Florida
Department of Environmental Protection

Biological Assessment of

Tri-Gas, Inc.

Palm Beach County

NPDES #FL0001678

Sampled August 1993

February 1994

Biology Section
Division of Technical Services

Department of Environmental Protection

Results of Fifth Year Inspections

Discharger: Tri-Gas, Inc.
County: Palm Beach
NPDES Number: FL0001678
State Permit Expiration Date: 1 June 1994

Toxics Sampling Inspection (XSI)

Date Sampled: 23 August 1993

Results: Copper (23 µg/L), iron (82 µg/L), and zinc (72 µg/L) were detected in the effluent. Iron was found at the reference site (415 µg/L) and the test site (243 µg/L). None of these concentrations exceeded Class III water quality standards. Acetone was detected at the reference site (34 µg/L) and at the test site (50 µg/L) at less than chronically toxic levels. Sediment petroleum hydrocarbons (with a chromatographic pattern similar to motor oil) were measured to be 530 mg/kg at the reference site and 10,000 mg/kg at the test site. This is cause for concern, since remediation guidelines for petroleum contaminated sediments (FDER 1992) require that no more than 50 mg/kg of total recoverable petroleum hydrocarbons be present in "clean" soil.

Compliance Biomonitoring Inspection (CBI)

Date Sampled: 23 August 1993

Results: The sample of effluent was not toxic to either test organism, *Ceriodaphnia dubia* or *Cyprinella leedsi*. No mortality occurred during the 48 hour static acute bioassay.

Impact Bioassessment Inspection (IBI)

Date Sampled: 23 August 1993

Results: Benthic macroinvertebrate communities were stressed throughout the study area, and the sediment contamination suggests that past Tri-Gas discharges may have been associated with the observed perturbation. Florida Index, taxa richness, and Shannon-Weaver diversity were depressed in Hester-Dendy samples, with these measurements generally being slightly lower at the test site. This degradation is related to the low dissolved oxygen throughout the study area and petroleum contamination. Phytoplankton populations were somewhat depressed at the test site, exhibited by a decrease in taxa richness, and an increase in the percent contribution of the dominant taxon. The test site assemblage consisted almost exclusively of blue-green algae, while that of the reference site was represented by a larger percentage of members from other divisions. The disturbances in the algal community at the test site were consistent with the elevated AGP found there.

Water Quality Inspection (WQI)

Date Sampled: 23 August 1993

Results: Nutrient compounds were elevated in the effluent, and moderate nutrient enrichment was noted at the test site. Algal growth potential (AGP) was quite high in the effluent (99.5 mg dry wt/L), and moderately elevated at the test site (15.2 mg dry wt/L), exceeding the "problem threshold" of 5 mg dry wt/L.

Major characteristics of community structure of control and test sites.

	Reference Site	Test Site
Macroinvertebrate Qualitative		
Number of Taxa	44	40
Florida Index	6	3
% Contribution of Dominant Taxon	19.2	23.4
% Diptera	70.6	52.5
% Oligochaeta	5.2	31.9
% Gastropoda	3.8	10.2
% Decapoda	5.2	0.6
% Odonata	4.2	1.7
% Amphipoda	3.5	1.2
% Other	7.5	1.9
% Predators	18.6	29.8
% Above Surface Deposit Feeders	46.6	20.2
% Below Surface Deposit Feeders	5.5	32.8
% Suspension Feeders	8.8	4.5
% Scrapers	4.8	10.5
% Shredders	9.3	1.0
% Other	6.4	1.2
Macroinvertebrate Hester-Dendy		
Number of Taxa	8	6
Florida Index	1	1
Shannon-Weaver Diversity	2.87	2.58
% Diptera	84.6	16.7
% Gastropoda	7.7	33.3
% Odonata	7.7	16.7
% Ephemeroptera	0	16.7
% Amphipoda	0	16.7
% Predators	30.8	16.7
% Above Surface Deposit Feeders	40.0	30.0
% Suspension Feeders	9.2	8.3
% Scrapers	7.7	33.3
% Shredders	12.3	6.7
Phytoplankton Algae		
Number of Taxa	16	7
% Contribution of Dominant Taxon	29.7	50.0
Chlorophyll a (µg/L)	4.06 I	4.81 I
Diatom/Diatom + B-G Abundance Ratio	0.21	0
% Blue-green	71.9	87.5
% Green	9.4	6.2
% Diatoms	18.7	0
% Euglenophytes	0	6.2
Algal Growth Potential (mg dry wt/l)	1.2	15.2

I - Value reported is less than the minimum quantitation limit, and greater than or equal to the minimum detection limit

Introduction

Tri-Gas, Inc., a facility engaged in the production and sale of various compressed gases, is located in Palm Beach County, Florida (see maps in Appendix). The maximum permitted discharge is 0.025 MGD, consisting of floor drain wash waters and cooling tower blowdown. The mean flow has been approximately 0.0097 MGD. Floor drain wastewater is treated in three belt type oil skimmers before it enters a Fram oil-water treatment system. Non-contact cooling water is run through an anthracite sand filter before mixing with floor drain wastewater. Final effluent is discharged to an unnamed Class III canal along the northeastern edge of the property.

The facility has a mixing zone extending 400 meters on either side of the outfall. Quarterly monitoring of chromium, total residual chlorine, oil and grease, pH, flow rate, temperature, zinc, total phosphorus, and specific conductance is required within this area of the canal and in the effluent. Outside the mixing zone, Class III water quality standards must be met at all times. No permit violations, plant upsets, or enforcement actions against the plant have occurred within the past year (see facility summary in Appendix).

