PORT BIENVILLE

Rail Alternatives Development

Technical Methodology Report

September 19, 2013

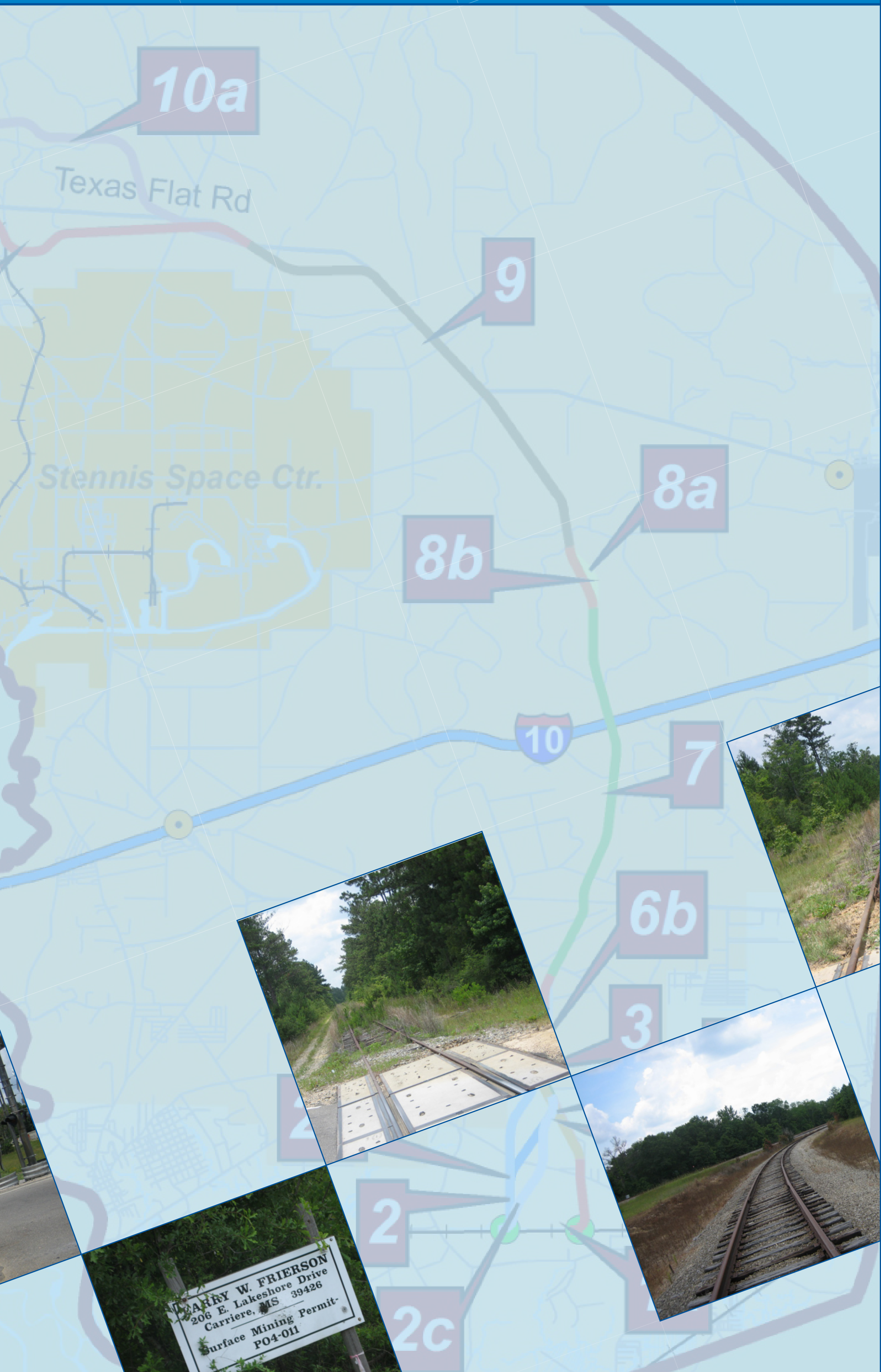
Presented to:

Mississippi Department of Transportation

In collaboration with:

Federal Railroad Administration

Hancock County Port and Harbor Commission



CDM Smith

in association with HDR

Port Bienville Rail Alternatives Development Technical Methodology Report

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Introduction

Project Approach

The alternative selection process for any transportation facility begins with the identification and quantification of a "universe" of preliminary alternatives and selection of reasonable alternatives that address the project objectives. To achieve the identification and evaluation of preliminary alternatives, selection of reasonable alternatives, and the recommendation of a preferred alternative in this project's aggressive schedule, a streamlined selection process was developed in regard to the NEPA process. The streamlined screening and selection process for this project incorporates geographic information systems (GIS), an automated corridor analysis tool called the Alignment Alternatives Research Tool (AART), limited field reconnaissance and data validation, engineering design criteria, and review and evaluation by the project team that consists of planners and engineers. The process also takes into account and incorporates client input, public and other stakeholder comments and concerns, as well as consideration of previous studies. The process is iterative in nature, providing a continuous quantification and comparison of impacts to an equal level of detail at each stage associated with the various alternatives, as they are modified based on design criteria, cost, and other considerations during project development. The remainder of this report provides a detailed explanation of the process that was utilized to determine reasonable corridor alternatives.

Study Area

The project study area is located in southern Mississippi near Louisiana. It extends from Nicholson on the northern end to the area between Pearlington and the Gulf of Mexico on the southern end. The Mississippi River forms the western boundary, and the eastern boundary extends between the Stennis International Airport and the town of Kiln. It has an area of 231 square miles.

The majority of the study area lies in Hancock County, but a portion surrounding Nicholson lies in Pearl River County. The predominant feature of the study area is NASA's Stennis Space Center, located near the center of the study area with a fenced-in area known as the "Fee Area" which encompasses approximately 22 square miles. Additionally, NASA's Stennis Space Center controls development rights on another 154.75 square miles surrounding the "Fee Area". This surrounding land is known as the "Buffer Area." Interstate 10 is the major highway in the study area. Interstate 59 passes through a small portion in the north. Other significant features are wetlands, forests, and open pit mines. The majority of the study area is very sparsely populated.

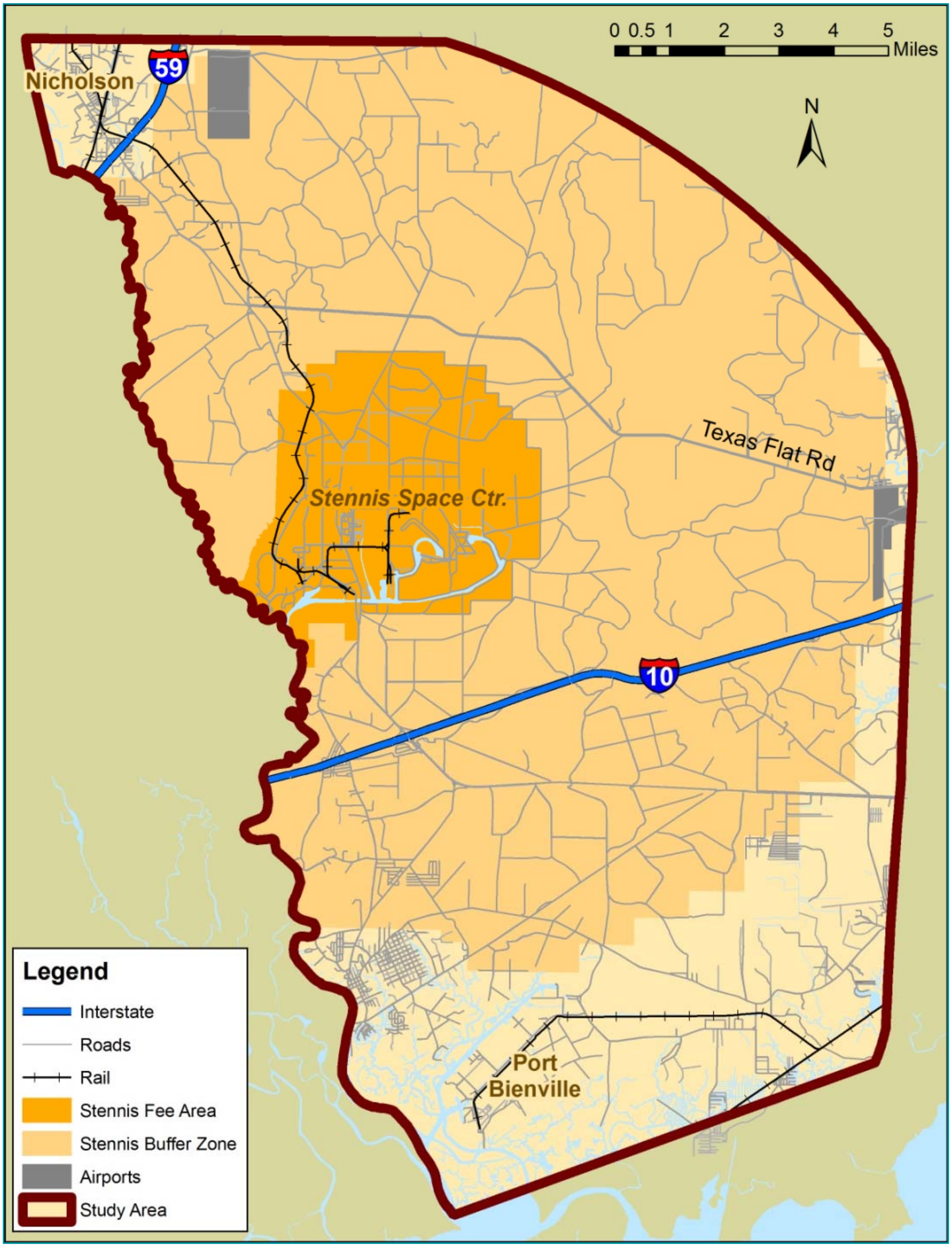

Figure 1 – Port Bienville Study Area.

Data Collection

Methodology

In order to create a complete picture of the project area, generate the best corridors and calculate accurate impacts, it was necessary to compile GIS data for the study area in the following categories: environmental, cultural, historical, and infrastructure. The majority of data were downloaded from the Mississippi Automated Resource Information System (MARIS) website (http://www.maris.state.ms.us/).

Historical data were obtained from the Mississippi Department of Archives and History (MDAH) through the Department's website.

Because the study area contains the NASA Stennis Space Center, it was necessary to submit a Freedom of Information Act (FOIA) request to obtain GIS data for areas inside the Center boundaries. Current aerial photography for the study area was provided by the Mississippi Department of Transportation (MDOT) via external USB drive.

Data for source water protection areas (SWPAs) were obtained through a direct request from the Mississippi Department of Environmental Quality (MDEQ). This data was deemed more accurate and current than the source water data available from the MARIS website.

As there was not a single comprehensive source for wetland information, the data for this layer was compiled from three sources: the US Army Corps of Engineers (USACE), MARIS, and Wetlands Solutions LLC. The USACE and Wetland Solutions LLC also provided data for proposed wetland mitigation banks.

No new GIS data were collected in the field for this feasibility study. With the exception of the mines layer, all of the GIS data were preexisting. Although there are a significant number of mines in the study area, there was no readily available GIS data layer showing their locations. The only available mine information was a list of mine locations containing township and range information obtained from the MDEQ. By using the list of mines, a township and range layer, a parcel layer and aerial photography, a new mines layer was created.

It is important to note that efforts were made to locate data for threatened and endangered (T&E) species within the study area. Fish and Wildlife was contacted regarding T&E species data and it was decided that the information was not in a format conducive to this study and the data was not provided to the project team. Therefore these data were not available for use in this Phase of the study. Fish and Wildlife did offer to check potential impacts to T&E species once the alternatives were identified. It was decided by the project team that this effort would be undertaken during Phase II after the reasonable alternatives have been identified.

Appendix D lists the data collected for this study and their sources.

Data Formats

Existing GIS data were obtained in shapefile, geodatabase and spreadsheet formats. Data in spreadsheets (MDAH historical data) were converted to GIS point layers.

Pre-Processing Techniques

Common Coordinate System

To facilitate the geoprocessing operations of the AART, all GIS data layers must be converted to a common coordinate system. The Port Bienville study area (Hancock and Pearl River counties) falls within the Mississippi State Plane Coordinate System – East, as described below:

Coordinate System:	Mississippi State Plane – East (FIPS 2301)
Projection:	Transverse Mercator
Datum:	NAD83
Unit:	US Foot

As the data were received, they were converted to this coordinate system.

Point Buffering

Some data that might represent large areas in the real world were available only as points. In instances where it was determined that it would create more meaningful AART output, point data were buffered by reasonable and defensible distances to convert them to polygonal data, thus giving them some dimension. These buffers provided additional protection to a certain resource or the creation of an extension of a site or resource to insure that it was identified during inventory of the alignments.

The features were combined into a GIS database as the next step to pre-processing in GIS. See Figure 2 for a diagram illustrating typical data preparation during this process.

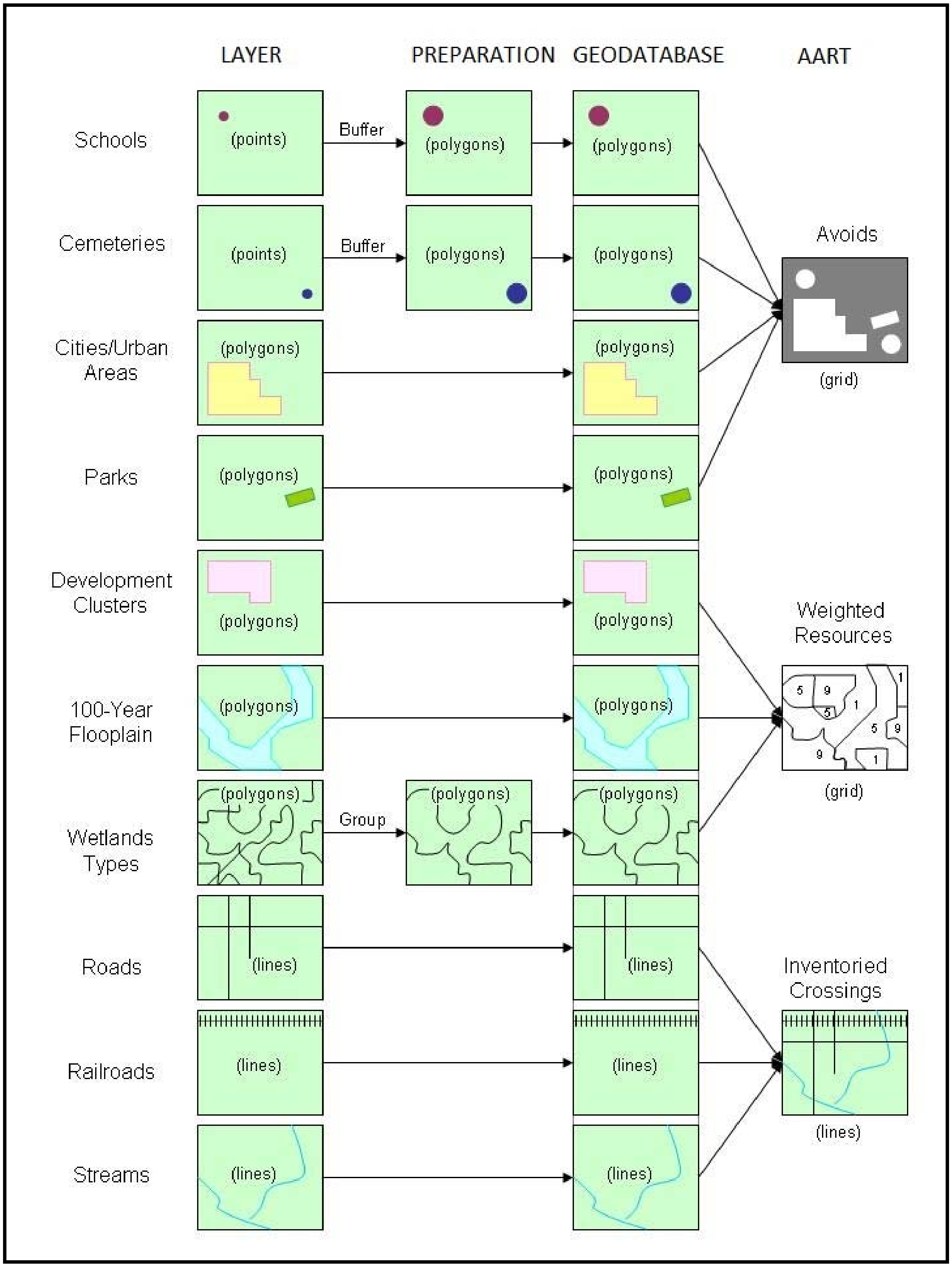

Figure 2 - Pre-processing for AART.

The first step in processing the data was to clip the GIS data using the study area boundary so that only features falling inside the study area are used. This helps to reduce processing time while running AART.

Next, to the extent possible a quality review of the data was conducted. Individual data layers were checked for locational accuracy against aerial photography. Because of the limitations inherent in this process, it is often only possible to detect gross errors and discrepancies in data layers. Data layers that did not contain features within the study area boundaries were not used in the analyses.

National Wetlands Inventory (NWI) GIS data are categorized into numerous codes which describe in detail the characteristics of each wetland polygon. In order to simplify the data, these codes were grouped into general categories based on wetland types. In addition, the original NWI codes were used to distinguish wetlands that have not been disturbed by man (non-disturbed) from those that have (disturbed). A summary of these groupings is shown in Appendix C. These groupings were applied to the NWI feature class in the geodatabase and used during the ranking process.

Grid Cell Size

Because AART conducts its analyses via raster processing, a grid (raster) cell size must be specified. This cell size determines the resolution of the grids when the input data layers are rasterized (converted to grids). Cell sizes that are too large will result in loss of detail and data; very small features may be lost in the rasterization process. On the other hand, cells sizes that are too small can severely impact processing times, strain computing resources and potentially exceed available disk space. For this project, a cell size of 20x20 feet was determined to be a reasonable compromise between detail and processing speed.

Evaluation Criteria for Preliminary Alternatives

Review and Classification of Data for AART

Avoids

As the term implies, areas designated as “Avoids” are avoided by the AART to the extent possible when determining the best alignments, allowing complete protection of the resources. However, in practice it is possible that some encroachment of these areas may occur during the smoothing process (when horizontal curvature criteria are applied) and when building corridors (for example, the wider the corridor, the greater the chance that an Avoid will be encountered). To minimize this possibility, a specified buffer width can be applied to the Avoid areas, thereby expanding its footprint.

During the GIS data evaluation process, the project Team and agencies identified some features as particularly sensitive and designated them as Avoids. These consisted of certain wetland, environmental, cultural and historical features as shown in Appendix E.

Ranked Resources

In contrast to Avoids, the assignment of a ranking does not guarantee that the area will not be impacted. Rather, the AART attempts to utilize the lower-ranked areas as much as possible while minimizing the overall length of the path/corridor. In some cases, AART may impact a few acres of highly-ranked areas if the overall impacts of the path are less than if those areas are avoided.

Once all of the layers have been ranked, the AART processes all of the layers and generates a single, composite “suitability” layer comprised of the highest rankings from all input layers. In other words, for each grid cell in the study area, the AART reviews each input layer, selects the highest value for that cell and assigns that value to the corresponding cell in the suitability layer (see Appendix B, Figure 4a).

In this study, rankings were developed by consensus among the various stakeholders, planners, engineers and domain experts. The initial step was to decide which layers should be included in the analysis. Next, each layer to be used was reviewed and rankings were assigned. See Appendix E for a detailed listing of all the rankings used in the study. Below is a summary of the GIS layers utilized and their rankings.

- Bays were programmed to be avoided.
- Estuarine and Marine Wetlands – tidal wetlands were programmed for avoidance and others were assigned rankings of 6 or 9 depending on their type and quality.
- Wetland Mitigation Banks were evaluated both as avoidance areas and with a ranking of 9. The results were almost identical for both scenarios.
- Freshwater Forested/Shrub Wetlands were initially assigned rankings between 4 and 9 depending on type. Later in the study these rankings were refined and were increased based on input from the Agencies to vary between 7 and 9.
- Bottomland Hardwoods were assigned a ranking of 6 or 7 depending on type.
- Freshwater Marshes were assigned a ranking of 6 or 9 depending on type.
- Savannahs were assigned a ranking of 6 or 9 depending on type.
- Rivers were programmed for avoidance for those with tidal influence. All other freshwater rivers were given rankings between 7 and 9.
- Lakes were assigned a ranking of 9.
- Water Bodies, (Linear and Areal) were assigned rankings of 6 and 9 respectively.
- Freshwater Ponds were assigned rankings between 4 and 7 depending on type.
- Prime Farmlands were assigned a ranking of 4.
- Landfills were assigned a ranking of 9.
- Surface Impoundment Areas were assigned a ranking of 9 along with a 500' buffer area.
- The following GIS features were all programmed as avoidance areas: Hazardous Waste Sites, RCRA, EPA, Tanks, Toxic Release Inventory, UST's, CERCLA 2008, CERCLA Site Areas, and Mines.

