To: Charles Kovach, DEP
From: Jennifer Wolny, FIO-FMRI

Date: January 12, 2004

Re: Piney Point Discharge Program - Phytoplankton Analysis Summary

From July to December 2003, 271 live and 271 lugols preserved water samples collected as part of the Piney Point Discharge Program were screened for the presence of harmful algal bloom (HAB) species at the request of the Florida Department of Environmental Protection. While all samples were screened for the presence of HAB species, only the preserved samples were used to enumerate the harmful species following the methods of Steidinger *et al*. (2003). Table 1 summarizes the HAB species counts and Table 2 lists all phytoplankton species observed during the examination of the 542 samples.

The 542 samples examined were characterized by extremely low concentrations of phytoplankton: 25% of the samples screened had no phytoplankton cells present. Of the 75% of samples with phytoplankton observed in them during the live or preserved analysis, only 4% (21 samples) had HAB species that could be enumerated. The scarcity of phytoplankton was expected due to the oligotrophic nature of offshore Gulf of Mexico waters (Vargo *et al*. 2001).

Karenia species were present at background concentrations (<1,000 cells/L; Steidinger *et al*. 1998) in only two samples on Aug 12 and Nov 13, 2003. *Trichodesmium* spp., a common bloom forming colonial cyanobacterium present off the west coast of Florida year round (Walsh and Steidinger 2001), was present in one sample (~10^4 cells/L) on July 29, 2003.

The potentially toxic diatom *Pseudo-nitzschia* was present in samples from July and August, and a single sample in November, generally at concentrations under 20,000 cells/L. There is no historical data on *Pseudo-nitzschia* – domoic acid interactions for this region of the Gulf of Mexico, but data from offshore regions of Scotland (Bresnan *et al*. 2003) and inshore areas of Puget Sound (Trainer *et al*. 1998) suggest that at a minimum 25,000 cells/L are needed to have detectable levels of domoic acid in shellfish tissue. In Monterey Bay, California monitoring of shellfish for domoic acid begins when cell counts of certain *Pseudo-nitzschia* species (*P. australis*) begin when cell concentrations are great than ~10^4 cells/L (C. Scholin, pers. comm.). The highest cell concentrations encountered during the Piney Point discharge program were 34,300 cells/L (on July 29, 2003, station 7, 0m).

Several factors complicate interpretation of data on *Pseudo-nitzschia* in the Gulf however. Not all species of *Pseudo-nitzschia* are toxic or produce equal amounts of toxin. Because of this researchers in New Zealand regulate their shellfish beds based on a sliding scale of cell concentrations based on the *Pseudo-nitzschia* species present (C. Scholin, pers. comm.). Additionally, scanning electron microscopy (SEM) is required to identify *Pseudo-nitzschia* to the species level. To date only two samples (July 10, 2003, stations 6 and 7) have been screened with SEM analysis for identification of the *Pseudo-*

nitzschia species present. Initial taxonomic identification indicates the presence of *P. pseudodelicatissima*, a potentially toxic species.

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Table 1. Harmful algae species enumerated from preserved phytoplankton samples collected during the 2003 Piney Point discharge program.

Species	Date Collected	Station	Depth	Cell Concentration
Karenia mikimotoi	8/19/2003	7	0m	333/L
Karenia papilionacea	11/13/2003	10	0m	333/L
Pseudo-nitzschia sp.	7/10/2003	6	0m	20,000/L
	7/10/2003	7	0m	20,000/L
	7/29/2003	5	0m	15,200/L
	7/29/2003	7	0m	34,300/L
	7/29/2003	9	0m	22,700/L
	7/29/2003	10	0m	2,300/L
	8/19/2003	3	55m	2,000/L
	8/19/2003	7	50m	4,000/L
	8/19/2003	9	0m	2,670/L
	8/19/2003	11	60m	2,000/L
	8/19/2003	12	55m	15,000/L
	8/29/2003	1	50m	1,670/L
	11/24/2003	1	10m	2,330/L
Trichodesmium erythreum	7/29/2003	13	0m	22,300/L

Table 2. List of phytoplankton species found during the examination of 542 samples collected during the 2003 Piney Point discharge program. Potentially harmful species are noted with their mode of action.

Species	Group	Mode of Action	Reference
** denotes harmful species*			
Bacteriastrum sp.	Diatom		
**Ceratium furca*	Dinoflagellate	uncharacterized toxin	Landsberg 2002
Ceratium hircus	Dinoflagellate		
**Cerataulina pelagica*	Diatom	mechanical	Landsberg 2002
Chaetoceros sp.	Diatom		
Cochlodinium sp.	Dinoflagellate		
Corethron hystrix	Diatom		
Coscinodiscus sp.	Diatom		
Cryptomonas sp.	Flagellate (Green)		
Dactyliosolen fragilissimus	Diatom		
Dictyocha sp.	Flagellate (Silico)		
Diplopsaloid	Dinoflagellate		
Gymnodinium sp.	Dinoflagellate		
Gyrodinium sp.	Dinoflagellate		
Haslea ostrearia	Diatom		
Heterocapsa sp.	Dinoflagellate		
**Karenia mikimotoi*	Dinoflagellate	hemolysins	Landsberg 2002
**Karenia papilionacea*	Dinoflagellate	brevetoxin	Haywood et al. 2004
Karenia sp.	Dinoflagellate		
Leptocylindricus danicus	Diatom		
microflagellates	Flagellate		
Navicula sp.	Diatom		
Nitzschia closterium	Diatom		
Oscillatoria sp.	Blue-Green		
Phalacroma sp.	Dinoflagellate		
Proboscia alata	Diatom		
Prorocentrum scutellum	Dinoflagellate		
Protoperidinium grande	Dinoflagellate		
Pseudo-nitzschia sp.	Diatom	domoic acid	Landsberg 2002
Rhizosolenia calcar-avis	Diatom		
Rhizosolenia setigera	Diatom		
Rhizosolenia stolterfothii	Diatom		
Scrippsiella sp.	Dinoflagellate		
Thalassionema nitzschioides	Diatom		
Thalassiosira sp.	Diatom		
Thalassiothrix sp.	Diatom		
Torodinium sp.	Dinoflagellate		
**Trichodesmium erythreum*	Cyanobacteria	uncharacterized toxin	Landsberg 2002
**Trichodesmium thiebautii*	Cyanobacteria	anatoxin-a like	Landsberg 2002