



**Espey, Huston & Associates, Inc.**  
Engineering & Environmental Consultants

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**PIPING PLOVER HABITAT SURVEY OF  
DREDGED MATERIAL DISPOSAL AREAS ALONG THE  
GULF INTRACOASTAL WATERWAY FROM  
CORPUS CHRISTI BAY TO THE MUD FLATS**

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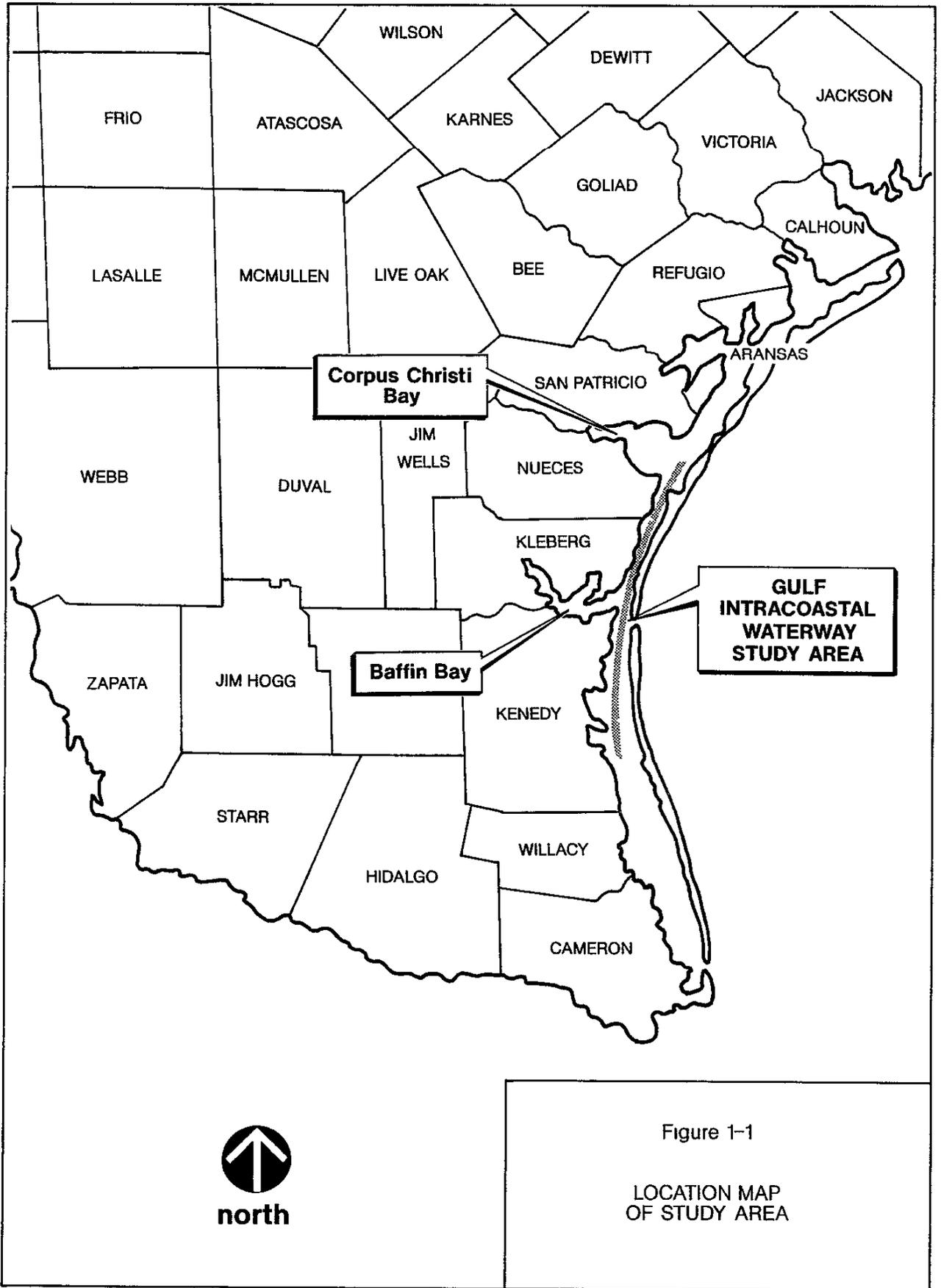
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1.0 INTRODUCTION

In September 1993, Espey, Huston & Associates, Inc (EH&A) performed a reconnaissance of Disposal Areas Nos. 171-207 along the Gulf Intracoastal Waterway (GIWW). The project area is approximately 51 miles long and stretches from the southern portion of Corpus Christi Bay, southward along the GIWW to the Mud Flats (Landcut) (Figure 1-1). The purpose of the survey was to identify piping plover (*Charadrius melodus*) habitat along the disposal areas and to determine if other members of the maritime shorebird guild were utilizing the disposal areas.

The reconnaissance survey was performed over a five-day period from 13-17 September 1993. All disposal areas were visited and habitat delineations were marked on aerial photographs or topographic maps. Qualitative notes concerning habitats were recorded in field books, as were notes concerning piping plovers, snowy plovers (*Charadrius alexandrinus*), and guild species observed on each disposal area.

The survey revealed that limited habitat occurs along the perimeter of most of the disposal areas. These habitats consist primarily of thin bands of sand or algal flats encircling the island or disposal area. A total of 30 piping plovers were found on 10 of the disposal areas, 26 snowy plovers were recorded from 7 of the disposal areas, and members of the maritime shorebird guild were recorded from 32 of the 37 disposal areas. Only a few of the disposal areas contained extensive areas of habitat. No large concentrations of piping plovers were recorded from any of the disposal areas, but were usually found singularly or in groups of two or three individuals.



2 0            LIFE HISTORY INFORMATION

2.1            PIPING PLOVER

The piping plover has been a species of concern throughout North America since the early 1900's (U.S. Fish and Wildlife Service (FWS), 1988). Shorebird hunting during the early 1900s caused the first known major decline of piping plovers (Bent, 1929). Since then, loss or modification of habitat due to commercial, residential, and recreational developments, dune stabilization, damming and channelization of rivers (eliminating sandbars, encroachment of vegetation, and altering water flows), and wetland drainage have further contributed to the decline of the species (FWS, 1987). Additional threats include human disturbances through recreational use of habitat, and predation of eggs by feral pets (FWS, 1987). In January 1986, the piping plover was listed as endangered in the watershed of the Great Lakes and threatened throughout the remainder of its range (50 FR 50726).

The piping plover is a small migratory shorebird which breeds in the northern Great Plains of the U.S. and Canada, along beaches of the Great Lakes, and along the Atlantic coastline from North Carolina to Newfoundland (Haig and Oring, 1987). Nesting habitat includes sandy beaches along the Atlantic coast or inland lakes, bare areas on dredge-created and natural alluvial islands in rivers, gravel pits along rivers; and salt-encrusted bare areas of sand, gravel, or pebbly mud on interior alkali lakes and ponds (FWS, 1987). Wintering sites include the southern U.S. Atlantic coastline, the Gulf of Mexico from Florida to Veracruz, Mexico, and on scattered Caribbean islands (Haig and Oring, 1985). Important post-breeding habitat includes Atlantic and Gulf coast beaches, dunes and sand flats. Little is known of the migration routes of the piping plover.

The piping plover begins arriving at its post-breeding and wintering grounds in Texas in mid- to late-July. Haig and Oring (1985, 1987) found that early in the post-breeding season, piping plovers frequented beaches, but later tended to inhabit ephemeral sandflats along the backside of barrier islands. Observations of wintering piping plovers in Alabama did not indicate a seasonal preference between habitats, but that wintering plovers spent >85% of their time on sand flats or mudflats each month (Johnson and Baldassarre, 1988). Along the upper Texas coast, a correlation appears to exist between tidal height and habitat selection, with piping plovers actively feeding on tidal flats during periods of low tides, and on the Gulf beaches during high tides (Eubanks, 1991). Winter distribution studies along the Atlantic and Gulf coasts found piping plovers usually occurring in small, unevenly distributed groups along the coast, however the sites with largest concentrations of plovers consisted of expansive sand flats or mud flats with sandy beach in close proximity (Nicholls and Baldassarre, 1990).