Rail Corridor

During initial discussions with project stakeholders, it was decided that the existing rail line from I-59 near Nicholson, MS to Texas Flat Road should be considered as the northern segment of the alternatives. This is an existing rail line that is no longer in service. The right-of-way and track is owned by Norfolk Southern and was originally constructed to serve Stennis. This rail line is an established corridor/roadbed and connects to the NS lead track in Nicholson. Utilizing this rail alignment would minimize impact to the environment and the cost would be less compared to constructing a new track. Since the track hasn't been used in over a decade it will have to be reconditioned since there has been no apparent maintenance in recent years. In order to encourage the AART to follow this path, a GIS layer consisting of a 1,000-foot corridor was created centered along this rail line. The corridor was assigned a ranking of "1" and superimposed on the final suitability layers so that the rail corridor would be the most suitable land in the vicinity. This process was performed to simply encourage the AART to identify this section of track as a possible alternative and to quantify the impacts associated with the initial wide corridor. In reality the impacts would be negligible since the rail bed is already established. Figure 3 shows the location of this corridor which is highlighted in yellow. The rail line is shown extending down into the Stennis "Fee Area" but portions of this track have been removed.

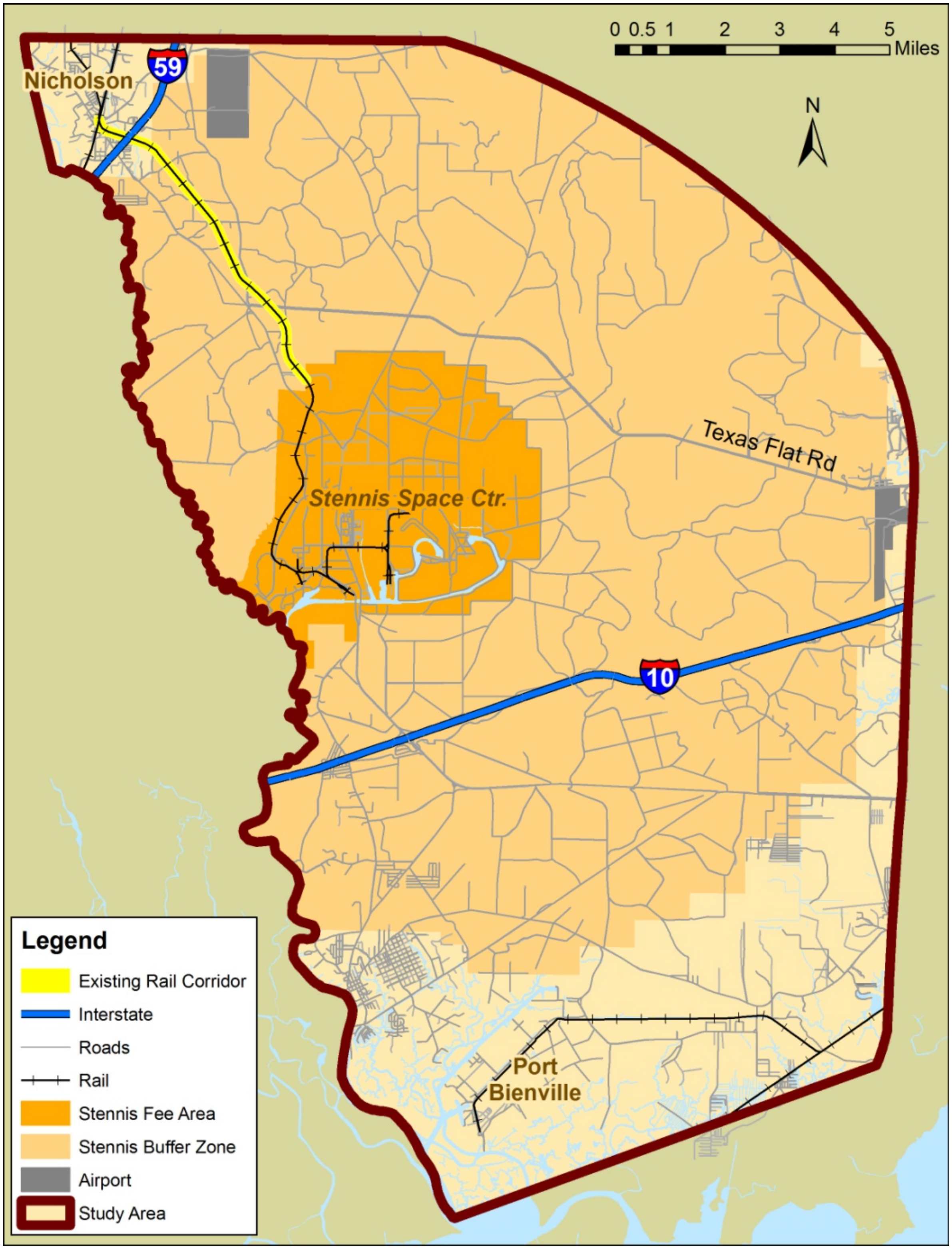

Figure 3 – Existing rail corridor used as part of all output corridors.

Scenarios

A "Scenario" is a specific combination of rankings and avoids. An initial, or "base", scenario was developed by the project Team. Variations of this base scenario were created which included or excluded certain avoids such as the Stennis Space Center Fee area and existing and proposed mitigation banks. These initial scenarios were used to generate an initial set of corridors ("runs") which were presented to the resource and regulatory agencies. Following further review and discussion, the agencies were given the opportunity to modify the rankings to create new scenarios based on their input.

Overall, seven scenarios were created from the Team's initial settings, four from EPA modifications and three from USACE modifications. Each scenario is used to create a suitability surface, which is in turn used by the AART to determine the best or least impacting corridors. The suitability surface resulting from the base scenario is shown in Figure 4.

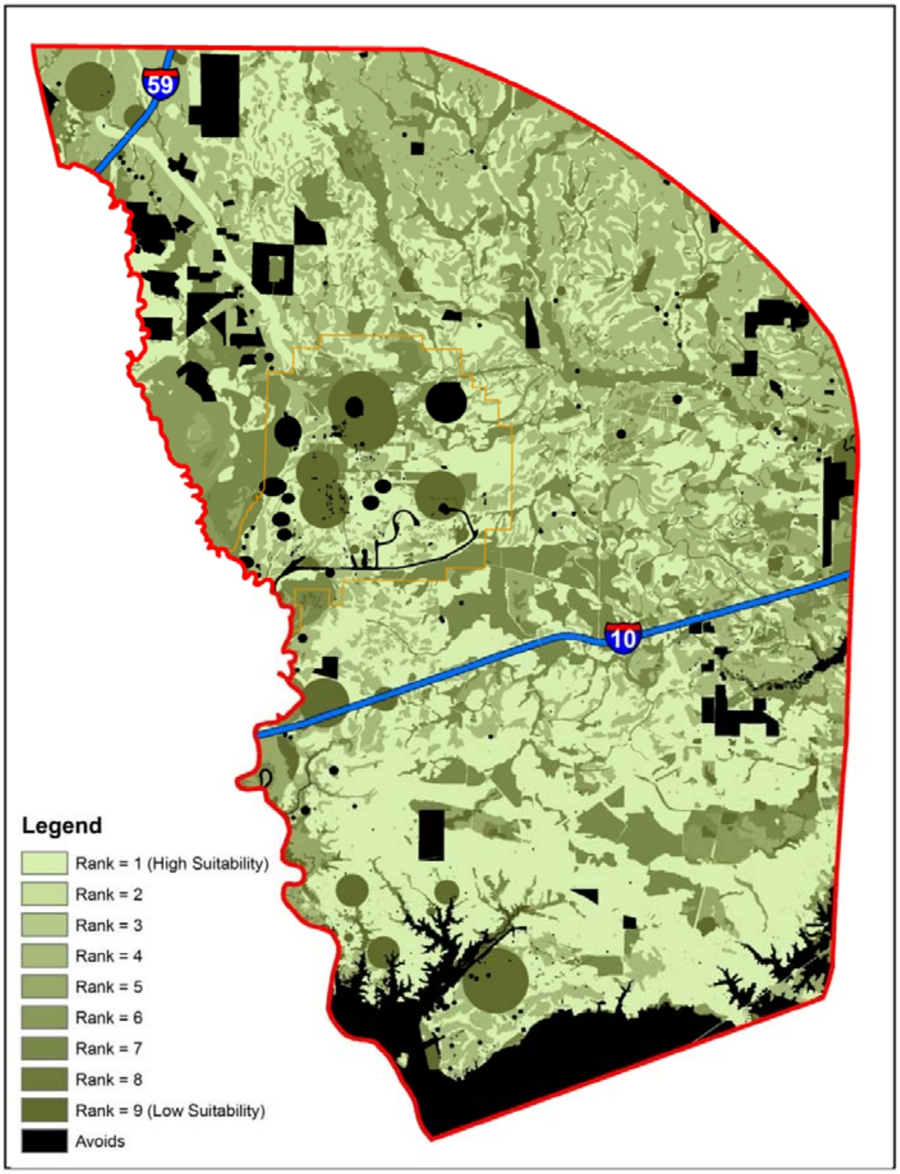

Figure 4 - Base Scenario showing rankings and avoids.

Identification of Layers to Quantify

Once the AART generates a corridor, it quantifies the occurrences of resources, or "impacts," along that corridor (for example, the total acreages of each wetland occurring in a corridor). These corridor impacts are generated for each corridor and used in comparing, evaluating and selecting preferred corridors. Any available GIS layer may be quantified, whether or not it was ranked or used as an Avoid. The layers used in impacts quantifications are listed below.

Point Feature Counts

Layer Description	Layer Name
Archaeological Sites (Stennis)	ArchSites
Archaeological Sites	ArchSites_MDAH
Cemeteries	Cemetery
CERCLA Wells	Cercla_2008
CERCLA Wells (Stennis)	CERCLA_Wells
Churches	Churches
Dams	dams
Detailed Archaeological Sites	DetArchSites
Dept of Health Wells	DoHWells
EPA Regulated Facilities	epa
Historic Properties	HistProps_MDAH
CERCLA Sites	MDEQ_CERCLA
Landfills	MDEQ_Landfills
Protected Water Sources	MDEQ_PWS_Wells
Underground Storage Tanks	MDEQ_UST
Recreational Facilities	mri
National Registry of Historic Places	natreg
NPDES Sites	npdes
Oil and Gas Wells	oilngas
RCRA Sites	rcra
Impoundment Sites	sia
Tanks, Petroleum	Tanks
Toxic Release Inventory Sites	tri
USGS Wells	USGS_Wells09
Underground Storage Tanks	UST_Dec08

Linear Feature Crossings

Layer Description	Layer Name
Hydrography	HydroLine
Major Transmission Lines	majr_transm10
Gas Lines	msgas
Natural Gas Pipelines	NatGasPipelines
Nat'l Hydrography Dataset, Named Streams	nhd_named_streams
Nat'l Hydrography Dataset, Other Flow Lines	nhd_othFL
Power Lines	PowerLines
Rail Lines	rail_lines
Roads	RoadsTIGER
Streams, 303d	Streams_303d
Wastewater Utility Lines	WasteWaterUtility
Water Utility Lines	WaterUtility
Streams	HydroLine

Linear Feature Mileage Calculations

Layer Description	Layer Name
Streams	HydroLine
Nat'l Hydrography Dataset, Named Streams	nhd_named_streams
Nat'l Hydrography Dataset, Other Flow Lines	nhd_othFL
Streams, 303d	treams_303d

Polygon Acreage Calculations

Layer Description	Layer Name
Archaeological Probability (Stennis)	ArchProb
Archaeological Sites (Stennis)	ArchSites_buff
Archaeological Sites	ArchSites_MDAH_buff
Cemeteries	Cemetery_buff
CERCLA Sites (Stennis)	CERCLA_Site_Areas
CERCLA Sites	CERCLA2008_buff
Dams	dams_buff
Dept. of Health Wells	DoHWells_buff
EPA Regulated Facilities	epa_buff
Hazardous Waste Sites	hazardous_waste_sites
Historic Properties	HistPropsMDAH_buff
Landfills (Stennis)	landfill_cells
Water Wells, Primary Protection Areas	MDEQ_PPA
Water Wells, Source Water Prot. Areas	MDEQ_SWPA
Mines	Mines
Recreational Facilities	MRI_buff
National Registry Sites	Natreg_buff
National Hydrography Dataset, Other Areas	nhd_othareas
National Hydrogrpahy Dataset, Water Bodies	nhd_waterb
Land Cover	NLCD_MS_UTM16
Oil and Gas Wells	oilngas_buff
Prime Farmland	PrimeFarmland
RCRA Sites	RCRA_buff
Tanks, Petroleum	Tanks_buff
Toxic Release Inventory Sites	TRI_buff
USGS Wells	USGS_Wells_buff
Underground Storage Tanks	UST_buff
Wetland Mitigation Banks, Existing	wetland_mit_exist
Wetland Mitigation Banks, Proposed	wetland_mit_prop
NWI Wetlands	Wetlands

Identification of Start, End, and Way Points

In order for the AART to identify the conceptual alternatives, it is necessary to provide it with start and end points. These points mark the beginning and ending of the corridors. The AART connects these points by finding the least-impact path through the suitability layer from one point to the other. In order to generate additional alternatives with the same set of criteria, waypoints may be used in between the start and end points to guide corridors through specific areas of interest.

Among the issues considered for potential points are logical "tie-ins" to the existing rail network, potential for economic development, avoidance of sensitive areas, etc. For this study, a total of three start/end points and two waypoints were used, as shown in Figure 5. Points S4 and S5 were chosen along the existing Port Bienville rail line in the southern portion of the study area. The northern endpoint is located near Nicholson, MS at the junction of the existing rail line and Norfolk Southern mainline. In order to investigate additional possibilities two waypoints were used for some of the initial runs. Point W1 was located near Stennis International Airport to explore a possible connection to the airport for potential economic development opportunities. Point W2 was placed at the interchange of I-10 and MS 607 to investigate possibly crossing I-10 at that specific location.

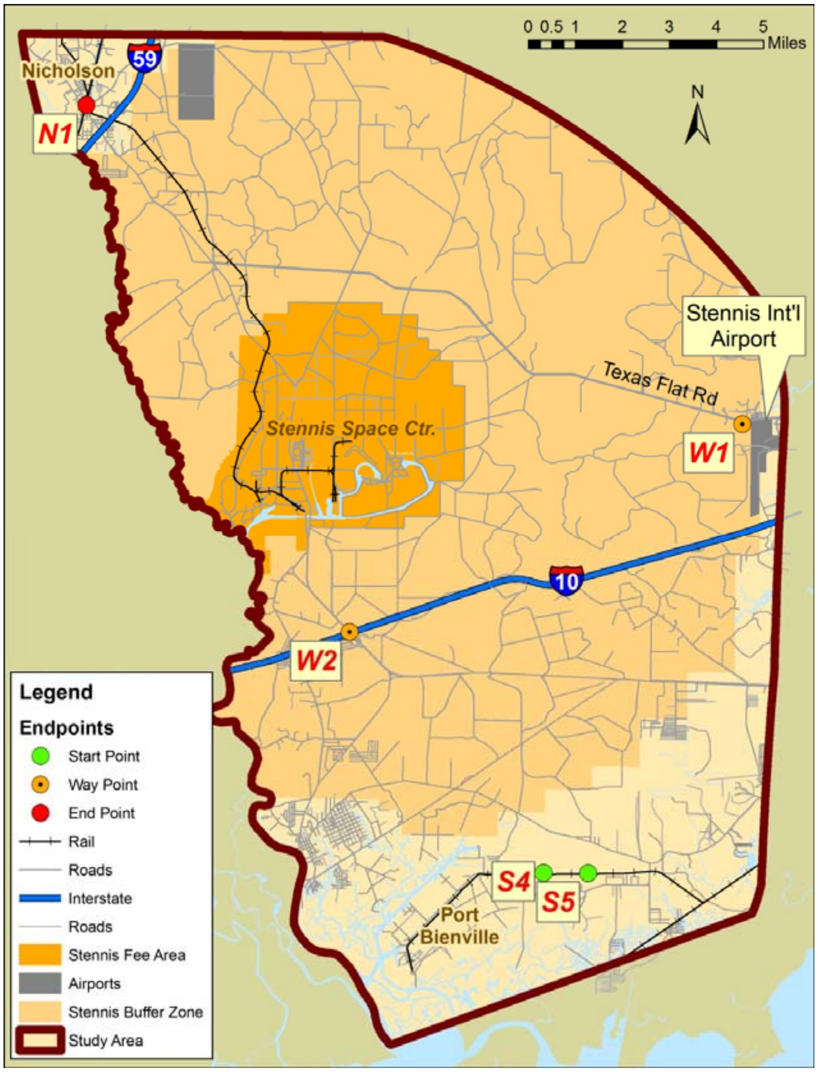

Figure 5 - Start, End, and Way Points.

Corridor Parameters

The AART calculates impacts based on a corridor width which is specified by the user. For this study a corridor width of 1,000 feet was used. In order to meet engineering requirements for minimum rail curvature, a horizontal curve radius of 1,500 feet was used for "smoothing" the corridors.

Generation of Conceptual Alternatives

Once the data were compiled, the rankings determined, and the endpoints chosen, the AART was ready to begin generating conceptual corridors. Various combinations of start, end and waypoints were developed in order to generate a number of corridor alternatives to evaluate. The point combinations that were used are as follows:

- S4 to N1
- S5 to N1
- S4 to W1 to N1
- S5 to W1 to N1
- S4 to W2 to N1
- S5 to W2 to N1

As the conceptual corridors were generated, their locations and impacts were reviewed. In cases where the corridors would veer into unexpected areas, explanations were sought by investigating the data layers and their assigned rankings.

The AART generated an impacts report for each corridor detailing the cultural and environmental impacts for that corridor. The corridor locations and the impacts reports were used by the project Team in the corridor evaluation process, along with factors such as future development and other intangibles. Staff experience and expertise in conducting corridor studies played an important part in the corridor review and evaluation process.

Initial AART Results

Figures 6 through 12 show the various ranking and avoids combinations (scenarios) and the resulting corridors that were generated from the base settings. Due to some preliminary and test scenarios, the scenario numbering begins at "20". Note that after Scenario 23, the waypoint alternatives were deemed unreasonable and were not utilized for subsequent scenarios. This is explained in greater detail in the section titled "Refinement of the Alternative Corridors".

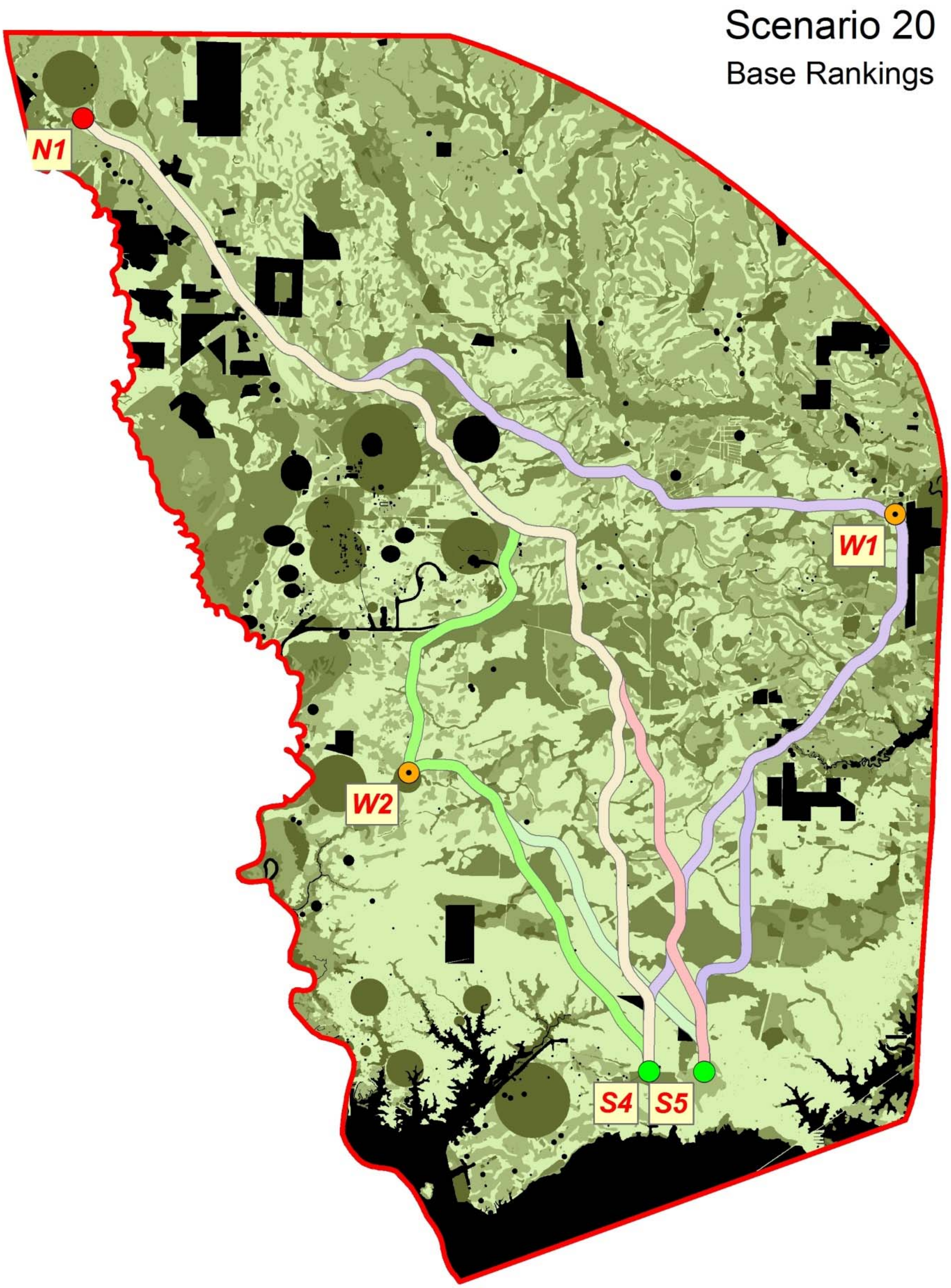

Figure 6 - Scenario 20.

