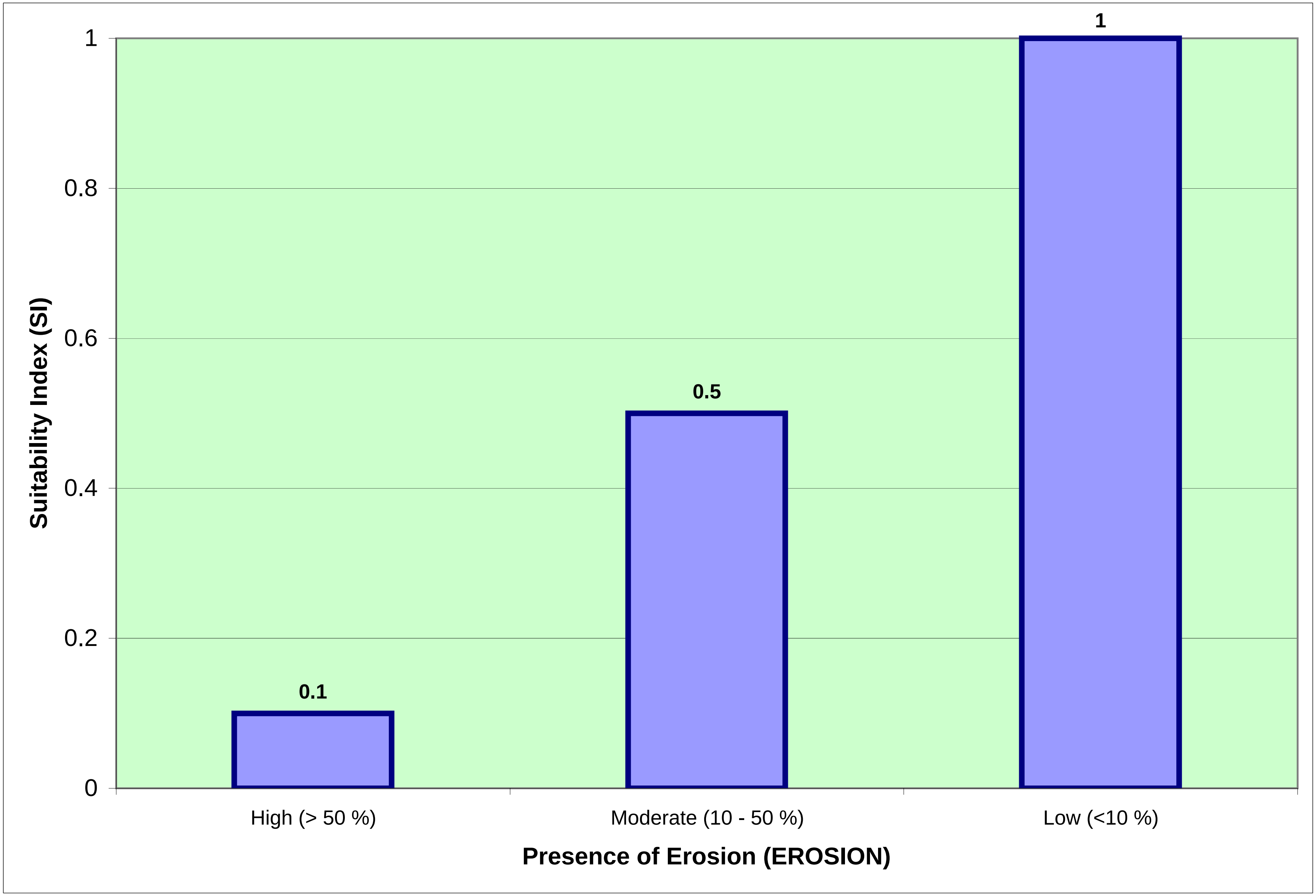


1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.1
0.4
0.8
1
< 25%
> 25 to 50%
> 50 to 75%
>75%
Percent Cover of Trees and Shrubs (CANTRSHRUB)

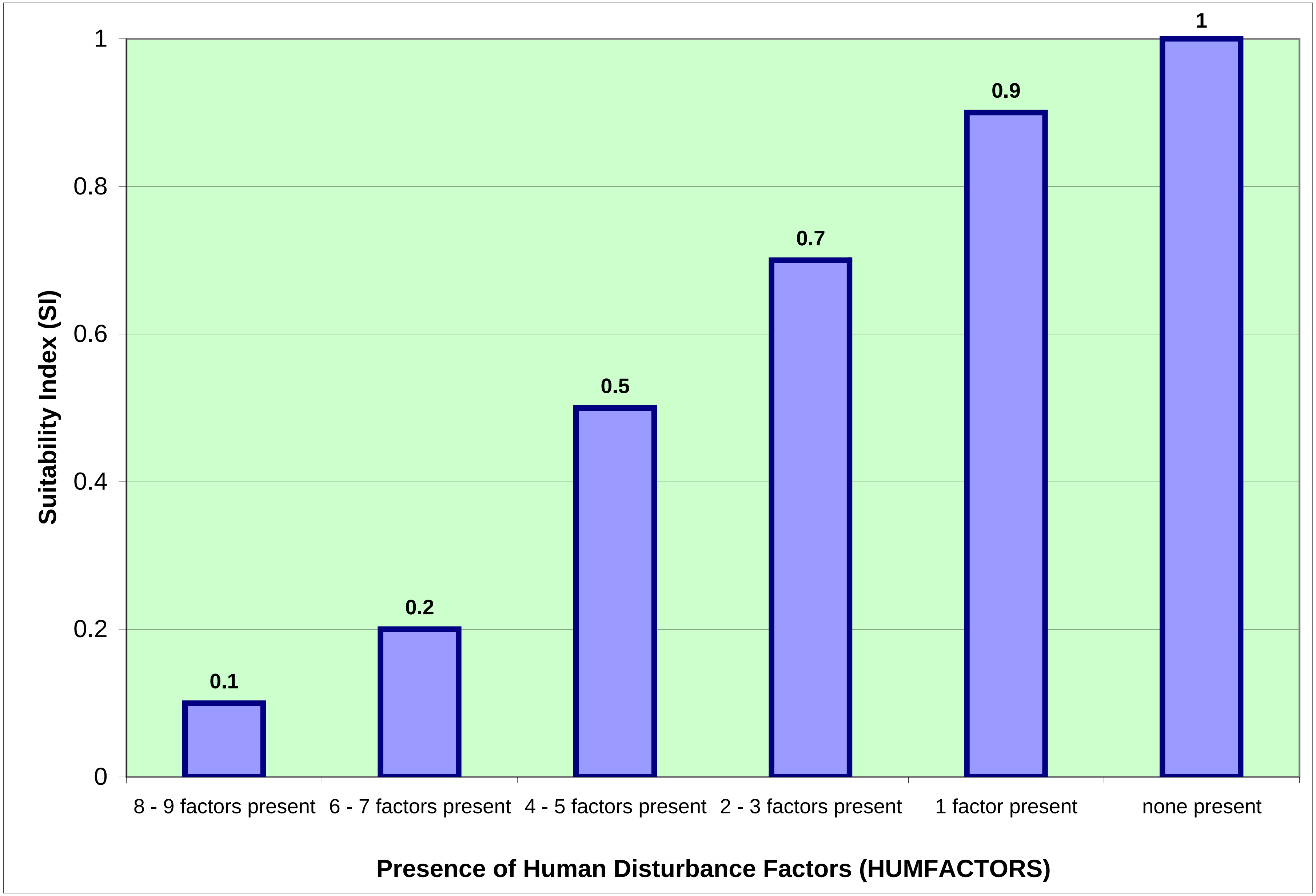


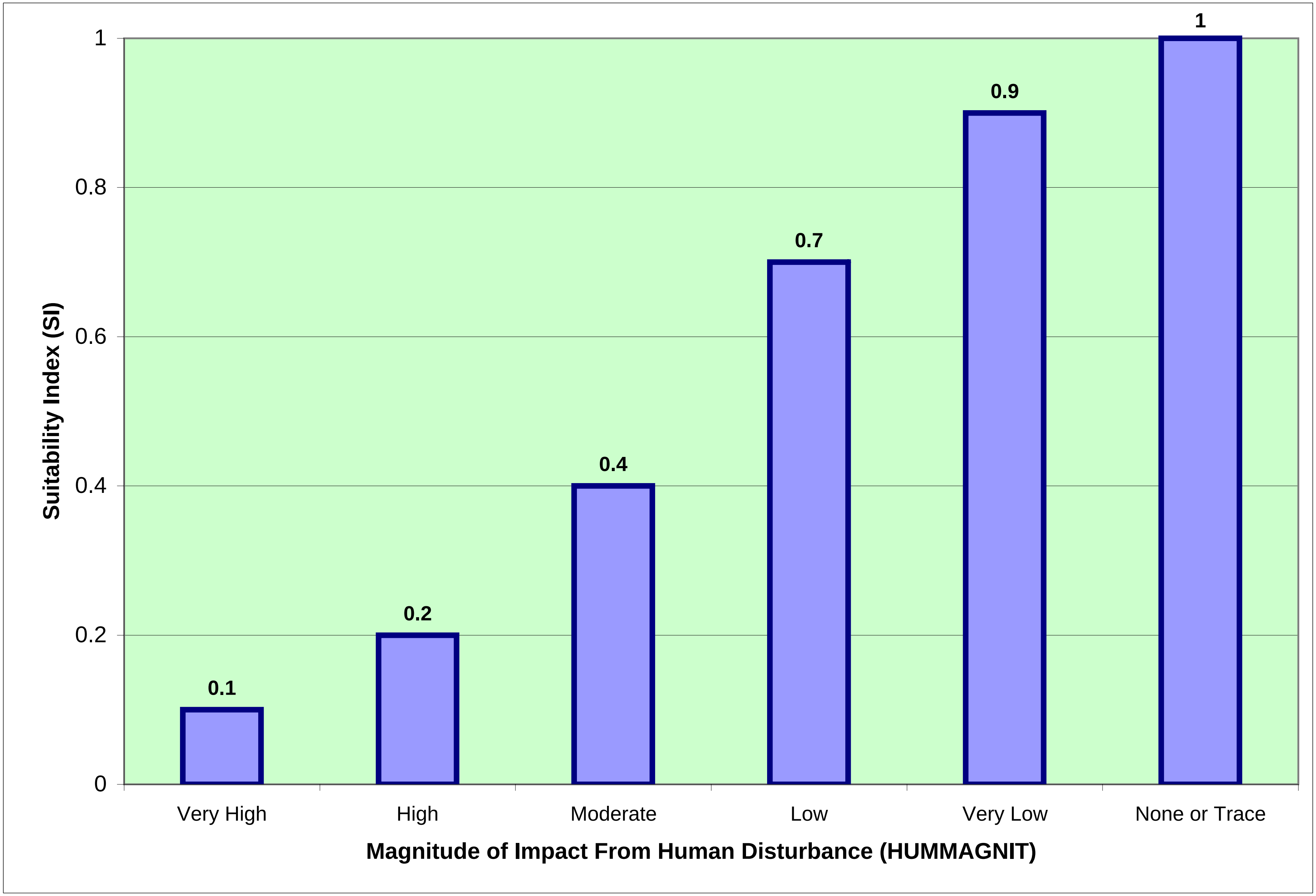
Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.1
0.4
0.6
0.8
1
0.9
0.8
0.6
0.4
0
<10%
10%
20%
30%
40-50%
60%
70%
80%
90%
100%
Percent Cover of Vegetation for DUNEGRASS (CANVEGCOV)

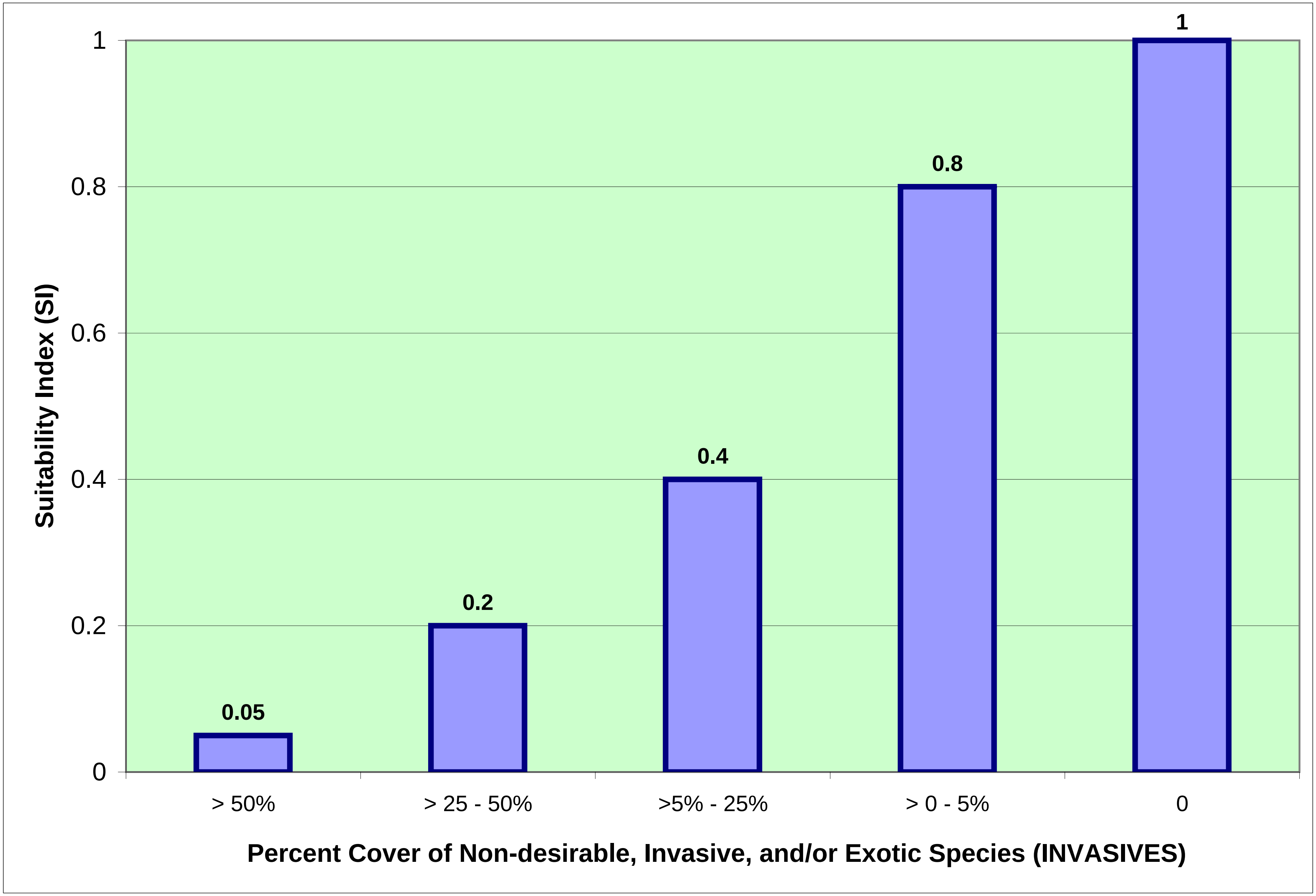

1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.1
0.2
0.4
0.6
0.8
1
0.8
0.7
0.6
0.5
< 5%
5%
10%
20%
30%
40%
50%
60%
80%
> 90%
Percent Cover of Vegetation for VEGBEACH (CANVEGCOV)



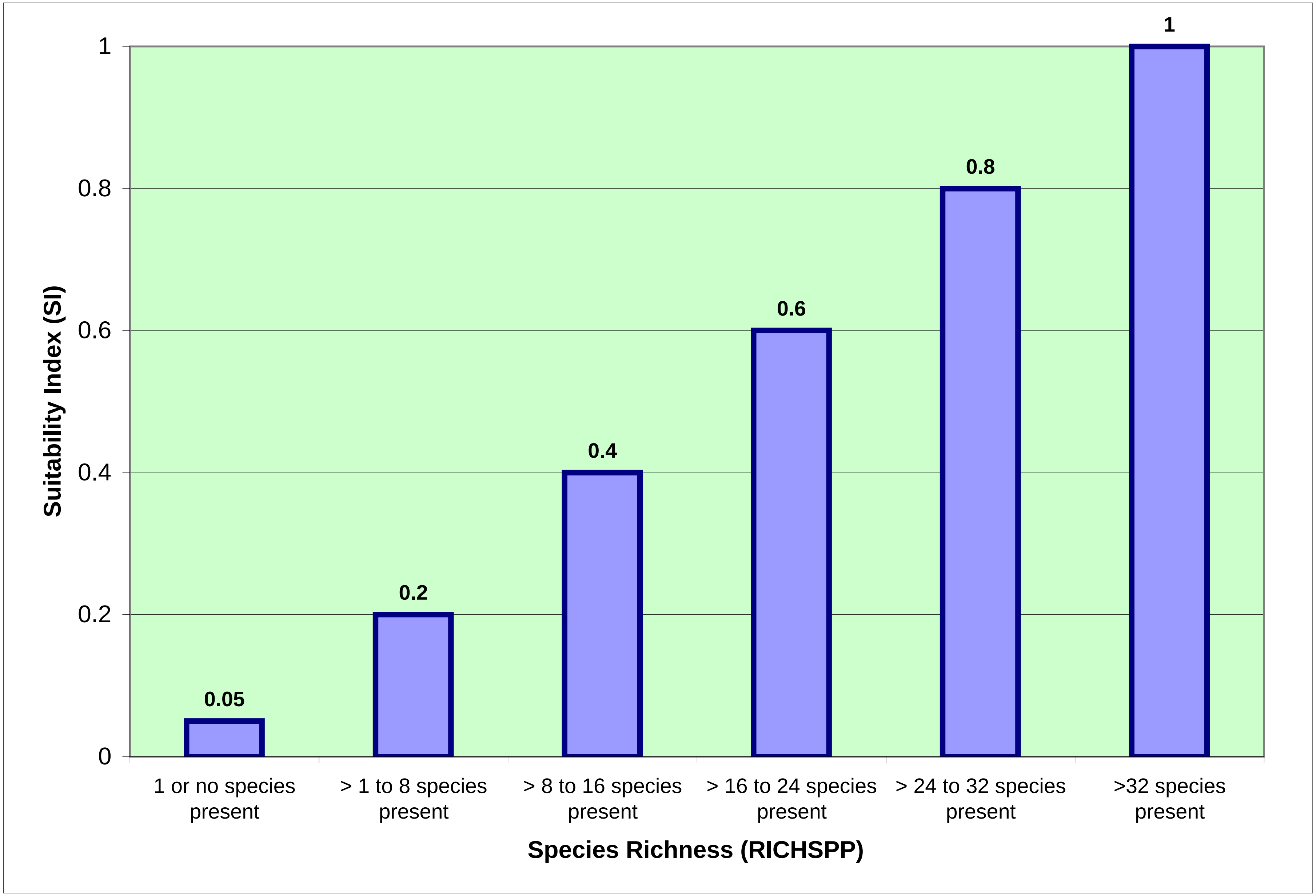
1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.1
0.5
1
High (> 50 %)
Moderate (10 - 50 %)
Low (<10 %)
Presence of Erosion (EROSION)


Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.1
0.2
0.5
0.7
0.9
1
8 - 9 factors present
6 - 7 factors present
4 - 5 factors present
2 - 3 factors present
1 factor present
none present
Presence of Human Disturbance Factors (HUMFACTORS)

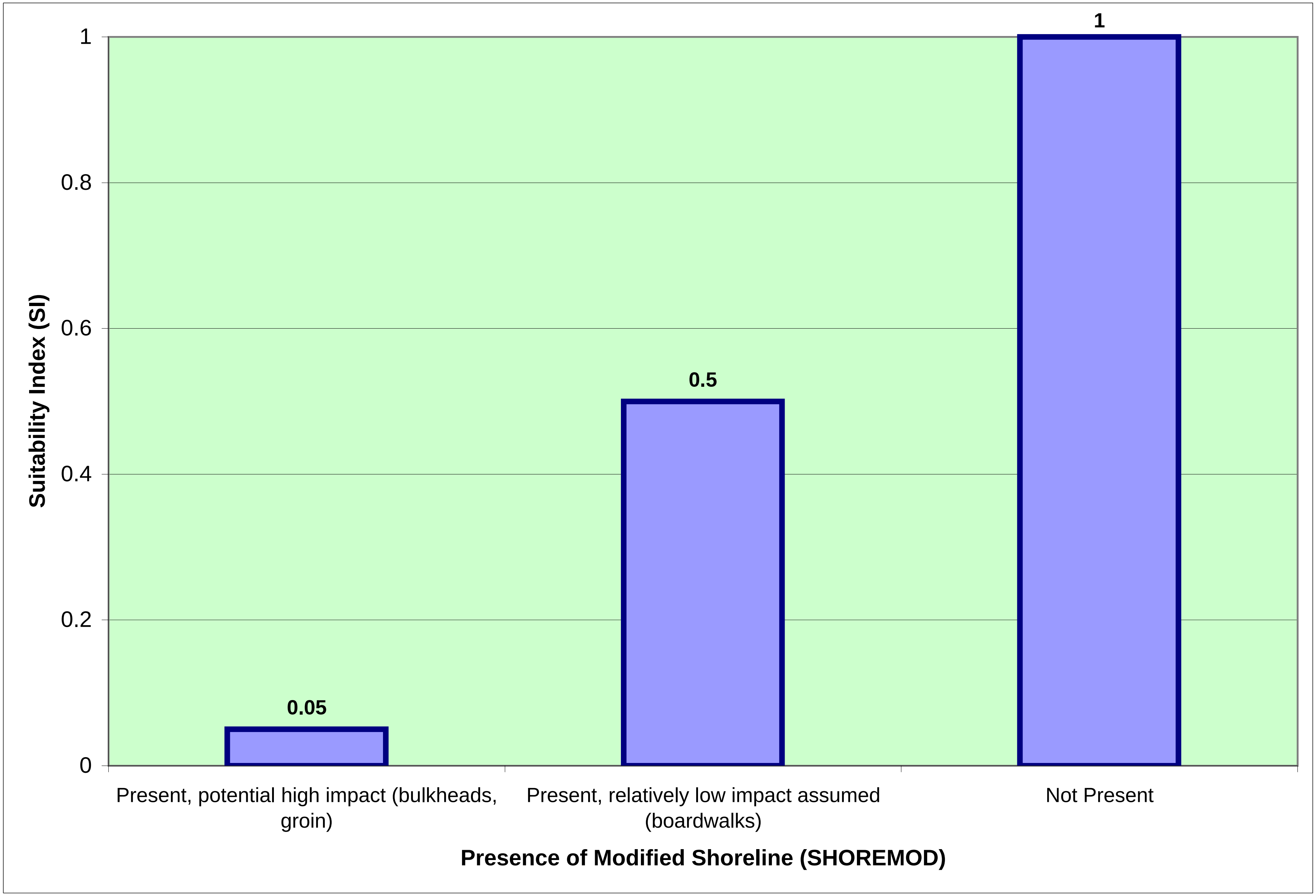

Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.1
0.2
0.4
0.7
0.9
1
Very High
High
Moderate
Low
Very Low
None or Trace
Magnitude of Impact From Human Disturbance (HUMMAGNIT)

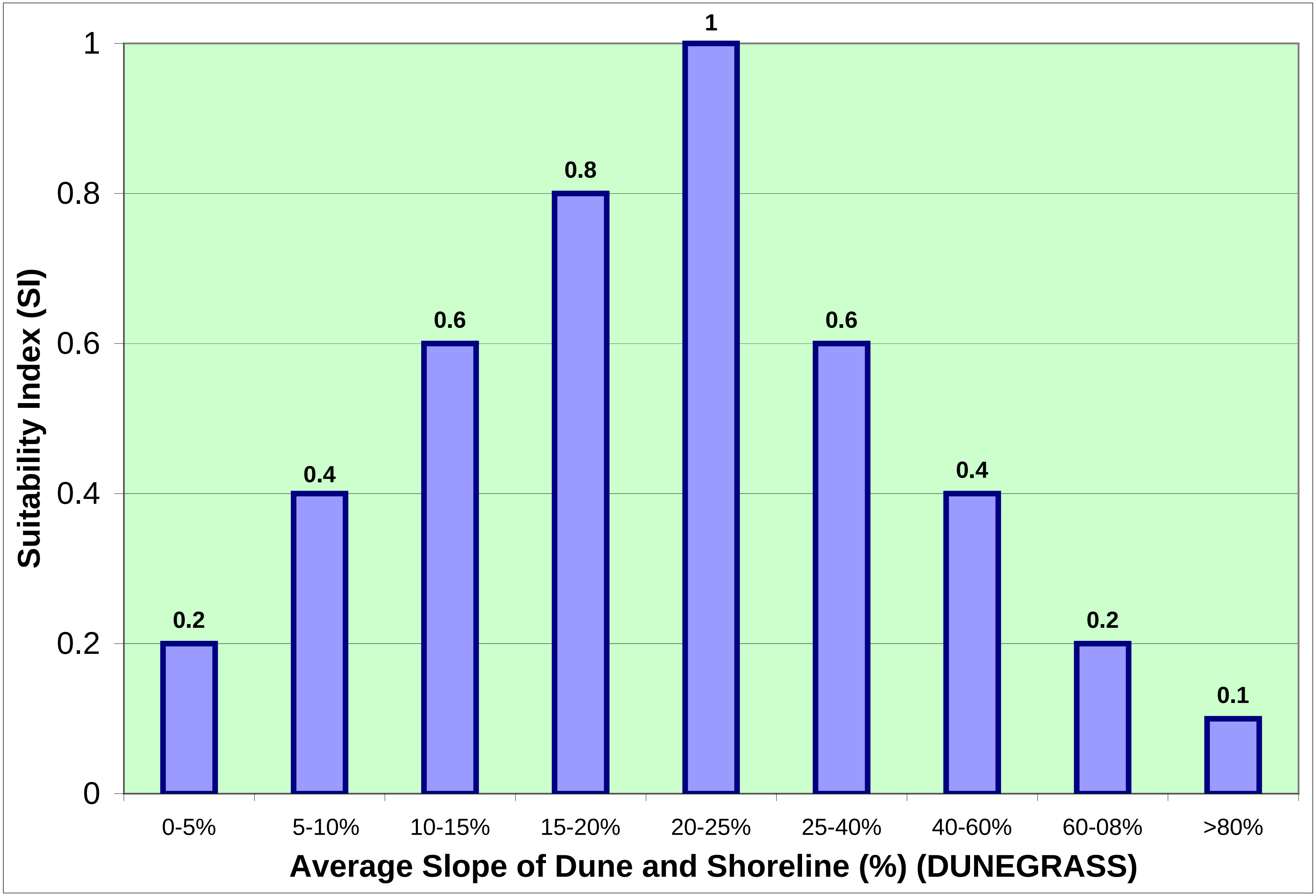


Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.05
0.2
0.4
0.8
1
> 50%
> 25 - 50%
>5% - 25%
> 0 - 5%
0
Percent Cover of Non-desirable, Invasive, and/or Exotic Species (INVASIVES)

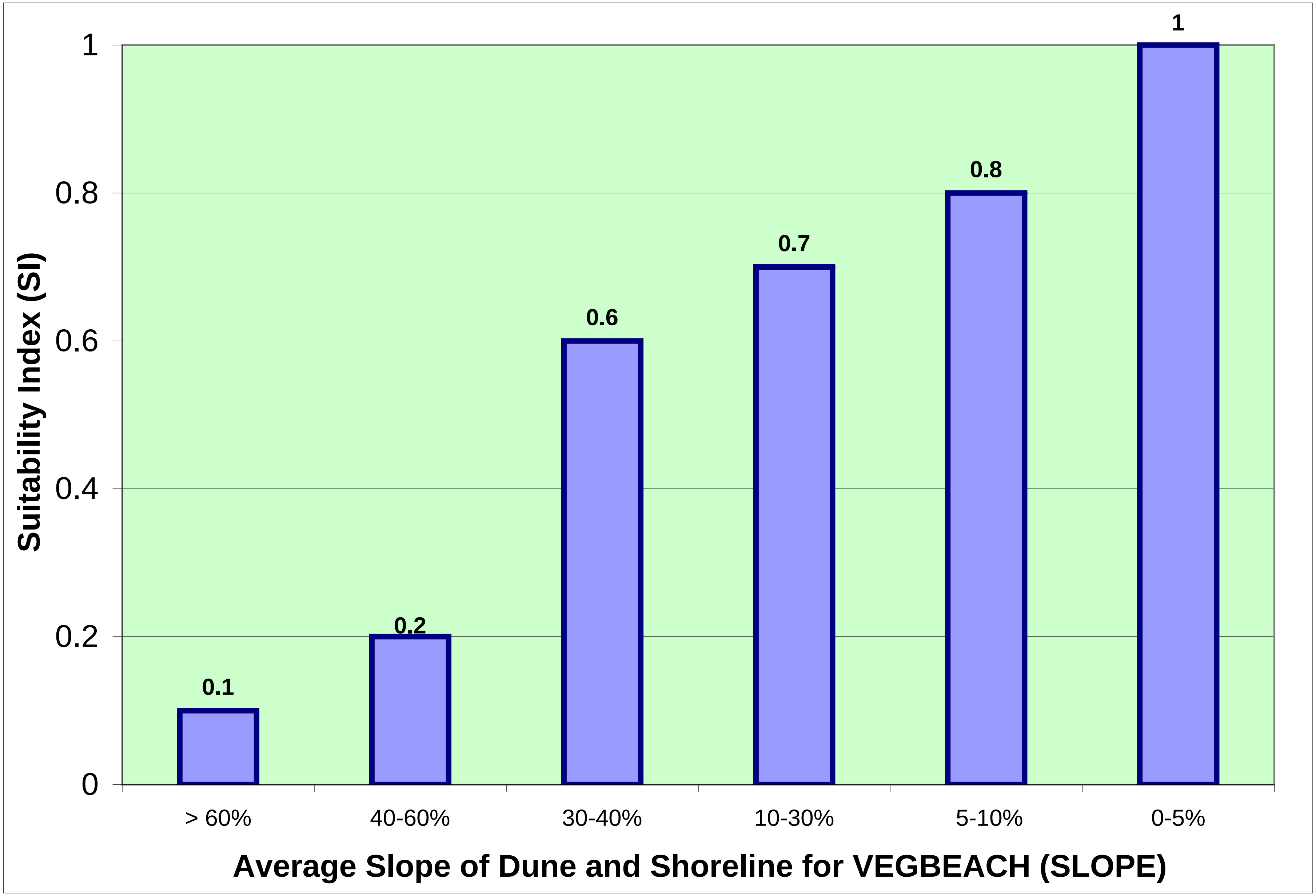


Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.05
0.2
0.4
0.6
0.8
1
1 or no species present
> 1 to 8 species present
> 8 to 16 species present
> 16 to 24 species present
> 24 to 32 species present
>32 species present
Species Richness (RICHSPP)

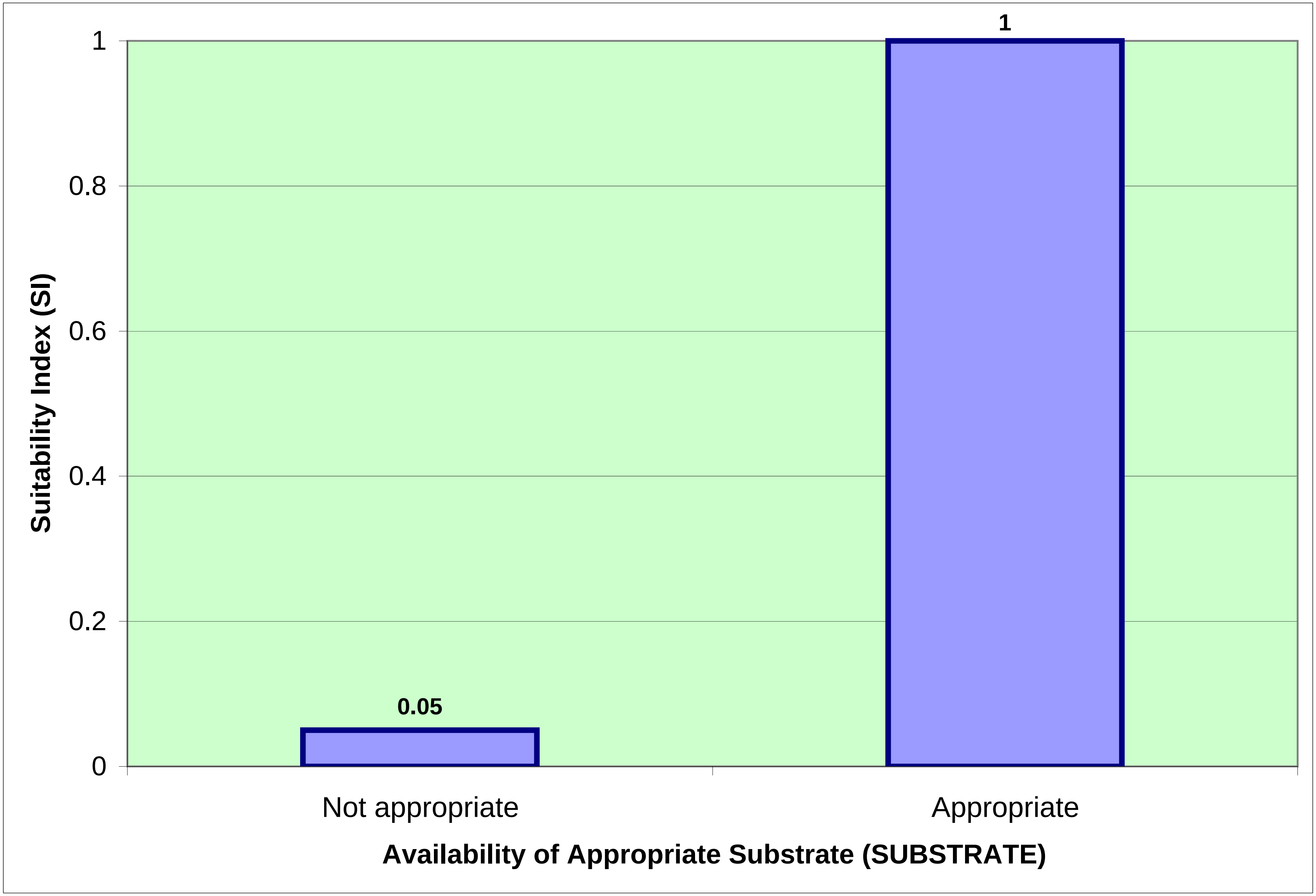

1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
0.05
0.5
1
Present, potential high impact (bulkheads, groin)
Present, relatively low impact assumed (boardwalks)
Not Present
Presence of Modified Shoreline (SHOREMOD)

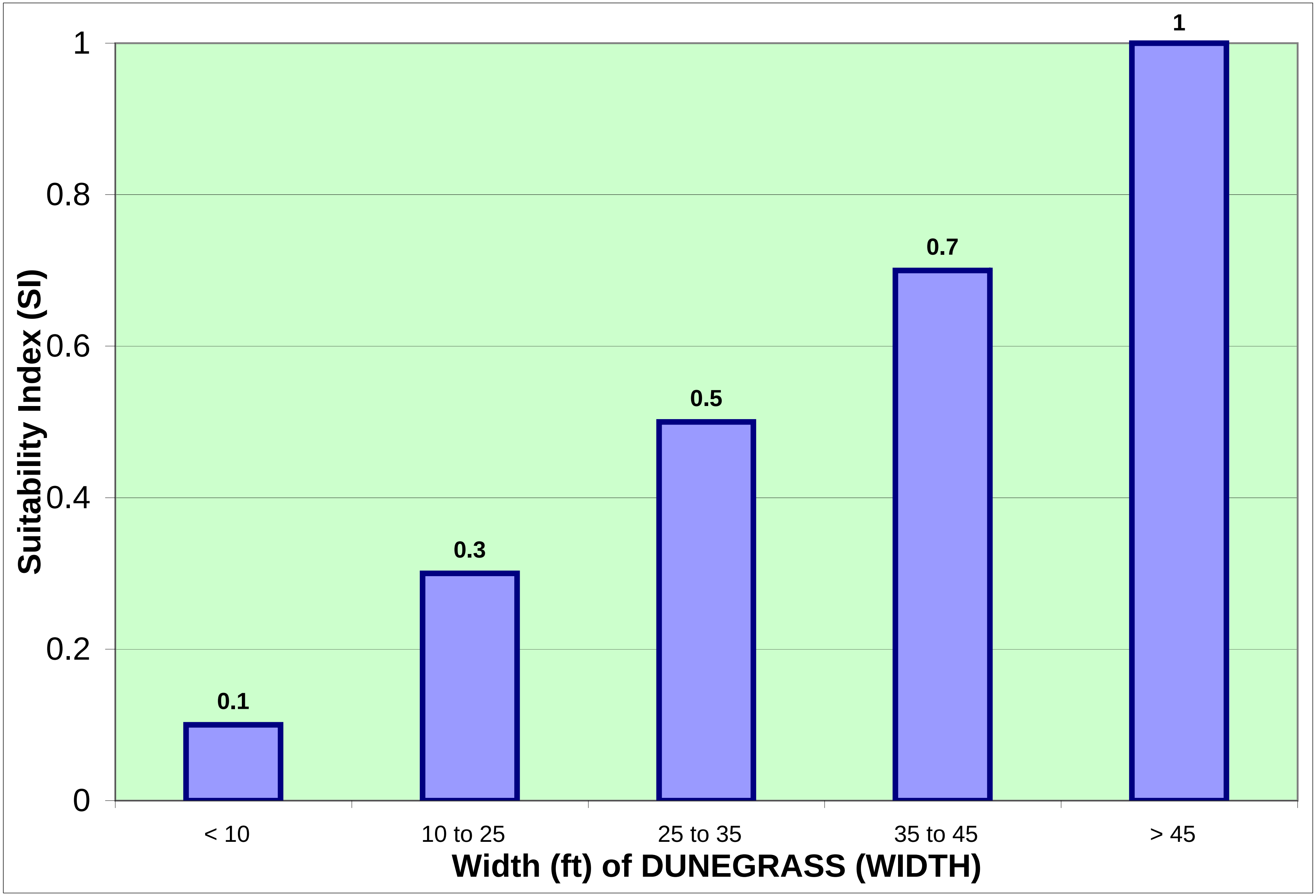


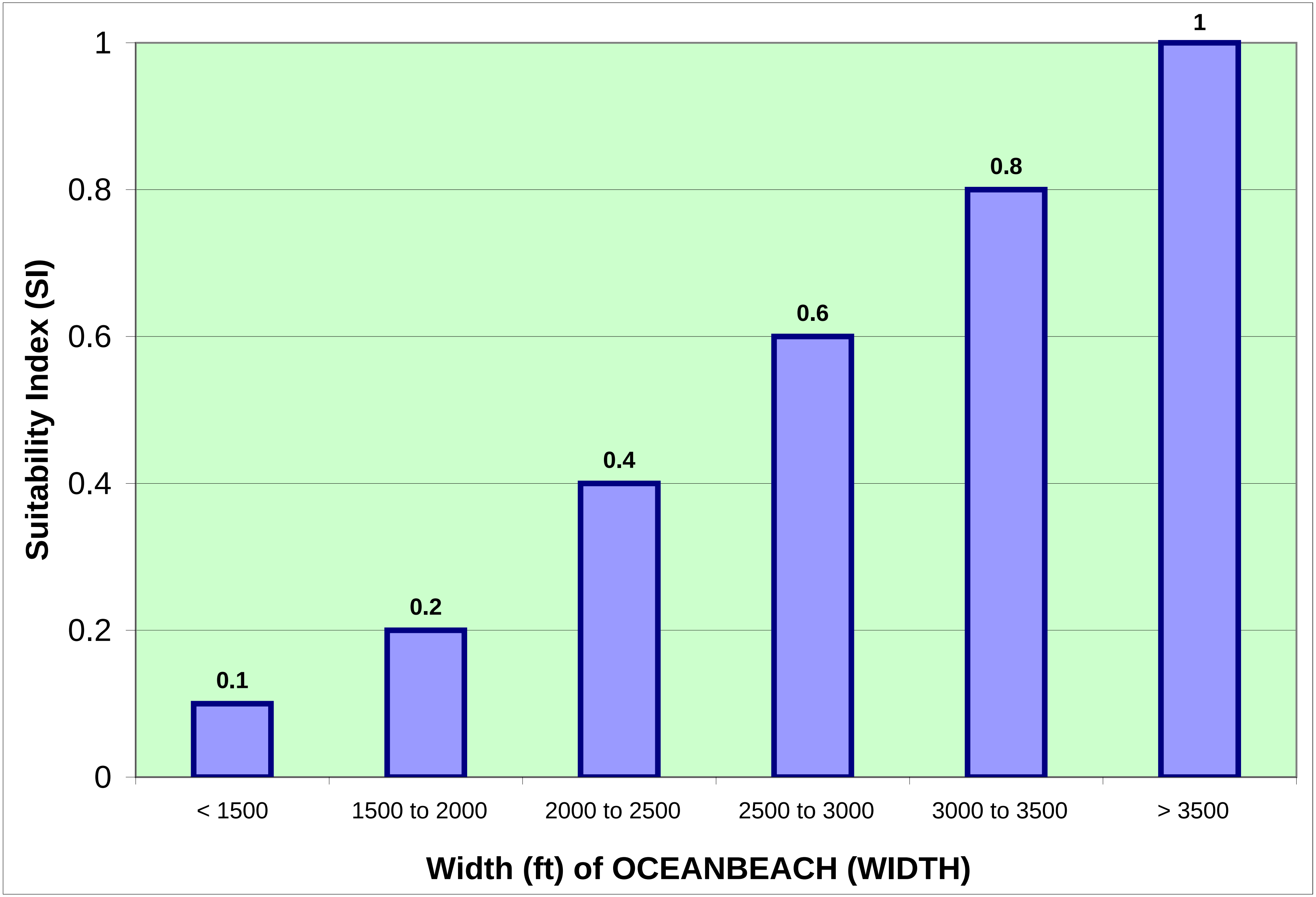
Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.2
0.4
0.6
0.8
1
0.6
0.4
0.2
0.1
0-5%
5-10%
10-15%
15-20%
20-25%
25-40%
40-60%
60-08%
>80%
Average Slope of Dune and Shoreline (%) (DUNEGRASS)



Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.1
0.2
0.6
0.7
0.8
1
> 60%
40-60%
30-40%
10-30%
5-10%
0-5%
Average Slope of Dune and Shoreline for VEGBEACH (SLOPE)


1
0.05
1
0.8
0.6
0.4
0.2
0
Suitability Index (SI)
Not appropriate
Appropriate
Availability of Appropriate Substrate (SUBSTRATE)


Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.1
0.3
0.5
0.7
1
< 10
10 to 25
25 to 35
35 to 45
> 45
Width (ft) of DUNEGRASS (WIDTH)



Suitability Index (SI)
1
0.8
0.6
0.4
0.2
0
0.1
0.2
0.4
0.6
0.8
1
< 1500
1500 to 2000
2000 to 2500
2500 to 3000
3000 to 3500
> 3500
Width (ft) of OCEANBEACH (WIDTH)

Habitat-based index models address the qualitative element of an assessment as outlined in the HEP procedures (USFWS 1980). Models are associated with specific areas that they are to be applied. The numbers of acres of the habitat areas provide the quantitative aspects of the assessment and ultimately, lead to area-based outputs displayed in terms of Habitat Units (HU).

A HEP workshop was convened by the FIMP HEP Team in October of 2004 to generate a list of key components or ecosystem characteristics of the unique FIMP setting. The initial product of the workshop was a series of community models, a list of "suggested" ecosystem components, and a list of variables (with suggested sampling protocols). When these components were combined in mathematical fashion, they could be used to capture the magnitude to which the community performed functions – community suitability was dictated by attributes of the ecosystems and the surrounding landscape and interaction between the two components. Six community models were developed and applied in the FIMP storm damage reduction and ecosystem restoration study as listed below.

MODEL CODE	MODEL NAME
OCEANBEACH	Ocean Nearshore and Intertidal Zone
VEGBEACH	Ocean Upper Vegetated Beach Zone
DUNEGRASS	Dunes, Interdunes and Swales Dominated by Sand or Herbs
UPLANDS	Dunes, Interdunes and Swales Dominated by Shrub, Forest or Development
BAYBEACH	Bay Intertidal and Bay Upper Shore Zone
BAYSUBSAV	Bay Subtidal and Submergent Aquatic Vegetation

The accuracy and utility of the proposed models were "tested" (e.g., validated and verified) with specific field and planning exercises on the District's ongoing FIMP storm damage reduction and ecosystem restoration feasibility study. The application led ERDC to modify the models to accommodate broader planning specifications.

Ocean Near-shore and Inter-tidal Community Model

This section defines the habitats associated with the ocean near-shore and inter-tidal community and the variables necessary to populate model formulations. This community includes the near-shore of the ocean and the beach inter-tidal zone extending from 30 ft (10 m) depth in the ocean landward to the average daily high tide line (i.e., wrack line). The community is characterized by un-vegetated areas that are dominated by sand.

Applicable Cover Type Habitats

To fully quantify the habitat conditions, the HEP process requires the study area be divided into manageable sections and quantified in terms of acres. This process, referred to as “cover typing,” allows the user to define the differences between vegetative covers (e.g., prairie, northern flatwood forest, shrublands), hydrology and soils characteristics, and clearly delineate these distinctions on a map. The final classification system, based primarily upon dominant vegetation cover, captures “natural” settings and common land-use practices in a specific and orderly fashion that accommodates the USACE Plan Formulation Process.

In the Fire Island to Montauk Point (FIMP) study, an Ocean near-shore and inter-tidal cover type (CT) was identified and mapped across the study area and referred to as: OCEANBEACH. Cover types identified as “NEW” refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains two discrete functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) SHOREMOD – Presence of modified shoreline

(3) SUBSTRATE – Suitability of substrate for a given area

(4) WIDTH – Width of cover type

(5) HUMFACTORS – Presence of human disturbance factors

(6) HUMMAGNIT – Magnitude of impact from human disturbance

The mathematical relationship is interpreted as the minimum of the SUBSTRATE or the average of the Geomorphic process (WIDTH and SHOREMOD) and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). Both, the Geomorphic and the Human factors are required and optimal to achieve a 1.0 score. If SUBSTRATE is not the limiting factor, shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic mean is taken for the components to determine the Suitability Index (SI) for the OCEANBEACH community.

HSI = minimum of SUBSTRATE or (WIDTH * ((SHOREMOD + (((HUMFACTORS * HUMMAGNIT) + BARWILDLF)/2))/2))

Ocean Upper Vegetated Beach Community Model

This section defines the habitats associated with the ocean upper vegetated beach community and the variables necessary to populate model formulations. This community includes the upper beach zone extending from the average daily high tide line (i.e., wrack line) landward to the toe of the primary (i.e., fore) dune. The community comprises bare or sparsely vegetated areas dominated by sand. Vegetation when present, is dominated by beachgrass (*Ammophila breviguluta*), but also includes beach pea (*Lathyrus maritimus*), seaside goldenrod (*Solidago sempervirens*), beach heather (*Hudsonia tomentosa*), running dune grass (*Panicum amarum*), and dune bean (*Strophyostyles helvola*). Scattered species from the open sandy dune areas can also be found on the primary dunes, but only in low densities.

Applicable Cover Type Habitats

In the Fire Island to Montauk Point (FIMP) study, an ocean upper vegetated beach cover type (CT) was identified and mapped across the study area and referred to as: VEGBEACH. Cover types identified as “NEW” refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains three functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): biota, geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) CANVEGCOV – Percent cover of vegetation

(3) SHOREMOD – Presence of modified shoreline

(4) SLOPE – Average slope of dune and shoreline

(5) SUBSTRATE – Suitability of substrate for a given area

(6) WIDTH – Width of cover type

(7) HUMFACTORS – Presence of human disturbance factors

(8) HUMMAGNIT – Magnitude of impact from human disturbance

The mathematical relationship is interpreted as the minimum of the SUBSTRATE or the average of the three components: Biota (CANVEGCOV), Geomorphic process (WIDTH, SLOPE and SHOREMOD) and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). All three components are required and optimal to achieve a 1.0 score. If SUBSTRATE is not the limiting factor, shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic mean is taken for the components to determine the Suitability Index (SI) for the VEGBEACH community.

HSI = Minimum of SUBSTRATE or (((((WIDTH * SLOPE)^(1/2)) * CANVEGCOV) + SHOREMOD + (((HUMFACTORS * HUMMAGNIT) + BARWILDLF)/2))/3)

Dunes, Inter-dunes and Swales Dominated by Sand or Herbaceous Vegetation Community Model

This section defines the habitats associated with the sand/herbaceous dunes, inter-dunes and swales community and the variables necessary to populate model formulations. This community includes the face of the primary dune (i.e., fore dune), dunes, inter-dunes, and swales that are dominated by sand or herbaceous cover. In general, this community is found in areas extending from the toe of the primary dune landward to the bayside storm high water mark. Beach grass is typically the dominant species, but the community often includes a significant component of vine species. Shrubs when present, are typically stunted and cover less than 20% of the community. The area is well interspersed throughout the island from ocean to bay.

Applicable Cover Type Habitats

In the Fire Island to Montauk Point (FIMP) study, a sand/herbaceous dune, inter-dune and swales cover type (CT) was identified and mapped across the study area and referred to as: DUNEGRASS. These dunes are dominated by sand and/or herbaceous vegetation. Cover types identified as “NEW” refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains three functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): biota, geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) CANVEGCOV – Percent cover of vegetation

(3) INVASIVES – Presence of non-desirable, invasive, and/or exotic species

(4) SLOPE – Average slope of dune and shoreline

(5) WIDTH – Width of cover type

(6) HUMFACTORS – Presence of human disturbance factors

(7) HUMMAGNIT – Magnitude of impact from human disturbance

The mathematical relationship is interpreted as the average of the three components: Biota (CANVEGCOV and INVASIVES), Geomorphic process (WIDTH and SLOPE) and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). All three components are required and optimal to achieve a 1.0 score. Shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic mean is taken for the components to determine the Suitability Index (SI) for the DUNEGRASS community.

HSI = (((((WIDTH * SLOPE)^(1/2)) * CANVEGCOV) + INVASIVES + (((HUMFACTORS * HUMMAGNIT) + BARWILDLF)/2))/3)

Dunes, Inter-dunes and Swales Dominated by Shrub, Forest or Development Community Model

This section defines the habitats associated with the woody/developed dunes, inter-dunes and swales community and the variables necessary to populate model formulations. This community occurs behind the primary dunes and includes shrub-dominated areas of the secondary dunes and stunted maritime forest that occur behind secondary dunes. Generally, this community is found in areas extending from the crest of the primary dune landward to the bayside storm high water mark. Vegetation is characterized by >20% cover of non-wetland shrubs or trees. Herbaceous vegetation and vines are also common, but do not dominate.

Applicable Cover Type Habitats

In the Fire Island to Montauk Point (FIMP) study, a woody/developed dune, inter-dune and swales cover type (CT) was identified and mapped across the study area and referred to as: UPLAND. These dunes are dominated by shrubs, forest and/or developed areas. Cover types identified as “NEW” refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains three functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): biota, geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) CANTRSHRUB – Percent cover of trees and shrubs

(3) INVASIVES – Presence of non-desirable, invasive, and/or exotic species

(4) HUMFACTORS – Presence of human disturbance factors

(5) HUMMAGNIT – Magnitude of impact from human disturbance

The mathematical relationship is interpreted as the average of the two components: Biota (CANTRSHRUB and INVASIVES), and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). Both components are required and optimal to achieve a 1.0 score. Shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic mean is taken to determine the Suitability Index (SI) for the UPLAND community.

HSI = (INVASIVES + CANTRSHRUB + (((HUMFACTORS * HUMMAGNIT) + BARWILDLF)/2))/3

Bay Inter-tidal and Bay Upper Shore Community Model

This section defines the habitats associated with the bay inter-tidal and bay upper shore community and the variables necessary to populate model formulations. This community includes bay inter-tidal areas and the bay upper shore zone and extends from the bay lower-low water (LLW) line landward to the point where the upland or dunegrass (i.e., non-wetland) community is encountered. This community may be dominated by sand, mud, or vegetated with wetland herbaceous and/or wetland shrub communities (i.e., salt marsh, *Phragmites, Baccharis, Vaccinium*) and includes wetland and beach areas that are hydrologically connected to the bay and are not permanently inundated. These wetlands can be very divers in terms of species composition and dependent on hydrologic regime.

Applicable Cover Type Habitats

In the Fire Island to Montauk Point (FIMP) study, a bay inter-tidal and bay upper shore cover type (CT) was identified and mapped across the study area and referred to as: BAYBEACH. These dunes are dominated by sand and/or herbaceous vegetation. Cover types identified as “NEW” refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains three functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): biota, geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) EROSION – Presence of erosion

(3) INVASIVES – Presence of non-desirable, invasive, and/or exotic species

(4) RICHSPP – Species richness of desirable plant and animal species

(5) SHOREMOD – Presence of modified shoreline

(6) SUBSTRATE – Availability of appropriate substrate

(7) HUMFACTORS – Presence of human disturbance factors

(8) HUMMAGNIT – Magnitude of impact from human disturbance

The mathematical relationship is interpreted as the minimum of the SUBSTRATE or the average of the three components: Biota (RICHSPP and INVASIVES), Geomorphic process (SHOREMOD and EROSION) and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). All three components are required and optimal to achieve a 1.0 score. If SUBSTRATE is not the limiting factor, shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic mean is taken for the components to determine the Suitability Index (SI) for the BAYBEACH community.

HSI = Minimum of SUBSTRATE or ((((RICHSPP * INVASIVES)^(1/2)) + SHOREMOD + EROSION + (((HUMFACTORS * HUMMAGNIT) + BARWILDLF)/2))/4)

Bay Sub-tidal and Submergent Aquatic Vegetation Community Model

This section defines the habitats associated with the bay sub-tidal and submergent Aquatic vegetation community and the variables necessary to populate model formulations. This community includes permanently inundated areas from the bay LLW line bayward to 500 ft from the shoreline and includes permanently inundated impounded areas (i.e., ponds). The 500 ft distance is arbitrary and was selected to facilitate HEP analysis of the community, which, could extend for several thousand feet in some areas of the study area. This community is typically not vegetated and is dominated by bare sand substrate. However, submergent aquatic vegetation (SAV) beds are found in some areas.

Applicable Cover Type Habitats

In the Fire Island to Montauk Point (FIMP) study, a bay sub-tidal and submergent aquatic vegetation cover type (CT) was identified and mapped across the study area and referred to as: BAYSUBSAV. These dunes are dominated by sand and/or herbaceous vegetation. Cover types identified as “NEW” refer to newly developed areas proposed with project designs. These cover types are assessed with this model.

Model Components and Relationships

The model components are detailed below, namely Components, Model Formulas and Associated Variables, and Reference Standards. The final version of the HSI models contains three functional components (referred to in HEP terms as Life Requisite Suitability Index (LRSI)): biota, geomorphology and human influence. It is important to note that the components described here were selected on the basis of their representation of ongoing critical ecosystem processes within the FIMP systems.

General form of the model component. Six measured variables comprise the Geomorphology component to qualify the geomorphic processes of the ocean beach.

(1) BARWILDLF – Impact of barriers to wildlife passage

(2) CANSAVCOV – Percent cover of submergent aquatic vegetation

(3) INVASIVES – Presence of non-desirable, invasive, and/or exotic species

(4) RICHSPP – Species richness of desirable plant and animal species

(5) SUBSTRATE – Availability of appropriate substrate

(6) HUMFACTORS – Presence of human disturbance factors

(7) HUMMAGNIT – Magnitude of impact from human disturbance

The mathematical relationship is interpreted as the minimum of the SUBSTRATE or the average of the two components: Biota (RICHSPP, INVASIVES, and CANSVACOV) and Human Influence factors (HUMFACTORS, HUMMAGNIT, BARWILDLF). Both components are required and optimal to achieve a 1.0 score. If SUBSTRATE is not the limiting factor, shortcomings of one variable can be offset (compensated for) by any other. One variable may be entirely absent, but some suitability will still be achieved with regards to the remaining variables. An arithmetic mean is taken for the components to determine the Suitability Index (SI) for the BAYSUBSAV community.

HSI = Minimum of SUBSTRATE or ((((RICHSPP * INVASIVES)^(1/2)) + CANSAVCOV + (HUMFACTORS*HUMMAGNIT))/3)

Appendix F

Contents

FIMP HEP Sampling Data Form

Site ID:	**Community type: NEARBEACH**	**Date:**
Team members:	**Tide condition: (high low mid storm surge)**	
Weather: temp: ____ °F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Should this community type be changed on the cover type map: Y or N	**New community type:**	
Dominant Species:		
GPS coordinate of transect start and transect bearing:		
Photographic documentation:		

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

_ 1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%

_ 6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%

_ 9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Width of area from llw to wrack line ______

FROM LIDAR/GIS DATA

Presence of modified shoreline < 5% > 5%–< 25% > 25%–< 45% >45%

Percent of community type that restricts terrapin access ____________(list barriers observed)
Percent of community type that restricts shorebird chick access ____________(list barriers observed)
Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

FIMP HEP Sampling Data Form

Site ID:	**Community type: VEGBEACH**	**Date:**
Team members:	**Tide condition: (high low mid storm surge)**	
Weather: temp: ____ °F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Should this community type be changed on the cover type map: Y or N	**New community type:**	
Dominant species:		
GPS coordinate of transect start and transect bearing:		
Photographic documentation:		

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%
2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%
3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%
4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%
5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%
6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%
7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%
8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%
9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Vegbeach/foredune profile:

Linear characterization of VEGBEACH zone (from wrack line to top of primary dune)

Zone	Average % Cover of Veg.	Average Slope	Width	Comments

Average height of vegetation (feet):

Percent of community type that restricts terrapin access ____________(list barriers observed)
Percent of community type that restricts shorebird chick access ____________(list barriers observed)
Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

Species richness of insects (average from 4 pit-fall trap locations):

Grain size (from benthic grab):

Species richness of benthic invertebrates (from benthic invert core sample):

FIMP HEP Sampling Data Form

Site ID:	Community type: DUNEGRASS	Date:
Team members:	Tide condition: (high low mid storm surge)	
Weather: temp: ____ °F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Should this community type be changed on the cover type map: Y or N	New community type:	
Dominant species:		
GPS coordinate of transect start and transect bearing:		
Photographic documentation:		

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

_ 1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% >45%

_ 6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% > 45%

_ 9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Height and slope of dune face (in feet and degree of slope)

Height										
Slope										

Average height of vegetation (feet):

Presence of modified shoreline < 5% > 5%–< 25% > 25%–< 45% >45%

Presence of erosion: low (< 10%) moderate (>10% to 50%) high (>50%)

Percent of community type that restricts terrapin access ____________(list barriers observed)

Percent of community type that restricts shorebird chick access ____________(list barriers observed)

Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

Draw average dune shape here:

FIMP HEP Sampling Data Form

Site ID:	**Community type: UPLAND**	**Date:**

Team members:	**Tide condition: (high low mid storm surge)**

Weather: temp: ____ °F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)

Dominant Species:

Should this community type be changed on the cover type map: Y or N	**New community type:**

Photographic documentation:

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%
2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%
3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%
4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%
5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%
6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%
7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%
8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%
9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Presence of non-desirable secies (circle or list specific examples)

_ 1. Percent of community impacted by herbivory (white-tailed deer, Canada geese, muskrat, snails) _________

_ 2. Percent of community covered by invasive/exotic vegetation (*Phragmites*, Japanese knotweed, mussel) ________

_ 3. Predators (feral cats, dogs, fox, crows, grackles, rats, coyote, gulls, raccoon, aquatic spp**)**

_ circle rank for predator threat 1 2 3 4 5

Height and slope of dune face (in feet and degree of slope)

Height										
Slope										

Average height of vegetation (feet):

Presence of modified shoreline < 5% > 5%–< 25% > 25%–< 45% >45%

Percent of community type that restricts terrapin access ____________(list barriers observed)
Percent of community type that restricts shorebird chick access ____________(list barriers observed)
Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

FIMP HEP Sampling Data Form

Site ID:	**Community type: BAYBEACH**	**Date:**
Team members:	**Tide condition: (high low mid storm surge)**	
Weather: temp: ____ °F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Should this community type be changed on the cover type map: Y or N	**New community type:**	
Dominant species:		
Photographic documentation:		

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%
2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%
3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%
4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%
5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%
6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%
7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%
8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%
9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Presence of non-desirable species (circle or list specific examples)

_ 1. Percent of community impacted by herbivory (white-tailed deer, Canada geese, muskrat, snails) ________

_ 2. Percent of community covered by invasive/exotic vegetation (*Phragmites*, Japanese knotweed, mussel spp.) ________

_ 3. Predators (feral cats, dogs, fox, crows, grackles, rats, coyote, gulls, raccoon, aquatic spp.)

_ 4. Circle rank for predator threat 1 2 3 4 5

Notes:

Species richness of insects (average from 4 pit-fall trap locations):

Grain size (from benthic grab):

Species richness of benthic invertebrates (from benthic invert core sample):

FIMP HEP Sampling Data Form (continued)

1m Quadrats (use for vegetation sampling)

Community Type: **Average Height:**

Quadrat	Species	% Cover	Species	% Cover
Percent cover of overall community type (top down, % bare ground not visible)				

1m Quadrats (use for vegetation sampling)

Community Type: **Average Height:**

Quadrat	Species	% Cover	Species	% Cover
Percent cover of overall community type (top down, % bare ground not visible)				

Seine captures **(use for fish sampling) 5 50-m tows using 50 foot seine net**

Species	Avg. #/Tow	Species	Avg. #/Tow

Average shoreline shape (in feet and degree of slope)

Height										
Slope										

Average height of vegetation (feet):

Presence of modified shoreline < 5% > 5%–< 25% > 25%–< 45% >45%

Shoreline profile:

Presence of erosion: **low (< 10%)** **moderate (> 10% to 50%)** **high (> 50%)**

Percent of community type that restricts terrapin access ____________(list barriers observed)
Percent of community type that restricts shorebird chick access ____________(list barriers observed)
Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

FIMP HEP Sampling Data Form

Site ID:	**Community type: BAYSUBSAV**	**Date:**
Team members:	**Tide condition: (high low mid storm surge)**	
Weather: temp: ____ °F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)		
Should this community type be changed on the cover type map: Y or N	**New community type:**	
Dominant species:		
Photographic documentation:		

Human disturbance factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%

2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%

3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%

4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%

5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%

6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%

7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%

8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%

9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Presence of non-desirable species (circle or list specific examples)

_ 1. Percent of community impacted by herbivory (white-tailed deer, Canada geese, muskrat, snails) ________

_ 2. Percent of community covered by invasive/exotic vegetation (*Phragmites*, Japanese knotweed, mussel spp.) ________

_ 3. Predators (feral cats, dogs, fox, crows, grackles, rats, coyote, gulls, raccoon, aquatic spp.)

_ circle rank for predator threat 1 2 3 4 5

Notes:

Grain size (from benthic grab):

Species richness of macro-infauna (from 5 50-m long clam rake transects)

Species	**Average/Sample**	**Species**	**Average/Sample**

Average percent cover of SAV:

Average height of SAV:

Seine captures (use for fish sampling) 5 50-m tows using 50 foot seine net

Species	Avg. #/Tow	Species	Avg. #/Tow

Presence of degraded conditions (check all that apply, circle or list specific examples)

_ 1. Poor water quality (turbidity, nutrient load, salinity) 1 2 3 4 5

_ 2. Significant physical disturbance (boat traffic, clamming activities) 1 2 3 4 5

_ 3. Low-quality substrate 1 2 3 4 5

_ 4. Less than optimal depth 1 2 3 4 5

Notes:

Percent of community type that restricts terrapin access ___________(list barriers observed)

Percent of community type that restricts shorebird chick access ___________(list barriers observed)

Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

FIMP HEP Sampling Data Form

Site ID:	Community type: ISLAND	Date:

Team members:	Tide Condition: (high low mid storm surge)

Weather: temp: ____ °F, wind: (calm slight breeze windy), precip: (sunny drizzle rain)

Should this community type be changed on the cover type map: Y or N	New community type:

Dominant Species:

Photographic documentation:

Human Disturbance Factors (check all that apply, circle rank for severity of impact, and circle or list specific factors)

1. Evidence of vehicle use (tracks, ruts, boat access areas) < 5% > 5%–< 25% > 25%–< 45% > 45%
2. Hard structures (groins, jetties, walls, docks, marinas) < 5% > 5%–< 25% > 25%–< 45% > 45%
3. Developed A (permanent buildings, bulkheads, paved roads) < 5% > 5%–< 25% > 25%–< 45% > 45%
4. Developed B (fences, unimproved roads, boardwalks, access points, landscaping/ornamental plantings) < 5% > 5%–< 25% > 25%–< 45% > 45%
5. Evidence of periodic maintenance (mowing, cutting, beach cleaning) < 5% > 5%–< 25% > 25%–< 45% > 5%
6. Trash, debris < 5% > 5%–< 25% > 25%–< 45% > 45%
7. Presence of outfall pipes or other potential sources of pollution < 5% > 5%–< 25% > 25%–< 45% > 45%
8. Human activities in close proximity (boat traffic, jet skis, various beach activities, residential areas, pedestrian traffic, picnic grounds, campsites) < 5% > 5%–< 25% > 25%–< 45% >45%
9. Area tilled, filled, logged, cleared, or excavated < 5% > 5%–< 25% > 25%–< 45% > 45%

Notes:

Presence of Non-desirable Species (circle or list specific examples)

_ 1. Percent of community impacted by herbivory (white-tailed deer, Canada geese, muskrat, **snails?**) _________

_ 2. Percent of community covered by invasive/exotic vegetation (*Phragmites*, Japanese knotweed, poison ivy, **mussel spp**.) ________

_ 3. Predators (feral cats, dogs, fox, crows, grackles, rats, coyote, gulls, raccoon, **any aquatic spp?)**

_ circle rank for predator threat 1 2 3 4 5

Notes:

Species Richness of Insects (average from 4 pit-fall trap locations):

Grain Size (from benthic grab):

Species Richness of Benthic Invertebrates (from benthic invert core sample):

Species Richness of Macro-infauna (from 5 50-m long clam rake transects)

Species	Average/Sample	Species	Average/Sample

FIMP HEP Sampling Data Form (continued)

1m Quadrats (use for vegetation sampling)

Community Type: **Average Height:**

Quadrat	Species	% Cover	Species	% Cover
Percent cover of overall community type (top down, % bare ground not visible)				

1m Quadrats (use for vegetation sampling)

Community Type: **Average Height:**

Quadrat	Species	% Cover	Species	% Cover

1m Quadrats (use for vegetation sampling)

Community Type: **Average Height:**

Quadrat	Species	% Cover	Species	% Cover
Percent cover of overall community type (top down, % bare ground not visible)				

Seine Captures **(use for fish sampling) 5 50-m tows using 50 foot seine net**

Species	Avg. #/Tow	Species	Avg. #/Tow

Height and slope of southward facing dune or shoreline(in feet and degree of slope)

Height										
Slope										

Dune Profile:

Average Height of Vegetation (feet):

Height and slope of northward facing dune or shoreline (in feet and degree of slope)

Height										
Slope										

Dune Profile:

Average Morphological Stage of Dune (circle dominant condition) Early Mid Late

Average Height of Vegetation (feet):

Presence of modified shoreline < 5% > 5%–< 25% > 25%–< 45% >45%

Percent of community type that restricts terrapin access ____________(list barriers observed)

Percent of community type that restricts shorebird chick access ____________(list barriers observed)

Dense vegetation such as *Phragmites* and/or shrubs, nearly vertical feature > 2 ft in height (curbs, walls, roads, steep/eroded banks), improved and unimproved roadways

Appendix G

Contents

Summary of FIMP HEP Restoration Alternatives

RESTORATION	Restoration Alternative ID	Goal	Effected HEP Community Types						Coastal Process (+) Effects	Coastal Process (-) Effects	Benefit to T&E Species
			OCEANBEACH	VEGBEACH	DUNEGRASS	UPLAND	BAYBEACH	BAYSUBSAV			
T-2 Sunken Forest											
Alternative 1	T-2-1	Shoreline stabilization, control Phragmites, remove bulkhead					x		2	0	n
Alternative 2	T-2-2	Enhance beach/dune, reduce disturbance		x	x	x			2	1	n
Alternative 3	T-2-3	Remove marina and structures, regrade bay shoreline, restore site to natural conditions	x	x	x	x	x	x	5	0	n
T-3 Reagan Property											
Alternative 1	T-3-1	Shoreline stabilization					x		2	0	n
Alternative 2	T-3-2	Enhance beach/dune, reduce disturbance		x	x	x			2	0	n
Alternative 3	T-3-3	Restore bay intertidal zone at Reagan bulkhead					x		2	0	n
T-5 Great Gun											
Alternative 1	T-5-1	Enhance salt marsh by restoring hydrologic connection				x	x		1	0	n
Alternative 2	T-5-2	Reduce disturbance		x	x	x	x		1	1	n
Alternative 3	T-5-3	Remove marina and structures, regrade bay shoreline, restore site to natural conditions	x	x	x	x	x	x	5	0	n
T-7 Tiana											
Alternative 1	T-7-1	Restore salt marsh and dune, reduce disturbance		x	x	x	x		3	1	n
Alternative 2	T-7-2	T-7-1 + further reduce disturbance to restore site to natural conditions		x	x	x	x		3	1	n
Alternative 3	T-7-3	Enhance exsiting SAV beds						x	1	0	n
T-8 WOSI											
Alternative 1	T-9-1	Create new salt marsh			x	x	x		1	0	n
Alternative 2	T-8-2	Reduce disturbance		x	x		x		3	1	n
Alternative 3	T-8-3	Further reduce disturbance to restore site to natural conditions		x	x	x	x		1	0	n
T-9 Georgica Pond											
Alternative 1	T-9-1	Control Phragmites in Georgica Pond					x		1	0	n
Alternative 2	T-9-2	T-9-1 + control Phragmites in adjacent cove					x		1	0	n
Alternative 3	T-9-3	Restore beach/dune at large cut, enhance beach/dune elsewhere, remove groins, install tide gate	x	x	x				2	1	n

Summary of FIMP HEP Restoration Alternatives

RESTORATION	Restoration Alternative ID	Goal	Effected HEP Community Types						Coastal Process (+) Effects	Coastal Process (-) Effects	Benefit to T&E Species
			OCEANBEACH	VEGBEACH	DUNEGRASS	UPLAND	BAYBEACH	BAYSUBSAV			
T-10 East Inlet Island											
Alternative 1	T-10-1	Fill Phragmites-dominated marsh to create habitat for nesting shorebirds, control Phragmites			x	x			1	1	y
Alternative 2	T-10-2	Retain Phragmites-dominated marsh but control Phragmites throughout island using herbicide			x	x	x		2	0	y
Alternative 3	T-10-3	T-10-1 + regrade and stabilize shoreline with bio-engineering			x	x	x		1	1	y
T-11 John Boyle Island											
Alternative 1	T-11-1	Enhance sandy areas to create shorebird nesting habitat, control Phragmites			x	x	x		0	0	y
Alternative 2	T-11-2	Convert sandy areas to upland to create heron nesting habitat, control Phragmites			x	x	x		0	0	y
Alternative 3	T-11-3	T-11-1 + regrade and stabilize shoreline with bio-engineering			x	x	x		1	0	y
T-14 Ocean Beach											
Alternative 1	T-14-1	Remove groins and relocate water supply well	x	x					1	0	n
Alternative 2	T-14-2	T-14-1 + enhance beach/dune, reduce disturbance	x	x	x				2	0	n
Alternative 3	T-14-3	T-14-2 + further reduce disturbance through buy-outs and structure removal	x	x	x				2	0	n
T-15 New Made Island											
Alternative 1	T-21-1	Fill Phragmites-dominated marsh to create habitat for nesting shorebirds, control Phragmites, remove silt to isolate island from mainland			x		x		2		y
Alternative 2	T-21-2	Retain Phragmites-dominated marsh but control Phragmites throughout island using herbicide			x	x	x		2		y
Alternative 3	T-21-3	T-21-1 + regrade and stabilize shoreline with bio-engineering				x	x		1	1	y
T-22 Islip Meadows											
Alternative 1	T-22-1	Restore hydrologic connection, install flap gates, control Phragmites with hydrology					x		1	0	n
Alternative 2	T-22-2	T-22-1 + reconfigure existing tidal channel					x		1	0	n
Alternative 3	T-22-3	Ditch plugging and pool creation, Phragmites control using herbicides					x		1	0	n

Summary of FIMP HEP Restoration Alternatives

RESTORATION	Restoration Alternative ID	Goal	Effected HEP Community Types: OCEANBEACH	VEGBEACH	DUNEGRASS	UPLAND	BAYBEACH	BAYSUBSAV	Coastal Process (+) Effects	Coastal Process (-) Effects	Benefit to T&E Species
T-23 Seatuck Refuge											
Alternative 1	T-23-1	Restore hydrologic connection, install culverts, control Phragmites using hydrology, convert disturbed areas to salt marsh					x		1	0	n
Alternative 2	T-23-2	T-23-1 + reconfigure existing tidal channel, control Phragmites with herbicides					x		1	0	n
Alternative 3	T-23-3	T-23-2 + remove bulhead/restore marsh					x		2	0	n
T-24 Davis Park											
Alternative 1	T-24-1	Restore dune and beach at large vehicle access cut		x	x				1	1	n
Alternative 2	T-24-2	Enhance beach/dune throughout the site		x	x				1	1	n
Alternative 3	T-24-3	T-24-2 + enahance addiitonal areas through buy-outs, restore upland near marina		x	x	x			1	1	n
T-25 Atlantique to Cornielle											
Alternative 1	T-25-1	Create bayside sand bar once per 50 year interval							2	0	n
Alternative 2	T-25-2	Create bayside sand bar 3 times per 50 year interval							2	0	n
Alternative 3	T-25-3	Enhance beach/dune throughout site		x	x	x			1	1	n
T-26 Kismet, Atlantique, Fair Harbor											
Alternative 1	T-26-1	Enhance beach/dune @ 1 site		x	x				1	0	n
Alternative 2	T-26-2	Enhance beach/dune @ 2 sites		x	x				1	0	n
Alternative 3	T-26-3	Enhance beach/dune @ 3 sites		x	x				1	0	n
T-27 Warner Island East											
Alternative 1	T-27-1	Convert bay intertidal areas to open sandy areas for shorebird nesting			x		x		1	1	y
Alternative 2	T-27-2	Convert bay intertidal areas to upland areas for heron nesting				x	x		1	1	y
Alternative 3	T-27-3	T-27-1 + regrade shoreline and stabilize with bioengineering			x		x		1	1	y

DESCRIPTION
OF

PROPOSED RESTORATION ALTERNATIVES

Description of FIMP HEP Restoration Alternatives

The HEP Team identified the following conceptual restoration alternatives for the 16 potential sites. The options include habitat enhancements, which would change HSI scores but not affect acreages as well as habitat conversions of one HEP community to another, or disturbed areas (non-HEP communities) into a HEP community. Descriptions of sites and photographs (when available) are based on the site conditions observed/documented during 2004 field visits.

The objective in evaluating conceptual restoration designs with HEP was to assess a broad spectrum of conceptual ideas that could be carried out at locations across the barrier island, to evaluate extremes of alternatives (e.g., full restoration versus reduced area), and to present a range of possible options, costs, etc. Although attempts were made to include at least one restoration option at each site that would meet goals and objective of each Team member's affiliation, all members of the Team do not necessarily support all of the site locations and alternatives presented here in. The proposed options may or may not be feasible and would be further evaluated during subsequent analysis of options in Phase II of this Project. In addition, the USACE has not predetermined that any restoration should take place on any given site, but are evaluating a suite of locations and alternatives that have been identified by the Team and outside sources.

In this evaluation, is assumed that any maintenance events needed to ensure the habitat conditions at a site following restoration are maintained over the 50-year life of the project (i.e., vegetation removal, invasive species control, minimization of human impacts, etc.) would occur. It is recognized that should maintenance activities not occur, a general decrease in habitat quality would likely occur over time and these conditions are not accounted for in the HEP method. Although management will be necessary to ensure long-term sustainability of restored sites, it is assumed that management activities will be funded by project sponsors or funded under separate USACE authority.

For HEP analysis, six barrier island communities have been identified and include UPLAND, DUNEGRASS, VEGBEACH, OCEANBEACH, BAYBEACH and BAYSUBSAV. Community definitions were based upon cover types as determined by data collection at representative transects (see Appendix F for example data sheets). In general, habitats representative of each of these communities are found along each of the 16 potential restoration areas selected for HEP and their general locations on the barrier island are shown in Appendix A, Figure 2. The exception are sites located along the mainland and on islands, in which case the OCEANBEACH and VEGBEACH communities are not applicable, and in areas where natural or manmade disturbance has eliminated a community. In general, the following descriptions of habitats are applicable to the six communities when present in a restoration area unless otherwise noted in the description of the restoration site.

OCEANBEACH

This community includes the nearshore zone of the ocean and the beach intertidal zone extending from 30 ft (10 m) depth in the ocean landward to the average daily high tide line (i.e., wrack line). The community is characterized by unvegetated areas that are dominated by sand

VEGBEACH

This community includes the upper beach zone extending from the average daily high tide line (i.e., wrack line) landward to the toe of the primary (i.e., fore) dune. The community comprises bare or sparsely vegetated areas dominated by sand. Vegetation, when present is dominated by beachgrass (*Ammophila breviguluta*), but also includes beach pea (*Lathyrus maritimus*), seaside goldenrod (*Solidago sempervirens)*, beach heather (*Hudsonia tomentosa*), running dune grass (*Panicum amarum*), and dune bean (*Strophyostyles helvola*). Scattered species from the open sandy dune areas can also be found on the primary dunes, but only in low densities.

DUNEGRASS

The DUNEGRASS community includes the face of the primary dune (i.e., fore dune), dunes, interdunes, and swales that are dominated by sand or herbaceous cover. In general, this community is found in areas extending from the seaward toe of the primary dune landward to the bayside storm high water mark, or landward to the seaward edge of upland community. Beach grass is typically the dominant species, but the community often also includes a significant component of vine species. Shrubs, when present are typically stunted and cover less than 20% of this community. This community is well interspersed throughout the island from ocean to bay. The dominant vegetation is American beachgrass, but beach plum (*Prunus maritima*), sand bur (*Cenchrus tribulides*), seaside goldenrod, beach heather, switch grass (*Panicum virgatum*), and vines/shrubs such as poison ivy (*Toxicodendron radicans*), multiflora rose (*Rosa multiflora*), bayberry (*Myrica pennsylvanica*), and wax myrtle (*Myrica cyrifera*) also are found in this community type. Areas of the secondary dune with shrub densities > 20% are included in the UPLAND community type.

UPLAND

The UPLAND community occurs behind the primary dunes and includes shrub-dominated areas of the secondary dunes and stunted maritime forest that occur behind secondary dunes. Generally, this community is found in areas extending from the crest of the primary dune landward to the bayside storm high water mark. Vegetation is characterized by > 20% cover of non-wetland shrubs or trees. Herbs and/or vines are also common components of this community, but do not dominate (< 20% cover). Dominant species in this community include pitch pine (*Pinus rigida*), post oak (*Quercus stellata*), red cedar (*Juniperus virginiana*), American holly (*Ilex opaca*), sassafras (*Sassafras albidum)*, and cherry (*Prunus virginiana*). Dominant shrub/vine species include poison ivy, greenbriar (*Smilax rotundifolia*), serviceberry (*Amelanchier canadensis)*, multiflora rose, bayberry, and wax myrtle.

BAYBEACH

The BAYBEACH community includes bay intertidal areas and the bay side upper shore zone and extends from the bay LLW (low-low water) line landward to the point where the upland or dunegrass (i.e., non-wetland) community is encountered. This community may be dominated by sand, mud, or vegetated with wetland herb and/or wetland shrub communities and includes wetland and beach areas that are hydrologically connected to the bay and are not permanently inundated. Often, the invasive species common reed (*Phragmites australis*) dominates these wetland areas. However, these wetlands can be very diverse in terms of species composition and depending on hydrologic regime include the following species: salt marsh cordgrass (*Spartina alterniflora)*, salt meadow hay *(Spartina patens)*, seashore saltgrass *(Distichli spicata)*, black grass *(Juncus gerardi),* sea lavender *(Limonium carolinianum),* seabeach orach *(Atriplex arenaria),* glasswort *(Salicornia spp.),* cattail *(Typha spp.),* American three-square (Schoenoplectus pungens), salt marsh bulrush *(Schoenoplectus robustus*), salt marsh fleabane *(Pluchea odorata),* saltmarsh aster *(Aster novae-angliae),* and shrubs such as blueberry (*Vaccinium corymbosum),* arrowwood (*Viburnum dentatum*), inkberry (*Ilex glabra*), marsh elder *(Iva frutescens)* and groundsel tree *(Baccharis halimifolia).*

BAYSUBSAV

The BAYSUBSAV community includes permanently inundated areas from the bay LLW line bay ward to 500 feet from the shoreline and includes permanently inundated impounded areas (i.e., ponds). The 500-foot distance is arbitrary and was selected to facilitate HEP analysis of the BAYSUBSAV community, which could extend for several thousand feet in some areas of the study area. The BAYSUBSAV community is typically not vegetated and is dominated by bare sand substrate. However, submergent aquatic vegetation (SAV) beds, dominated by eelgrass (*Zostera marina*), are found in some areas of the BAYSUBSAV community.

T-2 SUNKEN FOREST

The Sunken Forest site includes all six HEP community model types. The most notable restoration needs at this location are the severely eroding and steep bayside shoreline banks, a bulkhead, and scattered invasive common reed (*Phragmites australis)* also referred to as *Phragmites,* along the bayside shoreline. In addition, an active public marina and numerous buildings and recreational facilities associated with the National Park Service are also located on approximately 25 percent of the site. The site is dominated by maritime upland forest. Sand trails and wooden boardwalks traverse much of the site and provide access to the beach.

Recreational use of the area is high. Trash was noted along the bay and ocean shorelines and evidence of vehicle use of the beach was documented. Vehicle access to the beach is provided via open cuts in the dune located beyond the area surveyed for the restoration site. In general, bayside shoreline and estuarine processes have been negatively impacted in this area and appear to be most affected by hard structures such as a marina, bulk heading, buildings and various human activities along the shoreline and in aquatic and intertidal areas. Additionally, the dune development and evolution and cross-island sediment transport processes have also been negatively affected by placements of buildings and walkways within upland and dune areas and overall direct human use of the area. The negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach areas.

Restoration Alternative T-2-1, Bay

The goal of T-2-1 is to enhance the eroding bayside shoreline and intertidal zone and remove approximately 210 linear feet (lf) of bulkhead material located west of the marina. Components include:

- Remove a bulkhead
- Replenish shoreline grade
- Remove *Phragmites*.

Specific activities would include regrading approximately 900 lf the shoreline to a slope < 2:1 and placement of sand material over approximately a 2.2-acre (ac) area to enhance the interidal zone and provide bay sediment. Approximately 1 ac of material will be excavated from the area of the existing bulkhead and used to restore the shoreline grade. Dredge material would be used onsite for additional gradient alterations and would support dredge material management activities. The bulkhead and other debris along the shoreline would be removed and disposed of in a suitable location. Soft bioengineering structures and plantings would be utilized to stabilize the 900 lf of shoreline and minimize further erosion and loss of habitat. Approximately 0.5 ac of *Phragmites* would be removed manually as part of shoreline modification efforts. Desirable vegetation and faunal species are expected to recolonize communities of the site naturally once suitable habitat conditions are established.

Restoration measures are expected to enhance the existing BAYBEACH community and result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, erosion, shoreline modifications, and barriers to wildlife, as shown in Appendix G. The grade of the existing BAYBEACH community will be modified, but the overall width/size would not.

By stabilizing the bay side shoreline and restoring the intertidal zone and intertidal vegetation, this alternative is expected to positively affect the bayside shoreline and estuarine coastal processes.

Restoration Alternative T-2-2, Beach and Dune

The goal of T-2-2 is to enhance the existing beach and dune system and improve conditions within upland areas of the site. Components of T-2-2 include:

- Improve the dune face and slope
- Replace a boardwalk
- Restore dune at cut locations.

Specific tasks would be to improve the slope of approximately 1,800 feet of the existing dune face to approximately 20-25% slope, plant the dune face with approximately 40% cover of vegetation, widen the VEGBEACH community to 120 feet, and plant the upper 40 feet of the VEGBEACH community with dune grass species such as beachgrass, beach plum, seaside goldenrod, and beach heather, and switch grass. Measures would also include replacing the existing beach access boardwalk with a raised walkover and restoring the dune/upland beneath it to a slope and width matching the adjacent dunes and replanting as needed to stabilize the area. Approximately 6 ac of sand material will be needed for regrading and dune replacement. In addition, several existing sand roads and trails would be closed off, open cuts through the due to the beach would be restored and planted to stabilize, and the overall area of disturbance would be reduced by restricting access to these areas and planting a total of approximately 1 ac of dune species in disturbed areas. Most structures associated with the NPS service and recreational facilities would remain, as would several boardwalks and the sand road oriented east-west through the center of the site. Approximately 600 ft of sand fencing will be installed to restrict vehicle/pedestrian access. Alternative natural materials such as rock, logs, etc. should be used as restrictive barriers where feasible.

Restoration measures are expected to enhance the existing UPLAND, DUNEGRASS, and VEGBEACH communities and would result in some improvements to the HSI variables for percent cover of vegetation, impacts from human disturbance, shoreline modifications, slope, and width, as shown in Appendix G. The size of each of these communities and the OCEANBEACH community is expected to change slightly and this change is reflected in HEP HU calculations.

This alternative would make dunes more stable (i.e., by improving dune slope), restore the dune in access areas, and widen the beach and is expected to positively affect the longshore sediment transport and dune development and evolution processes. However, the activity would also have a negative affect on dune development and evolution by artificially modifying the dune structure and would negatively affect the cross-island transport process by closing off the areas most susceptible to overwashing. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

Restoration Alternative T-2-3, Marina

The goal of T-2-3 is to remove the marina and associated structures (3 ac) to restore the intertidal zone and regrade approximately 1,600 feet of the shoreline and disturbed areas. Components of T-2-3 include:

- Remove marina and associated structures
- Regrade shoreline
- Fill dune cuts

Sand material from the existing marina would be reused on site to regrade the shoreline, disturbed areas, and to fill dune cuts. No shoreline stabilization measures would be used. The effort also includes the removal of all man-made structures on the site (covering approximately 3 ac), which includes numerous wooden boardwalks, paved areas, and several large buildings and a bath house associated with recreational facilities. This measure includes regrading disturbed areas and allowing the site to return to conditions of natural barrier island communities. Incipient dunes (dunes much smaller and less established than fore dunes) would be placed in areas of dune cuts and planted with low-density dune grass species such as beachgrass, beach plum, seaside goldenrod, and beach heather, and switch grass to stabilize the area. Other disturbed areas would be left to revegetate naturally.

Restoration measures are expected to improve HSI scores for all communities. Hard structures will be removed from existing disturbed areas but otherwise the site is expected to revert to natural conditions naturally. Improvements to the HSI variables include, percent cover of vegetation, percent cover of trees and shrubs, species richness, erosion, shoreline modification, barriers to wildlife, and human factors/magnitude of human impacts, as shown in Appendix G. The size of each of these communities is expected to change slightly and this change is reflected in HEP HU calculations.

This alternative is expected to positively affect all five coastal processes by allowing the site to revert to natural conditions. Components of this alternative (i.e., filling dune cuts) would support storm damage reduction project objectives.

T-3 REAGAN PROPERTY

The Reagan site is similar to the Sunken forest in that a predominant restoration need at the site is the severely eroding bayside shoreline banks as well as scattered invasive *Phragmites* along the bayside shoreline. In addition, a significant portion of the site includes the highly developed community of Fire Island Pines. The entire bayside shoreline along this community is bulkheaded and as a result lacks a bayside intertidal zone. Vehicle cuts, pathways, sand fence, hard structures, and walkways from residential areas, heavily impact dunes along the ocean side of the site.

Upland areas adjacent to the residential community include sandy roads and trails, a power station, a helipad, and sand fence. Recreational use of the area is high and evidence of trash and vehicle use of the beach was documented. Access to the beach through the dune is via one wooden boardwalk, several small sand trails, and a major vehicle access point that connects the beach, residential area, and helipad.

Similar to the Sunken Forest site, the bayside shoreline and estuarine processes at the Reagan site have been negatively impacted and appear to be most affected by hard structures such as extensive bulk heading, boat slips, buildings and various human activities in the area, particularly those associated with the highly developed community of Fire Island Pines. Impacts have directly and indirectly affected the shoreline, intertidal, and aquatic areas of the site. Additionally, the dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, residential housing, and other hard structures within upland and dune areas, and overall direct human use of the area. The negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach areas.

Restoration Alternative T-3-1, Bayside

The goal of T-3-1 is to enhance approximately 900 feet of the eroding bayside shoreline and intertidal zone. Components of T-3-1 include:

- Regrade slope of shoreline and upland
- Install bioengineering and plantings

Specific measures would be to regrade the upland edge/shoreline to a slope < 2:1 and place sand material over approximately a 2.2 ac area to enhance the interidal zone and provide bay sediment. Dredge material may be utilized to restore grade in support of dredge material management activities. Soft bioengineering structures and plantings would be installed to stabilize 900 feet of the upland shoreline. Desirable vegetation and faunal species are expected to recolonize the site naturally once suitable habitat conditions are established.

Restoration measures are expected to enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, erosion, shoreline modifications, and barriers to wildlife, as shown in Appendix G. The grade of the existing BAYBEACH community will be modified, but the overall width/size would not.

By stabilizing the bay side shoreline and recreating the intertidal zone and vegetation, this activity is expected to result in positive impacts to the bayside shoreline and estuarine coastal processes.

Restoration Alternative T-3-2, Beach and Dune
The goal of T-3-2 is to enhance approximately 1,300 feet of the existing beach and dune system and improve conditions within upland areas of the site. Components of T-3-2 include:

- Remove sand fence on dunes
- Improve dune slope
- Close or reduce roads and trails
- Raise one walkway over dune

Specific tasks would be to remove sand fence from dunes, improve the slope of the existing dune face to approximately 20-25% slope and 50 foot width (i.e., fore dune characteristics), plant the dune face with approximately 40% cover of vegetation, and widen the VEGBEACH community to 120 feet and planting the upper 40 feet (from the toe of dune slope toward the ocean) with dune vegetation. Several existing sand roads and trails would be closed off or reduced in width. Approximately 6.5 acres of sand fill material would be needed for dune restoration and to minimize sand roads and trails. Structures and access roads associated with the residential area, power station, and helipad would remain on site. One existing walkway from the residential area to the beach would be raised and the dune would be restored to a slope and width matching the adjacent dunes and replanted as needed to stabilize the area. Restricting access to these areas using sand fence or natural materials such as large rocks would reduce the overall area of disturbance.

Restoration measures are expected to enhance the existing UPLAND, DUNEGRASS, and VEGBEACH communities and would result in some improvements to the HSI variables for percent cover of vegetation, impacts from human disturbance, shoreline modifications, slope, and width, as shown in Appendix G. The size of each of these communities and the OCEANBEACH community is expected to change slightly and this change is reflected in HEP HU calculations.

This alternative would make dunes more stable (i.e., by improving dune slope), restore the dune in access areas, and widen the beach and is expected to positively affect the longshore sediment transport and dune development and evolution processes. However, the activity would also have a negative affect on dune development and evolution by artificially modifying the dune structure and would negatively affect the cross-island transport process by closing off the areas most susceptible to overwashing. Although a relatively large cut in the dune would remain to provide access to residential areas and the helipad. Components of this alternative (i.e., dune enhancement) would support storm damage reduction project objectives.

Restoration Alternative T-3-3, Bayside Bulkhead
The goal of T-3-3 is to bury 300 feet of the existing bulkhead along Fire Island Pines, and regrade 1,200 feet of shoreline to restore the intertidal zone. Components of T-3-3 include:

- Apply bioengineering methods
- Extend intertidal zone

USACE assumes that the full 1,200 feet of shoreline will require stabilization using using bio-engineering methods. The intertidal zone will be extended over approximately 600 feet of the site. Dredge material would be utilized to restore grade in support of dredge material management activities. Approximately 3 ac of fill would be needed to restore and extend the intertidal zone at the bulkhead and 0.75 would be needed to restore the remaining shoreline slope.

Restoration measures are expected to restore/enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, shoreline modifications, and barriers to wildlife, as shown in Appendix G. The size of the BAYBEACH and BAYSUBSAV communities is expected to change and this change is reflected in HEP HU calculations.

Removal of hard structures and the recreation of intertidal areas and salt marsh along the bay shoreline is expected to positively affect the bayside shoreline and estuarine coastal processes.

T-5 GREAT GUN

Great Gun recreational use area includes a major boat dock, helipad, wooden boardwalk, and several structures associated with the recreational area (i.e., outhouses, picnic tables, storage sheds). Numerous sand roads and trails are found throughout the site and numerous access roads and trails cut through the dune. The site also is characterized by a tidal marsh system comprised of an inundated saltwater pond and saltmarsh. However, due to tidal restrictions the tidal pond associated with this marsh is relatively stagnant and a significant component of the upper zones of the high marsh is dominated by invasive *Phragmites*.

This area is a public recreational facility, and use of the area is high. Vegetation loss and substrate disturbance from pedestrian and vehicle use of uplands and dune areas is significant throughout the site. Despite the recreational uses of the area, the dunes and beach are of relatively high quality in terms of vegetation, slope and width. The bayside shoreline and estuarine processes at the site have been negatively impacted and appear to be most affected by hard structures such as extensive bulk heading, boat slips, buildings, a playground/recreational area, and general impact from various human uses the area. Impacts have directly and indirectly affected the shoreline, intertidal, and aquatic areas of the site and in particular have altered hydrologic connection to a relatively large salt marsh community on site. Evidence of erosion is present on the bayside shoreline, but is not as severe as other sites such as Reagan and Sunken Forest. The dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, other hard structures within upland and dune areas, and overall direct human use of the area. However, the negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach areas.

Restoration Alternative T-5-1, Tidal Marsh

The goal of T-5-1 is to restore the 1.14-acre degraded salt marsh and tidal pond at Great Gun. Components of T-5-1 include:

- Reestablishing hydrologic connection of road bisected marsh
- Plant disturbed areas

Specifically, a 48-inch metal culvert would be placed beneath a sand road to connect the existing marsh located on the western portion of the site with the degraded marsh located in the center and eastern portion of the site. Some excavation may be required on < 0.2 acres of the site to achieve desirable elevations for tidal flow. Planting is not proposed with this alternative since the increase in tidal flow is expected to create conditions favorable for desirable salt marsh species currently found on site to flourish, and to reduce the presence of *Phragmites*. However, areas disturbed during construction would be replanted. The existing sand road and boardwalk, which bisect the marsh system, would remain.

Restoration measures are expected to enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for percent cover of vegetation, invasive species, and species richness, as shown in Appendix G. The size of the BAYBEACH community would increase slightly and UPLAND would decrease as flooding is expected to result in the conversion of some fringe upland areas along the marsh to wetland shrub.

The enhancement of the existing degraded salt marsh is expected to positively affect the estuarine coastal process.

Restoration Alternative T-5-2, Human Disturbance
The goals of T-5-2 would encompass those of T-5-1, but additionally would be to minimize the number and widths of sandy roads, trails, and disturbed areas on the site. Components include:

- Reestablishing hydrologic connection of road bisected marsh
- Plant disturbed areas
- Restore cuts and dune trails other than primary access points

Structures associated with the recreational area, including the primary boardwalk and sand roads that provide vehicle access between the beach, helipad, and marina, would not be removed. To reduce disturbance on site, vehicle traffic would be restricted to a single access road and the road would parallel the existing boardwalk at the cut through the dune. Access would be restricted on the remaining sandy roads and trails using sand fence or natural objects such as large rocks and the disturbed areas are expected to revegetate naturally. Dune restoration would focus on disturbed areas (i.e., dune cuts and roads), which cover approximately 200 linear feet (1 ac) of the 1,100-foot fore dune and upper beach area. Within this area the dune face would be restored to approximately 20-25% slope, and planted with approximately 40% cover of vegetation. The VEGBEACH community would be widened to 120 feet, and the upper 40 feet planted with dune grass species such as beachgrass, beach plum, seaside goldenrod, and beach heather, and switch grass.

Restoration measures are expected to enhance the existing BAYBEACH and DUNEGRASS communities and improve the HSI variables for percent cover of vegetation, barriers to wildlife, and impacts from human disturbance, as shown in Appendix G. VEGBEACH and UPLAND restoration would generally mimic conditions of adjacent areas. Thus, other than improving the human magnitude variable, HSI scores for these communities will not change. The size of each of these communities is expected to increase slightly as areas are restored to natural conditions and these changes are reflected in HEP HU calculations.

As with Alternative 1, the enhancement of the existing degraded salt marsh is expected to positively affect the estuarine coastal process. In addition, this alternative is expected to have a slight positive affect the dune development and evolution processes by restoring disturbed access areas in the dune, but would negatively affect the cross-island transport process, by closing off the location most susceptible to cross-island overwashing. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

Restoration Alternative T-5-3, Marina
The goal of T-5-3 is to remove the marina (covering approximately 1.5 ac) to restore approximately 200 feet of the intertidal zone to conditions similar to the adjacent shoreline. Specific components of T-5-3 include:

- Removing the marina and all associated manmade structures
- Permit disturbed areas to revert to natural communities
- Restore dune cuts

The effort also includes the removal of all man-made structures (1.5 ac) on the site, including numerous boardwalks, a latrine, and several sheds, and allowing the approximately 5.5 ac of currently disturbed areas, such as roads, trails, boardwalks, and building sites, to return to barrier island communities. Fill from marina would be used to restore dune cuts and roads. Incipient dunes (dunes much smaller and less established than fore dunes) would be placed in areas of dune cuts (1 ac) and planted with low-density dune grass species (i.e., beachgrass, beach plum, seaside goldenrod, and beach heather, and switch grass) to stabilize the area. Other disturbed areas would be left to revegetate naturally, and no measures would be taken to stabilize the shoreline.

Restoration measures are expected to improve HSI scores for all communities. Hard structures will be removed from existing disturbed areas but otherwise the site is expected to revert to natural conditions naturally. Improvements to the HSI variables include percent cover of vegetation, percent cover of trees and shrubs, species richness, erosion, shoreline modification, barriers to wildlife, and human factors/magnitude of human impacts, as shown in Appendix G. The size of each of these communities is expected to change slightly and this change is reflected in HEP HU calculations.

This alternative is expected to positively affect all five coastal processes by allowing the site to revert to natural conditions. Components of this alternative (i.e., restoring dune cuts) would support storm damage reduction project objectives.

T-7 TIANA

The Tiana restoration site currently provides parking and access to the beach for recreational activities. The site is at a relatively narrow portion of the barrier island, however, the dunes and beach in this area are relatively wide and stable. On the bayside, overall the salt marsh is of relatively high quality. However, a portion of the site has been degraded due to flooding and runoff from the paved road, and use of the area as a boat launch point. Recreational use of the area is high and includes vehicle access to the beach. Access to the beach is provided by a large cut in the dune that extends from the end of the asphalt parking area.

Overall the bayside shoreline and estuarine processes at the site appear to be functioning naturally, considering the overall setting of the site. However, a small portion of the salt marsh and bay shoreline has been directly impacted by vehicles accessing the area to launch watercraft and from runoff from the adjacent road surface. The dune development and evolution process is affected by vehicle traffic on the upper beach and beach maintenance activities (i.e., sand deposition and dune building). This activity mimics sand accretion, which may or may not be the "natural trend in this area". Cross-island sediment transport processes have been negatively affected by beach maintenance activities and other hard structures (i.e., asphalt parking lot and roads) within upland and dune areas. The negative impacts to cross-island transport may be somewhat offset by man-made cuts in the primary dune that allow for vehicle access to beach areas.

Restoration Alternative T-7-1, Marsh/Upland/Dune

The goal of T-7-1 is to restore the salt marsh and upland on the bayside of the site, enhance the upland and dune located at the parking lot, and restore the dune. Specific components of T-7-1 include:

- Remove fill
- Regrade and plant
- Restore dune
- Install one dune walkover

On the bayside, approximately 0.2 ac of gravel, asphalt, and fill material, would be removed from the salt marsh and upland community. This portion of the site would be regraded and planted as needed to restore salt marsh and a narrow upland community along the road edge. On the oceanside, approximately a 200 foot-wide area of the dune and upper beach located at the vehicle cut would be restored to fore dune conditions such that approximately 200 feet of the existing dune face would be regraded to a slope of approximately 20-25%, planting the dune face with approximately 40% cover of vegetation, widening the VEGBEACH community to 120 feet, and planting the upper 40 feet of the VEGBEACH community with dune grass species that include beachgrass, beach plum, seaside goldenrod, and beach heather, and switch grass. One walkover would be installed to provide pedestrian access to the beach. The asphalt parking lot would be reduced in size from approximately 300 ft to 100 ft.

Restoration measures are expected to enhance, and in some cases restore, four of the six HEP communities (OCEANBEACH and BAYSUBSAV excluded), and would result in some improvements to the HSI variables for percent cover of vegetation, percent cover of trees and shrubs, species richness, erosion, shoreline modification, barriers to wildlife, and human factors/magnitude of human impacts, as shown in Appendix G. However, due to the small size of upland and salt marsh creation in disturbed areas, this alternative is expected to have an overall low change in habitat quality (HSI scores) for these habitats. The size of each of these enhanced communities (except VEGBEACH) is expected to increase slightly, and this change is reflected in HEP HU calculations.

The removal of fill and *Phragmites* in intertidal areas is expected to have a positive affect on the bayside shoreline and estuarine coastal processes. On one hand, dune development and evolution processes would be positively affected by restoring the dune in the open cut area. But, this would also negatively affect the cross-island transport process by closing off the areas most susceptible to overwashing. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

Restoration Alternative T-7-2, Marsh/Upland/Dune plus Human Structures
The goals of T-7-2 would encompass those of T-7-1, and also would be to remove manmade structures from the site to allow the site to revert to natural conditions. Specific components include:

- Remove an asphalt lot
- Remove fill
- Regrade and plant
- Restore dune

Specifically, the 300 x 50 ft asphalt lot would be removed entirely and there would be no walkovers installed to provide access to the beach or bay shoreline. The primary asphalt road through the site would remain.

Restoration measures are expected to convert existing disturbed areas to four of the six HEP communities (OCEANBEACH and BAYSUBSAV excluded), and would result in improvements to the HSI variables for, percent cover of vegetation, percent cover of trees and shrubs, species richness, erosion, shoreline modification, barriers to wildlife, and human factors/magnitude of human impacts, as shown in Appendix G. The size of each of these enhanced communities (except VEGBEACH) would increase slightly more than with Alternative 1 and this change is reflected in HEP HU calculations.

The removal of fill and *Phragmites* in intertidal areas is expected to have a positive affect on the bayside shoreline and estuarine coastal processes. On one hand, dune development and evolution processes would be positively affected by restoring the dune in the open cut area. But, this would also negatively affect the cross-island transport process by closing off the areas most susceptible to overwashing. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

Restoration Alternative T-7-3, Submerged Aquatic Vegetation
The goals of T-7-3 are to enhance conditions of the BAYSUBSAV community by:

- planting submergent aquatic vegetation

Restoration measures are expected to enhance the existing BAYSUBSAV community and would result in improvements to the following BAYSUBSAV HSI variables, percent cover of eelgrass and species richness, as shown in Appendix G. The community would be enhanced through this action, but the size of the BAYSUBSAV community would not change.

This alternative is expected to positively affect estuarine coastal processes by increasing the amount of desirable submergent aquatic vegetation in the area.

T-8 West of Shinnecock Inlet (WOSI)

The WOSI restoration site currently provides parking and access to the beach for recreational activities. The site is at a relatively narrow portion of the barrier island, however, the dunes and beach in this area are relatively wide and stable due to beach renourishment activities that were recently completed for the site. The dune currently has a wooden walkover that provides access for pedestrians to the beach. However, washouts have been occurring through the dune at this location and the foundation of the walkover is located within, rather than above, the dune.

Bayside, the site is characterized by an asphalt parking lot, relatively steep bayside dunes, and impacts to bayside dunes caused by pedestrian access from the parking lot to the bay shoreline. A relatively high quality salt marsh is located in the northeastern portion of the site, however the marsh does contain invasive *Phragmites*.

Recreational use of the bay and ocean shorelines areas is high. No vehicle access points are located within the restoration site, but vehicle access is provided elsewhere along the beach and tire ruts have been documented on the beach. The state and Federally-listed seabeach amaranth and piping plover have been documented in the VEGBEACH community in the vicinity of this location.

Overall the bayside shoreline and estuarine processes at the site appear to be functioning naturally, considering the overall setting of the site. A small portion of the salt marsh and bay shoreline has been directly impacted by human use of the area for recreation, but impacts overall are relatively minor. The dune development and evolution process is affected by vehicle traffic on the upper beach, hard structures (i.e., boardwalk), and beach maintenance activities (i.e., sand deposition and dune building). This activity mimicks sand accretion, which may or may not be the "natural trend in this area". Cross-island sediment transport processes have been negatively affected by beach maintenance activities and other hard structures (i.e., asphalt parking lot, boardwalk, and roads) within upland and dune areas.

Restoration Alternative T-8-1, Salt Marsh

The goal of T-8-1 is to create approximately 11 acres of new, high-quality salt marsh within a marginally productive upland/dune area and to enhance conditions of the existing 5 ac salt marsh and 4 ac of adjacent upland shrub communities by removing invasive *Phragmites* using herbicides. Specific components include:

- Lower elevations of dune and upland to create additional saltmarsh
- Remove *Phragmites*
- Reduce slope of shoreline to facilitate tidal flushing

Elevations with the dune and upland communities located to the northeast of the site would be lowered to create conditions similar to the existing marsh on site. Native salt marsh species including 8 ac of emergent wetland species such as salt marsh cordgrass, salt meadow hay, seashore saltgrass, and black grass, and 3 ac of wetland shrubs such as marsh elder, blueberry, bayberry, and groundsel tree to facilitate establishment of the marsh. The slope of approximately 200 ft of the existing shoreline would be lowered to an elevation adequate facilitate tidal flushing of the created marsh.

Restoration measures are expected to enhance the existing BAYBEACH community and would result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, and erosion, as shown in Appendix G. The size of the BAYBEACH, DUNEGRASS, and UPLAND communities would change as a result of salt marsh creation activities.

The creation of additional salt marsh and removal of *Phragmites* in the existing marsh are expected to positively affect the estuarine coastal process.

Restoration Alternative T-8-2, Dunes and Bayside

The goals of T-8-2 are to restore cuts in the dunes at pedestrian access points and reshape and stabilize the bayside shoreline to reduce erosion and improve wildlife access. Specific components of T-8-2 include:

- Restore bay shoreline at pedestrian access point and install walkway
- Regrade bayside shoreline slope to improve stability and intertidal zone
- Restore dune beneath existing dune walkway at ocean

Bayside, restoration measures include restoring a 0.1 ac pedestrian access area at the northern end of the parking lot and regrading approximately 1,400 feet of the bay side shoreline to a slope < 2:1, and placing approximately 1.7 ac of sand material to enhance the intertidal zone and provide bay sediment. Dredge material may be utilized to restore grade in support of dredge material management activities. A wooden walkway would be installed above the restored bayside dune to provide pedestrian access from the lot to the bay shoreline. Oceanside, the existing walkway would be raised above the dune and the dune would be restored to a slope and width matching the adjacent dunes and replanted as needed to stabilize the area, however, the HSI scores for DUNEGRASS and VEGBEACH slope, height, and width are not expected to change due to the small size (< 10' wide cut) of the affected area.

Restoration measures are expected to restore four of the six HEP communities (OCEANBEACH and BAYSUBSAV excluded), and would result in improvements to the HSI variables for, percent cover of vegetation, percent cover of trees and shrubs, species richness, erosion, shoreline modification, barriers to wildlife, and human factors/magnitude of human impacts, as shown in Appendix G. The size of each of these enhanced/restored communities would increase slightly and this change is reflected in HEP HU calculations.

Regrading the bayside shoreline slope and increasing the shoreline intertidal areas is expected to have a positive affect on the bayside shoreline and estuarine coastal processes. Dune development and evolution processes would be positively affected by restoring the dune in the area of the existing boardwalk. But, this would also negatively affect the cross-island transport process by closing off the areas most susceptible to overwashing. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

Restoration Alternative T-8-3, Human Disturbance
The goal of T-8-3 is to remove manmade structures from the site and allow the site to revert to natural conditions. Specific components include:

- Remove asphalt parking lot
- Remove walkway and restore dune beneath walkway

Specifically, the 0.40-acre asphalt parking lot would be removed entirely and the regraded to mimic adjacent communities and the 200-foot long wooden walkover would be removed from the site. No measures would be taken to regrade the bayside shoreline. The area beneath the walkway through the dune would be restored to conditions similar to adjacent dunes and the walkway would be removed. Due to the small size of impact from the walkover, the overall HSI scores for the slope, height and width of the DUNEGRASS and VEGBEACH communities are not expected to change as a result of this action. The primary asphalt road through the site would remain.

Restoration measures are expected to completely restore four of the six HEP communities (OCEANBEACH and BAYSUBSAV excluded), and would result in improvements to the HSI variables for percent cover of vegetation, percent cover of trees and shrubs, species richness, erosion, shoreline modification, barriers to wildlife, and human factors/magnitude of human impacts, as shown in Appendix G. The size of each of these enhanced communities (except VEGBEACH) would increase slightly more than with Alternative 2 and this change is reflected in HEP HU calculations.

This alternative is expected to have a positive affect on all coastal processes by allowing the site to revert to natural conditions.

T-9 GEORGICA POND

Georgica Pond is characterized by a large tidal pond system that is surrounded by highly developed residential areas. Tidal flushing in the pond is sporadic and is at times manually controlled as part of local pond management activities. The pond supports a diversity of vegetation and aquatic fauna and serves as a significant foraging area for shorebirds, particularly during draw down (low tide) conditions. However, intertidal areas along most of the perimeter of the pond and adjoining coves are dominated by
> 90% coverage of the invasive species *Phragmites*.

The width of the *Phragmites* along the perimeter ranges from 1 to 40 feet with an average height of 15 feet. Desirable marsh vegetation is more common at the northern end of the site, where freshwater input is higher. Species include a diversity of sedges, rushes, jewelweed (*Impatiens capensis*), blue flag (*Iris versicolor*), marsh elder, sweet gale, and arrowood, but also includes potentially invasive species that are tolerant of freshwater conditions such as cattail (*Typha* species) and purple loosestrife (*Lythrum salicaria*).

South of the pond (i.e., oceanside), there is a large wide cut in the dune that allows for occasional overflow from the ocean into the pond under extreme storm events. Flow into the pond is otherwise manually controlled via a tide gate. Dunes to either side of the pond have been restored to foredune height and widths, and replanted with beachgrass. Sand fence, holiday trees, and other wood debris is scattered throughout the dune area. The upper beach community is very narrow and includes a groin field as shown in the photo above. The beach is in general not accessible to the public and use of the area by local residents is moderate.

Surrounding development influences the bayside shoreline and estuarine processes at the site and the flow of saline water from the ocean into the tidal pond is unnaturally controlled via a tide gate. As a result, the shoreline fringe of the tidal pond is dominated by Phragmites. Despite this, desirable plant and wildlife communities are flourishing in area. Except for the low-lying area at the tide gate, the dune development and evolution process and cross-island transport processes are negatively affected by residential development close to the foredune areas, sand fence, vehicle traffic on the upper beach, and beach maintenance activities (i.e., sand deposition and dune building). This activity mimicks sand accretion, which may or may not be the "natural trend in this area”. The long shore transport process is affected by the presence of several groins in the area.

Restoration Alternative T-9-1, *Phragmites*

The objective of T-9-1 is to control invasive *Phragmites* to restore the 122 acres of intertidal area of Georgica Pond. Specific components of T-9-1 include:

- Manual removal of *Phragmites*
- Lower shoreline elevation to enhance tidal flushing

Efforts will focus on approximately 50 acres of the BAYSUBSAV community where *Phragmites* is most problematic. Herbicide use is recommended, but not supported by local communities. Therefore control measures will include the manual removal of *Phragmites* and associated rhizomes through mowing/cutting and excavation to reduce thatch material and lower the shoreline elevation. The resulting reintroduction of regular tidal flushing is expected to increase salinity levels and promote conditions for desirable species. This effort will focus on 122 acres of Georgica Pond proper and most major coves. However, this alternative does not include the hydrologically connected area located to the east of Georgica. The alternative will also include some spot planting of desirable salt marsh species on approximately 1/3 of the excavated area (17 ac) as needed to stabilize the site. Species would include emergent wetland species such as salt marsh cordgrass, salt meadow hay, seashore saltgrass, and black grass, and wetland shrubs such as marsh elder, blueberry, bayberry, and groundsel tree.

Restoration measures are expected to enhance conditions of the BAYBEACH community through the removal of *Phragmites*. Improvements to HSI variables include percent cover of vegetation, invasive species, species richness, and barriers to wildlife, as shown in Appendix G. The grade of the existing BAYBEACH community will be modified, but the overall width/size would not.

This alternative would positively affect the estuarine coastal processes by removing invasive *Phragmites*, improving tidal flushing of the site, and enhancing the tidal marsh shoreline through restoration of grades that would support natural vegetation.

Restoration Alternative T-9-2, *Phragmites* plus Intertidal

The goal of T-9-2 would encompass that of T-9-1, but also would restore 12 acres of intertidal area within the cove located in the eastern portion of the study site and hydrologically connected to Georgica Pond. Specific components for T-9-2 include:

- Manual removal of *Phragmites*
- Lower shoreline elevation to enhance tidal flushing
- Restore additional areas of shoreline

Proposed control measures are the same as with Alternative 1, and efforts will focus on an additional 10 acres of the shoreline within the cove. The alternative would also include spot planting of desirable salt marsh species on approximately 1/3 of the site (3 ac) to stabilize excavated areas.

Restoration measures are expected to further enhance conditions of the BAYBEACH community through the removal of *Phragmites*. Improvements to HSI variables include percent cover of vegetation, invasive species, species richness, and barriers to wildlife, as shown in Appendix G. The grade and species composition of the existing BAYBEACH community will be enhanced, but the overall width/size would not.

This alternative would positively affect the estuarine coastal processes by removing invasive *Phragmites*, improving tidal flushing of the site, and enhancing the tidal marsh shoreline through restoration of grades that would support natural vegetation.

Restoration Alternative T-9-3, Groins/Dune

The goal of T-9-3 is to remove three groins and restore habitat on the beach and dunes. Components of T-9-3 include:

- Remove three groins
- Enhance dune that surrounds a cut
- Install a tidal gate for Georgica Pond
- Remove fence and other sand retention structures

Approximately 2 ac of the OCEANBEACH and VEGBEACH communities will be restored beneath the groins and at a cut located directly in a front of Georgica Pond. Efforts would also include enhancing 1,750 feet of existing dune area that surrounds the cut, and 5,500 linear feet of dune in front of developed areas to either side of Georgica Pond. Dunes would be restored to fore dune height, slope, width, and planted with dunegrass cover such as American beachgrass, beach plum, seaside goldenrod, and beach heather. A gate system would be installed to allow for manual control of tidal flushing in the pond. Sand fence and similar sand retention structures would be removed from approximately 2,000 feet of the existing dune areas. The VEGBEACH community would be increased in width to 120 feet and the upper 40 feet of the VEGBEACH community along 7,500 feet of the shoreline would planted as needed to stabilize the community.

