Biological Assessment of

Mosaic Fertilizer - Wingate Creek Mine

Manatee County

NPDES #FL0032522

Sampled August 1 and September 12, 2005

April 2006

Biology Section

Bureau of Laboratories

Division of Resource Assessment and Management

Quality Manual No. 870346G

NELAC Certification No. E31780

Florida Department of Environmental Protection

Fifth Year Inspection Summary

Discharger: Mosaic Fertilizer – Wingate Creek Mine

Physical Address: 38651 State Road 54-East Myakka City, FL 34251

County: Manatee

NPDES Number: FL0032522

Permit Expiration: 4/5/2005

Toxics Sampling Inspection **(XSI)**

Date Sampled: September 12, 2005

Results: No organic constituents were detected in the effluent (Outfall 002). Aluminum and iron were detected in the effluent at levels above the practical quantitation limit (PQL). Arsenic, lead, and nickel were detected in the effluent at levels above the method detection limit (MDL), but below the PQL. Levels of all metals detected complied with applicable Class III Water Quality Criteria (62-302, F.A.C.).

Compliance Biomonitoring Inspection **(CBI)**

Due to no toxic findings in the recent past and a brief time-window for sampling, effluent samples were not collected for the purpose of toxicity testing for this event. Samples collected in August 2004 from Outfall 002 were not acutely toxic to the invertebrate, *Ceriodaphnia dubia*, or the fish, *Cyprinella leedsi*.

Water Quality Inspection **(WQI)**

Date Sampled: September 12, 2005

Results: Fecal and total coliform samples were not collected from the effluent or the receiving waters (Johnson Creek). The effluent total nitrogen concentration was 0.76 mg/L (Table 1). Dissolved oxygen, pH, and conductivity complied with Class III Water Quality Criteria in effluent samples and at the Control and Test Sites. Effluent total phosphorus (2.5 mg/L) and ortho-phosphate (2.2 mg/L) contributed to elevated levels at the Test Site. Test Site phosphatic nutrient levels were above the 95th percentile when compared with levels typical of Florida streams, while concentrations of these nutrients at the Control Site ranked in the 70th percentile of typical values for Florida streams. The algal growth potential (AGP) values at the upstream Control Site (1.33 mg dry wt/L), the downstream Test Site (0.82 mg dry wt/L), and in the effluent (0.48 mg dry wt/L) were well below the “problem” threshold (5.0 mg dry wt/L). There was no evidence of algal growth inhibition.

Impact Bioassessment Inspection **(IBI)**

Date Sampled: September 12, 2005

Results: Chlorophyll-*a* was detected in the effluent and water samples from the Control and Test Sites on both sampling dates; all levels were <10 µg/L. The phytoplankton community at the Test Site was similar to that in the effluent. Both samples were dominated by *Anabaena*, a blue-green algae capable of producing toxins. Phytoplankton Shannon-Weaver diversity was reduced by 26% and the total number of taxa was reduced by 31% at the Test Site compared to the Control Site. There were only slight differences in the periphyton algal communities collected from natural substrates at the Control and Test Sites that could be attributable to scouring from the increased velocity downstream. Quantitative measures of benthic macroinvertebrate assemblages from Hester-Dendy samplers showed a 31% reduction in Shannon-Weaver diversity at the Test Site compared to the Control Site, exceeding the Class III Surface Water Quality Criterion (62-302.530(11), F.A.C.). Qualitative measures of benthic macroinvertebrate assemblages from dipnet samples indicated the community fails to meet the expectation of a healthy community at both sites.

Biological assessments are prepared by FDEP staff to provide information for review of NPDES permit renewal applications. Biological assessments, in conjunction with other information concerning the subject facility and its receiving-water body, are used to determine appropriate permit conditions.

Introduction

The Mosaic Fertilizer-Wingate Creek Mine is located in Manatee County, Florida (Appendix 1). This facility includes phosphate mining and beneficiation facilities, phosphatic clay settling area, sand tailings disposal areas and a mine water recirculation system (see Facility Summary in Appendix 2). Activities include the mining and washing of phosphate ore. The mined ore is slurried into a pit and then pumped to the beneficiation plant where the fine clays and sand are separated from the phosphate rock by washing, screening and double flotation. The generated wet phosphate rock is transported to another location for further processing. The separated clays are pumped to the settling areas. Decanted water from the settling areas is returned to the beneficiation plant for reuse and discharged, as necessary, through Outfall 001 and Outfall 002. Water discharged through Outfall 001 flows to Wingate Creek and water discharged through Outfall 002 flows to Johnson Creek. Both creeks are Class III fresh waters. There is no design flow for this facility. The mean flow from Outfall 002 for the previous 12 months was 4.03 million gallons per day (MGD, August 2004 – July 2005). The actual flow during this survey was 5.93 MGD (see Facility Summary in Appendix 2). Outfall 001 discharging has been very limited over the past 12 months and was not discharging during this study and therefore will not be discussed further in this report.

Surface Water Quality Criteria and facility permit limits are listed in Table 1. According to the facility's monthly discharge monitoring reports for Outfall 002, the plant has had one permit violation within the last year (Appendix 2). The monthly average total phosphorus limit of 3.0 mg/L was exceeded on 8/31/2005 (3.70 mg/L). Additionally, effluent (Outfall 002) and receiving water samples were collected by FDEP staff in August 2004 in association with a facility inspection. Results complied with permit limits and Surface Water Quality Criteria. Although the facility does not have a numeric chlorophyll-*a* limit (limit is "report" only), high chlorophyll-*a* values were reported in effluent samples from that event.

Methods

Due to public interest in the facility's permit and thwarted sampling efforts in August 2004, this follow-up investigation was performed in an effort to collect data needed to evaluate the facility's discharge. Although samples were collected from the effluent, excessive rain in August 2004 inhibited efforts to collect macroinvertebrate samples, and sampling personnel were concerned this could happen again. Therefore, Biorecon macroinvertebrate samples and some water quality samples were collected on the day the sites were reconned (August 1, 2005). Fortunately, water levels remained below flood levels during the study period, which allowed for a complete set of samples (except bioassays and fecal indicators) to be collected on September 12, 2005.

The purpose of this investigation was to determine the potential effects of the facility's effluent from Outfall 002 on the biota of the receiving waters. Chemical and biological comparisons were made between a Control Site (located in Johnson Creek approximately 150 meters upstream of the discharge) and a Test Site (also located in Johnson Creek approximately 150 meters downstream of the discharge). Detailed methods and their relationship to Florida Administrative Code are given in Appendix 3.

All field and laboratory biological methods followed Biology Section Standard Operating Procedures (SOPs, see http://www.floridadep.org/labs/qa/2002sops.htm for details) and met FDEP quality assurance/quality control standards (see http://www.floridadep.org/labs/qa/index.htm).

The following were involved in this investigation: Jacki Champion and Scott Rose (FDEP-Phosphate Management), and FDEP Central Laboratory in Tallahassee. The report was reviewed by District representatives and the Point Source Studies Review Committee (Wayne Magley, Shannan Bogdanov, and Michael Tanski).

Results and Discussion

- Specific chemical results are reported in Table 1 and a complete list of chemical analytes can be reviewed in Appendix 4. Effluent metals complied with Class III Water Quality Criteria (62-302.530, F.A.C.) and facility permit limits. Aluminum and iron were detected in the effluent at levels above the practical quantitation limit (PQL), while arsenic, lead, and nickel were detected in the effluent at levels above the method detection limit (MDL) but below the PQL.
- No organic pollutants were detected in the effluent.
- Effluent conductivity, pH, and dissolved oxygen complied with Class III Water Quality Criteria (62-302, F.A.C.) and facility permit limits.
- Dissolved oxygen, pH, and conductivity at the Control and Test Sites complied with Class III Water Quality Criteria (Table 1, 62-302.530, F.A.C.). However, the conductivity measured at the Test Site (431 µmhos/cm) was similar to that measured in the effluent (455 µmhos/cm) and 2-3 times higher than at the Control Site (247 µmhos/cm).
- Effluent bioassay samples were not collected for the purpose of toxicity testing. However, samples collected in August 2004 were not acutely toxic to the invertebrate, *Ceriodaphnia dubia*, or the fish, *Cyprinella leedsi* (see report at: ftp://ftp.dep.state.fl.us/pub/labs/lds/reports/5403.pdf). The facility performs periodic toxicity testing (and has reported no exceedances or

Table 1. Effluent limits, Class III Freshwater Criteria and chemical, microbiological, and toxicological data.

Mosaic Fertilizer Wingate Creek Mine	Class III Stds	Effluent Limits	Effluent Samples 8/1/05	Effluent Samples 9/12/05	Control Site 8/1/05	Control Site 9/12/05	Test Site 8/1/05	Test Site 9/12/05
Organic Constituents (µg/L)								
None Detected	-	-	-	-	-	-	-	-
Metals (µg/L unless otherwise noted)								
Aluminum	-	-	-	138	-	-	-	-
Arsenic	≤ 50	-	-	13 I	-	-	-	-
Cadmium	≤ 2.5 b	-	-	0.05 U	-	-	-	-
Calcium (mg/L)	-	-	-	72.1	-	-	-	-
Chromium-III	≤ 195 b	-	-	2 U	-	-	-	-
Copper	≤ 21.9 b	-	-	0.5 U	-	-	-	-
Iron	≤ 1000	-	-	45	-	-	-	-
Lead	≤ 11.3 b	-	-	0.18 I	-	-	-	-
Magnesium (mg/L)	-	-	-	22.1	-	-	-	-
Nickel	≤ 121.3 b	-	-	3.4 I	-	-	-	-
Selenium	≤ 5	-	-	2.5 U	-	-	-	-
Silver	≤ 0.07	-	-	0.025 U	-	-	-	-
Zinc	≤ 278.9 b	-	-	3 U	-	-	-	-
Nutrients (mg/L)								
Ortho-phosphate	-	-	2.9	2.2	0.23	0.11	2.9	2.2
Total Phosphorus	-	≤ 5.0* s	3.2	2.5	0.29	0.25	3.2 A	2.4
Ammonia	-	-	0.01 U	0.017 I	0.064	0.086	0.026	0.034
Unionized Ammonia	≤ 0.02	-	≤ 0.02 c	≤ 0.02 c	≤ 0.02 c	≤ 0.02 c	≤ 0.02 c	≤ 0.02 c
Nitrate+Nitrite	-	-	0.004 U	0.006 I	0.067	0.053	0.012	0.025
Color (PCU)	-	-	-	100 A	-	-	-	-
Total Kjeldahl Nitrogen	-	-	0.73	0.75	1.1	0.58	0.81A	0.78
Organic Nitrogen	-	-	0.72 c	0.73 c	1.03 c	0.494 c	0.78 c	0.746 c
Total Nitrogen	-	Report	0.734 c	0.76 c	1.17 c	0.633 c	0.82 c	0.805 c
General Physical and Chemical Parameters								
Alpha, Total (pCi/L)	≤ 15	≤ 15.0*	-	1.6 U	-	-	-	-
Alpha-Counting Error (pCi/L)	-	-	-	1.2	-	-	-	-
Radium 226 (pCi/L)	-	-	-	0.6	-	-	-	-
Radium 226-Counting Error (pCi/L)	-	-	-	0.2	-	-	-	-
Radium 228 (pCi/L)	-	-	-	0.9 U	-	-	-	-
Radium 228-Counting Error (pCi/L)	-	-	-	0.6	-	-	-	-
Combined Radium ($Ra^{226+228}$) (pCi/l)	≤ 5	≤ 5.0* s	-	0.6	-	-	-	-
Habitat Assessment	-	-	-	-	-	121	-	137
Dissolved Oxygen (mg/L)	≥ 5	Report	5.9	7.3	5.9	5.4	6.8	7.2
BOD, 5 day (mg/L)	-	-	0.98 I	-	0.66 I	-	0.88 I	-
pH (S.U.)		6.0-8.5	7.1	7.2	6.6	6.5	7.1	7.2
Conductivity (umhos/cm)	≤ 1275	≤ 1275	612	455 J	181	247 J	577	431 J
Temperature (C)	-	Report	30.2	29.2	28.6	27.5	30.1	28.4
Chloride	-	-	-	8.4	-	-	-	-
Total Suspended Solids (mg/L)	-	60* s	4 U		4 U	16	4 U	4 U
Total Dissolved Solids	-	-	477 A	469	154	-	466 A	-
Oil and Grease (mg/L)	≤ 5.0	≤ 5.0 s	-	1.7 U	-	-	-	-
Turbidity (NTU)	≤ 41	-	2.4	2.9	1.4	12	2.1	2.7
Chlorophyll *a* (µg/L)			3	4.1 I	3.3	7.8	3.2	2.8
Phaeophytin (µg/L)			0.52	3.9 J	0	5.1	0	3.4
Fluoride	≤ 10	-	-	0.59	-	0.18	-	0.66
Sulfate	-	-	-	240	-	92	-	230
Alkalinity	≥ 20	-	-	64	-	-	-	-
Flow (MGD)	-	Report	-	5.93	-	-	-	-
Hardness (mg/L)	-	-	-	271.0 c	-	-	-	-

A - Value reported is the mean of two or more determinations
b - Value is calculated based on hardness
c - Value is calculated
I - The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
J - Estimated value
U - Material analyzed for but not detected; value reported is the minimum detection limit
s - Single sample
* - based on 24-hour composite sampling

Table 2. Measured and predicted algal growth potential (AGP) for total soluble inorganic nitrogen (TSIN) and total nitrogen (TN) limitation

Location	AGP (measured)	Predicted AGP (TSIN) ± 20%	Inorganic N:P ratio	Predicted AGP (TN) ± 20%	Total N:P ratio
Control (mg dry wt/L)	1.33 JV	5.3 ± 1.1	1.3	24.1 ± 4.8	2.5
Test (mg dry wt/L)	0.819 AIJV	2.2 ± 0.4	0.0	30.6 ± 6.1	0.3
Effluent (mg dry wt/L)	0.477 IJV	0.9 ± 0.2	0.0	28.7 ± 5.7	0.3

violations of Surface Water Quality Criteria and facility permit limits) (DMR data, Appendix 2).

- Because fecal and total coliform tests were not scheduled, samples were not collected from the effluent or the receiving waters to test for these bacterial indicators.

- The effluent total nitrogen concentration was 0.76 mg/L (Table 1). Effluent total phosphorus (2.5 mg/L) and ortho-phosphate (2.2 mg/L) concentrations contributed to elevated levels at the Test Site. Phosphatic nutrient concentrations were higher on 8/1/05 than on 9/12/05 (Table 1). Total Kjeldahl nitrogen (TKN) concentrations were similar in the effluent and Test Site water from both sampling dates. Nutrient levels at the Control Site were variable over the two events. Total nitrogen and phosphatic nutrients were higher at the Test Site than at the Control Site in water samples from 9/12/05. Total phosphorus and ortho-phosphate concentrations were 10 times higher at the Test Site than at the Control Site. Test Site levels of these nutrients were above the 95th percentile when compared with levels typical of Florida streams (Appendix 5), while concentrations of these nutrients at the Control Site ranked at or below the 70th percentile of typical values for Florida streams.

- Algal growth potential (AGP) is a measure of nutrients available for algal growth (Miller *et al*. 1978). Raschke and Shultz (1987) found that AGP above 5.0 mg dry wt/L represent a "problem" threshold for fresh receiving waters, implying nutrient enrichment. The AGP value at the upstream Control Site was 1.33 mg dry weight/L (Table 2). The AGP values of the downstream Test Site (0.819 mg dry weight/L) and the effluent (0.477 mg dry wt/L) were also below this threshold. Nutrient chemistry results indicate the waters are nitrogen-limited, but do not indicate algal inhibition (Table 2). The results were estimated due to lab contamination from an algal species other than the test species, *Pseudokirchneriella subcapitata* (noted in Table 2 as qualifiers J and V).

- Chlorophyll-*a* was detected in the effluent and water samples from the Control and Test Sites on both sampling dates (Table 1). All levels were <10 µg/L. The addition of more nitrogen could increase algal production and raise chlorophyll-*a* concentrations. We note that nutrients in the water column may or may not fuel algal production immediately, depending upon the sum of environmental conditions that limit algal growth at the site (e.g. pH, shading, turbidity). Habitat assessments indicate that the receiving water sites were shaded and the water was tannic. These factors could be depressing algal production despite elevated nutrient concentrations.

- The phytoplankton community at the Test Site was similar to that in the effluent. Both samples were dominated by *Anabaena*, a blue-green algae capable of producing toxins. Shannon-Weaver diversity was reduced by 26% and the total number of taxa was reduced by 31% at the Test Site compared to the Control Site (Table 3 and Appendix 10).

- Samples collected from natural substrates showed slight differences in the periphyton algal communities between the Control and Test Sites (Table 4, Appendix 7). Both were dominated by diatoms, but not the same ones. There were 30% fewer taxa and less algal units identified at

Table 3. Phytoplankton composition at effluent, control and test sites.

Mosaic Fertilizer Wingate Creek Mine	Effluent	Control Site	Test Site
Number of Taxa	37	65	45
Shannon-Weaver Diversity	3.4	5.1	3.8
Algal Density (number/ml)	766	520	562
Percent Dominant Taxon	37.6	14.2	37.9
Dominant Taxon (name)	*Anabaena* sp.	*Capartogramma crucicula*	*Anabaena* sp.
Number of Algal Units Identified	298	305	302
Percentage Composition:			
Blue-green algae	48.2	18.9	53.2
Green algae	41.9	6.9	31.0
Diatoms	7.8	67.7	15.8
Euglenophytes	0.8	6.0	0
Cryptophytes	1.3	0.6	0

the Test Site. This could be a result of scouring from the addition of the effluent to the stream; the stream velocity increased from 0.16 m/sec at the Control Site to 0.3 m/sec at the Test Site (Appendix 6).

- Habitat assessment scores were 121 at the Control Site and 137 at the Test Site (Table 1, data sheets in Appendix 6), placing both sites in the "optimal" category. The Test Site scored higher for increased velocity, which may help oxygenate the water for the macroinvertebrates, and substrate diversity. There were four productive habitats (snags, rock, leaf packs, and roots) at the Test Site compared to two at the Control Site (snags and roots). Both sites had a sufficient riparian buffer zone to supplement the available habitats.