Methods

The focus of this investigation was to determine the discharger's effects on the receiving waters. A comparison of biological community

health was made between a reference site (located in the unnamed canal approximately 0.5 miles above the outfall) and a test site (the area down gradient of the discharge) (see map and diagram in Appendix). A habitat assessment was performed *in situ* to establish comparability between sites. Supplemental physical/chemical data were also collected on the effluent and study sites. Acute screening toxicity bioassays, using *Ceriodaphnia dubia* and *Cyprinella leedsi* as test organisms, were performed on an effluent sample (Weber 1991). The effluent was analyzed for metals and the receiving water sites were tested for volatile organic compounds. Sediment samples from reference and test sites were tested for petroleum hydrocarbon content. Additionally, nutrient analyses were performed on effluent, reference, and test sites. Methods used for all chemical analyses are on file at the Tallahassee DEP Chemistry Laboratory.

Benthic macroinvertebrate communities were evaluated at reference and test sites. Invertebrates were collected from multiple substrates (*e.g.*, snags, leaf packs, vegetation) using discrete dip net sweeps. Additional invertebrate collections were accomplished using Hester-Dendy multiplate samplers which were incubated for 28 days (Ross 1990). Phytoplankton was sampled at both reference and test sites via subsurface grabs. Chlorophyll *a* was also determined for phytoplankton communities (Ross 1990). Algal Growth Potential tests, using *Selenastrum capricornutum* as the test organism, followed Miller *et al.* (1978).

Explanation of Measurements of Community Health

Several different measurements of macroinvertebrate and algal community health have been employed in this report. Many of these, such as the number of taxa, Shannon-Weaver Diversity Index, and chlorophyll *a* are well known. Others are briefly explained here. The Florida Index assigns points to stream-dwelling macroinvertebrates based on their sensitivity to pollution (see Ross 1990). A site with a high Florida Index score is considered healthy (*i.e.*, many clean-water organisms are present). Excessive numerical dominance of a single type of organism (a high % contribution of dominant taxon) is usually associated with disturbance. A decreased diatom to blue-green algae ratio (calculated by dividing the number of individuals in the Bacillariophyta by the number of individuals in the Bacillariophyta + Cyanophyta) is often indicative of nutrient enriched conditions. The determination of the Quantitative Stability Index (for taxonomic % composition) is a two step process. First, the relative proportions of major taxonomic groups are calculated for each site. Then, the lesser of the two percentages for each discrete taxonomic group is totaled. A QSI (for % composition) of 100% means that the two sites being compared are identical. This same type of procedure is used for calculating the QSI (for functional feeding groups).

For graphical purposes, the percent differences between the reference and test sites involving the number of taxa, the diversity index, Florida Index and the diatom to blue-green algae ratio are measured as the reference site minus test site divided by the reference site. The percent differences between sites involving the percent contribution of dominant taxon, chlorophyll *a*, and algal growth potential are measured as the test site minus reference site divided by the reference site.

The following personnel were involved in this investigation: Jeff Christian and Doug Strom (DEP Southeast District) and Marshall Faircloth, Russel Frydenborg, Kathleen Lurding, Tina Mikulski, Elizabeth Miller, Urania Quintana, Tobin Rader, Landon Ross, Greg Wynn, and David Young (Tallahassee Biology Laboratory). The report was reviewed by the Point Source Studies Review Committee, consisting of Wayne Magley, Jan Mandrup-Poulsen, and Michael Tanski, as well as District representatives.

Results and Discussion

The study area is situated in the Eastern Florida Flatwoods, bordering on an Everglades-type habitat. The unnamed canal that receives the Tri-Gas discharge is a channelized system, approximately 15 m in width. Overall, the two stations were very similar in habitat, with scores of 48 and 44, respectively (Appendix). Land use was similar at both the reference and test site areas, primarily forested (60-65%), with smaller proportions of field and pasture (10-15%), agricultural (10-15%), industrial (5-10%), and commercial (5%). Several types of substrate was available for benthic macroinvertebrate colonization and success at both study areas, consisting of aquatic macrophytes, leaf mats, and woody debris. As expected in this region of little topographic relief, water velocity was fairly low in the canal, ranging from 0.05 to 0.1 m/sec. Specific conductance was roughly doubled at the test site (490 µmhos/cm), compared with the reference site (230 µmhos/cm). Both stations were near

neutral in pH (reference site was 7.1, test site was 7.3 S.U.'s), and dissolved oxygen was reduced throughout the study area (1.5 mg/L and 1.9 mg/L at reference and test sites, respectively). Dissolved oxygen at both sites was below the Class III water quality standard (Rule 17-302.530(31) FAC).

The only volatile organic compound found in receiving water stations was acetone, 34 µg/L at the reference site and an estimated 50 µg/L below the discharge. Sediment petroleum hydrocarbons (with a chromatographic pattern similar to motor oil) were measured to be 530 mg/kg at the reference site and 10,000 mg/kg at the test site. This is cause for concern, since remediation guidelines for petroleum contaminated sediment (FDER 1992) require that no more than 50 mg/kg of total recoverable petroleum hydrocarbons be present in "clean" soil. Additionally, there is high potential of direct contact between burrowing benthic organisms and the contaminated sediments, which may result in biological uptake.