Restoration measures are expected to enhance the existing DUNEGRASS, VEGBEACH, and OCEANBEACH communities and would result in some improvements to the HSI variables for percent cover of vegetation, impacts from human disturbance, shoreline modifications, slope, and width, as shown in Appendix G. The size of each of these communities is expected to change slightly and this change is reflected in HEP HU calculations.

Because this alternative includes the removal of groins, removal of structures within the existing dunes, restoring the dune at a large cut, and beach widening, it is expected to positively affect the longshore sediment transport and dune development and evolution processes. Improved tidal flushing and the ability to monitor and manage this flushing using a tide gate is also expected to result in positive impacts to the estuarine coastal process. However, cross-island transport would be negatively affected from closing and increasing elevation of the low-lying areas of the dune, and the dune development and evolution processes may also be negatively affected by unnatural deposition of sand when enhancing existing dunes and beaches. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

T-10 EAST INLET ISLAND

As with most man-made dredge island in the study area, the restoration site at East Inlet Island (T-10) is characterized by habitats representative of four of the six HEP communities that are characteristic of a bayside island community. These habitats comprise sandy upland and dune areas surrounded by intertidal communities dominated by *Phragmites*. Dense *Phragmites* and steep slopes along some of the island perimeter pose significant obstacles to passage for some wildlife species.

The areas of most recent dredge deposition are sparsely vegetated. But, there is evidence of previous restoration planting efforts on this site, which includes about 5% cover of planted beachgrass and salt marsh goldenrod, as well as about 25% cover of *Phragmites*, sea rocket and beach pea. *Phragmites* composition increases moving down slope from the highest part of the island to nearly 95% cover in the intertidal areas. Upland areas include species such as rose, poison ivy, milkweed, raspberries, and several mulberry trees that at the time of the survey had black-crowned night heron roosting in them.

The northwest and western side of the island is experiencing significant erosion. Shoreline banks in these areas are up to 10 feet in height with nearly sheer slope faces. Sediment from the eroding island is being transported along the island perimeter and much of it has been deposited to the southeast of the island, forming a direct connection between the island and the mainland. This sand spit is exposed at low tide and provides foraging and loafing habitat for shorebirds. The primary focus of restoration activities on this dredge island is to lower the elevation of the island by removing dredge material, stabilize the island shoreline, maintaining vegetation to support shorebird nesting, and managing the island for long-term breeding and nesting habitat for shorebirds.

Although, located within bays, bay islands have communities representative of those found on the barrier island and are affected by similar coastal processes. Except for the long-shore transport process, all other processes are applicable to bay island communities. Generally, the cross-island process is actively occurring on East Inlet Island as sand from the dune face of the island is washed over and around the island to form productive tidal flats and low-lying areas that support intertidal vegetation. However, boat traffic and currents negatively affect the dune development process as the relatively unstable dunes are being scarped at an accelerated rate and sand is being moving away from the dune face. No new natural input of sand is occurring on the islands and new dunes are not being formed as a result of the dune erosion. Bayside shorelines and estuarine processes are also somewhat negatively affected by wave action and currents in the bay as the wave action erodes shorelines at an accelerated rate and prohibits establishment of salt marsh communities. However, although portions of East Inlet Island are negatively affected, a large, diverse salt marsh community and tidal flat have formed in protected areas on the southeast side of the island.

Restoration Alternative T-10-1, Dune

The goal of T-10-1 is to enhance existing sandy dune areas to promote use of the areas by breeding/nesting shorebirds. Specific components include:

- Create additional areas of dunegrass
- Regrade approximately 16 acres of existing dunegrass
- Remove *Phragmites*

Restoration measures would include the removal of dredge material and regrading of approximately 5 acres of the 11 acres of existing DUNEGRASS on the site to create elevations more favorable for shorebird nesting and the removal of *Phragmites* from a 2.39-acre upland area. Portions of the remaining 6 acres of DUNEGRASS are densely vegetated and contain some *Phragmites*, thus *Phragmites* and other vegetation would be removed from these areas using herbicide control to reduce vegetative cover and make the site more favorable for nesting shorebirds. Modifications would also include regrading of some areas of the shoreline to provide access points for wildlife to move between upper island areas and the shoreline. Dredge material from the existing DUNEGRASS community would be redistributed to cover approximately 16 ac of the existing *Phragmites*-dominated portion of the BAYBEACH area on the south end of the island, to restore the area to elevations suitable for shorebird nesting (DUNEGRASS). Approximately 5 ac of on-site sand material will be relocated from the regraded DUNEGRASS community. Dredge material from other sources would be used for additional sand needs and would support dredge material management activities, thus additional costs for fill material are not include in the cost estimate.

Restoration measures are expected to convert some BAYBEACH to DUNEGRASS, and would also enhance conditions of the existing DUNEGRASS community by regrading and removing high densities of vegetation. Improvements to HSI variables include percent cover of vegetation, species richness, invasives, slope, and barriers to wildlife, as shown in Appendix G.

Alternative T-10-1 would improve upland conditions by removing invasive *Phragmites* and would provide habitat for state and Federally-listed species.

Restoration Alternative T-10-2, Dune, Baybeach, *Phragmites*

The goal of T-10-2 is to enhance existing sandy dune areas to promote use of the areas by breeding/nesting shorebirds, as in Alternative 1, but differs from Alternative 1 in that *Phragmites* would be removed in the existing BAYBEACH area and the areas would be retained as productive salt marsh rather than placing 16 acres of fill material on the area to create additional DUNEGRASS. Specific components include:

- Create additional areas of dunegrass
- Regrade areas of existing dunegrass

- Remove *Phragmites*

Restoration measures would include regrading 5 acres of the existing approximately 11-acre DUNEGRASS community and the removal of *Phragmites* and other vegetation from 9 acres of DUNEGRASS and UPLAND areas to make the site more favorable for nesting shorebirds. No sand would be removed from the site. In addition, rather than filling 16 acres of the existing BAYBEACH area (as proposed in Alternative 1) this alternative would include the removal of *Phragmites* in this area to enhance the quality of BAYBEACH.

Restoration measures are expected to enhance conditions of the DUNEGRASS, UPLAND, and BAYBEACH community through the removal of *Phragmites* throughout the site and removal of dune vegetation necessary to make the site more favorable for shorebird nesting. Improvements to HSI variables include percent cover of vegetation, invasive species, species richness, and barriers to wildlife, as shown in Appendix G. None of the existing communities will gain or lose acreage as a result of this alternative.

This alternative would improve upland conditions by removing invasive *Phragmites,* would provide habitat for state and Federally-listed species, and would improve estuarine processes by removing invasive species from the existing salt marsh.

Restoration Alternative T-10-3, Dunes plus Shoreline
The goal of T-10-3 encompasses that of T-10-1, and also specifies the use of bio-engineering measures to stabilize approximately 3,700 feet of eroding island shoreline. Specific components include:

- Creation of additional Dunegrass habitat
- Regrading and use of bio-engineering along 3,700 feet of shoreline
- Removal of *Phragmites*

Regrading of the entire shoreline would be required, and deposition of material into some intertidal areas of the island would be necessary in order to reshape and stabilize the island. *Phragmites* will be removed within 24 ac of the site (6 in DUNEGRASS, 2.5 within UPLAND, and 16 within BAYBEACH) using herbicides, and the 16 ac BAYBEACH area would be converted to DUNEGRASS through placement of dredge material from the regraded DUNEGRASS community. Approximately 5 ac of on-site sand material will be relocated from the regraded DUNEGRASS community. Dredge material from other sources would be used for additional sand needs and would support dredge material management activities, thus additional costs for fill material are not include in the cost estimate.

As with Alternative T-10-1, this alternative would convert some BAYBEACH DUNEGRASS and would enhance conditions of the DUNEGRASS and BAYBEACH communities. Improvements to HSI variables include percent cover of vegetation, invasive species, species richness, barriers to wildlife, and in addition would halt further erosion of the shoreline, as shown in Appendix G. The DUNERASS community would increase in coverage, while BAYBEACH would decrease.

This alternative would improve upland conditions by removing invasive *Phragmites,* would provide habitat for state and Federally-listed species, and would improve bayside and estuarine processes by creating a relatively stable, vegetated shoreline, with appropriate slope to support salt marsh species.

T-11 JOHN BOYLE ISLAND

As with most dredge islands in the study area, steep eroding banks, sparsely vegetated sandy uplands and dunes, and a predominance of the invasive species *Phragmites* characterize John Boyle Island. A well-established gull colony has colonized the sparely vegetated open sandy areas of the site. These birds can be extremely aggressive and deter use of the site by other species. Seaside goldenrod, *Phragmites*, sea rocket, and beachgrass cover about 20% of the upland and dune area.

Dense *Phragmites* and steep slopes along some of the island perimeter pose significant obstacles to passage for some wildlife species. Upland areas include a few scattered sumac and poplar trees. No birds were observed roosting in these areas during site visits. Steep scarping banks were on average 4 feet in height. Sediment from the eroding island is being transported along the island perimeter and much of it has been deposited to the east and southeast of the island. This sand spit is exposed at low tide and provides foraging and loafing habitat for shorebirds.

Sand from the dune face of the island is washed over and around the island to form productive tidal flats and low-lying intertidal areas that support the cross-island process on John Boyle Island. However, boat traffic and currents negatively affect the dune development process as the relatively unstable dunes are being scarped at an accelerated rate and sand is being moving away from the dune face. As with other dredge islands in the area, no new natural input of sand is occurring on the islands and new dunes are not being formed as a result of the dune erosion. Bayside shorelines and estuarine processes are also somewhat negatively affected by wave action and currents in the bay as the wave action erodes shorelines at an accelerated rate and prohibits establishment of salt marsh communities. Despite this, a relatively small, *Phragmites*-dominated salt marsh, and itertidal zone have formed on the east side of the island.

Restoration Alternative T-11-1, Dune

Similar to efforts for East Inlet Island, the goal of T-11-1 on John Boyle Island is to enhance existing open sandy dune areas to promote use of the areas by breeding/nesting shorebirds. Specific components of T-11-1 include:

- Regrading dunegrass
- Removing *Phragmites* and other vegetation

Activities include regrading 1.1 ac of the DUNEGRASS community as needed to create elevations favorable for shorebird nesting and to provide shoreline access points for wildlife, the removal of *Phragmites* from 4 ac of upland, dune, and BAYBEACH intertidal areas, and removing vegetation from the remaining 1.8 ac DUNEGRASS community to make the site more favorable for nesting shorebirds.

Restoration measures would be designed to enhance conditions of the DUNEGRASS and BAYBEACH community. Improvements to HSI variables include percent cover of vegetation, invasive species, and species richness, and barriers to wildlife, as shown in Appendix G. Communities may be regraded and enhanced through vegetation changes, but acreages would not change.

This alternative would improve upland conditions by removing invasive *Phragmites*, and would provide habitat for state and Federally-listed species.

Restoration Alternative T-11-2, Upland

The goal of T-11-2 is to convert approximately 3 ac of existing DUNEGRASS to UPLAND habitats to promote use of the area by breeding and nesting heron species. Specific components of T-11-2 include:

- Regrade Dunegrass
- Add topsoil
- Control *Phragmites*

Measures would include adding approximately 6 ac of sand and regrading the DUNEGRASS community as needed to create appropriate elevations, and the addition of 3 ac of topsoil to improve growing substrate for trees/shrubs. Modifications would also include regrading and vegetation removal in 0.1 ac to provide shoreline access for wildlife and use of herbicide to control *Phragmites* in the existing 2.5 acres of upland and salt marsh.

Restoration measures are expected to enhance conditions of the UPLAND and BAYBEACH communities and would convert existing DUNEGRASS to UPLAND. Improvements to HSI variables include percent cover of vegetation, invasive species, species richness, and barriers to wildlife, as shown in Appendix G. The species composition of the existing BAYBEACH community will be enhanced, but the overall width/size would not.

This alternative would improve upland conditions and estuarine processes by removing invasive *Phragmites*, and would provide habitat for state and Federally-listed species.

Restoration Alternative T-11-3, Dune and Shoreline

The goal of T-11-3 would encompass that of T-11-1, and would also include the use of bio-engineering measures. Specific measures include:

- Regrade Dunegrass
- Remove *Phragmites* and other vegetation

- Use of bio-engineering measures

Bio-engineering measures would be incorporated to stabilize approximately 1,500 feet of the eroding island shoreline. The remaining shoreline would be regraded as needed, but bio-engineering measures would not be used in these areas to preserve the existing shorebird forging mudflat area.

As with Alternative T-11-1, this alternative would enhance conditions of the DUNEGRASS and BAYBEACH communities. In addition, this alternative would also convert some BAYBEACH to DUNEGRASS. Improvements to HSI variables include percent cover of vegetation, invasive species, species richness, barriers to wildlife, and in addition would halt further erosion of the shoreline, as shown in Appendix G. Under this scenario the DUNEGRASS community would increase in coverage, while BAYBEACH would decrease.

This alternative would improve upland conditions by removing invasive *Phragmites*, would provide habitat for state and Federally-listed species, and would improve bayside and estuarine processes by creating a relatively stable, vegetated shoreline, with appropriate slope to support salt marsh species.

T-14 OCEAN BEACH

Ocean Beach (T-14) is a typical highly developed barrier island community. Bayside intertidal areas are limited due to commercial development, bulkheading, marinas, and boat slips that currently dominate the bay side shoreline. Despite this, eelgrass beds are flourishing in permanently innundated areas just off the shoreline, an uncharacteristic situation in subtidal habitats in close proximity to dense development. Residential housing, commercial development, and paved roads and trails dominate interior upland and dune areas. Hard structures, sand fence, debris, makeshift sand stabilizers, and pedestrian walkways and access cuts have impacted dunes.

Deteriorated groins occupy the beach and near ocean areas. Groins are notched and are nearly completely covered by sand. Portions of the beach are narrow (< 50 feet from toe of dune to average high water line) and the beach is experiencing significant seasonal scarping at the high water line as documented in the above photograph. Recreational use of the beach by pedestrians is high and there is use of vehicles on the beach. In protected areas of the dune (i.e., behind sand fences) dunes overall are well-vegetated with 50% cover of beachgrass.

The bayside shoreline and estuarine processes at the Ocean Beach site have been negatively impacted and appear to be most affected by hard structures such as extensive bulk heading, boat slips, buildings and various human activities in the area, particularly those associated with the highly developed community of Ocean Beach. Impacts have directly and indirectly affected the shoreline, intertidal, and aquatic areas of the site. Additionally, the dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, residential housing, and other hard structures within upland and dune areas, and overall direct human use of the area.

Restoration Alternative T-14-1, Groins and Wells

The goal of T-14-1 is to enhance and restore the dune beach. Specific components of T-14-1 include:

- Removal of two groins
- Relocation of the Ocean Beach water supply well, which is currently located in the dune area behind the two groins

Restoration measures are expected to convert some disturbed areas to OCEANBEACH and VEGBEACH communities and would result in improvements to the HSI variables for these communities which include shoreline modifications and impacts from human disturbance as shown in Appendix G. OCEANBEACH and VEGBEACH communities would increase in coverage with this alternative.

Because this alternative includes the removal of groins, and removal of well structures within the existing dunes it is expected to positively affect the longshore sediment transport and dune development and evolution processes.

Restoration Alternative T-14-2, Groins, Wells, Dune
The goal for T-14-2 would encompass that of T-14-1, and would enhance and restore the dune and beach. Specific components of T-14-2 include:

- Removal of two groins
- Removal of the Ocean Beach water supply well
- Remove sand fence and structures
- Improve walkways
- Regrade and replant dune face

Specifically, T-14-2 would include removing sand fence and structures within approximately 1,200 feet of the existing dune, raising and replacing seven walkways and restoring the dune beneath them. Approximately 1,600 feet of the existing dune face would be regraded to a slope of approximately 20-25%, planting the dune face with approximately 40% cover of vegetation, widening the VEGBEACH community to 120 feet, and the upper 40 feet of the VEGBEACH community would be replanted with dune grass species such as beachgrass, beach plum, seaside goldenrod, and beach heather, and switch grass.

Restoration measures are expected to enhance the existing DUNEGRASS, VEGBEACH, and OCEANBEACH communities and would result in some improvements to the HSI variables for, percent cover of vegetation, impacts from human disturbance, shoreline modifications, slope, and width, as shown in Appendix G. The size of each of these communities is expected to change slightly and this change is reflected in HEP HU calculations.

Alternative T-14-2 includes improving groin and well removal, and significant improvements to dune slope and vegetation, restoring dune areas at access cuts, and beach widening, and thus is expected to positively affect the longshore sediment transport and dune development and evolution processes. Negative impacts to the cross-island transport process might be expected due to closing off dune cuts. However, overwashing at any location along this area is unlikely due to the significant development in the area. Therefore, no negative affects to processes are expected. In addition, components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

Restoration Alternative T-14-3, Groins, Dunes, Home buyouts
The goal of T-14-3 encompasses that of T-14-1 and 2 and would enhance the dune and beach. It also specifies buy-outs of homes currently located in fore dune areas, removing sand fence and

structures within the dune, and raising all existing walkways above the dune. However, instead of restoring dunes to desirable heights and slopes of adjacent dunes, this measure includes the creation of incipient dunes to closely imitate natural dune evolution processes. Specific components of T-14-3 include:

- Removal of two groins
- Removal of the Ocean Beach water supply well
- Remove sand fence and structures
- Improve walkways
- Regrade and replant duneface
- Buy-outs of homes
- Creation of incipient dunes

Restoration measures are expected to result in the same changes in HSI scores as with Alternative T-14-2, however, additional disturbed area would be converted to DUNEGRASS.

Similar to T-14-2 this alternative is expected to positively affect the longshore sediment transport and dune development and evolution processes. Affects are expected to be greater for the dune development process under this alternative, because the structures being removed have a larger impact on the dune system. Components of this alternative (i.e., dune enhancement and replacement) would support storm damage reduction project objectives.

T-15 NEW MADE ISLAND

Overall, sparsely vegetated upland and dune portions of New Made Island are limited. At the highest elevation on the island there is a small sandy area characterized by approximately 35% cover of seaside goldenrod, salt marsh aster, *Phragmites*, milkweed, poison ivy, and rose. Densities of the desirable species quickly diminishes downslope of this area for most of the island, and vegetated areas become dominated by > 95% cover of invasive *Phragmites*, which occurs in high density even in upland areas. Upland shrubs/trees were limited and included junipers < 10 feet in height. Protected, regularly flooded areas, along the southern edge of the island are dominated by desirable salt marsh species that include *Spartina* species, black grass, salt marsh aster, glasswort, and shrubs that include marsh elder and groundsel tree.

As with most islands in the study area, dense *Phragmites* and steep slopes along the northern shoreline of New Made Island pose significant obstacles to passage for some wildlife species. However, diamond back terrapin were observed nesting in the open sandy portion of the island and tracks on the scarp indicate that access to the site was via the scarped bank. Restoration alternatives will avoid disturbance to the existing DUNEGRASS community and will limit activities within the adjacent upland to *Phragmites* control only in order to protect the terrapin nesting area.

As with other dredge islands in the area, sand from the dune face of New Made Island is washed over and around the island to form productive tidal flats and low-lying intertidal areas that support the cross-island process. However, boat traffic and currents negatively affect the dune development process. Relatively unstable dunes are being scarped at an accelerated rate and sand is being moving away from the dune face. As a result, no new natural input of sand is occurring on the island and new dunes are not being formed as a result of the dune erosion. Bayside shorelines and estuarine processes are also somewhat negatively affected by wave action and currents in the bay as the wave action erodes shorelines at an accelerated rate and prohibits establishment of salt marsh communities. Despite this, a relatively large, *Phragmites*-dominated salt marsh, and itertidal zone have formed within protected low-lying areas of the island and around much of the island perimeter.

Restoration Alternative T-15-1, *Phragmites*, Saltmarsh
The goal of T-15-1 is to convert 1.2 ac of existing *Phragmites*-dominated intertidal areas to habitat suitable for shorebird breeding and nesting. Components of T-15-1 include:

- Placement of sand on BAYBEACH

- Control *Phragmites*
- Regrade steep banks

Specifically, sand would be deposited on the island to elevate the grade of the BAYBEACH community to create an open, sandy DUNEGRASS community. Restoration would focus on 1.2-ac area of *Phragmites*-dominated salt marsh (i.e., areas with > 75% cover) and would avoid the approximately 0.5-ac salt marsh area with suitable salt marsh vegetation such as that shown in the figure above (located on the southern end of the island). Activities would minimize disturbance to existing DUNEGRASS and UPLAND areas to avoid impacts to terrapin nesting areas. Fill material placed over *Phragmites* is expected to eliminate most of the *Phragmites* on the site, but herbicide control will be used for removal in the approximately 1.5 ac of UPLAND and existing DUNEGRASS communities. Steep banks around the island would be regraded to improve wildlife accessibility to the site.

Restoration measures are expected to convert *Phragmites*-dominated BAYBEACH to DUNEGRASS. Because *Phragmites* will be manually removed/covered, improvements to HSI variables for the remaining BAYBEACH community are expected to improve somewhat and include percent cover of vegetation, invasive species, and species richness, and barriers to wildlife, as shown in Appendix G. The HSI Scores for the newly created DUNEGRASS would be improved as shown in Appendix G. Under this scenario, the BAYBEACH community would be reduced in size and DUNEGRASS would increase.

Alternative T-15-1 would provide habitat for state and Federally-listed species.

Restoration Alternative T-15-2, *Phragmites*

The goal of T-15-2 is to control *Phragmites* in all communities (3.0 ac). Unlike T-15-1, the existing BAYBEACH community would not be converted to DUNEGRASS with this alternative. Specific components of T-15-2 include:

- Control *Phragmites*
- Regrade steep banks

Restoration measures are expected to enhance conditions of the DUNEGRASS community through Alternative 1, and under this scenario would also enhance the UPLAND community by removing *Phragmites*. Improvements to HSI variables include percent cover of vegetation, invasive species, species richness, and barriers to wildlife, as shown in Appendix G. Under this scenario the BAYBEACH community would be reduced in size and DUNEGRASS would increase due to measures outlines in Alternative 1, but the size of the upland community would not change.

Alternative T-15-2 would positively affect the bayside shoreline and estuarine coastal processes and would provide habitat for state and Federally-listed species.

Restoration Alternative T-15-3, *Phragmites*, Saltmarsh and Shoreline
The goal of T-15-3 would encompass those of T-15-1 and would also include the use of bio-engineering measures to stabilize approximately 1,000 ft of the eroding island shoreline. Specific components of T-15-3 include:

- Preserving tidal flushing in existing saltmarsh
- Regrade shoreline
- Relate some sand onto intertidal areas

Approximately 400 lf of shoreline to the south end of the island will not be stabilized in order to preserve tidal flushing in the existing salt marsh community in the area. Regrading of the shoreline would be required to achieve desired slope (20%), and relocation of sand material into some intertidal areas will be necessary in order to stabilize the island, however, the overall width/size of the BAYBEACH community is not expected to change under this alternative. Dredge material from the island or other sources may be used and may be included as part of dredge material management.

Restoration measures are expected to enhance conditions of the DUNEGRASS community through Alternative 1, would enhance the UPLAND community by removing *Phragmites*, and would improve the long-term stability of the island through Alternative 3. Improvements to HSI variables include percent cover of vegetation, invasive species, species richness, and barriers to wildlife, as shown in Appendix G. Under this scenario acreage changes are expected as part of the BAYBEACH community is converted to DUNEGRASS as part of Alternative 1. The slope of the existing shoreline and BAYBEACH community will be modified in some areas as needed, but the size of the BAYBEACH community will not change.

This alternative would improve upland conditions by removing invasive *Phragmites*, would provide habitat for state and Federally-listed species, and would improve bayside and estuarine processes by creating a relatively stable, vegetated shoreline, with appropriate slope to support salt marsh species.

T-22 ISLIP MEADOWS

The Islip Meadows site (part of the county nature preserve) is characterized by a large salt marsh surrounded on two sides by residential development and recreational areas and surrounded on the remaining sides by the Great South Bay and associated manmade channels. The marsh includes numerous linear ditches that were placed in the marsh to drain portions of the marsh surface as a form of mosquito control. Hydrologic connections between the Great South Bay and the marsh are further restricted at various locations along the shoreline where inlets have filled in with sediment. These inlets are associated with a manmade channel and pool located in the eastern section of the site. Tidal flow in the channels and pool is sporadic due to inlet blockage and other hydrologic restrictions on the marsh surface.

Desirable salt marsh species can be found throughout the marsh and include *Spartina* species, black grass, glasswort, sedges, rushes, salt marsh aster, marsh elder, bayberry, arrowwood, as well as a diversity of upland species on higher elevations within the study site. However, portions of the marsh (particularly in the northern and northwestern portion of the site) are dominated by monocultures of *Phragmites* with > 95% cover.

Restoration Alternative T-22-1, Saltmarsh
The goal of T-22-1 is to restore and maintain regular hydrological connection between the marsh and Great South Bay via stabilized inlets. Two inlets are currently located along the bay shoreline but have filled in with sediment. Specific components of T-22-1 include:

- Excavate sediment from inlet channels
- Install flap gates to maintain tidal flow

This alternative requires excavation of approximately 0.5 ac to remove sediment, and maintenance measures to ensure the long-term hydrologic connection. The installation of two flap gates is proposed to achieve and maintain adequate tidal flow and allow for management of hydrology on the marsh surface. A more natural hydrologic regime on the marsh surface is expected to improve the suitability of the marsh for desirable species.

Restoration measures are expected to enhance conditions of the existing salt marsh (BAYBEACH) community. Improvements to HSI variables include percent cover of vegetation, invasive species, and species richness, as shown in Appendix G. HSI score for Shoreline modification is lowered due to installation of culverts or tide gates on site. Under this scenario there would be no changes to acreages.

Alternative T-22-1 would positively affect estuarine coastal process by improving tidal flushing and flow throughout the marsh and making the site more favorable for desirable salt marsh species.

Restoration Alternative T-22-2, Saltmarsh and Tidal Channels
The goal of T-22-2 encompasses that of T-22-1, and would also create approximately 2,600 lf of tidal channels with a more natural (i.e., sinuous) configuration. Specific components of T-22-2 include:

- Excavate sediment from inlet channels

- Create a more sinuous channel configuration
- Install flap gates to maintain tidal flow

Specifically, marsh areas surrounding the relatively linear man-made channel associated with the pond at this site will be modified to create a more sinuous channel configuration. Some excavated material would be reused on site as part of reconfiguring the existing channel.

This alternative is not expected to result in changes to HSI scores in addition to the changes anticipated from Alternative 1. However, under this scenario there would be a gain in acreage of BAYSUBSAV and a loss for BAYBEACH as some salt marsh areas would be converted to create a sinuous permanently flooded channel.

Similar to alternative T-22-1, this alternative would positively affect estuarine coastal process by improving tidal flushing and flow throughout the marsh and making the site more favorable for desirable salt marsh species. Positive affects from this alternative are expected to be greater than with alternative T-22-1.

Restoration Alternative T-22-3, Ditches, Saltmarsh Pools, and *Phragmites*
The goal of T-22-3 would be to create pool habitat and control *Phragmites* throughout the site. Specific components of T-22-3 include:

- Plug 10 ditches
- Excavate 0.5 acres in high marsh areas to create pool habitat
- Herbicide control of *Phragmites*

The purpose of the ditch plugging would be to increase the hydroperiod on the marsh surface. Excavation of approximately 0.5 ac in high marsh areas would be intended to create pool habitat. Herbicide control of *Phragmites* would occur throughout the approximately 45-ac site, particularly in the northern portion of the marsh where the invasive species has formed dense monocultures. *Phragmites* removal methods will include herbicide application and flooding. It is assumed that excavated material from created pool areas would be reused on site to plug ditches.

Restoration measures are expected to enhance conditions of the existing salt marsh (BAYBEACH) and create additional permanently flooded areas (BAYSUBSAV) within the marsh system. Improvements to HSI variables include reducing invasive species, and improving species richness, as shown in Appendix G. Under this scenario there would be a gain in acreage of BAYSUBSAV and a loss for BAYBEACH as some salt marsh areas would be converted to permanently flooded pools.

This alternative would also positively affect estuarine coastal process by improving tidal flushing and flow throughout the marsh and making the site more favorable for desirable salt marsh species. Positive affects from this alternative are expected to be greater than with alternative T-22-1 and T-22-2.

T-23 SEATUCK REFUGE

The Seatuck site (part of the U.S. Fish and Wildlife Service's Wildlife Refuge) is characterized by a relatively large salt marsh surrounded on two sides by residential development and surrounded on the remaining sides by the Great South Bay and Champlain Creek. The marsh includes numerous linear ditches that were placed in the marsh to drain portions of the marsh surface as a form of mosquito control, and several disturbed areas associated with dredge/fill deposition sites. Three culverts located along the south shore of the site were intended to provide hydrologic connections between the Great South Bay and the marsh. However, culverts are undersized and/or degraded and as a result hydrologic flow to the marsh is restricted at these locations. Various areas of shoreline along Champlain Creek have been bulkheaded and as a result have minimal to no intertidal zone.

Desirable salt marsh species can be found throughout the marsh and include *Spartina* species, black grass, glasswort, sedges, rushes, salt marsh aster, marsh elder, bayberry, arrowwood, as well as a diversity of upland species on higher elevations within the study site. However, portions of the marsh (particularly in the southern and southeastern portion of the site) are dominated by monocultures of *Phragmites* with > 95% cover.

Restoration Alternative T-23-1, Saltmarsh

The goal of T-23-1 is to convert approximately 6 ac of disturbed area to salt marsh and restore and maintain regular hydrological connection between the marsh and Great South Bay via stabilized inlets or culverts. Specific components of T-23-1 include:

- Replace existing culverts
- Reduce coverage of *Phragmites*
- Excavate filled sites to create wetlands

Three culverts are currently located along the bay shoreline but do not provide adequate hydrologic flow into the marsh. As a result, the lower portion of the marsh is dominated by *Phragmites*. T-23-1 includes measures to replace existing culverts with three 48-inch culverts of adequate size to restore and maintain long-term hydrologic connection. A more natural hydrologic regime on the marsh surface is expected to improve the suitability of the marsh for desirable species and reduce the coverage of some of the *Phragmites* currently found on the marsh. In addition dredge/fill deposition sites will be excavated to a depth appropriate for establishment of a brackish wetland shrub community and the sites will be replanted with native shrub species including 4 ac of emergent wetland species such as salt marsh cordgrass, salt meadow hay, seashore saltgrass, and black grass, and 2 ac of wetland shrubs such as marsh elder, blueberry, bayberry, and groundsel tree to facilitate establishment of the marsh. .

Restoration measures are expected to convert disturbed dredge/fill sites to salt marsh and to enhance conditions of the existing salt marsh (BAYBEACH) community by restoring hydrology to the marsh surface. Improvements to HSI variables include percent cover of vegetation, invasive species, and species richness, as shown in Appendix G. HSI score for Shoreline modification is lowered due to installation of culverts or tide gates on site. Under this scenario there would be an increase in acreage for BAYBEACH.

T-23-1 would positively affect estuarine coastal process by improving tidal flow, removing invasive species and fill material and making the estuarine system more favorableove4rall to desirable species.

Restoration Alternative T-23-2, Saltmarsh and *Phragmites*

The goal of T-23-2 encompasses that of T-23-1, and adds efforts to create tidal channels with a more natural (i.e., sinuous) configuration and herbicide methods to control *Phragmites*, particularly in the southern portion of the marsh where the invasive species has formed dense monocultures. Specific components of T-23-2 include:

- Increase channel sinuosity
- Control *Phragmites*

Specifically, marsh areas surrounding the relatively linear man-made channel that bisects the site from east to west will be modified to create a 2,500 lf sinuous channel. Excavated material would be reused on site as part of reconfiguring the existing channel. *Phragmites* control measures will be implemented throughout the 90-ac site and will include herbicide application and flooding.

Restoration measures will further control *Phragmites* on the marsh, but otherwise are not expected to result in changes to HSI scores in addition to the changes anticipated from Alternative 1. However, under this scenario there would be a gain in acreage of BAYSUBSAV and a loss for BAYBEACH as some salt marsh areas would be converted to create a sinuous permanently flooded channel. The size of each of these communities is expected to change slightly and this change is reflected in HEP HU calculations.

Similar to alternative T-23-1, this alternative would positively affect estuarine coastal process by improving tidal flushing and flow throughout the marsh and the removal of Phragmites, thus making the site more favorable for desirable salt marsh species. Positive affects from this alternative are expected to be greater than with alternative T-23-1.

Restoration Alternative T-23-3, Saltmarsh, *Phragmites*, Bulkhead

The goal of T-23-3 would encompass the goals for T-23-1 and 2, and would remove 1,700 lf of the existing bulkhead along the western shoreline of Champlain Creek to restore the intertidal zone. Specific aspects of T-23-3 would include:

- Regrade shoreline
- Replant intertidal areas

The 1,700 lf area would be regraded as needed to create a suitable transition from low marsh into upland, and techniques such as bio-logs or geo-textile tube would be used to stabilize 1,700 lf of shoreline bank. Intertidal areas would be replanted with approximately 2 ac of native salt marsh species including 1.5 ac of emergent wetland species such as salt marsh cordgrass, salt meadow hay, seashore saltgrass, and black grass, and 0.5 ac of wetland shrubs such as marsh elder, blueberry, bayberry, and groundsel tree to facilitate establishment of the marsh. Dredge material may be utilized to restore grade in support of dredge material management activities.

Restoration measures are expected to convert disturbed dredge/fill sites to salt marsh and to enhance conditions of the existing salt marsh (BAYBEACH) community by restoring hydrology to the marsh surface, and will convert disturbed (bulkheaded) areas to BAYBEACH. In addition, this alternative is expected to enhance conditions of the existing salt marsh (BAYBEACH) by reducing the presence of invasive species and would create additional permanently flooded areas (BAYSUBSAV) within the marsh system by modifying the configuration of an existing linear tidal channel. Improvements to HSI variables include percent cover of vegetation, invasive species, and species richness, as shown in Appendix G. The size of each of these communities is expected to change slightly and this change is reflected in HEP HU calculations.

This alternative would positively affect estuarine coastal process by improving tidal flushing and flow throughout the marsh and the removal of *Phragmites*, thus making the site more favorable for desirable salt marsh species. In addition, removal of hard structures will positively affect the bayside processes by returning the shoreline to a more natural vegetated state. .

T-24 DAVIS PARK

Similar to other barrier island residential communities, Davis Park is characterized by commercial development, bulkheading, marinas, and boat slips that dominate the bay side shoreline, and residential housing, commercial development, paved roads and trails that dominate upland and dune areas. Dunes at this site have been significantly impacted by the placement of hard structures within foredunes, sand fence, debris, pedestrian walkways, and a large 500-foot vehicle access cut. Portions of the beach are narrow (< 70 feet from toe of dune to average high water line) and the beach is experiencing significant seasonal scarping at the high water line. In the center of Davis Park there is approximately a 1000-foot section where the dune is essentially absent or very low. The low dune is the result of anthropogenic actions for recreational benefit and not natural processes. Public access to the beach throughout Davis Park is via cuts in the dune, rather than boardwalks that cross above the dunes and thus interfere with dune development and evolution. In addition, there is a dune cut for vehicle access in the approximately one thousand foot low dune area. Recreational use of the beach by pedestrians is high and vehicles are permitted on the beach. The driving regulations, developed under NPS negotiated rule making, call for the relocation of all driving from the beach to the interior road.

As with other highly-developed areas of the barrier island, the bayside shoreline and estuarine processes at Davis Park have been negatively impacted and appear to be most affected by hard structures such as extensive bulk heading, boat slips, buildings and various human activities in the area, particularly those associated with the highly developed community. Impacts have directly and indirectly affected the shoreline, intertidal, and aquatic areas of the site. Additionally, the dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, residential housing, and other hard structures within upland and dune areas, and overall direct human use of the area. The negative impacts to the cross-island process could be somewhat offset by a large cut in the dune that allows for vehicle access to the beach. However, even if an overwash were to occur at the dune cut, significant alterations and hard structures bayside would severely inhibit environmental benefits that would normally be expected from an overwash event.

Restoration Alternative T-24-1, Dune

The goal of T-24-1 is to restore the dune by closing off a 500 foot wide area of dune cut (1 ac) located at the vehicle access cut and convert the disturbed area to DUNEGRASS. Specific components of T-24-1 include:

- Closing the vehicle access cut
- Planting as needed

The restored dune would have characteristics similar to incipient dunes (i.e., DUNEGRASS slope 5-10%, vegetation 20%, and width 25 ft) rather than large fore dunes (i.e., slope 20-25%, and width 50 ft). Planting would be conducted as needed to stabilize the area. The incipient dune would close an existing vehicle cut. However, there are dune cuts at Watch Hill and Blue Point Beach located on either side of Davis Park, thus this cut is not essential to provide for the direction of traffic from the beach to the interior road.

Restoration measures would convert disturbed habitat to DUNEGRASS. Human disturbance and human impact HSI variable scores for the new dune will improve as a result of this activity because a large access point for vehicles will be closed off. However, because the site is small relative to the beach and dune found it the overall area, the activity will not result in any significant changes tot eh HSI score for the overall site.

T-24-1 is expected to result in somewhat positive affects on the dune development and evolution process and a slightly negative affect on the cross-island transport process due to creation of a dune in the area most susceptible to overwashing. This affect is only slightly negative due to the insipient nature of the dune. Components of this alternative (i.e., dune enhancement and placement of insipient dunes at existing cuts) would support storm damage reduction project objectives.

Restoration Alternative T-24-2, Dune and Walkways
The goal of T-24-2 would include activities from T-24-1 and would also enhance approximately 4,700 lf of existing dune to create conditions similar to a young insipient dune, and convert disturbed dunes areas to dune. Specific components of T-24-2 include:

- Closing vehicle access
- Relocate 16 walkways
- Remove sand fence
- Convert disturbed habitat to DUNEGRASS

Sixteen (16) walkways from residential areas will be replaced at elevations above the dune, and insipient dunes will be restored beneath them. Sand fence and similar sand retention structures would be removed from approximately 3,500 lf of dune. Enhanced and created dunes would have characteristics similar to insipient dunes rather than large fore dunes as described above.

Restoration measures would convert disturbed habitat to DUNEGRASS and would enhance conditions of existing dune areas. Because Alternative 2 would affect the overall dune area and beach area of the site, some improvements to HSI scores are expected. However, these changes will reflect insipient dune conditions.

T-24-2 is expected to result in a positive affect on the dune development and evolution process and a slightly negative affect on the cross-island transport process due to creation of a dune in the area most susceptible to overwashing. This affect is only slightly negative due to the insipient nature of the dune. Components of this alternative (i.e., dune enhancement and placement of insipient dunes at existing cuts) would support storm damage reduction project objectives.

Restoration Alternative T-24-3, Dunes, Walkways, and Structure Buyout
The goal of T-24-3 would encompass the goals of T-24-1 and 2, and would buy-out and relocate/remove the Casino Restaurant to a position north of Burma Road, and create an insipient dune in the 0.75 ac disturbed area. Specific components of T-24-3 include:

- Closing vehicle access
- Relocate 16 walkways
- Remove sand fence
- Convert disturbed habitat to DUNEGRASS
- Removal of the Casino Restaurant

Removal of the Casino Restaurant, combined with previous alternatives, would allow for future migration of the constructed incipient dune at Davis Park and would contribute to dune development and evolution as well as storm damage protection. This alternative would also include the conversion of 2.1 ac of disturbed area adjacent to the marina to upland habitat by restricting vehicle access and replanting the site with 2 ac of upland species such as post oak, sassafras, cherry, and serviceberry. Sandy-loam dredge material would be added to improve suitability of substrate for upland species.

Improvements to HSI scores would be the same as those expected for T-24-2. However, UPLAND HSI scores would improve slightly through plantings and restrictions to access to this area. The extent of UPLAND and DUNEGRASS communities will increase under this option.

T-24-3 is expected to result in positive affects on the dune development and evolution process and a negative affect on the cross-island transport process due to restoration of the upland community and placement of an insipient dune in the area most susceptible to overwashing. Affects are expected to be greater for the dune development process under this alternative, because the structures being removed have a larger impact on the dune system. Components of this alternative (i.e., dune enhancement and placement of insipient dunes at existing cuts) would support storm damage reduction project objectives.

T-25 ATLANTIQUE TO CORNEILLE

The area from Atlantique to Corneille (T-25) includes habitat representative of the six HEP community model types. The site is similar to the Reagan site in that well-vegetated upland and dune areas characterize the site and these communities are located adjacent to densely populated residential communities. Bayside portions of the shoreline are bulkheaded and include boat docks and commercial development. Other areas of the shoreline are experiencing accelerated rates of erosion, which is severe in some areas. Vehicle cuts and pathways are interspersed throughout the upland and dune communities and cuts in the dune provide access to the beach. Overall the dunes and beach in the area are of moderate size and width and experience moderate recreational use. Several buildings have been built within the fore dune area and appear to extend into the upper beach zone. The highly developed communities of Atlantiqe (to the west) and Corneille Estates (to the east) abut the site.

This site closely resembles the Reagan site. Bayside shoreline and estuarine processes have been negatively impacted and appear to be most affected by hard structures such as extensive bulk heading, boat slips, buildings and various human activities in the area, particularly those associated with the highly developed community of Fire Island Pines. Impacts have resulted in accelerated shoreline erosion in unprotected areas and direct loss of shoreline and intertidal areas. Additionally, the dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, residential housing, and other hard structures within upland and dune areas, and overall direct human use of the area. However, some of the negative impacts to processes from the development may be somewhat offset by the presence of large undeveloped upland and dune areas within the site. These low-lying areas are relatively natural and likely have a positive affect on the five coastal processes.

Restoration Alternative T-25-1, Cross Island Processes

The goal of T-25-1 is to simulate cross-island overwashing without disturbing existing upland and dune communities by creating a sand lobe on the bayside shoreline of the site to provide sand input for bayside processes. Specific components of T-25-1 include:

- Deposit sand on bayside
- Create a sand spit

Restoration measures would include the deposition of approximately 15 ac of sand material up to 100 feet from the existing 1,900 ft shoreline and located between the eastern boundary of the Village of Atlantique to the western boundary of Corneille Estates. Dredge material may be utilized to restore grade in support dredge material management activities. Efforts would be made to create sand spit habitat that would provide habitat for foraging shorebirds. Under this scenario, there would be an initial sand deposition event and no additional deposition throughout the 50-year project life. No plantings or other shoreline modifications are proposed.

T-25-1 would result in the conversion of some BAYSUBSAV to BAYBEACH, thus acreages will change. This activity supports a key bay process, but will not affect HSI scores because variables in the models do not account for the habitat changes anticipated from this alternative.

This alternative is expected to result in a positive affect on the cross-island and bay shoreline processes by simulating a breach event.

Restoration Alternative T-25-2, Multiple Cross Island
The goal for T-25-2 is similar to T-25-1, but differs in that additional sand material would be placed on the site 15 and 35 years following the initial sand deposition activity for a total of 45 ac of sand deposition. As with T-25-1, no plantings or other shoreline modifications are proposed. Specific components of T-25-2 include:

- Deposit sand on bayside multiple times
- Create a sand spit

This alternative would result in the conversion of some BAYSUBSAV to BAYBEACH. This activity supports a key bay process, but will not affect HSI scores. HSI scores are expected to remain the same as scores prior to restoration.

T-25-2 is expected to result in a positive affect on the cross-island and bay shoreline processes by simulating a breach event.

Restoration Alternative T-25-3, Habitat Restoration
The goal of T-25-3 is to restore and enhance upland, dune, and upper beach habitats. Specific components of T-25-3 include:

- Enhance dune width and slope
- Plant dune species
- Eliminate human disturbances

Specifically, the slope and width of 2,000 lf of the existing dune would be enhanced to replicate foredune (i.e., slope of approximately 20-25%, 50 foot wide, 40% cover of vegetation), and the VEGBEACH community would be widened to 120 feet and the upper 40 feet would be planted with dune grass species (i.e., beachgrass, beach plum, seaside goldenrod, and beach heather, and switch grass). Approximately 3.6 ac of sand roads and trails would be eliminated and the disturbed areas converted to 0.8 ac of UPLAND and 2.8 ac of DUNEGRASS. One road will remain to provide access between Atlantique and Cornielle Estates.

Restoration measures would convert of some disturbed areas to UPLAND, DUNEGRASS and VEGBEACH HEP communities and enhance existing VEGBEACH and DUNEGRASS communities. HSI scores are expected to improve for several variables.

T-25-3 is expected to result in a positive affect on the dune development and evolution process and a slightly negative impact on the cross-island process due to restoration of fore dunes, and presence of dense upland forest, in areas most susceptible to overswashing. Components of this alternative (i.e., dune enhancement) would support storm damage reduction project objectives.

T-26 KISMET, ATLANTIQUE, FAIR HARBOR

Areas included in this restoration site closely resemble those found at Ocean Beach and typical of a highly developed barrier island community. Bayside intertidal areas are limited due to commercial development, bulkheading, marinas, and boat slips that currently dominate the bay side shoreline. Residential housing, commercial development, and paved roads and trails dominate interior upland and dune areas. Hard structures, sand fence, debris, makeshift sand stabilizers, and pedestrian walkways and access cuts have impacted dunes and the upper beach. Portions of the beach are narrow (< 50 feet from toe of dune to average high water line) and the beach is experiencing significant seasonal scarping at the high water line in some areas. Recreational use of the beach by pedestrians is moderate and use of vehicles is permitted on the beach.

Similar to all other highly-developed areas of the barrier island, the bayside shoreline and estuarine processes at these sites have been negatively impacted by hard structures such as extensive bulk heading, boat slips, marinas, buildings and various human activities in the area. Impacts have negatively affected the shoreline, intertidal, and aquatic areas of the site. Additionally, the dune development and evolution and cross-island sediment transport processes have also been significantly negatively affected by placements of boardwalks, sand fence, residential housing and other hard structures within upland and dune areas, and overall direct human use of the area.

Restoration Alternative T-26-1, Dune and Beach

The goal of T-26-1 is to restore the dune and upper beach along 1,200 lf of shoreline in front of the highly developed community of Kismet. Specific components of T-26-1 include:

- Buyout and remove houses
- Rebuild walkways
- Enhance dune
- Enhance upper beach

Specifically, this alternative will include the buy-out and removal of five homes currently located within the fore dune area. Activities will also include rebuilding five existing pedestrian walkways and restoring the dune beneath them to fore dune height, width, and vegetative composition. The slope and width of the dune throughout the area will be improved to fore dune width (50 feet) and slope (20-25%), and dunes will be revegetated to 40% cover of dune species. The width of the upper beach (VEGBEACH) community will be extended to an average width of 120 feet and the upper 40 feet will be planted to stabilize.

Restoration measures are expected to convert some disturbed areas to DUNEGRASS, some OCEANBEACH to VEGBEACH and to enhance the existing DUNEGRASS and VEGBEACH communities. The activity is expected to result in some improvements to the HSI variables for, percent cover of vegetation, impacts from human disturbance, shoreline modifications, slope, and width, as shown in Appendix G. The size of each of these communities is expected to change slightly and this change is reflected in HEP HU calculations.

T-26-1 includes increasing dune slope and restoring the dune beneath a walkway in front of a highly developed community. As a result, it expected to have a positive affect on the longshore sediment transport. Although foredune replacement tends to negatively affect the cross-island process by blocking potential overwash areas. It will not do so in this case because overwash potential in this area is very low due to the presence of the residential community behind the dune. Components of this alternative (i.e., dune enhancement) would support storm damage reduction project objectives.

Restoration Alternative T-26-2, Dune, Beach, House Buyout, and Walkways
The goal of T-26-2 encompasses that of T-26-1, and will also restore additional dune and beach. Specific components of T-26-2 include:

- Buyout and remove houses
- Rebuild walkways
- Enhance dune
- Enhance upper beach

Restoration would occur at 800 lf of dune and upper beach in front of the highly developed communities of Atlantique; the project would also include the buy-out of four houses, and removal and restoration of four additional walkways above the dune.

HSI changes will be the same as with T-26-1 in that there will be the same enhancements to the variables for the existing DUNEGRASS and VEGBEACH communities. The difference between T-26-1 and T-26-2 is the size of the area proposed for restoration. As with T-26-1, disturbed areas will be converted to DUNEGRASS, and some OCEANBEACH will be converted to VEGBEACH, however this change encompasses more area with T-26-2.

This alternative includes increasing dune slope and restoring the dune beneath a walkway in front of a highly developed community. As a result, the activities are expected to have a positive affect on the longshore sediment transport. Although foredune replacement tends to negatively affect the cross-island process by blocking potential overwash areas. It will not do so in this case because overwash potential in this area is very low due to the presence of the residential community behind the dune. Components of this alternative (i.e., dune enhancement) would support storm damage reduction project objectives.

Restoration Alternative T-26-3, Dune, Beach, House Buyout, and Walkways, Plus
The goal of T-26-3 will encompass the goals of T-26-2, and will restore an additional 850 lf of dune and beach in front of the highly developed community of Fair Harbor. Specific components of T-26-3 include:

- Buyout and remove houses
- Rebuild walkways
- Enhance dune
- Enhance upper beach

This alternative also includes the buy-out and removal of seven additional homes, and replacement of two boardwalks above the dune.

HSI changes will be the same as with T-26-2 in that there will be the same enhancements to the variables for the existing DUNEGRASS and VEGBEACH communities. The difference between 26-3 and 26-2 is the size of the area proposed for restoration. As with 26-2, disturbed areas will be converted to DUNEGRASS, and some OCEANBEACH will be converted to VEGBEACH, however this change encompasses more area with 26-3.

Restoration measures include increasing dune slope and restoring the dune beneath a walkway in front of a highly developed community. As a result, the activities are expected to have a positive affect on the longshore sediment transport. Although foredune replacement tends to negatively affect the cross-island process by blocking potential overwash areas. It will not do so in this case because overwash potential in this area is very low due to the presence of the residential community behind the dune. Components of this alternative (i.e., dune enhancement) would support storm damage reduction project objectives.

T-27 WARNER ISLAND EAST

Warner Island East is a former "island" that is essentially now a sandy spit that is exposed only during low tide conditions. Severe erosion has resulted in the loss of most of the original dredge material from the site and currently only two of the six HEP communities are represented at this location (BAYBEACH and BAYSUBSAV). When exposed, the site served as loafing/resting area for shorebirds, waterbirds, and gulls. However, there is potential to restore the site to habitat conditions that would support shorebird or heron nesting activities.

Erosive forces have negatively disrupted all coastal processes at Warner's Island East.

Restoration Alternative T-27-1, Dunegrass

The goal of T-27-1 is to create additional DUNEGRASS habitat. Specific components of this alternative include:

- Add sand
- Plant dune species

Material would be added to the site and planted as needed to create 3 ac of DUNEGRASS habitat that would support breeding/nesting shorebirds (i.e., sparsely vegetated dune habitat). DUNEGRASS species would include American beachgrass, beach plum, seaside goldenrod, and beach heather. Dredge material may be utilized to restore grade in support of dredge material management activities.

Restoration measures would result in the conversion of some BAYBEACH community to DUNEGRASS. The HSI scores for the DUNGRASS community would represent conditions suitable for shorebird nesting (i.e., lack of invasive species, appropriate dune vegetative cover, and lack of hard structures and human disturbance, etc.).

T-27-1 is expected to positively affect the bayside shoreline Process and would provide habitat for state and/or Federally-listed species.

Restoration Alternative T-27-2, Upland

The goal of T-27-2 is to create a heron rookery. Specific components of T-27-2 include:

- Add topsoil
- Plant upland shrubs and trees

Material would be added to the site, which would then be planted as needed to create 3 ac of UPLAND habitat that would support breeding/nesting herons (i.e., tall shrubs and trees). UPLAND species would include cherry, holly, post oak, and sasafrass. Dredge material may be utilized to restore grade in support of dredge material management activities.

Restoration measures would result in the conversion of some BAYBEACH community to UPLAND. The HSI scores for the UPLAND community would represent conditions suitable for heron nesting (i.e., lack of invasive species, appropriate tree and shrub vegetative structure and cover, and lack of hard structures and human disturbance).

T-27-2 is expected to positively affect the bayside shoreline Process.

Restoration Alternative T-27-3, Dunegrass and Shoreline Stabilization
The goal of T-27-3 encompasses that of T-27-1 (creation of DUNEGRASS) and also would include the use of bio-engineering measures. Specific components of T-27-3 include:

- Add sand
- Plant dune species
- Use bio-engineering measures to 1,500 lf of the island shoreline

Bio-engineering measures would stabilize 1,500 lf of the island shoreline once appropriate elevations are achieved. The shoreline and BAYBEACH slope would be modified as part of this alternative, but the overall size and width of the community would not be altered. Dredge material from the island or other sources may be used and may be included as part of dredge material management.

Restoration measures would result in the conversion of some BAYBEACH community to DUNEGRASS. The HSI scores for the DUNGRASS community would represent conditions suitable for shorebird nesting (i.e., lack of invasive species, appropriate dune vegetative cover, and lack of hard structures and human disturbance, etc.).

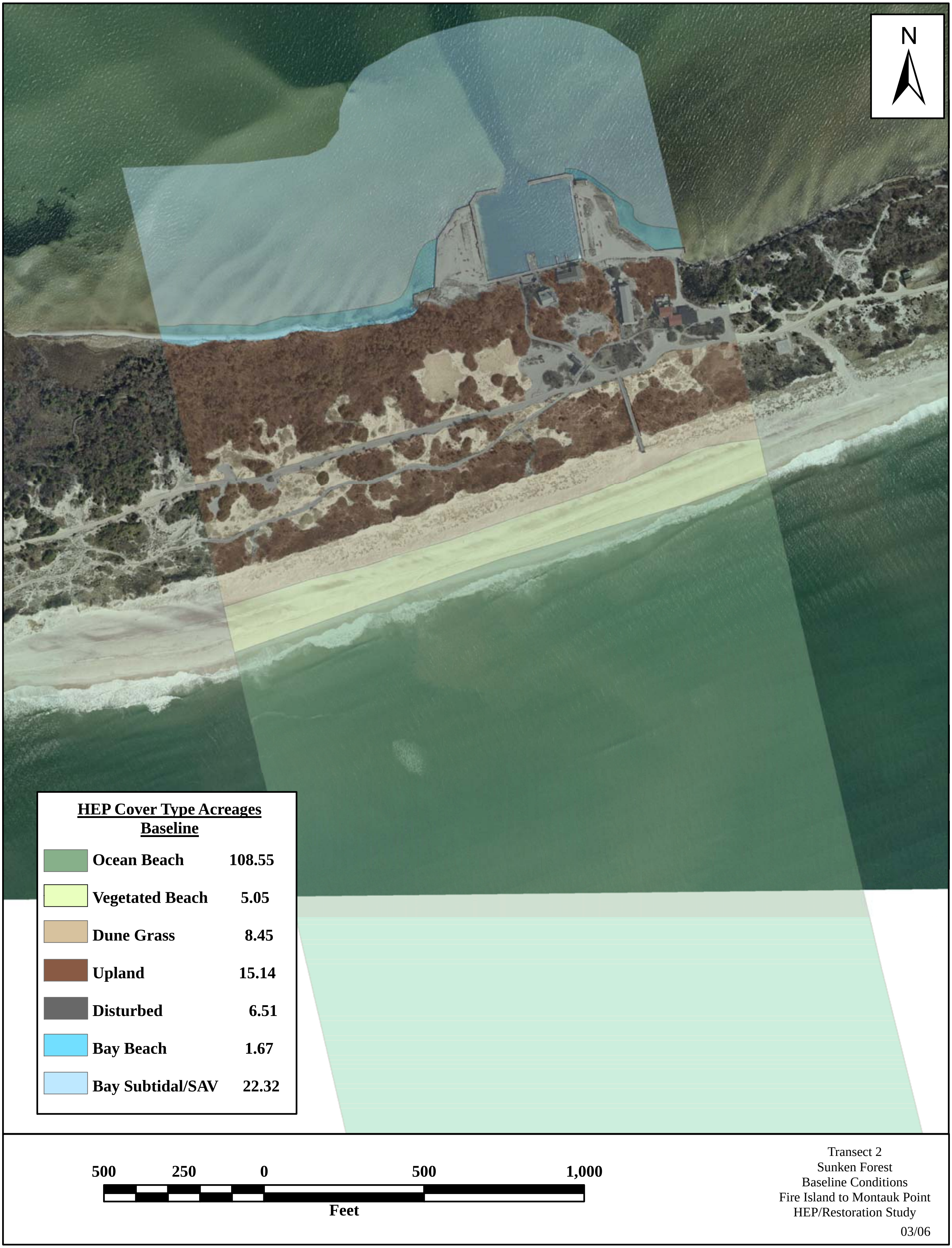
T-27-3 is expected to positively affect the bayside shoreline Process and would provide long-term habitat for state and/or Federally-listed species.

RESTORATION SITE FIGURES

BASELINE COMMUNITY TYPES
AND
FUTURE COMMUNITY TYPES
WITH
RESTORATION ALTERNATIVES

Transect 2

Sunken Forest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Vegetated Beach 5.05
Dune Grass 8.45
Upland 15.14
Disturbed 6.51
Bay Beach 1.67
Bay Subtidal/SAV 22.32
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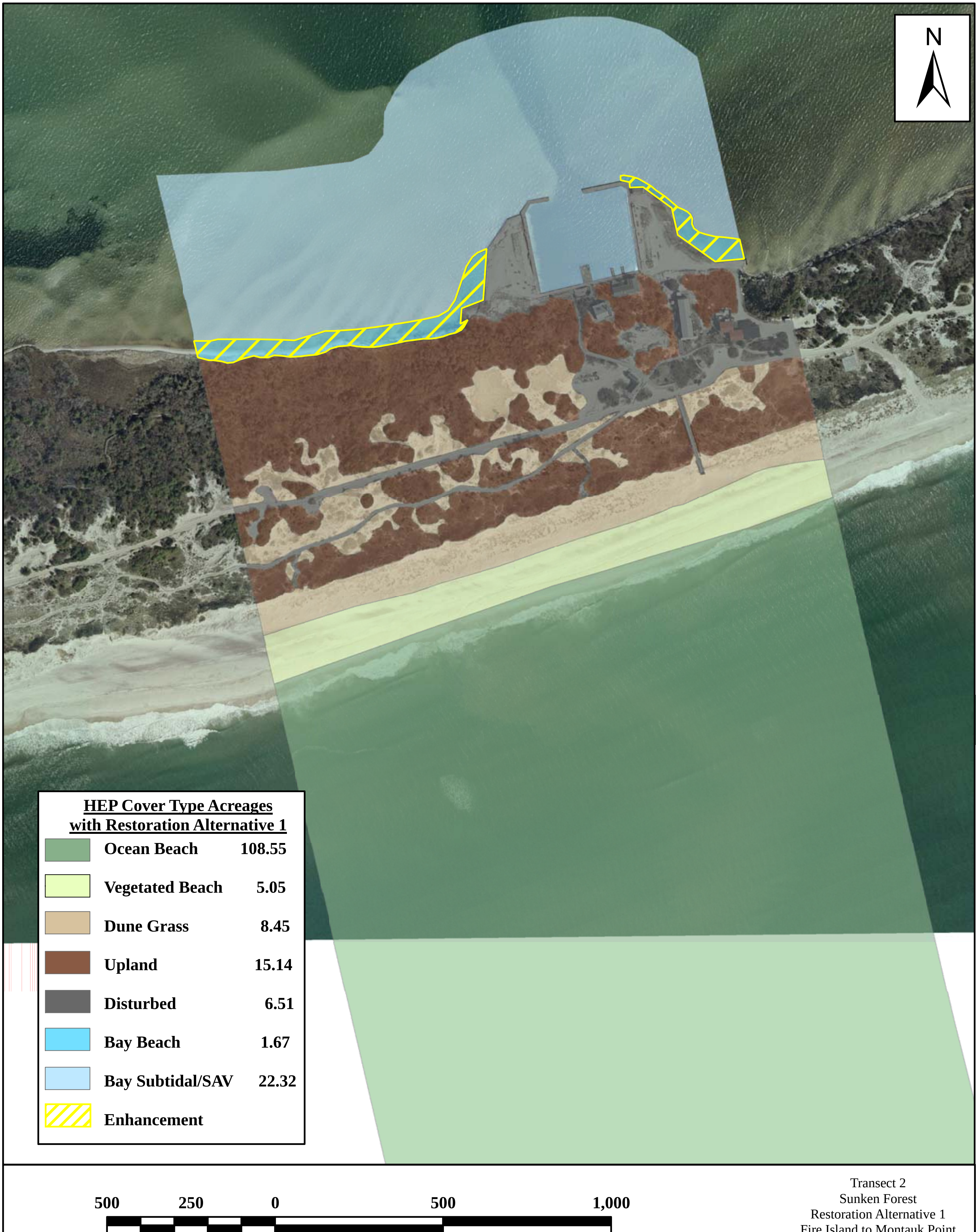
Feet
Transect 2
Sunken Forest
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study
03/06



Transect 2
Sunken Forest
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

05/06

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Feet

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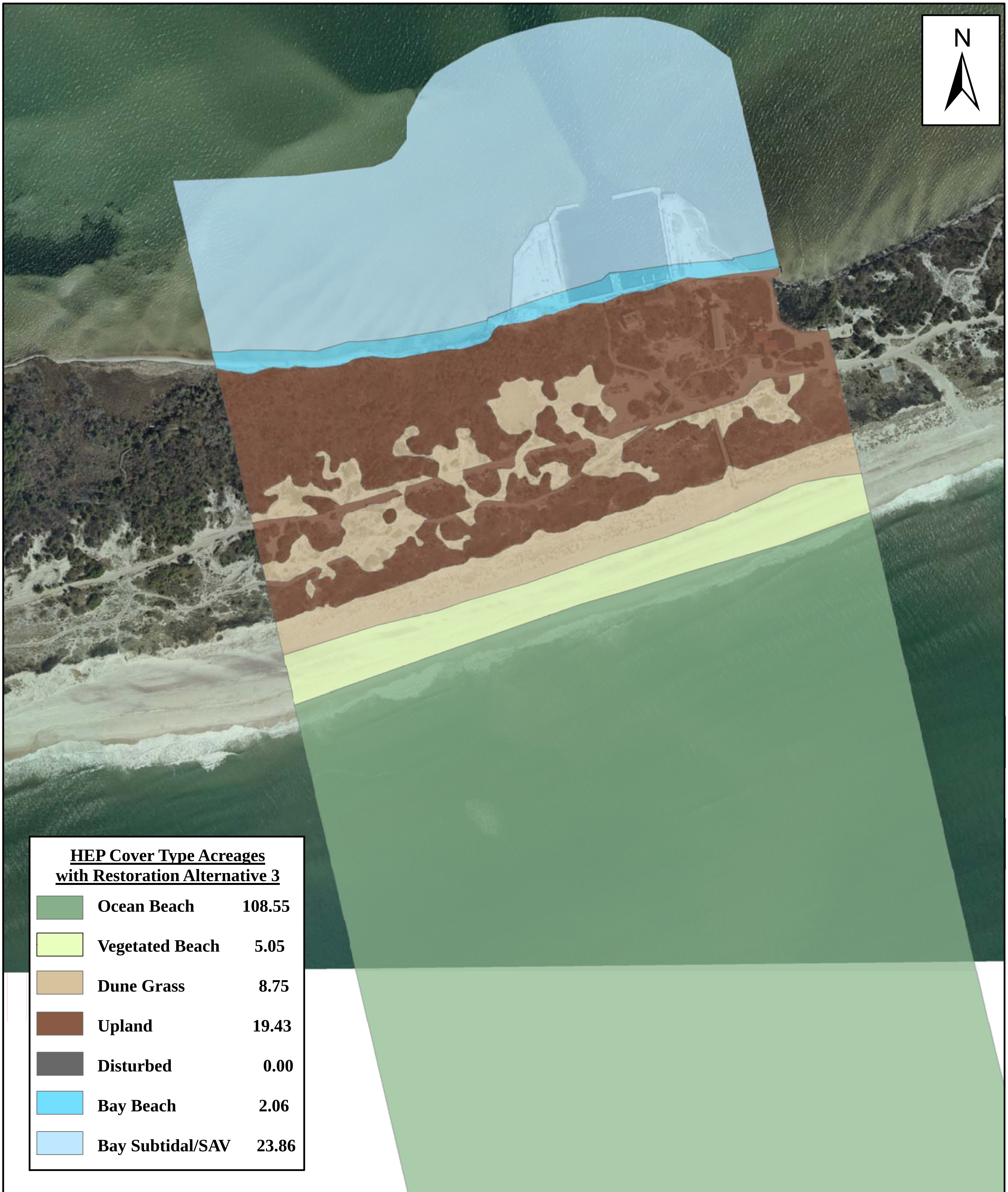
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

05/06



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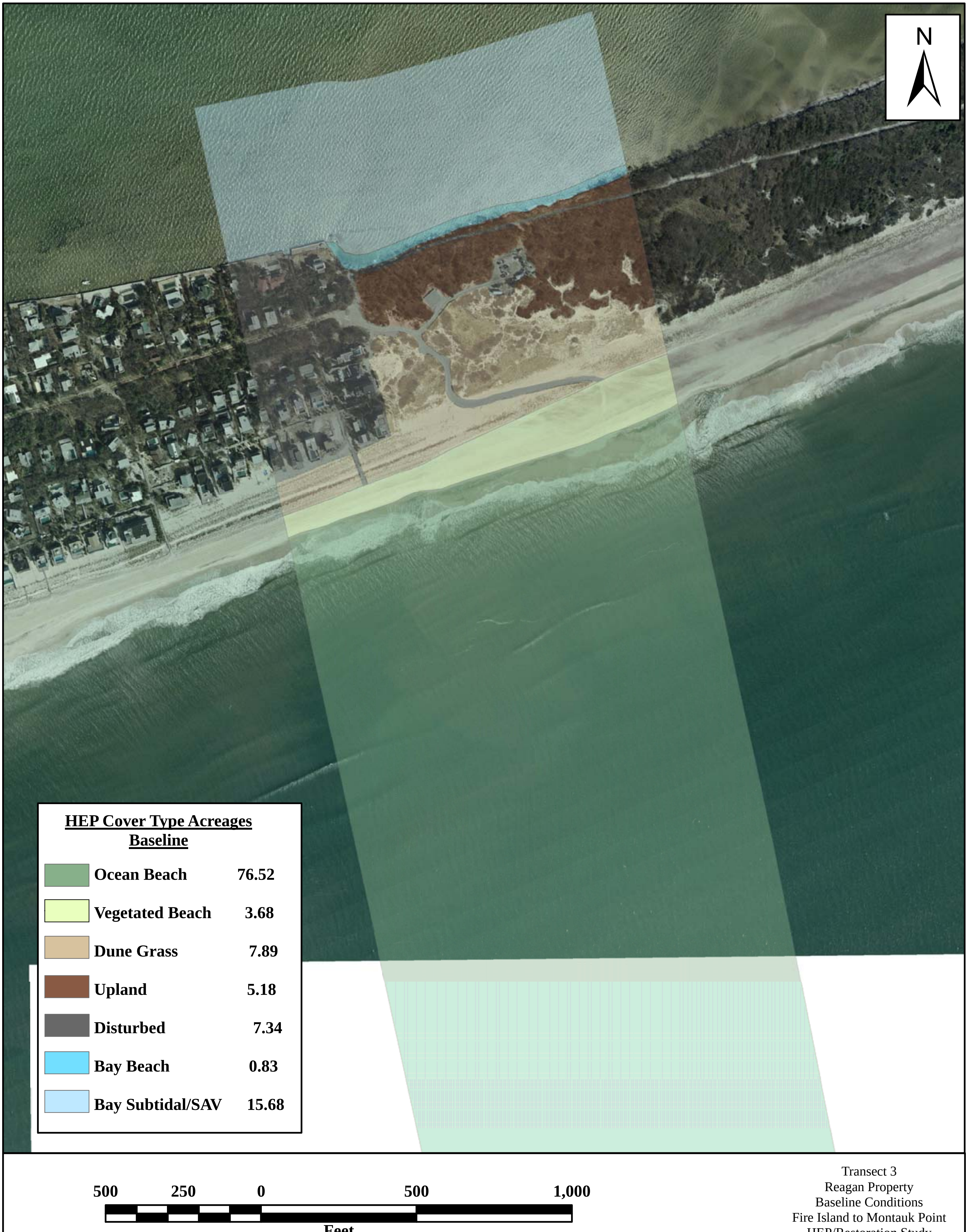
Feet

Transect 2
Sunken Forest
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

03/06

Transect 3

Reagan Property



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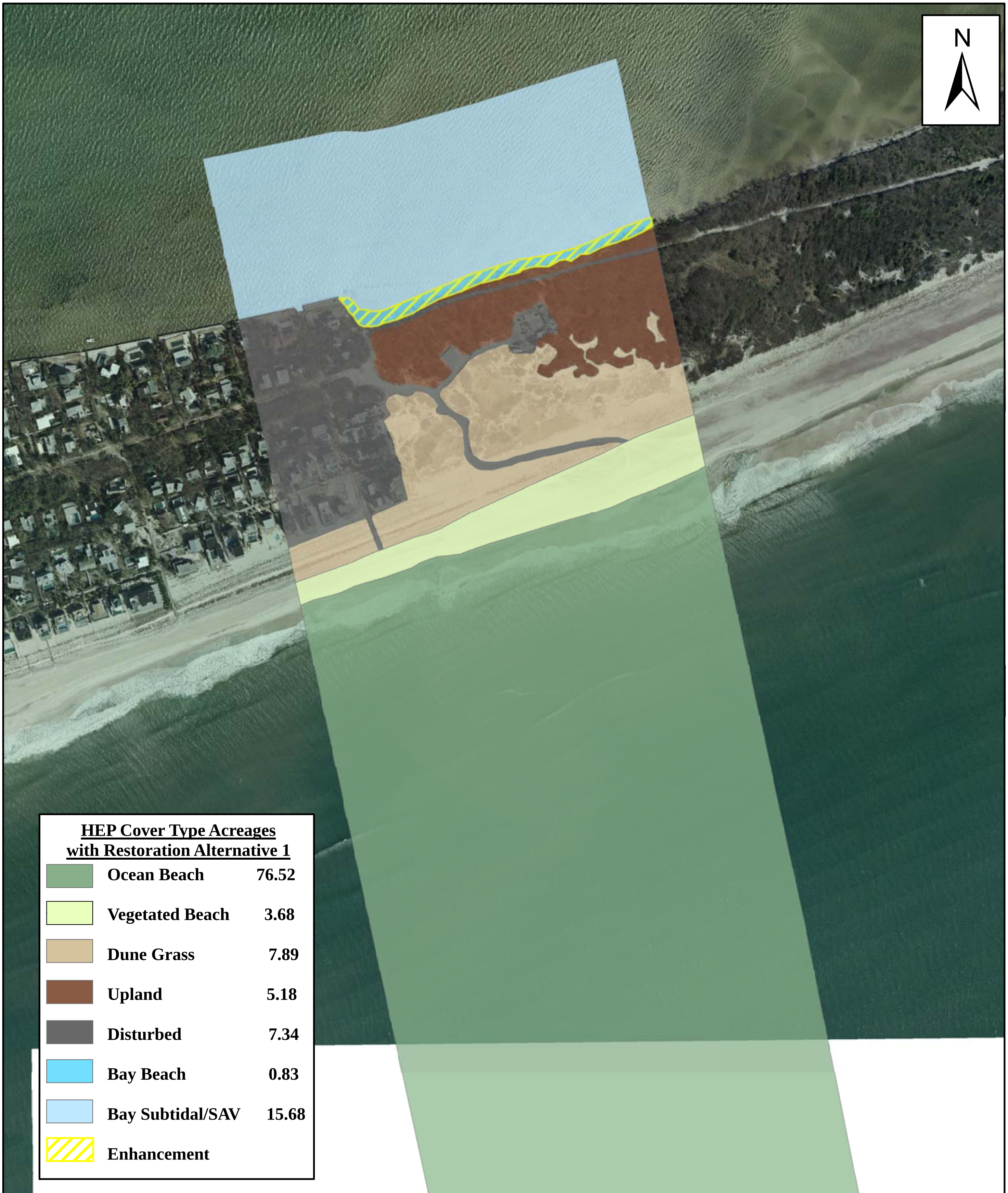
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

03/06



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Feet

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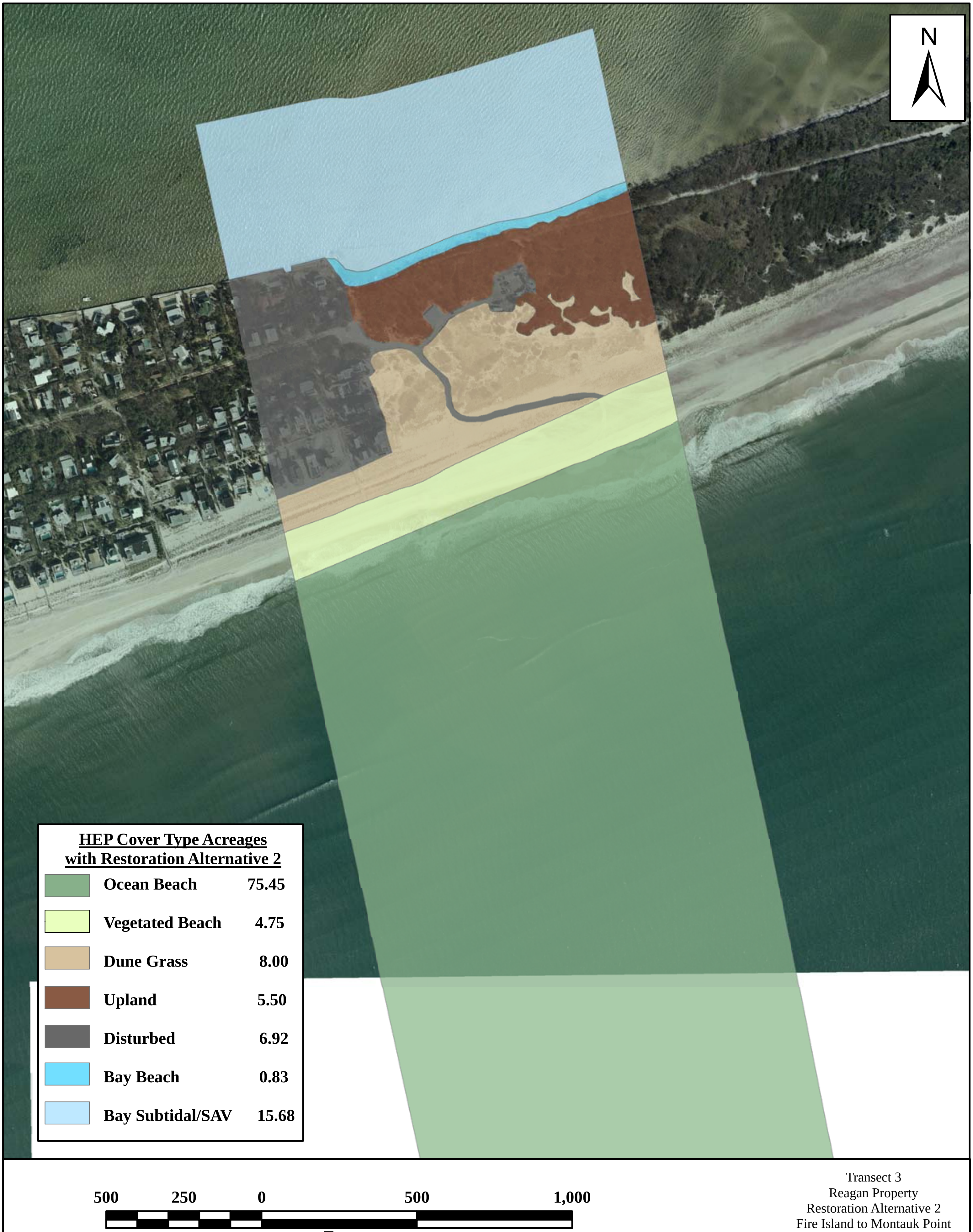
Fire Island to Montauk Point
HEP/Restoration Study

03/06



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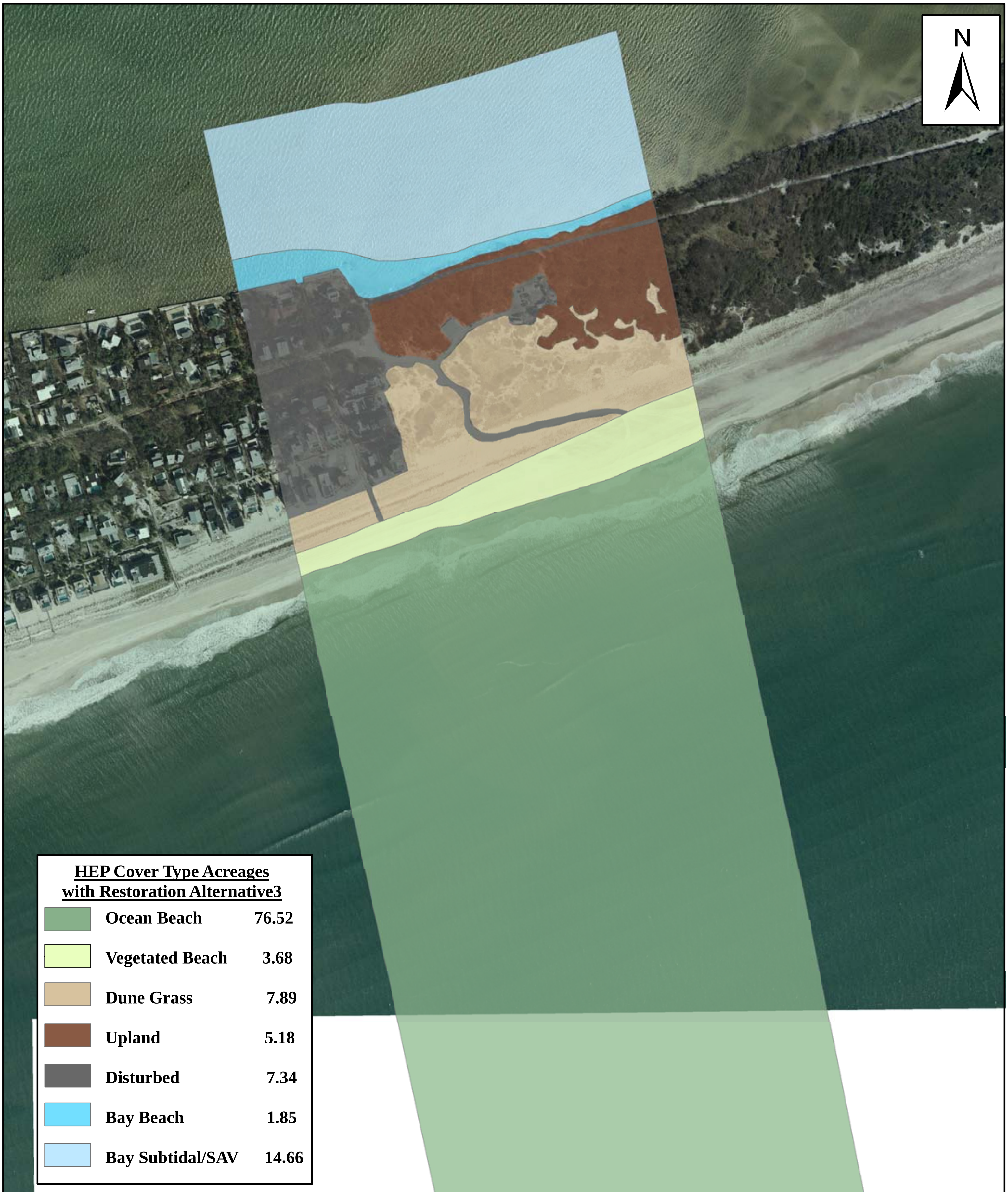
HEP/Restoration Study

05/06



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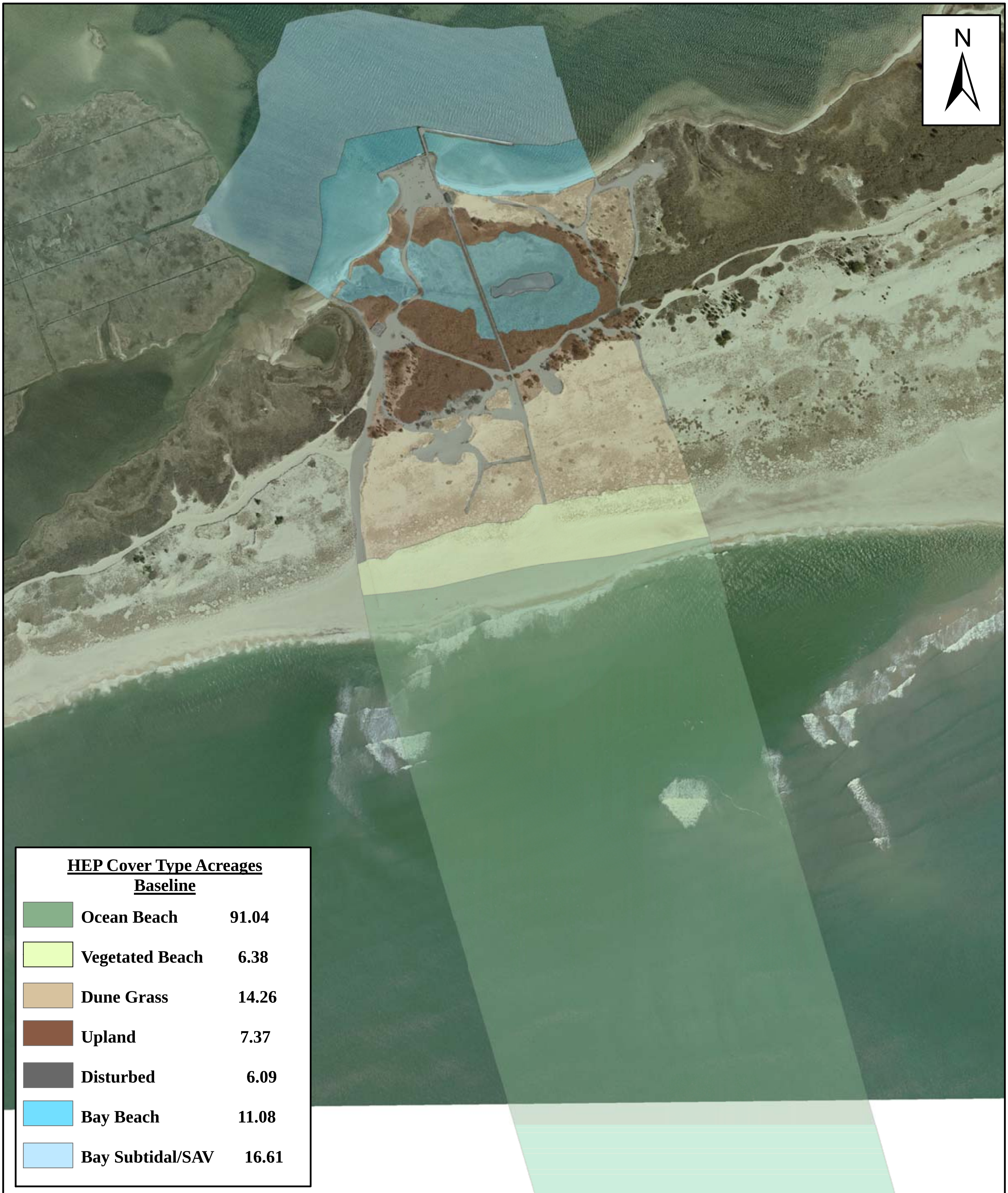
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study
03/06

Transect 5

Great Gun



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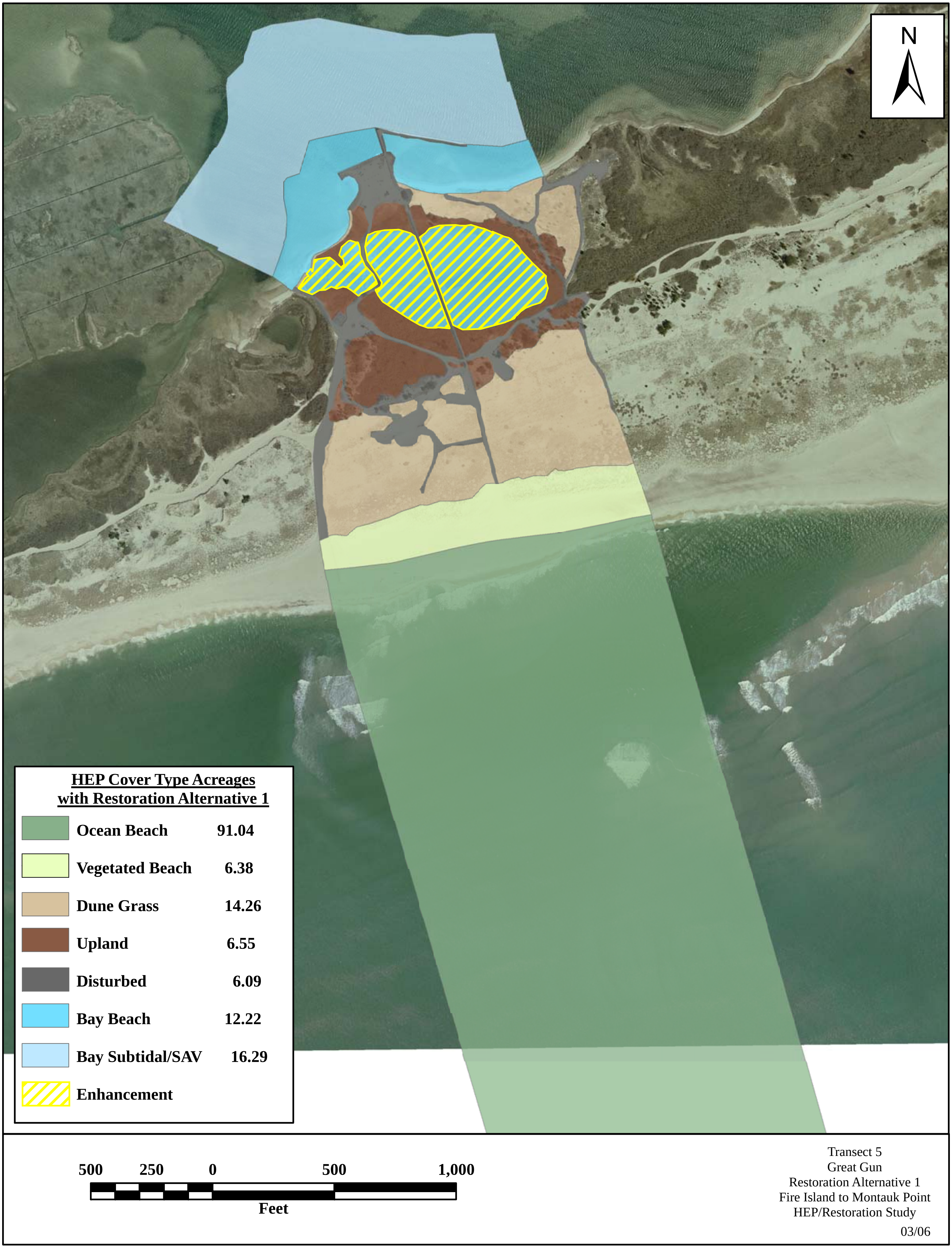
Feet

Transect 5
Great Gun
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

03/06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HEP Cover Type Acreages
with Restoration Alternative 1
Ocean Beach 91.04
Vegetated Beach 6.38
Dune Grass 14.26
Upland 6.55
Disturbed 6.09
Bay Beach 12.22
Bay Subtidal/SAV 16.29
Enhancement
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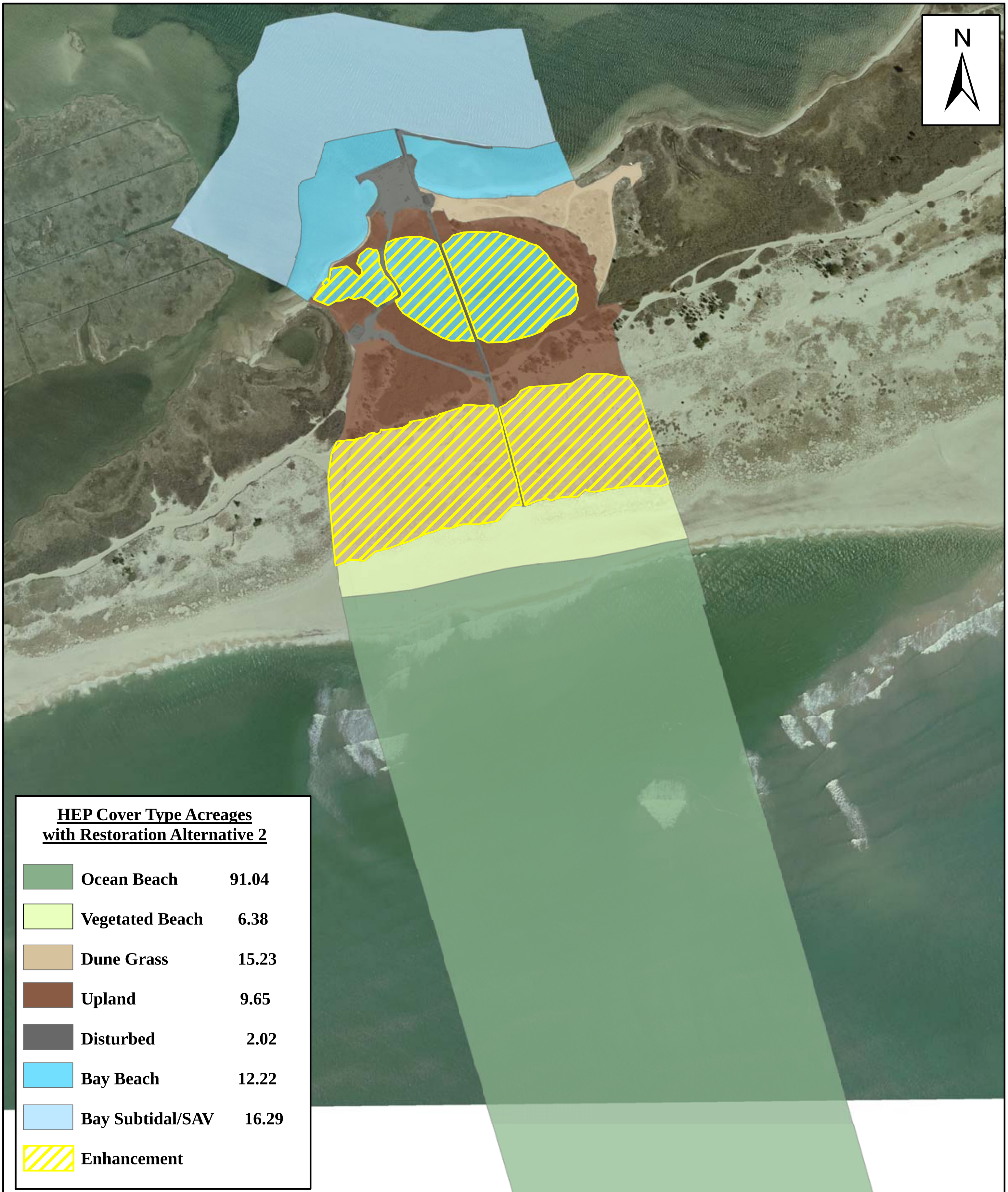
Feet
Transect 5
Great Gun
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study
03/06



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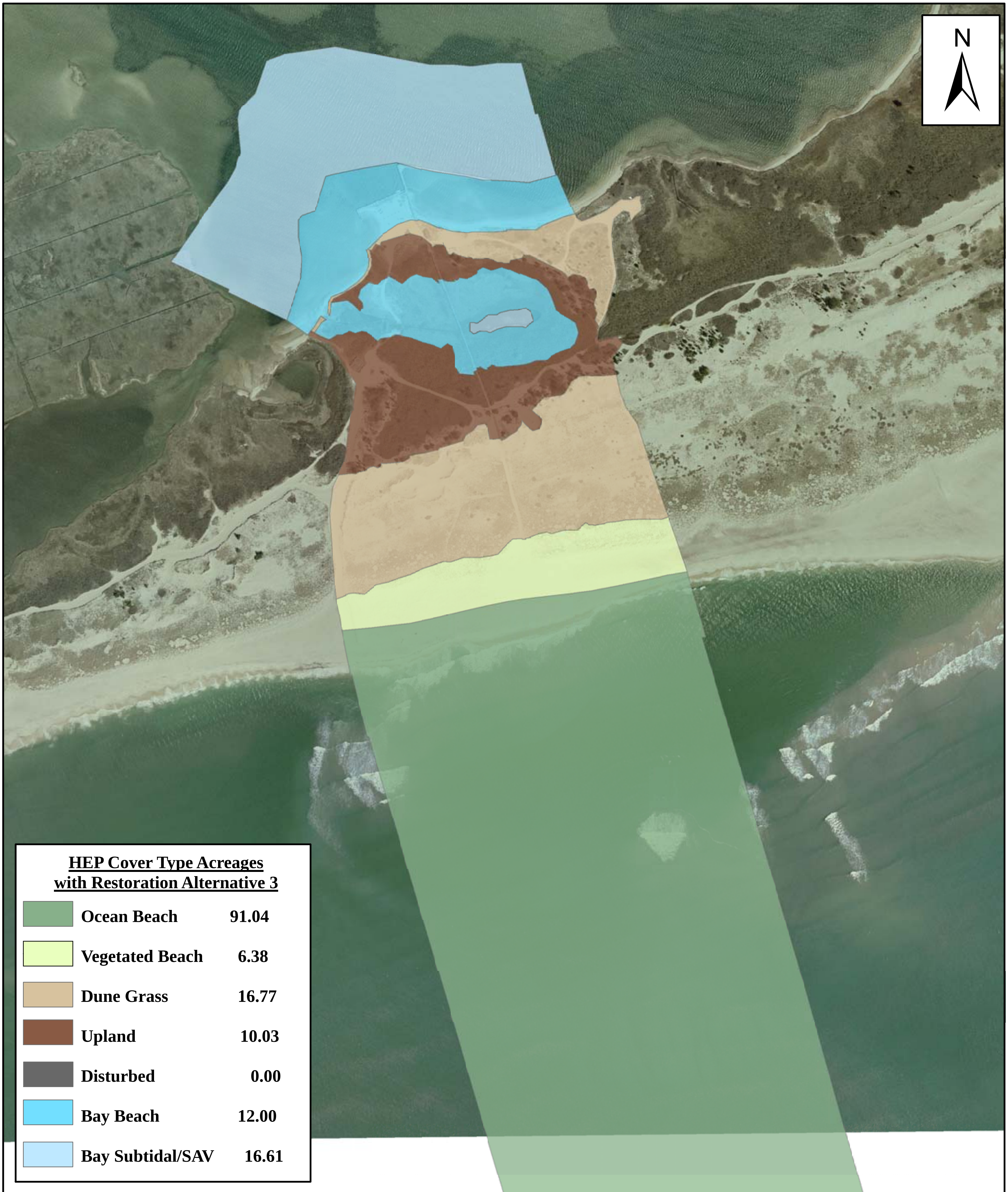
Feet

Transect 5
Great Gun
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

03/06



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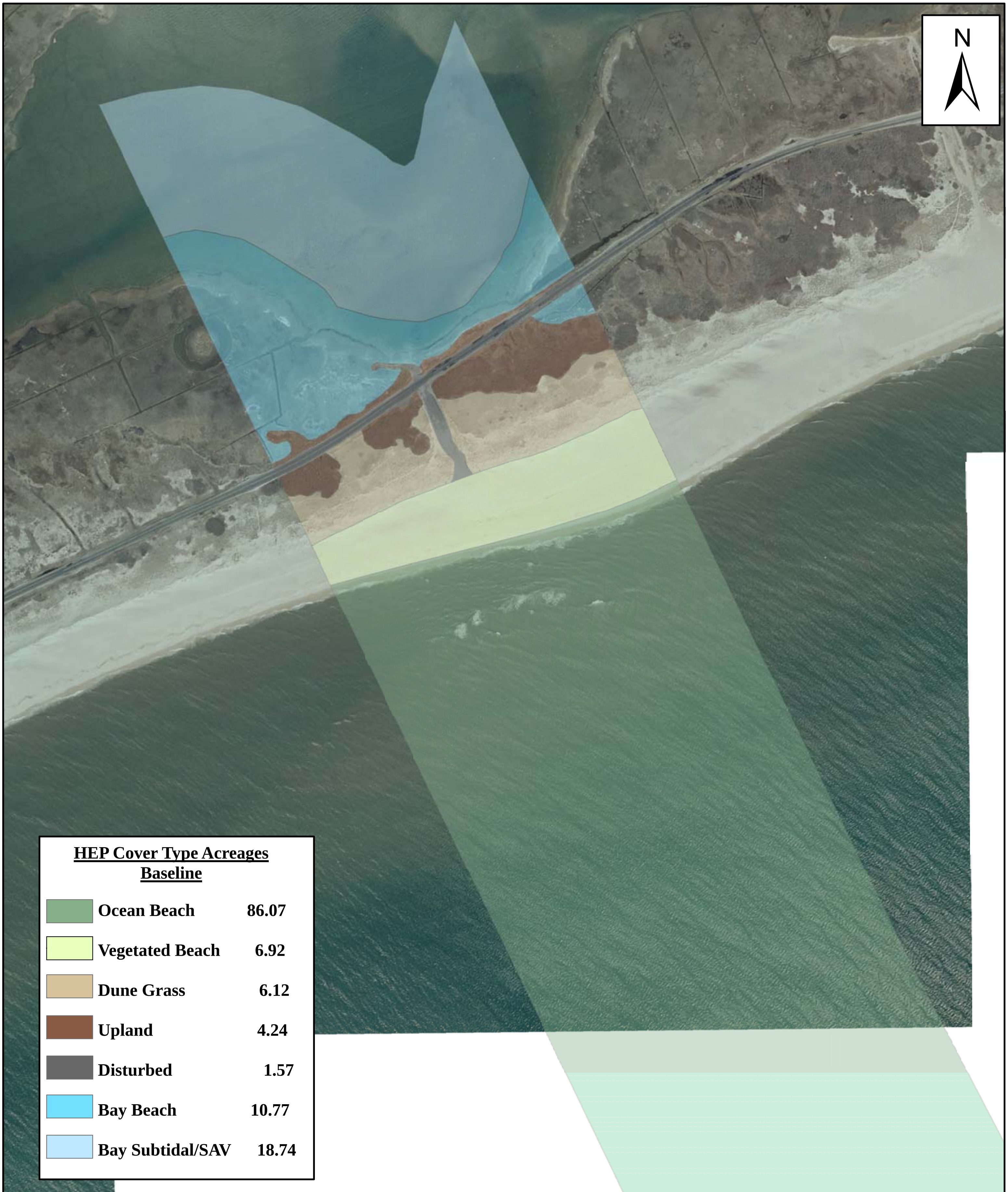
Feet

Transect 5
Great Gun
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

05/06

Transect 7

Tiana



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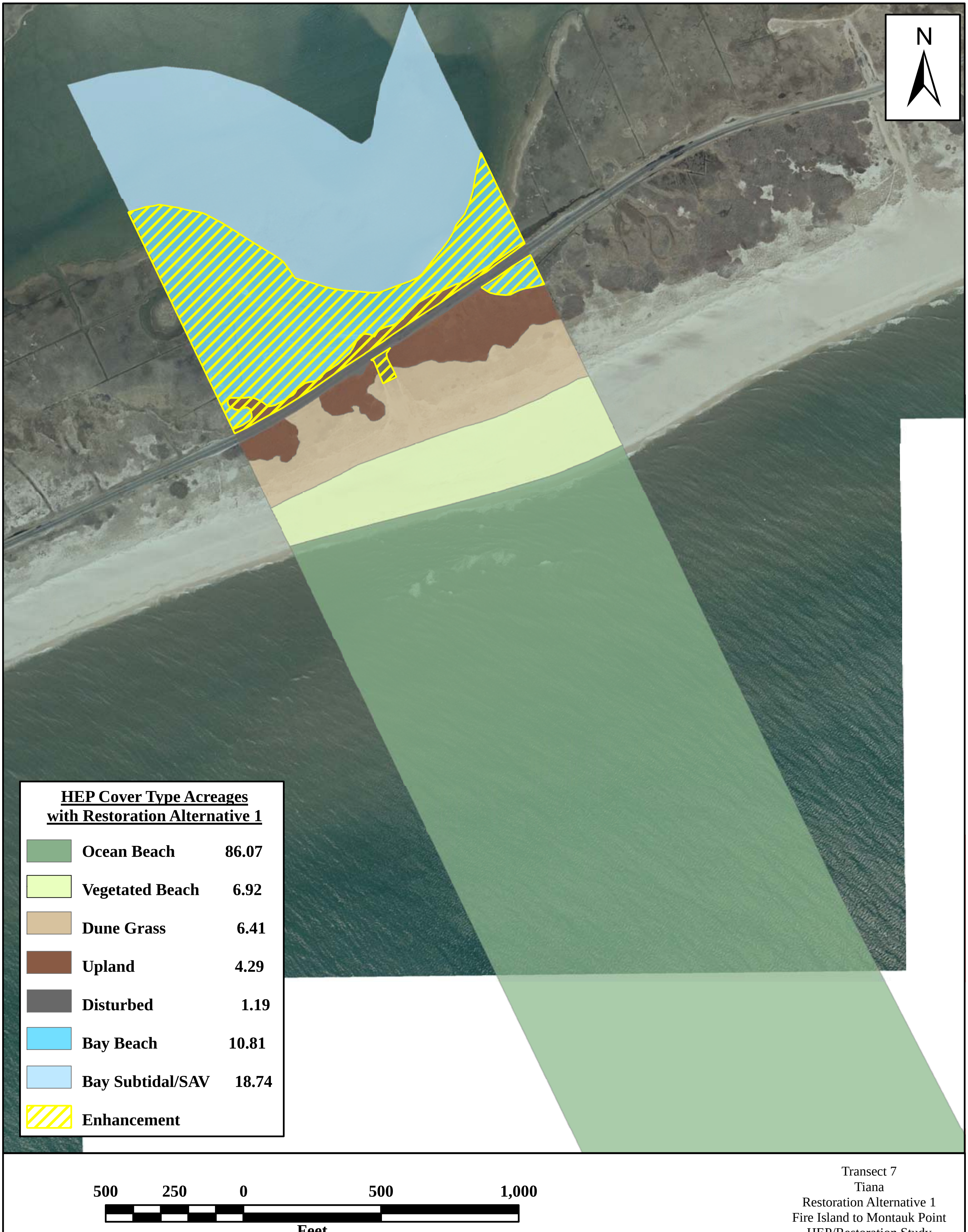
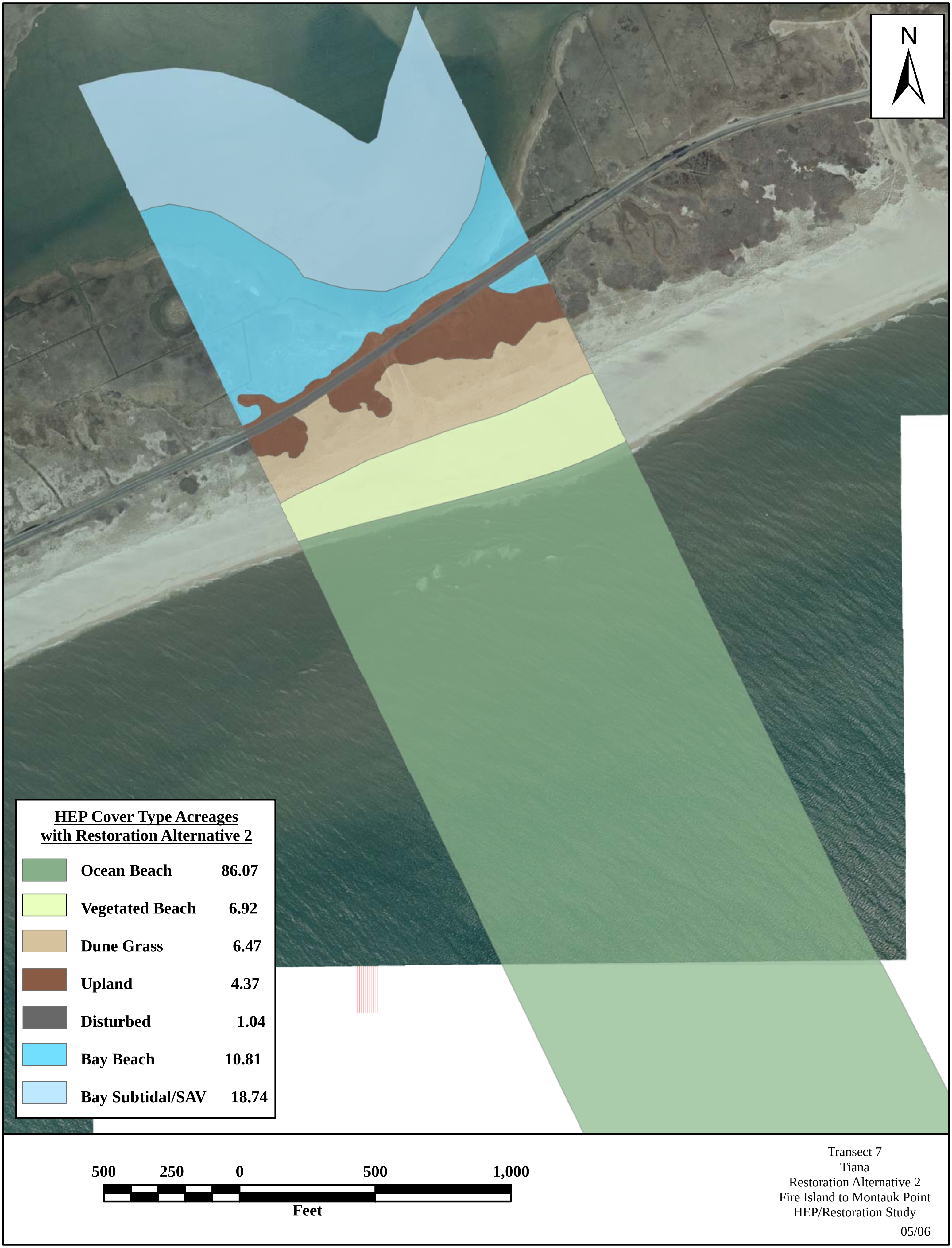
Feet

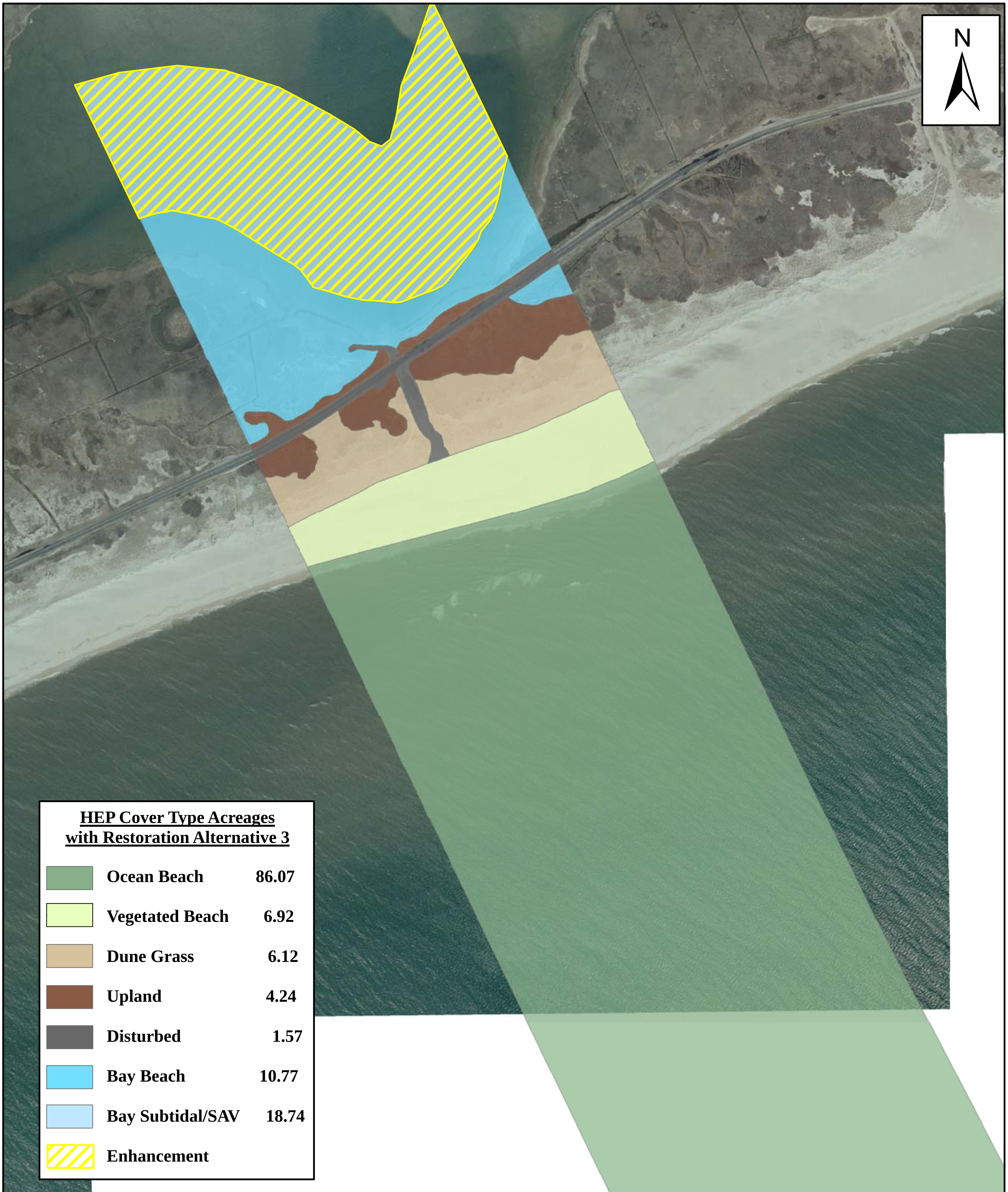
Transect 7
Tiana
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

03/06



Transect 7
Tiana
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study
03/06


N
HEP Cover Type Acreages
with Restoration Alternative 2
Ocean Beach 86.07
Vegetated Beach 6.92
Dune Grass 6.47
Upland 4.37
Disturbed 1.04
Bay Beach 10.81
Bay Subtidal/SAV 18.74
500 250 0 500 1,000
Feet
Transect 7
Tiana
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study
05/06