- Quantitative measures of benthic macroinvertebrate assemblages from Hester-Dendy samplers showed a shift in the community at the Test Site compared to the Control Site (Table 5, Appendix 8). Ephemeroptera (mayflies) and gastropoda (snails) were significantly reduced at the Test Site. These changes are likely in response to the increases in conductivity and velocity. Sensitive taxa (includes some mayflies) have been shown to decrease with increases in conductivity (reference) and scouring from increased velocity would diminish the snails ability to attach to substrates. Shannon-Weaver diversity was reduced by 31% at the Test Site compared to the Control Site, an exceedance of the Class III Surface Water Quality Criterion (62-302.530(11), F.A.C.).

- Qualitative measures of benthic macroinvertebrate assemblages from dipnet samples are summarized in Tables 6, 7a, 7b, 8a and 8b and in Appendices 9 and 11. Biorecon samples collected on 8/1/05 placed both the Control and Test Sites in the "Fail" category and the SCI samples collected on 9/12/05 placed them both in the "Poor" category. These results indicate an impaired or unhealthy macroinvertebrate community in this portion of Johnson Creek. The cause of these results cannot be determined from this data. The facility's effluent may be having some effect downstream, but the upstream portion is in a similar condition. Additional data collection is needed to make a better determination.

Table 4. Periphyton composition at control and test sites.

Mosaic Fertilizer Wingate Creek Mine	Control Site	Test Site
Number of Taxa	64	45
Percent Dominant Taxon	14.9	14.4
Dominant Taxon (name)	*Capartogramma crucicula*	*Diadesmis confervacea*
Number of Algal Units Identified	315	187
Percentage Composition:		
Blue-green algae	14.0	7.5
Green algae	2.9	4.8
Diatoms	82.2	87.7
Other	1.0	0.0

Table 5. Macroinvertebrate Hester-Dendy Samples - Quantitative

Mosaic Fertilizer Wingate Creek Mine	Control Site	Test Site
Summary Statistics		
Shannon-Weaver Diversity	3.5	2.4
Number of Taxa	36	23
Florida Index	21	13
Number of EPT Taxa	5	6
Percent Dominant Taxon	26.5	36.1
Dominant Taxon (name)	*Tribelos fuscicornis*	*Polypedilum flavum*
Dominant Taxon (group)	Diptera	Diptera
Total Number of Individuals (counted)	513	2372
Total Number of Individuals (#/m2)	1358	6277
Community Composition: Percent of total		
Coleoptera	7.0	9.9
Diptera	58.1	39.1
Ephemeroptera	22.0	0.2
Gastropoda	10.0	5.3
Trichoptera	2.0	45.0
Odonata	0.6	0.0
Functional Feeding Groups: Percent of total		
Predators	8.2	1.3
Surface Deposit Feeders	57.0	27.3
Suspension Feeders	4.8	43.5
Scrapers	25.8	9.3
Shredders	4.2	18.6

Value exceeds the Class III Water Quality Criteria

Summary

The effluent complied with all Class III Surface Water Quality Criteria and facility permit limits. No exceedances of Class III Criteria were measured in water samples collected at the Control and Test Sites in Johnson Creek. Chlorophyll-*a* concentrations were <5.0 µg/L in the effluent and Test Site samples.

Despite the presence of more habitat and increased velocity the diversity of both algal and macroinvertebrate assemblages were reduced downstream of the facility, which indicates the facility's effluent may be contributing to some degradation in this portion of Johnson Creek. Qualitative macroinvertebrate dipnet samples indicate that both the Control and Test Sites are not supporting healthy macroinvertebrate communities, since both sites ranked in the "Fail" and "Poor" categories for the Biorecon and Stream Condition Indices, respectively. Measures of benthic macroinvertebrate assemblages from Hester-Dendy samplers indicated a reduction of 31% in Shannon-Weaver diversity at the Test Site compared to the Control Site, an exceedance of the Class III Surface Water Biological Integrity Criterion (62-302-.530(11), F.A.C.).

Both DMR and FDEP data from this inspection indicate continued monitoring is warranted for this facility. Levels of phosphatic nutrients are a cause for concern. Although samples collected for this study did not indicate the facility is exceeding permit limits or water quality criteria, the combination of the current ortho-phosphate concentrations, an increase in bioavailable nitrogen and a reduction in the riparian buffer zone could lead to excessive algal growth and chlorophyll-*a* increases in Johnson Creek. If the riparian zone were reduced more sunlight would penetrate the stream and be available for algal production.

Table 6. Macroinvertebrate Dipnet Samples - Qualitative

Mosaic Fertilizer Wingate Creek Mine	Control Site	Test Site
Stream Condition Index (value)	37	39
Stream Condition Index (word)	Poor	Poor
Stream Condition Index Metrics		
Number of Total Taxa	24	15
Number of Ephemeroptera Taxa	1	0
Number of Trichoptera Taxa	2	3
Number of Clinger Taxa	3	4
Number of Long-lived Taxa	0	2
Number of Sensitive Taxa	1	1
Percent of Dominant Taxon	27.5	27.8
Percent Suspension Feeders and Filterers	5.4	37.0
Percent of Tanytarsini individuals	6.9	0
Percent of Very Tolerant individuals	2.0	10.2
Total Number of Individuals	102	108
Community Composition: Percent of total		
Dominant Taxon (name)	*Caenis* sp.	*Cheumatopsyche* sp.
Dominant Taxon (group)	Ephemeroptera	Trichoptera
Coleoptera	40.2	25.0
Ephemeroptera	27.5	0.0
Bivalvia	1.0	2.8
Diptera	19.6	17.6
Gastropoda	2.0	1.9
Odonata	4.9	0.9
Oligochaeta	1.0	13.9
Platyhelminthes	1.0	0.0
Trichoptera	2.9	37.0
Functional Feeding Groups: Percent of total		
Burrowing Deposit Feeders	1.0	13.9
Predators	11.8	2.8
Surface Deposit Feeders	40.7	20.8
Suspension Feeders and Filterers	5.4	37.0
Scrapers	37.8	17.1
Shredders	2.5	8.3
Unknown	1.0	0.0

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Table 7a. Stream Condition Index Metrics - Peninsula Bioregion

Mosaic Fertilizer Wingate Creek Mine Control Site			
Metric:	Value	Raw Metric Score	Fixed Score 0 -10
Total Number of Taxa	24	3.2	3.2
Number of Ephemeroptera Taxa	1	2.0	2.0
Number of Trichoptera Taxa	2	2.9	2.9
Number of Clinger Taxa	3	3.8	3.8
Number of Long-lived Taxa	0	0.0	0.0
Number of Sensitive Taxa	1	1.1	1.1
Percent Contribution of Dominant Taxon	27.5	6.0	6.0
Percent Suspension Feeders and Filterers	5.4	1.1	1.1
Percent of Tanytarsini individuals	6.9	6.3	6.3
Percent of Very Tolerant individuals	2.0	7.3	7.3
Total Score		**Poor**	**37**
Interpretation of Scores		Good	73-100
		Fair	46-72
		Poor	19-45
		Very Poor	0-18

Table 7b. Stream Condition Index Metrics - Peninsula Bioregion

Mosaic Fertilizer Wingate Creek Mine Test Site			
Metric:	Value	Raw Metric Score	Fixed Score 0 -10
Total Number of Taxa	15	0.0	0.0
Number of Ephemeroptera Taxa	0	0.0	0.0
Number of Trichoptera Taxa	3	4.3	4.3
Number of Clinger Taxa	4	5.0	5.0
Number of Long-lived Taxa	2	5.0	5.0
Number of Sensitive Taxa	1	1.1	1.1
Percent Contribution of Dominant Taxon	27.8	6.0	6.0
Percent Suspension Feeders and Filterers	37	9.2	9.2
Percent of Tanytarsini individuals	0	0.0	0.0
Percent of Very Tolerant individuals	10.2	4.1	4.1
Total Score		**Poor**	**39**
Interpretation of Scores		Good	73-100
		Fair	46-72
		Poor	19-45
		Very Poor	0-18

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Stevenson, R. J. and J. P. Smol. 2003. Use of algae in environmental assessments, pp. 775-803, in: Freshwater algae of North America, edited by J. D. Wehr and R. G. Sheath, Academic Press, San Diego. 918 pp.

Wallace, J. B., J. W. Grubaugh and M. R. Whiles. 1996. Biotic indices and stream ecosystem processes: results from an experimental study. Ecol. Appl. 6(1): 140-151.

USEPA. 2000. Nutrient Criteria Technical Guidance Manual – River and Streams. EPA-822-B-00-002.

USEPA. 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. 4th Edition. EPA-821-R-02-013.

Table 8a. Biorecon Metrics - Peninsula Bioregion

Mosaic Fertilizer Wingate Creek Mine Control Site, collected 8/1/05			Score
Metric:	Raw data	Raw metric	Fix 0-10
Total Taxa	15	0.2	0.2
Ephemeroptera taxa	2	0.4	0.4
Tricoptera Taxa	3	0.4	0.4
Long-Lived taxa	3	0.4	0.4
Clinger Taxa	4	0.5	0.5
Sensitive Taxa	2	0.2	0.2

Final Score 4

Evaluation Fail

Table 8b. Biorecon Metrics - Peninsula Bioregion

Mosaic Fertilizer Wingate Creek Mine Test Site, collected 8/1/05			Score
Metric:	Raw data	Raw metric	Fix 0-10
Total Taxa	14	0.1	0.1
Ephemeroptera taxa	1	0.2	0.2
Tricoptera Taxa	3	0.4	0.4
Long-Lived taxa	2	0.3	0.3
Clinger Taxa	4	0.5	0.5
Sensitive Taxa	2	0.2	0.2

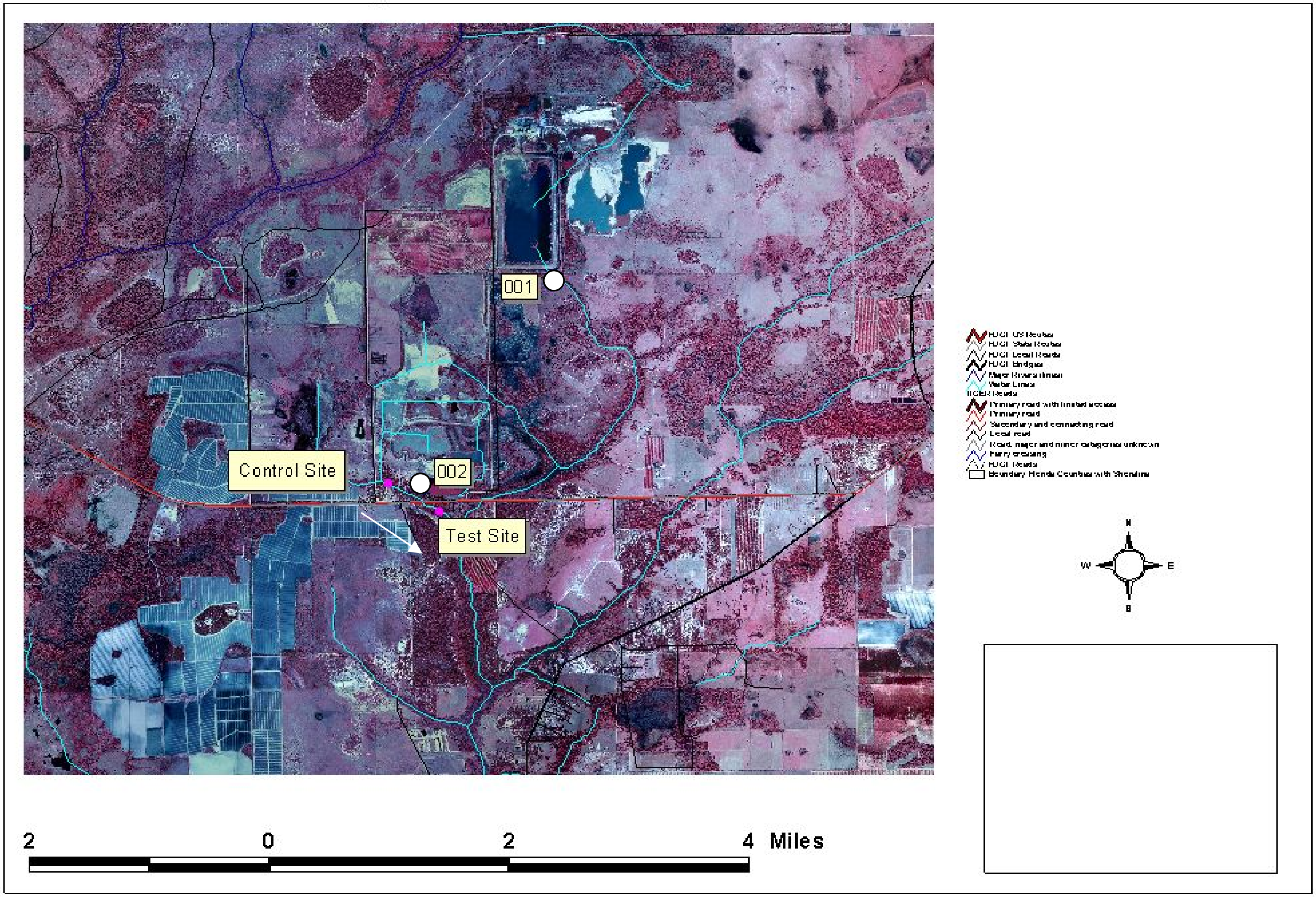
Final Score 3

Evaluation Fail

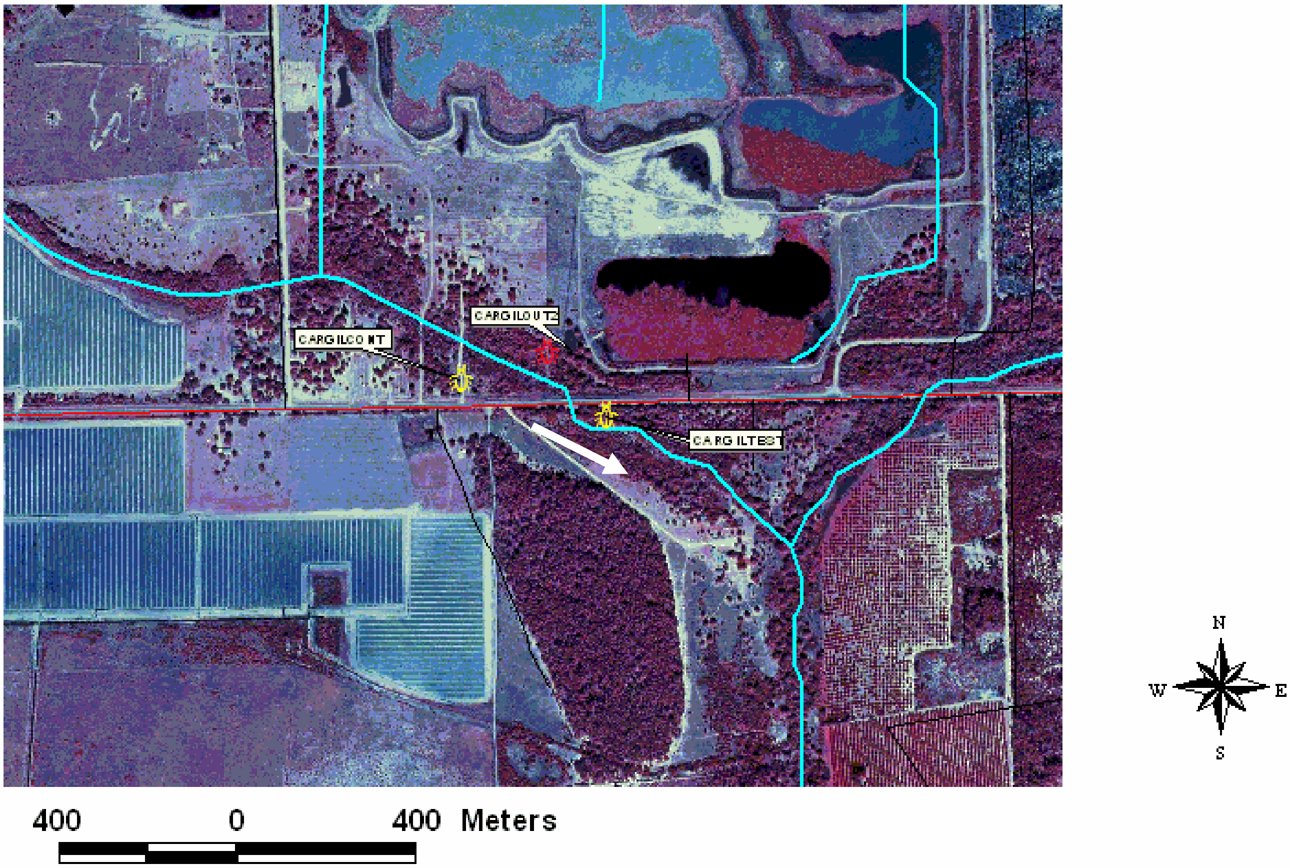
Appendices

- Appendix 1. Map of facility
- Appendix 2. Facility summary and DMR data
- Appendix 3. Explanation of measurements
- Appendix 4. Chemical analyses of effluent and receiving water.
- Appendix 5. Typical values for selected parameters in Florida waters
- Appendix 6. Habitat Assessment field sheets
- Appendix 7. Periphyton: Taxa list and number of individuals counted
- Appendix 8a. Hester-Dendy multi-plate samplers: Taxa list and macroinvertebrate density (average number of individuals per m^2)
- Appendix 8b. Hester-Dendy multi-plate samplers: Taxa list and total number of macroinvertebrates counted
- Appendix 9a. DipnetX20 samples: Taxa list and number of macroinvertebrates counted (collapsed)
- Appendix 9b. DipnetX20 samples: Taxa list and number of macroinvertebrates counted
- Appendix 10a. Phytoplankton: Taxa list and density (number of individuals per mL)
- Appendix 10b. Phytoplankton: Taxa list and number of individuals counted
- Appendix 11. DipnetX4 (Biorecon) samples: Taxa list of macroinvertebrates (collapsed)

Wingate Creek Mine



Mosaic Fertilizer-Wingate Creek Mine



Appendix 2

State of Florida
Department of Environmental Protection
Facility Introduction & Summary

