



# EVERGLADES NATIONAL PARK MINIMUM REQUIREMENTS DECISION GUIDE WORKBOOK

*"...except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act..."*

-- The Wilderness Act of 1964

**Project Title:** Cape Sable Plugs Restoration -- Phase II

**Prepared by:** Amy Renshaw, ENP Project Lead  
PJ Walker, Wilderness Committee Chair

**Reviewed by:** Wilderness Committee comprised of the following individuals:

PJ Walker	Michael Jester
Samantha Towery	Steven Tennis
Abby Sadle	Penelope del Bene
Jimi Sadle	Mayavati Tupaj

APPROVED

DENIED

**Comments:**

Approved / Denied	Name	Position	
	Pedro Ramos	Superintendent, Everglades National Park	
	Signature		Date

**REVIEW and RECOMMENDATION**  
**Minimum Requirement Analysis**

*Prior to implementation of the proposed action, the following individuals must review and/or recommend the Minimum Requirement Analysis. Signatures indicate review has been completed, and where appropriate, recommended for consideration and approval by the Superintendent. See "MRDG Step 2: Determination" for recommended action(s).*

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_  
Project Proponent

\_\_\_\_\_ Date: \_\_\_\_\_  
Wilderness Committee Representative

Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_  
PJ Walker, Wilderness Committee Chair

\_\_\_\_\_ Date: \_\_\_\_\_  
Abby Sadle, Wilderness Committee Member

\_\_\_\_\_ Date: \_\_\_\_\_  
Jimi Sadle, Wilderness Committee Member

\_\_\_\_\_ Date: \_\_\_\_\_  
Penelope del Bene, Wilderness Committee Member

\_\_\_\_\_ Date: \_\_\_\_\_  
Samantha Towery, Wilderness Committee Member

\_\_\_\_\_ Date: \_\_\_\_\_  
Michael Jester, Wilderness Committee Member

\_\_\_\_\_ Date: \_\_\_\_\_  
Steven Tennis, Wilderness Committee Member

\_\_\_\_\_ Date: \_\_\_\_\_  
Mayavati Tupaj, Wilderness Committee Member

Recommended by: \_\_\_\_\_ Date: \_\_\_\_\_  
PJ Walker, Wilderness Committee Chair

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## MRDG Step 1: Determination

*Determine if Administrative Action is Necessary*

### **Description of the Situation**

*What is the situation that may prompt administrative action?*

Historically, the interior wetlands of Cape Sable were isolated from tidal flow from both Florida Bay and the Gulf of Mexico by a marl ridge known as the Flamingo embankment or marl ridge. Early in the last century, seven canals were dug through this marl ridge on Cape Sable in an attempt to drain and reclaim land for development, agriculture, and cattle grazing. These canals opened up the interior wetlands to tidal influence and the inflow of salt water from Florida Bay and the Gulf of Mexico. At least five of these canals (Homestead, East Cape, Raulerson, House, and Slagle Ditch) were subsequently plugged at the marl ridge with earthen plugs in 1956. All of these earthen plugs have either been breached or compromised since then by the forces of weathering and erosion.

Plugs on the Homestead and East Cape canals failed in 1992, were replaced in 1997, failed again within a short period, and were replaced again in 2010 by 100-foot-long earthen plugs bounded at each end by two sheet pile bulkheads and rip rap armoring with sheet piling along the banks on all four corners. The plug in Raulerson Canal had eroded to perhaps one-third of its original length by early 2007, partially as a result of damage from the 2005 hurricanes, and the plug failed in November of that year. Repairs were attempted in 2007 and 2008, but the plug completely failed in 2009.

Respectively, House Ditch and Slagle Ditch are located about 0.8 and 2.3 miles east of East Cape Canal and both extend north from Florida Bay across the marl ridge into the interior marshes. Both of the canals were dammed with earthen plugs in 1956 where the canals cross the old Cape Sable Road, which is now referred to as the Coastal Prairie Trail. Both plugs are currently functional but both have eroded from the north side. Damage to the Slagle Ditch plug is significant: seepage through the plug is already occurring, and the structure is in danger of failing catastrophically if impacted by a storm or because of erosion accelerated by seepage through the structure.

Once a plug fails, incoming tides are able to push marine water into the interior marshes of Cape Sable through the canals. Outgoing tides drain rainwater from the wetlands north of the marl ridge. The constant tidal action erodes the banks of the canals, quickly increasing the canal cross section and thereby increasing the influence of the canal on interior wetlands. Raulerson Canal has widened five-fold since the plug was breached in 2007 (from 8 to 40 feet).

The canals allow the transport of sediment into and out of the wetlands behind the marl ridge, causing high turbidity and building mudbanks in areas of previously open water. An average of 4,000 metric tons of sediment per year is being transported from the interior wetlands of Cape Sable to Florida Bay through East Side Creek. Although numbers are not yet available for Raulerson Canal, the concentration of sediment in the water is likely to be similar. In addition to negatively impacting the wetlands of Cape Sable, increased turbidity caused by the erosion impacts the downstream estuarine waters. Sediment transport will increase further as the canal size increases over time.

Increased salinity in the interior marshes has also reduced the quality of wildlife habitat. American crocodiles and smalltooth sawfish, two species protected by the Endangered Species Act, rely on Cape Sable as nursery habitat. Cape Sable is one of the most significant nesting areas for crocodiles in south Florida. High salinity in interior wetlands reduces habitat suitability for juvenile crocodiles and also for smalltooth sawfish. Even temporarily improved salinity conditions could enable a long-term recovery of both species. Crocodile nesting in the East Cape Canal area increased following plugging of East Cape Canal. Plugging Raulerson Canal may also limit the ability of large predators to access the wetland areas behind the marl ridge used by young sawfish. More research is needed to determine the extent that each of these factors influences crocodile nesting success and the quality of wildlife habitat.

Seawater incursions, loss of freshwater, sedimentation in the lakes and marshes, and tidal action have caused physical and chemical changes that are compromising the function of coastal habitats for endangered species, recreational fishes, and other plants and animals that depend on Cape Sable for survival. Rising sea level will significantly impact biological resources on Cape Sable over the life of this project. However, restoring the function of the marl ridge by plugging the man-made canals will enhance community resilience by slowing the rate of change early in the process. As the canals on Cape Sable continue to widen, the rate of change is expected to accelerate further, emphasizing the need for timely corrective action.

### Options Outside of Wilderness

*Can action be taken outside of wilderness that adequately addresses the situation?*

YES **STOP – DO NOT TAKE ACTION IN WILDERNESS**

NO **EXPLAIN AND COMPLETE STEP 1 OF THE MRDG**

Explain:

Cape Sable and associated canals and plugs in need of remediation are located within remote portions of designated wilderness, and thus no action taken outside of wilderness could correct the situation.

### Criteria for Determining Necessity

*Is action necessary to meet any of the criteria below?*

#### A. Valid Existing Rights or Special Provisions of Wilderness Legislation

*Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that **requires** action? Cite law and section.*

YES  NO

Explain:

There is no language in wilderness legislation, including the wilderness legislation establishing the Everglades Wilderness (PL 195-625, subsequently renamed Marjory Stoneman Douglas Wilderness - Public Law 105-82), that requires this action to take place.

## B. Requirements of Other Legislation

*Is action necessary to meet the requirements of other federal laws? Cite law and section.*

YES     NO

Explain:

There is no language in any other legislation that would require this action to take place.

## C. Wilderness Character

*Is action necessary to preserve one or more of the qualities of wilderness character, including: Untrammeled, Undeveloped, Natural, Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation, or Other Features of Value?*

UNTRAMMELED

YES     NO

Explain:

The untrammeled quality is a measurement of how "wild" the Wilderness is. It monitors actions that intentionally manipulate or control ecological systems, which if allowed to occur, would affect wilderness character. This quality is typically preserved when no action is taken to control, hinder, or manipulate the natural functioning of the ecosystem. Any human manipulation that is intended to manipulate or control the biophysical environment, regardless of impact (i.e. benefit or detriment), is considered a trammel upon the Wilderness. This concept of trammeling applies to all manipulation since the time of wilderness designation but does not apply to manipulations that occurred prior to designation because the mandates of the Wilderness Act don't apply prior to designation.

The canals and associated plugs were in existence prior to the designation of the wilderness, thus the continued existence of the canals and existing plugs would not impact this quality. However, any reconstruction of failed plugs, regardless of design, would impair this quality. Reinforcement of existing plugs would not impair this quality unless the biophysical environment would incur additional human manipulation or control beyond the current condition. This quality would be preserved only if no further action is taken to control the biophysical environment in this area.

UNDEVELOPED

YES     NO

Explain:

The Undeveloped quality is preserved when wilderness retains its "primeval character and influence," and is essentially "without permanent improvements" or modern human occupation. This quality is influenced by the section 4(c) prohibited uses which are the presence of modern structures, installations, habitations, and the use of motor vehicles, motorized equipment, or mechanical transport. This quality is preserved by the absence of structures and installations, and refraining from these prohibited uses.

Few wildernesses have escaped at least some modern human occupation and modification. Many developments were "grandfathered" into some wilderness areas by special provisions in the enabling legislation. As indicated above, the continued existence of canals and associated plugs, were not included in any such legislation.

This quality would be preserved only if canals and associated plugs were removed from the wilderness; however, this is unlikely due to impacts to the natural quality and the fact that some of these "installations" may be considered cultural resources.

## NATURAL

YES     NO

Explain:

Historically, wilderness is strongly associated with protecting and preserving ecological systems from the impacts of modern people. Wilderness ecological systems are substantially free from the effects of modern civilization. This quality is preserved or improved by restoring ecological processes, and can be degraded by the alteration of ecological processes, such as water flow, as well as the effects of climate change.

The canals on Cape Sable have negatively influenced general ecological conditions, including critical wildlife populations north of the marl ridge. Loss of freshwater through the canals has accelerated the change from brackish or freshwater wetlands to a marine ecosystem. Juvenile crocodiles require nearby waters of lower salinity to thrive. Intruding salt water now separates higher nesting areas from suitable habitat required by young crocodiles. Brackish water systems produce more abundant stocks of small prey fish and invertebrates than fully marine systems and these species are food for wading birds (e.g. Rosette Spoonbills, Wood Storks), crocodiles, and large game fish.

Tidal flushing through the canals has negatively impacted water quality by eroding canals banks and depositing sediment in both Lake Ingraham and the interior marshes. Suspended sediment is also transported to Florida Bay and the Gulf of Mexico. Reducing or blocking tidally driven flow would lower water velocity in the canals and substantially reduce salt and sediment transported to the interior wetlands and also reduce sediment transported to the Gulf. The tidal signal will be dampened in nearby wetland areas, reducing the influence of tidal energy on these habitats.

Reducing interior salinity and restoring Cape Sable forage fish habitats will help to revitalize coastal and marine biological resources including crocodiles, Rosette Spoonbills, and other wading birds. Reducing turbidity and lowering salinity in the interior marshes are expected to improve the visitor experience for fishermen, bird watchers, and boaters. Rising sea level will significantly impact biological resources on Cape Sable over the life of this project. However, restoring the function of the marl ridge would enhance community resilience by slowing the rate of change early in the process.

## SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

YES     NO

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality is primarily about the opportunity for people to experience wilderness, and is influenced by settings that affect these opportunities. This quality is preserved or improved by management actions that reduce visitor encounters, signs of modern civilization inside wilderness, agency-provided recreation facilities, and management restrictions on visitor behavior. Many activities that affect this quality can have contradicting impacts. For example, an action intended to improve solitude could negatively impact unconfined recreation.

There is a possibility the width and depth of Raulerson Canal could be allowing unauthorized motorboat access into the wilderness which would impact opportunities for solitude. However, depending on the action utilized, eliminating this perceived issue could introduce impacts to the other sub-parts of this quality. This issue could also be accomplished in a variety of different ways, many of which by wilderness compliant methods. It is also unknown how much this is an issue, and there are other natural creeks that could allow the same access.

However, the plugs at House and Slagel currently act as bridges over the ditches for the Coastal Prairie Trail. The trail is the only land access to the wilderness area west of Flamingo. By ensuring the continued existence of these plugs, visitors to the wilderness would continue to have foot access west of the respective ditches which would continue to promote access to club house beach for primitive recreation activities (i.e. camping).

## OTHER FEATURES OF VALUE

YES     NO

Explain:

The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. From this wording, this quality focuses on "features" and features



typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included in this quality, the intent is to include those that significantly contribute to the setting of the wilderness and understanding of its wilderness character. Since these features have yet to be identified for the purposes of wilderness and this quality for the Marjory Stoneman Douglas Wilderness, action is not necessary to preserve this quality.

**Step 1 Decision**

*Is administrative action necessary in wilderness?*

Decision Criteria

- |  |   |  |
|--|---|--|
| A. Existing Rights or Special Provisions | <input type="checkbox"/> YES            | <input checked="" type="checkbox"/> NO |
| B. Requirements of Other Legislation     | <input type="checkbox"/> YES            | <input checked="" type="checkbox"/> NO |
| C. Wilderness Character                  |   |  |
| Untrammeled                              | <input type="checkbox"/> YES            | <input checked="" type="checkbox"/> NO |
| Undeveloped                              | <input type="checkbox"/> YES            | <input checked="" type="checkbox"/> NO |
| Natural                                  | <input checked="" type="checkbox"/> YES | <input type="checkbox"/> NO            |
| Outstanding Opportunities                | <input checked="" type="checkbox"/> YES | <input type="checkbox"/> NO            |
| Other Features of Value                  | <input type="checkbox"/> YES            | <input checked="" type="checkbox"/> NO |

Is administrative action necessary in wilderness?

YES

**EXPLAIN AND PROCEED TO STEP 2 OF THE MRDG**

NO

**STOP – DO NOT TAKE ACTION IN WILDERNESS**

Explain:

The natural character of wilderness has been and continues to be degraded due to the presence of canals in the Cape Sable region. Evaluation of alternatives to reduce these impacts through restoration of the marl ridge is a priority based on the scale of the impacts and the potential for those impacts to become worse over time. If implemented, the overall project would contribute to wilderness character by improving natural conditions within and adjacent to Cape Sable by restoring the function of the marl ridge at Raulerson Canal. Repairing the plugs at House and Slagle would prevent their failure and subsequent impacts to the upstream wetlands and Florida Bay. Preventing failure and thereby preventing the widening of the canals will allow for smaller, less hardened plugs than is necessary on the canals that have been widened by tidal action.

## MRDG Step 2a (House & Slagle Ditches)

Determine the Minimum Activity

### Other Direction

Is there “special provisions” language in legislation (or other Congressional direction) that explicitly **allows** consideration of a use otherwise prohibited by Section 4(c)?

**AND/OR**

Has the issue been addressed in agency policy, management plans, species recovery plans, or agreements with other agencies or partners?

YES

**DESCRIBE OTHER DIRECTION BELOW**

NO

**SKIP AHEAD TO TIME CONSTRAINTS BELOW**

Describe Other Direction:

### Time Constraints

What, if any, are the time constraints that may affect the action?

Work will be limited to the period of October 1 – March 1 to avoid crocodile mating and nesting season.

### Components of the Action

What are the discrete components or phases of the action?

Component X: *Example: Transportation of personnel to the project site*

Component 1: Transportation of Personnel

Component 2: Transportation of Materials & Equipment

Component 3: Method for Clearing Vegetation

Component 4: Method for Placing Fill

Component 5: Erosion Protection

Component 6: Condition of Sites after Completion

**Proceed to the alternatives.**

Refer to the [MRDG Instructions](#) regarding alternatives and the effects to each of the comparison criteria.

## MRDG Step 2a: Alternative 1

**Alternative 1:** No Action

### Description of the Alternative

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

The No-Action alternative involves leaving the House and Slagle Ditch dam plugs in their current condition and allowing the dams to continue to be exposed to the current and futures erosion processes impacting the plugs. Eventually at some uncertain date, the plugs will become breached and tidal flows will be capable of propagating past the marl ridge and inland to the Park inland marshes. Once the plug breach occurs, future erosion would accelerate along the current ditch alignment down into the very soft lime mud soils and the ditch would erode significantly by widening and deepening therein creating a significant path for tidal inflow back into the Park.

### Component Activities

*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation of Personnel	No transportation required for personnel
2	Transportation of Materials & Equipment	No transportation required for Materials & Equipment
3	Method for Clearing Vegetation	Vegetation Clearing not required
4	Method for Placing Fill	Placing Fill not required
5	Erosion Protection	Erosion Protection not required
6	Condition of Sites after Completion	Plugs would remain in current condition.

### Wilderness Character

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

## UNTRAMMELED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	No transportation required for personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	No transportation required for Materials & Equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Vegetation Clearing not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Placing Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Plugs would remain in current condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Untrammeled Total Rating</u></b>		<b>0</b>		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While the canals and existing plugs are considered intentional manipulations in their own right, those manipulations occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation because the mandates of the Wilderness Act don't apply prior to designation. By conducting no action, the wilderness is free from any additional intentional manipulations imposed upon the biophysical environment.

## UNDEVELOPED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	No transportation required for personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	No transportation required for Materials & Equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Vegetation Clearing not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Placing Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Plugs would remain in current condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE

<u>Undeveloped Total Rating</u>	<b>0</b>
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Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus, this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment. By conducting no action, the use of anything generally prohibited within a wilderness area is not required.

#### NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	No transportation required for personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	No transportation required for Materials & Equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Vegetation Clearing not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Placing Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Plugs would remain in current condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		<b>0</b>	<b>0</b>	<b>NE</b>
<u>Natural Total Rating</u>		<b>0</b>		

Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. By conducting no action, there would be no immediate impact upon the ecological systems inside the wilderness. However, the concern is that the existing plugs are showing signs of erosion. Without preventative maintenance, they could breach at an undeterminable point which would expose the canal, as well as the interior of Cape Sable, to the conditions experienced at other failed plug sites.

#### SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

1	No transportation required for personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	No transportation required for Materials & Equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Vegetation Clearing not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Placing Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Plugs would remain in current condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u></b>		<b>0</b>		

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities. By conducting no action, the setting would be unaltered from current conditions, and thus would have no effect on this quality. In the case of Slagle's ditch, the plug is part of the Coastal Prairie Trail which traverses from Flamingo to Club House Beach. It provides a bridge by which visitors can cross the canal. Should this plug be breached in the future, the path to Club House Beach would be impeded by the canal. While this could provide an opportunity for self-discovery in the form of unconfined recreation by finding individual, alternative ways to cross the canal, safety and resource management factors also have to be considered.