500 250 0 500 1,000

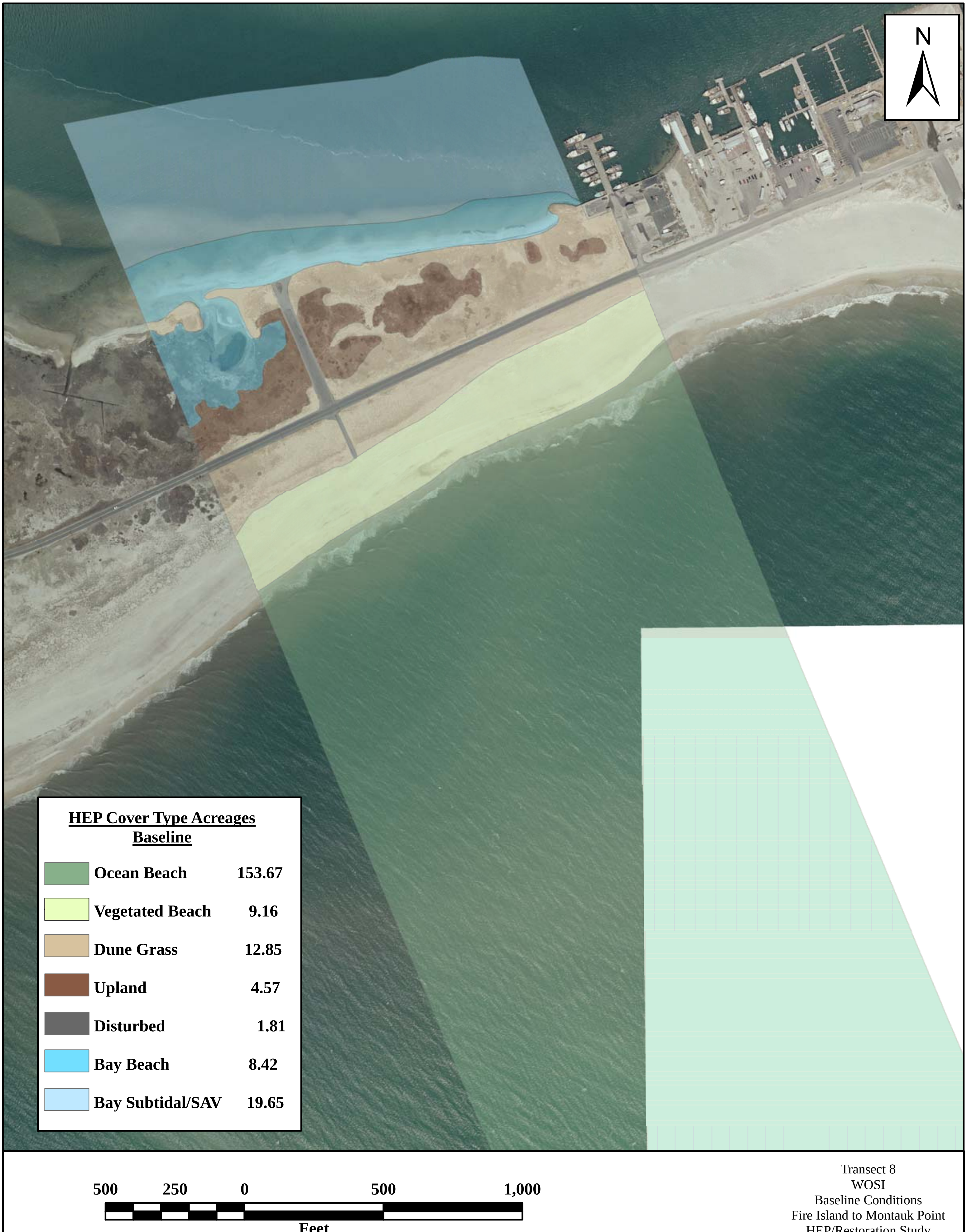
Feet

Transect 7
Tiana
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

03/06

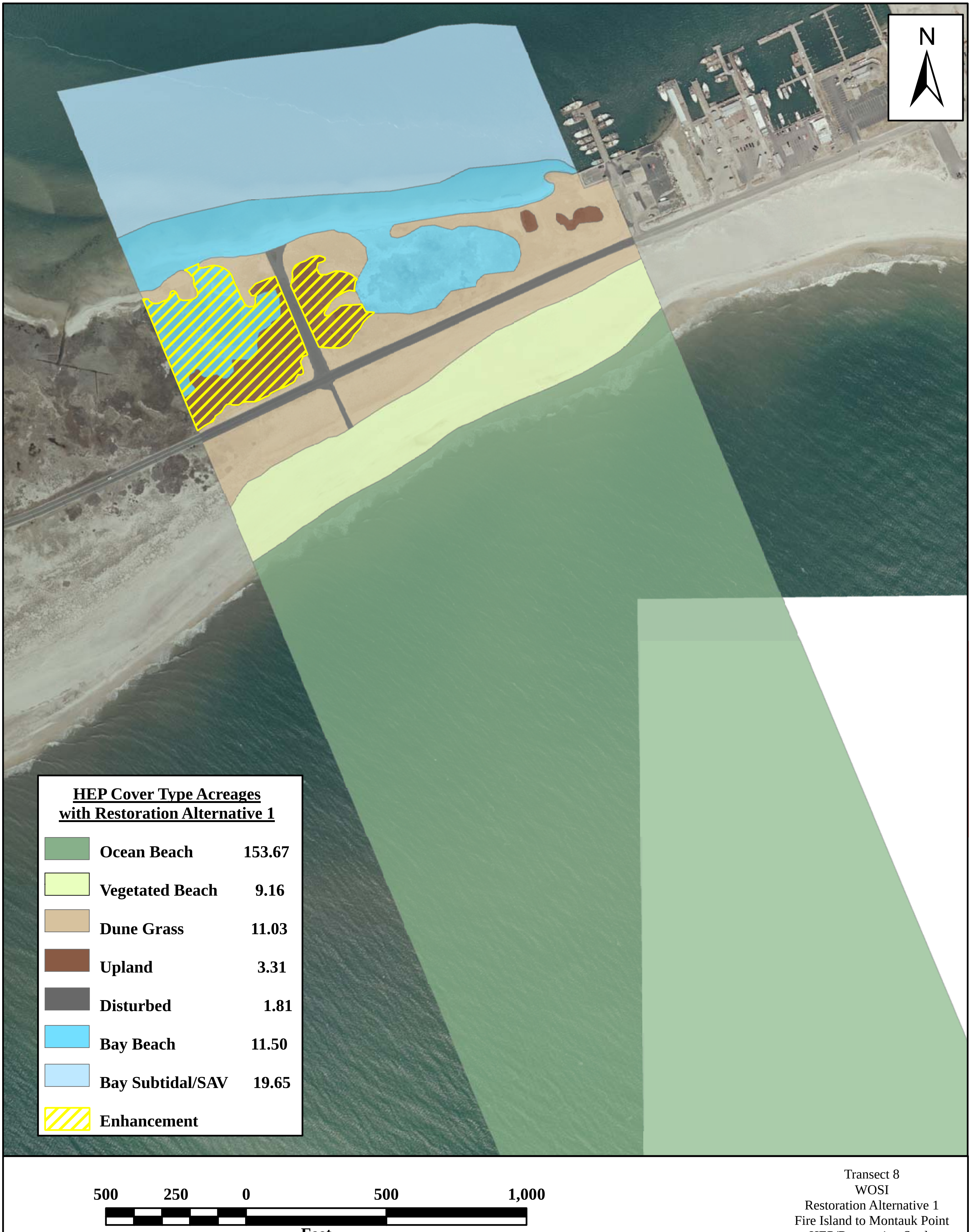
Transect 8

WOSI



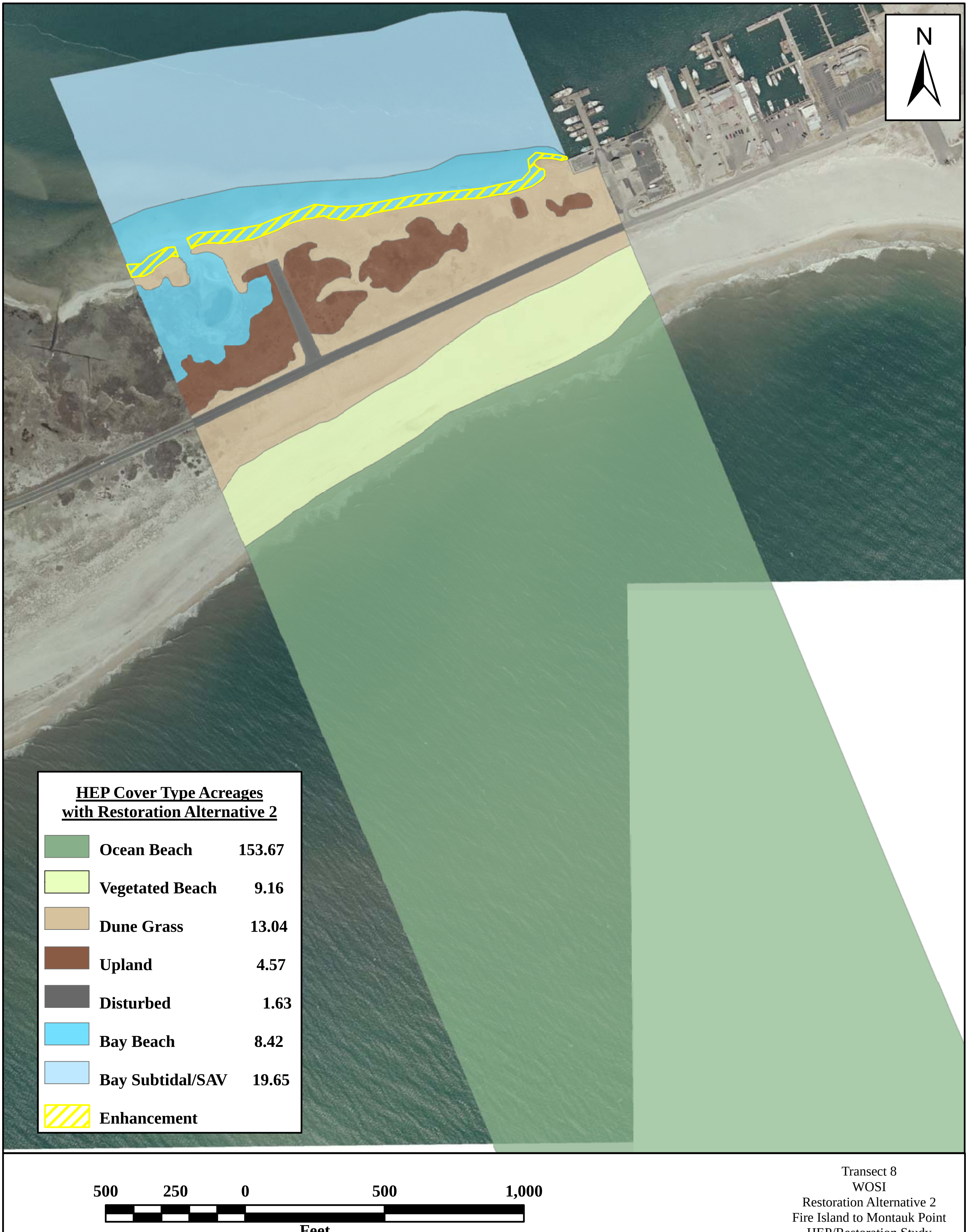
Transect 8
WOSI
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

03/06



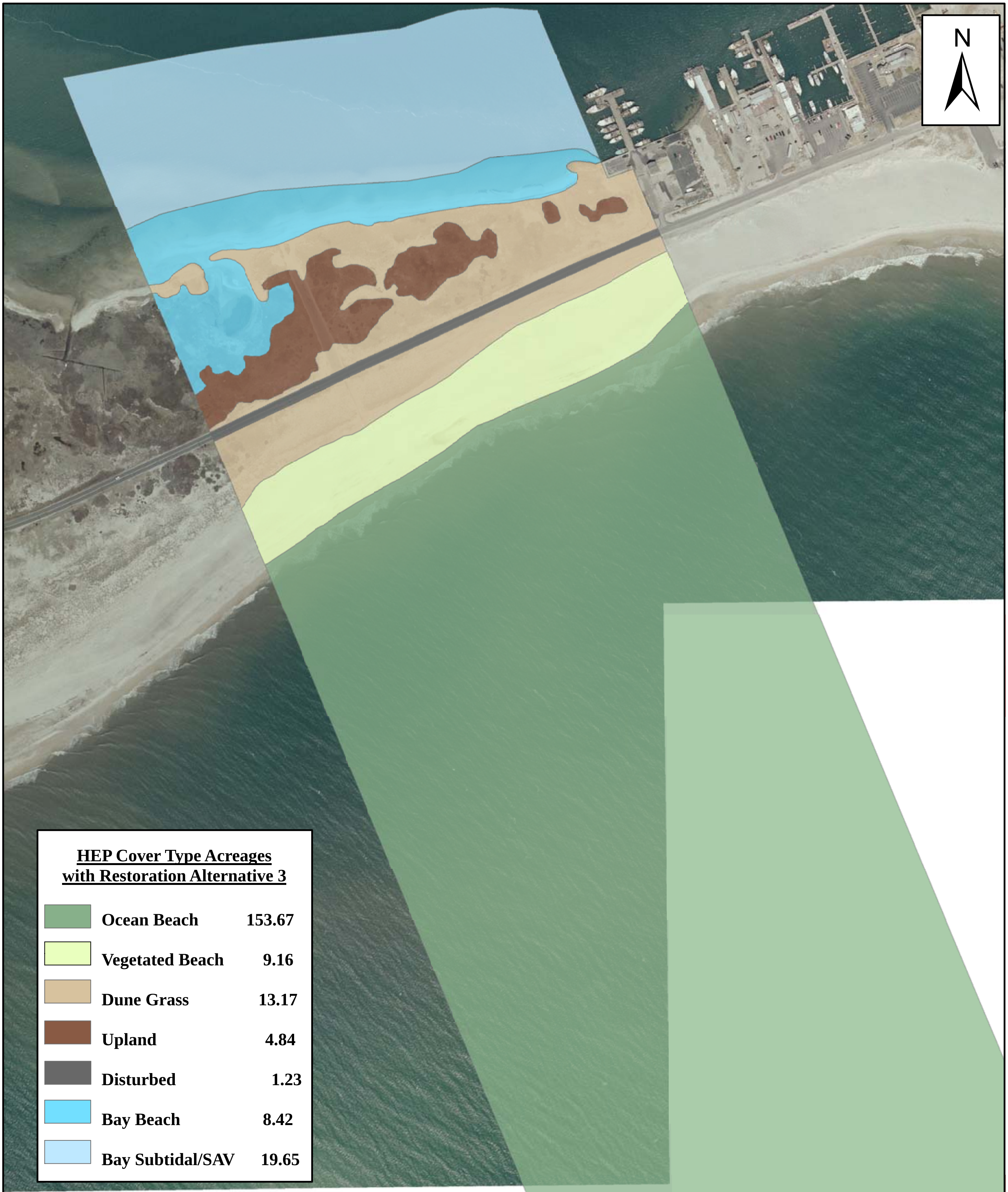
Transect 8
WOSI
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

03/06



Transect 8
WOSI
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

03/06



500 250 0 500 1,000

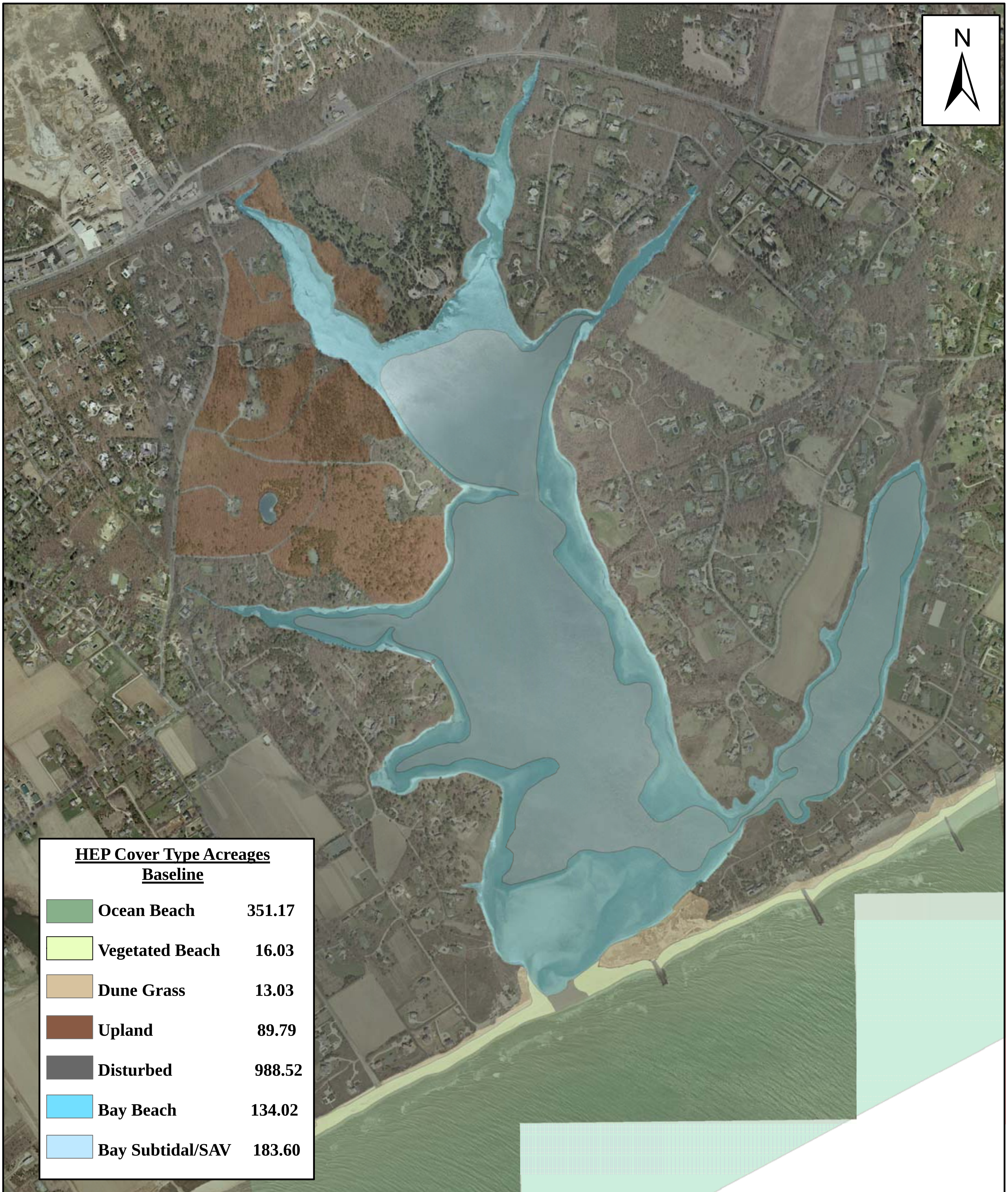
Feet

Transect 8
WOSI
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

05/06

Transect 9

Georgica Pond

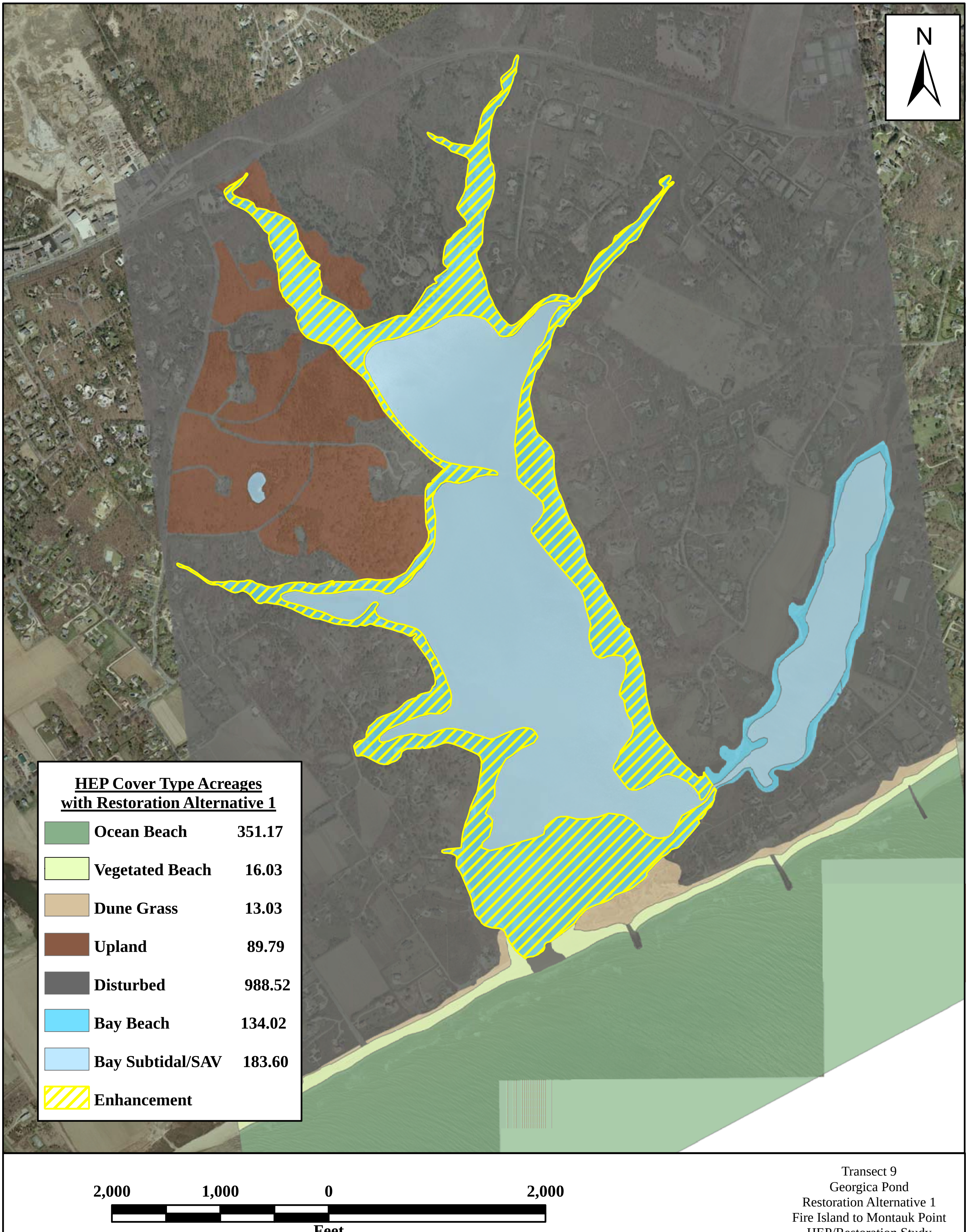


2,000 1,000 0 2,000

Feet

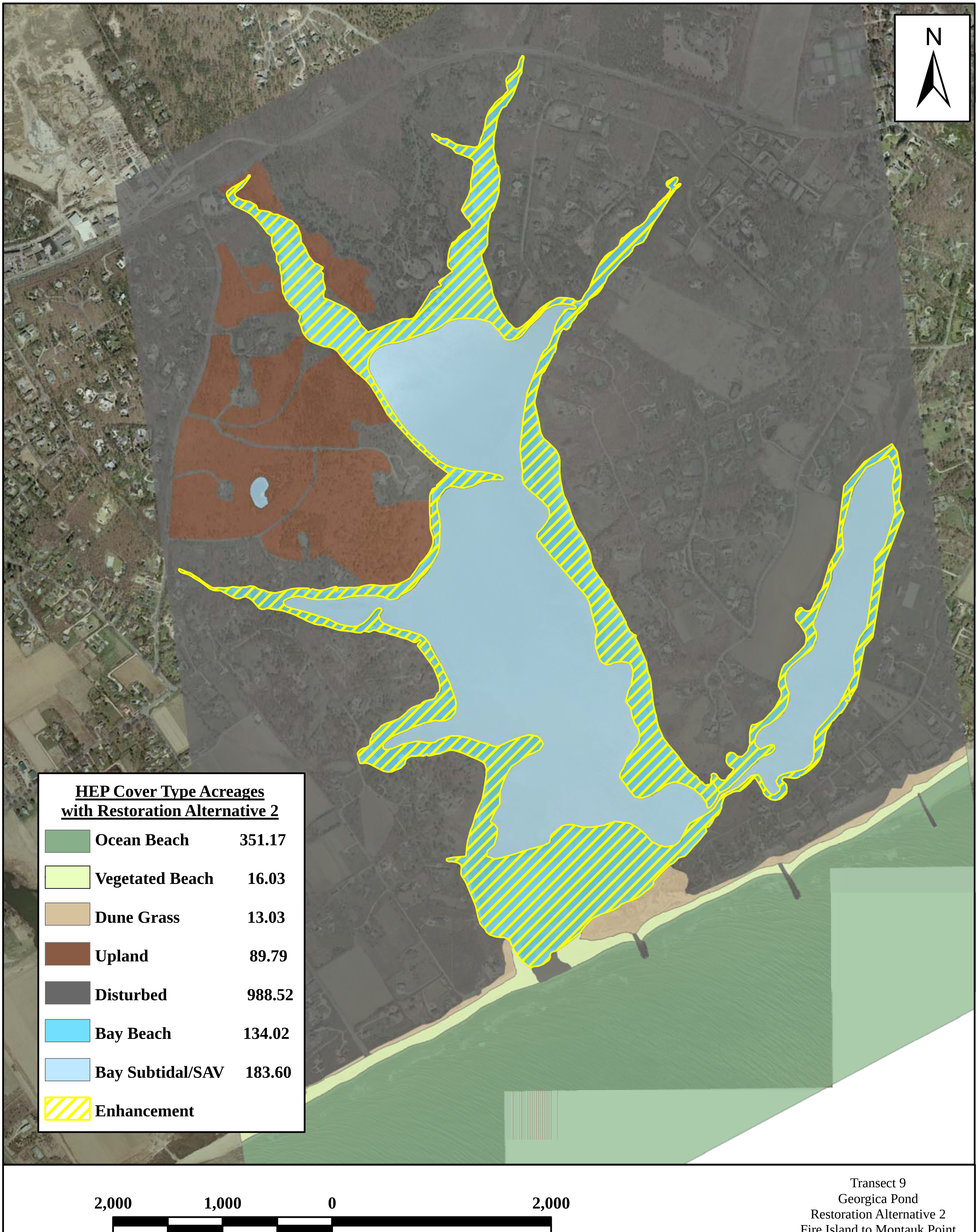
Transect 9
Georgica Pond
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

03/06

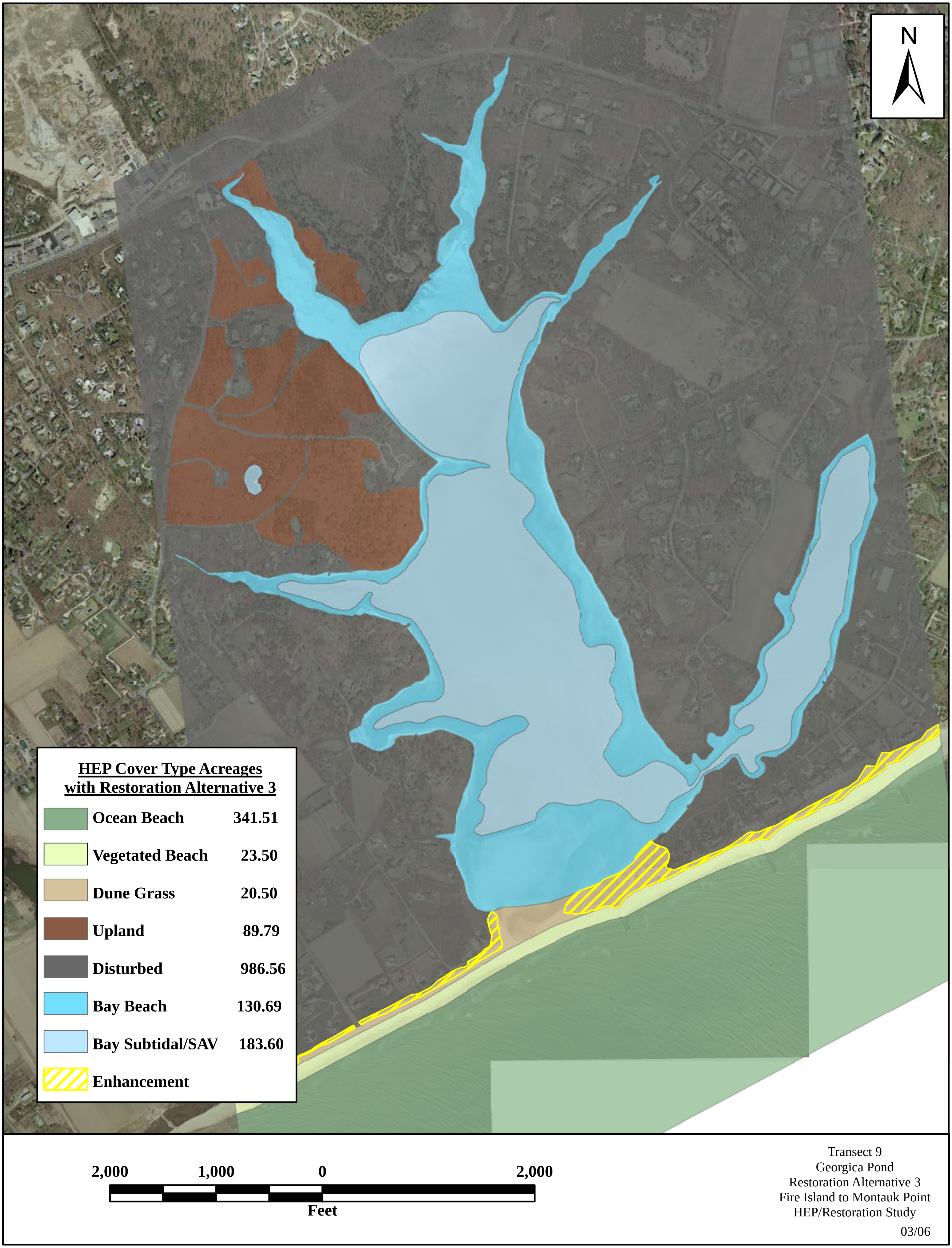


Transect 9
Georgica Pond
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

03/06

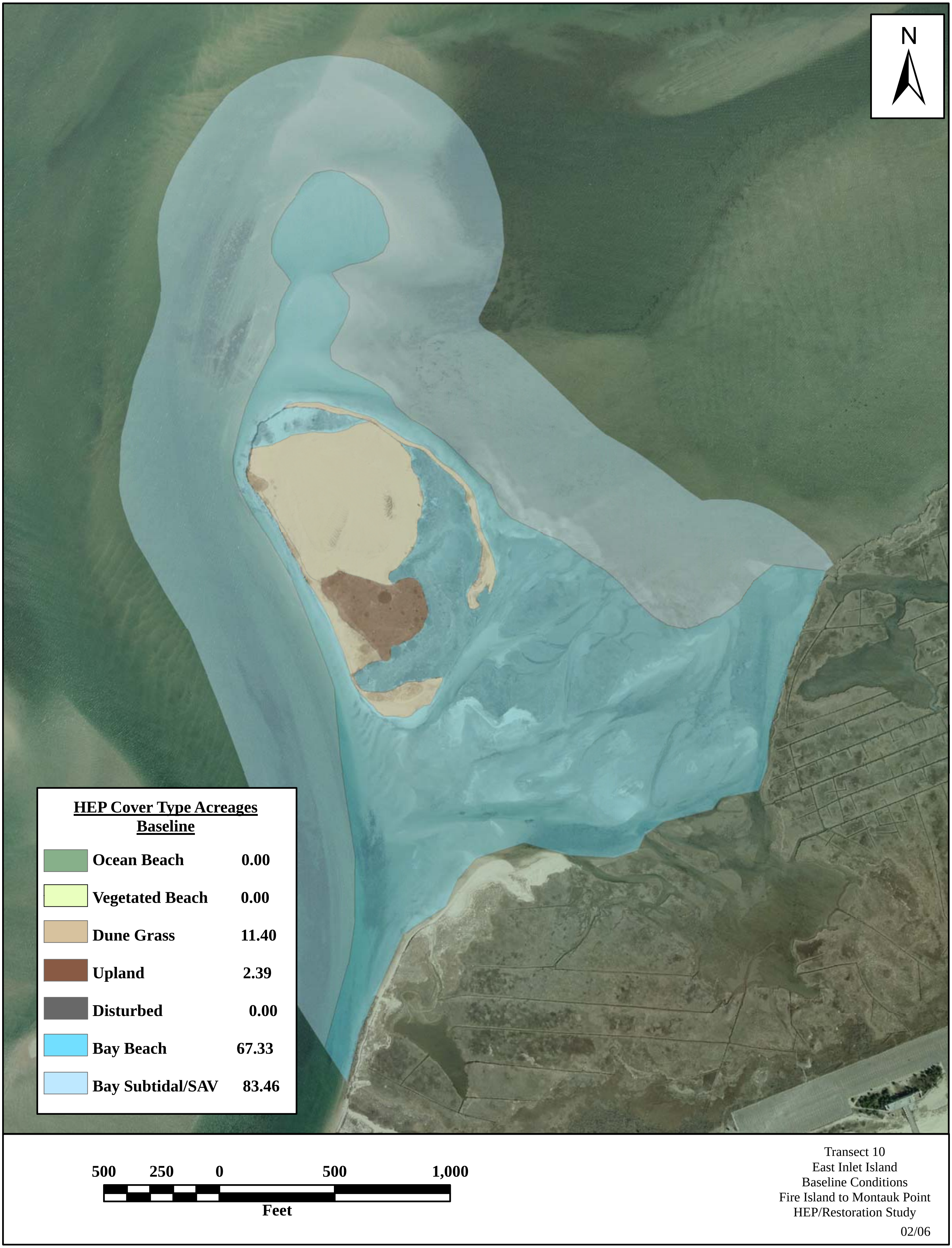


Transcect 9
Georgica Pond
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study
03/06


N
HEP Cover Type Acreages
with Restoration Alternative 3
Ocean Beach 341.51
Vegetated Beach 23.50
Dune Grass 20.50
Upland 89.79
Disturbed 986.56
Bay Beach 130.69
Bay Subtidal/SAV 183.60
Enhancement
2,000 1,000 0 2,000
Feet
Transect 9
Georgica Pond
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study
03/06

Transect 10

East Inlet Island


N
HEP Cover Type Acreages
Baseline
Ocean Beach 0.00
Vegetated Beach 0.00
Dune Grass 11.40
Upland 2.39
Disturbed 0.00
Bay Beach 67.33
Bay Subtidal/SAV 83.46
500 250 0 500 1,000
Feet
Transect 10
East Inlet Island
Baseline Conditions
Fire Island to Montauk Point
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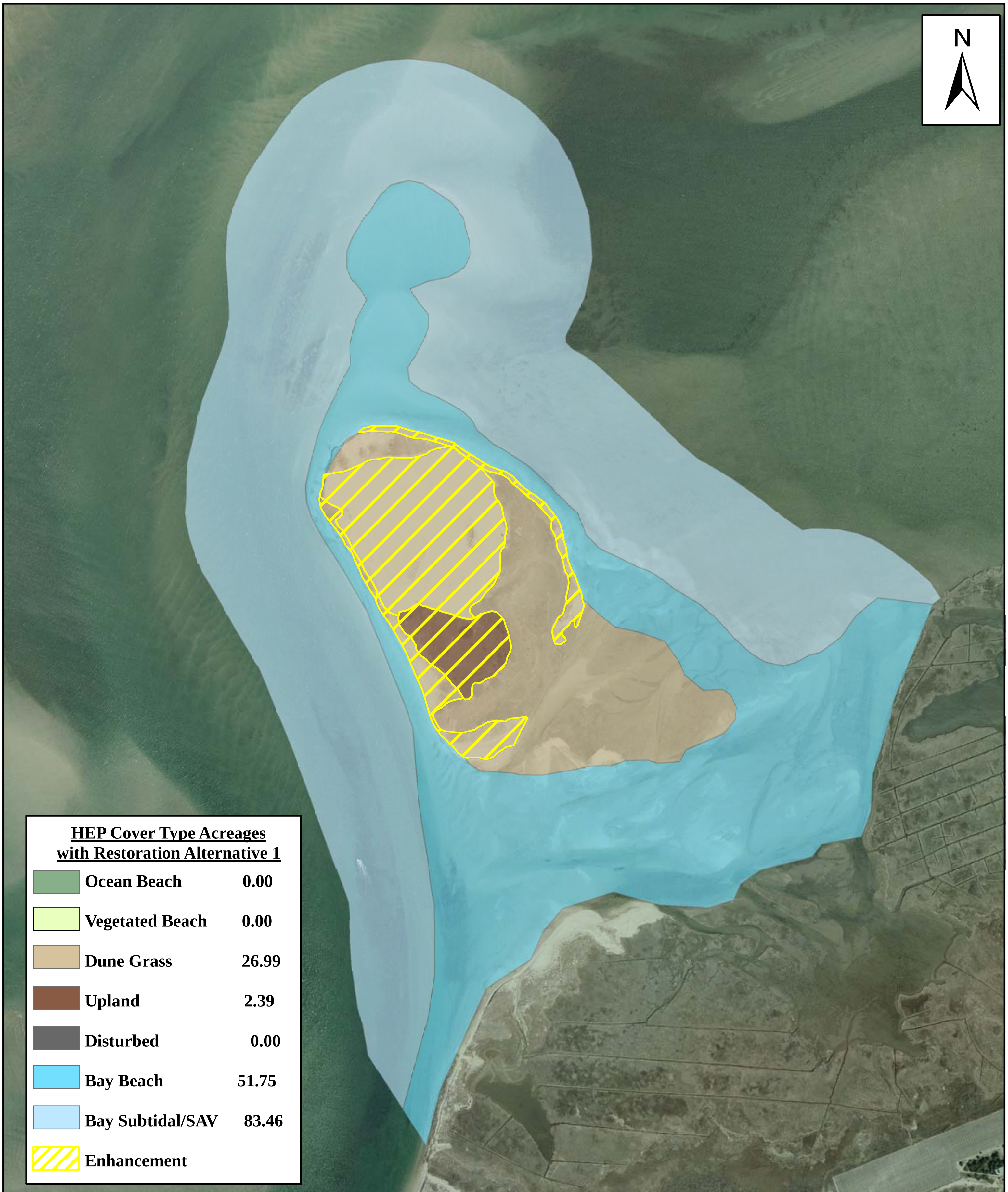
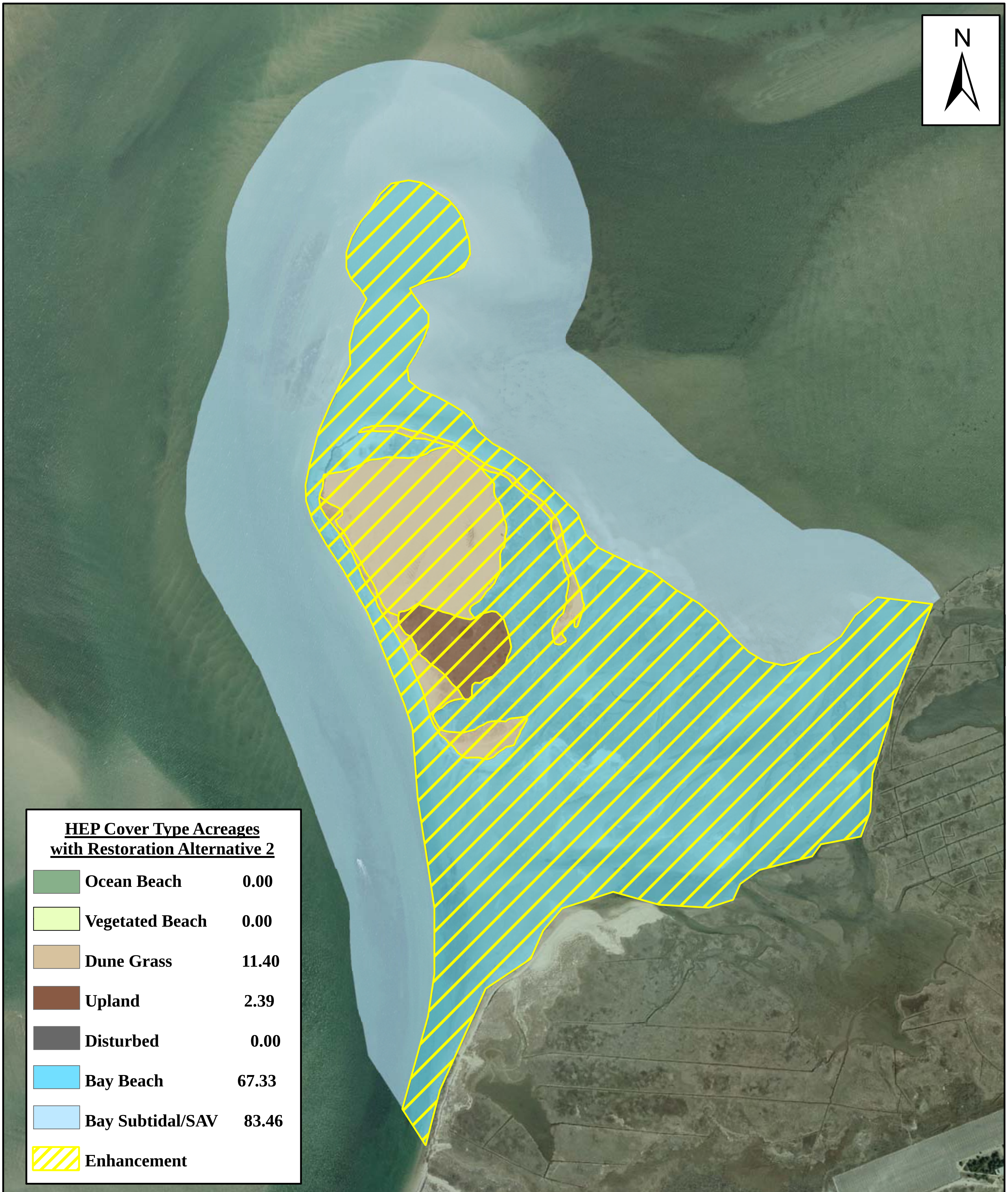
02/06



500 250 0 500 1,000
Feet

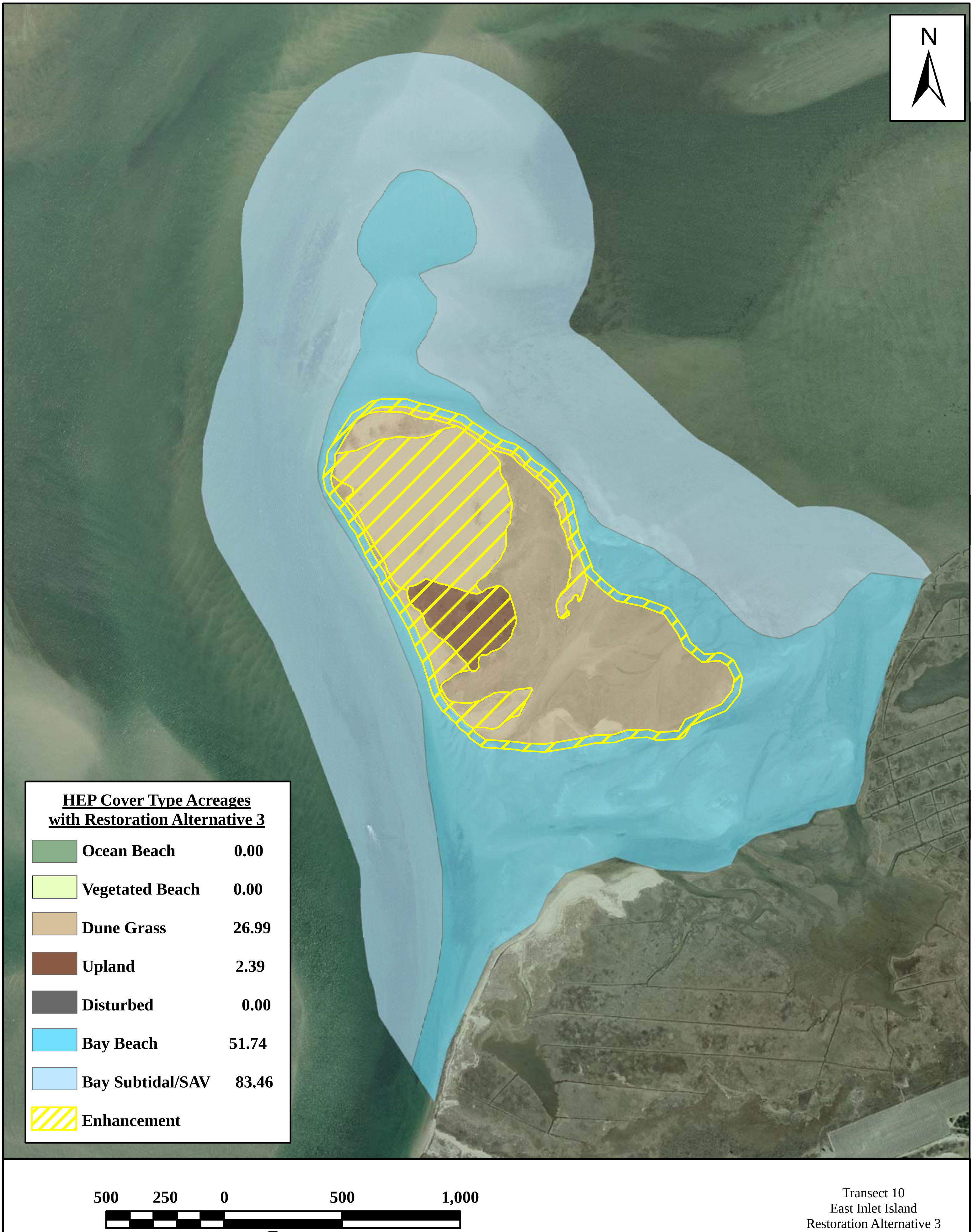
Transect 10
East Inlet Island
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

05/06



500 250 0 500 1,000
Feet

Transect 10
East Inlet Island
Restoration Alternative 2
HEP/Restoration Study
05/06

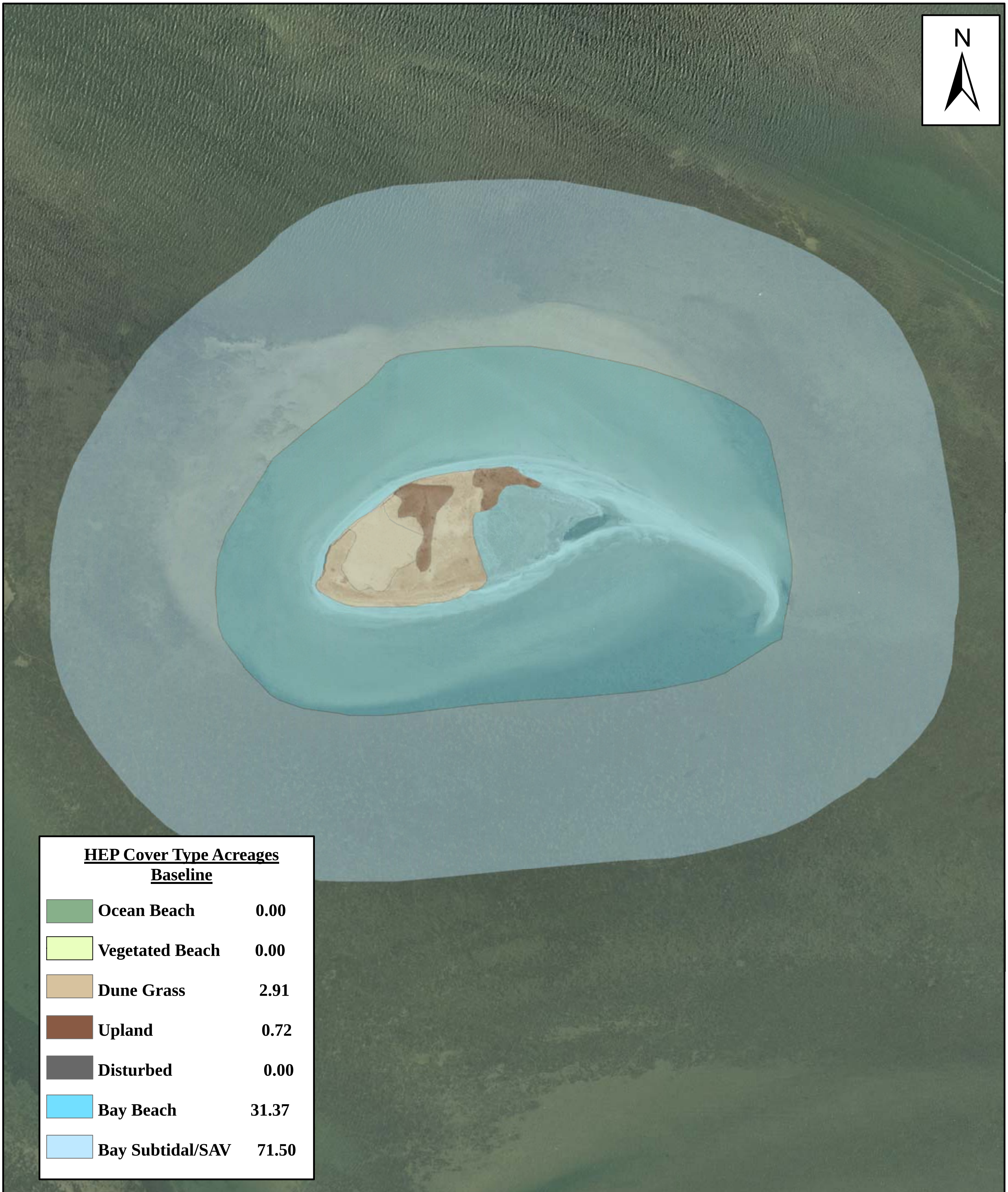


Transect 10
East Inlet Island
Restoration Alternative 3
HEP/Restoration Study

05/06

Transect 11

John Boyle Island

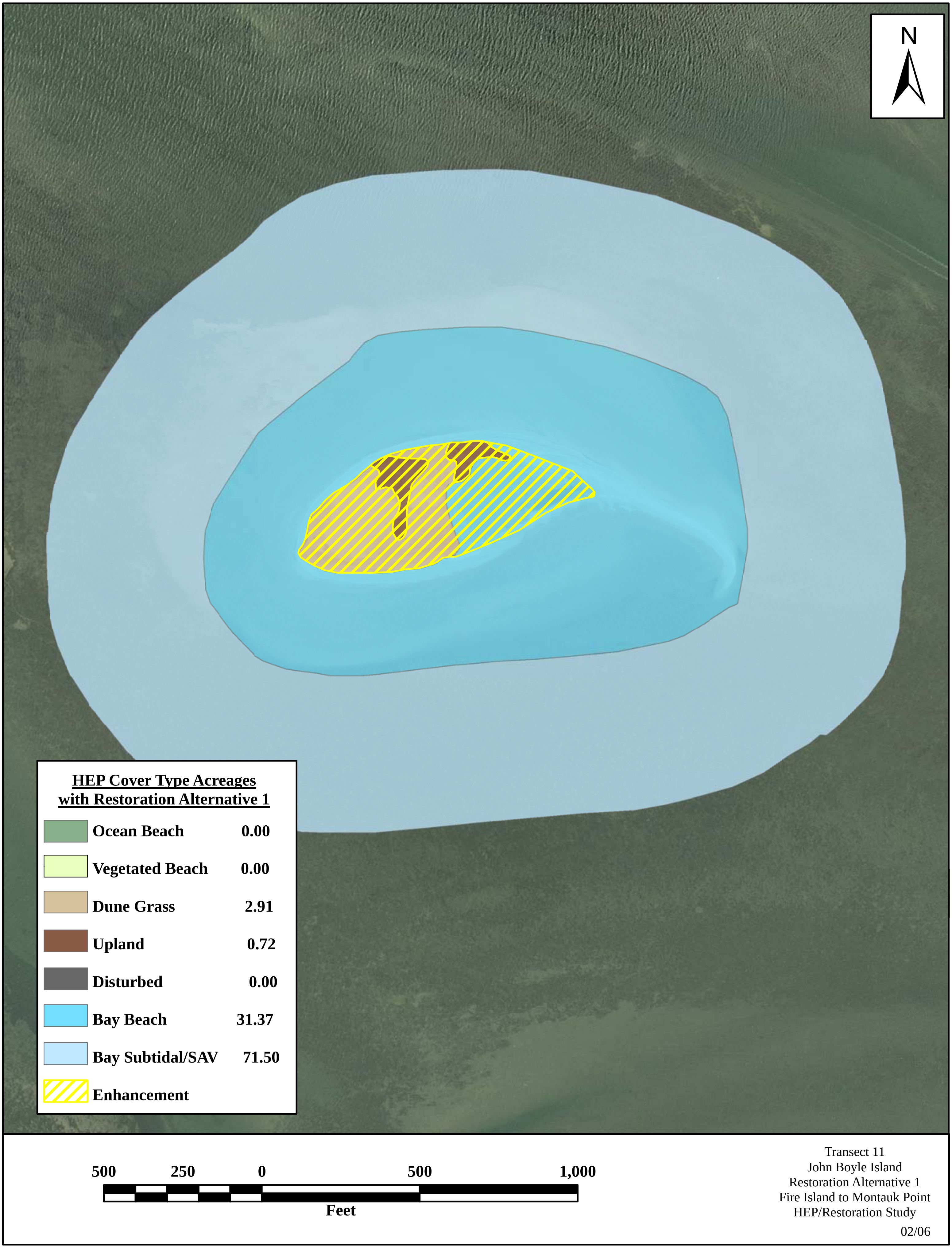


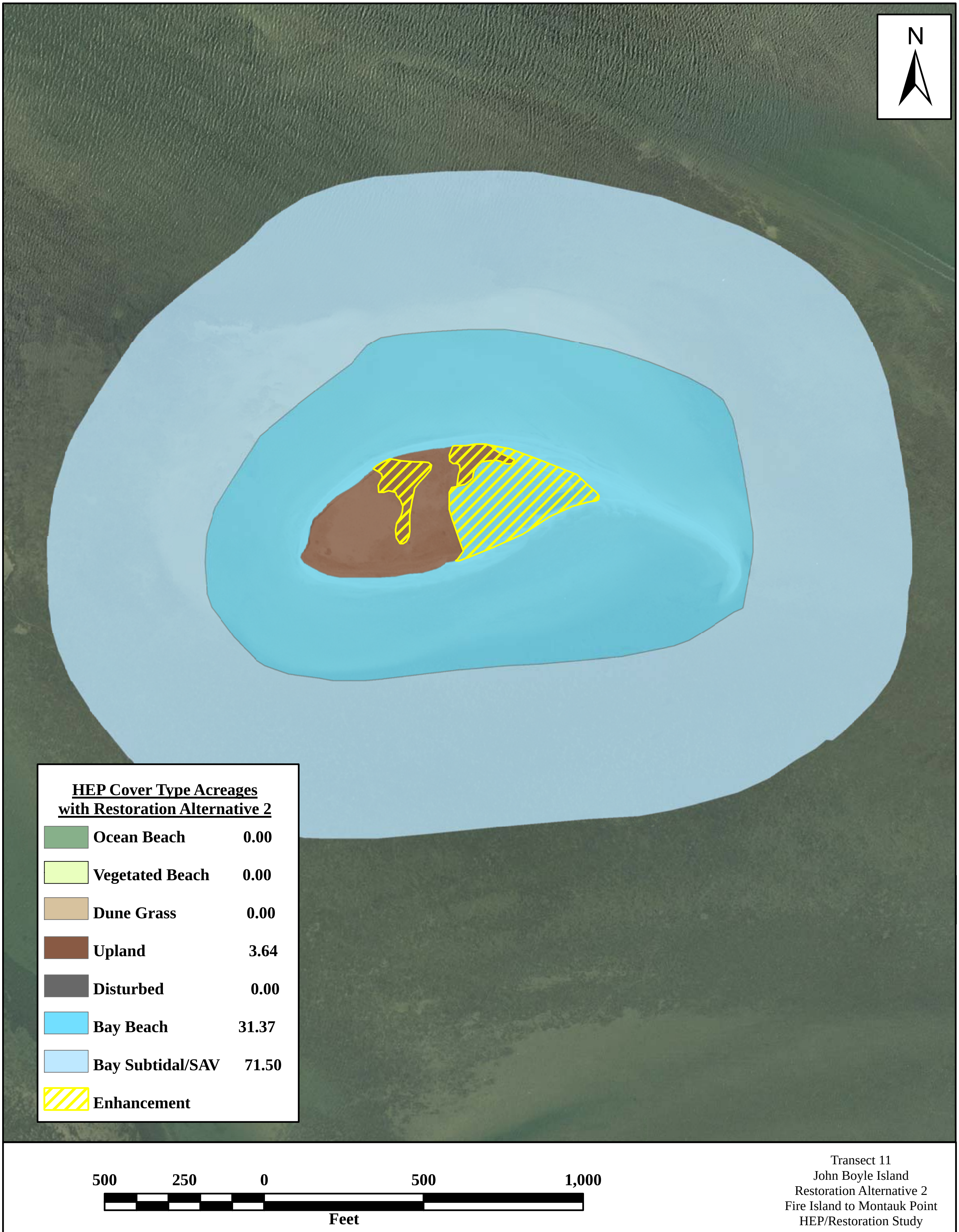
500 250 0 500 1,000

Feet

Transect 11
John Boyle Island
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

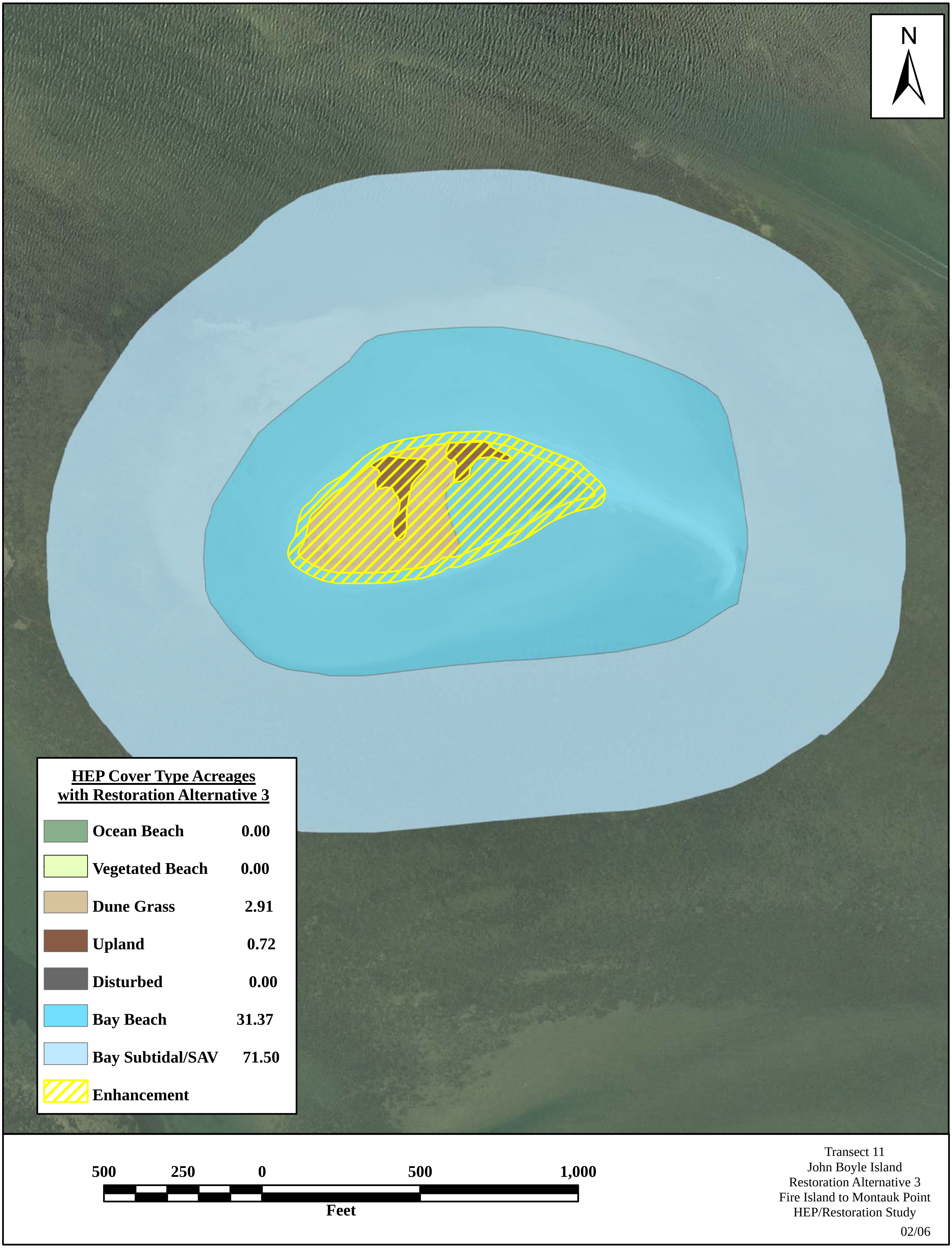
02/06


N
HEP Cover Type Acreages
with Restoration Alternative 1
Ocean Beach 0.00
Vegetated Beach 0.00
Dune Grass 2.91
Upland 0.72
Disturbed 0.00
Bay Beach 31.37
Bay Subtidal/SAV 71.50
Enhancement
500 250 0 500 1,000
Feet
Transect 11
John Boyle Island
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study
02/06



Transect 11
John Boyle Island
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

02/06



Transect 11
John Boyle Island
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study
02/06

Transect 14

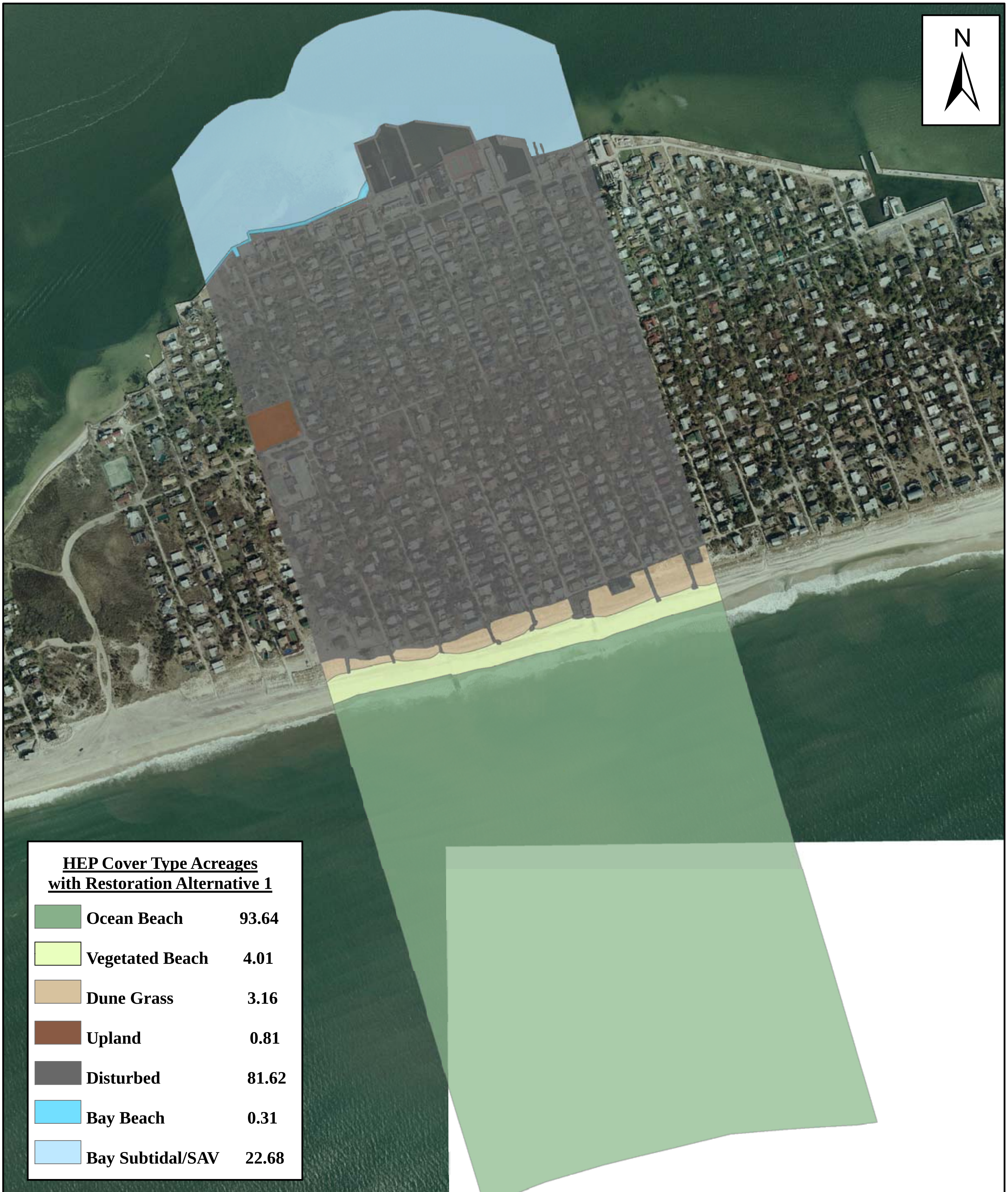
Ocean Beach

500 250 0 500 1,000

Feet

Transect 14
Ocean Beach
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

03/06



500 250 0 500 1,000

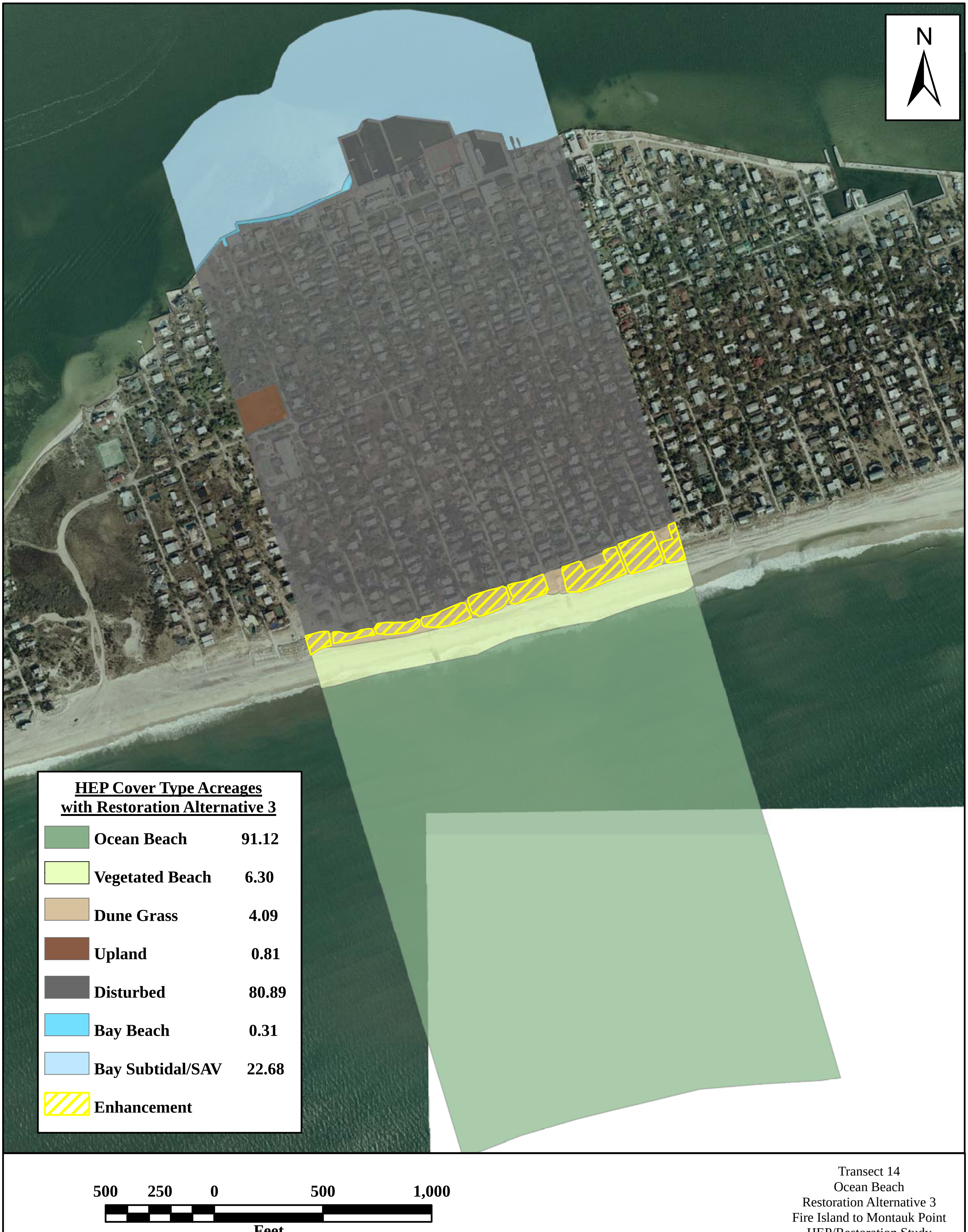
Feet

Transect 14
Ocean Beach
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

05/06

Transect 14
Ocean Beach
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

03/06

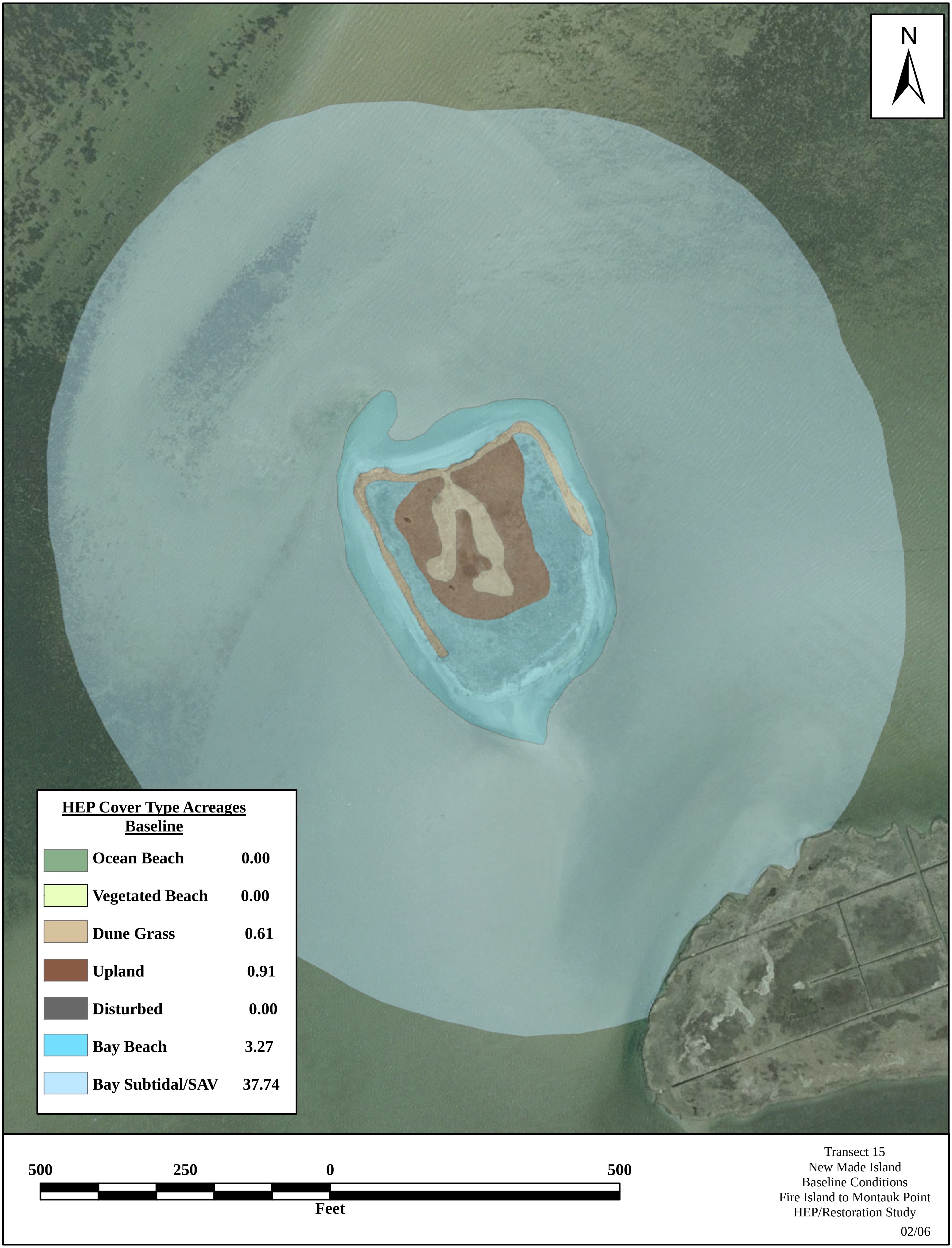


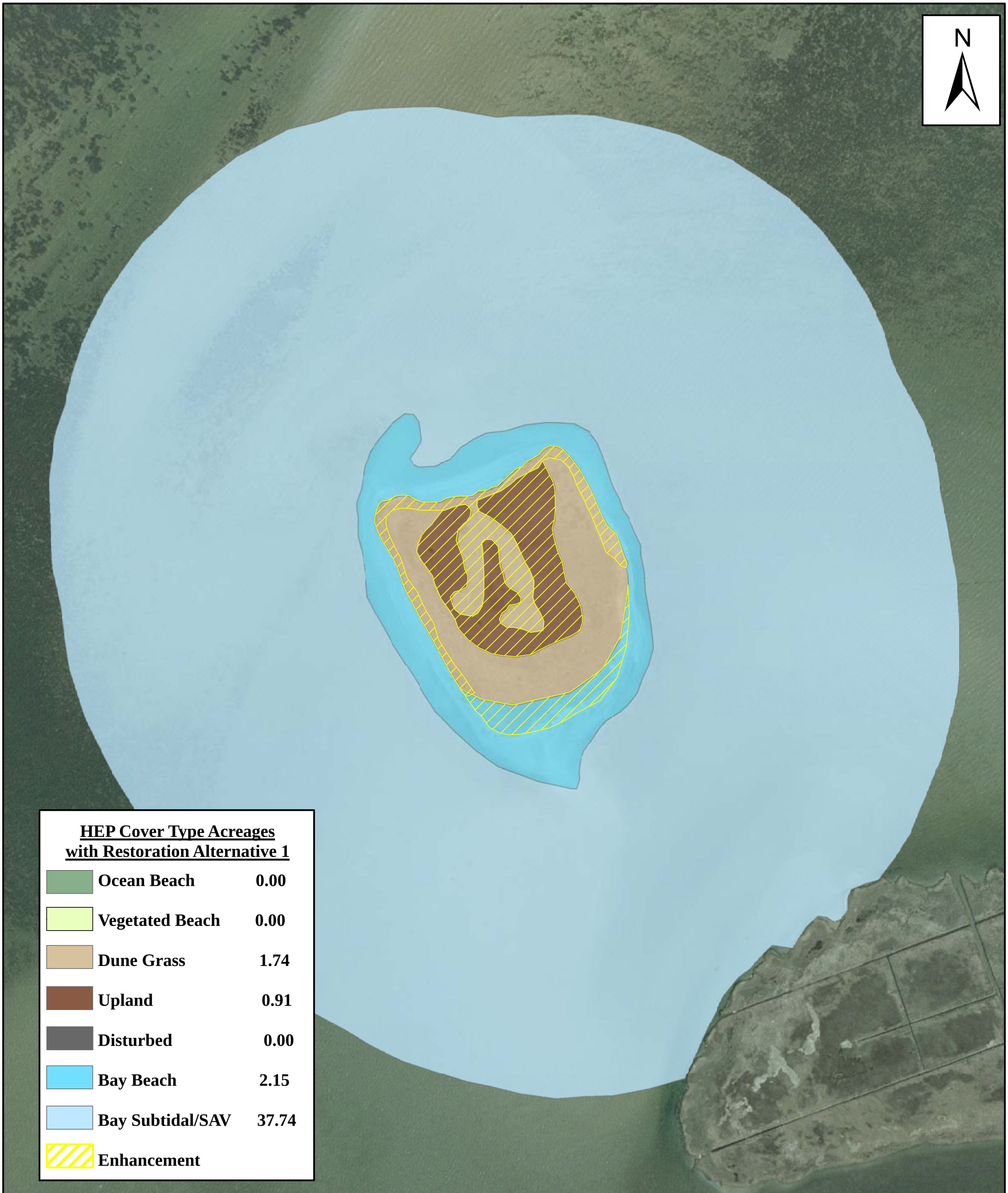
Transect 14
Ocean Beach
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

03/06

Transect 15

New Made Island

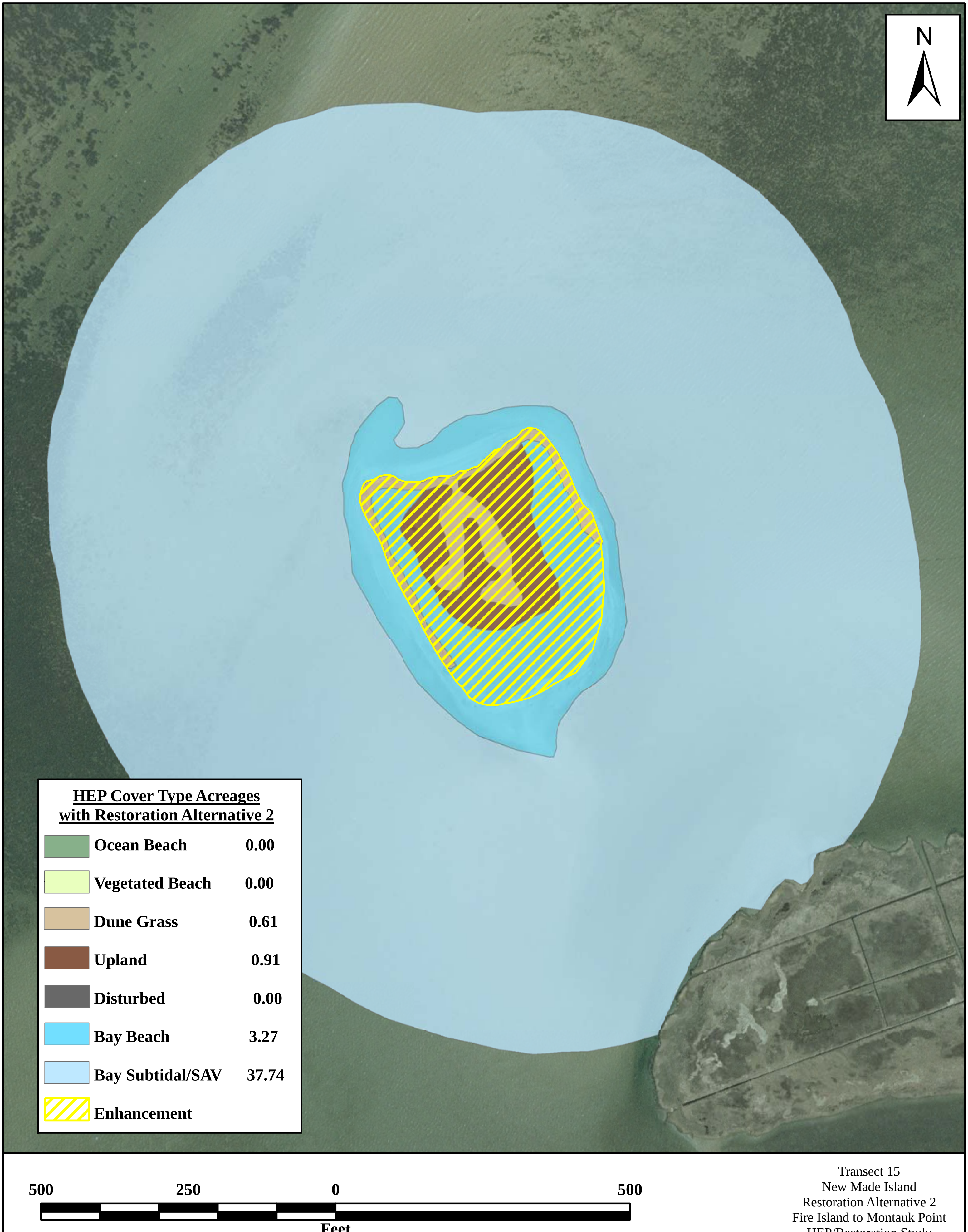

N
HEP Cover Type Acreages
Baseline
Ocean Beach 0.00
Vegetated Beach 0.00
Dune Grass 0.61
Upland 0.91
Disturbed 0.00
Bay Beach 3.27
Bay Subtidal/SAV 37.74
500 250 0 500
Feet
Transect 15
New Made Island
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study
02/06



500 250 0 500
Feet

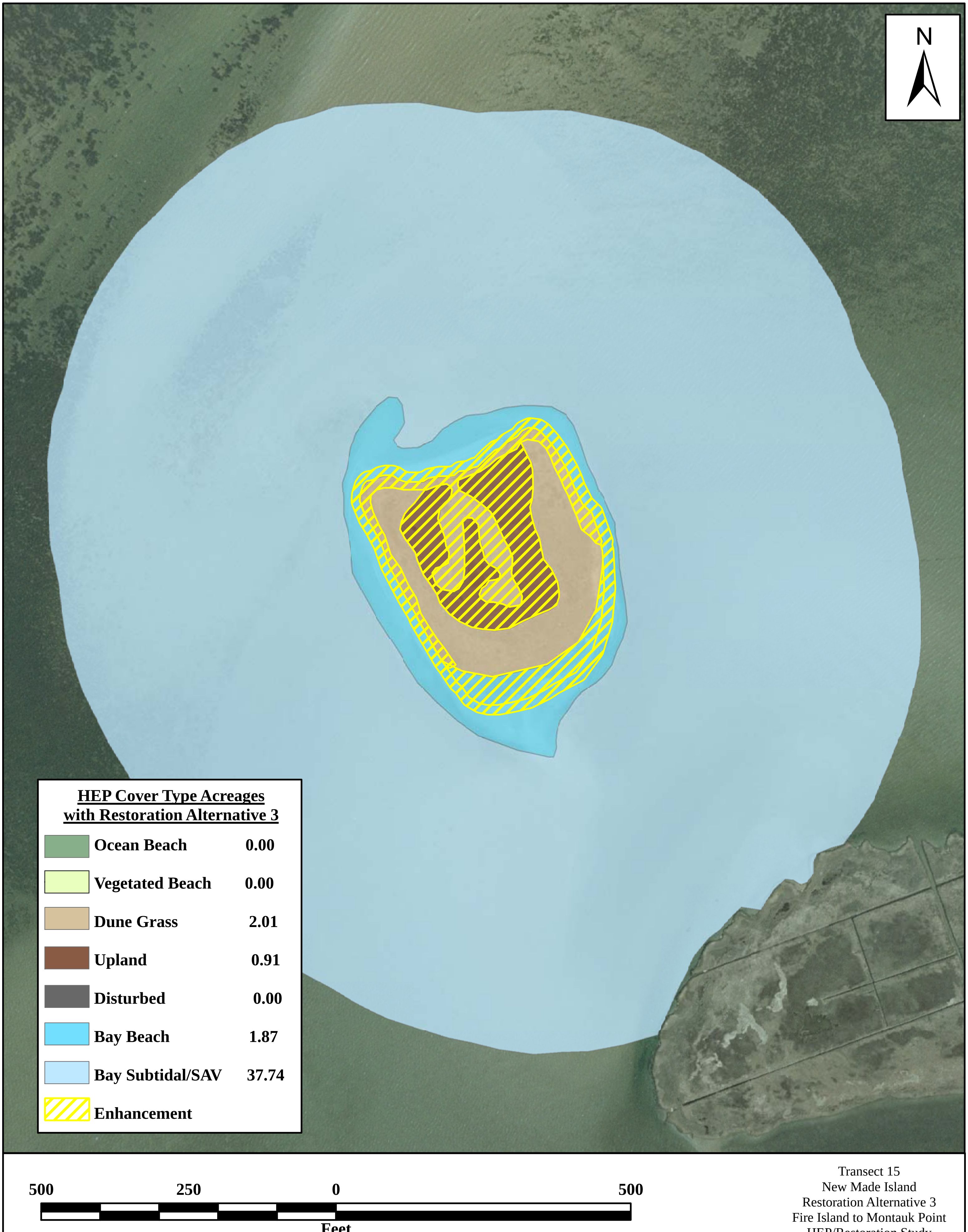
Transect 15
New Made Island
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

02/06



Transect 15
New Made Island
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

02/06

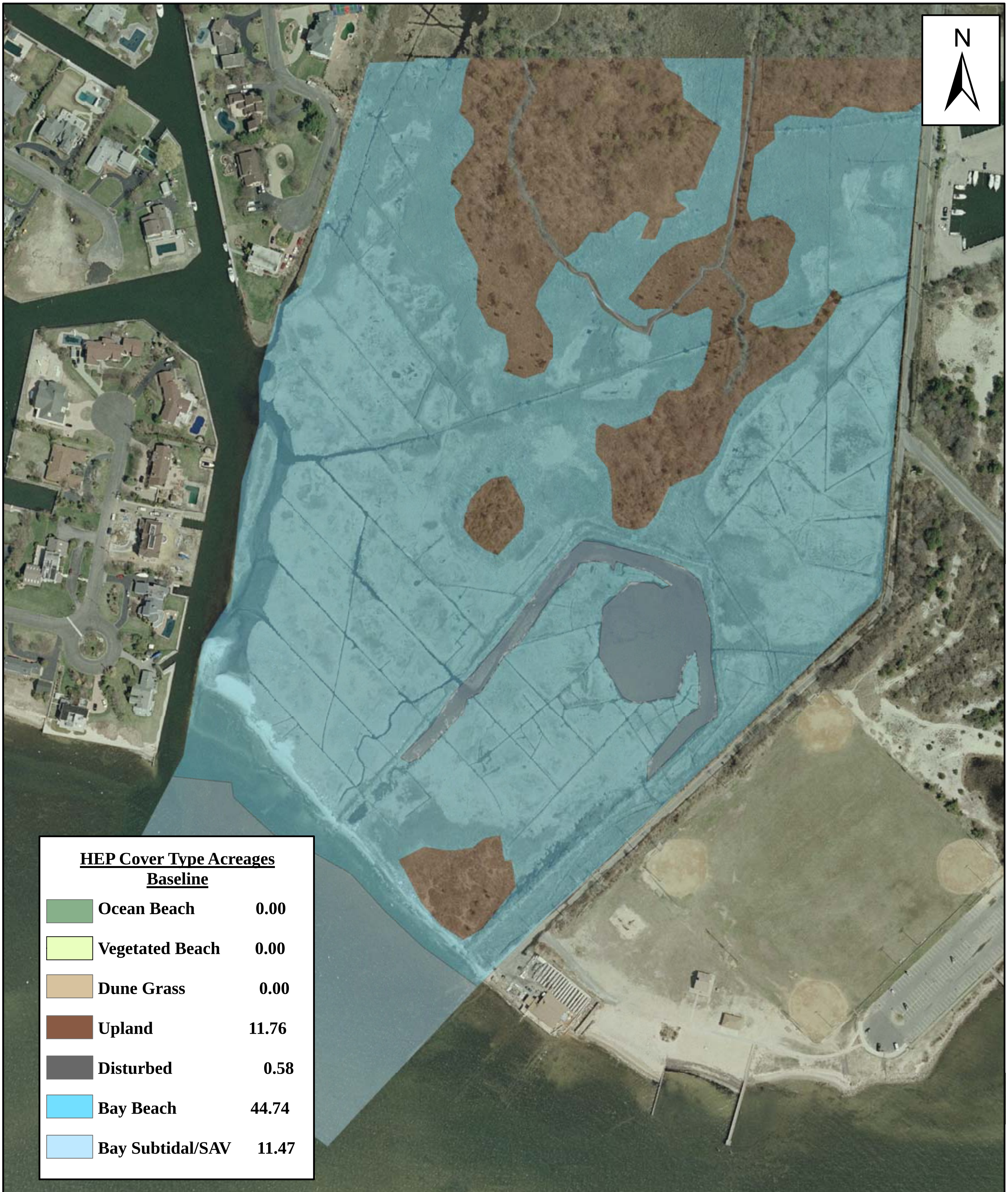


Transect 15
New Made Island
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

02/06

Transect 22

Islip Meadows

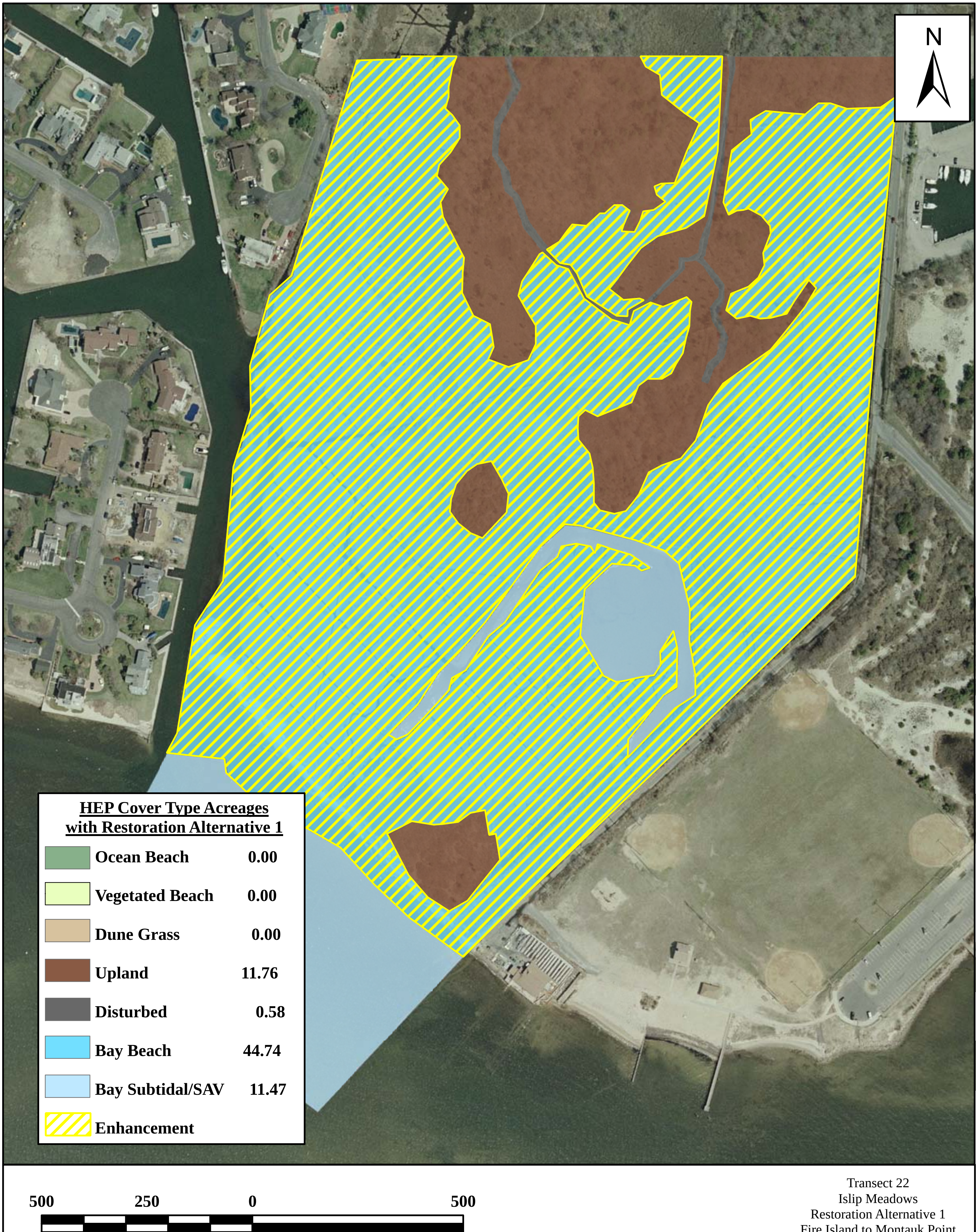


500 250 0 500 1,000

Feet

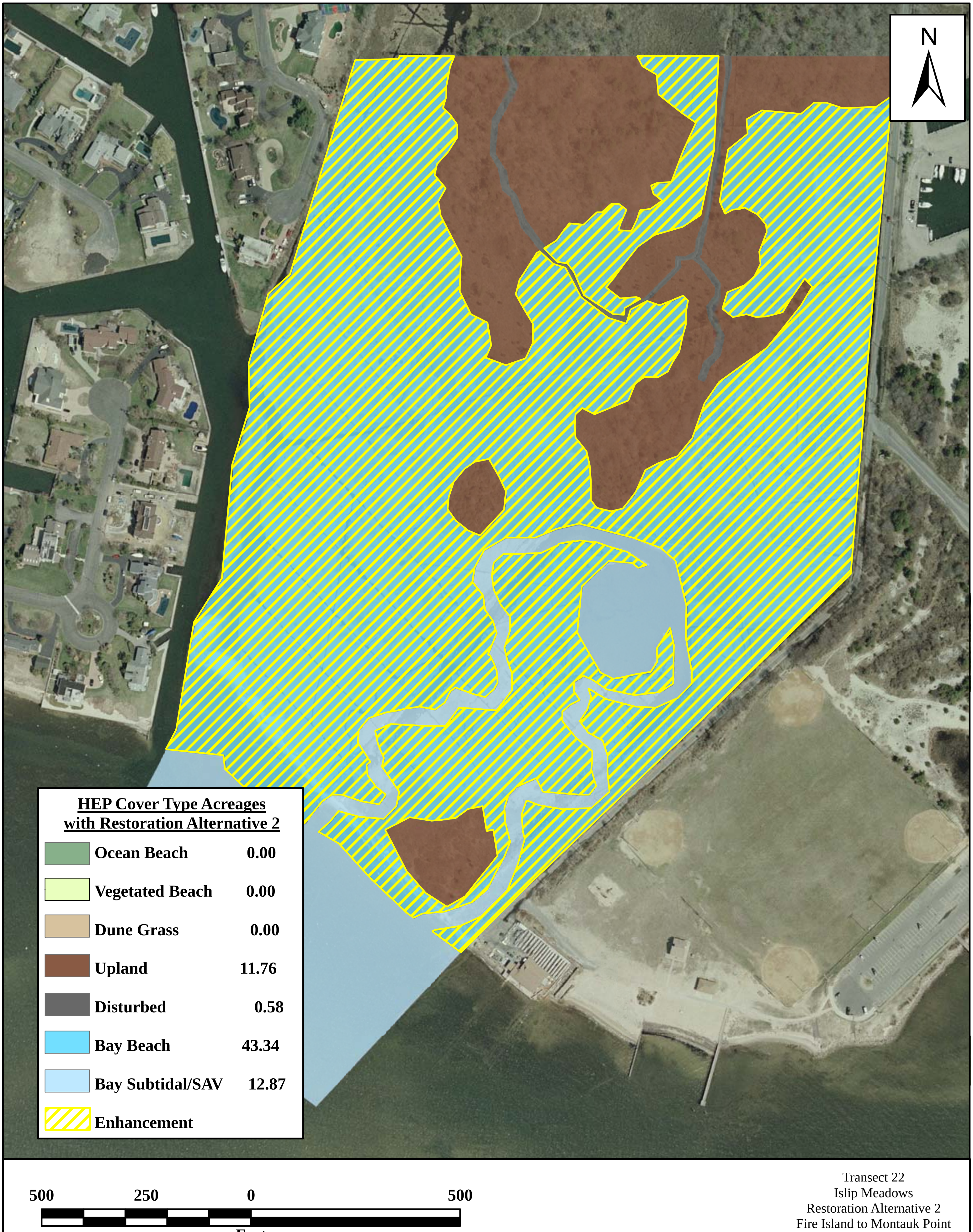
Transect 22
Islip Meadows
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

02/06



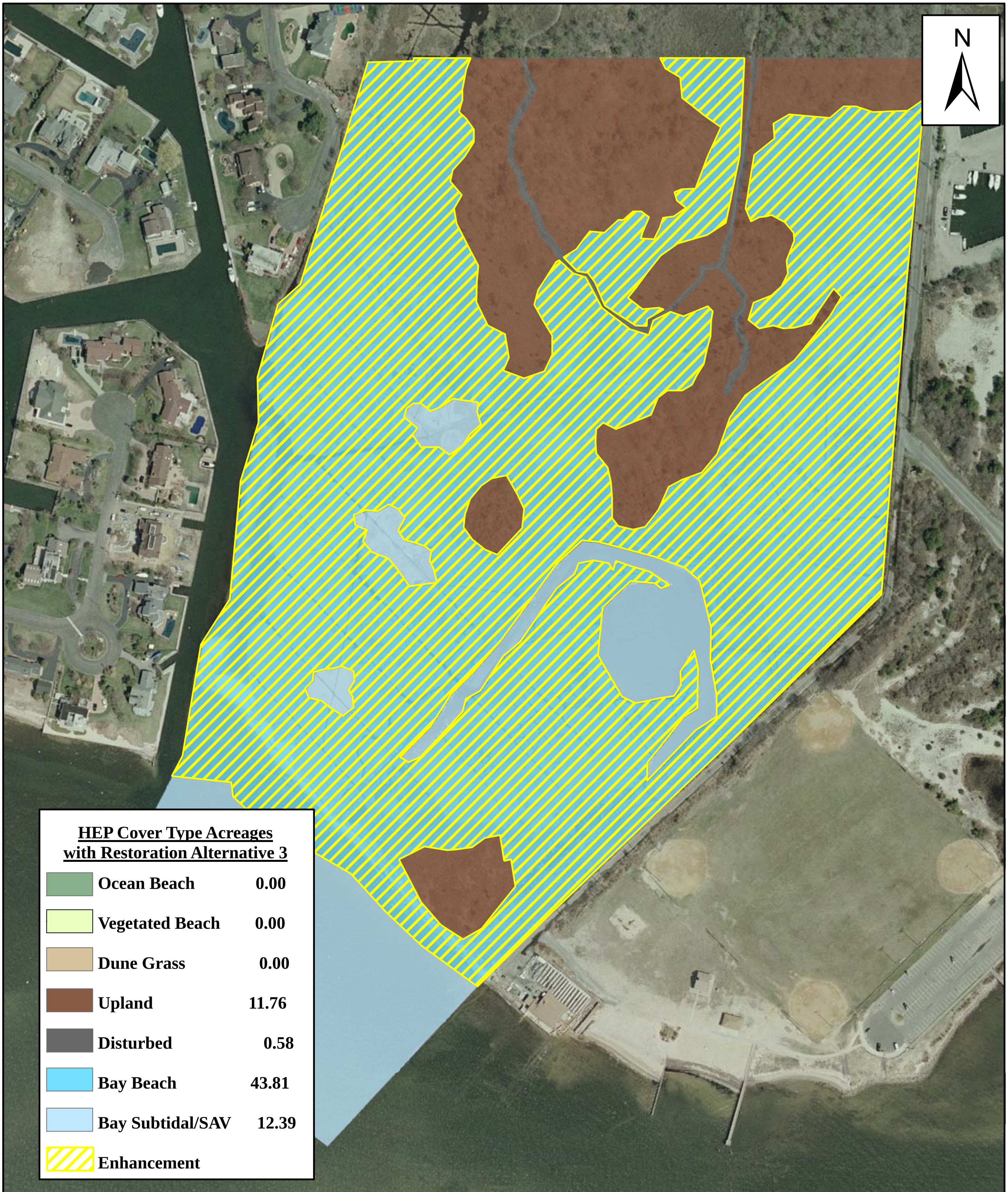
Transect 22
Islip Meadows
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

02/06



Transect 22
Islip Meadows
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

02/06



500 250 0 500

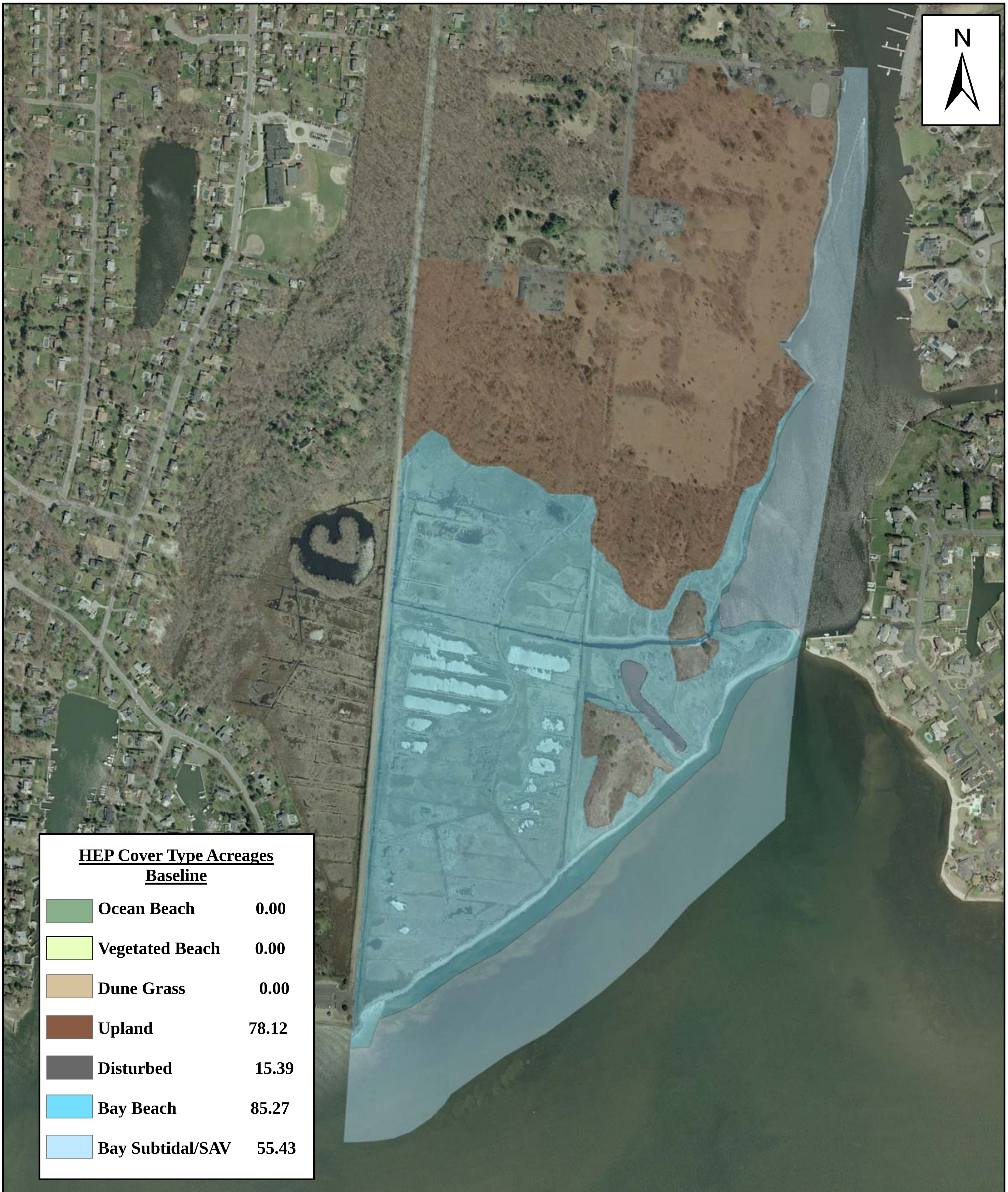
Feet

Transect 22
Islip Meadows
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

02/06

Transect 23

Seatuck Refuge

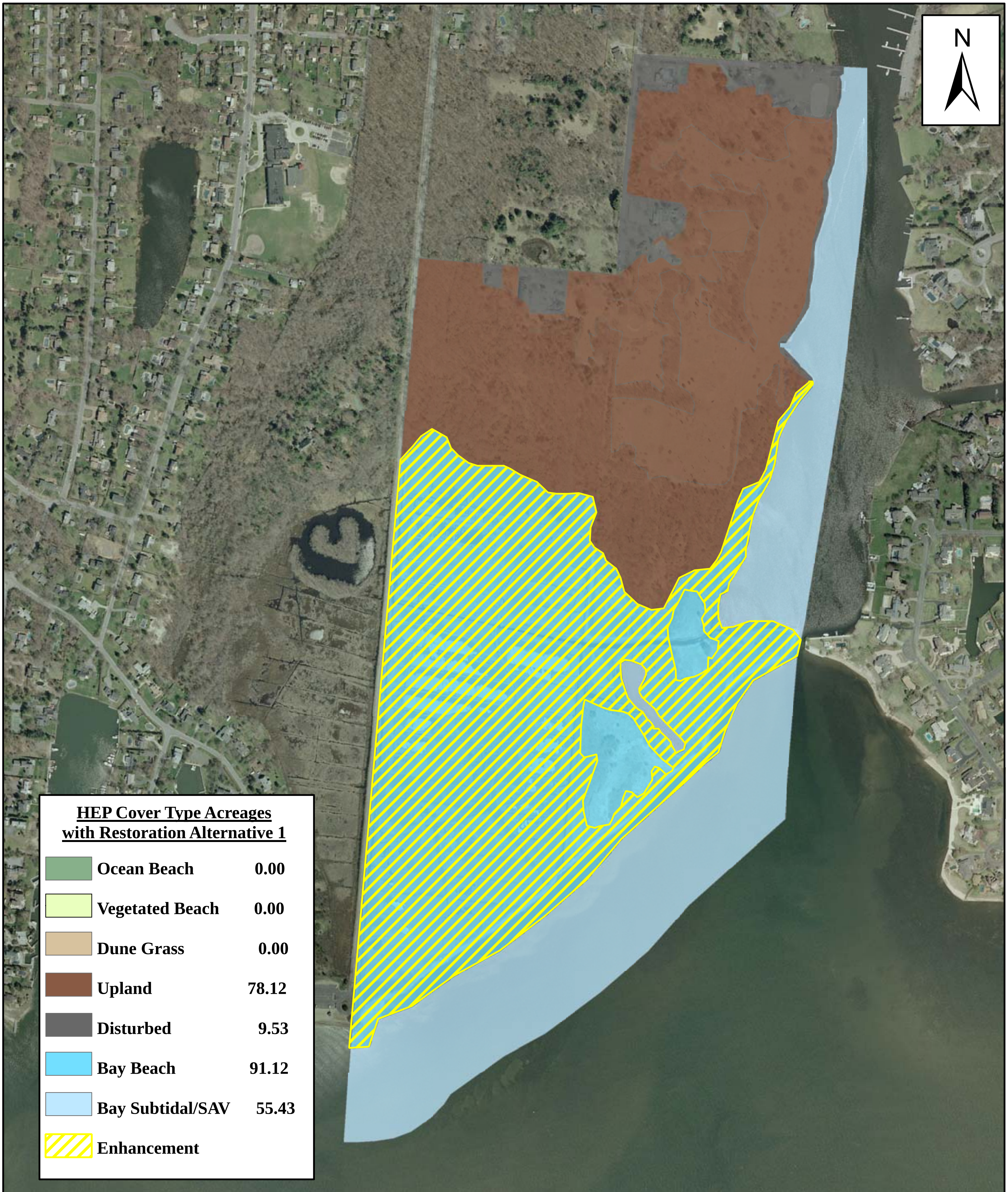


500 250 0 500 1,000

Feet

Transect 23
Seatuck Refuge
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

02/06

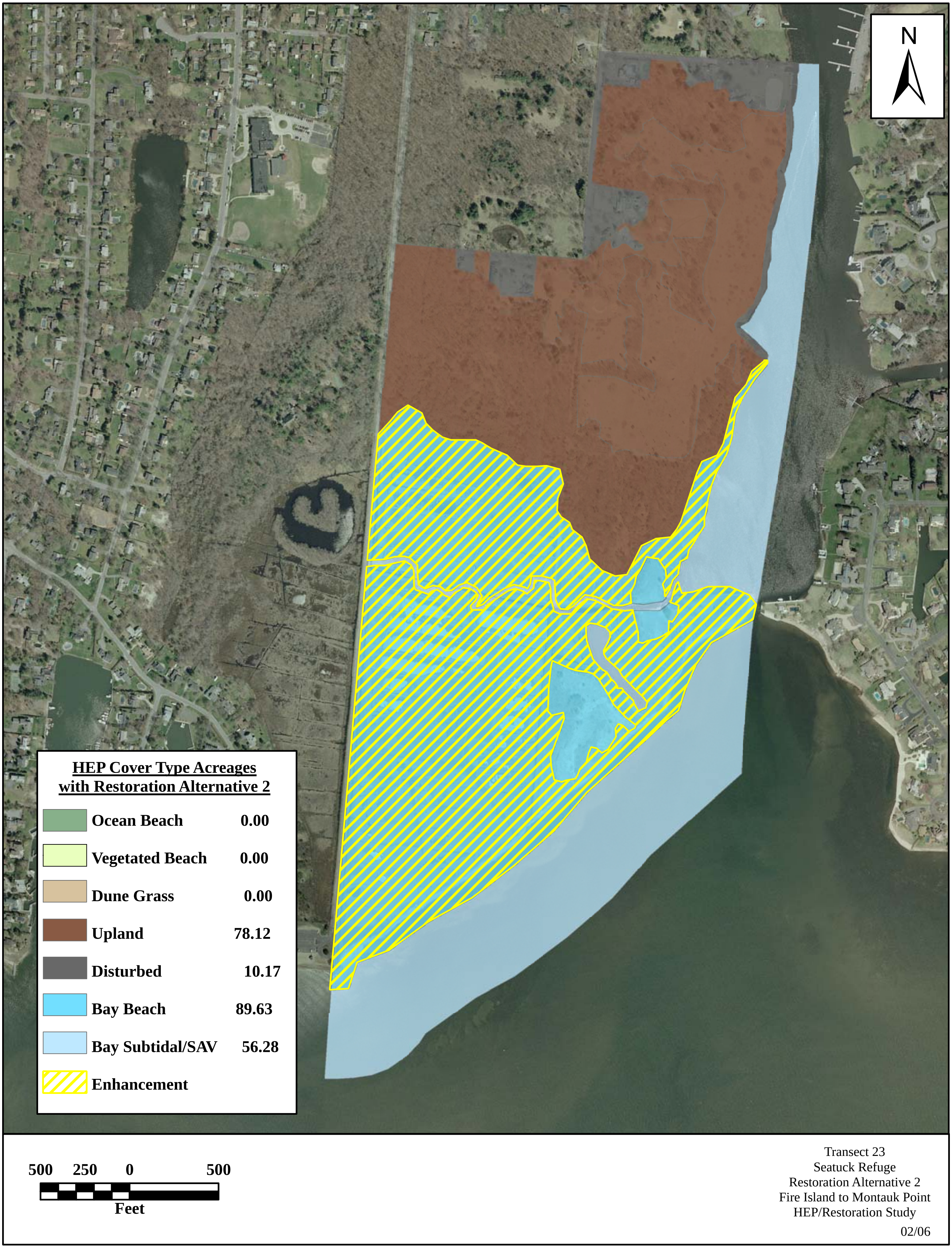


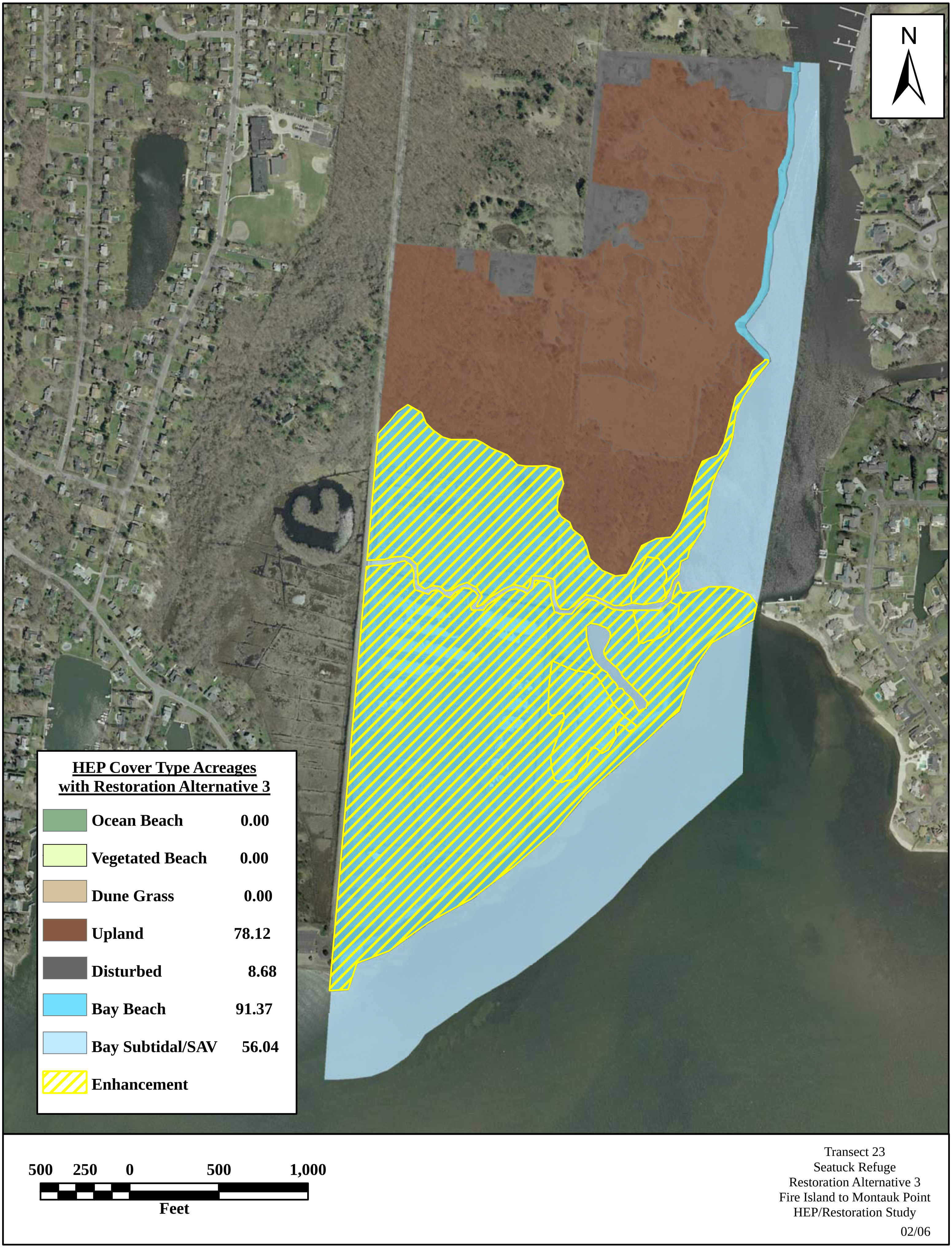
500 250 0 500

Feet

Transect 23
Seatuck Refuge
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

02/06


N
HEP Cover Type Acreages
with Restoration Alternative 2
Ocean Beach 0.00
Vegetated Beach 0.00
Dune Grass 0.00
Upland 78.12
Disturbed 10.17
Bay Beach 89.63
Bay Subtidal/SAV 56.28
Enhancement
500 250 0 500
Feet
Transect 23
Seatuck Refuge
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study
02/06

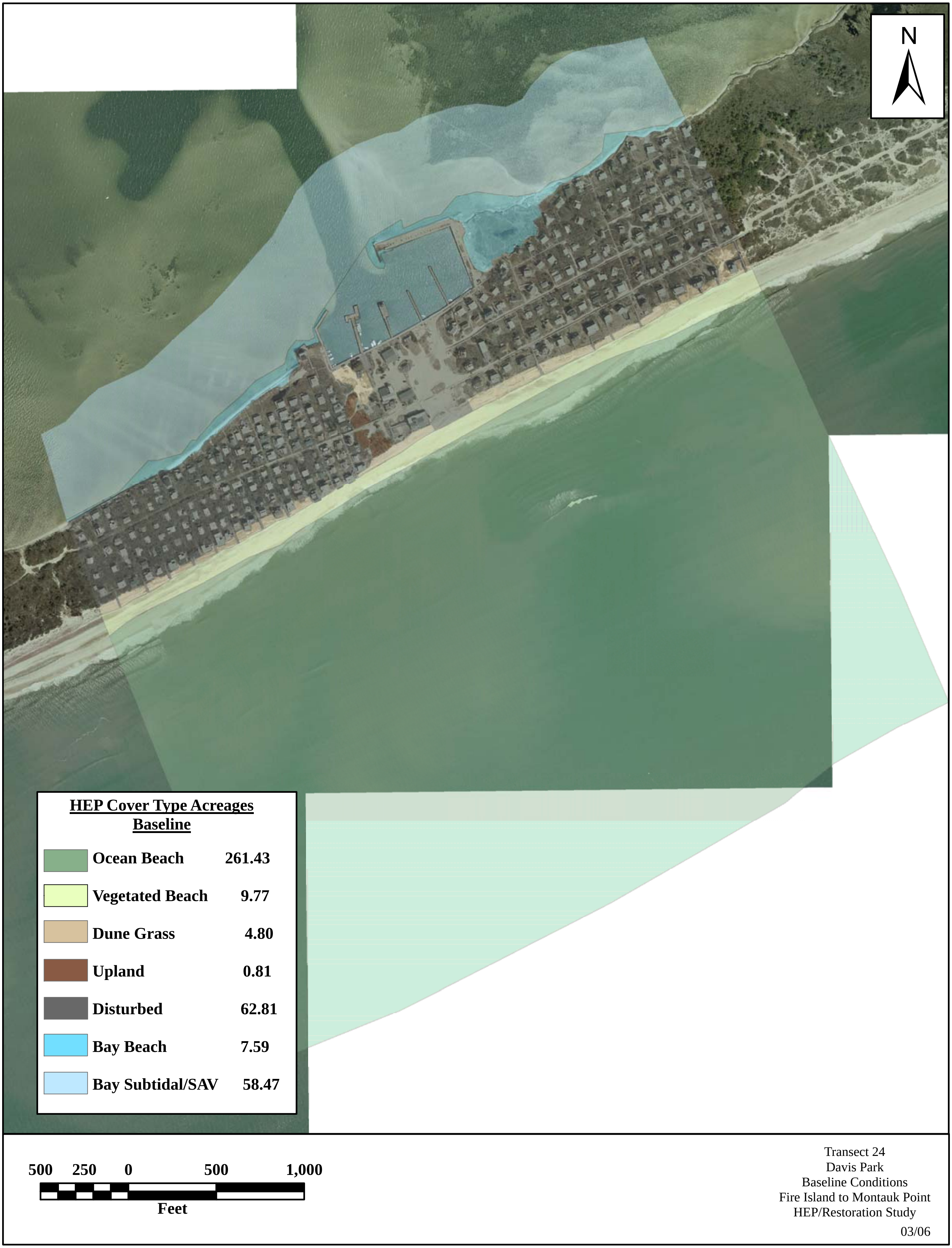


Transect 23
Seatuck Refuge
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

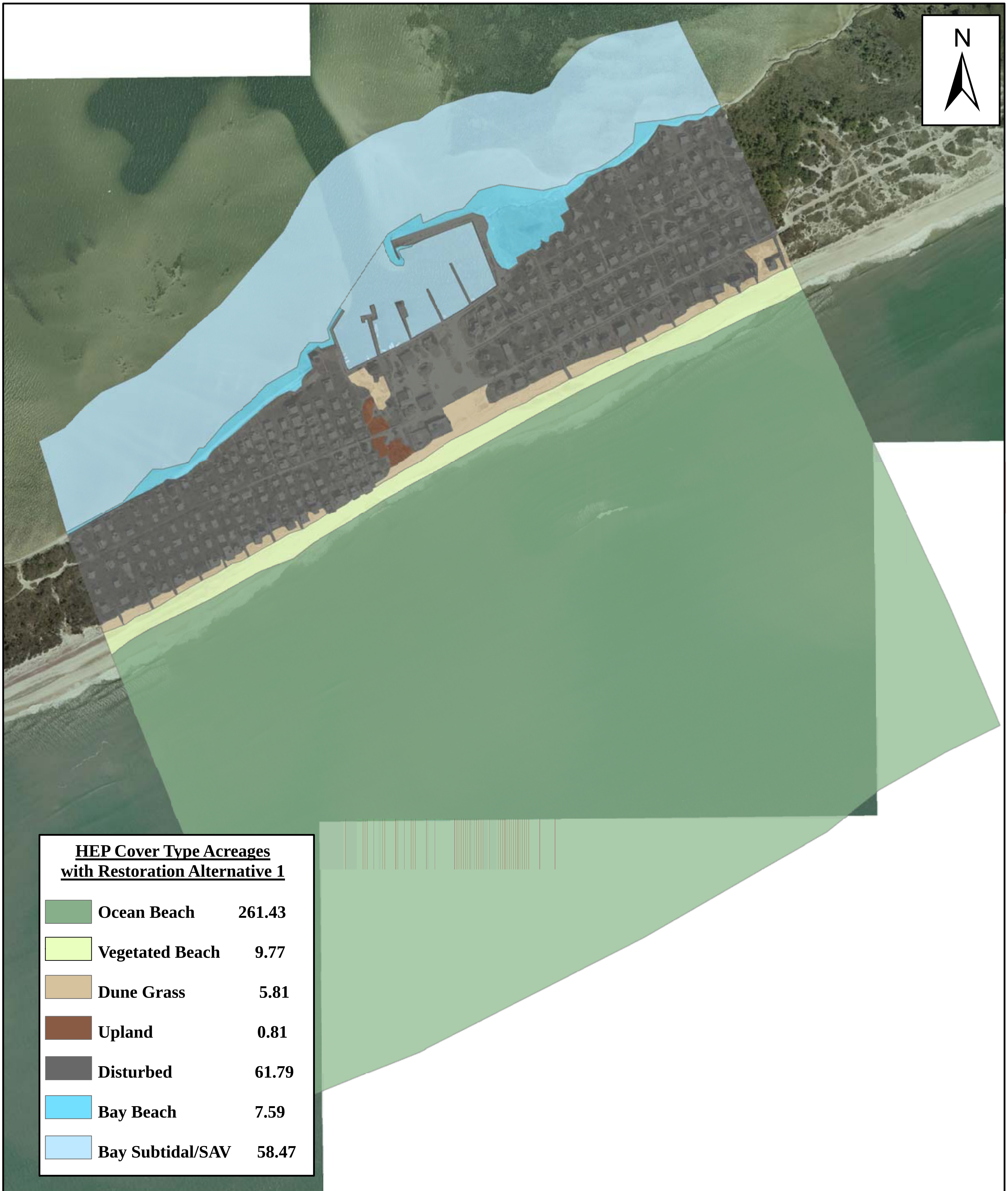
02/06

Transect 24

Davis Park



Transect 24
Davis Park
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study
03/06