Piping plover concentrations in Texas occur in the following counties. Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kleberg, Matagorda, Nueces, San Patricio and Willacy (FWS, 1988)

Several areas along the Texas coast have been identified by the FWS as essential wintering habitat for the piping plover. Essential wintering habitat for the piping plover provides the space and requisite resources necessary for the continued existence and growth of piping plover populations and consists of coastal beach, sandflat and mudflat habitats. Within the vicinity of the study area, the Padre Island National Seashore has been identified as essential habitat for the piping plover (FWS, 1988)

## 2.2 SNOWY PLOVER

The snowy plover is a cosmopolitan species which is widely distributed in warmer parts of all continents except Antarctica (Oberholser, 1974). In Texas it is an uncommon migrant across the state, and an uncommon resident along the coast and in north Texas. Two breeding populations are known from the state: one along the lower coast from Calhoun to Cameron County, and one in the playa lakes region of north and west Texas (Eubanks, 1992). Along the Texas coast, habitat for the snowy plover is similar to that of the piping plover, and consists of beaches and tidal flats where it forages for small mollusks, polychaetes, crustaceans, and insects. The snowy plover usually appears singly or in small groups, where it may be seen foraging with other members of the shore bird guild to which it belongs.

The snowy plover is currently not listed by the FWS as an endangered or threatened species. But because it is believed that snowy plover numbers have been significantly reduced, it is classified as a Category 2 species by the FWS. Category 2 includes taxa which are possibly appropriate for listing as endangered or threatened, but for which conclusive biological data concerning vulnerability and threat are not currently available to support listing. Based upon the current information concerning the species, it is likely that the snowy plover will be federally-listed as an endangered or threatened species in the near future.

3 0            METHODOLOGY

On 13 September 1993, two EH&A biologists drove to Corpus Christi, Texas, to meet with Mr Johnny French of the FWS. The purpose of the meeting was to gather pertinent information concerning piping plovers in the vicinity of the study area, and to determine if piping plover surveys had been performed on any of the existing disposal areas. Following that meeting, EH&A began field surveys of the 37 disposal areas which comprise the study area.

From 13-17 September 1993, EH&A performed surveys to delineate habitats along the GIWW from Disposal Area No. 171, southward to Disposal Area No. 207. The survey corresponded to Step II a of the Winter Survey Guidelines prepared by Ted L. Eubanks, Jr. for the Great Lakes/Northern Great Plains Piping Plover Recovery Team. These guidelines require that projects with federal involvement should conduct a site assessment to assess and delineate habitats being considered for permitting. Additionally, EH&A recorded and mapped all piping plover and snowy plover sightings, and recorded which members of the maritime shorebird guild were present at each disposal area.

Habitats of each disposal area were delineated on 1985 color-infrared aerial photographs. Each photograph was enclosed in an acetate sheath for waterproofing, and habitats were delineated directly onto the acetate with waterproof ink. In areas of the project where no photographic coverage was available, habitat delineations were performed on U.S. Geological Survey (USGS) 7.5" quadrangle maps. All piping plover and snowy plover sightings were also recorded on the habitat maps.

Transportation to each site was via boat since all but one disposal area were inaccessible to vehicular traffic. Upon arriving at the disposal areas, the two EH&A biologists would traverse the site on foot, recording habitat descriptions, delineating habitats, and noting which bird species were present on the site. Representative photographs were taken at each disposal area throughout the survey.

Following the conclusion of field surveys, EH&A digitized the study area on AutoCAD from the aerial photographs and USGS quadrangle maps. Habitats and plover sightings were transferred from the field maps to the final map and digitized.

4 0            RESULTS

4.1            LITERATURE SEARCH

Prior to performing field surveys, EH&A met with representatives of FWS to gather information concerning piping plovers in the project area. It was learned that a detailed piping plover survey had been performed for the Texas General Land Office (GLO) at Disposal Area No. 175, and that piping plovers were frequently observed on that site. EH&A was also notified that a "large concentration" of piping plovers was present east of Disposal Area No. 176, however, the precise location was not known. South of Disposal Area No. 176, piping plover surveys had not been performed or were not on file with FWS. There was also no information for those disposal areas north of the Kennedy Causeway.

4.2            FIELD SURVEYS

4.2.1        13 September 1993

On 13 September 1993, the weather was extremely windy, warm, and humid. Winds were from the east-southeast, blowing at a sustained 30-35 miles per hour (mph), with gusts to 49 mph. Skies were relatively clear and the high temperature was approximately 92° F. Birding conditions were poor on this date due to the strong winds.

On this date, EH&A performed surveys from Disposal Area No. 171 in Corpus Christi Bay, southward to Disposal Area No. 175 south of the Kennedy Causeway. Three of the five disposal areas contain suitable habitat for the piping plover. Of these three, Disposal Area No. 172 contains the most extensive habitat due to the large size of the disposal area. Disposal Area No. 172 is 2.2 miles in length and consists of eight disposal islands (Figure 4-1). Sand flats are the predominant piping plover habitat and form a thin band around the perimeter of each disposal island. Small algal flats are also present in portions of the disposal area. Piping plover habitat at Disposal Areas No. 173 and 175 also consists of sand and algal flats, but is less extensive than at Disposal Area No. 172 (Figure 4-1). Disposal Area No. 174 has a more sloping shoreline, which abruptly grades into upland habitats (Figure 4-1). A barren sand flat occurs on the west side of the disposal area, but its elevation precludes it from being inundated on a frequent basis. It is unlikely that this disposal area provides habitat for the piping plover. No terrestrial habitats are present at Disposal Area No. 171 (Figure 4-1), which is an open water disposal area in Corpus Christi Bay.

**LEGEND**

A	Algal flat	Sh	Shell
M	Mud flat	U	Upland
R	Rock	W	Water
S	Sand		
▲	Number of Piping Plover observations		
●	Number of Snowy Plover observations		

**CORPUS CHRISTI BAY**

**LAGUNA MADRE**

Disposal Area No 175

Causeway

S/Sh

GWW

Disposal Area No 174

Disposal Area No 173

Disposal Area No 172

Open Water

Disposal Area No 171

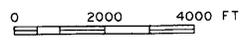
Kennedy

**LAGUNA MADRE**

**E&A Espey, Huston & Associates, Inc**  
Engineering & Environmental Consultants

Figure 4 1

Habitats Occurring Along GWW Disposal Area Nos 171 175



A total of 14 piping plovers (47% of the weekly total) were observed on 13 September 1993. Eleven occurred at Disposal Area No. 172, and three were recorded from Disposal Area No. 175 (Figure 4-1).

At Disposal Area No. 172, four piping plovers were recorded from the north end of the disposal area, one was observed near the center of the disposal area, and six were recorded from the south end of the disposal area (Figure 4-1). Six snowy plovers were also recorded from this disposal area, four from the northern end and two from the southern end (Figure 4-1).

Three piping plovers were recorded from the vicinity of Disposal Area No. 175. These plovers were observed from the parking lot of Marker 37 and were foraging along the sand flats near the GIWW (Figure 4-1). Although these three piping plovers were not actually within the disposal area, they are likely to utilize the habitats of the disposal area. Additionally, a piping plover survey for Disposal Area No. 175 is now on file with FWS, which documents regular plover use of the area.

Members of the maritime shorebird guild were recorded from all disposal areas except for Disposal Area No. 171. Table 4-1 presents a list of all guild species which were recorded at each disposal area.

#### 4.2.2 14 September 1993

On 14 September 1993, the weather had calmed from the previous day as the first cold front of the season approached. Winds were still from the southeast during the morning hours, but began to shift to the east and the northeast in the afternoon. Wind speeds averaged 15 to 20 mph in the morning, but began to calm by 1400 CST. Temperatures were in the 80s to low 90s until the cold front arrived at 1620 CST. At this time, temperatures dropped, winds shifted to the northeast, and rain began to fall. Thunderstorms associated with the front lasted approximately an hour to an hour and a half, and surveys were concluded at 1615 CST due to the adverse weather.