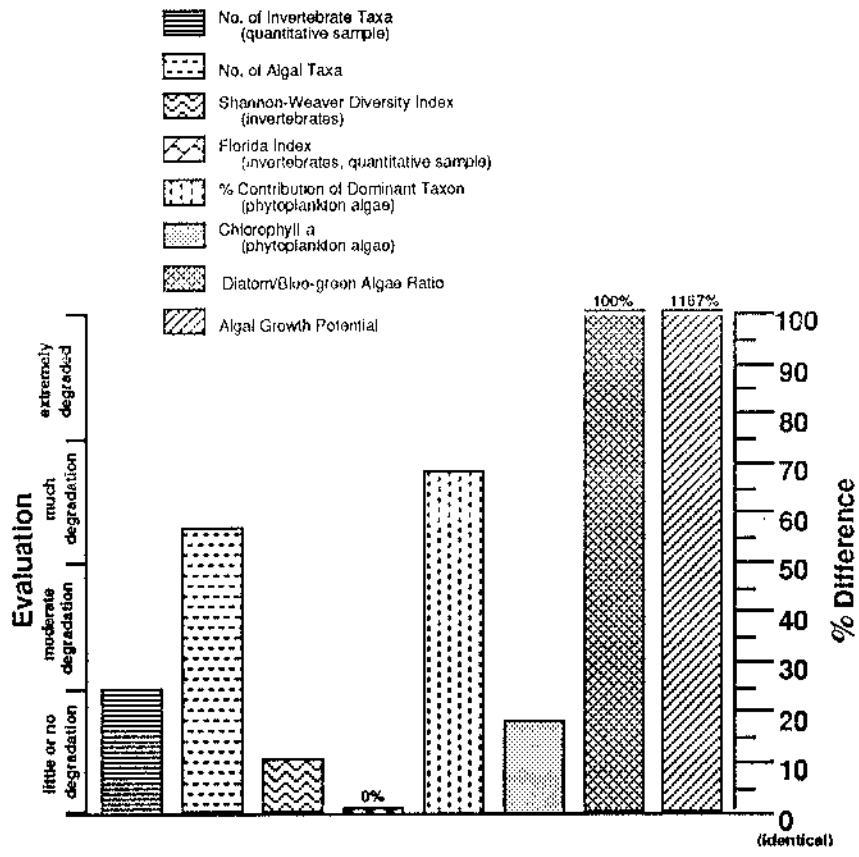
The following metals were found in the effluent at concentrations above the practical quantitation limit (PQL): copper (23 µg/L), iron (82 µg/L), and zinc (72 µg/L). At a hardness of 486.6 mg/L $CaCO_3$, none of these levels are in violation of Class III standards. The only metal found in the receiving waters was iron, at concentrations of 415 µg/L (reference site) and 243 µg/L (test site).

The sample of effluent was not toxic to either test organism, *Ceriodaphnia dubia* or *Cyprinella leedsi*. No mortality occurred during the 48 hour static acute bioassay (Appendix).

While some nutrient compounds were elevated in the effluent, including orthophosphate (0.7 mg/L), total phosphorus (0.77 mg/L), and nitrate-nitrite (0.97 mg/L), only low to moderate receiving water nutrient enrichment was due to the discharge. For example, most nutrient compounds were below the practical quantitation limit or undetected at the test site, except for moderate levels of total phosphorus (0.044 mg/L) and TKN (1.0 mg/L). With the exception of a high ammonia concentration (0.45 mg/L), nutrients were low or undetected at the reference site.

Algal growth potential (AGP) was elevated in the effluent (99.5 mg dry wt/L), low at the reference site (1.2 mg dry wt/L), and moderately elevated at the test site (15.2 mg dry wt/L). A receiving water AGP of 5 mg dry wt/L is used to predict when detrimental consequences associated with cultural eutrophication (e.g., excessive algal or macrophyte growth, D.O. sags) will occur in freshwater systems (Raschke and Schultz 1987). Apparently, the increased phosphorus concentrations at the test site were sufficient to stimulate a substantial amount of *Selenastrum* (test algae) growth.

Benthic macroinvertebrate communities indicated that populations were stressed throughout the receiving canal, and some evidence suggests that the discharge was responsible. The figure on this page indicates the degree of difference between the control and test sites. Larger differences (that is, higher percentages) correspond with greater degrees of degradation. Negative values mean that the test site is better than the control. The figure on p. 4 sum-

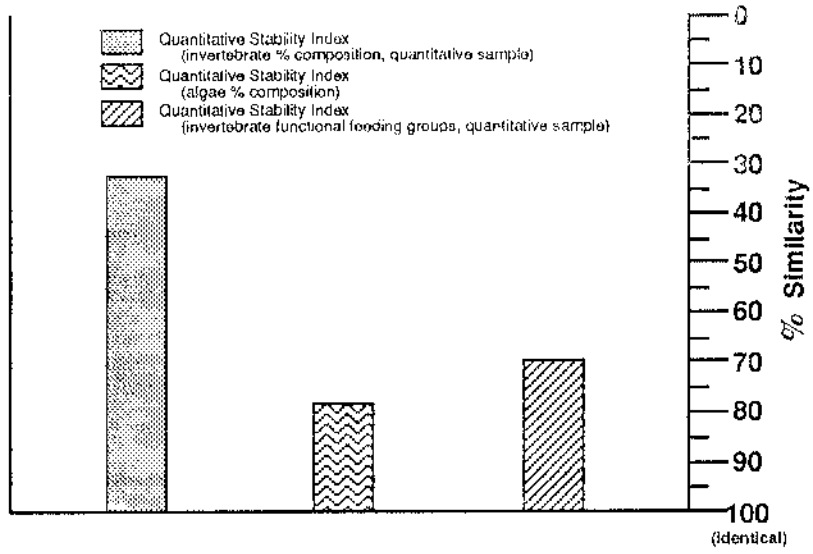


Effect of discharge on receiving stream
(measured as difference between control and test sites).

marizes similarities between the sites. Smaller similarities (lower percentages) generally correspond with greater degradation, unless the test sites are better than the reference site. The average or relative abundance of each individual taxon appears in the Appendix.