#### OTHER FEATURES OF VALUE

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	No transportation required for personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	No transportation required for Materials & Equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Vegetation Clearing not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Placing Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Plugs would remain in current condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Other Features of Value Total Rating</u></b>		<b>0</b>		

Explain:

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

### Traditional Skills

*What is the effect of each component activity on traditional skills?*

#### TRADITIONAL SKILLS

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	No transportation required for personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	No transportation required for Materials & Equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Vegetation Clearing not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Placing Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Plugs would remain in current condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<u>Traditional Skills Total Rating</u>		<b>0</b>		

Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. Given that no action would take place, proficiency in the use of traditional skills is neither preserved nor eroded.

### Economics

*What is the estimated cost of each component activity?*

#### COST

<u>Component Activity for this Alternative</u>		Estimated Cost
X	<i>Example: Personnel will travel by horseback</i>	\$1,900
1	No transportation required for personnel	
2	No transportation required for Materials & Equipment	
3	Vegetation Clearing not required	
4	Placing Fill not required	
5	Erosion Protection not required	
6	Plugs would remain in current condition.	
<b><u>Total Estimated Cost</u></b>		<b>\$0</b>

Explain:

N/A

### Safety of Visitors & Workers

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
<b><u>Risk Assessment</u></b>					

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

N/A



## Summary Ratings for Alternative 1

Wilderness Character	
<a href="#">Untrammeled</a>	0
<a href="#">Undeveloped</a>	0
<a href="#">Natural</a>	0
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	0
<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>0</b>
Traditional Skills	
<a href="#">Traditional Skills</a>	0
Economics	
<a href="#">Cost</a>	\$0
Safety	
<a href="#">Risk Assessment</a>	N/A

## MRDG Step 2a: Alternative 2

**Alternative 2:** Reinforcement of Earthen Plug via Helicopter

### Description of the Alternative

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

The eroded plugs will be backfilled with a gravelly limerock fill containing silty binder type fines. Locally available limerock fill, typical of that used for roadway base material in South Florida, will be used as backfill in the eroded area of the plug only. The backfill will be placed in sufficient quantities to only re-construct the original plug cross-section consistent with matching the adjacent plug slopes and elevation/grades. No other modifications would be made to the plug area to provide any additional erosion protection other than that afforded by compacting the fill in-place and providing a fill material containing silty limestone fines. These silty fines will have a propensity to dry out and become weakly cemented with time, therein providing a slight cementation in the fill similar to the present plug.

Personnel will be mobilized daily from Flamingo Marina. They will use a small boat to travel in Florida Bay, then inland from the Bay along the navigable reaches of House and Slagle Ditch. There may be some hand trimming of branches necessary for the safety of boat passengers. Neither plug can be accessed by water; personnel will have to disembark from the boats and walk, approximately 0.1 mile to House Ditch and 0.2 miles to Slagle Ditch. Some minor hand clearing may be necessary on the walking paths.

The helicopter will be used for 1.5 days for each plug. The contractor has provided a preliminary estimate of 6-8 lifts for House Ditch and 6-8 lifts for Slagle's Ditch. This includes materials, equipment, and incidentals. There will be a 1/8 acre drop zone near the plug sites. Some limited clearing and ground planking will be required from inland drop areas near the plug to the Coastal Prairie trail. Personnel will hand carry supplies and equipment.

Personnel will locally hand trim and clear vegetation/roots from plug repair areas using tools such as machetes and saws. Fill will be hand placed and graded, then compacted with a small, vibratory, walk behind compactor. This alternative will require 10 CY of fill for House and 10 CY for Slagle. Completed construction will be inspected and approved. Personnel will clean up the work site and demobilize miscellaneous bags, trash, and any equipment from job sites. It is estimated that it would take a 5 person crew 3 days to complete the work at House Ditch and 3 days to complete the work at Slagle's Ditch. Work will be limited to the period of October 1 – March 1 to avoid crocodile mating and nesting season.

**Component Activities**

*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation of Personnel	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3 days per plug
2	Transportation of Materials & Equipment	Materials & Equipment transported via helicopter for 1.5 days per plug with 6-8 lifts each. Hand carried from 1/8 acre drop zone to plug
3	Method for Clearing Vegetation	Limited vegetation clearing using hand tools, including machetes and saws
4	Method for Placing Fill	Fill placed and graded by hand, then compacted with a small motorized vibratory

		walk behind compactor
5	Erosion Protection	No erosion protection required
6	Condition of Sites after Completion	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.

### Wilderness Character

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

### UNTRAMMELED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 6-8 lifts each. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<u>Untrammed Total Rating</u>		<b>0</b>		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While the canals and existing plugs are considered intentional manipulations in their own right, those manipulations occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation

because the mandates of the Wilderness Act don't apply prior to designation.

No action proposed within this alternative would impact this quality. While landing of helicopters and limited clearing of vegetation could have a minor impact, their intent is not to manipulate "the earth and its community of life," and the impacts are confined to a small area or are temporary and would have only a very small and inconsequential impact on the Untrammeled quality. The fill placed to repair the plug would not hinder the biophysical environment any more than current conditions; however, it would extend the life of the plugs.

UNDEVELOPED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 6-8 lifts each. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	3	NE
<u>Undeveloped Total Rating</u>		<b>-3</b>		

Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus, this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

Transportation via motorboat above submerged wilderness is the reason submerged wilderness exists in the first place, thus would have no effect upon this quality; however, the use of a helicopter and motorized compactor are clear prohibitions as indicated by the

Wilderness Act and thus are considered a negative for this quality. Furthermore, for the purposes of this discussion, the backfilling of the plug to its original extent would be considered a negative on this quality because the footprint would be expanded beyond current conditions and the existence of an installation in wilderness, earthen as it is, would be prolonged.

NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 6-8 lifts each. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	0	NE
<u>Natural Total Rating</u>		1		

Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. Limited vegetation clearing was considered to have negligible impacts, and thus is identified as having no effect. It can be debated whether or not the reinforcement of existing plugs would have an effect on this quality. On the one hand, there would be no immediate effect by reinforcing the plugs; however, on the other hand, reinforcing the plugs could prevent a future catastrophic event which may expose the canal, as well as the interior of Cape Sable, to the conditions experienced at other failed plug sites. While House Ditch seems to be holding with only slight erosion, Slagle is showing signs that water is already passing through the plug, which is a precursor to failing. Given this, for the purposes of this

discussion, preventing future degradation to the natural quality is considered a positive effect.

**SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION**

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 6-8 lifts each. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	2	NE
<b><u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u></b>		<b>-1</b>		

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities.

The use of a helicopter and motorized compactor would clearly remind visitors of the modern world, and would thus have a negative effect upon opportunities for solitude, particularly for visitors walking the coastal prairie trail. Since the reinforced plug would be fill only, the ability for visitors to notice would be negligible if at all. As such, the visual evidence of the re-filled plug would not have an effect upon opportunities for solitude.

It is also debatable whether or not reinforcement of the plug would have a benefit to this quality since the continued existence of the plug at Slagle Ditch provides an earthen bridge by which visitors can cross while walking the Coastal Prairie Trail enroute to Club House Beach, which provides primitive recreation opportunities in the form of hiking and camping; one of the only places in which this can be accomplished in the park let alone the wilderness. Similar to

the natural quality, there would be no immediate effect by reinforcing the plug. However, should this plug be breached in the future, the path to Club House Beach would be impeded by the canal. As previously mentioned, Slagle Ditch is showing signs that water is already passing through the plug, which is a precursor to failing. While this could provide an opportunity for self-discovery in the form of unconfined recreation by finding individual, alternative ways to cross the canal, safety and resource management factors, including impacts to the natural quality of wilderness character, also have to be considered. For these reasons, there is an overall benefit and thus positive impact upon this quality.

#### OTHER FEATURES OF VALUE

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 6-8 lifts each. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<u>Other Features of Value Total Rating</u>		<b>0</b>		

#### Explain:

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

## Traditional Skills

What is the effect of each component activity on traditional skills?

### TRADITIONAL SKILLS

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3 days per plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 6-8 lifts each. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		2	3	NE
<b><u>Traditional Skills Total Rating</u></b>		<b>-1</b>		

#### Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. Even though they are used above submerged wilderness, the use of motorboats would impair the preservation of traditional skills. Similarly, the use of a helicopter would also impair the preservation of traditional skills. The use of hand tools, as opposed to motorized equipment such as chainsaws, would maintain the proficiency in using these tools. Likewise, hand placing fill would also benefit proficiency in the use of traditional skills; however, the use of a motorized compactor would degrade such skills. As such, this component was awarded both a positive and a negative effect.



## Economics

What is the estimated cost of each component activity?

### COST

<u>Component Activity for this Alternative</u>		Estimated Cost
X	<i>Example: Personnel will travel by horseback</i>	\$1,900
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3 days per plug	
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 6-8 lifts each. Hand carried from 1/8 acre drop zone to plug	
3	Limited vegetation clearing using hand tools, including machetes and saws	
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	
5	No erosion protection required	
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	
<b><u>Total Estimated Cost</u></b>		<b>\$100,100</b>

Explain:

Cost amongst the alternatives are considered to be similar by the COR, and thus will not be a determining factor in deciding upon an alternative.

## Safety of Visitors & Workers

What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?

RISK ASSESSMENT Severity of Accident	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>

Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
<a href="#">Risk Assessment</a>					

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

Risk Assessment was not provided by the contractor, COR, or park representative.

### Summary Ratings for Alternative 2

<b>Wilderness Character</b>	
<a href="#">Untrammeled</a>	0
<a href="#">Undeveloped</a>	-3
<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-1
<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>-4</b>
<b>Traditional Skills</b>	
<a href="#">Traditional Skills</a>	-1
<b>Economics</b>	
<a href="#">Cost</a>	\$100,100
<b>Safety</b>	
<a href="#">Risk Assessment</a>	N/A

### MRDG Step 2a: Alternative 3

**Alternative 3:** Reinforcement of Earthen Plug with Erosion Protection via Helicopter

### **Description of the Alternative**

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

In addition to backfilling of the eroded plug areas, the slopes of the plug in the repaired area and a few feet each side thereof will be covered with a geotextile wrapped sand drain. The geotextile and drain would then be covered with erosion protection armoring such as Sakcrete bags or gravel filled Geoweb up to a 4 inch size to militate against future erosion at the eroding plug location. A gravel filled Geoweb system may allow for some future vegetation re-growth into the Geoweb. A slotted PVC drain pipe would be inserted into the sand drain material to collect and discharge any seepage water passing through the plug. The ditch alignment to a distance of 10 feet from the toe of the backfilled plug slope would also be covered with geotextile fabric and a layer of erosion protection to provide an armored ditch surface leading up to the plug.

Personnel will be mobilized daily from Flamingo Marina. They will use a small boat to travel in Florida Bay, then inland from the Bay along the navigable reaches of House and Slagle Ditch. There may be some hand trimming of branches necessary for the safety of boat passengers. Neither plug can be accessed by water; personnel will have to disembark from the boats and walk, approximately 0.1 mile to House Ditch and 0.2 miles to Slagle Ditch. Some minor hand clearing may be necessary on the walking paths.

The helicopter will be used for 1.5 days for each plug. The contractor has provided a preliminary estimate of 7-9 lifts for House Ditch and 8-10 lifts for Slagle Ditch. This includes materials, equipment, and incidentals. There will be a 1/8 acre drop zone near the plug sites. Some limited clearing and ground planking will be required from inland drop areas near the plug to the Coastal Prairie trail. Personnel will hand carry supplies and equipment. It will take 3.5 days to complete the construction at Slagle Ditch and 3.5 days at House Ditch.

Personnel will locally hand trim and clear vegetation/roots from plug repair areas using tools such as machetes and saws. Fill will be hand placed and graded, then compacted with a small, vibratory, walk behind compactor. This alternative will require 12 CY of fill at House Ditch and 13 CY of fill at Slagle Ditch. Geotextile fabric and drain material, including slotted PVC pipe will be graded and hand placed. Erosion protection and associated geotextile fabric will be hand placed. Completed construction will be inspected and approved. Personnel will clean up the work site and demobilize miscellaneous bags, trash, and any equipment from job sites. Work will be limited to the period of October 1 – March 1 to avoid crocodile mating and nesting season.

### **Component Activities**

*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation of Personnel	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3.5 days per plug
2	Transportation of Materials & Equipment	Materials & Equipment transported via helicopter for 1.5 days per plug with 7-9 lifts for House & 8-10 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug
3	Method for Clearing Vegetation	Limited vegetation clearing using hand tools, including machetes and saws
4	Method for Placing Fill	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor
5	Erosion Protection	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.
6	Condition of Sites after Completion	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.

### **Wilderness Character**

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

### UNTRAMMELED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3.5 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 7-9 lifts for House & 8-10 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Untrammled Total Rating</u></b>		<b>0</b>		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While the canals and existing plugs are considered intentional manipulations in their own right, those manipulations occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation because the mandates of the Wilderness Act don't apply prior to designation.

While landing of helicopters and limited clearing of vegetation could have a minor impact, their intent is not to manipulate "the earth and its community of life," and the impacts are confined to a small area or are temporary and would have only a very small and inconsequential impact on the Untrammled quality. Reinforcement of the plugs would not hinder the biophysical environment any more than current conditions; however, it would extend the life of the plugs.

UNDEVELOPED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3.5 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 7-9 lifts for House & 8-10 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	4	NE
<u>Undeveloped Total Rating</u>		<b>-4</b>		

Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus, this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

Transportation via motorboat above submerged wilderness is the reason submerged wilderness exists in the first place, thus would have no effect upon this quality; however, the

use of a helicopter and motorized compactor are clear prohibitions as indicated by the Wilderness Act and thus are considered a negative for this quality. Furthermore, for the purposes of this discussion, the backfilling of the plug to its original extent as well as installation of additional erosion protection would both be considered a negative on this quality because the footprint would be expanded beyond current conditions and the existence of an installation in wilderness would be prolonged.

NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3.5 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 7-9 lifts for House & 8-10 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	0	NE
<u>Natural Total Rating</u>		1		

Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species

composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. Limited vegetation clearing was considered to have negligible impacts, and thus is identified as having no effect. It can be debated whether or not the reinforcement of existing plugs would have an effect on this quality. On the one hand, there would be no immediate effect by reinforcing the plugs; however, on the other hand, reinforcing the plugs could prevent a future catastrophic event which may expose the canal, as well as the interior of Cape Sable, to the conditions experienced at other failed plug sites. While House Ditch seems to be holding with only slight erosion, Slagle is showing signs that water is already passing through the plug, which is a precursor to failing. Given this, for the purposes of this discussion, preventing future degradation to the natural quality is considered a positive effect.

### SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3.5 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 7-9 lifts for House & 8-10 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	3	NE



**Solitude or Primitive & Unconfined Rec. Total Rating**

**-2**

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities.

The use of a helicopter and motorized compactor would clearly remind visitors of the modern world, and would thus have a negative effect upon opportunities for solitude, particularly for visitors walking the coastal prairie trail. In addition to fill, the reinforced plug would contain erosion protection features which may be more visible to park visitors, particularly when water levels are lower during the dry season when visitation is higher. As such, the visual evidence of the erosion protection features would have a negative effect upon opportunities for solitude.

It is also debatable whether or not reinforcement of the plug would have a benefit to this quality since the continued existence of the plug at Slagle Ditch provides an earthen bridge by which visitors can cross while walking the Coastal Prairie Trail enroute to Club House Beach, which provides primitive recreation opportunities in the form of hiking and camping; one of the only places in which this can be accomplished in the park let alone the wilderness. Similar to the natural quality, there would be no immediate effect by reinforcing the plug. However, should this plug be breached in the future, the path to Club House Beach would be impeded by the canal. As previously mentioned, Slagle Ditch is showing signs that water is already passing through the plug, which is a precursor to failing. While this could provide an opportunity for self-discovery in the form of unconfined recreation by finding individual, alternative ways to cross the canal, safety and resource management factors, including impacts to the natural quality of wilderness character, also have to be considered. For these reasons, there is an overall benefit and thus positive impact upon this quality.

**OTHER FEATURES OF VALUE**

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3.5 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 7-9 lifts for House & 8-10 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools,	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	including machetes and saws			
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Other Features of Value Total Rating</u></b>		<b>0</b>		

Explain:

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

### Traditional Skills

*What is the effect of each component activity on traditional skills?*

#### TRADITIONAL SKILLS

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3.5 days per plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

2	Materials & Equipment transported via helicopter for 1.5 days per plug with 7-9 lifts for House & 8-10 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		2	3	NE
<b><u>Traditional Skills Total Rating</u></b>		<b>-1</b>		

Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. Even though they are used above submerged wilderness, the use of motorboats would impair the preservation of traditional skills. Similarly, the use of a helicopter would also impair the preservation of traditional skills. The use of hand tools, as opposed to motorized equipment such as chainsaws, would maintain the proficiency in using these tools. Likewise, hand placing fill would also benefit proficiency in the use of traditional skills; however, the use of a motorized compactor would degrade such skills. As such, this component was awarded both a positive and a negative effect.

### **Economics**

*What is the estimated cost of each component activity?*

### **COST**

<u>Component Activity for this Alternative</u>	Estimated Cost
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X	<i>Example: Personnel will travel by horseback</i>	\$1,900
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 3.5 days per plug	
2	Materials & Equipment transported via helicopter for 1.5 days per plug with 7-9 lifts for House & 8-10 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	
3	Limited vegetation clearing using hand tools, including machetes and saws	
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	
<b>Total Estimated Cost</b>		<b>\$109,200</b>

Explain:

Cost amongst the alternatives are considered to be similar by the COR, and thus will not be a determining factor in deciding upon an alternative.

### Safety of Visitors & Workers

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>

Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
<a href="#">Risk Assessment</a>					

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

Risk Assessment was not provided by the contractor, COR, or park representative.