Surveys on this date were performed at Disposal Area Nos. 176 through 182 (figures 4-2 and 4-3). Suitable habitat for the piping plover occurred on all of the disposal areas surveyed. Habitats were comprised of sand and algal flats along the perimeter of the islands.

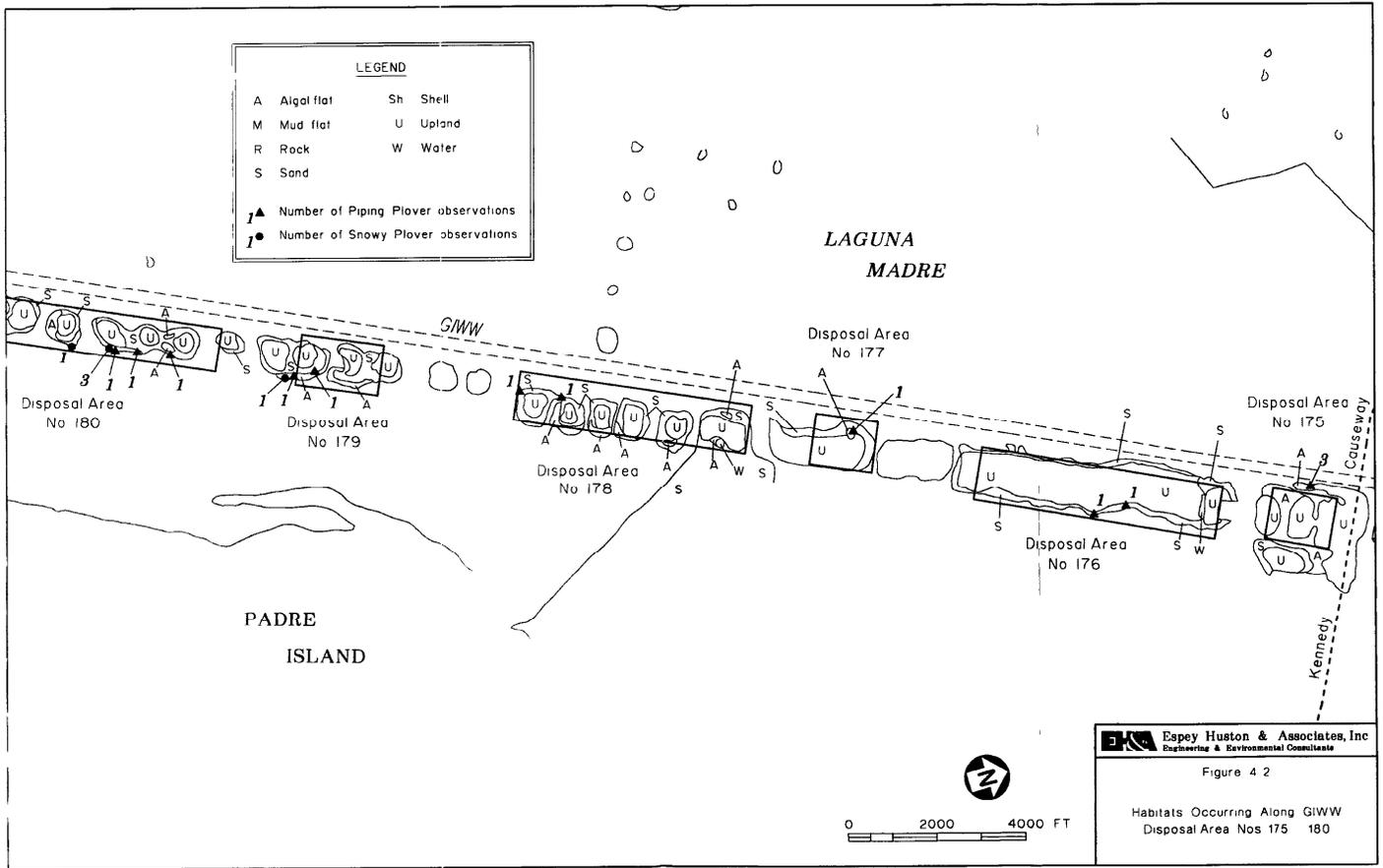
TABLE 4-1

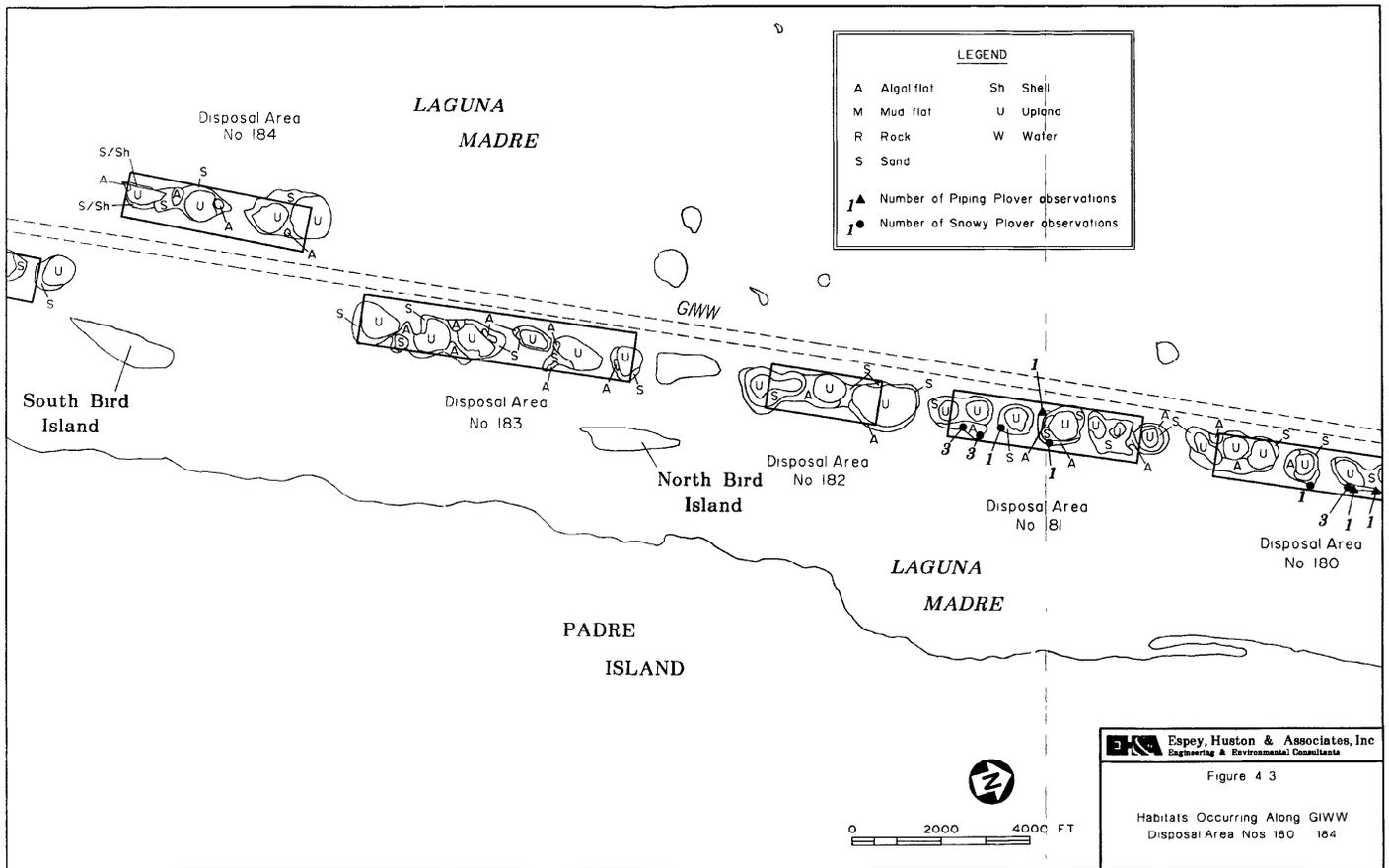
PIPING PLOVERS AND ASSOCIATED GUILD MEMBERS OBSERVED AT THE  
GIWW DISPOSAL AREA NOS. 171-207 - SEPTEMBER 1993