Taxa richness in Hester-Dendy samples, with 8 taxa at the reference site and 6 taxa at the test site, was lower than the taxa richness values found in 84% to 95% of other Florida streams (see Table of Typical Water Quality Values in Appendix). Similarly, Shannon-Weaver diversity at both sites was lower than the diversities measured in 60% of other Florida stream systems, decreasing from 2.9 at the reference site to 2.6 at the test site. Each station received only one Florida Index point, which is considerably less than the 15 points expected from this part of the State. Each site was predominantly composed of pollution-tolerant dipterans. The depressed taxa richness and lack of pollution-sensitive animals is probably due to the low dissolved oxygen measured at both sites, or possibly, due to the petroleum contamination found at both sites, which suggests past episodes of detrimental discharges. The higher amount of sediment petroleum hydrocarbons found near the discharge suggests that Tri-Gas may have been the source of the contamination. Historically, high levels of oil and grease have been measured in the effluent from this facility (Jeff Christian, personal communication, FDEP Southeast District). The contamination at the reference site may be due to wind-induced currents which previously directed the discharge to the site.

Macroinvertebrate samples collected with dip net sweeps yielded similar results, although the taxa richness was substantially higher.



Effect of discharge on receiving stream
(measured as similarity between control and test sites).

Forty-four taxa were collected from the reference site, while the test site supported 40 taxa. Florida Index scores were still low, however, decreasing from 6 at the reference site to 3 points at the test site. The percent contribution of the dominant taxon was slightly higher below the discharge, analogous to the small diversity decrease observed in Hester-Dendy samples. Again, the reference site was strongly dominated by dipterans (70.6%), particularly the chironomid midges, *Glyptotendipes* sp. and *Pseudochironomus* sp. Dominant midges at the test site included *Larsia decolorata* and *Pseudochironomus* sp. All of these organisms are common in slowly moving or lentic waters, and many are tolerant of low dissolved oxygen. The test site population was also made up of a high number of oligochaetes (31.9%), compared to the reference site oligochaete population, which was 5.2% of the total community. Differences in functional feeding groups corresponded to those observed for species composition.

Phytoplankton populations were somewhat depressed at the test site, compared to the reference station. Sixteen taxa were identified above the discharge, represented by cyanophytes (71.9%), diatoms (18.7%), and chlorophytes (9.4%). The seven taxa found at the test site were nearly all cyanophytes, making up 87.5% of the population. The percent contribution of the dominant taxon also indicated degraded conditions, increasing by 70% below the outfall. Although higher numbers of algae were collected from the reference site, chlorophyll *a* (less than 5 µg/L) was essentially the same at both stations. The disturbances in the algal community at the test site were consistent with the elevated AGP found there.

Conclusions

The sample of effluent was not toxic to either test organism, *Ceriodaphnia dubia* or *Cyprinella leedsi*. No mortality occurred during the 48 hour static acute bioassay.

Copper (23 µg/L), iron (82 µg/L), and zinc (72 µg/L) were detected in the effluent. Iron was found at the reference site (415 µg/L) and the test site (243 µg/L). None of these concentrations exceeded Class III water quality standards.

Acetone was detected at the reference site (34 µg/L) and at the test site (50 µg/L) at less than chronically toxic levels. Sediment petroleum hydrocarbons (with a chromatographic pattern similar to motor oil) were measured to be 530 mg/kg at the reference site and 10,000 mg/kg at the test site. This is cause for concern, since remediation guidelines for petroleum contaminated sediment (DEP 1992) require that no more than 50 mg/kg of total recoverable petroleum hydrocarbons be present in "clean" soil.

Nutrient compounds were elevated in the effluent, and moderate nutrient enrichment was noted at the test site. Algal growth potential (AGP) was quite high in the effluent (99.5 mg dry wt/L), and moderately elevated at the test site (15.2 mg dry wt/L), exceeding the problem threshold of 5 mg dry wt/L. These high AGP's corresponded to the phosphorus concentrations in the effluent and at the test site.

Benthic macroinvertebrate communities were stressed throughout the study area, and the sediment contamination suggests that past Tri-Gas discharges may have been associated with the observed perturbation. Florida Index was substantially lower than expected, and taxa richness was extremely depressed in Hester-Dendy samples. Modest decreases in taxa richness and the Florida Index occurred in both dip net and Hester-Dendy samples collected at the test site. Additionally, Shannon-Weaver diversity was depressed at both sites, but was slightly lower below the outfall. This degradation is related to the low dissolved oxygen throughout the study area, or possibly, due to the petroleum contamination found at both sites, which is probably associated with previous oil and grease discharges by the facility. The higher amount of sediment petroleum hydrocarbons found near the discharge further suggests that Tri-Gas was the source of the contamination. The contamination at the reference site may be due to wind-induced currents which previously directed the discharge to the site.

Phytoplankton populations were somewhat depressed at the test site, exhibiting a 56% decrease in taxa richness, and a 70% increase in the percent contribution of the dominant taxon, compared to the reference site. The test site assemblage consisted almost exclusively of blue-green algae, while the reference site community was represented by a larger percentage of members from other divisions. The disturbances in the algal community at the test site were consistent with the elevated AGP found there.

Literature Cited

FDER. 1992. Guidelines for assessment and remediation of petroleum contaminated soil. Fla. Dept. Environ. Reg. Bureau of Waste Cleanup. 39 p. + Appendix.

Miller, W. E., T. E. Maloney, and J. C. Greene. 1978. The *Selenastrum capricornutum* Printz algal assay bottle test. U. S. Environ. Prot. Agency, EPA-600/9-78-018. 126 p.

Raschke, R. L. and D. A. Schultz. 1987. The use of the algal growth potential test for data assessment. J. Wat. Poll. Cont. Fed. 59(4): 222-227.