### Summary Ratings for Alternative 3

<b>Wilderness Character</b>	
<a href="#">Untrammeled</a>	0
<a href="#">Undeveloped</a>	-4
<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-2
<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>-6</b>
<b>Traditional Skills</b>	
<a href="#">Traditional Skills</a>	-1
<b>Economics</b>	
<a href="#">Cost</a>	\$109,200
<b>Safety</b>	
<a href="#">Risk Assessment</a>	N/A

### MRDG Step 2a: Alternative 4

**Alternative 4:** Reinforcement of Earthen Plug with Erosion Protection & Additional Fill via Helicopter

**Description of the Alternative**

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

In addition to backfilling the eroded plug areas, the ditches approaching the plug would be backfilled to the prevailing adjacent ground level to a distance of 10 feet from the toe of the plug slope with limerock fill. The slopes of the plug and the sloped end of the refilled ditch areas, including a few feet on each side, will be covered with a geotextile wrapped sand drain. The geotextile and sand drain would then be covered with erosion protection such as Sakcrete bags or gravel filled Geoweb to militate against future erosion on the exposed slope faces. A slotted PVC drain pipe would be inserted into the sand drain material to collect and discharge any seepage water entering the drain behind the erosion protection.

Personnel will be mobilized daily from Flamingo Marina. They will use a small boat to travel in Florida Bay, then inland from the Bay along the navigable reaches of House and Slagle Ditch. There may be some hand trimming of branches necessary for the safety of boat passengers. Neither plug can be accessed by water; personnel will have to disembark from the boats and walk, approximately 0.1 mile to House Ditch and 0.2 miles to Slagle Ditch. Some minor hand clearing may be necessary on the walking paths.

The helicopter will be used for 2 days for each plug. The contractor has provided a preliminary estimate of 8-10 lifts for House Ditch and 10-12 lifts for Slagle Ditch. This includes materials, equipment, and incidentals. There will be a 1/8 acre drop zone near the plug sites. Some limited clearing and ground planking will be required from inland drop areas near the plug to the Coastal Prairie trail. Personnel will hand carry supplies and equipment. It will take 4 days to complete the construction at Slagle Ditch and 4 days at House Ditch.

Personnel will locally hand trim and clear vegetation/roots from plug repair areas using tools such as machetes and saws. Fill will be hand placed and graded, then compacted with a small, vibratory, walk behind compactor. This alternative will require 18 CY of fill at House Ditch and 21 CY of fill at Slagle’s Ditch. Geotextile fabric and drain material, including slotted PVC pipe will be graded and hand placed. Erosion protection and associated geotextile fabric will be hand placed. Completed construction will be inspected and approved. Personnel will clean up the work site and demobilize miscellaneous bags, trash, and any equipment from job sites. Work will be limited to the period of October 1 – March 1 to avoid crocodile mating and nesting season.

**Component Activities**

*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>	Activity for this Alternative
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X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation of Personnel	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 4 days per plug
2	Transportation of Materials & Equipment	Materials & Equipment transported via helicopter for 2 days per plug with 8-10 lifts for House & 10-12 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug
3	Method for Clearing Vegetation	Limited vegetation clearing using hand tools, including machetes and saws
4	Method for Placing Fill	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor
5	Erosion Protection	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.
6	Condition of Sites after Completion	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.

**Wilderness Character**

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

UNTRAMMELED

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 4 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

2	Materials & Equipment transported via helicopter for 2 days per plug with 8-10 lifts for House & 10-12 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Untrammled Total Rating</u></b>		<b>0</b>		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While the canals and existing plugs are considered intentional manipulations in their own right, those manipulations occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation because the mandates of the Wilderness Act don't apply prior to designation.

While landing of helicopters and limited clearing of vegetation could have a minor impact, their intent is not to manipulate "the earth and its community of life," and the impacts are confined to a small area or are temporary and would have only a very small and inconsequential impact on the Untrammled quality. Reinforcement of the plugs would not hinder the biophysical environment any more than current conditions; however, it would extend the life of the plugs.

UNDEVELOPED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 4 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 2 days per plug with 8-10 lifts for House & 10-12 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	4	NE
<b><u>Undeveloped Total Rating</u></b>		<b>-4</b>		

Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus, this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

Transportation via motorboat above submerged wilderness is the reason submerged wilderness exists in the first place, thus would have no effect upon this quality; however, the use of a helicopter and motorized compactor are clear prohibitions as indicated by the Wilderness Act and thus are considered a negative for this quality. Furthermore, for the purposes of this discussion, the backfilling of the plug to its original extent as well as installation of additional erosion protection would both be considered a negative on this quality because the footprint would be expanded well beyond current conditions and the existence of an installation in wilderness would be prolonged.

NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 4 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 2 days per plug with 8-10 lifts for House & 10-12 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	0	NE
<u>Natural Total Rating</u>		1		

Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. Limited vegetation clearing was considered to have negligible impacts, and thus is identified as having no effect. It can be debated whether or not the reinforcement of existing plugs would have an effect on this quality. On the one hand, there would be no immediate effect by reinforcing the plugs; however, on the other hand, reinforcing the plugs could prevent a future catastrophic event which may expose the canal, as well as the interior of Cape Sable, to the conditions experienced at other failed plug sites. While House Ditch seems to be holding with only slight erosion, Slagle is showing signs that water is already

passing through the plug, which is a precursor to failing. Given this, for the purposes of this discussion, preventing future degradation to the natural quality is considered a positive effect.

### SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 4 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 2 days per plug with 8-10 lifts for House & 10-12 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	3	NE
<b><u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u></b>		<b>-2</b>		

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities.

The use of a helicopter and motorized compactor would clearly remind visitors of the modern world, and would thus have a negative effect upon opportunities for solitude, particularly for visitors walking the coastal prairie trail. In addition to fill, the reinforced plug would contain

erosion protection features which would be more visible to park visitors. As such, the visual evidence of the erosion protection features would have a negative effect upon opportunities for solitude.

It is also debatable whether or not reinforcement of the plug would have a benefit to this quality since the continued existence of the plug at Slagle Ditch provides an earthen bridge by which visitors can cross while walking the Coastal Prairie Trail enroute to Club House Beach, which provides primitive recreation opportunities in the form of hiking and camping; one of the only places in which this can be accomplished in the park let alone the wilderness. Similar to the natural quality, there would be no immediate effect by reinforcing the plug. However, should this plug be breached in the future, the path to Club House Beach would be impeded by the canal. As previously mentioned, Slagle Ditch is showing signs that water is already passing through the plug, which is a precursor to failing. While this could provide an opportunity for self-discovery in the form of unconfined recreation by finding individual, alternative ways to cross the canal, safety and resource management factors, including impacts to the natural quality of wilderness character, also have to be considered. For these reasons, there is an overall benefit and thus positive impact upon this quality.

#### OTHER FEATURES OF VALUE

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 4 days per plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via helicopter for 2 days per plug with 8-10 lifts for House & 10-12 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.			
Total Number of Effects		0	0	NE
<b><u>Other Features of Value Total Rating</u></b>		<b>0</b>		

Explain:

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

### Traditional Skills

*What is the effect of each component activity on traditional skills?*

#### TRADITIONAL SKILLS

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 4 days per plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Materials & Equipment transported via helicopter for 2 days per plug with 8-10 lifts for House & 10-12 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		2	3	NE
<b><u>Traditional Skills Total Rating</u></b>		<b>-1</b>		

Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. Even though they are used above submerged wilderness, the use of motorboats would impair the preservation of traditional skills. Similarly, the use of a helicopter would also impair the preservation of traditional skills. The use of hand tools, as opposed to motorized equipment such as chainsaws, would maintain the proficiency in using these tools. Likewise, hand placing fill would also benefit proficiency in the use of traditional skills; however, the use of a motorized compactor would degrade such skills. As such, this component was awarded both a positive and a negative effect.

### **Economics**

*What is the estimated cost of each component activity?*

### **COST**

<u>Component Activity for this Alternative</u>		Estimated Cost
X	<i>Example: Personnel will travel by horseback</i>	\$1,900
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot; ~5 person crew for 4 days per plug	
2	Materials & Equipment transported via helicopter for 2 days per plug with 8-10 lifts for House & 10-12 lifts for Slagle. Hand carried from 1/8 acre drop zone to plug	
3	Limited vegetation clearing using hand tools, including machetes and saws	
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of	

	each slope to collect & discharge seepage water.	
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	
<b>Total Estimated Cost</b>		<b>\$130,300</b>

Explain:

Cost amongst the alternatives are considered to be similar by the COR, and thus will not be a determining factor in deciding upon an alternative.

### Safety of Visitors & Workers

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT Severity of Accident	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
<b><u>Risk Assessment</u></b>					

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

Risk Assessment was not provided by the contractor, COR, or park representative.

### Summary Ratings for Alternative 4

<b>Wilderness Character</b>	
<b><u>Untrammeled</u></b>	0

<a href="#">Undeveloped</a>	-4
<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-2
<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>-6</b>
<b>Traditional Skills</b>	
<a href="#">Traditional Skills</a>	-1
<b>Economics</b>	
<a href="#">Cost</a>	\$130,300
<b>Safety</b>	
<a href="#">Risk Assessment</a>	N/A

## MRDG Step 2a: Alternative 5

**Alternative 5:** Reinforcement of Earthen Plug via Hydraulic Pumping

### Description of the Alternative

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

The eroded plugs will be backfilled with a gravelly limerock fill containing silty binder type fines. Locally available limerock fill, typical of that used for roadway base material in South Florida, will be used as backfill in the eroded area of the plug only. The backfill will be placed in sufficient quantities to only re-construct the original plug cross-section consistent with matching the adjacent plug slopes and elevation/grades. No other modifications would be made to the plug area to provide any additional erosion protection other than that afforded by compacting the fill in-place and providing a fill material containing silty limestone fines. These silty fines will have a propensity to dry out and become weakly cemented with time, therein providing a slight cementation in the fill similar to the present plug.

Personnel will be mobilized daily from Flamingo Marina. They will use a small boat to travel in Florida Bay, then inland from the Bay along the navigable reaches of House and Slagle Ditch. There may be some hand trimming of branches necessary for the safety of boat passengers. Neither plug can be accessed by water; personnel will have to disembark from



the boats and walk, approximately 0.1 mile to House Ditch and 0.2 miles to Slagle Ditch. Some minor hand clearing may be necessary on the walking paths.

Personnel will locally hand trim and clear vegetation/roots from plug repair areas using tools such as machetes and saws. The existing plug area will then be cleared and graded with hand tools. A geofabric containment tube will be positioned to receive and dewater pumped in granular slurry. A barge would be positioned at the mouth of Slagle/House Ditch. A skiff would be used to tow a floating pipeline (4 inch diameter High Density Polyethylene), to the walking path. A cable would then be walked to the plug site, where it would be anchored to a tree trunk using a large diameter idler sheave. The cable would then be attached to the pipeline, and would be winched to the plug site while manually guiding the pipeline around obstructions. The pipeline is then attached to the geofabric containment bag, and well-graded coarse sand or granular limestone material will be pumped from the barge to the plug site. This alternative will require 10 CY of fill for House and 10 CY for Slagle. The fill will be manually placed and graded, then compacted with a small, vibratory, walk behind compactor. Completed construction will be inspected and approved. Personnel will clean up the work site and demobilize miscellaneous bags, trash, and any equipment from job sites. Work will be limited to the period of October 1 – March 1 to avoid crocodile mating and nesting season.

**Component Activities**

*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation of Personnel	Personnel transported via small boats from Flamingo above submerged wilderness then on foot
2	Transportation of Materials & Equipment	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried from walking path to plug.
3	Method for Clearing Vegetation	Limited vegetation clearing using hand tools, including machetes and saws
4	Method for Placing Fill	Fill placed and graded by hand, then compacted with a small motorized vibratory

		walk behind compactor
5	Erosion Protection	No erosion protection required
6	Condition of Sites after Completion	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.

### Wilderness Character

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

### UNTRAMMELED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried from walking path to plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<u>Untrammeled Total Rating</u>		0		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While the canals and existing plugs are considered intentional manipulations in their

own right, those manipulations occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation because the mandates of the Wilderness Act don't apply prior to designation.

No action proposed within this alternative would impact this quality. While landing of helicopters and limited clearing of vegetation could have a minor impact, their intent is not to manipulate "the earth and its community of life," and the impacts are confined to a small area or are temporary and would have only a very small and inconsequential impact on the Untrammelled quality. The fill placed to repair the plug would not hinder the biophysical environment any more than current conditions; however, it would extend the life of the plugs.

**UNDEVELOPED**

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried from walking path to plug.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects				NE
<u>Undeveloped Total Rating</u>				

Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus, this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

Transportation via motorboat above submerged wilderness is the reason submerged wilderness exists in the first place, thus would have no effect upon this quality; however, the use of motorized equipment, including a compactor and winch, are clear prohibitions as indicated by the Wilderness Act and thus are considered a negative for this quality. Furthermore, for the purposes of this discussion, the backfilling of the plug to its original extent would be considered a negative on this quality because the footprint would be expanded beyond current conditions and the existence of an installation in wilderness, earthen as it is, would be prolonged.

#### NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	0	NE
<b><u>Natural Total Rating</u></b>		<b>1</b>		

#### Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. Limited vegetation clearing was considered to have negligible impacts, and thus is identified as having no effect. It can be debated whether or not the reinforcement

of existing plugs would have an effect on this quality. On the one hand, there would be no immediate effect by reinforcing the plugs; however, on the other hand, reinforcing the plugs could prevent a future catastrophic event which may expose the canal, as well as the interior of Cape Sable, to the conditions experienced at other failed plug sites. While House Ditch seems to be holding with only slight erosion, Slagle is showing signs that water is already passing through the plug, which is a precursor to failing. Given this, for the purposes of this discussion, preventing future degradation to the natural quality is considered a positive effect.

### SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	2	NE
<u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u>		-1		

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities.

The use of motorized equipment, including a compactor and winch, would clearly remind visitors of the modern world, and would thus have a negative effect upon opportunities for solitude, particularly for visitors walking the coastal prairie trail. Since the reinforced plug

would be fill only, the ability for visitors to notice would be negligible if at all. As such, the visual evidence of the re-filled plug would not have an effect upon opportunities for solitude.

It is also debatable whether or not reinforcement of the plug would have a benefit to this quality since the continued existence of the plug at Slagle Ditch provides an earthen bridge by which visitors can cross while walking the Coastal Prairie Trail enroute to Club House Beach, which provides primitive recreation opportunities in the form of hiking and camping; one of the only places in which this can be accomplished in the park let alone the wilderness. Similar to the natural quality, there would be no immediate effect by reinforcing the plug. However, should this plug be breached in the future, the path to Club House Beach would be impeded by the canal. As previously mentioned, Slagle Ditch is showing signs that water is already passing through the plug, which is a precursor to failing. While this could provide an opportunity for self-discovery in the form of unconfined recreation by finding individual, alternative ways to cross the canal, safety and resource management factors, including impacts to the natural quality of wilderness character, also have to be considered. For these reasons, there is an overall benefit and thus positive impact upon this quality.

#### OTHER FEATURES OF VALUE

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<u>Other Features of Value Total Rating</u>		<b>0</b>		

Explain:

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

### Traditional Skills

*What is the effect of each component activity on traditional skills?*

#### TRADITIONAL SKILLS

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	No erosion protection required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		2	3	NE
<a href="#">Traditional Skills Total Rating</a>		-1		

Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. Even though they are used above submerged wilderness, the use of motorboats would impair the preservation of traditional skills. Similarly, the use of a motorized winch would also impair the preservation of traditional skills. The use of hand tools, as opposed to motorized equipment such as chainsaws, would maintain the proficiency in using these tools. Likewise, hand placing fill would also benefit proficiency in the use of traditional skills; however, the use of a motorized compactor would degrade such skills. As such, this component was awarded both a positive and a negative effect.

**Economics**

*What is the estimated cost of each component activity?*

**COST**

<u>Component Activity for this Alternative</u>		Estimated Cost
X	<i>Example: Personnel will travel by horseback</i>	\$1,900
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	
3	Limited vegetation clearing using hand tools, including machetes and saws	
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	
5	No erosion protection required	
6	Eroded area of each plug backfilled to original extent with ~10 cubic yards of a gravelly limerock fill. All other equipment and debris will be removed from site.	
<b><u>Total Estimated Cost</u></b>		

Explain:

No cost was provided for this alternative; however, cost amongst the alternatives are considered to be similar by the COR, and thus will not be a determining factor in deciding upon an alternative.



## Safety of Visitors & Workers

What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?

RISK ASSESSMENT Severity of Accident	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
<a href="#">Risk Assessment</a>					

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

Risk Assessment was not provided by the contractor, COR, or park representative.

## Summary Ratings for Alternative 5

Wilderness Character	
<a href="#">Untrammeled</a>	0
<a href="#">Undeveloped</a>	-3
<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-1
<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>-4</b>
Traditional Skills	
<a href="#">Traditional Skills</a>	-1
Economics	

<a href="#">Cost</a>	N/A
<b>Safety</b>	
<a href="#">Risk Assessment</a>	N/A

## MRDG Step 2a: Alternative 6

**[Alternative 6:](#)** Reinforcement of Earthen Plug with Erosion Protection via Hydraulic Pumping

### Description of the Alternative

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

In addition to backfilling of the eroded plug areas, the slopes of the plug in the repaired area and a few feet each side thereof will be covered with a geotextile wrapped sand drain. The geotextile and drain would then be covered with erosion protection armoring such as Sakcrete bags or gravel filled Geoweb up to a 4 inch size to militate against future erosion at the eroding plug location. A gravel filled Geoweb system may allow for some future vegetation re-growth into the Geoweb. A slotted PVC drain pipe would be inserted into the sand drain material to collect and discharge any seepage water passing through the plug. The ditch alignment to a distance of 10 feet from the toe of the backfilled plug slope would also be covered with geotextile fabric and a layer of erosion protection to provide an armored ditch surface leading up to the plug.

Personnel will be mobilized daily from Flamingo Marina. They will use a small boat to travel in Florida Bay, then inland from the Bay along the navigable reaches of House and Slagle Ditch. There may be some hand trimming of branches necessary for the safety of boat passengers. Neither plug can be accessed by water; personnel will have to disembark from the boats and walk, approximately 0.1 mile to House Ditch and 0.2 miles to Slagle Ditch. Some minor hand clearing may be necessary on the walking paths.