Disposal Areas	Species																
	Piping Plover ( <i>Charadrius melodia</i> )	Black bellied Plover ( <i>Pluvialis squatarola</i> )	Snowy Plover ( <i>Charadrius alexandrinus</i> )	Wilson's Plover ( <i>Charadrius wilsonia</i> )	Semipalmated Plover ( <i>Charadrius semipalmatus</i> )	American oystercatcher ( <i>Haematopus palliatus</i> )	American avocet ( <i>Recurvirostra americana</i> )	Willet ( <i>Catoptrophorus semipalmatus</i> )	Long-billed curlew ( <i>Numenius americanus</i> )	Marbled godwit ( <i>Limosa fedoa</i> )	Ruddy turnstone ( <i>Arenaria interpres</i> )	Red knot ( <i>Calidris canutus</i> )	Sanderling ( <i>Calidris alba</i> )	Western sandpiper ( <i>Calidris mauri</i> )	Least sandpiper ( <i>Calidris minimilla</i> )	Dunlin ( <i>Calidris alpina</i> )	Short-billed Dowitcher ( <i>Limnodromus griseus</i> )
No 171																	
No 172	X	X	X	X		X	X	X	X					X	X		X
No 173		X					X	X	X	X		X		X			X
No 174		X					X	X		X		X	X	X			X
No 175	X				X							X					
No 176	X						X	X				X	X	X			X
No 177	X	X					X	X	X			X	X	X			
No 178	X	X		X		X	X	X	X			X	X	X			
No 179	X	X	X	X	X		X			X		X	X	X			
No 180	X	X	X	X			X	X				X	X	X			X
No 181	X	X	X	X	X	X	X	X				X	X	X			
No 182		X					X	X					X	X			
No 183		X			X		X	X		X			X	X			X
No 184		X			X		X	X					X	X			
No 185		X					X	X	X	X		X	X				
No 186																	
No 187							X										
No 188							X	X						X	X		X
No 189		X					X			X		X	X				
No 190		X					X						X				
No 191		X					X			X		X	X	X			
No 192																	
No 193		X	X	X			X	X					X	X			
No 194							X			X		X					
No 195		X	X		X		X	X	X		X	X	X				X
No 196		X		X	X		X		X	X		X	X	X			

TABLE 4-1 (Concluded)

Disposal Areas	Species																
	Piping Plover ( <i>Charadrius melodus</i> )	Black-bellied Plover ( <i>Pluvialis squatarola</i> )	Snowy Plover ( <i>Charadrius alexandrinus</i> )	Wilson's Plover ( <i>Charadrius wilsonia</i> )	Semipalmated Plover ( <i>Charadrius semipalmatus</i> )	American oystercatcher ( <i>Haematopus palliatus</i> )	American avocet ( <i>Recurvirostra americana</i> )	Willet ( <i>Catoptrophorus semipalmatus</i> )	Long-billed curlew ( <i>Numenius americanus</i> )	Marbled godwit ( <i>Limosa fedoa</i> )	Ruddy turnstone ( <i>Arenaria interpres</i> )	Red knot ( <i>Calidris caninus</i> )	Sanderling ( <i>Calidris alba</i> )	Western sandpiper ( <i>Calidris mauri</i> )	Least sandpiper ( <i>Calidris minutilla</i> )	Dunlin ( <i>Calidris alpina</i> )	Short-billed Dowitcher ( <i>Limnodromus griseus</i> )
No 197		X			X		X	X			X	X	X	X	X		X
No 198										X		X	X				X
No 199		X			X		X	X				X	X	X	X		X
No 200		X					X			X		X	X	X	X		X
No 201	X	X			X		X			X		X	X	X	X		X
No 202	X	X	X				X	X		X		X	X	X	X		X
No 203		X					X	X				X	X	X			
No 204																	
No 205							X					X	X	X			
No 206																	
No 207							X						X				





A total of 11 piping plovers and 13 snowy plovers were observed at the disposal areas on this date (figures 4-2 and 4-3). The daily total accounts for 37 percent of the total number of piping plovers sighted during the five-day survey. Piping plovers were observed on all of the disposal areas except for Disposal Area No. 182 (figures 4-2 and 4-3). Disposal Area No. 180 contained the most piping plovers with three, Disposal Area Nos. 176, 178, and 179 each contained two piping plovers, and Disposal Area Nos. 177 and 181 each had only one piping plover.

Members of the maritime shorebird guild were recorded from all disposal areas surveyed on this date and are presented for each disposal area in Table 4-1.