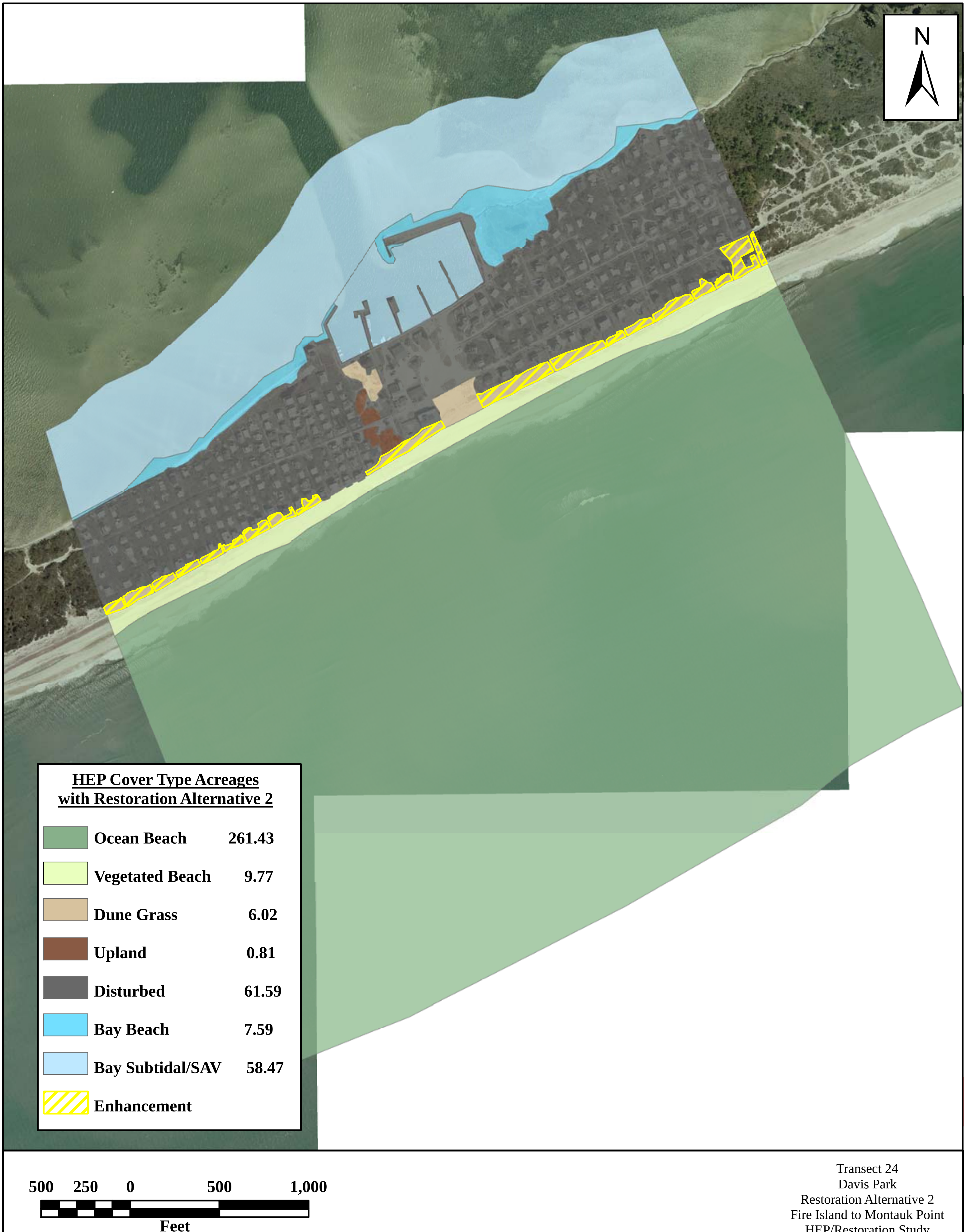


500 250 0 500 1,000

Feet

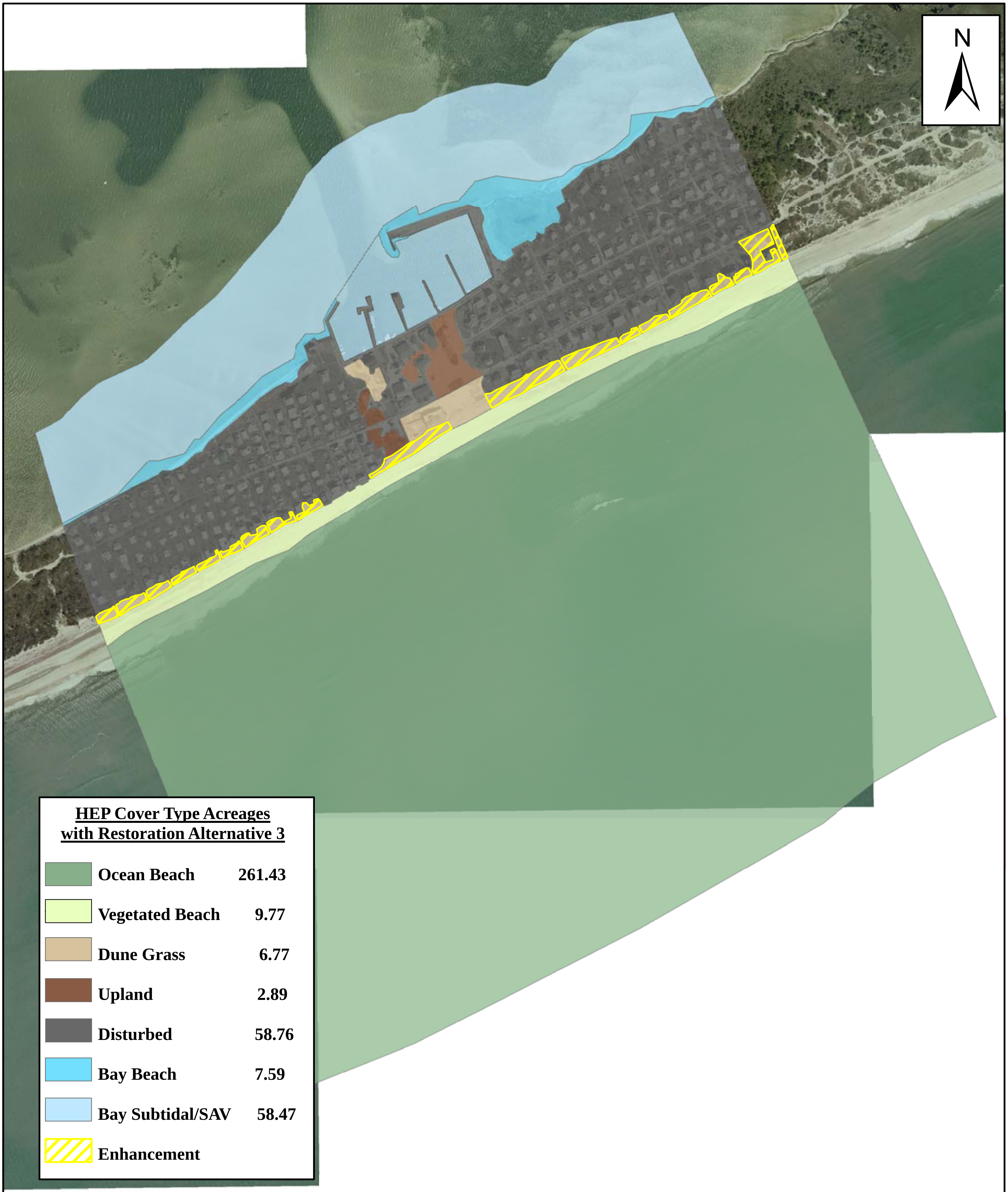
Transect 24
Davis Park
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

05/06



Transect 24
Davis Park
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

03/06



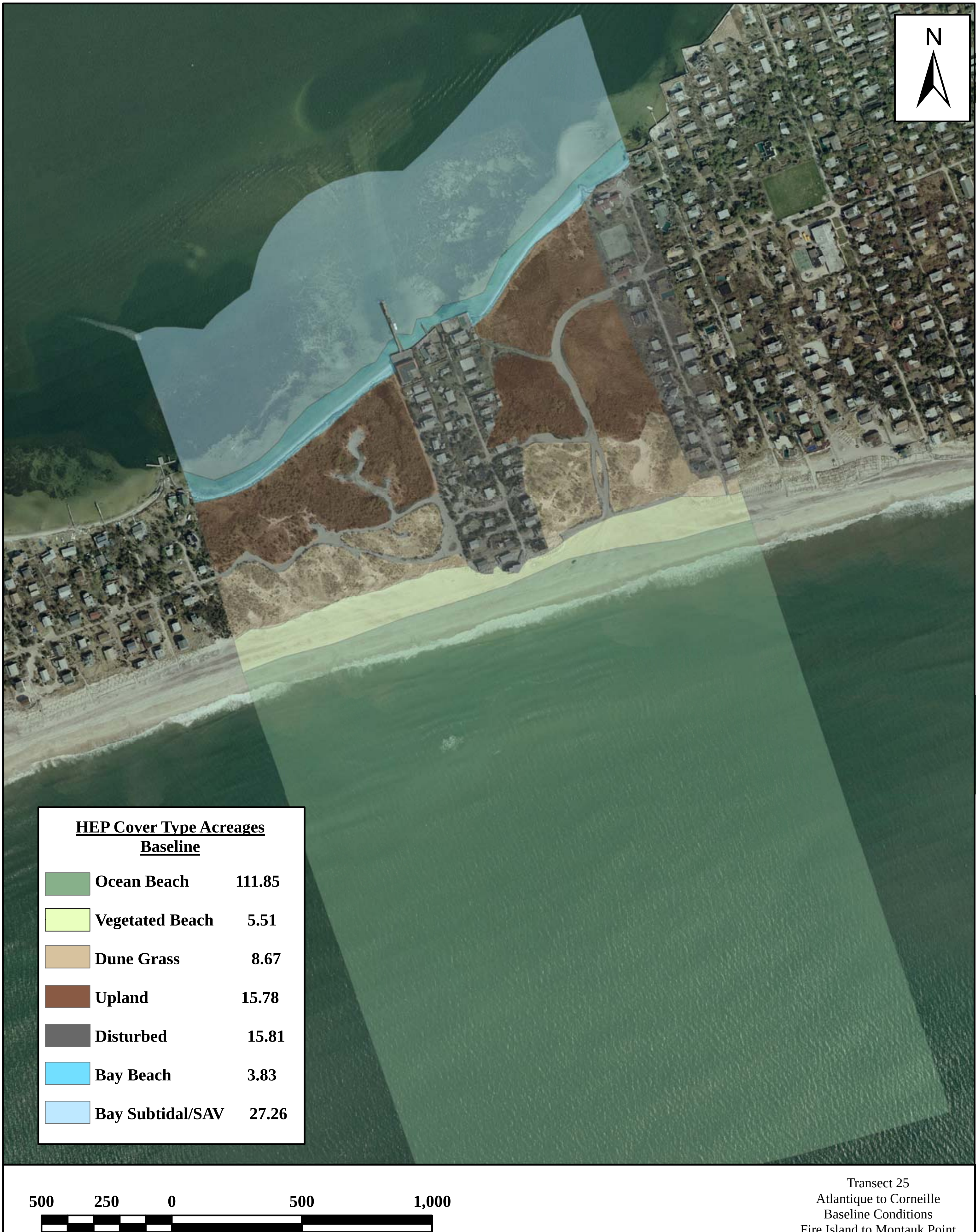
500 250 0 500 1,000
Feet

Transect 24
Davis Park
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

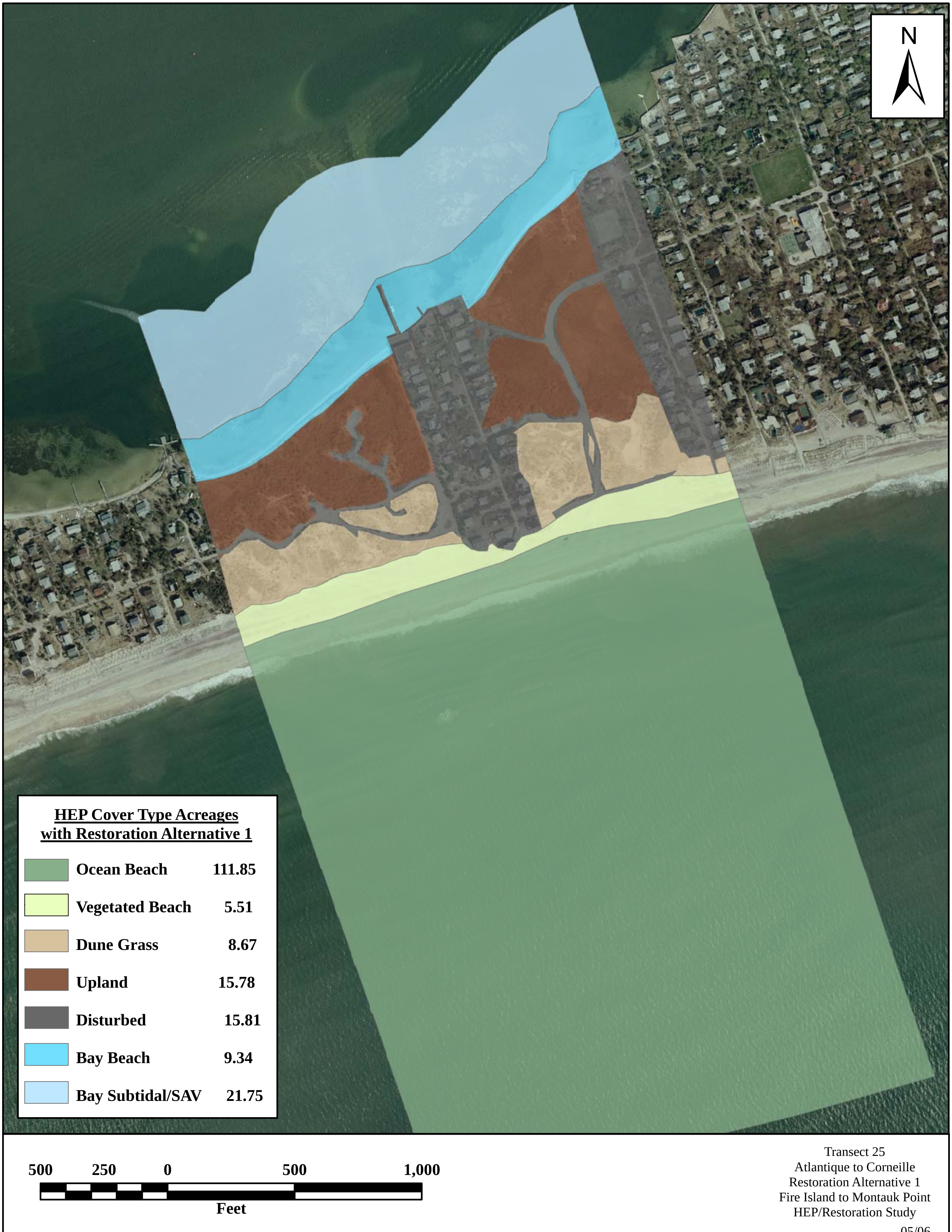
03/06

Transect 25

Atlantique to Corneille

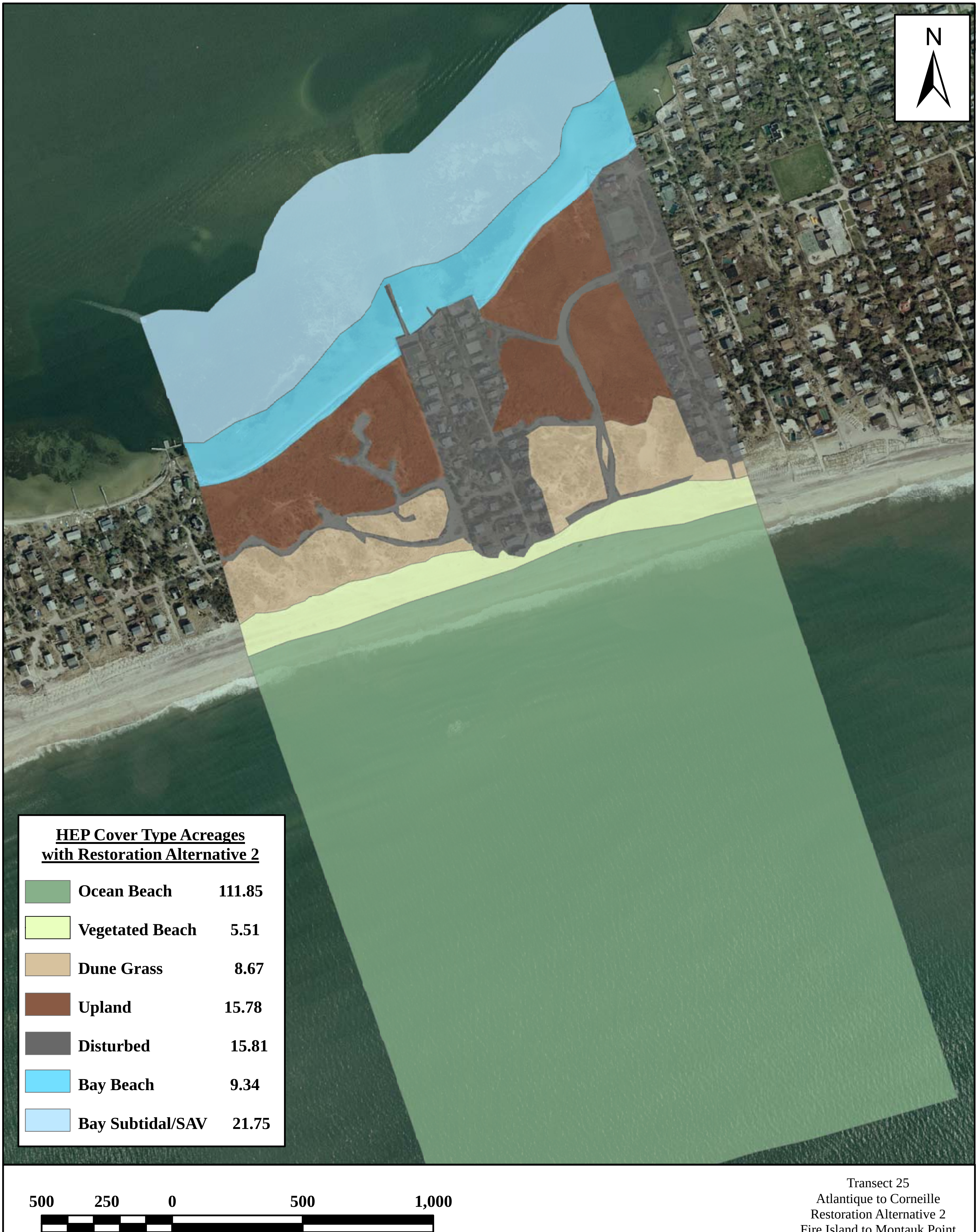


Transect 25
Atlantique to Corneille
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study
03/06



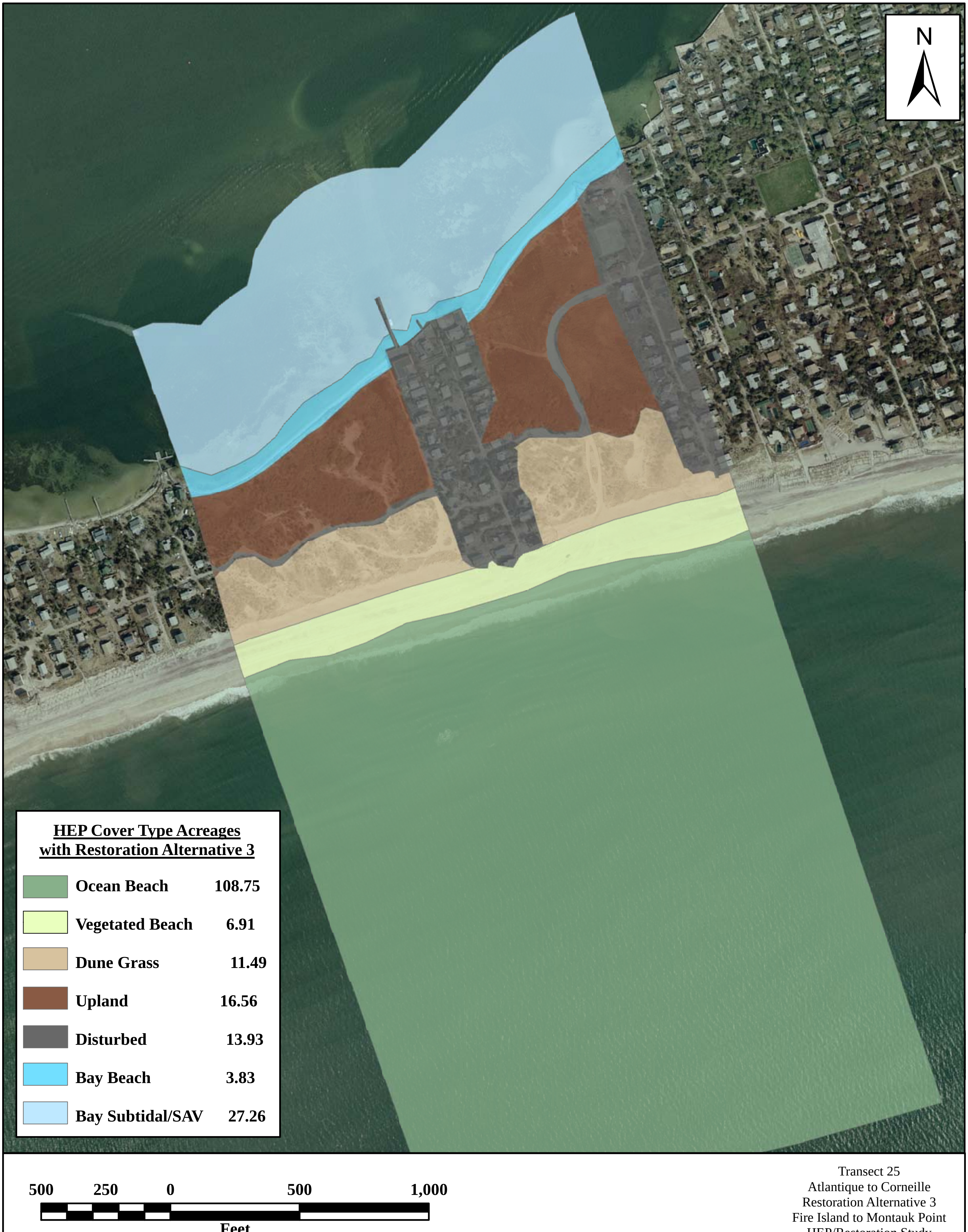
Transect 25
Atlantique to Corneille
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

05/06



Transect 25
Atlantique to Corneille
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

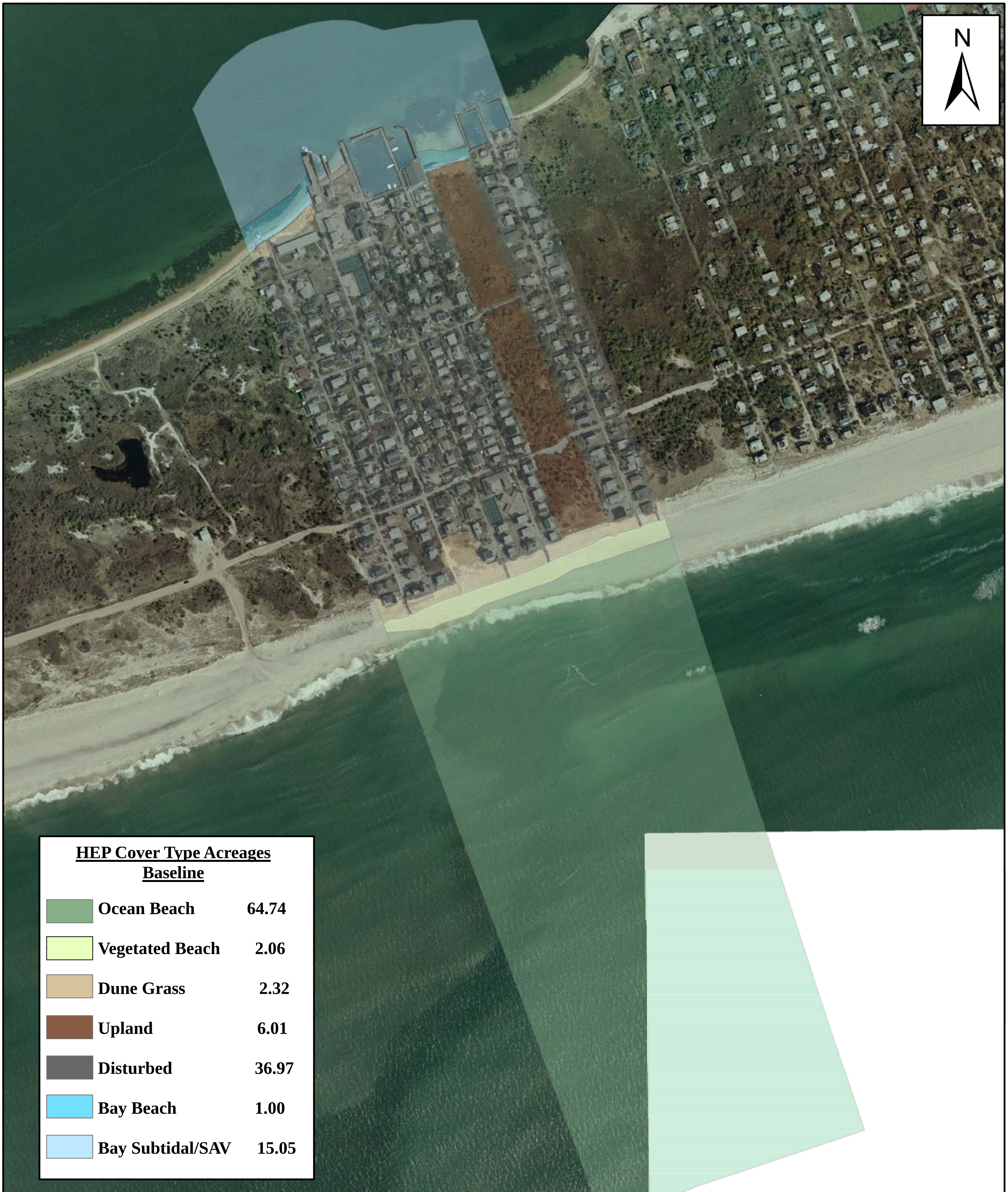
05/06



Transect 25
Atlantique to Corneille
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study
05/06

Transect 26 a, b and c

Kismet, Atlantique, Fair Harbor

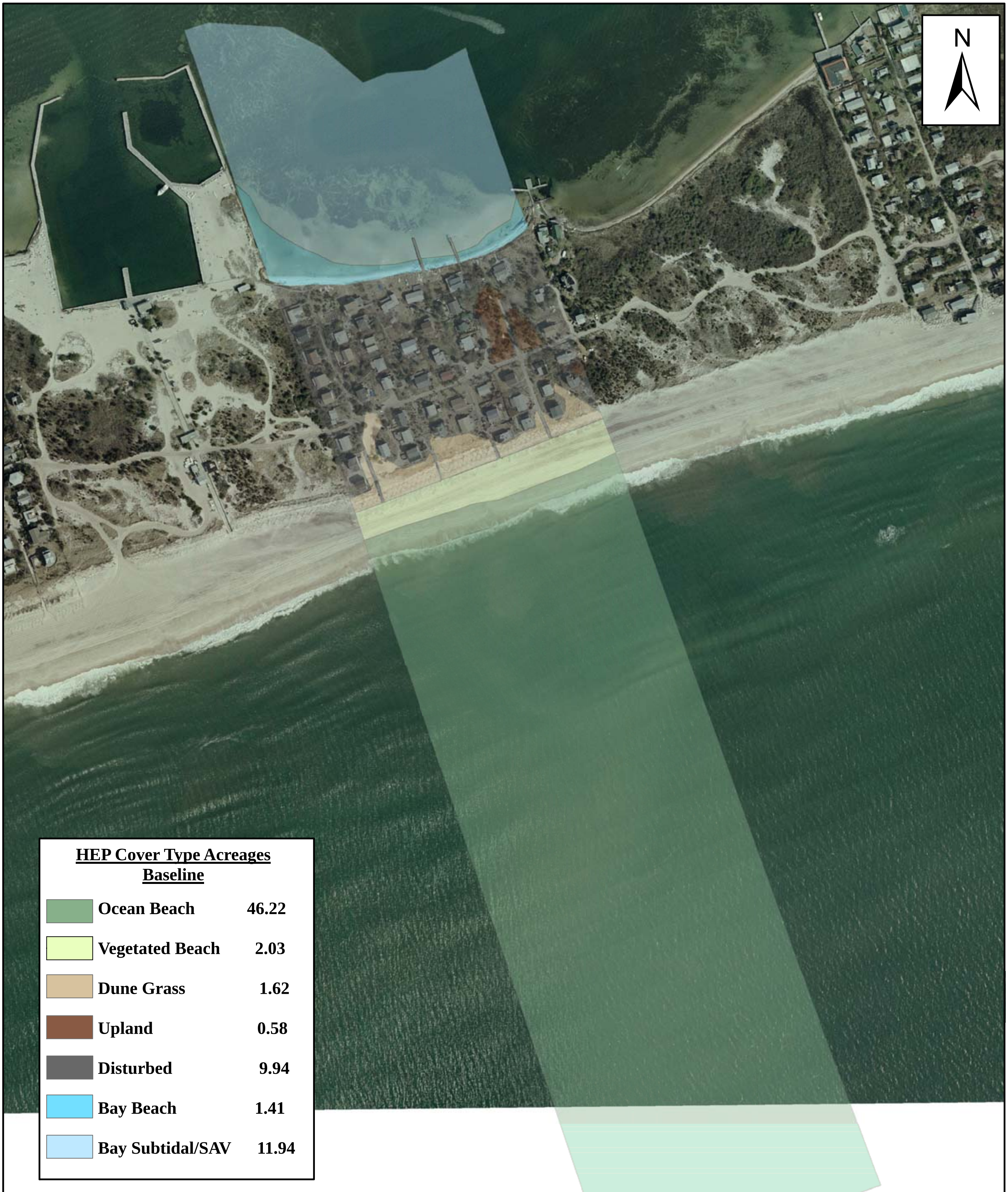


500 250 0 500 1,000

Feet

Transect 26a
Kismet
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

03/06



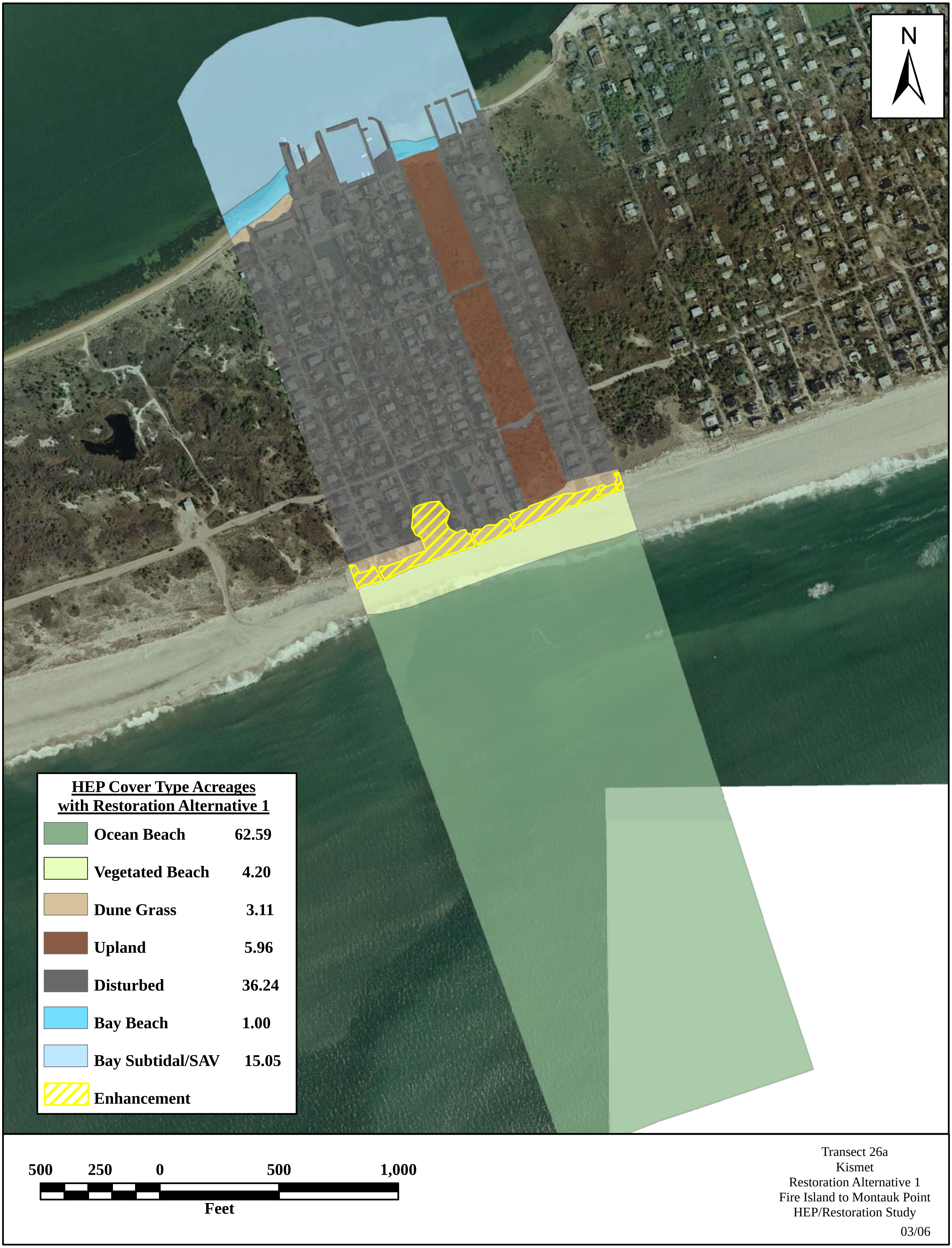
500 250 0 500 1,000

Feet

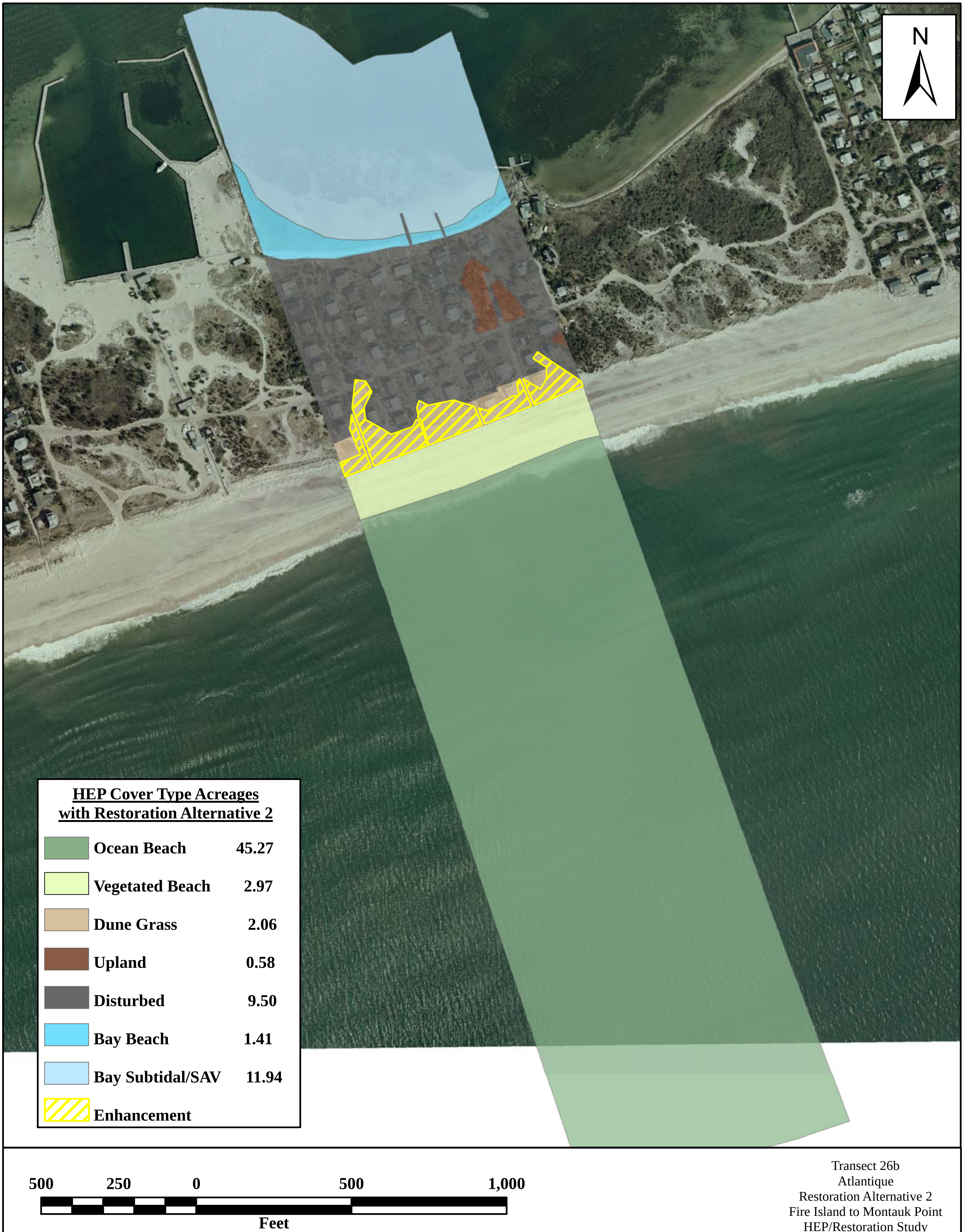
Transect 26b
Atlantique
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

03/06


N
HEP Cover Type Acreages
Baseline
Ocean Beach 50.98
Vegetated Beach 2.63
Dune Grass 0.61
Upland 0.36
Disturbed 25.08
Bay Beach 1.68
Bay Subtidal/SAV 11.09
500 250 0 500 1,000
Feet
Transect 26c
Fair Harbor
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study
03/06



Transect 26a
Kismet
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study
03/06



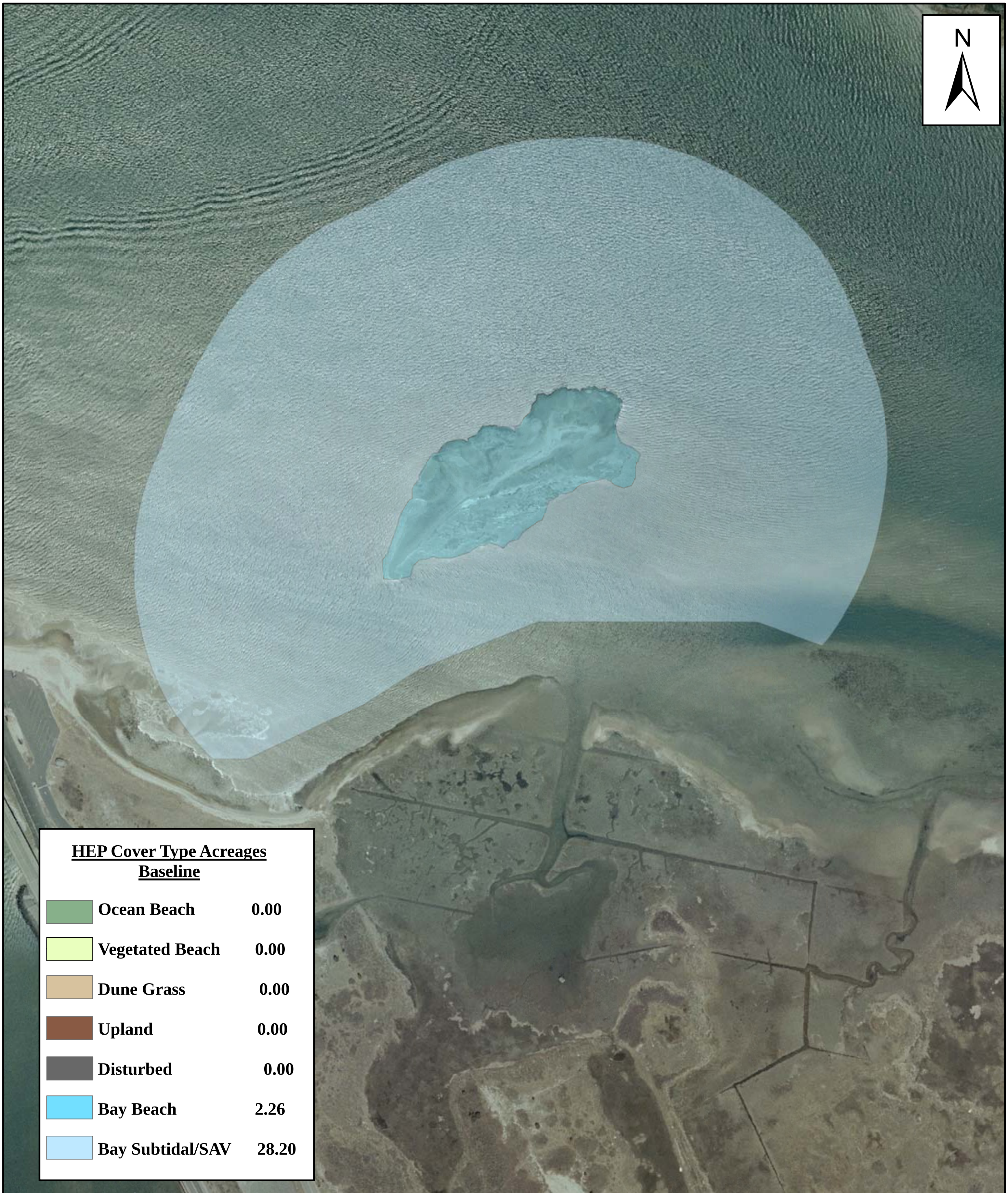
Transcect 26b
Atlantique
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

03/06


N
HEP Cover Type Acreages
with Restoration Alternative 3
Ocean Beach 50.41
Vegetated Beach 3.19
Dune Grass 1.27
Upland 0.36
Disturbed 24.41
Bay Beach 1.68
Bay Subtidal/SAV 11.09
Enhancement
500 250 0 500 1,000
Feet
Transect 26c
Fair Harbor
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study
03/06

Transect 27

Warner’s South Island

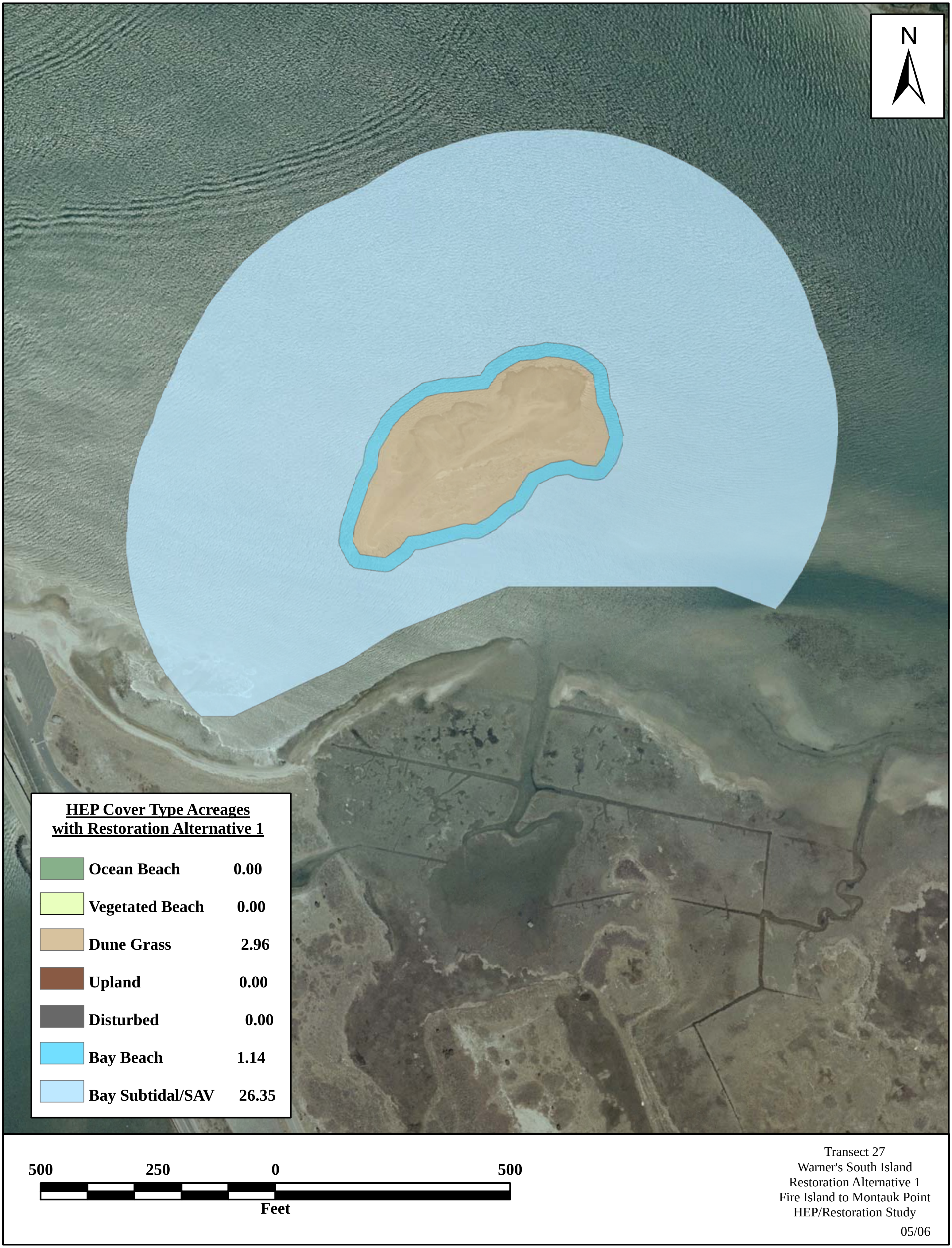


500 250 0 500

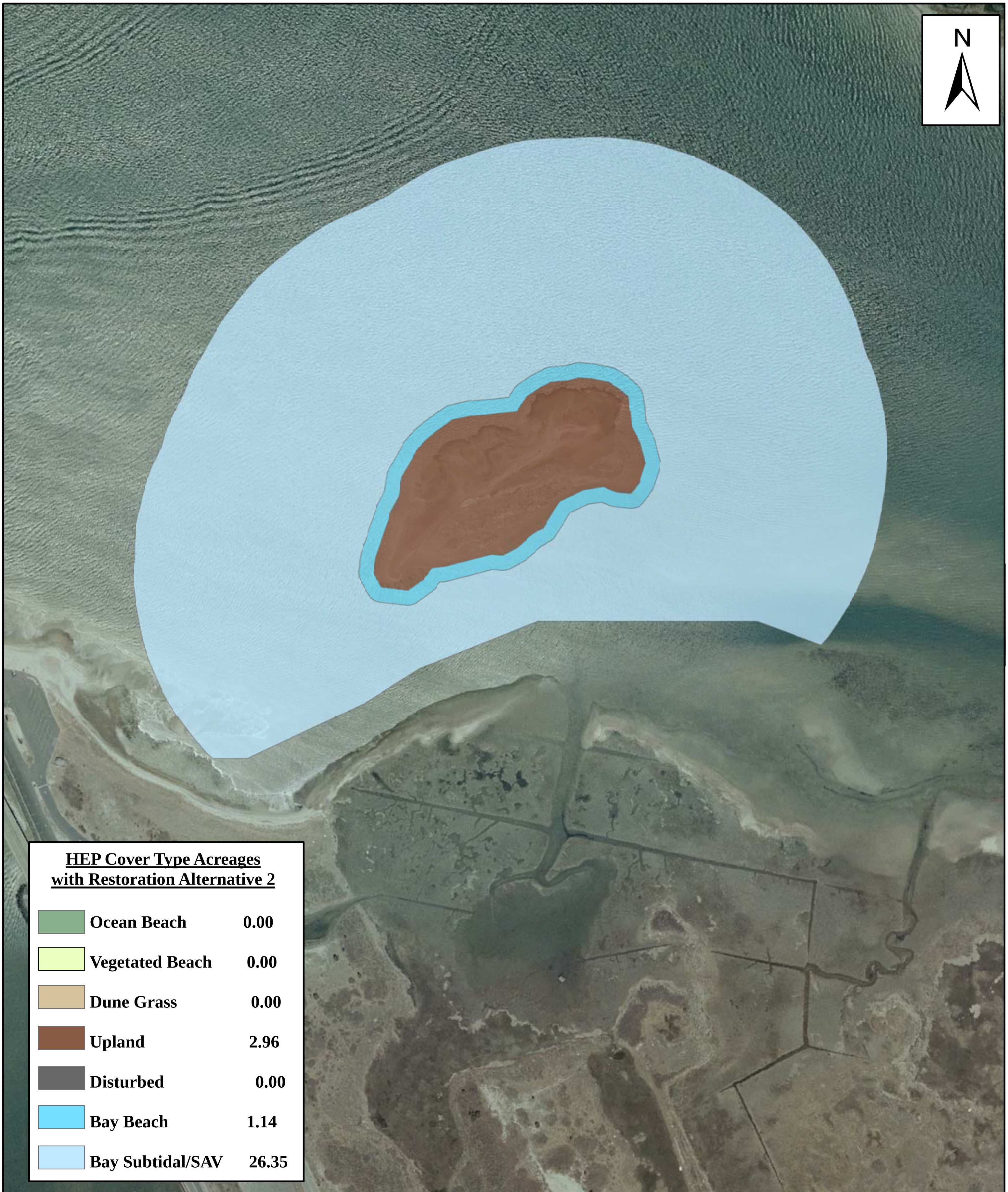
Feet

Transect 27
Warner's South Island
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

02/06



N
HEP Cover Type Acreages
with Restoration Alternative 1
Ocean Beach 0.00
Vegetated Beach 0.00
Dune Grass 2.96
Upland 0.00
Disturbed 0.00
Bay Beach 1.14
Bay Subtidal/SAV 26.35
500 250 0 500
Feet
Transect 27
Warner's South Island
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study
05/06

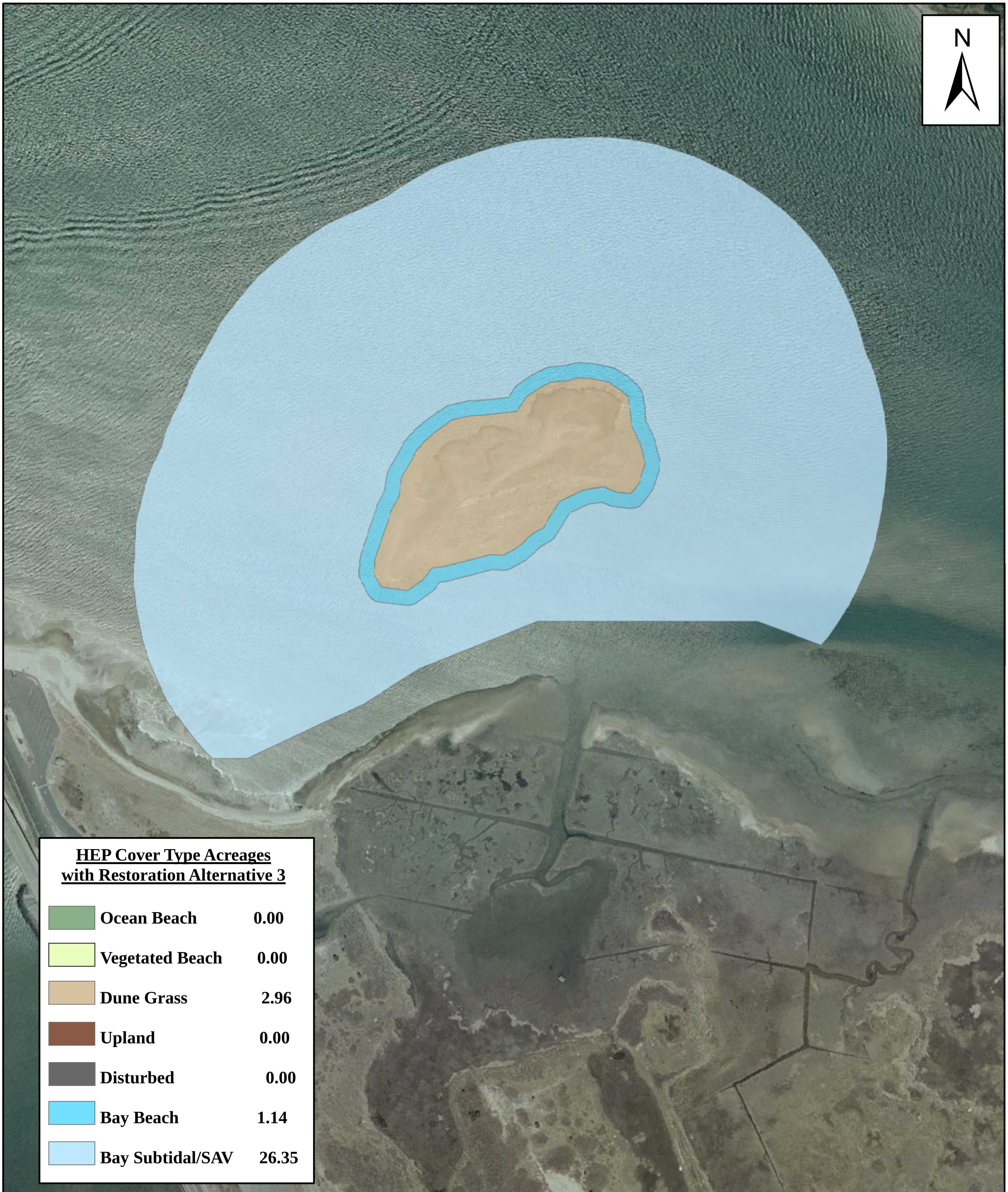


500 250 0 500

Feet

Transect 27
Warner's South Island
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

05/06



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Feet

Transect 27
Warner's South Island
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

05/06

SUMMARY

OF

HSI, HU AND ACRES

FOR

BASELINE, FUTURE NO-ACTION, AND FUTURE WITH-ACTION CONDITIONS AT RESTORATION SITES

Comparison of HSI Scores for Baseline, Future no-action, and Future with-restoration Scenarios.

	Baseline	No Action	Alternative 1	Alternative 2	Alternative 3
Sunken Forest	0.569	0.408	0.645	0.645	0.766
Reagan Property	0.440	0.287	0.514	0.564	0.525
Great Gunn	0.466	0.323	0.504	0.583	0.667
Tiana	0.584	0.401	0.712	0.769	0.629
WOSI	0.512	0.345	0.619	0.613	0.603
East Inlet Island	0.310	0.171	0.382	0.411	0.453
John Boyle Island	0.310	0.171	0.413	0.461	0.451
Ocean Beach	0.293	0.195	0.371	0.462	0.462
New Made Island	0.288	0.168	0.368	0.410	0.448
Georgica Pond	0.483	0.334	0.510	0.510	0.676
Islip Meadows	0.313	0.214	0.321	0.321	0.333
Seatuck Refuge	0.313	0.214	0.321	0.327	0.337
Davis Park	0.374	0.276	0.382	0.461	0.445
Atlantique to Corneille	0.374	0.276	0.374	0.374	0.467
Kismet, Atlantique, Fair Harbor	0.374	0.276	0.452	0.464	0.464
Warner Island East	0.235	0.177	0.338	0.394	0.338

Comparison of Acres for Baseline, Future no-action, and Future with-restoration Scenarios.

	Baseline	No Action*	Alternative 1	Alternative 2	Alternative 3
Sunken Forest	118.3	111.7	118.3	118.3	118.3
Reagan Property	88.5	83.6	88.5	88.5	88.5
Great Gunn	119.4	109.7	119.4	119.4	119.4
Tiana	102.9	95.4	102.9	102.9	102.9
WOSI	138.2	128.7	138.2	138.3	138.3
East Inlet Island	164.6	163.5	164.6	164.6	164.6
John Boyle Island	106.5	106.9	106.5	106.5	106.5
Ocean Beach	183.6	175.7	183.6	183.6	183.6
New Made Island	42.5	41.9	42.5	42.5	42.5
Georgica Pond	1706.2	1706.2	1706.2	1706.2	1706.2
Islip Meadows	68.6	67.4	68.6	68.6	68.5
Seatuck Refuge	234.2	226.4	234.2	234.2	234.2
Davis Park	329.4	309.3	329.4	329.4	329.4
Atlantique to Corneille	158.7	147.5	158.7	158.7	158.7
Kismet, Atlantique, Fair Harbor	253.2	239.3	253.2	253.2	253.2
Warner Island East	30.5	30.5	30.5	30.5	30.5

* need to evaluate future assumptions, the loss of habitat is reflected in HSI score but not in acreages

Comparison of HUs for Baseline, Future no-action, and Future with-restoration Scenarios.

	Baseline	No Action	Alternative 1	Alternative 2	Alternative 3
Sunken Forest	67.30	49.30	68.76	72.67	82.77
Reagan Property	41.45	29.62	42.45	46.08	42.26
Great Gunn	57.31	40.43	59.46	66.60	75.27
Tiana	59.81	40.37	65.71	67.90	64.83
WOSI	102.09	65.62	108.44	107.66	106.66
East Inlet Island	82.42	55.90	87.00	97.25	108.92
John Boyle Island	53.52	35.94	60.19	60.99	67.24
Ocean Beach	31.34	26.64	42.81	46.12	46.44
New Made Island	20.89	13.27	21.64	22.02	22.33
Georgica Pond	343.70	246.32	365.57	365.57	418.18
Islip Meadows	42.00	29.74	44.17	43.93	47.31
Seatuck Refuge	139.96	92.88	147.94	150.65	157.45
Davis Park	143.75	115.31	144.51	148.91	146.96
Atlantique to Corneille	70.50	54.15	68.42	68.42	76.01
Kismet, Atlantique, Fair Harbor	95.63	75.92	99.16	99.85	100.35
Warner Island East	16.09	10.53	15.98	16.97	15.98

BASELINE CONDITIONS

HSIs, HUs and Acres

Baseline HSI Scores per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
Sunken Forest	0.54	0.57	0.69	0.20	0.64	0.78	0.569
Reagan Property	0.57	0.40	0.44	0.21	0.35	0.67	0.440
Great Gunn	0.54	0.48	0.56	0.24	0.54	0.42	0.466
Tiana	0.57	0.59	0.70	0.67	0.61	0.35	0.584
WOSI	0.95	0.46	0.44	0.57	0.44	0.22	0.512
East Inlet Island	0.00	0.00	0.39	0.53	0.50	0.45	0.310
John Boyle Island	0.00	0.00	0.39	0.53	0.50	0.45	0.310
Ocean Beach	0.24	0.22	0.43	0.15	0.53	0.19	0.293
New Made Island	0.00	0.00	0.32	0.46	0.50	0.45	0.288
Georgica Pond	0.17	0.25	0.47	0.78	0.75	0.47	0.483
Islip Meadows	0.00	0.00	0.00	0.61	0.48	0.78	0.313
Seatuck Refuge	0.00	0.00	0.00	0.61	0.48	0.78	0.313
Davis Park	0.57	0.37	0.43	0.15	0.53	0.19	0.374
Atlantique to Corneille	0.57	0.37	0.43	0.15	0.53	0.19	0.374
Kismet, Atlantique, Fair Harbor	0.57	0.37	0.43	0.15	0.53	0.19	0.374
Warner Island East	0.00	0.00	0.00	0.91	0.50	0.00	0.235

Baseline Acres per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	DISTURBED	TOTAL ACRES
Sunken Forest	59	5	8	2	22	15	7	118
Reagan Property	48	4	8	1	16	5	7	89
Great Gunn	58	6	14	11	17	7	6	119
Tiana	55	7	6	11	19	4	2	103
WOSI	82	9	13	8	20	5	2	138
East Inlet Island	0	0	11	67	83	2	0	165
John Boyle Island	0	0	3	31	72	1	0	107
Ocean Beach	71	4	3	0	23	1	82	184
New Made Island	0	0	1	3	38	1	0	43
Georgica Pond	281	16	13	134	184	90	989	1,706
Islip Meadows	0	0	0	45	11	12	1	69
Seatuck Refuge	0	0	0	85	55	78	15	234
Davis Park	185	10	5	8	58	1	63	329
Atlantique to Corneille	82	6	9	4	27	16	16	159
Kismet, Atlantique, Fair Harbor	121	7	5	4	38	7	72	253
Warner Island East	0	0	0	2	28	0	0	30

Baseline HU Scores per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
Sunken Forest	32	3	6	0	14	12	67.30
Reagan Property	27	1	3	0	5	3	41.45
Great Gunn	31	3	8	3	9	3	57.31
Tiana	31	4	4	7	12	1	59.81
WOSI	78	4	6	5	9	1	102.09
East Inlet Island	0	0	4	35	42	1	82.42
John Boyle Island	0	0	1	17	36	0	53.52
Ocean Beach	17	1	1	0	12	0	31.34
New Made Island	0	0	0	2	19	0	20.89
Georgica Pond	49	4	6	104	138	43	343.70
Islip Meadows	0	0	0	27	6	9	42.00
Seatuck Refuge	0	0	0	52	27	61	139.96
Davis Park	106	4	2	1	31	0	143.75
Atlantique to Corneille	47	2	4	1	14	3	70.50
Kismet, Atlantique, Fair Harbor	69	2	2	1	20	1	95.63
Warner Island East	0	0	0	2	14	0	16.09

FUTURE NO-ACTION CONDITIONS

HSIs, HUs and Acres

(Future conditions without project or restoration activities)

HSI Scores per Transect and Per Community - RESTORATION Future No Action

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
Sunken Forest	0.48	0.52	0.39	0.12	0.51	0.42	0.408
Reagan Property	0.51	0.35	0.22	0.13	0.20	0.32	0.287
Great Gunn	0.48	0.45	0.29	0.20	0.40	0.12	0.323
Tiana	0.42	0.56	0.44	0.53	0.43	0.02	0.401
WOSI	0.68	0.40	0.23	0.49	0.27	0.00	0.345
East Inlet Island	0.00	0.00	0.17	0.40	0.31	0.15	0.171
John Boyle Island	0.00	0.00	0.17	0.40	0.31	0.15	0.171
Ocean Beach	0.24	0.18	0.21	0.10	0.44	0.00	0.195
New Made Island	0.00	0.00	0.17	0.38	0.31	0.15	0.168
Georgica Pond	0.07	0.20	0.21	0.64	0.59	0.30	0.334
Islip Meadows	0.00	0.00	0.00	0.46	0.30	0.52	0.214
Seatuck Refuge	0.00	0.00	0.00	0.46	0.30	0.52	0.214
Davis Park	0.51	0.33	0.21	0.10	0.44	0.07	0.276
Atlantique to Corneille	0.51	0.33	0.21	0.10	0.44	0.07	0.276
Kismet, Atlantique, Fair Harbor	0.51	0.33	0.21	0.10	0.44	0.07	0.276
Warner Island East	0.00	0.00	0.00	0.75	0.31	0.00	0.177

Acres per Transect and Per Community - RESTORATION Future No Action

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	DISTURBED	TOTAL ACRES
Sunken Forest	53.23	4.55	7.61	1.67	24.55	13.63	6.51	111.73
Reagan Property	43.13	3.31	7.10	0.83	17.25	4.66	7.34	83.62
Great Gunn	51.87	5.74	12.83	9.97	16.61	6.63	6.09	109.75
Tiana	49.10	6.92	5.51	9.69	18.74	3.82	1.57	95.35
WOSI	73.60	8.24	12.85	8.42	19.65	4.11	1.81	128.69
East Inlet Island	0.00	0.00	8.55	70.70	83.46	0.84	0.00	163.54
John Boyle Island	0.00	0.00	2.18	32.94	71.50	0.25	0.00	106.87
Ocean Beach	63.81	3.53	2.84	0.31	22.68	0.73	81.84	175.74
New Made Island	0.00	0.00	0.46	3.43	37.74	0.32	0.00	41.95
Georgica Pond	281.21	16.03	13.03	134.02	183.60	89.79	988.52	1706.20
Islip Meadows	0.00	0.00	0.00	44.74	11.47	10.58	0.58	67.37
Seatuck Refuge	0.00	0.00	0.00	85.27	55.43	70.31	15.39	226.40
Davis Park	166.64	8.79	4.32	7.59	58.47	0.73	62.81	309.35
Atlantique to Corneille	73.61	4.96	7.80	3.83	27.26	14.20	15.81	147.48
Kismet, Atlantique, Fair Harbor	108.76	6.05	4.19	4.09	38.08	6.26	71.89	239.30
Warner Island East	0.00	0.00	0.00	2.26	28.20	0.00	0.00	30.46

HU Scores per Transect and Per Community - RESTORATION Future No Action

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
Sunken Forest	25	2	3	0	13	6	49.30
Reagan Property	22	1	2	0	3	1	29.62
Great Gunn	25	3	4	2	7	1	40.43
Tiana	21	4	2	5	8	0	40.37
WOSI	50	3	3	4	5	0	65.62
East Inlet Island	0	0	1	28	26	0	55.90
John Boyle Island	0	0	0	13	22	0	35.94
Ocean Beach	15	1	1	0	10	0	26.64
New Made Island	0	0	0	1	12	0	13.27
Georgica Pond	19	3	3	86	108	27	246.32
Islip Meadows	0	0	0	21	3	6	29.74
Seatuck Refuge	0	0	0	40	16	37	92.88
Davis Park	85	3	1	1	26	0	115.31
Atlantique to Corneille	37	2	2	0	12	1	54.15
Kismet, Atlantique, Fair Harbor	55	2	1	0	17	0	75.92
Warner Island East	0	0	0	2	9	0	10.53

FUTURE WITH-ACTION CONDITIONS

HSIs, HUs and Acres

(Future conditions with project or restoration activities)

Alternative 1 HSI Scores per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
Sunken Forest	0.54	0.57	0.79	0.55	0.64	0.78	0.645
Reagan Property	0.57	0.40	0.53	0.56	0.35	0.67	0.514
Great Gunn	0.54	0.48	0.56	0.40	0.54	0.48	0.504
Tiana	0.57	0.88	0.87	0.88	0.61	0.47	0.712
WOSI	0.95	0.46	0.64	0.81	0.44	0.42	0.619
East Inlet Island	0.00	0.00	0.62	0.53	0.50	0.65	0.382
John Boyle Island	0.00	0.00	0.62	0.71	0.50	0.65	0.413
Ocean Beach	0.38	0.54	0.43	0.15	0.53	0.19	0.371
New Made Island	0.00	0.00	0.62	0.64	0.50	0.45	0.368
Georgica Pond	0.17	0.25	0.47	0.94	0.75	0.47	0.510
Islip Meadows	0.00	0.00	0.00	0.66	0.48	0.78	0.321
Seatuck Refuge	0.00	0.00	0.00	0.66	0.48	0.78	0.321
Davis Park	0.57	0.38	0.47	0.15	0.53	0.19	0.382
Atlantique to Corneille	0.57	0.37	0.43	0.15	0.53	0.19	0.374
Kismet, Atlantique, Fair Harbor	0.57	0.68	0.59	0.15	0.53	0.19	0.452
Warner Island East	0.00	0.00	0.62	0.91	0.50	0.00	0.338

Alternative 1 Acres per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	DISTURBED	TOTAL ACRES
Sunken Forest	59.14	5.05	8.45	1.67	22.32	15.14	7	118
Reagan Property	47.92	3.68	7.89	0.83	15.68	5.18	7	89
Great Gunn	57.63	6.38	14.26	12.22	16.29	6.55	6	119
Tiana	54.56	6.92	6.41	10.81	18.74	4.29	1	103
WOSI	81.78	9.16	11.03	11.50	19.65	3.31	2	138
East Inlet Island	0.00	0.00	26.99	51.75	83.46	2.39	0	165
John Boyle Island	0.00	0.00	2.91	31.37	71.50	0.72	0	107
Ocean Beach	71.02	4.01	3.16	0.31	22.68	0.81	82	184
New Made Island	0.00	0.00	1.74	2.15	37.74	0.91	0	43
Georgica Pond	281.21	16.03	13.03	134.02	183.60	89.79	989	1,706
Islip Meadows	0.00	0.00	0.00	44.74	11.47	11.76	1	69
Seatuck Refuge	0.00	0.00	0.00	91.12	55.43	78.12	10	234
Davis Park	185.15	9.77	5.81	7.59	58.47	0.81	62	329
Atlantique to Corneille	81.79	5.51	8.67	9.34	21.75	15.78	16	159
Kismet, Atlantique, Fair Harbor	118.69	8.86	5.44	4.09	38.08	6.90	71	253
Warner Island East	0.00	0.00	2.96	1.14	26.35	0.00	0	30

Alternative 1 HU Scores per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
Sunken Forest	32	3	7	1	14	12	68.76
Reagan Property	27	1	4	0	5	3	42.45
Great Gunn	31	3	8	5	9	3	59.46
Tiana	31	6	6	9	12	2	65.71
WOSI	78	4	7	9	9	1	108.44
East Inlet Island	0	0	17	27	42	2	87.00
John Boyle Island	0	0	2	22	36	0	60.19
Ocean Beach	27	2	1	0	12	0	42.81
New Made Island	0	0	1	1	19	0	21.64
Georgica Pond	49	4	6	126	138	43	365.57
Islip Meadows	0	0	0	29	6	9	44.17
Seatuck Refuge	0	0	0	60	27	61	147.94
Davis Park	106	4	3	1	31	0	144.51
Atlantique to Corneille	47	2	4	1	12	3	68.42
Kismet, Atlantique, Fair Harbor	68	6	3	1	20	1	99.16
Warner Island East	0	0	2	1	13	0	15.98

Alternative 2 HSI Scores per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
Sunken Forest	0.54	0.75	0.91	0.20	0.64	0.83	0.645
Reagan Property	0.57	0.88	0.78	0.21	0.35	0.61	0.564
Great Gunn	0.54	0.71	0.78	0.40	0.54	0.52	0.583
Tiana	0.57	0.93	0.95	0.91	0.61	0.64	0.769
WOSI	0.95	0.89	0.45	0.73	0.44	0.22	0.613
East Inlet Island	0.00	0.00	0.62	0.70	0.50	0.65	0.411
John Boyle Island	0.00	0.00	0.62	0.70	0.50	0.95	0.461
Ocean Beach	0.38	0.87	0.65	0.15	0.53	0.19	0.462
New Made Island	0.00	0.00	0.62	0.69	0.50	0.65	0.410
Georgica Pond	0.17	0.25	0.47	0.94	0.75	0.47	0.510
Islip Meadows	0.00	0.00	0.00	0.66	0.48	0.78	0.321
Seatuck Refuge	0.00	0.00	0.00	0.69	0.48	0.78	0.327
Davis Park	0.57	0.76	0.56	0.15	0.53	0.19	0.461
Atlantique to Corneille	0.57	0.37	0.43	0.15	0.53	0.19	0.374
Kismet, Atlantique, Fair Harbor	0.57	0.68	0.66	0.15	0.53	0.19	0.464
Warner Island East	0.00	0.00	0.00	0.91	0.50	0.95	0.394

Alternative 2 Acres per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	DISTURBED	TOTAL ACRES
Sunken Forest	58.11	6.08	9.18	1.67	22.32	16.28	5	118
Reagan Property	46.84	4.75	8.00	0.83	15.68	5.50	7	89
Great Gunn	57.63	6.38	15.23	12.22	16.29	9.65	2	119
Tiana	54.56	6.92	6.47	10.81	18.74	4.37	1	103
WOSI	81.78	9.16	13.04	8.42	19.65	4.57	2	138
East Inlet Island	0.00	0.00	11.40	67.33	83.46	2.39	0	165
John Boyle Island	0.00	0.00	0.00	31.37	71.50	3.64	0	107
Ocean Beach	68.53	6.30	3.60	0.31	22.68	0.81	81	184
New Made Island	0.00	0.00	0.61	3.27	37.74	0.91	0	43
Georgica Pond	281.21	16.03	13.03	134.02	183.60	89.79	989	1,706
Islip Meadows	0.00	0.00	0.00	43.34	12.87	11.76	1	69
Seatuck Refuge	0.00	0.00	0.00	89.63	56.28	78.12	10	234
Davis Park	185.15	9.77	6.02	7.59	58.47	0.81	62	329
Atlantique to Corneille	81.79	5.51	8.67	9.34	21.75	15.78	16	159
Kismet, Atlantique, Fair Harbor	117.75	9.80	5.78	4.09	38.08	6.90	71	253
Warner Island East	0.00	0.00	0.00	1.14	26.35	2.96	0	30

Alternative 2 HU Scores per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
Sunken Forest	32	5	8	0	14	14	72.67
Reagan Property	27	4	6	0	5	3	46.08
Great Gunn	31	5	12	5	9	5	66.60
Tiana	31	6	6	10	12	3	67.90
WOSI	78	8	6	6	9	1	107.66
East Inlet Island	0	0	7	47	42	2	97.25
John Boyle Island	0	0	0	22	36	3	60.99
Ocean Beach	26	5	2	0	12	0	46.12
New Made Island	0	0	0	2	19	1	22.02
Georgica Pond	49	4	6	126	138	43	365.57
Islip Meadows	0	0	0	28	6	9	43.93
Seatuck Refuge	0	0	0	62	27	61	150.65
Davis Park	106	7	3	1	31	0	148.91
Atlantique to Corneille	47	2	4	1	12	3	68.42
Kismet, Atlantique, Fair Harbor	67	7	4	1	20	1	99.85
Warner Island East	0	0	0	1	13	3	16.97

Alternative 3 HSI Scores per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
Sunken Forest	0.57	0.84	0.80	0.70	0.80	0.89	0.766
Reagan Property	0.57	0.40	0.44	0.72	0.35	0.67	0.525
Great Gunn	0.57	0.77	0.70	0.70	0.71	0.55	0.667
Tiana	0.57	0.59	0.70	0.67	0.88	0.35	0.629
WOSI	0.95	0.70	0.49	0.63	0.44	0.40	0.603
East Inlet Island	0.00	0.00	0.62	0.95	0.50	0.65	0.453
John Boyle Island	0.00	0.00	0.62	0.94	0.50	0.65	0.451
Ocean Beach	0.38	0.87	0.65	0.15	0.53	0.19	0.462
New Made Island	0.00	0.00	0.62	0.92	0.50	0.65	0.448
Georgica Pond	0.36	0.87	0.83	0.78	0.75	0.47	0.676
Islip Meadows	0.00	0.00	0.00	0.73	0.48	0.78	0.333
Seatuck Refuge	0.00	0.00	0.00	0.76	0.48	0.78	0.337
Davis Park	0.57	0.40	0.56	0.15	0.53	0.45	0.445
Atlantique to Corneille	0.57	0.65	0.65	0.15	0.53	0.24	0.467
Kismet, Atlantique, Fair Harbor	0.57	0.68	0.66	0.15	0.53	0.19	0.464
Warner Island East	0.00	0.00	0.62	0.91	0.50	0.00	0.338

Alternative 3 Acres per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	DISTURBED	TOTAL ACRES
Sunken Forest	59.14	5.05	8.75	2.06	23.86	19.43	0	118
Reagan Property	47.92	3.68	7.89	1.85	14.66	5.18	7	89
Great Gunn	57.63	6.38	16.77	12.00	16.61	10.03	0	119
Tiana	54.56	6.92	6.12	10.77	18.74	4.24	2	103
WOSI	81.78	9.16	13.17	8.42	19.65	4.84	1	138
East Inlet Island	0.00	0.00	26.99	51.75	83.46	2.39	0	165
John Boyle Island	0.00	0.00	2.91	31.37	71.50	0.72	0	107
Ocean Beach	68.53	6.30	4.09	0.31	22.68	0.81	81	184
New Made Island	0.00	0.00	2.01	1.87	37.74	0.91	0	43
Georgica Pond	271.55	23.50	20.50	130.69	183.60	89.79	987	1,706
Islip Meadows	0.00	0.00	0.00	43.81	12.39	11.76	1	69
Seatuck Refuge	0.00	0.00	0.00	91.37	56.04	78.12	9	234
Davis Park	185.15	9.77	6.77	7.59	58.47	2.89	59	329
Atlantique to Corneille	78.68	6.91	11.49	3.83	27.26	16.56	14	159
Kismet, Atlantique, Fair Harbor	117.19	10.36	6.44	4.09	38.08	6.90	70	253
Warner Island East	0.00	0.00	2.96	1.14	26.35	0.00	0	30

Alternative 3 HU Scores per Transect and Community - RESTORATION

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
Sunken Forest	34	4	7	1	19	17	82.77
Reagan Property	27	1	3	1	5	3	42.26
Great Gunn	33	5	12	8	12	6	75.27
Tiana	31	4	4	7	17	1	64.83
WOSI	78	6	7	5	9	2	106.66
East Inlet Island	0	0	17	49	42	2	108.92
John Boyle Island	0	0	2	29	36	0	67.24
Ocean Beach	26	5	3	0	12	0	46.44
New Made Island	0	0	1	2	19	1	22.33
Georgica Pond	99	20	17	102	138	43	418.18
Islip Meadows	0	0	0	32	6	9	47.31
Seatuck Refuge	0	0	0	69	27	61	157.45
Davis Park	106	4	4	1	31	1	146.96
Atlantique to Corneille	45	5	8	1	14	4	76.01
Kismet, Atlantique, Fair Harbor	67	7	4	1	20	1	100.35
Warner Island East	0	0	2	1	13	0	15.98

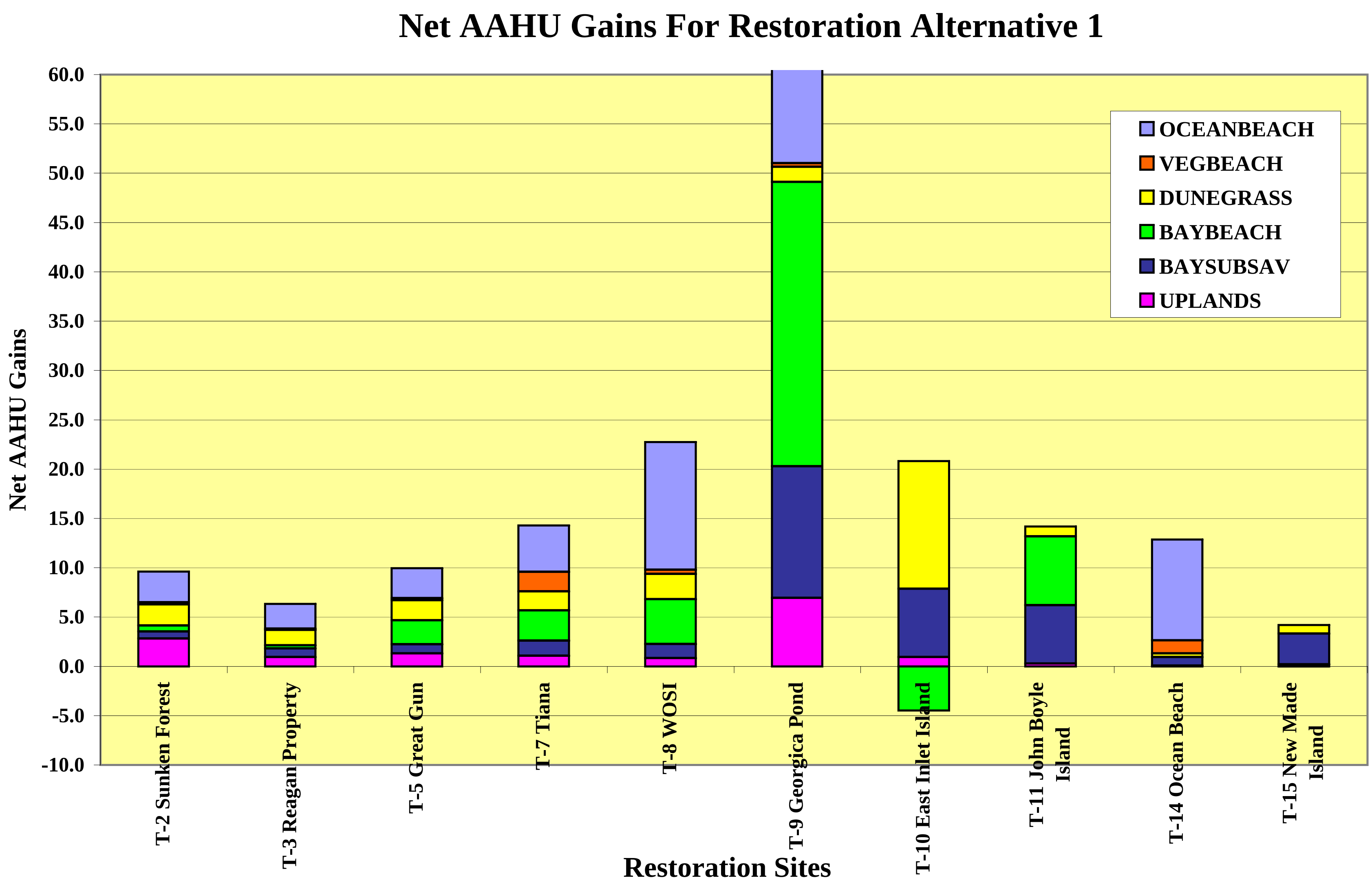
SUMMARY

OF

AAHU'S
FOR RESTORATION SITES

AAHU

ALTERNATIVE 1


Net AAHU Gains For Restoration Alternative 1
Net AAHU Gains
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
OCEANBEACH
VEGBEACH
DUNEGRASS
BAYBEACH
BAYSUBSAV
UPLANDS
T-2 Sunken Forest
T-3 Reagan Property
T-5 Great Gun
T-7 Tiana
T-8 WOSI
T-9 Georgica Pond
T-10 East Inlet Island
T-11 John Boyle Island
T-14 Ocean Beach
T-15 New Made Island
Restoration Sites

Restoration Alternative 1 AAHUs per Transect and Per Community

RESTORATION	Sum of AAHUs	Average Annual Habitat Units (AAHUs)					
		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
T-2 Sunken Forest	10	3.1	0.2	2.1	0.6	0.7	2.8
T-3 Reagan Property	6	2.5	0.1	1.6	0.3	0.9	0.9
T-5 Great Gun	10	3.0	0.2	2.0	2.4	0.9	1.3
T-7 Tiana	14	4.7	2.0	1.9	3.1	1.6	1.1
T-8 WOSI	23	12.9	0.4	2.6	4.6	1.4	0.8
T-9 Georgica Pond	64	13.4	0.4	1.5	28.8	13.3	6.9
T-10 East Inlet Island	16			12.9	-4.5	6.9	0.9
T-11 John Boyle Island	14			1.0	7.0	5.9	0.3
T-14 Ocean Beach	13	10.2	1.3	0.4	0.0	0.9	0.1
T-15 New Made Island	4			0.9	0.0	3.1	0.2
T-22 Islip Meadows	8				4.9	1.0	1.7
T-23 Seatuck Refuge	29				13.0	4.7	11.3
T-24 Davis Park	14	9.7	0.5	1.1	0.2	2.2	0.0
T-25 Atlantique to Cornielle	5	4.3	0.2	0.9	0.9	-1.7	0.9
T-26 Kismet, Atlantique, Fair Harbor	12	5.2	3.6	1.5	0.1	1.5	0.4
T-27 Warner Island East	2			1.7	-0.8	1.5	0.0
Average	**19**	7	1	2	4	3	2

Habitats not applicable

Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	59	59	32	32.2	0	1	0.545	0.545	59	59	32
1	5	0.545	0.545	59	59	129		1	5	0.545	0.545	59	59	129
5	50	0.545	0.477	59	53	1,293	25.39	5	50	0.545	0.545	59	59	1,449
Without Project AAHUs:						**29**		**With Project AAHUs:**						**32**
													Net AAHUs:	**3**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.567	0.567	5	5	3		0	1	0.567	0.567	5	5	3
1	5	0.567	0.567	5	5	11		1	5	0.567	0.567	5	5	11
5	50	0.567	0.523	5	5	118	2.379	5	50	0.567	0.567	5	5	129
Without Project AAHUs:						**2.641**		**With Project AAHUs:**						**2.862**
													Net AAHUs:	**0.221**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.687	0.687	8	8	6		0	1	0.687	0.687	8	8	6
1	5	0.687	0.687	8	8	23		1	5	0.687	0.790	8	8	25
5	50	0.687	0.388	8	8	195	2.953	5	50	0.790	0.790	8	8	300
Without Project AAHUs:						**4**		**With Project AAHUs:**						**7**
													Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.198	0.198	2	2	0		0	1	0.198	0.198	2	2	0
1	5	0.198	0.198	2	2	1		1	5	0.198	0.550	2	2	2
5	50	0.198	0.123	2	2	12	0.206	5	50	0.550	0.550	2	2	41
Without Project AAHUs:						**0**		**With Project AAHUs:**						**1**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.638	0.638	22	22	14		0	1	0.638	0.638	22	22	14
1	5	0.638	0.638	22	22	57		1	5	0.638	0.638	22	22	57
5	50	0.638	0.513	22	25	606	12.6	5	50	0.638	0.638	22	22	641
					Without Project AAHUs:	**14**							**With Project AAHUs:**	**14**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.783	15	15	12		0	1	0.783	0.783	15	15	12
1	5	0.783	0.783	15	15	47		1	5	0.783	0.783	15	15	47
5	50	0.783	0.423	15	14	393	5.768	5	50	0.783	0.783	15	15	534
					Without Project AAHUs:	**9**							**With Project AAHUs:**	**12**
													Net AAHUs:	**3**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	48	48	27	27.39	0	1	0.572	0.572	48	48	27
1	5	0.572	0.572	48	48	110		1	5	0.572	0.572	48	48	110
5	50	0.572	0.509	48	43	1,107	21.93	5	50	0.572	0.572	48	48	1,232
					Without Project AAHUs:	**25**							**With Project AAHUs:**	**27**
													Net AAHUs:	**3**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.396	0.396	4	4	1		0	1	0.396	0.396	4	4	1
1	5	0.396	0.396	4	4	6		1	5	0.396	0.396	4	4	6
5	50	0.396	0.353	4	3	59	1.17	5	50	0.396	0.396	4	4	66
					Without Project AAHUs:	**1.326**							**With Project AAHUs:**	**1.459**
													Net AAHUs:	**0.133**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.443	0.443	8	8	3		0	1	0.443	0.443	8	8	3
1	5	0.443	0.443	8	8	14		1	5	0.443	0.532	8	8	15
5	50	0.443	0.216	8	7	112	1.536	5	50	0.532	0.532	8	8	189
					Without Project AAHUs:	**3**							**With Project AAHUs:**	**4**
													Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.209	0.209	1	1	0		0	1	0.209	0.209	1	1	0
1	5	0.209	0.209	1	1	1		1	5	0.209	0.561	1	1	1
5	50	0.209	0.127	1	1	6	0.105	5	50	0.561	0.561	1	1	21
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.347	0.347	16	16	5		0	1	0.347	0.347	16	16	5
1	5	0.347	0.347	16	16	22		1	5	0.347	0.347	16	16	22
5	50	0.347	0.197	16	17	201	3.392	5	50	0.347	0.347	16	16	245
Without Project AAHUs:						**5**		**With Project AAHUs:**						**5**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.673	0.673	5	5	3		0	1	0.673	0.673	5	5	3
1	5	0.673	0.673	5	5	14		1	5	0.673	0.673	5	5	14
5	50	0.673	0.318	5	5	110	1.484	5	50	0.673	0.673	5	5	157
Without Project AAHUs:						**3**		**With Project AAHUs:**						**3**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	58	58	31	31.38	0	1	0.545	0.545	58	58	31
1	5	0.545	0.545	58	58	126		1	5	0.545	0.545	58	58	126
5	50	0.545	0.477	58	52	1,260	24.74	5	50	0.545	0.545	58	58	1,412
Without Project AAHUs:						**28**		**With Project AAHUs:**						**31**
Net AAHUs:														**3**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.483	0.483	6	6	3		0	1	0.483	0.483	6	6	3
1	5	0.483	0.483	6	6	12		1	5	0.483	0.483	6	6	12
5	50	0.483	0.453	6	6	128	2.603	5	50	0.483	0.483	6	6	139
Without Project AAHUs:						**2.865**		**With Project AAHUs:**						**3.084**
Net AAHUs:														**0.219**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.564	0.564	14	14	8		0	1	0.564	0.564	14	14	8
1	5	0.564	0.564	14	14	32		1	5	0.564	0.564	14	14	32
5	50	0.564	0.288	14	13	261	3.691	5	50	0.564	0.564	14	14	362
Without Project AAHUs:						**6**		**With Project AAHUs:**						**8**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.243	0.243	11	11	3		0	1	0.243	0.243	11	11	3
1	5	0.243	0.243	11	11	11		1	5	0.243	0.403	11	12	15
5	50	0.243	0.196	11	10	104	1.953	5	50	0.403	0.403	12	12	222
Without Project AAHUs:						**2**		**With Project AAHUs:**						**5**
Net AAHUs:														**2**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.544	0.544	17	17	9		0	1	0.544	0.544	17	17	9
1	5	0.544	0.544	17	17	36		1	5	0.544	0.544	17	16	36
5	50	0.544	0.399	17	17	352	6.624	5	50	0.544	0.544	16	16	399
					Without Project AAHUs:	**8**							**With Project AAHUs:**	**9**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.417	0.417	7	7	3		0	1	0.417	0.417	7	7	3
1	5	0.417	0.417	7	7	12		1	5	0.417	0.483	7	7	13
5	50	0.417	0.123	7	7	86	0.818	5	50	0.483	0.483	7	7	151
					Without Project AAHUs:	**2**							**With Project AAHUs:**	**3**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	55	55	31	31.18	0	1	0.572	0.572	55	55	31
1	5	0.572	0.572	55	55	125		1	5	0.572	0.570	55	55	125
5	50	0.572	0.424	55	49	1,164	20.81	5	50	0.570	0.570	55	55	1,399
Without Project AAHUs:						**26**		**With Project AAHUs:**						**31**
Net AAHUs:														**5**

VEGBEACH Community

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.593	0.593	7	7	4		0	1	0.593	0.593	7	7	4
1	5	0.593	0.593	7	7	16		1	5	0.593	0.880	7	7	20
5	50	0.593	0.556	7	7	179	3.85	5	50	0.880	0.880	7	7	274
Without Project AAHUs:						**3.989**		**With Project AAHUs:**						**5.969**
Net AAHUs:														**1.980**

DUNEGRASS Communtity

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.703	0.703	6	6	4		0	1	0.703	0.703	6	6	4
1	5	0.703	0.703	6	6	17		1	5	0.703	0.865	6	6	20
5	50	0.703	0.440	6	6	150	2.423	5	50	0.865	0.865	6	6	244
Without Project AAHUs:						**3**		**With Project AAHUs:**						**5**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.671	0.671	11	11	7		0	1	0.671	0.671	11	11	7
1	5	0.671	0.671	11	11	29		1	5	0.671	0.876	11	11	33
5	50	0.671	0.531	11	10	277	5.145	5	50	0.876	0.876	11	11	425
Without Project AAHUs:						**6**		**With Project AAHUs:**						**9**
Net AAHUs:														**3**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.614	0.614	19	19	12		0	1	0.614	0.614	19	19	12
1	5	0.614	0.614	19	19	46		1	5	0.614	0.614	19	19	46
5	50	0.614	0.430	19	19	440	8.058	5	50	0.614	0.614	19	19	518
					Without Project AAHUs:	**10**							**With Project AAHUs:**	**12**
													Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.350	0.350	4	4	1		0	1	0.350	0.350	4	4	1
1	5	0.350	0.350	4	4	6		1	5	0.350	0.467	4	0	4
5	50	0.350	0.023	4	4	34	0.089	5	50	0.467	0.467	4	4	90
					Without Project AAHUs:	**1**							**With Project AAHUs:**	**2**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.953	0.953	82	82	78	77.9	0	1	0.953	0.953	82	82	78
1	5	0.953	0.953	82	82	312		1	5	0.953	0.953	82	82	312
5	50	0.953	0.678	82	74	2,859	49.9	5	50	0.953	0.953	82	82	3,505
					Without Project AAHUs:	**65**							**With Project AAHUs:**	**78**
													Net AAHUs:	**13**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.458	0.458	9	9	4		0	1	0.458	0.458	9	9	4
1	5	0.458	0.458	9	9	17		1	5	0.458	0.458	9	9	17
5	50	0.458	0.397	9	8	168	3.27	5	50	0.458	0.458	9	9	189
					Without Project AAHUs:	**3.772**							**With Project AAHUs:**	**4.198**
													Net AAHUs:	**0.426**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.441	0.441	13	13	6		0	1	0.441	0.441	13	13	6
1	5	0.441	0.441	13	13	23		1	5	0.441	0.641	13	11	26
5	50	0.441	0.226	13	13	193	2.907	5	50	0.641	0.641	11	11	318
					Without Project AAHUs:	**4**							**With Project AAHUs:**	**7**
													Net AAHUs:	**3**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.567	0.567	8	8	5		0	1	0.567	0.567	8	8	5
1	5	0.567	0.567	8	8	19		1	5	0.567	0.811	8	12	28
5	50	0.567	0.493	8	8	201	4.154	5	50	0.811	0.811	12	12	420
					Without Project AAHUs:	**4**							**With Project AAHUs:**	**9**
													Net AAHUs:	**5**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.436	0.436	20	20	9		0	1	0.436	0.436	20	20	9
1	5	0.436	0.436	20	20	34		1	5	0.436	0.436	20	20	34
5	50	0.436	0.274	20	20	314	5.39	5	50	0.436	0.436	20	20	385
					Without Project AAHUs:	**7**							**With Project AAHUs:**	**9**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.217	0.217	5	5	1		0	1	0.217	0.217	5	5	1
1	5	0.217	0.217	5	5	4		1	5	0.217	0.417	5	3	5
5	50	0.217	0.000	5	4	22	0	5	50	0.417	0.417	3	3	62
					Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
													Net AAHUs:	**1**

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
													Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0.000**		**With Project AAHUs:**						**0.000**
													Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.385	0.385	11	11	4		0	1	0.385	0.385	11	11	4
1	5	0.385	0.385	11	11	18		1	5	0.385	0.618	11	27	40
5	50	0.385	0.168	11	9	127	1.439	5	50	0.618	0.618	27	27	751
Without Project AAHUs:						**3**		**With Project AAHUs:**						**16**
													Net AAHUs:	**13**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.526	0.526	67	67	35		0	1	0.526	0.526	67	67	35
1	5	0.526	0.526	67	67	142		1	5	0.526	0.526	67	52	125
5	50	0.526	0.399	67	71	1,435	28.19	5	50	0.526	0.526	52	52	1,226
Without Project AAHUs:						**32**		**With Project AAHUs:**						**28**
													Net AAHUs:	**-5**

Fire Island to Montauk Point, NY Reformulation Study

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	83	83	42		0	1	0.497	0.497	83	83	42
1	5	0.497	0.497	83	83	166		1	5	0.497	0.497	83	83	166
5	50	0.497	0.313	83	83	1,523	26.15	5	50	0.497	0.497	83	83	1,868
Without Project AAHUs:						35		With Project AAHUs:						42
Net AAHUs:														7

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	2	2	1		0	1	0.452	0.452	2	2	1
1	5	0.452	0.452	2	2	4		1	5	0.452	0.652	2	2	5
5	50	0.452	0.148	2	1	24	0.124	5	50	0.652	0.652	2	2	70
Without Project AAHUs:						1		With Project AAHUs:						2
Net AAHUs:														1

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0.000**							**With Project AAHUs:**	**0.000**
													Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.385	0.385	3	3	1		0	1	0.385	0.385	3	3	1
1	5	0.385	0.385	3	3	4		1	5	0.385	0.618	3	3	6
5	50	0.385	0.168	3	2	32	0.367	5	50	0.618	0.618	3	3	81
					Without Project AAHUs:	**1**							**With Project AAHUs:**	**2**
													Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.526	0.526	31	31	17		0	1	0.526	0.526	31	31	17
1	5	0.526	0.526	31	31	66		1	5	0.526	0.712	31	31	78
5	50	0.526	0.399	31	33	668	13.13	5	50	0.712	0.712	31	31	1,006
					Without Project AAHUs:	**15**							**With Project AAHUs:**	**22**
													Net AAHUs:	**7**

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	72	72	36		0	1	0.497	0.497	72	72	36
1	5	0.497	0.497	72	72	142		1	5	0.497	0.497	72	72	142
5	50	0.497	0.313	72	72	1,304	22.4	5	50	0.497	0.497	72	72	1,601
Without Project AAHUs:						**30**		**With Project AAHUs:**						**36**
Net AAHUs:														**6**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	1		1	5	0.452	0.652	1	1	2
5	50	0.452	0.148	1	0	7	0.037	5	50	0.652	0.652	1	1	21
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.239	0.239	71	71	17	16.91	0	1	0.239	0.239	71	71	17
1	5	0.239	0.239	71	71	68		1	5	0.239	0.381	71	71	88
5	50	0.239	0.240	71	64	725	15.31	5	50	0.381	0.381	71	71	1,217
Without Project AAHUs:						**16**		**With Project AAHUs:**						**26**
Net AAHUs:														**10**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.220	0.220	4	4	1		0	1	0.220	0.220	4	4	1
1	5	0.220	0.220	4	4	3		1	5	0.220	0.545	4	4	6
5	50	0.220	0.178	4	4	33	0.627	5	50	0.545	0.545	4	4	97
Without Project AAHUs:						**0.754**		**With Project AAHUs:**						**2.083**
Net AAHUs:														**1.329**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.434	0.434	3	3	1		0	1	0.434	0.434	3	3	1
1	5	0.434	0.434	3	3	5		1	5	0.434	0.434	3	3	5
5	50	0.434	0.208	3	3	44	0.593	5	50	0.434	0.434	3	3	62
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	0	0	0		0	1	0.153	0.153	0	0	0
1	5	0.153	0.153	0	0	0		1	5	0.153	0.153	0	0	0
5	50	0.153	0.101	0	0	2	0.031	5	50	0.153	0.153	0	0	2
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	23	23	12		0	1	0.529	0.529	23	23	12
1	5	0.529	0.529	23	23	48		1	5	0.529	0.529	23	23	48
5	50	0.529	0.444	23	23	497	10.08	5	50	0.529	0.529	23	23	540
					Without Project AAHUs:	**11**							**With Project AAHUs:**	**12**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	1		1	5	0.187	0.187	1	1	1
5	50	0.187	0.000	1	1	3	0	5	50	0.187	0.187	1	1	7
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0.000**		**With Project AAHUs:**						**0.000**
Net AAHUs:														**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.318	0.318	1	1	0		0	1	0.318	0.318	1	1	0
1	5	0.318	0.318	1	1	1		1	5	0.318	0.618	1	2	2
5	50	0.318	0.165	1	0	6	0.075	5	50	0.618	0.618	2	2	48
Without Project AAHUs:						**0**		**With Project AAHUs:**						**1**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.462	0.462	3	3	2		0	1	0.462	0.462	3	3	2
1	5	0.462	0.462	3	3	6		1	5	0.462	0.643	3	2	6
5	50	0.462	0.384	3	3	64	1.319	5	50	0.643	0.643	2	2	62
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	38	38	19		0	1	0.497	0.497	38	38	19
1	5	0.497	0.497	38	38	75		1	5	0.497	0.497	38	38	75
5	50	0.497	0.313	38	38	689	11.83	5	50	0.497	0.497	38	38	845
Without Project AAHUs:						**16**		**With Project AAHUs:**						**19**
Net AAHUs:														**3**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	2		1	5	0.452	0.452	1	1	2
5	50	0.452	0.148	1	0	9	0.047	5	50	0.452	0.452	1	1	18
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.173	0.173	281	281	49	48.65	0	1	0.173	0.173	281	281	49
1	5	0.173	0.173	281	281	195		1	5	0.173	0.173	281	281	195
5	50	0.173	0.068	281	281	1,522	18.98	5	50	0.173	0.173	281	281	2,189
Without Project AAHUs:						**35**		**With Project AAHUs:**						**49**
Net AAHUs:														**13**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.250	0.250	16	16	4		0	1	0.250	0.250	16	16	4
1	5	0.250	0.250	16	16	16		1	5	0.250	0.250	16	16	16
5	50	0.250	0.198	16	16	161	3.17	5	50	0.250	0.250	16	16	180
Without Project AAHUs:						**3.631**		**With Project AAHUs:**						**4.008**
Net AAHUs:														**0.377**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.470	0.470	13	13	6		0	1	0.470	0.470	13	13	6
1	5	0.470	0.470	13	13	24		1	5	0.470	0.470	13	13	24
5	50	0.470	0.207	13	13	198	2.693	5	50	0.470	0.470	13	13	276
Without Project AAHUs:						**5**		**With Project AAHUs:**						**6**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.778	0.778	134	134	104		0	1	0.778	0.778	134	134	104
1	5	0.778	0.778	134	134	417		1	5	0.778	0.941	134	134	461
5	50	0.778	0.641	134	134	4,279	85.89	5	50	0.941	0.941	134	134	5,677
Without Project AAHUs:						**96**		**With Project AAHUs:**						**125**
Net AAHUs:														**29**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.752	0.752	184	184	138		0	1	0.752	0.752	184	184	138
1	5	0.752	0.752	184	184	553		1	5	0.752	0.752	184	184	553
5	50	0.752	0.591	184	184	5,549	108.5	5	50	0.752	0.752	184	184	6,216
					Without Project AAHUs:	**125**							**With Project AAHUs:**	**138**
													Net AAHUs:	**13**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.473	0.473	90	90	43		0	1	0.473	0.473	90	90	43
1	5	0.473	0.473	90	90	170		1	5	0.473	0.473	90	90	170
5	50	0.473	0.302	90	90	1,566	27.09	5	50	0.473	0.473	90	90	1,913
					Without Project AAHUs:	**36**							**With Project AAHUs:**	**43**
													Net AAHUs:	**7**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0.000**		**With Project AAHUs:**						**0.000**
Net AAHUs:														**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.609	0.609	45	45	27		0	1	0.609	0.609	45	45	27
1	5	0.609	0.609	45	45	109		1	5	0.609	0.657	45	45	113
5	50	0.609	0.465	45	45	1,081	20.8	5	50	0.657	0.657	45	45	1,323
Without Project AAHUs:						**24**		**With Project AAHUs:**						**29**
Net AAHUs:														**5**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.485	0.485	11	11	6		0	1	0.485	0.485	11	11	6
1	5	0.485	0.485	11	11	22		1	5	0.485	0.485	11	11	22
5	50	0.485	0.297	11	11	202	3.402	5	50	0.485	0.485	11	11	250
Without Project AAHUs:						**5**		**With Project AAHUs:**						**6**
Net AAHUs:														**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	12	12	9		0	1	0.783	0.783	12	12	9
1	5	0.783	0.783	12	12	37		1	5	0.783	0.783	12	12	37
5	50	0.783	0.523	12	11	330	5.539	5	50	0.783	0.783	12	12	415
Without Project AAHUs:						**8**		**With Project AAHUs:**						**9**
Net AAHUs:														**2**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0.000**		**With Project AAHUs:**						**0.000**
Net AAHUs:														**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.609	0.609	85	85	52		0	1	0.609	0.609	85	85	52
1	5	0.609	0.609	85	85	208		1	5	0.609	0.657	85	91	223
5	50	0.609	0.465	85	85	2,059	39.64	5	50	0.657	0.657	91	91	2,694
Without Project AAHUs:						**46**		**With Project AAHUs:**						**59**
Net AAHUs:														**13**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.485	0.485	55	55	27		0	1	0.485	0.485	55	55	27
1	5	0.485	0.485	55	55	108		1	5	0.485	0.485	55	55	108
5	50	0.485	0.297	55	55	975	16.44	5	50	0.485	0.485	55	55	1,209
					Without Project AAHUs:	**22**							**With Project AAHUs:**	**27**
													Net AAHUs:	**5**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.783	78	78	61		0	1	0.783	0.783	78	78	61
1	5	0.783	0.783	78	78	245		1	5	0.783	0.783	78	78	245
5	50	0.783	0.523	78	70	2,190	36.79	5	50	0.783	0.783	78	78	2,754
					Without Project AAHUs:	**50**							**With Project AAHUs:**	**61**
													Net AAHUs:	**11**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	185	185	106	105.8	0	1	0.572	0.572	185	185	106
1	5	0.572	0.572	185	185	423		1	5	0.572	0.572	185	185	423
5	50	0.572	0.509	185	167	4,279	84.73	5	50	0.572	0.572	185	185	4,762
Without Project AAHUs:						**96**		**With Project AAHUs:**						**106**
Net AAHUs:														**10**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.370	0.370	10	10	4		0	1	0.370	0.370	10	10	4
1	5	0.370	0.370	10	10	14		1	5	0.370	0.383	10	10	15
5	50	0.370	0.328	10	9	146	2.882	5	50	0.383	0.383	10	10	168
Without Project AAHUs:						**3.278**		**With Project AAHUs:**						**3.736**
Net AAHUs:														**0.458**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.434	0.434	5	5	2		0	1	0.434	0.434	5	5	2
1	5	0.434	0.434	5	5	8		1	5	0.434	0.467	5	6	10
5	50	0.434	0.208	5	4	66	0.901	5	50	0.467	0.467	6	6	122
Without Project AAHUs:						**2**		**With Project AAHUs:**						**3**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	8	8	1		0	1	0.153	0.153	8	8	1
1	5	0.153	0.153	8	8	5		1	5	0.153	0.153	8	8	5
5	50	0.153	0.101	8	8	43	0.768	5	50	0.153	0.153	8	8	52
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	58	58	31		0	1	0.529	0.529	58	58	31
1	5	0.529	0.529	58	58	124		1	5	0.529	0.529	58	58	124
5	50	0.529	0.444	58	58	1,281	25.98	5	50	0.529	0.529	58	58	1,392
Without Project AAHUs:						**29**		**With Project AAHUs:**						**31**
Net AAHUs:														**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	1		1	5	0.187	0.187	1	1	1
5	50	0.187	0.068	1	1	4	0.05	5	50	0.187	0.187	1	1	7
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	82	82	47	46.74	0	1	0.572	0.572	82	82	47
1	5	0.572	0.572	82	82	187		1	5	0.572	0.572	82	82	187
5	50	0.572	0.509	82	74	1,890	37.43	5	50	0.572	0.572	82	82	2,103
					Without Project AAHUs:	**42**							**With Project AAHUs:**	**47**
													Net AAHUs:	**4**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	6	6	2		0	1	0.370	0.370	6	6	2
1	5	0.370	0.370	6	6	8		1	5	0.370	0.370	6	6	8
5	50	0.370	0.328	6	5	82	1.625	5	50	0.370	0.370	6	6	92
					Without Project AAHUs:	**1.849**							**With Project AAHUs:**	**2.038**
													Net AAHUs:	**0.189**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	9	9	4		0	1	0.434	0.434	9	9	4
1	5	0.434	0.434	9	9	15		1	5	0.153	0.434	9	9	10
5	50	0.434	0.208	9	8	120	1.627	5	50	0.434	0.434	9	9	169
					Without Project AAHUs:	**3**							**With Project AAHUs:**	**4**
													Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	4	4	1		0	1	0.153	0.153	4	4	1
1	5	0.153	0.153	4	4	2		1	5	0.153	0.153	4	9	4
5	50	0.153	0.101	4	4	22	0.388	5	50	0.153	0.153	9	9	64
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**1**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	27	27	14		0	1	0.529	0.529	27	27	14
1	5	0.529	0.529	27	27	58		1	5	0.529	0.529	27	22	52
5	50	0.529	0.444	27	27	597	12.11	5	50	0.529	0.529	22	22	518
Without Project AAHUs:						**13**		**With Project AAHUs:**						**12**
Net AAHUs:														**-2**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.187	0.187	16	16	3		0	1	0.187	0.187	16	16	3
1	5	0.187	0.187	16	16	12		1	5	0.187	0.187	16	16	12
5	50	0.187	0.068	16	14	87	0.97	5	50	0.187	0.187	16	16	133
Without Project AAHUs:						**2**		**With Project AAHUs:**						**3**
Net AAHUs:														**1**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet, Atlantique, and Fair Harbor

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	121	121	69	69.06	0	1	0.572	0.572	121	121	69
1	5	0.572	0.572	121	121	276		1	5	0.572	0.572	121	119	274
5	50	0.572	0.509	121	109	2,792	55.3	5	50	0.572	0.572	119	119	3,052
Without Project AAHUs:						**63**		**With Project AAHUs:**						**68**
Net AAHUs:														**5**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	7	7	2		0	1	0.370	0.370	7	7	2
1	5	0.370	0.370	7	7	10		1	5	0.370	0.682	7	9	17
5	50	0.370	0.328	7	6	100	1.982	5	50	0.682	0.682	9	9	272
Without Project AAHUs:						**2.255**		**With Project AAHUs:**						**5.817**
Net AAHUs:														**3.563**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	5	5	2		0	1	0.434	0.434	5	5	2
1	5	0.434	0.434	5	5	8		1	5	0.434	0.593	5	5	10
5	50	0.434	0.208	5	4	64	0.872	5	50	0.593	0.593	5	5	135
Without Project AAHUs:						**1**		**With Project AAHUs:**						**3**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	4	4	1		0	1	0.153	0.153	4	4	1
1	5	0.153	0.153	4	4	2		1	5	0.153	0.153	4	4	2
5	50	0.153	0.101	4	4	23	0.414	5	50	0.153	0.153	4	4	28
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet, Atlantique, and Fair Harbor

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	38	38	20		0	1	0.529	0.529	38	38	20
1	5	0.529	0.529	38	38	81		1	5	0.529	0.529	38	38	81
5	50	0.529	0.444	38	38	834	16.92	5	50	0.529	0.529	38	38	907
Without Project AAHUs:						**19**		**With Project AAHUs:**						**20**
Net AAHUs:														**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	7	7	1		0	1	0.187	0.187	7	7	1
1	5	0.187	0.187	7	7	5		1	5	0.187	0.187	7	7	5
5	50	0.187	0.068	7	6	38	0.427	5	50	0.187	0.187	7	7	58
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 1)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0.000**							**With Project AAHUs:**	**0.000**
													Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.618	0	3	2
5	50	0.000	0.000	0	0	0	0	5	50	0.618	0.618	3	3	82
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**2**
													Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.914	0.914	2	2	2		0	1	0.914	0.914	2	2	2
1	5	0.914	0.914	2	2	8		1	5	0.914	0.914	2	1	6
5	50	0.914	0.749	2	2	85	1.692	5	50	0.914	0.914	1	1	47
					Without Project AAHUs:	**2**							**With Project AAHUs:**	**1**
													Net AAHUs:	**-1**

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 1)

BAYSUBSAV Community

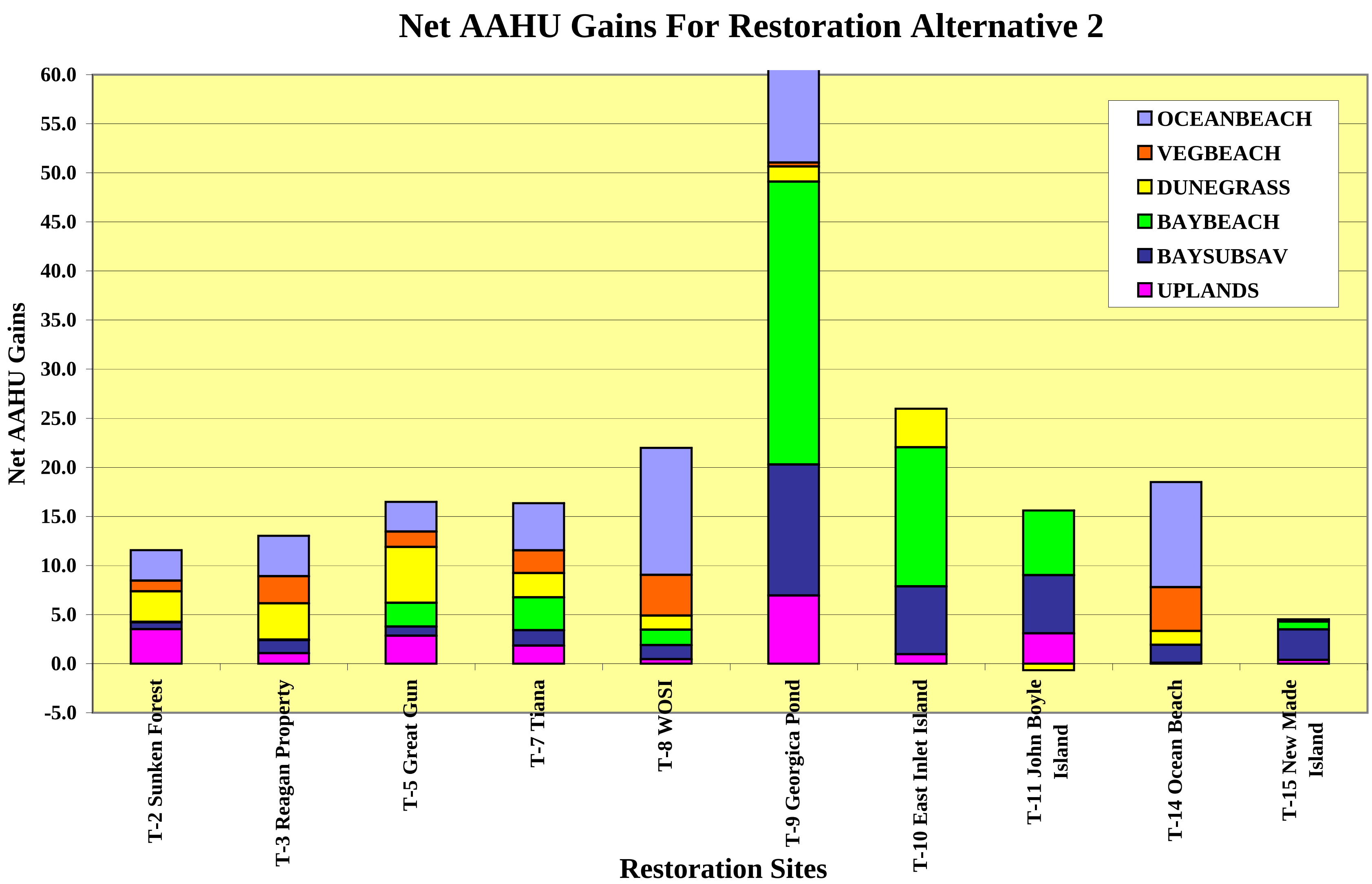
Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	28	28	14		0	1	0.497	0.497	28	28	14
1	5	0.497	0.497	28	28	56		1	5	0.497	0.497	28	26	54
5	50	0.497	0.313	28	28	514	8.836	5	50	0.497	0.497	26	26	590
					Without Project AAHUs:	**12**							**With Project AAHUs:**	**13**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