Personnel will clear and grade the existing plug area with hand tools and position a geofabric containment tube to receive and dewater pumped in granular slurry. A barge would be positioned at the mouth of House/Slagle's Ditch. A skiff would be used to tow a floating pipeline (4 inch diameter High Density Polyethylene), to the walking path. A cable would then be walked to the plug site, where it would be anchored to a tree trunk using a large diameter idler sheave. The cable would then be attached to the pipeline, and would be winched to the plug site while manually guiding the pipeline around obstructions. The pipeline is then attached to the geofabric containment bag, and well-graded course sand or granular

limestone material will be pumped from the barge to the plug site. The fill will then be manually placed and graded, then compacted with a small, vibratory, walk behind compactor. This alternative will require 12 CY of fill at House Ditch and 13 CY of fill at Slagle's Ditch. Geofabric would then be placed along the slopes of the plug face and a few feet on each side. A slotted PVC drain pipe would be inserted into the sand drain material. Concrete bags or gravel filled geoweb articulating block mat forms would be hand carried and placed on the side slopes that are subject to erosion and scour. The barge would pump high strength fine aggregate cement into these forms through the pipeline. Completed construction will be inspected and approved. Personnel will clean up the work site and demobilize miscellaneous bags, trash, and any equipment from job sites. Work will be limited to the period of October 1 – March 1 to avoid crocodile mating and nesting season.

### Component Activities

*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation of Personnel	Personnel transported via small boats from Flamingo above submerged wilderness then on foot
2	Transportation of Materials & Equipment	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.
3	Method for Clearing Vegetation	Limited vegetation clearing using hand tools, including machetes and saws
4	Method for Placing Fill	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor
5	Erosion Protection	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the

		toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.
6	Condition of Sites after Completion	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.

### Wilderness Character

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

#### UNTRAMMELED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	Slagle. All other equipment and debris will be removed from site.			
Total Number of Effects		0	0	NE
<b><u>Untrammled Total Rating</u></b>		<b>0</b>		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While the canals and existing plugs are considered intentional manipulations in their own right, those manipulations occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation because the mandates of the Wilderness Act don't apply prior to designation.

While use of a motorized winch and limited clearing of vegetation could have a minor impact, their intent is not to manipulate "the earth and its community of life," and the impacts are confined to a small area or are temporary and would have only a very small and inconsequential impact on the Untrammled quality. Reinforcement of the plugs would not hinder the biophysical environment any more than current conditions; however, it would extend the life of the plugs.

#### UNDEVELOPED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

	toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.			
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	-4	NE
<u>Undeveloped Total Rating</u>		-4		

Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus, this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

Transportation via motorboat above submerged wilderness is the reason submerged wilderness exists in the first place, thus would have no effect upon this quality; however, the use of motorized equipment, including a compactor and winch, are clear prohibitions as indicated by the Wilderness Act and thus are considered a negative for this quality. Furthermore, for the purposes of this discussion, the backfilling of the plug to its original extent as well as installation of additional erosion protection would both be considered a negative on this quality because the footprint would be expanded beyond current conditions and the existence of an installation in wilderness would be prolonged.

## NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	0	NE
<b>Natural Total Rating</b>		<b>1</b>		

Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. Limited vegetation clearing was considered to have negligible impacts, and thus is identified as having no effect. It can be debated whether or not the reinforcement of existing plugs would have an effect on this quality. On the one hand, there would be no immediate effect by reinforcing the plugs; however, on the other hand, reinforcing the plugs could prevent a future catastrophic event which may expose the canal, as well as the interior of Cape Sable, to the conditions experienced at other failed plug sites. While House Ditch seems to be holding with only slight erosion, Slagle is showing signs that water is already passing through the plug, which is a precursor to failing. Given this, for the purposes of this discussion, preventing future degradation to the natural quality is considered a positive effect.

SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

	geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.			
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	3	NE
<b><u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u></b>		<b>-2</b>		

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities.

The use of motorized equipment, including a compactor and winch, would clearly remind visitors of the modern world, and would thus have a negative effect upon opportunities for solitude, particularly for visitors walking the coastal prairie trail. In addition to fill, the reinforced plug would contain erosion protection features which may be more visible to park visitors, particularly when water levels are lower during the dry season when visitation is higher. As such, the visual evidence of the erosion protection features would have a negative effect upon opportunities for solitude.

It is also debatable whether or not reinforcement of the plug would have a benefit to this quality since the continued existence of the plug at Slagle Ditch provides an earthen bridge by which visitors can cross while walking the Coastal Prairie Trail enroute to Club House Beach, which provides primitive recreation opportunities in the form of hiking and camping; one of the only places in which this can be accomplished in the park let alone the wilderness. Similar to



the natural quality, there would be no immediate effect by reinforcing the plug. However, should this plug be breached in the future, the path to Club House Beach would be impeded by the canal. As previously mentioned, Slagle Ditch is showing signs that water is already passing through the plug, which is a precursor to failing. While this could provide an opportunity for self-discovery in the form of unconfined recreation by finding individual, alternative ways to cross the canal, safety and resource management factors, including impacts to the natural quality of wilderness character, also have to be considered. For these reasons, there is an overall benefit and thus positive impact upon this quality.

#### OTHER FEATURES OF VALUE

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<u>Other Features of Value Total Rating</u>		<b>0</b>		

Explain:

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

### Traditional Skills

*What is the effect of each component activity on traditional skills?*

#### TRADITIONAL SKILLS

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an armored ditch.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	Slagle. All other equipment and debris will be removed from site.			
Total Number of Effects		2	3	NE
<b><u>Traditional Skills Total Rating</u></b>		<b>-1</b>		

Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. Even though they are used above submerged wilderness, the use of motorboats would impair the preservation of traditional skills. Similarly, the use of motorized winch would also impair the preservation of traditional skills. The use of hand tools, as opposed to motorized equipment such as chainsaws, would maintain the proficiency in using these tools. Likewise, hand placing fill would also benefit proficiency in the use of traditional skills; however, the use of a motorized compactor would degrade such skills. As such, this component was awarded both a positive and a negative effect.

### **Economics**

*What is the estimated cost of each component activity?*

### **COST**

<b><u>Component Activity for this Alternative</u></b>		<b>Estimated Cost</b>
X	<i>Example: Personnel will travel by horseback</i>	\$1,900
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	
3	Limited vegetation clearing using hand tools, including machetes and saws	
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	
5	Slopes of repaired area and a few feet on either side covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain to collect & discharge seepage water. 10 feet from the toe of the backfilled plug slope also covered with geotextile fabric and a layer of erosion protection to create an	

	armored ditch.	
6	Eroded area of each plug backfilled to original extent plus erosion protection with ~12 cubic yards of a gravelly limerock fill at House & ~13 cubic yards at Slagle. All other equipment and debris will be removed from site.	
<b>Total Estimated Cost</b>		

Explain:

No cost was provided for this alternative; however, cost amongst the alternatives are considered to be similar by the COR, and thus will not be a determining factor in deciding upon an alternative.

### Safety of Visitors & Workers

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT Severity of Accident	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
<b><u>Risk Assessment</u></b>					

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

Risk Assessment was not provided by the contractor, COR, or park representative.

### Summary Ratings for Alternative 6

<b>Wilderness Character</b>	
<b><u>Untrammeled</u></b>	0

<a href="#">Undeveloped</a>	-4
<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-3
<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>-6</b>
<b>Traditional Skills</b>	
<a href="#">Traditional Skills</a>	-1
<b>Economics</b>	
<a href="#">Cost</a>	
<b>Safety</b>	
<a href="#">Risk Assessment</a>	

## MRDG Step 2a: Alternative 7

### Alternative 7:

Reinforcement of Earthen Plug with Erosion Protection and Additional Fill via Hydraulic Pumping

#### **Description of the Alternative**

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

In addition to backfilling the eroded plug areas, the ditches approaching the plug would be backfilled to the prevailing adjacent ground level to a distance of 10 feet from the toe of the plug slope with limerock fill. The slopes of the plug and the sloped end of the refilled ditch areas, including a few feet on each side, will be covered with a geotextile wrapped sand drain. The geotextile and sand drain would then be covered with erosion protection such as Sakcrete bags or gravel filled Geoweb to militate against future erosion on the exposed slope faces. A slotted PVC drain pipe would be inserted into the sand drain material to collect and discharge any seepage water entering the drain behind the erosion protection.

Personnel will be mobilized daily from Flamingo Marina. They will use a small boat to travel in Florida Bay, then inland from the Bay along the navigable reaches of House and Slagle Ditch. There may be some hand trimming of branches necessary for the safety of boat passengers. Neither plug can be accessed by water; personnel will have to disembark from

the boats and walk, approximately 0.1 mile to House Ditch and 0.2 miles to Slagle Ditch. Some minor hand clearing may be necessary on the walking paths.

Personnel will clear and grade the existing plug area with hand tools and position a geofabric containment tube to receive and dewater pumped in granular slurry. A barge would be positioned at the mouth of Slagle Ditch. A skiff would be used to tow a floating pipeline (4 inch diameter High Density Polyethylene), to the walking path. A cable would then be walked to the plug site, where it would be anchored to a tree trunk using a large diameter idler sheave. The cable would then be attached to the pipeline, and would be winched to the plug site while manually guiding the pipeline around obstructions. The pipeline is then attached to the geofabric containment bag, and well-graded course sand or granular limestone material will be pumped from the barge to the plug site. The fill will then be manually placed and graded, then compacted with a small, vibratory, walk behind compactor. This alternative will require 18 CY of fill at House Ditch and 21 CY of fill at Slagle’s Ditch. Geofabric would then be placed along the slopes of the plug face and a few feet on each side. A slotted PVC drain pipe would be inserted into the sand drain material. Concrete bags or gravel filled geoweb articulating block mat forms would be hand carried and placed on the side slopes that are subject to erosion and scour. The barge would pump high strength fine aggregate cement into these forms through the pipeline. Completed construction will be inspected and approved. Personnel will clean up the work site and demobilize miscellaneous bags, trash, and any equipment from job sites. Work will be limited to the period of October 1 – March 1 to avoid crocodile mating and nesting season.

**Component Activities**  
*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation of Personnel	Personnel transported via small boats from Flamingo above submerged wilderness then on foot
2	Transportation of Materials & Equipment	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.

3	Method for Clearing Vegetation	Limited vegetation clearing using hand tools, including machetes and saws
4	Method for Placing Fill	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor
5	Erosion Protection	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.
6	Condition of Sites after Completion	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.

### Wilderness Character

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

### UNTRAMMELED

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Untrammeeled Total Rating</u></b>		<b>0</b>		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While the canals and existing plugs are considered intentional manipulations in their own right, those manipulations occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation because the mandates of the Wilderness Act don't apply prior to designation.

While use of a motorized winch and limited clearing of vegetation could have a minor impact, their intent is not to manipulate "the earth and its community of life," and the impacts are confined to a small area or are temporary and would have only a very small and inconsequential impact on the Untrammeeled quality. Reinforcement of the plugs would not hinder the biophysical environment any more than current conditions; however, it would extend the life of the plugs.

#### UNDEVELOPED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools,	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



	including machetes and saws			
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	4	NE
<u>Undeveloped Total Rating</u>		-4		

Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus, this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

Transportation via motorboat above submerged wilderness is the reason submerged wilderness exists in the first place, thus would have no effect upon this quality; however, the use of motorized equipment, including a compactor and winch, are clear prohibitions as indicated by the Wilderness Act and thus are considered a negative for this quality. Furthermore, for the purposes of this discussion, the backfilling of the plug to its original extent as well as installation of additional erosion protection would both be considered a negative on this quality because the footprint would be expanded beyond current conditions and the existence of an installation in wilderness would be prolonged.

#### NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.			
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	0	NE
<b>Natural Total Rating</b>		<b>1</b>		

Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. Limited vegetation clearing was considered to have negligible impacts, and thus is identified as having no effect. It can be debated whether or not the reinforcement of existing plugs would have an effect on this quality. On the one hand, there would be no immediate effect by reinforcing the plugs; however, on the other hand, reinforcing the plugs could prevent a future catastrophic event which may expose the canal, as well as the interior of Cape Sable, to the conditions experienced at other failed plug sites. While House Ditch seems to be holding with only slight erosion, Slagle is showing signs that water is already passing through the plug, which is a precursor to failing. Given this, for the purposes of this discussion, preventing future degradation to the natural quality is considered a positive effect.

SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		1	3	NE
<b><u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u></b>		<b>-2</b>		

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities.

The use of motorized equipment, including a compactor and winch, would clearly remind visitors of the modern world, and would thus have a negative effect upon opportunities for solitude, particularly for visitors walking the coastal prairie trail. In addition to fill, the reinforced plug would contain erosion protection features which would be more visible to park visitors. As such, the visual evidence of the erosion protection features would have a negative effect upon opportunities for solitude.

It is also debatable whether or not reinforcement of the plug would have a benefit to this quality since the continued existence of the plug at Slagle Ditch provides an earthen bridge by

which visitors can cross while walking the Coastal Prairie Trail enroute to Club House Beach, which provides primitive recreation opportunities in the form of hiking and camping; one of the only places in which this can be accomplished in the park let alone the wilderness. Similar to the natural quality, there would be no immediate effect by reinforcing the plug. However, should this plug be breached in the future, the path to Club House Beach would be impeded by the canal. As previously mentioned, Slagle Ditch is showing signs that water is already passing through the plug, which is a precursor to failing. While this could provide an opportunity for self-discovery in the form of unconfined recreation by finding individual, alternative ways to cross the canal, safety and resource management factors, including impacts to the natural quality of wilderness character, also have to be considered. For these reasons, there is an overall benefit and thus positive impact upon this quality.

#### OTHER FEATURES OF VALUE

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<u>Other Features of Value Total Rating</u>				

Explain:

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

### Traditional Skills

*What is the effect of each component activity on traditional skills?*

#### TRADITIONAL SKILLS

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Limited vegetation clearing using hand tools, including machetes and saws	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with ~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	other equipment and debris will be removed from site.			
Total Number of Effects		2	-3	NE
<b><u>Traditional Skills Total Rating</u></b>		<b>-1</b>		

Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. Even though they are used above submerged wilderness, the use of motorboats would impair the preservation of traditional skills. Similarly, the use of motorized winch would also impair the preservation of traditional skills. The use of hand tools, as opposed to motorized equipment such as chainsaws, would maintain the proficiency in using these tools. Likewise, hand placing fill would also benefit proficiency in the use of traditional skills; however, the use of a motorized compactor would degrade such skills. As such, this component was awarded both a positive and a negative effect.

### **Economics**

*What is the estimated cost of each component activity?*

#### **COST**

<b><u>Component Activity for this Alternative</u></b>		<b>Estimated Cost</b>
X	<i>Example: Personnel will travel by horseback</i>	<i>\$1,900</i>
1	Personnel transported via small boats from Flamingo above submerged wilderness then on foot	
2	Materials & Equipment transported via barge. A floating pipeline would be towed to the walking path then dragged via cable & winch to the plug site. A geofabric containment tube used to receive and dewater pumped in granular slurry. Other equipment hand carried to from walking path to plug.	
3	Limited vegetation clearing using hand tools, including machetes and saws	
4	Fill placed and graded by hand, then compacted with a small motorized vibratory walk behind compactor	
5	Slopes of plug and the sloped end of the refilled ditch, including a few feet on either side, covered with sand drain then erosion protection. Slotted PVC drain pipe inserted into sand drain of each slope to collect & discharge seepage water.	
6	Eroded area of each plug backfilled to the prevailing adjacent ground level to a distance of 10 feet plus erosion protection with	

~18 cubic yards of a gravelly limerock fill at House & ~21 cubic yards at Slagle. All other equipment and debris will be removed from site.	
<b><u>Total Estimated Cost</u></b>	

Explain:

No cost was provided for this alternative; however, cost amongst the alternatives are considered to be similar by the COR, and thus will not be a determining factor in deciding upon an alternative.

### Safety of Visitors & Workers

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT Severity of Accident	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
<b><u>Risk Assessment</u></b>					

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

Risk Assessment was not provided by the contractor, COR, or park representative.

### Summary Ratings for Alternative 7

Wilderness Character	
<u>Untrammeled</u>	0
<u>Undeveloped</u>	-4

<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-2
<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>-6</b>
<b>Traditional Skills</b>	
<a href="#">Traditional Skills</a>	-1
<b>Economics</b>	
<a href="#">Cost</a>	N/A
<b>Safety</b>	
<a href="#">Risk Assessment</a>	N/A

## MRDG Step 2a: Alternatives Not Analyzed

### Alternatives Not Analyzed

*What alternatives were considered but not analyzed? Why were they not analyzed?*

**Filling the ditches** - The IDT considered filling House and Slagle Ditch and Raulerson Canal. Filling the ditches would be much more expensive than the alternatives currently under consideration. The ditches are also considered to be a cultural resource. Filling the ditches would have a negative impact on the cultural resource by eliminating it completely. Filling the canals would have to be performed mechanically. Moving that quantity of fill by mule or helicopter would be almost impossible

**Using Mules to Transport Supplies and Equipment** – The IDT considered using mule trains to transport supplies and equipment to House and Slagle Ditch. If Design Alternative 2 were selected, it would take a 15 mule train 17 (20 trips) days to deliver supplies and equipment to House and Slagle Ditch. If Design Alternative 3 were selected, it would take the mule train 21 days (25 trips) to deliver supplies to House and Slagle Ditch. If Design Alternative 4 were selected, it would take 32 days (39 trips) to deliver supplies to House and Slagle Ditch. These deliveries would occur during the time of year that the Coastal Prairie Trail is most heavily utilized by visitors. The Coastal Prairie Trail is a dirt trail, subject to regular wetting. The many trips required to deliver supplies would cause ruts, particularly if the work period was rainy, and it would likely require substantial trail repair once the deliveries were completed. The Coastal Prairie Trail does not extend past Clubhouse Beach. An additional 1.6 miles of trail would have to be created and cleared to access House Ditch.



A water tank would need to be placed at Slagle Ditch for the mules to use. Mules are prone to eating seeds from their food, which will be deposited in their droppings in the park. These seeds may lead to the growth of invasive plant species. Mules require 25% forage for their diet, even if forage is provided; it is likely that the mules will graze in their enclosure at the park which could pose adverse environmental impacts. Mule droppings contaminate water supplies and may also contain harmful trace chemicals that affect the natural environment. Mule droppings and urine may be offensive to hikers and boaters. The problems related to mule droppings could be mitigated using manure bags.