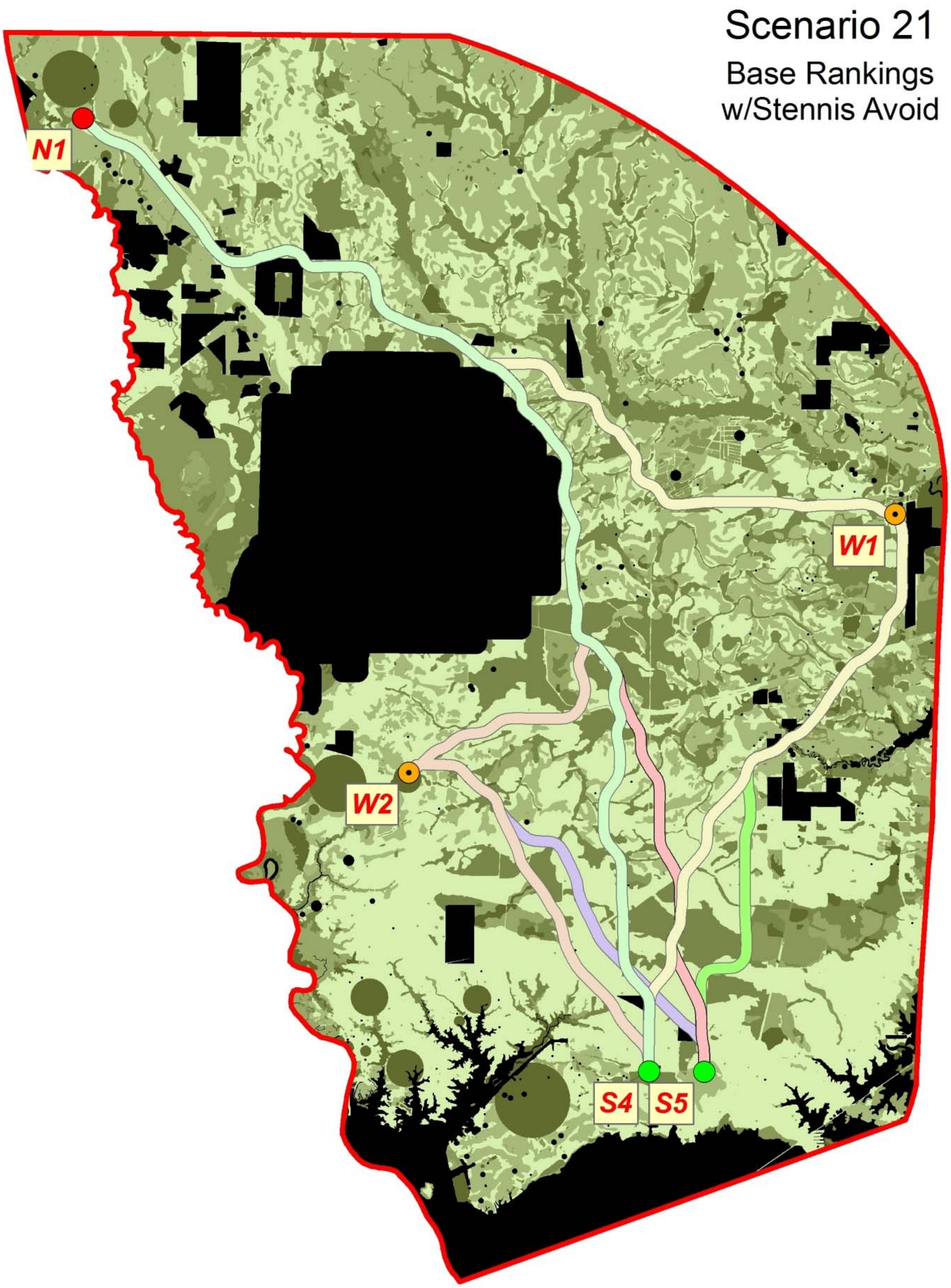

Figure 7 - Scenario 21.

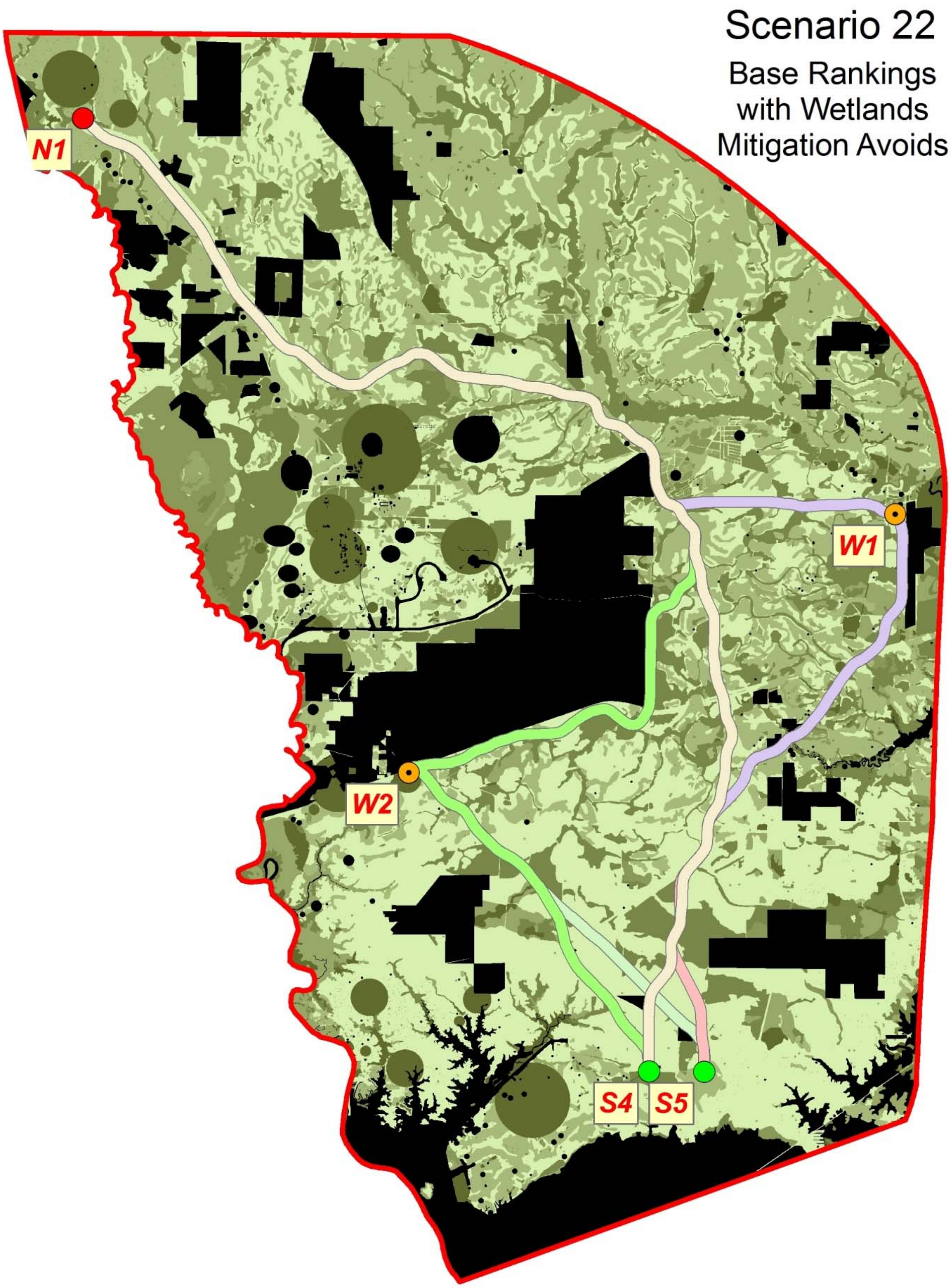

Figure 8 - Scenario 22.

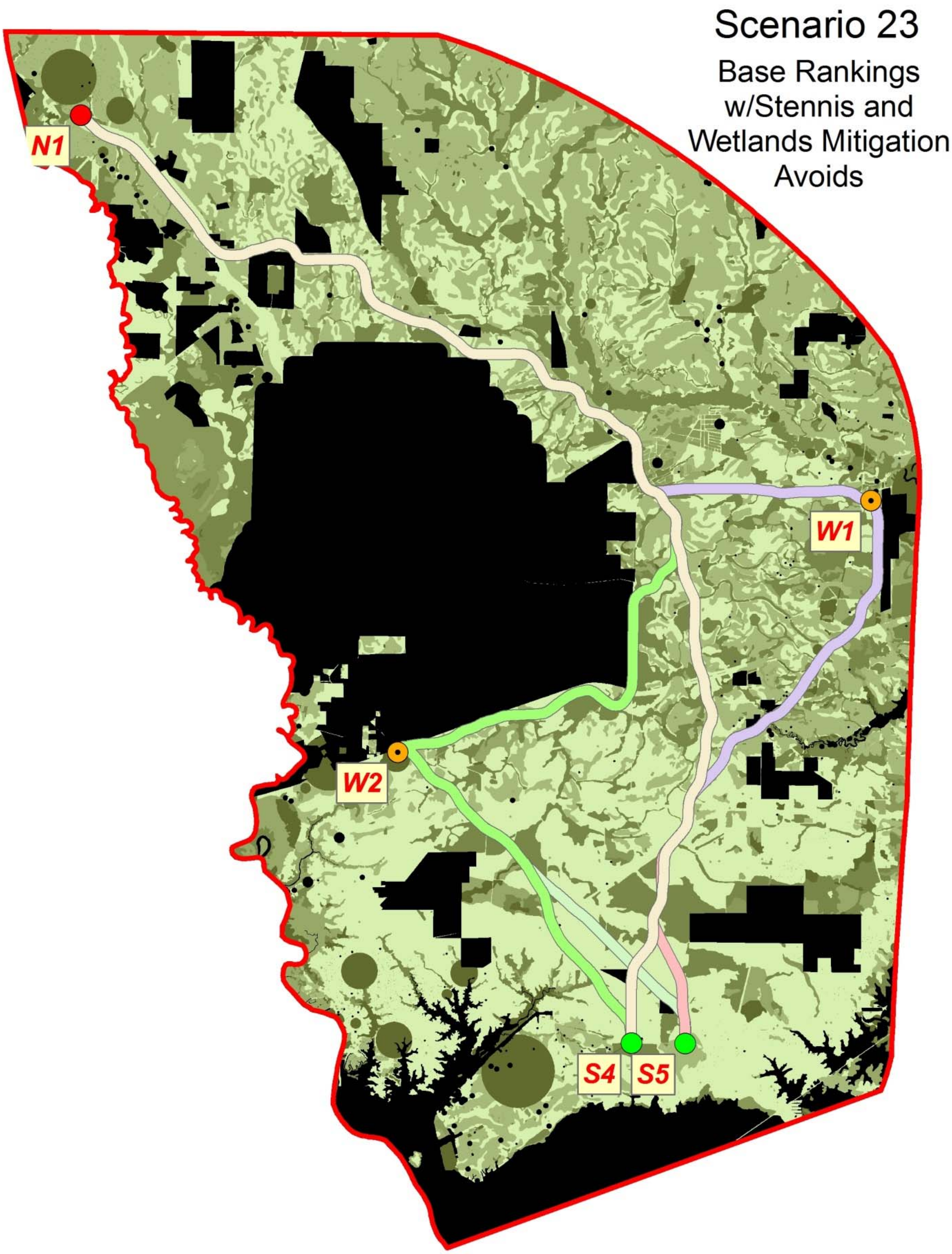

Figure 9 - Scenario 23.

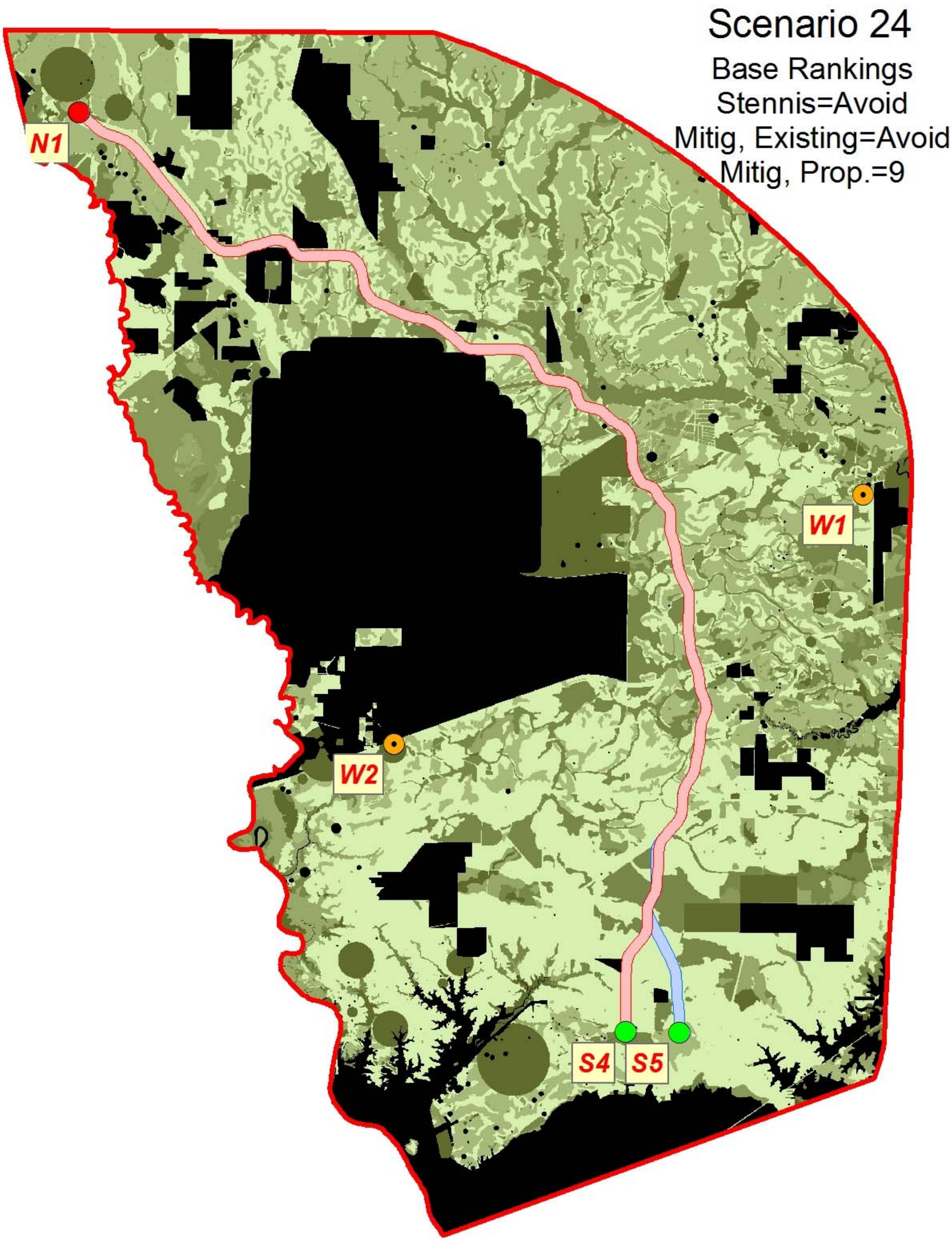

Figure 10 - Scenario 24.

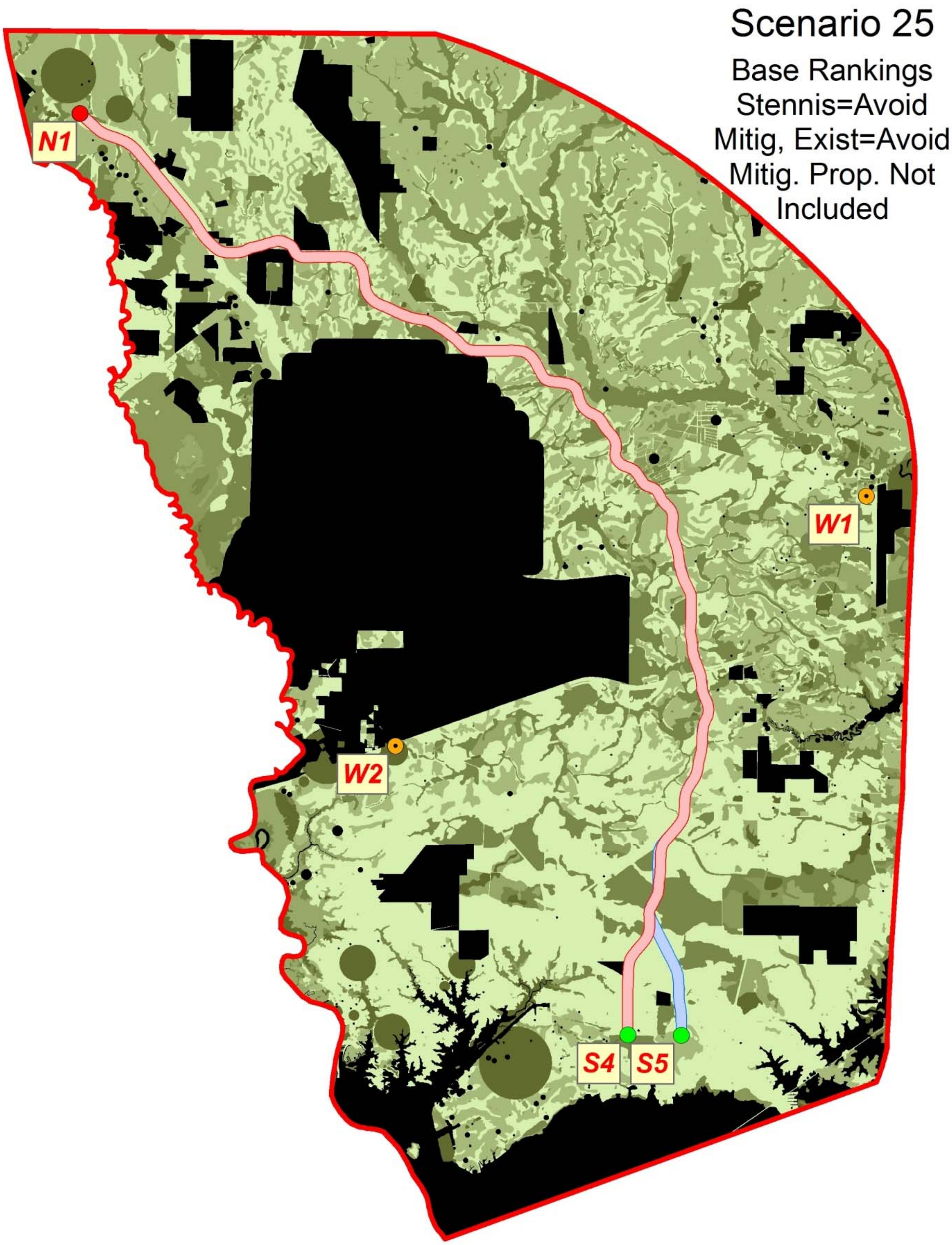

Figure 11 - Scenario 25.

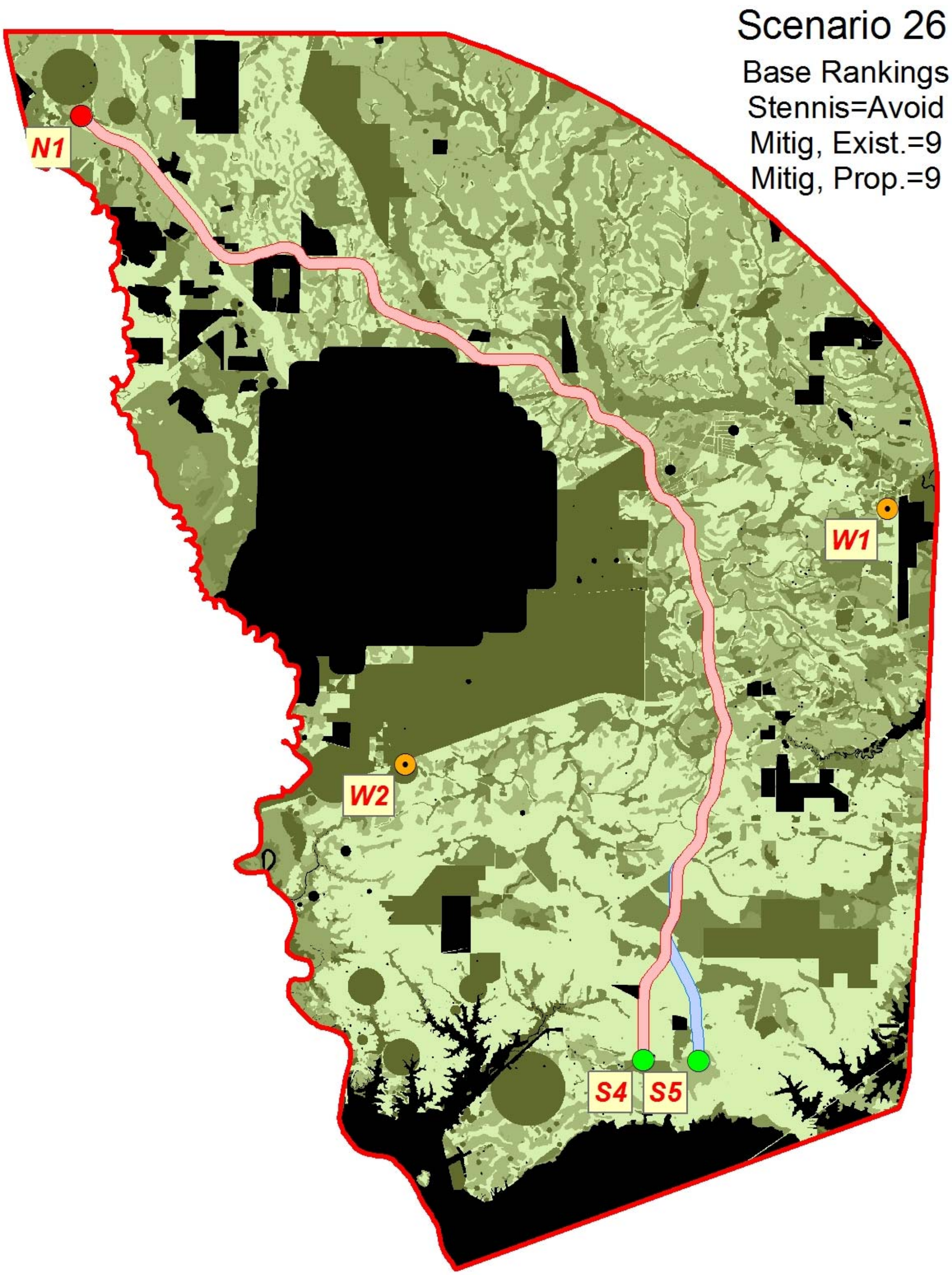

Figure 12 - Scenario 26.