AAHU

ALTERNATIVE 2


Net AAHU Gains For Restoration Alternative 2
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
Net AAHU Gains
OCEANBEACH
VEGBEACH
DUNEGRASS
BAYBEACH
BAYSUBSAV
UPLANDS
T-2 Sunken Forest
T-3 Reagan Property
T-5 Great Gun
T-7 Tiana
T-8 WOSI
T-9 Georgica Pond
T-10 East Inlet Island
T-11 John Boyle Island
T-14 Ocean Beach
T-15 New Made Island
Restoration Sites

Restoration Alternative 2 AAHUs per Transect and Per Community

RESTORATION	Sum of AAHUs	Average Annual Habitat Units (AAHUs)					
		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
T-2 Sunken Forest	12	3.1	1.1	3.1	0.1	0.7	3.5
T-3 Reagan Property	13	4.1	2.8	3.7	0.0	1.3	1.1
T-5 Great Gun	16	3.0	1.6	5.7	2.4	0.9	2.8
T-7 Tiana	16	4.8	2.3	2.5	3.4	1.6	1.8
T-8 WOSI	22	12.9	4.2	1.4	1.6	1.4	0.5
T-9 Georgica Pond	64	13.4	0.4	1.5	28.8	13.3	6.9
T-10 East Inlet Island	26			3.9	14.2	6.9	0.9
T-11 John Boyle Island	15			-0.7	6.6	5.9	3.1
T-14 Ocean Beach	19	10.7	4.5	1.4	0.0	1.8	0.1
T-15 New Made Island	5			0.2	0.8	3.1	0.4
T-22 Islip Meadows	7				4.1	1.6	1.7
T-23 Seatuck Refuge	31				15.2	4.9	11.3
T-24 Davis Park	18	9.7	3.9	1.8	0.2	2.2	0.0
T-25 Atlantique to Cornielle	7	4.3	0.2	1.0	0.9	-0.4	0.9
T-26 Kismet, Atlantique, Fair Harbor	13	4.6	4.5	2.2	0.1	1.5	0.4
T-27 Warner Island East	3			0.0	-0.8	1.5	2.6
Average	**22**	7	3	2	5	3	2

Habitats not applicable

Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	59	59	32	32.2	0	1	0.545	0.545	59	59	32
1	5	0.545	0.545	59	59	129		1	5	0.545	0.545	59	59	129
5	50	0.545	0.477	59	53	1,293	25.39	5	50	0.545	0.545	59	59	1,449
					Without Project AAHUs:	**29**							**With Project AAHUs:**	**32**
													Net AAHUs:	**3**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.567	0.567	5	5	3		0	1	0.567	0.567	5	5	3
1	5	0.567	0.567	5	5	11		1	5	0.567	0.750	5	5	13
5	50	0.567	0.523	5	5	118	2.379	5	50	0.750	0.750	5	5	170
					Without Project AAHUs:	**2.641**							**With Project AAHUs:**	**3.732**
													Net AAHUs:	**1.091**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.687	0.687	8	8	6		0	1	0.687	0.687	8	8	6
1	5	0.687	0.687	8	8	23		1	5	0.687	0.910	8	8	27
5	50	0.687	0.388	8	8	195	2.953	5	50	0.910	0.910	8	8	346
					Without Project AAHUs:	**4**							**With Project AAHUs:**	**8**
													Net AAHUs:	**3**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.198	0.198	2	2	0		0	1	0.198	0.198	2	2	0
1	5	0.198	0.198	2	2	1		1	5	0.198	0.198	2	2	1
5	50	0.198	0.123	2	2	12	0.206	5	50	0.198	0.198	2	2	15
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.638	0.638	22	22	14		0	1	0.638	0.638	22	22	14
1	5	0.638	0.638	22	22	57		1	5	0.638	0.638	22	22	57
5	50	0.638	0.513	22	25	606	12.6	5	50	0.638	0.638	22	22	641
					Without Project AAHUs:	**14**							**With Project AAHUs:**	**14**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.783	15	15	12		0	1	0.783	0.783	15	15	12
1	5	0.783	0.783	15	15	47		1	5	0.783	0.832	15	15	49
5	50	0.783	0.423	15	14	393	5.768	5	50	0.832	0.832	15	15	567
					Without Project AAHUs:	**9**							**With Project AAHUs:**	**13**
													Net AAHUs:	**4**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	48	48	27	27.39	0	1	0.572	0.572	48	48	27
1	5	0.572	0.572	48	48			1	5	0.572	0.572	48	47	108
5	50	0.572	0.509	48	43	1,107	21.93	5	50	0.572	0.572	47	47	1,205
Without Project AAHUs:						**23**		**With Project AAHUs:**						**27**
Net AAHUs:														**4**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.396	0.396	4	4	1		0	1	0.396	0.396	4	4	1
1	5	0.396	0.396	4	4			1	5	0.396	0.875	4	5	11
5	50	0.396	0.353	4	3	59	1.17	5	50	0.875	0.875	5	5	187
Without Project AAHUs:						**1.210**		**With Project AAHUs:**						**3.988**
Net AAHUs:														**2.778**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.443	0.443	8	8	3		0	1	0.443	0.443	8	8	3
1	5	0.443	0.443	8	8			1	5	0.443	0.775	8	8	19
5	50	0.443	0.216	8	7	112	1.536	5	50	0.775	0.775	8	8	277
Without Project AAHUs:						**2**		**With Project AAHUs:**						**6**
Net AAHUs:														**4**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.209	0.209	1	1	0		0	1	0.209	0.209	1	1	0
1	5	0.209	0.209	1	1			1	5	0.209	0.209	1	1	1
5	50	0.209	0.127	1	1	6	0.105	5	50	0.209	0.209	1	1	8
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.347	0.347	16	16	5		0	1	0.347	0.347	16	16	5
1	5	0.347	0.347	16	16			1	5	0.347	0.347	16	16	22
5	50	0.347	0.197	16	17	201	3.392	5	50	0.347	0.347	16	16	245
					Without Project AAHUs:	**4**							**With Project AAHUs:**	**5**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.673	0.673	5	5	3		0	1	0.673	0.673	5	5	3
1	5	0.673	0.673	5	5			1	5	0.673	0.607	5	6	14
5	50	0.673	0.318	5	5	110	1.484	5	50	0.607	0.607	6	6	150
					Without Project AAHUs:	**2**							**With Project AAHUs:**	**3**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	58	58	31	31.38	0	1	0.545	0.545	58	58	31
1	5	0.545	0.545	58	58	126		1	5	0.545	0.545	58	58	126
5	50	0.545	0.477	58	52	1,260	24.74	5	50	0.545	0.545	58	58	1,412
					Without Project AAHUs:	**28**							**With Project AAHUs:**	**31**
													Net AAHUs:	**3**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.483	0.483	6	6	3		0	1	0.483	0.483	6	6	3
1	5	0.483	0.483	6	6	12		1	5	0.483	0.708	6	6	15
5	50	0.483	0.453	6	6	128	2.603	5	50	0.708	0.708	6	6	203
					Without Project AAHUs:	**2.865**							**With Project AAHUs:**	**4.433**
													Net AAHUs:	**1.569**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.564	0.564	14	14	8		0	1	0.564	0.564	14	14	8
1	5	0.564	0.564	14	14	32		1	5	0.564	0.783	14	15	40
5	50	0.564	0.288	14	13	261	3.691	5	50	0.783	0.783	15	15	537
					Without Project AAHUs:	**6**							**With Project AAHUs:**	**12**
													Net AAHUs:	**6**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.243	0.243	11	11	3		0	1	0.243	0.243	11	11	3
1	5	0.243	0.243	11	11	11		1	5	0.243	0.403	11	12	15
5	50	0.243	0.196	11	10	104	1.953	5	50	0.403	0.403	12	12	222
					Without Project AAHUs:	**2**							**With Project AAHUs:**	**5**
													Net AAHUs:	**2**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.544	0.544	17	17	9		0	1	0.544	0.544	17	17	9
1	5	0.544	0.544	17	17	36		1	5	0.544	0.544	17	16	36
5	50	0.544	0.399	17	17	352	6.624	5	50	0.544	0.544	16	16	399
					Without Project AAHUs:	**8**							**With Project AAHUs:**	**9**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.417	0.417	7	7	3		0	1	0.417	0.417	7	7	3
1	5	0.417	0.417	7	7	12		1	5	0.417	0.517	7	10	16
5	50	0.417	0.123	7	7	86	0.818	5	50	0.517	0.517	10	10	224
					Without Project AAHUs:	**2**							**With Project AAHUs:**	**5**
													Net AAHUs:	**3**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	55	55	31	31.18	0	1	0.572	0.572	55	55	31
1	5	0.572	0.572	55	55	125		1	5	0.572	0.572	55	55	125
5	50	0.572	0.424	55	49	1,164	20.81	5	50	0.572	0.572	55	55	1,403
Without Project AAHUs:						**26**		**With Project AAHUs:**						**31**
Net AAHUs:														**5**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.593	0.593	7	7	4		0	1	0.593	0.593	7	7	4
1	5	0.593	0.593	7	7	16		1	5	0.593	0.933	7	7	21
5	50	0.593	0.556	7	7	179	3.85	5	50	0.933	0.933	7	7	291
Without Project AAHUs:						**3.989**		**With Project AAHUs:**						**6.316**
Net AAHUs:														**2.327**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.703	0.703	6	6	4		0	1	0.703	0.703	6	6	4
1	5	0.703	0.703	6	6	17		1	5	0.703	0.952	6	6	21
5	50	0.703	0.440	6	6	150	2.423	5	50	0.952	0.952	6	6	270
Without Project AAHUs:						**3**		**With Project AAHUs:**						**6**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.671	0.671	11	11	7		0	1	0.671	0.671	11	11	7
1	5	0.671	0.671	11	11	29		1	5	0.671	0.907	11	11	34
5	50	0.671	0.531	11	10	277	5.145	5	50	0.907	0.907	11	11	441
Without Project AAHUs:						**6**		**With Project AAHUs:**						**10**
Net AAHUs:														**3**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.614	0.614	19	19	12		0	1	0.614	0.614	19	19	12
1	5	0.614	0.614	19	19	46		1	5	0.614	0.614	19	19	46
5	50	0.614	0.430	19	19	440	8.058	5	50	0.614	0.614	19	19	518
					Without Project AAHUs:	**10**							**With Project AAHUs:**	**12**
													Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.350	0.350	4	4	1		0	1	0.350	0.350	4	4	1
1	5	0.350	0.350	4	4	6		1	5	0.350	0.638	4	4	9
5	50	0.350	0.023	4	4	34	0.089	5	50	0.638	0.638	4	4	124
					Without Project AAHUs:	**1**							**With Project AAHUs:**	**3**
													Net AAHUs:	**2**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.953	0.953	82	82	78	77.9	0	1	0.953	0.953	82	82	78
1	5	0.953	0.953	82	82	312		1	5	0.953	0.953	82	82	312
5	50	0.953	0.678	82	74	2,859	49.9	5	50	0.953	0.953	82	82	3,505
					Without Project AAHUs:	**65**							**With Project AAHUs:**	**78**
													Net AAHUs:	**13**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.458	0.458	9	9	4		0	1	0.458	0.458	9	9	4
1	5	0.458	0.458	9	9	17		1	5	0.458	0.892	9	9	25
5	50	0.458	0.397	9	8	168	3.27	5	50	0.892	0.892	9	9	368
					Without Project AAHUs:	**3.772**							**With Project AAHUs:**	**7.930**
													Net AAHUs:	**4.157**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.441	0.441	13	13	6		0	1	0.441	0.441	13	13	6
1	5	0.441	0.441	13	13	23		1	5	0.441	0.453	13	13	23
5	50	0.441	0.226	13	13	193	2.907	5	50	0.453	0.453	13	13	264
					Without Project AAHUs:	**4**							**With Project AAHUs:**	**6**
													Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.567	0.567	8	8	5		0	1	0.567	0.567	8	8	5
1	5	0.567	0.567	8	8	19		1	5	0.567	0.730	8	8	22
5	50	0.567	0.493	8	8	201	4.154	5	50	0.730	0.730	8	8	276
					Without Project AAHUs:	**4**							**With Project AAHUs:**	**6**
													Net AAHUs:	**2**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.436	0.436	20	20	9		0	1	0.436	0.436	20	20	9
1	5	0.436	0.436	20	20	34		1	5	0.436	0.436	20	20	34
5	50	0.436	0.274	20	20	314	5.39	5	50	0.436	0.436	20	20	385
Without Project AAHUs:						**7**		**With Project AAHUs:**						**9**
Net AAHUs:														**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.217	0.217	5	5	1		0	1	0.217	0.217	5	5	1
1	5	0.217	0.217	5	5	4		1	5	0.217	0.217	5	5	4
5	50	0.217	0.000	5	4	22	0	5	50	0.217	0.217	5	5	45
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0.000**		**With Project AAHUs:**						**0.000**
Net AAHUs:														**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.385	0.385	11	11	4		0	1	0.385	0.385	11	11	4
1	5	0.385	0.385	11	11	18		1	5	0.385	0.618	11	11	23
5	50	0.385	0.168	11	9	127	1.439	5	50	0.618	0.618	11	11	317
Without Project AAHUs:						**3**		**With Project AAHUs:**						**7**
Net AAHUs:														**4**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.526	0.526	67	67	35		0	1	0.526	0.526	67	67	35
1	5	0.526	0.526	67	67	142		1	5	0.526	0.700	67	67	165
5	50	0.526	0.399	67	71	1,435	28.19	5	50	0.700	0.700	67	67	2,120
Without Project AAHUs:						**32**		**With Project AAHUs:**						**46**
Net AAHUs:														**14**

Fire Island to Montauk Point, NY Reformulation Study

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	83	83	42		0	1	0.497	0.497	83	83	42
1	5	0.497	0.497	83	83	166		1	5	0.497	0.497	83	83	166
5	50	0.497	0.313	83	83	1,523	26.15	5	50	0.497	0.497	83	83	1,868
Without Project AAHUs:						**35**		**With Project AAHUs:**						**42**
													Net AAHUs:	**7**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	2	2	1		0	1	0.452	0.452	2	2	1
1	5	0.452	0.452	2	2	4		1	5	0.452	0.652	2	2	5
5	50	0.452	0.148	2	1	24	0.124	5	50	0.652	0.652	2	2	70
Without Project AAHUs:						**1**		**With Project AAHUs:**						**2**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0.000**							**With Project AAHUs:**	**0.000**
													Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.385	0.385	3	3	1		0	1	0.385	0.385	3	3	1
1	5	0.385	0.385	3	3	4		1	5	0.385	0.618	3	0	3
5	50	0.385	0.168	3	2	32	0.367	5	50	0.618	0.618	0	0	0
					Without Project AAHUs:	**1**							**With Project AAHUs:**	**0**
													Net AAHUs:	**-1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.526	0.526	31	31	17		0	1	0.526	0.526	31	31	17
1	5	0.526	0.526	31	31	66		1	5	0.526	0.700	31	31	77
5	50	0.526	0.399	31	33	668	13.13	5	50	0.700	0.700	31	31	988
					Without Project AAHUs:	**15**							**With Project AAHUs:**	**22**
													Net AAHUs:	**7**

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.497	0.497	72	72	36		0	1	0.497	0.497	72	72	36
1	5	0.497	0.497	72	72	142		1	5	0.497	0.497	72	72	142
5	50	0.497	0.313	72	72	1,304	22.4	5	50	0.497	0.497	72	72	1,601
Without Project AAHUs:						**30**		**With Project AAHUs:**						**36**
Net AAHUs:														**6**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	1		1	5	0.452	0.952	1	4	7
5	50	0.452	0.148	1	0	7	0.037	5	50	0.952	0.952	4	4	156
Without Project AAHUs:						**0**		**With Project AAHUs:**						**3**
Net AAHUs:														**3**

Fire Island to Montauk Point, NY Reformulation Study

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.239	0.239	71	71	17	16.91	0	1	0.239	0.239	71	71	17
1	5	0.239	0.239	71	71			1	5	0.239	0.381	71	69	86
5	50	0.239	0.240	71	64	725	15.31	5	50	0.381	0.381	69	69	1,175
					Without Project AAHUs:	**15**							**With Project AAHUs:**	**26**
													Net AAHUs:	**11**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.220	0.220	4	4	1		0	1	0.220	0.220	4	4	1
1	5	0.220	0.220	4	4			1	5	0.220	0.867	4	6	12
5	50	0.220	0.178	4	4	33	0.627	5	50	0.867	0.867	6	6	246
					Without Project AAHUs:	**0.685**							**With Project AAHUs:**	**5.164**
													Net AAHUs:	**4.479**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.434	0.434	3	3	1		0	1	0.434	0.434	3	3	1
1	5	0.434	0.434	3	3			1	5	0.434	0.653	3	4	7
5	50	0.434	0.208	3	3	44	0.593	5	50	0.653	0.653	4	4	106
					Without Project AAHUs:	**1**							**With Project AAHUs:**	**2**
													Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	0	0	0		0	1	0.153	0.153	0	0	0
1	5	0.153	0.153	0	0			1	5	0.153	0.153	0	0	0
5	50	0.153	0.101	0	0	2	0.031	5	50	0.153	0.153	0	0	2
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	23	23	12		0	1	0.529	0.529	23	23	12
1	5	0.529	0.529	23	23			1	5	0.529	0.529	23	23	48
5	50	0.529	0.444	23	23	497	10.08	5	50	0.529	0.529	23	23	540
					Without Project AAHUs:	**10**							**With Project AAHUs:**	**12**
													Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1			1	5	0.187	0.187	1	1	1
5	50	0.187	0.000	1	1	3	0	5	50	0.187	0.187	1	1	7
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0.000**		**With Project AAHUs:**						**0.000**
Net AAHUs:														**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.318	0.318	1	1	0		0	1	0.318	0.318	1	1	0
1	5	0.318	0.318	1	1	1		1	5	0.318	0.618	1	1	1
5	50	0.318	0.165	1	0	6	0.075	5	50	0.618	0.618	1	1	17
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.462	0.462	3	3	2		0	1	0.462	0.462	3	3	2
1	5	0.462	0.462	3	3	6		1	5	0.462	0.695	3	3	8
5	50	0.462	0.384	3	3	64	1.319	5	50	0.695	0.695	3	3	102
Without Project AAHUs:						**1**		**With Project AAHUs:**						**2**
Net AAHUs:														**1**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.497	0.497	38	38	19		0	1	0.497	0.497	38	38	19
1	5	0.497	0.497	38	38	75		1	5	0.497	0.497	38	38	75
5	50	0.497	0.313	38	38	689	11.83	5	50	0.497	0.497	38	38	845
Without Project AAHUs:						**16**		**With Project AAHUs:**						**19**
													Net AAHUs:	**3**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	2		1	5	0.452	0.652	1	1	2
5	50	0.452	0.148	1	0	9	0.047	5	50	0.652	0.652	1	1	27
Without Project AAHUs:						**0**		**With Project AAHUs:**						**1**
													Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0.000**		**With Project AAHUs:**						**0.000**
Net AAHUs:														**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.609	0.609	45	45	27		0	1	0.609	0.609	45	45	27
1	5	0.609	0.609	45	45	109		1	5	0.609	0.657	45	43	111
5	50	0.609	0.465	45	45	1,081	20.8	5	50	0.657	0.657	43	43	1,282
Without Project AAHUs:						**24**		**With Project AAHUs:**						**28**
Net AAHUs:														**4**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.485	0.485	11	11	6		0	1	0.485	0.485	11	11	6
1	5	0.485	0.485	11	11	22		1	5	0.485	0.485	11	13	24
5	50	0.485	0.297	11	11	202	3.402	5	50	0.485	0.485	13	13	281
					Without Project AAHUs:	**5**							**With Project AAHUs:**	**6**
													Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.783	12	12	9		0	1	0.783	0.783	12	12	9
1	5	0.783	0.783	12	12	37		1	5	0.783	0.783	12	12	37
5	50	0.783	0.523	12	11	330	5.539	5	50	0.783	0.783	12	12	415
					Without Project AAHUs:	**8**							**With Project AAHUs:**	**9**
													Net AAHUs:	**2**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.173	0.173	281	281	49	48.65	0	1	0.173	0.173	281	281	49
1	5	0.173	0.173	281	281	195		1	5	0.173	0.173	281	281	195
5	50	0.173	0.068	281	281	1,522	18.98	5	50	0.173	0.173	281	281	2,189
Without Project AAHUs:						**35**		**With Project AAHUs:**						**49**
													Net AAHUs:	**13**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.250	0.250	16	16	4		0	1	0.250	0.250	16	16	4
1	5	0.250	0.250	16	16	16		1	5	0.250	0.250	16	16	16
5	50	0.250	0.198	16	16	161	3.17	5	50	0.250	0.250	16	16	180
Without Project AAHUs:						**3.631**		**With Project AAHUs:**						**4.008**
													Net AAHUs:	**0.377**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.470	0.470	13	13	6		0	1	0.470	0.470	13	13	6
1	5	0.470	0.470	13	13	24		1	5	0.470	0.470	13	13	24
5	50	0.470	0.207	13	13	198	2.693	5	50	0.470	0.470	13	13	276
Without Project AAHUs:						**5**		**With Project AAHUs:**						**6**
													Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.778	0.778	134	134	104		0	1	0.778	0.778	134	134	104
1	5	0.778	0.778	134	134	417		1	5	0.778	0.941	134	134	461
5	50	0.778	0.641	134	134	4,279	85.89	5	50	0.941	0.941	134	134	5,677
Without Project AAHUs:						**96**		**With Project AAHUs:**						**125**
													Net AAHUs:	**29**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.752	0.752	184	184	138		0	1	0.752	0.752	184	184	138
1	5	0.752	0.752	184	184	553		1	5	0.752	0.752	184	184	553
5	50	0.752	0.591	184	184	5,549	108.5	5	50	0.752	0.752	184	184	6,216
Without Project AAHUs:						**125**		**With Project AAHUs:**						**138**
Net AAHUs:														**13**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.473	0.473	90	90	43		0	1	0.473	0.473	90	90	43
1	5	0.473	0.473	90	90	170		1	5	0.473	0.473	90	90	170
5	50	0.473	0.302	90	90	1,566	27.09	5	50	0.473	0.473	90	90	1,913
Without Project AAHUs:						**36**		**With Project AAHUs:**						**43**
Net AAHUs:														**7**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0.000**							**With Project AAHUs:**	**0.000**
													Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.609	0.609	85	85	52		0	1	0.609	0.609	85	85	52
1	5	0.609	0.609	85	85	208		1	5	0.609	0.694	85	90	228
5	50	0.609	0.465	85	85	2,059	39.64	5	50	0.694	0.694	90	90	2,798
					Without Project AAHUs:	**46**							**With Project AAHUs:**	**62**
													Net AAHUs:	**15**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.485	0.485	55	55	27		0	1	0.485	0.485	55	55	27
1	5	0.485	0.485	55	55	108		1	5	0.485	0.485	55	56	108
5	50	0.485	0.297	55	55	975	16.44	5	50	0.485	0.485	55	56	1,219
					Without Project AAHUs:	**22**							**With Project AAHUs:**	**27**
													Net AAHUs:	**5**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.783	78	78	61		0	1	0.783	0.783	78	78	61
1	5	0.783	0.783	78	78	245		1	5	0.783	0.783	78	78	245
5	50	0.783	0.523	78	70	2,190	36.79	5	50	0.783	0.783	78	78	2,754
					Without Project AAHUs:	**50**							**With Project AAHUs:**	**61**
													Net AAHUs:	**11**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	185	185	106	105.8	0	1	0.572	0.572	185	185	106
1	5	0.572	0.572	185	185	423		1	5	0.572	0.572	185	185	423
5	50	0.572	0.509	185	167	4,279	84.73	5	50	0.572	0.572	185	185	4,762
Without Project AAHUs:						**96**		**With Project AAHUs:**						**106**
													Net AAHUs:	**10**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	10	10	4		0	1	0.370	0.370	10	10	4
1	5	0.370	0.370	10	10	14		1	5	0.370	0.763	10	10	22
5	50	0.370	0.328	10	9	146	2.882	5	50	0.763	0.763	10	10	336
Without Project AAHUs:						**3.278**		**With Project AAHUs:**						**7.225**
													Net AAHUs:	**3.947**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	5	5	2		0	1	0.434	0.434	5	5	2
1	5	0.434	0.434	5	5	8		1	5	0.434	0.565	5	6	11
5	50	0.434	0.208	5	4	66	0.901	5	50	0.565	0.565	6	6	153
Without Project AAHUs:						**2**		**With Project AAHUs:**						**3**
													Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	8	8	1		0	1	0.153	0.153	8	8	1
1	5	0.153	0.153	8	8	5		1	5	0.153	0.153	8	8	5
5	50	0.153	0.101	8	8	43	0.768	5	50	0.153	0.153	8	8	52
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
													Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	58	58	31		0	1	0.529	0.529	58	58	31
1	5	0.529	0.529	58	58	124		1	5	0.529	0.529	58	58	124
5	50	0.529	0.444	58	58	1,281	25.98	5	50	0.529	0.529	58	58	1,392
					Without Project AAHUs:	29							With Project AAHUs:	31
													Net AAHUs:	2

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	1		1	5	0.187	0.187	1	1	1
5	50	0.187	0.068	1	1	4	0.05	5	50	0.187	0.187	1	1	7
					Without Project AAHUs:	0							With Project AAHUs:	0
													Net AAHUs:	0

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	82	82	47	46.74	0	1	0.572	0.572	82	82	47
1	5	0.572	0.572	82	82	187		1	5	0.572	0.572	82	82	187
5	50	0.572	0.509	82	74	1,890	37.43	5	50	0.572	0.572	82	82	2,103
Without Project AAHUs:						**42**		**With Project AAHUs:**						**47**
Net AAHUs:														**4**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.370	0.370	6	6	2		0	1	0.370	0.370	6	6	2
1	5	0.370	0.370	6	6	8		1	5	0.370	0.370	6	6	8
5	50	0.370	0.328	6	5	82	1.625	5	50	0.370	0.370	6	6	92
Without Project AAHUs:						**1.849**		**With Project AAHUs:**						**2.038**
Net AAHUs:														**0.189**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.434	0.434	9	9	4		0	1	0.434	0.434	9	9	4
1	5	0.434	0.434	9	9	15		1	5	0.434	0.434	9	9	15
5	50	0.434	0.208	9	8	120	1.627	5	50	0.434	0.434	9	9	169
Without Project AAHUs:						**3**		**With Project AAHUs:**						**4**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	4	4	1		0	1	0.153	0.153	4	4	1
1	5	0.153	0.153	4	4	2		1	5	0.153	0.153	4	9	4
5	50	0.153	0.101	4	4	22	0.388	5	50	0.153	0.153	9	9	64
Without Project AAHUs:						**0**		**With Project AAHUs:**						**1**
Net AAHUs:														**1**

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	27	27	14		0	1	0.529	0.529	27	27	14
1	5	0.529	0.529	27	27	58		1	5	0.529	0.529	27	22	52
5	50	0.529	0.444	27	27	597	12.11	5	50	0.529	0.529	27	22	583
Without Project AAHUs:						**13**		**With Project AAHUs:**						**13**
													Net AAHUs:	**0**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.187	0.187	16	16	3		0	1	0.187	0.187	16	16	3
1	5	0.187	0.187	16	16	12		1	5	0.187	0.187	16	16	12
5	50	0.187	0.068	16	14	87	0.97	5	50	0.187	0.187	16	16	133
Without Project AAHUs:						**2**		**With Project AAHUs:**						**3**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet, Atlantique, and Fair Harbor

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	121	121	69	69.06	0	1	0.572	0.572	121	121	69
1	5	0.572	0.572	121	121	276		1	5	0.572	0.572	121	118	273
5	50	0.572	0.509	121	109	2,792	55.3	5	50	0.572	0.572	118	118	3,028
Without Project AAHUs:						**63**		**With Project AAHUs:**						**67**
													Net AAHUs:	**5**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	7	7	2		0	1	0.370	0.370	7	7	2
1	5	0.370	0.370	7	7	10		1	5	0.370	0.682	7	10	18
1	50	0.370	0.328	7	6	109	1.982	1	50	0.682	0.682	10	10	327
Without Project AAHUs:						**2.433**		**With Project AAHUs:**						**6.950**
													Net AAHUs:	**4.517**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	5	5	2		0	1	0.434	0.434	5	5	2
1	5	0.434	0.434	5	5	8		1	5	0.434	0.660	5	6	11
5	50	0.434	0.208	5	4	64	0.872	5	50	0.660	0.660	6	6	172
Without Project AAHUs:						**1**		**With Project AAHUs:**						**4**
													Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	4	4	1		0	1	0.153	0.153	4	4	1
1	5	0.153	0.153	4	4	2		1	5	0.153	0.153	4	4	2
5	50	0.153	0.101	4	4	23	0.414	5	50	0.153	0.153	4	4	28
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
													Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet, Atlantique, and Fair Harbor

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	38	38	20		0	1	0.529	0.529	38	38	20
1	5	0.529	0.529	38	38	81		1	5	0.529	0.529	38	38	81
5	50	0.529	0.444	38	38	834	16.92	5	50	0.529	0.529	38	38	907
Without Project AAHUs:						**19**		**With Project AAHUs:**						**20**
Net AAHUs:														**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	7	7	1		0	1	0.187	0.187	7	7	1
1	5	0.187	0.187	7	7	5		1	5	0.187	0.187	7	7	5
5	50	0.187	0.068	7	6	38	0.427	5	50	0.187	0.187	7	7	58
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0.000**		**With Project AAHUs:**						**0.000**
Net AAHUs:														**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.914	0.914	2	2	2		0	1	0.914	0.914	2	2	2
1	5	0.914	0.914	2	2	8		1	5	0.914	0.914	2	1	6
5	50	0.914	0.749	2	2	85	1.692	5	50	0.914	0.914	1	1	47
Without Project AAHUs:						**2**		**With Project AAHUs:**						**1**
Net AAHUs:														**-1**

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 2)

BAYSUBSAV Community

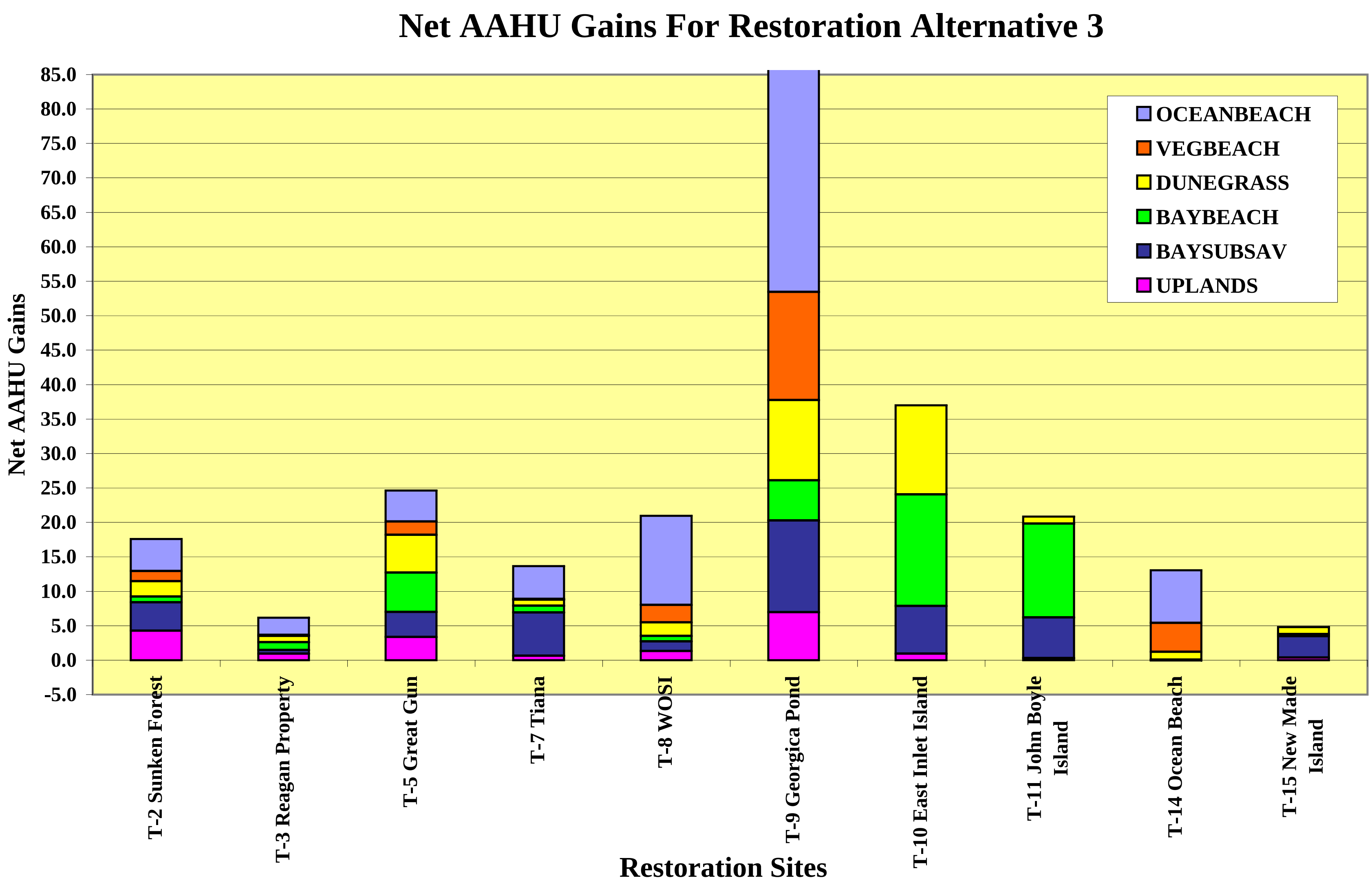
Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	28	28	14		0	1	0.497	0.497	28	28	14
1	5	0.497	0.497	28	28	56		1	5	0.497	0.497	28	26	54
5	50	0.497	0.313	28	28	514	8.836	5	50	0.497	0.497	26	26	590
Without Project AAHUs:						**12**		**With Project AAHUs:**						**13**
Net AAHUs:														**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.952	0	3	4
5	50	0.000	0.000	0	0	0	0	5	50	0.952	0.952	3	3	127
Without Project AAHUs:						**0**		**With Project AAHUs:**						**3**
Net AAHUs:														**3**

AAHU

ALTERNATIVE 3


Net AAHU Gains For Restoration Alternative 3
Net AAHU Gains
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
OCEANBEACH
VEGBEACH
DUNEGRASS
BAYBEACH
BAYSUBSAV
UPLANDS
T-2 Sunken Forest
T-3 Reagan Property
T-5 Great Gun
T-7 Tiana
T-8 WOSI
T-9 Georgica Pond
T-10 East Inlet Island
T-11 John Boyle Island
T-14 Ocean Beach
T-15 New Made Island
Restoration Sites

Restoration Alternative 3 AAHUs per Transect and Per Community

RESTORATION	Sum of AAHUs	Average Annual Habitat Units (AAHUs)					
		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
T-2 Sunken Forest	18	4.6	1.5	2.2	0.8	4.1	4.3
T-3 Reagan Property	6	2.5	0.1	0.9	1.1	0.6	0.9
T-5 Great Gun	25	4.5	1.9	5.5	5.7	3.6	3.4
T-7 Tiana	14	4.8	0.1	0.9	1.0	6.3	0.6
T-8 WOSI	21	12.9	2.5	2.0	0.8	1.4	1.3
T-9 Georgica Pond	115	61.9	15.7	11.6	5.8	13.3	6.9
T-10 East Inlet Island	37			12.9	16.2	6.9	0.9
T-11 John Boyle Island	21			1.0	13.6	5.9	0.3
T-14 Ocean Beach	13	7.6	4.2	1.1	0.0	-0.1	0.1
T-15 New Made Island	5			1.0	0.3	3.1	0.4
T-22 Islip Meadows	11				7.5	1.4	1.7
T-23 Seatuck Refuge	38				21.7	5.0	11.3
T-24 Davis Park	16	9.7	0.6	2.2	0.2	2.2	1.1
T-25 Atlantique to Cornielle	13	3.4	2.5	4.5	0.1	1.0	1.8
T-26 Kismet, Atlantique, Fair Harbor	13	4.3	4.5	2.6	0.1	1.5	0.4
T-27 Warner Island East	1				-0.8	1.5	
Average	**29**	12	3	4	5	4	2

Habitats not applicable

Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	59	59	32	32.2	0	1	0.545	0.545	59	59	32
1	5	0.545	0.545	59	59	129		1	5	0.545	0.572	59	59	132
5	50	0.545	0.477	59	53	1,293	25.39	5	50	0.572	0.572	59	59	1,521
Without Project AAHUs:						**29**		**With Project AAHUs:**						**34**
													Net AAHUs:	**5**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.567	0.567	5	5	3		0	1	0.567	0.567	5	5	3
1	5	0.567	0.567	5	5	11		1	5	0.567	0.835	5	5	14
5	50	0.567	0.523	5	5	118	2.379	5	50	0.835	0.835	5	5	190
Without Project AAHUs:						**2.641**		**With Project AAHUs:**						**4.135**
													Net AAHUs:	**1.494**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.687	0.687	8	8	6		0	1	0.687	0.687	8	8	6
1	5	0.687	0.687	8	8	23		1	5	0.687	0.799	8	8	25
5	50	0.687	0.388	8	8	195	2.953	5	50	0.799	0.799	8	8	304
Without Project AAHUs:						**4**		**With Project AAHUs:**						**7**
													Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.198	0.198	2	2	0		0	1	0.198	0.198	2	2	0
1	5	0.198	0.198	2	2	1		1	5	0.198	0.701	2	2	3
5	50	0.198	0.123	2	2	12	0.206	5	50	0.701	0.701	2	2	53
Without Project AAHUs:						**0**		**With Project AAHUs:**						**1**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-2 Sunken Forest

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.638	0.638	22	22	14		0	1	0.638	0.638	22	22	14
1	5	0.638	0.638	22	22	57		1	5	0.638	0.802	22	22	64
5	50	0.638	0.513	22	25	606	12.6	5	50	0.802	0.802	22	22	805
Without Project AAHUs:						**14**		**With Project AAHUs:**						**18**
Net AAHUs:														**4**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.783	15	15	12		0	1	0.783	0.783	15	15	12
1	5	0.783	0.783	15	15	47		1	5	0.783	0.885	15	15	51
5	50	0.783	0.423	15	14	393	5.768	5	50	0.885	0.885	15	15	603
Without Project AAHUs:						**9**		**With Project AAHUs:**						**13**
Net AAHUs:														**4**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	48	48	27	27.39	0	1	0.572	0.572	48	48	27
1	5	0.572	0.572	48	48	110		1	5	0.572	0.572	48	48	110
5	50	0.572	0.509	48	43	1,107	21.93	5	50	0.572	0.572	48	48	1,232
Without Project AAHUs:						**25**		**With Project AAHUs:**						**27**
Net AAHUs:														**3**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.396	0.396	4	4	1		0	1	0.396	0.396	4	4	1
1	5	0.396	0.396	4	4	6		1	5	0.396	0.400	4	4	6
5	50	0.396	0.353	4	3	59	1.17	5	50	0.400	0.400	4	4	66
Without Project AAHUs:						**1.326**		**With Project AAHUs:**						**1.471**
Net AAHUs:														**0.145**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.443	0.443	8	8	3		0	1	0.443	0.443	8	8	3
1	5	0.443	0.443	8	8	14		1	5	0.443	0.443	8	8	14
5	50	0.443	0.216	8	7	112	1.536	5	50	0.443	0.443	8	8	157
Without Project AAHUs:						**3**		**With Project AAHUs:**						**3**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.209	0.209	1	1	0		0	1	0.209	0.209	1	1	0
1	5	0.209	0.209	1	1	1		1	5	0.209	0.716	1	2	3
5	50	0.209	0.127	1	1	6	0.105	5	50	0.716	0.716	2	2	60
Without Project AAHUs:						**0**		**With Project AAHUs:**						**1**
Net AAHUs:														**1**

Fire Island to Montauk Point, NY Reformulation Study

T-3 Reagan

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.347	0.347	16	16	5		0	1	0.347	0.347	16	16	5
1	5	0.347	0.347	16	16	22		1	5	0.347	0.347	16	15	21
5	50	0.347	0.197	16	17	201	3.392	5	50	0.347	0.347	15	15	229
					Without Project AAHUs:	**5**							**With Project AAHUs:**	**5**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.673	0.673	5	5	3		0	1	0.673	0.673	5	5	3
1	5	0.673	0.673	5	5	14		1	5	0.673	0.673	5	5	14
5	50	0.673	0.318	5	5	110	1.484	5	50	0.673	0.673	5	5	157
					Without Project AAHUs:	**3**							**With Project AAHUs:**	**3**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	58	58	31	31.38	0	1	0.545	0.545	58	58	31
1	5	0.545	0.545	58	58	126		1	5	0.545	0.572	58	58	129
5	50	0.545	0.477	58	52	1,260	24.74	5	50	0.572	0.572	58	58	1,482
Without Project AAHUs:						**28**		**With Project AAHUs:**						**33**
Net AAHUs:														**5**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.483	0.483	6	6	3		0	1	0.483	0.483	6	6	3
1	5	0.483	0.483	6	6	12		1	5	0.483	0.768	6	6	16
5	50	0.483	0.453	6	6	128	2.603	5	50	0.768	0.768	6	6	221
Without Project AAHUs:						**2.865**		**With Project AAHUs:**						**4.793**
Net AAHUs:														**1.928**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.564	0.564	14	14	8		0	1	0.564	0.564	14	14	8
1	5	0.564	0.564	14	14	32		1	5	0.564	0.699	14	17	39
5	50	0.564	0.288	14	13	261	3.691	5	50	0.699	0.699	17	17	528
Without Project AAHUs:						**6**		**With Project AAHUs:**						**12**
Net AAHUs:														**5**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.243	0.243	11	11	3		0	1	0.243	0.243	11	11	3
1	5	0.243	0.243	11	11	11		1	5	0.243	0.701	11	12	22
5	50	0.243	0.196	11	10	104	1.953	5	50	0.701	0.701	12	12	379
Without Project AAHUs:						**2**		**With Project AAHUs:**						**8**
Net AAHUs:														**6**

Fire Island to Montauk Point, NY Reformulation Study

T-5 Great Gun

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.544	0.544	17	17	9		0	1	0.544	0.544	17	17	9
1	5	0.544	0.544	17	17	36		1	5	0.544	0.708	17	17	42
5	50	0.544	0.399	17	17	352	6.624	5	50	0.708	0.708	17	17	529
Without Project AAHUs:						**8**		**With Project AAHUs:**						**12**
Net AAHUs:														**4**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.417	0.417	7	7	3		0	1	0.417	0.417	7	7	3
1	5	0.417	0.417	7	7	12		1	5	0.417	0.552	7	10	17
5	50	0.417	0.123	7	7	86	0.818	5	50	0.552	0.552	10	10	249
Without Project AAHUs:						**2**		**With Project AAHUs:**						**5**
Net AAHUs:														**3**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	55	55	31	31.18	0	1	0.572	0.572	55	55	31
1	5	0.572	0.572	55	55	125		1	5	0.572	0.572	55	55	125
5	50	0.572	0.424	55	49	1,164	20.81	5	50	0.572	0.572	55	55	1,403
Without Project AAHUs:						**26**		**With Project AAHUs:**						**31**
								Net AAHUs:						**5**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.593	0.593	7	7	4		0	1	0.593	0.593	7	7	4
1	5	0.593	0.593	7	7	16		1	5	0.593	0.593	7	7	16
5	50	0.593	0.556	7	7	179	3.85	5	50	0.593	0.593	7	7	185
Without Project AAHUs:						**3.989**		**With Project AAHUs:**						**4.103**
								Net AAHUs:						**0.114**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.703	0.703	6	6	4		0	1	0.703	0.703	6	6	4
1	5	0.703	0.703	6	6	17		1	5	0.703	0.703	6	6	17
5	50	0.703	0.440	6	6	150	2.423	5	50	0.703	0.703	6	6	194
Without Project AAHUs:						**3**		**With Project AAHUs:**						**4**
								Net AAHUs:						**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.671	0.671	11	11	7		0	1	0.671	0.671	11	11	7
1	5	0.671	0.671	11	11	29		1	5	0.671	0.671	11	11	29
5	50	0.671	0.531	11	10	277	5.145	5	50	0.671	0.671	11	11	325
Without Project AAHUs:						**6**		**With Project AAHUs:**						**7**
								Net AAHUs:						**1**

Fire Island to Montauk Point, NY Reformulation Study

T-7 Tiana

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.614	0.614	19	19	12		0	1	0.614	0.614	19	19	12
1	5	0.614	0.614	19	19	46		1	5	0.614	0.882	19	19	56
5	50	0.614	0.430	19	19	440	8.058	5	50	0.882	0.882	19	19	744
Without Project AAHUs:						**10**		**With Project AAHUs:**						**16**
Net AAHUs:														**6**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.350	0.350	4	4	1		0	1	0.350	0.350	4	4	1
1	5	0.350	0.350	4	4	6		1	5	0.350	0.350	4	4	6
5	50	0.350	0.023	4	4	34	0.089	5	50	0.350	0.350	4	4	67
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**1**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.953	0.953	82	82	78	77.9	0	1	0.953	0.953	82	82	78
1	5	0.953	0.953	82	82	312		1	5	0.953	0.953	82	82	312
5	50	0.953	0.678	82	74	2,859	49.9	5	50	0.953	0.953	82	82	3,505
					Without Project AAHUs:	**65**							**With Project AAHUs:**	**78**
													Net AAHUs:	**13**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.458	0.458	9	9	4		0	1	0.458	0.458	9	9	4
1	5	0.458	0.458	9	9	17		1	5	0.458	0.702	9	9	21
5	50	0.458	0.397	9	8	168	3.27	5	50	0.702	0.702	9	9	289
					Without Project AAHUs:	**3.772**							**With Project AAHUs:**	**6.294**
													Net AAHUs:	**2.521**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.441	0.441	13	13	6		0	1	0.441	0.441	13	13	6
1	5	0.441	0.441	13	13	23		1	5	0.441	0.495	13	13	24
5	50	0.441	0.226	13	13	193	2.907	5	50	0.495	0.495	13	13	290
					Without Project AAHUs:	**4**							**With Project AAHUs:**	**6**
													Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.567	0.567	8	8	5		0	1	0.567	0.567	8	8	5
1	5	0.567	0.567	8	8	19		1	5	0.567	0.632	8	8	20
5	50	0.567	0.493	8	8	201	4.154	5	50	0.632	0.632	8	8	239
					Without Project AAHUs:	**4**							**With Project AAHUs:**	**5**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-8 WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.436	0.436	20	20	9		0	1	0.436	0.436	20	20	9
1	5	0.436	0.436	20	20	34		1	5	0.436	0.436	20	20	34
5	50	0.436	0.274	20	20	314	5.39	5	50	0.436	0.436	20	20	385
					Without Project AAHUs:	**7**							**With Project AAHUs:**	**9**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.217	0.217	5	5	1		0	1	0.217	0.217	5	5	1
1	5	0.217	0.217	5	5	4		1	5	0.217	0.402	5	5	6
5	50	0.217	0.000	5	4	22	0	5	50	0.402	0.402	5	5	85
					Without Project AAHUs:	**1**							**With Project AAHUs:**	**2**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0.000**							**With Project AAHUs:**	**0.000**
													Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.385	0.385	11	11	4		0	1	0.385	0.385	11	11	4
1	5	0.385	0.385	11	11	18		1	5	0.385	0.618	11	27	40
5	50	0.385	0.168	11	9	127	1.439	5	50	0.618	0.618	27	27	751
					Without Project AAHUs:	**3**							**With Project AAHUs:**	**16**
													Net AAHUs:	**13**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.526	0.526	67	67	35		0	1	0.526	0.526	67	67	35
1	5	0.526	0.526	67	67	142		1	5	0.526	0.950	67	52	174
5	50	0.526	0.399	67	71	1,435	28.19	5	50	0.950	0.950	52	52	2,212
					Without Project AAHUs:	**32**							**With Project AAHUs:**	**48**
													Net AAHUs:	**16**

Fire Island to Montauk Point, NY Reformulation Study

T-10 East Inlet Island

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	83	83	42		0	1	0.497	0.497	83	83	42
1	5	0.497	0.497	83	83	166		1	5	0.497	0.497	83	83	166
5	50	0.497	0.313	83	83	1,523	26.15	5	50	0.497	0.497	83	83	1,868
Without Project AAHUs:						**35**		**With Project AAHUs:**						**42**
Net AAHUs:														**7**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.452	0.452	2	2	1		0	1	0.452	0.452	2	2	1
1	5	0.452	0.452	2	2	4		1	5	0.452	0.652	2	2	5
5	50	0.452	0.148	2	1	24	0.124	5	50	0.652	0.652	2	2	70
Without Project AAHUs:						**1**		**With Project AAHUs:**						**2**
Net AAHUs:														**1**

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0.000**							**With Project AAHUs:**	**0.000**
													Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.385	0.385	3	3	1		0	1	0.385	0.385	3	3	1
1	5	0.385	0.385	3	3	4		1	5	0.385	0.618	3	3	6
5	50	0.385	0.168	3	2	32	0.367	5	50	0.618	0.618	3	3	81
					Without Project AAHUs:	**1**							**With Project AAHUs:**	**2**
													Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.526	0.526	31	31	17		0	1	0.526	0.526	31	31	17
1	5	0.526	0.526	31	31	66		1	5	0.526	0.937	31	31	92
5	50	0.526	0.399	31	33	668	13.13	5	50	0.937	0.937	31	31	1,323
					Without Project AAHUs:	**15**							**With Project AAHUs:**	**29**
													Net AAHUs:	**14**

Fire Island to Montauk Point, NY Reformulation Study

T-11 John Boyle Island

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.497	0.497	72	72	36		0	1	0.497	0.497	72	72	36
1	5	0.497	0.497	72	72	142		1	5	0.497	0.497	72	72	142
5	50	0.497	0.313	72	72	1,304	22.4	5	50	0.497	0.497	72	72	1,601
Without Project AAHUs:						**30**		**With Project AAHUs:**						**36**
													Net AAHUs:	**6**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	1		1	5	0.452	0.652	1	1	2
5	50	0.452	0.148	1	0	7	0.037	5	50	0.652	0.652	1	1	21
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
													Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.239	0.239	71	71	17	16.91	0	1	0.239	0.239	71	71	17
1	5	0.239	0.239	71	71	68		1	5	0.239	0.381	71	69	
5	50	0.239	0.240	71	64	725	15.31	5	50	0.381	0.381	69	69	1,175
Without Project AAHUs:						**16**		**With Project AAHUs:**						**24**
													Net AAHUs:	**8**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.220	0.220	4	4	1		0	1	0.220	0.220	4	4	1
1	5	0.220	0.220	4	4	3		1	5	0.220	0.867	4	6	
5	50	0.220	0.178	4	4	33	0.627	5	50	0.867	0.867	6	6	246
Without Project AAHUs:						**0.754**		**With Project AAHUs:**						**4.931**
													Net AAHUs:	**4.178**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.434	0.434	3	3	1		0	1	0.434	0.434	3	3	1
1	5	0.434	0.434	3	3	5		1	5	0.434	0.653	3	4	
5	50	0.434	0.208	3	3	44	0.593	5	50	0.653	0.653	3	4	107
Without Project AAHUs:						**1**		**With Project AAHUs:**						**2**
													Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	0	0	0		0	1	0.153	0.153	0	0	0
1	5	0.153	0.153	0	0	0		1	5	0.153	0.153	0	0	
5	50	0.153	0.101	0	0	2	0.031	5	50	0.153	0.153	0	0	2
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
													Net AAHUs:	**0**

T-14 Ocean Beach

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	23	23	12		0	1	0.529	0.529	23	23	12
1	5	0.529	0.529	23	23	48		1	5	0.529	0.529	23	23	
5	50	0.529	0.444	23	23	497	10.08	5	50	0.529	0.529	23	23	540
					Without Project AAHUs:	**11**							**With Project AAHUs:**	**11**
													Net AAHUs:	**0**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	1		1	5	0.187	0.187	1	1	
5	50	0.187	0.000	1	1	3	0	5	50	0.187	0.187	1	1	7
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0.000**		**With Project AAHUs:**						**0.000**
Net AAHUs:														**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.318	0.318	1	1	0		0	1	0.318	0.318	1	1	0
1	5	0.318	0.318	1	1	1		1	5	0.318	0.618	1	2	3
5	50	0.318	0.165	1	0	6	0.075	5	50	0.618	0.618	2	2	56
Without Project AAHUs:						**0**		**With Project AAHUs:**						**1**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.462	0.462	3	3	2		0	1	0.462	0.462	3	3	2
1	5	0.462	0.462	3	3	6		1	5	0.462	0.920	3	2	7
5	50	0.462	0.384	3	3	64	1.319	5	50	0.920	0.920	2	2	77
Without Project AAHUs:						**1**		**With Project AAHUs:**						**2**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-15 New Made Island

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.497	0.497	38	38	19		0	1	0.497	0.497	38	38	19
1	5	0.497	0.497	38	38	75		1	5	0.497	0.497	38	38	75
5	50	0.497	0.313	38	38	689	11.83	5	50	0.497	0.497	38	38	845
					Without Project AAHUs:	**16**							**With Project AAHUs:**	**19**
													Net AAHUs:	**3**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.452	0.452	1	1	0		0	1	0.452	0.452	1	1	0
1	5	0.452	0.452	1	1	2		1	5	0.452	0.652	1	1	2
5	50	0.452	0.148	1	0	9	0.047	5	50	0.652	0.652	1	1	27
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**1**
													Net AAHUs:	**0**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.173	0.173	281	281	49	48.65	0	1	0.173	0.173	281	281	49
1	5	0.173	0.173	281	281	195		1	5	0.173	0.363	281	272	296
5	50	0.173	0.068	281	281	1,522	18.98	5	50	0.363	0.363	281	272	4,515
Without Project AAHUs:						**35**		**With Project AAHUs:**						**97**
													Net AAHUs:	**62**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.250	0.250	16	16	4		0	1	0.250	0.250	16	16	4
1	5	0.250	0.250	16	16	16		1	5	0.250	0.867	16	24	46
5	50	0.250	0.198	16	16	161	3.17	5	50	0.867	0.867	24	24	917
Without Project AAHUs:						**3.631**		**With Project AAHUs:**						**19.324**
													Net AAHUs:	**15.693**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.470	0.470	13	13	6		0	1	0.470	0.470	13	13	6
1	5	0.470	0.470	13	13	24		1	5	0.470	0.825	13	21	44
5	50	0.470	0.207	13	13	198	2.693	5	50	0.825	0.825	21	21	761
Without Project AAHUs:						**5**		**With Project AAHUs:**						**16**
													Net AAHUs:	**12**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.778	0.778	134	134	104		0	1	0.778	0.778	134	134	104
1	5	0.778	0.778	134	134	417		1	5	0.778	0.778	134	131	412
5	50	0.778	0.641	134	134	4,279	85.89	5	50	0.778	0.778	131	131	4,576
Without Project AAHUs:						**96**		**With Project AAHUs:**						**102**
													Net AAHUs:	**6**

Fire Island to Montauk Point, NY Reformulation Study

T-9 Georgica Pond

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.752	0.752	184	184	138		0	1	0.752	0.752	184	184	138
1	5	0.752	0.752	184	184	553		1	5	0.752	0.752	184	184	553
5	50	0.752	0.591	184	184	5,549	108.5	5	50	0.752	0.752	184	184	6,216
Without Project AAHUs:						**125**		**With Project AAHUs:**						**138**
								Net AAHUs:						**13**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.473	0.473	90	90	43		0	1	0.473	0.473	90	90	43
1	5	0.473	0.473	90	90	170		1	5	0.473	0.473	90	90	170
5	50	0.473	0.302	90	90	1,566	27.09	5	50	0.473	0.473	90	90	1,913
Without Project AAHUs:						**36**		**With Project AAHUs:**						**43**
								Net AAHUs:						**7**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0.000**							**With Project AAHUs:**	**0.000**
													Net AAHUs:	**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.609	0.609	45	45	27		0	1	0.609	0.609	45	45	27
1	5	0.609	0.609	45	45	109		1	5	0.609	0.733	45	44	119
5	50	0.609	0.465	45	45	1,081	20.8	5	50	0.733	0.733	44	44	1,444
					Without Project AAHUs:	**24**							**With Project AAHUs:**	**32**
													Net AAHUs:	**7**

Fire Island to Montauk Point, NY Reformulation Study

T-22 Islip Meadows

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.485	0.485	11	11	6		0	1	0.485	0.485	11	11	6
1	5	0.485	0.485	11	11	22		1	5	0.485	0.485	11	12	23
5	50	0.485	0.297	11	11	202	3.402	5	50	0.485	0.485	12	12	270
Without Project AAHUs:						**5**		**With Project AAHUs:**						**6**
Net AAHUs:														**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	12	12	9		0	1	0.783	0.783	12	12	9
1	5	0.783	0.783	12	12	37		1	5	0.783	0.783	12	12	37
5	50	0.783	0.523	12	11	330	5.539	5	50	0.783	0.783	12	12	415
Without Project AAHUs:						**8**		**With Project AAHUs:**						**9**
Net AAHUs:														**2**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0.000**		**With Project AAHUs:**						**0.000**
Net AAHUs:														**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.609	0.609	85	85	52		0	1	0.609	0.609	85	85	52
1	5	0.609	0.609	85	85	208		1	5	0.609	0.756	85	91	241
5	50	0.609	0.465	85	85	2,059	39.64	5	50	0.756	0.756	91	91	3,109
Without Project AAHUs:						**46**		**With Project AAHUs:**						**68**
Net AAHUs:														**22**

Fire Island to Montauk Point, NY Reformulation Study

T-23 Seatuck Refuge

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.485	0.485	55	55	27		0	1	0.485	0.485	55	55	27
1	5	0.485	0.485	55	55	108		1	5	0.485	0.485	55	56	108
5	50	0.485	0.297	55	55	975	16.44	5	50	0.485	0.485	56	56	1,223
					Without Project AAHUs:	**22**							**With Project AAHUs:**	**27**
													Net AAHUs:	**5**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.783	78	78	61		0	1	0.783	0.783	78	78	61
1	5	0.783	0.783	78	78	245		1	5	0.783	0.783	78	78	245
5	50	0.783	0.523	78	70	2,190	36.79	5	50	0.783	0.783	78	78	2,754
					Without Project AAHUs:	**50**							**With Project AAHUs:**	**61**
													Net AAHUs:	**11**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	185	185	106	105.8	0	1	0.572	0.572	185	185	106
1	5	0.572	0.572	185	185	423		1	5	0.572	0.572	185	185	423
5	50	0.572	0.509	185	167	4,279	84.73	5	50	0.572	0.572	185	185	4,762
Without Project AAHUs:						**96**		**With Project AAHUs:**						**106**
Net AAHUs:														**10**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.370	0.370	10	10	4		0	1	0.370	0.370	10	10	4
1	5	0.370	0.370	10	10	14		1	5	0.370	0.403	10	10	15
5	50	0.370	0.328	10	9	146	2.882	5	50	0.403	0.403	10	10	177
Without Project AAHUs:						**3.278**		**With Project AAHUs:**						**3.919**
Net AAHUs:														**0.641**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.434	0.434	5	5	2		0	1	0.434	0.434	5	5	2
1	5	0.434	0.434	5	5	8		1	5	0.434	0.565	5	7	12
5	50	0.434	0.208	5	4	66	0.901	5	50	0.565	0.565	7	7	172
Without Project AAHUs:						**2**		**With Project AAHUs:**						**4**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	8	8	1		0	1	0.153	0.153	8	8	1
1	5	0.153	0.153	8	8	5		1	5	0.153	0.153	8	8	5
5	50	0.153	0.101	8	8	43	0.768	5	50	0.153	0.153	8	8	52
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-24 Davis Park

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	58	58	31		0	1	0.529	0.529	58	58	31
1	5	0.529	0.529	58	58	124		1	5	0.529	0.529	58	58	124
5	50	0.529	0.444	58	58	1,281	25.98	5	50	0.529	0.529	58	58	1,392
Without Project AAHUs:						**29**		**With Project AAHUs:**						**31**
Net AAHUs:														**2**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.187	0.187	1	1	0		0	1	0.187	0.187	1	1	0
1	5	0.187	0.187	1	1	1		1	5	0.187	0.448	1	3	3
5	50	0.187	0.068	1	1	4	0.05	5	50	0.448	0.448	3	3	58
Without Project AAHUs:						**0**		**With Project AAHUs:**						**1**
Net AAHUs:														**1**

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	82	82	47	46.74	0	1	0.572	0.572	82	82	47
1	5	0.572	0.572	82	82	187		1	5	0.572	0.572	82	79	183
5	50	0.572	0.509	82	74	1,890	37.43	5	50	0.572	0.572	82	79	2,063
Without Project AAHUs:						**42**		**With Project AAHUs:**						**46**
Net AAHUs:														**3**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.370	0.370	6	6	2		0	1	0.370	0.370	6	6	2
1	5	0.370	0.370	6	6	8		1	5	0.370	0.651	6	7	13
5	50	0.370	0.328	6	5	82	1.625	5	50	0.651	0.651	7	7	203
Without Project AAHUs:						**1.849**		**With Project AAHUs:**						**4.349**
Net AAHUs:														**2.500**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.434	0.434	9	9	4		0	1	0.434	0.434	9	9	4
1	5	0.434	0.434	9	9	15		1	5	0.434	0.653	9	11	22
5	50	0.434	0.208	9	8	120	1.627	5	50	0.653	0.653	11	11	338
Without Project AAHUs:						**3**		**With Project AAHUs:**						**7**
Net AAHUs:														**5**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	4	4	1		0	1	0.153	0.153	4	4	1
1	5	0.153	0.153	4	4	2		1	5	0.153	0.153	4	4	2
5	50	0.153	0.101	4	4	22	0.388	5	50	0.153	0.153	4	4	26
Without Project AAHUs:						**0**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-25 Atlantique to Cornielle

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	27	27	14		0	1	0.529	0.529	27	27	14
1	5	0.529	0.529	27	27	58		1	5	0.529	0.529	27	27	58
5	50	0.529	0.444	27	27	597	12.11	5	50	0.529	0.529	27	27	649
					Without Project AAHUs:	**13**							**With Project AAHUs:**	**14**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	16	16	3		0	1	0.187	0.187	16	16	3
1	5	0.187	0.187	16	16	12		1	5	0.187	0.243	16	17	14
5	50	0.187	0.068	16	14	87	0.97	5	50	0.243	0.243	16	17	177
					Without Project AAHUs:	**2**							**With Project AAHUs:**	**4**
													Net AAHUs:	**2**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet, Atlantique, and Fair Harbor

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	121	121	69	69.06	0	1	0.572	0.572	121	121	69
1	5	0.572	0.572	121	121	276		1	5	0.572	0.572	121	117	272
5	50	0.572	0.509	121	109	2,792	55.3	5	50	0.572	0.572	117	117	3,014
Without Project AAHUs:						**63**		**With Project AAHUs:**						**67**
Net AAHUs:														**4**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	7	7	2		0	1	0.370	0.370	7	7	2
1	5	0.370	0.370	7	7	10		1	5	0.370	0.682	7	10	18
5	50	0.370	0.328	7	6	100	1.982	5	50	0.682	0.682	10	10	318
Without Project AAHUs:						**2.255**		**With Project AAHUs:**						**6.772**
Net AAHUs:														**4.518**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	5	5	2		0	1	0.434	0.434	5	5	2
1	5	0.434	0.434	5	5	8		1	5	0.434	0.660	5	6	12
5	50	0.434	0.208	5	4	64	0.872	5	50	0.660	0.660	6	6	191
Without Project AAHUs:						**1**		**With Project AAHUs:**						**4**
Net AAHUs:														**3**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	4	4	1		0	1	0.153	0.153	4	4	1
1	5	0.153	0.153	4	4	2		1	5	0.153	0.153	4	4	2
5	50	0.153	0.101	4	4	23	0.414	5	50	0.153	0.153	4	4	28
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

Fire Island to Montauk Point, NY Reformulation Study

T-26 Kismet, Atlantique, and Fair Harbor

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	38	38	20		0	1	0.529	0.529	38	38	20
1	5	0.529	0.529	38	38	81		1	5	0.529	0.529	38	38	81
5	50	0.529	0.444	38	38	834	16.92	5	50	0.529	0.529	38	38	907
Without Project AAHUs:						19		With Project AAHUs:						20
Net AAHUs:														1

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	7	7	1		0	1	0.187	0.187	7	7	1
1	5	0.187	0.187	7	7	5		1	5	0.187	0.187	7	7	5
5	50	0.187	0.068	7	6	38	0.427	5	50	0.187	0.187	7	7	58
Without Project AAHUs:						1		With Project AAHUs:						1
Net AAHUs:														0

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0	0	0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0.000**		**With Project AAHUs:**						**0.000**
Net AAHUs:														**0.000**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.618	0	3	2
5	50	0.000	0.000	0	0	0	0	5	50	0.618	0.618	3	3	82
Without Project AAHUs:						**0**		**With Project AAHUs:**						**2**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.914	0.914	2	2	2		0	1	0.914	0.914	2	2	2
1	5	0.914	0.914	2	2	8		1	5	0.914	0.914	2	1	6
5	50	0.914	0.749	2	2	85	1.692	5	50	0.914	0.914	1	1	47
Without Project AAHUs:						**2**		**With Project AAHUs:**						**1**
Net AAHUs:														**-1**

Fire Island to Montauk Point, NY Reformulation Study

T-27 Warner Island East

AAHU Calculation Summary (Restoration Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.497	0.497	28	28	14		0	1	0.497	0.497	28	28	14
1	5	0.497	0.497	28	28	56		1	5	0.497	0.497	28	26	54
5	50	0.497	0.313	28	28	514	8.836	5	50	0.497	0.497	26	26	590
					Without Project AAHUs:	**12**							**With Project AAHUs:**	**13**
													Net AAHUs:	**1**

UPLANDS Community

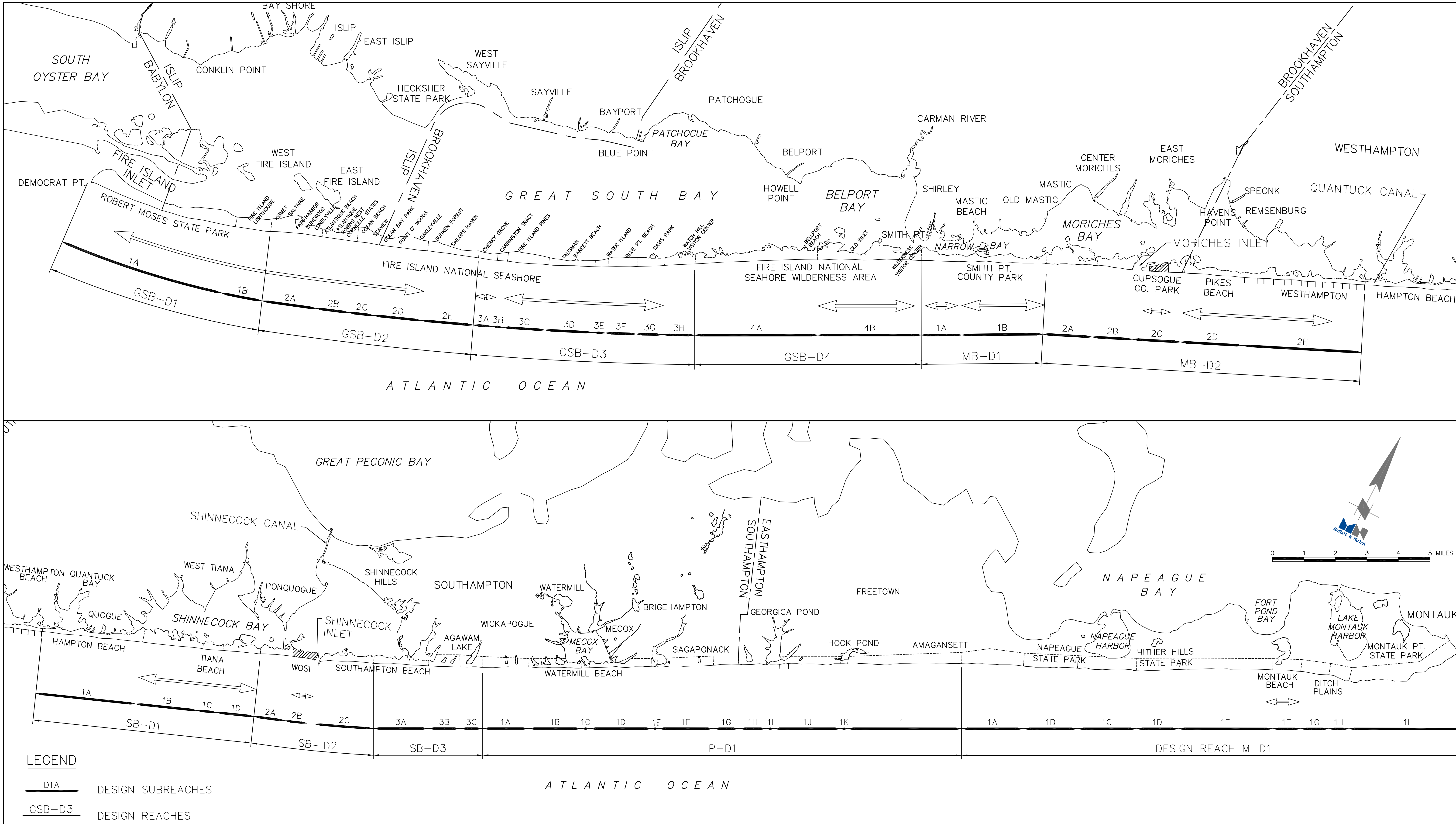
Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

Appendix H

Contents

Actions to maintain beach condition (beach fill/dune enhancement)

This measure includes initial construction and periodic beach fills (i.e., maintenance or periodic renourishment) and enhancement of existing dunes to maintain a threshold beach condition to provide storm damage reduction. The threshold condition has been identified through extensive modeling of historic beach conditions, storm events and other natural processes, and land uses. For HEP evaluation purposes, these storm damage reduction measures include the deposition of sand material to widen existing beaches and raise dune heights to either 13 feet (ft) or 17 ft NGVD, as well as the creation of foredune areas of adequate slope and vegetative composition to stabilize dune areas and achieve high quality habitat as defined by the HEP models. Vegetation would also be replaced at 40% cover to achieve highest overall habitat quality as defined by the HEP models. It is assumed that these conditions would be maintained for the long term (i.e., 50 + years) through active management and maintenance activities.



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MOFFATT & NICHOL
NEW YORK, NEW YORK

FIRE ISLAND INLET TO MONTAUK POINT
LONG ISLAND, NEW YORK
REFORMULATION STUDY

APPROXIMATE BEACH FILL EXTENTS AND LOCATION OF STRUCTURAL FEATURES (PRELIMINARY DRAFT)

FIMP Design Alternatives (DRAFT 9-30-05)

Reach Designations						Alternatives								
						Beachfill			BCP (1)		Structural/Non-Str.		Environmental	Remarks
Project Reach	Design Reach	Design Subreaches	Profile Reach	Reach Designation	Approximate Length (ft)	Alignments	Max. Possible Fill Length [ft] (2)	Design Sections (4)	Breaching Risk	Design Sections (5)	Structural.	Non-Str.	Measures	
Fire Island Inlet											Inlet Mod.			See Inlet Alternatives
GSB	GSB-1	1A		Robert Moses State Park	25,700	1	16,458	Berm only: 90 ft	Very Low	9.5/11/13				
		1B		FI Lighthouse Tract	6,700	1	5,468	13/90 (LLOP)	Low	9.5/11/13				FINS Track
	GSB-2	2A		Kismet to Lonelyville	8,900	3	8,880	13/90 15/90 17/90	Low	9.5/11/13		acq / relocate		2 Small FINS Tracks
		2B		Town Beach to Corneille States	5,100	3	4,556	13/90 15/90 17/90	Low	9.5/11/13		acq / relocate		2 Small FINS Tracks
		2C		Ocean Beach & Seaview	3,800	3	3,696	13/90 15/90 17/90	Very Low	9.5/11/13		acq / relocate		
		2D		OBP to Point O' Woods	7,400	3	7,267	13/90 15/90 17/90	Very Low	9.5/11/13		acq / relocate		
		2E		Sailors Haven	8,100			None	Very Low	9.5/11/13				FINS Track
	GSB-3	3A		Cherry Grove	3,000	1	2928 (3)	13/90 15/90 17/90	Very Low	9.5/11/13		acq / relocate		
		3B		Carrington Tract	1,500			None	Very Low	9.5/11/13				FINS Track
		3C		Fire Island Pines	6,600	3	6,424	13/90 15/90 17/90	Very Low	9.5/11/13		acq / relocate		
		3D		Talisman to Water Island	7,300	1	7,076	13/90	Low	9.5/11/13				FINS Track
		3E		Water Island	2,000	1	1,202	13/90 15/90 17/90	Low	9.5/11/13		acq / relocate		
		3F		Water Island to Davis Park	4,700	1	5,445	13/90	Low	9.5/11/13				FINS Track
		3G		Davis Park	4,100	3	4,042	13/90 15/90 17/90	Low	9.5/11/13		acq / relocate		
		3H		Watch Hill	5,000			None	Very Low	9.5/11/13				FINS Track
	GSB-4	4A		Wilderness Area - West	19,000			None	Very Low	9.5/11/13				
		4B		Old Inlet	16,000	1	15,023	13/90	High	9.5/11/13			Wetland	Low Level Design
MB	MB-1	1A		Smith Point CP- West	6,300	1	1,889	Berm only: 90 ft	Very Low	9.5/11/13		acq / relocate		
		1B		Smith Point CP - East	13,500	1	13,174	13/90	Med/High	9.5/11/13			Wetland	
	MB-2	2A		Great Gun	7,600			None	Very Low	9.5/11/13				
		2B		Moriches Inlet - West	6,200			None	Very Low	9.5/11/13				
Moriches Inlet											Inlet Mod.			See Inlet Alternatives
		2C		Cupsogue Co Park	7,500	1	2,000	13/90	Low	9.5/11/13				
		2D		Pikes	9,700	1 (Interim)	9,630	15/90 17/120	Very Low	9.5/11/13		acq / relocate		
		2E		Westhampton	18,300	1 (Interim)	10,908 (3)	-/90	Very Low	9.5/11/13	Groin Mod.	acq / relocate		Groin Shortening
SB	SB-1	1A		Hampton Beach	16,800			None	Very Low	9.5/11/13				
		1B		Sedge Island	10,200	1	4,967	13/90	Low	9.5/11/13				
		1C		Tiana Beach	3,400	1	3,361	13/90	Medium	9.5/11/13		Road Raising	Wetland	See BCP Alternatives
		1D		Shinnecock Inlet Park West	6,300		6,288	13/90	Low	9.5/11/13		Road Raising	Wetland	for western end only
	SB-2	2A		Ponquogue	5,300			None	Very Low	9.5/11/13				
		2B		WOSI	3,900	1 WOSI	3,875	13/90 15/90 17/120	High	9.5/11/13	T-Groin			See Inlet Alternatives
Shinnecock Inlet											Inlet Mod			See Inlet Alternatives
	SB-3	2C		Shinnecock Inlet - East	9,800			None	Very Low	9.5/11/13				
		3A		Southampton Beach	9,200			None	Very Low	9.5/11/13		acq / relocate		
		3B		Southampton	5,300			None	Very Low	9.5/11/13		acq / relocate		
		3C		Agawam	3,800			None	Very Low	9.5/11/13		acq / relocate		
P	P-1	1A		Wickapogue	7,700			None				acq / relocate		
		1B		Watermill	8,800			None				acq / relocate		
		1C		Mecox Bay	1,400			None					Bay Manag.	See Bay Manag. Plan
		1D		Mecox to Sagaponack	10,400			None				acq / relocate		
		1E		Sagaponack Lake	1,100			None					Pond Manag.	
		1F		Sagaponack to Potato Rd	9,300			None				acq / relocate		
		1G		Potato Rd	4,300	1	3500	15/90 17/90 17/120 (or 19/90)				acq / relocate		
		1H		Wainscott	4,600			None				acq / relocate		
		1I		Georgica Pond	1,200			None					Pond Manag.	
		1J		Georgica to Hook Pond	11,200			None			Groin Mod	acq / relocate		
		1K		Hook Pond	1,100			None						
		1L		Hook Pond to Amagansett	19,200			None			Groin Mod	acq / relocate		
M	M-1	1A		Amagansett	10,400			None				acq / relocate		
		1B		Napeague State Park	9,100			None				acq / relocate		
		1C		Napeague Beach	9,900			None				acq / relocate		
		1D		Hither Hills SP	7,000			None				acq / relocate		
		1E		Hither Hills to Montauk B	15,800			None				acq / relocate		
		1F		Montauk Beach	4,700	1	4,636	15/90 17/90 17/120 (or 19/90)	Very Low	9.5/11/13		acq / relocate		Western Taper of M-D1G
		1G		Montauk B to Ditch Plains	4,700			None				acq / relocate	Dune Restoration	
		1H		Ditch Plains	3,400			None				acq / relocate	Dune Restoration	
		1I		Ditch Plains to Montauk Pt	19,300			None				acq / relocate		

(1) If BCP is required, breaching risk and a range of possible templates are shown
(2) Actual Length of fill depends of section and alignment
(3) No fill is likely to be required during initial construction
(4) In areas where 3 sections are considered, these 3 sections are referred to as Large, Medium and Small in other documents
(5) Berm width and overall closure length and width will mimic conditions prior to breach and conditions in adjacent areas
In addition, a range of elevations will be considered: a flat "berm only" closure with an elev of +9.5 and two additional alternatives with a small dune at elev of +11 or +13

Baseline Conditions Based on ALL Profiles along each Maximum Beachfill Length

Design SubReach	Location	Total subreach Length [ft]	Max. Fill Length [ft]	Dune Height [ft]	Foredune Width [ft]	Foredune Slope			VegBeach Width [ft]	VegBeach Slope		
						Deg.	%	Ratio		Deg.	%	Ratio
GSB-1A	RMSP	25,700	16,458	19.9	89	7.1	12%	1:8	199	3.0	5%	1:19
GSB-1B	FILT	6,700	5,468	16.0	34	8.9	16%	1:6	199	2.6	5%	1:22
GSB-2A	**Kismet to Lonelyville**	8,900	8,880	17.3	51	8.9	16%	1:6	107	5.2	9%	1:11
GSB-2B	**Town Beach to Corneille**	5,100	4,557	15.4	51	8.7	15%	1:7	153	3.4	6%	1:17
GSB-2C	**Ocean Beach to Seaview**	3,800	3,696	19.8	66	8.4	15%	1:7	178	2.9	5%	1:19
GSB-2D	**OBP to POW**	7,400	7,267	17.5	57	8.4	15%	1:7	139	4.2	7%	1:14
GSB-3A	**Cherry Grove**	3,000	2,929	20.1	105	5.3	9%	1:11	161	3.2	6%	1:18
GSB-3C	**Fire Island Pines**	6,600	6,424	17.9	54	9.9	18%	1:6	101	5.5	10%	1:10
GSB-3D	Talisman to Water Island	7,300	7,076	16.3	95	3.5	6%	1:16	172	3.1	5%	1:19
GSB-3E	**Water Island**	2,000	1,202	16.9	164	2.7	5%	1:21	151	3.4	6%	1:17
GSB-3F	Water Island to Davis Park	5,500	5,445	20.4	104	8.1	14%	1:7	138	3.9	7%	1:15
GSB-3G	**Davis Park**	4,100	4,042	17.5	62	6.6	12%	1:9	170	3.4	6%	1:17
GSB-4B	Old Inlet	16,000	15,023	16.9	41	11.2	20%	1:5	181	3.3	6%	1:18
MB-1A	SPCP-TWA	6,300	1,889	18.6	90	7.8	14%	1:7	142	3.9	7%	1:15
MB-1B	SPCP	13,500	13,174	16.2	44	8.3	15%	1:7	193	3.1	5%	1:18
MB-2C	Cupsogue	7,500	2,000	19.5	40	12.7	23%	1:4	194	2.8	5%	1:21
MB-2D	**WHPTIN Pikes**	9,700	9,630	18.7	70	6.4	11%	1:9	217	2.5	4%	1:23
MB-2E	**WHPTIN East**	18,300	10,908	21.2	175	3.8	7%	1:15	169	3.3	6%	1:17
SB-1B	Sedge Island	10,200	4,967	19.3	59	9.1	16%	1:6	135	4.1	7%	1:14
SB-1C	Tiana	3,400	3,361	17.3	47	10.0	18%	1:6	146	3.8	7%	1:15
SB-1D	Shinnecock Inlet Park-West	6,300	6,288	19.0	31	16.5	30%	1:3	146	3.9	7%	1:15
SB-2B	**WOSI**	3,900	3,875	14.8	51	7.4	13%	1:8	238	2.3	4%	1:25
P-1G	**Potato Road**	4,300	3,500	19.2	73	8.2	14%	1:7	97	5.4	9%	1:11
M-1F	**Montauk**	4,700	4,636	22.8	86	10.8	19%	1:5	109	4.8	8%	1:12

NOTES:

(1) All elevations are referenced to NGVD'29
(2) "Maximum Fill Length" refers to the maximum footprint of beach fill within each reach. See Basemaps for details.
(3) Dune Height refers to the max elevation of the seawardmost dune system
(4) Foredune Width is distance between the Seaward Toe of Dune (roughly the +11ft contour) and the Dune Crest
(5) Foredune Slope is the average slope between the 11ft contour and the Dune Crest
(6) VegBeach Width is the distance from the MHW contour (+2ft) to the Seaward Toe of Dune (roughly the +11ft contour)
(7) VegBeach Slope is the average slope between the MHW contour and the Seaward Toe of Dune
(8) Dimensions are based on beach profiles cut every 200 ft alongshore from LIDAR Sep-2000 data

		SMALL SCENARIO								LARGE SCENARIO							
		BASELINE				WITH ACTION				BASELINE				WITH ACTION			
		VEGBEACH		DUNEGRASS		VEGBEACH		DUNEGRASS		VEGBEACH		DUNEGRASS		VEGBEACH		DUNEGRASS	
		Slope	Width	Slope	Width	Slope	Width	Slope	Width	Slope	Width	Slope	Width	Slope	Width	Slope	Width
GSB-1A	RMSP	7%	128	12%	89	4%	201	12%	89	7%	128	12%	89	4%	201	12%	89
GSB-1B	FILT	5%	188	13%	24	4%	201	20%	30	5%	188	13%	24	4%	201	20%	30
GSB-2A	**Kismet to Lonelyville**	11%	86	16%	51	4%	201	16%	51	9%	106	12%	60	4%	201	20%	50
GSB-2B	**Town Beach to Corneille**	7%	137	9%	75	4%	201	20%	50	6%	153	15%	52	4%	201	20%	50
GSB-2C	**Ocean Beach to Seaview**	5%	178	15%	66	5%	178	15%	66	5%	172	13%	55	4%	201	20%	50
GSB-2D	**OBP to POW**	9%	100	15%	57	4%	201	15%	57	7%	137	15%	52	4%	201	20%	50
GSB-3A	**Cherry Grove**	6%	161	9%	105	6%	161	9%	105	6%	161	9%	105	6%	161	9%	105
GSB-3C	**Fire Island Pines**	11%	89	18%	54	4%	201	18%	54	10%	101	25%	43	4%	201	20%	50
GSB-3D	Talisman to Water Island	5%	172	5%	37	5%	172	20%	30	5%	172	5%	47	5%	172	20%	30
GSB-3E	**Water Island**	6%	151	3%	116	6%	151	20%	50	6%	151	5%	96	6%	151	20%	50
GSB-3F	Water Island to Davis Park	7%	138	14%	104	7%	138	14%	104	7%	138	14%	62	7%	138	14%	104
GSB-3G	**Davis Park**	9%	104	12%	62	4%	197	12%	62	6%	174	12%	54	4%	197	20%	50
GSB-4B	Old Inlet	8%	116	12%	25	4%	197	20%	30	8%	116	12%	25	4%	197	20%	30
MB-1A	SPCP-TWA	7%	127	14%	90	4%	197	14%	90	7%	127	14%	90	4%	197	14%	90
MB-1B	SPCP	5%	193	9%	32	5%	193	20%	30	7%	193	9%	32	5%	193	20%	30
MB-2C	Cupsogue	6%	148	23%	40	4%	197	23%	40	6%	148	23%	40	4%	197	23%	40
MB-2D	**WHPTIN Pikes**	6%	162	11%	70	4%	211	11%	70	5%	177	9%	70	3%	241	20%	50
MB-2E	**WHPTIN East**	6%	169	7%	175	4%	169	7%	175	6%	169	7%	175	6%	169	7%	175
SB-1B	Sedge Island	9%	104	5%	74	4%	193	20%	30	9%	104	5%	74	4%	193	20%	30
SB-1C	Tiana	9%	109	12%	27	4%	193	20%	30	9%	109	12%	27	4%	193	20%	30
SB-1D	Shinnecock Inlet Park-West	9%	102	30%	31	4%	193	30%	31	9%	102	30%	31	4%	193	20%	31
SB-2B	**WOSI**	4%	238	12%	37	4%	238	20%	50	5%	200	16%	23	3%	251	20%	50
P-1G	**Potato Road**	9%	97	11%	57	3%	229	20%	50	9%	97	10%	76	3%	259	20%	50
M-1F	**Montauk**	9%	107	21%	63	3%	221	11%	110	9%	107	21%	63	3%	251	10%	125

SUMMARY
OF

HSI, HU AND ACRES

FOR

BASELINE, FUTURE NO-ACTION, AND FUTURE WITH-ACTION CONDITIONS AT PROJECT SITES

(LARGE SCENARIO)

Comparison of HSI Scores for Baseline, Future no-action, and Future with-project (Large Scenario).

		Baseline	No Action	Alternative 1
GSB-1A	RMSP	0.489	0.343	0.550
GSB-1B	FILT	0.470	0.318	0.545
GSB-2A	Kismet to Lonelyville	0.379	0.278	0.440
GSB-2B	Town Beach to Corneille	0.461	0.331	0.521
GSB-2C	Ocean Beach to Seaview	0.461	0.332	0.521
GSB-2D	OBP to POW	0.461	0.331	0.521
GSB-3A	Cherry Grove	0.455	0.326	0.504
GSB-3C	Fire Island Pines	0.463	0.333	0.521
GSB-3D	Talisman to Water Island	0.498	0.357	0.555
GSB-3E	Water Island	0.395	0.258	0.461
GSB-3F	Blue Point	0.501	0.347	0.553
GSB-3G	Davis Park	0.380	0.261	0.440
GSB-4B	Old Inlet	0.666	0.542	0.719
MB-1A	SPCP-TWA	0.485	0.343	0.525
MB-1B	SPCP	0.488	0.353	0.535
MB-2C	Cupsogue	0.532	0.404	0.572
MB-2D	WHPTIN Pikes	0.569	0.403	0.614
MB-2E	WHPTIN East	0.410	0.307	0.459
SB-1B	Sedge Island	0.557	0.417	0.601
SB-1C	Tiana	0.573	0.390	0.612
SB-1D	Shinnecock Inlet Park-West	0.542	0.367	0.600
SB-2B	WOSI	0.510	0.343	0.600
P-1G	Potato Road	0.302	0.206	0.360
M-1F	Montauk	0.285	0.183	0.325

Comparison of HU's for Baseline, Future no-action, and Future with-project (Large Scenario).

		Baseline	No Action	Alternative 1
GSB-1A	RMSP	864	541	904
GSB-1B	FILT	272	145	287
GSB-2A	Kismet to Lonelyville	403	281	411
GSB-2B	Town Beach to Corneille	231	159	238
GSB-2C	Ocean Beach to Seaview	232	151	236
GSB-2D	OBP to POW	434	305	444
GSB-3A	Cherry Grove	130	94	133
GSB-3C	Fire Island Pines	344	260	350
GSB-3D	Talisman to Water Island	335	247	345
GSB-3E	Water Island	48	35	50
GSB-3F	Blue Point	261	188	266
GSB-3G	Davis Park	130	96	136
GSB-4B	Old Inlet	1,072	912	1,100
MB-1A	SPCP-TWA	95	67	98
MB-1B	SPCP	666	511	683
MB-2C	Cupsogue	135	114	138
MB-2D	WHPTIN Pikes	635	451	650
MB-2E	WHPTIN East	328	253	343
SB-1B	Sedge Island	331	248	337
SB-1C	Tiana	189	121	192
SB-1D	Shinnecock Inlet Park-West	481	315	489
SB-2B	WOSI	285	184	297
P-1G	Potato Road	70	40	79
M-1F	Montauk	93	51	106

Comparison of Acres for Baseline, Future no-action, and Future with-project (Large Scenario).

		Baseline	No Action	Alternative 1
GSB-1A	RMSP	1,853	1,692	1,853
GSB-1B	FILT	583	534	583
GSB-2A	Kismet to Lonelyville	982	905	982
GSB-2B	Town Beach to Corneille	446	413	446
GSB-2C	Ocean Beach to Seaview	405	371	405
GSB-2D	OBP to POW	819	755	819
GSB-3A	Cherry Grove	234	215	234
GSB-3C	Fire Island Pines	605	589	605
GSB-3D	Talisman to Water Island	618	566	618
GSB-3E	Water Island	96	89	96
GSB-3F	Blue Point	479	444	479
GSB-3G	Davis Park	386	353	386
GSB-4B	Old Inlet	1,684	1,598	1,684
MB-1A	SPCP-TWA	192	175	192
MB-1B	SPCP	1,277	1,185	1,277
MB-2C	Cupsogue	232	221	232
MB-2D	WHPTIN Pikes	1,088	990	1,088
MB-2E	WHPTIN East	994	922	994
SB-1B	Sedge Island	582	551	582
SB-1C	Tiana	336	306	336
SB-1D	Shinnecock Inlet Park-West	713	649	713
SB-2B	WOSI	375	346	375
P-1G	Potato Road	245	245	245
M-1F	Montauk	290	290	290

BASELINE CONDITIONS

HSIs, HUs and Acres

Shoreline Protection Project - Baseline HSI Scores per Transect and Per Community (Large Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
GSB-1A	Robert Moses State Park	0.42	0.40	0.56	0.52	0.52	0.52	0.489
GSB-1B	Fire Island Lighthouse Tract	0.54	0.55	0.31	0.69	0.54	0.19	0.470
GSB-2A	Kismet to Lonelyville	0.57	0.37	0.47	0.15	0.53	0.19	0.379
GSB-2B	Town Beach to Corneille	0.57	0.37	0.47	0.15	0.53	0.67	0.461
GSB-2C	Ocean Beach to Seaview	0.57	0.37	0.47	0.15	0.53	0.67	0.461
GSB-2D	Ocean Beach Park to Point of Woods	0.57	0.37	0.47	0.15	0.53	0.67	0.461
GSB-3A	Cherry Grove	0.57	0.37	0.43	0.15	0.53	0.67	0.455
GSB-3C	Fire Island Pines	0.57	0.37	0.48	0.15	0.53	0.67	0.463
GSB-3D	Talisman to Water Island	0.57	0.40	0.44	0.49	0.41	0.67	0.498
GSB-3E	Water Island	0.57	0.40	0.41	0.21	0.35	0.43	0.395
GSB-3F	Water Island to Davis Park	0.57	0.40	0.49	0.53	0.35	0.67	0.501
GSB-3G	Davis Park	0.24	0.22	0.47	0.15	0.53	0.67	0.380
GSB-4B	Old Inlet	0.59	0.64	0.73	0.78	0.47	0.78	0.666
MB-1A	Smith Point County Park-TWA	0.54	0.47	0.60	0.59	0.49	0.22	0.485
MB-1B	Smith Point County Park	0.54	0.47	0.52	0.51	0.47	0.42	0.488
MB-2C	Cupsogue	0.54	0.47	0.61	0.78	0.47	0.32	0.532
MB-2D	Westhampton Pikes Beach	0.54	0.65	0.49	0.89	0.53	0.32	0.569
MB-2E	Westhampton East	0.24	0.22	0.43	0.78	0.47	0.32	0.410
SB-1B	Sedge Island	0.57	0.59	0.62	0.78	0.47	0.32	0.557
SB-1C	Tiana	0.57	0.59	0.64	0.67	0.61	0.35	0.573
SB-1D	Shinnecock Inlet Park-West	0.76	0.52	0.54	0.62	0.52	0.28	0.542
SB-2B	WOSI	0.95	0.46	0.43	0.57	0.44	0.22	0.510
P-1G	Potato Road	0.18	0.54	0.61	0.00	0.00	0.47	0.302
M-1F	Montauk	0.15	0.39	0.62	0.00	0.00	0.55	0.285

Shoreline Protection Project - Baseline HU Scores per Transect and Per Community (Large Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
GSB-1A	Robert Moses State Park	433	19	103	26	98	184	863.58
GSB-1B	Fire Island Lighthouse Tract	170	13	13	22	34	21	272.21
GSB-2A	Kismet to Lonelyville	266	8	8	17	54	50	402.76
GSB-2B	Town Beach to Corneille	117	6	8	9	28	63	231.43
GSB-2C	Ocean Beach to Seaview	106	5	3	3	22	92	231.68
GSB-2D	Ocean Beach Park to Point of Woods	249	8	14	14	44	105	434.20
GSB-3A	Cherry Grove	77	4	5	1	18	26	130.22
GSB-3C	Fire Island Pines	203	5	9	3	39	85	343.89
GSB-3D	Talisman to Water Island	237	11	13	8	33	33	335.10
GSB-3E	Water Island	35	2	2	0	5	5	48.43
GSB-3F	Water Island to Davis Park	178	7	7	6	22	41	261.08
GSB-3G	Davis Park	59	4	6	1	25	36	130.49
GSB-4B	Old Inlet	532	26	89	254	80	92	1,071.82
MB-1A	Smith Point County Park-TWA	64	3	10	3	11	6	95.39
MB-1B	Smith Point County Park	457	27	32	52	70	27	666.10
MB-2C	Cupsogue	65	3	12	40	11	4	134.56
MB-2D	Westhampton Pikes Beach	324	25	24	171	58	32	634.97
MB-2E	Westhampton East	134	9	32	57	58	38	328.05
SB-1B	Sedge Island	170	7	17	86	27	25	331.22
SB-1C	Tiana	133	5	4	12	24	11	189.07
SB-1D	Shinnecock Inlet Park-West	322	8	20	85	38	9	480.87
SB-2B	WOSI	219	8	13	22	19	3	284.84
P-1G	Potato Road	29	4	3	0	0	33	69.83
M-1F	Montauk	26	4	7	0	0	56	92.98

Shoreline Protection Project - Baseline Acres per Transect and Per Community (Large Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL ACRES
GSB-1A	RMSP	1,026	49	185	49	189	356	1,853
GSB-1B	FILT	312	24	41	32	63	112	583
GSB-2A	Kismet to Lonelyville	466	22	18	108	102	266	982
GSB-2B	Town Beach to Corneille	205	16	17	62	52	94	446
GSB-2C	Ocean Beach to Seaview	185	15	6	20	42	137	405
GSB-2D	OBP to POW	436	23	30	92	83	156	819
GSB-3A	Cherry Grove	135	11	10	6	34	38	234
GSB-3C	Fire Island Pines	355	15	18	17	74	127	605
GSB-3D	Talisman to Water Island	414	28	29	16	81	50	618
GSB-3E	Water Island	60	4	5	0	14	12	96
GSB-3F	Water Island to Davis Park	312	17	14	11	63	61	479
GSB-3G	Davis Park	249	16	12	10	46	53	386
GSB-4B	Old Inlet	909	40	121	325	172	117	1,684
MB-1A	SPCP-TWA	117	6	16	5	22	26	192
MB-1B	SPCP	840	58	61	102	151	64	1,277
MB-2C	Cupsogue	119	7	20	51	23	12	232
MB-2D	WHPTIN Pikes	595	39	50	192	111	101	1,088
MB-2E	WHPTIN East	562	42	73	73	125	119	994
SB-1B	Sedge Island	297	12	28	110	57	78	582
SB-1C	Tiana	232	8	7	18	39	32	336
SB-1D	Shinnecock Inlet Park-West	423	15	37	137	72	30	713
SB-2B	WOSI	230	18	31	39	44	13	375
P-1G	Potato Road	162	8	5	0	0	69	245
M-1F	Montauk	165	11	11	0	0	102	290

FUTURE NO-ACTION CONDITIONS

HSIs, HUs and Acres

(Future conditions without project or restoration activities)

Shoreline Protection Project - Future No-action HSI Scores per Transect and Community (Large Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
GSB-1A	Robert Moses State Park	0.32	0.36	0.32	0.44	0.33	0.30	0.343
GSB-1B	Fire Island Lighthouse Tract	0.32	0.52	0.10	0.62	0.34	0.00	0.318
GSB-2A	Kismet to Lonelyville	0.51	0.35	0.27	0.10	0.44	0.00	0.278
GSB-2B	Town Beach to Corneille	0.51	0.35	0.27	0.10	0.44	0.32	0.331
GSB-2C	Ocean Beach to Seaview	0.51	0.35	0.27	0.10	0.44	0.32	0.332
GSB-2D	Ocean Beach Park to Point of Woods	0.51	0.35	0.27	0.10	0.44	0.32	0.331
GSB-3A	Cherry Grove	0.51	0.35	0.23	0.10	0.44	0.32	0.326
GSB-3C	Fire Island Pines	0.51	0.35	0.28	0.10	0.44	0.32	0.333
GSB-3D	Talisman to Water Island	0.51	0.36	0.22	0.48	0.26	0.32	0.357
GSB-3E	Water Island	0.51	0.35	0.20	0.13	0.20	0.16	0.258
GSB-3F	Water Island to Davis Park	0.51	0.35	0.26	0.45	0.20	0.32	0.347
GSB-3G	Davis Park	0.24	0.20	0.27	0.10	0.44	0.32	0.261
GSB-4B	Old Inlet	0.53	0.59	0.47	0.83	0.32	0.51	0.542
MB-1A	Smith Point County Park-TWA	0.48	0.44	0.32	0.49	0.34	0.00	0.343
MB-1B	Smith Point County Park	0.48	0.44	0.24	0.52	0.32	0.12	0.353
MB-2C	Cupsogue	0.48	0.44	0.34	0.83	0.32	0.02	0.404
MB-2D	Westhampton Pikes Beach	0.48	0.62	0.26	0.72	0.32	0.02	0.403
MB-2E	Westhampton East	0.24	0.20	0.23	0.83	0.32	0.02	0.307
SB-1B	Sedge Island	0.42	0.55	0.35	0.83	0.32	0.02	0.417
SB-1C	Tiana	0.42	0.55	0.38	0.53	0.43	0.02	0.390
SB-1D	Shinnecock Inlet Park-West	0.55	0.47	0.30	0.51	0.35	0.01	0.367
SB-2B	WOSI	0.68	0.40	0.21	0.49	0.27	0.00	0.343
P-1G	Potato Road	0.08	0.52	0.33	0.00	0.00	0.30	0.206
M-1F	Montauk	0.07	0.36	0.36	0.00	0.00	0.32	0.183

Shoreline Protection Project - Future No-action HU Scores per Transect and Community (Large Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
GSB-1A	Robert Moses State Park	294	16	53	22	62	95	541.17
GSB-1B	Fire Island Lighthouse Tract	89	11	4	20	22	0	145.35
GSB-2A	Kismet to Lonelyville	213	7	4	11	45	0	280.55
GSB-2B	Town Beach to Corneille	94	5	4	6	23	27	159.29
GSB-2C	Ocean Beach to Seaview	85	5	1	2	19	39	150.79
GSB-2D	Ocean Beach Park to Point of Woods	199	7	7	9	37	45	304.57
GSB-3A	Cherry Grove	62	3	2	1	15	11	93.94
GSB-3C	Fire Island Pines	180	5	5	2	33	36	260.41
GSB-3D	Talisman to Water Island	190	9	6	8	21	14	247.05
GSB-3E	Water Island	28	1	1	0	3	2	34.69
GSB-3F	Water Island to Davis Park	143	5	3	5	14	18	187.79
GSB-3G	Davis Park	54	3	3	1	21	15	96.38
GSB-4B	Old Inlet	433	21	51	298	55	53	912.43
MB-1A	Smith Point County Park-TWA	50	2	5	3	7	0	66.94
MB-1B	Smith Point County Park	361	23	13	58	49	7	510.66
MB-2C	Cupsogue	51	3	6	47	7	0	114.15
MB-2D	Westhampton Pikes Beach	255	22	12	125	36	2	451.02
MB-2E	Westhampton East	121	8	15	67	40	2	252.90
SB-1B	Sedge Island	113	6	9	101	18	1	248.32
SB-1C	Tiana	89	4	2	9	17	1	120.90
SB-1D	Shinnecock Inlet Park-West	210	6	10	63	25	0	314.67
SB-2B	WOSI	141	6	6	19	12	0	184.06
P-1G	Potato Road	13	4	2	0	0	21	39.68
M-1F	Montauk	11	4	4	0	0	32	51.46

Shoreline Protection Project - Future No-action Acres per Transect and Community (Large Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL ACRES
GSB-1A	RMSP	924	44	166	49	189	320	1,692
GSB-1B	FILT	281	21	37	32	63	101	534
GSB-2A	**Kismet to Lonelyville**	419	20	16	108	102	239	905
GSB-2B	**Town Beach to Corneille**	184	14	16	62	52	85	413
GSB-2C	**Ocean Beach to Seaview**	166	13	5	20	42	124	371
GSB-2D	**OBP to POW**	392	21	27	92	83	140	755
GSB-3A	**Cherry Grove**	122	10	9	6	34	34	215
GSB-3C	**Fire Island Pines**	355	13	16	17	74	114	589
GSB-3D	Talisman to Water Island	373	25	26	16	81	45	566
GSB-3E	**Water Island**	54	4	5	0	15	11	89
GSB-3F	Water Island to Davis Park	281	16	13	11	69	55	444
GSB-3G	**Davis Park**	224	15	11	10	46	48	353
GSB-4B	Old Inlet	818	36	109	357	172	105	1,598
MB-1A	SPCP-TWA	105	5	14	5	22	24	175
MB-1B	SPCP	756	53	55	112	151	58	1,185
MB-2C	Cupsogue	107	6	18	56	23	11	221
MB-2D	**WHPTIN Pikes**	535	35	45	172	111	91	990
MB-2E	**WHPTIN East**	506	38	65	80	125	108	922
SB-1B	Sedge Island	268	11	25	121	57	70	551
SB-1C	Tiana	209	8	6	16	39	29	306
SB-1D	Shinnecock Inlet Park-West	381	13	33	123	72	27	649
SB-2B	**WOSI**	207	16	27	39	44	12	346
P-1G	**Potato Road**	162	8	5	0	0	69	245
M-1F	**Montauk**	165	11	11	0	0	102	290

FUTURE WITH-ACTION CONDITIONS

HSIs, HUs and Acres

(Future conditions with project or restoration activities)

Shoreline Protection Project - Future With Action HSI Scores per Transect and Community (Large Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
GSB-1A	Robert Moses State Park	0.42	0.63	0.68	0.52	0.52	0.52	0.550
GSB-1B	Fire Island Lighthouse Tract	0.54	0.78	0.53	0.69	0.54	0.19	0.545
GSB-2A	Kismet to Lonelyville	0.57	0.61	0.59	0.15	0.53	0.19	0.440
GSB-2B	Town Beach to Corneille	0.57	0.61	0.59	0.15	0.53	0.67	0.521
GSB-2C	Ocean Beach to Seaview	0.57	0.61	0.59	0.15	0.53	0.67	0.521
GSB-2D	Ocean Beach Park to Point of Woods	0.57	0.61	0.59	0.15	0.53	0.67	0.521
GSB-3A	Cherry Grove	0.57	0.58	0.52	0.15	0.53	0.67	0.504
GSB-3C	Fire Island Pines	0.57	0.61	0.59	0.15	0.53	0.67	0.521
GSB-3D	Talisman to Water Island	0.57	0.63	0.55	0.49	0.41	0.67	0.555
GSB-3E	Water Island	0.57	0.61	0.60	0.21	0.35	0.43	0.461
GSB-3F	Water Island to Davis Park	0.57	0.61	0.59	0.53	0.35	0.67	0.553
GSB-3G	Davis Park	0.24	0.46	0.59	0.15	0.53	0.67	0.440
GSB-4B	Old Inlet	0.59	0.88	0.82	0.78	0.47	0.78	0.719
MB-1A	Smith Point County Park-TWA	0.54	0.62	0.69	0.59	0.49	0.22	0.525
MB-1B	Smith Point County Park	0.54	0.62	0.65	0.51	0.47	0.42	0.535
MB-2C	Cupsogue	0.54	0.62	0.71	0.78	0.47	0.32	0.572
MB-2D	Westhampton Pikes Beach	0.54	0.78	0.62	0.89	0.53	0.32	0.614
MB-2E	Westhampton East	0.24	0.43	0.52	0.78	0.47	0.32	0.459
SB-1B	Sedge Island	0.57	0.80	0.67	0.78	0.47	0.32	0.601
SB-1C	Tiana	0.57	0.80	0.67	0.67	0.61	0.35	0.612
SB-1D	Shinnecock Inlet Park-West	0.76	0.73	0.68	0.62	0.52	0.28	0.600
SB-2B	WOSI	0.95	0.66	0.77	0.57	0.44	0.22	0.600
P-1G	Potato Road	0.18	0.78	0.72	0.00	0.00	0.47	0.360
M-1F	Montauk	0.15	0.63	0.62	0.00	0.00	0.55	0.325

Shoreline Protection Project - Future With Action HU Scores Transect and Community (Large Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
GSB-1A	Robert Moses State Park	421	48	126	26	98	184	903.70
GSB-1B	Fire Island Lighthouse Tract	168	20	22	22	34	21	287.17
GSB-2A	Kismet to Lonelyville	256	25	10	17	54	50	410.83
GSB-2B	Town Beach to Corneille	114	13	10	9	28	63	237.54
GSB-2C	Ocean Beach to Seaview	105	10	3	3	22	92	235.84
GSB-2D	Ocean Beach Park to Point of Woods	243	20	17	14	44	105	443.66
GSB-3A	Cherry Grove	77	6	5	1	18	26	133.40
GSB-3C	Fire Island Pines	194	18	11	3	39	85	349.97
GSB-3D	Talisman to Water Island	238	18	15	8	33	33	344.85
GSB-3E	Water Island	35	3	3	0	5	5	50.30
GSB-3F	Water Island to Davis Park	175	10	12	6	22	41	266.25
GSB-3G	Davis Park	59	8	7	1	25	36	136.17
GSB-4B	Old Inlet	514	60	100	254	80	92	1,100.17
MB-1A	Smith Point County Park-TWA	62	5	11	3	11	6	97.90
MB-1B	Smith Point County Park	458	36	39	52	70	27	682.64
MB-2C	Cupsogue	64	6	14	40	11	4	137.65
MB-2D	Westhampton Pikes Beach	319	42	28	171	58	32	650.01
MB-2E	Westhampton East	134	18	38	57	58	38	343.25
SB-1B	Sedge Island	167	18	15	86	27	25	336.93
SB-1C	Tiana	129	12	5	12	24	11	192.48
SB-1D	Shinnecock Inlet Park-West	312	20	25	85	38	9	488.70
SB-2B	WOSI	213	15	25	22	19	3	297.03
P-1G	Potato Road	28	16	2	0	0	33	79.00
M-1F	Montauk	22	17	11	0	0	56	106.02

Shoreline Protection Project - Future With Action Acres per Transect and Community (Large Scenario)

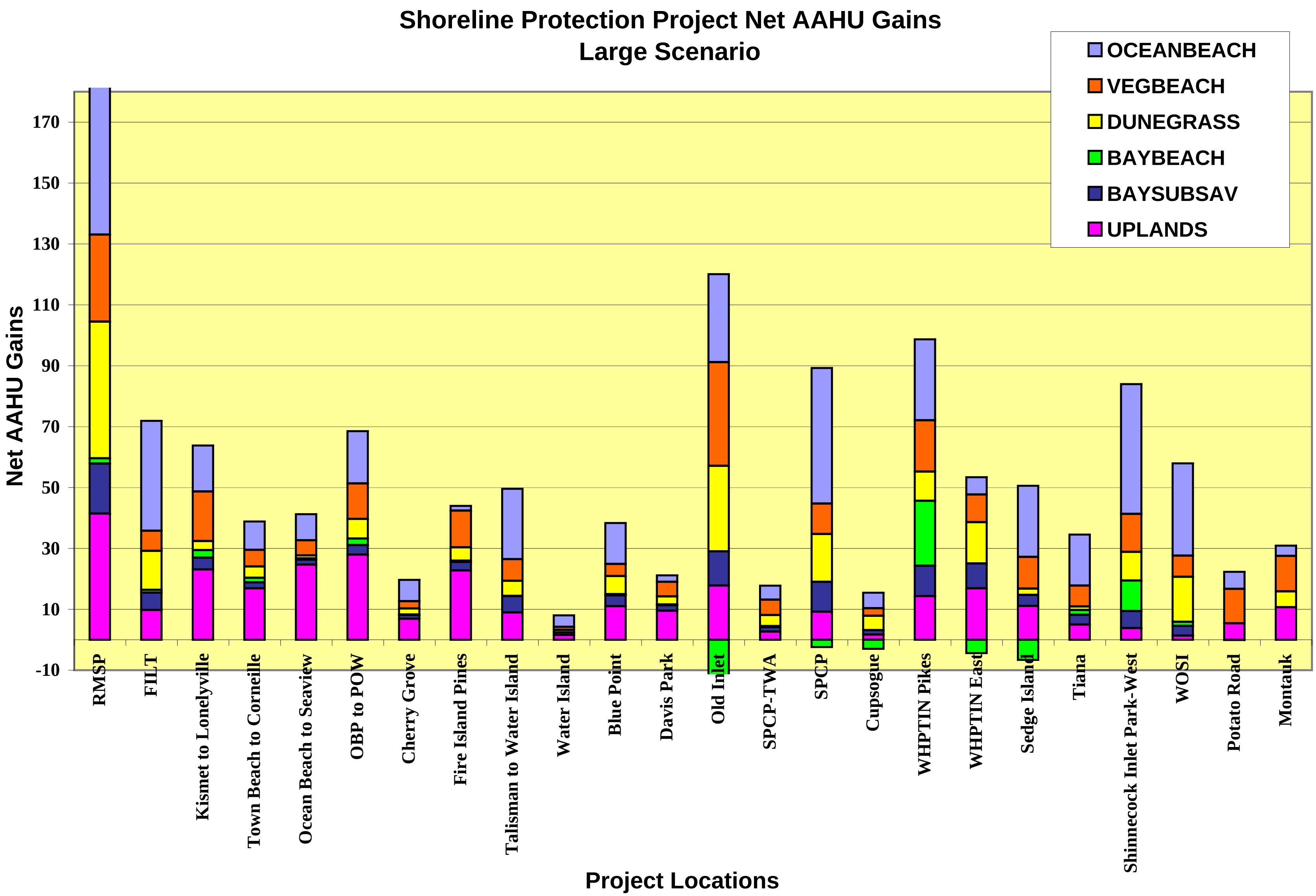
		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL ACRES
GSB-1A	RMSP	999	76	185	49	189	356	1,853
GSB-1B	FILT	309	25	42	32	63	112	583
GSB-2A	Kismet to Lonelyville	449	41	16	108	102	266	982
GSB-2B	Town Beach to Corneille	200	21	17	62	52	94	446
GSB-2C	Ocean Beach to Seaview	183	17	5	20	42	137	405
GSB-2D	OBP to POW	425	33	29	92	83	156	819
GSB-3A	Cherry Grove	135	11	10	6	34	38	234
GSB-3C	Fire Island Pines	339	30	19	17	74	127	605
GSB-3D	Talisman to Water Island	417	28	26	16	81	50	618
GSB-3E	Water Island	62	4	4	0	14	12	96
GSB-3F	Water Island to Davis Park	307	17	20	11	63	61	479
GSB-3G	Davis Park	247	18	12	10	46	53	386
GSB-4B	Old Inlet	879	68	122	325	172	117	1,684
MB-1A	SPCP-TWA	114	9	16	5	22	26	192
MB-1B	SPCP	840	58	60	102	151	64	1,277
MB-2C	Cupsogue	117	9	20	51	23	12	232
MB-2D	WHPTIN Pikes	585	53	45	192	111	101	1,088
MB-2E	WHPTIN East	562	42	73	73	125	119	994
SB-1B	Sedge Island	292	22	23	110	57	78	582
SB-1C	Tiana	225	15	7	18	39	32	336
SB-1D	Shinnecock Inlet Park-West	410	28	37	137	72	30	713
SB-2B	WOSI	224	22	33	39	44	13	375
P-1G	Potato Road	152	21	3	0	0	69	245
M-1F	Montauk	144	27	18	0	0	102	290

SUMMARY
OF

AAHU's

FOR
SHORELINE PROTECTION
PROJECT SITES

(LARGE SCENARIO)


Shoreline Protection Project Net AAHU Gains
Large Scenario
OCEANBEACH
VEGBEACH
DUNEGRASS
BAYBEACH
BAYSUBSAV
UPLANDS
Net AAHU Gains
170
150
130
110
90
70
50
30
10
-10
RMSP
FILT
Kismet to Lonelyville
Town Beach to Corneille
Ocean Beach to Seaview
OBP to POW
Cherry Grove
Fire Island Pines
Talisman to Water Island
Water Island
Blue Point
Davis Park
Old Inlet
SPCP-TWA
SPCP
Cupsogue
WHPTIN Pikes
WHPTIN East
Sedge Island
Tiana
Shinnecock Inlet Park-West
WOSI
Potato Road
Montauk
Project Locations

Net AAHUs per Community Types along each Transect and the Total AAHUs per Transect (Project Sites - Large Scenario)

Project Sites		Sum of AAHUs	Average Annual Habitat Units (AAHUs)					
			OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
GSB-1A	RMSP	186	53	29	45	2	16	41
GSB-1B	FILT	72	36	7	13	1	6	10
GSB-2A	Kismet to Lonelyville	64	15	16	3	2	4	23
GSB-2B	Town Beach to Corneille	39	9	5	4	1	2	17
GSB-2C	Ocean Beach to Seaview	41	9	5	1	0	2	25
GSB-2D	OBP to POW	69	17	12	6	2	3	28
GSB-3A	Cherry Grove	20	7	2	2	0	1	7
GSB-3C	Fire Island Pines	44	2	12	4	0	3	23
GSB-3D	Talisman to Water Island	50	23	7	5	0	5	9
GSB-3E	Water Island	8	4	1	1	0	1	2
GSB-3F	Blue Point	38	13	4	6	0	4	11
GSB-3G	Davis Park	21	2	5	3	0	2	10
GSB-4B	Old Inlet	100	29	34	28	-20	11	18
MB-1A	SPCP-TWA	18	5	5	4	0	1	3
MB-1B	SPCP	87	45	10	16	-3	10	9
MB-2C	Cupsogue	12	5	2	5	-3	1	2
MB-2D	WHPTIN Pikes	99	27	17	10	21	10	14
MB-2E	WHPTIN East	49	6	9	14	-4	8	17
SB-1B	Sedge Island	44	23	10	2	-7	4	11
SB-1C	Tiana	35	17	7	1	2	3	5
SB-1D	Shinnecock Inlet Park-West	84	43	12	9	10	6	4
SB-2B	WOSI	58	30	7	15	1	3	1
P-1G	Potato Road	22	6	11	0	0	0	5
M-1F	Montauk	31	3	12	5	0	0	11
	Average	**52**	**20**	**10**	**8**	**2**	**5**	**8**