## MRDG Step 2a: Alternative Comparison

<a href="#">Alternative 1:</a>	No Action
<a href="#">Alternative 2:</a>	Reinforcement of Earthen Plugs via Helicopter
<a href="#">Alternative 3:</a>	Reinforcement of Earthen Plugs with Erosion Protection via Helicopter
<a href="#">Alternative 4:</a>	Reinforcement of Earthen Plugs with Erosion Protection and Additional Fill via Helicopter

Wilderness Character	<a href="#">Alternative 1</a>		<a href="#">Alternative 2</a>		<a href="#">Alternative 3</a>		<a href="#">Alternative 4</a>	
	+	-	+	-	+	-	+	-
Untrammeled	0	0	0	0	0	0	0	0
Undeveloped	0	0	0	3	0	4	0	4
Natural	0	0	1	0	1	0	1	0
Solitude/Primitive/Unconfined	0	0	1	2	1	3	1	3
Other Features of Value	0	0	0	0	0	0	0	0
Total Number of Effects	0	0	2	5	2	7	2	7
<b>Wilderness Character Rating</b>	0		-3		-5		-5	

Traditional Skills	<a href="#">Alternative 1</a>		<a href="#">Alternative 2</a>		<a href="#">Alternative 3</a>		<a href="#">Alternative 4</a>	
	+	-	+	-	+	-	+	-
Traditional Skills	0	0	2	3	2	3	2	3
<b>Traditional Skills Rating</b>	0		-1		-1		-1	

Economics	<a href="#">Alternative 1</a>	<a href="#">Alternative 2</a>	<a href="#">Alternative 3</a>	<a href="#">Alternative 4</a>
Cost	\$0	\$100,100	\$109,200	\$130,300

<b>Safety of Visitors &amp; Workers</b>	<a href="#">Alternative 1</a>	<a href="#">Alternative 2</a>	<a href="#">Alternative 3</a>	<a href="#">Alternative 4</a>
Risk Assessment	N/A	N/A	N/A	N/A

<a href="#">Alternative 5:</a>	Reinforcement of Earthen Plugs via Hydraulic Pumping
<a href="#">Alternative 6:</a>	Reinforcement of Earthen Plugs with Erosion Protection via Hydraulic Pumping
<a href="#">Alternative 7:</a>	Reinforcement of Earthen Plugs with Erosion Protection and Additional Fill via Hydraulic Pumping

<b>Wilderness Character</b>	<a href="#">Alternative 5</a>		<a href="#">Alternative 6</a>		<a href="#">Alternative 7</a>	
	+	-	+	-	+	-
Untrammeled	0	0	0	0	0	0
Undeveloped	0	3	0	4	0	4
Natural	1	0	1	0	1	0
Solitude/Primitive/Unconfined	1	2	1	3	1	3
Other Features of Value	0	0	0	0	0	0
Total Number of Effects	2	5	2	7	2	7
<b>Wilderness Character Rating</b>	-3		-5		-5	
<b>Traditional Skills</b>	<a href="#">Alternative 5</a>		<a href="#">Alternative 6</a>		<a href="#">Alternative 7</a>	
	+	-	+	-	+	-
Traditional Skills	2	3	2	3	2	3
<b>Traditional Skills Rating</b>	-1		-1		-1	
<b>economics</b>	<a href="#">Alternative 5</a>		<a href="#">Alternative 6</a>		<a href="#">Alternative 7</a>	
Cost	N/A		N/A		N/A	
<b>Safety of Visitors &amp; Workers</b>	<a href="#">Alternative 5</a>		<a href="#">Alternative 6</a>		<a href="#">Alternative 7</a>	
Risk Assessment	N/A		N/A		N/A	

## MRDG Step 2b (Raulerson Canal)

Determine the Minimum Activity

### Other Direction

Is there “special provisions” language in legislation (or other Congressional direction) that explicitly **allows** consideration of a use otherwise prohibited by Section 4(c)?

**AND/OR**

Has the issue been addressed in agency policy, management plans, species recovery plans, or agreements with other agencies or partners?

YES

**DESCRIBE OTHER DIRECTION BELOW**

NO

**SKIP AHEAD TO TIME CONSTRAINTS BELOW**

Describe Other Direction:

### Time Constraints

What, if any, are the time constraints that may affect the action?

Work will be limited to the period of October 1 – March 1 to avoid crocodile mating and nesting season.

### Components of the Action

What are the discrete components or phases of the action?

Component X: *Example: Transportation of personnel to the project site*

Component 1: Transportation to Project Site

Component 2: Method for Clearing Vegetation

Component 3: Methods for Surveys & Core Collection

Component 4: Site Preparation

Component 5: Sheet Pile Installation

Component 6: Placement of Fill

Component 7: Erosion Protection

Component 8:	Visitor Features
Component 9:	Condition of Site After Completion

**Proceed to the alternatives.**

Refer to the [MRDG Instructions](#) regarding alternatives and the effects to each of the comparison criteria.

## MRDG Step 2b: Alternative 1

**Alternative 1:** No Action

**Description of the Alternative**  
*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

The Take No-Action alternative involves leaving the failed plug in its present condition and allowing the canal to continue to erode, widen and transport suspended sediment to the inland marshes as well as to Florida Bay and the Gulf of Mexico. The unnatural exchange of fresh and saltwater will continue within the wetlands, and the value of habitat for wading birds, juvenile crocodiles, and other wildlife will remain degraded.

**Component Activities**  
*How will each of the components of the action be performed under this alternative?*

<a href="#">Component of the Action</a>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation to Project Site	No transportation is required
2	Method for Clearing Vegetation	Vegetation clearing is not required
3	Methods for Surveys & Core Collection	Surveys & core collection are not required
4	Site Preparation	Site Preparation not required
5	Sheet Pile Installation	Sheet Pile Installation not required
6	Placement of Fill	Placement of Fill not required
7	Erosion Protection	Erosion Protection not required
8	Visitor Features	Visitor Features not required

9	Condition of Site After Completion	Raulerson Canal would remain unplugged
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### Wilderness Character

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

#### UNTRAMMELED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	No transportation is required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation clearing is not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys & core collection are not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site Preparation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet Pile Installation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Placement of Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Visitor Features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Raulerson Canal would remain unplugged	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<u>Untrammeled Total Rating</u>		0		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While the canal is considered an intentional manipulation in its own right, those manipulations occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation because the mandates of the Wilderness Act don't apply prior to designation. By conducting no action, the wilderness is free from any additional intentional manipulations imposed upon the biophysical environment.

#### UNDEVELOPED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

1	No transportation is required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation clearing is not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys & core collection are not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site Preparation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet Pile Installation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Placement of Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Visitor Features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Raulerson Canal would remain unplugged	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Undeveloped Total Rating</u></b>		<b>0</b>		

Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus, this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment. By conducting no action, the use of anything generally prohibited within a wilderness area is not required.

#### NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	No transportation is required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation clearing is not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys & core collection are not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site Preparation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet Pile Installation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Placement of Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Visitor Features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Raulerson Canal would remain unplugged	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Total Number of Effects	0	1	NE
<b><u>Natural Total Rating</u></b>	<b>-1</b>		

Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. By conducting no action, Raulerson Canal would continue to erode, widen and transport suspended sediment to the inland marshes as well as to Florida Bay and the Gulf of Mexico. The unnatural exchange of fresh and saltwater will continue within the wetlands on the interior of Cape Sable, and the value of habitat for wading birds, juvenile crocodiles, and other wildlife would remain degraded.

#### SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	No transportation is required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation clearing is not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys & core collection are not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site Preparation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet Pile Installation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Placement of Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Visitor Features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Raulerson Canal would remain unplugged	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u></b>		<b>0</b>		

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities. By conducting no action, the setting would be unaltered from current conditions, and thus would have no effect on this quality. However, it is noted that unauthorized motorboat access into the wilderness is possible through this canal; however, it

is unknown how much this is an issue, and there are other natural creeks that could allow the same access.

### OTHER FEATURES OF VALUE

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	No transportation is required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation clearing is not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys & core collection are not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site Preparation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet Pile Installation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Placement of Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Visitor Features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Raulerson Canal would remain unplugged	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Other Features of Value Total Rating</u></b>		<b>0</b>		

Explain:

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

### **Traditional Skills**

*What is the effect of each component activity on traditional skills?*

### TRADITIONAL SKILLS

<u>Component Activity for this Alternative</u>	Positive	Negative	No Effect
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X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	No transportation is required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation clearing is not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys & core collection are not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site Preparation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet Pile Installation not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Placement of Fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Erosion Protection not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Visitor Features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Raulerson Canal would remain unplugged	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Traditional Skills Total Rating</u></b>		<b>0</b>		

Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. Given that no action would take place, proficiency in the use of traditional skills is neither preserved nor eroded.

### **Economics**

*What is the estimated cost of each component activity?*

### **COST**

<u>Component Activity for this Alternative</u>		Estimated Cost
X	<i>Example: Personnel will travel by horseback</i>	\$1,900
1	No transportation is required	
2	Vegetation clearing is not required	
3	Surveys & core collection are not required	
4	Site Preparation not required	
5	Sheet Pile Installation not required	
6	Placement of Fill not required	
7	Erosion Protection not required	

8	Visitor Features not required	
9	Raulerson Canal would remain unplugged	
<b>Total Estimated Cost</b>		<b>\$0</b>

Explain:

N/A

### Safety of Visitors & Workers

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT Severity of Accident	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
<b>Risk Assessment</b>					

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

N/A

### Summary Ratings for Alternative 1

Wilderness Character	
<a href="#">Untrammeled</a>	0
<a href="#">Undeveloped</a>	0
<a href="#">Natural</a>	-1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	0

<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>-1</b>
<b>Traditional Skills</b>	
<a href="#">Traditional Skills</a>	0
<b>Economics</b>	
<a href="#">Cost</a>	N/A
<b>Safety</b>	
<a href="#">Risk Assessment</a>	N/A

## MRDG Step 2b: Alternative 2

**Alternative 2:** Sheet Pile (Without Earthen Plug) with Rip Rap Erosion Protection

### Description of the Alternative

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

Cross canal sheet piling with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. This design would provide a cross canal cutoff which would not be subject to internal erosion and end around seepage failure. This design would be an expanded version of the cross canal sheet piling design used earlier for the Homestead and East Cape Canal cutoffs constructed in the later 1990's.

The area around the inland extension and around the ends of the inland sheet piling would be armored with geotextile covered by 12 inch average to 18 inch sized rip rap needed to mitigate erosion action immediately adjacent to and at the end of the sheets. The cross canal sheet piling section would be extended some 15 feet inland from the canal to seat the cross canal plug well into the adjacent land surface. The area around the inland extension and around the inland end of the inland sheet piling would be armored with geotextile and rip rap to mitigate flow related erosion action adjacent to the sheets. Rip rap would be of a 12 inch average to 18 inch maximum size stone.

The side bank sheet piling would be installed within a few feet of the edge of the pre-existing canal and would be driven to an elevation of 0.0 to -0.5 feet below the prevailing ground surface. The intent of the side bank sheet piling is to allow for overland high tide events to

flow around the cross canal cutoff sheet piling and then to re-enter the canal by flowing back over the top of the side bank sheet piling. The gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill to within 2 feet of the top of the sheets, a geotextile filter fabric will then be placed and the remainder of the gap would be filled with rip rap stone up to an 18" max, 12" average size rock. The side bank canal sheet piling and rip rap would provide an armored and protected overflow region both upstream and downstream of the main plug cutoff that would not become eroded by such over topping events.

The plug would be built at the location of the previous plug, at the bend in the canal where it turns to the east. Work will be limited to the period of October 1 – March 1 to avoid crocodile mating and nesting season.

Prior to construction, a crew would be deployed to take a geophysical boring at the selected plug location on Raulerson Canal. This would require transport to the site by motor boat. The exact site will be selected during the field visit, but is expected to be close to the plug location. The equipment used to obtain the borings is not motorized and consists of a tripod fitted with a drop hammer that drives the coring device. The retrieved cores will be about 2 inches in diameter and approximately 8 to 12 feet long. Approximately 1 day would be required, as the boring will only be taken at one site. Equipment will be carried to the boring location and operated by hand. A crew of four people will be required to complete this task. Crew communication and the drop hammer used for boring will create some noise. Short term and minimal disturbance of vegetation can be expected. The crew will be instructed to minimize impacts of this activity on vegetation and wildlife.

Surveying will be performed at the plug site and the nearby land surface throughout construction. Surveys could be conducted via optical, laser, or GPS methodologies.

Mangrove canopy will be required to be cut back to facilitate barge and equipment access along the canal. There is vegetation that will be required to be cut within the wilderness boundary. Vegetation will be trimmed by hand. The vegetation will be trimmed from land when possible, but the use of a motor boat may eliminate some unnecessary trimming. There may also be vegetation that must be trimmed at the plug location. That vegetation will be trimmed on foot and by the use hand tools. A small motor boat will be necessary to transport the cut vegetation from the plug site to a barge for disposal.

A motorized barge would be necessary to provide a working platform for the plug installation. Most work activities would take place on the barge. The contractor has proposed to install a temporary plug to help slow down the water flow to make sheet pile installation and barge movement easier. The portadam concept utilizes a steel supporting structure with a continuous reinforced liner/membrane to effectively provide a means of water diversion, retention, or impoundment. If the temporary plug is installed, the barge will not need to constantly engage the engine to remain in place. Localized mechanical excavation would be necessary to remove the failed plug, parts of which are still present below the water surface in

Raulerson Canal. The barge would also provide a platform for equipment capable of clearing the vegetation and preparing the wing wall areas for sheetpile and riprap. Mechanical equipment will also be necessary for lifting and driving 20 foot long sheet piling. Sheet piling and other materials would be delivered to the plug sites, most of this would be stored on a barge positioned outside the wilderness boundary, but it might be necessary to store some items in the cleared area where the wing walls will be installed. A small motor boat will also be operated to transport the work force from Flamingo to Raulerson Canal. The motor boat will also be used to transport equipment and staff around the work location.

The anticipated construction sequence is as follows. The easternmost sheet pile will be driven and the backfill and rip-rap erosion protection will be installed for the eastern half of the plug. The canal cutoff sheets will be driven, along with the westernmost sheet piling. The sheet pile and rip-rap erosion protection will be installed in the cutoff plug area and along the westernmost canal sheet piling. The contractor will then cleanup and demobilize remnant materials and equipment, including the barges from the plug site.

**Component Activities**

*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation to Project Site	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.
2	Method for Clearing Vegetation	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.
3	Methods for Surveys & Core Collection	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.
4	Site Preparation	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug
5	Sheet Pile Installation	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.

6	Placement of Fill	Large-scale fill not required
7	Erosion Protection	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.
8	Visitor Features	Visitor features not required
9	Condition of Site After Completion	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.

### Wilderness Character

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

### UNTRAMMELED

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also,	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

	localized mechanical excavation to remove remnants of the failed plug			
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Visitor features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	2	NE
<b><u>Untrammed Total Rating</u></b>		<b>-2</b>		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While Raulerson Canal is considered an intentional manipulation in its own right, this manipulation occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation because the mandates of the Wilderness Act don't apply prior to designation.

While the use of motorboats and other mechanical equipment as well as limited clearing of vegetation could have a minor impact, their intent is not to manipulate "the earth and its community of life," and the impacts are confined to a small area or are temporary and would have only a very small and inconsequential impact on the Untrammed quality. The use of a temporary dam to cease flow of water through the dam during construction activities would negatively impact this quality. Likewise, the presence of a permanent plug once construction is completed would also be a negative effect.

UNDEVELOPED

<a href="#">Component Activity for this Alternative</a>	Positive	Negative	No Effect
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X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	Visitor features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	5	NE
<b><u>Undeveloped Total Rating</u></b>		<b>-5</b>		

Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing



mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus, this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

While some motorboat transportation would occur above submerged wilderness, once on site, the boat would continue to operate within designated wilderness. As such, this would have a negative effect upon this quality. The use of survey and coring equipment would not be considered installations since they would not remain in the wilderness once the user has left the area, thus a determination of no effect. Installation of a temporary dam, mechanical excavation, mechanical installation of sheet piles, installation of erosion protection, and existence of permanent plug once construction is completed would all have a negative effect upon this quality. Obviously some more permanent than others.

NATURAL

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

8	Visitor features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	0	NE
<b><u>Natural Total Rating</u></b>		1		

Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. Limited vegetation clearing was considered to have negligible impacts, and thus is identified as having no effect. Based on information presented to the IDT during scoping meetings for the EA process and shared with the Wilderness Committee, plugging Raulerson Canal is expected to have a significant impact upon the natural environment of the inland marshes on Cape Sable. Among other things, the unnatural exchange of fresh and saltwater would cease within the wetlands, and the quality of habitat for wading birds, juvenile crocodiles, and other wildlife is expected to improve.

**SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION**

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	Visitor features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	5	NE
<b>Solitude or Primitive &amp; Unconfined Rec. Total Rating</b>		<b>-5</b>		

**Explain:**

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities.

While some motorboat transportation would occur above submerged wilderness, once on site, the boat would continue to operate within designated wilderness. As such, this would have a negative effect upon this quality. Furthermore, the installation of a temporary dam, mechanical excavation, mechanical installation of sheet piles, installation of erosion protection, and existence of permanent plug once construction is completed would all clearly remind visitors of the modern world, and would thus have a negative effect upon opportunities for solitude. Some of these impacts would last much longer than others.

**OTHER FEATURES OF VALUE**

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Visitor features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<u>Other Features of Value Total Rating</u>		<b>0</b>		

Explain:

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

### Traditional Skills

*What is the effect of each component activity on traditional skills?*

#### TRADITIONAL SKILLS

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18"	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	max, 12" average size rock.			
8	Visitor features not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		2	4	NE
<b><u>Traditional Skills Total Rating</u></b>		<b>-2</b>		

Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. The use of motorboats would impair the preservation of traditional skills, as would the use of mechanical means to excavate the site during prep and install sheet piles. The use of hand tools to clear vegetation, as opposed to motorized equipment such as chainsaws, would maintain the proficiency in using these tools. The use of a non-motorized drop hammer would also appear to maintain the proficiency in using traditional skills; however, GPS enabled survey equipment could be perceived as an impairment upon traditional skills.