Ross, L. T. 1990. Methods for aquatic biology. Fla. Dept. Environ. Reg. Tech. Ser. 10(1): 1-47.

Weber, C. I. 1991. Methods for measuring the acute toxicity of effluents to freshwater and marine organisms. 4th edition. EPA/600/4-90/027. U. S. EPA, Cincinnati, Ohio. 216 pp.

DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

Facility Name: Tri-Gas Inc.		Date Summary Prepared : 930729
Location (attach detailed map): 18000 Beeline Highway Riviera Beach Fl.	County: Palm Beach	District: Southeast
Federal Permit # FL0001678 and expiration date: March 31, 1995	State GMS # and 5050P01642 State expiration date: June 1, 1994	Facility Type: (Industrial) Municipal Federal Agricultural Other (list):

Function of facility: The function of this facility is the production and sale of various gases.

Description of treatment process:

See the permit in the section called operate.

Receiving waters: Unnamed Canal		Classification: I II (III)
Design Flow: 0.025 MGD (maximum)	Mean Flow: ≈ 9700 GPD	Flow during survey: ≈ 0.05-0.1 M/Sec.

Discharge is: Continuous (Intermittent) Seasonal Rainfall dependent
Other (describe)

therefore, the best time to sample is:

If facility has a mixing zone, give details (size, parameters affected, etc.):

See Specific Condition #2 & 3 of the permit.

List effluent limits (if necessary, attach relevant paperwork):

Parameter	Limit (units)
See Specific Condition #3 of the Permit.	The Quality and Quantity of the effluent discharged shall not exceed State water Quality Standards for Class III waters.

Describe special permit conditions and permit modifications:

NO special permit conditions or permit modifications exist.

DEPARTMENT OF ENVIRONMENTAL REGULATION

FACILITY SUMMARY

(Facility)

Description of permitted outfall(s):

This facility is permitted to discharge a maximum of 0.025 MGD. The discharge is intermittent.

List permit violations (from MOR data or other source) and plant upsets that occurred within past year: There has not been any permit violations within the past year.

There is no plant upsets on file.

Describe previous impact bioassessments, WQBEL's, and previous or current enforcement actions:

There is no existing or pending state enforcement actions against this facility.

For the WQBEL's refer to the attached permit.

Discuss comparability of MOR results to past DER results and whether there are trends (improving, declining) in the data set:

The Department does not have sampling results that would be comparable to establish trends.

Additional information:	Staff contributing to this review (signature):
	Jeff Christian (Biologist)
	Jeff Christian (Inspector)
	(Engineer)
	( )
	( )
	( )

Florida Department of Environmental Regulation

Southeast District • 1900 S. Congress Ave., Suite A • West Palm Beach, Florida 33406 • 407-964-9668

Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary
Scott Benyon, Deputy Assistant Secretary

FILE

PERMITTEE:
Mr. Harold N. Houchard, Plant Mgr.
Tri-Gas, Inc.
18000 Beeline Highway
Riviera Beach, FL 33404

I.D. NUMBER: 5050P01642
PERMIT/CERTIFICATION NUMBER: IO 50-164582
DATE OF ISSUE: JUN 01 1989
EXPIRATION DATE: JUN 01 1994
COUNTY: Palm Beach
LATITUDE/LONGITUDE: 26°56'20"/80°20'32"
SECTION/TOWNSHIP/RANGE: 11/T41S/R40E
PROJECT: Industrial Wastewater Treatment and Disposal System

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapter(s) 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

OPERATE: An industrial wastewater treatment and disposal system to discharge a maximum of 0.025 MGD of floor drain wash waters and cooling tower blowdown discharges. The floor drain wastewater is treated in three belt type oil skimmers before it enters a Fram oil-water treatment system. After the Fram treatment unit, the water is filtered through a carbon/sand filter. Non-contact cooling water blowdown water is also filtered in a anthracite sand filter before it is mixed with the treated floor drain wastewater and discharged to Class III Surface Waters through an outfall to an unnamed canal along the northeastern edge of the property.

IN ACCORDANCE WITH: The plans and specifications submitted in conjunction with this application DER Form 17-1.205(4), submitted on May 8, 1989.

LOCATED AT: 18000 Beeline Highway, Riviera Beach, Florida.

TO SERVE: An air separation plant (SIC # 2813).

SUBJECT TO: General Conditions 1-15 and Specific Conditions 1-8.

DER Form 17-1.201(5)
Effective November 30, 1982

PERMITTEE:
Mr. Harold N. Houchard, Plant Mgr.
Tri-Gas, Inc.

I.D. NUMBER: 5050P01642
PERMIT/CERTIFICATION NUMBER: IO 50-164582
DATE OF ISSUE: JUN 01 1989
EXPIRATION DATE: JUN 01 1994

FILE

SPECIFIC CONDITIONS:

1. The permittee shall maintain the quality and quantity of the effluent discharged into the unnamed canal such that it does not cause a violation of the State water quality standards for Class III Surface Waters specified in F.A.C. Rule 17-3.121 except within the zone of mixing authorized in Specific Condition 2 below.

2. The Zone of Mixing shall be in accordance with Section 17-4.244, F.A.C. and shall extend 400 meters in either direction as measured from the outfall along the center of the unnamed canal.