Fire Island to Montauk Point, NY Reformulation Study

GSB-1A RMSP (Robert Moses State Park)

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.422	0.422	1,026	1,026	433	432.9	0	1	0.422	0.422	1,026	1,026	433
1	5	0.422	0.422	1,026	1,026	1,732		1	5	0.422	0.422	1,026	999	1,709
5	50	0.422	0.319	1,026	924	16,283	294.3	5	50	0.422	0.422	999	999	18,962
					Without Project AAHUs:	**369**							**With Project AAHUs:**	**422**
													Net AAHUs:	**53**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.396	0.396	49	49	19		0	1	0.396	0.396	49	49	19
1	5	0.396	0.396	49	49	77		1	5	0.396	0.633	49	76	130
5	50	0.396	0.360	49	44	785	15.72	5	50	0.633	0.633	76	76	2,162
					Without Project AAHUs:	**17.633**							**With Project AAHUs:**	**46.223**
													Net AAHUs:	**29**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.559	0.559	185	185	103		0	1	0.559	0.559	185	185	103
1	5	0.559	0.559	185	185	413		1	5	0.559	0.682	185	185	459
5	50	0.559	0.317	185	166	3,477	52.78	5	50	0.682	0.682	185	185	5,673
					Without Project AAHUs:	**80**							**With Project AAHUs:**	**125**
													Net AAHUs:	**45**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.521	0.521	49	49	26		0	1	0.521	0.521	49	49	26
1	5	0.521	0.521	49	49	102		1	5	0.521	0.521	49	49	102
5	50	0.521	0.439	49	49	1,061	21.57	5	50	0.521	0.521	49	49	1,151
					Without Project AAHUs:	**24**							**With Project AAHUs:**	**26**
													Net AAHUs:	**2**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-1A RMSP (Robert Moses State Park)

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.521	0.521	189	189	98		0	1	0.521	0.521	189	189	98
1	5	0.521	0.521	189	189	394		1	5	0.521	0.521	189	189	394
5	50	0.521	0.328	189	189	3,611	62.02	5	50	0.521	0.521	189	189	4,430
					Without Project AAHUs:	**82**							**With Project AAHUs:**	**98**
													Net AAHUs:	**16**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.518	0.518	356	356	184		0	1	0.518	0.518	356	356	184
1	5	0.518	0.518	356	356	737		1	5	0.518	0.518	356	356	737
5	50	0.518	0.296	356	320	6,217	94.76	5	50	0.518	0.518	356	356	8,288
					Without Project AAHUs:	**143**							**With Project AAHUs:**	**184**
													Net AAHUs:	**41**

Fire Island to Montauk Point, NY Reformulation Study

GSB-1B FILT (Fire Island Lighthouse)

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	312	312	170	169.7	0	1	0.545	0.545	312	312	170
1	5	0.545	0.545	312	312	679		1	5	0.545	0.545	312	309	676
5	50	0.545	0.318	312	281	5,772	89.2	5	50	0.545	0.545	309	309	7,581
Without Project AAHUs:						**132**		**With Project AAHUs:**						**169**
Net AAHUs:														**36**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.550	0.550	24	24	13		0	1	0.550	0.550	24	24	13
1	5	0.550	0.550	24	24	52		1	5	0.550	0.783	24	25	65
5	50	0.550	0.520	24	21	541	11.07	5	50	0.783	0.783	24	25	861
Without Project AAHUs:						**12.123**		**With Project AAHUs:**						**18.784**
Net AAHUs:														**6.660**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.306	0.306	41	41	13		0	1	0.306	0.306	41	41	13
1	5	0.306	0.306	41	41	50		1	5	0.306	0.527	41	42	69
5	50	0.306	0.101	41	37	360	3.724	5	50	0.527	0.527	41	42	982
Without Project AAHUs:						**8**		**With Project AAHUs:**						**21**
Net AAHUs:														**13**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.687	0.687	32	32	22		0	1	0.687	0.687	32	32	22
1	5	0.687	0.687	32	32	87		1	5	0.687	0.687	32	32	87
5	50	0.687	0.624	32	32	936	19.81	5	50	0.687	0.687	32	32	981
Without Project AAHUs:						**21**		**With Project AAHUs:**						**22**
Net AAHUs:														**1**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-1B FILT (Fire Island Lighthouse)

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	63	63	34		0	1	0.545	0.545	63	63	34
1	5	0.545	0.545	63	63	137		1	5	0.545	0.545	63	63	137
5	50	0.545	0.343	63	63	1,254	21.55	5	50	0.545	0.545	63	63	1,539
Without Project AAHUs:						**29**		**With Project AAHUs:**						**34**
													Net AAHUs:	**6**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	112	112	21		0	1	0.187	0.187	112	112	21
1	5	0.187	0.187	112	112	84		1	5	0.187	0.187	112	112	84
5	50	0.187	0.000	112	101	456	0	5	50	0.187	0.187	112	112	943
Without Project AAHUs:						**11**		**With Project AAHUs:**						**21**
													Net AAHUs:	**10**

Fire Island to Montauk Point, NY Reformulation Study

GSB-2A Kismet to Lonelyville

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	466	466	266	266.2	0	1	0.572	0.572	466	466	266
1	5	0.572	0.572	466	466	1,065		1	5	0.572	0.572	466	449	1,045
5	50	0.572	0.509	466	419	10,765	213.2	5	50	0.572	0.572	449	449	11,538
Without Project AAHUs:						**242**		**With Project AAHUs:**						**257**
Net AAHUs:														**15**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.368	0.368	22	22	8		0	1	0.368	0.368	22	22	8
1	5	0.368	0.368	22	22	32		1	5	0.368	0.607	22	41	63
5	50	0.368	0.347	22	20	332	6.771	5	50	0.607	0.607	41	41	1,117
Without Project AAHUs:						**7.437**		**With Project AAHUs:**						**23.758**
Net AAHUs:														**16**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.467	0.467	18	18	8		0	1	0.467	0.467	18	18	8
1	5	0.467	0.467	18	18	34		1	5	0.467	0.592	18	16	36
5	50	0.467	0.266	18	16	286	4.339	5	50	0.592	0.592	16	16	429
Without Project AAHUs:						**7**		**With Project AAHUs:**						**9**
Net AAHUs:														**3**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	108	108	17		0	1	0.153	0.153	108	108	17
1	5	0.153	0.153	108	108	66		1	5	0.153	0.153	108	108	66
5	50	0.153	0.101	108	108	618	10.96	5	50	0.153	0.153	108	108	743
Without Project AAHUs:						**14**		**With Project AAHUs:**						**17**
Net AAHUs:														**2**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-2A Kismet to Lonelyville

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	102	102	54		0	1	0.529	0.529	102	102	54
1	5	0.529	0.529	102	102	216		1	5	0.529	0.529	102	102	216
5	50	0.529	0.444	102	102	2,232	45.29	5	50	0.529	0.529	102	102	2,427
Without Project AAHUs:						**50**		**With Project AAHUs:**						**54**
													Net AAHUs:	**4**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.187	0.187	266	266	50		0	1	0.187	0.187	266	266	50
1	5	0.187	0.187	266	266	198		1	5	0.187	0.187	266	266	198
5	50	0.187	0.000	266	239	1,079	0	5	50	0.187	0.187	266	266	2,233
Without Project AAHUs:						**27**		**With Project AAHUs:**						**50**
													Net AAHUs:	**23**

Fire Island to Montauk Point, NY Reformulation Study

GSB 2B Town Beach to Corneille

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	205	205	117	117	0	1	0.572	0.572	205	205	117
1	5	0.572	0.572	205	205	468		1	5	0.572	0.572	205	200	463
5	50	0.572	0.509	205	184	4,731	93.69	5	50	0.572	0.572	205	200	5,204
Without Project AAHUs:						**106**		**With Project AAHUs:**						**116**
Net AAHUs:														**9**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.370	0.370	16	16	6		0	1	0.370	0.370	16	16	6
1	5	0.370	0.370	16	16	24		1	5	0.370	0.607	16	21	37
5	50	0.370	0.348	16	14	246	5.024	5	50	0.607	0.607	16	21	505
Without Project AAHUs:						**5.517**		**With Project AAHUs:**						**10.960**
Net AAHUs:														**5**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.467	0.467	17	17	8		0	1	0.467	0.467	17	17	8
1	5	0.467	0.467	17	17	32		1	5	0.467	0.592	17	17	36
5	50	0.467	0.266	17	16	272	4.128	5	50	0.592	0.592	17	17	457
Without Project AAHUs:						**6**		**With Project AAHUs:**						**10**
Net AAHUs:														**4**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	62	62	9		0	1	0.153	0.153	62	62	9
1	5	0.153	0.153	62	62	38		1	5	0.153	0.153	62	62	38
5	50	0.153	0.101	62	62	354	6.27	5	50	0.153	0.153	62	62	425
Without Project AAHUs:						**8**		**With Project AAHUs:**						**9**
Net AAHUs:														**1**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB 2B Town Beach to Corneille

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	52	52	28		0	1	0.529	0.529	52	52	28
1	5	0.529	0.529	52	52	111		1	5	0.529	0.529	52	52	111
5	50	0.529	0.444	52	52	1,145	23.24	5	50	0.529	0.529	52	52	1,245
					Without Project AAHUs:	**26**							**With Project AAHUs:**	**28**
													Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.673	0.673	94	94	63		0	1	0.673	0.673	94	94	63
1	5	0.673	0.673	94	94	253		1	5	0.673	0.673	94	94	253
5	50	0.673	0.318	94	85	2,006	26.94	5	50	0.673	0.673	94	94	2,849
					Without Project AAHUs:	**46**							**With Project AAHUs:**	**63**
													Net AAHUs:	**17**

Fire Island to Montauk Point, NY Reformulation Study

GSB-2C Ocean Beach to Seaview

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	185	185	106	105.7	0	1	0.572	0.572	185	185	106
1	5	0.572	0.572	185	185	423		1	5	0.572	0.572	185	183	420
5	50	0.572	0.509	185	166	4,273	84.62	5	50	0.572	0.572	183	183	4,703
Without Project AAHUs:						**96**		**With Project AAHUs:**						**105**
								Net AAHUs:						**9**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.373	0.373	15	15	5		0	1	0.373	0.373	15	15	5
1	5	0.373	0.373	15	15	22		1	5	0.373	0.607	15	17	31
5	50	0.373	0.352	15	13	226	4.609	5	50	0.607	0.607	17	17	465
Without Project AAHUs:						**5.059**		**With Project AAHUs:**						**10.033**
								Net AAHUs:						**5**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.467	0.467	6	6	3		0	1	0.467	0.467	6	6	3
1	5	0.467	0.467	6	6	10		1	5	0.467	0.592	6	5	11
5	50	0.467	0.266	6	5	87	1.319	5	50	0.592	0.592	5	5	135
Without Project AAHUs:						**2**		**With Project AAHUs:**						**3**
								Net AAHUs:						**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	20	20	3		0	1	0.153	0.153	20	20	3
1	5	0.153	0.153	20	20	12		1	5	0.153	0.153	20	20	12
5	50	0.153	0.101	20	20	116	2.053	5	50	0.153	0.153	20	20	139
Without Project AAHUs:						**3**		**With Project AAHUs:**						**3**
								Net AAHUs:						**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-2C Ocean Beach to Seaview

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	42	42	22		0	1	0.529	0.529	42	42	22
1	5	0.529	0.529	42	42	90		1	5	0.529	0.529	42	42	90
5	50	0.529	0.444	42	42	929	18.85	5	50	0.529	0.529	42	42	1,010
Without Project AAHUs:						**21**		**With Project AAHUs:**						**22**
													Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.673	0.673	137	137	92		0	1	0.673	0.673	137	137	92
1	5	0.673	0.673	137	137	370		1	5	0.673	0.673	137	137	370
5	50	0.673	0.318	137	124	2,929	39.34	5	50	0.673	0.673	137	137	4,160
Without Project AAHUs:						**68**		**With Project AAHUs:**						**92**
													Net AAHUs:	**25**

Fire Island to Montauk Point, NY Reformulation Study

GSB-2D OBP to POW (Ocean Beach to Point of Woods)

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	436	436	249	248.9	0	1	0.572	0.572	436	436	249
1	5	0.572	0.572	436	436	996		1	5	0.572	0.572	436	425	984
5	50	0.572	0.509	436	392	10,065	199.3	5	50	0.572	0.572	425	425	10,937
Without Project AAHUs:						**226**		**With Project AAHUs:**						**243**
Net AAHUs:														**17**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.370	0.370	23	23	8		0	1	0.370	0.370	23	23	8
1	5	0.370	0.370	23	23	34		1	5	0.370	0.607	23	33	56
5	50	0.370	0.348	23	21	352	7.176	5	50	0.607	0.607	33	33	914
Without Project AAHUs:						**7.880**		**With Project AAHUs:**						**19.572**
Net AAHUs:														**12**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.467	0.467	30	30	14		0	1	0.467	0.467	30	30	14
1	5	0.467	0.467	30	30	55		1	5	0.467	0.592	30	29	62
5	50	0.467	0.266	30	27	465	7.062	5	50	0.592	0.592	29	29	779
Without Project AAHUs:						**11**		**With Project AAHUs:**						**17**
Net AAHUs:														**6**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	92	92	14		0	1	0.153	0.153	92	92	14
1	5	0.153	0.153	92	92	56		1	5	0.153	0.153	92	92	56
5	50	0.153	0.101	92	92	527	9.34	5	50	0.153	0.153	92	92	633
Without Project AAHUs:						**12**		**With Project AAHUs:**						**14**
Net AAHUs:														**2**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-2D OBP to POW (Ocean Beach to Point of Woods)

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	83	83	44		0	1	0.529	0.529	83	83	44
1	5	0.529	0.529	83	83	177		1	5	0.529	0.529	83	83	177
5	50	0.529	0.444	83	83	1,827	37.06	5	50	0.529	0.529	83	83	1,986
Without Project AAHUs:						**41**		**With Project AAHUs:**						**44**
								Net AAHUs:						**3**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.673	0.673	156	156	105		0	1	0.673	0.673	156	156	105
1	5	0.673	0.673	156	156	419		1	5	0.673	0.673	156	156	419
5	50	0.673	0.318	156	140	3,320	44.59	5	50	0.673	0.673	156	156	4,716
Without Project AAHUs:						**77**		**With Project AAHUs:**						**105**
								Net AAHUs:						**28**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3A Cherry Grove

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	135	135	77	77.27	0	1	0.572	0.572	135	135	77
1	5	0.572	0.572	135	135	309		1	5	0.572	0.572	135	135	309
5	50	0.572	0.509	135	122	3,124	61.87	5	50	0.572	0.572	135	135	3,477
					Without Project AAHUs:	**70**							**With Project AAHUs:**	**77**
													Net AAHUs:	**7**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.370	0.370	11	11	4		0	1	0.370	0.370	11	11	4
1	5	0.370	0.370	11	11	16		1	5	0.370	0.579	11	11	21
5	50	0.370	0.348	11	10	166	3.392	5	50	0.579	0.579	11	11	282
					Without Project AAHUs:	**3.724**							**With Project AAHUs:**	**6.126**
													Net AAHUs:	**2**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.434	0.434	10	10	5		0	1	0.434	0.434	10	10	5
1	5	0.434	0.434	10	10	18		1	5	0.434	0.522	10	10	20
5	50	0.434	0.233	10	9	150	2.195	5	50	0.522	0.522	10	10	246
					Without Project AAHUs:	**3**							**With Project AAHUs:**	**5**
													Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	6	6	1		0	1	0.153	0.153	6	6	1
1	5	0.153	0.153	6	6	4		1	5	0.153	0.153	6	6	4
5	50	0.153	0.101	6	6	35	0.626	5	50	0.153	0.153	6	6	42
					Without Project AAHUs:	**1**							**With Project AAHUs:**	**1**
													Net AAHUs:	**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3A Cherry Grove

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	34	34	18		0	1	0.529	0.529	34	34	18
1	5	0.529	0.529	34	34	71		1	5	0.529	0.529	34	34	71
5	50	0.529	0.444	34	34	736	14.93	5	50	0.529	0.529	34	34	800
Without Project AAHUs:						**17**		**With Project AAHUs:**						**18**
Net AAHUs:														**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.673	0.673	38	38	26		0	1	0.673	0.673	38	38	26
1	5	0.673	0.673	38	38	103		1	5	0.673	0.673	38	38	103
5	50	0.673	0.318	38	34	813	10.92	5	50	0.673	0.673	38	38	1,155
Without Project AAHUs:						**19**		**With Project AAHUs:**						**26**
Net AAHUs:														**7**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3C Fire Island Pines

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	355	355	203	202.8	0	1	0.572	0.572	355	355	203
1	5	0.572	0.572	355	355	811		1	5	0.572	0.572	355	339	793
5	50	0.572	0.509	355	355	8,622	180.4	5	50	0.572	0.572	339	339	8,717
Without Project AAHUs:						**193**		**With Project AAHUs:**						**194**
Net AAHUs:														**2**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.368	0.368	15	15	5		0	1	0.368	0.368	15	15	5
1	5	0.368	0.368	15	15	22		1	5	0.368	0.607	15	30	45
5	50	0.368	0.347	15	13	227	4.635	5	50	0.607	0.607	30	30	808
Without Project AAHUs:						**5.091**		**With Project AAHUs:**						**17.164**
Net AAHUs:														**12**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.482	0.482	18	18	9		0	1	0.482	0.482	18	18	9
1	5	0.482	0.482	18	18	35		1	5	0.482	0.592	18	19	40
5	50	0.482	0.280	18	16	297	4.574	5	50	0.592	0.592	19	19	512
Without Project AAHUs:						**7**		**With Project AAHUs:**						**11**
Net AAHUs:														**4**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	17	17	3		0	1	0.153	0.153	17	17	3
1	5	0.153	0.153	17	17	10		1	5	0.153	0.153	17	17	10
5	50	0.153	0.101	17	17	98	1.732	5	50	0.153	0.153	17	17	117
Without Project AAHUs:						**2**		**With Project AAHUs:**						**3**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3C Fire Island Pines

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	74	74	39		0	1	0.529	0.529	74	74	39
1	5	0.529	0.529	74	74	156		1	5	0.529	0.529	74	74	156
5	50	0.529	0.444	74	74	1,615	32.76	5	50	0.529	0.529	74	74	1,755
Without Project AAHUs:						**36**		**With Project AAHUs:**						**39**
Net AAHUs:														**3**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.673	0.673	127	127	85		0	1	0.673	0.673	127	127	85
1	5	0.673	0.673	127	127	341		1	5	0.673	0.673	127	127	341
5	50	0.673	0.318	127	114	2,702	36.29	5	50	0.673	0.673	127	127	3,838
Without Project AAHUs:						**63**		**With Project AAHUs:**						**85**
Net AAHUs:														**23**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3D Talisman to Water Island

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	414	414	237	236.7	0	1	0.572	0.572	414	414	237
1	5	0.572	0.572	414	414	947		1	5	0.572	0.572	414	417	950
5	50	0.572	0.509	414	373	9,573	189.6	5	50	0.572	0.572	417	417	10,724
					Without Project AAHUs:	**215**							**With Project AAHUs:**	**238**
													Net AAHUs:	**23**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.400	0.400	28	28	11		0	1	0.400	0.400	28	28	11
1	5	0.400	0.400	28	28	45		1	5	0.400	0.633	28	28	58
5	50	0.400	0.357	28	25	452	8.969	5	50	0.633	0.633	28	28	796
					Without Project AAHUs:	**10.165**							**With Project AAHUs:**	**17.305**
													Net AAHUs:	**7**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.443	0.443	29	29	13		0	1	0.443	0.443	29	29	13
1	5	0.443	0.443	29	29	52		1	5	0.443	0.552	29	26	55
5	50	0.443	0.216	29	26	412	5.661	5	50	0.552	0.552	26	26	654
					Without Project AAHUs:	**10**							**With Project AAHUs:**	**14**
													Net AAHUs:	**5**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.495	0.495	16	16	8		0	1	0.495	0.495	16	16	8
1	5	0.495	0.495	16	16	31		1	5	0.495	0.495	16	16	31
5	50	0.495	0.481	16	16	346	7.576	5	50	0.495	0.495	16	16	351
					Without Project AAHUs:	**8**							**With Project AAHUs:**	**8**
													Net AAHUs:	**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3D Talisman to Water Island

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.407	0.407	81	81	33		0	1	0.407	0.407	81	81	33
1	5	0.407	0.407	81	81	132		1	5	0.407	0.407	81	81	132
5	50	0.407	0.259	81	81	1,216	21.02	5	50	0.407	0.407	81	81	1,486
Without Project AAHUs:						**28**		**With Project AAHUs:**						**33**
Net AAHUs:														**5**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.673	0.673	50	50	33		0	1	0.673	0.673	50	50	33
1	5	0.673	0.673	50	50	134		1	5	0.673	0.673	50	50	134
5	50	0.673	0.318	50	45	1,060	14.24	5	50	0.673	0.673	50	50	1,506
Without Project AAHUs:						**25**		**With Project AAHUs:**						**33**
Net AAHUs:														**9**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3E Water Island

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	60	60	35	34.51	0	1	0.572	0.572	60	60	35
1	5	0.572	0.572	60	60	138		1	5	0.572	0.572	60	62	139
5	50	0.572	0.509	60	54	1,395	27.63	5	50	0.572	0.572	62	62	1,585
Without Project AAHUs:						**31**		**With Project AAHUs:**						**35**
Net AAHUs:														**4**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.396	0.396	4	4	2		0	1	0.396	0.396	4	4	2
1	5	0.396	0.396	4	4	7		1	5	0.396	0.605	4	4	8
5	50	0.396	0.353	4	4	67	1.324	5	50	0.605	0.605	4	4	113
Without Project AAHUs:						**1.502**		**With Project AAHUs:**						**2.470**
Net AAHUs:														**1**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.413	0.413	5	5	2		0	1	0.413	0.413	5	5	2
1	5	0.413	0.413	5	5	9		1	5	0.413	0.603	5	4	10
5	50	0.413	0.202	5	5	72	0.995	5	50	0.603	0.603	4	4	114
Without Project AAHUs:						**2**		**With Project AAHUs:**						**3**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.209	0.209	0	0	0		0	1	0.209	0.209	0	0	0
1	5	0.209	0.209	0	0	0		1	5	0.209	0.209	0	0	0
5	50	0.209	0.127	0	0	2	0.035	5	50	0.209	0.209	0	0	3
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3E Water Island

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.347	0.347	14	14	5		0	1	0.347	0.347	14	14	5
1	5	0.347	0.347	14	14	19		1	5	0.347	0.347	14	14	19
5	50	0.347	0.197	14	15	177	2.985	5	50	0.347	0.347	14	14	216
Without Project AAHUs:						**4**		**With Project AAHUs:**						**5**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.430	0.430	12	12	5		0	1	0.430	0.430	12	12	5
1	5	0.430	0.430	12	12	21		1	5	0.430	0.430	12	12	21
5	50	0.430	0.159	12	11	152	1.72	5	50	0.430	0.430	12	12	232
Without Project AAHUs:						**4**		**With Project AAHUs:**						**5**
													Net AAHUs:	**2**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3F Blue Point Beach

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	312	312	178	178.5	0	1	0.572	0.572	312	312	178
1	5	0.572	0.572	312	312	714		1	5	0.572	0.572	312	307	708
5	50	0.572	0.509	312	281	7,216	142.9	5	50	0.572	0.572	307	307	7,896
					Without Project AAHUs:	**162**							**With Project AAHUs:**	**176**
													Net AAHUs:	**13**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.396	0.396	17	17	7		0	1	0.396	0.396	17	17	7
1	5	0.396	0.396	17	17	27		1	5	0.396	0.605	17	17	35
5	50	0.396	0.353	17	16	277	5.483	5	50	0.605	0.605	17	17	470
					Without Project AAHUs:	**6.218**							**With Project AAHUs:**	**10.224**
													Net AAHUs:	**4**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.487	0.487	14	14	7		0	1	0.487	0.487	14	14	7
1	5	0.487	0.487	14	14	28		1	5	0.487	0.590	14	20	37
5	50	0.487	0.260	14	13	229	3.334	5	50	0.590	0.590	20	20	518
					Without Project AAHUs:	**5**							**With Project AAHUs:**	**11**
													Net AAHUs:	**6**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.530	0.530	11	11	6		0	1	0.530	0.530	11	11	6
1	5	0.530	0.530	11	11	24		1	5	0.530	0.530	11	11	24
5	50	0.530	0.447	11	11	247	5.025	5	50	0.530	0.530	11	11	269
					Without Project AAHUs:	**6**							**With Project AAHUs:**	**6**
													Net AAHUs:	**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3F Blue Point Beach

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.347	0.347	63	63	22		0	1	0.347	0.347	63	63	22
1	5	0.347	0.347	63	63	87		1	5	0.347	0.347	63	63	87
5	50	0.347	0.197	63	69	800	13.52	5	50	0.347	0.347	63	63	977
					Without Project AAHUs:	**18**							**With Project AAHUs:**	**22**
													Net AAHUs:	**4**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.673	0.673	61	61	41		0	1	0.673	0.673	61	61	41
1	5	0.673	0.673	61	61	165		1	5	0.673	0.673	61	61	165
5	50	0.673	0.318	61	55	1,304	17.51	5	50	0.673	0.673	61	61	1,852
					Without Project AAHUs:	**30**							**With Project AAHUs:**	**41**
													Net AAHUs:	**11**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3G Davis Park

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.239	0.239	249	249	59	59.29	0	1	0.239	0.239	249	249	59
1	5	0.239	0.239	249	249	237		1	5	0.239	0.239	249	247	236
5	50	0.239	0.240	249	224	2,543	53.7	5	50	0.239	0.239	247	247	2,650
Without Project AAHUs:						**57**		**With Project AAHUs:**						**59**
Net AAHUs:														**2**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.220	0.220	16	16	4		0	1	0.220	0.220	16	16	4
1	5	0.220	0.220	16	16	14		1	5	0.220	0.457	16	18	23
5	50	0.220	0.198	16	15	144	2.877	5	50	0.457	0.457	18	18	375
Without Project AAHUs:						**3.239**		**With Project AAHUs:**						**8.044**
Net AAHUs:														**5**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.467	0.467	12	12	6		0	1	0.467	0.467	12	12	6
1	5	0.467	0.467	12	12	23		1	5	0.467	0.592	12	12	26
5	50	0.467	0.266	12	11	196	2.974	5	50	0.592	0.592	12	12	326
Without Project AAHUs:						**4**		**With Project AAHUs:**						**7**
Net AAHUs:														**3**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	10	10	1		0	1	0.153	0.153	10	10	1
1	5	0.153	0.153	10	10	6		1	5	0.153	0.153	10	10	6
5	50	0.153	0.101	10	10	56	0.987	5	50	0.153	0.153	10	10	67
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3G Davis Park

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	46	46	25		0	1	0.529	0.529	46	46	25
1	5	0.529	0.529	46	46	98		1	5	0.529	0.529	46	46	98
5	50	0.529	0.444	46	46	1,016	20.61	5	50	0.529	0.529	46	46	1,105
Without Project AAHUs:						**23**		**With Project AAHUs:**						**25**
Net AAHUs:														**2**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.673	0.673	53	53	36		0	1	0.673	0.673	53	53	36
1	5	0.673	0.673	53	53	143		1	5	0.673	0.673	53	53	143
5	50	0.673	0.318	53	48	1,134	15.23	5	50	0.673	0.673	53	53	1,611
Without Project AAHUs:						**26**		**With Project AAHUs:**						**36**
Net AAHUs:														**10**

Fire Island to Montauk Point, NY Reformulation Study

GSB-4B Old Inlet

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.585	0.585	909	909	532	531.6	0	1	0.585	0.585	909	909	532
1	5	0.585	0.585	909	909	2,127		1	5	0.585	0.585	909	879	2,092
5	50	0.585	0.530	909	818	21,668	433.1	5	50	0.585	0.585	879	879	23,150
Without Project AAHUs:						**487**		**With Project AAHUs:**						**515**
								Net AAHUs:						**29**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.645	0.645	40	40	26		0	1	0.645	0.645	40	40	26
1	5	0.645	0.645	40	40	104		1	5	0.645	0.883	40	68	167
5	50	0.645	0.587	40	36	1,058	21.21	5	50	0.883	0.883	68	68	2,697
Without Project AAHUs:						**23.759**		**With Project AAHUs:**						**57.810**
								Net AAHUs:						**34**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.735	0.735	121	121	89		0	1	0.735	0.735	121	121	89
1	5	0.735	0.735	121	121	355		1	5	0.735	0.819	121	122	378
5	50	0.735	0.473	121	109	3,129	51.41	5	50	0.819	0.819	122	122	4,510
Without Project AAHUs:						**71**		**With Project AAHUs:**						**100**
								Net AAHUs:						**28**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.781	0.781	325	325	254		0	1	0.781	0.781	325	325	254
1	5	0.781	0.781	325	325	1,015		1	5	0.781	0.781	325	325	1,015
5	50	0.781	0.835	325	357	12,405	298.2	5	50	0.781	0.781	325	325	11,415
Without Project AAHUs:						**273**		**With Project AAHUs:**						**254**
								Net AAHUs:						**-20**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-4B Old Inlet

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.466	172	172	80		0	1	0.466	0.466	172	172	80
1	5	0.466	0.466	172	172	321		1	5	0.466	0.466	172	172	321
5	50	0.466	0.321	172	172	3,052	55.35	5	50	0.466	0.466	172	172	3,614
Without Project AAHUs:						**69**		**With Project AAHUs:**						**80**
								Net AAHUs:						**11**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.783	117	117	92		0	1	0.783	0.783	117	117	92
1	5	0.783	0.783	117	117	366		1	5	0.783	0.783	117	117	366
5	50	0.783	0.505	117	105	3,232	53.14	5	50	0.783	0.783	117	117	4,121
Without Project AAHUs:						**74**		**With Project AAHUs:**						**92**
								Net AAHUs:						**18**

Fire Island to Montauk Point, NY Reformulation Study

MB-1A SPCP-TWA (Smith Point County Park-TWA)

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	117	117	64	63.65	0	1	0.545	0.545	117	117	64
1	5	0.545	0.545	117	117	255		1	5	0.545	0.545	117	114	251
5	50	0.545	0.477	117	105	2,555	50.19	5	50	0.545	0.545	114	114	2,791
Without Project AAHUs:						**57**		**With Project AAHUs:**						**62**
Net AAHUs:														**5**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.469	0.469	6	6	3		0	1	0.469	0.469	6	6	3
1	5	0.469	0.469	6	6	10		1	5	0.469	0.617	117	9	131
5	50	0.469	0.439	6	5	107	2.184	5	50	0.617	0.617	9	9	237
Without Project AAHUs:						**2.406**		**With Project AAHUs:**						**7.405**
Net AAHUs:														**5**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.597	0.597	16	16	10		0	1	0.597	0.597	16	16	10
1	5	0.597	0.597	16	16	38		1	5	0.597	0.690	16	16	41
5	50	0.597	0.321	16	14	316	4.619	5	50	0.690	0.690	16	16	497
Without Project AAHUs:						**7**		**With Project AAHUs:**						**11**
Net AAHUs:														**4**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.593	0.593	5	5	3		0	1	0.593	0.593	5	5	3
1	5	0.593	0.593	5	5	13		1	5	0.593	0.593	5	5	13
5	50	0.593	0.486	5	5	133	2.653	5	50	0.593	0.593	5	5	146
Without Project AAHUs:						**3**		**With Project AAHUs:**						**3**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

MB-1A SPCP-TWA (Smith Point County Park-TWA)

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.490	0.490	22	22	11		0	1	0.490	0.490	22	22	11
1	5	0.490	0.490	22	22	42		1	5	0.490	0.490	22	22	42
5	50	0.490	0.337	22	22	403	7.296	5	50	0.490	0.490	22	22	478
Without Project AAHUs:						**9**		**With Project AAHUs:**						**11**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.217	0.217	26	26	6		0	1	0.217	0.217	26	26	6
1	5	0.217	0.217	26	26	23		1	5	0.217	0.217	26	26	23
5	50	0.217	0.000	26	24	124	0	5	50	0.217	0.217	26	26	257
Without Project AAHUs:						**3**		**With Project AAHUs:**						**6**
													Net AAHUs:	**3**

Fire Island to Montauk Point, NY Reformulation Study

MB-1B SPCP (Smith Point County Park)

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	840	840	457	457.3	0	1	0.545	0.545	840	840	457
1	5	0.545	0.545	840	840	1,829		1	5	0.545	0.545	840	840	1,830
5	50	0.545	0.477	840	756	18,359	360.5	5	50	0.545	0.545	840	840	20,586
					Without Project AAHUs:	**413**							**With Project AAHUs:**	**457**
													Net AAHUs:	**45**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.469	0.469	58	58	27		0	1	0.469	0.469	58	58	27
1	5	0.469	0.469	58	58	110		1	5	0.469	0.617	58	58	127
5	50	0.469	0.439	58	53	1,134	23.07	5	50	0.617	0.617	58	58	1,620
					Without Project AAHUs:	**25.422**							**With Project AAHUs:**	**35.478**
													Net AAHUs:	**10**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.521	0.521	61	61	32		0	1	0.521	0.521	61	61	32
1	5	0.521	0.521	61	61	127		1	5	0.521	0.652	61	60	143
5	50	0.521	0.244	61	55	1,006	13.43	5	50	0.652	0.652	60	60	1,774
					Without Project AAHUs:	**23**							**With Project AAHUs:**	**39**
													Net AAHUs:	**16**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.512	0.512	102	102	52		0	1	0.512	0.512	102	102	52
1	5	0.512	0.512	102	102	209		1	5	0.512	0.512	102	102	209
5	50	0.512	0.515	102	112	2,480	57.93	5	50	0.512	0.512	102	102	2,354
					Without Project AAHUs:	**55**							**With Project AAHUs:**	**52**
													Net AAHUs:	**-3**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

MB-1B SPCP (Smith Point County Park)

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.466	151	151	70		0	1	0.466	0.466	151	151	70
1	5	0.466	0.466	151	151	282		1	5	0.466	0.466	151	151	282
5	50	0.466	0.321	151	151	2,677	48.53	5	50	0.466	0.466	151	151	3,169
Without Project AAHUs:						**61**		**With Project AAHUs:**						**70**
													Net AAHUs:	**10**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.417	0.417	64	64	27		0	1	0.417	0.417	64	64	27
1	5	0.417	0.417	64	64	107		1	5	0.417	0.417	64	64	107
5	50	0.417	0.123	64	58	751	7.15	5	50	0.417	0.417	64	64	1,208
Without Project AAHUs:						**18**		**With Project AAHUs:**						**27**
													Net AAHUs:	**9**

Fire Island to Montauk Point, NY Reformulation Study

MB-2C Cupsogue

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	119	119	65	64.83	0	1	0.545	0.545	119	119	65
1	5	0.545	0.545	119	119	259		1	5	0.545	0.545	119	117	257
5	50	0.545	0.477	119	107	2,603	51.11	5	50	0.545	0.545	117	117	2,863
Without Project AAHUs:						**59**		**With Project AAHUs:**						**64**
Net AAHUs:														**5**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.469	0.469	7	7	3		0	1	0.469	0.469	7	7	3
1	5	0.469	0.469	7	7	13		1	5	0.469	0.617	7	9	17
5	50	0.469	0.439	7	6	132	2.692	5	50	0.617	0.617	9	9	251
Without Project AAHUs:						**2.966**		**With Project AAHUs:**						**5.424**
Net AAHUs:														**2**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.612	0.612	20	20	12		0	1	0.612	0.612	20	20	12
1	5	0.612	0.612	20	20	50		1	5	0.612	0.706	20	20	54
5	50	0.612	0.335	20	18	413	6.123	5	50	0.706	0.706	20	20	645
Without Project AAHUs:						**10**		**With Project AAHUs:**						**14**
Net AAHUs:														**5**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.781	0.781	51	51	40		0	1	0.781	0.781	51	51	40
1	5	0.781	0.781	51	51	159		1	5	0.781	0.781	51	51	159
5	50	0.781	0.835	51	56	1,941	46.66	5	50	0.781	0.781	51	51	1,786
Without Project AAHUs:						**43**		**With Project AAHUs:**						**40**
Net AAHUs:														**-3**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

MB-2C Cupsogue

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.466	0.466	23	23	11		0	1	0.466	0.466	23	23	11
1	5	0.466	0.466	23	23	43		1	5	0.466	0.466	23	23	43
5	50	0.466	0.321	23	23	406	7.368	5	50	0.466	0.466	23	23	481
Without Project AAHUs:						**9**		**With Project AAHUs:**						**11**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.320	0.320	12	12	4		0	1	0.320	0.320	12	12	4
1	5	0.320	0.320	12	12	15		1	5	0.320	0.320	12	12	15
5	50	0.320	0.018	12	11	86	0.193	5	50	0.320	0.320	12	12	169
Without Project AAHUs:						**2**		**With Project AAHUs:**						**4**
													Net AAHUs:	**2**

Fire Island to Montauk Point, NY Reformulation Study

MB-2D WHPTIN Pikes (Westhampton Dunes - Pikes Beach)

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	595	595	324	323.9	0	1	0.545	0.545	595	595	324
1	5	0.545	0.545	595	595	1,296		1	5	0.545	0.545	595	585	1,285
5	50	0.545	0.477	595	535	13,004	255.4	5	50	0.545	0.545	585	585	14,343
					Without Project AAHUs:	**292**							**With Project AAHUs:**	**319**
													Net AAHUs:	**27**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.650	0.650	39	39	25		0	1	0.650	0.650	39	39	25
1	5	0.650	0.650	39	39	102		1	5	0.650	0.783	39	53	133
5	50	0.650	0.620	39	35	1,064	21.86	5	50	0.783	0.783	53	53	1,876
					Without Project AAHUs:	**23.825**							**With Project AAHUs:**	**40.691**
													Net AAHUs:	**17**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.485	0.485	50	50	24		0	1	0.485	0.485	50	50	24
1	5	0.485	0.485	50	50	97		1	5	0.485	0.622	50	45	105
5	50	0.485	0.259	50	45	799	11.63	5	50	0.622	0.622	45	45	1,271
					Without Project AAHUs:	**18**							**With Project AAHUs:**	**28**
													Net AAHUs:	**10**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.891	0.891	192	192	171		0	1	0.891	0.891	192	192	171
1	5	0.891	0.891	192	192	683		1	5	0.891	0.891	192	192	683
5	50	0.891	0.723	192	172	6,623	124.6	5	50	0.891	0.891	192	192	7,687
					Without Project AAHUs:	**150**							**With Project AAHUs:**	**171**
													Net AAHUs:	**21**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

MB-2D WHPTIN Pikes (Westhampton Dunes - Pikes Beach)

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.525	0.525	111	111	58		0	1	0.525	0.525	111	111	58
1	5	0.525	0.525	111	111	232		1	5	0.525	0.525	111	111	232
5	50	0.525	0.324	111	111	2,113	35.84	5	50	0.525	0.525	111	111	2,612
Without Project AAHUs:						**48**		**With Project AAHUs:**						**58**
													Net AAHUs:	**10**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.320	0.320	101	101	32		0	1	0.320	0.320	101	101	32
1	5	0.320	0.320	101	101	130		1	5	0.320	0.320	101	101	130
5	50	0.320	0.018	101	91	745	1.674	5	50	0.320	0.320	101	101	1,461
Without Project AAHUs:						**18**		**With Project AAHUs:**						**32**
													Net AAHUs:	**14**

Fire Island to Montauk Point, NY Reformulation Study

MB-2E WHPTIN East (Westhampton Dunes - East)

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.239	0.239	562	562	134	134	0	1	0.239	0.239	562	562	134
1	5	0.239	0.239	562	562	536		1	5	0.239	0.239	562	562	536
5	50	0.239	0.240	562	506	5,745	121.3	5	50	0.239	0.239	562	562	6,028
Without Project AAHUs:						**128**		**With Project AAHUs:**						**134**
													Net AAHUs:	**6**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.220	0.220	42	42	9		0	1	0.220	0.220	42	42	9
1	5	0.220	0.220	42	42	37		1	5	0.220	0.429	42	42	55
5	50	0.220	0.198	42	38	378	7.547	5	50	0.429	0.429	42	42	816
Without Project AAHUs:						**8.499**		**With Project AAHUs:**						**17.605**
													Net AAHUs:	**9**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.434	0.434	73	73	32		0	1	0.434	0.434	73	73	32
1	5	0.434	0.434	73	73	126		1	5	0.434	0.522	73	73	139
5	50	0.434	0.233	73	65	1,041	15.2	5	50	0.522	0.522	73	73	1,706
Without Project AAHUs:						**24**		**With Project AAHUs:**						**38**
													Net AAHUs:	**14**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.781	0.781	73	73	57		0	1	0.781	0.781	73	73	57
1	5	0.781	0.781	73	73	227		1	5	0.781	0.781	73	73	227
5	50	0.781	0.835	73	80	2,773	66.67	5	50	0.781	0.781	73	73	2,552
Without Project AAHUs:						**61**		**With Project AAHUs:**						**57**
													Net AAHUs:	**-4**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

MB-2E WHPTIN East (Westhampton Dunes - East)

AAHU Calculation Summary (Large Scenario)

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.466	125	125	58		0	1	0.466	0.466	125	125	58
1	5	0.466	0.466	125	125	233		1	5	0.466	0.466	125	125	233
5	50	0.466	0.321	125	125	2,216	40.19	5	50	0.466	0.466	125	125	2,624
					Without Project AAHUs:	**50**							**With Project AAHUs:**	**58**
													Net AAHUs:	**8**

UPLANDS Community

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.320	0.320	119	119	38		0	1	0.320	0.320	119	119	38
1	5	0.320	0.320	119	119	153		1	5	0.320	0.320	119	119	153
5	50	0.320	0.018	119	108	877	1.971	5	50	0.320	0.320	119	119	1,720
					Without Project AAHUs:	**21**							**With Project AAHUs:**	**38**
													Net AAHUs:	**17**

Fire Island to Montauk Point, NY Reformulation Study

SB-1B Sedge Island

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	297	297	170	169.9	0	1	0.572	0.572	297	297	170
1	5	0.572	0.572	297	297	680		1	5	0.572	0.572	297	292	674
5	50	0.572	0.424	297	268	6,342	113.4	5	50	0.572	0.572	292	292	7,516
Without Project AAHUs:						**144**		**With Project AAHUs:**						**167**
Net AAHUs:														**23**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.590	0.590	12	12	7		0	1	0.590	0.590	12	12	7
1	5	0.590	0.590	12	12	28		1	5	0.590	0.800	12	22	48
5	50	0.590	0.553	12	11	290	5.91	5	50	0.800	0.800	22	22	791
Without Project AAHUs:						**6.504**		**With Project AAHUs:**						**16.919**
Net AAHUs:														**10**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.616	0.616	28	28	17		0	1	0.616	0.616	28	28	17
1	5	0.616	0.616	28	28	69		1	5	0.616	0.665	28	23	65
5	50	0.616	0.353	28	25	579	8.828	5	50	0.665	0.665	23	23	684
Without Project AAHUs:						**13**		**With Project AAHUs:**						**15**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.781	0.781	110	110	86		0	1	0.781	0.781	110	110	86
1	5	0.781	0.781	110	110	342		1	5	0.781	0.781	110	110	342
5	50	0.781	0.835	110	121	4,184	100.6	5	50	0.781	0.781	110	110	3,850
Without Project AAHUs:						**92**		**With Project AAHUs:**						**86**
Net AAHUs:														**-7**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

SB-1B Sedge Island

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.466	0.466	57	57	27		0	1	0.466	0.466	57	57	27
1	5	0.466	0.466	57	57	106		1	5	0.466	0.466	57	57	106
5	50	0.466	0.321	57	57	1,009	18.3	5	50	0.466	0.466	57	57	1,195
Without Project AAHUs:						**23**		**With Project AAHUs:**						**27**
Net AAHUs:														**4**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.320	0.320	78	78	25		0	1	0.320	0.320	78	78	25
1	5	0.320	0.320	78	78	100		1	5	0.320	0.320	78	78	100
5	50	0.320	0.018	78	70	575	1.291	5	50	0.320	0.320	78	78	1,126
Without Project AAHUs:						**14**		**With Project AAHUs:**						**25**
Net AAHUs:														**11**

Fire Island to Montauk Point, NY Reformulation Study

SB-1C Tiana

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	232	232	133	132.7	0	1	0.572	0.572	232	232	133
1	5	0.572	0.572	232	232	531		1	5	0.572	0.572	232	225	523
5	50	0.572	0.424	232	209	4,952	88.55	5	50	0.572	0.572	225	225	5,799
Without Project AAHUs:						**112**		**With Project AAHUs:**						**129**
Net AAHUs:														**17**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.590	0.590	8	8	5		0	1	0.590	0.590	8	8	5
1	5	0.590	0.590	8	8	20		1	5	0.590	0.800	8	15	33
5	50	0.590	0.553	8	8	205	4.178	5	50	0.800	0.800	15	15	535
Without Project AAHUs:						**4.598**		**With Project AAHUs:**						**11.464**
Net AAHUs:														**7**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.643	0.643	7	7	4		0	1	0.643	0.643	7	7	4
1	5	0.643	0.643	7	7	17		1	5	0.643	0.665	7	7	17
5	50	0.643	0.379	7	6	144	2.24	5	50	0.665	0.665	7	7	200
Without Project AAHUs:						**3**		**With Project AAHUs:**						**4**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.671	0.671	18	18	12		0	1	0.671	0.671	18	18	12
1	5	0.671	0.671	18	18	49		1	5	0.671	0.671	18	18	49
5	50	0.671	0.531	18	16	467	8.663	5	50	0.671	0.671	18	18	548
Without Project AAHUs:						**11**		**With Project AAHUs:**						**12**
Net AAHUs:														**2**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

SB-1C Tiana

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.614	0.614	39	39	24		0	1	0.614	0.614	39	39	24
1	5	0.614	0.614	39	39	95		1	5	0.614	0.614	39	39	95
5	50	0.614	0.430	39	39	906	16.59	5	50	0.614	0.614	39	39	1,066
Without Project AAHUs:						**20**		**With Project AAHUs:**						**24**
Net AAHUs:														**3**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.350	0.350	32	32	11		0	1	0.350	0.350	32	32	11
1	5	0.350	0.350	32	32	45		1	5	0.350	0.350	32	32	45
5	50	0.350	0.023	32	29	263	0.681	5	50	0.350	0.350	32	32	510
Without Project AAHUs:						**6**		**With Project AAHUs:**						**11**
Net AAHUs:														**5**

Fire Island to Montauk Point, NY Reformulation Study

SB-1D Shinnecock Inlet Park-West

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.762	0.762	423	423	322	322.2	0	1	0.762	0.762	423	423	322
1	5	0.762	0.762	423	423	1,289		1	5	0.762	0.762	423	410	1,269
5	50	0.762	0.551	423	381	11,899	209.6	5	50	0.762	0.762	410	410	14,051
Without Project AAHUs:						**270**		**With Project AAHUs:**						**313**
													Net AAHUs:	**43**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.519	0.519	15	15	8		0	1	0.519	0.519	15	15	8
1	5	0.519	0.519	15	15	31		1	5	0.519	0.729	15	28	54
5	50	0.519	0.470	15	13	312	6.243	5	50	0.729	0.729	28	28	913
Without Project AAHUs:						**7.013**		**With Project AAHUs:**						**19.495**
													Net AAHUs:	**12**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.542	0.542	37	37	20		0	1	0.542	0.542	37	37	20
1	5	0.542	0.542	37	37	79		1	5	0.542	0.683	37	37	90
5	50	0.542	0.303	37	33	665	9.993	5	50	0.683	0.683	37	37	1,127
Without Project AAHUs:						**15**		**With Project AAHUs:**						**25**
													Net AAHUs:	**9**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.619	0.619	137	137	85		0	1	0.619	0.619	137	137	85
1	5	0.619	0.619	137	137	339		1	5	0.619	0.619	137	137	339
5	50	0.619	0.512	137	123	3,315	63.07	5	50	0.619	0.619	137	137	3,813
Without Project AAHUs:						**75**		**With Project AAHUs:**						**85**
													Net AAHUs:	**10**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

SB-1D Shinnecock Inlet Park-West

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.525	0.525	72	72	38		0	1	0.525	0.525	72	72	38
1	5	0.525	0.525	72	72	152		1	5	0.525	0.525	72	72	152
5	50	0.525	0.352	72	72	1,424	25.42	5	50	0.525	0.525	72	72	1,705
					Without Project AAHUs:	**32**							**With Project AAHUs:**	**38**
													Net AAHUs:	**6**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.283	0.283	30	30	9		0	1	0.283	0.283	30	30	9
1	5	0.283	0.283	30	30	34		1	5	0.283	0.283	30	30	34
5	50	0.283	0.012	30	27	192	0.315	5	50	0.283	0.283	30	30	383
					Without Project AAHUs:	**5**							**With Project AAHUs:**	**9**
													Net AAHUs:	**4**

Fire Island to Montauk Point, NY Reformulation Study

SB-2B WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.953	0.953	230	230	219	219.5	0	1	0.953	0.953	230	230	219
1	5	0.953	0.953	230	230	878		1	5	0.953	0.953	230	224	865
5	50	0.953	0.678	230	207	8,054	140.6	5	50	0.953	0.953	224	224	9,581
Without Project AAHUs:						**183**		**With Project AAHUs:**						**213**
Net AAHUs:														**30**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.458	0.458	18	18	8		0	1	0.458	0.458	18	18	8
1	5	0.458	0.458	18	18	33		1	5	0.458	0.658	18	22	45
5	50	0.458	0.397	18	16	326	6.353	5	50	0.658	0.658	22	22	661
Without Project AAHUs:						**7.328**		**With Project AAHUs:**						**14.282**
Net AAHUs:														**7**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.430	0.430	31	31	13		0	1	0.430	0.430	31	31	13
1	5	0.430	0.430	31	31	52		1	5	0.430	0.770	31	33	76
5	50	0.430	0.215	31	27	423	5.895	5	50	0.770	0.770	33	33	1,140
Without Project AAHUs:						**10**		**With Project AAHUs:**						**25**
Net AAHUs:														**15**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.567	0.567	39	39	22		0	1	0.567	0.567	39	39	22
1	5	0.567	0.567	39	39	87		1	5	0.567	0.567	39	39	87
5	50	0.567	0.493	39	39	919	19	5	50	0.567	0.567	39	39	983
Without Project AAHUs:						**21**		**With Project AAHUs:**						**22**
Net AAHUs:														**1**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

SB-2B WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.436	0.436	44	44	19		0	1	0.436	0.436	44	44	19
1	5	0.436	0.436	44	44	78		1	5	0.436	0.436	44	44	78
5	50	0.436	0.274	44	44	711	12.2	5	50	0.436	0.436	44	44	872
Without Project AAHUs:						**16**		**With Project AAHUs:**						**19**
								Net AAHUs:						**3**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.217	0.217	13	13	3		0	1	0.217	0.217	13	13	3
1	5	0.217	0.217	13	13	11		1	5	0.217	0.217	13	13	11
5	50	0.217	0.000	13	12	62	0	5	50	0.217	0.217	13	13	129
Without Project AAHUs:						**2**		**With Project AAHUs:**						**3**
								Net AAHUs:						**1**

Fire Island to Montauk Point, NY Reformulation Study

P1-G Potato Road

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.182	0.182	162	162	29	29.49	0	1	0.182	0.182	162	162	29
1	5	0.182	0.182	162	162	118		1	5	0.182	0.182	162	152	114
5	50	0.182	0.080	162	162	954	12.92	5	50	0.182	0.182	152	152	1,238
Without Project AAHUs:						**22**		**With Project AAHUs:**						**28**
Net AAHUs:														**6**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	8	8	4		0	1	0.545	0.545	8	8	4
1	5	0.545	0.545	8	8	17		1	5	0.545	0.783	8	21	39
5	50	0.545	0.522	8	8	186	4.048	5	50	0.783	0.783	21	21	733
Without Project AAHUs:						**4.148**		**With Project AAHUs:**						**15.521**
Net AAHUs:														**11**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.610	0.610	5	5	3		0	1	0.610	0.610	5	5	3
1	5	0.610	0.610	5	5	13		1	5	0.610	0.722	5	3	12
5	50	0.610	0.333	5	5	116	1.82	5	50	0.722	0.722	3	3	109
Without Project AAHUs:						**3**		**With Project AAHUs:**						**2**
Net AAHUs:														**0**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

P1-G Potato Road

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
													Net AAHUs:	**0**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.473	0.473	69	69	33		0	1	0.473	0.473	69	69	33
1	5	0.473	0.473	69	69	131		1	5	0.473	0.473	69	69	131
5	50	0.473	0.302	69	69	1,208	20.89	5	50	0.473	0.473	69	69	1,475
Without Project AAHUs:						**27**		**With Project AAHUs:**						**33**
													Net AAHUs:	**5**

Fire Island to Montauk Point, NY Reformulation Study

M-1F Montauk

AAHU Calculation Summary (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.154	0.154	165	165	26	25.54	0	1	0.154	0.154	165	165	26
1	5	0.154	0.154	165	165	102		1	5	0.154	0.154	165	144	95
5	50	0.154	0.066	165	165	820	10.91	5	50	0.154	0.154	144	144	997
					Without Project AAHUs:	**19**							**With Project AAHUs:**	**22**
													Net AAHUs:	**3**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.387	0.387	11	11	4		0	1	0.387	0.387	11	11	4
1	5	0.387	0.387	11	11	18		1	5	0.387	0.626	11	27	40
5	50	0.387	0.360	11	11	191	4.096	5	50	0.626	0.626	27	27	752
					Without Project AAHUs:	**4.268**							**With Project AAHUs:**	**15.915**
													Net AAHUs:	**12**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.617	0.617	11	11	7		0	1	0.617	0.617	11	11	7
1	5	0.617	0.617	11	11	28		1	5	0.617	0.619	11	18	36
5	50	0.617	0.355	11	11	247	4.005	5	50	0.619	0.619	18	18	499
					Without Project AAHUs:	**6**							**With Project AAHUs:**	**11**
													Net AAHUs:	**5**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**0**
													Net AAHUs:	**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

M-1F Montauk

AAHU Calculation Summary (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.550	0.550	102	102	56		0	1	0.550	0.550	102	102	56
1	5	0.550	0.550	102	102	224		1	5	0.550	0.550	102	102	224
5	50	0.550	0.318	102	102	1,992	32.46	5	50	0.550	0.550	102	102	2,523
Without Project AAHUs:						**45**		**With Project AAHUs:**						**56**
Net AAHUs:														**11**

SUMMARY
OF

HSI, HU AND ACRES

FOR

BASELINE, FUTURE NO-ACTION, AND FUTURE WITH-ACTION CONDITIONS AT PROJECT SITES

(SMALL SCENARIO)

Comparison of HSI Scores for Baseline, Future no-action, and Future with-project (Small Scenario).

		Baseline	No Action	Alternative 1
GSB-1A	RMSP	0.489	0.343	0.490
GSB-1B	FILT	0.470	0.318	0.471
GSB-2A	Kismet to Lonelyville	0.383	0.282	0.385
GSB-2B	Town Beach to Corneille	0.343	0.326	0.466
GSB-2C	Ocean Beach to Seaview	0.349	0.332	0.461
GSB-2D	OBP to POW	0.348	0.331	0.461
GSB-3A	Cherry Grove	0.343	0.326	0.455
GSB-3C	Fire Island Pines	0.352	0.335	0.466
GSB-3D	Talisman to Water Island	0.384	0.355	0.502
GSB-3E	Water Island	0.338	0.258	0.408
GSB-3F	Blue Point	0.389	0.347	0.501
GSB-3G	Davis Park	0.268	0.261	0.381
GSB-4B	Old Inlet	0.666	0.542	0.674
MB-1A	SPCP-TWA	0.485	0.343	0.488
MB-1B	SPCP	0.491	0.356	0.498
MB-2C	Cupsogue	0.532	0.404	0.534
MB-2D	WHPTIN Pikes	0.573	0.407	0.576
MB-2E	WHPTIN East	0.410	0.307	0.410
SB-1B	Sedge Island	0.557	0.417	0.567
SB-1C	Tiana	0.573	0.390	0.579
SB-1D	Shinnecock Inlet Park-West	0.542	0.367	0.543
SB-2B	WOSI	0.515	0.348	0.523
P-1G	Potato Road	0.306	0.211	0.311
M-1F	Montauk	0.285	0.183	0.279

Comparison of HU's for Baseline, Future no-action, and Future with-project (Small Scenario).

		Baseline	No Action	Alternative 1
GSB-1A	RMSP	864	541	863
GSB-1B	FILT	272	145	272
GSB-2A	Kismet to Lonelyville	402	280	397
GSB-2B	Town Beach to Corneille	167	158	230
GSB-2C	Ocean Beach to Seaview	139	151	232
GSB-2D	OBP to POW	327	303	429
GSB-3A	Cherry Grove	105	94	130
GSB-3C	Fire Island Pines	258	242	340
GSB-3D	Talisman to Water Island	301	247	336
GSB-3E	Water Island	44	35	49
GSB-3F	Blue Point	220	188	261
GSB-3G	Davis Park	93	95	129
GSB-4B	Old Inlet	1072	885	1079
MB-1A	SPCP-TWA	95	67	95
MB-1B	SPCP	667	511	670
MB-2C	Cupsogue	135	114	135
MB-2D	WHPTIN Pikes	634	450	636
MB-2E	WHPTIN East	328	253	328
SB-1B	Sedge Island	331	248	333
SB-1C	Tiana	189	121	190
SB-1D	Shinnecock Inlet Park-West	481	315	478
SB-2B	WOSI	287	186	288
P-1G	Potato Road	70	40	74
M-1F	Montauk	93	51	98

Comparison of Acres for Baseline, Future no-action, and Future with-project (Small Scenario).

		Baseline	No Action	Alternative 1
GSB-1A	RMSP	1,853	1,692	1,853
GSB-1B	FILT	583	534	583
GSB-2A	Kismet to Lonelyville	978	901	978
GSB-2B	Town Beach to Corneille	445	412	445
GSB-2C	Ocean Beach to Seaview	406	371	406
GSB-2D	OBP to POW	813	749	813
GSB-3A	Cherry Grove	234	215	234
GSB-3C	Fire Island Pines	604	552	604
GSB-3D	Talisman to Water Island	618	566	618
GSB-3E	Water Island	96	89	96
GSB-3F	Blue Point	479	444	479
GSB-3G	Davis Park	380	349	380
GSB-4B	Old Inlet	1,684	1,565	1,684
MB-1A	SPCP-TWA	192	175	192
MB-1B	SPCP	1,277	1,185	1,277
MB-2C	Cupsogue	232	221	232
MB-2D	WHPTIN Pikes	1,084	987	1,084
MB-2E	WHPTIN East	994	922	994
SB-1B	Sedge Island	582	551	582
SB-1C	Tiana	336	306	336
SB-1D	Shinnecock Inlet Park-West	713	649	713
SB-2B	WOSI	378	349	378
P-1G	Potato Road	245	245	245
M-1F	Montauk	290	290	290

BASELINE CONDITIONS

HSIs, HUs and Acres

Shoreline Protection Project - Baseline HSI Scores per Transect and Community (Small Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
GSB-1A	Robert Moses State Park	0.42	0.40	0.56	0.52	0.52	0.52	0.489
GSB-1B	Fire Island Lighthouse Tract	0.54	0.55	0.31	0.69	0.54	0.19	0.470
GSB-2A	Kismet to Lonelyville	0.57	0.36	0.50	0.15	0.53	0.19	0.383
GSB-2B	Town Beach to Corneille	0.57	0.37	0.43	0.15	0.53	0.00	0.343
GSB-2C	Ocean Beach to Seaview	0.57	0.37	0.47	0.15	0.53	0.00	0.349
GSB-2D	Ocean Beach Park to Point of Woods	0.57	0.37	0.47	0.15	0.53	0.00	0.348
GSB-3A	Cherry Grove	0.57	0.37	0.43	0.15	0.53	0.00	0.343
GSB-3C	Fire Island Pines	0.57	0.36	0.50	0.15	0.53	0.00	0.352
GSB-3D	Talisman to Water Island	0.57	0.40	0.43	0.49	0.41	0.00	0.384
GSB-3E	Water Island	0.57	0.40	0.41	0.21	0.35	0.09	0.338
GSB-3F	Water Island to Davis Park	0.57	0.40	0.49	0.53	0.35	0.00	0.389
GSB-3G	Davis Park	0.24	0.22	0.47	0.15	0.53	0.00	0.268
GSB-4B	Old Inlet	0.59	0.64	0.73	0.78	0.47	0.78	0.666
MB-1A	Smith Point County Park-TWA	0.54	0.47	0.60	0.59	0.49	0.22	0.485
MB-1B	Smith Point County Park	0.54	0.48	0.52	0.51	0.47	0.42	0.491
MB-2C	Cupsogue	0.54	0.47	0.61	0.78	0.47	0.32	0.532
MB-2D	Westhampton Pikes Beach	0.54	0.64	0.52	0.89	0.53	0.32	0.573
MB-2E	Westhampton East	0.24	0.22	0.43	0.78	0.47	0.32	0.410
SB-1B	Sedge Island	0.57	0.59	0.62	0.78	0.47	0.32	0.557
SB-1C	Tiana	0.57	0.59	0.64	0.67	0.61	0.35	0.573
SB-1D	Shinnecock Inlet Park-West	0.76	0.52	0.54	0.62	0.52	0.28	0.542
SB-2B	WOSI	0.95	0.46	0.46	0.57	0.44	0.22	0.515
P-1G	Potato Road	0.18	0.54	0.64	0.00	0.00	0.47	0.306
M-1F	Montauk	0.15	0.39	0.62	0.00	0.00	0.55	0.285

Shoreline Protection Project - Baseline HU Scores per Transect and Community (Small Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
GSB-1A	Robert Moses State Park	433	19	103	26	98	184	863.58
GSB-1B	Fire Island Lighthouse Tract	170	13	13	22	34	21	272.21
GSB-2A	Kismet to Lonelyville	266	6	9	17	54	50	401.66
GSB-2B	Town Beach to Corneille	117	5	7	9	28	0	166.92
GSB-2C	Ocean Beach to Seaview	106	6	3	3	22	0	139.43
GSB-2D	Ocean Beach Park to Point of Woods	249	6	14	14	44	0	327.07
GSB-3A	Cherry Grove	77	4	5	1	18	0	104.55
GSB-3C	Fire Island Pines	203	5	9	3	39	0	258.15
GSB-3D	Talisman to Water Island	237	11	13	8	33	0	301.35
GSB-3E	Water Island	35	2	2	0	5	1	44.39
GSB-3F	Water Island to Davis Park	178	7	7	6	22	0	219.92
GSB-3G	Davis Park	59	2	6	1	25	0	93.25
GSB-4B	Old Inlet	532	26	89	254	80	92	1,071.82
MB-1A	Smith Point County Park-TWA	64	3	10	3	11	6	95.39
MB-1B	Smith Point County Park	457	28	32	52	70	27	666.92
MB-2C	Cupsogue	65	3	12	40	11	4	134.56
MB-2D	Westhampton Pikes Beach	324	23	26	171	58	32	634.18
MB-2E	Westhampton East	134	9	32	57	58	38	328.05
SB-1B	Sedge Island	170	7	17	86	27	25	331.22
SB-1C	Tiana	133	5	4	12	24	11	189.07
SB-1D	Shinnecock Inlet Park-West	322	8	20	85	38	9	480.87
SB-2B	WOSI	219	10	14	22	19	3	287.36
P-1G	Potato Road	29	4	3	0	0	33	69.99
M-1F	Montauk	26	4	7	0	0	56	92.98

Shoreline Protection Project - Baseline Acres per Transect and Community (Small Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL ACRES
GSB-1A	RMSP	1,026	49	185	49	189	356	1,853
GSB-1B	FILT	312	24	41	32	63	112	583
GSB-2A	**Kismet to Lonelyville**	466	18	18	108	102	266	978
GSB-2B	**Town Beach to Corneille**	205	14	17	62	52	94	445
GSB-2C	**Ocean Beach to Seaview**	185	15	6	20	42	137	406
GSB-2D	**OBP to POW**	436	17	30	92	83	156	813
GSB-3A	**Cherry Grove**	135	11	10	6	34	38	234
GSB-3C	**Fire Island Pines**	355	13	18	17	74	127	604
GSB-3D	Talisman to Water Island	414	28	29	16	81	50	618
GSB-3E	**Water Island**	60	4	5	0	14	12	96
GSB-3F	Water Island to Davis Park	312	17	14	11	63	61	479
GSB-3G	**Davis Park**	249	10	12	10	46	53	380
GSB-4B	Old Inlet	909	40	121	325	172	117	1,684
MB-1A	SPCP-TWA	117	6	16	5	22	26	192
MB-1B	SPCP	840	58	61	102	151	64	1,277
MB-2C	Cupsogue	119	7	20	51	23	12	232
MB-2D	**WHPTIN Pikes**	595	36	50	192	111	101	1,084
MB-2E	**WHPTIN East**	562	42	73	73	125	119	994
SB-1B	Sedge Island	297	12	28	110	57	78	582
SB-1C	Tiana	232	8	7	18	39	32	336
SB-1D	Shinnecock Inlet Park-West	423	15	37	137	72	30	713
SB-2B	**WOSI**	230	21	31	39	44	13	378
P-1G	**Potato Road**	162	8	5	0	0	69	245
M-1F	**Montauk**	165	11	11	0	0	102	290

FUTURE NO-ACTION CONDITIONS

HSIs, HUs and Acres

(Future conditions without project or restoration activities)

Shoreline Protection Project - Future No-action HSI Scores per Transect and Community (Small Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
GSB-1A	Robert Moses State Park	0.32	0.36	0.32	0.44	0.33	0.30	0.343
GSB-1B	Fire Island Lighthouse Tract	0.32	0.52	0.10	0.62	0.34	0.00	0.318
GSB-2A	Kismet to Lonelyville	0.51	0.34	0.29	0.10	0.44	0.00	0.282
GSB-2B	Town Beach to Corneille	0.51	0.35	0.23	0.10	0.44	0.32	0.326
GSB-2C	Ocean Beach to Seaview	0.51	0.35	0.27	0.10	0.44	0.32	0.332
GSB-2D	Ocean Beach Park to Point of Woods	0.51	0.35	0.27	0.10	0.44	0.32	0.331
GSB-3A	Cherry Grove	0.51	0.35	0.23	0.10	0.44	0.32	0.326
GSB-3C	Fire Island Pines	0.51	0.34	0.29	0.10	0.44	0.32	0.335
GSB-3D	Talisman to Water Island	0.51	0.36	0.21	0.48	0.26	0.32	0.355
GSB-3E	Water Island	0.51	0.35	0.20	0.13	0.20	0.16	0.258
GSB-3F	Water Island to Davis Park	0.51	0.35	0.26	0.45	0.20	0.32	0.347
GSB-3G	Davis Park	0.24	0.20	0.27	0.10	0.44	0.32	0.261
GSB-4B	Old Inlet	0.53	0.59	0.47	0.83	0.32	0.51	0.542
MB-1A	Smith Point County Park-TWA	0.48	0.44	0.32	0.49	0.34	0.00	0.343
MB-1B	Smith Point County Park	0.48	0.45	0.24	0.52	0.32	0.12	0.356
MB-2C	Cupsogue	0.48	0.44	0.34	0.83	0.32	0.02	0.404
MB-2D	Westhampton Pikes Beach	0.48	0.61	0.30	0.72	0.32	0.02	0.407
MB-2E	Westhampton East	0.24	0.20	0.23	0.83	0.32	0.02	0.307
SB-1B	Sedge Island	0.42	0.55	0.35	0.83	0.32	0.02	0.417
SB-1C	Tiana	0.42	0.55	0.38	0.53	0.43	0.02	0.390
SB-1D	Shinnecock Inlet Park-West	0.55	0.47	0.30	0.51	0.35	0.01	0.367
SB-2B	WOSI	0.68	0.40	0.25	0.49	0.27	0.00	0.348
P-1G	Potato Road	0.08	0.52	0.36	0.00	0.00	0.30	0.211
M-1F	Montauk	0.07	0.36	0.36	0.00	0.00	0.32	0.183

Shoreline Protection Project - Future No-action HU Scores per Transect and Community (Small Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
GSB-1A	Robert Moses State Park	294	16	53	22	62	95	541.17
GSB-1B	Fire Island Lighthouse Tract	89	11	4	20	22	0	145.35
GSB-2A	Kismet to Lonelyville	213	5	5	11	45	0	279.64
GSB-2B	Town Beach to Corneille	94	5	4	6	23	27	158.25
GSB-2C	Ocean Beach to Seaview	85	5	1	2	19	39	150.96
GSB-2D	Ocean Beach Park to Point of Woods	199	5	7	9	37	45	302.59
GSB-3A	Cherry Grove	62	3	2	1	15	11	93.94
GSB-3C	Fire Island Pines	162	4	5	2	33	36	241.99
GSB-3D	Talisman to Water Island	190	9	5	8	21	14	246.80
GSB-3E	Water Island	28	1	1	0	3	2	34.69
GSB-3F	Water Island to Davis Park	143	5	3	5	14	18	187.79
GSB-3G	Davis Park	54	2	3	1	21	15	95.32
GSB-4B	Old Inlet	433	21	51	271	55	53	885.32
MB-1A	Smith Point County Park-TWA	50	2	5	3	7	0	66.94
MB-1B	Smith Point County Park	361	24	13	58	49	7	511.40
MB-2C	Cupsogue	51	3	6	47	7	0	114.15
MB-2D	Westhampton Pikes Beach	255	20	13	125	36	2	450.40
MB-2E	Westhampton East	121	8	15	67	40	2	252.90
SB-1B	Sedge Island	113	6	9	101	18	1	248.32
SB-1C	Tiana	89	4	2	9	17	1	120.90
SB-1D	Shinnecock Inlet Park-West	210	6	10	63	25	0	314.67
SB-2B	WOSI	141	8	7	19	12	0	186.13
P-1G	Potato Road	13	4	2	0	0	21	39.83
M-1F	Montauk	11	4	4	0	0	32	51.46

Shoreline Protection Project - Future No-action Acres per Transect and Community (Small Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL ACRES
GSB-1A	RMSP	924	44	166	49	189	320	1,692
GSB-1B	FILT	281	21	37	32	63	101	534
GSB-2A	Kismet to Lonelyville	419	16	16	108	102	239	901
GSB-2B	Town Beach to Corneille	184	13	16	62	52	85	412
GSB-2C	Ocean Beach to Seaview	166	14	5	20	42	124	371
GSB-2D	OBP to POW	392	15	27	92	83	140	749
GSB-3A	Cherry Grove	122	10	9	6	34	34	215
GSB-3C	Fire Island Pines	319	12	16	17	74	114	552
GSB-3D	Talisman to Water Island	373	25	26	16	81	45	566
GSB-3E	Water Island	54	4	5	0	15	11	89
GSB-3F	Water Island to Davis Park	281	16	13	11	69	55	444
GSB-3G	Davis Park	224	9	11	11	46	48	349
GSB-4B	Old Inlet	818	36	109	325	172	105	1,565
MB-1A	SPCP-TWA	105	5	14	5	22	24	175
MB-1B	SPCP	756	53	55	112	151	58	1,185
MB-2C	Cupsogue	107	6	18	56	23	11	221
MB-2D	WHPTIN Pikes	535	32	45	172	111	91	987
MB-2E	WHPTIN East	506	38	65	80	125	108	922
SB-1B	Sedge Island	268	11	25	121	57	70	551
SB-1C	Tiana	209	8	6	16	39	29	306
SB-1D	Shinnecock Inlet Park-West	381	13	33	123	72	27	649
SB-2B	WOSI	207	19	27	39	44	12	349
P-1G	Potato Road	162	8	5	0	0	69	245
M-1F	Montauk	165	11	11	0	0	102	290

FUTURE WITH-ACTION CONDITIONS

HSIs, HUs and Acres

(Future conditions with project or restoration activities)

Shoreline Protection Project - Future with Action HSI Scores per Transect and Community (Small Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
GSB-1A	Robert Moses State Park	0.42	0.40	0.56	0.52	0.52	0.52	0.490
GSB-1B	Fire Island Lighthouse Tract	0.54	0.55	0.31	0.69	0.54	0.19	0.471
GSB-2A	Kismet to Lonelyville	0.57	0.37	0.50	0.15	0.53	0.19	0.385
GSB-2B	Town Beach to Corneille	0.57	0.37	0.50	0.15	0.53	0.67	0.466
GSB-2C	Ocean Beach to Seaview	0.57	0.37	0.47	0.15	0.53	0.67	0.461
GSB-2D	Ocean Beach Park to Point of Wo	0.57	0.37	0.47	0.15	0.53	0.67	0.461
GSB-3A	Cherry Grove	0.57	0.37	0.43	0.15	0.53	0.67	0.455
GSB-3C	Fire Island Pines	0.57	0.37	0.50	0.15	0.53	0.67	0.466
GSB-3D	Talisman to Water Island	0.57	0.40	0.47	0.49	0.41	0.67	0.502
GSB-3E	Water Island	0.57	0.40	0.50	0.21	0.35	0.43	0.408
GSB-3F	Water Island to Davis Park	0.57	0.40	0.49	0.53	0.35	0.67	0.501
GSB-3G	Davis Park	0.24	0.22	0.47	0.15	0.53	0.67	0.381
GSB-4B	Old Inlet	0.59	0.65	0.78	0.78	0.47	0.78	0.674
MB-1A	Smith Point County Park-TWA	0.54	0.48	0.60	0.59	0.49	0.22	0.488
MB-1B	Smith Point County Park	0.54	0.48	0.56	0.51	0.47	0.42	0.498
MB-2C	Cupsogue	0.54	0.48	0.61	0.78	0.47	0.32	0.534
MB-2D	Westhampton Pikes Beach	0.54	0.65	0.52	0.89	0.53	0.32	0.576
MB-2E	Westhampton East	0.24	0.22	0.43	0.78	0.47	0.32	0.410
SB-1B	Sedge Island	0.57	0.60	0.67	0.78	0.47	0.32	0.567
SB-1C	Tiana	0.57	0.60	0.67	0.67	0.61	0.35	0.579
SB-1D	Shinnecock Inlet Park-West	0.76	0.53	0.54	0.62	0.52	0.28	0.543
SB-2B	WOSI	0.95	0.46	0.51	0.57	0.44	0.22	0.523
P-1G	Potato Road	0.18	0.55	0.66	0.00	0.00	0.47	0.311
M-1F	Montauk	0.15	0.39	0.58	0.00	0.00	0.55	0.279

Shoreline Protection Project - Future with Action HU Scores per Transect and Community (Small Scenario)

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
GSB-1A	Robert Moses State Park	421	30	103	26	98	184	863.15
GSB-1B	Fire Island Lighthouse Tract	168	14	13	22	34	21	272.34
GSB-2A	Kismet to Lonelyville	253	15	9	17	54	50	397.21
GSB-2B	Town Beach to Corneille	115	8	7	9	28	63	230.23
GSB-2C	Ocean Beach to Seaview	106	6	3	3	22	92	231.88
GSB-2D	Ocean Beach Park to Point of Woods	239	13	14	14	44	105	428.62
GSB-3A	Cherry Grove	77	4	5	1	18	26	130.22
GSB-3C	Fire Island Pines	193	11	9	3	39	85	340.31
GSB-3D	Talisman to Water Island	237	11	13	8	33	33	335.94
GSB-3E	Water Island	36	2	2	0	5	5	49.02
GSB-3F	Water Island to Davis Park	178	7	7	6	22	41	261.08
GSB-3G	Davis Park	57	4	6	1	25	36	128.97
GSB-4B	Old Inlet	514	44	95	254	80	92	1,079.18
MB-1A	Smith Point County Park-TWA	62	4	10	3	11	6	95.28
MB-1B	Smith Point County Park	458	28	34	52	70	27	669.55
MB-2C	Cupsogue	64	4	12	40	11	4	134.52
MB-2D	Westhampton Pikes Beach	318	30	26	171	58	32	635.82
MB-2E	Westhampton East	134	9	32	57	58	38	328.20
SB-1B	Sedge Island	167	13	15	86	27	25	332.53
SB-1C	Tiana	129	9	5	12	24	11	189.51
SB-1D	Shinnecock Inlet Park-West	312	15	20	85	38	9	477.97
SB-2B	WOSI	218	10	16	22	19	3	288.33
P-1G	Potato Road	28	10	3	0	0	33	73.82
M-1F	Montauk	23	9	9	0	0	56	97.65

Project Future With Action Acres per Transect and Per Community (Small Scenario)

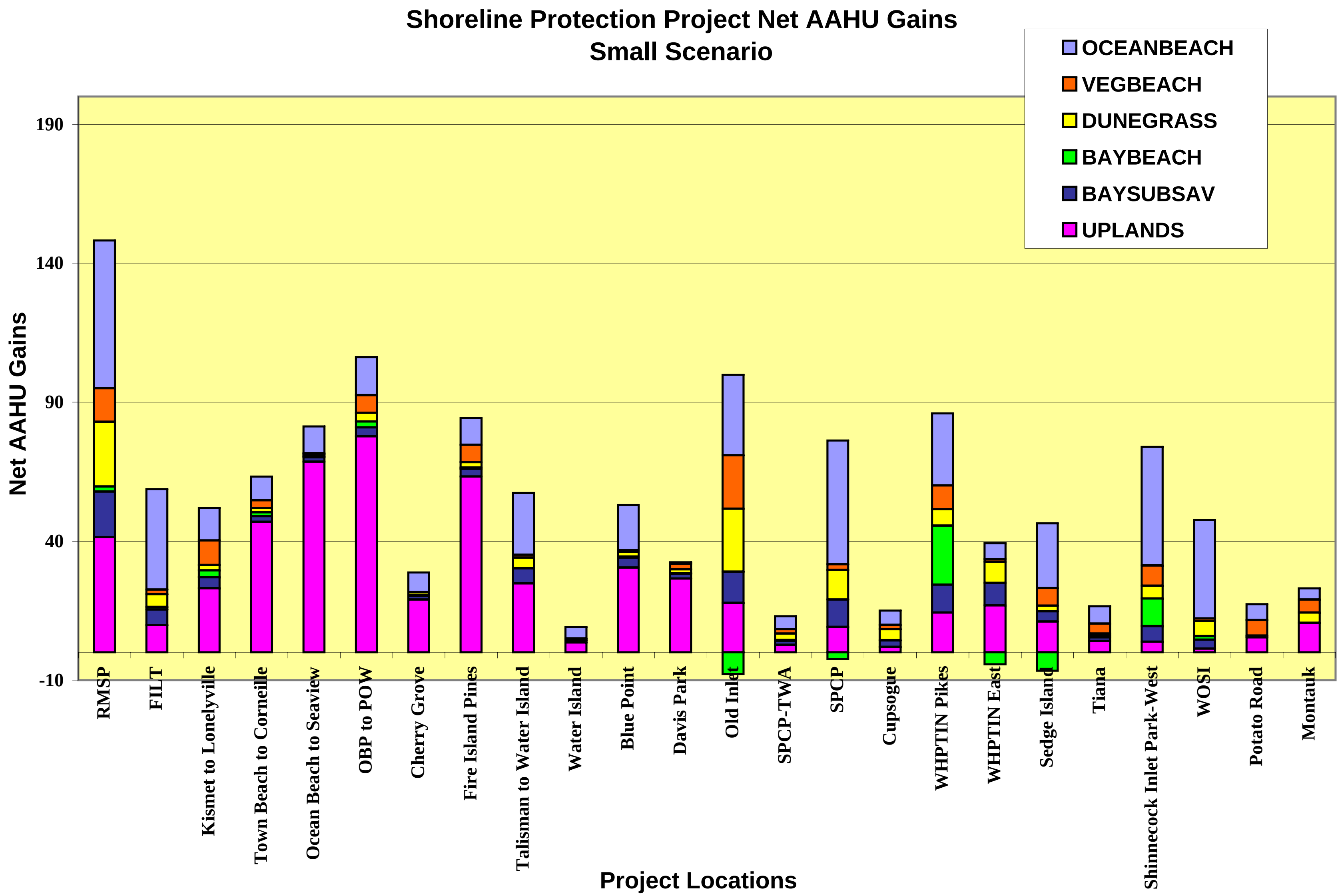
		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL ACRES
GSB-1A	RMSP	999	76	185	49	189	356	1,853
GSB-1B	FILT	309	25	42	32	63	112	583
GSB-2A	Kismet to Lonelyville	442	41	18	108	102	266	978
GSB-2B	Town Beach to Corneille	201	21	15	62	52	94	445
GSB-2C	Ocean Beach to Seaview	185	15	6	20	42	137	406
GSB-2D	OBP to POW	419	33	30	92	83	156	813
GSB-3A	Cherry Grove	135	11	10	6	34	38	234
GSB-3C	Fire Island Pines	338	30	18	17	74	127	604
GSB-3D	Talisman to Water Island	415	28	28	16	81	50	618
GSB-3E	Water Island	62	4	4	0	14	12	96
GSB-3F	Water Island to Davis Park	312	17	14	11	63	61	479
GSB-3G	Davis Park	240	18	12	10	46	53	380
GSB-4B	Old Inlet	879	68	122	325	172	117	1,684
MB-1A	SPCP-TWA	114	9	16	5	22	26	192
MB-1B	SPCP	840	58	60	102	151	64	1,277
MB-2C	Cupsogue	117	9	20	51	23	12	232
MB-2D	WHPTIN Pikes	584	47	50	192	111	101	1,084
MB-2E	WHPTIN East	562	42	73	73	125	119	994
SB-1B	Sedge Island	292	22	23	110	57	78	582
SB-1C	Tiana	225	15	7	18	39	32	336
SB-1D	Shinnecock Inlet Park-West	410	28	37	137	72	30	713
SB-2B	WOSI	229	21	32	39	44	13	378
P-1G	Potato Road	152	18	5	0	0	69	245
M-1F	Montauk	148	23	16	0	0	102	290

SUMMARY
OF

AAHU'S

FOR
SHORELINE PROTECTION
PROJECT SITES

(SMALL SCENARIO)


Shoreline Protection Project Net AAHU Gains
Small Scenario
OCEANBEACH
VEGBEACH
DUNEGRASS
BAYBEACH
BAYSUBSAV
UPLANDS
Net AAHU Gains
190
140
90
40
-10
RMSP
FILT
Kismet to Lonelyville
Town Beach to Corneille
Ocean Beach to Seaview
OBP to POW
Cherry Grove
Fire Island Pines
Talisman to Water Island
Water Island
Blue Point
Davis Park
Old Inlet
SPCP-TWA
SPCP
Cupsogue
WHPTIN Pikes
WHPTIN East
Sedge Island
Tiana
Shinnecock Inlet Park-West
WOSI
Potato Road
Montauk
Project Locations

			OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	U
GSB-1A	RMSP	148	53	12	23	2	16	
GSB-1B	FILT	59	36	2	5	1	6	
GSB-2A	Kismet to Lonelyville	52	12	9	2	2	4	
GSB-2B	Town Beach to Corneille	63	9	3	2	1	2	
GSB-2C	Ocean Beach to Seaview	81	10	0	1	0	2	
GSB-2D	OBP to POW	106	14	6	3	2	3	
GSB-3A	Cherry Grove	29	7	0	1	0	1	
GSB-3C	Fire Island Pines	84	10	6	2	0	3	
GSB-3D	Talisman to Water Island	57	22	1	4	0	5	
GSB-3E	Water Island	9	4	0	1	0	1	
GSB-3F	Blue Point	53	16	1	2	0	4	
GSB-3G	Davis Park	32	1	2	1	0	2	
GSB-4B	Old Inlet	92	29	19	23	-8	11	
MB-1A	SPCP-TWA	13	5	2	2	0	1	
MB-1B	SPCP	74	45	2	11	-3	10	
MB-2C	Cupsogue	15	5	2	4	0	2	
MB-2D	WHPTIN Pikes	86	26	9	6	21	10	
MB-2E	WHPTIN East	35	6	1	8	-4	8	
SB-1B	Sedge Island	40	23	6	2	-7	4	
SB-1C	Tiana	17	6	4	1	1	1	

Fire Island to Montauk Point, NY Reformulation Study

GSB-1A RMSP (Robert Moses State Park)

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.422	0.422	1,026	1,026	433	432.9	0	1	0.422	0.422	1,026	1,026	433
1	5	0.422	0.422	1,026	1,026	1,732		1	5	0.422	0.422	1,026	999	1,709
5	50	0.422	0.319	1,026	924	16,283	294.3	5	50	0.422	0.422	999	999	18,962
Without Project AAHUs:						**369**		**With Project AAHUs:**						**422**
Net AAHUs:														**53**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.396	0.396	49	49	19		0	1	0.396	0.396	49	49	19
1	5	0.396	0.396	49	49	77		1	5	0.396	0.400	49	76	99
5	50	0.396	0.360	49	44	785	15.72	5	50	0.400	0.400	76	76	1,365
Without Project AAHUs:						**17.633**		**With Project AAHUs:**						**29.672**
Net AAHUs:														**12**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.559	0.559	185	185	103		0	1	0.559	0.559	185	185	103
1	5	0.559	0.559	185	185	413		1	5	0.559	0.559	185	185	413
5	50	0.559	0.317	185	166	3,477	52.78	5	50	0.559	0.559	185	185	4,645
Without Project AAHUs:						**80**		**With Project AAHUs:**						**103**
Net AAHUs:														**23**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.521	0.521	49	49	26		0	1	0.521	0.521	49	49	26
1	5	0.521	0.521	49	49	102		1	5	0.521	0.521	49	49	102
5	50	0.521	0.439	49	49	1,061	21.57	5	50	0.521	0.521	49	49	1,151
Without Project AAHUs:						**24**		**With Project AAHUs:**						**26**
Net AAHUs:														**2**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-1A RMSP (Robert Moses State Park)

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.521	0.521	189	189	98		0	1	0.521	0.521	189	189	98
1	5	0.521	0.521	189	189	394		1	5	0.521	0.521	189	189	394
5	50	0.521	0.328	189	189	3,611	62.02	5	50	0.521	0.521	189	189	4,430
Without Project AAHUs:						**82**		**With Project AAHUs:**						**98**
													Net AAHUs:	**16**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.518	0.518	356	356	184		0	1	0.518	0.518	356	356	184
1	5	0.518	0.518	356	356	737		1	5	0.518	0.518	356	356	737
5	50	0.518	0.296	356	320	6,217	94.76	5	50	0.518	0.518	356	356	8,288
Without Project AAHUs:						**143**		**With Project AAHUs:**						**184**
													Net AAHUs:	**41**

Fire Island to Montauk Point, NY Reformulation Study

GSB-1B FILT (Fire Island Lighthouse)

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	312	312	170	169.7	0	1	0.545	0.545	312	312	170
1	5	0.545	0.545	312	312	679		1	5	0.545	0.545	312	309	676
5	50	0.545	0.318	312	281	5,772	89.2	5	50	0.545	0.545	309	309	7,581
Without Project AAHUs:						**132**		**With Project AAHUs:**						**169**
													Net AAHUs:	**36**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.550	0.550	24	24	13		0	1	0.550	0.550	24	24	13
1	5	0.550	0.550	24	24	52		1	5	0.550	0.550	24	25	54
5	50	0.550	0.520	24	21	541	11.07	5	50	0.550	0.550	25	25	624
Without Project AAHUs:						**12.123**		**With Project AAHUs:**						**13.808**
													Net AAHUs:	**1.685**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.306	0.306	41	41	13		0	1	0.306	0.306	41	41	13
1	5	0.306	0.306	41	41	50		1	5	0.306	0.313	41	42	51
5	50	0.306	0.101	41	37	360	3.724	5	50	0.313	0.313	42	42	588
Without Project AAHUs:						**8**		**With Project AAHUs:**						**13**
													Net AAHUs:	**5**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.687	0.687	32	32	22		0	1	0.687	0.687	32	32	22
1	5	0.687	0.687	32	32	87		1	5	0.687	0.687	32	32	87
5	50	0.687	0.624	32	32	936	19.81	5	50	0.687	0.687	32	32	981
Without Project AAHUs:						**21**		**With Project AAHUs:**						**22**
													Net AAHUs:	**1**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-1B FILT (Fire Island Lighthouse)

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	63	63	34		0	1	0.545	0.545	63	63	34
1	5	0.545	0.545	63	63	137		1	5	0.545	0.545	63	63	137
5	50	0.545	0.343	63	63	1,254	21.55	5	50	0.545	0.545	63	63	1,539
Without Project AAHUs:						**29**		**With Project AAHUs:**						**34**
Net AAHUs:														**6**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.187	112	112	21		0	1	0.187	0.187	112	112	21
1	5	0.187	0.187	112	112	84		1	5	0.187	0.187	112	112	84
5	50	0.187	0.000	112	101	456	0	5	50	0.187	0.187	112	112	943
Without Project AAHUs:						**11**		**With Project AAHUs:**						**21**
Net AAHUs:														**10**

Fire Island to Montauk Point, NY Reformulation Study

GSB-2A Kismet to Lonelyville

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	466	466	266	266.2	0	1	0.572	0.572	466	466	266
1	5	0.572	0.572	466	466	1,065		1	5	0.572	0.572	466	442	1,038
5	50	0.572	0.509	466	419	10,765	213.2	5	50	0.572	0.572	442	442	11,380
Without Project AAHUs:						**242**		**With Project AAHUs:**						**254**
Net AAHUs:														**12**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.363	0.363	18	18	6		0	1	0.363	0.363	18	18	6
1	5	0.363	0.363	18	18	26		1	5	0.363	0.373	18	41	43
5	50	0.363	0.342	18	16	265	5.405	5	50	0.373	0.373	41	41	688
Without Project AAHUs:						**5.939**		**With Project AAHUs:**						**14.743**
Net AAHUs:														**9**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.495	0.495	18	18	9		0	1	0.495	0.495	18	18	9
1	5	0.495	0.495	18	18	36		1	5	0.495	0.495	18	18	36
5	50	0.495	0.294	18	16	307	4.796	5	50	0.495	0.495	18	18	404
Without Project AAHUs:						**7**		**With Project AAHUs:**						**9**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	108	108	17		0	1	0.153	0.153	108	108	17
1	5	0.153	0.153	108	108	66		1	5	0.153	0.153	108	108	66
5	50	0.153	0.101	108	108	618	10.96	5	50	0.153	0.153	108	108	743
Without Project AAHUs:						**14**		**With Project AAHUs:**						**17**
Net AAHUs:														**2**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-2A Kismet to Lonelyville

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	102	102	54		0	1	0.529	0.529	102	102	54
1	5	0.529	0.529	102	102	216		1	5	0.529	0.529	102	102	216
5	50	0.529	0.444	102	102	2,232	45.29	5	50	0.529	0.529	102	102	2,427
Without Project AAHUs:						**50**		**With Project AAHUs:**						**54**
Net AAHUs:														**4**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.187	0.187	266	266	50		0	1	0.187	0.187	266	266	50
1	5	0.187	0.187	266	266	198		1	5	0.187	0.187	266	266	198
5	50	0.187	0.000	266	239	1,079	0	5	50	0.187	0.187	266	266	2,233
Without Project AAHUs:						**27**		**With Project AAHUs:**						**50**
Net AAHUs:														**23**

Fire Island to Montauk Point, NY Reformulation Study

GSB 2B Town Beach to Corneille

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	205	205	117	117	0	1	0.572	0.572	205	205	117
1	5	0.572	0.572	205	205	468		1	5	0.572	0.572	205	201	463
5	50	0.572	0.509	205	184	4,731	93.69	5	50	0.572	0.572	201	201	5,162
Without Project AAHUs:						**106**		**With Project AAHUs:**						**115**
Net AAHUs:														**9**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.370	0.370	14	14	5		0	1	0.370	0.370	14	14	5
1	5	0.370	0.370	14	14	21		1	5	0.370	0.373	14	21	26
5	50	0.370	0.348	14	13	221	4.503	5	50	0.373	0.373	21	21	353
Without Project AAHUs:						**4.944**		**With Project AAHUs:**						**7.688**
Net AAHUs:														**3**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	17	17	7		0	1	0.434	0.434	17	17	7
1	5	0.434	0.434	17	17	30		1	5	0.434	0.495	17	15	30
5	50	0.434	0.233	17	16	247	3.613	5	50	0.495	0.495	15	15	326
Without Project AAHUs:						**6**		**With Project AAHUs:**						**7**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	62	62	9		0	1	0.153	0.153	62	62	9
1	5	0.153	0.153	62	62	38		1	5	0.153	0.153	62	62	38
5	50	0.153	0.101	62	62	354	6.27	5	50	0.153	0.153	62	62	425
Without Project AAHUs:						**8**		**With Project AAHUs:**						**9**
Net AAHUs:														**1**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB 2B Town Beach to Corneille

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	52	52	28		0	1	0.529	0.529	52	52	28
1	5	0.529	0.529	52	52	111		1	5	0.529	0.529	52	52	111
5	50	0.529	0.444	52	52	1,145	23.24	5	50	0.529	0.529	52	52	1,245
Without Project AAHUs:						**26**		**With Project AAHUs:**						**28**
								Net AAHUs:						**2**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	94	94	0		0	1	0.000	0.000	94	94	0
1	5	0.000	0.000	94	94	0		1	5	0.000	0.673	94	94	127
5	50	0.000	0.318	94	85	629	26.94	5	50	0.673	0.673	94	94	2,849
Without Project AAHUs:						**13**		**With Project AAHUs:**						**60**
								Net AAHUs:						**47**

Fire Island to Montauk Point, NY Reformulation Study

GSB-2C Ocean Beach to Seaview

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	185	185	106	105.7	0	1	0.572	0.572	185	185	106
1	5	0.572	0.572	185	185	423		1	5	0.572	0.572	185	185	423
5	50	0.572	0.509	185	166	4,273	84.62	5	50	0.572	0.572	185	185	4,755
Without Project AAHUs:						**96**		**With Project AAHUs:**						**106**
Net AAHUs:														**10**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.373	0.373	15	15	6		0	1	0.373	0.373	15	15	6
1	5	0.373	0.373	15	15	23		1	5	0.373	0.373	15	15	23
5	50	0.373	0.352	15	14	234	4.781	5	50	0.373	0.373	15	15	254
Without Project AAHUs:						**5.248**		**With Project AAHUs:**						**5.639**
Net AAHUs:														**0**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.467	0.467	6	6	3		0	1	0.467	0.467	6	6	3
1	5	0.467	0.467	6	6	10		1	5	0.467	0.467	6	6	10
5	50	0.467	0.266	6	5	87	1.319	5	50	0.467	0.467	6	6	116
Without Project AAHUs:						**2**		**With Project AAHUs:**						**3**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	20	20	3		0	1	0.153	0.153	20	20	3
1	5	0.153	0.153	20	20	12		1	5	0.153	0.153	20	20	12
5	50	0.153	0.101	20	20	116	2.053	5	50	0.153	0.153	20	20	139
Without Project AAHUs:						**3**		**With Project AAHUs:**						**3**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-2C Ocean Beach to Seaview

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	42	42	22		0	1	0.529	0.529	42	42	22
1	5	0.529	0.529	42	42	90		1	5	0.529	0.529	42	42	90
5	50	0.529	0.444	42	42	929	18.85	5	50	0.529	0.529	42	42	1,010
Without Project AAHUs:						**21**		**With Project AAHUs:**						**22**
													Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	137	137	0		0	1	0.000	0.000	137	137	0
1	5	0.000	0.000	137	137	0		1	5	0.000	0.673	137	137	185
5	50	0.000	0.318	137	124	918	39.34	5	50	0.673	0.673	137	137	4,160
Without Project AAHUs:						**18**		**With Project AAHUs:**						**87**
													Net AAHUs:	**69**

Fire Island to Montauk Point, NY Reformulation Study

GSB-2D OBP to POW (Ocean Beach to Point of Woods)

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	436	436	249	248.9	0	1	0.572	0.572	436	436	249
1	5	0.572	0.572	436	436	996		1	5	0.572	0.572	436	419	976
5	50	0.572	0.509	436	392	10,065	199.3	5	50	0.572	0.572	419	419	10,769
Without Project AAHUs:						**226**		**With Project AAHUs:**						**240**
													Net AAHUs:	**14**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.368	0.368	17	17	6		0	1	0.368	0.368	17	17	6
1	5	0.368	0.368	17	17	25		1	5	0.368	0.373	17	33	37
5	50	0.368	0.347	17	15	255	5.201	5	50	0.373	0.373	33	33	563
Without Project AAHUs:						**5.712**		**With Project AAHUs:**						**12.120**
													Net AAHUs:	**6**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.467	0.467	30	30	14		0	1	0.467	0.467	30	30	14
1	5	0.467	0.467	30	30	55		1	5	0.467	0.467	30	30	55
5	50	0.467	0.266	30	27	465	7.062	5	50	0.467	0.467	30	30	621
Without Project AAHUs:						**11**		**With Project AAHUs:**						**14**
													Net AAHUs:	**3**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	92	92	14		0	1	0.153	0.153	92	92	14
1	5	0.153	0.153	92	92	56		1	5	0.153	0.153	92	92	56
5	50	0.153	0.101	92	92	527	9.34	5	50	0.153	0.153	92	92	633
Without Project AAHUs:						**12**		**With Project AAHUs:**						**14**
													Net AAHUs:	**2**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-2D OBP to POW (Ocean Beach to Point of Woods)

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	83	83	44		0	1	0.529	0.529	83	83	44
1	5	0.529	0.529	83	83	177		1	5	0.529	0.529	83	83	177
5	50	0.529	0.444	83	83	1,827	37.06	5	50	0.529	0.529	83	83	1,986
Without Project AAHUs:						**41**		**With Project AAHUs:**						**44**
Net AAHUs:														**3**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	156	156	0		0	1	0.000	0.000	156	156	0
1	5	0.000	0.000	156	156	0		1	5	0.000	0.673	156	156	210
5	50	0.000	0.318	156	140	1,040	44.59	5	50	0.673	0.673	156	156	4,716
Without Project AAHUs:						**21**		**With Project AAHUs:**						**99**
Net AAHUs:														**78**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3A Cherry Grove

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	135	135	77	77.27	0	1	0.572	0.572	135	135	77
1	5	0.572	0.572	135	135	309		1	5	0.572	0.572	135	135	309
5	50	0.572	0.509	135	122	3,124	61.87	5	50	0.572	0.572	135	135	3,477
Without Project AAHUs:						**70**		**With Project AAHUs:**						**77**
Net AAHUs:														**7**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.370	0.370	11	11	4		0	1	0.370	0.370	11	11	4
1	5	0.370	0.370	11	11	16		1	5	0.370	0.370	11	0	8
5	50	0.370	0.348	11	10	166	3.392	5	50	0.370	0.370	11	11	180
Without Project AAHUs:						**3.724**		**With Project AAHUs:**						**3.848**
Net AAHUs:														**0**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.434	0.434	10	10	5		0	1	0.434	0.434	10	10	5
1	5	0.434	0.434	10	10	18		1	5	0.434	0.434	10	10	18
5	50	0.434	0.233	10	9	150	2.195	5	50	0.434	0.434	10	10	205
Without Project AAHUs:						**3**		**With Project AAHUs:**						**5**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	6	6	1		0	1	0.153	0.153	6	6	1
1	5	0.153	0.153	6	6	4		1	5	0.153	0.153	6	6	4
5	50	0.153	0.101	6	6	35	0.626	5	50	0.153	0.153	6	6	42
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3A Cherry Grove

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	34	34	18		0	1	0.529	0.529	34	34	18
1	5	0.529	0.529	34	34	71		1	5	0.529	0.529	34	34	71
5	50	0.529	0.444	34	34	736	14.93	5	50	0.529	0.529	34	34	800
Without Project AAHUs:						**17**		**With Project AAHUs:**						**18**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	38	38	0		0	1	0.000	0.000	38	38	0
1	5	0.000	0.000	38	38	0		1	5	0.000	0.673	38	38	51
5	50	0.000	0.318	38	34	255	10.92	5	50	0.673	0.673	38	38	1,155
Without Project AAHUs:						**5**		**With Project AAHUs:**						**24**
													Net AAHUs:	**19**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3C Fire Island Pines

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	355	355	203	202.8	0	1	0.572	0.572	355	355	203
1	5	0.572	0.572	355	355	811		1	5	0.572	0.572	355	338	792
5	50	0.572	0.509	355	319	8,199	162.4	5	50	0.572	0.572	338	338	8,701
Without Project AAHUs:						**184**		**With Project AAHUs:**						**194**
Net AAHUs:														**10**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.363	0.363	13	13	5		0	1	0.363	0.363	13	13	5
1	5	0.363	0.363	13	13	19		1	5	0.363	0.373	13	30	32
5	50	0.363	0.342	13	12	198	4.038	5	50	0.373	0.373	30	30	497
Without Project AAHUs:						**4.437**		**With Project AAHUs:**						**10.673**
Net AAHUs:														**6**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.495	0.495	18	18	9		0	1	0.495	0.495	18	18	9
1	5	0.495	0.495	18	18	36		1	5	0.495	0.495	18	18	36
5	50	0.495	0.294	18	16	307	4.794	5	50	0.495	0.495	18	18	404
Without Project AAHUs:						**7**		**With Project AAHUs:**						**9**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.153	17	17	3		0	1	0.153	0.153	17	17	3
1	5	0.153	0.153	17	17	10		1	5	0.153	0.153	17	17	10
5	50	0.153	0.101	17	17	98	1.732	5	50	0.153	0.153	17	17	117
Without Project AAHUs:						**2**		**With Project AAHUs:**						**3**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3C Fire Island Pines

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.529	0.529	74	74	39		0	1	0.529	0.529	74	74	39
1	5	0.529	0.529	74	74	156		1	5	0.529	0.529	74	74	156
5	50	0.529	0.444	74	74	1,615	32.76	5	50	0.529	0.529	74	74	1,755
Without Project AAHUs:						**36**		**With Project AAHUs:**						**39**
Net AAHUs:														**3**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	127	127	0		0	1	0.000	0.000	127	127	0
1	5	0.000	0.000	127	127	0		1	5	0.000	0.673	127	127	171
5	50	0.000	0.318	127	114	847	36.29	5	50	0.673	0.673	127	127	3,838
Without Project AAHUs:						**17**		**With Project AAHUs:**						**80**
Net AAHUs:														**63**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3D Talisman to Water Island

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	414	414	237	236.7	0	1	0.572	0.572	414	414	237
1	5	0.572	0.572	414	414	947		1	5	0.572	0.572	414	415	948
5	50	0.572	0.509	414	373	9,573	189.6	5	50	0.572	0.572	415	415	10,682
					Without Project AAHUs:	**215**							**With Project AAHUs:**	**237**
													Net AAHUs:	**22**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.400	0.400	28	28	11		0	1	0.400	0.400	28	28	11
1	5	0.400	0.400	28	28	45		1	5	0.400	0.400	28	28	45
5	50	0.400	0.357	28	25	452	8.969	5	50	0.400	0.400	28	28	503
					Without Project AAHUs:	**10.165**							**With Project AAHUs:**	**11.177**
													Net AAHUs:	**1**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.433	0.433	29	29	13		0	1	0.433	0.433	29	29	13
1	5	0.433	0.433	29	29	50		1	5	0.433	0.468	29	28	51
5	50	0.433	0.207	29	26	400	5.406	5	50	0.468	0.468	28	28	588
					Without Project AAHUs:	**9**							**With Project AAHUs:**	**13**
													Net AAHUs:	**4**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.495	0.495	16	16	8		0	1	0.495	0.495	16	16	8
1	5	0.495	0.495	16	16	31		1	5	0.495	0.495	16	16	31
5	50	0.495	0.481	16	16	346	7.576	5	50	0.495	0.495	16	16	351
					Without Project AAHUs:	**8**							**With Project AAHUs:**	**8**
													Net AAHUs:	**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3D Talisman to Water Island

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.407	0.407	81	81	33		0	1	0.407	0.407	81	81	33
1	5	0.407	0.407	81	81	132		1	5	0.407	0.407	81	81	132
5	50	0.407	0.259	81	81	1,216	21.02	5	50	0.407	0.407	81	81	1,486
Without Project AAHUs:						**28**		**With Project AAHUs:**						**33**
													Net AAHUs:	**5**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	50	50	0		0	1	0.000	0.000	50	50	0
1	5	0.000	0.000	50	50	0		1	5	0.000	0.673	50	50	67
5	50	0.000	0.318	50	45	332	14.24	5	50	0.673	0.673	50	50	1,506
Without Project AAHUs:						**7**		**With Project AAHUs:**						**31**
													Net AAHUs:	**25**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3E Water Island

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.572	60	60	35	34.51	0	1	0.572	0.572	60	60	35
1	5	0.572	0.572	60	60	138		1	5	0.572	0.572	60	62	140
5	50	0.572	0.509	60	54	1,395	27.63	5	50	0.572	0.572	62	62	1,600
Without Project AAHUs:						**31**		**With Project AAHUs:**						**35**
								Net AAHUs:						**4**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.396	0.396	4	4	2		0	1	0.396	0.396	4	4	2
1	5	0.396	0.396	4	4	7		1	5	0.396	0.396	4	4	7
5	50	0.396	0.353	4	4	67	1.324	5	50	0.396	0.396	4	4	74
Without Project AAHUs:						**1.502**		**With Project AAHUs:**						**1.652**
								Net AAHUs:						**0**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.413	0.413	5	5	2		0	1	0.413	0.413	5	5	2
1	5	0.413	0.413	5	5	9		1	5	0.413	0.495	5	4	8
5	50	0.413	0.202	5	5	72	0.995	5	50	0.495	0.495	5	4	101
Without Project AAHUs:						**2**		**With Project AAHUs:**						**2**
								Net AAHUs:						**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.209	0.209	0	0	0		0	1	0.209	0.209	0	0	0
1	5	0.209	0.209	0	0	0		1	5	0.209	0.209	0	0	0
5	50	0.209	0.127	0	0	2	0.035	5	50	0.209	0.209	0	0	3
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
								Net AAHUs:						**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3E Water Island

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.347	0.347	14	14	5		0	1	0.347	0.347	14	14	5
1	5	0.347	0.347	14	14	19		1	5	0.347	0.347	14	14	19
5	50	0.347	0.197	14	15	177	2.985	5	50	0.347	0.347	14	14	216
Without Project AAHUs:						**4**		**With Project AAHUs:**						**5**
Net AAHUs:														**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.093	0.093	12	12	1		0	1	0.093	0.093	12	12	1
1	5	0.093	0.093	12	12	4		1	5	0.093	0.430	12	12	13
5	50	0.093	0.159	12	11	64	1.72	5	50	0.430	0.430	12	12	232
Without Project AAHUs:						**1**		**With Project AAHUs:**						**5**
Net AAHUs:														**4**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3F Blue Point Beach

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	312	312	178	178.5	0	1	0.572	0.572	312	312	178
1	5	0.572	0.572	312	312	714		1	5	0.572	0.572	312	312	714
5	50	0.572	0.509	312	281	7,216	142.9	5	50	0.572	0.572	312	312	8,031
Without Project AAHUs:						**162**		**With Project AAHUs:**						**178**
Net AAHUs:														**16**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.396	0.396	17	17	7		0	1	0.396	0.396	17	17	7
1	5	0.396	0.396	17	17	27		1	5	0.396	0.396	17	17	27
5	50	0.396	0.353	17	16	277	5.483	5	50	0.396	0.396	17	17	308
Without Project AAHUs:						**6.218**		**With Project AAHUs:**						**6.840**
Net AAHUs:														**1**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.487	0.487	14	14	7		0	1	0.487	0.487	14	14	7
1	5	0.487	0.487	14	14	28		1	5	0.487	0.487	14	14	28
5	50	0.487	0.260	14	13	229	3.334	5	50	0.487	0.487	14	14	312
Without Project AAHUs:						**5**		**With Project AAHUs:**						**7**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.530	0.530	11	11	6		0	1	0.530	0.530	11	11	6
1	5	0.530	0.530	11	11	24		1	5	0.530	0.530	11	11	24
5	50	0.530	0.447	11	11	247	5.025	5	50	0.530	0.530	11	11	269
Without Project AAHUs:						**6**		**With Project AAHUs:**						**6**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3F Blue Point Beach

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.347	0.347	63	63	22		0	1	0.347	0.347	63	63	22
1	5	0.347	0.347	63	63	87		1	5	0.347	0.347	63	63	87
5	50	0.347	0.197	63	69	800	13.52	5	50	0.347	0.347	63	63	977
Without Project AAHUs:						**18**		**With Project AAHUs:**						**22**
Net AAHUs:														**4**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	61	61	0		0	1	0.000	0.000	61	61	0
1	5	0.000	0.000	61	61	0		1	5	0.000	0.673	61	61	82
5	50	0.000	0.318	61	55	409	17.51	5	50	0.673	0.673	61	61	1,852
Without Project AAHUs:						**8**		**With Project AAHUs:**						**39**
Net AAHUs:														**31**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3G Davis Park

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.239	0.239	249	249	59	59.29	0	1	0.239	0.239	249	249	59
1	5	0.239	0.239	249	249	237		1	5	0.239	0.239	249	240	233
5	50	0.239	0.240	249	224	2,543	53.7	5	50	0.239	0.239	240	240	2,576
Without Project AAHUs:						**57**		**With Project AAHUs:**						**57**
Net AAHUs:														**1**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.218	0.218	10	10	2		0	1	0.218	0.218	10	10	2
1	5	0.218	0.218	10	10	8		1	5	0.218	0.223	10	18	12.35
5	50	0.218	0.197	10	9	86	1.712	5	50	0.223	0.223	18	18	183
Without Project AAHUs:						**1.928**		**With Project AAHUs:**						**3.959**
Net AAHUs:														**2**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.467	0.467	12	12	6		0	1	0.467	0.467	12	12	6
1	5	0.467	0.467	12	12	23		1	5	0.467	0.467	12	12	23
5	50	0.467	0.266	12	11	196	2.974	5	50	0.467	0.467	12	12	262
Without Project AAHUs:						**4**		**With Project AAHUs:**						**6**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.153	10	10	1		0	1	0.153	0.153	10	10	1
1	5	0.153	0.153	10	10	6		1	5	0.153	0.153	10	10	6
5	50	0.153	0.101	10	11	58	1.085	5	50	0.153	0.153	10	10	67
Without Project AAHUs:						**1**		**With Project AAHUs:**						**1**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3G Davis Park

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.529	46	46	25		0	1	0.529	0.529	46	46	25
1	5	0.529	0.529	46	46	98		1	5	0.529	0.529	46	46	98
5	50	0.529	0.444	46	46	1,016	20.61	5	50	0.529	0.529	46	46	1,105
					Without Project AAHUs:	**23**							**With Project AAHUs:**	**25**
													Net AAHUs:	**2**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	53	53	0		0	1	0.000	0.000	53	53	0
1	5	0.000	0.000	53	53	0		1	5	0.000	0.673	53	53	72
5	50	0.000	0.318	53	48	355	15.23	5	50	0.673	0.673	53	53	1,611
					Without Project AAHUs:	**7**							**With Project AAHUs:**	**34**
													Net AAHUs:	**27**

Fire Island to Montauk Point, NY Reformulation Study

GSB-4B Old Inlet

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.585	0.585	909	909	532	531.6	0	1	0.585	0.585	909	909	532
1	5	0.585	0.585	909	909	2,127		1	5	0.585	0.585	909	879	2,092
5	50	0.585	0.530	909	818	21,668	433.1	5	50	0.585	0.585	879	879	23,150
Without Project AAHUs:						**487**		**With Project AAHUs:**						**515**
													Net AAHUs:	**29**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.645	0.645	40	40	26		0	1	0.645	0.645	40	40	26
1	5	0.645	0.645	40	40	104		1	5	0.645	0.650	40	68	140
5	50	0.645	0.587	40	36	1,058	21.21	5	50	0.650	0.650	68	68	1,985
Without Project AAHUs:						**23.759**		**With Project AAHUs:**						**43.013**
													Net AAHUs:	**19**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.735	0.735	121	121	89		0	1	0.735	0.735	121	121	89
1	5	0.735	0.735	121	121	355		1	5	0.735	0.776	121	122	367
5	50	0.735	0.473	121	109	3,129	51.41	5	50	0.776	0.776	121	122	4,248
Without Project AAHUs:						**71**		**With Project AAHUs:**						**94**
													Net AAHUs:	**23**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.781	0.781	325	325	254		0	1	0.781	0.781	325	325	254
1	5	0.781	0.781	325	325	1,015		1	5	0.781	0.781	325	325	1,015
5	50	0.781	0.835	325	325	11,808	271.1	5	50	0.781	0.781	325	325	11,415
Without Project AAHUs:						**262**		**With Project AAHUs:**						**254**
													Net AAHUs:	**-8**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-4B Old Inlet

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.466	172	172	80		0	1	0.466	0.466	172	172	80
1	5	0.466	0.466	172	172	321		1	5	0.466	0.466	172	172	321
5	50	0.466	0.321	172	172	3,052	55.35	5	50	0.466	0.466	172	172	3,614
Without Project AAHUs:						**69**		**With Project AAHUs:**						**80**
								Net AAHUs:						**11**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.783	117	117	92		0	1	0.783	0.783	117	117	92
1	5	0.783	0.783	117	117	366		1	5	0.783	0.783	117	117	366
5	50	0.783	0.505	117	105	3,232	53.14	5	50	0.783	0.783	117	117	4,121
Without Project AAHUs:						**74**		**With Project AAHUs:**						**92**
								Net AAHUs:						**18**

Fire Island to Montauk Point, NY Reformulation Study

MB-1A SPCP-TWA (Smith Point County Park-TWA)

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	117	117	64	63.65	0	1	0.545	0.545	117	117	64
1	5	0.545	0.545	117	117	255		1	5	0.545	0.545	117	114	251
5	50	0.545	0.477	117	105	2,555	50.19	5	50	0.545	0.545	114	114	2,791
Without Project AAHUs:						**57**		**With Project AAHUs:**						**62**
Net AAHUs:														**5**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.469	0.469	6	6	3		0	1	0.469	0.469	6	6	3
1	5	0.469	0.469	6	6	10		1	5	0.469	0.483	6	9	13
5	50	0.469	0.439	6	5	107	2.184	5	50	0.483	0.483	9	9	186
Without Project AAHUs:						**2.406**		**With Project AAHUs:**						**4.031**
Net AAHUs:														**2**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.597	0.597	16	16	10		0	1	0.597	0.597	16	16	10
1	5	0.597	0.597	16	16	38		1	5	0.597	0.597	16	16	38
5	50	0.597	0.321	16	14	316	4.619	5	50	0.597	0.597	16	16	430
Without Project AAHUs:						**7**		**With Project AAHUs:**						**10**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.593	0.593	5	5	3		0	1	0.593	0.593	5	5	3
1	5	0.593	0.593	5	5	13		1	5	0.593	0.593	5	5	13
5	50	0.593	0.486	5	5	133	2.653	5	50	0.593	0.593	5	5	146
Without Project AAHUs:						**3**		**With Project AAHUs:**						**3**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

MB-1A SPCP-TWA (Smith Point County Park-TWA)

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.490	0.490	22	22	11		0	1	0.490	0.490	22	22	11
1	5	0.490	0.490	22	22	42		1	5	0.490	0.490	22	22	42
5	50	0.490	0.337	22	22	403	7.296	5	50	0.490	0.490	22	22	478
Without Project AAHUs:						**9**		**With Project AAHUs:**						**11**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.217	0.217	26	26	6		0	1	0.217	0.217	26	26	6
1	5	0.217	0.217	26	26	23		1	5	0.217	0.217	26	26	23
5	50	0.217	0.000	26	24	124	0	5	50	0.217	0.217	26	26	257
Without Project AAHUs:						**3**		**With Project AAHUs:**						**6**
													Net AAHUs:	**3**