Figures 13 and 14 show the results obtained after incorporating the modifications to the base scenario that were requested by the US Army Corps of Engineers (USACE).

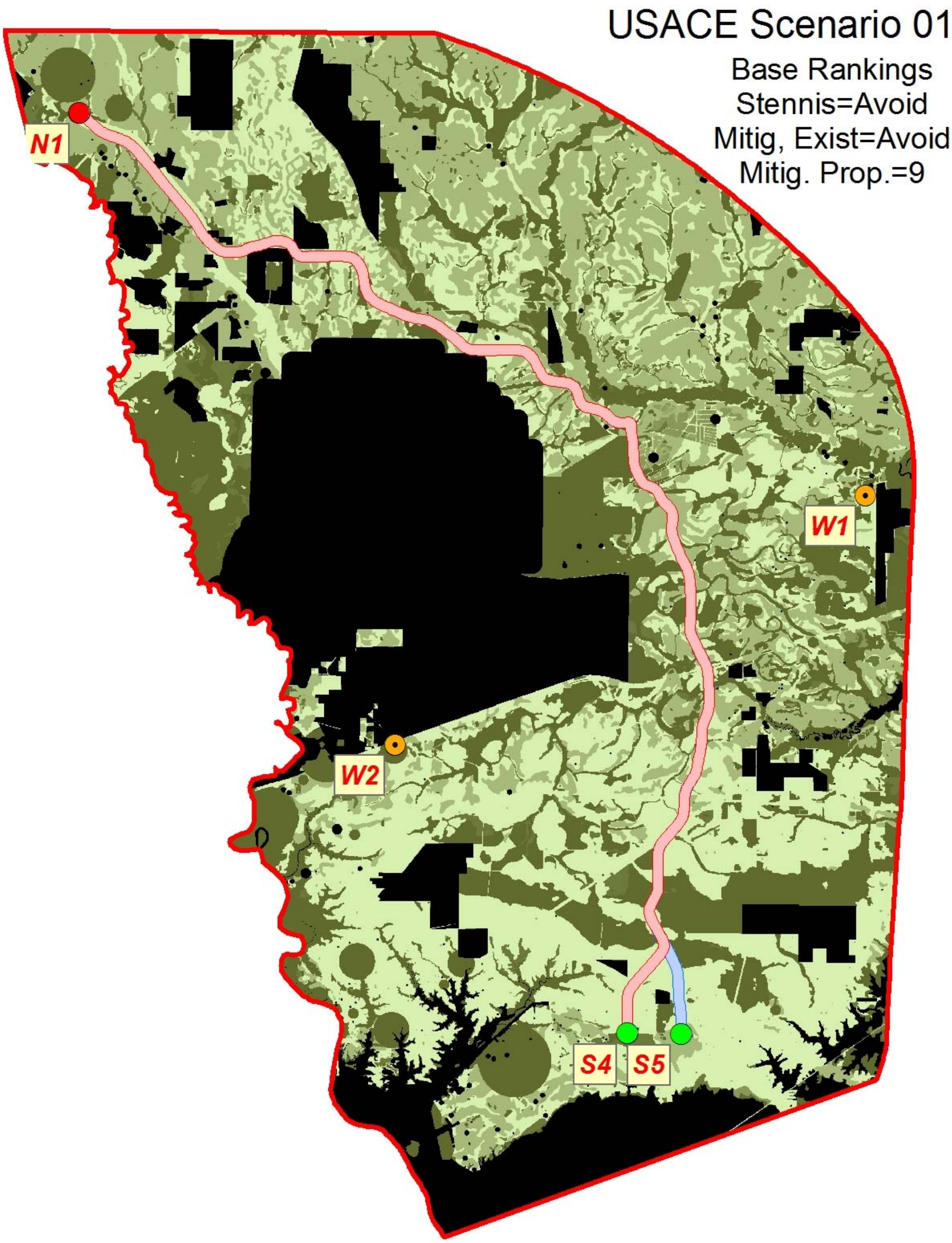

Figure 13 - US Army Corps of Engineers Scenario 1.

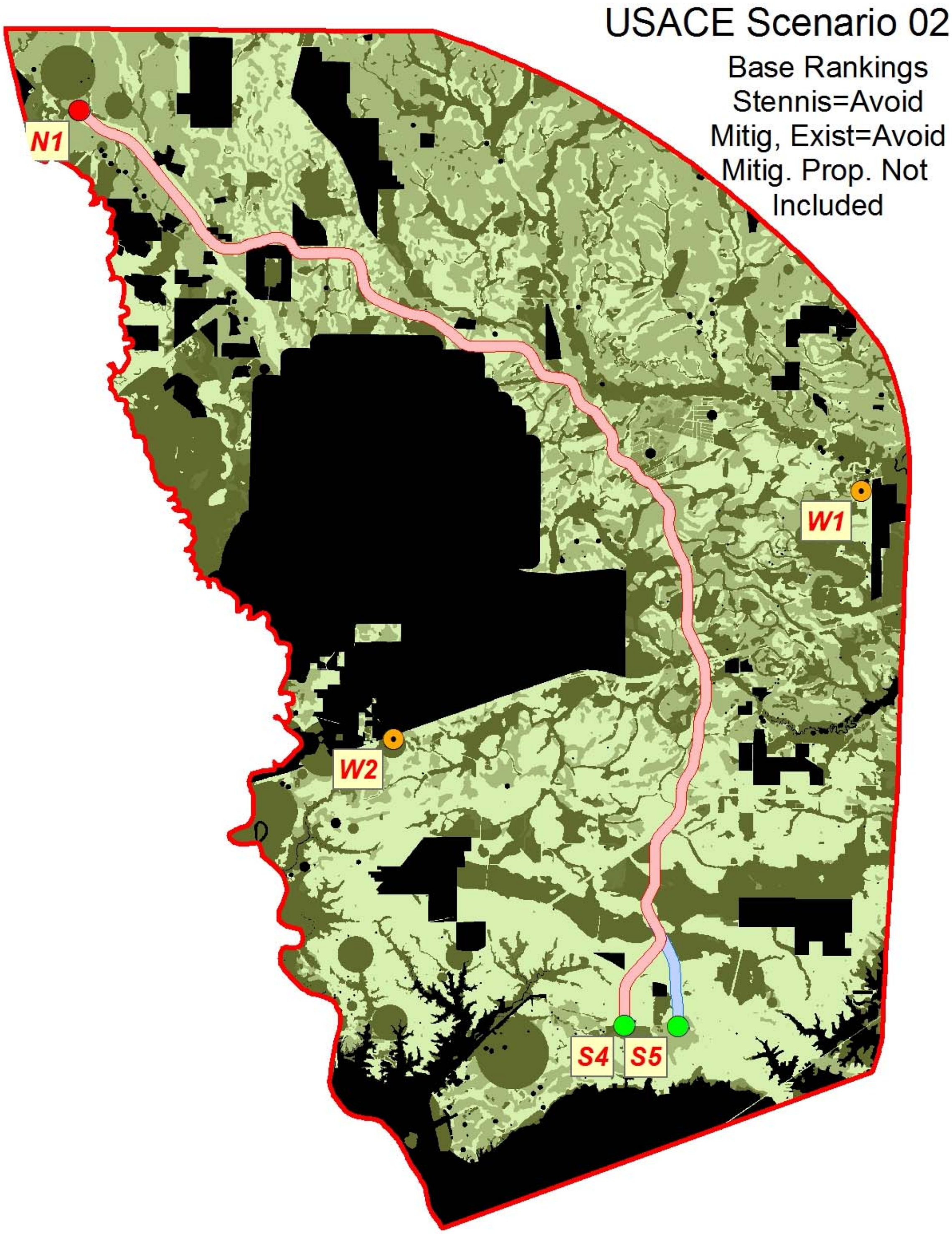

Figure 14 - US Army Corps of Engineers Scenario 2.

Finally, figures 15 - 17 show the results obtained after incorporating the modifications to the base scenario that were requested by the Environmental Protection Agency (EPA).

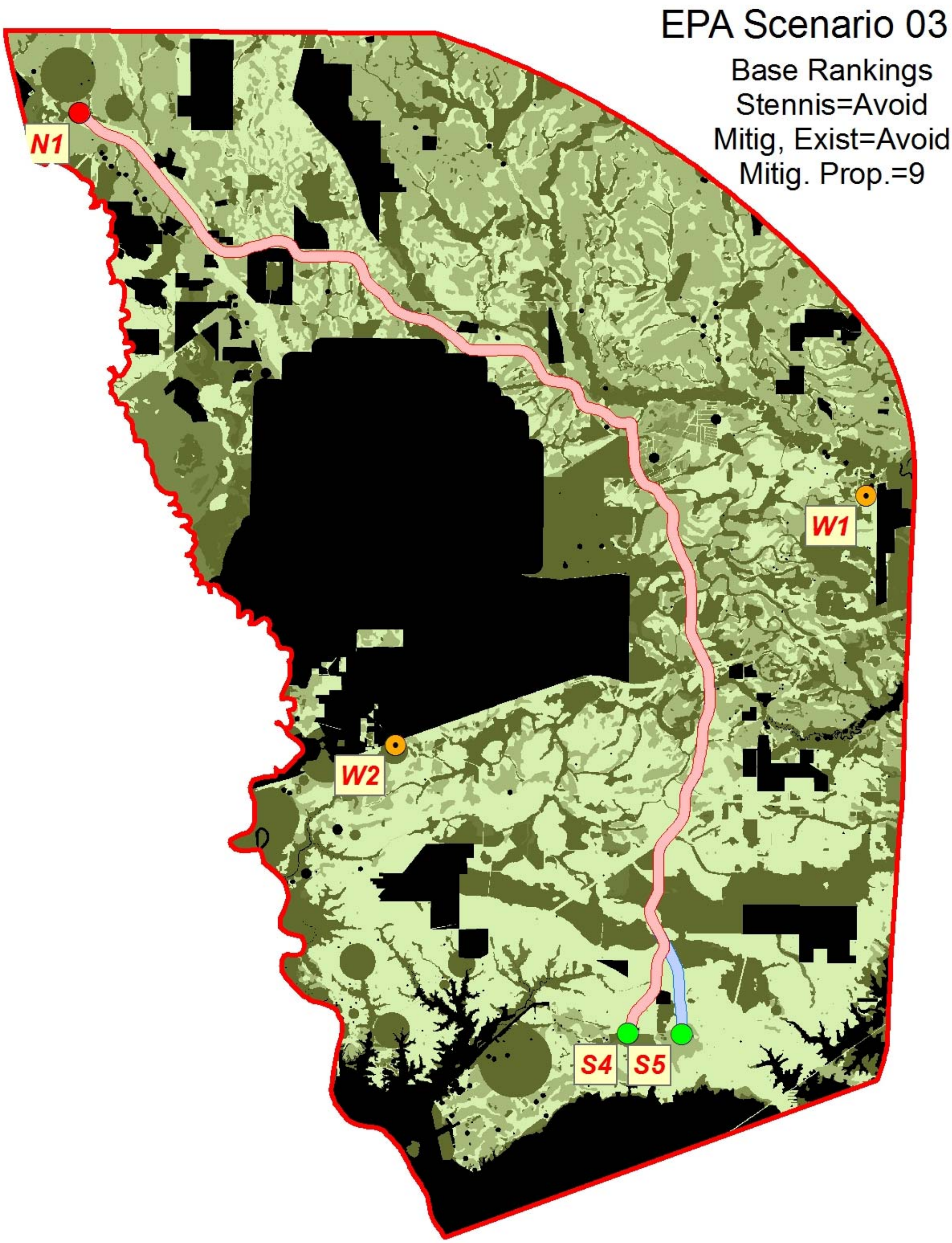

Figure 15 - Environmental Protection Agency Scenario 3

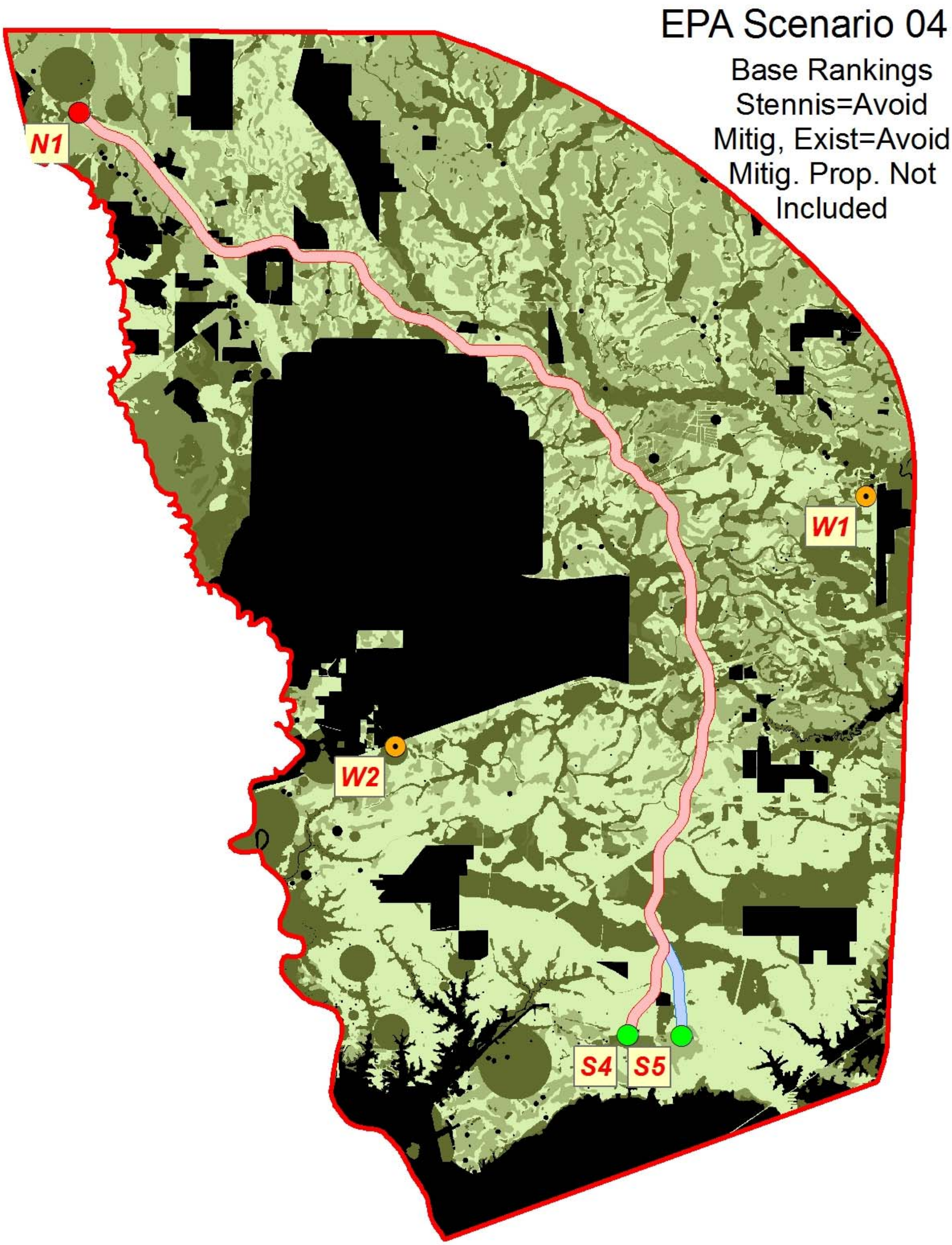

Figure 16 - Environmental Protection Agency Scenario 4.

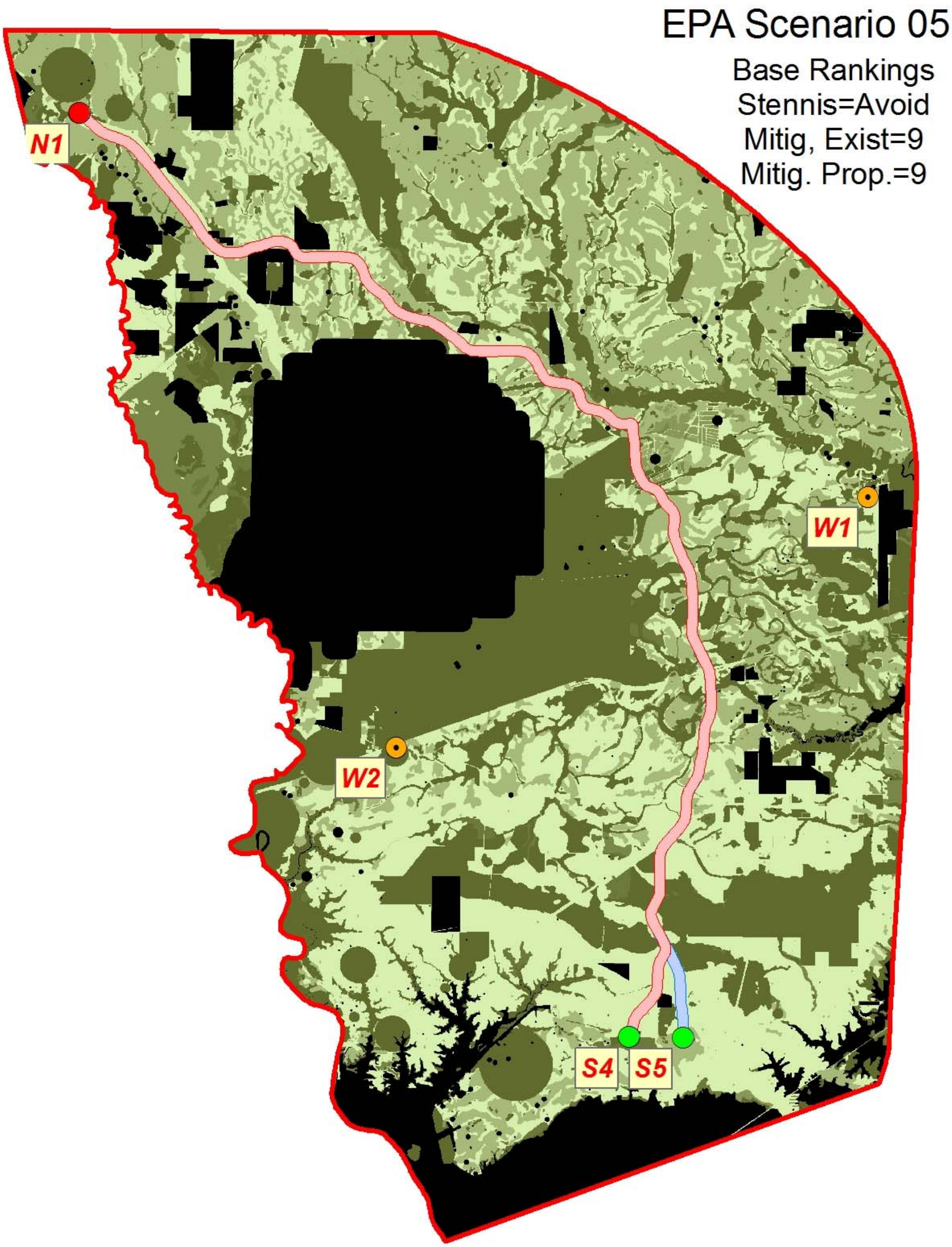

Figure 17 - Environmental Protection Agency Scenario 5.

Refinement of the Alternative Corridors

Once the initial AART developed alternative corridors were identified the refinement process began. Early on, quite a few corridors were eliminated from further study for various reasons. As documented below, Scenarios 20, 21, 22, 23 and 24 were eliminated as a first step in the process towards identification of the Reasonable Alternatives.