3. The permittee shall monitor the effluent and the receiving canal on a quarterly basis for the following parameters:

Chromium	Temperature
Total Residual Chlorine	Zinc
Oil & Grease	Total Phosphorus
pH	Specific Conductance
Flow rate (daily average GPD)	

For the purpose of monitoring the water quality of the canal, the permittee shall collect grab samples at the northwestern and southeastern edge of the zone of mixing authorized in Specific Condition 2 above. All sampling and analysis shall be in accordance with F.A.C. Rule 17-4.246. Reports on the analysis as called for on the enclosed form shall be submitted on copies of this form to the Department and the Palm Beach County Health Department by the fifteenth (15th) day of the month following each sampling event. Additional sampling and analysis may be required as conditions warrant in order to further assess the water quality.

4. No wastewater shall be allowed to deliberately bypass the treatment facility, except in cases of emergency, without the prior approval of the Department. The Department shall be promptly notified, in writing, of the emergency and all information as to the cause of the problem and the corrective measures to be taken to prevent its recurrence.

5. The treatment facilities are to be operated in such a manner that the maximum level of efficiency is maintained at all times.

6. Waste sludge or other solid waste shall not be discharged into the waters of the State either directly or indirectly.

7. This permit does not authorize treatment, storage or disposal of any hazardous wastes. Such wastes shall be handled in accordance with State, local and federal hazardous waste regulations.

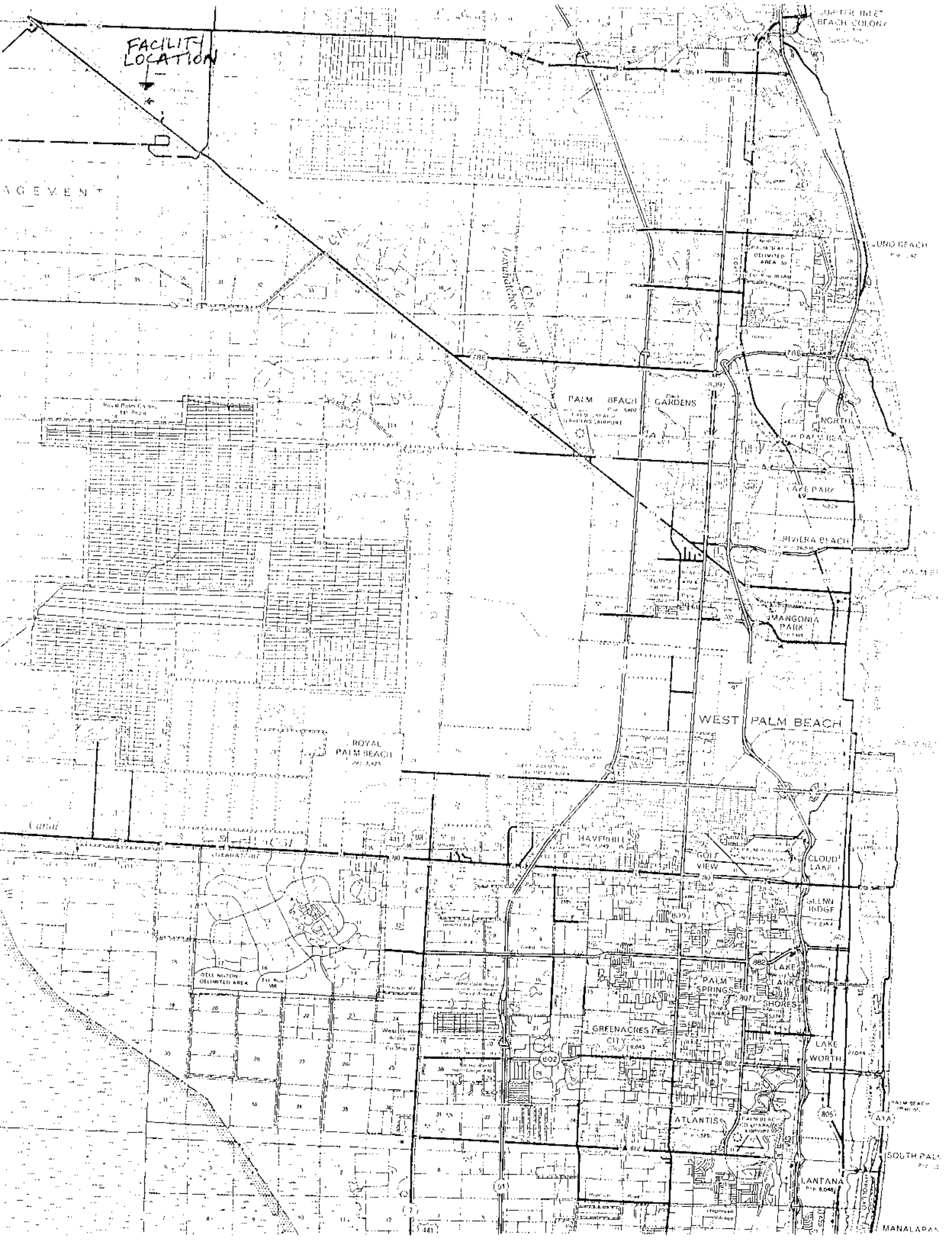
8. All records and data relating to this permit shall be made available for inspection by the staff of the Department in the offices of the permittee.