Fire Island to Montauk Point, NY Reformulation Study

MB-1B SPCP (Smith Point County Park)

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	840	840	457	457.3	0	1	0.545	0.545	840	840	457
1	5	0.545	0.545	840	840	1,829		1	5	0.545	0.545	840	840	1,830
5	50	0.545	0.477	840	756	18,359	360.5	5	50	0.545	0.545	840	840	20,586
Without Project AAHUs:						**413**		**With Project AAHUs:**						**457**
Net AAHUs:														**45**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.483	0.483	58	58	28		0	1	0.483	0.483	58	58	28
1	5	0.483	0.483	58	58	113		1	5	0.483	0.483	58	58	113
5	50	0.483	0.453	58	53	1,169	23.81	5	50	0.483	0.483	58	58	1,270
Without Project AAHUs:						**26.207**		**With Project AAHUs:**						**28.211**
Net AAHUs:														**2**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.521	0.521	61	61	32		0	1	0.521	0.521	61	61	32
1	5	0.521	0.521	61	61	127		1	5	0.521	0.564	61	60	132
5	50	0.521	0.244	61	55	1,006	13.43	5	50	0.564	0.564	60	60	1,535
Without Project AAHUs:						**23**		**With Project AAHUs:**						**34**
Net AAHUs:														**11**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.512	0.512	102	102	52		0	1	0.512	0.512	102	102	52
1	5	0.512	0.512	102	102	209		1	5	0.512	0.512	102	102	209
5	50	0.512	0.515	102	112	2,480	57.93	5	50	0.512	0.512	102	102	2,354
Without Project AAHUs:						**55**		**With Project AAHUs:**						**52**
Net AAHUs:														**-3**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

MB-1B SPCP (Smith Point County Park)

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.466	151	151	70		0	1	0.466	0.466	151	151	70
1	5	0.466	0.466	151	151	282		1	5	0.466	0.466	151	151	282
5	50	0.466	0.321	151	151	2,677	48.53	5	50	0.466	0.466	151	151	3,169
Without Project AAHUs:						**61**		**With Project AAHUs:**						**70**
Net AAHUs:														**10**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.417	0.417	64	64	27		0	1	0.417	0.417	64	64	27
1	5	0.417	0.417	64	64	107		1	5	0.417	0.417	64	64	107
5	50	0.417	0.123	64	58	751	7.15	5	50	0.417	0.417	64	64	1,208
Without Project AAHUs:						**18**		**With Project AAHUs:**						**27**
Net AAHUs:														**9**

Fire Island to Montauk Point, NY Reformulation Study

MB-2C Cupsogue

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	119	119	65	64.83	0	1	0.545	0.545	119	119	65
1	5	0.545	0.545	119	119	259		1	5	0.545	0.545	119	117	257
5	50	0.545	0.477	119	107	2,603	51.11	5	50	0.545	0.545	117	117	2,863
Without Project AAHUs:						**59**		**With Project AAHUs:**						**64**
Net AAHUs:														**5**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.469	0.469	7	7	3		0	1	0.469	0.469	7	7	3
1	5	0.469	0.469	7	7			1	5	0.469	0.483	7	9	15
5	50	0.469	0.439	7	6	132	2.692	5	50	0.483	0.483	9	9	196
Without Project AAHUs:						**2.711**		**With Project AAHUs:**						**4.296**
Net AAHUs:														**2**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.612	0.612	20	20	12		0	1	0.612	0.612	20	20	12
1	5	0.612	0.612	20	20			1	5	0.612	0.612	20	20	50
5	50	0.612	0.335	20	18	413	6.123	5	50	0.612	0.612	20	20	559
Without Project AAHUs:						**9**		**With Project AAHUs:**						**12**
Net AAHUs:														**4**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.781	0.781	51	51	40		0	1	0.781	0.781	51	51	40
1	5	0.781	0.781	51	51			1	5	0.781	0.781	51	51	159
5	50	0.781	0.835	51	56	1,941	46.66	5	50	0.781	0.781	51	51	1,786
Without Project AAHUs:						**40**		**With Project AAHUs:**						**40**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

MB-2C Cupsogue

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.466	0.466	23	23	11		0	1	0.466	0.466	23	23	11
1	5	0.466	0.466	23	23			1	5	0.466	0.466	23	23	43
5	50	0.466	0.321	23	23	406	7.368	5	50	0.466	0.466	23	23	481
Without Project AAHUs:						**8**		**With Project AAHUs:**						**11**
Net AAHUs:														**2**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.320	0.320	12	12	4		0	1	0.320	0.320	12	12	4
1	5	0.320	0.320	12	12			1	5	0.320	0.320	12	12	15
5	50	0.320	0.018	12	11	86	0.193	5	50	0.320	0.320	12	12	169
Without Project AAHUs:						**2**		**With Project AAHUs:**						**4**
Net AAHUs:														**2**

Fire Island to Montauk Point, NY Reformulation Study

MB-2D WHPTIN Pikes (Westhampton Dunes - Pikes Beach)

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.545	595	595	324	323.9	0	1	0.545	0.545	595	595	324
1	5	0.545	0.545	595	595	1,296		1	5	0.545	0.545	595	584	1,284
5	50	0.545	0.477	595	535	13,004	255.4	5	50	0.545	0.545	584	584	14,312
Without Project AAHUs:						**292**		**With Project AAHUs:**						**318**
Net AAHUs:														**26**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.636	0.636	36	36	23		0	1	0.636	0.636	36	36	23
1	5	0.636	0.636	36	36	91		1	5	0.636	0.650	36	47	106
5	50	0.636	0.606	36	32	951	19.54	5	50	0.650	0.650	47	47	1,363
Without Project AAHUs:						**21.308**		**With Project AAHUs:**						**29.831**
Net AAHUs:														**9**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.523	0.523	50	50	26		0	1	0.523	0.523	50	50	26
1	5	0.523	0.523	50	50	105		1	5	0.523	0.523	50	50	105
5	50	0.523	0.297	50	45	880	13.33	5	50	0.523	0.523	50	50	1,176
Without Project AAHUs:						**20**		**With Project AAHUs:**						**26**
Net AAHUs:														**6**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.891	0.891	192	192	171		0	1	0.891	0.891	192	192	171
1	5	0.891	0.891	192	192	683		1	5	0.891	0.891	192	192	683
5	50	0.891	0.723	192	172	6,623	124.6	5	50	0.891	0.891	192	192	7,687
Without Project AAHUs:						**150**		**With Project AAHUs:**						**171**
Net AAHUs:														**21**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

MB-2D WHPTIN Pikes (Westhampton Dunes - Pikes Beach)

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.525	0.525	111	111	58		0	1	0.525	0.525	111	111	58
1	5	0.525	0.525	111	111	232		1	5	0.525	0.525	111	111	232
5	50	0.525	0.324	111	111	2,113	35.84	5	50	0.525	0.525	111	111	2,612
Without Project AAHUs:						**48**		**With Project AAHUs:**						**58**
Net AAHUs:														**10**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.320	0.320	101	101	32		0	1	0.320	0.320	101	101	32
1	5	0.320	0.320	101	101	130		1	5	0.320	0.320	101	101	130
5	50	0.320	0.018	101	91	745	1.674	5	50	0.320	0.320	101	101	1,461
Without Project AAHUs:						**18**		**With Project AAHUs:**						**32**
Net AAHUs:														**14**

Fire Island to Montauk Point, NY Reformulation Study

MB-2E WHPTIN East (Westhampton Dunes - East)

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.239	0.239	562	562	134	134	0	1	0.239	0.239	562	562	134
1	5	0.239	0.239	562	562	536		1	5	0.239	0.239	562	562	536
5	50	0.239	0.240	562	506	5,745	121.3	5	50	0.239	0.239	562	562	6,028
Without Project AAHUs:						**128**		**With Project AAHUs:**						**134**
Net AAHUs:														**6**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.220	0.220	42	42	9		0	1	0.220	0.220	42	42	9
1	5	0.220	0.220	42	42	37		1	5	0.220	0.223	42	42	38
5	50	0.220	0.198	42	38	378	7.547	5	50	0.223	0.223	42	42	425
Without Project AAHUs:						**8.499**		**With Project AAHUs:**						**9.443**
Net AAHUs:														**1**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.434	0.434	73	73	32		0	1	0.434	0.434	73	73	32
1	5	0.434	0.434	73	73	126		1	5	0.434	0.434	73	73	126
5	50	0.434	0.233	73	65	1,041	15.2	5	50	0.434	0.434	73	73	1,419
Without Project AAHUs:						**24**		**With Project AAHUs:**						**32**
Net AAHUs:														**8**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.781	0.781	73	73	57		0	1	0.781	0.781	73	73	57
1	5	0.781	0.781	73	73	227		1	5	0.781	0.781	73	73	227
5	50	0.781	0.835	73	80	2,773	66.67	5	50	0.781	0.781	73	73	2,552
Without Project AAHUs:						**61**		**With Project AAHUs:**						**57**
Net AAHUs:														**-4**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

MB-2E WHPTIN East (Westhampton Dunes - East)

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.466	125	125	58		0	1	0.466	0.466	125	125	58
1	5	0.466	0.466	125	125	233		1	5	0.466	0.466	125	125	233
5	50	0.466	0.321	125	125	2,216	40.19	5	50	0.466	0.466	125	125	2,624
Without Project AAHUs:						**50**		**With Project AAHUs:**						**58**
Net AAHUs:														**8**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.320	0.320	119	119	38		0	1	0.320	0.320	119	119	38
1	5	0.320	0.320	119	119	153		1	5	0.320	0.320	119	119	153
5	50	0.320	0.018	119	108	877	1.971	5	50	0.320	0.320	119	119	1,720
Without Project AAHUs:						**21**		**With Project AAHUs:**						**38**
Net AAHUs:														**17**

Fire Island to Montauk Point, NY Reformulation Study

SB-1B Sedge Island

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	297	297	170	169.9	0	1	0.572	0.572	297	297	170
1	5	0.572	0.572	297	297	680		1	5	0.572	0.572	297	292	674
5	50	0.572	0.424	297	268	6,342	113.4	5	50	0.572	0.572	292	292	7,516
					Without Project AAHUs:	144							With Project AAHUs:	167
													Net AAHUs:	23

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.590	0.590	12	12	7		0	1	0.590	0.590	12	12	7
1	5	0.590	0.590	12	12	28		1	5	0.590	0.600	12	22	40
5	50	0.590	0.553	12	11	290	5.91	5	50	0.600	0.600	22	22	593
					Without Project AAHUs:	6.504							With Project AAHUs:	12.814
													Net AAHUs:	6

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.616	0.616	28	28	17		0	1	0.616	0.616	28	28	17
1	5	0.616	0.616	28	28	69		1	5	0.616	0.665	28	23	65
5	50	0.616	0.353	28	25	579	8.828	5	50	0.665	0.665	23	23	684
					Without Project AAHUs:	13							With Project AAHUs:	15
													Net AAHUs:	2

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.781	0.781	110	110	86		0	1	0.781	0.781	110	110	86
1	5	0.781	0.781	110	110	342		1	5	0.781	0.781	110	110	342
5	50	0.781	0.835	110	121	4,184	100.6	5	50	0.781	0.781	110	110	3,850
					Without Project AAHUs:	92							With Project AAHUs:	86
													Net AAHUs:	-7

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

SB-1B Sedge Island

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.466	57	57	27		0	1	0.466	0.466	57	57	27
1	5	0.466	0.466	57	57	106		1	5	0.466	0.466	57	57	106
5	50	0.466	0.321	57	57	1,009	18.3	5	50	0.466	0.466	57	57	1,195
Without Project AAHUs:						**23**		**With Project AAHUs:**						**27**
Net AAHUs:														**4**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.320	0.320	78	78	25		0	1	0.320	0.320	78	78	25
1	5	0.320	0.320	78	78	100		1	5	0.320	0.320	78	78	100
5	50	0.320	0.018	78	70	575	1.291	5	50	0.320	0.320	78	78	1,126
Without Project AAHUs:						**14**		**With Project AAHUs:**						**25**
Net AAHUs:														**11**

Fire Island to Montauk Point, NY Reformulation Study

SB-1C Tiana

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	232	232	133	132.7	0	1	0.572	0.572	232	232	133
1	5	0.572	0.572	232	232	531		1	5	0.572	0.572	232	225	
5	50	0.572	0.424	232	209	4,952	88.55	5	50	0.572	0.572	225	225	5,799
Without Project AAHUs:						**112**		**With Project AAHUs:**						**119**
													Net AAHUs:	**6**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.590	0.590	8	8	5		0	1	0.590	0.590	8	8	5
1	5	0.590	0.590	8	8	20		1	5	0.590	0.600	8	15	
5	50	0.590	0.553	8	8	205	4.178	5	50	0.600	0.600	15	15	402
Without Project AAHUs:						**4.598**		**With Project AAHUs:**						**8.131**
													Net AAHUs:	**4**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.643	0.643	7	7	4		0	1	0.643	0.643	7	7	4
1	5	0.643	0.643	7	7	17		1	5	0.643	0.665	7	7	
5	50	0.643	0.379	7	6	144	2.24	5	50	0.665	0.665	7	7	200
Without Project AAHUs:						**3**		**With Project AAHUs:**						**4**
													Net AAHUs:	**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.671	0.671	18	18	12		0	1	0.671	0.671	18	18	12
1	5	0.671	0.671	18	18	49		1	5	0.671	0.671	18	18	
5	50	0.671	0.531	18	16	467	8.663	5	50	0.671	0.671	18	18	548
Without Project AAHUs:						**11**		**With Project AAHUs:**						**11**
													Net AAHUs:	**1**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

SB-1C Tiana

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.614	0.614	39	39	24		0	1	0.614	0.614	39	39	24
1	5	0.614	0.614	39	39	95		1	5	0.614	0.614	39	39	
5	50	0.614	0.430	39	39	906	16.59	5	50	0.614	0.614	39	39	1,066
Without Project AAHUs:						**20**		**With Project AAHUs:**						**22**
								Net AAHUs:						**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.350	0.350	32	32	11		0	1	0.350	0.350	32	32	11
1	5	0.350	0.350	32	32	45		1	5	0.350	0.350	32	32	
5	50	0.350	0.023	32	29	263	0.681	5	50	0.350	0.350	32	32	510
Without Project AAHUs:						**6**		**With Project AAHUs:**						**10**
								Net AAHUs:						**4**

Fire Island to Montauk Point, NY Reformulation Study

SB-1D Shinnecock Inlet Park-West

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.762	0.762	423	423	322	322.2	0	1	0.762	0.762	423	423	322
1	5	0.762	0.762	423	423	1,289		1	5	0.762	0.762	423	410	1,269
5	50	0.762	0.551	423	381	11,899	209.6	5	50	0.762	0.762	410	410	14,051
Without Project AAHUs:						**270**		**With Project AAHUs:**						**313**
Net AAHUs:														**43**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.519	0.519	15	15	8		0	1	0.519	0.519	15	15	8
1	5	0.519	0.519	15	15	31		1	5	0.519	0.529	15	28	45
5	50	0.519	0.470	15	13	312	6.243	5	50	0.529	0.529	28	28	663
Without Project AAHUs:						**7.013**		**With Project AAHUs:**						**14.299**
Net AAHUs:														**7**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.542	0.542	37	37	20		0	1	0.542	0.542	37	37	20
1	5	0.542	0.542	37	37	79		1	5	0.542	0.542	37	37	79
5	50	0.542	0.303	37	33	665	9.993	5	50	0.542	0.542	37	37	894
Without Project AAHUs:						**15**		**With Project AAHUs:**						**20**
Net AAHUs:														**5**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.619	0.619	137	137	85		0	1	0.619	0.619	137	137	85
1	5	0.619	0.619	137	137	339		1	5	0.619	0.619	137	137	339
5	50	0.619	0.512	137	123	3,315	63.07	5	50	0.619	0.619	137	137	3,813
Without Project AAHUs:						**75**		**With Project AAHUs:**						**85**
Net AAHUs:														**10**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

SB-1D Shinnecock Inlet Park-West

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.525	0.525	72	72	38		0	1	0.525	0.525	72	72	38
1	5	0.525	0.525	72	72	152		1	5	0.525	0.525	72	72	152
5	50	0.525	0.352	72	72	1,424	25.42	5	50	0.525	0.525	72	72	1,705
Without Project AAHUs:						**32**		**With Project AAHUs:**						**38**
Net AAHUs:														**6**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.283	0.283	30	30	9		0	1	0.283	0.283	30	30	9
1	5	0.283	0.283	30	30	34		1	5	0.283	0.283	30	30	34
5	50	0.283	0.012	30	27	192	0.315	5	50	0.283	0.283	30	30	383
Without Project AAHUs:						**5**		**With Project AAHUs:**						**9**
Net AAHUs:														**4**

Fire Island to Montauk Point, NY Reformulation Study

SB-2B WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.953	0.953	230	230	219	219.5	0	1	0.953	0.953	230	230	219
1	5	0.953	0.953	230	230	878		1	5	0.953	0.953	230	229	876
5	50	0.953	0.678	230	207	8,054	140.6	5	50	0.953	0.953	229	229	9,825
Without Project AAHUs:						**183**		**With Project AAHUs:**						**218**
								Net AAHUs:						**35**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.458	0.458	21	21	10		0	1	0.458	0.458	21	21	10
1	5	0.458	0.458	21	21	39		1	5	0.458	0.458	21	21	39
5	50	0.458	0.397	21	19	387	7.559	5	50	0.458	0.458	21	21	437
Without Project AAHUs:						**8.720**		**With Project AAHUs:**						**9.705**
								Net AAHUs:						**1**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.461	0.461	31	31	14		0	1	0.461	0.461	31	31	14
1	5	0.461	0.461	31	31	56		1	5	0.461	0.511	31	32	60
5	50	0.461	0.246	31	27	464	6.764	5	50	0.511	0.511	32	32	728
Without Project AAHUs:						**11**		**With Project AAHUs:**						**16**
								Net AAHUs:						**5**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.567	0.567	39	39	22		0	1	0.567	0.567	39	39	22
1	5	0.567	0.567	39	39	87		1	5	0.567	0.567	39	39	87
5	50	0.567	0.493	39	39	919	19	5	50	0.567	0.567	39	39	983
Without Project AAHUs:						**21**		**With Project AAHUs:**						**22**
								Net AAHUs:						**1**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

SB-2B WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.436	0.436	44	44	19		0	1	0.436	0.436	44	44	19
1	5	0.436	0.436	44	44	78		1	5	0.436	0.436	44	44	78
5	50	0.436	0.274	44	44	711	12.2	5	50	0.436	0.436	44	44	872
Without Project AAHUs:						**16**		**With Project AAHUs:**						**19**
													Net AAHUs:	**3**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.217	0.217	13	13	3		0	1	0.217	0.217	13	13	3
1	5	0.217	0.217	13	13	11		1	5	0.217	0.217	13	13	11
5	50	0.217	0.000	13	12	62	0	5	50	0.217	0.217	13	13	129
Without Project AAHUs:						**2**		**With Project AAHUs:**						**3**
													Net AAHUs:	**1**

Fire Island to Montauk Point, NY Reformulation Study

P1-G Potato Road

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.182	0.182	162	162	29	29.49	0	1	0.182	0.182	162	162	29
1	5	0.182	0.182	162	162	118		1	5	0.182	0.182	162	152	114
5	50	0.182	0.080	162	162	954	12.92	5	50	0.182	0.182	152	152	1,244
Without Project AAHUs:						**22**		**With Project AAHUs:**						**28**
Net AAHUs:														**6**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.545	8	8	4		0	1	0.545	0.545	8	8	4
1	5	0.545	0.545	8	8	17		1	5	0.545	0.550	8	18	29
5	50	0.545	0.522	8	8	186	4.048	5	50	0.550	0.550	18	18	455
Without Project AAHUs:						**4.148**		**With Project AAHUs:**						**9.755**
Net AAHUs:														**6**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.638	0.638	5	5	3		0	1	0.638	0.638	5	5	3
1	5	0.638	0.638	5	5	14		1	5	0.638	0.662	5	5	14
5	50	0.638	0.362	5	5	123	1.976	5	50	0.662	0.662	5	5	155
Without Project AAHUs:						**3**		**With Project AAHUs:**						**3**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

P1-G Potato Road

AAHU Calculation Summary (Small Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
Net AAHUs:														**0**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.473	0.473	69	69	33		0	1	0.473	0.473	69	69	33
1	5	0.473	0.473	69	69	131		1	5	0.473	0.473	69	69	131
5	50	0.473	0.302	69	69	1,208	20.89	5	50	0.473	0.473	69	69	1,475
Without Project AAHUs:						**27**		**With Project AAHUs:**						**33**
Net AAHUs:														**5**

Fire Island to Montauk Point, NY Reformulation Study

M-1F Montauk

AAHU Calculation Summary (Small Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.154	0.154	165	165	26	25.54	0	1	0.154	0.154	165	165	26
1	5	0.154	0.154	165	165	102		1	5	0.154	0.154	165	148	97
5	50	0.154	0.066	165	165	820	10.91	5	50	0.154	0.154	148	148	1,030
					Without Project AAHUs:	**19**							With Project AAHUs:	**23**
													Net AAHUs:	**4**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.387	0.387	11	11	4		0	1	0.387	0.387	11	11	4
1	5	0.387	0.387	11	11	18		1	5	0.387	0.393	11	23	27
5	50	0.387	0.360	11	11	191	4.096	5	50	0.393	0.393	23	23	415
					Without Project AAHUs:	**4.268**							With Project AAHUs:	**8.932**
													Net AAHUs:	**5**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.617	0.617	11	11	7		0	1	0.617	0.617	11	11	7
1	5	0.617	0.617	11	11	28		1	5	0.617	0.579	11	16	33
5	50	0.617	0.355	11	11	247	4.005	5	50	0.579	0.579	16	16	426
					Without Project AAHUs:	**6**							With Project AAHUs:	**9**
													Net AAHUs:	**4**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
					Without Project AAHUs:	**0**							With Project AAHUs:	**0**
													Net AAHUs:	**0**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

M-1F Montauk

AAHU Calculation Summary (Small Scenario)

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.000	0.000	0	0	0		0	1	0.000	0.000	0	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.000	0	0	0
5	50	0.000	0.000	0	0	0	0	5	50	0.000	0.000	0	0	0
Without Project AAHUs:						**0**		**With Project AAHUs:**						**0**
								Net AAHUs:						**0**

UPLANDS Community

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.550	0.550	102	102	56		0	1	0.550	0.550	102	102	56
1	5	0.550	0.550	102	102	224		1	5	0.550	0.550	102	102	224
5	50	0.550	0.318	102	102	1,992	32.46	5	50	0.550	0.550	102	102	2,523
Without Project AAHUs:						**45**		**With Project AAHUs:**						**56**
								Net AAHUs:						**11**

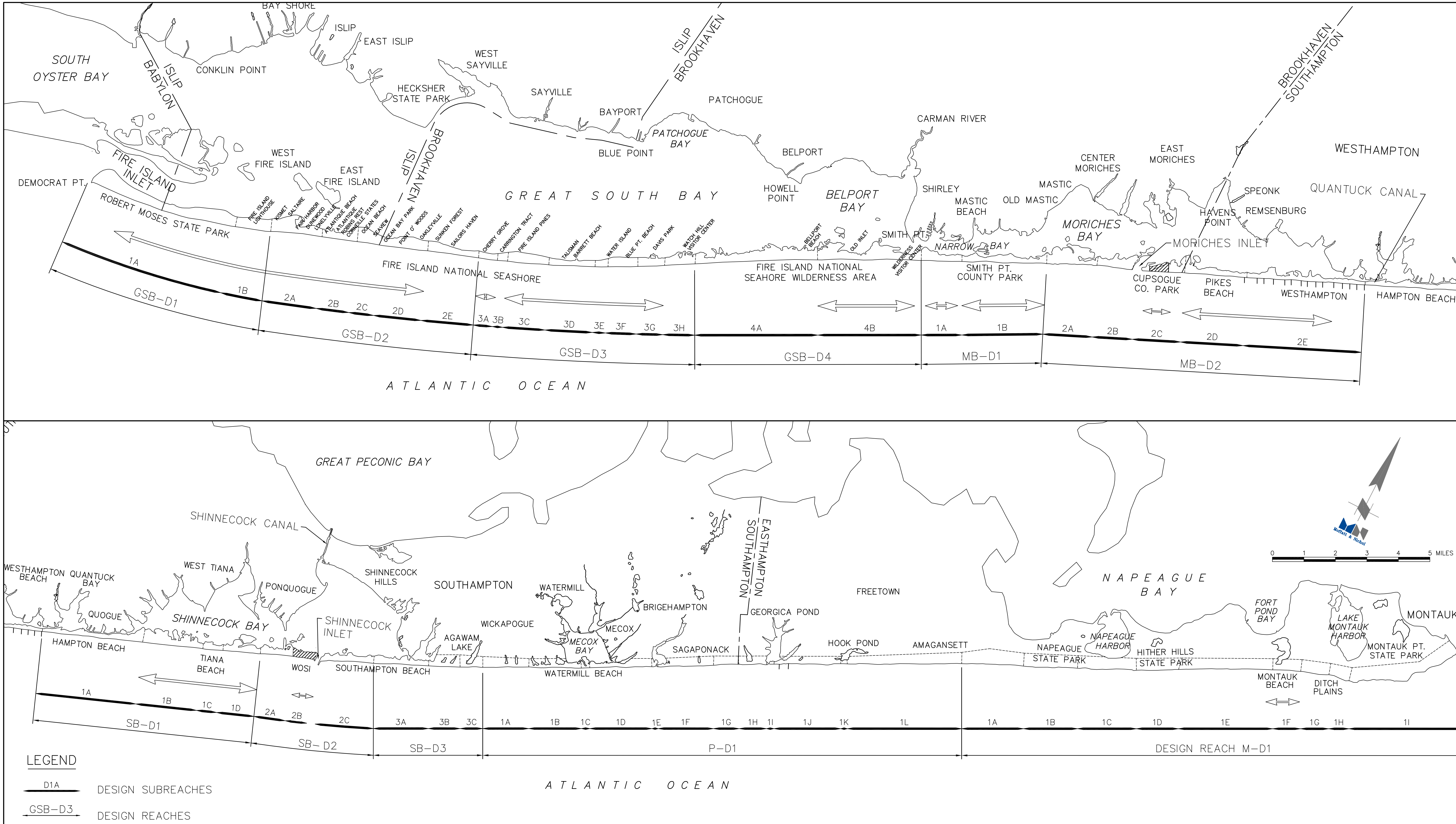
Appendix I

Contents

Breach Response Alternative

The Breach Response Alternative includes actions to close breaches in the barrier islands quickly, after they occur, through human intervention. Models of coastal processes were evaluated and breach response sites were selected based on locations most likely to experience breaching. For HEP evaluation purposes several assumptions were made to facilitate analysis of post-breach conditions: 1) a full breach of the dune will occur at TY1, and at that time existing community types in the breach area will be converted to open water (i.e., BAYSUBSAV and OCEANBEACH HEP community types); 2) the fully breached condition is represented as the future no-action condition; 3) the future with-action condition assumes that the breach will be filled in at TY1 and that by TY 5 conditions of all HEP communities will closely resemble baseline except that there will be a reduction in human disturbance factors, shoreline modifications, invasive species, barriers to wildlife, and an improvement to the percent cover of vegetation; and 4) the effects of breach closure (i.e., changes in HSI and acreages) are realized gradually from TY1 to TY5 and then maintained over the remaining life of the project until TY50.

Breach response measures will include the deposition of sand material in breached areas to rebuild the communities to topographic conditions similar to pre-beach conditions. However, the objectives of sand placement under the breach response alternatives are to close off a breach, thus the resulting beach width and dune height/slope are typically smaller (13 ft) than that desired for optimal storm damage reduction (17 ft +). Created foredune areas would be of adequate slope and vegetative composition to stabilize dune areas and achieve high quality habitat as defined by the HEP models. Vegetation would also be replaced at 40% cover to achieve highest overall habitat quality as defined by the HEP models. It is assumed that these conditions would be maintained for the long term (i.e., 50 + years) through active management and maintenance activities.



MOFFATT & NICHOL
NEW YORK, NEW YORK

FIRE ISLAND INLET TO MONTAUK POINT
LONG ISLAND, NEW YORK
REFORMULATION STUDY

APPROXIMATE BEACH FILL EXTENTS AND LOCATION OF STRUCTURAL FEATURES (PRELIMINARY DRAFT)

FILE: D:\FIMP\PRESENTATION\S_FEATURE

Breach Response
Baseline Conditions Based on estimated breach closure widths

Design SubReach	Location	Specific Location	Total subreach Length [ft]	Estimated Closure Length [ft]	Lengh of Dune Required [ft]	Dune Height [ft]	Foredune Width [ft]	Foredune Slope			Lengh of Berm Required [ft]	VegBeach Width [ft]	VegBeach Slope		
								Deg.	%	Ratio			Deg.	%	Ratio
GSB-1B	FILT	See layout	6,700	1,400	1,400	14.7	31	8.2	14%	1:7	1,400	198	2.6	5%	1:22
GSB-2B	Town Beach to Corneille	Robins Rest	5,100	1,400	1,400	14.0	21	8.5	15%	1:7	1,400	147	3.6	6%	1:16
GSB-3D	Talisman to Water Island	Barrett Beach	7,300	1,400	1,400	17.1	104	3.2	6%	1:18	1,400	225	2.3	4%	1:25
GSB-3G	Davis Park	Davis Park	4,100	1,400	1,400	16.5	56	6.1	11%	1:9	1,400	223	2.4	4%	1:24
GSB-4B	Old Inlet (West)	Old Inlet	16,000	1,400	1,400	12.7	32	3.4	6%	1:17	1,400	245	2.2	4%	1:26
GSB-4B	Old Inlet (East)	Old Inlet	16,000	1,400	1,400	13.5	24	9.1	16%	1:6	1,400	200	2.8	5%	1:20
MB-1B	SPCP	See layout	13,500	700	700	11.8	31	2.9	5%	1:20	700	220	2.3	4%	1:24
SB-1B	Sedge Island	See layout	10,200	780	780	14.8	73	3.3	6%	1:17	780	211	2.4	4%	1:23
SB-1C	Tiana	See layout	3,400	780	780	15.5	37	12.3	22%	1:5	780	100	5.2	9%	1:11
SB-2B	WOSI	See layout	3,900	780	780	13.4	18	8.8	15%	1:6	780	213	2.4	4%	1:24
TOTAL			**86,200**	**11,440**	**11,440**						**11,440**				

NOTES:

(1) All elevations are referenced to NGVD'29
(2) See GIS layouts and sections for additional details
(3) Dune Height refers to the max elevation of the seawardmost dune system
(4) Foredune Width is distance between the Seaward Toe of Dune (roughly the +11ft contour) and the Dune Crest
(5) Foredune Slope is the average slope between the 11ft contour and the Dune Crest
(6) VegBeach Width is the distance from the MHW contour (+2ft) to the Seaward Toe of Dune (roughly the +11ft contour)
(7) VegBeach Slope is the average slope between the MHW contour and the Seaward Toe of Dune
(8) Dimensions are based on beach profiles cut every 200 ft alongshore from LIDAR Sep-2000 data

Breach Response Alternative No.1 (+9.5 ft berm, no dune)
With-Project Conditions based on Proposed Design Templates

Design SubReach ID	**Design SubReach Name**	**Specific Location**	**Total subreach Length [ft]**	**Estimated Closure Length [ft]**	**Lengh of Dune Required [ft]**	**Dune Height [ft]**	**Foredune Width [ft]**	**Foredune Slope**			**Lengh of Berm Required [ft]**	**VegBeach Width [ft]**	**VegBeach Slope**		
								Deg.	**%**	**Ratio**			**Deg.**	**%**	**Ratio**
GSB-1B	FILT	See layout	6,700	1,400	no dune						1,400	291	1.5	3%	1:39
GSB-2B	Town Beach to Corneille	Robins Rest	5,100	1,400	no dune						1,400	241	1.8	3%	1:32
GSB-3D	Talisman to Water Island	Barrett Beach	7,300	1,400	no dune						1,400	391	1.1	2%	1:52
GSB-3G	Davis Park	Davis Park	4,100	1,400	no dune						1,400	391	1.1	2%	1:52
GSB-4B	Old Inlet	Old Inlet West	16,000	1,400	no dune						1,400	341	1.3	2%	1:45
GSB-4B	Old Inlet	Old inlet East	16,000	1,400	no dune						1,400	191	2.3	4%	1:25
MB-1B	SPCP	See layout	13,500	700	no dune						700	291	1.5	3%	1:39
SB-1B	Sedge Island	See layout	10,200	780	no dune						780	291	1.5	3%	1:39
SB-1C	Tiana	See layout	3,400	780	no dune						780	241	1.8	3%	1:32
SB-2B	WOSI	See layout	3,900	780	no dune						780	266	1.6	3%	1:35
TOTAL			**86,200**	**11,440**	**0**						**11,440**				

NOTES:

(1) All elevations are referenced to NGVD'29
(2) See GIS layouts and sections for additional details

Breach Response Alternative No.2 (+9.5 ft berm, +11 ft "dune")
With-Project Conditions based on Proposed Design Templates

Design SubReach ID	**Design SubReach Name**	**Specific Location**	**Total subreach Length [ft]**	**Estimated Closure Length [ft]**	**Lengh of Dune Required [ft]**	**Dune Height [ft]**	**Foredune Width [ft]**	**Foredune Slope**			**Lengh of Berm Required [ft]**	**VegBeach Width [ft]**	**VegBeach Slope**		
								Deg.	**%**	**Ratio**			**Deg.**	**%**	**Ratio**
GSB-1B	FILT	See layout	6,700	1,400	1,400	11.0	20	11.3	20%	1:5	1,400	191	2.3	4%	1:25
GSB-2B	Town Beach to Corneille	Robins Rest	5,100	1,400	1,400	11.0	20	11.3	20%	1:5	1,400	141	3.1	5%	1:19
GSB-3D	Talisman to Water Island	Barrett Beach	7,300	1,400	1,400	11.0	20	11.3	20%	1:5	1,400	191	2.3	4%	1:25
GSB-3G	Davis Park	Davis Park	4,100	1,400	1,400	11.0	20	11.3	20%	1:5	1,400	116	3.7	6%	1:15
GSB-4B	Old Inlet	Old Inlet West	16,000	1,400	1,400	11.0	20	11.3	20%	1:5	1,400	191	2.3	4%	1:25
GSB-4B	Old Inlet	Old inlet East	16,000	1,400	1,400	11.0	20	11.3	20%	1:5	1,400	116	3.7	6%	1:15
MB-1B	SPCP	See layout	13,500	700	700	11.0	20	11.3	20%	1:5	700	171	2.5	4%	1:23
SB-1B	Sedge Island	See layout	10,200	780	780	11.0	20	11.3	20%	1:5	780	191	2.3	4%	1:25
SB-1C	Tiana	See layout	3,400	780	780	11.0	20	11.3	20%	1:5	780	116	3.7	6%	1:15
SB-2B	WOSI	See layout	3,900	780	780	11.0	20	11.3	20%	1:5	780	191	2.3	4%	1:25
TOTAL			**86,200**	**11,440**	**11,440**						**11,440**				

NOTES:

(1) All elevations are referenced to NGVD'29
(2) See GIS layouts and sections for additional details

Breach Response Alternative No.3 (+9.5 ft berm, +13 ft "dune")
With-Project Conditions based on Proposed Design Templates

Design SubReach ID	Design SubReach Name	Specific Location	Total subreach Length [ft]	Estimated Closure Length [ft]	Lengh of Dune Required [ft]	Dune Height [ft]	Foredune Width [ft]	Foredune Slope			Lengh of Berm Required [ft]	VegBeach Width [ft]	VegBeach Slope		
								Deg.	%	Ratio			Deg.	%	Ratio
GSB-1B	FILT	See layout	6,700	1,400	1,400	13.0	30	11.3	20%	1:5	1,400	191	2.3	4%	1:25
GSB-2B	Town Beach to Corneille	Robins Rest	5,100	1,400	1,400	13.0	30	11.3	20%	1:5	1,400	141	3.1	5%	1:19
GSB-3D	Talisman to Water Island	Barrett Beach	7,300	1,400	1,400	13.0	30	11.3	20%	1:5	1,400	191	2.3	4%	1:25
GSB-3G	Davis Park	Davis Park	4,100	1,400	1,400	13.0	30	11.3	20%	1:5	1,400	116	3.7	6%	1:15
GSB-4B	Old Inlet	Old Inlet West	16,000	1,400	1,400	13.0	30	11.3	20%	1:5	1,400	191	2.3	4%	1:25
GSB-4B	Old Inlet	Old inlet East	16,000	1,400	1,400	13.0	30	11.3	20%	1:5	1,400	116	3.7	6%	1:15
MB-1B	SPCP	See layout	13,500	700	700	13.0	30	11.3	20%	1:5	700	171	2.5	4%	1:23
SB-1B	Sedge Island	See layout	10,200	780	780	13.0	30	11.3	20%	1:5	780	191	2.3	4%	1:25
SB-1C	Tiana	See layout	3,400	780	780	13.0	30	11.3	20%	1:5	780	116	3.7	6%	1:15
SB-2B	WOSI	See layout	3,900	780	780	13.0	30	11.3	20%	1:5	780	191	2.3	4%	1:25
TOTAL			**86,200**	**11,440**	**11,440**						**11,440**				

NOTES:

(1) All elevations are referenced to NGVD'29
(2) See GIS layouts and sections for additional details

SUMMARY
OF

HSI, HU AND ACRES

FOR

BASELINE, FUTURE NO-ACTION, AND FUTURE WITH-ACTION CONDITIONS AT BREACH RESPONSE SITES

Comparison of HSI Scores for Baseline, Future no-action, and Future with-restoration Scenarios for Breach Response Sites.

Site ID	Site Name	**Baseline**	**No Action**	**Alternative 1**	**Alternative 2**	**Alternative 3**
PROJECT						
GSB-1B	FILT	0.470	0.102	0.724		
GSB-2B	Town Beach to Corneille	0.447	0.101	0.761		
GSB-3D	Talisman to Water Island	0.502	0.122	0.728		
GSB-3G	Davis Park	0.381	0.057	0.713		
GSB-4B	Old Inlet (WEST)	0.667	0.137	0.745		
MB-1B	SPCP	0.485	0.128	0.734		
SB-1B	Sedge Island	0.567	0.120	0.724		
SB-1C	Tiana	0.586	0.116	0.745		
SB-2B	WOSI	0.508	0.154	0.780		
GSB-4B	Old Inlet (EAST)	0.669	0.137	0.744		
RESTORATION						
	Tiana	0.401	0.347	0.486	0.516	0.600
	Smith's Point East	0.656	0.594	0.722	0.719	0.722

Comparison of Acres for Baseline, Future no-action, and Future with-restoration Scenarios for Breach Response Sites.

Site ID	Site Name	Baseline	No Action	Alternative 1	Alternative 2	Alternative 3
PROJECT						
GSB-1B	FILT	157	143	157		
GSB-2B	Town Beach to Corneille	154	142	154		
GSB-3D	Talisman to Water Island	124	113	124		
GSB-3G	Davis Park	135	124	135		
GSB-4B	Old Inlet (WEST)	163	154	163		
MB-1B	SPCP	68	63	68		
SB-1B	Sedge Island	93	88	93		
SB-1C	Tiana	78	71	78		
SB-2B	WOSI	76	70	76		
GSB-4B	Old Inlet (EAST)	163	154	163		
RESTORATION						
	Tiana	128	128	128	128	128
	Smith's Point East	213	213	213	213	213

Comparison of HUs for Baseline, Future no-action, and Future with-restoration Scenarios for Breach Response Sites.

Site ID	Site Name	Baseline	No Action	Alternative 1	Alternative 2	Alternative 3
PROJECT						
GSB-1B	FILT	73.990	44.700	103.758		
GSB-2B	Town Beach to Corneille	80.258	54.558	108.515		
GSB-3D	Talisman to Water Island	67.120	49.571	75.509		
GSB-3G	Davis Park	45.566	25.305	63.542		
GSB-4B	Old Inlet (WEST)	103.783	70.691	111.482		
MB-1B	SPCP	35.548	27.292	42.415		
SB-1B	Sedge Island	53.399	33.702	63.630		
SB-1C	Tiana	43.879	27.877	49.241		
SB-2B	WOSI	57.357	39.292	65.142		
GSB-4B	Old Inlet (EAST)	103.880	70.691	111.299		
RESTORATION						
	Tiana	59.67	51.71	62.41	62.70	65.43
	Smith's Point East	122.79	110.56	137.38	133.78	139.88

BASELINE CONDITIONS

HSIs, HUs and Acres

Breach Response Sites Baseline HSI Scores per Transect and Community

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
GSB-1B	Fire Island Lighthouse Tract	0.54	0.55	0.31	0.69	0.54	0.19	0.470
GSB-2B	Town Beach to Corneille	0.57	0.37	0.39	0.15	0.53	0.67	0.447
GSB-3D	Talisman to Water Island	0.57	0.40	0.47	0.49	0.41	0.67	0.502
GSB-3G	Davis Park	0.24	0.22	0.47	0.15	0.53	0.67	0.381
GSB-4B	Old Inlet	0.59	0.65	0.74	0.78	0.47	0.78	0.667
MB-1B	Smith Point County Park	0.54	0.48	0.49	0.51	0.47	0.42	0.485
SB-1B	Sedge Island	0.57	0.60	0.67	0.78	0.47	0.32	0.567
SB-1C	Tiana	0.57	0.59	0.72	0.67	0.61	0.35	0.586
SB-2B	WOSI	0.95	0.46	0.42	0.57	0.44	0.22	0.508
GSB-4B	Old Inlet (EAST)	0.59	0.65	0.75	0.78	0.47	0.78	0.669

Breach Response Sites Baseline Acres per Transect and Community

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL ACRES
GSB-1B	FILT	87	6	11	8	16	29	157
GSB-2B	Town Beach to Corneille	80	5	5	19	16	29	154
GSB-3D	Talisman to Water Island	82	7	6	3	16	10	124
GSB-3G	Davis Park	86	7	4	3	16	18	135
GSB-4B	Old Inlet (WEST)	87	8	11	30	16	11	163
MB-1B	SPCP	45	4	3	5	8	3	68
SB-1B	Sedge Island	47	4	4	17	9	12	93
SB-1C	Tiana	54	2	2	4	9	8	78
SB-2B	WOSI	46	4	6	8	9	3	76
GSB-4B	Old Inlet (EAST)	87	8	11	30	16	11	163

Breach Response Sites Baseline HU Scores per Transect and Community

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
GSB-1B	Fire Island Lighthouse Tract	48	4	3	6	9	5	73.99
GSB-2B	Town Beach to Corneille	46	2	2	3	9	19	80.26
GSB-3D	Talisman to Water Island	47	3	3	2	7	7	67.12
GSB-3G	Davis Park	21	2	2	1	9	12	45.57
GSB-4B	Old Inlet	51	5	8	24	7	9	103.78
MB-1B	Smith Point County Park	24	2	2	3	4	1	35.55
SB-1B	Sedge Island	27	2	3	13	4	4	53.40
SB-1C	Tiana	31	1	1	3	5	3	43.88
SB-2B	WOSI	44	2	3	4	4	1	57.36
GSB-4B	Old Inlet (EAST)	51	5	8	24	7	9	103.88

FUTURE NO-ACTION CONDITIONS

HSIs, HUs and Acres

(Future conditions without project or restoration activities)

Breach Response Sites Future No-action HSI Scores per Transect and Community

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
GSB-1B	Fire Island Lighthouse Tract	0.32	0.00	0.00	0.00	0.30	0.00	0.102
GSB-2B	Town Beach to Corneille	0.51	0.00	0.00	0.00	0.10	0.00	0.101
GSB-3D	Talisman to Water Island	0.51	0.00	0.00	0.00	0.23	0.00	0.122
GSB-3G	Davis Park	0.24	0.00	0.00	0.00	0.10	0.00	0.057
GSB-4B	Old Inlet	0.53	0.00	0.00	0.00	0.29	0.00	0.137
MB-1B	Smith Point County Park	0.48	0.00	0.00	0.00	0.29	0.00	0.128
SB-1B	Sedge Island	0.42	0.00	0.00	0.00	0.29	0.00	0.120
SB-1C	Tiana	0.42	0.00	0.00	0.00	0.27	0.00	0.116
SB-2B	WOSI	0.68	0.00	0.00	0.00	0.25	0.00	0.154
GSB-4B	Old Inlet (EAST)	0.53	0.00	0.00	0.00	0.29	0.00	0.137

Set to 0 to reflect complete breach of island and loss of this communtiy

Breach Response Sites Future No-action Acres per Transect and Community

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL ACRES
GSB-1B	FILT	103	0	0	0	40	0	143
GSB-2B	Town Beach to Corneille	99	0	0	0	43	0	142
GSB-3D	Talisman to Water Island	85	0	0	0	28	0	113
GSB-3G	Davis Park	92	0	0	0	31	0	124
GSB-4B	Old Inlet (WEST)	108	0	0	0	46	0	154
MB-1B	SPCP	48	0	0	0	16	0	63
SB-1B	Sedge Island	61	0	0	0	27	0	88
SB-1C	Tiana	55	0	0	0	16	0	71
SB-2B	WOSI	51	0	0	0	18	0	70
GSB-4B	Old Inlet (EAST)	108	0	0	0	46	0	154

Breach Response Sites Future No-action HU Scores per Transect and Community

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
GSB-1B	Fire Island Lighthouse Tract	33	0	0	0	12	0	44.70
GSB-2B	Town Beach to Corneille	50	0	0	0	4	0	54.56
GSB-3D	Talisman to Water Island	43	0	0	0	6	0	49.57
GSB-3G	Davis Park	22	0	0	0	3	0	25.30
GSB-4B	Old Inlet	57	0	0	0	14	0	70.69
MB-1B	Smith Point County Park	23	0	0	0	5	0	27.29
SB-1B	Sedge Island	26	0	0	0	8	0	33.70
SB-1C	Tiana	24	0	0	0	4	0	27.88
SB-2B	WOSI	35	0	0	0	5	0	39.29
GSB-4B	Old Inlet (EAST)	57	0	0	0	14	0	70.69

FUTURE WITH-ACTION CONDITIONS

HSIs, HUs and Acres

(Future conditions with project or restoration activities)

Breach Response Sites Future With-action HSI Scores per Transect and Community

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
GSB-1B	Fire Island Lighthouse Tract	0.57	0.67	0.79	0.88	0.54	0.89	0.724
GSB-2B	Town Beach to Corneille	0.57	0.67	0.79	0.84	0.75	0.95	0.761
GSB-3D	Talisman to Water Island	0.57	0.67	0.79	0.91	0.48	0.95	0.728
GSB-3G	Davis Park	0.29	0.66	0.79	0.84	0.75	0.95	0.713
GSB-4B	Old Inlet	0.59	0.68	0.82	0.93	0.47	0.98	0.745
MB-1B	Smith Point County Park	0.57	0.77	0.79	0.93	0.47	0.89	0.734
SB-1B	Sedge Island	0.57	0.70	0.79	0.93	0.47	0.89	0.724
SB-1C	Tiana	0.57	0.69	0.79	0.92	0.61	0.89	0.745
SB-2B	WOSI	0.95	0.70	0.79	0.92	0.44	0.89	0.780
GSB-4B	Old Inlet (EAST)	0.59	0.68	0.82	0.93	0.47	0.98	0.744

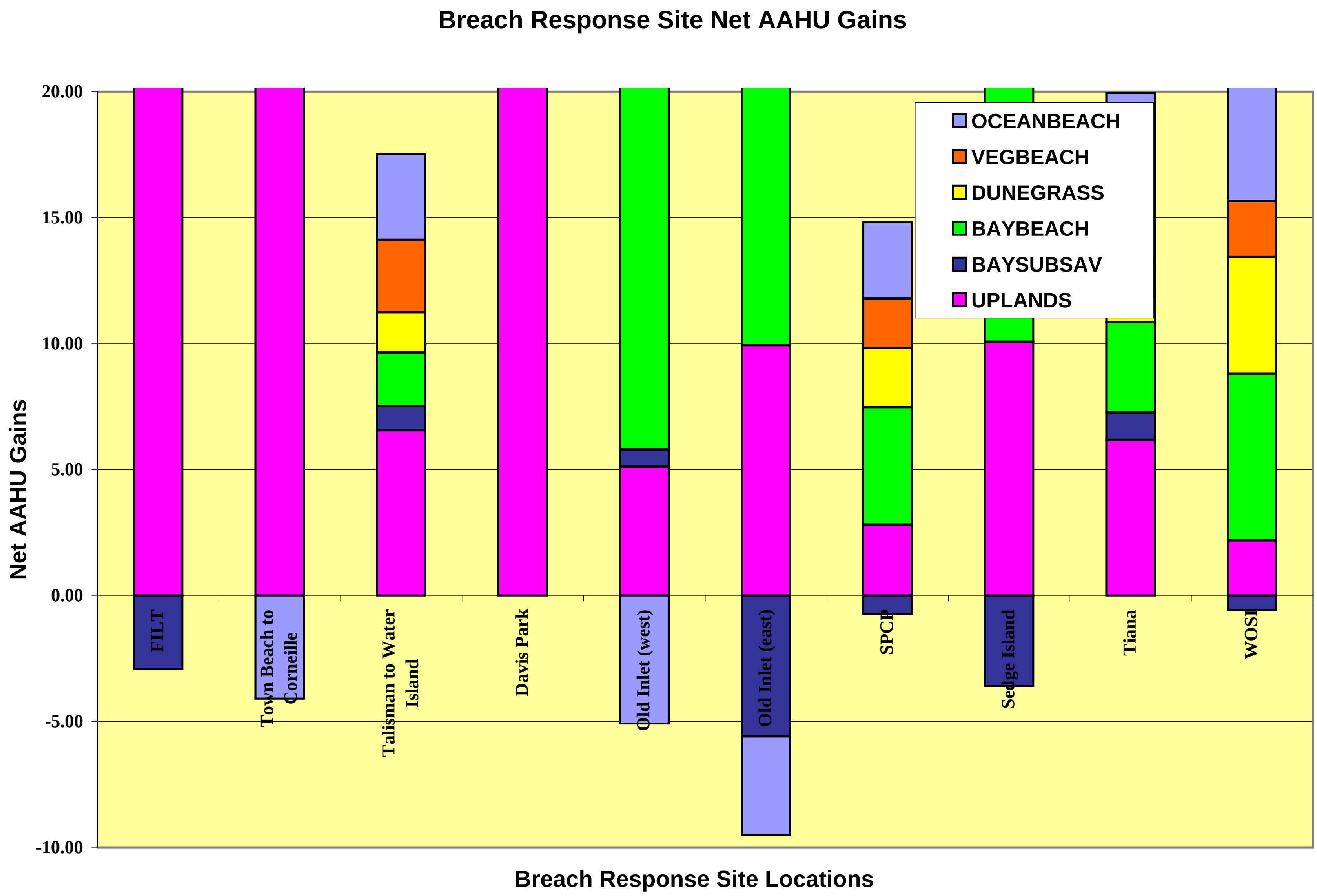
Breach Response Sites Future With-action Acres per Transect and Community

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL ACRES
GSB-1B	FILT	88	6	10	8	16	29	157
GSB-2B	**Town Beach to Corneille**	80	5	6	19	16	29	154
GSB-3D	Talisman to Water Island	85	6	3	3	16	10	124
GSB-3G	**Davis Park**	90	4	3	3	16	18	135
GSB-4B	Old Inlet (WEST)	88	6	11	30	16	11	163
MB-1B	SPCP	45	3	3	5	8	3	68
SB-1B	Sedge Island	48	3	4	17	9	12	93
SB-1C	Tiana	54	2	1	4	9	8	78
SB-2B	**WOSI**	47	3	6	8	9	3	76
GSB-4B	Old Inlet (EAST)	91	4	11	30	16	11	163

Breach Response Sites Future With-action HU Scores per Transect and Community

		OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
GSB-1B	Fire Island Lighthouse Tract	50	4	8	7	9	25	103.76
GSB-2B	Town Beach to Corneille	46	3	4	16	12	27	108.52
GSB-3D	Talisman to Water Island	49	4	3	3	8	9	75.51
GSB-3G	Davis Park	26	2	3	3	12	18	63.54
GSB-4B	Old Inlet	52	4	9	28	7	11	111.48
MB-1B	Smith Point County Park	26	2	3	5	4	3	42.41
SB-1B	Sedge Island	27	2	3	16	4	11	63.63
SB-1C	Tiana	31	1	1	4	5	7	49.24
SB-2B	WOSI	44	2	5	7	4	2	65.14
GSB-4B	Old Inlet (EAST)	53	3	9	28	7	11	111.30

SUMMARY
OF
AAHU'S
FOR
BREACH RESPONSE
PROJECT SITES


Breach Response Site Net AAHU Gains
Net AAHU Gains
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
OCEANBEACH
VEGBEACH
DUNEGRASS
BAYBEACH
BAYSUBSAV
UPLANDS
FILT
Town Beach to Corneille
Talisman to Water Island
Davis Park
Old Inlet (west)
Old Inlet (east)
SPCP
Sedge Island
Tiana
WOSI
Breach Response Site Locations

Net AAHUs per Community Types along each Transect and the Total AAHUs per Transect (Breach Response Sites)

Project Sites		Sum of AAHUs	Average Annual Habitat Units (AAHUs)					
			OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
GSB-1B	FILT	55.05	16.31	3.80	7.64	6.66	-2.93	23.56
GSB-2B	Town Beach to Corneille	50.81	-4.11	2.81	4.08	14.78	7.77	25.48
GSB-3D	Talisman to Water Island	17.52	3.40	2.88	1.59	2.14	0.96	6.55
GSB-3G	Davis Park	79.24	24.35	2.79	4.08	14.78	7.77	25.48
GSB-4B	Old Inlet (west)	39.20	-5.09	3.89	8.48	26.12	0.69	5.11
GSB-4B	Old Inlet (east)	37.58	-3.91	2.35	8.68	26.12	-5.60	9.93
MB-1B	SPCP	14.07	3.04	1.96	2.36	4.66	-0.75	2.81
SB-1B	Sedge Island	27.77	1.61	2.22	2.62	14.85	-3.61	10.07
SB-1C	Tiana	19.94	6.75	1.33	1.02	3.59	1.09	6.17
SB-2B	WOSI	24.11	9.05	2.22	4.64	6.61	-0.59	2.19
	Average	**21**	**5**	**2**	**3**	**7**	**-1**	**5**

Fire Island to Montauk Point, NY Reformulation Study

GSB-1B FILT (Fire Island Lighthouse)

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.318	87	103	41	32.74	0	1	0.545	0.318	87	103	41
1	5	0.318	0.318	103	103	131		1	5	0.318	0.572	103	88	168
5	50	0.318	0.318	103	103	1,473	32.74	5	50	0.572	0.572	88	88	2,252
					Without Project AAHUs:	**33**							**With Project AAHUs:**	**49**
													Net AAHUs:	**16**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.550	0.000	6	0	1		0	1	0.550	0.000	6	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.668	0	6	5
5	50	0.000	0.000	0	0	0	0	5	50	0.668	0.668	6	6	185
					Without Project AAHUs:	**0.023**							**With Project AAHUs:**	**3.825**
													Net AAHUs:	**3.802**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.310	0.000	11	0	1		0	1	0.310	0.000	11	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.787	0	10	11
5	50	0.000	0.000	0	0	0	0	5	50	0.787	0.787	10	10	371
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**8**
													Net AAHUs:	**8**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.687	0.000	8	0	2		0	1	0.687	0.000	8	0	2
1	5	0.000	0.000	0	0	0		1	5	0.000	0.884	0	8	10
5	50	0.000	0.000	0	0	0	0	5	50	0.884	0.884	8	8	324
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**7**
													Net AAHUs:	**7**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-1B FILT (Fire Island Lighthouse)

AAHU Calculation Summary Breach Response Sites (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.545	0.295	16	40	11		0	1	0.545	0.295	16	40	11
1	5	0.295	0.295	40	40	48		1	5	0.295	0.545	40	16	45
5	50	0.295	0.295	40	40	538	11.96	5	50	0.545	0.545	16	16	394
Without Project AAHUs:						**12**		**With Project AAHUs:**						**9**
Net AAHUs:														**-3**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.187	0.000	29	0	2		0	1	0.187	0.000	29	0	2
1	5	0.000	0.000	0	0	0		1	5	0.000	0.885	0	29	34
5	50	0.000	0.000	0	0	0	0	5	50	0.885	0.885	29	29	1,144
Without Project AAHUs:						**0**		**With Project AAHUs:**						**24**
Net AAHUs:														**24**

Fire Island to Montauk Point, NY Reformulation Study

GSB-2B Town Beach to Corneille

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.509	87	99	50	50.25	0	1	0.572	0.572	87	99	53
1	5	0.509	0.509	99	99	201		1	5	0.572	0.572	99	80	204
5	50	0.509	0.509	99	99	2,261	50.25	5	50	0.572	0.572	80	80	2,050
Without Project AAHUs:						**50**		**With Project AAHUs:**						**46**
								Net AAHUs:						**-4**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.370	0.000	6	0	1		0	1	0.370	0.000	6	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.668	0	5	4
5	50	0.000	0.000	0	0	0	0	5	50	0.668	0.668	5	5	136
Without Project AAHUs:						**0.016**		**With Project AAHUs:**						**2.822**
								Net AAHUs:						**2.807**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.386	0.000	11	0	1		0	1	0.386	0.000	11	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.787	0	6	6
5	50	0.000	0.000	0	0	0	0	5	50	0.787	0.787	6	6	198
Without Project AAHUs:						**0**		**With Project AAHUs:**						**4**
								Net AAHUs:						**4**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.153	0.000	8	0	0		0	1	0.153	0.000	8	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.838	0	19	21
5	50	0.000	0.000	0	0	0	0	5	50	0.838	0.838	19	19	718
Without Project AAHUs:						**0**		**With Project AAHUs:**						**15**
								Net AAHUs:						**15**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-2B Town Beach to Corneille

AAHU Calculation Summary Breach Response Sites (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.100	16	40	8		0	1	0.529	0.100	16	40	8
1	5	0.100	0.100	40	40	16		1	5	0.100	0.752	40	16	43
5	50	0.100	0.100	40	40	182	4.047	5	50	0.752	0.752	16	16	544
Without Project AAHUs:						**4**		**With Project AAHUs:**						**12**
Net AAHUs:														**8**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.673	0.000	29	0	6		0	1	0.673	0.000	29	0	6
1	5	0.000	0.000	0	0	0		1	5	0.000	0.952	0	29	37
5	50	0.000	0.000	0	0	0	0	5	50	0.952	0.952	29	29	1,237
Without Project AAHUs:						**0**		**With Project AAHUs:**						**26**
Net AAHUs:														**25**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3D Talisman to Water Island

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.572	0.572	82	82	47	46.84	0	1	0.572	0.572	82	82	47
1	5	0.572	0.572	82	82	187		1	5	0.572	0.572	82	85	191
5	50	0.572	0.509	82	85	2,031	43.35	5	50	0.572	0.572	85	85	2,197
Without Project AAHUs:						**45**		**With Project AAHUs:**						**49**
Net AAHUs:														**3**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.400	0.400	7	7	3		0	1	0.400	0.400	7	7	3
1	5	0.400	0.400	7	7	12		1	5	0.400	0.668	7	6	14
5	50	0.400	0.000	7	0	43	0	5	50	0.668	0.668	6	6	185
Without Project AAHUs:						**1.157**		**With Project AAHUs:**						**4.034**
Net AAHUs:														**3**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.468	0.468	6	6	3		0	1	0.468	0.468	6	6	3
1	5	0.468	0.468	6	6	11		1	5	0.468	0.787	6	3	11
5	50	0.468	0.000	6	0	40	0	5	50	0.787	0.787	3	3	120
Without Project AAHUs:						**1**		**With Project AAHUs:**						**3**
Net AAHUs:														**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.495	0.495	3	3	2		0	1	0.495	0.495	3	3	2
1	5	0.495	0.495	3	3	6		1	5	0.495	0.908	3	3	9
5	50	0.495	0.000	3	0	23	0	5	50	0.908	0.908	3	3	127
Without Project AAHUs:						**1**		**With Project AAHUs:**						**3**
Net AAHUs:														**2**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3D Talisman to Water Island

AAHU Calculation Summary Breach Response Sites (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.407	0.407	16	16	7		0	1	0.407	0.407	16	16	7
1	5	0.407	0.407	16	16	26		1	5	0.407	0.482	16	16	29
5	50	0.407	0.225	16	28	303	6.216	5	50	0.482	0.482	16	16	348
					Without Project AAHUs:	**7**							**With Project AAHUs:**	**8**
													Net AAHUs:	**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.673	0.673	10	10	7		0	1	0.673	0.673	10	10	7
1	5	0.673	0.673	10	10	26		1	5	0.673	0.952	10	10	32
5	50	0.673	0.000	10	0	99	0	5	50	0.952	0.952	10	10	421
					Without Project AAHUs:	**3**							**With Project AAHUs:**	**9**
													Net AAHUs:	**7**

Fire Island to Montauk Point, NY Reformulation Study

GSB-3G Davis Park

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.239	0.000	80	92	10	0	0	1	0.239	0.000	80	92	10
1	5	0.000	0.000	92	92	0		1	5	0.000	0.287	92	90	52
5	50	0.000	0.000	92	92	0	0	5	50	0.287	0.287	90	90	1,165
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**25**
													Net AAHUs:	**24**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.223	0.000	5	0	0		0	1	0.223	0.000	5	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.663	0	5	4
5	50	0.000	0.000	0	0	0	0	5	50	0.663	0.663	5	5	135
					Without Project AAHUs:	**0.007**							**With Project AAHUs:**	**2.792**
													Net AAHUs:	**3**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.467	0.000	5	0	1		0	1	0.467	0.000	5	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.787	0	6	6
5	50	0.000	0.000	0	0	0	0	5	50	0.787	0.787	6	6	198
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**4**
													Net AAHUs:	**4**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.153	0.000	19	0	1		0	1	0.153	0.000	19	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.838	0	19	21
5	50	0.000	0.000	0	0	0	0	5	50	0.838	0.838	19	19	718
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**15**
													Net AAHUs:	**15**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-3G Davis Park

AAHU Calculation Summary Breach Response Sites (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.529	0.100	16	40	8		0	1	0.529	0.100	16	40	8
1	5	0.100	0.100	40	40	16		1	5	0.100	0.752	40	16	43
5	50	0.100	0.100	40	40	182	4.047	5	50	0.752	0.752	16	16	544
Without Project AAHUs:						**4**		**With Project AAHUs:**						**12**
Net AAHUs:														**8**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.673	0.000	29	0	6		0	1	0.673	0.000	29	0	6
1	5	0.000	0.000	0	0	0		1	5	0.000	0.952	0	29	37
5	50	0.000	0.000	0	0	0	0	5	50	0.952	0.952	29	29	1,237
Without Project AAHUs:						**0**		**With Project AAHUs:**						**26**
Net AAHUs:														**25**

Fire Island to Montauk Point, NY Reformulation Study

GSB-4B Old Inlet

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.585	0.530	87	108	54	57.18	0	1	0.585	0.530	87	108	54
1	5	0.530	0.530	108	108	229		1	5	0.530	0.585	108	88	219
5	50	0.530	0.530	108	108	2,573	57.18	5	50	0.585	0.585	88	88	2,328
Without Project AAHUs:						**57**		**With Project AAHUs:**						**52**
Net AAHUs:														**-5**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.650	0.000	8	0	2		0	1	0.650	0.000	8	0	2
1	5	0.000	0.000	0	0	0		1	5	0.000	0.683	0	6	6
5	50	0.000	0.000	0	0	0	0	5	50	0.683	0.683	6	6	189
Without Project AAHUs:						**0.034**		**With Project AAHUs:**						**3.921**
Net AAHUs:														**4**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.739	0.000	11	0	3		0	1	0.739	0.000	11	0	3
1	5	0.000	0.000	0	0	0		1	5	0.000	0.819	0	11	12
5	50	0.000	0.000	0	0	0	0	5	50	0.819	0.819	11	11	412
Without Project AAHUs:						**0**		**With Project AAHUs:**						**9**
Net AAHUs:														**8**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.781	0.000	30	0	8		0	1	0.781	0.000	30	0	8
1	5	0.000	0.000	0	0	0		1	5	0.000	0.931	0	30	38
5	50	0.000	0.000	0	0	0	0	5	50	0.931	0.931	30	30	1,269
Without Project AAHUs:						**0**		**With Project AAHUs:**						**26**
Net AAHUs:														**26**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-4B Old Inlet

AAHU Calculation Summary Breach Response Sites (Large Scenario)

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.466	0.293	16	46	11		0	1	0.466	0.293	16	46	11
1	5	0.293	0.293	46	46	54		1	5	0.293	0.466	46	16	45
5	50	0.293	0.293	46	46	608	13.51	5	50	0.466	0.466	46	16	651
Without Project AAHUs:						**13**		**With Project AAHUs:**						**14**
Net AAHUs:														**1**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.783	0.000	11	0	3		0	1	0.783	0.000	11	0	3
1	5	0.000	0.000	0	0	0		1	5	0.000	0.983	0	11	14
5	50	0.000	0.000	0	0	0	0	5	50	0.983	0.983	0	11	241
Without Project AAHUs:						**0**		**With Project AAHUs:**						**5**
Net AAHUs:														**5**

Fire Island to Montauk Point, NY Reformulation Study

GSB-4B Old Inlet

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.585	0.530	87	108	54	57.18	0	1	0.585	0.530	87	108	54
1	5	0.530	0.530	108	108	229		1	5	0.530	0.585	108	91	221
5	50	0.530	0.530	108	108	2,573	57.18	5	50	0.585	0.585	91	91	2,385
Without Project AAHUs:						**57**		**With Project AAHUs:**						**53**
Net AAHUs:														**-4**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.650	0.000	8	0	2		0	1	0.650	0.000	8	0	2
1	5	0.000	0.000	0	0	0		1	5	0.000	0.682	0	4	3
5	50	0.000	0.000	0	0	0	0	5	50	0.682	0.682	4	4	114
Without Project AAHUs:						**0.034**		**With Project AAHUs:**						**2.389**
Net AAHUs:														**2**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.748	0.000	11	0	3		0	1	0.748	0.000	11	0	3
1	5	0.000	0.000	0	0	0		1	5	0.000	0.819	0	11	12
5	50	0.000	0.000	0	0	0	0	5	50	0.819	0.819	11	11	422
Without Project AAHUs:						**0**		**With Project AAHUs:**						**9**
Net AAHUs:														**9**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.781	0.000	30	0	8		0	1	0.781	0.000	30	0	8
1	5	0.000	0.000	0	0	0		1	5	0.000	0.931	0	30	38
5	50	0.000	0.000	0	0	0	0	5	50	0.931	0.931	30	30	1,269
Without Project AAHUs:						**0**		**With Project AAHUs:**						**26**
Net AAHUs:														**26**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

GSB-4B Old Inlet

AAHU Calculation Summary Breach Response Sites (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.293	16	46	11		0	1	0.466	0.293	16	46	11
1	5	0.293	0.293	46	46	54		1	5	0.293	0.466	46	16	45
5	50	0.293	0.293	46	46	608	13.51	5	50	0.466	0.466	16	16	337
Without Project AAHUs:						**13**		**With Project AAHUs:**						**8**
													Net AAHUs:	**-6**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.000	11	0	3		0	1	0.783	0.000	11	0	3
1	5	0.000	0.000	0	0	0		1	5	0.000	0.983	0	11	14
5	50	0.000	0.000	0	0	0	0	5	50	0.983	0.983	11	11	482
Without Project AAHUs:						**0**		**With Project AAHUs:**						**10**
													Net AAHUs:	**10**

Fire Island to Montauk Point, NY Reformulation Study

MB-1B SPCP (Smith Point County Park)

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.545	0.477	45	48	24	22.74	0	1	0.545	0.477	45	48	24
1	5	0.477	0.477	48	48	91		1	5	0.477	0.572	48	45	98
5	50	0.477	0.477	48	48	1,023	22.74	5	50	0.572	0.572	45	45	1,168
					Without Project AAHUs:	**23**							**With Project AAHUs:**	**26**
													Net AAHUs:	**3**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.483	0.000	4	0	1		0	1	0.483	0.000	4	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.768	0	3	3
5	50	0.000	0.000	0	0	0	0	5	50	0.768	0.768	3	3	95
					Without Project AAHUs:	**0.011**							**With Project AAHUs:**	**1.968**
													Net AAHUs:	**2**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.490	0.000	3	0	1		0	1	0.490	0.000	3	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.787	0	3	3
5	50	0.000	0.000	0	0	0	0	5	50	0.787	0.787	3	3	114
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**2**
													Net AAHUs:	**2**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.512	0.000	5	0	1		0	1	0.512	0.000	5	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.926	0	5	7
5	50	0.000	0.000	0	0	0	0	5	50	0.926	0.926	5	5	226
					Without Project AAHUs:	**0**							**With Project AAHUs:**	**5**
													Net AAHUs:	**5**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

MB-1B SPCP (Smith Point County Park)

AAHU Calculation Summary Breach Response Sites (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.293	8	16	4		0	1	0.466	0.293	8	16	4
1	5	0.293	0.293	16	16	18		1	5	0.293	0.466	16	8	17
5	50	0.293	0.293	16	16	205	4.557	5	50	0.466	0.466	8	8	168
Without Project AAHUs:						**5**		**With Project AAHUs:**						**4**
													Net AAHUs:	**-1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.417	0.000	3	0	0		0	1	0.417	0.000	3	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.885	0	3	4
5	50	0.000	0.000	0	0	0	0	5	50	0.885	0.885	3	3	136
Without Project AAHUs:						**0**		**With Project AAHUs:**						**3**
													Net AAHUs:	**3**

SB-1B Sedge Island

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.424	47	61	27	25.65	0	1	0.572	0.424	47	61	27
1	5	0.424	0.424	61	61	103		1	5	0.424	0.572	61	48	107
5	50	0.424	0.424	61	61	1,154	25.65	5	50	0.572	0.572	48	48	1,230
Without Project AAHUs:						**26**		**With Project AAHUs:**						**27**
Net AAHUs:														**2**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.600	0.000	4	0	1		0	1	0.600	0.000	4	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.702	0	3	3
5	50	0.000	0.000	0	0	0	0	5	50	0.702	0.702	3	3	108
Without Project AAHUs:						**0.015**		**With Project AAHUs:**						**2.239**
Net AAHUs:														**2**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.665	0.000	4	0	1		0	1	0.665	0.000	4	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.787	0	4	4
5	50	0.000	0.000	0	0	0	0	5	50	0.787	0.787	4	4	127
Without Project AAHUs:						**0**		**With Project AAHUs:**						**3**
Net AAHUs:														**3**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.781	0.000	17	0	4		0	1	0.781	0.000	17	0	4
1	5	0.000	0.000	0	0	0		1	5	0.000	0.931	0	17	21
5	50	0.000	0.000	0	0	0	0	5	50	0.931	0.931	17	17	721
Without Project AAHUs:						**0**		**With Project AAHUs:**						**15**
Net AAHUs:														**15**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

SB-1B Sedge Island

AAHU Calculation Summary Breach Response Sites (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.293	9	27	7		0	1	0.466	0.293	9	27	7
1	5	0.293	0.293	27	27	32		1	5	0.293	0.466	27	9	27
5	50	0.293	0.293	27	27	362	8.053	5	50	0.466	0.466	9	9	188
Without Project AAHUs:						**8**		**With Project AAHUs:**						**4**
													Net AAHUs:	**-4**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.320	0.000	12	0	1		0	1	0.320	0.000	12	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.885	0	12	14
5	50	0.000	0.000	0	0	0	0	5	50	0.885	0.885	12	12	489
Without Project AAHUs:						**0**		\						**10**
													Net AAHUs:	**10**

SB-1C Tiana

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.572	0.424	54	55	27	23.5	0	1	0.572	0.424	54	55	27
1	5	0.424	0.424	55	55	94		1	5	0.424	0.572	55	54	109
5	50	0.424	0.424	55	55	1,058	23.5	5	50	0.572	0.572	54	54	1,381
Without Project AAHUs:						**24**		**With Project AAHUs:**						**30**
Net AAHUs:														**7**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.590	0.000	2	0	0		0	1	0.590	0.000	2	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.692	0	2	2
5	50	0.000	0.000	0	0	0	0	5	50	0.692	0.692	2	2	65
Without Project AAHUs:						**0.007**		**With Project AAHUs:**						**1.338**
Net AAHUs:														**1**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.720	0.000	2	0	0		0	1	0.720	0.000	2	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.787	0	1	1
5	50	0.000	0.000	0	0	0	0	5	50	0.787	0.787	1	1	49
Without Project AAHUs:						**0**		**With Project AAHUs:**						**1**
Net AAHUs:														**1**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.671	0.000	4	0	1		0	1	0.671	0.000	4	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.920	0	4	5
5	50	0.000	0.000	0	0	0	0	5	50	0.920	0.920	4	4	174
Without Project AAHUs:						**0**		**With Project AAHUs:**						**4**
Net AAHUs:														**4**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

SB-1C Tiana

AAHU Calculation Summary Breach Response Sites (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.614	0.274	9	16	5		0	1	0.614	0.274	9	16	5
1	5	0.274	0.274	16	16	18		1	5	0.274	0.614	16	9	21
5	50	0.274	0.274	16	16	197	4.376	5	50	0.614	0.614	9	9	247
Without Project AAHUs:						**4**		**With Project AAHUs:**						**5**
Net AAHUs:														**1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.350	0.000	8	0	1		0	1	0.350	0.000	8	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.885	0	8	9
5	50	0.000	0.000	0	0	0	0	5	50	0.885	0.885	8	8	300
Without Project AAHUs:						**0**		**With Project AAHUs:**						**6**
Net AAHUs:														**6**

Fire Island to Montauk Point, NY Reformulation Study

SB-2B WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.953	0.678	46	51	40	34.74	0	1	0.953	0.678	46	51	40
1	5	0.678	0.678	51	51	139		1	5	0.678	0.953	51	47	159
5	50	0.678	0.678	51	51	1,563	34.74	5	50	0.953	0.953	47	47	1,996
Without Project AAHUs:						**35**		**With Project AAHUs:**						**44**
								Net AAHUs:						**9**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.458	0.000	4	0	1		0	1	0.458	0.000	4	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.702	0	3	3
5	50	0.000	0.000	0	0	0	0	5	50	0.702	0.702	3	3	108
Without Project AAHUs:						**0.012**		**With Project AAHUs:**						**2.235**
								Net AAHUs:						**2**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.417	0.000	6	0	1		0	1	0.417	0.000	6	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.787	0	6	7
5	50	0.000	0.000	0	0	0	0	5	50	0.787	0.787	6	6	225
Without Project AAHUs:						**0**		**With Project AAHUs:**						**5**
								Net AAHUs:						**5**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.567	0.000	8	0	1		0	1	0.567	0.000	8	0	1
1	5	0.000	0.000	0	0	0		1	5	0.000	0.920	0	8	10
5	50	0.000	0.000	0	0	0	0	5	50	0.920	0.920	8	8	321
Without Project AAHUs:						**0**		**With Project AAHUs:**						**7**
								Net AAHUs:						**7**

BAYSUBSAV Community

Fire Island to Montauk Point, NY Reformulation Study

SB-2B WOSI (West of Shinnecock Inlet)

AAHU Calculation Summary Breach Response Sites (Large Scenario)

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.436	0.247	9	18	5		0	1	0.436	0.247	9	18	5
1	5	0.247	0.247	18	18	18		1	5	0.247	0.436	18	9	18
5	50	0.247	0.247	18	18	205	4.552	5	50	0.436	0.436	9	9	176
Without Project AAHUs:						**5**		**With Project AAHUs:**						**4**
Net AAHUs:														**-1**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.217	0.000	3	0	0		0	1	0.217	0.000	3	0	0
1	5	0.000	0.000	0	0	0		1	5	0.000	0.885	0	3	3
5	50	0.000	0.000	0	0	0	0	5	50	0.885	0.885	3	3	106
Without Project AAHUs:						**0**		**With Project AAHUs:**						**2**
Net AAHUs:														**2**

SUMMARY
OF

DESIGN ALTERNATIVES
FOR
BREACH RESPONSE
RESTORATION SITES

Summary of FIMP HEP Breach Response Site Restoration Alternatives

BCP Site	BCP Restoration Alternative ID	Goal	Effected HEP Community Types						Coastal Process (+) Effects	Coastal Process (-) Effects	Benefit to T&E Species
			OCEANBEACH	VEGBEACH	DUNEGRASS	UPLAND	BAYBEACH	BAYSUBSAV			
Tiana											
Alternative 1	A-1	Restore bayside shoreline, stabilize eroding areas, remove bulkhread, control Phragmites					x	x	2	0	n
Alternative 2	A-2	Buy-out two properties, convert disturbed areas to dunegrass, widen beach and dune, and enhance/plant dunegrass		x	x				2	1	n
Alternative 3	A-3	Combined Alt 1 and Alt 2		x	x		x	x	4	1	n
Smith's Point County Park											
Alternative 1	A-1	Remode dredge piles in bay intertidal areas, and restore all disturbed areas in intertidal zone and upland, control Phragmites throughout site				x	x		2	0	n
Alternative 2	A-2	Control Phragmites throughout site, create overwash sany lobe of bayintertidal and dunegrass			x		x	x	3	0	n
Alternative 3	A-3	Combined Alt 1 and Alt 2			x	x	x	x	3	0	n

Description of Restoration Alternatives Proposed for FIMP HEP BCP Sites

The Team identified the following conceptual restoration alternatives for the two potential BCP restoration sites. The options include habitat enhancements, which would change HSI scores but not affect acreages as well as habitat conversions of one HEP community to another, or disturbed areas (non-HEP communities) into a HEP community.

The alternatives proposed are not necessarily supported by all members of the HEP Team, nor are they alternatives that have been evaluated by entities outside of the HEP Team. They are strictly conceptual in nature and are presented in order to evaluate a full range of possible scenarios that could be implemented to address restoration needs at a given site. The proposed option may or may not be feasible and would be further evaluated during subsequent analysis of options.

TIANA

The Tiana site includes all six HEP community model types. The most notable restoration needs at this location include bulkheaded bayside shoreline banks, eroding shoreline, a deteriorating bulkhead, and scattered invasive common reed (*Phragmites australis)* along the bayside shoreline and into upland areas. Residential development is located on approximately 5o percent of the site. The site is dominated by residential development and dune/beach. Several walkways provide access to the beach from developed areas and two structures are located well into the fore dune area. Recreational use of the area is high and vehicle use of the area is permitted during various times of the year. Vehicle access to the beach is provided via open cuts in the dune.

Restoration Alternative 1, Bayside Shoreline Improvements

The goal of this alternative is to enhance the eroding bayside shoreline and intertidal zone along approximately 1,600 linear feet (lf) of shoreline and remove approximately 700 lf of bulkhead material located along the shoreline. Components include:

- Remove bulkhead
- Stabilize shoreline with bio-engineering
- Replenish shoreline grade
- Control common reed

Specific activities would include regrading approximately 1,600 lf the shoreline to a slope < 2:1 and placement of sand material over approximately a 7.7-acre (ac) area along the shoreline to improve the shoreline slope, enhance the interidal zone, and provide bay sediment. Approximately 700 lf of existing bulkhead would be removed and disposed of in a suitable location and approximately 2.4 ac of material will be excavated from the area of the existing bulkhead and used to restore the shoreline grade. Dredge material would be used onsite for any additional gradient alterations and would support dredge material management activities. Soft bioengineering structures would be used to stabilize approximately 200 lf of shoreline at the location of existing houses. Upland plantings, consisting of species such as post oak (*Quercus* *stellataa*), American holly (*Ilex opaca*), sassafras (*Sassafras albidum),* cherry (*Prunus virginiana*), serviceberry (*Amelanchier canadensis),* bayberry (*Myrica pennsylvanica),* and wax myrtle (*Myrica cyrifera*), would be utilized to stabilize approximately 800 ft of the shoreline bank and minimize further erosion and loss of habitat. Approximately 2.0 ac of common reed would be removed using herbicide applications as part of shoreline modification efforts. Salt marsh does exist on site, but approximately 3.0 ac of additional salt marsh species will be planted to facilitate establishment of the marsh in regraded areas. Species will include 2.5 ac of emergent wetland species such as salt marsh cordgrass (*Spartina alterniflora),* salt meadow hay *(Spartina patens),* seashore saltgrass *(Distichlis spicata),* and black grass *(Juncus gerardi),* and 0.5 ac of wetland shrubs such as blueberry (*Vaccinium corymbosum),* arrowwood (*Viburnum dentatum*), marsh elder *(Iva frutescens)* and groundsel tree *(Baccharis halimifolia).*

Restoration measures are expected to enhance the existing BAYBEACH community and result in some improvements to the BAYBEACH HSI variables for invasive species, species richness, erosion, shoreline modifications, and barriers to wildlife, as shown in Appendix G. The grade of the existing BAYBEACH community will be modified, and the overall width/size would increase slightly as disturbed areas are converted to intertidal habitats.

By stabilizing the bay side shoreline and adding bay sediment, this alternative is expected to positively affect the bayside shoreline (++) and estuarine coastal (+) processes.

Restoration Alternative 2, Beach and Dune Improvements

The goal of alternative 2 is to enhance the existing beach and dune system and improve conditions within upland areas of the site. Components of this alternative include:

- Improve the dune face and slope
- Home buy-outs
- Replace a boardwalk
- Restore dune at access locations

Specific tasks would include remove two homes currently located in the fore dune area, restore dune cuts, and improve the slope of approximately 1,600 feet of the existing dune face to approximately 20-25% slope, and plant the dune face with approximately 40% cover of dune species such American beachgrass (*Ammophila breviligulata*), beach plum (*Prunus maritima*), seaside goldenrod (*Solidago sempervirens*), beach heather (*Hudsonia tomentosa),* and switch grass (*Panicum virgatum*). Measures would also include replacing one existing beach access boardwalk with a raised walkover and restoring the dune/upland beneath it to a slope and width matching the adjacent dunes and replanting as needed to stabilize the area.

Restoration would require 10 ac of regrading, 8 ac of sand fill material, approximately 2.5 ac of dune plantings, boardwalk replacement, and buy-out/removal of two homes. Approximately 900 ft of sand fencing will be installed to restrict vehicle/pedestrian access. Alternative natural materials such as rock, logs, etc. should be used as restrictive barriers where feasible.

Restoration measures are expected to enhance the existing DUNEGRASS, and VEGBEACH communities and would result in some improvements to the HSI variables for percent cover of vegetation, impacts from human disturbance, shoreline modifications, slope, and width, as shown in Appendix G. The size of the DUNEGRASS community is expected to increase as a result of this action and this change is reflected in HEP HU calculations.

Because this alternative would improve dune slope and restore the dune in access areas and disturbed sites, this activity is expected to positively affect the longshore sediment transport (+) and dune development and evolution processes (+), but negatively affect the cross-island transport (-) process by closing off areas susceptible to overwashing.

Restoration Alternative 3, Bayside, Beach, and Dune Improvements

The goal of alternative 3 is to combine efforts for alternatives 1 and 2. Specific activities include:

- Remove bulkhead
- Stabilize shoreline with bio-engineering
- Replenish shoreline grade
- Remove common reed
- Improve the dune face and slope
- Home buy-outs
- Replace a boardwalk
- Restore dune at access locations

Details of alternatives 1 and 2 are discussed above. Collectively, this option would include regrading of an approximately 18 ac area, 16 ac of fill, 700 lf of bulkhead removal, replacement of a boardwalk, buy out and removal of two homes, herbicide application on 2 ac, 2.5 ac of dune planting, 3.0 ac of salt marsh planting, and 900 lf of sand fence.

Restoration measures are expected to improve HSI scores for the BAYSUBSAV, BAYBEACH, DUNEGRASS and VEGBEACH communities. Improvements to the HSI variables include, percent cover of vegetation, species richness, erosion, shoreline modification, barriers to wildlife, and human factors/magnitude of human impacts, as shown in Appendix G. The size of the DUNEGRASS and BAYBEACH communities are expected to change slightly and this change is reflected in HEP HU calculations.

As described above, this alternative is expected to positively affect four of the five coastal processes, but will negatively affect the cross-island transport (-) process by closing off areas susceptible to overwashing.

SMITH'S POINT COUNTY PARK

This BCP restoration site includes all six HEP community types but is located in an area of the barrier island that is narrow (< 500 ft wide) relative to other areas of the island. The site is relatively undisturbed and is dominated by the BAYBEACH community type. The existing marsh contains native salt marsh emergent and shrub species, but is dominated by common reed and contains several piles of fill material. A sand road/trail bisects the site from east to west.

Restoration Alternative 1, Bayside and Upland Improvements

The goal of this alternative is to enhance the existing bay intertidal and upland communities Specific activities include:

- Control common reed
- Remove fill material
- Restore salt marsh
- Restore sand roads/trails in upland

Specific tasks would include herbicide application across approximately 25 ac of salt marsh and upland, removal of 10.5 ac of fill material for the salt marsh, plant 9 ac of emergents such as salt marsh cordgrass, salt meadow hay, seashore saltgrass, and black grass, and 1,5 ac of wetland shrubs such as blueberry, arrowwood, marsh elder and groundsel to restore disturbed areas. Access would also be restricted at sand roads/trails using sand fence or natural materials and areas would be allowed to revert to natural conditions.

Restoration measures are expected to improve HSI scores for the BAYBEACH and UPLAND communities. Improvements to the HSI variables include, percent cover of vegetation, species richness, barriers to wildlife, invasive species, and human factors/magnitude of human impacts, as shown in Appendix G. The size of the BAYBEACH and UPLAND communities are expected to change slightly and this change is reflected in HEP HU calculations.

By enhancing the existing salt marsh this alternative is expected to positively affect the bayside shoreline (++) and estuarine coastal (+) processes.

Restoration Alternative 2, Bayside Shoreline Improvements, Create Sand Lobe

The goal of this alternative is to enhance the existing bay intertidal and upland communities, remove dredge fill in the salt marsh, and create an overwash lobe for shorebird foraging/nesting habitat and bayside sediment input. Specific activities include:

- Control common reed
- Create overwash lobe

Specific tasks would include herbicide application across approximately 25 ac of salt marsh, deposition of approximately 15 ac of fill material across a 11.0 ac area, regrading of approximately 11.0 ac, planting of 2 ac of dunegrass species such American beachgrass, beach plum, seaside goldenrod, beach heather, and switch grass, on the highest elevations of the sand lobe, and planting of 3 ac of emergent salt marsh species along edges of newly created lobe. The remaining are of the lobe would be left unvegetated to provide foraging habitat.

Restoration measures are expected to improve HSI scores for the BAYBEACH and DUNEGRASS communities. Improvements to the HSI variables include, percent cover of vegetation, species richness, barriers to wildlife, and invasive species as shown in Appendix G. The size of the BAYBEACH, BAYSUBSAV, and DUNEGRASS communities are expected to change slightly and this change is reflected in HEP HU calculations.

By enhancing the existing salt marsh, adding bay sediment, and adding a simulated overwash lobe bayside, this alternative is expected to positively affect the bayside shoreline (++), cross-island transport (+), and estuarine coastal (+) processes.

Restoration Alternative 3, Bayside Shoreline and Upland Improvements, Create Sand Lobe

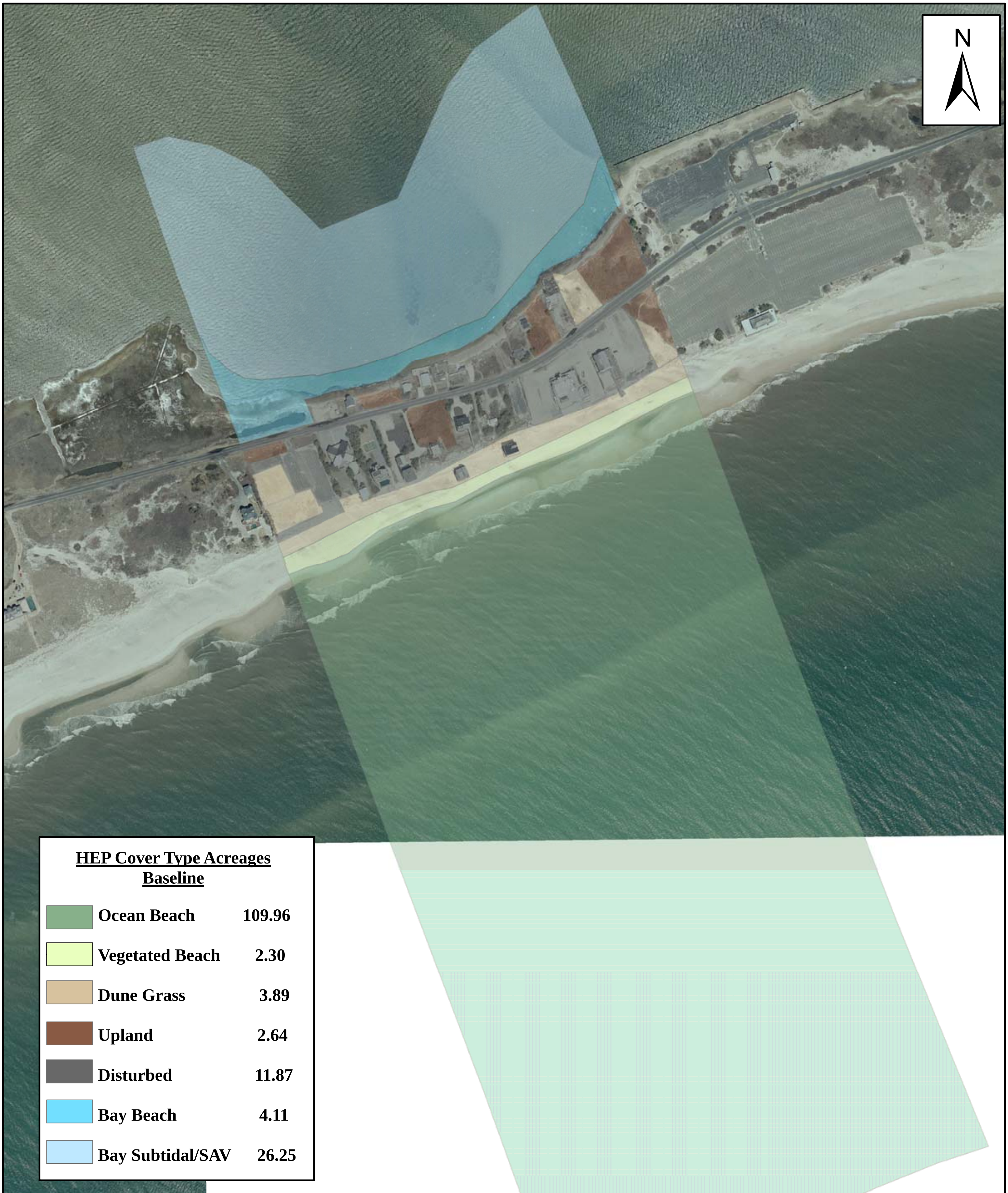
The goal of this alternative is to combine activities proposed with alternatives 1 and 2 to enhance the existing bay intertidal area, restore disturbed sites, and create an overwash lobe for shorebird foraging/nesting habitat and bayside sediment input. Specific activities include:

- Control common reed
- Create overwash lobe
- Remove dredge fill material
- Restore salt marsh
- Restore sand roads/trails in upland

Specific tasks would include herbicide application across approximately 25 ac of salt marsh, removal of approximately 11 ac of fill material in the existing salt marsh an redistribution of the material to create the sand lobe (15 ac of additional material would be needed to create lobe of desired size/elevation), regrading of 21 ac, planting of 2 ac of dunegrass species on the sand lobe, and planting of 12 ac of emergent salt marsh species (some along edges of lobe and the remaining in areas of dredge material removal), and planting 1.5 ac of wetland shrubs in disturbed areas. Access would also be restricted at sand roads/trails using sand fence or natural materials and areas would be allowed to revert to natural conditions.

Restoration measures are expected to improve HSI scores for the BAYBEACH, UPLAND, and DUNEGRASS communities. Improvements to the HSI variables include, percent cover of vegetation, species richness, barriers to wildlife, and invasive species as shown in Appendix G. The size of the BAYBEACH, BAYSUBSAV, UPLAND, and DUNEGRASS communities are expected to change slightly and this change is reflected in HEP HU calculations.

By enhancing the existing salt marsh, adding bay sediment, and adding a simulated overwash lobe bayside, this alternative is expected to positively affect the bayside shoreline (++), cross-island transport (+), and estuarine coastal (+) processes.



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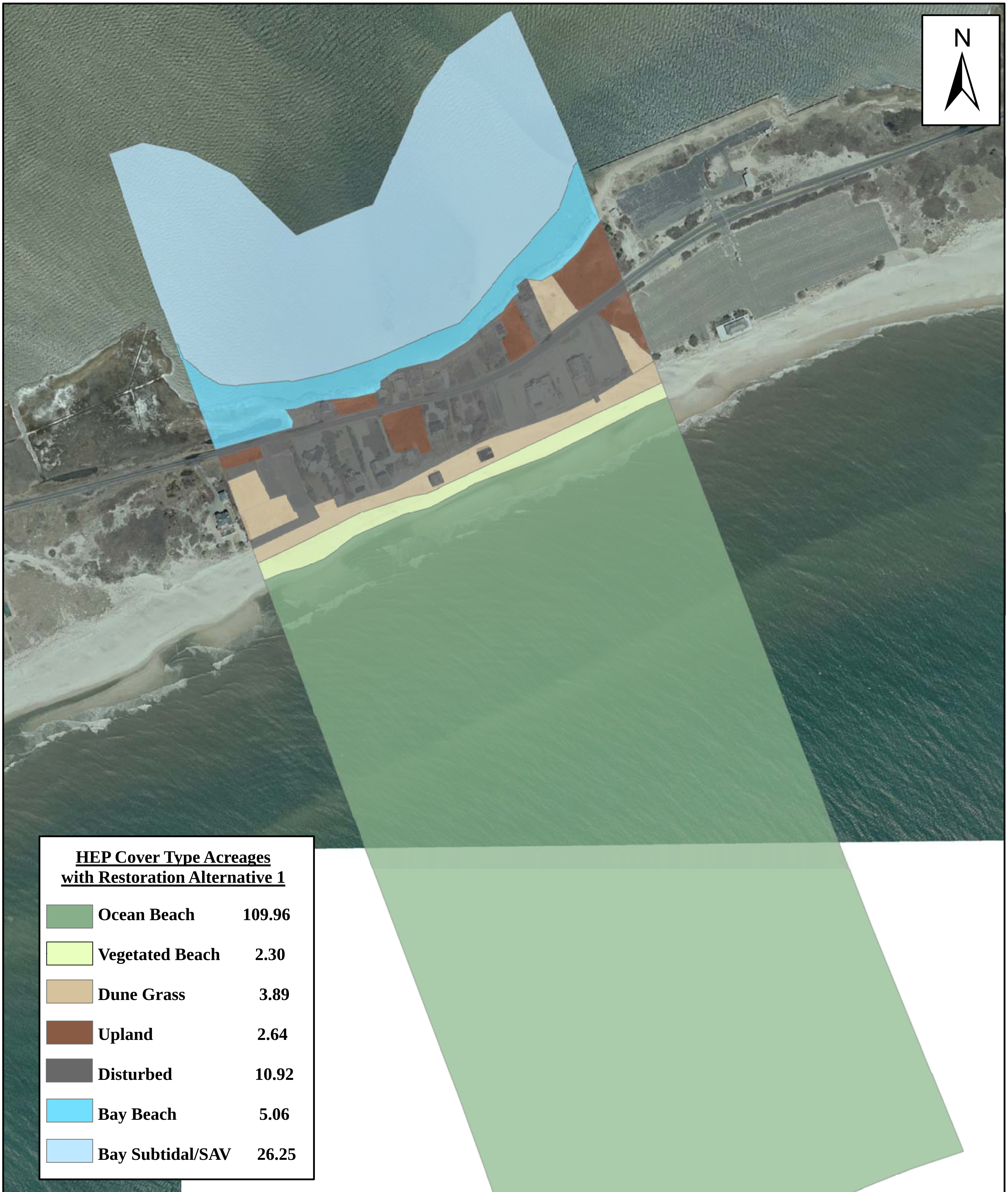
Feet

SB-1C
Tiana
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

03/06



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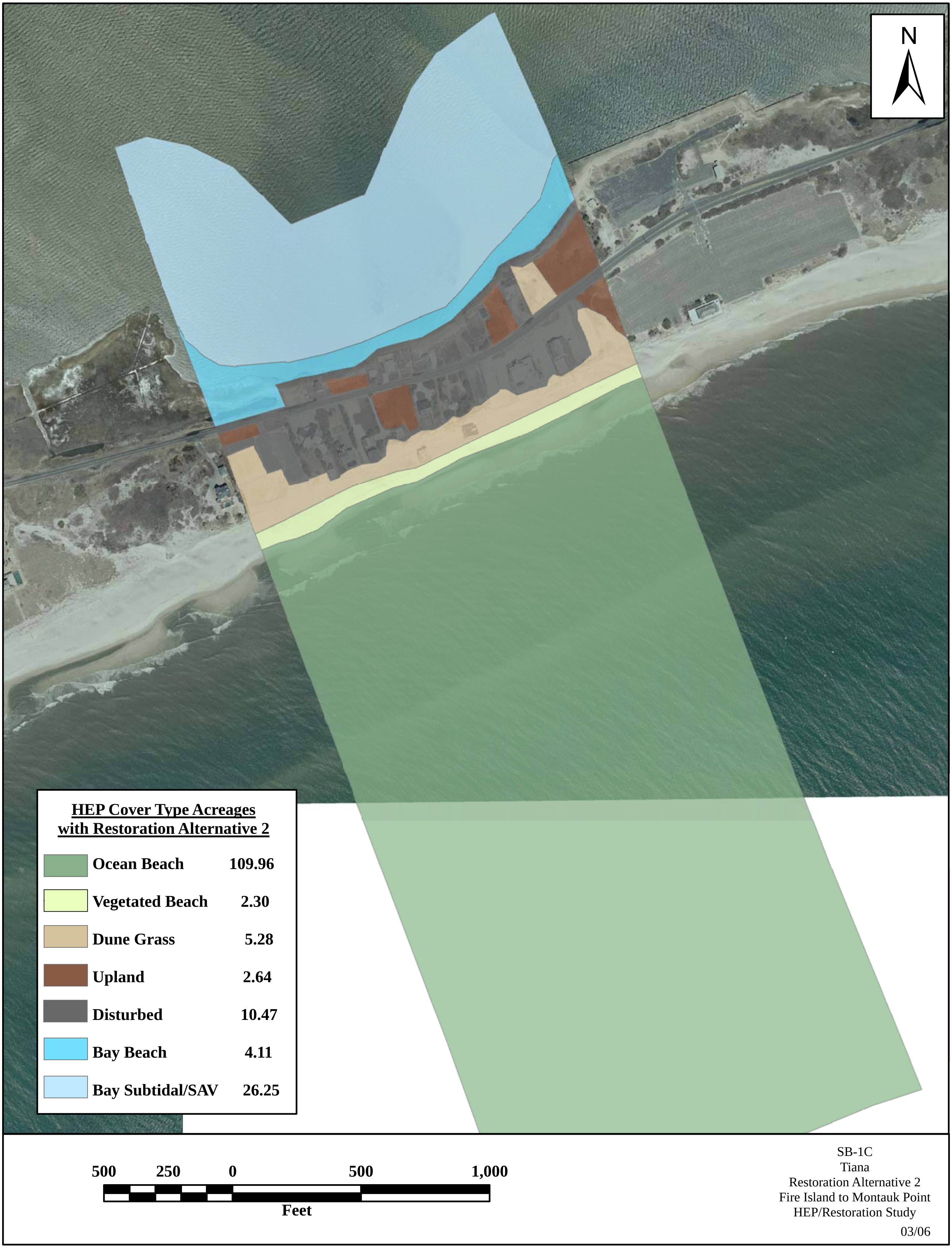
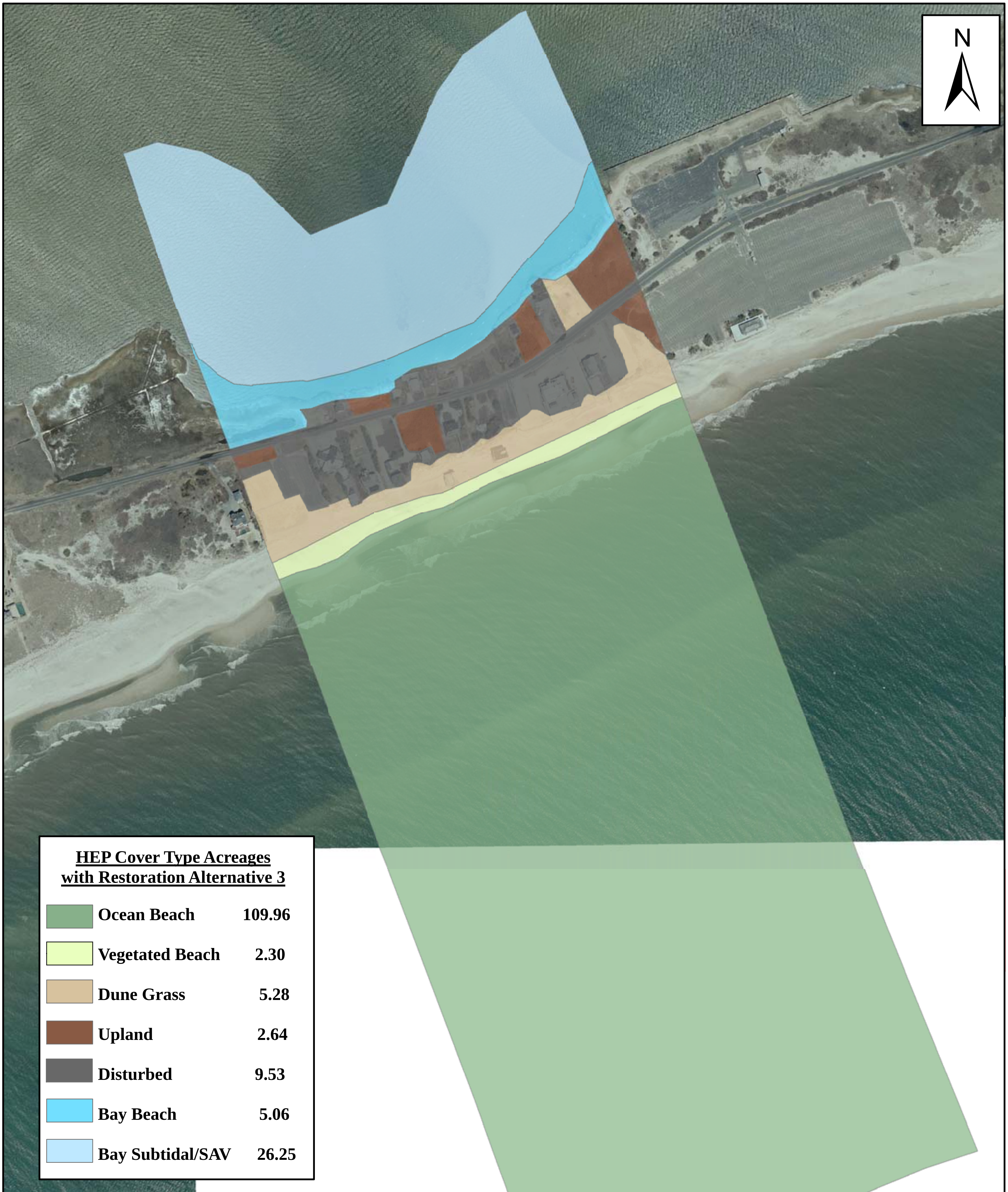
Feet

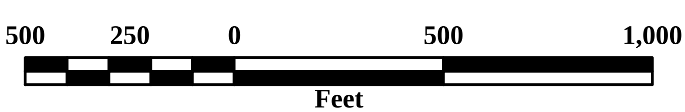
SB-1C
Tiana
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

03/06



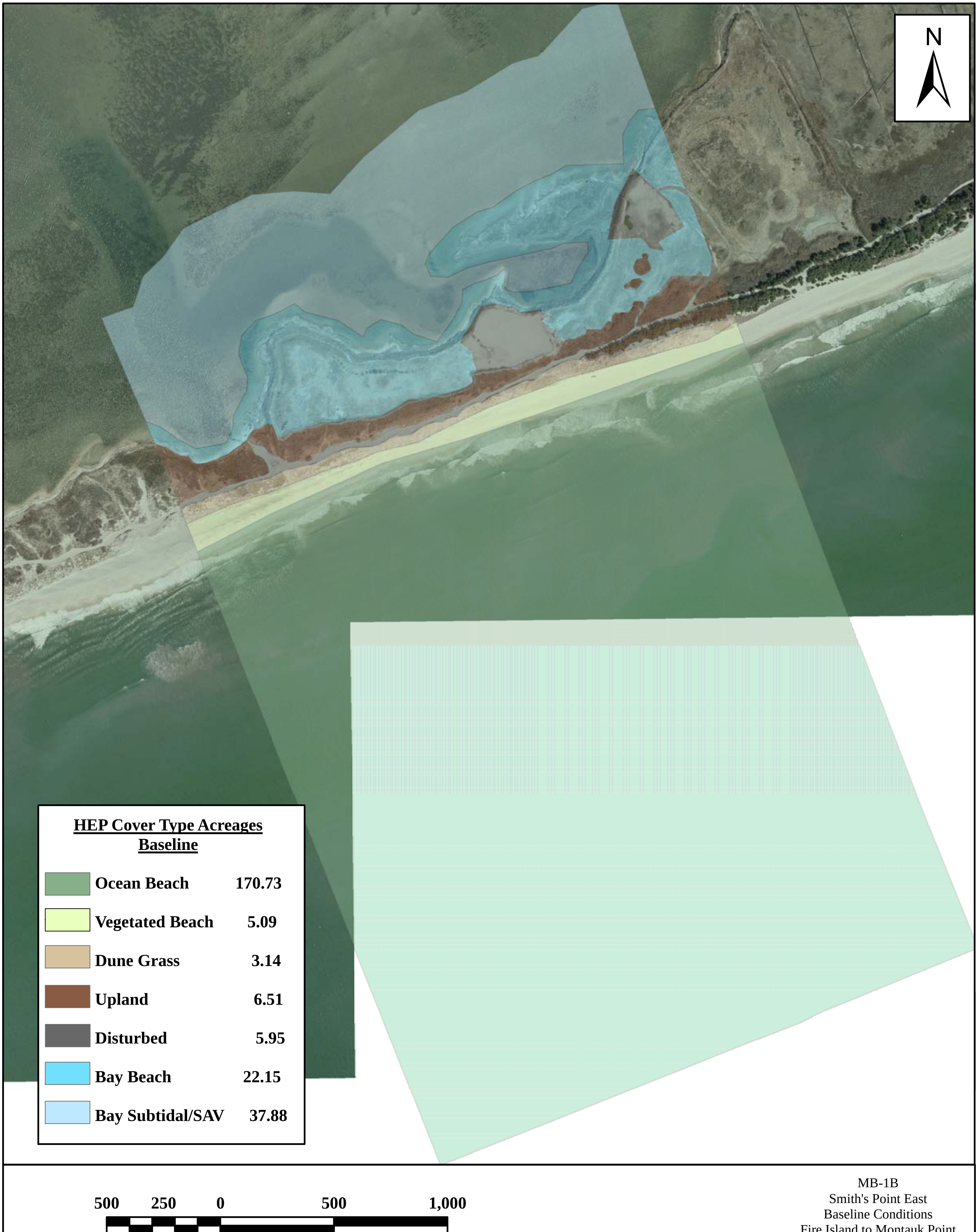
SB-1C
Tiana
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study
03/06





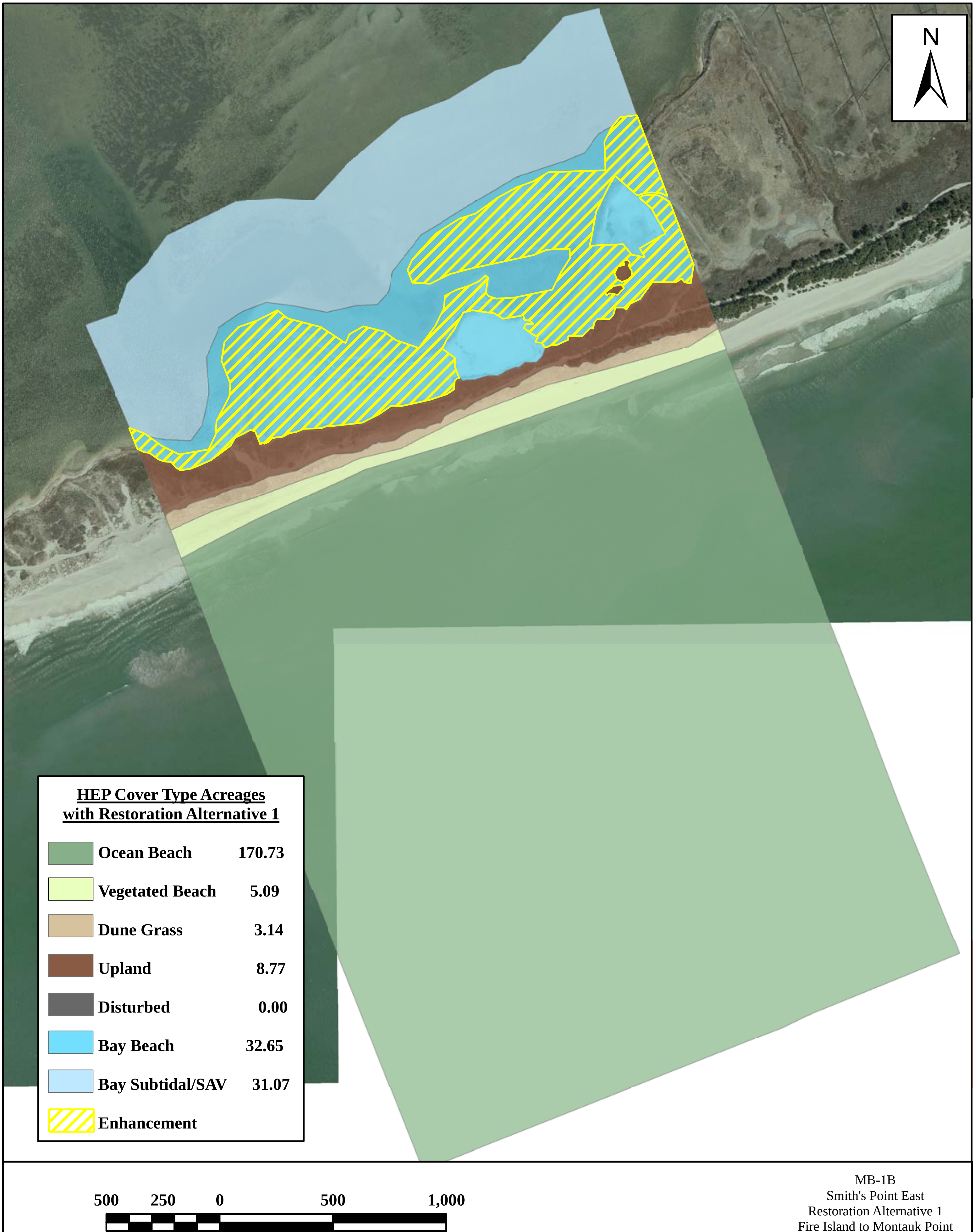
SB-1C
Tiana
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

03/06



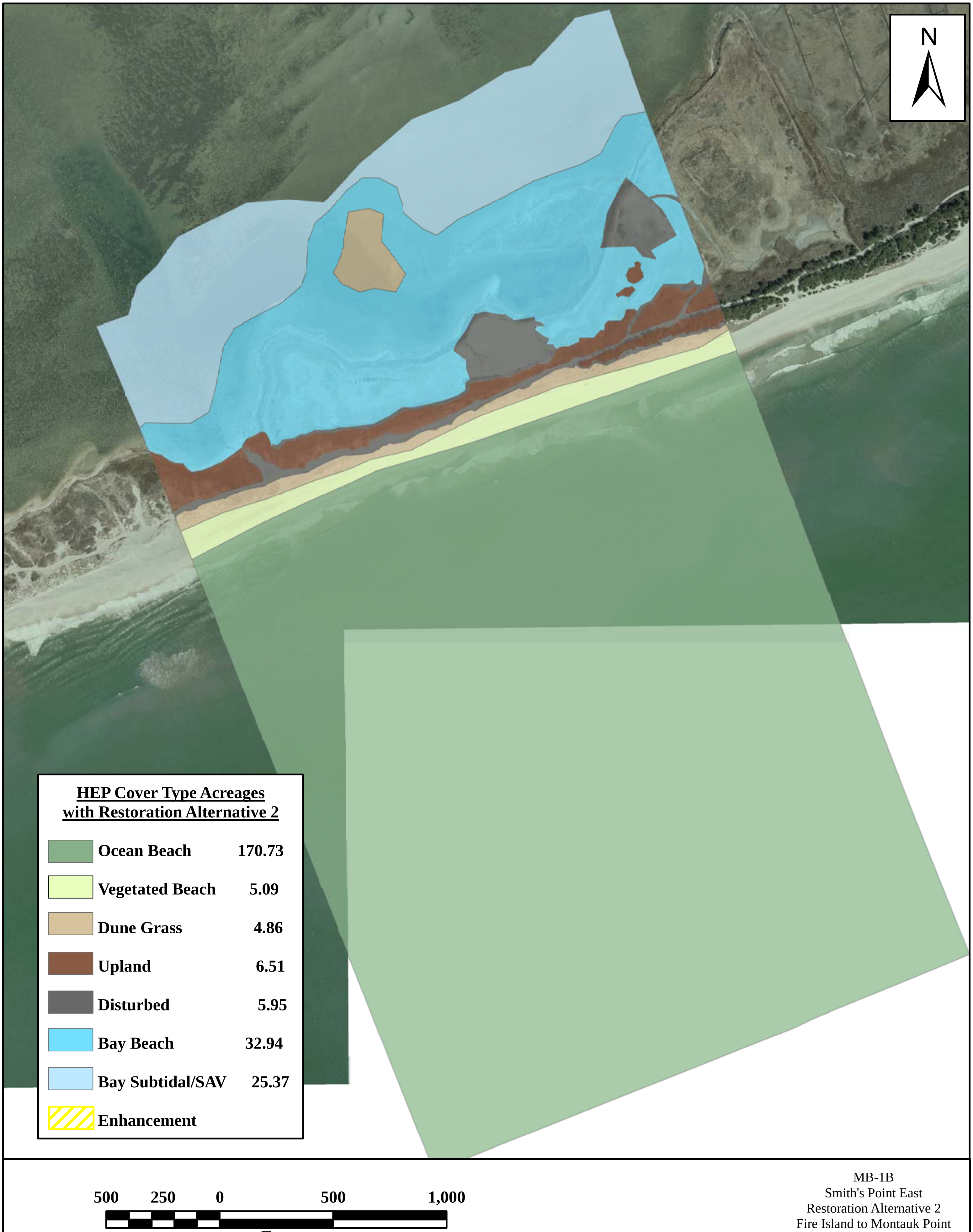
MB-1B
Smith's Point East
Baseline Conditions
Fire Island to Montauk Point
HEP/Restoration Study

03/06



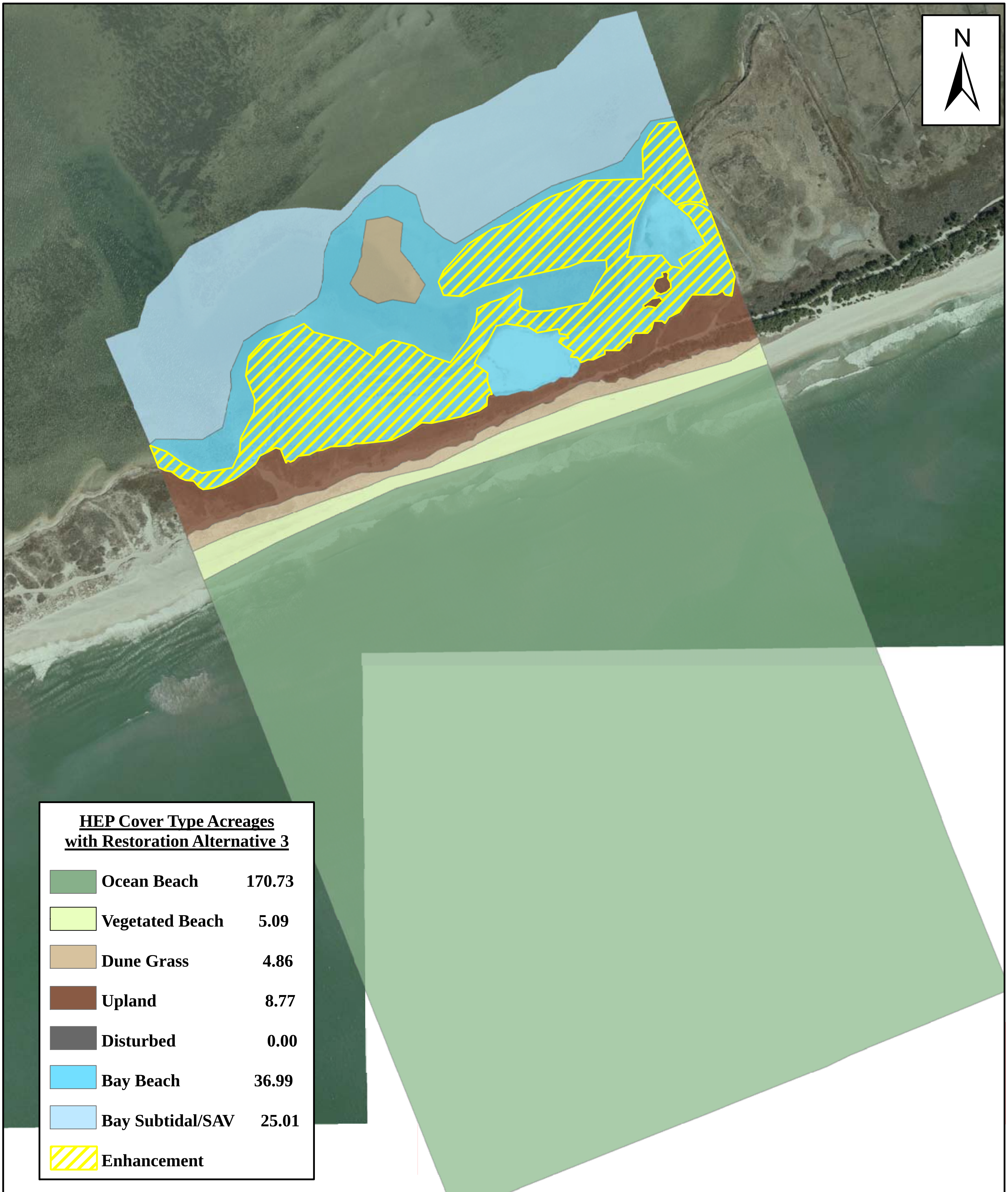
MB-1B
Smith's Point East
Restoration Alternative 1
Fire Island to Montauk Point
HEP/Restoration Study

03/06



MB-1B
Smith's Point East
Restoration Alternative 2
Fire Island to Montauk Point
HEP/Restoration Study

03/06



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Feet

MB-1B
Smith's Point East
Restoration Alternative 3
Fire Island to Montauk Point
HEP/Restoration Study

03/06

SUMMARY
OF

HSI, HU AND ACRES

FOR

BASELINE, FUTURE NO-ACTION, AND FUTURE WITH-ACTION CONDITIONS AT BREACH RESPONSE RESTORATION SITES

Comparison of HSI Scores for Baseline, Future no-action, and Future with-restoration Scenarios for Breach Response Sites.