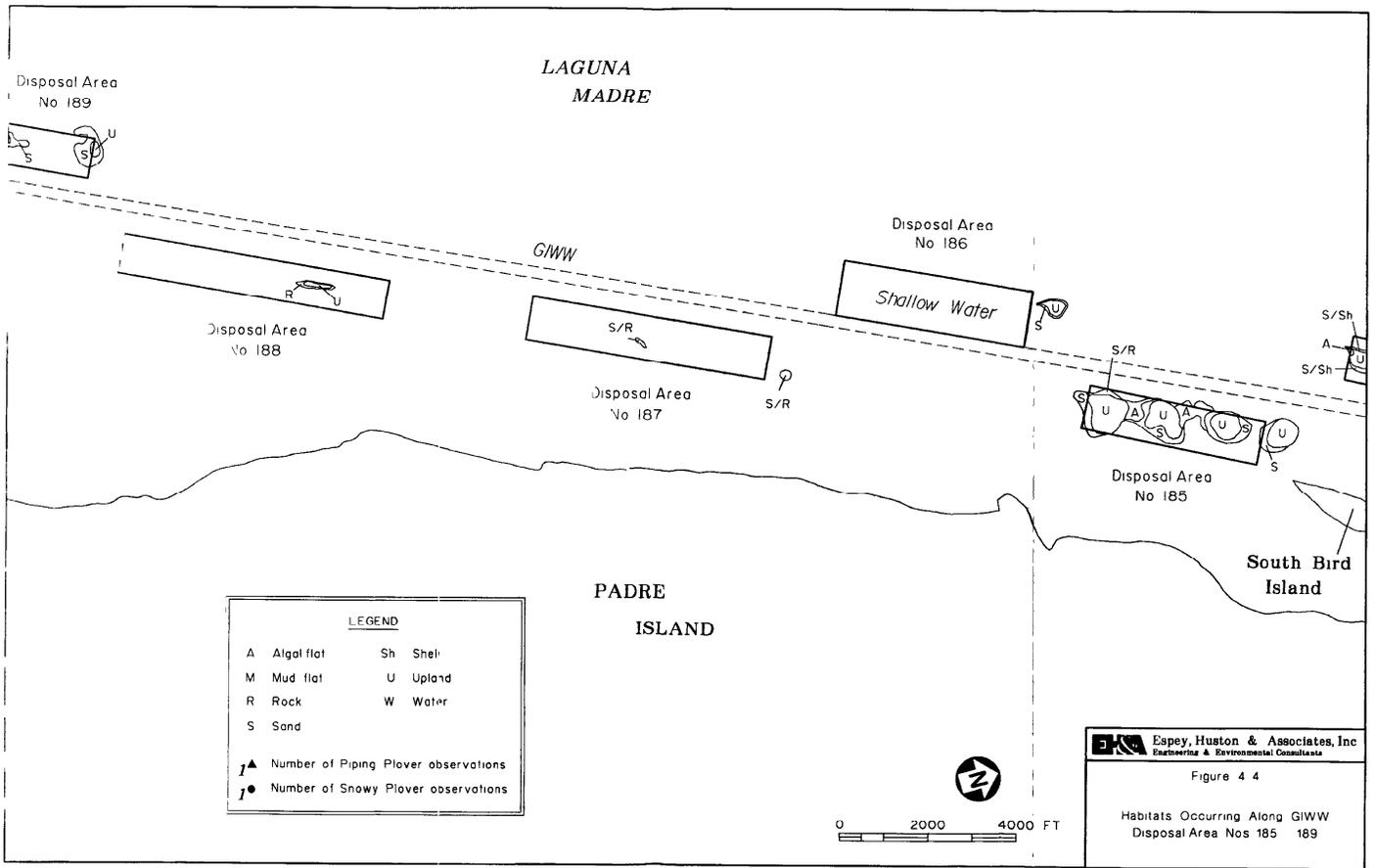
#### 4.2.3 15 September 1993

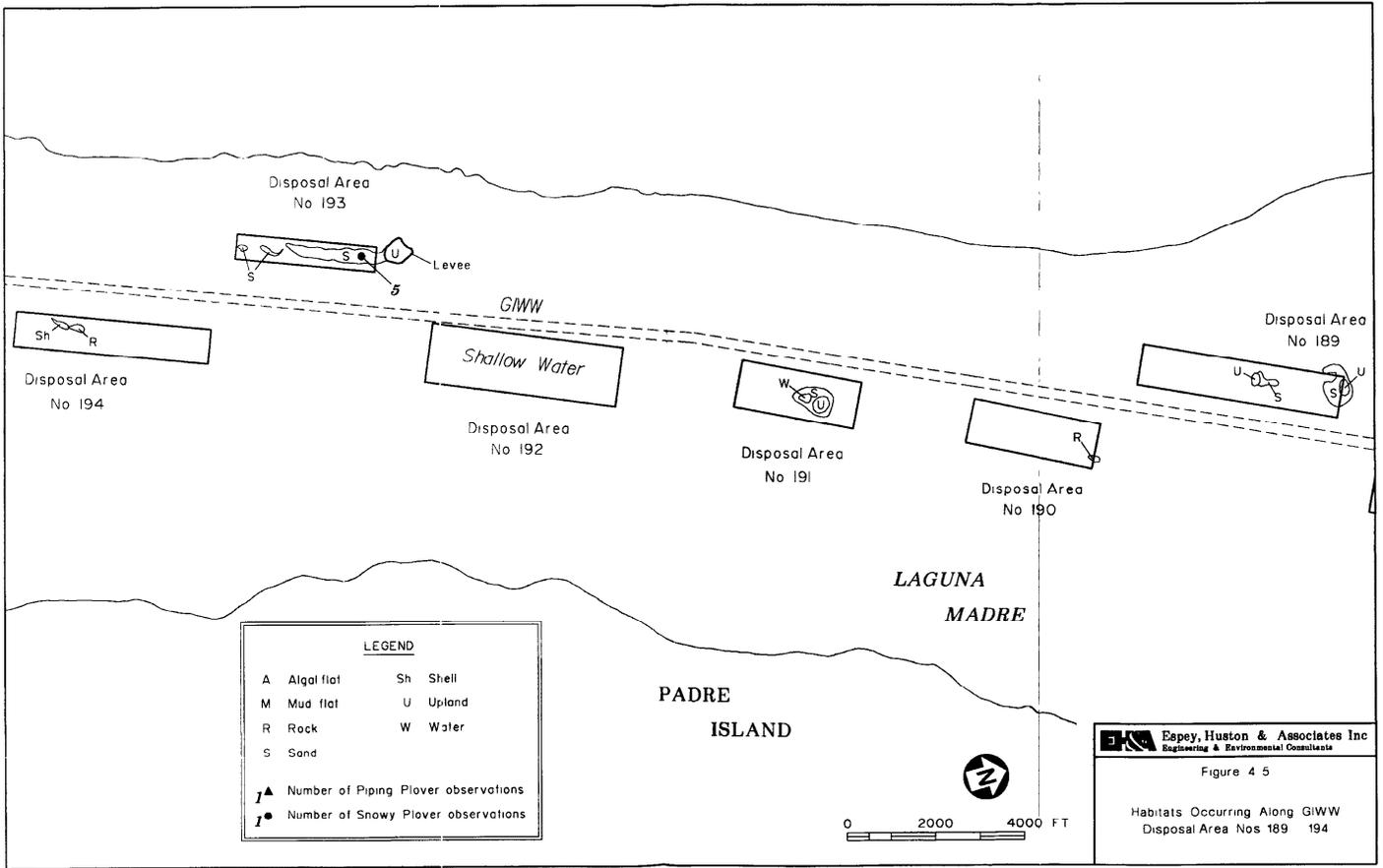
On 15 September 1993 the weather was cooler due to the passage of the cold front. Temperatures ranged from 68°F in the morning to 75°F in the afternoon. Winds were from the north at 20-25 mph in the morning, decreasing to 15 mph by late afternoon.

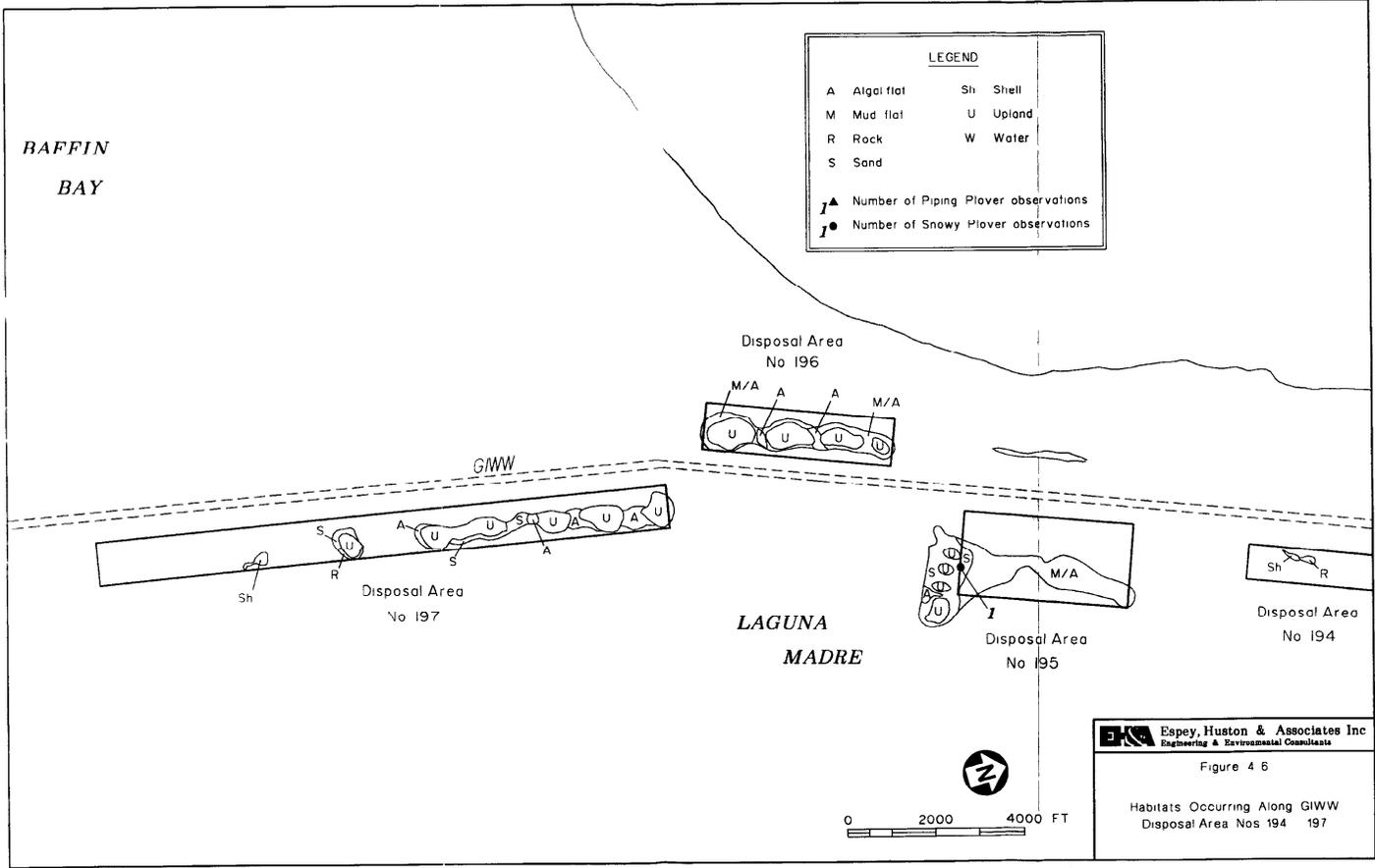
On this date, EH&A began surveys at Disposal Area No. 183 near North Bird Island and worked southward to Disposal Area No. 196 at the entrance to Baffin Bay (figures 4-3 through 4-6).