Scenario 20

As shown on page 17, Scenario 20 identified 6 possible corridors. These corridors were the initial corridors developed incorporating the base AART criteria. For this scenario restrictions were not placed on the Stennis Fee Area or the existing or proposed wetland mitigation banks within the study area. These alternative corridors were eliminated for the following reasons:

1. Each corridor traversed through the Stennis Fee Area which is a secure area of property, contained by high security fencing and is owned and maintained by the Federal Government. This property is solely dedicated to operations related to NASA's Stennis Space Facility.

2. Two (2) of the alternative corridors severed the wetland mitigation bank known as Devil's Swamp Mitigation Bank. Additionally these corridors also cut through the proposed wetland mitigation bank known as the Texas Flat Mitigation Bank. Extensive impacts to the existing and proposed banks would result from these corridors. (the boundaries of the banks are not shown on the map on page 20 but are shown on other maps beginning with Scenario 22)

3. Four (4) of the alternative corridors utilized waypoints W1 and W2 which were initially identified by the study team as potential strategic locations for the rail corridor. Waypoint 1 was established to consider the economic benefits of the rail line in close proximity to the Stennis International Airport. It was determined that currently there are no strong economic drivers to support diverting the rail line over to the airport. If the need develops in the future a rail spur off the proposed project could be considered. Waypoint 2 was established as a possible I-10 crossing location for the rail line. This interstate crossing location proved to not be a good location. Impacts to the Devil's Swamp Mitigation Bank and required modifications to the I-10/SR 607 interchange were determined to be too extensive.

Scenario 21

As shown on page 18, Scenario 21 identified 6 possible corridors. These corridors incorporated the base AART criteria in addition to restrictions placed on the Stennis Fee Area. No restrictions were placed on the existing or proposed wetland mitigation banks. These alternative corridors were eliminated for the following reasons:

1. Four (4) of the alternative corridors severed the wetland mitigation bank known as Devil's Swamp Mitigation Bank and also impacted the proposed Texas Flat mitigation bank

2. Four (4) of the alternative corridors utilized waypoints W1 and W2. The corridors associated with W1 were considered not economically beneficial. The corridors associated with W2 required extensive modifications to the I-10/SR 607 interchange and paralleled and impacted I-10 for several miles and were determined not feasible.

Scenario 22

As shown on page 19, Scenario 22 identified 6 possible corridors. These corridors incorporated the base AART criteria in addition to restrictions placed on the existing and proposed wetland mitigation banks. No restrictions were placed on the Stennis Fee Area. These alternative corridors were eliminated for the following reasons:

1. Each corridor dipped down into the Stennis Fee Area on the very north boundary of the property.
2. Four (4) of the alternative corridors severed the wetland mitigation bank known as Devil's Swamp Mitigation Bank and also impacted the proposed Texas Flat mitigation bank
3. Four (4) of the alternative corridors utilized waypoints W1 and W2. The corridors associated with W1 were considered not economically beneficial. The corridors associated with W2 required extensive modifications to the I-10/SR 607 interchange and paralleled and impacted I-10 for several miles and were determined not feasible.

Scenario 23

As shown on page 20, Scenario 23 identified 6 possible corridors. These corridors incorporated the base AART criteria in addition to restrictions placed on the Stennis Fee Area and the existing and proposed wetland mitigation banks. These alternative corridors were eliminated for the following reasons:

1. Each corridor crossed Texas Flat Road several times. Texas Flat road is one of the main 2-lane highways in the northern half of the study area that is accessible to the general public. Crossing the road multiple times with the rail alignment would be detrimental to the highways operation.
2. Four (4) of the alternative corridors utilized waypoints W1 and W2. The corridors associated with W1 were considered not economically beneficial. The corridors associated with W2 required extensive modifications to the I-10/SR 607 interchange and paralleled and impacted I-10 for several miles and were determined not feasible. Waypoints W1 and W2 we eliminated from further consideration.

Scenario 24

As shown on page 21, Scenario 24 identified 2 possible corridors. These corridors incorporated the base AART criteria in addition to restrictions placed on the Stennis Fee Area and the existing wetland mitigation bank. The proposed Texas Flat mitigation bank was given a priority ranking value of 9. These alternative corridors were eliminated for the following reason:

1. Both corridors crossed Texas Flat Road several times.

Engineered Alignments

After the initial round of cuts the remaining Alternative Corridors identified in Scenarios 25, 26, USACE01, USACE02 , EPA03, EPA04 and EPA05 were further refined. By using the standard fixed-width corridors and the irregular corridors generated by AART, the study team was able to make slight adjustments to the alignments in order to meet the engineering design criteria for the proposed rail line. The AART also generates irregular corridors which depict the percentage impact variance from the absolute "best fit" line (in other words, the "next-best" corridors). These are areas that, while not as good as the least-impact corridor, are also worth considering. An example of these corridors is shown in Figure 18.

Additionally, Team engineers also identified several new segments for consideration. These new manually-developed segments were derived taking into account the irregular corridors as shown in Figure 18. These new alignments were developed with the intent to maintain minimal impacts to the environment where practical while meeting the design criteria. These engineered alignments were then used to generate new 1,000-foot corridors centered about theses alignments. A new set of corridor impact reports were generated and initial cost estimates for each corridor were prepared. This information was compiled in a matrix format. Impacts were summarized based on the refined 1,000 foot wide corridors. However, the actual impacts for the proposed railroad would be considerably less, probably 90% less, since the final constructed footprint of the rail bed is expected to be typically less than 100 feet in width. Detailed field investigations have not been performed yet and the 1,000 foot wide corridors will allow flexibility to adjust the alignment in the future to further minimize impacts once the detail field work has been completed.

The impacts within these wide corridors and the initial cost estimates for the engineered alignments were used for comparing one alternative to another.

A matrix was developed for comparing the refined corridors to one another. The refined alternative corridors are identified in the matrix by their initial Scenario run and by their respective beginning and end points. The matrix on page 33 includes the impacts for both the original AART generated corridors as well as the manually developed alignments and corridors and the initial cost estimate for the manually developed alignments. The cost estimates provided in the initial matrix do not take into account potential wetland bridging. This initial matrix was developed for comparing the 1,000' wide corridors. Once the corridors were refined and the reasonable alternatives identified a more detailed cost estimate of each was prepared. These refined cost estimates include potential bridging of wetlands and is discussed in more detail in the following section.

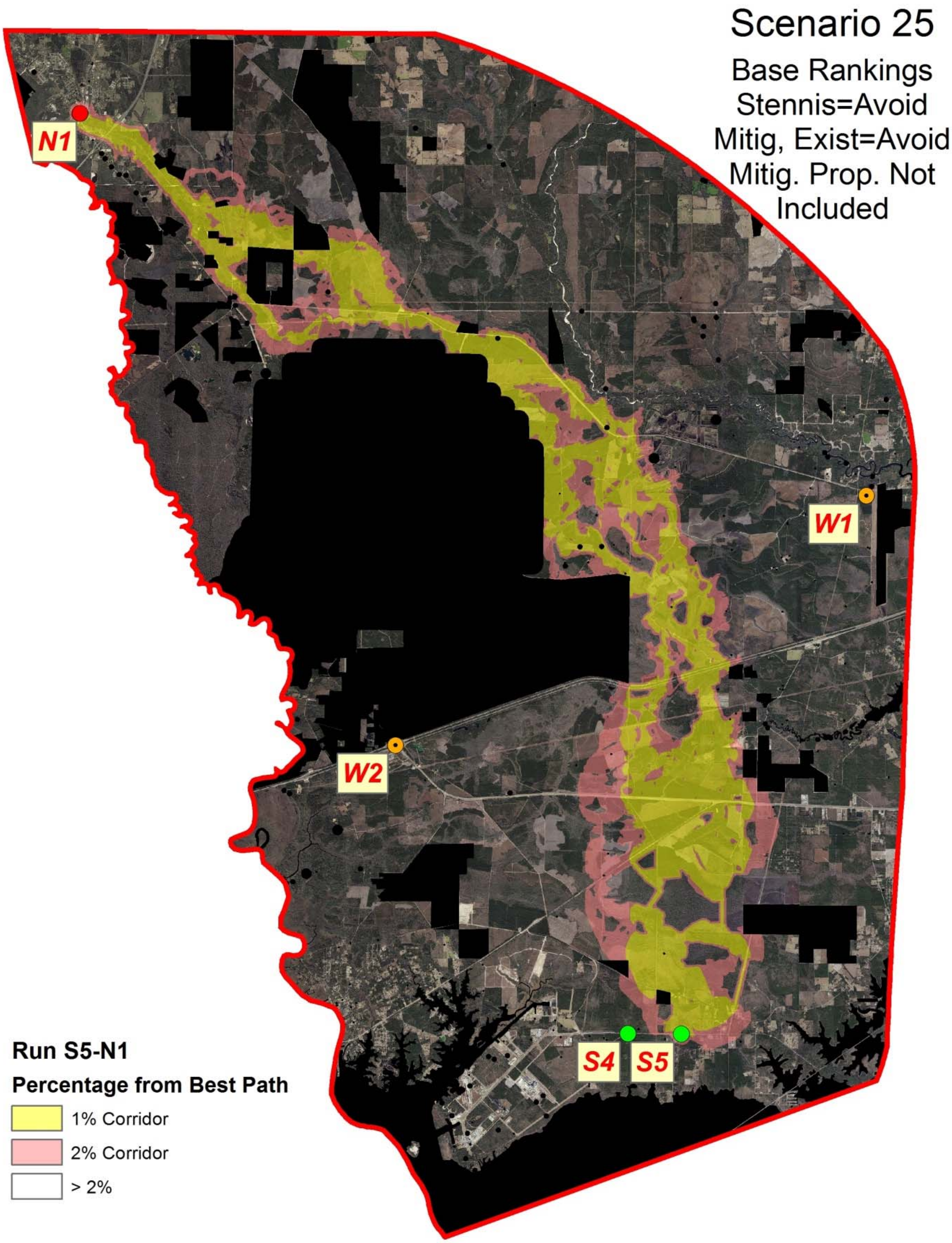

Figure 18 - Other potential corridors for run S5 to N1. These corridors depict "next-best" areas.

ALTERNATIVES MATRIX
PORT BIENVILLE FEASIBILITY STUDY - PORT BIENVILLE TO NICHOLSON

		Scenario 25				Scenario 26				Manual Scenario 27		Scenario EPA03 & EPA05 (1)				Scenario EPA04				Scenario USACE01				Scenario USACE02			
		S4N1	Manual S4N1	S5N1	Manual S5N1	S4N1	Manual S4N1	S5N1	Manual S5N1	Manual S4N1	Manual S5N1	S4N1	Manual S4N1	S5N1	Manual S5N1	S4N1	Manual S4N1	S5N1	Manual S5N1	S4N1	Manual S4N1	S5N1	Manual S5N1	S4N1	Manual S4N1	S5N1	Manual S5N1
ENGINEERING CRITERIA																											
Length	Miles	23.69	23.53	23.73	23.62	23.75	23.53	23.78	23.62	23.76	23.85	23.96	23.69	23.85	23.65	23.78	23.69	23.67	23.65	24.08	23.69	23.93	23.64	23.90	23.69	23.75	23.64
Construction Cost	$ Millions		$61.9		$62.1		$61.9		$62.1	$58.7	$58.3		$62.2		$62.1		$62.7		$62.5		$61.7		$62.0		$62.1		$62.4
NATURAL FEATURES																											
Threatened and Endangered Species	Yes (#) / No	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Wetlands	Acreage	435	461	421	436	446	461	432	436	493	467	426	436	425	428	416	436	416	428	429	435	429	429	420	435	420	429
Wetland Quality	Value	2,917	3,117	2,846	2,946	2,935	3,117	2,864	2,946	3,319	3,148	3,569	2,954	3,570	2,891	3,555	2,954	3,556	2,891	3,603	2,946	3,607	2,900	3,589	2,946	3,593	2,900
Wetland Mitigation Bank	Acreage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Proposed Wetland Mitigation Bank	Acreage	86	66	86	66	33	66	33	66	66	66	33	66	33	66	86	66	86	66	33	66	33	66	86	66	86	66
Stream Crossings	# of Crossings	19	18	18	17	20	18	19	17	16	15	19	18	18	17	18	18	17	17	19	18	18	17	18	18	17	17
MAN-MADE FEATURES																											
CERCLA	Acreage	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Parks and Wildlife Refuges	Yes (#) / No	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Historical Structures	Yes (#) / No	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Archaeological Sites	Acreage	4.5	4.5	4.5	4.5	0.0	4.5	0.0	4.5	4.5	4.5	0.0	4.5	0.0	4.5	4.5	4.5	4.5	4.5	0.0	4.5	0.0	4.5	4.5	4.5	4.5	4.5
Farmland																											
Prime	Acreage	988	1,039	996	1,062	999	1,039	1,007	1,062	1,081	1,104	1,037	1,057	1,043	1,077	1,017	1,057	1,023	1,077	1,037	1,054	1,045	1,077	1,017	1,054	1,025	1,077
Prime if Drained	Acreage	498	481	492	481	498	481	491	481	565	565	478	488	460	469	478	488	460	469	502	490	476	466	502	490	476	466
Statewide Important	Acreage	16	5	16	5	16	5	16	5	8	8	18	8	18	8	18	8	18	8	18	8	18	8	18	8	18	8
Relocations	#	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mines	Acreage	48	47	31	42	48	47	31	42	50	44	34	44	31	42	34	44	31	42	31	42	31	42	31	42	31	42
Recreational Facilities	Acreage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Native American Tribe Impacts	# (Acreage)	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
INFRASTRUCTURE																											
Water Wells	Acreage	10.3	10.6	10.2	10.6	10.6	10.6	10.5	10.6	11.2	11.2	10.5	10.8	10.5	10.6	10.3	10.8	10.3	10.6	10.5	10.6	10.5	10.6	10.3	10.6	10.3	10.6
Cemeteries	#	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transmission Line Crossings	#	2	2	2	2	2	2	2	2	2	2	3	2	3	2	3	2	3	2	2	2	2	2	2	2	2	2
Gas Line Crossings	#	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

INA - Information Not Available at this time
(1) Scenarios EPA03 and EPA05 produced the same results

Reasonable Alternatives

Once the corridor Matrix was completed and the comparison performed several corridors centrally located within the study area emerged as the least costly and least impacting. Every one of these "Reasonable Alternatives" shared a common central corridor. However, two distinct corridors on the north end of the project were identified and several corridors on the southern end were identified. To further define the "Reasonable Alternatives" the study team divided the advanced corridors into segments as identified in Figure 19 on page 35. These 17 segments represent a possible combination of 40 potential corridors. Following the development of the segments, the study team re-quantified impacts and cost by segment. Additionally, the costs estimates were further refined by taking into account anticipated bridging of high value wetlands and stream mitigation. These costs estimates are considered all inclusive and represent potential "implementation costs" which includes final design, right-of-way acquisition, construction and inspection services. The estimates are based on the true engineered alignments within each refined corridor and are representative of 2013 unit cost data derived from other rail projects and from cost experience on other similar projects. At this stage in the project development the alignments are considered conceptual, therefore 20% contingencies have been included in the cost estimates. Following Figure 19 is the Segment Matrix for the Reasonable Alternatives.

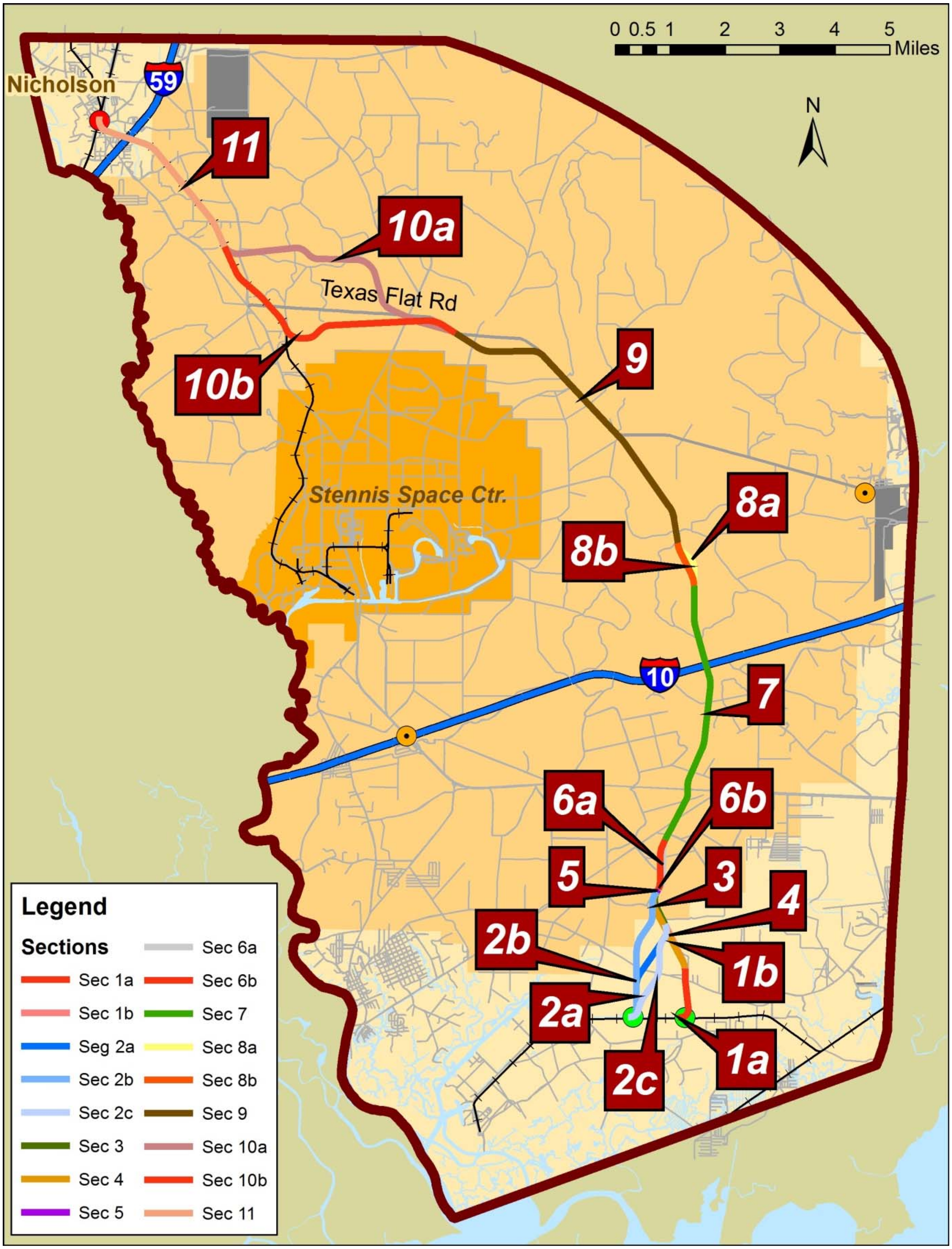

Figure 19 – Engineered alignments and section numbers

SEGMENT MATRIX FOR THE REASONABLE ALTERMATIVES
PORT BIENVILLE FEASIBILITY STUDY - PORT BIENVILLE TO NICHOLSON

	CATEGORY	Unit of Measure	Segment 1a	Segment 1b	Segment 2a	Segment 2b	Segment 2c	Segment 3	Segment 4	Segment 5	Segment 6a	Segment 6b	Segment 7	Segment 8a	Segment 8b	Segment 9	Segment 10a	Segment 10b	Segment 11
ENGINEERING CRITERIA	Length	Miles	1.02	0.89	1.95	2.47	1.95	0.64	1.54	0.05	0.92	0.92	4.84	0.88	0.83	5.99	4.95	5.18	3.46
	Total Estimated Implementation Cost	$ Millions	2.10	1.60	3.80	9.20	3.90	5.50	7.10	2.90	7.90	2.10	20.10	1.60	1.50	26.30	24.60	23.60	5.70
NATURAL FEATURES	Wetland Impacts	Acreage	5	0	8	39	9	12	13	6	55	57	68	3	8	157	67	98	55
	Wetland Quality	Value	33	0	56	262	64	82	90	44	387	398	457	18	55	1,057	455	658	357
	Cost of Impacts to Wetlands	$60K per acre @ 10%	$12,600	$9,600	$22,800	$55,200	$23,400	$33,000	$42,600	$17,400	$47,400	$12,600	$120,600	$9,600	$9,000	$157,800	$147,600	$141,600	$34,200
	Devil's Swamp Mitigation Bank	Acreage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Proposed Texas Flat Mitigation Bank	Acreage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.52	0.00	0.00	0.00
	Cost of Impacts to Mitigation Banks	$120K per acre @ 10%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$786,240	$0	$0	$0
	Length of Wetland Bridging	LF	0	0	0	430		430	430	283	587		596	0	0	1174	1469	1482	0
	Stream Crossings	# of Crossings	3	2	7	5	5	1	3	0	0	0	10	0	0	11	10	6	5
	HydroLine-Connector	Miles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.05
	HydroLine- Ditch	Miles	0.90	0.71	0.87	0.66	1.00	0.09	0.72	0.00	0.00	0.00	1.95	0.00	0.00	2.06	2.05	2.07	2.35
	HydroLine- Stream	Miles	0.00	0.00	0.40	0.40	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.32	0.45	0.91
	Stream/River - named	Miles	0.00	0.00	0.33	0.20	0.16	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.64	0.19	0.22	0.82
	Stream/River - other	Miles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	1.81	1.60	0.84	0.07
	Streams 303(d)	#	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.19	0.22	0.00
	Artificial Path	Miles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00
	Total Stream Impacts	Miles	0.90	0.71	1.60	1.26	1.27	0.09	0.72	0.00	0.00	0.00	2.64	0.00	0.00	5.22	4.16	3.58	4.19
	Total Stream Impacts	Feet	4,752	3,744	8,437	6,653	6,706	465	3,802	0	0	0	13,929	0	0	27,565	21,938	18,881	22,128
	Cost of Impacts to Streams	$200 per linear feet @ 10%	$95,040	$74,870	$168,749	$133,056	$134,112	$9,293	$76,032	$0	$0	$0	$278,573	$0	$0	$551,295	$438,768	$377,626	$442,570
MAN-MADE FEATURES	CERCLA	Acreage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.44
	Archaeological Sites	Acreage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.51	0.00	0.00	0.00
	Farmland (Prime)	Acreage	14.58	0.00	0.00	0.00	2.72	0.00	0.00	0.00	0.00	0.00	129.02	35.83	20.72	296.40	233.08	275.18	350.92
	Farmland (Prime if Drained)	Acreage	0.00	42.04	63.42	94.70	60.81	49.23	94.93	0.04	64.04	61.63	73.38	34.97	45.60	81.86	123.29	207.70	3.31
	Farmland (Statewide Importance0	Acreage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.92	1.99	0.00	0.00	2.72	0.00
	Mines	Acreage	0.00	0.00	0.00	5.78	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24	36.26	28.50	4.22
	Recreational Facilities	Acreage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INFRASTRUCTURE	Water Wells	Acreage	0.00	0.00	0.00	0.67	0.20	1.02	0.67	0.78	0.72	0.72	3.61	0.00	0.00	0.00	0.72	1.28	4.10
	Transmission Line Crossings	#	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
	Gas Line Crossings	#	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00	0.00

Port Bienville Rail Alternatives Development Technical Methodology Report

APPENDIX A
GLOSSARY OF TERMS

CDM Smith

AART (Alternatives Analysis Research Tool) – A CDM Smith proprietary, automated GIS-based tool that identifies and quantifies the corridor and/or alignments with the least amount of impacts.