Site ID	Site Name	Baseline	No Action	Alternative 1	Alternative 2	Alternative 3
PROJECT						
GSB-1B	FILT	0.470	0.102	0.724		
GSB-2B	Town Beach to Corneille	0.447	0.101	0.761		
GSB-3D	Talisman to Water Island	0.502	0.122	0.728		
GSB-3G	Davis Park	0.381	0.057	0.713		
GSB-4B	Old Inlet (WEST)	0.667	0.137	0.745		
MB-1B	SPCP	0.485	0.128	0.734		
SB-1B	Sedge Island	0.567	0.120	0.724		
SB-1C	Tiana	0.586	0.116	0.745		
SB-2B	WOSI	0.508	0.154	0.780		
GSB-4B	Old Inlet (EAST)	0.669	0.137	0.744		
RESTORATION						
	Tiana	0.401	0.347	0.486	0.516	0.600
	Smith's Point East	0.656	0.594	0.722	0.719	0.722

Comparison of Acres for Baseline, Future no-action, and Future with-restoration Scenarios for Breach Response Sites.

Site ID	Site Name	Baseline	No Action	Alternative 1	Alternative 2	Alternative 3
PROJECT						
GSB-1B	FILT	157	143	157		
GSB-2B	Town Beach to Corneille	154	142	154		
GSB-3D	Talisman to Water Island	124	113	124		
GSB-3G	Davis Park	135	124	135		
GSB-4B	Old Inlet (WEST)	163	154	163		
MB-1B	SPCP	68	63	68		
SB-1B	Sedge Island	93	88	93		
SB-1C	Tiana	78	71	78		
SB-2B	WOSI	76	70	76		
GSB-4B	Old Inlet (EAST)	163	154	163		
RESTORATION						
	Tiana	128	128	128	128	128
	Smith's Point East	213	213	213	213	213

Comparison of HUs for Baseline, Future no-action, and Future with-restoration Scenarios for Breach Response Sites.

Site ID	Site Name	Baseline	No Action	Alternative 1	Alternative 2	Alternative 3
PROJECT						
GSB-1B	FILT	73.990	44.700	103.758		
GSB-2B	Town Beach to Corneille	80.258	54.558	108.515		
GSB-3D	Talisman to Water Island	67.120	49.571	75.509		
GSB-3G	Davis Park	45.566	25.305	63.542		
GSB-4B	Old Inlet (WEST)	103.783	70.691	111.482		
MB-1B	SPCP	35.548	27.292	42.415		
SB-1B	Sedge Island	53.399	33.702	63.630		
SB-1C	Tiana	43.879	27.877	49.241		
SB-2B	WOSI	57.357	39.292	65.142		
GSB-4B	Old Inlet (EAST)	103.880	70.691	111.299		
RESTORATION						
	Tiana	59.67	51.71	62.41	62.70	65.43
	Smith's Point East	122.79	110.56	137.38	133.78	139.88

BASELINE CONDITIONS

HSIs, HUs and Acres

Breach Response RESTORATION Sites Baseline HSI Scores per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
Tiana	0.55	0.31	0.43	0.19	0.51	0.43	0.401
Smith's Point East	0.59	0.65	0.67	0.78	0.47	0.78	0.656

Breach Response RESTORATION Sites Baseline Acres per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	DISTURBED	TOTAL ACRES
Tiana	69.36	2.30	3.89	4.11	26.25	2.64	11.870	120.423
Smith's Point East	132.21	5.09	3.14	22.15	37.88	6.51	5.950	212.93

Breach Response RESTORATION Sites Baseline HU Scores per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
Tiana	37.87	0.70	1.68	0.77	13.30	1.14	55.460
Smith's Point East	77.34	3.31	2.10	17.29	17.64	5.10	122.792

FUTURE NO-ACTION CONDITIONS

HSIs, HUs and Acres

(Future conditions without project or restoration activities)

Breach Response RESTORATION Sites No-action HSI Scores per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
Tiana	0.57	0.00	0.00	0.00	0.14	0.00	0.117
Smith's Point East	0.53	0.00	0.00	0.00	0.29	0.00	0.137

Breach Response RESTORATION Sites No-action Acres per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	DISTURBED	TOTAL ACRES
Tiana	77.07	2.30	3.89	4.11	26.25	2.64	11.870	128.13
Smith's Point East	132.21	5.09	3.14	22.15	37.88	6.51	6.510	213.49

Breach Response RESTORATION Sites No-action HU Scores per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
Tiana	43.56	0.00	0.00	0.00	3.57	0.00	47.137
Smith's Point East	70.01	0.00	0.00	0.00	11.11	0.00	81.117

FUTURE WITH-ACTION CONDITIONS

HSIs, HUs and Acres

(Future conditions with project or restoration activities)

Breach Response RESTORATION Sites Alt 1 HSI Scores per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
Tiana	0.55	0.31	0.43	0.69	0.51	0.43	0.486
Smith's Point East	0.59	0.65	0.67	0.96	0.47	1.00	0.722

Breach Response RESTORATION Sites Alt 1 Acres per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	DISTURBED	TOTAL ACRES
Tiana	77.07	2.30	3.89	5.06	26.25	2.64	10.920	128.13
Smith's Point East	132.21	5.09	3.14	32.65	31.07	8.77	0.000	212.93

Breach Response RESTORATION Sites Alt 1 HU Scores per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
Tiana	42.08	0.71	1.68	3.50	13.30	1.14	62.405
Smith's Point East	77.34	3.31	2.10	31.38	14.47	8.77	137.376

BREACH RESPONSE RESTORATION Sites Alt 2 HSI Scores per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
Tiana	0.55	0.71	0.72	0.19	0.51	0.43	0.516
Smith's Point East	0.59	0.65	0.67	0.96	0.47	0.98	0.719

BREACH RESPONSE RESTORATION Sites Alt 2 Acres per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	DISTURBED	TOTAL ACRES
Tiana	77.07	2.30	5.28	4.11	26.25	2.64	10.470	128.12
Smith's Point East	132.21	5.09	4.86	32.94	25.37	6.51	5.950	212.93

Breach Response RESTORATION Sites Alt 2 HU Scores per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
Tiana	42.08	1.63	3.78	0.76	13.30	1.14	62.697
Smith's Point East	77.34	3.31	3.26	31.66	11.82	6.40	133.784

Breach Response RESTORATION Sites Alt 3 HSI Scores per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	AVERAGE HSI
Tiana	0.55	0.71	0.72	0.69	0.51	0.43	0.600
Smith's Point East	0.59	0.65	0.67	0.96	0.47	1.00	0.722

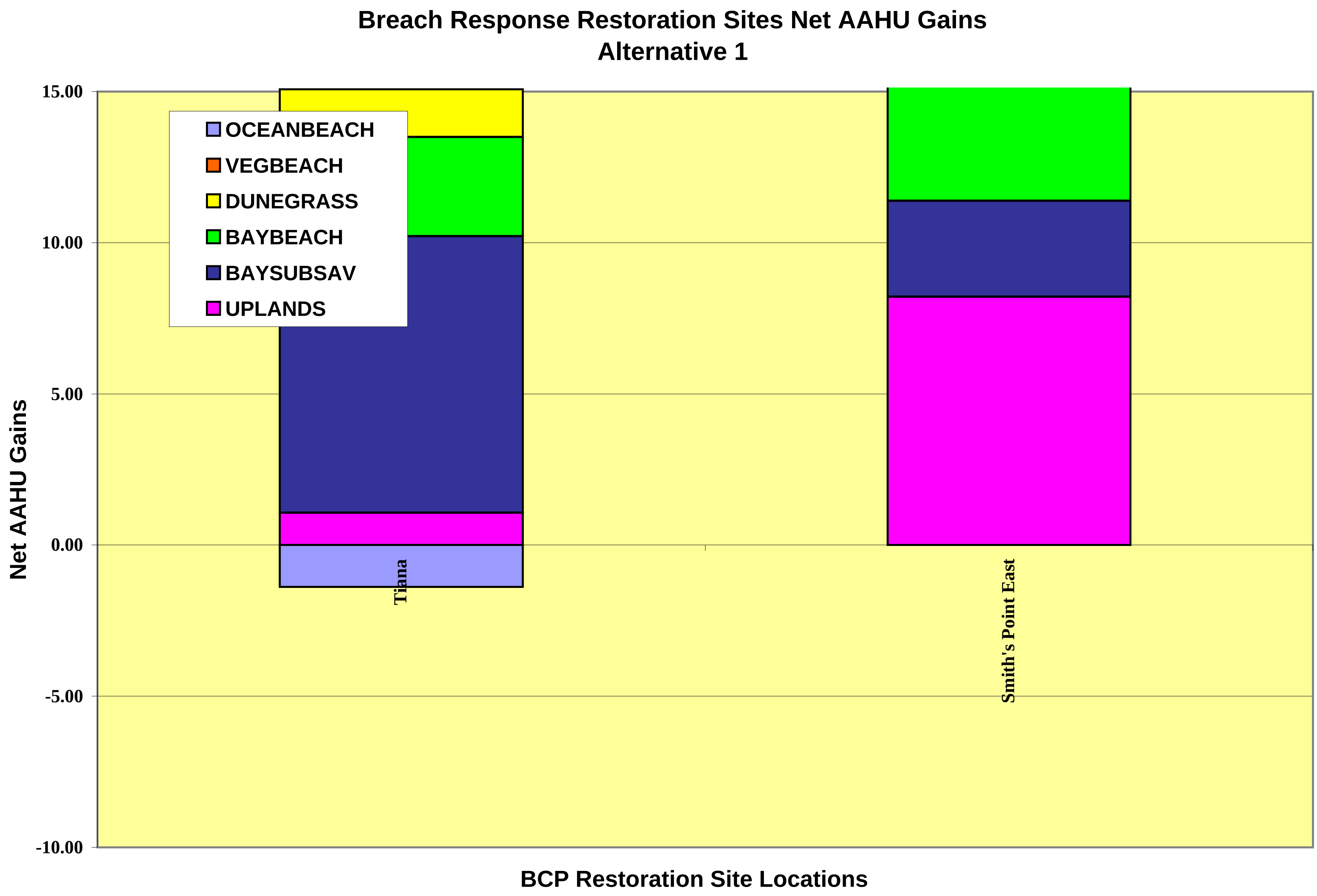
Breach Response RESTORATION Sites Alt 3 Acres per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	DISTURBED	TOTAL ACRES
Tiana	77.07	2.30	5.28	5.06	26.25	2.64	9.530	128.13
Smith's Point East	132.21	5.09	4.86	36.99	25.01	8.77	0.000	212.93

Breach Response RESTORATION Sites Alt 3 HU Scores per Transect and Community

	OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS	TOTAL HU
Tiana	42.08	1.63	3.78	3.50	13.30	1.14	65.432
Smith's Point East	77.34	3.31	3.26	35.55	11.65	8.77	139.877

SUMMARY
OF
AAHU's
FOR
SHORELINE PROTECTION
RESTORATION SITES



Breach Response Restoration Sites Net AAHU Gains
Alternative 1
15.00
10.00
5.00
0.00
-5.00
-10.00
Net AAHU Gains
OCEANBEACH
VEGBEACH
DUNEGRASS
BAYBEACH
BAYSUBSAV
UPLANDS
Tiana
Smith's Point East
BCP Restoration Site Locations

Net AAHUs per Community Types along each Transect and the Total AAHUs per Transect (BCP Restoration Sites - Alternative 1)

Project Sites		Sum of AAHUs	Average Annual Habitat Units (AAHUs)					
			OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
BCP Restoration 1	Tiana	14.34	-1.39	0.66	1.58	3.28	9.15	1.07
BCP Restoration 2	Smith's Point East	52.73	6.90	3.11	1.98	29.36	3.17	8.21

Fire Island to Montauk Point, NY Reformulation Study

Tiana Breach Response Restoration Site

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.546	0.565	69	77	41	43.56	0	1	0.546	0.565	69	77	41
1	5	0.565	0.565	77	77	174		1	5	0.565	0.546	77	77	171
5	50	0.565	0.565	77	77	1,960	43.56	5	50	0.546	0.546	77	77	1,894
Without Project AAHUs:						**43.5**		**With Project AAHUs:**						**42.1**
Net AAHUs:														**-1.395**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.306	0.000	2	2	0		0	1	0.306	0.000	2	2	0
1	5	0.000	0.000	2	2	0		1	5	0.000	0.307	2	2	1
5	50	0.000	0.000	2	2	0	0	5	50	0.307	0.307	2	2	32
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**0.7**
Net AAHUs:														**0.664**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.432	0.000	4	4	1		0	1	0.432	0.000	4	4	1
1	5	0.000	0.000	4	4	0		1	5	0.000	0.432	4	4	3
5	50	0.000	0.000	4	4	0	0	5	50	0.432	0.432	4	4	76
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**1.595**
Net AAHUs:														**1.578**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.000	4	4	0		0	1	0.187	0.000	4	4	0
1	5	0.000	0.000	4	4	0		1	5	0.000	0.692	4	5	7
5	50	0.000	0.000	4	4	0	0	5	50	0.692	0.692	5	5	158
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**3.3**
Net AAHUs:														**3.282**

Fire Island to Montauk Point, NY Reformulation Study

Tiana Breach Response Restoration Site

AAHU Calculation Summary Breach Response Sites (Large Scenario)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.507	0.136	26	26	8		0	1	0.507	0.136	26	26	8
1	5	0.136	0.136	26	26	14		1	5	0.136	0.507	26	26	34
5	50	0.136	0.136	26	26	161	3.573	5	50	0.507	0.507	26	26	599
Without Project AAHUs:						**3.7**		**With Project AAHUs:**						**12.8**
Net AAHUs:														**9.146**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.430	0.000	3	3	1		0	1	0.430	0.000	3	3	1
1	5	0.000	0.000	3	3	0		1	5	0.000	0.430	3	3	2
5	50	0.000	0.000	3	3	0	0	5	50	0.430	0.430	3	3	51
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**1.1**
Net AAHUs:														**1.067**

Fire Island to Montauk Point, NY Reformulation Study

Smith's Point East Breach Response Restoration Site

AAHU Calculation Summary Breach Response Sites (Large Scenario)

OCEANBEACH Community

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.585	0.530	132	132	74	70.01	0	1	0.585	0.530	132	132	74
1	5	0.530	0.530	132	132	280		1	5	0.530	0.585	132	132	295
5	50	0.530	0.530	132	132	3,150	70.01	5	50	0.585	0.585	132	132	3,480
Without Project AAHUs:						**70.1**		**With Project AAHUs:**						**77.0**
													Net AAHUs:	**6.897**

VEGBEACH Community

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.650	0.000	5	5	2		0	1	0.650	0.000	5	5	2
1	5	0.000	0.000	5	5	0		1	5	0.000	0.650	5	5	7
5	50	0.000	0.000	5	5	0	0	5	50	0.650	0.650	5	5	149
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**3.1**
													Net AAHUs:	**3.110**

DUNEGRASS Communtity

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.670	0.000	3	3	1		0	1	0.670	0.000	3	3	1
1	5	0.000	0.000	3	3	0		1	5	0.000	0.670	3	3	4
5	50	0.000	0.000	3	3	0	0	5	50	0.670	0.670	3	3	95
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**1.999**
													Net AAHUs:	**1.978**

BAYBEACH Community

Without Project								**With Project**						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.781	0.000	22	22	9		0	1	0.781	0.000	22	22	9
1	5	0.000	0.000	22	22	0		1	5	0.000	0.961	22	33	56
5	50	0.000	0.000	22	22	0	0	5	50	0.961	0.961	33	33	1,412
Without Project AAHUs:						**0.2**		**With Project AAHUs:**						**29.5**
													Net AAHUs:	**29.363**

Fire Island to Montauk Point, NY Reformulation Study

Smith's Point East Breach Response Restoration Site

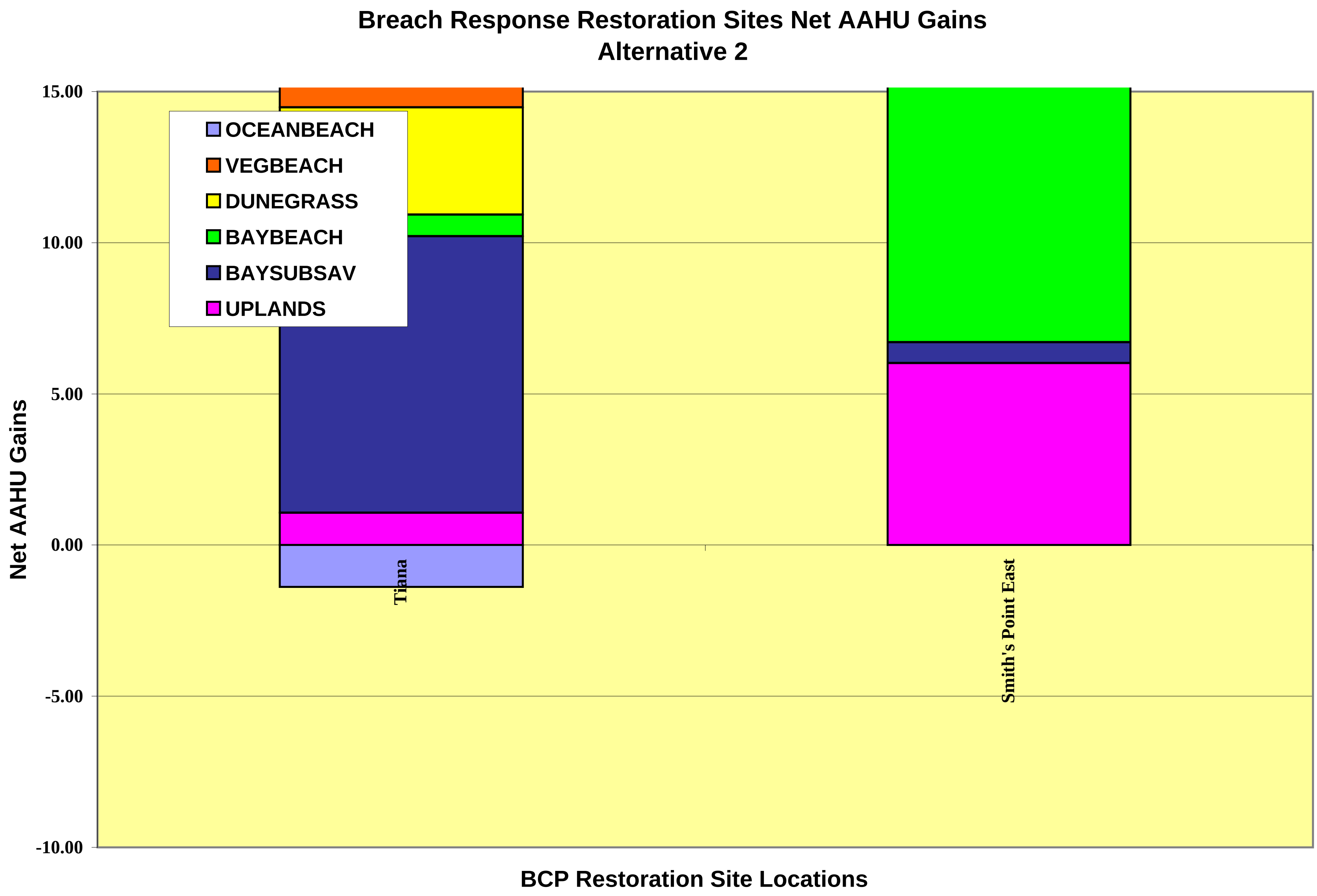
AAHU Calculation Summary Breach Response Sites (Large Scenario)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.293	38	38	14		0	1	0.466	0.293	38	38	14
1	5	0.293	0.293	38	38	44		1	5	0.293	0.466	38	31	52
5	50	0.293	0.293	38	38	500	11.11	5	50	0.466	0.466	31	31	651
Without Project AAHUs:						**11.2**		**With Project AAHUs:**						**14.3**
Net AAHUs:														**3.173**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.000	7	7	3		0	1	0.783	0.000	7	7	3
1	5	0.000	0.000	7	7	0		1	5	0.000	1.000	7	9	16
5	50	0.000	0.000	7	7	0	0	5	50	1.000	1.000	9	9	395
Without Project AAHUs:						**0.1**		**With Project AAHUs:**						**8.3**
Net AAHUs:														**8.214**


Breach Response Restoration Sites Net AAHU Gains
Alternative 2
15.00
10.00
5.00
0.00
-5.00
-10.00
Net AAHU Gains
OCEANBEACH
VEGBEACH
DUNEGRASS
BAYBEACH
BAYSUBSAV
UPLANDS
Tiana
Smith's Point East
BCP Restoration Site Locations

Net AAHUs per Community Types along each Transect and the Total AAHUs per Transect (Breach Response Restoration Sites - Alternative 2)

Project Sites		Sum of AAHUs	Average Annual Habitat Units (AAHUs)					
			OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
Breach Response Restoration 1	Tiana	14.61	-1.39	1.53	3.54	0.72	9.15	1.07
Breach Response Restoration 2	Smith's Point East	49.38	6.90	3.11	3.05	29.62	0.69	6.02

Fire Island to Montauk Point, NY Reformulation Study

Tiana Breach Response Restoration Site

AAHU Calculation Summary Breach Response Sites (Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.546	0.565	69	77	41	43.56	0	1	0.546	0.565	69	77	41
1	5	0.565	0.565	77	77	174		1	5	0.565	0.546	77	77	171
5	50	0.565	0.565	77	77	1,960	43.56	5	50	0.546	0.546	77	77	1,894
Without Project AAHUs:						**43.5**		**With Project AAHUs:**						**42.1**
Net AAHUs:														**-1.395**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.306	0.000	2	2	0		0	1	0.306	0.000	2	2	0
1	5	0.000	0.000	2	2	0		1	5	0.000	0.708	2	2	3
5	50	0.000	0.000	2	2	0	0	5	50	0.708	0.708	2	2	73
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**1.5**
Net AAHUs:														**1.531**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.432	0.000	4	4	1		0	1	0.432	0.000	4	4	1
1	5	0.000	0.000	4	4	0		1	5	0.000	0.717	4	5	7
5	50	0.000	0.000	4	4	0	0	5	50	0.717	0.717	5	5	170
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**3.560**
Net AAHUs:														**3.544**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.187	0.000	4	4	0		0	1	0.187	0.000	4	4	0
1	5	0.000	0.000	4	4	0		1	5	0.000	0.186	4	4	2
5	50	0.000	0.000	4	4	0	0	5	50	0.186	0.186	4	4	34
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**0.7**
Net AAHUs:														**0.719**

Fire Island to Montauk Point, NY Reformulation Study

Tiana Breach Response Restoration Site

AAHU Calculation Summary Breach Response Sites (Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.507	0.136	26	26	8		0	1	0.507	0.136	26	26	8
1	5	0.136	0.136	26	26	14		1	5	0.136	0.507	26	26	34
5	50	0.136	0.136	26	26	161	3.573	5	50	0.507	0.507	26	26	599
					Without Project AAHUs:	**3.7**							**With Project AAHUs:**	**12.8**
													Net AAHUs:	**9.146**

UPLANDS Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.430	0.000	3	3	1		0	1	0.430	0.000	3	3	1
1	5	0.000	0.000	3	3	0		1	5	0.000	0.430	3	3	2
5	50	0.000	0.000	3	3	0	0	5	50	0.430	0.430	3	3	51
					Without Project AAHUs:	**0.0**							**With Project AAHUs:**	**1.1**
													Net AAHUs:	**1.067**

Fire Island to Montauk Point, NY Reformulation Study

Smith's Point East Breach Response Restoration Site

AAHU Calculation Summary Breach Response Sites (Alternative 2)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.585	0.530	132	132	74	70.01	0	1	0.585	0.530	132	132	74
1	5	0.530	0.530	132	132	280		1	5	0.530	0.585	132	132	295
5	50	0.530	0.530	132	132	3,150	70.01	5	50	0.585	0.585	132	132	3,480
Without Project AAHUs:						**70.1**		**With Project AAHUs:**						**77.0**
Net AAHUs:														**6.897**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.650	0.000	5	5	2		0	1	0.650	0.000	5	5	2
1	5	0.000	0.000	5	5	0		1	5	0.000	0.650	5	5	7
5	50	0.000	0.000	5	5	0	0	5	50	0.650	0.650	5	5	149
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**3.1**
Net AAHUs:														**3.110**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.670	0.000	3	3	1		0	1	0.670	0.000	3	3	1
1	5	0.000	0.000	3	3	0		1	5	0.000	0.670	3	5	6
5	50	0.000	0.000	3	3	0	0	5	50	0.670	0.670	5	5	147
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**3.067**
Net AAHUs:														**3.045**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.781	0.000	22	22	9		0	1	0.781	0.000	22	22	9
1	5	0.000	0.000	22	22	0		1	5	0.000	0.961	22	33	56
5	50	0.000	0.000	22	22	0	0	5	50	0.961	0.961	33	33	1,425
Without Project AAHUs:						**0.2**		**With Project AAHUs:**						**29.8**
Net AAHUs:														**29.621**

Fire Island to Montauk Point, NY Reformulation Study

Smith's Point East Breach Response Restoration Site

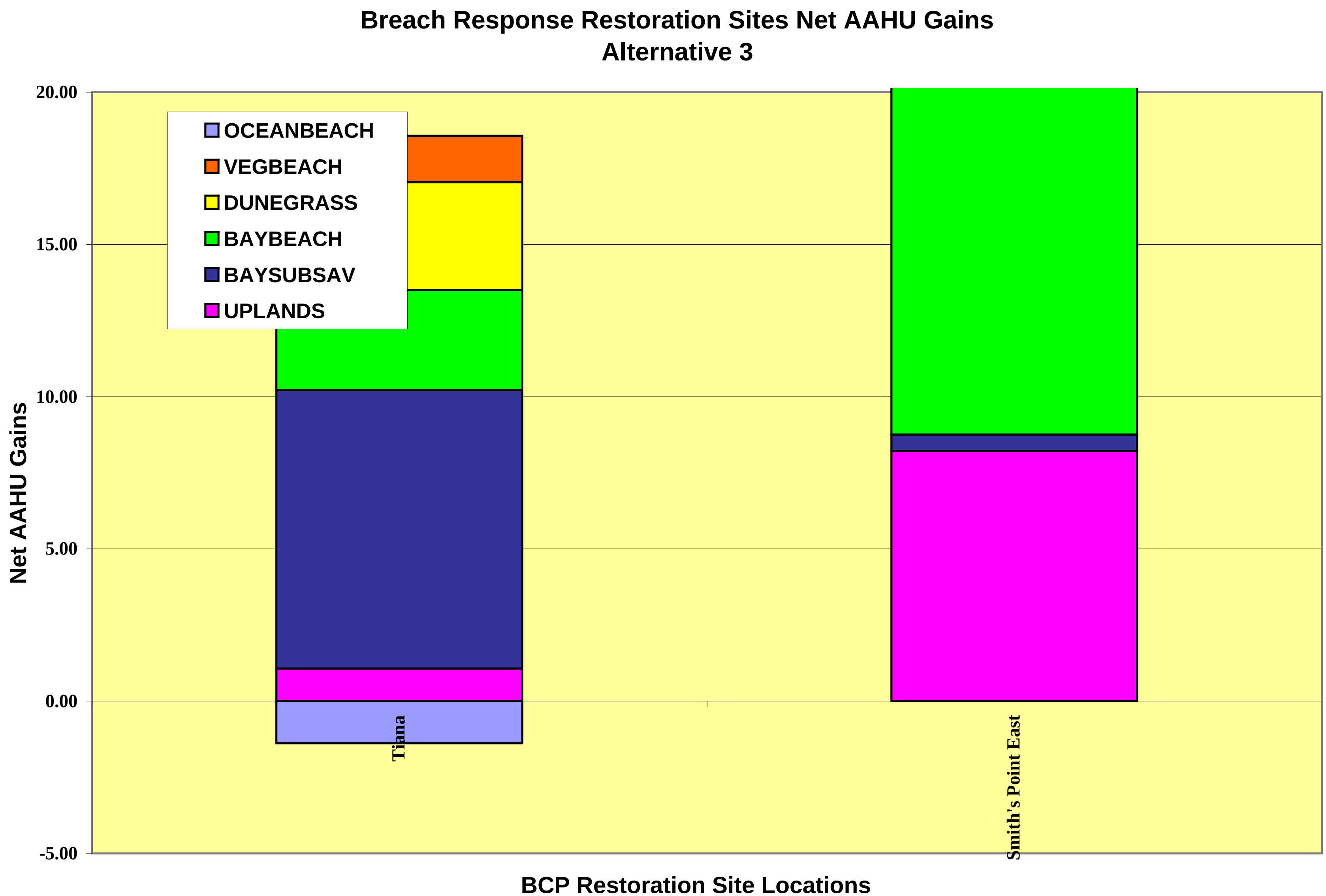
AAHU Calculation Summary Breach Response Sites (Alternative 2)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.293	38	38	14		0	1	0.466	0.293	38	38	14
1	5	0.293	0.293	38	38	44		1	5	0.293	0.466	38	25	47
5	50	0.293	0.293	38	38	500	11.11	5	50	0.466	0.466	25	25	532
					Without Project AAHUs:	**11.2**							**With Project AAHUs:**	**11.9**
													Net AAHUs:	**0.691**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.000	7	7	3		0	1	0.783	0.000	7	7	3
1	5	0.000	0.000	7	7	0		1	5	0.000	0.983	7	7	13
5	50	0.000	0.000	7	7	0	0	5	50	0.983	0.983	7	7	288
					Without Project AAHUs:	**0.1**							**With Project AAHUs:**	**6.1**
													Net AAHUs:	**6.017**



Breach Response Restoration Sites Net AAHU Gains
Alternative 3
Net AAHU Gains
20.00
15.00
10.00
5.00
0.00
-5.00
OCEANBEACH
VEGBEACH
DUNEGRASS
BAYBEACH
BAYSUBSAV
UPLANDS
Tiana
Smith's Point East
BCP Restoration Site Locations

Net AAHUs per Community Types along each Transect and the Total AAHUs per Transect (Breach Response Restoration Sites - Alternative 3)

Project Sites		Sum of AAHUs	Average Annual Habitat Units (AAHUs)					
			OCEANBEACH	VEGBEACH	DUNEGRASS	BAYBEACH	BAYSUBSAV	UPLANDS
Breach Response R	Tiana	17.18	-1.39	1.53	3.54	3.28	9.15	1.07
Breach Response R	Smith's Point East	55.03	6.90	3.11	3.05	33.23	0.53	8.21

Fire Island to Montauk Point, NY Reformulation Study

Tiana Breach Response Restoration Site

AAHU Calculation Summary Breach Response Sites (Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.546	0.565	69	77	41	43.56	0	1	0.546	0.565	69	77	41
1	5	0.565	0.565	77	77	174		1	5	0.565	0.546	77	77	171
5	50	0.565	0.565	77	77	1,960	43.56	5	50	0.546	0.546	77	77	1,894
Without Project AAHUs:						**43.5**		**With Project AAHUs:**						**42.1**
								Net AAHUs:						**-1.395**

VEGBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.306	0.000	2	2	0		0	1	0.306	0.000	2	2	0
1	5	0.000	0.000	2	2	0		1	5	0.000	0.708	2	2	3
5	50	0.000	0.000	2	2	0	0	5	50	0.708	0.708	2	2	73
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**1.5**
								Net AAHUs:						**1.531**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.432	0.000	4	4	1		0	1	0.432	0.000	4	4	1
1	5	0.000	0.000	4	4	0		1	5	0.000	0.717	4	5	7
5	50	0.000	0.000	4	4	0	0	5	50	0.717	0.717	5	5	170
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**3.560**
								Net AAHUs:						**3.544**

BAYBEACH Community

Without Project								With Project						
TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs		TY 1	TY 2	HSI 1	HSI 2	Area 1	Area 2	Cumulative HUs
0	1	0.187	0.000	4	4	0		0	1	0.187	0.000	4	4	0
1	5	0.000	0.000	4	4	0		1	5	0.000	0.692	4	5	7
5	50	0.000	0.000	4	4	0	0	5	50	0.692	0.692	5	5	158
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**3.3**
								Net AAHUs:						**3.282**

Fire Island to Montauk Point, NY Reformulation Study

Tiana Breach Response Restoration Site

AAHU Calculation Summary Breach Response Sites (Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.507	0.136	26	26	8		0	1	0.507	0.136	26	26	8
1	5	0.136	0.136	26	26	14		1	5	0.136	0.507	26	26	34
5	50	0.136	0.136	26	26	161	3.573	5	50	0.507	0.507	26	26	599
					Without Project AAHUs:	**3.7**							**With Project AAHUs:**	**12.8**
													Net AAHUs:	**9.146**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.430	0.000	3	3	1		0	1	0.430	0.000	3	3	1
1	5	0.000	0.000	3	3	0		1	5	0.000	0.430	3	3	2
5	50	0.000	0.000	3	3	0	0	5	50	0.430	0.430	3	3	51
					Without Project AAHUs:	**0.0**							**With Project AAHUs:**	**1.1**
													Net AAHUs:	**1.067**

Fire Island to Montauk Point, NY Reformulation Study

Smith's Point East Breach Response Restoration Site

AAHU Calculation Summary Breach Response Sites (Alternative 3)

OCEANBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.585	0.530	132	132	74	70.01	0	1	0.585	0.530	132	132	74
1	5	0.530	0.530	132	132	280		1	5	0.530	0.585	132	132	295
5	50	0.530	0.530	132	132	3,150	70.01	5	50	0.585	0.585	132	132	3,480
Without Project AAHUs:						**70.1**		**With Project AAHUs:**						**77.0**
Net AAHUs:														**6.897**

VEGBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.650	0.000	5	5	2		0	1	0.650	0.000	5	5	2
1	5	0.000	0.000	5	5	0		1	5	0.000	0.650	5	5	7
5	50	0.000	0.000	5	5	0	0	5	50	0.650	0.650	5	5	149
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**3.1**
Net AAHUs:														**3.110**

DUNEGRASS Communtity

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.670	0.000	3	3	1		0	1	0.670	0.000	3	3	1
1	5	0.000	0.000	3	3	0		1	5	0.000	0.670	3	5	6
5	50	0.000	0.000	3	3	0	0	5	50	0.670	0.670	5	5	147
Without Project AAHUs:						**0.0**		**With Project AAHUs:**						**3.067**
Net AAHUs:														**3.045**

BAYBEACH Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.781	0.000	22	22	9		0	1	0.781	0.000	22	22	9
1	5	0.000	0.000	22	22	0		1	5	0.000	0.961	22	37	62
5	50	0.000	0.000	22	22	0	0	5	50	0.961	0.961	37	37	1,600
Without Project AAHUs:						**0.2**		**With Project AAHUs:**						**33.4**
Net AAHUs:														**33.228**

Fire Island to Montauk Point, NY Reformulation Study

Smith's Point East Breach Response Restoration Site

AAHU Calculation Summary Breach Response Sites (Alternative 3)

BAYSUBSAV Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.466	0.293	38	38	14		0	1	0.466	0.293	38	38	14
1	5	0.293	0.293	38	38	44		1	5	0.293	0.466	38	25	47
5	50	0.293	0.293	38	38	500	11.11	5	50	0.466	0.466	25	25	524
					Without Project AAHUs:	**11.2**							**With Project AAHUs:**	**11.7**
													Net AAHUs:	**0.534**

UPLANDS Community

Without Project								With Project						
TY 1	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**		**TY 1**	**TY 2**	**HSI 1**	**HSI 2**	**Area 1**	**Area 2**	**Cumulative HUs**
0	1	0.783	0.000	7	7	3		0	1	0.783	0.000	7	7	3
1	5	0.000	0.000	7	7	0		1	5	0.000	1.000	7	9	16
5	50	0.000	0.000	7	7	0	0	5	50	1.000	1.000	9	9	395
					Without Project AAHUs:	**0.1**							**With Project AAHUs:**	**8.3**
													Net AAHUs:	**8.214**

Appendix J

(Photo documentation is provided on CD in binder pocket)

Appendix K

Contents

SUMMARY
OF

HEP PROJECT COST

Matrix of Conceptual Size Estimates for Fire Island to Montauk Point Shoreline Protection Project Alternatives.

Line Item	Item	Description	Cost Adjusted to Fire Island, NY (4)	Units	RMSP		FILT		Kismet to Lonelyville		Town Beach to Corneille		Ocean Beach to Seaview		OBP to POW		Cherry Grove		Fire Island Pines		Talisman to Water Island		Water Island		Blue Point		Davis Park	
					GSB-1A		GSB-1B		GSB-2A		GSB-2B		GSB-2C		GSB-2D		GSB-3A		GSB-3C		GSB-3D		GSB-3E		GSB-3F		GSB-3G	
					Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
A	**Regrade**																											
A1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	27.3	27.3	2.3	2.3	23.4	24.6	9.3	9.3	0.0	3.3	16.8	18.0	0.0	0.0	16.5	17.1	1.1	1.1	1.8	1.8	0.0	0.0	8.6	9.7
B	**Fill**																											
B1		Sand, using dredge material	$ 21,780	AC	27.3	27.3	3.0	3.0	23.4	24.6	6.7	6.9	0.0	2.2	16.8	17.1	0.0	0.0	16.5	16.7	0.1	0.3	0.1	0.3	0.0	0.0	8.6	8.8
C	**Plants & Bioengineering**																											
C1		Dune grass	$ 8,141	AC	6.8	6.8	0.6	0.6	5.8	5.9	2.3	2.3	0.0	0.8	4.2	4.5	0.0	0.0	4.1	4.3	0.3	0.3	0.5	0.5	0.0	0.0	2.1	2.4
D	**Other**																											
D1		Mobilization & Demobilization	2%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D2		Contingency	20%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D3		E&D and S&A	15%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Assumptions:

1 ac = 209 x 209 sq ft area
Plantings - assume 1/4 of each acre of regraded area will be planted

Matrix of Conceptual Size Estimates for Fire Island to Montauk Point Shoreline Protection Project Alternatives.

					Old Inlet		SPCP-TWA		SPCP		Cupsogue		WHPTIN Pikes		WHPTIN East		Sedge Island		Tiana		Shinnecock Inlet Park-West		WOSI		Potato Road		Montauk	
					GSB-4B		MB-1A		MB-1B		MB-2C		MB-2D		MB-2E		SB-1B		SB-1C		SB-1D		SB-2B		P-1G		M-1F	
Line Item	**Item**	**Description**	**Cost Adjusted to Fire Island, NY (4)**	**Units**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**
A	**Regrade**																											
A1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	29.9	29.4	3.0	3.0	0.0	0.6	2.2	2.2	10.8	21.8	0.0	0.0	15.1	15.1	6.7	6.7	13.1	13.1	1.2	2.3	11.1	13.5	17.2	22.0
B	**Fill**																											
B1		Sand, using dredge material	$ 21,780	AC	31.1	31.1	3.0	3.0	0.0	0.3	2.2	2.2	10.8	17.6	0.0	0.0	10.2	10.4	6.9	6.9	13.1	13.1	2.4	3.5	10.7	13.3	22.2	28.6
C	**Plants & Bioengineering**																											
C1		Dune grass	$ 8,141	AC	7.3	7.3	0.8	0.8	0.0	0.2	0.6	0.6	2.7	5.5	0.0	0.0	3.8	3.8	1.7	1.7	3.3	3.3	0.3	0.6	2.8	3.4	4.3	5.5
D	**Other**																											
D1		Mobilization & Demobilization	2%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D2		Contingency	20%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D3		E&D and S&A	15%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Assumptions:

1 ac = 209 x 209 sq ft area

Plantings - assume 1/4 of each acre of regraded ar

Matrix of Conceptual Cost Estimates for Fire Island to Montauk Point Shoreline Protection Project Project Alternatives.[1]

					RMSP GSB-1A		FILT GSB-1B		Kismet to Lonelyville GSB-2A		Town Beach to Corneille GSB-2B		Ocean Beach to Seaview GSB-2C		OBP to POW GSB-2D		Cherry Grove GSB-3A		Fire Island Pines GSB-3C	
Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
A	Regrade																			
A1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	$ 92,973	$ 92,973	$ 7,833	$ 7,833	$ 79,691	$ 83,778	$ 31,672	$ 31,672	$ -	$ 11,239	$ 57,214	$ 61,301	$ -	$ -	$ 56,193	$ 58,236
B	Fill																			
B1		Sand, using dredge material	$ 21,780	AC	$ 594,593	$ 594,593	$ 65,340	$ 65,340	$ 509,651	$ 535,787	$ 145,926	$ 150,282	$ -	$ 47,916	$ 365,903	$ 372,437	$ -	$ -	$ 359,369	$ 363,725
C	Plants & Bioengineering																			
C1		Dune grass	$ 8,141	AC	$ 55,359	$ 55,359	$ 4,885	$ 4,885	$ 47,218	$ 48,032	$ 18,725	$ 18,725	$ -	$ 6,513	$ 34,193	$ 36,635	$ -	$ -	$ 33,378	$ 35,007
				SUBTOTAL	$ 742,925	$ 742,925	$ 78,057	$ 78,057	$ 636,561	$ 667,597	$ 196,322	$ 200,678	$ -	$ 65,667	$ 457,310	$ 470,373	$ -	$ -	$ 448,940	$ 456,968
D	Other																			
D1		Mobilization & Demobilization	2%		$ 14,859	$ 14,859	$ 1,561	$ 1,561	$ 12,731	$ 13,352	$ 3,926	$ 4,014	$ -	$ 1,313	$ 9,146	$ 9,407	$ -	$ -	$ 8,979	$ 9,139
D2		Contingency	20%		$ 148,585	$ 148,585	$ 15,611	$ 15,611	$ 127,312	$ 133,519	$ 39,264	$ 40,136	$ -	$ 13,133	$ 91,462	$ 94,075	$ -	$ -	$ 89,788	$ 91,394
D3		E&D and S&A (2)	15%		$ 135,955	$ 135,955	$ 14,285	$ 14,285	$ 116,491	$ 122,170	$ 35,927	$ 36,724	$ -	$ 12,017	$ 83,688	$ 86,078	$ -	$ -	$ 82,156	$ 83,625
				TOTAL	**$ 1,042,324**	**$ 1,042,324**	**$ 109,515**	**$ 109,515**	**$ 893,094**	**$ 936,639**	**$ 275,440**	**$ 281,552**	**$ -**	**$ 92,131**	**$ 641,606**	**$ 659,933**	**$ -**	**$ -**	**$ 629,863**	**$ 641,126**

Notes

(1) Costs are preliminary, and are for comparison of alternatives only.

(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15% of the Subtotal *plus* Mob & Demob and Contingency cost.

Matrix of Conceptual Cost Estimates for Fire Island to Montauk Point Shoreline Protection Project Project Alternatives (continued).[1]

					Talisman to Water Island		Water Island		Blue Point		Davis Park		Old Inlet		SPCP-TWA		SPCP		Cupsogue	
					GSB-3D		GSB-3E		GSB-3F		GSB-3G		GSB-4B		MB-1A		MB-1B		MB-2C	
Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
A	Regrade																			
A1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	$ 3,746	$ 3,746	$ 6,130	$ 6,130	$ -	$ -	$ 29,288	$ 33,034	$ 101,828	$ 100,125	$ 10,217	$ 10,217	$ -	$ 2,043	$ 7,492	$ 7,492
B	Fill																			
B1		Sand, using dredge material	$ 21,780	AC	$ 2,178	$ 6,534	$ 2,178	$ 6,534	$ -	$ -	$ 187,308	$ 191,664	$ 677,357	$ 677,357	$ 65,340	$ 65,340	$ -	$ 6,534	$ 47,916	$ 47,916
C	Plants & Bioengineering																			
C1		Dune grass	$ 8,141	AC	$ 2,442	$ 2,442	$ 4,071	$ 4,071	$ -	$ -	$ 17,096	$ 19,539	$ 59,430	$ 59,430	$ 6,513	$ 6,513	$ -	$ 1,628	$ 4,885	$ 4,885
				SUBTOTAL	$ 8,366	$ 12,722	$ 12,379	$ 16,735	$ -	$ -	$ 233,692	$ 244,237	$ 838,614	$ 836,911	$ 82,070	$ 82,070	$ -	$ 10,206	$ 60,293	$ 60,293
D	Other																			
D1		Mobilization & Demobilization	2%		$ 167	$ 254	$ 248	$ 335	$ -	$ -	$ 4,674	$ 4,885	$ 16,772	$ 16,738	$ 1,641	$ 1,641	$ -	$ 204	$ 1,206	$ 1,206
D2		Contingency	20%		$ 1,673	$ 2,544	$ 2,476	$ 3,347	$ -	$ -	$ 46,738	$ 48,847	$ 167,723	$ 167,382	$ 16,414	$ 16,414	$ -	$ 2,041	$ 12,059	$ 12,059
D3		E&D and S&A (2)	15%		$ 1,531	$ 2,328	$ 2,265	$ 3,062	$ -	$ -	$ 42,766	$ 44,695	$ 153,466	$ 153,155	$ 15,019	$ 15,019	$ -	$ 1,868	$ 11,034	$ 11,034
				TOTAL	**$ 11,738**	**$ 17,850**	**$ 17,367**	**$ 23,479**	**$ -**	**$ -**	**$ 327,870**	**$ 342,664**	**$ 1,176,576**	**$ 1,174,187**	**$ 115,144**	**$ 115,144**	**$ -**	**$ 14,318**	**$ 84,591**	**$ 84,591**

Notes

(1) Costs are preliminary, and are for comparison of alternatives onl

(2) Engineering & Design (E&D) and Supervision & Administration (

Matrix of Conceptual Cost Estimates for Fire Island to Montauk Point Shoreline Protection Project Project Alternatives (continued).[1]

					WHPTIN Pikes MB-2D		WHPTIN East MB-2E		Sedge Island SB-1B		Tiana SB-1C		Shinnecock Inlet Park-West SB-1D		WOSI SB-2B		Potato Road P-1G		Montauk M-1F	
Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
A	**Regrade**																			
A1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	$ 36,781	$ 74,242	$ -	$ -	$ 51,425	$ 51,425	$ 22,818	$ 22,818	$ 44,613	$ 44,613	$ 4,087	$ 7,833	$ 37,802	$ 45,976	$ 58,576	$ 74,923
B	**Fill**																			
B1		Sand, using dredge material	$ 21,780	AC	$ 235,224	$ 383,327	$ -	$ -	$ 222,156	$ 226,512	$ 150,282	$ 150,282	$ 285,317	$ 285,317	$ 52,272	$ 76,230	$ 233,046	$ 289,673	$ 483,515	$ 622,907
C	**Plants & Bioengineering**																			
C1		Dune grass	$ 8,141	AC	$ 21,981	$ 44,776	$ -	$ -	$ 30,936	$ 30,936	$ 13,840	$ 13,840	$ 26,866	$ 26,866	$ 2,442	$ 4,885	$ 22,795	$ 27,680	$ 35,007	$ 44,776
				SUBTOTAL	$ 293,985	$ 502,345	$ -	$ -	$ 304,516	$ 308,872	$ 186,939	$ 186,939	$ 356,796	$ 356,796	$ 58,801	$ 88,947	$ 293,643	$ 363,329	$ 577,098	$ 742,606
D	**Other**																			
D1		Mobilization & Demobilization	2%		$ 5,880	$ 10,047	$ -	$ -	$ 6,090	$ 6,177	$ 3,739	$ 3,739	$ 7,136	$ 7,136	$ 1,176	$ 1,779	$ 5,873	$ 7,267	$ 11,542	$ 14,852
D2		Contingency	20%		$ 58,797	$ 100,469	$ -	$ -	$ 60,903	$ 61,774	$ 37,388	$ 37,388	$ 71,359	$ 71,359	$ 11,760	$ 17,789	$ 58,729	$ 72,666	$ 115,420	$ 148,521
D3		E&D and S&A (2)	15%		$ 53,799	$ 91,929	$ -	$ -	$ 55,726	$ 56,524	$ 34,210	$ 34,210	$ 65,294	$ 65,294	$ 10,761	$ 16,277	$ 53,737	$ 66,489	$ 105,609	$ 135,897
				TOTAL	**$ 412,461**	**$ 704,791**	**$ -**	**$ -**	**$ 427,236**	**$ 433,348**	**$ 262,276**	**$ 262,276**	**$ 500,585**	**$ 500,585**	**$ 82,498**	**$ 124,793**	**$ 411,981**	**$ 509,750**	**$ 809,669**	**$ 1,041,876**

Notes

(1) Costs are preliminary, and are for comparison of alternatives onl

(2) Engineering & Design (E&D) and Supervision & Administration (:

Summary of Conceptual Cost Estimates for Fire Island to Montauk Point Shoreline Protection Project Project Alternatives.[1]

	RMSP		**FILT**		**Kismet to Lonelyville**		**Town Beach to Corneille**		**Ocean Beach to Seaview**		**OBP to POW**	
	GSB-1A		**GSB-1B**		**GSB-2A**		**GSB-2B**		**GSB-2C**		**GSB-2D**	
	Small	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**
Regrade	$ 92,973	$ 92,973	$ 7,833	$ 92,973	$ 92,973	$ 7,833	$ 31,672	$ 31,672	$ -	$ 11,239	$ 57,214	$ 61,301
Fill	$ 594,593	$ 594,593	$ 65,340	$ 65,340	$ 509,651	$ 535,787	$ 145,926	$ 150,282	$ -	$ 47,916	$ 365,903	$ 372,437
Dune Planting	$ 55,359	$ 55,359	$ 4,885	$ 4,885	$ 47,218	$ 48,032	$ 18,725	$ 18,725	$ -	$ 6,513	$ 34,193	$ 36,635
Mob & Demob (2%)	$ 14,859	$ 14,859	$ 1,561	$ 1,561	$ 12,731	$ 13,352	$ 3,926	$ 4,014	$ -	$ 1,313	$ 9,146	$ 9,407
Contingency (20%)	$ 148,585	$ 148,585	$ 15,611	$ 15,611	$ 127,312	$ 133,519	$ 39,264	$ 40,136	$ -	$ 13,133	$ 91,462	$ 94,075
E&D and S&A (15%)[2]	$ 135,955	$ 135,955	$ 14,285	$ 14,285	$ 116,491	$ 122,170	$ 35,927	$ 36,724	$ -	$ 12,017	$ 83,688	$ 86,078
TOTAL	**$ 1,042,324**	**$ 1,042,324**	**$ 109,515**	**$ 194,655**	**$ 906,376**	**$ 860,694**	**$ 275,440**	**$ 281,552**	**$ -**	**$ 92,131**	**$ 641,606**	**$ 659,933**

	Cherry Grove		**Fire Island Pines**		**Talisman to Water Island**		**Water Island**		**Blue Point**		**Davis Park**	
	GSB-3A		**GSB-3C**		**GSB-3D**		**GSB-3E**		**GSB-3F**		**GSB-3G**	
	Small	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**
Regrade	$ -	$ -	$ 56,193	$ 58,236	$ 3,746	$ 3,746	$ 6,130	$ 6,130	$ -	$ -	$ 29,288	$ 33,034
Fill	$ -	$ -	$ 359,369	$ 363,725	$ 2,178	$ 6,534	$ 2,178	$ 6,534	$ -	$ -	$ 187,308	$ 191,664
Dune Planting	$ -	$ -	$ 33,378	$ 35,007	$ 2,442	$ 2,442	$ 4,071	$ 4,071	$ -	$ -	$ 17,096	$ 19,539
Mob & Demob (2%)	$ -	$ -	$ 8,979	$ 9,139	$ 167	$ 254	$ 248	$ 335	$ -	$ -	$ 4,674	$ 4,885
Contingency (20%)	$ -	$ -	$ 89,788	$ 91,394	$ 1,673	$ 2,544	$ 2,476	$ 3,347	$ -	$ -	$ 46,738	$ 48,847
E&D and S&A (15%)[2]	$ -	$ -	$ 82,156	$ 83,625	$ 1,531	$ 2,328	$ 2,265	$ 3,062	$ -	$ -	$ 42,766	$ 44,695
TOTAL	**$ -**	**$ -**	**$ 629,863**	**$ 641,126**	**$ 11,738**	**$ 17,850**	**$ 17,367**	**$ 23,479**	**$ -**	**$ -**	**$ 327,870**	**$ 342,664**

	Old Inlet		**SPCP-TWA**		**SPCP**		**Cupsogue**		**WHPTIN Pikes**		**WHPTIN East**	
	GSB-4B		**MB-1A**		**MB-1B**		**MB-2C**		**MB-2D**		**MB-2E**	
	Small	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**
Regrade	$ 101,828	$ 100,125	$ 10,217	$ 10,217	$ -	$ 2,043	$ 7,492	$ 7,492	$ 36,781	$ 74,242	$ -	$ -
Fill	$ 677,357	$ 677,357	$ 65,340	$ 65,340	$ -	$ 6,534	$ 47,916	$ 47,916	$ 235,224	$ 383,327	$ -	$ -
Dune Planting	$ 59,430	$ 59,430	$ 6,513	$ 6,513	$ -	$ 1,628	$ 4,885	$ 4,885	$ 21,981	$ 44,776	$ -	$ -
Mob & Demob (2%)	$ 16,772	$ 16,738	$ 1,641	$ 1,641	$ -	$ 204	$ 1,206	$ 1,206	$ 5,880	$ 10,047	$ -	$ -
Contingency (20%)	$ 167,723	$ 167,382	$ 16,414	$ 16,414	$ -	$ 2,041	$ 12,059	$ 12,059	$ 58,797	$ 100,469	$ -	$ -
E&D and S&A (15%)[2]	$ 153,466	$ 153,155	$ 15,019	$ 15,019	$ -	$ 1,868	$ 11,034	$ 11,034	$ 53,799	$ 91,929	$ -	$ -
TOTAL	**$ 1,176,576**	**$ 1,174,187**	**$ 115,144**	**$ 115,144**	**$ -**	**$ 14,318**	**$ 84,591**	**$ 84,591**	**$ 412,461**	**$ 704,791**	**$ -**	**$ -**

	Sedge Island		**Tiana**		**Shinnecock Inlet Park-West**		**WOSI**		**Potato Road**		**Montauk**	
	SB-1B		**SB-1C**		**SB-1D**		**SB-2B**		**P-1G**		**M-1F**	
	Small	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**	**Small**	**Large**
Regrade	$ 51,425	$ 51,425	$ 22,818	$ 22,818	$ 44,613	$ 44,613	$ 4,087	$ 7,833	$ 37,802	$ 45,976	$ 58,576	$ 74,923
Fill	$ 222,156	$ 226,512	$ 150,282	$ 150,282	$ 285,317	$ 285,317	$ 52,272	$ 76,230	$ 233,046	$ 289,673	$ 483,515	$ 622,907
Dune Planting	$ 30,936	$ 30,936	$ 13,840	$ 13,840	$ 26,866	$ 26,866	$ 2,442	$ 4,885	$ 22,795	$ 27,680	$ 35,007	$ 44,776
Mob & Demob (2%)	$ 6,090	$ 6,177	$ 3,739	$ 3,739	$ 7,136	$ 7,136	$ 1,176	$ 1,779	$ 5,873	$ 7,267	$ 11,542	$ 14,852
Contingency (20%)	$ 60,903	$ 61,774	$ 37,388	$ 37,388	$ 71,359	$ 71,359	$ 11,760	$ 17,789	$ 58,729	$ 72,666	$ 115,420	$ 148,521
E&D and S&A (15%)[2]	$ 55,726	$ 56,524	$ 34,210	$ 34,210	$ 65,294	$ 65,294	$ 10,761	$ 16,277	$ 53,737	$ 66,489	$ 105,609	$ 135,897
TOTAL	**$ 427,236**	**$ 433,348**	**$ 262,276**	**$ 262,276**	**$ 500,585**	**$ 500,585**	**$ 82,498**	**$ 124,793**	**$ 411,981**	**$ 509,750**	**$ 809,669**	**$ 1,041,876**

Notes

(1) For the Final Design of the Proposed Alternative, more detailed plans/specifications and construction procedures/equipment will be necessary. These costs are considered preliminary, conceptual level, costs, for comparison of alternatives only.

(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15% of the Subtotal *plus* Mob & Demob and Contingency cost.

SUMMARY
OF

HEP RESTORATION COST

Matrix of Conceptual Size Estimates for Fire Island to Montauk Point HEP Restoration Alternatives.

					Sunken Forest			Reagan Property			Great Gun			Tiana			WOSI			Georgica Pond			East Inlet Island			John Boyle Island			Ocean Beach			New Made Island			Islip Meadows			Seatuck Refuge			Davis Park			Atlantique to Corneille			Kismet, Atlantique, Fair Harbor			Warner Island East		
					T-2			T-3			T-5			T-7			T-8			T-9			T-10			T-11			T-14			T-15			T-22			T-23			T-24			T-25			T-26			T-27		
Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3
A	**Remove**																																																			
A1		Bulkhead (incl. disposal)	$ 84,776	AC	0.50		10.00						3.00																											8.50												
A2		Rubbish handling, loading & trucking, incl 2 mi haul, machine load truck Dump charges - rubbish only	$ 12,693	AC	0.25		5.00						1.50																											4.00												
A3		Remove sod, by hand & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - trees, brush, lumber	$ 87,652	AC																			0.10	0.10	0.10	0.10		0.10																								
A4		Building demolition, large urban project, incl. 20 mi haul, 2 family, 2 story house, wood, maximum Disposal only, urban building with salvage value allowed, including loading and 5 mi haul to dump, wood frame	$ 23,348	Each			9.00						0.25						0.10											0.10	0.10												1.00				6.00	9.75	16.25			
A5		Fencing, wood, all types, 4' to 6' high & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - rubbish only	$ 2,554	AC					2.00													9.60								5.70	5.70											16.70	16.70				4.00	7.00	10.00			
A6		Pavement removal, bituminous roads, 3" thick & For disposal to 5 miles, add	$ 60,321	AC			0.50							0.30	0.40				0.40																																	
A7		Rip-rap, random, broken stone (incl. disposal)	$ 6,841	Each			0.30						0.10									3.00							2.00	2.00	2.00																					
B	**Regrade**																																																			
B1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	4.30	9.00	7.70	4.30	6.50	5.70		1.00	2.00	1.00	1.20		1.00	6.70	0.50			36.00	5.50	5.50	23.00	1.10	3.00	1.10		7.60	7.60	1.20		1.20						8.50	1.00	23.50	26.00	9.00	9.00	9.60	5.70	9.70	13.80	3.00	3.00	3.00
C	**Fill**																																																			
C1		Sand, using dredge material	$ 21,780	AC	1.10	4.30		2.20	6.50	3.75		1.00		1.00	1.00			1.70	0.10			36.00	14.00		17.00					7.60	3.80	1.20		1.20						4.20	0.50	11.20	11.00	15.00	45.00	9.60	5.70	9.70	13.80	3.00	3.00	3.00
C2		Loam, using dredge material	$ 28,233	AC										0.20	0.20												3.00																2.00									
D	**Relocate**																																																			
D1		Wells, domestic water, gravel pack well, 40' deep, incl. gravel & casing, complete, 24" diam. casing x 18" diam screen	$ 82,358	Each																									1.00	1.00	1.00																					
E	**Install**																																																			
E1		Culvert/headwall, 1-1/2 to 1 slope soil, CIP concrete, 48" diam pipe, 4'-6' long wing walls	$ 10,571	Each							3.00	3.00																										3.00	3.00	3.00												
E2		Flap Gate, Aluminum, 48" diam	$ 12,194	Each																															2.00	2.00																
E3		24" diam Self-regulating Tide (SRT) Gate	$ 101,994	Each																		1.00																														
E4		36" diam SRT Gate	$ 121,290	Each																																																
E5		Sand fencing	$ 1,043	AC		3.00			1.00			1.00																																								
E6		Boardwalk/recreational access	$ 38,846	Each		1.00			1.00					1.00				1.50												7.00	7.00											13.00	13.00				5.00	9.00	11.00			
F	**Excavate & Move Material**																																																			
F1		To tidal elevation w/ offsite disposal	$ 51,084	AC							0.10	0.10					11.00			50.00	60.00																	6.00	6.00	6.00												
F2		To subtidal elevation w/ offsite disposal	$ 189,012	AC							0.10	0.10																							0.50	0.50																
F3		To salt marsh elevation w/ onsite use	$ 29,799	AC																																	0.50															
F4		To (sinuous) tidal creek elevation w/ onsite use	$ 105,009	AC																			21.00	21.00	21.00											12.40			12.00	12.00												
G	**Invasive Species Control**																																																			
G1		Herbicide	$ 796	AC													9.00						8.50	25.00	8.50	4.00	2.50	4.00				1.80	3.00	1.80			45.00		90.00	90.00												
G2		Manual removal	$ 51,084	AC	0.50															50.00	60.00																															
H	**Plants & Bioengineering**																																																			
H1		Dune grass	$ 8,141	AC		4.50			3.25			0.25	0.30	0.25	0.30			0.10	0.10			9.00								2.00	1.00										0.25	6.00	6.00			5.20	1.50	3.50	4.50	3.00		3.00
H2		Upland	$ 1,090	AC							0.10	0.10		0.10	0.10				0.10																								2.00			0.80					3.00	
H3		Bay Beach- Emergents	$ 12,439	AC							0.10	0.10		0.20	0.20		8.00			11.00	13.00																	4.00	4.00	5.50												
H4		Bay Beach - Shrubs	$ 816	AC	2.00						0.20	0.20		0.10	0.10		3.00		0.10	6.00	7.00																	2.00	2.00	2.50												
H5		BaySub SAV	$ 37,000	AC												1.00																																				
H6		Bioengineering	$1,425.00	AC	4.30			4.30		5.70															18.00			7.00						4.80						8.50												6.70
H7		Supporting Products	$112.50	AC	4.30			4.30		5.70															18.00			7.00						4.80						8.50												6.70
I	**Other**																																																			
I1		Mobilization & Demobilization	2%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I2		Contingency	20%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I3		E&D and S&A	15%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J	**Real Estate**																																																			
J1		Buy-out Houses/Properties - USACE Real Estate to provide					9.00						1.00																		1.00												1.00				5.00	9.00	16.00			

Assumptions: Sand fill - assumed 1/2 AC per 209 LF of shoreline bayside
1/2 AC per 209 LF of shoreline oceanside for insipient dunes
1 AC per 209 LF of shoreline oceanside for foredunes
Plantings - assume 1/4 of each AC graded/restored will be planted
Assumed structure and boardwalk removal under A4, but costs probably very low for these tasks
Adjusted # of units of bulkhead removal to account for Marina removal
Adjusted # units of building demolition to account for sheds/small wooden structures
Included boardwalk removal, shed removal, in structure demolition and disposal costs
Assume marina property that would be removed is donated (not purchased) in T-2 (RA3) and T-5 (RA3)

Matrix of Conceptual Cost Estimates for Fire Island to Montauk Point HEP Restoration Alternatives[1]

Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	Sunken Forest T-2 RA1	Sunken Forest T-2 RA2	Sunken Forest T-2 RA3	Reagan Property T-3 RA1	Reagan Property T-3 RA2	Reagan Property T-3 RA3	Great Gun T-5 RA1	Great Gun T-5 RA2	Great Gun T-5 RA3	Tiana T-7 RA1	Tiana T-7 RA2	Tiana T-7 RA3
A	Remove															
A1		Bulkhead (incl. disposal)	$ 84,776	AC	$ 42,388	$ -	$ 847,763	$ -	$ -	$ -	$ -	$ -	$ 254,329	$ -	$ -	$ -
A2		Rubbish handling, loading & trucking, incl 2 mi haul, machine load truck Dump charges - rubbish only	$ 12,693	AC	$ 3,173	$ -	$ 63,467	$ -	$ -	$ -	$ -	$ -	$ 19,040	$ -	$ -	$ -
A3		Remove sod, by hand & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - trees, brush, lumber	$ 87,652	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A4		Building demolition, large urban project, incl. 20 mi haul, 2 family, 2 story house, wood, maximum Disposal only, urban building with salvage value allowed, including loading and 5 mi haul to dump, wood frame	$ 23,348	Each	$ -	$ -	$ 210,132	$ -	$ -	$ -	$ -	$ -	$ 5,837	$ -	$ -	$ -
A5		Fencing, wood, all types, 4' to 6' high & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - rubbish only	$ 2,554	AC	$ -	$ -	$ -	$ -	$ 5,109	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A6		Pavement removal, bituminous roads, 3" thick & For disposal to 5 miles, add	$ 60,321	AC	$ -	$ -	$ 30,160	$ -	$ -	$ -	$ -	$ -	$ -	$ 18,096	$ 24,128	$ -
A7		Rip-rap, random, broken stone (incl. disposal)	$ 6,841	Each	$ -	$ -	$ 2,052	$ -	$ -	$ -	$ -	$ -	$ 684	$ -	$ -	$ -
B	Regrade															
B1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	$ 14,644	$ 30,650	$ 26,223	$ 14,644	$ 22,136	$ 19,412	$ -	$ 3,406	$ 6,811	$ 3,406	$ 4,087	$ -
C	Fill															
C1		Sand, using dredge material	$ 21,780	AC	$ 23,958	$ 93,654	$ -	$ 47,916	$ 141,570	$ 81,675	$ -	$ 21,780	$ -	$ 21,780	$ 21,780	$ -
C2		Loam, using dredge material	$ 28,233	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,647	$ 5,647	$ -
D	Relocate															
D1		Wells, domestic water, gravel pack well, 40' deep, incl. gravel & casing, complete, 24" diam. casing x 18" diam screen	$ 82,358	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E	Install															
E1		Culvert/headwall, 1-1/2 to 1 slope soil, CIP concrete, 48" diam pipe, 4'-6' long wing walls	$ 10,571	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ 31,712	$ 31,712	$ -	$ -	$ -	$ -
E2		Flap Gate, Aluminum, 48" diam	$ 12,194	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E3		24" diam Self-regulating Tide (SRT) Gate	$ 101,994	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E4		36" diam SRT Gate	$ 121,290	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E5		Sand fencing	$ 1,043	AC	$ -	$ 3,130	$ -	$ -	$ 1,043	$ -	$ -	$ 1,043	$ -	$ -	$ -	$ -
E6		Boardwalk/recreational access	$ 38,846	Each	$ -	$ 38,846	$ -	$ -	$ 38,846	$ -	$ -	$ -	$ -	$ 38,846	$ -	$ -
F	Excavate & Move Material															
F1		To tidal elevation w/ offsite disposal	$ 51,084	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,108	$ 5,108	$ -	$ -	$ -	$ -
F2		To subtidal elevation w/ offsite disposal	$ 189,012	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ 18,901	$ 18,901	$ -	$ -	$ -	$ -
F3		To salt marsh elevation w/ onsite use	$ 29,799	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F4		To (sinuous) tidal creek elevation w/ onsite use	$ 105,009	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
G	Invasive Species Control															
G1		Herbicide	$ 796	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
G2		Manual removal	$ 51,084	AC	$ 25,542	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H	Plants & Bioengineering															
H1		Dune grass	$ 8,141	AC	$ -	$ 36,635	$ -	$ -	$ 26,459	$ -	$ -	$ 2,035	$ 2,442	$ 2,035	$ 2,442	$ -
H2		Upland	$ 1,090	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ 109	$ 109	$ -	$ 109	$ 109	$ -
H3		Bay Beach- Emergents	$ 12,439	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,244	$ 1,244	$ -	$ 2,488	$ 2,488	$ -
H4		Bay Beach - Shrubs	$ 816	AC	$ 1,631	$ -	$ -	$ -	$ -	$ -	$ 163	$ 163	$ -	$ 82	$ 82	$ -
H5		BaySub SAV	$ 37,000	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 37,000
H6		Bioengineering	$ 1,425	AC	$ 6,128	$ -	$ -	$ 6,128	$ -	$ 8,123	$ -	$ -	$ -	$ -	$ -	$ -
H7		Supporting Products	$ 113	AC	$ 484	$ -	$ -	$ 484	$ -	$ 641	$ -	$ -	$ -	$ -	$ -	$ -
				SUBTOTAL	$ 117,948	$ 202,915	$1,179,799	$ 69,171	$ 235,163	$ 109,851	$ 57,237	$ 85,501	$ 289,144	$ 92,488	$ 60,762	$ 37,000
I	Other															
I1		Mobilization & Demobilization	2%		$ 2,359	$ 4,058	$ 23,596	$ 1,383	$ 4,703	$ 2,197	$ 1,145	$ 1,710	$ 5,783	$ 1,850	$ 1,215	$ 740
I2		Contingency	20%		$ 23,590	$ 40,583	$ 235,960	$ 13,834	$ 47,033	$ 21,970	$ 11,447	$ 17,100	$ 57,829	$ 18,498	$ 12,152	$ 7,400
I3		E&D and S&A (2)	15%		$ 21,584	$ 37,133	$ 215,903	$ 12,658	$ 43,035	$ 20,103	$ 10,474	$ 15,647	$ 52,913	$ 16,925	$ 11,119	$ 6,771
				TOTAL	**$ 165,481**	**$ 284,689**	**$1,655,258**	**$ 97,047**	**$ 329,933**	**$ 154,120**	**$ 80,304**	**$ 119,958**	**$ 405,669**	**$ 129,761**	**$ 85,249**	**$ 51,911**
J	Real Estate (3)															
J1		Buy-out Houses - USACE Real Estate to provide														

Line Item	Description	WOSI T-8 RA1	WOSI T-8 RA2	WOSI T-8 RA3	Georgica Pond T-9 RA1	Georgica Pond T-9 RA2	Georgica Pond T-9 RA3	East Inlet Island T-10 RA1	East Inlet Island T-10 RA2	East Inlet Island T-10 RA3	John Boyle Island T-11 RA1	John Boyle Island T-11 RA2	John Boyle Island T-11 RA3
A	Remove												
A1	Bulkhead (incl. disposal)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A2	Rubbish handling, loading & trucking, incl 2 mi haul, machine load truck Dump charges - rubbish only	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A3	Remove sod, by hand & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - trees, brush, lumber	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,765	$ 8,765	$ 8,765	$ 8,765	$ -	$ 8,765
A4	Building demolition, large urban project, incl. 20 mi haul, 2 family, 2 story house, wood, maximum Disposal only, urban building with salvage value allowed, including loading and 5 mi haul to dump, wood frame	$ -	$ -	$ 2,335	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A5	Fencing, wood, all types, 4' to 6' high & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - rubbish only	$ -	$ -	$ -	$ -	$ -	$ 24,522	$ -	$ -	$ -	$ -	$ -	$ -
A6	Pavement removal, bituminous roads, 3" thick & For disposal to 5 miles, add	$ -	$ -	$ 24,128	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A7	Rip-rap, random, broken stone (incl. disposal)	$ -	$ -	$ -	$ -	$ -	$ 20,523	$ -	$ -	$ -	$ -	$ -	$ -
B	Regrade												
B1	Grading at dump, or embankment if required, by dozer	$ 3,406	$ 22,818	$ 1,703	$ -	$ -	$ 122,602	$ 18,731	$ 18,731	$ 78,329	$ 3,746	$ 10,217	$ 3,746
C	Fill												
C1	Sand, using dredge material	$ -	$ 37,026	$ 2,178	$ -	$ -	$ 784,078	$ 304,919	$ -	$ 370,259	$ -	$ -	$ -
C2	Loam, using dredge material	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 84,700	$ -
D	Relocate												
D1	Wells, domestic water, gravel pack well, 40' deep, incl. gravel & casing, complete, 24" diam. casing x 18" diam screen	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E	Install												
E1	Culvert/headwall, 1-1/2 to 1 slope soil, CIP concrete, 48" diam pipe, 4'-6' long wing walls	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E2	Flap Gate, Aluminum, 48" diam	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E3	24" diam Self-regulating Tide (SRT) Gate	$ -	$ -	$ -	$ -	$ -	$ 101,994	$ -	$ -	$ -	$ -	$ -	$ -
E4	36" diam SRT Gate	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E5	Sand fencing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E6	Boardwalk/recreational access	$ -	$ 58,269	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F	Excavate & Move Material												
F1	To tidal elevation w/ offsite disposal	$ 561,927	$ -	$ -	$2,554,212	$3,065,054	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F2	To subtidal elevation w/ offsite disposal	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F3	To salt marsh elevation w/ onsite use	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F4	To (sinuous) tidal creek elevation w/ onsite use	$ -	$ -	$ -	$ -	$ -	$ -	$2,205,198	$2,205,198	$2,205,198	$ -	$ -	$ -
G	Invasive Species Control												
G1	Herbicide	$ 7,161	$ -	$ -	$ -	$ -	$ -	$ 6,763	$ 19,893	$ 6,763	$ 3,183	$ 1,989	$ 3,183
G2	Manual removal	$ -	$ -	$ -	$2,554,212	$3,065,054	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H	Plants & Bioengineering												
H1	Dune grass	$ -	$ 814	$ 814	$ -	$ -	$ 73,270	$ -	$ -	$ -	$ -	$ -	$ -
H2	Upland	$ -	$ -	$ 109	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H3	Bay Beach- Emergents	$ 99,510	$ -	$ -	$ 136,827	$ 161,704	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H4	Bay Beach - Shrubs	$ 2,447	$ -	$ 82	$ 4,893	$ 5,709	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H5	BaySub SAV	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H6	Bioengineering	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,650	$ -	$ -	$ 9,975
H7	Supporting Products	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,025	$ -	$ -	$ 788
	SUBTOTAL	$ 674,450	$ 118,926	$ 31,349	$5,250,143	$6,297,521	$1,126,989	$2,544,376	$2,252,586	$2,696,989	$ 15,694	$ 96,906	$ 26,457
I	Other												
I1	Mobilization & Demobilization	$ 13,489	$ 2,379	$ 627	$ 105,003	$ 125,950	$ 22,540	$ 50,888	$ 45,052	$ 53,940	$ 314	$ 1,938	$ 529
I2	Contingency	$ 134,890	$ 23,785	$ 6,270	$1,050,029	$1,259,504	$ 225,398	$ 508,875	$ 450,517	$ 539,398	$ 3,139	$ 19,381	$ 5,291
I3	E&D and S&A (2)	$ 123,424	$ 21,764	$ 5,737	$ 960,776	$1,152,446	$ 206,239	$ 465,621	$ 412,223	$ 493,549	$ 2,872	$ 17,734	$ 4,842
	TOTAL	**$ 946,254**	**$ 166,854**	**$ 43,982**	**$7,365,951**	**$8,835,421**	**$1,581,166**	**$3,569,760**	**$3,160,378**	**$3,783,876**	**$ 22,019**	**$ 135,959**	**$ 37,119**
J	Real Estate (3)												
J1	Buy-out Houses - USACE Real Estate to provide												

Notes

(1) Costs are preliminary, and are for comparison of alternatives only.
(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15% of the Subtotal *plus* Mob & Demob and Contingency cost.
(3) Real Estate Costs for buy-out of houses is not currently included in the Total Cost (T-14 (RA3), T-24 (RA3), and T-26).

Matrix of Conceptual Cost Estimates for Fire Island to Montauk Point HEP Restoration Alternatives.(1)

Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	Ocean Beach T-14			New Made Island T-15			Islip Meadows T-22			Seatuck Refuge T-23			Davis Park T-24			Atlantique to Corneille T-25			Kismet, Atlantique, Fair Harbor T-26			Warner Island East T-27		
					RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3
A	Remove																											
A1		Bulkhead (incl. disposal)	$ 84,776	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 720,599	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A2		Rubbish handling, loading & trucking, incl 2 mi haul, machine load truck Dump charges - rubbish only	$ 12,693	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 50,774	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A3		Remove sod, by hand & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - trees, brush, lumber	$ 87,652	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A4		Building demolition, large urban project, incl. 20 mi haul, 2 family, 2 story house, wood, maximum Disposal only, urban building with salvage value allowed, including loading and 5 mi haul to dump, wood frame	$ 23,348	Each	$ -	$ 2,335	$ 2,335	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 23,348	$ -	$ -	$ -	$ 140,088	$ 227,643	$ 379,406	$ -	$ -	$ -
A5		Fencing, wood, all types, 4' to 6' high & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - rubbish only	$ 2,554	AC	$ -	$ 14,560	$ 14,560	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 42,659	$ 42,659	$ -	$ -	$ -	$ 10,218	$ 17,881	$ 25,544	$ -	$ -	$ -
A6		Pavement removal, bituminous roads, 3" thick & For disposal to 5 miles, add	$ 60,321	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
A7		Rip-rap, random, broken stone (incl. disposal)	$ 6,841	Each	$ 13,682	$ 13,682	$ 13,682	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
B	Regrade																											
B1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	$ -	$ 25,883	$ 25,883	$ 4,087	$ -	$ 4,087	$ -	$ -	$ -	$ -	$ -	$ 28,948	$ 3,406	$ 80,032	$ 88,546	$ 30,650	$ 30,650	$ 32,694	$ 19,412	$ 33,034	$ 46,997	$ 10,217	$ 10,217	$ 10,217
C	Fill																											
C1		Sand, using dredge material	$ 21,780	AC	$ -	$ 165,528	$ 82,764	$ 26,136	$ -	$ 26,136	$ -	$ -	$ -	$ -	$ -	$ 91,476	$ 10,890	$ 243,935	$ 239,580	$ 326,699	$ 980,098	$ 209,088	$ 124,146	$ 211,266	$ 300,563	$ 65,340	$ 65,340	$ 65,340
C2		Loam, using dredge material	$ 28,233	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 56,467	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
D	Relocate																											
D1		Wells, domestic water, gravel pack well, 40' deep, incl. gravel & casing, complete, 24" diam. casing x 18" diam screen	$ 82,358	Each	$ 82,358	$ 82,358	$ 82,358	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E	Install																											
E1		Culvert/headwall, 1-1/2 to 1 slope soil, CIP concrete, 48" diam pipe, 4'-6' long wing walls	$ 10,571	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 31,712	$ 31,712	$ 31,712	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E2		Flap Gate, Aluminum, 48" diam	$ 12,194	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ 24,388	$ 24,388	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E3		24" diam Self-regulating Tide (SRT) Gate	$ 101,994	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E4		36" diam SRT Gate	$ 121,290	Each	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E5		Sand fencing	$ 1,043	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
E6		Boardwalk/recreational access	$ 38,846	Each	$ -	$ 271,921	$ 271,921	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 504,997	$ 504,997	$ -	$ -	$ -	$ 194,230	$ 349,613	$ 427,305	$ -	$ -	$ -
F	Excavate & Move Material																											
F1		To tidal elevation w/ offsite disposal	$ 51,084	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 306,505	$ 306,505	$ 306,505	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F2		To subtidal elevation w/ offsite disposal	$ 189,012	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ 94,506	$ 94,506	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F3		To salt marsh elevation w/ onsite use	$ 29,799	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 14,900	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
F4		To (sinuous) tidal creek elevation w/ onsite use	$ 105,009	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$1,302,117	$ -	$ -	$1,260,113	$1,260,113	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
G	Invasive Species Control																											
G1		Herbicide	$ 796	AC	$ -	$ -	$ -	$ 1,432	$ 2,387	$ 1,432	$ -	$ -	$ 35,807	$ -	$ 71,613	$ 71,613	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
G2		Manual removal	$ 51,084	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H	Plants & Bioengineering																											
H1		Dune grass	$ 8,141	AC	$ -	$ 16,282	$ 8,141	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,035	$ 48,847	$ 48,847	$ -	$ -	$ 42,334	$ 12,212	$ 28,494	$ 36,635	$ 24,423	$ -	$ 24,423
H2		Upland	$ 1,090	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,180	$ -	$ -	$ 872	$ -	$ -	$ -	$ -	$ 3,270	$ -
H3		Bay Beach- Emergents	$ 12,439	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 49,755	$ 49,755	$ 68,413	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H4		Bay Beach - Shrubs	$ 816	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,631	$ 1,631	$ 2,039	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H5		BaySub SAV	$ 37,000	AC	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
H6		Bioengineering	$ 1,425	AC	$ -	$ -	$ -	$ -	$ -	$ 6,840	$ -	$ -	$ -	$ -	$ -	$ 12,113	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 9,548
H7		Supporting Products	$ 113	AC	$ -	$ -	$ -	$ -	$ -	$ 540	$ -	$ -	$ -	$ -	$ -	$ 956	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 754
				SUBTOTAL	$ 96,040	$ 592,548	$ 501,644	$ 31,655	$ 2,387	$ 39,035	$ 118,893	$1,421,010	$ 50,706	$ 389,603	$1,721,330	$2,645,261	$ 16,331	$ 920,470	$1,006,622	$ 357,350	$1,010,748	$ 284,987	$ 500,305	$ 867,931	$1,216,451	$ 99,980	$ 78,827	$ 110,281
I	Other																											
I1		Mobilization & Demobilization	2%		$ 1,921	$ 11,851	$ 10,033	$ 633	$ 48	$ 781	$ 2,378	$ 28,420	$ 1,014	$ 7,792	$ 34,427	$ 52,905	$ 327	$ 18,409	$ 20,132	$ 7,147	$ 20,215	$ 5,700	$ 10,006	$ 17,359	$ 24,329	$ 2,000	$ 1,577	$ 2,206
I2		Contingency	20%		$ 19,208	$ 118,510	$ 100,329	$ 6,331	$ 477	$ 7,807	$ 23,779	$ 284,202	$ 10,141	$ 77,921	$ 344,266	$ 529,052	$ 3,266	$ 184,094	$ 201,324	$ 71,470	$ 202,150	$ 56,997	$ 100,061	$ 173,586	$ 243,290	$ 19,996	$ 15,765	$ 22,056
I3		E&D and S&A (2)	15%		$ 17,575	$ 108,436	$ 91,801	$ 5,793	$ 437	$ 7,143	$ 21,757	$ 260,045	$ 9,279	$ 71,297	$ 315,003	$ 484,083	$ 2,989	$ 168,446	$ 184,212	$ 65,395	$ 184,967	$ 52,153	$ 91,556	$ 158,831	$ 222,610	$ 18,296	$ 14,425	$ 20,181
				TOTAL	**$ 134,743**	**$ 831,345**	**$ 703,806**	**$ 44,412**	**$ 3,349**	**$ 54,766**	**$ 166,807**	**$1,993,677**	**$ 71,141**	**$ 546,613**	**$2,415,026**	**$3,711,301**	**$ 22,912**	**$1,291,419**	**$1,412,291**	**$ 501,362**	**$1,418,080**	**$ 399,837**	**$ 701,928**	**$1,217,708**	**$1,706,680**	**$ 140,272**	**$ 110,594**	**$ 154,725**
J	Real Estate (3)																											
J1		Buy-out Houses - USACE Real Estate to provide					x												x				x	x	x			

Notes

(1) Costs are preliminary, and are for comparison of alternatives only.

(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15%

(3) Real Estate Costs for buy-out of houses is not currently included in the Total Cost (T-14 (RA3), T-

Summary Conceptual Cost Estimates for Fire Island to Montauk Point HEP Restoration Alternatives.(1)

	Sunken Forest			Reagan Property			Great Gun		
	T-2			T-3			T-5		
	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3
Remove	$ 45,562	$ -	$ 1,153,576	$ -	$ 5,109	$ -	$ -	$ -	$ 279,890
Regrade	$ 14,644	$ 30,650	$ 26,223	$ 14,644	$ 30,650	$ 26,223	$ -	$ 3,406	$ 6,811
Fill	$ 23,958	$ 93,654	$ -	$ 47,916	$ 141,570	$ 81,675	$ -	$ 21,780	$ -
Relocate	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Install	$ -	$ 41,976	$ -	$ -	$ 39,889	$ -	$ 31,712	$ 32,755	$ -
Excavate & Move Material	$ -	$ -	$ -	$ -	$ -	$ -	$ 24,010	$ 24,010	$ -
Invasive Species Control	$ 25,542	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Plants & Bioengineering	$ 8,242	$ 36,635	$ -	$ 6,611	$ 26,459	$ 8,764	$ 1,516	$ 3,551	$ 2,442
Mob & Demob (2%)	$ 2,359	$ 4,058	$ 23,596	$ 1,383	$ 4,703	$ 2,197	$ 1,145	$ 1,710	$ 5,783
Contingency (20%)	$ 23,590	$ 40,583	$ 235,960	$ 13,834	$ 47,033	$ 21,970	$ 11,447	$ 17,100	$ 57,829
E&D and S&A (15%)(2)	$ 21,584	$ 37,133	$ 215,903	$ 12,658	$ 43,035	$ 20,103	$ 10,474	$ 15,647	$ 52,913
TOTAL (3)	**$ 165,481**	**$ 284,689**	**$ 1,655,258**	**$ 97,047**	**$ 338,447**	**$ 160,932**	**$ 80,304**	**$ 119,958**	**$ 405,669**

	Tiana			WOSI			Georgica Pond		
	T-7			T-8			T-9		
	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3
Remove	$ 18,096	$ 24,128	$ -	$ -	$ -	$ 26,463	$ -	$ -	$ 45,045
Regrade	$ 3,406	$ 4,087	$ -	$ 3,406	$ 22,818	$ 1,703	$ -	$ -	$ 122,602
Fill	$ 27,427	$ 27,427	$ -	$ -	$ 37,026	$ 2,178	$ -	$ -	$ 784,078
Relocate	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Install	$ 38,846	$ -	$ -	$ -	$ 58,269	$ -	$ -	$ -	$ 101,994
Excavate & Move Material	$ -	$ -	$ -	$ 561,927	$ -	$ -	$ 2,554,212	$ 3,065,054	$ -
Invasive Species Control	$ -	$ -	$ -	$ 7,161	$ -	$ -	$ 2,554,212	$ 3,065,054	$ -
Plants & Bioengineering	$ 4,714	$ 5,121	$ 37,000	$ 101,957	$ 814	$ 1,005	$ 141,720	$ 167,413	$ 73,270
Mob & Demob (2%)	$ 1,850	$ 1,215	$ 740	$ 13,489	$ 2,379	$ 627	$ 105,003	$ 125,950	$ 22,540
Contingency (20%)	$ 18,498	$ 12,152	$ 7,400	$ 134,890	$ 23,785	$ 6,270	$ 1,050,029	$ 1,259,504	$ 225,398
E&D and S&A (15%)(2)	$ 16,925	$ 11,119	$ 6,771	$ 123,424	$ 21,764	$ 5,737	$ 960,776	$ 1,152,446	$ 206,239
TOTAL (3)	**$ 129,761**	**$ 85,249**	**$ 51,911**	**$ 946,254**	**$ 166,854**	**$ 43,982**	**$ 7,365,951**	**$ 8,835,421**	**$ 1,581,166**

	East Inlet Island			John Boyle Island			Ocean Beach		
	T-10			T-11			T-14		
	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3
Remove	$ 8,765	$ 8,765	$ 8,765	$ 8,765	$ -	$ 8,765	$ 13,682	$ 30,577	$ 30,577
Regrade	$ 18,731	$ 18,731	$ 78,329	$ 3,746	$ 10,217	$ 3,746	$ -	$ 25,883	$ 25,883
Fill	$ 304,919	$ -	$ 370,259	$ -	$ 84,700	$ -	$ -	$ 165,528	$ 82,764
Relocate	$ -	$ -	$ -	$ -	$ -	$ -	$ 82,358	$ 82,358	$ 82,358
Install	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 271,921	$ 271,921
Excavate & Move Material	$ 2,205,198	$ 2,205,198	$ 2,205,198	$ -	$ -	$ -	$ -	$ -	$ -
Invasive Species Control	$ 6,763	$ 19,893	$ 6,763	$ 3,183	$ 1,989	$ 3,183	$ -	$ -	$ -
Plants & Bioengineering	$ -	$ -	$ 27,675	$ -	$ -	$ 10,763	$ -	$ 16,282	$ 8,141
Mob & Demob (2%)	$ 50,888	$ 45,052	$ 53,940	$ 314	$ 1,938	$ 529	$ 1,921	$ 11,851	$ 10,033
Contingency (20%)	$ 508,875	$ 450,517	$ 539,398	$ 3,139	$ 19,381	$ 5,291	$ 19,208	$ 118,510	$ 100,329
E&D and S&A (15%)(2)	$ 465,621	$ 412,223	$ 493,549	$ 2,872	$ 17,734	$ 4,842	$ 17,575	$ 108,436	$ 91,801
TOTAL (3)	**$ 3,569,760**	**$ 3,160,378**	**$ 3,783,876**	**$ 22,019**	**$ 135,959**	**$ 37,119**	**$ 134,743**	**$ 831,345**	**$ 703,806**

	New Made Island			Islip Meadows			Seatuck Refuge		
	T-15			T-22			T-23		
	RA1	RA2	RA3	RA1	RA2	RA3	RA1	RA2	RA3
Remove	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 771,373
Regrade	$ 4,087	$ -	$ 4,087	$ -	$ -	$ -	$ -	$ -	$ 28,948
Fill	$ 26,136	$ -	$ 26,136	$ -	$ -	$ -	$ -	$ -	$ 91,476
Relocate	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Install	$ -	$ -	$ -	$ 24,388	$ 24,388	$ -	$ 31,712	$ 31,712	$ 31,712
Excavate & Move Material	$ -	$ -	$ -	$ 94,506	$ 1,396,622	$ 14,900	$ 306,505	$ 1,566,618	$ 1,566,618
Invasive Species Control	$ 1,432	$ 2,387	$ 1,432	$ -	$ -	$ 35,807	$ -	$ 71,613	$ 71,613
Plants & Bioengineering	$ -	$ -	$ 7,380	$ -	$ -	$ -	$ 51,386	$ 51,386	$ 83,521
Mob & Demob (2%)	$ 633	$ 48	$ 781	$ 2,378	$ 28,420	$ 1,014	$ 7,792	$ 34,427	$ 52,905
Contingency (20%)	$ 6,331	$ 477	$ 7,807	$ 23,779	$ 284,202	$ 10,141	$ 77,921	$ 344,266	$ 529,052
E&D and S&A (15%)(2)	$ 5,793	$ 437	$ 7,143	$ 21,757	$ 260,045	$ 9,279	$ 71,297	$ 315,003	$ 484,083
TOTAL (3)	**$ 44,412**	**$ 3,349**	**$ 54,766**	**$ 166,807**	**$ 1,993,677**	**$ 71,141**	**$ 546,613**	**$ 2,415,026**	**$ 3,711,301**

	Davis Park			Atlantique to Corneille		
	T-24			T-25		
	RA1	RA2	RA3	RA1	RA2	RA3
Remove	$ -	$ 42,659	$ 66,007	$ -	$ -	$ -
Regrade	$ 3,406	$ 80,032	$ 88,546	$ 30,650	$ 30,650	$ 32,694
Fill	$ 10,890	$ 243,935	$ 296,046	$ 326,699	$ 980,098	$ 209,088
Relocate	$ -	$ -	$ -	$ -	$ -	$ -
Install	$ -	$ 504,997	$ 504,997	$ -	$ -	$ -
Excavate & Move Material	$ -	$ -	$ -	$ -	$ -	$ -
Invasive Species Control	$ -	$ -	$ -	$ -	$ -	$ -
Plants & Bioengineering	$ 2,035	$ 48,847	$ 51,027	$ -	$ -	$ 43,206
Mob & Demob (2%)	$ 327	$ 18,409	$ 20,132	$ 7,147	$ 20,215	$ 5,700
Contingency (20%)	$ 3,266	$ 184,094	$ 201,324	$ 71,470	$ 202,150	$ 56,997
E&D and S&A (15%)(2)	$ 2,989	$ 168,446	$ 184,212	$ 65,395	$ 184,967	$ 52,153
TOTAL (3)	**$ 22,912**	**$ 1,291,419**	**$ 1,412,291**	**$ 501,362**	**$ 1,418,080**	**$ 399,837**

	Kismet, Atlantique, Fair Harbor			Warner Island East		
	T-26			T-27		
	RA1	RA2	RA3	RA1	RA2	RA3
Remove	$ 150,306	$ 245,524	$ 404,950	$ -	$ -	$ -
Regrade	$ 19,412	$ 33,034	$ 46,997	$ 10,217	$ 10,217	$ 10,217
Fill	$ 124,146	$ 211,266	$ 300,563	$ 65,340	$ 65,340	$ 65,340
Relocate	$ -	$ -	$ -	$ -	$ -	$ -
Install	$ 194,230	$ 349,613	$ 427,305	$ -	$ -	$ -
Excavate & Move Material	$ -	$ -	$ -	$ -	$ -	$ -
Invasive Species Control	$ -	$ -	$ -	$ -	$ -	$ -
Plants & Bioengineering	$ 12,212	$ 28,494	$ 36,635	$ 24,423	$ 3,270	$ 34,725
Mob & Demob (2%)	$ 10,006	$ 17,359	$ 24,329	$ 2,000	$ 1,577	$ 2,206
Contingency (20%)	$ 100,061	$ 173,586	$ 243,290	$ 19,996	$ 15,765	$ 22,056
E&D and S&A (15%)(2)	$ 91,556	$ 158,831	$ 222,610	$ 18,296	$ 14,425	$ 20,181
TOTAL (3)	**$ 701,928**	**$ 1,217,708**	**$ 1,706,680**	**$ 140,272**	**$ 110,594**	**$ 154,725**

Notes

(1) For the Final Design of the Proposed Alternative, more detailed plans/specifications and construction procedures/equipment will be necessary. These costs are considered preliminary, conceptual level, costs, for comparison of alternatives only.

(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15% of the Subtotal *plus* Mob & Demob and Contingency cost.

(3) Real Estate Costs for buy-out of houses are not currently included in the Total Cost (in particular, this applies to: T-14 (RA3), T-24 (RA3), and T-26).

SUMMARY

OF

BREACH RESPONSE PROJECT COST

Matrix of Conceptual Size Estimates for Fire Island to Montauk Point Breach Response Project Alternatives.

					FILT GSB-1B	Town Beach to Corneille GSB-2B	Water Island GSB-3D	Davis Park GSB-3G	Old Inlet West GSB-4B	Old Inlet East GSB-4B	SPCP MB-1B	Sedge Island SB-1B	Tiana SB-1C	WOSI SB-2B
Line Item	**Item**	**Description**	**Cost Adjusted to Fire Island, NY (4)**	**Units**	**Large**	**Large**	**Large**	**Large**	**Large**	**Large**	**Large**	**Large**	**Large**	**Large**
A	**Regrade**													
A1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	9.5	7.9	9.5	7.1	9.5	4.4	4.0	5.3	5.3	7.1
B	**Fill**													
B1		Sand, using dredge material	$ 21,780	AC	9.5	7.9	9.5	7.1	9.5	4.4	4.0	5.3	5.3	7.1
C	**Plants & Bioengineering**													
C1		Dune grass	$ 8,141	AC	2.4	2.0	2.4	1.8	2.4	1.1	1.0	1.3	1.3	1.8
D	**Other**													
D1		Mobilization & Demobilization	2%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D2		Contingency	20%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D3		E&D and S&A	15%		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Assumptions:

1 ac = 209 x 209 sq ft area

Plantings - assume 1/4 of each acre of regraded area will be planted

Matrix of Conceptual Cost Estimates for Fire Island to Montauk Point Breach Response Project Alternatives.[1]

Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	FILT GSB-1B	Town Beach to Corneille GSB-2B	Talisman to Water Island GSB-3D	Davis Park GSB-3G	Old Inlet West GSB-4B	Old Inlet East GSB-4B	SPCP MB-1B	Sedge Island SB-1B	Tiana SB-1C	WOSI SB-2B
					Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
A	**Regrade**													
A1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	$ 32,353	$ 26,904	$ 32,353	$ 24,180	$ 32,353	$ 14,985	$ 13,622	$ 18,050	$ 18,050	$ 24,180
B	**Fill**													
B1		Sand, using dredge material	$ 21,780	AC	$ 206,910	$ 172,062	$ 206,910	$ 154,638	$ 206,910	$ 95,832	$ 87,120	$ 115,434	$ 115,434	$ 154,638
C	**Plants & Bioengineering**													
C1		Dune grass	$ 8,141	AC	$ 19,539	$ 16,282	$ 19,539	$ 14,654	$ 19,539	$ 8,955	$ 8,141	$ 10,583	$ 10,583	$ 14,654
				SUBTOTAL	$ 258,801	$ 215,248	$ 258,801	$ 193,471	$ 258,801	$ 119,772	$ 108,883	$ 144,067	$ 144,067	$ 193,471
D	**Other**													
D1		Mobilization & Demobilization	2%		$ 5,176	$ 4,305	$ 5,176	$ 3,869	$ 5,176	$ 2,395	$ 2,178	$ 2,881	$ 2,881	$ 3,869
D2		Contingency	20%		$ 51,760	$ 43,050	$ 51,760	$ 38,694	$ 51,760	$ 23,954	$ 21,777	$ 28,813	$ 28,813	$ 38,694
D3		E&D and S&A (2)	15%		$ 47,361	$ 39,390	$ 47,361	$ 35,405	$ 47,361	$ 21,918	$ 19,926	$ 26,364	$ 26,364	$ 35,405
				TOTAL	**$ 363,098**	**$ 301,993**	**$ 363,098**	**$ 271,440**	**$ 363,098**	**$ 168,040**	**$ 152,763**	**$ 202,126**	**$ 202,126**	**$ 271,440**

Notes

(1) Costs are preliminary, and are for comparison of alternatives only.

(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15% of the Subtotal *plus* Mob & Demob and Contingency cost.

Summary Conceptual Cost Estimates for Fire Island to Montauk Point Breach Response Project Alternatives.[1]

	FILT	Town Beach to Corneille	Talisman to Water Island	Davis Park	Old Inlet West
	GSB-1B	GSB-2B	GSB-3D	GSB-3G	GSB-4B
	Large	Large	Large	Large	Large
Regrade	$ 32,353	$ 26,904	$ 32,353	$ 24,180	$ 32,353
Fill	$ 206,910	$ 172,062	$ 206,910	$ 154,638	$ 206,910
Dune Planting	$ 19,539	$ 16,282	$ 19,539	$ 14,654	$ 19,539
Mob & Demob (2%)	$ 5,176	$ 4,305	$ 5,176	$ 3,869	$ 5,176
Contingency (20%)	$ 51,760	$ 43,050	$ 51,760	$ 38,694	$ 51,760
E&D and S&A (15%)[2]	$ 47,361	$ 39,390	$ 47,361	$ 35,405	$ 47,361
TOTAL	**$ 363,098**	**$ 301,993**	**$ 363,098**	**$ 271,440**	**$ 363,098**

	Old Inlet East	SPCP	Sedge Island	Tiana	WOSI
	GSB-4B	MB-1B	SB-1B	SB-1C	SB-2B
	Large	Large	Large	Large	Large
Regrade	$ 14,985	$ 13,622	$ 18,050	$ 18,050	$ 24,180
Fill	$ 95,832	$ 87,120	$ 115,434	$ 115,434	$ 154,638
Dune Planting	$ 8,955	$ 8,141	$ 10,583	$ 10,583	$ 14,654
Mob & Demob (2%)	$ 2,395	$ 2,178	$ 2,881	$ 2,881	$ 3,869
Contingency (20%)	$ 23,954	$ 21,777	$ 28,813	$ 28,813	$ 38,694
E&D and S&A (15%)[2]	$ 21,918	$ 19,926	$ 26,364	$ 26,364	$ 35,405
TOTAL	**$ 168,040**	**$ 152,763**	**$ 202,126**	**$ 202,126**	**$ 271,440**

Notes

(1) For the Final Design of the Proposed Alternative, more detailed plans/specifications and construction procedures/equipment will be necessary.
These costs are considered preliminary, conceptual level, costs, for comparison of alternatives only.

(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15% of the Subtotal *plus* Mob & Demob and Contingency cost.

SUMMARY
OF

BREACH RESPONSE RESTORATION COST

Matrix of Conceptual Size Estimates for Fire Island to Montauk Point Breach Response Site Restoration Alternatives[1]

Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	Tiana RA1	Tiana RA2	Tiana RA3	Smith's Point County Park RA1	Smith's Point County Park RA2	Smith's Point County Park RA3
A	**Remove**									
A1		Bulkhead (incl. disposal)	$ 84,776	AC	1.00					
A2		Rubbish handling, loading & trucking, incl 2 mi haul, machine load truck Dump charges - rubbish only	$ 12,693	AC						
A3		Remove sod, by hand & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - trees, brush, lumber	$ 87,652	AC						
A4		Building demolition, large urban project, incl. 20 mi haul, 2 family, 2 story house, wood, maximum Disposal only, urban building with salvage value allowed, including loading and 5 mi haul to dump, wood frame	$ 23,348	Each		2.00	2.00			
A5		Fencing, wood, all types, 4' to 6' high & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - rubbish only	$ 2,554	AC						
A6		Pavement removal, bituminous roads, 3" thick & For disposal to 5 miles, add	$ 60,321	AC						
A7		Rip-rap, random, broken stone (incl. disposal)	$ 6,841	Each						
B	**Regrade**									
B1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	7.60	10.00	17.60	10.50	11.00	21.50
C	**Fill**									
C1		Sand, using dredge material	$ 21,780	AC	7.70	8.00	15.70		25.00	15.00
C2		Loam, using dredge material	$ 28,233	AC						
D	**Relocate**									
D1		Wells, domestic water, gravel pack well, 40' deep, incl. gravel & casing, complete, 24" diam. casing x 18" diam screen	$ 82,358	Each						
E	**Install**									
E1		Culvert/headwall, 1-1/2 to 1 slope soil, CIP concrete, 48" diam pipe, 4'-6' long wing walls	$ 10,571	Each						
E2		Flap Gate, Aluminum, 48" diam	$ 12,194	Each						
E3		24" diam Self-regulating Tide (SRT) Gate	$ 101,994	Each						
E4		36" diam SRT Gate	$ 121,290	Each						
E5		Sand fencing	$ 1,043	AC						
E6		Boardwalk/recreational access	$ 38,846	Each		1.00	1.00			
F	**Excavate & Move Material**									
F1		To tidal elevation w/ offsite disposal	$ 51,084	AC						
F2		To subtidal elevation w/ offsite disposal	$ 189,012	AC						
F3		To salt marsh elevation w/ onsite use	$ 29,799	AC	2.40		2.40	10.50		10.50
F4		To (sinuous) tidal creek elevation w/ onsite use	$ 105,009	AC						
G	**Invasive Species Control**									
G1		Herbicide	$ 796	AC	2.00		2.00	25.00	25.00	25.00
G2		Manual removal	$ 51,084	AC						
H	**Plants & Bioengineering**									
H1		Dune grass	$ 8,141	AC		2.50	2.50		2.00	2.00
H2		Upland	$ 1,090	AC	1.00		1.00			
H3		Bay Beach- Emergents	$ 12,439	AC	2.50		2.50	9.00	3.00	12.00
H4		Bay Beach - Shrubs	$ 816	AC	0.50		0.50	1.50		1.50
H5		BaySub SAV	$ 37,000	AC						
H6		Bioengineering	$1,425.00	AC	1.00		1.00			
H7		Supporting Products	$112.50	AC	4.30		4.30	100.00		100.00
I	**Other**									
I1		Mobilization & Demobilization	2%		N/A	N/A	N/A	N/A	N/A	N/A
I2		Contingency	20%		N/A	N/A	N/A	N/A	N/A	N/A
I3		E&D and S&A	15%		N/A	N/A	N/A	N/A	N/A	N/A
J	**Real Estate**									
J1		Buy-out Houses/Properties - USACE Real Estate to provide				2.00	2.00			

Assumptions: Sand fill - assumed 1/2 AC per 209 LF of shoreline bayside
Fill at 1 ft avg depth rer ac., adjusted for depth of sand lobe at avg. 3 ft
1/2 AC per 209 LF of shoreline oceanside for insipient dunes
1 AC per 209 LF of shoreline oceanside for foredunes
Plantings - assume 1/4 of each AC graded/restored will be planted
Assumed structure and boardwalk removal under A4, but costs probably very low for these tasks
Adjusted # of units of bulkhead removal to account for Marina removal
Adjusted # units of building demolition to account for sheds/small wooden structures
Included boardwalk removal, shed removal, in structure demolition and disposal costs
Assume marina property that would be removed is donated (not purchased) in T-2 (RA3) and T-5 (RA3)

Matrix of Conceptual Cost Estimates for Fire Island to Montauk Point Breach Response Site Restoration Alternatives[1]

Line Item	Item	Description	Cost Adjusted to Fire Island, NY (2006 dollars)	Units	Tiana RA1	Tiana RA2	Tiana RA3	Smith's Point County Park RA1	Smith's Point County Park RA2	Smith's Point County Park RA3
A	**Remove**									
A1		Bulkhead (incl. disposal)	$ 84,776	AC	$ 84,776	$ -	$ -	$ -	$ -	$ -
A2		Rubbish handling, loading & trucking, incl 2 mi haul, machine load truck Dump charges - rubbish only	$ 12,693	AC	$ -	$ -	$ -	$ -	$ -	$ -
A3		Remove sod, by hand & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - trees, brush, lumber	$ 87,652	AC	$ -	$ -	$ -	$ -	$ -	$ -
A4		Building demolition, large urban project, incl. 20 mi haul, 2 family, 2 story house, wood, maximum Disposal only, urban building with salvage value allowed, including loading and 5 mi haul to dump, wood frame	$ 23,348	Each	$ -	$ 46,696	$ 46,696	$ -	$ -	$ -
A5		Fencing, wood, all types, 4' to 6' high & Rubbish handling, loading & trucking, incl 2 mi haul, hand loading truck, 50' haul Dump charges - rubbish only	$ 2,554	AC	$ -	$ -	$ -	$ -	$ -	$ -
A6		Pavement removal, bituminous roads, 3" thick & For disposal to 5 miles, add	$ 60,321	AC	$ -	$ -	$ -	$ -	$ -	$ -
A7		Rip-rap, random, broken stone (incl. disposal)	$ 6,841	Each	$ -	$ -	$ -	$ -	$ -	$ -
B	**Regrade**									
B1		Grading at dump, or embankment if required, by dozer	$ 3,406	AC	$ 25,883	$ 34,056	$ 59,939	$ 35,759	$ 37,462	$ 73,221
C	**Fill**									
C1		Sand, using dredge material	$ 21,780	AC	$ 167,706	$ 174,240	$ 341,945	$ -	$ 544,499	$ 326,699
C2		Loam, using dredge material	$ 28,233	AC	$ -	$ -	$ -	$ -	$ -	$ -
D	**Relocate**									
D1		Wells, domestic water, gravel pack well, 40' deep, incl. gravel & casing, complete, 24" diam. casing x 18" diam screen	$ 82,358	Each	$ -	$ -	$ -	$ -	$ -	$ -
E	**Install**									
E1		Culvert/headwall, 1-1/2 to 1 slope soil, CIP concrete, 48" diam pipe, 4'-6' long wing walls	$ 10,571	Each	$ -	$ -	$ -	$ -	$ -	$ -
E2		Flap Gate, Aluminum, 48" diam	$ 12,194	Each	$ -	$ -	$ -	$ -	$ -	$ -
E3		24" diam Self-regulating Tide (SRT) Gate	$ 101,994	Each	$ -	$ -	$ -	$ -	$ -	$ -
E4		36" diam SRT Gate	$ 121,290	Each	$ -	$ -	$ -	$ -	$ -	$ -
E5		Sand fencing	$ 1,043	AC	$ -	$ -	$ -	$ -	$ -	$ -
E6		Boardwalk/recreational access	$ 38,846	Each	$ -	$ 38,846	$ 38,846	$ -	$ -	$ -
F	**Excavate & Move Material**									
F1		To tidal elevation w/ offsite disposal	$ 51,084	AC	$ -	$ -	$ -	$ -	$ -	$ -
F2		To subtidal elevation w/ offsite disposal	$ 189,012	AC	$ -	$ -	$ -	$ -	$ -	$ -
F3		To salt marsh elevation w/ onsite use	$ 29,799	AC	$ 71,518	$ -	$ 71,518	$ 312,891	$ -	$ 312,891
F4		To (sinuous) tidal creek elevation w/ onsite use	$ 105,009	AC	$ -	$ -	$ -	$ -	$ -	$ -
G	**Invasive Species Control**									
G1		Herbicide	$ 796	AC	$ 1,591	$ -	$ 1,591	$ 19,893	$ 19,893	$ 19,893
G2		Manual removal	$ 51,084	AC	$ -	$ -	$ -	$ -	$ -	$ -
H	**Plants & Bioengineering**									
H1		Dune grass	$ 8,141	AC	$ -	$ 20,353	$ 20,353	$ -	$ 16,282	$ 16,282
H2		Upland	$ 1,090	AC	$ 1,090	$ -	$ 1,090	$ -	$ -	$ -
H3		Bay Beach- Emergents	$ 12,439	AC	$ 31,097	$ -	$ 31,097	$ 111,949	$ 37,316	$ 149,266
H4		Bay Beach - Shrubs	$ 816	AC	$ 408	$ -	$ 408	$ 1,223	$ -	$ 1,223
H5		BaySub SAV	$ 37,000	AC	$ -	$ -	$ -	$ -	$ -	$ -
H6		Bioengineering	$ 1,425	AC	$ 1,425	$ -	$ 1,425	$ -	$ -	$ -
H7		Supporting Products	$ 113	AC	$ 484	$ -	$ 484	$ 11,250	$ -	$ 11,250
				SUBTOTAL	$ 385,977	$ 314,190	$ 615,392	$ 492,965	$ 655,452	$ 910,724
I	**Other**									
I1		Mobilization & Demobilization	2%		$ 7,720	$ 6,284	$ 12,308	$ 9,859	$ 13,109	$ 18,214
I2		Contingency	20%		$ 77,195	$ 62,838	$ 123,078	$ 98,593	$ 131,090	$ 182,145
I3		E&D and S&A (2)	15%		$ 70,634	$ 57,497	$ 112,617	$ 90,213	$ 119,948	$ 166,663
				TOTAL	**$ 541,526**	**$ 440,809**	**$ 863,394**	**$ 691,630**	**$ 919,599**	**$ 1,277,746**
J	**Real Estate (3)**									
J1		Buy-out Houses - USACE Real Estate to provide								

Notes

(1) Costs are preliminary, and are for comparison of alternatives only.
(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15% of the Subtotal *plus* Mob & Demob and Contingency cost.
(3) Real Estate Costs for buy-out of houses is not currently included in the Total Cost

Summary Conceptual Cost Estimates for Fire Island to Montauk Point Breach Response Site Restoration Alternatives.[1]

	Tiana			Smith's Point County Park		
	RA1	RA2	RA3	RA1	RA2	RA3
Remove	$ 84,776	$ 46,696	$ 46,696	$ -	$ -	$ -
Regrade	$ 25,883	$ 34,056	$ 59,939	$ 35,759	$ 37,462	$ 73,221
Fill	$ 167,706	$ 174,240	$ 341,945	$ -	$ 544,499	$ 326,699
Relocate	$ -	$ -	$ -	$ -	$ -	$ -
Install	$ -	$ 38,846	$ 38,846	$ -	$ -	$ -
Excavate & Move Material	$ 71,518	$ -	$ 71,518	$ 312,891	$ -	$ 312,891
Invasive Species Control	$ 1,591	$ -	$ 1,591	$ 19,893	$ 19,893	$ 19,893
Plants & Bioengineering	$ 34,504	$ 20,353	$ 54,856	$ 124,422	$ 53,599	$ 178,021
Mob & Demob (2%)	$ 7,720	$ 6,284	$ 12,308	$ 9,859	$ 13,109	$ 18,214
Contingency (20%)	$ 77,195	$ 62,838	$ 123,078	$ 98,593	$ 131,090	$ 182,145
E&D and S&A (15%) [2]	$ 70,634	$ 57,497	$ 112,617	$ 90,213	$ 119,948	$ 166,663
TOTAL [3]	**$ 541,526**	**$ 440,809**	**$ 863,394**	**$ 691,630**	**$ 919,599**	**$ 1,277,746**

Notes

(1) For the Final Design of the Proposed Alternative, more detailed plans/specifications and construction procedures/equipment will be necessary.
These costs are considered preliminary, conceptual level, costs, for comparison of alternatives only.

(2) Engineering & Design (E&D) and Supervision & Administration (S&A) costs are calculated as 15% of the Subtotal *plus* Mob & Demob and Contingency cost.

(3) Real Estate Costs for buy-out of houses are not currently included in the Total Cost