Six of the 14 disposal areas surveyed do not appear to provide habitat for the piping plover. Disposal Area Nos. 186 and 192 (figures 4-4 and 4-5) were both shallow water habitats and were completely submerged at the time of the site visit. The other four disposal areas which do not provide plover habitat are Disposal Area Nos. 187, 188, 190 and 194 (figures 4-4 through 4-6). The disposal areas are primarily open water with very small exposed islands. The shorelines of these islands are sloping, typically rocky or shelly, and are very thin before making the transition to upland habitat. Although all four disposal areas contained at least one guild species (Table 4-1), they did not provide the type of habitat typically utilized by the piping plover.

Disposal Area Nos. 183, 184, 185, 189, 191, 193 and 196 all contained small areas of sand or algal flats which could potentially be utilized by the piping plover (figures 4-3 through 4-6). No piping plovers were observed on these disposal areas, however the cold front may have had some impact upon this since few shorebirds were recorded throughout the day. Five snowy plovers were recorded from Disposal Area No. 193 (Figure 4-5).

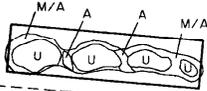




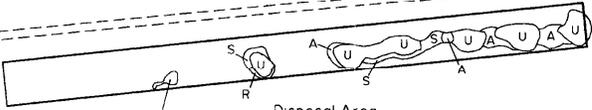


LEGEND			
A	Algal flat	Sh	Shell
M	Mud flat	U	Upland
R	Rock	W	Water
S	Sand		
▲	Number of Piping Plover observations		
●	Number of Snowy Plover observations		

Disposal Area  
No 196

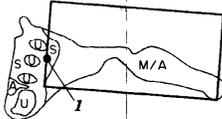


GIWW

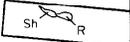


Disposal Area  
No 197

LAGUNA  
MADRE



Disposal Area  
No 195

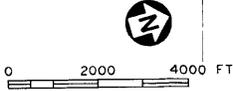


Disposal Area  
No 194

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Figure 4.6

Habitats Occurring Along GIWW  
Disposal Area Nos 194 197



Disposal Area No 195 contained the largest amount of potential piping plover habitat recorded on this date. This disposal area consisted of a large expanse of mud and algal flats which ran the length of the disposal area (Figure 4-6). These flats were partially exposed at the time of the site visit and contained numerous guild species including one snowy plover. Although no piping plovers were observed at Disposal Area No 195, this disposal area contained some of the best habitat recorded during the survey. However, during high tides, much of the area may be covered with water.

Guild members were observed on all disposal areas except for Disposal Area Nos 186 and 192, both of which were shallow water habitats. Table 4-1 presents a list of all guild species recorded from the disposal areas.

4.2.4 16 September 1993

On 16 September 1993, the weather was calm throughout the day. Winds were light in the morning picking up to 10-15 mph from the north at noon. By 1600 CST, the winds had died to 0-5 mph. Temperatures ranged from 72°F in the morning to 95°F by mid-afternoon.

On this date, EH&A travelled to Disposal Area No 207 which was the southernmost disposal area in the Mud Flats, then worked northward toward Baffin Bay. Disposal Area Nos 207 through 201 were surveyed on this date (figures 4-7 through 4-10). Within this portion of the study area known as the Mud Flats or landcut, many of the disposal areas are leveed, or at least partially leveed. This is true for Disposal Area Nos 202, 203, 204, 206 and 207. Disposal Area Nos 201 and 205 are both unleveed disposal sites.

Disposal Area No 201 consists of a thin band of islands in the southern portion of the disposal area and two small islands at the northern end (figures 4-7 and 4-8). The majority of the disposal area is open water. Three piping plovers were observed on the islands at the southern end of the disposal area (Figure 4-8). These islands contained a narrow, sandy shoreline with a thin algal mat along the GIWW, and a rocky shoreline with a thick seagrass accumulation along the eastern shore.

Disposal Area No. 205 is a small disposal island east of Disposal Area No 206 (Figure 4-9 and 4-10). This island has a wide, sandy shoreline with a thin algal mat on the south side. No piping plovers were observed on this disposal area, however several guild species were recorded (Table 4-1).

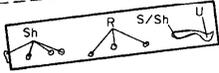
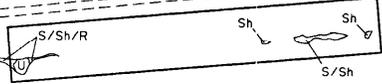
BAFFIN  
BAY

LEGEND	
A	Algal flat
M	Mud flat
R	Rock
S	Sand
Sh	Shell
U	Upland
W	Water
	Number of Piping Plover observations
	Number of Snowy Plover observations

Disposal Area  
No 198

Shallow Water

GIWW



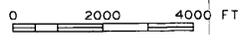
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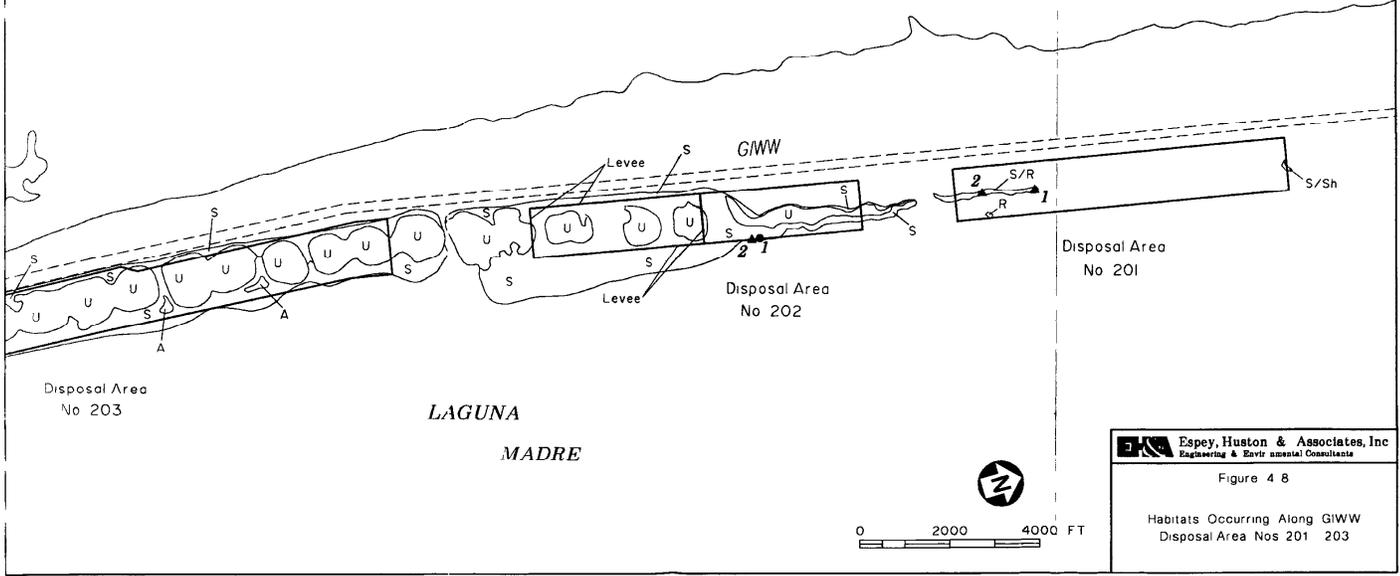
Espey, Huston & Associates, Inc  
Engineering & Environmental Consultants