Alignment - The horizontal and vertical route or direction of a transportation railway or highway.

Avoids – Constraint or buffered areas that are to be bypassed or avoided by the AART.

Buffer - Is an area or zone around a point, line, or polygon that creates an extension that would provide protection or inclusion while using the AART.

Coordinate System - A reference framework consisting of a set of points, lines, and/or surfaces, and a set of rules, used to define the positions of points in space in either two or three dimensions. The Cartesian coordinate system and the geographic coordinate system used on the earth's surface are common examples of coordinate systems.[1]

Corridor - Is a pathway consisting of a long wide strip of land that would be studied for a planned transportations facility such as a railway. The corridor defines a study area that would be furthered studied to develop a reasonable number of alternative alignments.

Geodata - Information in a geographic format that can be used by various computer programs and applications for planning and environmental analysis.

Geodatabase - A database used for storing, querying, and manipulating geodata.

Grid - The division of a map into smaller uniform squares (or cells) providing a horizontal and vertical system used to located fixed positions within a geographical area. The number of squares can be changed to accommodate the size of a geographical area.

Qualitative – An analysis of information that cannot be quantified by numbers.

Quantitative – A numerically-based analysis of data by size or amount.

Raster - Is a format used as a GIS data model and is made up of a grid/cells system. Each cell contains a single value.

Shapefile - A GIS file format that contains a set of points, lines, and/or polygons that provide attributes and geographical information. This file format can also be linked to tabular data and is used by GIS software for mapping and analysis.

Spatial Analysis - The process of studying and comparing spatial data, their attributes and locations and how they interrelate.

Spatial Data - Data that includes points, lines, polygons, and pixels that define a certain specific geographical location that define specific location.

Waypoints – are additional beginning and end points that can be placed in order to allow the user to assist and guide the AART to a specific location or reference point.

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[1] ESRI. GIS Dictionary. 11 April 2006 <http://support.esri.com/index.cfm?fa=knowledgebase.gisDictionary.gateway>

Port Bienville Rail Alternatives Development
Technical Methodology Report

APPENDIX B

THE ALIGNMENT ALTERNATIVES RESEARCH TOOL (AART)

CDM Smith

The Alignment Alternatives Research Tool (AART) has been proven effective in helping to streamline the NEPA process by providing planners and engineers with critical information from a standardized, inclusive, and defensible process with a turnaround time not possible when using conventional methods. This cost-effective tool processes large amounts of data quickly and results in corridors best suited to project and stakeholder specifications. Since the AART allows users to interactively weight geographic features and attributes, they can be assured that corridors are developed with minimized impacts on the natural and human environment.

The AART is a desktop application consisting of a series of GIS-based functions designed to route conceptual corridor "footprints" among the identified community and environmental resources available from both public databases and project derived databases (see Figure B-1). These "footprints" are developed through a simple "opportunities and constraints" approach. In this approach values are assigned to site-specific resources by experts in the field. The computer model routes preferred paths between user-selected endpoints through an artificial "terrain" created by the weighting of natural resources, socioeconomic, infrastructure and other values that have been assigned in the study area. Additionally, "avoid" areas can be included to effectively 'mask out' any areas where development should not be considered. The system uses a grid- (or cell-) based format for improved model efficiency. The resolution or grid cell size may be further refined as viable corridor alternatives are identified and higher resolution field data is incorporated into the system. The AART will find the least-cost (least impact) path between endpoints and summarize the impacts for each corridor selection. Additionally, AART will also display potential alternative corridor regions for each model run.

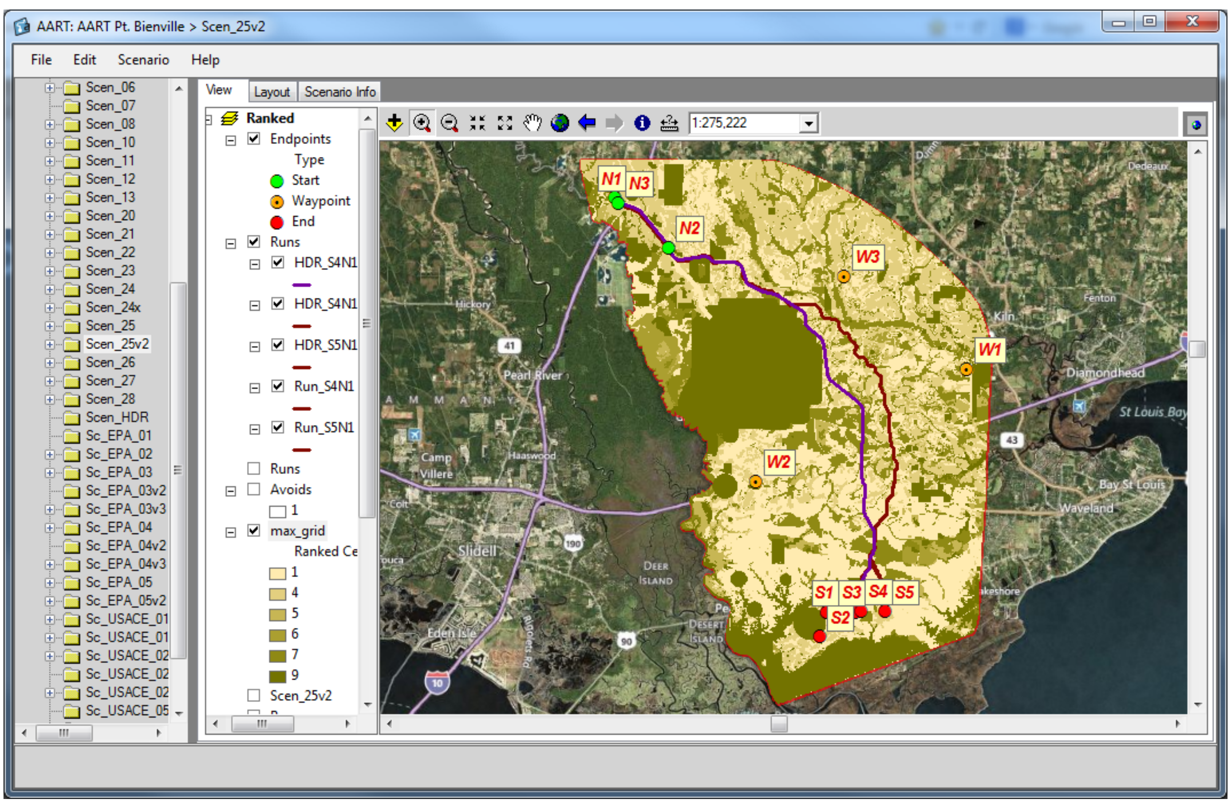

Figure B-1 - AART main interface.

The tool incorporates the functions of ArcGIS, ArcGIS Spatial Analyst, and geodatabases to maintain information and perform the complex spatial calculations needed to effectively analyze each model run.

How AART Works

AART is used to identify potential corridors based on user-provided points and user-ranked GIS data layers. The Tool finds a least-impact path between the points by attempting to stay away from high-ranked areas while maintaining as short a path as possible between points. The desired corridor width is applied and the environmental and cultural impacts of the corridor are calculated.

Endpoints - In order to generate corridors, AART requires at least two endpoints indicating the start and end of the corridor. These points are supplied by the user and are based on project requirements.

Input Data - AART will accept nearly any type of GIS vector data as inputs. Some examples of the types of data that are commonly used are shown in Figure B-2. A special data layer outlining the project study area is also required. All analyses conducted by the Tool will be constrained by the boundaries of this study area.

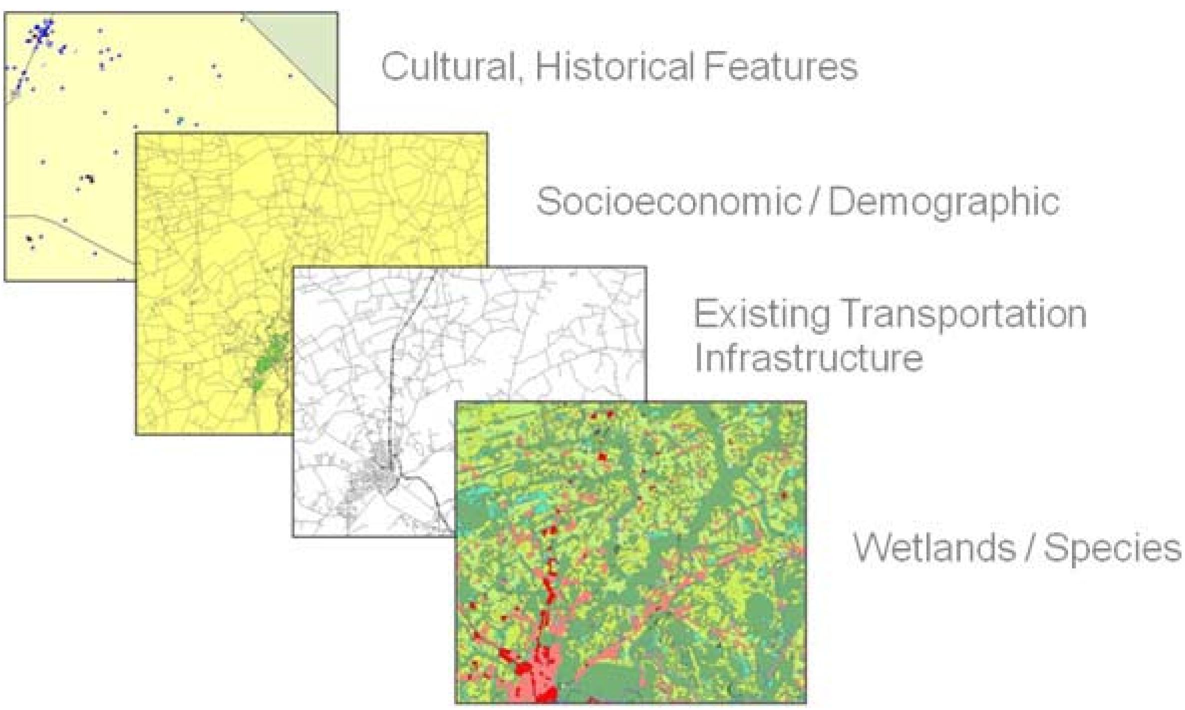

Figure B-2 - Examples of GIS data layers

When the AART is run, the input vector data layers are converted to raster layers using a user-specified cell size (Figures B-3a and B-3b).

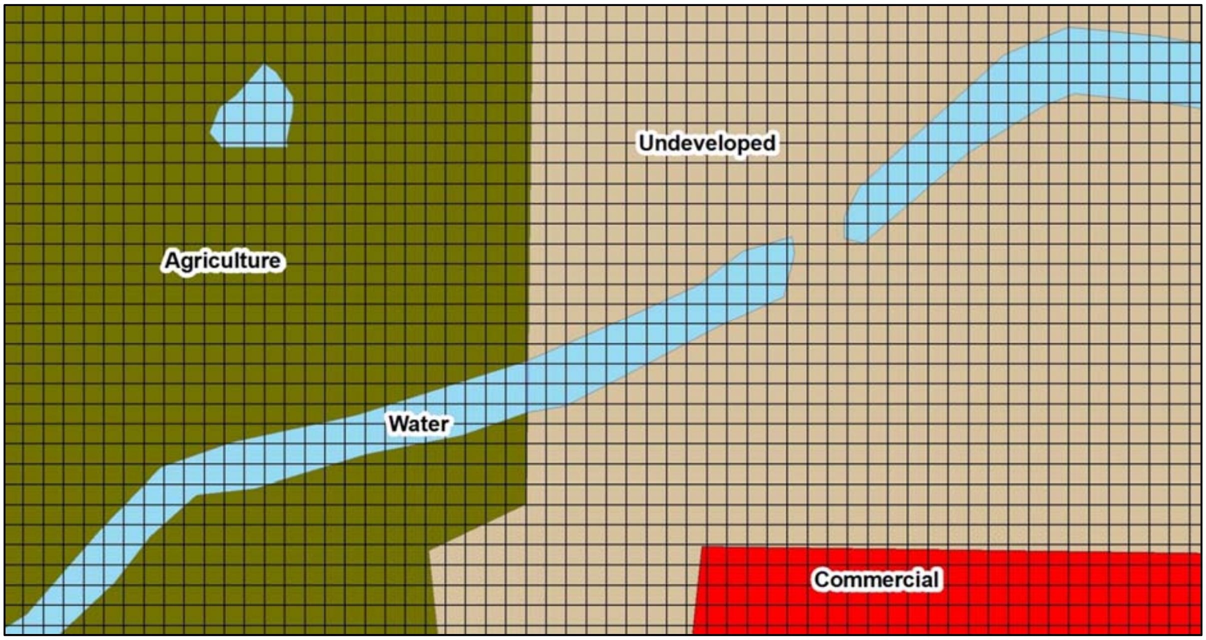

Figure B-3a - GIS data with grid cell overlay.

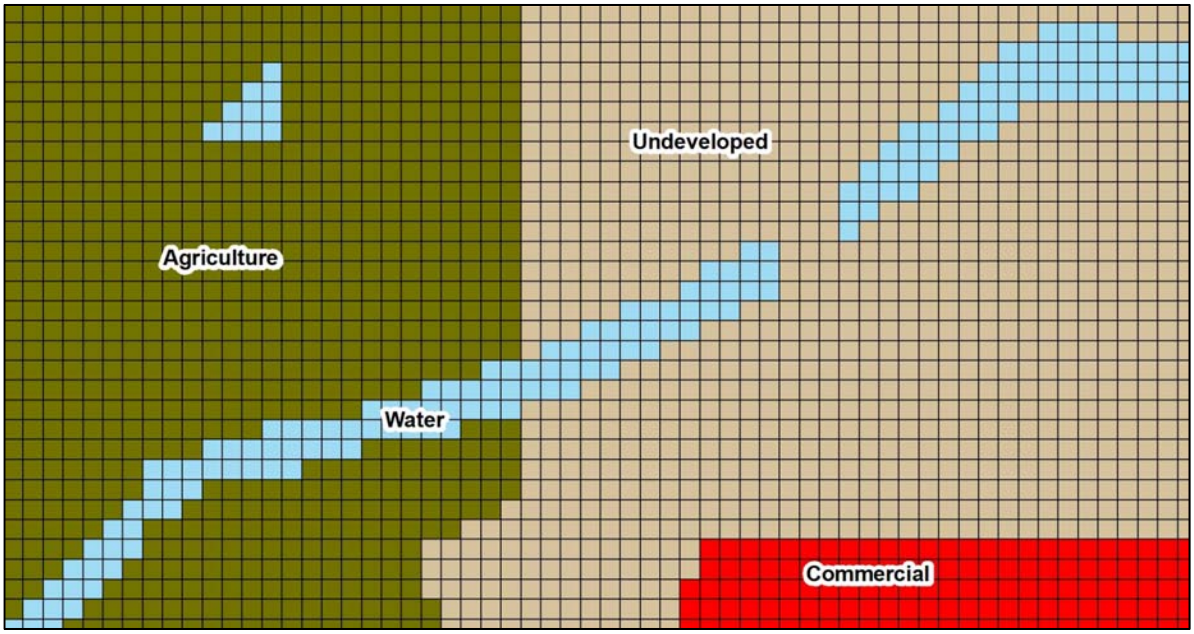

Figure B-3b - GIS data after conversion to raster (cell) data.

Ranking - The GIS layers typically contain various features. For example, a wetlands layer contains polygons for the various types of wetlands. In order for AART to generate least-impact paths, these features must be ranked according to their suitability for locating an alignment. This ranking is based on a scale of 1-9, where low values indicate high suitability and high values indicate low suitability. In addition, there is a designation of "Avoid", which indicates features that are completely "off limits". Examples are shown in the table below.

Category	Layer	Ranking
Land Cover		
	Freshwater Marshes	9
	Bottomland Hardwoods	9
	Pasture Land	2
Cultural Features		
	Hospitals	9
	Cemeteries	Avoid
	Schools	9

Input Parameters - The user may specify values for horizontal alignment curvature, corridor width, and layers to be evaluated for impacts.

Data Processing – Once the layer features have been ranked, the AART creates a single "suitability" layer. This layer is created by selecting the highest ranking for each corresponding cell in each layer. Figure B-4a depicts this process while Figure B-4b shows an example of a real-world suitability layer.

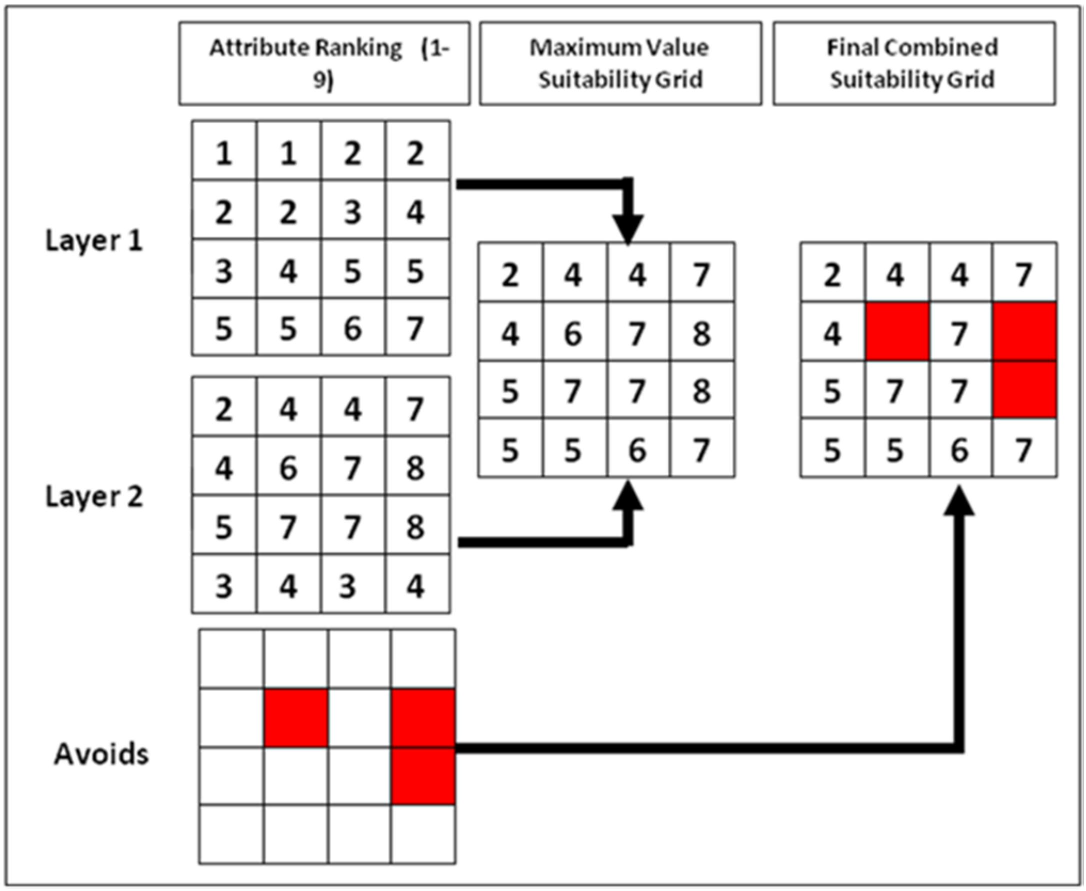

Figure B-4a - Suitability layer creation process

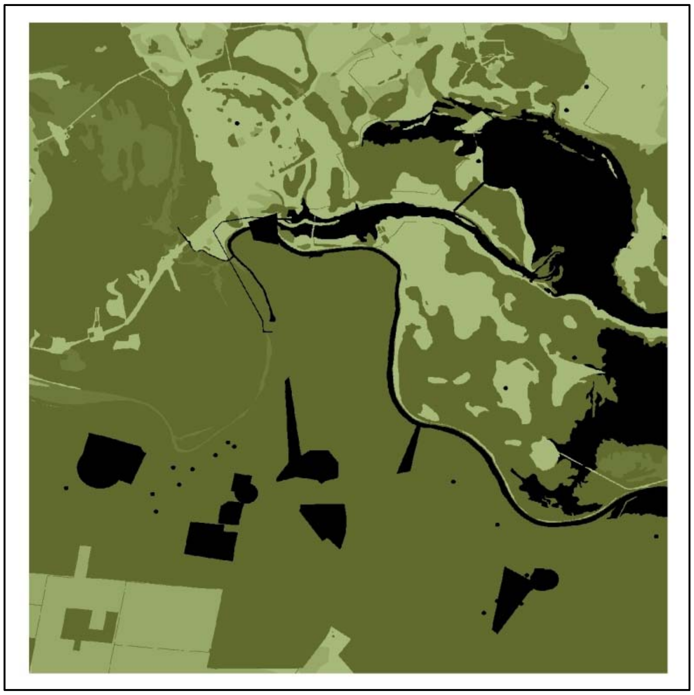

Figure B-4b - Sample suitability layer. The most suitable areas are in light green, the least suitable are dark green, and avoids are black.