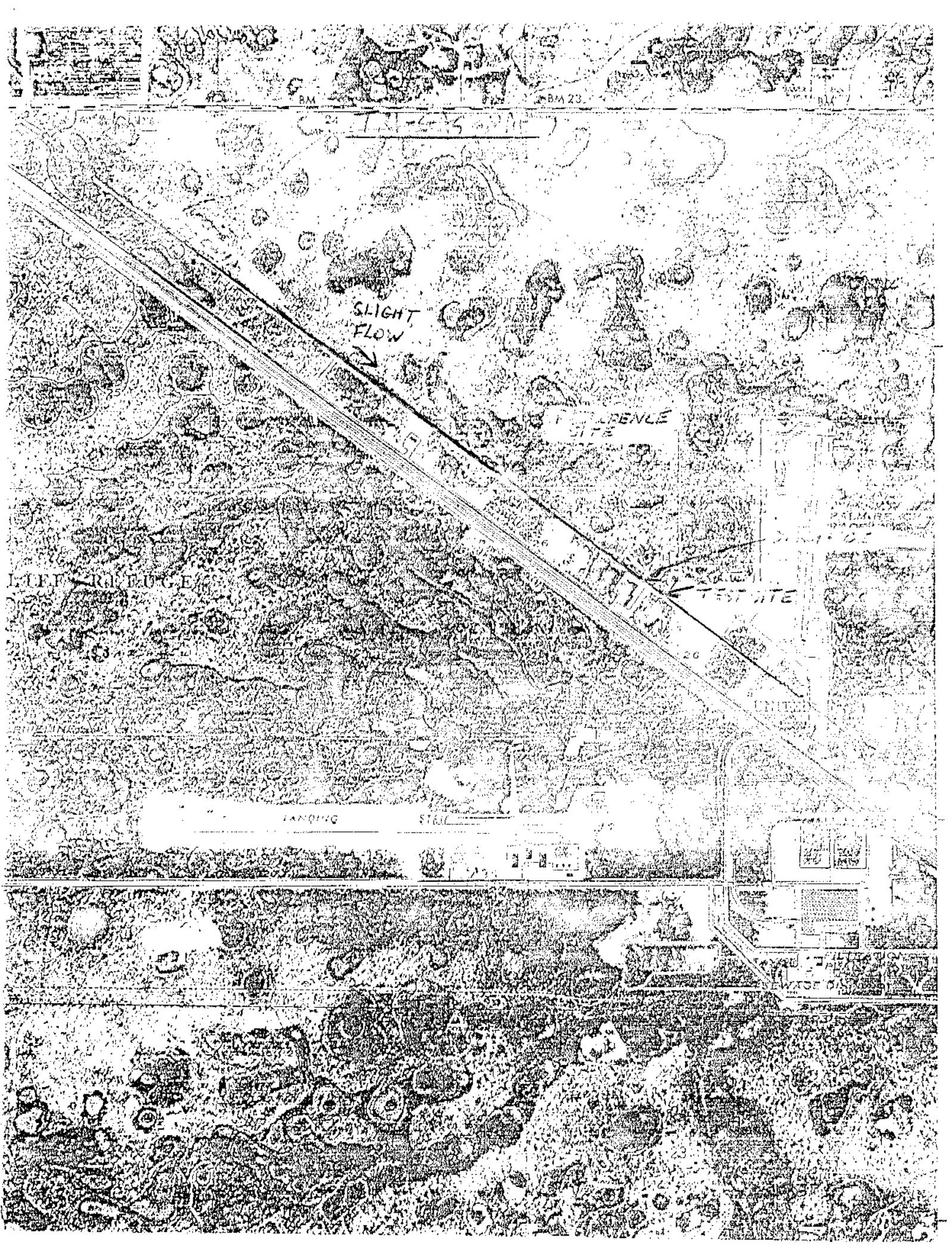
Issued this 1st day of June, 1989

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

J. Scott Benyon
Deputy Assistant Secretary

DER Form 17-1.201(5)
Effective November 30, 1982


FACILITY LOCATION
JUPITER INLET BEACH COLONY
JUPITER
LOXAHATCHEE SLOUGH
PALM BEACH GARDENS
NORTH PALM BEACH
LAKE PARK
RIVIERA BEACH
MANGONIA PARK
WEST PALM BEACH
ROYAL PALM BEACH
HAVERHILL
GOLF VIEW
CLOUD LAKE
GLENN RIDGE
LAKE CLARKE SHORES
PALM SPRINGS
GREENACRES CITY
LAKE WORTH
ATLANTIS
LANTANA
SOUTH PALM
MANALAPAN
Canal


BM
BM 23
SLIGHT
FLOW
TEST SITE
LANDING
STREET

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME: DEP	STORET STATION NUMBER: 28010233	DATE (M/D/Y): 08-23-93	RECEIVING BODY OF WATER: Unnamed Canal

REMARKS:	LOCATION: Tri-Gas, Inc. 15000 Beeline Hwy. Riviera Bch, Fl.	FIELD ID/NAME: Reference Site

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover **26**	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity **8**	Max. observed: >0.3 m/sec. but < 1 m/sec **23-30 points**	Max. observed; 0.1 to 0.3 m/sec **16-22 points**	Max. observed; 0.05 to 0.1 m/sec **8-15 points**	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec **0-7 points**
Artificial Channel/ Flow Alteration **2**	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. **12-15 points**	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. **0-3 points**
Bank Stability **9**	Stable. No evidence of erosion or bank failure. Little potential for future problems. **9-10 points**	Moderately stable. Infrequent or small areas of erosion, mostly healed over. **6-8 points**	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. **3-5 points**	Unstable. Many raw, eroded areas. Obvious bank sloughing. **0-2 points**
Riparian Zone Vegetation Quality **3**	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments	Add 5 points if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	TOTAL SCORE **48**

COMMENTS:

ANALYSIS DATE: 930823	ANALYST: J. Christian	SIGNATURE: Jeff Christian

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
FRESHWATER BENTHIC HABITAT ASSESSMENT FIELD DATA SHEET

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME: DEP	STORET STATION NUMBER: 28010234	DATE (M/D/Y): 08-23-93	RECEIVING BODY OF WATER: UNNAMED CANAL