### **Economics**

*What is the estimated cost of each component activity?*

### **COST**

<b><u>Component Activity for this Alternative</u></b>		<b>Estimated Cost</b>
X	<i>Example: Personnel will travel by horseback</i>	<b>\$1,900</b>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	

4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	
6	Large-scale fill not required	
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	
8	Visitor features not required	
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.	
<b>Total Estimated Cost</b>		<b>\$1, 380,000</b>

Explain:

Cost amongst the alternatives are considered to be similar by the COR, and thus will not be a determining factor in deciding upon an alternative.

### Safety of Visitors & Workers

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>

<a href="#">Risk Assessment</a>	
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Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

Risk Assessment was not provided by the contractor, COR, or park representative.

<b>Summary Ratings for Alternative 2</b>
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<b>Wilderness Character</b>	
<a href="#">Untrammeled</a>	-2
<a href="#">Undeveloped</a>	-5
<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-5
<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>-11</b>
<b>Traditional Skills</b>	
<a href="#">Traditional Skills</a>	-2
<b>Economics</b>	
<a href="#">Cost</a>	<b>\$1, 380,000</b>
<b>Safety</b>	
<a href="#">Risk Assessment</a>	N/A

### MRDG Step 2b: Alternative 3

**Alternative 3:** Sheet Pile (Without Earthen Plug) with Rip Rap Erosion Protection and Canoe Ramp



## **Description of the Alternative**

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

Cross canal sheet piling with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. This design would provide a cross canal cutoff which would not be subject to internal erosion and end around seepage failure. This design would be an expanded version of the cross canal sheet piling design used earlier for the Homestead and East Cape Canal cutoffs constructed in the later 1990's.

The area around the inland extension and around the ends of the inland sheet piling would be armored with geotextile covered by 12 inch average to 18 inch sized rip rap needed to mitigate erosion action immediately adjacent to and at the end of the sheets. The cross canal sheet piling section would be extended some 15 feet inland from the canal to seat the cross canal plug well into the adjacent land surface. The area around the inland extension and around the inland end of the inland sheet piling would be armored with geotextile and rip rap to mitigate flow related erosion action adjacent to the sheets. Rip rap would be of a 12 inch average to 18 inch maximum size stone.

The side bank sheet piling would be installed within a few feet of the edge of the pre-existing canal and would be driven to an elevation of 0.0 to -0.5 feet below the prevailing ground surface. The intent of the side bank sheet piling is to allow for overland high tide events to flow around the cross canal cutoff sheet piling and then to re-enter the canal by flowing back over the top of the side bank sheet piling. The gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill to within 2 feet of the top of the sheets, a geotextile filter fabric will then be placed and the remainder of the gap would be filled with rip rap stone up to an 18" max, 12" average size rock. The side bank canal sheet piling and rip rap would provide an armored and protected overflow region both upstream and downstream of the main plug cutoff that would not become eroded by such over topping events.

Also included in this alternative is a canoe access ramp area for the portage of canoes and kayaks over the plug sheet piling. A ramp width of 8 feet is initially proposed however, a 10' wide ramp could be provided. The ramp area will be horizontally contained and protected by sheet piling and in-filled with #57 coarse stone gravel. A concrete in-filled geotextile/geoblock system will be used to cover the 4H:1V sloping surface of the ramp between the sheet piling and a wooden lattice cover will be installed to provide a foot hold for the porting recreationist as well as to provide a protective layer to prevent plugage to watercraft entering the ramp area.

The plug would be built at the location of the previous plug, at the bend in the canal where it turns to the east. Work will be limited to the period of October 1 – March 1 to avoid crocodile

mating and nesting season.

Prior to construction, a crew would be deployed to take a geophysical boring at the selected plug location on Raulerson Canal. This would require transport to the site by motor boat. The exact site will be selected during the field visit, but is expected to be close to the plug location. The equipment used to obtain the borings is not motorized and consists of a tripod fitted with a drop hammer that drives the coring device. The retrieved cores will be about 2 inches in diameter and approximately 8 to 12 feet long. Approximately 1 day would be required, as the boring will only be taken at one site. Equipment will be carried to the boring location and operated by hand. A crew of four people will be required to complete this task. Crew communication and the drop hammer used for boring will create some noise. Short term and minimal disturbance of vegetation can be expected. The crew will be instructed to minimize impacts of this activity on vegetation and wildlife.

Surveying will be performed at the plug site and the nearby land surface throughout construction. Surveys could be conducted via optical, laser, or GPS methodologies.

Mangrove canopy will be required to be cut back to facilitate barge and equipment access along the canal. There is vegetation that will be required to be cut within the wilderness boundary. Vegetation will be trimmed by hand. The vegetation will be trimmed from land when possible, but the use of a motor boat may eliminate some unnecessary trimming. There may also be vegetation that must be trimmed at the plug location. That vegetation will be trimmed on foot and by the use of hand tools. A small motor boat will be necessary to transport the cut vegetation from the plug site to a barge for disposal.

A motorized barge would be necessary to provide a working platform for the plug installation. Most work activities would take place on the barge. The contractor has proposed to install a temporary plug to help slow down the water flow to make sheet pile installation and barge movement easier. The portadam concept utilizes a steel supporting structure with a continuous reinforced liner/membrane to effectively provide a means of water diversion, retention, or impoundment. If the temporary plug is installed, the barge will not need to constantly engage the engine to remain in place. Localized mechanical excavation would be necessary to remove the failed plug, parts of which are still present below the water surface in Raulerson Canal. The barge would also provide a platform for equipment capable of clearing the vegetation and preparing the wing wall areas for sheetpile and riprap. Mechanical equipment would also be necessary for lifting and driving 20 foot long sheet piling. Sheet piling and other materials would be delivered to the plug sites, most of this would be stored on a barge positioned outside the wilderness boundary, but it might be necessary to store some items in the cleared area where the wing walls will be installed. A small motor boat will also be operated to transport the work force from Flamingo to Raulerson Canal. The motor boat will also be used to transport equipment and staff around the work location.

The anticipated construction sequence is as follows. This work will take place on the barge with mechanized equipment. The easternmost sheet pile will be driven and the backfill and

rip-rap erosion protection will be installed for the eastern half of the plug. The canal cutoff sheets will be driven, along with the canoe ramp sheets and the westernmost sheet piling. The canoe ramp will be installed. The sheet pile and rip-rap erosion protection will be installed in the cutoff plug area and along the westernmost canal sheet piling. The contractor will then cleanup and demobilize remnant materials and equipment, including the barges from the plug site.

### Component Activities

*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation to Project Site	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.
2	Method for Clearing Vegetation	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.
3	Methods for Surveys & Core Collection	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.
4	Site Preparation	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug
5	Sheet Pile Installation	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.
6	Placement of Fill	Large-scale fill not required
7	Erosion Protection	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.

8	Visitor Features	Installation of a canoe ramp (8-10 feet wide) to be horizontally contained and protected by sheet piling and filled with coarse stone gravel. A concrete filled geotextile/geoblock system to be used to cover the sloping surface of the ramp between the sheet piling. A wooden lattice cover would be installed to provide a foot hold for porting recreationists
9	Condition of Site After Completion	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.

### Wilderness Character

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

### UNTRAMMELED

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

	block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug			
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Installation of a canoe ramp (8-10 feet wide) to be horizontally contained and protected by sheet piling and filled with coarse stone gravel. A concrete filled geotextile/geoblock system to be used to cover the sloping surface of the ramp between the sheet piling. A wooden lattice cover would be installed to provide a foot hold for porting recreationists	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	2	NE
<b><u>Untrammled Total Rating</u></b>		<b>-2</b>		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While Raulerson Canal is considered an intentional manipulation in its own right, this manipulation occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation because the mandates of the Wilderness Act don't apply prior to designation.

While the use of motorboats and other mechanical equipment as well as limited clearing of vegetation could have a minor impact, their intent is not to manipulate "the earth and its community of life," and the impacts are confined to a small area or are temporary and would have only a very small and inconsequential impact on the Untrammled quality. The use of a

temporary dam to cease flow of water through the dam during construction activities would negatively impact this quality. Likewise, the presence of a permanent plug once construction is completed would also be a negative effect.

## UNDEVELOPED

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	Installation of a canoe ramp (8-10 feet wide) to be horizontally contained and protected by sheet piling and filled with coarse stone gravel. A concrete filled geotextile/geoblock system to be used to cover the sloping surface of the ramp between the sheet piling. A wooden lattice cover would be installed to provide a foot hold for porting recreationists	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

	canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.			
Total Number of Effects		0	6	NE
<u>Undeveloped Total Rating</u>		-6		

Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus, this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

While some motorboat transportation would occur above submerged wilderness, once on site, the boat would continue to operate within designated wilderness. As such, this would have a negative effect upon this quality. The use of survey and coring equipment would not be considered installations since they would not remain in the wilderness once the user has left the area, thus a determination of no effect. Installation of a temporary dam, mechanical excavation, mechanical installation of sheet piles, installation of erosion protection, canoe ramp features, and existence of permanent plug once construction is completed would all have a negative effect upon this quality. Obviously some more permanent than others.

#### NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also,	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



	localized mechanical excavation to remove remnants of the failed plug			
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Installation of a canoe ramp (8-10 feet wide) to be horizontally contained and protected by sheet piling and filled with coarse stone gravel. A concrete filled geotextile/geoblock system to be used to cover the sloping surface of the ramp between the sheet piling. A wooden lattice cover would be installed to provide a foot hold for porting recreationists	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	0	NE
<b><u>Natural Total Rating</u></b>		<b>1</b>		

Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. Limited vegetation clearing was considered to have negligible impacts, and thus is identified as having no effect. Based on information presented to the IDT during scoping meetings for the EA process and shared with the Wilderness Committee, plugging Raulerson Canal is expected to have a significant impact upon the natural environment of the inland marshes on Cape Sable. Among other things, the unnatural exchange of fresh and saltwater would cease within the wetlands, and the quality of habitat for wading birds, juvenile crocodiles, and other wildlife is expected to improve.



SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	Installation of a canoe ramp (8-10 feet wide) to be horizontally contained and protected by sheet piling and filled with coarse stone gravel. A concrete filled geotextile/geoblock system to be used to cover the sloping surface of the ramp between the sheet piling. A wooden lattice cover would be installed to provide a foot hold for porting recreationists	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

	would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.			
Total Number of Effects		1	6	NE
<b><u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u></b>		<b>-5</b>		

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities.

While some motorboat transportation would occur above submerged wilderness, once on site, the boat would continue to operate within designated wilderness. As such, this would have a negative effect upon this quality. Furthermore, the installation of a temporary dam, mechanical excavation, mechanical installation of sheet piles, installation of erosion protection, and existence of permanent plug once construction is completed would all clearly remind visitors of the modern world, and would thus have a negative effect upon opportunities for solitude. Some of these impacts would last much longer than others.

The presence of a canoe ramp could be perceived in different ways with regards to this quality. The canoe portage features would facilitate an opportunity for primitive recreation within the wilderness, however, these features would require improvements to the plug design that would resemble, and most likely be considered, an agency-provided recreation facility which would impact opportunities for unconfined recreation.

OTHER FEATURES OF VALUE

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Installation of a canoe ramp (8-10 feet wide) to be horizontally contained and protected by sheet piling and filled with coarse stone gravel. A concrete filled geotextile/geoblock system to be used to cover the sloping surface of the ramp between the sheet piling. A wooden lattice cover would be installed to provide a foot hold for porting recreationists	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Other Features of Value Total Rating</u></b>		<b>0</b>		

**Explain:**

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

## Traditional Skills

What is the effect of each component activity on traditional skills?

### TRADITIONAL SKILLS

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Large-scale fill not required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Installation of a canoe ramp (8-10 feet wide) to be horizontally contained and protected by sheet piling and filled with coarse stone gravel. A concrete filled geotextile/geoblock system to be used to cover the sloping surface of the ramp between the sheet piling. A wooden lattice cover would be installed to provide a foot hold for porting recreationists	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Existence of a cross canal sheet piling extending ~15	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.			
Total Number of Effects		3	4	NE
<b><u>Traditional Skills Total Rating</u></b>		<b>-1</b>		

Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. The use of motorboats would impair the preservation of traditional skills, as would the use of mechanical means to excavate the site during prep and install sheet piles. The use of hand tools to clear vegetation, as opposed to motorized equipment such as chainsaws, would maintain the proficiency in using these tools. The use of a non-motorized drop hammer would also appear to maintain the proficiency in using traditional skills; however, GPS enabled survey equipment could be perceived as an impairment upon traditional skills. While the installation of a canoe ramp would not affect the preservation of traditional skills during construction, it may encourage, or at least facilitate, the use of canoes/kayaks by visitors upon completion.

### **Economics**

*What is the estimated cost of each component activity?*

#### **COST**

<b><u>Component Activity for this Alternative</u></b>		<b>Estimated Cost</b>
X	<i>Example: Personnel will travel by horseback</i>	<b>\$1,900</b>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to	

	remove remnants of the failed plug	
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	
6	Large-scale fill not required	
7	For erosion protection, the gap area between the side bank sheets and the eroded canal side bank would be backfilled with sand fill, then covered with a geotextile filter fabric and rip rap stone up to an 18" max, 12" average size rock.	
8	Installation of a canoe ramp (8-10 feet wide) to be horizontally contained and protected by sheet piling and filled with coarse stone gravel. A concrete filled geotextile/geoblock system to be used to cover the sloping surface of the ramp between the sheet piling. A wooden lattice cover would be installed to provide a foot hold for porting recreationists	
9	Existence of a cross canal sheet piling extending ~15 feet inland from the canal with sheet pile protected canal side banks extending up to 200 feet up and down stream of the plug cutoff for both sides of the cross canal sheet pile section. Erosion protection would cover the banks up to 400 feet on both sides of the canal. All other equipment and debris will be removed from site.	
<b>Total Estimated Cost</b>		\$1,455,000

Explain:

Cost amongst the alternatives are considered to be similar by the COR, and thus will not be a determining factor in deciding upon an alternative.

### Safety of Visitors & Workers

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>

Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
<a href="#">Risk Assessment</a>					

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

Risk Assessment was not provided by the contractor, COR, or park representative.

### Summary Ratings for Alternative 3

<b>Wilderness Character</b>	
<a href="#">Untrammeled</a>	-2
<a href="#">Undeveloped</a>	-6
<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-5
<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>-12</b>
<b>Traditional Skills</b>	
<a href="#">Traditional Skills</a>	-1
<b>Economics</b>	
<a href="#">Cost</a>	\$1,455,000
<b>Safety</b>	
<a href="#">Risk Assessment</a>	N/A

### MRDG Step 2b: Alternative 4

**Alternative 4:** Sheet Pile with Earthen Plug and Rip Rap Erosion Protection

## **Description of the Alternative**

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

This alternative includes construction of an earthen plug by installing two sheetpile walls, one upstream and one downstream within the canal. The two sheetpile walls would be placed a distance of approximately 100 feet apart (canal width plus a safety factor of >50%), to reduce the erosional energy forces associated with the seasonal overtopping events. The area between the two walls would be filled with pumped in sand. The top of the plug surface will be covered by geotextile fabric and then a hard surface to minimize potential erosion of the surface of the pumped in sand. The fill material would originate from an off-site location; potentially a barge located in Lake Ingraham or at a location within the canal closer to the plug site. The sheetpile would be installed in all four quadrants of the plugs to form flow deflector wingwalls to promote surface sheetflow away from the plug structures and thus prevent seepage and tunneling through the marl. Additionally, fill material would be placed adjacent to each sheetpile wall (2.5:1 slope from the sheetpile to the ground on the waterward side) to substantially increase the lateral support for the plugs. Graded rip-rap would be placed on top of the fill material along the outside face of the sheetpile walls and along the deflector wingwalls and canal banks to provide erosion resistance.

This design has proven to be effective and stable at East Cape canal. This plug would be constructed starting at the western edge of the canal (where it turns south) and extending 100 feet inland. The plug would be built at the location of the previous plug, at the bend in the canal where it turns to the east. Work will be limited to the period of October 1 – March 1 to avoid crocodile mating and nesting season.

Prior to construction, a crew would be deployed to take a geophysical boring at the selected plug location on Raulerson Canal. This would require transport to the site by motor boat. The exact site will be selected during the field visit, but is expected to be close to the plug location. The equipment used to obtain the borings is not motorized and consists of a tripod fitted with a drop hammer that drives the coring device. The retrieved cores will be about 2 inches in diameter and approximately 8 to 12 feet long. Approximately 1 day would be required, as the boring will only be taken at one site. Equipment will be carried to the boring location and operated by hand. A crew of four people will be required to complete this task. Crew communication and the drop hammer used for boring will create some noise. Short term and minimal disturbance of vegetation can be expected. The crew will be instructed to minimize impacts of this activity on vegetation and wildlife.

Surveying will be performed at the plug site and the nearby land surface throughout construction. Surveys could be conducted via optical, laser, or GPS methodologies.

Mangrove canopy will be required to be cut back to facilitate barge and equipment access along the canal. There is vegetation that will be required to be cut within the wilderness



boundary. Vegetation will be trimmed by hand. The vegetation will be trimmed from land when possible, but the use of a motor boat may eliminate some unnecessary trimming. There may also be vegetation that must be trimmed at the plug location. That vegetation will be trimmed on foot and by the use of hand tools. A small motor boat will be necessary to transport the cut vegetation from the plug site to a barge for disposal.

A motorized barge would be necessary to provide a working platform for the plug installation. Most work activities would take place on the barge. The contractor has proposed to install a temporary plug to help slow down the water flow to make sheet pile installation and barge movement easier. The portadam concept utilizes a steel supporting structure with a continuous reinforced liner/membrane to effectively provide a means of water diversion, retention, or impoundment. If the temporary plug is installed, the barge will not need to constantly engage the engine to remain in place. Localized mechanical excavation will be necessary to remove the failed plug, parts of which are still present below the water surface in Raulerson Canal. The barge would also provide a platform for preparing the wing wall areas for sheetpile and riprap. Mechanical equipment would also be necessary for lifting and driving 20 foot long sheet piling. Sheet piling and other materials would be delivered to the plug sites, most of this would be stored on a barge positioned outside the wilderness boundary, but it might be necessary to store some items in the cleared area where the wing walls will be installed. If supplies are on a barge outside the wilderness boundary, the work barge will have to make trips to resupply. Once the sheet piling is placed, the plug area will backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. A small motor boat will also be operated to transport the work force from Flamingo to Raulerson Canal. The motor boat will also be used to transport equipment and staff around the work location.