Outputs - Once the Suitability layer has been created, AART finds the best path along the Suitability layer between the user-provided start and end points (Figure B-5). The user-defined corridor width is then applied to the path to create the corridor for impacts calculations.

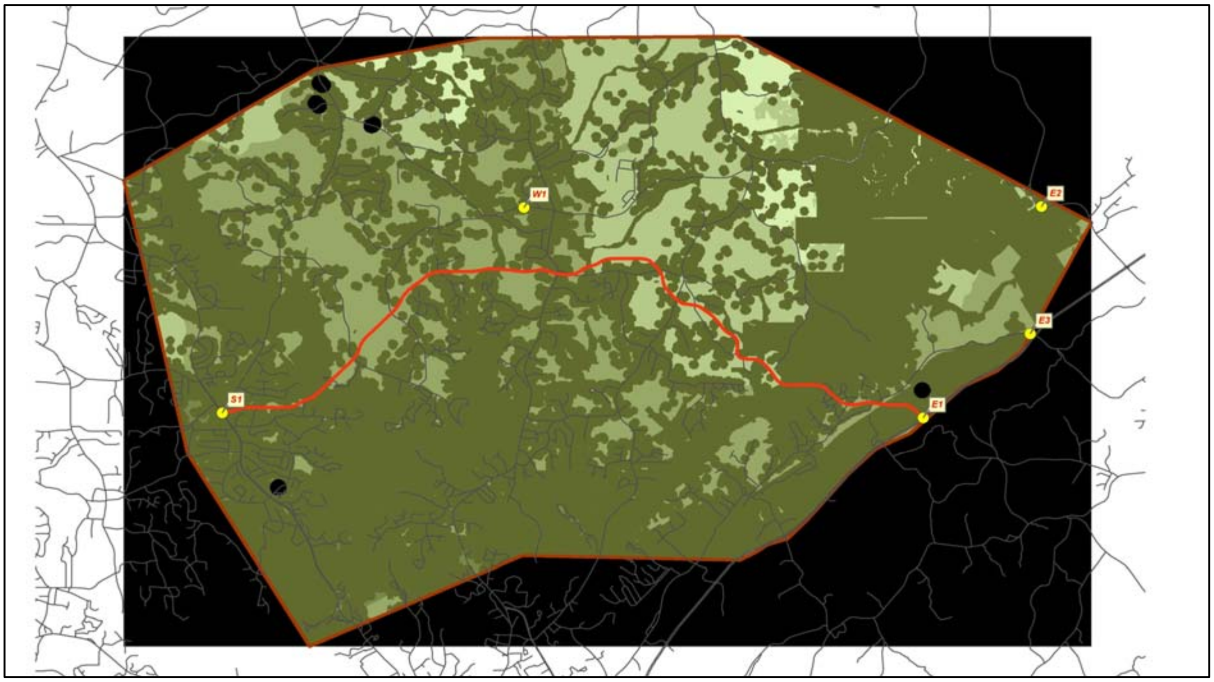

Figure B-5 - AART finds the best path between endpoints by minimizing the crossing of highly-ranked areas.

The AART output also generates a layer showing other potential corridors of interest that may be worth investigating (Figure B-6).

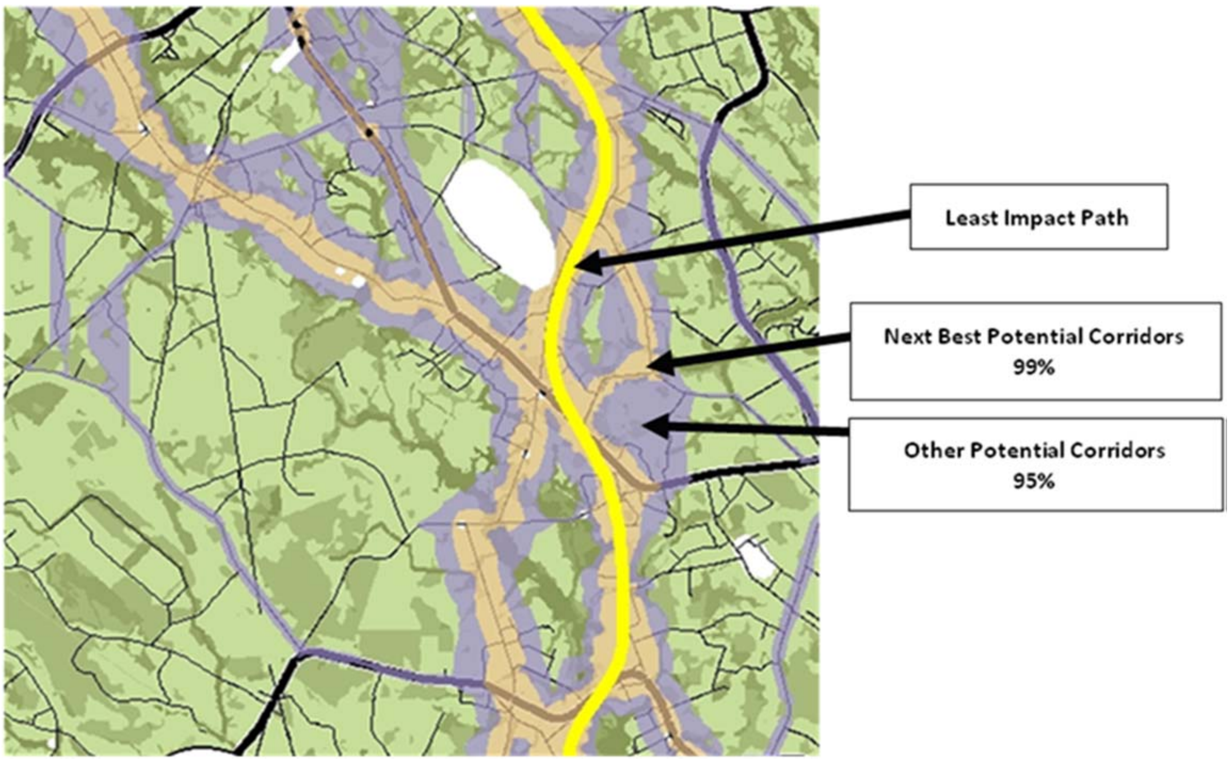

Figure B-6 - Other potential corridors.

The AART also generates a table showing the impacts of the output corridor on polygon, linear, and point features (cultural and environmental). A sample is shown in Figure B-7.

Polygon Impacts			
Layer	Description	Rank	Acreage Impact
arch_shpo_cemeteries	Not Evaluated By Shpo	1	1.19
			1.19
arch_shpo_resourcegroup	Potentially Eligible For Nrhp	5	3.84
			3.84
env_cleanupsites	State Cleanup Site	1	0.71
			0.71
env_habitat	Southeastern American Kestrel	9	14.70
			14.70
env_managedareas	Managed Lands	9	20.29
			20.29
env_outstandingwaters	Outstanding Florida Waters	9	33.80
			33.80
env_wetlands	Wetlands	9	194.01
			194.01
land_aglands	Agriculture	9	525.16
			525.16
land_landuse	Retail/Office	5	92.39
land_landuse	Institutional	9	64.47
land_landuse	Acreage Not Zoned For Agricultur	1	87.45
land_landuse	Industrial	5	14.18

Figure B-7 - Excerpt from impacts table.

Port Bienville Rail Alternatives Development Technical Methodology Report

APPENDIX C
National Wetlands Inventory Code Groupings

CDM Smith

Identification of Wetlands and Deepwater Habitats

I. Estuarine Ecological System (E) - The Estuarine System consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semi enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land.

A. Bays - Open water between the Barrier Island and the mainland to a point upstream at which salinities are less than 0.5 parts per thousand during low water periods.

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
E1UBLx	Estuarine	Sub-Tidal	Unconsolidated Bottom	N/A	Sub-Tidal	Excavated
E2USNs	Estuarine	Intertidal	Unconsolidated Shore	N/A	Regularly Flooded	Spoil
E2USNx	Estuarine	Intertidal	Unconsolidated Shore	N/A	Regularly Flooded	Excavated
E2USMx	Estuarine	Intertidal	Unconsolidated Shore	N/A	Irregularly Flooded	Excavated
E2USPx	Estuarine	Intertidal	Unconsolidated Shore	N/A	Irregularly Flooded	Excavated

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
E1UBL	Estuarine	Sub-Tidal	Unconsolidated Bottom	N/A	Sub-Tidal	None
E1AB3L	Estuarine	Sub-Tidal	Aquatic Bed	Rooted Vascular	Sub-Tidal	None
E2USM	Estuarine	Intertidal	Unconsolidated Shore	N/A	Irregularly Exposed	None

B. Tidal Flats - Unconsolidated material with less than 30% cover by vegetation and which is exposed by tides.

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
E2USPs	Estuarine	Inter-Tidal	Unconsolidated Shore	Spoil	Irregularly Flooded	Spoil

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
E2USN	Estuarine	Inter-Tidal	Unconsolidated Shore	N/A	Regularly Flooded	None
E2USP	Estuarine	Inter-Tidal	Unconsolidated Shore	N/A	Irregularly Flooded	None

C. Estuarine Intertidal Marsh (Tidal Marsh) - Any salt marsh or other marsh subject to regular or occasional flooding by tides, including wind tides (whether or not the tide waters reach the marshland areas through natural or artificial watercourses), as long as this flooding does not include hurricane or tropical storm waters. Coastal wetland plant species include: smooth cordgrass; black needlerush; glasswort; salt grass; sea lavender; salt marsh bullrush; saw grass; cattail; salt meadow cordgrass; and big/giant cordgrass.

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
E2SS1Pd						

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
E2SS1P	Estuarine					

C. Scrub Marsh - A salt marsh subject to regular or occasional flooding by tides, characterized by scrub-shrub vegetation

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
E2EM1Ps	Estuarine	Sub-Tidal	Emergent	Persistent	Irregularly Flooded	Spoil

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
E2EM1N	Estuarine	Sub-Tidal	Emergent	Persistent	Regularly Flooded	None
E2EM1P	Estuarine	Sub-Tidal	Emergent	Persistent	Irregularly Flooded	None

II. Lacustrine Ecological System (Lakes) - The Lacustrine System includes wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% areal coverage; and (3) total area exceeds 8 ha (20 acres).

A. Freshwater Lakes & Impoundments - Open water areas found within a basin or dammed channel which exceed 20 acres in size with salinities less than 0.5 parts per thousand.

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
L1UBHx	Lacustrine	Limnetic	Unconsolidated Bottom	N/A	Permanently Flooded	Excavated
L1UBKh	Lacustrine	Limnetic	Unconsolidated Bottom	N/A	Artificially Flooded	Diked/ Impounded
L1UBKx	Lacustrine	Limnetic	Unconsolidated Bottom	N/A	Artificially Flooded	Excavated
L2UBFx	Lacustrine	Littoral	Unconsolidated Bottom	N/A	Semi permanently Flooded	Excavated

L2UBKh	Lacustrine	Littoral	Unconsolidated Bottom	N/A	Artificially Flooded	Diked/ Impounded
L2USKh	Lacustrine	Littoral	Unconsolidated Shore	N/A	Artificially Flooded	Diked/ Impounded
L1ABHx	Lacustrine					
L1UBHx	Lacustrine					

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
L2UBF	Lacustrine	Littoral	Unconsolidated Bottom	N/A	Semi permanently Flooded	None

III. Riverine Ecological System (R) - The Riverine System includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5 ‰.

A. Rivers & Canals - Channels which at least periodically carry water with salinities less than 0.5 parts per thousand.

2. Non-Disturbed/Naturally Occurring

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
R1UBV	Riverine	Tidal	Unconsolidated Bottom	NA	Permanent-Tidal	None
R2UBF	Riverine	Lower Perennial	Unconsolidated Bottom	NA	Semi permanently Flooded	None
R2UBH	Riverine	Lower Perennial	Unconsolidated Bottom	NA	Permanently Flooded	None

IV. Palustrine Ecological System (P) - The Palustrine System (Fig. 6) includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ‰. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 m at low water; and (4) salinity due to ocean-derived salts less than 0.5 ‰.

A. Ponds & Borrow Pits - Small fresh water bodies less than 20 acres in size.

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PUBFh	Palustrine	N/A	Unconsolidated Bottom	None	Semi permanently Flooded	Diked/ Impounded
PUBHh	Palustrine	N/A	Unconsolidated Bottom	None	Permanently Flooded	Diked/ Impounded
PUBHx	Palustrine	N/A	Unconsolidated Bottom	None	Permanently Flooded	Excavated
PUBKx	Palustrine	N/A	Unconsolidated Bottom	None	Artificially Flooded	Excavated
PUBFX	Palustrine	N/A	Unconsolidated Bottom	None	Semi permanently Flooded	Excavated

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PUBF	Palustrine	N/A	Unconsolidated Bottom	None	Semi permanently Flooded	None
PUBH	Palustrine	N/A	Unconsolidated Bottom	None	Permanently Flooded	None

B. Unvegetated Flats - Areas with less than 30% vegetative cover which are periodically flooded by fresh water.

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PUSAd	Palustrine	N/A	Unconsolidated Shore	None	Temporary Flooded	Partially Drained/Ditched
Push	Palustrine	N/A	Unconsolidated Shore	None	Temporary Flooded	Diked/ Impounded
PUSAx	Palustrine	N/A	Unconsolidated Shore	None	Temporary Flooded	Excavated
PUSCh	Palustrine	N/A	Unconsolidated Shore	None	Seasonally Flooded	Diked/ Impounded
PUSCx	Palustrine	N/A	Unconsolidated Shore	None	Seasonally Flooded	Excavated
PUSKx	Palustrine	N/A	Unconsolidated Shore	None	Artificially Flooded	Excavated

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PUSA	Palustrine	N/A	Unconsolidated Shore	None	Temporary Flooded	None
PUSC	Palustrine	N/A	Unconsolidated Shore	None	Seasonally Flooded	None
PUSR	Palustrine	N/A	Unconsolidated Shore	None	Seasonal-Tidal	None

C. Savannahs & Wet Meadows - Herbaceous areas which are flooded only briefly but which may be saturated for long periods during the growing season. Species include pitcher plants, sundews, pogonias, pipeworts, meadow beauties, orchids, yellow-eyed grasses, asters, and goldenrod. Potential species of concern - Canby's Dropwort (Oxypolis canbyi).

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PEM1Ad	Palustrine	N/A	Emergent	Persistent	Temporary	Partially Drained/Ditched
PEM1Cd	Palustrine	N/A	Emergent	Persistent	Seasonally Flooded	Partially Drained/Ditched
PEM1Ch	Palustrine	N/A	Emergent	Persistent	Seasonally Flooded	Diked/ Impounded
PEM1Cx	Palustrine	N/A	Emergent	Persistent	Seasonally Flooded	Excavated

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PEM1A	Palustrine	N/A	Emergent	Persistent	Temporary	None
PEM1C	Palustrine	N/A	Emergent	Persistent	Seasonally Flooded	None

D. Freshwater Marshes - Herbaceous areas that are flooded for extended periods during the growing season. Included are marshes within lacustrine systems, managed impoundments, some Carolina bays and other non-tidal marshes (i.e. marshes that do not fall into the Salt/Brackish Marsh category). A tremendous variety of species may occur. Typical communities include species of sedges, millets, rushes and grasses that are not specified in the coastal wetland regulations. Also included are maidencane, giant cane, arrowhead, pickeralweed, arrow arum, smartweed and cattail.

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PEM1Fh	Palustrine	N/A	Emergent	Persistent	Semi-permanent	Diked/ Impounded
PEM1Fx	Palustrine	N/A	Emergent	Persistent	Semi-permanent	Excavated
PEM1Kx	Palustrine	N/A	Emergent	Persistent	Artificial - Tidal	Excavated
PEM1/SS1Ax	Palustrine	N/A	Emergent/ Scrub-Shrub	Persistent/Broad-Leaved Deciduous	Temporary Flooded	Excavated

PEM1/SS1Cx	Palustrine	N/A	Emergent/ Scrub-Shrub	Persistent/Broad-Leaved Deciduous	Seasonally Flooded	Excavated
PEM1Ah	Palustrine	N/A	Emergent	Persistent	Temporary Flooded	Diked/ Impounded
PEM1Ax	Palustrine	N/A	Emergent	Persistent	Temporary Flooded	Excavated

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PEM1F	Palustrine	N/A	Emergent	Persistent	Semi-permanent	None
PEM1R	Palustrine	N/A	Emergent	Persistent	Seasonally Flooded Tidal	None
PEM1/SS1A	Palustrine	N/A	Emergent/ Scrub-Shrub	Persistent/Broad-Leaved Deciduous	Temporary Flooded	None
PEM1/SS1J	Palustrine	N/A	Emergent/ Scrub-Shrub	Persistent/ Broad-Leaved Deciduous	Intermittently Flooded	None
PEM1J	Palustrine	N/A	Emergent	Persistent	Intermittently Flooded	None
PEM1/SS1C	Palustrine	N/A	Emergent/ Scrub-Shrub	Persistent/Broad-Leaved Deciduous	Seasonally Flooded	None

E. Aquatic Beds - Areas vegetated by dense mats of vegetation which grow on or below the water surface. Water is permanent or nearly so. Plant species include pondweeds, coontails, duckweeds, lotus, water-lily, spatter-dock and others.

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PAB4Fh	Palustrine	N/A	Aquatic Bed	Floating Vascular	Semi-permanent	Diked/ Impounded
PAB4Fx	Palustrine	N/A	Aquatic Bed	Floating Vascular	Semi-permanent	Excavated

PAB4Hh	Palustrine		Aquatic Bed			
PAB4Hx	Palustrine		Aquatic Bed			
PAB4Vx	Palustrine		Aquatic Bed			
PABFx	Palustrine		Aquatic Bed			
PABHh	Palustrine		Aquatic Bed			
PABHx	Palustrine		Aquatic Bed			
PABVx	Palustrine		Aquatic Bed			
PAB/UBHx	Palustrine		Aquatic Bed			

1.Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PAB4V	Palustrine		Aquatic Bed			
PABF	Palustrine		Aquatic Bed			
PABH	Palustrine		Aquatic Bed			

G. Bottomland Hardwoods - Riverine forested or occasionally shrub/scrub communities, usually occurring in floodplains, that are seasonally flooded (typ. winter & spring). Typical species include oaks (overcup, water, laurel, swamp chestnut), sweet gum, hickories, cottonwoods, river birch, green ash, cottonwoods, willows, river birch and occasionally pines (esp. loblolly).

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PFO1/SS1Cx	Palustrine	N/A	Forested/ Scrub-Shrub	Broad-Leaved Deciduous	Seasonally Flooded	Excavated
PFO1Ax	Palustrine	N/A	Forested	Broad-Leaved Deciduous	Temporarily Flooded	Excavated
PSS1Ah	Palustrine	N/A	Scrub-Shrub	Broad-Leaved Deciduous	Temporarily Flooded	Diked/ Impounded

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PFO1A	Palustrine	N/A	Forested	Broad-Leaved Deciduous	Temporarily Flooded	None
PSS1A	Palustrine	N/A	Scrub-Shrub	Broad-Leaved Deciduous	Temporarily Flooded	None
PFO1/SS1A	Palustrine	N/A	Forested/ Scrub-Shrub	Broad-Leaved Deciduous	Temporarily Flooded	None
PFO1/SS1C	Palustrine	N/A	Forested/ Scrub-Shrub	Broad-Leaved Deciduous	Seasonally Flooded	None

H. Hardwood Swamp - Very poorly drained riverine or non-riverine forested or occasionally shrub/scrub communities that are semi-permanently flooded, including temporarily flooded depressional systems. Typical species include cypress, black gum, water tupelo, green ash and red maple. We could add Headwater Swamp as separate category denoting a wooded, riverine system occurring along first order streams. These include hardwood-dominated communities with soil that is moist most of the year. Channels receive their water from overland flow and rarely overflow their own banks.