<table>
<tr><td colspan="2">Facility Name (as it appears on permit):
Mosaic Fertilizer-Wingate Creek Mine</td><td>Former Names: Cargill Fertilizer-Wingate Creek Mine; Nu-Gulf Wingate Creek Holdings</td></tr>
<tr><td>Physical Address:
38651 State Road 64 East
Myakka City, Florida 34251</td><td>NPDES Permit No.:
FL0032522
Expiration Date:</td><td>Prepared By: Jacki Champion</td></tr>
<tr><td>County: Manatee</td><td>District: Phosphate Mgmt.</td><td>Facility Type: Phosphate Mine</td></tr>
<tr><td colspan="3">Function of Facility: Phosphate mining and beneficiation facilities</td></tr>
<tr><td colspan="3">Sampling Location (actual permit designation of permitted sampling point): Outfalls 001 and 002</td></tr>
<tr><td colspan="3">Description of permitted outfall: Both outfalls are rectangular weir structures.</td></tr>
<tr><td colspan="3">Description of treatment process (if multiple discharge points, include a map or diagram of facility):

Mosaic Phosphates Wingate Creek Mine operations include phosphate mining and beneficiation facilities, phosphatic clay settling area, sand tailings disposal areas and a mine water recirculation system. The activities include the mining and washing of phosphate ore. The mined ore is slurried into a pit and pumped to the beneficiation plant where the fine clays and sand are separated from the phosphate rock (product) by washing, screening and double flotation. The generated wet phosphate rock is transported to another location for further processing. The separated clays are pumped to the settling area (see Table 2). Sand tailings are pumped as a slurry to mined areas for use as reclamation fill. The monitoring requirements for ground water discharges from sand tailings areas are also covered under this permit. Decanted water from the clay settling areas is returned to the beneficiation plant for reuse and discharged, as necessary, through outfalls (see Table 1) authorized by this permit. Stormwater runoff from each area including the plant as well as deep well water utilized for the amine flotation process is also combined with other industrial wastewater streams. Each of these portions are managed in the water recovery and recirculation system. During operation activities, heavy equipment (such as dozers and scrapers) is periodically rinsed on the concrete floor of the flotation plant, utilizing high-pressure deep well water as the only cleaning agent. This rinse/wash water is conveyed to the clay settling area. Raw materials fed to the plant are ore matrix and water pumped through pipelines. Reagents utilized during the feed preparation and flotation processes occurring in the beneficiation plant include caustic soda for pH control, fatty acid blends, fuel oils, amines and sulfuric acid.</td></tr>
</table>

Receiving Waters: Outfall 001 discharges to Wingate Creek, Outfall 002 discharges to Johnson Creek	**Classification (indicate whether fresh or marine):** Both are Class III Fresh
Temperature (C): 29.16 (outfall 002)	**Design Flow:** na
pH (SU): 7.22 (outfall 002)	**Mean Flow (for previous 12 months):** 4.0297 MGD (8/04-7/05)
Conductivity (umhos/cm): 455 (outfall 002)	**Flow During Survey:** 5.93 MGD Outfall 002
Method of Chlorination na	**Method of Dechlorination** na
Dissolved Oxygen (mg/L): 7.25 (outfall 002)	**Total Residual Chlorine (mg/L) (after disinfection):** na

Discharge is: Continuous X Intermittent Seasonal XRainfall Dependent Other

Toxicity Test Requirements (routine and/or additional test language test species, salinity adjustment, etc.):
See language below.

Administrative or Consent Orders: None

Facility Mixing Zone Details: None

List permit violations (DMR data) and plant upsets that occurred at the plant within the last year:
None

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:
Effluent and receiving stream samples were collected from Outfall 002 in August of 2004 and August of 2005. High Chlorophyll was detected in the '04 sampling event.

Discuss MOR trends to prior data; is trend improving or declining:

List Effluent Limits (include additional sheets as necessary):

OUTFALL 001:

Parameters (units)	Discharge Limitations			Monitoring Requirements	
	Monthly Minimum	Monthly Average	Monthly Maximum	Frequency	Sample Type
Flow (MGD)	**N/A**	**Report**	**Report**	**Continuous**	**Recorder**
Total Non-filterable Residue [TSS] (mg/l)	**N/A**	**30**	**60**	**1/Week**	**24-Hour Composite**

Parameters (units)	Discharge Limitations			Monitoring Requirements	
	Monthly Minimum	Monthly Average	Monthly Maximum	Frequency	Sample Type
Total Non-volatile, Non-filterable Residue [FS] * (mg/l)**	**N/A**	**12**	**25**	**1/Week**	**24-Hour Composite**
Total Phosphorus [as P] * (mg/l)	**N/A**	**3.0**	**5.0**	**1/Week**	**24-Hour Composite**

Total Phosphorus [as P] * (mg/l)	**N/A**	**3.0**	**5.0**	**1/Week**	**24-Hour Composite**
Total Phosphorus [as P] (lbs/day) [See Condition I.A.2 below]	**N/A**	**N/A**	**Report**	**1/Week**	**Calculation**
pH (standard units)	**6.0**	**Report**	**8.5**	**1/Week**	**Grab**
Specific Conductance (μmhos/centimeter)	**N/A**	**Report**	**See Condition I.A.5**	**1/Week**	**Grab**
Dissolved Oxygen (mg/l)	**5.0**	**Report**	**N/A**	**1/Week**	**Grab**
Temperature (°F)	**N/A**	**Report**	**Report**	**1/Week**	**Grab**
Oil and Grease (mg/l)	**N/A**	**Report**	**5.0**	**1/Week**	**Grab**
Total Nitrogen [as N] (mg/l)	**N/A**	**3.0 ****	**4.0 ****	**1/Week**	**Grab**
Total Nitrogen [as N] (lbs/day) [See Condition I.A.2 below]	**N/A**	**Report**	**Report**	**1/Week**	**Calculation**
Total Nitrogen [as N] (lbs/year)	**N/A**	**N/A**	**33,581****	**1/Year**	**Calculation**
Chlorophyll-a (μg/l)	**N/A**	**N/A**	**Report**	**1/Month**	**Grab**
Gross Alpha Particle Activity (pCi/l)	**N/A**	**N/A**	**15.0 See Condition I.A.10.**	**1/Month**	**24-Hour Composite**
Combined Radium [$Ra^{226+228}$] (pCi/l)	**N/A**	**N/A**	**5.0 See Condition I.A.11.**	**1/Month**	**24-Hour Composite**
Toxicity	**See Condition I.A.4**				

<u>OUTFALL 002:</u>

Parameters (units)	Discharge Limitations			Monitoring Requirements	
	Monthly Minimum	Monthly Average	Monthly Maximum	Frequency	Sample Type
Flow (MGD)	**N/A**	**Report**	**Report**	**Continuous**	**Recorder**
Total Non-filterable Residue [TSS] (mg/l)	**N/A**	**30**	**60**	**1/Week**	**24-Hour Composite**
Total Non-volatile, Non-filterable Residue [FS] * (mg/l)**	**N/A**	**12**	**25**	**1/Week**	**24-Hour Composite**
Total Phosphorus [as P] * (mg/l)	**N/A**	**3.0**	**5.0**	**1/Week**	**24-Hour Composite**
Total Phosphorus [as P] (lbs/day) [See Condition I.A.2 below]	**N/A**	**N/A**	**Report**	**1/Week**	**Calculation**
pH (standard units)	**6.0**	**Report**	**8.5**	**1/Week**	**Grab**

Parameters (units)	Discharge Limitations			Monitoring Requirements	
	Monthly Minimum	Monthly Average	Monthly Maximum	Frequency	Sample Type
Specific Conductance (μmhos/centimeter)	**N/A**	**Report**	**See Condition I.A.5**	**1/Week**	**Grab**
Dissolved Oxygen (mg/l)	**5.0**	**Report**	**N/A**	**1/Week**	**Grab**
Temperature (°F)	**N/A**	**Report**	**Report**	**1/Week**	**Grab**
Oil and Grease (mg/l)	**N/A**	**Report**	**5.0**	**1/Week**	**Grab**
Total Nitrogen [as N] (mg/l)	**N/A**	**3.0 ****	**4.0 ****	**1/Week**	**Grab**
Total Nitrogen [as N] (lbs/day) [See Condition I.A.2 below]	**N/A**	**Report**	**Report**	**1/Week**	**Calculation**
Total Nitrogen [as N] (lbs/year)	**N/A**	**N/A**	**41,571****	**1/Year**	**Calculation**
Chlorophyll-a (μg/l)	**N/A**	**N/A**	**Report**	**1/Month**	**Grab**
Gross Alpha Particle Activity (pCi/l)	**N/A**	**N/A**	**15.0 See Condition I.A.10.**	**1/Month**	**24-Hour Composite**
Combined Radium [$Ra^{226+228}$] (pCi/l)	**N/A**	**N/A**	**5.0 See Condition I.A.11.**	**1/Month**	**24-Hour Composite**
Toxicity	**See Condition I.A.4**				

In order to provide the Department with reasonable assurance that the discharge from Outfalls 001 and 002 do not violate the Acute toxicity requirements of Section 62-302.500, F.A.C., the permittee shall perform the toxicity tests as specified below and submit the results to the Department.

The permittee shall initiate the series of tests described below, beginning in the first testing period following the effective date of this permit, to evaluate whole effluent toxicity of the discharge from Outfalls 001 and 002. All test species, procedures and quality assurance criteria used shall be in accordance with Methods for Measuring Acute Toxicity of Effluents to Freshwater and Marine Organisms, EPA/600/4-90/027F, or the most current edition. The control water and dilution water used will be moderately hard water as described in EPA/600/4-90/027F, Table 6, or the most current edition. A standard reference toxicant (SRT) quality assurance (QA) acute toxicity test shall be conducted concurrently or no greater than 30 days before the date of the "routine" test, with each species used in the toxicity tests. The results of all toxicity tests shall be submitted with the discharge monitoring report (DMR). Any deviation of the bioassay procedures outlined herein shall be submitted in writing to the Department for review and approval prior to use.

a. (1) The permittee shall conduct 96-hour acute static renewal toxicity tests using the daphnid, Ceriodaphnia dubia, and the bannerfin shiner, Cyprinella leedsi. All tests will be conducted on single grab samples of 100% whole effluent and on a control.

(2) If control mortality exceeds 10% for either species in any test, the test(s) for that species (including the control) shall be repeated. A test will be considered valid only if

control mortality does not exceed 10% for either species. If, in any separate grab sample test, 100% mortality occurs prior to the end of the test, and control mortality is less than 10% at that time, that test (including the control) shall be terminated with the conclusion that the sample demonstrates unacceptable acute toxicity.

b. (1) The toxicity tests specified above shall be conducted once during the months of December, January and February, and again during the months of July, August and September, but not to exceed two tests per year. Samples shall be collected only during actual discharge events. These tests are referred to as "routine" tests. The permittee shall monitor the toxicity, as described above, for the life of this permit.

(2) Results from "routine" tests shall be reported according to EPA/600/4-90/027F, Section 12, Report Preparation (or the most current edition), and shall be submitted to the Department.

c. (1) All "routine" test shall be conducted using a control (0% effluent) and a test concentration of 100% **final effluent.**

(2) Mortalities of greater than 50% in a 100% effluent in any "routine" sample or an LC50 of less than 100% effluent in any additional definitive test will constitute a violation of these permit conditions, and Rule 62-302.200(1), Rule 62-302.500(1)(d) and Rule 62-4.244(3)(a), F. A. C.

d. (1) If unacceptable acute toxicity (greater than 20% mortality of either test species in any grab sample test) is found in a "routine" test, the permittee shall conduct three additional tests on each species indicating unacceptable toxicity. The first additional test will include four grab samples taken as described in 1.a. and run as four separate definitive analyses. The second and third additional definitive tests will be run on a single grab sample collected on the day and time when the greatest toxicity was identified in the first additional definitive test. Results for each additional test will include the determination of LC50 values with 95% confidence limits.

(2) The first additional test shall be conducted using a control (0% effluent) and a minimum of five dilutions: 100%, 50%, 25%, 12.5% and 6.25% effluent. The dilution series may be modified in the second and third test to more accurately identify the toxicity, such that at least two dilutions above and two dilutions below the target toxicity and a control (0% effluent) are run.

(3) For each additional test, the sample collection requirements and the test acceptability criteria specified in Section 1 above must be met for the test to be considered valid. The first test shall begin within two weeks of the end of the "routine" tests, and shall be conducted weekly thereafter until *three* additional, valid tests are completed. The additional tests will be used to determine if the toxicity found in the "routine" test is still present.

(4) Results from additional tests, required due to unacceptable acute toxicity in the "routine" tests, shall be submitted in a single report prepared according to EPA/600/4-90/027F, Section 12, or the most current edition and submitted within 45 days of completion of the additional, valid tests. Upon completion of the third additional test,

the permittee will schedule to meet with the Department within 30 days of the report submittal to identify the cause(s) and corrective actions (if applicable) necessary to remedy the unacceptable acute toxicity.

(5) If acute toxicity is found, chronic toxicity testing may be required.

DMR Summary

(September 1, 2004 to August 31, 2005)

Facility ID	Facility Name	District	Facility Type	Major (M)	Outfall Type	Monitoring Date	Outfall Indicator	Parameter Description	Monitoring Location Code	Concentration (2)	Concentration Limit (2)	Concentration Statistical Base (2)	Concentration (3)	Concentration Limit (3)	Concentration Statistical Base (3)	Concentration Units	Violation Code
FL0032522	WINGATE CREEK MINE	TA	I	M	EFFLUENT	8/31/2005	002-1	PHOSPHORUS, TOTAL (AS P)	1	3.40	3.0	MO AVG	3.70	5.0	DAILY MX	MG/L	E90

Appendix 3

Explanation of Measurements

(1) Quality Assurance and Quality Control

FDEP's quality assurance requirements for analytical laboratories and field activities are codified in Chapter 62-160, F.A.C., Quality Assurance (QA Rule) and in internal Standard Operating Procedures (FDEP SOPs). Methods for all analyses are on file at the FDEP Central Laboratory in Tallahassee and may be viewed on the web at http://www.floridadep.org/labs/sop/index.htm and/or http://www.floridadep.org/labs/qa/index.htm .

(2) Chemical Analyses of the Effluent

The effluent was analyzed for nutrients, metals, organic constituents (base, neutral, and acid extractables) and pesticides following FDEP SOPs. A list of the analytes tested for, results, data qualifiers, the minimum detection limit and the practical quantitation limit are given in Appendix 4. The results from these analyses were compared with Water Quality Criteria (62-302 F.A.C.) and facility permit limits (Table 1, Appendix 2). Exceedances of Water Quality Criteria may be violations of specific provisions of Chapter 62-302 (F.A.C.) and/ or facility permit limits.

(3) Habitat Assessment

Habitat assessment is used to evaluate the physical structure and extent of disturbance in a waterbody. Eight aspects are ranked, with 20 possible points for each aspect (QA Rule SOP FT 3100). The Habitat Assessment score includes types and amounts of benthic substrates, water velocity, amount of sand or silt accumulation, extent of artificial channelization, bank stability, and riparian zone width and vegetation type. All scores are summed to yield an overall Habitat Assessment score. Habitat Assessment score ranges from 11-160 and overall habitat quality is assigned to one of four categories: Optimal (120-160 points), Suboptimal (80-119 points), Marginal (40-79 points), and Poor (11-39 points).

(4) Algal Growth Potential (AGP)

The effluent and water from control and test sites are autoclaved, filtered (0.45μm), inoculated with the unicellular green alga, *Pseudokirchneriella subcapitata* (formerly *Selenastrum capricornutum,* USEPA 2002*),* and incubated for 14 days (FDEP SOP TA08_05). The algal growth potential (AGP) value is the peak growth of the alga within that 14-day period, recorded as mg dry weight/L. Raschke and Shultz (1987) found that an AGP above 5.0 mg dry weight/L represents a "problem" threshold for fresh receiving waters, implying nutrient enrichment. High AGP values may constitute one line of evidence for violation of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C. and/or 62-302.530(48)(b) F.A.C..

The concentration of nutrients in a water sample may be used to calculate the expected yield of AGP under the assumption that other required nutrients (e.g. silicon, micronutrients) are present in excess (Miller *et al*. 1978). The expected amount of production is calculated as 38 times the total soluble inorganic nitrogen (nitrate and nitrite plus ammonia) under nitrogen limitation or 430 times the ortho-phosphate (OP) concentration under phosphorus limitation with an error of ± 20%. When the ratio of nitrogen to phosphorus (N: P) is less than 10:1, nitrogen limitation of algal production is likely. When the N: P ratio is 20:1 or greater, phosphorus limitation is likely (USEPA 2000). For ratios in-between, co-limitation may occur. Production of lower biomass than expected may be evidence of growth inhibition related to toxic compounds present in the water sample tested and may be a violation of 62-302.530(62) F.A.C..

(5) Algal Phytoplankton and Periphyton Assemblages

Methods: Qualitative periphyton were sampled at both control and test sites by taking subsamples of algae from natural substrates throughout the sample reach (QA Rule FS7220). Phytoplankton were sampled using a 1 L grab sample (QA Rule SOP FS7100). Periphyton and phytoplankton were subsampled and identified to the lowest practical level, usually species (FDEP SOPs AB03, AB03_1 and AB05).

Chlorophyll *a* Content: Chlorophyll *a* content is measured in phytoplankton samples to estimate algal biomass (FDEP SOP BB05). High algal biomass implies nutrient stress (Stevenson and Bahls 1999) and may be a violation of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C. and/or 62-302.530(48)(b) F.A.C..

Algal Density: Algal density is estimated as number of natural units/ml for phytoplankton samples. Although algal density of a single site is highly variable and depends on a number of factors, comparison of algal density at a control site to algal density at a related test site gives a partial comparison of algal biomass at the two sites (Stevenson and Smol 2003).

Taxa richness: Taxa richness is the number of distinct algal taxa present in a sample. Extreme nutrient enrichment tends to reduce the number of different types of algae present in a sample because a few tolerant taxa tend to reproduce rapidly and constitute the majority of the cells present. However, moderate nutrient enrichment of nutrient poor waters may sometimes be correlated with increased algal taxa richness (Stevenson and Bahls 1999) as the algal community begins to respond to the increased input of nutrients.