The anticipated construction sequence is as follows. This work will take place on the barge with mechanized equipment. The easternmost sheet pile will be driven and the backfill and rip-rap erosion protection will be installed for the eastern half of the plug. The canal cutoff sheets will be driven, along with the westernmost sheet piling. The sheet pile, backfill, and rip-rap erosion protection will be installed in the cutoff plug area and along the westernmost canal sheet piling. The contractor will then cleanup and demobilize remnant materials and equipment, including the barges from the plug site.

**Component Activities**  
*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation to Project Site	Personnel transported via small boats from

		Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.
2	Method for Clearing Vegetation	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.
3	Methods for Surveys & Core Collection	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.
4	Site Preparation	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug
5	Sheet Pile Installation	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.
6	Placement of Fill	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.
7	Erosion Protection	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.
8	Visitor Features	No visitor features required
9	Condition of Site After Completion	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.

**Wilderness Character**

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

UNTRAMMELED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	No visitor features required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	2	NE
<u>Untrammeled Total Rating</u>		-2		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While Raulerson Canal is considered an intentional manipulation in its own right, this manipulation occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation because the mandates of the Wilderness Act don't apply prior to designation.

While the use of motorboats and other mechanical equipment as well as limited clearing of vegetation could have a minor impact, their intent is not to manipulate "the earth and its community of life," and the impacts are confined to a small area or are temporary and would have only a very small and inconsequential impact on the Untrammled quality. The use of a temporary dam to cease flow of water through the dam during construction activities would negatively impact this quality. Likewise, the presence of a permanent plug once construction is completed would also be a negative effect.

UNDEVELOPED

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

	compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.			
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	No visitor features required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	6	NE
<u>Undeveloped Total Rating</u>		-6		

Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus, this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

While some motorboat transportation would occur above submerged wilderness, once on site, the boat would continue to operate within designated wilderness. As such, this would have a negative effect upon this quality. The use of survey and coring equipment would not be considered installations since they would not remain in the wilderness once the user has left the area, thus a determination of no effect. Installation of a temporary dam, mechanical excavation, mechanical installation of sheet piles, installation of fill and erosion protection, and existence of permanent plug once construction is completed would all have a negative effect upon this quality. Obviously some more permanent than others.

#### NATURAL

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation cleared from canal leading up to plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	using hand tools, including machetes and saws, to facilitate passage of barge.			
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	No visitor features required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	0	NE
<b>Natural Total Rating</b>		<b>1</b>		

Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. Limited vegetation clearing was considered to have negligible impacts, and thus is identified as having no effect. Based on information presented to the IDT during scoping meetings for the EA process and shared with the Wilderness Committee, plugging Raulerson Canal is expected to have a significant impact upon the natural environment of the

inland marshes on Cape Sable. Among other things, the unnatural exchange of fresh and saltwater would cease within the wetlands, and the quality of habitat for wading birds, juvenile crocodiles, and other wildlife is expected to improve.

#### SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	No visitor features required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Total Number of Effects	0	6	NE
<b><u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u></b>	<b>-6</b>		

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities.

While some motorboat transportation would occur above submerged wilderness, once on site, the boat would continue to operate within designated wilderness. As such, this would have a negative effect upon this quality. Furthermore, the installation of a temporary dam, mechanical excavation, mechanical installation of sheet piles, installation of fill and erosion protection, and existence of permanent plug once construction is completed would all clearly remind visitors of the modern world, and would thus have a negative effect upon opportunities for solitude. Some of these impacts would last much longer than others.

#### OTHER FEATURES OF VALUE

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



	the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.			
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	No visitor features required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		0	0	NE
<b><u>Other Features of Value Total Rating</u></b>		<b>0</b>		

Explain:

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

### **Traditional Skills**

*What is the effect of each component activity on traditional skills?*

#### TRADITIONAL SKILLS

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	using hand tools, including machetes and saws, to facilitate passage of barge.			
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	No visitor features required	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		2	5	NE
<b><u>Traditional Skills Total Rating</u></b>		<b>-3</b>		

Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. The use of motorboats would impair the preservation of traditional skills, as would the use of mechanical means to excavate the site during prep, installation of sheet piles, and compaction of fill. The use of hand tools to clear vegetation, as opposed to motorized equipment such as chainsaws, would maintain the proficiency in using these tools. The use of a non-motorized drop hammer would also appear to maintain the proficiency in using traditional skills; however, GPS enabled survey equipment could be perceived as an impairment upon traditional skills.

## Economics

What is the estimated cost of each component activity?

### COST

<u>Component Activity for this Alternative</u>		Estimated Cost
X	<i>Example: Personnel will travel by horseback</i>	\$1,900
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	
8	No visitor features required	
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	
<b><u>Total Estimated Cost</u></b>		\$1,437,600

Explain:

Cost amongst the alternatives are considered to be similar by the COR, and thus will not be a determining factor in deciding upon an alternative.

**Safety of Visitors & Workers**

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT Severity of Accident	Probability of Accident				
	Frequent	Likely	Common	Unlikely	Rare
Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
<a href="#">Risk Assessment</a>					

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

Risk Assessment was not provided by the contractor, COR, or park representative.

**Summary Ratings for Alternative 4**

Wilderness Character	
<a href="#">Untrammeled</a>	-2
<a href="#">Undeveloped</a>	-6
<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-6
<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>-13</b>
Traditional Skills	

<a href="#">Traditional Skills</a>	-3
<b>Economics</b>	
<a href="#">Cost</a>	\$1,437,600
<b>Safety</b>	
<a href="#">Risk Assessment</a>	N/A

## MRDG Step 2b: Alternative 5

**Alternative 5:** Sheet Pile with Earthen Plug, Rip Rap Erosion Protection, and Canoe Ramp

### Description of the Alternative

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?*

This alternative includes construction of an earthen plug by installing two sheetpile walls, one upstream and one downstream within the canal. The two sheetpile walls would be placed a distance of approximately 100 feet apart (canal width plus a safety factor of >50%), to reduce the erosional energy forces associated with the seasonal overtopping events. The area between the two walls would be filled with pumped in sand. The top of the plug surface will be covered by geotextile fabric and then a hard surface to minimize potential erosion of the surface of the pumped in sand. The fill material would originate from an off-site location; potentially a barge located in Lake Ingraham or at a location within the canal closer to the plug site. The sheetpile would be installed in all four quadrants of the plugs to form flow deflector wingwalls to promote surface sheetflow away from the plug structures and thus prevent seepage and tunneling through the marl. Additionally, fill material would be placed adjacent to each sheetpile wall (2.5:1 slope from the sheetpile to the ground on the waterward side) to substantially increase the lateral support for the plugs. Graded rip-rap would be placed on top of the fill material along the outside face of the sheetpile walls and along the deflector wingwalls and canal banks to provide erosion resistance.

This design has proven to be effective and stable at East Cape canal. This plug would be constructed starting at the western edge of the canal (where it turns south) and extending 100 feet inland. Also included in this alternative is a canoe access ramp area for the portage of canoes and kayaks over the plug. The plug would be built at the location of the previous plug, at the bend in the canal where it turns to the east. Work will be limited to the period of October 1 – March 1 to avoid crocodile mating and nesting season.

Prior to construction, a crew would be deployed to take a geophysical boring at the selected plug location on Raulerson Canal. This would require transport to the site by motor boat. The exact site will be selected during the field visit, but is expected to be close to the plug location. The equipment used to obtain the borings is not motorized and consists of a tripod fitted with a drop hammer that drives the coring device. The retrieved cores will be about 2 inches in diameter and approximately 8 to 12 feet long. Approximately 1 day would be required, as the boring will only be taken at one site. Equipment will be carried to the boring location and operated by hand. A crew of four people will be required to complete this task. Crew communication and the drop hammer used for boring will create some noise. Short term and minimal disturbance of vegetation can be expected. The crew will be instructed to minimize impacts of this activity on vegetation and wildlife.

Surveying will be performed at the plug site and the nearby land surface throughout construction. Surveys could be conducted via optical, laser, or GPS methodologies.

Mangrove canopy will be required to be cut back to facilitate barge and equipment access along the canal. There is vegetation that will be required to be cut within the wilderness boundary. Vegetation will be trimmed by hand. The vegetation will be trimmed from land when possible, but the use of a motor boat may eliminate some unnecessary trimming. There may also be vegetation that must be trimmed at the plug location. That vegetation will be trimmed on foot and by the use hand tools. A small motor boat will be necessary to transport the cut vegetation from the plug site to a barge for disposal.

A motorized barge would be necessary to provide a working platform for the plug installation. Most work activities would take place on the barge. The contractor has proposed to install a temporary plug to help slow down the water flow to make sheet pile installation and barge movement easier. The portadam concept utilizes a steel supporting structure with a continuous reinforced liner/membrane to effectively provide a means of water diversion, retention, or impoundment. If the temporary plug is installed, the barge will not need to constantly engage the engine to remain in place. Localized mechanical excavation will be necessary to remove the failed plug, parts of which are still present below the water surface in Raulerson Canal. The barge would also provide a platform for preparing the wing wall areas for sheetpile and riprap. Mechanical equipment would also be necessary for lifting and driving 20 foot long sheet piling. Sheet piling and other materials would be delivered to the plug sites, most of this would be stored on a barge positioned outside the wilderness boundary, but it might be necessary to store some items in the cleared area where the wing walls will be installed. If supplies are on a barge outside the wilderness boundary, the work barge will have to make trips to resupply. Once the sheet piling is placed, the plug area will backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Rip Rap will be placed on the wing walls and other locations as necessary using an excavator. The canoe ramp will be installed. Design of the canoe ramps has not yet been discussed. A small motor boat will also be operated to transport the work force from Flamingo to Raulerson Canal. The motor boat will also be used to transport

equipment and staff around the work location.

The anticipated construction sequence is as follows. This work will take place on the barge with mechanized equipment. The easternmost sheet pile will be driven and the backfill and rip-rap erosion protection will be installed for the eastern half of the plug. The canal cutoff sheets will be driven, along with the canoe ramp sheets and the westernmost sheet piling. The canoe ramp will be installed. The sheet pile, backfill, and rip-rap erosion protection will be installed in the cutoff plug area and along the westernmost canal sheet piling. The contractor will then cleanup and demobilize remnant materials and equipment, including the barges from the plug site.

**Component Activities**

*How will each of the components of the action be performed under this alternative?*

<u>Component of the Action</u>		Activity for this Alternative
X	<i>Example: Transportation of personnel to the project site</i>	<i>Example: Personnel will travel by horseback</i>
1	Transportation to Project Site	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.
2	Method for Clearing Vegetation	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.
3	Methods for Surveys & Core Collection	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.
4	Site Preparation	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug
5	Sheet Pile Installation	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.
6	Placement of Fill	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to

		compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.
7	Erosion Protection	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.
8	Visitor Features	Installation of a canoe ramp for portage across the plug.
9	Condition of Site After Completion	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.

### Wilderness Character

*What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?*

### UNTRAMMELED

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>



5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Installation of a canoe ramp for portage across the plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	2	NE
<b><u>Untrammled Total Rating</u></b>		<b>-2</b>		

Explain:

This quality is a measurement of how "wild" the wilderness is, and is primarily focused on the intentional manipulations of the biophysical environment that are generally broad in scale or impact. While Raulerson Canal is considered an intentional manipulation in its own right, this manipulation occurred prior to wilderness designation. The concept of trammeling applies only to manipulations that have occurred since the time of designation because the mandates of the Wilderness Act don't apply prior to designation.

While the use of motorboats and other mechanical equipment as well as limited clearing of vegetation could have a minor impact, their intent is not to manipulate "the earth and its community of life," and the impacts are confined to a small area or are temporary and would have only a very small and inconsequential impact on the Untrammled quality. The use of a temporary dam to cease flow of water through the dam during construction activities would negatively impact this quality. Likewise, the presence of a permanent plug once construction is completed would also be a negative effect.

UNDEVELOPED

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	Installation of a canoe ramp for portage across the plug.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		0	7	NE
<b><u>Undeveloped Total Rating</u></b>		<b>-7</b>		

Explain:

As indicated in the Wilderness Act, wilderness is to be in contrast to other areas of "growing mechanization," and "the imprint of man's work will remain substantially unnoticeable." Thus,

this quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

While some motorboat transportation would occur above submerged wilderness, once on site, the boat would continue to operate within designated wilderness. As such, this would have a negative effect upon this quality. The use of survey and coring equipment would not be considered installations since they would not remain in the wilderness once the user has left the area, thus a determination of no effect. Installation of a temporary dam, mechanical excavation, mechanical installation of sheet piles and fill, installation of erosion protection, canoe ramp features, and existence of permanent plug once construction is completed would all have a negative effect upon this quality. Obviously some more permanent than others.

#### NATURAL

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	deflector wingwalls and canal banks.			
8	Installation of a canoe ramp for portage across the plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	0	NE
<b>Natural Total Rating</b>		<b>1</b>		

Explain:

This quality is affected by intended or unintended effects of modern civilization on the ecological systems inside the wilderness. This means that the indigenous species composition, structures, and functions of the ecological systems in wilderness are protected and allowed to be on their own, without the planned intervention or the unintended effects of modern civilization. Limited vegetation clearing was considered to have negligible impacts, and thus is identified as having no effect. Based on information presented to the IDT during scoping meetings for the EA process and shared with the Wilderness Committee, plugging Raulerson Canal is expected to have a significant impact upon the natural environment of the inland marshes on Cape Sable. Among other things, the unnatural exchange of fresh and saltwater would cease within the wetlands, and the quality of habitat for wading birds, juvenile crocodiles, and other wildlife is expected to improve.

#### SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	Installation of a canoe ramp for portage across the plug.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Number of Effects		1	7	NE
<b><u>Solitude or Primitive &amp; Unconfined Rec. Total Rating</u></b>		<b>-6</b>		

Explain:

This quality is comprised of 3 sub-parts: (1) opportunities for solitude, (2) opportunities for primitive recreation, and (3) opportunities for unconfined recreation. This quality concerns the opportunity for people to experience wilderness, and is impacted by settings that affect these opportunities.

While some motorboat transportation would occur above submerged wilderness, once on site, the boat would continue to operate within designated wilderness. As such, this would have a negative effect upon this quality. Furthermore, the installation of a temporary dam, mechanical excavation, mechanical installation of sheet piles and fill, installation of erosion protection, and existence of permanent plug once construction is completed would all clearly remind visitors of the modern world, and would thus have a negative effect upon opportunities for solitude. Some of these impacts would last much longer than others.

The presence of a canoe ramp could be perceived in different ways with regards to this quality. The canoe portage features would facilitate an opportunity for primitive recreation

within the wilderness, however, these features would require improvements to the plug design that would resemble, and most likely be considered, an agency-provided recreation facility which would impact opportunities for unconfined recreation.

#### OTHER FEATURES OF VALUE

<a href="#">Component Activity for this Alternative</a>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Installation of a canoe ramp for portage across the plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	debris will be removed from site.			
Total Number of Effects		0	0	NE
<b><u>Other Features of Value Total Rating</u></b>		<b>0</b>		

Explain:

This quality may or may not be present in a wilderness. The Wilderness Act says wilderness areas "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical use" that reflect the character of this wilderness. This quality focuses on "features" and features typically occur in specific locations, whereas the other four qualities apply throughout an entire wilderness. While many different types of features could be included, the intent is to include those that are significant or integral to the specific wilderness. As of yet, specific features have not been identified for protection via this quality; although in the recent past, cultural resources was considered in general but features were not specifically identified. Thus, no actions or inactions proposed would affect this quality.

### **Traditional Skills**

*What is the effect of each component activity on traditional skills?*

#### TRADITIONAL SKILLS

<u>Component Activity for this Alternative</u>		Positive	Negative	No Effect
X	<i>Example: Personnel will travel by horseback</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and equipment, as well as to provide a working platform.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Installation of a canoe ramp for portage across the plug.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Number of Effects		3	5	NE
<b><u>Traditional Skills Total Rating</u></b>		<b>-2</b>		

Explain:

Part of maintaining a wilderness culture is maintaining proficiency in the use of primitive and traditional skills, non-motorized tools, and non-mechanical travel methods. The use of motorboats would impair the preservation of traditional skills, as would the use of mechanical means to excavate the site during prep and install sheet piles. The use of hand tools to clear vegetation, as opposed to motorized equipment such as chainsaws, would maintain the proficiency in using these tools. The use of a non-motorized drop hammer would also appear to maintain the proficiency in using traditional skills; however, GPS enabled survey equipment could be perceived as an impairment upon traditional skills. While the installation of a canoe ramp would not affect the preservation of traditional skills during construction, it may encourage, or at least facilitate, the use of canoes/kayaks by visitors upon completion.

### **Economics**

*What is the estimated cost of each component activity?*

### **COST**

<b><u>Component Activity for this Alternative</u></b>		<b>Estimated Cost</b>
X	<i>Example: Personnel will travel by horseback</i>	<i>\$1,900</i>
1	Personnel transported via small boats from Flamingo to Raulerson Canal. Motorized barge to transport materials and	



	equipment, as well as to provide a working platform.	
2	Vegetation cleared from canal leading up to plug using hand tools, including machetes and saws, to facilitate passage of barge.	
3	Surveys conducted via optical, laser, or GPS. Collection of a geophysical boring using a non-motorized drop hammer fitted to a tripod to drive the coring device.	
4	Site prepared by installation of temporary plug to block water flow while work is completed. Also, localized mechanical excavation to remove remnants of the failed plug	
5	Sheet piles (each 20 foot long) mechanically lifted and driven from barge.	
6	~100 feet of canal area between two sheet pile cross sections backfilled using an excavator positioned on the barge. Mechanical equipment will be used to compact the plug surface. Fill material also placed adjacent to each sheet pile wall on waterward side.	
7	Graded rip-rap placed on top of the fill material along the outside face of the sheet pile walls and along the deflector wingwalls and canal banks.	
8	Installation of a canoe ramp for portage across the plug.	
9	Existence of a plug consisting of two sheet pile walls placed ~100 feet apart within the canal with the area between the walls filled with sand covered with geotextile fabric and a hard surface; surrounded by erosion protection features. All other equipment and debris will be removed from site.	
<b><u>Total Estimated Cost</u></b>		\$1,512,600

Explain:

Cost amongst the alternatives are considered to be similar by the COR, and thus will not be a determining factor in deciding upon an alternative.