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PFO1S	Palustrine	N/A	Forested	Broad-Leaved Deciduous	Temporary Tidal	None
PFO1Fx	Palustrine	N/A	Forested	Broad-Leaved Deciduous	Semi permanently Flooded	Excavated

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PFO1C	Palustrine	N/A	Forested	Broad-Leaved Deciduous	Seasonally Flooded	None

L. Deciduous Shrub Swamps - Usually an early successional stage of the wooded swamp community. These habitats are often the result of clearcutting, beaver ponds, or other disturbance. Plant species may include button bush, alder, red maple, sweet gum, or willow.

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PSS1Ch	Palustrine	N/A	Scrub-Shrub	Broad-Leaved Deciduous	Seasonally Flooded	Diked/ Impounded
PSS1Cx	Palustrine	N/A	Scrub-Shrub	Broad-Leaved Deciduous	Seasonally Flooded	Excavated
PSS1Fx	Palustrine	N/A	Scrub-Shrub	Broad-Leaved Deciduous	Semi permanently Flooded	Excavated

2. Non-Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
PSS1C	Palustrine	N/A	Scrub-Shrub	Broad-Leaved Deciduous	Seasonally Flooded	None
PSS1F	Palustrine	N/A	Scrub-Shrub	Broad-Leaved Deciduous	Semi permanently Flooded	None
PSS1J	Palustrine	N/A	Scrub-Shrub	Broad-Leaved Deciduous	Intermittently Flooded	None

V. Other - Farmed Wetlands

1. Disturbed

NWI Code	Ecological System	Sub-System	Class	Subclass	Water-Regime	Special Modifier
Pf	Palustrine					Farmed

APPENDIX D
Data Sources

CDM Smith

Category: Environmental				
Layer Description	**Layer Name**	**Feature Type**	**Source**	**Comments**
Threatened & Endangered Species				*Not available*
Critical Habitat		Line, Polygon	USFWS	*Not in Study Area*
Wetlands (NWI)	Wetlands	Polygon	MARIS	
Wetlands Mitigation Sites	wetland_mitig	Polygon	NASA (Stennis), USACE RIBITS, Wetlands Solutions LLC	
Prime Farmlands	PrimeFarmland	Polygon	Geospatial Data Gateway (NRCS/USDA)	Derived from soils
Water Bodies, Linear	nhd_named_streams	Line	MARIS	
Water Bodies, Linear	nhd_othFL	Line	MARIS	Other flow lines
Water Bodies, Areal	nhd_waterb	Polygon	MARIS	
Water Bodies, Areal	nhd_othareas	Polygon	MARIS	Other areas
Floodplain	Floodplain	Polygon	NASA (Stennis Space Center)	
Landfills	Landfill_cells	Polygon	NASA (Stennis Space Center)	FOIA; only for SPCC boundary
Surface Impoundment Areas	SIA	Point	MARIS	
Hazardous Waste Sites	hazardous_waste_sites	Polygon	NASA (Stennis Space Center)	FOIA
RCRA	Rcra	Point	MARIS	
EPA Regulated Facilities	Epa	Point	MARIS	
Tanks, Petroleum	tanks_buff	Point	MARIS	
Toxic Release Inventory Sites	TRI	Point	MARIS	
Underground Storage Tanks	UST	Point	MARIS	
CERCLA 2008	CERCLA2008	Point	MARIS	
CERCLA Site Areas	CERCLA_Site_Areas	Polygon	NASA (Stennis Space Center)	Covers all CERCLA Wells
Mines	Mines	Polygon	MDEQ (provided list)	Created polygons from list
Source Water Protection Areas	SWPA	Polygon	MDEQ	

Category: Cultural and Historical				
Layer Description	**Layer Name**	**Feature Type**	**Source**	**Comments**
Archaeological Sites	ArchSites	Point	NASA (Stennis Space Center)	FOIA; only for SPCC boundary
Archaeological Sites	ArchSites_MDAH	Point	MDAH	
Historic Properties	HistProps_MDAH	Point	MDAH	
National Registry Sites	natreg	Point	MARIS	
Archaeological Site Probability	Arch_Prob	Polygon	NASA (Stennis Space Center)	FOIA; only for SPCC boundary
Cemeteries	Cemetery	Polygon	MARIS	
Churches	Churches	Polygon	MARIS	
Recreation Sites	mri	Polygon	MARIS	
Land Use	LandUse	Polygon	Geospatial Data Gateway (NRCS/USDA)	

INFRASTRUCTURE	**Layer Name**	**Type**	**Source**	**Comments**
Roads	Roads_TIGER	Line	TIGER	
Railroads	rail_lines	Line	NTAD 2012	
Dams	Dams	Point	MARIS	
Airports	AirportStennis	Polygon	NTAD 2012	Polygons created from aerial photography
Wells, Oil & Gas	oilngas	Point	MARIS	
Wells, Water (USGS)	USGS_Wells	Point	MARIS	
Wells, Water (Dept of Health)	DoHWells	Point	MARIS	
Pipelines, Natural Gas	NatGasPipelines	Line	Stennis Space Center	FOIA; only for SPCC boundary
Gas	msgas	Line	MARIS	
Transmission Lines, major	majr_transm10	Line	MARIS	
Power Lines	PowerLines	Line	NASA (Stennis Space Center)	FOIA; only for SPCC boundary
Water Utility Lines	WaterUtility	Line	NASA (Stennis Space Center)	
Wastewater Utility Lines	WastewaterUtility	Line	NASA (Stennis Space Center)	

JURISDICTIONS	**Layer Name**	**Type**	**Source**	**Comments**
Stennis Fee Area Boundary	Stennis Space Center	Polygon	Stennis Space Center	FOIA request
Stennis Buffer Zone	Stennis Space Center	Polygon	Stennis Space Center	FOIA request

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APPENDIX E
Data Used in AART Analyses

CDM Smith

					Base Rankings		Agency Modifications	
ENVIRONMENTAL	**Feature Class Name**	**Feature Type**	**Category**	**Include?**	**Ranking**	**Buffer (ft)**	**USACE**	**EPA**
Wetlands (NWI)	Wetlands	A		Yes				
Estuarine and Marine Deepwater								
Bay (N)			E1UBL	Yes	Avoid			
Bay (D)			E1UBLx	Yes	Avoid			
Estuarine and Marine Wetland								
Scrub Marsh (N)			E2EM1/SS1P	Yes	9			
			E2SS1/EM1P	Yes	9			
			E2SS1P	Yes	9			
Scrub Marsh (D)			E2EM1/SS1Pd	Yes	6			
			E2SS1Pd	Yes	6			
Tidal Marsh (N)			E2EM1N	Yes	Avoid			
			E2EM1P	Yes	Avoid			
Tidal Marsh (D)			E2EM1Nd	Yes	Avoid			
			E2EM1Pd	Yes	Avoid			
Tidal Flat (N)			E2USN	Yes	Avoid			
			E2USP	Yes	Avoid			
Freshwater Emergent Wetland								
Bottomland Hardwood (N)			PEM1/FO1F	Yes	7			
			PEM1/FO1S	Yes	7			
			PFO1/EM1B	Yes	7			
			PFO1/EM1C	Yes	7			
			PFO1/EM1F	Yes	7			
			PFO1/SS1A	Yes	7			
			PFO1/SS1B	Yes	7			
			PFO1/SS1C	Yes	7			
			PFO1/SS1F	Yes	7			
					Base Rankings		Agency	

							Modifications	
ENVIRONMENTAL	Feature Class Name	Feature Type	Category	Include?	Ranking	Buffer (ft)	USACE	EPA
Bottomland Hardwood (N)			PFO1/SS1T	Yes	7			
			PFO1/SS3B	Yes	7			
			PFO1/SS3C	Yes	7			
			PFO1/SS4A	Yes	7			
			PFO1/SS4B	Yes	7			
			PFO1/SS4C	Yes	7			
			PFO1A	Yes	7			
			PFO1B	Yes	7			
			PFO1C	Yes	7			
			PFO1E	Yes	7			
			PFO1F	Yes	7			
			PFO1R	Yes	7			
			PFO1S	Yes	7			
			PFO1T	Yes	7			
Bottomland Hardwood (D)			PFO1/SS1Ad	Yes	6			
			PFO1Ad	Yes	6			
			PFO1As	Yes	6			
			PFO1Bd	Yes	6			
			PFO1Cd	Yes	6			
			PFO1Fd	Yes	6			
			PFO1Fx	Yes	6			
			PFO1Sd	Yes	6			
Freshwater Marsh (N)			PEM1/SS1B	Yes	9			
			PEM1/SS1F	Yes	9			
			PEM1/SS1R	Yes	9			
			PEM1/SS1T	Yes	9			
			PEM1/SS3B	Yes	9			
			PEM1/SS4B	Yes	9			
			PEM1/SS4E	Yes	9			
			PEM1/SS4R	Yes	9			

					Base Rankings		Agency Modifications	
ENVIRONMENTAL	**Feature Class Name**	**Feature Type**	**Category**	**Include?**	**Ranking**	**Buffer (ft)**	**USACE**	**EPA**
Freshwater Marsh (N)			PEM1B	Yes	9			
			PEM1F	Yes	9			
			PEM1R	Yes	9			
			PEM1S	Yes	9			
			PEM1T	Yes	9			
Freshwater Marsh (D)			PEM1/SS3Bd	Yes	6			
			PEM1/SS3Fx	Yes	6			
			PEM1Ax	Yes	6			
			PEM1Bd	Yes	6			
			PEM1Fh	Yes	6			
			PEM1Fx	Yes	6			
			PEM1Kh	Yes	6			
			PEM1Sd	Yes	6			
			PEM1Td	Yes	6			
Savannah (N)			PEM1/SS1A	Yes	9			
			PEM1/SS1C	Yes	9			
			PEM1/SS3C	Yes	9			
			PEM1/SS4C	Yes	9			
			PEM1A	Yes	9			
			PEM1C	Yes	9			
Savannah (D)			PEM1/SS1Cx	Yes	6			
			PEM1/SS4Cd	Yes	6			
			PEM1Cd	Yes	6			
			PEM1Cx	Yes	6			
Freshwater Forested/Shrub Wetland								
Forested Swamp (N)			PFO1/2C	Yes	7		9	9
			PFO1/2F	Yes	7		9	9
			PFO1/2R	Yes	7		9	9
			PFO1/2S	Yes	7		9	9
			PFO1/2T	Yes	7		9	9

					Base Rankings		Agency Modifications	
			PFO1/3A	Yes	7		9	9
ENVIRONMENTAL	**Feature Class Name**	**Feature Type**	**Category**	**Include?**	**Ranking**	**Buffer (ft)**	**USACE**	**EPA**
Forested Swamp (N)			PFO1/3B	Yes	7		9	9
			PFO1/3C	Yes	7		9	9
			PFO1/3F	Yes	7		9	9
			PFO1/4A	Yes	7		9	9
			PFO1/4B	Yes	7		9	9
			PFO1/4C	Yes	7		9	9
			PFO1/4E	Yes	7		9	9
			PFO1/4F	Yes	7		9	9
			PFO1/4R	Yes	7		9	9
			PFO1/4S	Yes	7		9	9
			PFO2/1C	Yes	7		9	9
			PFO2/1F	Yes	7		9	9
			PFO2/1R	Yes	7		9	9
			PFO2/4B	Yes	7		9	9
			PFO2/4C	Yes	7		9	9
			PFO2/EM1F	Yes	7		9	9
			PFO2B	Yes	7		9	9
			PFO2F	Yes	7		9	9
			PFO2R	Yes	7		9	9
			PFO3/1A	Yes	7		9	9
			PFO3/1B	Yes	7		9	9
			PFO3/1C	Yes	7		9	9
			PFO3/4B	Yes	7		9	9
			PFO3/EM1B	Yes	7		9	9
			PFO3B	Yes	7		9	9
			PFO3C	Yes	7		9	9
			PFO4/1A	Yes	7		9	9
			PFO4/1B	Yes	7		9	9
			PFO4/1C	Yes	7		9	9

ENVIRONMENTAL	Feature Class Name	Feature Type	Category	Include?	Base Rankings: Ranking	Base Rankings: Buffer (ft)	Agency Modifications: USACE	Agency Modifications: EPA
			PFO4/1R	Yes	7		9	9
			PFO4/1S	Yes	7		9	9
Forested Swamp (N)			PFO4/3A	Yes	7		9	9
			PFO4/3B	Yes	7		9	9
			PFO4/EM1B	Yes	7		9	9
			PFO4/EM1C	Yes	7		9	9
			PFO4/SS1B	Yes	7		9	9
			PFO4/SS1C	Yes	7		9	9
			PFO4/SS3B	Yes	7		9	9
			PFO4/SS4A	Yes	7		9	9
			PFO4/SS4B	Yes	7		9	9
			PFO4/SS4C	Yes	7		9	9
			PFO4/SS4R	Yes	7		9	9
			PFO4A	Yes	7		9	9
			PFO4B	Yes	7		9	9
			PFO4C	Yes	7		9	9
			PFO4F	Yes	7		9	9
			PFO4R	Yes	7		9	9
			PEM1/FO3B	Yes	7		9	9
			PEM1/FO4B	Yes	7		9	9
			PEM1/FO4C	Yes	7		9	9
Forested Swamp (D)			PFO1/2Fb	Yes	6		9	7
			PFO1/3Bd	Yes	6		9	7
			PFO1/3Cd	Yes	6		9	7
			PFO1/4Ad	Yes	6		9	7
			PFO1/4Bd	Yes	6		9	7
			PFO1/4Cd	Yes	6		9	7
			PFO2/1Fd	Yes	6		9	7
			PFO3/1Cd	Yes	6		9	7
			PFO4/1Ad	Yes	6		9	7
			PFO4/1Bd	Yes	6		9	7

			PFO4/1Cd	Yes	6		9	7
			PFO4/3Bd	Yes	6		9	7
					Base Rankings		**Agency Modifications**	
ENVIRONMENTAL	**Feature Class Name**	**Feature Type**	**Category**	**Include?**	**Ranking**	**Buffer (ft)**	**USACE**	**EPA**
Forested Swamp (D)			PFO4Ad	Yes	6		9	7
			PFO4Bd	Yes	6		9	7
			PFO4Cd	Yes	6		9	7
Shrub Swamp (N)			PSS1/2C	Yes	5		9	9
			PSS1/2F	Yes	5		9	9
			PSS1/2R	Yes	5		9	9
			PSS1/2T	Yes	5		9	9
			PSS1/3B	Yes	5		9	9
			PSS1/3C	Yes	5		9	9
			PSS1/4A	Yes	5		9	9
			PSS1/4B	Yes	5		9	9
			PSS1/4C	Yes	5		9	9
			PSS1/4F	Yes	5		9	9
			PSS1/4R	Yes	5		9	9
			PSS1/4S	Yes	5		9	9
			PSS1/EM1A	Yes	5		9	9
			PSS1/EM1B	Yes	5		9	9
			PSS1/EM1C	Yes	5		9	9
			PSS1/EM1R	Yes	5		9	9
			PSS1/EM1S	Yes	5		9	9
			PSS1/EM1T	Yes	5		9	9
			PSS1/FO1R	Yes	5		9	9
			PSS1/FO1S	Yes	5		9	9
			PSS1/FO2F	Yes	5		9	9
			PSS1/FO4A	Yes	5		9	9
			PSS1/FO4B	Yes	5		9	9
			PSS1/FO4C	Yes	5		9	9
			PSS1/FO4R	Yes	5		9	9
			PSS1A	Yes	5		9	9

			PSS1B	Yes	5		9	9
			PSS1C	Yes	5		9	9
					Base Rankings		**Agency Modifications**	
ENVIRONMENTAL	**Feature Class Name**	**Feature Type**	**Category**	**Include?**	**Ranking**	**Buffer (ft)**	**USACE**	**EPA**
Shrub Swamp (N)			PSS1F	Yes	5		9	9
			PSS1R	Yes	5		9	9
			PSS1S	Yes	5		9	9
			PSS1T	Yes	5		9	9
			PSS3/1B	Yes	5		9	9
			PSS3/1C	Yes	5		9	9
			PSS3/4B	Yes	5		9	9
			PSS3/EM1B	Yes	5		9	9
			PSS3/EM1C	Yes	5		9	9
			PSS3/FO1C	Yes	5		9	9
			PSS3/FO4B	Yes	5		9	9
			PSS3B	Yes	5		9	9
			PSS3C	Yes	5		9	9
			PSS4/1A	Yes	5		9	9
			PSS4/1B	Yes	5		9	9
			PSS4/1C	Yes	5		9	9
			PSS4/3B	Yes	5		9	9
			PSS4/EM1A	Yes	5		9	9
			PSS4/EM1C	Yes	5		9	9
			PSS4/FO4C	Yes	5		9	9
			PSS4A	Yes	5		9	9
			PSS4B	Yes	5		9	9
			PSS4C	Yes	5		9	9
			PSS4F	Yes	5		9	9
			PSS4R	Yes	5		9	9
			PSS4S	Yes	5		9	9
			PSS5F	Yes	5		9	9
Shrub Swamp (D)			PSS1/3Bd	Yes	4		9	7
			PSS1/4Bd	Yes	4		8	7

			PSS1/4Cd	Yes	4		8	7
			PSS1/FO1Bd	Yes	4		8	7
					Base Rankings		**Agency Modifications**	
ENVIRONMENTAL	**Feature Class Name**	**Feature Type**	**Category**	**Include?**	**Ranking**	**Buffer (ft)**	**USACE**	**EPA**
Shrub Swamp (D)			PSS1/FO1Cx	Yes	4		8	7
			PSS1Cb	Yes	4		8	7
			PSS1Cd	Yes	4		8	7
			PSS1Ch	Yes	4		8	7
			PSS1Cx	Yes	4		8	7
			PSS1Fh	Yes	4		8	7
			PSS1Fx	Yes	4		8	7
			PSS1Td	Yes	4		8	7
			PSS3Cd	Yes	4		8	7
			PSS3Fx	Yes	4		8	7
			PSS4/1Bd	Yes	4		8	7
			PSS4/1Cd	Yes	4		8	7
			PSS4/1Cx	Yes	4		8	7
			PSS5Fx	Yes	4		8	7
Freshwater Pond								
Aquatic Bed (N)			PAB4V	Yes	7			
			PABF	Yes	7			
			PABH	Yes	7			
Aquatic Bed (D)			PAB/UBHx	Yes	5			
			PAB4Hh	Yes	5			
			PAB4Hx	Yes	5			
			PAB4Vx	Yes	5			
			PABFx	Yes	5			
			PABHh	Yes	5			
			PABHx	Yes	5			
			PABVx	Yes	5			
Pond (N)			PUBH	Yes	5			
			PUBV	Yes	5			
Pond (D)			PUBFx	Yes	4			

			PUBHh	Yes	4			
			PUBHx	Yes	4			
					Base Rankings		**Agency Modifications**	
ENVIRONMENTAL	**Feature Class Name**	**Feature Type**	**Category**	**Include?**	**Ranking**	**Buffer (ft)**	**USACE**	**EPA**
Pond (D)			PUBVh	Yes	4			
			PUBVx	Yes	4			
			PUSAx	Yes	4			
			PUSCx	Yes	4			
			PUBVh	Yes	4			
			PUBVx	Yes	4			
			PUSAx	Yes	4			
			PUSCx	Yes	4			
Lake								
Lake (D)			L1ABHx	Yes	9			
			L1UBHx	Yes	9			
Riverine								
Tidal River (N)			R1UBV	Yes	Avoid			
Tidal River (D)			R1UBVx	Yes	Avoid			
River (N)			R2UBH	Yes	7		9	9
			R2US2C	Yes	7		9	9
			R2USA	Yes	7		9	9
			R2USC	Yes	7		9	9
River (D)			R2UBHx	Yes	7		9	9
Other								
Wetlands Mitigation Sites	wetland_mitig	A		Yes	9			
Prime Farmlands	PrimeFarmland	A						
			Prime Farmland	Yes	4			
			Statewide Importance	Yes	4			
			Prime if drained	No				
			Prime if drained & protected	No				
Water Bodies, Linear	nhd_named_streams	L		Quantify				6

Water Bodies, Linear	nhd_othFL	L		Quantify				3
Streams, 303d	Streams_303d	L		Quantify				
Water Bodies, Areal	nhd_waterb	A		Yes	9			9
					Base Rankings		**Agency Modifications**	
ENVIRONMENTAL	**Feature Class Name**	**Feature Type**	**Category**	**Include?**	**Ranking**	**Buffer (ft)**	**USACE**	**EPA**
Water Bodies, Areal	nhd_othareas	A		Quantify				9
Landfills	Landfill_cells	A		Yes	9			
Surface Impoundment Areas	SIA_buff	P		Yes	9	500		
Hazardous Waste Sites	hazardous_waste_sites	A		Yes	Avoid			
RCRA	rcra_buff	P		Yes	Avoid			
EPA	epa_buff	P		Yes	Avoid			
Tanks	tanks_buff	P		Yes	Avoid			
Toxic Release Inventory	tri_buff	P		Yes	Avoid			
Underground Storage Tanks	UST_buff	P		Yes	Avoid			
CERCLA 2008	CERCLA2008_buff	P		Yes	Avoid			
CERCLA Site Areas	CERCLA_Site_Areas	A		Yes	Avoid			
Mines	Mines	A		Yes	Avoid			

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