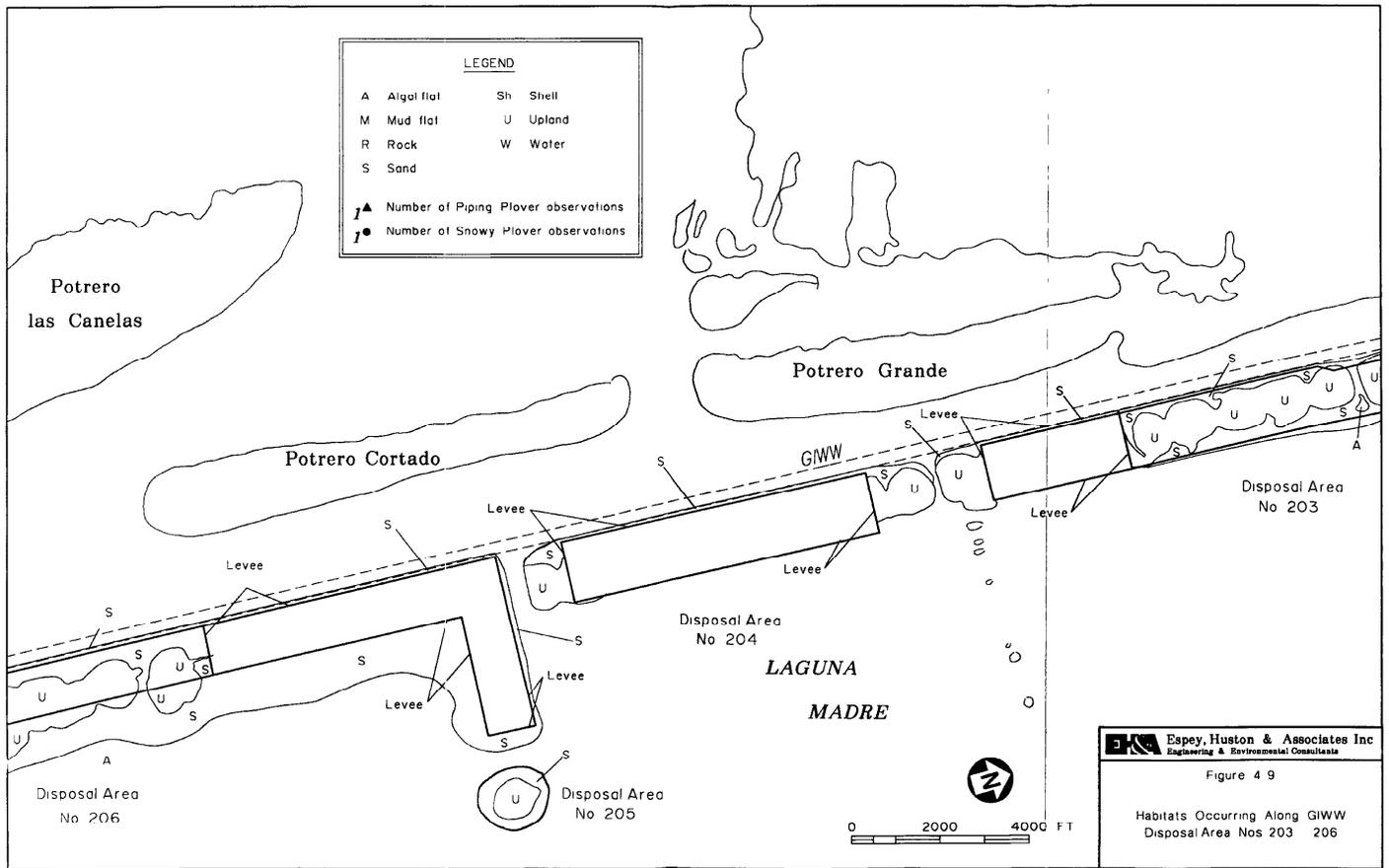
Figure 4.7

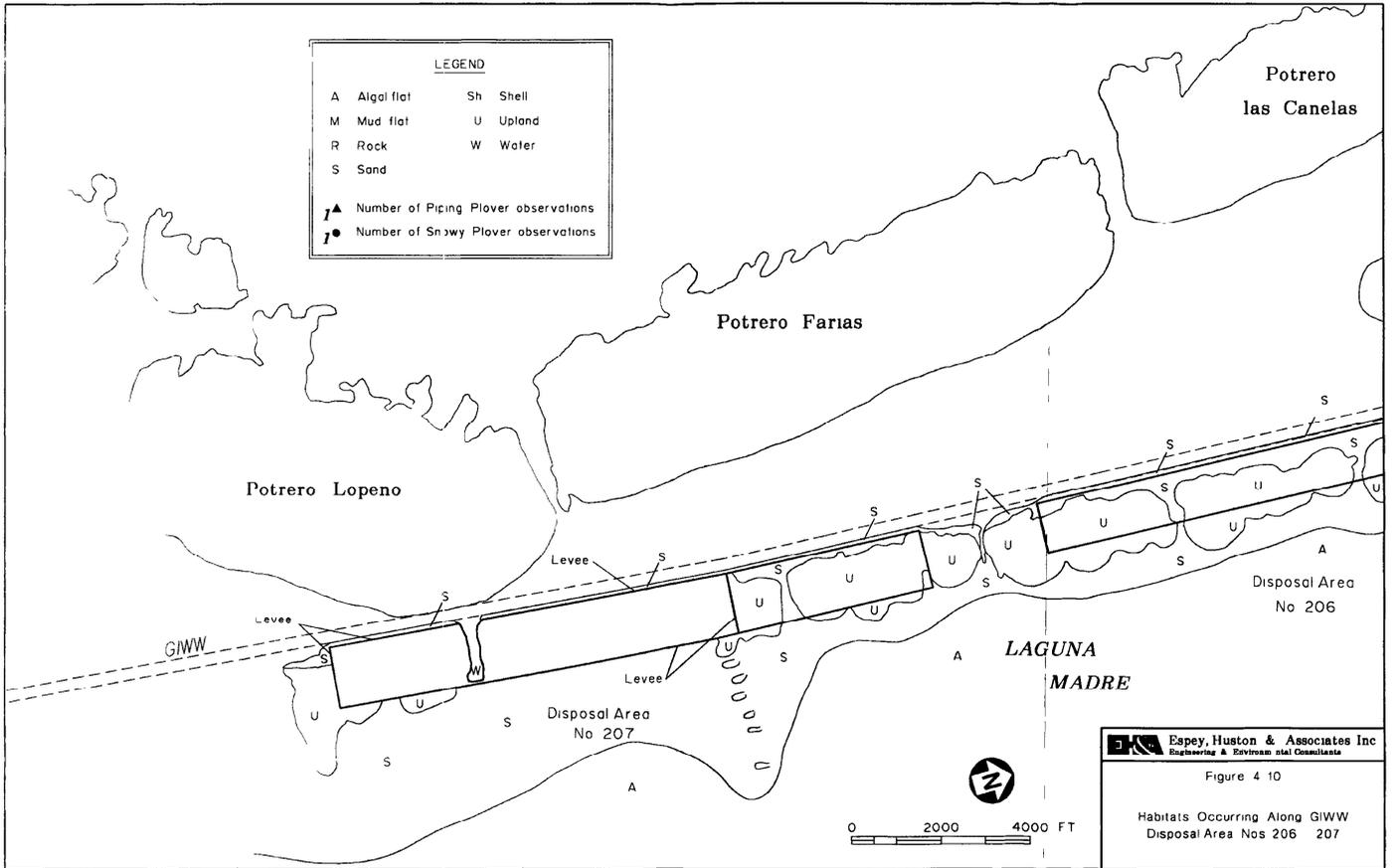
Habitats Occurring Along GIWW  
Disposal Area Nos 198 201



LEGEND			
A	Algal flat	Sh	Shell
M	Mud flat	U	Upland
R	Rock	W	Water
S	Sand		
<b>1</b> ▲	Number of Piping Plover observations		
<b>1</b> ●	Number of Snowy Plover observations		







Disposal Area No 202 is a partially-contained disposal area. The southern half of the disposal area is leveed, and the northern half is unleveed (Figure 4-8). The unleveed portion is a vegetated island which is rather narrow at the northern end and becomes wider at the southern end. At the southeast end of the unleveed area is a large sand flat with some shell intermixed. Large amounts of seagrass had accumulated on the sand flat at the time of the site visit. Two piping plovers and one snowy plover were observed on the sandflat (Figure 4-8), foraging along the piled-up seagrass.