Community Composition: Shifts in relative proportions of major groups of algae downstream of a point source, compared to upstream, control conditions, may indicate negative effects of a discharge (Stevenson and Bahls 1999) and may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

Shannon-Weaver Diversity Index: This index is specified in the Florida Administrative Code 62-302 as a measure of biological integrity. Low diversity scores are undesirable. Where diversity is low, only a few taxa are abundant as compared to an area where many taxa are present with more equitable abundance among taxa (Magurran 1988). Low diversity scores related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

(6) Benthic Macroinvertebrate Assemblages

Methods: Benthic macroinvertebrates were collected using three methods. Quantitative samples were collected from Hester-Dendy multi-plate samplers incubated for 28 days (QA Rule SOP FS7430). Qualitative collections are made using 4 dipnet sweeps and 20 dipnet sweeps (QA Rule SOP FS7410 & FS7420). Benthic macroinvertebrates were sorted and identified to the lowest practical taxonomic level, usually species (FDEP SOP IZ06).

Taxa richness: Taxa richness is the number of distinct macroinvertebrate taxa present in a sample. Stress, habitat destruction and pollution tend to reduce the number of different types of organisms present (Karr and Chu 1998). Decreases in taxa richness related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

Percent Contribution of Dominant Taxon: Percent contribution of the dominant taxon is calculated by dividing the number of individuals in the most abundant taxa by the total number of individuals counted. Percent contribution of the dominant taxon tends to increase with increasing perturbation (Plafkin *et al*., 1989). Increases in the percent contribution of the dominant taxon related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C. and/or 62-302.530(48)(b) F.A.C..

Shannon-Weaver Diversity Index: This index is specified in the Florida Administrative Code 62-302 as a measure of biological integrity. Low diversity scores are undesirable. Where diversity is low, only a few taxa are abundant as compared to an area where many taxa are present in equitable abundance among taxa (Magurran 1988). A difference of 25% in Shannon-Weaver diversity between results from Hester-Dendy multiplate samplers incubated for 28 days at test and control sites constitutes a violation of 62-302.530(11) F.A.C..

Community Composition: Shifts in proportions of major groups of organisms downstream of a point source, compared to upstream, control conditions, may indicate negative effects of a discharge (Karr and Chu 1998). Shifts in community composition related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

Functional Feeding Groups: Environmental degradation may differentially affect groups of invertebrates based on how the group feeds (e.g. predators, deposit feeders, etc.). In Florida, pollution may be responsible for reducing the numbers of filter feeders (FDEP 1994) and shredders (EA Engineering 1994). Changes in the proportions of functional feeding groups related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

The Biorecon: The Biorecon is a composite macroinvertebrate metric developed for Florida. This Index was revised in 2004 using data from qualitative dipnet samples. The biorecon assigns points to 7 parameters; depending on how closely each parameter approaches an expected value (QA Rule SOP LT 7200). Points are assigned depending on which bioregion (Panhandle, Northeast, or Peninsula) the sampling location exists in and summed to yield a final Biorecon score (range 0-10). Included in the calculation of the Biorecon are taxa richness, number of Ephemeroptera taxa, number of Trichoptera taxa, number of sensitive taxa, number of clinger taxa, and the number of long-lived taxa. Scores are broken into two ordinal groups: Pass or Fail.

The Stream Condition Index (SCI): The SCI is a composite macroinvertebrate metric developed for Florida. This Index was revised in 2004 using data from qualitative dipnet samples. The SCI now assigns points to ten parameters; depending on how closely each parameter approaches an expected value (QA Rule SOP LT 7200). Points are assigned depending on which bioregion (Panhandle, Northeast, or Peninsula) the sampling location exists in and summed to yield a final SCI score (range 0-100). Included in the calculation of SCI are taxa richness, number of Ephemeroptera taxa, number of Trichoptera taxa, percent contribution of the dominant taxon, number of sensitive taxa, number of clinger taxa, number of long-lived taxa, percent contribution of Tanytarsini, percent contribution of very tolerant, and the percent contribution of suspension and filter feeders. Scores are broken into four ordinal groups: Good, Fair, Poor, and Very Poor. A decrease in ordinal SCI score from the Control to the Test site may be evidence of degradation related to a facility's effluent. An SCI score of "Poor" or "Very Poor" related to a facility's effluent may constitute violations of 62-302.530(47) F.A.C., 62-302.530(48)(a) F.A.C., 62-302.530(48)(b) F.A.C. and/or 62-302.530(62) F.A.C..

(7) Statistical Comparisons

Statistical comparisons of the proportions of taxa, major groups or feeding groups were made using 95% confidence intervals on proportions. A 95% confidence interval is the range of values above and below a given proportion that has a 95% chance of containing the true proportion (Sokal and Rohlf 1995). If the 95% confidence intervals for two proportions do not overlap, then the proportion of X in sample 1 is significantly different from the proportion of X in sample 2 at $p<0.05$. A "$p<0.05$" level of significance means that there is less than a 5% chance that the true proportions in the two samples are the same. All comparisons that are labeled as significant in the text have a probability <0.05 that the proportions are the same.

Appendix 4

Chemical analysis of effluent and receiving water

DATE SAMPLED	FIELD ID	ANALYSIS GROUP	COMPONENT	RESULT	UNITS	REMARK	MDL	PQL
8/1/05	DOWNSTREAM JOHNSON CRK	Bio-BOD	Biochemical Oxygen Demand-5 Day	0.88	mg/L	I	0.2	2.0
8/1/05	DOWNSTREAM JOHNSON CRK	Bio-Chl-a	Chlorophyll-A, Monochromatic, Water	3.2	ug/L		0.85	2.6
8/1/05	DOWNSTREAM JOHNSON CRK	Bio-Chl-a	Phaeophytin-A, Monochromatic, Water	0	ug/L		0.85	2.6
8/1/05	DOWNSTREAM JOHNSON CRK	Nutrients-Liquid	Ammonia-N	0.026	mg N/L		0.01	0
8/1/05	DOWNSTREAM JOHNSON CRK	Nutrients-Liquid	Kjeldahl Nitrogen	0.81	mg N/L	A	0.06	0.2
8/1/05	DOWNSTREAM JOHNSON CRK	Nutrients-Liquid	NO2NO3-N	0.012	mg N/L		0	0
8/1/05	DOWNSTREAM JOHNSON CRK	Nutrients-Liquid	O-Phosphate-P	2.9	mg P/L		0.08	0.2
8/1/05	DOWNSTREAM JOHNSON CRK	Nutrients-Liquid	Specific_Conductance	577	umhos/cm		2	8
8/1/05	DOWNSTREAM JOHNSON CRK	Nutrients-Liquid	TDS	466	mg/L	A	15	60
8/1/05	DOWNSTREAM JOHNSON CRK	Nutrients-Liquid	TSS	4	mg/L	U	4	16
8/1/05	DOWNSTREAM JOHNSON CRK	Nutrients-Liquid	Total-P	3.2	mg P/L	A	0.1	0.3
8/1/05	DOWNSTREAM JOHNSON CRK	Nutrients-Liquid	Turbidity	2.1	NTU		0.05	0.1
8/1/05	FIELD BLANK	Nutrients-Liquid	Ammonia-N	0.01	mg N/L	U	0.01	0
8/1/05	FIELD BLANK	Nutrients-Liquid	Kjeldahl Nitrogen	0.06	mg N/L	U	0.06	0.2
8/1/05	FIELD BLANK	Nutrients-Liquid	NO2NO3-N	0.004	mg N/L	U	0	0
8/1/05	FIELD BLANK	Nutrients-Liquid	O-Phosphate-P	0.011	mg P/L		0	0
8/1/05	FIELD BLANK	Nutrients-Liquid	Specific_Conductance	7.7	umhos/cm	I	2	8
8/1/05	FIELD BLANK	Nutrients-Liquid	Total-P	0.02	mg P/L	U	0.02	0.1
8/1/05	OUTFALL 002	Bio-BOD	Biochemical Oxygen Demand-5 Day	0.98	mg/L	I		
8/1/05	OUTFALL 002	Bio-Chl-a	Chlorophyll-A, Monochromatic, Water	3	ug/L		0.85	2.6
8/1/05	OUTFALL 002	Bio-Chl-a	Phaeophytin-A, Monochromatic, Water	0.52	ug/L		0.85	2.6
8/1/05	OUTFALL 002	Nutrients-Liquid	Ammonia-N	0.01	mg N/L	U	0.01	0
8/1/05	OUTFALL 002	Nutrients-Liquid	Kjeldahl Nitrogen	0.73	mg N/L		0.06	0.2
8/1/05	OUTFALL 002	Nutrients-Liquid	NO2NO3-N	0.004	mg N/L	U	0	0
8/1/05	OUTFALL 002	Nutrients-Liquid	O-Phosphate-P	2.9	mg P/L		0.12	0.3
8/1/05	OUTFALL 002	Nutrients-Liquid	Specific_Conductance	612	umhos/cm		2	8
8/1/05	OUTFALL 002	Nutrients-Liquid	TDS	477	mg/L	A	15	60
8/1/05	OUTFALL 002	Nutrients-Liquid	TSS	4	mg/L	U	4	16
8/1/05	OUTFALL 002	Nutrients-Liquid	Total-P	3.2	mg P/L		0.1	0.3
8/1/05	OUTFALL 002	Nutrients-Liquid	Turbidity	2.4	NTU		0.05	0.1
8/1/05	UPSTREAM JOHNSON CRK	Bio-BOD	Biochemical Oxygen Demand-5 Day	0.66	mg/L	I		
8/1/05	UPSTREAM JOHNSON CRK	Bio-Chl-a	Chlorophyll-A, Monochromatic, Water	3.3	ug/L		0.85	2.6
8/1/05	UPSTREAM JOHNSON CRK	Bio-Chl-a	Phaeophytin-A, Monochromatic, Water	0	ug/L		0.85	2.6
8/1/05	UPSTREAM JOHNSON CRK	Nutrients-Liquid	Ammonia-N	0.064	mg N/L		0.01	0
8/1/05	UPSTREAM JOHNSON CRK	Nutrients-Liquid	Kjeldahl Nitrogen	1.1	mg N/L		0.06	0.2
8/1/05	UPSTREAM JOHNSON CRK	Nutrients-Liquid	NO2NO3-N	0.067	mg N/L		0	0
8/1/05	UPSTREAM JOHNSON CRK	Nutrients-Liquid	O-Phosphate-P	0.23	mg P/L		0.02	0
8/1/05	UPSTREAM JOHNSON CRK	Nutrients-Liquid	Specific_Conductance	181	umhos/cm		2	8
8/1/05	UPSTREAM JOHNSON CRK	Nutrients-Liquid	TDS	154	mg/L		15	60

8/1/05	UPSTREAM JOHNSON CRK	Nutrients-Liquid	TSS	4	mg/L	U	4	16
8/1/05	UPSTREAM JOHNSON CRK	Nutrients-Liquid	Total-P	0.29	mg P/L		0.02	0.1
8/1/05	UPSTREAM JOHNSON CRK	Nutrients-Liquid	Turbidity	1.4	NTU		0.05	0.1
9/12/05	DOWNSTREAM JOHNSON CR	Bio-AGP/LimNut	Algal Growth Potential	0.819	mg DryWt/L	AIJV	0.3	0.9
9/12/05	DOWNSTREAM JOHNSON CR	Bio-Chl-a	Chlorophyll-A, Monochromatic, Periphyton		mg/m2			
9/12/05	DOWNSTREAM JOHNSON CR	Bio-Chl-a	Chlorophyll-A, Monochromatic, Water	2.8	ug/L		0.85	2.6
9/12/05	DOWNSTREAM JOHNSON CR	Bio-Chl-a	Phaeophytin-A, Monochromatic, Periphyton		mg/m2			
9/12/05	DOWNSTREAM JOHNSON CR	Bio-Chl-a	Phaeophytin-A, Monochromatic, Water	3.4	ug/L		0.85	2.6
9/12/05	DOWNSTREAM JOHNSON CR	Bio-Invertebrates	Macroinvert-FW-Qual-Dipnetx20-# Taxa	16	# Taxa			
9/12/05	DOWNSTREAM JOHNSON CR	Bio-Peri/Phyto	Periphyton-Qualitative-# Diatom Taxa	35	# Taxa			
9/12/05	DOWNSTREAM JOHNSON CR	Bio-Peri/Phyto	Periphyton-Qualitative-# Wet Taxa	10	#Taxa			
9/12/05	DOWNSTREAM JOHNSON CR	Bio-Peri/Phyto	Phytoplankton-Quantitative-# Wet Taxa	23	#Taxa			
9/12/05	DOWNSTREAM JOHNSON CR	Bio-Peri/Phyto	Phytoplankton-Quantitative-#Diatom Taxa	23	#Taxa			
9/12/05	DOWNSTREAM JOHNSON CR	Nutrients-Liquid	Ammonia-N	0.034	mg N/L		0.01	0
9/12/05	DOWNSTREAM JOHNSON CR	Nutrients-Liquid	Fluoride	0.66	mg F/L		0.05	0.1
9/12/05	DOWNSTREAM JOHNSON CR	Nutrients-Liquid	Kjeldahl Nitrogen	0.78	mg N/L		0.12	0.4
9/12/05	DOWNSTREAM JOHNSON CR	Nutrients-Liquid	NO2NO3-N	0.025	mg N/L		0	0
9/12/05	DOWNSTREAM JOHNSON CR	Nutrients-Liquid	O-Phosphate-P	2.2	mg P/L		0.08	0.2
9/12/05	DOWNSTREAM JOHNSON CR	Nutrients-Liquid	Sulfate	230	mg SO4/L		2	5
9/12/05	DOWNSTREAM JOHNSON CR	Nutrients-Liquid	TSS	4	mg/L	U	4	16
9/12/05	DOWNSTREAM JOHNSON CR	Nutrients-Liquid	Total-P	2.4	mg P/L		0.1	0.3
9/12/05	DOWNSTREAM JOHNSON CR	Nutrients-Liquid	Turbidity	2.7	NTU		0.05	0.1
9/12/05	FIELD BLANK	BNA-Water	1,2,4-Trichlorobenzene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	1,2-Dichlorobenzene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	1,3-Dichlorobenzene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	1,4-Dichlorobenzene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	2,4,6-Trichlorophenol	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	2,4-Dichlorophenol	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	2,4-Dimethylphenol	54	ug/L	U	54	220
9/12/05	FIELD BLANK	BNA-Water	2,4-Dinitrophenol	16	ug/L	U	16	65
9/12/05	FIELD BLANK	BNA-Water	2,4-Dinitrotoluene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	2,6-Dinitrotoluene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	2-Chloronaphthalene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	2-Chlorophenol	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	2-Methyl-4,6-dinitrophenol	3.3	ug/L	U	3.3	13
9/12/05	FIELD BLANK	BNA-Water	2-Nitrophenol	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	3,3'-Dichlorobenzidine	43	ug/L	U	43	170
9/12/05	FIELD BLANK	BNA-Water	4,4'-DDD	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	4,4'-DDE	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	4,4'-DDT	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	4-Bromophenyl phenyl ether	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	4-Chloro-3-methylphenol	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	4-Chlorophenyl phenyl ether	2.2	ug/L	U	2.2	8.7
9/12/05	FIELD BLANK	BNA-Water	4-Nitrophenol	16	ug/L	U	16	65

9/12/05	FIELD BLANK	BNA-Water	Acenaphthene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Acenaphthylene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Aldrin	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	Anthracene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Benzidine	110	ug/L	U	110	430
9/12/05	FIELD BLANK	BNA-Water	Benzo(a)anthracene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Benzo(a)pyrene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Benzo(b)fluoranthene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Benzo(g,h,i)perylene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Benzo(k)fluoranthene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Bis(2-chloroethoxy)methane	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Bis(2-chloroethyl)ether	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Bis(2-chloroisopropyl)ether	3.3	ug/L	U	3.3	13
9/12/05	FIELD BLANK	BNA-Water	Bis(2-ethylhexyl)phthalate	16	ug/L	U	16	65
9/12/05	FIELD BLANK	BNA-Water	Butyl benzyl phthalate	5.4	ug/L	U	5.4	22
9/12/05	FIELD BLANK	BNA-Water	Chrysene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Di-n-butyl phthalate	5.4	ug/L	U	5.4	22
9/12/05	FIELD BLANK	BNA-Water	Di-n-octyl phthalate	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Dibenzo(a,h)anthracene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Dieldrin	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	Diethyl phthalate	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Dimethyl phthalate	54	ug/L	U	54	220
9/12/05	FIELD BLANK	BNA-Water	Endosulfan I	4.3	ug/L	U	4.3	17
9/12/05	FIELD BLANK	BNA-Water	Endosulfan II	4.3	ug/L	U	4.3	17
9/12/05	FIELD BLANK	BNA-Water	Endosulfan sulfate	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	Endrin	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	Endrin aldehyde	4.3	ug/L	U	4.3	17
9/12/05	FIELD BLANK	BNA-Water	Fluoranthene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Fluorene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Heptachlor	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	Heptachlor epoxide	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	Hexachlorobenzene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Hexachlorobutadiene	3.3	ug/L	U	3.3	13
9/12/05	FIELD BLANK	BNA-Water	Hexachlorocyclopentadiene	3.3	ug/L	U	3.3	13
9/12/05	FIELD BLANK	BNA-Water	Hexachloroethane	3.3	ug/L	U	3.3	13
9/12/05	FIELD BLANK	BNA-Water	Indeno(1,2,3-cd)pyrene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Isophorone	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	N-Nitrosodi-n-propylamine	2.2	ug/L	U	2.2	8.7
9/12/05	FIELD BLANK	BNA-Water	N-Nitrosodimethylamine	2.2	ug/L	U	2.2	8.7
9/12/05	FIELD BLANK	BNA-Water	N-Nitrosodiphenylamine	3.3	ug/L	U	3.3	13
9/12/05	FIELD BLANK	BNA-Water	Naphthalene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Nitrobenzene	2.2	ug/L	U	2.2	8.7
9/12/05	FIELD BLANK	BNA-Water	Pentachlorophenol	3.3	ug/L	U	3.3	13
9/12/05	FIELD BLANK	BNA-Water	Phenanthrene	1.1	ug/L	U	1.1	4.3