### **Safety of Visitors & Workers**

*What is the risk of this alternative to the safety of visitors and workers? What mitigation measures will be taken?*

RISK ASSESSMENT	Probability of Accident				
	Severity of Accident	Frequent	Likely	Common	Unlikely

Catastrophic: Death or permanent disability	1 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
Critical: Permanent partial disability or temporary total disability	1 <input type="checkbox"/>	2 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>
Marginal: Compensable injury or illness, treatment, lost work	2 <input type="checkbox"/>	3 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
Negligible: Superficial injury or illness, first aid only, no lost work	3 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>	4 <input type="checkbox"/>
<a href="#">Risk Assessment</a>					

Risk Assessment Code

<b>1 = Extremely High Risk</b>	<b>2 = High Risk</b>	<b>3 = Moderate Risk</b>	<b>4 = Low Risk</b>
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Explain:

Risk Assessment was not provided by the contractor, COR, or park representative.

**Summary Ratings for Alternative 5**

<b>Wilderness Character</b>	
<a href="#">Untrammeled</a>	-2
<a href="#">Undeveloped</a>	-7
<a href="#">Natural</a>	1
<a href="#">Solitude or Primitive &amp; Unconfined Recreation</a>	-6
<a href="#">Other Features of Value</a>	0
<b>Wilderness Character Summary Rating</b>	<b>-14</b>
<b>Traditional Skills</b>	
<a href="#">Traditional Skills</a>	-2
<b>Economics</b>	
<a href="#">Cost</a>	\$1,512,600
<b>Safety</b>	
<a href="#">Risk Assessment</a>	N/A

## MRDG Step 2b: Alternatives Not Analyzed

### Alternatives Not Analyzed

*What alternatives were considered but not analyzed? Why were they not analyzed?*

**Filling the canal entirely** -- The IDT considered filling Raulerson Canal. Filling the canal would be prohibitively expensive. A conservative estimate of the cost of filling Raulerson was performed, and the cost would be close to \$6M. The canals and ditches are also considered to be a cultural resource. Filling the ditches completely would have a negative impact on the cultural resource by eliminating it completely. The benefits to the natural quality of the wilderness at Cape Sable can be achieved using plugs.

**An earthen plug** – Earthen plugs were very effective on Cape Sable. Most of the canals had earthen plugs that were installed in the 1950s, and did not fail until the 1980s and 1990s. The plugs at House and Slagle Ditch remain in place. Earthen plugs would look far more natural than the structures that were built in Homestead and the East Cape Canal. When the earthen plug on Raulerson Canal failed in 2007, the park made an effort to replace the plug with a repair in March 2008. The maintenance staff at Everglades National Park tried to repair the plug using 100,000 pounds of material (760 sand bags, 1240 bags of Sakcrete, wire baskets, and geo-fabric). The rebuilt plug failed in the summer of 2008. Once the plugs are breached, the canals on Cape Sable widen rapidly, most likely due to the high velocity of the flow through them as the tide goes in and out. The wider the canals are, the more difficult it becomes to plug them. The failed effort to plug Raulerson, which occurred 7 years ago indicates that a more engineered solution has become necessary to successfully plug the canal for a substantial amount of time.

## MRDG Step 2b: Alternative Comparison

<a href="#">Alternative 1:</a>	No Action
<a href="#">Alternative 2:</a>	Sheet Pile (Without Earthen Plug) with Rip Rap Erosion Protection
<a href="#">Alternative 3:</a>	Sheet Pile (Without Earthen Plug) with Rip Rap Erosion Protection and Canoe Ramp
<a href="#">Alternative 4:</a>	Sheet Pile with Earthen Plug and Rip Rap Erosion Protection
<a href="#">Alternative 5:</a>	Sheet Pile with Earthen Plug, Rip Rap Erosion Protection, and Canoe Ramp

Wilderness Character	<a href="#">Alternative 1</a>		<a href="#">Alternative 2</a>		<a href="#">Alternative 3</a>		<a href="#">Alternative 4</a>		<a href="#">Alternative 5</a>	
	+	-	+	-	+	-	+	-	+	-

Untrammeled	0	0	0	2	0	2	0	2	0	2
Undeveloped	0	0	0	5	0	6	0	6	0	7
Natural	0	1	1	0	1	0	1	0	1	0
Solitude/Primitive/Unconfined	0	0	0	5	1	6	0	6	1	7
Other Features of Value	0	0	0	0	0	0	0	0	0	0
Total Number of Effects	0	1	1	12	2	14	1	14	2	16
<b>Wilderness Character Rating</b>	-1		-11		-12		-13		-14	

<b>Traditional Skills</b>	<a href="#">Alternative 1</a>		<a href="#">Alternative 2</a>		<a href="#">Alternative 3</a>		<a href="#">Alternative 4</a>		<a href="#">Alternative 5</a>	
	+	-	+	-	+	-	+	-	+	-
Traditional Skills	0	0	2	4	3	4	2	5	3	5
<b>Traditional Skills Rating</b>	<b>0</b>		<b>-2</b>		<b>-1</b>		<b>-3</b>		<b>-2</b>	

<b>Economics</b>	<a href="#">Alternative 1</a>	<a href="#">Alternative 2</a>	<a href="#">Alternative 3</a>	<a href="#">Alternative 4</a>	<a href="#">Alternative 5</a>
Cost	\$0	<b>\$1, 380,000</b>	\$1,455,000	\$1,437,600	\$1,512,600

<b>Safety of Visitors &amp; Workers</b>	<a href="#">Alternative 1</a>	<a href="#">Alternative 2</a>	<a href="#">Alternative 3</a>	<a href="#">Alternative 4</a>	<a href="#">Alternative 5</a>
Risk Assessment	N/A	N/A	N/A	N/A	N/A

## MRDG Step 2: Determination

<b>Recommended Alternative for Step 2a</b>
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<input checked="" type="checkbox"/>	<a href="#">Alternative 1:</a>	No Action (House Ditch only, see Recommendation 2 on page 153)
<input checked="" type="checkbox"/>	<a href="#">Alternative 2:</a>	Reinforcement of Earthen Plugs via Helicopter (Slagle's Ditch only)
<input type="checkbox"/>	<a href="#">Alternative 3:</a>	Reinforcement of Earthen Plugs with Erosion Protection via Helicopter
<input type="checkbox"/>	<a href="#">Alternative 4:</a>	Reinforcement of Earthen Plugs with Erosion Protection and Additional Fill via Helicopter
<input type="checkbox"/>	<a href="#">Alternative 5:</a>	Reinforcement of Earthen Plugs via Hydraulic Pumping
<input type="checkbox"/>	<a href="#">Alternative 6:</a>	Reinforcement of Earthen Plugs with Erosion Protection via Hydraulic Pumping
<input type="checkbox"/>	<a href="#">Alternative 7:</a>	Reinforcement of Earthen Plugs with Erosion Protection and Additional Fill via Hydraulic Pumping

<b>Prohibited Uses in Recommended Alternative for Step 2a</b>
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Which of the prohibited uses found in Section 4(c) of the Wilderness Act are approved in the selected alternative and for what quantity?

<u>Prohibited Use</u>	<u>Quantity</u>
<input type="checkbox"/> Mechanical Transport:	
<input checked="" type="checkbox"/> Motorized Equipment:	Use of 1 vibratory compactor during construction (~3 days)
<input type="checkbox"/> Motor Vehicles:	
<input type="checkbox"/> Motorboats:	
<input checked="" type="checkbox"/> Landing of Aircraft:	1.5 days of helicopter use with up to 8 lifts
<input type="checkbox"/> Temporary Roads:	
<input type="checkbox"/> Structures:	
<input checked="" type="checkbox"/> Installations:	Reinforcement of 1 plug to original extent

### Recommended Alternative for Step 2b

<input type="checkbox"/>	<a href="#">Alternative 1:</a>	No Action
<input type="checkbox"/>	<a href="#">Alternative 2:</a>	Sheet Pile (Without Earthen Plug) with Rip Rap Erosion Protection
<input type="checkbox"/>	<a href="#">Alternative 3:</a>	Sheet Pile (Without Earthen Plug) with Rip Rap Erosion Protection and Canoe Ramp
<input checked="" type="checkbox"/>	<a href="#">Alternative 4:</a>	Sheet Pile with Earthen Plug and Rip Rap Erosion Protection
<input type="checkbox"/>	<a href="#">Alternative 5:</a>	Sheet Pile with Earthen Plug, Rip Rap Erosion Protection, and Canoe Ramp

### Prohibited Uses in Recommended Alternative for Step 2b

Which of the prohibited uses found in Section 4(c) of the Wilderness Act are approved in the selected alternative and for what quantity?

<u>Prohibited Use</u>	<u>Quantity</u>
<input type="checkbox"/> Mechanical Transport:	
<input checked="" type="checkbox"/> Motorized Equipment:	Use of a mechanical excavator to prepare the site and place and compact fill. Crane or similar to place and drive sheet piles.
<input type="checkbox"/> Motor Vehicles:	
<input checked="" type="checkbox"/> Motorboats:	Use of small motorboat & motorized barge for duration of construction
<input type="checkbox"/> Landing of Aircraft:	
<input type="checkbox"/> Temporary Roads:	
<input type="checkbox"/> Structures:	
<input checked="" type="checkbox"/> Installations:	2 installations: a temporary port-a-dam to be installed for the duration of construction and the long-term plug as described in Alternative 4.

#### Explain Rationale for Selections:

This project is directly related to efforts being considered by Everglades National Park to prevent further degradation of brackish and saline wetlands in the Cape Sable region as described in the Cape Sable Plugs Restoration Phase II Environmental Assessment. The majority of the project area described in the alternatives and the locations of all sites for construction or reinforcement of plugs within the existing canals are within Designated Wilderness. As a result, this MRDG was prepared.

Based on the information provided, the Wilderness Committee agrees that elements of this project will result in direct improvements to the natural quality of Wilderness character by reducing tidal exchange and associated sediment transport via man-made canals across the marl ridge that extends across the Cape Sable region. In addition, the committee acknowledges that illegal access to Wilderness may be occurring and that access may be degrading opportunities for solitude in the affected area of the Wilderness. The committee determined that the project should be considered necessary for the management of the area as Wilderness (Step 1 of MRDG) and conducted a minimum requirements analysis on the alternatives provided (Step 2 of the MRDG).

Due to the complexity of the project, the committee split the minimum requirements review into two parts, Steps 2a and 2b. This approach was taken to ensure that all prohibited activities were considered and to simplify the review. The range of activities and methods being considered at Raulerson Canal were considered different enough from those being considered at House and Slagle Ditch to warrant considering them separately. House and Slagle were reviewed together due to the similarity of the actions being considered at those two locations.

**Slagle Ditch:**

In reviewing the proposed actions Step 2a, the committee recommends that Alternative 2 (Reinforcement of earthen plugs via helicopter) represents the minimum activity to address the impacts to wilderness character from the partial failure of the existing canal plug at Slagle Ditch. This alternative was selected because the existing plug is currently allowing tidal water to pass through the marl ridge and reinforcing the plug would result in limited but direct improvements to the natural quality of wilderness character and reduce the possibility for greater impacts to this quality in the near future. The committee determined that delivery of fill to the site by helicopter or by pumping fill in from a barge will have similar and limited impacts to the natural quality of wilderness character. The committee concluded that the duration of impacts from helicopter transport would be shorter than pumping operations and that helicopter transport and other methods described in Alternative 2 represent the least impacting method under consideration. The committee also believes that the limestone gravel transportable by helicopter is more likely to look similar to the existing plug material than the sand that would be pumped in by barge. The resulting plug is expected to be less visually impacting, giving the perception of reduced impacts to the undeveloped quality of wilderness character. The committee concluded that the selected action minimizes the impacts to the undeveloped and untrammelled qualities of wilderness character when compared to the other alternatives analyzed while providing measurable benefits to the natural quality of wilderness character.

**House Ditch:**

The committee recommends that No action (Alternative 1) represents the minimum activity to address the degradation of the existing plug at House Ditch. This alternative was selected because the existing plug is not currently allowing tidal water to pass across the marl ridge and reinforcing the plug would not result in direct improvements to the natural quality of wilderness character. The plug is intact and is effectively preventing illegal access to motorized vessels. Reinforcing the plug would not result in improved opportunities for solitude in the Wilderness area. Finally, this recommendation is also being made, in part, due to the amount of uncertainty associated with the life span of a reinforced plug when compared to the lifespan of the existing plug. The project description indicated the reinforced plug would have an expected lifespan of 50 years, excluding catastrophic events but

did not indicate the expected lifespan of the existing plug. The committee also considered the fact that either plug could fail as a result of one or more tropical storms that are likely to occur over the 50 year life span of the project. Finally, the committee also considered the uncertainty of the remaining lifespan of the entire marl ridge in the face of current rates of sea level rise. The committee concluded that the selected alternative minimizes the impacts to the natural, undeveloped and untrammelled qualities of wilderness character when compared to the other alternatives analyzed.

**Raulerson Brothers Canal:**

In reviewing the proposed alternatives at Raulerson Canal (Step 2b), the committee recommends that Alternative 4 (Sheet pile with earthen plug and rip rap erosion protection) represents the minimum activity to address the direct impacts to wilderness character resulting from the failed plug at Raulerson Brothers Canal. The committee struggled to quantify the impacts to the undeveloped quality of wilderness character resulting from the two designs presented as alternatives. The majority of members recommended that the plug design in Alts 4 and 5, would reduce impacts to the undeveloped quality because of its smaller total footprint. However, the greater amount of fill required, structural complexity and greater visibility of this plug design led some committee members to determine that the plug design in Alts 2 and 3 may be less visible, require less fill and will be structurally less complex and would therefore have less impact on the undeveloped quality of wilderness character. Following deliberations, the committee reviewed the alternatives report provided by the EA IDT and determined that the plug design included in Alts 2 and 3 was no longer being considered as a design option. Based on the dismissal of this design alternative from the alternatives analysis, the committee did not consider it to be a viable alternative for consideration in the MRDG.

The committee agreed that the presence of a walkway and canoe ramp would prevent the revegetation of at least some of the plug surface. Providing a ramp would also give the appearance of an ENP provided visitor facility within the Designated Wilderness area. Presence of a ramp may increase the need for maintenance, resulting in additional impacts to wilderness character from access and maintenance activities. Finally, two other ENP canoe ramps and one natural creek already provide a means of accessing the wilderness in this vicinity. As a result, alternative 5 was considered to have greater impacts to wilderness character than Alternative 4. Based on these deliberations, the committee concluded that the selected alternative minimizes the impacts to the natural, undeveloped and untrammelled qualities of wilderness character when compared to the other action alternatives analyzed.

**Additional Recommendations:**

The committee would also like to offer the following additional recommendations to be considered in the current decision as well as the long term approach to managing the Wilderness area within the Cape Sable region of ENP. These recommendations represent concerns identified during the evaluation of this MRDG, and that the committee would like to have considered during any subsequent discussions related to the Environmental Analysis (EA) for this project.

**Recommendation 1:** All work should be conducted, to the extent possible, at the driest time of the year (typically February-April).

Rationale: Marl soils in the project area are more susceptible to disturbance when wet than when dry.



Dry season wetland conditions will limit extent of impacts to natural quality of wilderness character by reducing the impacts to wetland soils.

**Recommendation 2:** ENP should monitor existing plug at House Ditch.

**Rationale:** Regular ongoing monitoring of existing plug would allow ENP to calculate rates of erosion, and estimate lifespan of existing structure. Monitoring would also allow ENP to rapidly detect plug failure, if it occurs, and better evaluate corrective actions, if needed. Should monitoring detect an impending failure similar to current conditions at Slagle's Ditch and environmental conditions and wilderness impacts are consistent with conditions reviewed in this MRDG, House Ditch may be repaired using the same means and methods as approved for Slagle's Ditch (See Step 2a, Alternative 2) without completion of another MRDG. However, it would be expected that the Wilderness Committee would have the opportunity to review the proposed actions to ensure consistency.

**Recommendation 3:** The committee recommends that design details be completely developed and included with the selected action alternatives.

**Rationale:** Alternatives did not include details on surface armoring of plugs for reinforcement. Email correspondence between contractor, Project leader and Wilderness Committee chair indicated that surface armoring would be required for design at House and Slagle Ditch. Due to the importance of remaining on schedule, the committee based recommendations on the information provided by the project leader.

**Recommendation 4:** The committee recommends that a revegetation plan be developed and included with the selected action alternatives.

**Rationale:** Even though revegetation would be considered an impact to the untrammelled quality of wilderness, established vegetation that is consistent with the surroundings would reduce the visibility of the sheet pile, rip rap and fill and improve the wilderness experience of park users. Proper revegetation would also mitigate impacts to the natural quality of wilderness character that will occur from transport of fill, site access and other project activities.

**Recommendation 5:** The committee recommends that ENP make a written commitment to the removal of the material used in plugging or reinforcing existing plugs, to the extent it is consistent with Wilderness and other resources of the area, once the canal plugs fail to serve their purpose. This recommendation applies to the canals being considered for plugging here, the existing plugs at Homestead and East Cape Canal and any additional plugs that may be constructed in the future.

**Rationale:** It is acknowledged that sea level rise will result in the eventual failure of the canal plugs and the marl ridge. It is also acknowledged that a catastrophic event such as a hurricane may result in the immediate failure of the canal plugs. As a result, the committee considers the benefits to the natural quality of wilderness character to be of limited duration. The committee also considers the proposed plug construction, particularly at Raulerson Canal, to have a lifespan that will exceed the life span of the marl ridge. The committee is concerned that the plug structures will no longer serve a purpose in the management of the area as a wilderness but will continue to impact the natural and undeveloped qualities of wilderness character as well as opportunities for solitude indefinitely.