The contained portion of Disposal Area No. 202 was not searched for piping plovers and habitat descriptions within the levees were not recorded. Notes concerning the GIWW shoreline were recorded in order to facilitate access for dredge pipeline placement without impacting plover habitat. The shoreline was primarily narrow sand flats which graded into upland areas near the base of the levees. Occasional small algal mats occurred in low-elevation areas. No piping plovers were observed along the GIWW shoreline of the contained portion of Disposal Area No. 202.

Disposal Area No. 203 is also partially contained (figures 4-8 and 4-9), with the southern one-fourth of disposal area enclosed in levees. Along the GIWW, narrow sandflats and vegetated dunes are the primary habitat.

The uncontained portion of Disposal Area No. 203 is primarily composed of densely vegetated dunes. East of the dunes were sand and algal flats which contained a relatively thick mat of seagrass along the water's edge (figure 4-8 and 4-9). These sand and algal flats appear to be suitable habitat for the piping plover, though none were observed on this date.

Disposal Area No. 204 was entirely enclosed in levees (Figure 4-9). The interior of the levees is composed primarily of vegetated dunes. The shoreline of the GIWW is similar to that of the other disposal areas in the vicinity, with thin sand flats occurring along the edge of the GIWW then grading into uplands near the base of the levee. No piping plovers were observed along the GIWW side of Disposal Area No. 204. Searches along the back side of the disposal area were not conducted.

Disposal Area No. 206 is uncontained in the southern half and contained in the northern half (figures 4-9 and 4-10). The uncontained portion of the disposal area has wide sand flats along the GIWW then rises to vegetated dunes (figures 4-9 and 4-10). The backside or eastern edge of the disposal area also contains a wide sand flat, with thick algal mats occurring approximately 500 feet (ft) to the east of the disposal area (figures 4-9 and 4-10). These sand and algal flats were dry at the time of the site visit and were virtually devoid of bird life. However, the presence of the thick algal mats east of the

disposal area indicates that the area receives periodic tidal influence. Under the right tidal conditions, the back side of the disposal area may provide habitat for the piping plover. Additionally, the sand flats along the GIWW may also provide habitat under the right conditions. No piping plovers were observed at Disposal Area No 206 at the time of the survey. Numerous shorebirds were observed on the expansive algal flats west of the GIWW.

Disposal Area No. 207 is the southernmost disposal area within the study area (Figure 4-10). The southern two-thirds is contained within levees, the northernmost one-third is uncontained. The uncontained portion of the disposal area is primarily upland habitat, which extends eastward outside the disposal area boundary. Immediately east of the upland habitats is a wide sand flat bordered by algal flats further to the east. The GIWW side of the uncontained portion of the disposal area contains a wide area of sand and algal flats which grades into vegetated uplands to the east. The leveed portion of the study area has a fairly wide sand and algal flat along the GIWW side. No piping plovers were observed at Disposal Area No 207 during the survey. Similar to Disposal Area No 206, very little bird life was recorded at this disposal area, however, under the right tidal conditions portions of the study area may provide habitat for the piping plover.

Guild members were observed at five of the seven disposal areas surveyed on this date and are presented in Table 4-1.

4 2 5      17 September 1993

On 17 September 1993, the weather was warm, mostly cloudy, with winds ranging from 5-20 mph. Temperatures ranged from 78°F in the morning to 93°F in the afternoon. Winds were light in the morning increasing to 20 mph by midafternoon.

Disposal Area Nos. 197 through 200 were surveyed from 0920-1415 CST (figures 4-6 and 4-7). Disposal Area No. 197 was the largest area surveyed on this date, and was the only one which appears to provide potential habitat for the piping plover. This disposal area consisted of a series of vegetated islands, joined to one another by sand or algal flats (figures 4-6 and 4-7). The perimeter of the islands contained a thin sand flat which became rocky in a few areas. No piping plovers were recorded from the disposal area.

Disposal Area No 198 is on the south end of Baffin Bay east of Point Penascal (Figure 4-7). This disposal area was entirely submerged at the time of the survey, except for piles of

seagrass barely exposed in the shallow water. It is unlikely that this disposal <sup>area</sup> provides habitat for the piping plover, however, several guild members were observed foraging on the piles of seagrass.

Disposal Area Nos 199 and 200 are both composed primarily of open-water habitats (Figure 4-7). Each disposal area has a series of small islands with rock, sand or shell shorelines. The shorelines are sloping and rather narrow in width, with deep seagrass accumulations occurring on the eastern shorelines. No piping plovers were observed on the two disposal areas, and habitats appear unsuitable for the piping plover.

Guild members were recorded on all disposal areas surveyed on this date and are presented in Table 4-1.

5.0 DISCUSSION

The results of the September survey revealed piping plover use on 10 of the 37 disposal areas. The majority of sightings (83%) came from disposal areas north of North Bird Island. Habitats utilized in these areas were sand and algal flats along the perimeter of the disposal islands. These habitats were rarely extensive, but occurred as a thin band around the islands.

The surveys of disposal areas south of North Bird Island were performed after the passage of a cold front. It is possible that this cold front may have affected avian activity, thereby lowering the number of piping plovers recorded from 15-17 September. The presence of guild members was noticeably lower on 15 September, the first day following the passage of the front. Additionally, many of the uncontained disposal areas south of North Bird Island where no piping plovers were found had habitats similar to those north of North Bird Island.

Virtually all of the contained disposal areas had a thin sand or sand and algal flat along the edge of the GIWW. While these flats were thin and no piping plovers were observed on them, they do not appear to be very different from sand or algal flats where piping plovers were observed. However, there are places along each of the contained disposal areas which could facilitate placement of dredge pipe. These areas include places where upland habitats and particularly vegetated habitats encroach closest to the GIWW shoreline.

Guild members were present on all but five of the 37 disposal areas. Three of these disposal areas, Nos. 171, 186 and 192, were completely submerged and afforded no terrestrial habitat. One disposal area, No. 204, was a contained area and Disposal Area No. 206 was partially contained. The most frequently observed guild members were the willet (*Catoptrophorus semipalmatus*), western sandpiper (*Calidris mauri*), black-bellied plover (*Pluvialis squatarola*), least sandpiper (*Calidris minutilla*), and sanderling (*Calidris alba*), respectively.

6 0            CONCLUSIONS

Based upon the five day survey of the GIWW Disposal Areas, it is apparent that many of the disposal areas may warrant further investigations as to the presence and utilization by the piping plover. Judging by the presence of the piping plover or guild members, 32 of the 37 disposal areas would require additional surveys. However, it is the opinion of EH&A biologists that several of the disposal areas where guild species were present do not provide habitats suitable for the piping plover. Undoubtedly, the disposal areas which contained piping plovers or snowy plovers will require additional investigations. These include Disposal Area Nos 172, 175, 176, 177, 178, 179, 180, 181, 193, 195, 201 and 202. Since a detailed survey for Disposal Area No. 175 has recently been completed for the GLO, surveys for this area may not be necessary. Additionally, surveys of disposal areas with habitats similar to those where piping plovers were found is also recommended, and probably will be required. These disposal areas include Nos 173, 182, 183, 184, 185, 189, 191, 196, 197, 203, 205, 206, and 207.

Disposal areas not recommended for additional surveys include those which are totally submerged, totally contained within levees; have extremely limited sand or algal flat habitat, or have very little exposure above water dominated by upland habitat or rock or shell substrates. The disposal areas not recommended for additional surveys are Nos 171, 174, 186, 187, 188, 190, 192, 194, 198, 199, 200 and 204.

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