9/12/05	FIELD BLANK	BNA-Water	Phenol	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	Pyrene	1.1	ug/L	U	1.1	4.3
9/12/05	FIELD BLANK	BNA-Water	alpha-BHC	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	beta-BHC	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	delta-BHC	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	BNA-Water	gamma-BHC	1.6	ug/L	U	1.6	6.5
9/12/05	FIELD BLANK	GC-Water	Alachlor	0.65	ug/L	U	0.65	2.6
9/12/05	FIELD BLANK	GC-Water	Ametryn	0.054	ug/L	U	0.05	0.2
9/12/05	FIELD BLANK	GC-Water	Atrazine	0.054	ug/L	U	0.05	0.2
9/12/05	FIELD BLANK	GC-Water	Azinphos Methyl	0.22	ug/L	U	0.22	0.9
9/12/05	FIELD BLANK	GC-Water	Bromacil	0.22	ug/L	U	0.22	0.9
9/12/05	FIELD BLANK	GC-Water	Butylate	0.22	ug/L	UJ	0.22	0.9
9/12/05	FIELD BLANK	GC-Water	Chlorpyrifos Ethyl	0.054	ug/L	U	0.05	0.2
9/12/05	FIELD BLANK	GC-Water	Chlorpyrifos Methyl	0.11	ug/L	U	0.11	0.4
9/12/05	FIELD BLANK	GC-Water	Diazinon	0.054	ug/L	U	0.05	0.2
9/12/05	FIELD BLANK	GC-Water	Ethion	0.054	ug/L	U	0.05	0.2
9/12/05	FIELD BLANK	GC-Water	Ethoprop	0.11	ug/L	UJ	0.11	0.4
9/12/05	FIELD BLANK	GC-Water	Fenamiphos	0.22	ug/L	U	0.22	0.9
9/12/05	FIELD BLANK	GC-Water	Fonofos	0.11	ug/L	U	0.11	0.4
9/12/05	FIELD BLANK	GC-Water	Hexazinone	0.11	ug/L	U	0.11	0.4
9/12/05	FIELD BLANK	GC-Water	Malathion	0.16	ug/L	UJ	0.16	0.6
9/12/05	FIELD BLANK	GC-Water	Metalaxyl	0.27	ug/L	U	0.27	1.1
9/12/05	FIELD BLANK	GC-Water	Metolachlor	0.54	ug/L	U	0.54	2.2
9/12/05	FIELD BLANK	GC-Water	Metribuzin	0.11	ug/L	U	0.11	0.4
9/12/05	FIELD BLANK	GC-Water	Mevinphos	0.22	ug/L	U	0.22	0.9
9/12/05	FIELD BLANK	GC-Water	Naled	0.86	ug/L	UJ	0.86	3.4
9/12/05	FIELD BLANK	GC-Water	Norflurazon	0.16	ug/L	UJ	0.16	0.6
9/12/05	FIELD BLANK	GC-Water	Parathion Ethyl	0.16	ug/L	U	0.16	0.6
9/12/05	FIELD BLANK	GC-Water	Parathion Methyl	0.11	ug/L	U	0.11	0.4
9/12/05	FIELD BLANK	GC-Water	Phorate	0.054	ug/L	U	0.05	0.2
9/12/05	FIELD BLANK	GC-Water	Prometryn	0.16	ug/L	U	0.16	0.6
9/12/05	FIELD BLANK	GC-Water	Simazine	0.054	ug/L	U	0.05	0.2
9/12/05	FIELD BLANK	Metals-Water	Aluminum	5	ug/L	U	5	20
9/12/05	FIELD BLANK	Metals-Water	Arsenic	4	ug/L	U	4	16
9/12/05	FIELD BLANK	Metals-Water	Cadmium	0.05	ug/L	U	0.05	0.2
9/12/05	FIELD BLANK	Metals-Water	Calcium	0.05	mg/L	U	0.05	0.2
9/12/05	FIELD BLANK	Metals-Water	Chromium	2	ug/L	U	2	8
9/12/05	FIELD BLANK	Metals-Water	Copper	11	ug/L	U	11	44
9/12/05	FIELD BLANK	Metals-Water	Iron	10	ug/L	U	10	40
9/12/05	FIELD BLANK	Metals-Water	Lead	0.6	ug/L	U	0.6	2.4
9/12/05	FIELD BLANK	Metals-Water	Magnesium	0.01	mg/L	U	0.01	0
9/12/05	FIELD BLANK	Metals-Water	Nickel	2	ug/L	U	2	8
9/12/05	FIELD BLANK	Metals-Water	Selenium	0.5	ug/L	U	0.5	2
9/12/05	FIELD BLANK	Metals-Water	Silver	0.025	ug/L	U	0.03	0.1

9/12/05	FIELD BLANK	Metals-Water	Zinc	3.7	ug/L	I	3	12
9/12/05	FIELD BLANK	Nutrients-Liquid	Ammonia-N	0.01	mg N/L	U	0.01	0
9/12/05	FIELD BLANK	Nutrients-Liquid	Kjeldahl Nitrogen	0.06	mg N/L	U	0.06	0.2
9/12/05	FIELD BLANK	Nutrients-Liquid	NO2NO3-N	0.004	mg N/L	U	0	0
9/12/05	FIELD BLANK	Nutrients-Liquid	O-Phosphate-P	0.004	mg P/L	U	0	0
9/12/05	FIELD BLANK	Nutrients-Liquid	Total-P	0.02	mg P/L	U	0.02	0.1
9/12/05	HD-DOWNSTREAM REP 1	Bio-Invertebrates	Macroinvert-FW-Quan-ArtSubstr-# Taxa	14	# Taxa			
9/12/05	HD-DOWNSTREAM REP 2	Bio-Invertebrates	Macroinvert-FW-Quan-ArtSubstr-# Taxa	18	# Taxa			
9/12/05	HD-DOWNSTREAM REP 3	Bio-Invertebrates	Macroinvert-FW-Quan-ArtSubstr-# Taxa	16	# Taxa			
9/12/05	HD-UPSTREAM 002 REP 1	Bio-Invertebrates	Macroinvert-FW-Quan-ArtSubstr-# Taxa	20	# Taxa			
9/12/05	HD-UPSTREAM 002 REP 2	Bio-Invertebrates	Macroinvert-FW-Quan-ArtSubstr-# Taxa	21	# Taxa			
9/12/05	HD-UPSTREAM 002 REP 3	Bio-Invertebrates	Macroinvert-FW-Quan-ArtSubstr-# Taxa	24	# Taxa			
9/12/05	OUTFALL 002	Bio-AGP/LimNut	Algal Growth Potential	0.477	mg DryWt/L	IJV	0.3	0.9
9/12/05	OUTFALL 002	Bio-Chl-a	Chlorophyll-A, Monochromatic, Water	4.1	ug/L	I	1.4	4.3
9/12/05	OUTFALL 002	Bio-Chl-a	Phaeophytin-A, Monochromatic, Water	3.9	ug/L	J	1.4	4.3
9/12/05	OUTFALL 002	Bio-Peri/Phyto	Phytoplankton-Quantitative-# Wet Taxa	27	#Taxa			
9/12/05	OUTFALL 002	Bio-Peri/Phyto	Phytoplankton-Quantitative-#Diatom Taxa	10	#Taxa			
9/12/05	OUTFALL 002	BNA-Water	1,2,4-Trichlorobenzene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	1,2-Dichlorobenzene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	1,3-Dichlorobenzene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	1,4-Dichlorobenzene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	2,4,6-Trichlorophenol	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	2,4-Dichlorophenol	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	2,4-Dimethylphenol	49	ug/L	U	49	190
9/12/05	OUTFALL 002	BNA-Water	2,4-Dinitrophenol	15	ug/L	U	15	58
9/12/05	OUTFALL 002	BNA-Water	2,4-Dinitrotoluene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	2,6-Dinitrotoluene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	2-Chloronaphthalene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	2-Chlorophenol	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	2-Methyl-4,6-dinitrophenol	2.9	ug/L	U	2.9	12
9/12/05	OUTFALL 002	BNA-Water	2-Nitrophenol	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	3,3'-Dichlorobenzidine	39	ug/L	U	39	160
9/12/05	OUTFALL 002	BNA-Water	4,4'-DDD	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	BNA-Water	4,4'-DDE	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	BNA-Water	4,4'-DDT	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	BNA-Water	4-Bromophenyl phenyl ether	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	4-Chloro-3-methylphenol	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	4-Chlorophenyl phenyl ether	1.9	ug/L	U	1.9	7.8
9/12/05	OUTFALL 002	BNA-Water	4-Nitrophenol	15	ug/L	U	15	58
9/12/05	OUTFALL 002	BNA-Water	Acenaphthene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Acenaphthylene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Aldrin	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	BNA-Water	Anthracene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Benzidine	97	ug/L	U	97	390

9/12/05	OUTFALL 002	BNA-Water	Benzo(a)anthracene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Benzo(a)pyrene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Benzo(b)fluoranthene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Benzo(g,h,i)perylene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Benzo(k)fluoranthene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Bis(2-chloroethoxy)methane	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Bis(2-chloroethyl)ether	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Bis(2-chloroisopropyl)ether	2.9	ug/L	U	2.9	12
9/12/05	OUTFALL 002	BNA-Water	Bis(2-ethylhexyl)phthalate	15	ug/L	U	15	58
9/12/05	OUTFALL 002	BNA-Water	Butyl benzyl phthalate	4.9	ug/L	U	4.9	19
9/12/05	OUTFALL 002	BNA-Water	Chrysene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Di-n-butyl phthalate	4.9	ug/L	U	4.9	19
9/12/05	OUTFALL 002	BNA-Water	Di-n-octyl phthalate	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Dibenzo(a,h)anthracene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Dieldrin	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	BNA-Water	Diethyl phthalate	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Dimethyl phthalate	49	ug/L	U	49	190
9/12/05	OUTFALL 002	BNA-Water	Endosulfan I	3.9	ug/L	U	3.9	16
9/12/05	OUTFALL 002	BNA-Water	Endosulfan II	3.9	ug/L	U	3.9	16
9/12/05	OUTFALL 002	BNA-Water	Endosulfan sulfate	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	BNA-Water	Endrin	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	BNA-Water	Endrin aldehyde	3.9	ug/L	U	3.9	16
9/12/05	OUTFALL 002	BNA-Water	Fluoranthene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Fluorene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Heptachlor	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	BNA-Water	Heptachlor epoxide	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	BNA-Water	Hexachlorobenzene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Hexachlorobutadiene	2.9	ug/L	U	2.9	12
9/12/05	OUTFALL 002	BNA-Water	Hexachlorocyclopentadiene	2.9	ug/L	U	2.9	12
9/12/05	OUTFALL 002	BNA-Water	Hexachloroethane	2.9	ug/L	U	2.9	12
9/12/05	OUTFALL 002	BNA-Water	Indeno(1,2,3-cd)pyrene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Isophorone	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	N-Nitrosodi-n-propylamine	1.9	ug/L	U	1.9	7.8
9/12/05	OUTFALL 002	BNA-Water	N-Nitrosodimethylamine	1.9	ug/L	U	1.9	7.8
9/12/05	OUTFALL 002	BNA-Water	N-Nitrosodiphenylamine	2.9	ug/L	U	2.9	12
9/12/05	OUTFALL 002	BNA-Water	Naphthalene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Nitrobenzene	1.9	ug/L	U	1.9	7.8
9/12/05	OUTFALL 002	BNA-Water	Pentachlorophenol	2.9	ug/L	U	2.9	12
9/12/05	OUTFALL 002	BNA-Water	Phenanthrene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Phenol	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	Pyrene	0.97	ug/L	U	0.97	3.9
9/12/05	OUTFALL 002	BNA-Water	alpha-BHC	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	BNA-Water	beta-BHC	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	BNA-Water	delta-BHC	1.5	ug/L	U	1.5	5.8

9/12/05	OUTFALL 002	BNA-Water	gamma-BHC	1.5	ug/L	U	1.5	5.8
9/12/05	OUTFALL 002	GC-Water	Alachlor	0.6	ug/L	U	0.6	2.4
9/12/05	OUTFALL 002	GC-Water	Ametryn	0.05	ug/L	U	0.05	0.2
9/12/05	OUTFALL 002	GC-Water	Atrazine	0.05	ug/L	U	0.05	0.2
9/12/05	OUTFALL 002	GC-Water	Azinphos Methyl	0.2	ug/L	U	0.2	0.8
9/12/05	OUTFALL 002	GC-Water	Bromacil	0.2	ug/L	U	0.2	0.8
9/12/05	OUTFALL 002	GC-Water	Butylate	0.2	ug/L	UJ	0.2	0.8
9/12/05	OUTFALL 002	GC-Water	Chlorpyrifos Ethyl	0.05	ug/L	U	0.05	0.2
9/12/05	OUTFALL 002	GC-Water	Chlorpyrifos Methyl	0.1	ug/L	U	0.1	0.4
9/12/05	OUTFALL 002	GC-Water	Diazinon	0.05	ug/L	U	0.05	0.2
9/12/05	OUTFALL 002	GC-Water	Ethion	0.05	ug/L	U	0.05	0.2
9/12/05	OUTFALL 002	GC-Water	Ethoprop	0.1	ug/L	UJ	0.1	0.4
9/12/05	OUTFALL 002	GC-Water	Fenamiphos	0.2	ug/L	U	0.2	0.8
9/12/05	OUTFALL 002	GC-Water	Fonofos	0.1	ug/L	U	0.1	0.4
9/12/05	OUTFALL 002	GC-Water	Hexazinone	0.1	ug/L	U	0.1	0.4
9/12/05	OUTFALL 002	GC-Water	Malathion	0.15	ug/L	UJ	0.15	0.6
9/12/05	OUTFALL 002	GC-Water	Metalaxyl	0.25	ug/L	U	0.25	1
9/12/05	OUTFALL 002	GC-Water	Metolachlor	0.5	ug/L	U	0.5	2
9/12/05	OUTFALL 002	GC-Water	Metribuzin	0.1	ug/L	U	0.1	0.4
9/12/05	OUTFALL 002	GC-Water	Mevinphos	0.2	ug/L	U	0.2	0.8
9/12/05	OUTFALL 002	GC-Water	Naled	0.8	ug/L	UJ	0.8	3.2
9/12/05	OUTFALL 002	GC-Water	Norflurazon	0.15	ug/L	UJ	0.15	0.6
9/12/05	OUTFALL 002	GC-Water	Parathion Ethyl	0.15	ug/L	U	0.15	0.6
9/12/05	OUTFALL 002	GC-Water	Parathion Methyl	0.1	ug/L	U	0.1	0.4
9/12/05	OUTFALL 002	GC-Water	Phorate	0.05	ug/L	U	0.05	0.2
9/12/05	OUTFALL 002	GC-Water	Prometryn	0.15	ug/L	U	0.15	0.6
9/12/05	OUTFALL 002	GC-Water	Simazine	0.05	ug/L	U	0.05	0.2
9/12/05	OUTFALL 002	Metals-Water	Aluminum	138	ug/L		5	20
9/12/05	OUTFALL 002	Metals-Water	Arsenic	13	ug/L	I	4	16
9/12/05	OUTFALL 002	Metals-Water	Cadmium	0.05	ug/L	U	0.05	0.2
9/12/05	OUTFALL 002	Metals-Water	Calcium	72.1	mg/L		0.05	0.2
9/12/05	OUTFALL 002	Metals-Water	Chromium	2	ug/L	U	2	8
9/12/05	OUTFALL 002	Metals-Water	Copper	0.5	ug/L	U	0.5	2
9/12/05	OUTFALL 002	Metals-Water	Iron	45	ug/L		10	40
9/12/05	OUTFALL 002	Metals-Water	Lead	0.18	ug/L	I	0.08	0.3
9/12/05	OUTFALL 002	Metals-Water	Magnesium	22.1	mg/L		0.01	0
9/12/05	OUTFALL 002	Metals-Water	Nickel	3.4	ug/L	I	2	8
9/12/05	OUTFALL 002	Metals-Water	Selenium	2.5	ug/L	U	2.5	10
9/12/05	OUTFALL 002	Metals-Water	Silver	0.025	ug/L	U	0.03	0.1
9/12/05	OUTFALL 002	Metals-Water	Zinc	3	ug/L	U	3	12
9/12/05	OUTFALL 002	Nutrients-Liquid	Alkalinity	64	mg CaCO3/L		0.65	2.5
9/12/05	OUTFALL 002	Nutrients-Liquid	Ammonia-N	0.017	mg N/L	I	0.01	0
9/12/05	OUTFALL 002	Nutrients-Liquid	Chloride	8.4	mg Cl/L		1	2.5
9/12/05	OUTFALL 002	Nutrients-Liquid	Color	100	PCU	A	10	10

9/12/05	OUTFALL 002	Nutrients-Liquid	Fluoride	0.59	mg F/L		0.05	0.1
9/12/05	OUTFALL 002	Nutrients-Liquid	Kjeldahl Nitrogen	0.75	mg N/L		0.12	0.4
9/12/05	OUTFALL 002	Nutrients-Liquid	NO2NO3-N	0.006	mg N/L	I	0	0
9/12/05	OUTFALL 002	Nutrients-Liquid	O-Phosphate-P	2.2	mg P/L		0.08	0.2
9/12/05	OUTFALL 002	Nutrients-Liquid	Sulfate	240	mg SO4/L		1	2.5
9/12/05	OUTFALL 002	Nutrients-Liquid	TDS	469	mg/L		15	60
9/12/05	OUTFALL 002	Nutrients-Liquid	Total-P	2.5	mg P/L		0.1	0.3
9/12/05	OUTFALL 002	Nutrients-Liquid	Turbidity	2.9	NTU		0.05	0.1
9/12/05	OUTFALL 002	Overflow	Alpha, Total	1.6	pCi/L	U		
9/12/05	OUTFALL 002	Overflow	Alpha-Counting Error	1.2	pCi/L			
9/12/05	OUTFALL 002	Overflow	Oil and Grease	1.7	mg/L	U		
9/12/05	OUTFALL 002	Overflow	Radium 226	0.6	pCi/L			
9/12/05	OUTFALL 002	Overflow	Radium 226-Counting Error	0.2	pCi/L			
9/12/05	OUTFALL 002	Overflow	Radium 228	0.9	pCi/L	U		
9/12/05	OUTFALL 002	Overflow	Radium 228-Counting Error	0.6	pCi/L			
9/12/05	UPSTREAM JOHNSON CR	Bio-AGP/LimNut	Algal Growth Potential	1.33	mg DryWt/L	JV	0.3	0.9
9/12/05	UPSTREAM JOHNSON CR	Bio-Chl-a	Chlorophyll-A, Monochromatic, Periphyton		mg/m2			
9/12/05	UPSTREAM JOHNSON CR	Bio-Chl-a	Chlorophyll-A, Monochromatic, Water	7.8	ug/L		1.4	4.3
9/12/05	UPSTREAM JOHNSON CR	Bio-Chl-a	Phaeophytin-A, Monochromatic, Periphyton		mg/m2			
9/12/05	UPSTREAM JOHNSON CR	Bio-Chl-a	Phaeophytin-A, Monochromatic, Water	5.1	ug/L		1.4	4.3
9/12/05	UPSTREAM JOHNSON CR	Bio-Invertebrates	Macroinvert-FW-Qual-Dipnetx20-# Taxa	24	# Taxa			
9/12/05	UPSTREAM JOHNSON CR	Bio-Peri/Phyto	Periphyton-Qualitative-# Diatom Taxa	52	# Taxa			
9/12/05	UPSTREAM JOHNSON CR	Bio-Peri/Phyto	Periphyton-Qualitative-# Wet Taxa	13	#Taxa			
9/12/05	UPSTREAM JOHNSON CR	Bio-Peri/Phyto	Phytoplankton-Quantitative-# Wet Taxa	23	#Taxa			
9/12/05	UPSTREAM JOHNSON CR	Bio-Peri/Phyto	Phytoplankton-Quantitative-#Diatom Taxa	42	#Taxa			
9/12/05	UPSTREAM JOHNSON CR	Nutrients-Liquid	Ammonia-N	0.086	mg N/L		0.01	0
9/12/05	UPSTREAM JOHNSON CR	Nutrients-Liquid	Fluoride	0.18	mg F/L		0.05	0.1
9/12/05	UPSTREAM JOHNSON CR	Nutrients-Liquid	Kjeldahl Nitrogen	0.58	mg N/L		0.12	0.4
9/12/05	UPSTREAM JOHNSON CR	Nutrients-Liquid	NO2NO3-N	0.053	mg N/L		0	0
9/12/05	UPSTREAM JOHNSON CR	Nutrients-Liquid	O-Phosphate-P	0.11	mg P/L		0.01	0
9/12/05	UPSTREAM JOHNSON CR	Nutrients-Liquid	Sulfate	92	mg SO4/L		1	2.5
9/12/05	UPSTREAM JOHNSON CR	Nutrients-Liquid	TSS	16	mg/L		4	16
9/12/05	UPSTREAM JOHNSON CR	Nutrients-Liquid	Total-P	0.25	mg P/L		0.02	0.1
9/12/05	UPSTREAM JOHNSON CR	Nutrients-Liquid	Turbidity	12	NTU		0.05	0.1

Appendix 5

Typical Values for Selected Parameters in Florida Waters

Percentile Distribution (1617 stations)

CONTROL SITE 9/12/05

Parameter	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	Measured
Hester-Dendy Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	**3.40**	3.52	3.76	3.90	**3.5**
Hester-Dendy Taxa Richness	6	6.5	9	11.5	13	15	17	21.5	26	29	**32**	**36**
Dipnet Taxa Richness	9	12	17	20	**22**	24.5	26	28	31	37	53	**24**
Total Kjeldahl Nitrogen	0.30	0.39	**0.56**	0.73	0.87	1.00	1.11	1.26	1.49	1.93	2.80	**0.58**
Total Ammonia	0.02	0.02	0.04	0.05	0.06	**0.08**	0.11	0.14	0.20	0.34	0.60	**0.086**
Nitrate plus Nitrite	0.01	0.01	0.03	**0.05**	0.07	0.10	0.14	0.20	0.32	0.64	1.05	**0.053**
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	**0.25**	0.39	0.74	1.51	**0.25**
Orthophosphate	0.01	0.01	0.03	0.04	0.05	0.08	**0.11**	0.17	0.27	0.59	1.37	**0.11**
Turbidity (NTU)	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	**10.45**	16.30	**12**

TEST SITE 9/12/05

Parameter	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	Measured
Hester-Dendy Diversity	0.84	**2.12**	2.48	2.74	2.88	3.09	3.25	3.40	3.52	3.76	3.90	**2.4**
Hester-Dendy Taxa Richness	6	6.5	9	11.5	13	15	17	**21.5**	26	29	32	**23**
Dipnet Taxa Richness	9	**12**	17	20	22	24.5	26	28	31	37	53	**15**
Total Kjeldahl Nitrogen	0.30	0.39	0.56	**0.73**	0.87	1.00	1.11	1.26	1.49	1.93	2.80	**0.78**
Total Ammonia	0.02	**0.02**	0.04	0.05	0.06	0.08	0.11	0.14	0.20	0.34	0.60	**0.034**
Nitrate plus Nitrite	0.01	**0.01**	0.03	0.05	0.07	0.10	0.14	0.20	0.32	0.64	1.05	**0.025**
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	0.25	0.39	0.74	**1.51**	**2.4**
Orthophosphate	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	**1.37**	**2.2**
Turbidity (NTU)	0.60	0.90	1.20	**1.45**	2.10	2.80	3.60	4.50	6.65	10.45	16.30	**2.7**

Taxa richness and diversity values are for benthic macroinvertebrates. Hester-Dendy sample= benthic macroinvertebrates collected from a standardized multi-plate sampler. Dipnet taxa richness = number of taxa collected in standardized dipnet sweep samples. Diversity = Shannon-Weaver H'. NTU = Nephelometric turbidity units. Adapted from Joe Hand, FDER, personal communication, 1991 (data collected 1980-1989). ND = No data.

Appendix 6

Habitat Assessment Field Sheets

DEP-SOP-001/01: Form FD 9000-3 (December 11, 2001)
PHYSICAL/CHEMICAL CHARACTERIZATION FIELD SHEET

SUBMITTING AGENCY CODE: ______ SUBMITTING AGENCY NAME: ______	STORET STATION NUMBER: 24020054	DATE (M/D/Y): 9/12/05	TIME 315	RECEIVING BODY OF WATER: Johnson Cr. → Myakka River
REMARKS:	COUNTY: Manatee	LOCATION: Mosaic Wingate Creek Mine	FIELD ID/NAME: Upstream Outfall 002 - Johnson Creek	

RIPARIAN ZONE/STREAM FEATURES

PREDOMINANT LAND-USE IN WATERSHED (specify relative percent in each category):

FOREST/NATURAL	SILVICULTURE	FIELD/PASTURE	AGRICULTURAL	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	OTHER (SPECIFY)
X							

LOCAL WATERSHED EROSION (check box): None ☐ Slight ☒ Moderate ☐ Heavy ☐

LOCAL WATERSHED NPS POLLUTION (check box): No evidence ☐ Slight ☐ Moderate potential ☒ Obvious sources ☐

WIDTH OF RIPARIAN VEGETATION (m) On least buffered side: >18

LIST & MAP DOMINANT VEGETATION ON BACK

TYPICAL WIDTH (M) DEPTH (M)/VELOCITY (M/SEC) TRANSECT: 0.5 m wide

Velocity: ____ m/s; 0.16 m/s; ____ m/s

Depth: ____ m deep; 0.2 m deep; ____ m deep

ARTIFICIALLY CHANNELIZED ☒ no ☐ recent, severe ☐ some recovery ☐ mostly recovered more sinuous

ARTIFICIALLY IMPOUNDED ☐ yes

HIGH WATER MARK 1.3 + 0.2 = 1.5
(m above present water level) (present depth in m) (m above bed)

CANOPY COVER % : OPEN: ☐ LIGHTLY SHADED (11-45%): ☒ MODERATELY SHADED (46-80%): ☐ HEAVILY SHADED: ☐

SEDIMENT/SUBSTRATE

SEDIMENT ODORS: NORMAL: ☒ SEWAGE: ☐ PETROLEUM: ☐ CHEMICAL: ☐ ANAEROBIC: ☐ OTHER: ☐ ______

SEDIMENT OILS: ABSENT: ☒ SLIGHT: ☐ MODERATE: ☐ PROFUSE: ☐

SEDIMENT DEPOSITION: SLUDGE: ☐ SAND SMOTHERING: NONE (SLIGHT) MODERATE SEVERE; SILT SMOTHERING: NONE SLIGHT (MODERATE) SEVERE; OTHER: ______

SUBSTRATE TYPE	% COVERAGE	# TIMES SAMPLED	METHOD	SUBSTRATE TYPES	% COVERAGE	# TIMES SAMPLED	METHOD
WOODY DEBRIS (SNAGS)	7	7 ~~IIII~~ II		SAND			
LEAF PACKS OR MATS	—			MUD/MUCK/SILT	78	6 ~~IIII~~ I	
AQUATIC VEGETATION	—			OTHER:			
ROCK OR SHELL RUBBLE	—			OTHER:			
UNDERCUT BANKS/ROOTS	15	7 ~~IIII~~ II		DRAW AERIAL VIEW SKETCH OF HABITATS FOUND IN 100 M SECTION			

WATER QUALITY	DEPTH (M):	TEMP. (°C):	PH (SU):	D.O. (MG/L):	COND. (UMHO/CM) OR SALINITY (PPT):			SECCHI (M):
TOP								
MID-DEPTH	0.2	27.46	6.48	5.42	247			
BOTTOM								

SYSTEM TYPE: STREAM: (1ST-2ND ORDER) 3RD-4TH ORDER 5TH – 6TH ORDER 7TH ORDER OR GREATER LAKE: ☐ WETLAND: ☐ ESTUARY: ☐ OTHER: ☐ ______

WATER ODORS (CHECK BOX): NORMAL: ☒ SEWAGE: ☐ PETROLEUM: ☐ CHEMICAL: ☐ OTHER: ☐ ______

WATER SURFACE OILS (CHECK BOX): NONE: ☒ SHEEN: ☐ GLOBS: ☐ SLICK: ☐

CLARITY (CHECK BOX): CLEAR: ☒ SLIGHTLY TURBID: ☐ TURBID: ☐ OPAQUE: ☐

COLOR (CHECK BOX): TANNIC: ☒ GREEN (ALGAE): ☐ CLEAR: ☐ OTHER: ☐ ______

WEATHER CONDITIONS/NOTES: hot/sunny

ABUNDANCE:	ABSENT	RARE	COMMON	ABUNDANT
PERIPHYTON	☐	☒	☐	☐
FISH	☐	☐	☒	☐
AQUATIC MACROPHYTES	☒	☐	☐	☐
IRON/SULFUR BACTERIA	☒	☐	☐	☐

SAMPLING TEAM: Scott Rose, Jacki Champion

SIGNATURE: Jacquelyn Champion

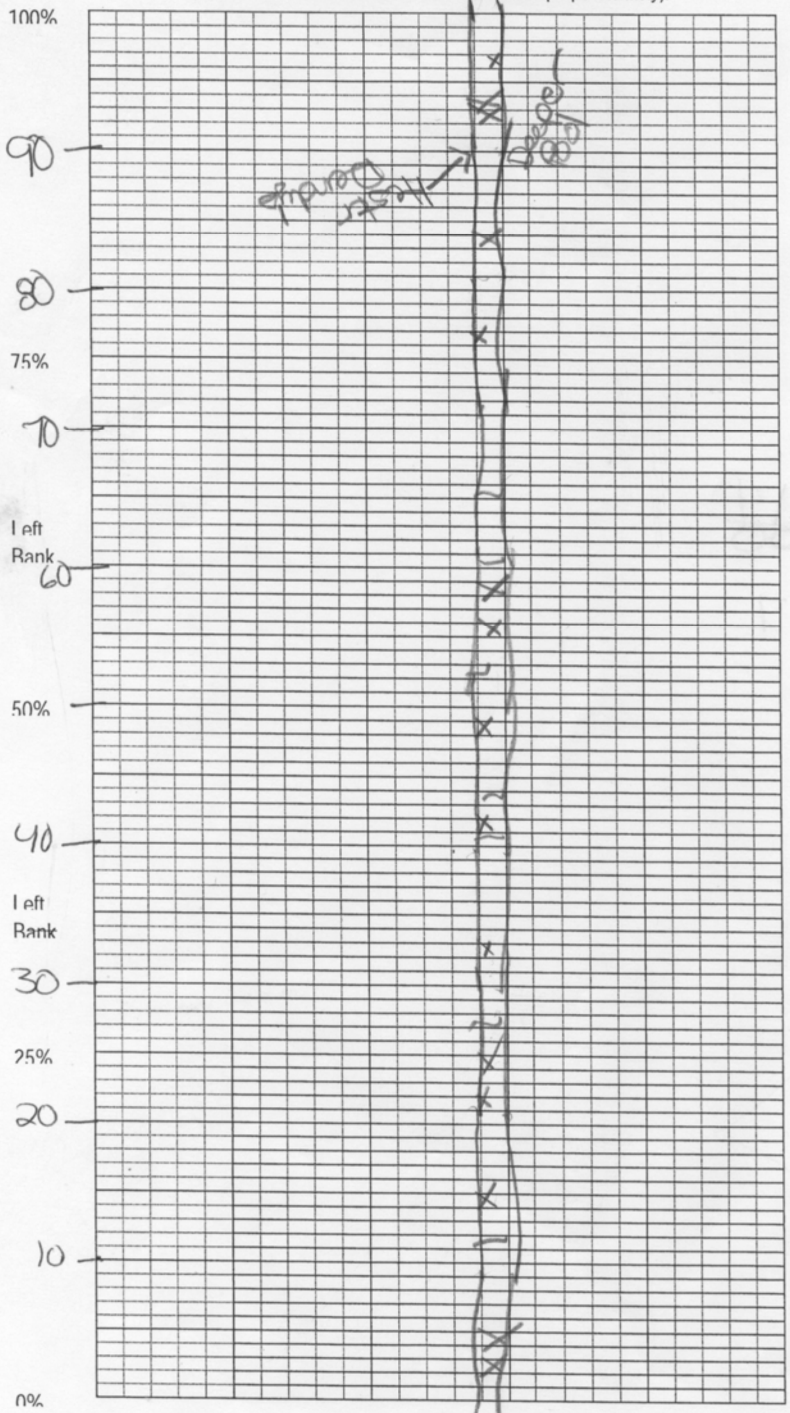
DATE: 9/12/05

Mosaic Wingate Creek Mine

DEP-SOP-001/01: Form FD 9000-4

Stream/River Habitat Sketch Sheet

Length of grid represents 100 m of stream (not linear meters).
(Horizontal scale is double vertical scale, draw proportionately).



Substrates: Code key, draw proportionate habitat abundance.

- Snags
- Roots/undercut banks
- Leaf Packs (or mats)
- Macrophytes
- ______
- ______
- ______

Velocity:
Note where velocity measures were taken.

Habitat Smothering:
Note areas (on map) where sand or silt is smothering substrates, limiting habitability.

Bank Stability:
Note areas (on map) with unstable, eroding banks.

Riparian Buffer Width:
Note areas (on map) where natural vegetation is altered or eliminated.

Plants observed/other notes:

Upstream Outfall 002
Johnson Creek
9/12/05
N 27° 27' 44.8"
W 82° 09' 10.2"

FDEP-SOP-001/01: Form FD 9000-5 (June 1, 2001)

STREAM/RIVER HABITAT ASSESSMENT FIELD SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME:	STORET STATION NUMBER:	DATE (M/D/Y): 9/12/05	RECEIVING BODY OF WATER: Johnson Cr. → Myakka River
REMARKS:	COUNTY: Manatee	LOCATION: Mosaic Wingate Creek	FIELD ID/NAME: Upstream Outfall 002 Johnson Creek

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Primary Habitat Components	Four or more productive habitats present (snags, tree roots/undercut banks, aquatic vegetation, leaf packs (partially decayed), rock).	Three productive habitats present. Adequate habitat. Some substrates may be new fall (fresh leaves or snags).	Two productive habitats present. Less than desirable habitat, frequently disturbed or removed.	One or less productive habitat. Lack of habitat is obvious, substrates unstable or smothered.
Substrate Diversity 8	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1
Substrate Availability 11	Greater than 30% productive habitat present at site.	16% to 30% productive habitat, by aerial extent.	6% to 15% productive habitat	Less than 5% productive habitat.
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1
Water Velocity 11	Max. observed at typical transect: > 0.25 m/sec. But < 1 m/sec	Max. observed at typical transect: 0.1 to 0.25 m/sec	Max. observed at typical transect: 0.05 to 0.1 m/sec	Max. observed at typical transect: <0.05 m/sec. Or spate occurring: > 1 m/sec
	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1
Habitat Smothering 13	Less than 20% of habitats affected by sand or silt accumulation	20%-50% of habitats affected by sand or silt accumulation	Smothering of 50%-80% of the habitats with sand or silt, pools shallow, frequent sediment movement	Smothering of >80% of habitats with sand or silt, as severe problem, pools absent
Primary Score 43	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1
Secondary Habitat Components	No artificial channelization or dredging. Stream with normal, sinuous pattern	Many have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern	Channelized, somewhat recovered, but > 80% of area affected	Artificially channelized, box-cut banks, straight, instream habitat highly altered
Artificial Channelization 20	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Bank Stability	Stable. No evidence of erosion or bank failure. Little potential for future problems.	Moderately stable. Infrequent or small areas of erosion, mostly healed over.	Moderately unstable. Moderate areas of erosion, high erosion potential during floods.	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing.
Right Bank 9 / Left Bank 9	10 (9)	8 7 6	5 4	3 2 1
Riparian Buffer Zone Width	Width of native vegetation (least buffered side) greater than 18 m	Width of native vegetation (least buffered side) 12m to 18 m	Width of native vegetation 6 to 12 m. human activities still close to system	Less than 6 m of native buffer zone due to intensive human activities
Right Bank 10 / Left Bank 10	10 9	8 7 6	5 4	3 2 1
Riparian Zone Vegetation Quality	Over 80% of riparian surfaces consist of native plants, including trees, understory shrubs, or non-woody machrophytes. Normal, expected plant community for given sunlight & habitat conditions.	50% to 80% of riparian zone is vegetated, and/or one class of plants normally expected for the sunlight & habitat conditions is not represented. Some disruption in community evident.	25% to 50% of riparian ozone is vegetated, and or one or two expected classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious.	Less than 25% of streambank surfaces are vegetated and/or poor plant community (e.g. grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less.
Right Bank 10 / Left Bank 10				
Secondary Score 78	10 9	8 7 6	5 4	3 2 1

121 **TOTAL SCORE**

ANALYSIS DATE: 9/12/05	ANALYST: Jacki Champion	SIGNATURE: Jacquelyn Champion

DEP-SOP-001/01: Form FD 9000-3 (December 11, 2001)
PHYSICAL/CHEMICAL CHARACTERIZATION FIELD SHEET

SUBMITTING AGENCY CODE: ______ SUBMITTING AGENCY NAME: ______	STORET STATION NUMBER: 24020061	DATE (M/D/Y): 9/12/05	TIME: 930	RECEIVING BODY OF WATER: Johnson Cr. → Myakka River
REMARKS:	COUNTY: Manatee	LOCATION: Downstream Outfall 002 Wingate Creek Mine		FIELD ID/NAME: Downstream Outfall 002 - Johnson Creek

RIPARIAN ZONE/STREAM FEATURES

PREDOMINANT LAND-USE IN WATERSHED (specify relative percent in each category):

FOREST/NATURAL	SILVICULTURE	FIELD/PASTURE	AGRICULTURAL	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	OTHER (SPECIFY)
X							

LOCAL WATERSHED EROSION (check box): None ☐ Slight ☒ Moderate ☐ Heavy ☐

LOCAL WATERSHED NPS POLLUTION (check box): No evidence ☐ Slight ☐ Moderate potential ☒ Obvious sources ☐

WIDTH OF RIPARIAN VEGETATION (m) On least buffered side: >18

LIST & MAP DOMINANT VEGETATION ON BACK

TYPICAL WIDTH (M) DEPTH (M)/VELOCITY (M/SEC) TRANSECT: 3 m wide

0.3 m/s | 0.3 m/s | 0.3 m/s

0.3 m deep | 0.4 m deep | 0.3 m deep

80 m to 70 m

ARTIFICIALLY CHANNELIZED ☒ no ☐ recent, ☐ severe ☐ some recovery mostly recovered more sinuous

ARTIFICIALLY IMPOUNDED ☐ yes

HIGH WATER MARK 1 + 0.4 = 1.4
(m above present water level) (present depth in m) (m above bed)

CANOPY COVER %: OPEN: ☐ LIGHTLY SHADED (11-45%): ☐ MODERATELY SHADED (46-80%): ☒ HEAVILY SHADED: ☐

SEDIMENT/SUBSTRATE

SEDIMENT ODORS: NORMAL: ☒ SEWAGE: ☐ PETROLEUM: ☐ CHEMICAL: ☐ ANAEROBIC: ☐ OTHER: ☐ ______

SEDIMENT OILS: ABSENT: ☒ SLIGHT: ☐ MODERATE: ☐ PROFUSE: ☐

SEDIMENT DEPOSITION: SLUDGE: ☐ SAND SMOTHERING: NONE MODERATE (SLIGHT) SEVERE SILT SMOTHERING: NONE MODERATE (SLIGHT) SEVERE OTHER: ______

SUBSTRATE TYPE	% COVERAGE	# TIMES SAMPLED	METHOD	SUBSTRATE TYPES	% COVERAGE	# TIMES SAMPLED	METHOD
WOODY DEBRIS (SNAGS)	7	5 ~~llll~~		SAND	85	5 ~~llll~~	
LEAF PACKS OF MATS	<1	1 /		MUD/MUCK/SILT			
AQUATIC VEGETATION				OTHER:			
ROCK OR SHELL RUBBLE	1	4 llll		OTHER:			
UNDERCUT BANKS/ROOTS	6	5 ~~llll~~		*DRAW AERIAL VIEW SKETCH OF HABITATS FOUND IN 100 M SECTION*			

WATER QUALITY	DEPTH (M):	TEMP. (°C):	PH (SU):	D.O. (MG/L):	COND. (UMHO/CM) OR SALINITY (PPT):			SECCHI (M):
TOP								
MID-DEPTH	0.4	28.44	7.20	7.21	431			
BOTTOM								

SYSTEM TYPE: STREAM: (1ST-2ND ORDER) 3RD-4TH ORDER 5TH – 6TH ORDER 7TH ORDER OR GREATER LAKE: ☐ WETLAND: ☐ ESTUARY: ☐ OTHER: ☐ ______

WATER ODORS (CHECK BOX): NORMAL: ☒ SEWAGE: ☐ PETROLEUM: ☐ CHEMICAL: ☐ OTHER: ☐ ______

WATER SURFACE OILS (CHECK BOX): NONE: ☒ SHEEN: ☐ GLOBS: ☐ SLICK: ☐

CLARITY (CHECK BOX): CLEAR: ☒ SLIGHTLY TURBID: ☐ TURBID: ☐ OPAQUE: ☐

COLOR (CHECK BOX): TANNIC: ☒ GREEN (ALGAE): ☐ CLEAR: ☐ OTHER: ☐ ______

WEATHER CONDITIONS/NOTES: 80's Sunny

ABUNDANCE:	ABSENT	RARE	COMMON	ABUNDANT
PERIPHYTON	☐	☒	☐	☐
FISH	☐	☐	☒	☐
AQUATIC MACROPHYTES	☐	☒	☐	☐
IRON/SULFUR BACTERIA	☒	☐	☐	☐

SAMPLING TEAM: Scott Rose, Jacki Champion

SIGNATURE: Jacquelyn Champion

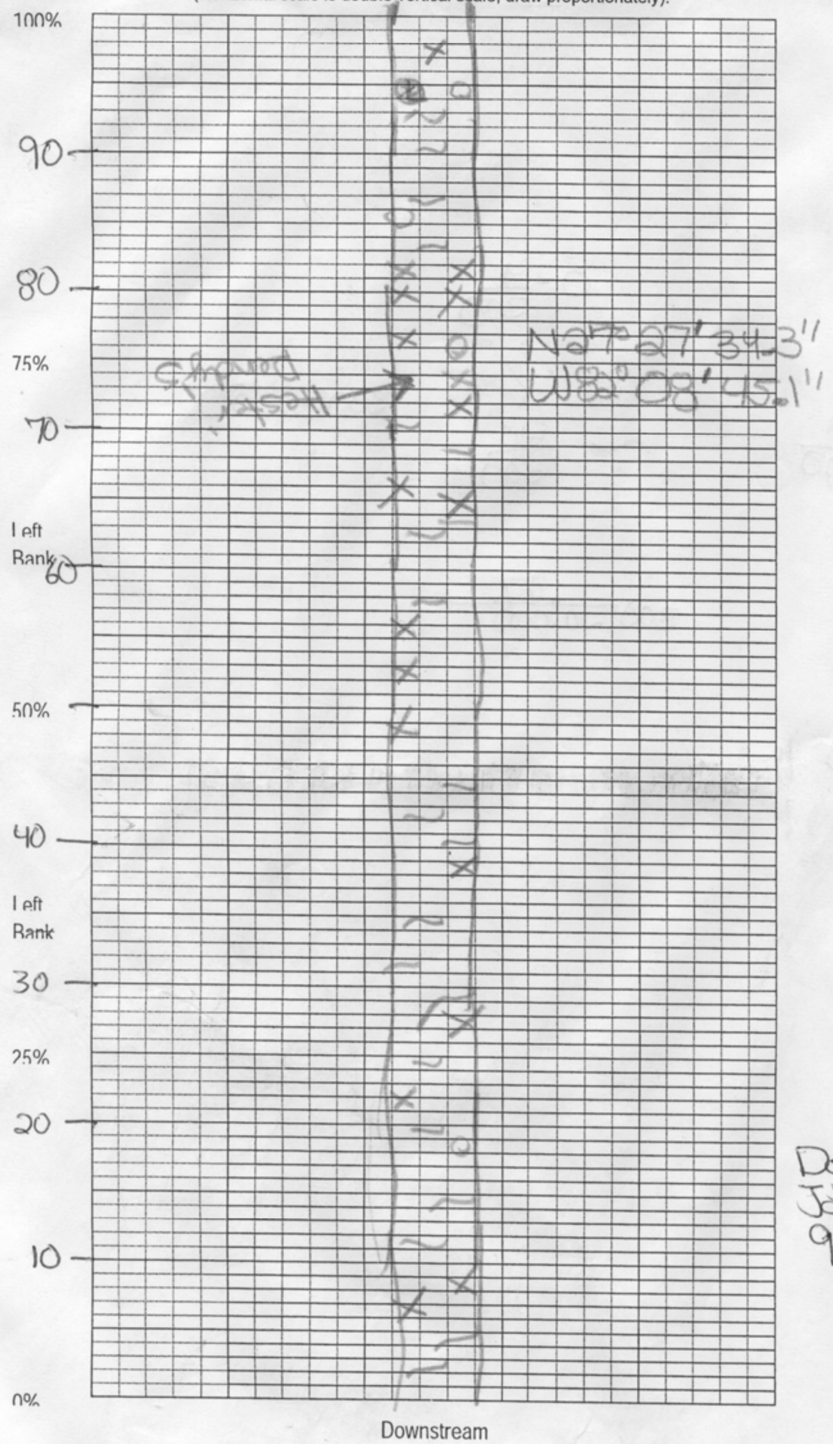
DATE: 9/12/05

Mosaic- Wingate Creek Mine

DEP-SOP-001/01: Form FD 9000-4

Stream/River Habitat Sketch Sheet

Length of grid represents 100 m of stream (not linear meters).
(Horizontal scale is double vertical scale, draw proportionately).



Substrates: Code key, draw proportionate habitat abundance.

- Snags
- Roots/undercut banks
- Leaf Packs (or mats)
- Macrophytes
- Rubble
- ______
- ______

Velocity:

Note where velocity measures were taken.

Habitat Smothering:

Note areas (on map) where sand or silt is smothering substrates, limiting habitability.

Bank Stability:

Note areas (on map) with unstable, eroding banks.

Riparian Buffer Width:

Note areas (on map) where natural vegetation is altered or eliminated.

Plants observed/other notes:

Downstream Outfall 002
Johnson Creek
9/12/05

Form FD 9000-4

Revision Date: February 1, 2004

FDEP-SOP-001/01: Form FD 9000-5 (June 1, 2001)

STREAM/RIVER HABITAT ASSESSMENT FIELD SHEET

SUBMITTING AGENCY CODE:______ SUBMITTING AGENCY NAME:______	STORET STATION NUMBER:	DATE (M/D/Y): 9/12/05	RECEIVING BODY OF WATER: Johnson Cr. → Myakka River

REMARKS:	COUNTY: Manatee	LOCATION: Mosaic Wingate Creek Mine	FIELD ID/NAME: Downstream Outfall 002 Johnson Creek

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor
Primary Habitat Components **Substrate Diversity** 16	Four or more productive habitats present (snags, tree roots/undercut banks, aquatic vegetation, leaf packs (partially decayed), rock). 20 19 18 17 (16)	Three productive habitats present. Adequate habitat. Some substrates may be new fall (fresh leaves or snags). 15 14 13 12 11	Two productive habitats present. Less than desirable habitat, frequently disturbed or removed. 10 9 8 7 6	One or less productive habitat. Lack of habitat is obvious, substrates unstable or smothered. 5 4 3 2 1
Substrate Availability 10	Greater than 30% productive habitat present at site. 20 19 18 17 16	16% to 30% productive habitat, by aerial extent. 15 14 13 12 11	6% to 15% productive habitat (10) 9 8 7 6	Less than 5% productive habitat. 5 4 3 2 1
Water Velocity 17	Max. observed at typical transect: > 0.25 m/sec. But < 1 m/sec 20 19 18 (17) 16	Max. observed at typical transect: 0.1 to 0.25 m/sec 15 14 13 12 11	Max. observed at typical transect: 0.05 to 0.1 m/sec 10 9 8 7 6	Max. observed at typical transect: <0.05 m/sec. Or spate occurring: > 1 m/sec 5 4 3 2 1
Habitat Smothering 14 - - - - - - - - - Primary Score 57	Less than 20% of habitats affected by sand or silt accumulation 20 19 18 17 16	20%-50% of habitats affected by sand or silt accumulation 15 (14) 13 12 11	Smothering of 50%-80% of the habitats with sand or silt, pools shallow, frequent sediment movement 10 9 8 7 6	Smothering of >80% of habitats with sand or silt, as severe problem, pools absent 5 4 3 2 1
Secondary Habitat Components **Artificial Channelization** 20	No artificial channelization or dredging. Stream with normal, sinuous pattern (20) 19 18 17 16	Many have been channelized in the past (>20 yrs), but mostly recovered, fairly good sinuous pattern 15 14 13 12 11	Channelized, somewhat recovered, but > 80% of area affected 10 9 8 7 6	Artificially channelized, box-cut banks, straight, instream habitat highly altered 5 4 3 2 1
Bank Stability Right Bank 10 Left Bank 10	Stable. No evidence of erosion or bank failure. Little potential for future problems. 10 9	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 8 7 6	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 5 4	Unstable. Many (60%-80%) raw, eroded areas. Obvious bank sloughing. 3 2 1
Riparian Buffer Zone Width Right Bank 10 Left Bank 10	Width of native vegetation (least buffered side) greater than 18 m 10 9	Width of native vegetation (least buffered side) 12m to 18 m 8 7 6	Width of native vegetation 6 to 12 m. human activities still close to system 5 4	Less than 6 m of native buffer zone due to intensive human activities 3 2 1
Riparian Zone Vegetation Quality Right Bank 10 Left Bank 10 - - - - - - - - - Secondary Score 80	Over 80% of riparian surfaces consist of native plants, including trees, understory shrubs, or non-woody machrophytes. Normal, expected plant community for given sunlight & habitat conditions. 10 9	50% to 80% of riparian zone is vegetated, and/or one class of plants normally expected for the sunlight & habitat conditions is not represented. Some disruption in community evident. 8 7 6	25% to 50% of riparian ozone is vegetated, and/or one or two expected classes of plants are not represented. Patches of bare soil or closely cropped vegetation, disruption obvious. 5 4	Less than 25% of streambank surfaces are vegetated and/or poor plant community (e.g. grass monoculture or exotics) present. Vegetation removed to stubble height of 2 inches or less. 3 2 1

137 **TOTAL SCORE**

ANALYSIS DATE: 9/12/05	ANALYST: Jacki Champion	SIGNATURE: Jacquelyn Champion

Appendix 7

Qualitative periphyton taxa list and number of individuals counted from natural substrates upstream and downstream of Mosaic Fertilizer-Wingate Creek facility discharge, 9/12/05.

	Control	Test
Bacillariophyceae		
Achnanthes sp.	1	1
Achnanthes clevei	-	1
Achnanthes exigua	-	4
Achnanthes exigua constricta	5	-
Achnanthes hungarica	1	-
Achnanthes lanceolata	4	-
Achnanthes lanceolata apiculata	6	-
Achnanthes lanceolata rostrata	-	1
Achnanthes minutissima	-	1
Amphora sp.	1	-
Aulacoseira granulata	-	2
Aulacoseira herzogii	2	-
Aulacoseira sp.	19	2
Caloneis sp.	1	-
Capartogramma crucicula	47	1
Cocconeis fluviatilis	15	1
Cocconeis placentula	-	5
Craticula sp.	1	-
Cyclotella meneghiniana	6	14
Cyclotella sp.	-	1
Cymbellaceae	-	1
Diadesmis confervacea	16	27
Diadesmis contenta	-	2
Diploneis ovalis	1	-
Encyonema minutum	1	6
Encyonema silesiacum	1	-
Eunotia bilunaris	2	-
Eunotia incisa	2	1
Eunotia pectinalis	2	1
Eunotia sp.	30	22
Fragilaria capucina	1	1
Frustulia rhomboides	1	1
Frustulia saxonica	-	1
Gomphonema affine	1	-
Gomphonema augur	2	-
Gomphonema gracile	1	-
Gomphonema parvulum	3	9
Gomphonema sp.	3	4
Hippodonta hungarica	1	-
Hippodonta sp.	7	-
Luticola sp.	2	-
Melosira sp.	2	-
Navicula brasiliana	1	-
Navicula constans	1	1
Navicula jaenefeltii	-	1
Navicula latens	1	-
Navicula minima	8	3
Navicula rostellata	3	-
Navicula seminulum	1	-
Navicula sp.	7	8
Naviculaceae	7	-

Appendix 7 continued

Nitzschia amphibia	-	25
Nitzschia gracilis	1	-
Nitzschia nana	1	-
Nitzschia palea	4	1
Nitzschia sp.	12	8
Pinnularia sp.	11	3
Rhopalodia gibberula	-	2
Sellaphora laevissima	1	-
Sellaphora pupula	1	1
Sellaphora sp.	1	-
Stauroneis phoenicenteron	2	-
Synedra ulna	2	-
Undetermined Bacillariophyceae	6	1
Chlorophycota		
Chlorella sp.	1	6
Chlorococcum sp.	5	1
Oedogonium sp.	2	-
Scenedesmus bijuga	1	1
Selenastrum sp.	-	1
Cryptophycota		
Cryptomonas sp.	2	-
Cyanophycota		
Anabaena sp.	1	4
Cyanobium parvum	-	2
Jaaginema sp.	9	2
Merismopedia warmingiana	3	-
Planktolyngbya sp.	9	1
Pseudanabaena sp.	15	-
Rhabdogloea sp.	-	1
Schizothrix calcicola	5	-
Synechocystis sp.	2	4
Euglenophycota		
Euglena spirogyra	1	-

Appendix 8a

Benthic macroinvertebrates collapsed taxa list and density (average number of individuals/m^2 rounded to the nearest individual, n = 3 samples) from Hester-Dendy artificial substrates incubated for 28 days upstream and downstream of the Mosaic Fertilizer-Wingate Creek facility and collected 9/12/05. See SOP LT 7100 sect. 4.2.1 for method on collapsing taxa.

	Control	Test
Arthropoda		
Insecta		
Coleoptera		
Microcylloepus pusillus	71	524
Scirtes sp.	8	-
Stenelmis sp.	17	96
Diptera		
Ablabesmyia mallochi	26	6
Ablabesmyia rhamphe grp.	140	-
Ceratopogonidae	-	5
Corynoneura sp.	3	-
Dicrotendipes simpsoni	97	-
Glyptotendipes sp.	-	6
Goeldichironomus carus	-	11
Palpomyia/bezzia grp.	13	-
Paralauterborniella nigrohalterale	9	-
Pentaneura inconspicua	9	42
Polypedilum beckae	3	28
Polypedilum fallax	9	-
Polypedilum flavum	3	2,266
Polypedilum halterale grp.	6	-
Polypedilum illinoense grp.	3	-
Polypedilum scalaenum grp.	74	6
Rheocricotopus robacki	-	11
Stenochironomus sp.	3	50
Tanytarsus sp. A Epler	3	-
Tanytarsus sp. C Epler	3	-
Tanytarsus sp. L Epler	16	-
Tanytarsus sp. O Epler	3	-
Tanytarsus sp. T Epler	3	-
Thienemanniella sp.	3	-
Tribelos fuscicornis	360	23
Ephemeroptera		
Baetidae	-	8
Caenis sp.	-	3
Caenis diminuta	289	-
Choroterpes basalis	8	-
Heptageniidae	-	3
Stenacron sp.	3	-

Megaloptera		
Corydalus cornutus	3	35
Odonata		
Argia fumipennis	5	-
Gomphus sp.	3	-
Trichoptera		
Cheumatopsyche sp.	3	2,119
Hydropsyche sp.	-	610
Neotrichia sp.	24	93
Mollusca		
Gastropoda		
Basommatophora		
Ancylidae	-	3
Ferrissia sp.	35	-
Haitia sp.	5	323
Micromenetus dilatatus	95	8
Nemertea		
Nemertea		
Undetermined Nemertea	3	-

Appendix 8b

Benthic macroinvertebrates taxa list and counts (number of individuals counted) collected from Hester-Dendy artificial substrates (n= 3 samples) incubated upstream and downstream of the Mosaic Fertilizer-Wingate Creek facility for 28 days and collected 9/12/05.

Taxon	Control	Test
Arthropoda		
Insecta		
Coleoptera		
Elmidae	1	1
Microcylloepus pusillus	26	197
Scirtes sp.	3	-
Stenelmis sp.	6	36
Diptera		
Ablabesmyia mallochi	9	2
Ablabesmyia rhamphe grp.	49	-
Ceratopogonidae	3	2
Chironomidae	22	50
Corynoneura sp.	1	-
Dicrotendipes sp.	2	-
Dicrotendipes simpsoni	32	-
Glyptotendipes sp.	-	2
Goeldichironomus carus	-	4
Palpomyia/bezzia grp.	2	-
Paralauterborniella sp.	1	-
Paralauterborniella nigrohalterale	2	-
Pentaneura inconspicua	3	15
Polypedilum sp.	1	-
Polypedilum beckae	1	10
Polypedilum fallax	3	-
Polypedilum flavum	1	810
Polypedilum halterale grp.	2	-
Polypedilum illinoense grp.	1	-
Polypedilum scalaenum grp.	25	2
Rheocricotopus robacki	-	4
Stenochironomus sp.	1	18
Tanytarsus sp.	1	-
Tanytarsus sp. A Epler	1	-
Tanytarsus sp. C Epler	1	-
Tanytarsus sp. L Epler	5	-
Tanytarsus sp. O Epler	1	-
Tanytarsus sp. T Epler	1	-
Thienemanniella sp.	1	-
Tribelos fuscicornis	126	8
Ephemeroptera		
Baetidae	-	3
Caenis sp.	63	1
Caenis diminuta	46	-
Choroterpes basalis	2	-
Heptageniidae	-	1
Leptophlebiidae	1	-
Stenacron sp.	1	-

Megaloptera		
Corydalus cornutus	1	13
Odonata		
Argia fumipennis	2	-
Gomphus sp.	1	-
Trichoptera		
Cheumatopsyche sp.	1	747
Hydropsyche sp.	-	215
Hydropsychidae	-	60
Neotrichia sp.	9	35
Undetermined Trichoptera	-	10
Mollusca		
Gastropoda		
Gastropoda		
Undetermined Gastropoda	1	1
Basommatophora		
Ancylidae	10	1
Ferrissia sp.	3	-
Haitia sp.	2	98
Micromenetus sp.	6	1
Micromenetus dilatatus	20	2
Physidae	-	23
Planorbidae	9	-
Nemertea		
Nemertea		
Nemertea		
Undetermined Nemertea	1	-

Appendix 9a

Benthic macroinvertebrates collapsed taxa list and number of individuals counted from 20-discrete-dipnet sweeps upstream and downstream of Mosaic Fertilizer-Wingate Creek facility (9/12/05). See SOP LT 7100 sect. 4.2.1 for method on collapsing taxa.

	Control Site	Test Site
Annelida		
Oligochaeta		
Haplotaxida		
Allonais paraguayensis	-	2
Nais communis complex	-	11
Pristina aequiseta	-	2
Slavina appendiculata	1	-
Arthropoda		
Insecta		
Coleoptera		
Dubiraphia vittata	6	-
Microcylloepus pusillus	27	22
Stenelmis sp.	8	5
Diptera		
Ablabesmyia mallochi	1	-
Ablabesmyia rhamphe grp.	5	-
Cladotanytarsus cf. *daviesi*	1	-
Cryptochironomus sp.	2	-
Pentaneura inconspicua	2	1
Polypedilum flavum	2	18
Polypedilum halterale grp.	1	-
Rheotanytarsus exiguus grp.	2	-
Rheotanytarsus pellucidus	1	-
Tanytarsus sp. C Epler	1	-
Tanytarsus sp. L Epler	1	-
Tanytarsus sp. O Epler	1	-
Ephemeroptera		
Caenis sp.	28	-
Megaloptera		
Corydalus cornutus	-	1
Odonata		
Argia sp.	3	1
Enallagma sp.	2	-
Trichoptera		
Cheumatopsyche sp.	-	30
Hydropsyche sp.	-	7
Neotrichia sp.	2	3
Triaenodes sp.	1	-
Mollusca		
Bivalvia		
Bivalvia		
Undetermined Bivalvia	1	-
Veneroida		
Corbicula fluminea	-	3
Gastropoda		
Gastropoda		
Undetermined Gastropoda	2	-
Basommatophora		
Ancylidae	-	1
Physidae	-	1
Platyhelminthes		
Platyhelminthes		
Undetermined Platyhelminthes	1	-

Appendix 9b

Qualitative benthic macroinvertebrate taxa list and number of individuals counted from **20**-discrete-dipnet sweeps upstream and downstream of Mosaic Fertilizer-Wingate Creek facility (9/12/05).

	Control Site	Test Site
Annelida		
Oligochaeta		
Haplotaxida		
Allonais paraguayensis	-	2
Naididae	-	1
Nais communis complex	-	10
Pristina aequiseta	-	2
Slavina appendiculata	1	-
Arthropoda		
Insecta		
Coleoptera		
Dubiraphia vittata	6	-
Elmidae	1	-
Microcylloepus pusillus	26	22
Stenelmis sp.	8	5
Diptera		
Ablabesmyia mallochi	1	-
Ablabesmyia rhamphe grp.	5	-
Chironomidae	-	3
Cladotanytarsus cf. *daviesi*	1	-
Cryptochironomus sp.	2	-
Pentaneura inconspicua	2	1
Polypedilum flavum	2	15
Polypedilum halterale grp.	1	-
Rheotanytarsus sp.	1	-
Rheotanytarsus exiguus grp.	1	-
Rheotanytarsus pellucidus	1	-
Tanytarsus sp. C Epler	1	-
Tanytarsus sp. L Epler	1	-
Tanytarsus sp. O Epler	1	-
Ephemeroptera		
Caenis sp.	28	-
Megaloptera		
Corydalus cornutus	-	1
Odonata		
Argia sp.	2	1
Coenagrionidae	2	-
Enallagma sp.	1	-
Trichoptera		
Cheumatopsyche sp.	-	30
Hydropsyche sp.	-	7
Hydroptilidae	1	-
Neotrichia sp.	1	3
Triaenodes sp.	1	-
Mollusca		
Bivalvia		
Bivalvia		
Undetermined Bivalvia	1	-
Veneroida		
Corbicula fluminea	-	3
Gastropoda		
Gastropoda		
Undetermined Gastropoda	2	-
Basommatophora		
Ancylidae	-	1
Physidae	-	1
Platyhelminthes		
Platyhelminthes		
Platyhelminthes		
Undetermined Platyhelminthes	1	-

Appendix 10a

Taxa list and density (number/mL) for phytoplankton collected from the effluent and upstream and downstream of the Mosaic Fertilizer-Wingate Creek facility discharge, 9/12/05.

	Effluent	Control	Test
Bacillariophyceae			
Achnanthes exigua	-	8	2
Achnanthes hungarica	-	2	-
Achnanthes lanceolata apiculata	-	15	-
Achnanthes lanceolata rostrata	-	2	4
Achnanthes minutissima	-	-	2
Aulacoseira sp.	-	19	-
Bacillariophyceae	-	5	-
Brachysira vitrea	-	-	2
Caloneis sp.	-	2	-
Caloneis bacillum	-	2	-
Capartogramma crucicula	3	74	-
Cocconeis sp.	-	2	-
Cocconeis fluviatilis	-	12	-
Cocconeis placentula	5	-	7
Cyclotella sp.	5	-	2
Cyclotella meneghiniana	13	24	13
Diadesmis confervacea	3	32	7
Encyonema minutum	-	2	2
Encyonema silesiacum	-	2	-
Eunotia sp.	10	24	2
Eunotia incisa	-	-	2
Eunotia monodon	-	2	-
Eunotia pectinalis	-	2	-
Frustulia sp.	-	2	-
Frustulia rhomboides	-	3	-
Frustulia saxonica	-	2	-
Gomphonema sp.	-	7	7
Gomphonema gracile	-	-	2
Gomphonema parvulum	-	8	4
Hantzschia sp.	-	2	-
Hippodonta sp.	-	-	2
Hippodonta hungarica	-	5	-
Navicula sp.	3	12	-
Navicula constans	-	2	-
Navicula cryptotenella	-	-	2
Navicula minima	-	7	2
Navicula seminulum	-	7	2
Naviculaceae	-	3	-
Neidium sp.	-	2	-
Nitzschia sp.	10	15	11
Nitzschia amphibia	5	-	6
Nitzschia nana	-	2	-
Nitzschia palea	-	2	2
Nitzschia rosenstockii	-	2	4
Nitzschia scalaris	-	2	-
Nitzschia subacicularis	-	2	-
Pinnularia sp.	-	17	-
Sellaphora sp.	-	3	-
Sellaphora pupula	3	10	-
Stauroneis phoenicenteron	-	2	-
Synedra ulna	-	2	-

Appendix 10a continued

Chlorophycota			
Actinotaenium sp.	-	2	-
Ankistrodesmus sp.	10	2	22
Ankistrodesmus falcatus	13	3	9
Characium sp.	3	-	2
Chlamydomonas sp.	5	8	4
Chlorella sp.	18	10	17
Chlorococcaceae	-	-	2
Chlorococcum sp.	5	2	6
Closterium sp.	3	-	2
Dictyosphaerium sp.	28	-	-
Gloeocystis sp.	13	-	9
Kirchneriella sp.	3	-	-
Planktosphaeria sp.	3	-	-
Pleurotaenium minutum	-	2	-
Scenedesmus sp.	8	-	2
Scenedesmus acutiformis	-	2	-
Scenedesmus bijuga	-	3	-
Schroederia setigera	56	2	19
Selenastrum sp.	153	-	80
Cryptophycota			
Cryptomonas sp.	-	3	-
Undetermined Cryptophyceae	10	-	-
Cyanophycota			
Anabaena sp.	288	-	213
Aphanocapsa sp.	-	-	7
Aphanothece sp.	3	-	-
Cyanobium parvum	23	3	7
Cyanobium planctictum	13	-	17
Cyanothece sp.	-	3	-
Jaaginema sp.	8	42	11
Merismopedia warmingiana	-	-	4
Microcystis sp.	5	-	2
Oscillatoria sp.	-	2	-
Planktolyngbya sp.	-	12	-
Planktothrix sp.	8	3	2
Pseudanabaena sp.	-	25	7
Romeria sp.	3	-	-
Snowella sp.	5	-	7
Synechocystis sp.	13	8	22
Euglenophycota			
Euglena sp.	-	3	-
Lepocinclis sp.	-	2	-
Trachelomonas sp.	3	24	-
Undetermined Euglenophyceae	3	2	-

Appendix 10b

Taxa list and number of individuals for phytoplankton collected from the effluent and upstream and downstream of the Mosaic Fertilizer-Wingate Creek facility discharge, 9/12/05.

	Effluent	Control	Test
Bacillariophyceae			
Achnanthes exigua	-	5	1
Achnanthes hungarica	-	1	-
Achnanthes lanceolata apiculata	-	9	-
Achnanthes lanceolata rostrata	-	1	2
Achnanthes minutissima	-	-	1
Aulacoseira sp.	-	11	-
Brachysira vitrea	-	-	1
Caloneis bacillum	-	1	-
Caloneis sp.	-	1	-
Capartogramma crucicula	1	44	-
Cocconeis fluviatilis	-	7	-
Cocconeis placentula	2	-	4
Cocconeis sp.	-	1	-
Cyclotella meneghiniana	5	14	7
Cyclotella sp.	2	-	1
Diadesmis confervacea	1	19	4
Encyonema minutum	-	1	1
Encyonema silesiacum	-	1	-
Eunotia incisa	-	-	1
Eunotia monodon	-	1	-
Eunotia pectinalis	-	1	-
Eunotia sp.	4	14	1
Frustulia rhomboides	-	2	-
Frustulia saxonica	-	1	-
Frustulia sp.	-	1	-
Gomphonema gracile	-	-	1
Gomphonema parvulum	-	5	2
Gomphonema sp.	-	4	4
Hantzschia sp.	-	1	-
Hippodonta hungarica	-	3	-
Hippodonta sp.	-	-	1
Navicula constans	-	1	-
Navicula cryptotenella	-	-	1
Navicula minima	-	4	1
Navicula seminulum	-	4	1
Navicula sp.	1	7	-
Naviculaceae	-	2	-
Neidium sp.	-	1	-
Nitzschia amphibia	2	-	3
Nitzschia nana	-	1	-
Nitzschia palea	-	1	1
Nitzschia rosenstockii	-	1	2
Nitzschia scalaris	-	1	-
Nitzschia sp.	4	9	6
Nitzschia subacicularis	-	1	-
Pinnularia sp.	-	10	-
Sellaphora pupula	1	6	-
Sellaphora sp.	-	2	-
Stauroneis phoenicenteron	-	1	-
Synedra ulna	-	1	-
Undetermined Bacillariophyceae	-	3	-

Chlorophycota			
Actinotaenium sp.	-	1	-
Ankistrodesmus sp.	4	1	12
Ankistrodesmus falcatus	5	2	5
Characium sp.	1	-	1
Chlamydomonas sp.	2	5	2
Chlorella sp.	7	6	9
Chlorococcaceae	-	-	1
Chlorococcum sp.	2	1	3
Closterium sp.	1	-	1
Dictyosphaerium sp.	11	-	-
Gloeocystis sp.	5	-	5
Kirchneriella sp.	1	-	-
Planktosphaeria sp.	1	-	-
Pleurotaenium minutum	-	1	-
Scenedesmus sp.	3	-	1
Scenedesmus acutiformis	-	1	-
Scenedesmus bijuga	-	2	-
Schroederia setigera	22	1	10
Selenastrum sp.	60	-	43
Cryptophycota			
Cryptomonas sp.	-	2	-
Undetermined Cryptophyceae	4	-	-
Cyanophycota			
Anabaena sp.	113	-	115
Aphanocapsa sp.	-	-	4
Aphanothece sp.	1	-	-
Cyanobium parvum	9	2	4
Cyanobium plancticum	5	-	9
Cyanothece sp.	-	2	-
Jaaginema sp.	3	25	6
Merismopedia warmingiana	-	-	2
Microcystis sp.	2	-	1
Oscillatoria sp.	-	1	-
Planktolyngbya isp.	-	7	-
Planktothrix sp.	3	2	1
Pseudanabaena sp.	-	15	4
Romeria sp.	1	-	-
Snowella sp.	2	-	4
Synechocystis sp.	5	5	12
Euglenophycota			
Euglena sp.	-	2	-
Lepocinclis sp.	-	1	-
Trachelomonas sp.	1	14	-
Undetermined Euglenophyceae	1	1	-

Appendix 11

Qualitative benthic macroinvertebrate collapsed taxa list from **4**-discrete-dipnet sweeps (Biorecon) upstream and downstream of Mosaic Fertilizer-Wingate Creek facility (8/1/05). See SOP LT 7100 sect. 4.2.1 for method on collapsing taxa.

	Control Site	Test Site
Annelida		
Oligochaeta		
Undetermined Oligochaeta	-	+
Arthropoda		
Insecta		
Coleoptera		
Dineutus sp.	+	-
Dubiraphia vittata	+	-
Microcylloepus pusillus	+	+
Stenelmis sp.	+	+
Decapoda		
Cambaridae	+	-
Diptera		
Chironomidae	+	+
Limonia sp.	-	+
Ephemeroptera		
Caenis sp.	+	-
Heptageniidae	+	-
Maccaffertium exiguum	-	+
Megaloptera		
Corydalus cornutus	+	+
Odonata		
Argia sedula	-	+
Enallagma cardenium	+	+
Gomphus sp.	+	-
Trichoptera		
Cheumatopsyche sp.	+	+
Hydropsyche sp.	+	+
Neotrichia sp.	+	-
Oecetis cinerascens	-	+
Mollusca		
Bivalvia		
Veneroida		
Corbicula fluminea	-	+
Gastropoda		
Basommatophora		
Haitia sp.	-	+
Micromenetus sp.	+	-

Biological Analyses of the Mosaic Fertilizer Wingate Creek Mine effluent sampled on September 12, 2005, NPDES #FL0032522.

Fill Out This Section For All Surface Water Discharger Inspections(CEI, CSI, CBI, PAI, XSI-RI Optional)

Transaction Code		NPDES NUMBER	YR/MO/DA	Insp Type	Inspector	Fac Type
1 N	2 5	3 F L 0 0 2 0 3 3 8 11	12 0 4 0 5 1 7	18 S	19 S	20 1

Remarks

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