REMARKS:	LOCATION: TRI-GAS, INC. 18000 BEELINE HWY. RIVIERA BCH, FL	FIELD ID/NAME: TEST SITE

Habitat Parameter / score	Excellent	Good	Fair	Poor
Bottom Substrate/ Available Cover 22	Greater than 40% snags, logs, tree roots, emergent vegetation, leaf packs, undercut banks, rubble, or other stable habitat. **23-30 points**	20% to 40% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Adequate habitat. **16-22 points**	5% to 20% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Less than desirable habitat. **8-15 points**	Less than 5% snags, logs, tree roots, emergent vegetation, leaf packs, etc. Lack of habitat is obvious. **0-7 points**
Water Velocity 8	Max. observed: >0.3 m/sec. but < 1 m/sec 23-30 points	Max. observed; 0.1 to 0.3 m/sec 16-22 points	Max. observed; 0.05 to 0.1 m/sec 8-15 points	Max. observed; <0.05 m/sec, or spate occurring; > 2 m/sec 0-7 points
Artificial Channel/ Flow Alteration 2	No artificial channelization. Little activity (impervious surface) in watershed which would cause scouring during spates. 12-15 points	—	—	Artificially channelized, or scouring present during spates because of excess impervious surface in watershed. 0-3 points
Bank Stability 9	Stable. No evidence of erosion or bank failure. Little potential for future problems. 9-10 points	Moderately stable. Infrequent or small areas of erosion, mostly healed over. 6-8 points	Moderately unstable. Moderate areas of erosion, high erosion potential during floods. 3-5 points	Unstable. Many raw, eroded areas. Obvious bank sloughing. 0-2 points
Riparian Zone Vegetation Quality 3	Over 80% of streambank surfaces consist of native plants, classified as: bottomland hardwoods, understory shrubs, or non-woody macrophytes. **9-10 points**	50% to 80% of riparian zone is vegetated, but one class of plants is not represented. **6-8 points**	25% to 50% of riparian zone is vegetated, but one or two classes of plants are not represented. **3-5 points**	Less than 25% of streambank surfaces are vegetated. Poor plant community (e.g. grass monoculture) present. **0-2 points**

Adjustments	Add 5 points if cross-sectional area of flow is estimated to be greater than one square meter during periods of normal flow.	TOTAL SCORE
		44

COMMENTS:

ANALYSIS DATE:	ANALYST:	SIGNATURE:
930823	J. Christian	Jeff Christian

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME: DEP	STORET STATION NUMBER: 28010233	DATE (M/DAY): 08-23-93	TIME: 1300	RECEIVING BODY OF WATER: Unnamed Canal

REMARKS:	LOCATION: Tri-Gas, Inc, 18000 Beeline Hwy. Riviera Beach Fl.	FIELD ID/NAME: Reference Site

RIPARIAN ZONE/INSTREAM FEATURES

Predominant Surrounding Land-Use (specify relative percent in each category):

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
60%	15%	15%		5%	5%	

Local Watershed Erosion (check box): None ☑ Moderate ☐ Heavy ☐

Local Watershed NPS Pollution (check box): No evidence ☑ Some potential sources ☐ Obvious sources ☐

Point-Source Pollution (list location and describe):

Estimated System Width (range, m): 15 m	Estimated System Depth (range, m): 1-2 m	yes
High Water Mark (m above bed): 0.3m	Velocity (range, m/s): 0.05-0.1	Impounded ☐ Channelized ☑

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 Deposits: Sludge: ☐ Paper Fiber: ☐ Mud: ☐ Sand: ☑ Shell: ☐ Other: ☑ organic matter

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	5%	7	D,grad	Rock or Shell Rubble			Diving
Leaf Packs mats	10%	3	"	Sand	10%	2	"
Aquatic Vegetation	40%	7	"	Mud/Muck	35%	2	"
Submerged Roots				Other:			
Undercut Banks				Other:			

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (umho/cm):			Secchi (m):
Top	0.5'	30.1	7.10	1.54	238.5			
Mid-depth	2.5'	29.5	7.06	0.75	242.5			
Bottom	5.0'	29.5	7.03	0.52	246.1			1.0L

System Type: Stream: ☐ (Surficial Aquifer Fed / Deep Aquifer Fed / Alluvial / Blackwater) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☑ canal

Water Odors (check box): Normal: ☑ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Other: ☐

Water Surface Oils (check box): Slick: ☐ Sheen: ☐ Globs: ☐ None: ☑

Clarity (check box): Clear: ☑ Slightly turbid: ☐ Turbid: ☐ Opaque: ☐

Color (check box): Tannic: ☑ Green (algae): ☐ Clear: ☐ Other: ☐

Weather Conditions:
≈ 95°F
Partly Cloudy
Slight Wind from the SE

Abundance:	Absent	Rare	Common	Abundant
Periphyton	☐	☑	☐	☐
Fish	☐	☐	☐	☑
Aquatic Macrophytes	☐	☐	☐	☑
Iron/sulfur Bacteria	☑	☐	☐	☐

SAMPLING TEAM:	SIGNATURE:	DATE:
Jeff Christian / Doug Strom	Jeff Christian /	

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

PHYSICAL/CHEMICAL CHARACTERIZATION FIELD DATA SHEET (Version 4)

SUBMITTING AGENCY CODE: / SUBMITTING AGENCY NAME: DEP	STORET STATION NUMBER: 28010234	DATE (M/D/Y): 08-23-93	TIME: 1200	RECEIVING BODY OF WATER: Unnamed Canal

REMARKS:	LOCATION: Tri-Gas Inc. 18000 Beeline Hwy. Riviera Beh, FL.	FIELD ID/NAME: Test Site

RIPARIAN ZONE/INSTREAM FEATURES

Predominant Surrounding Land-Use (specify relative percent in each category):

Forest	Field/Pasture	Agricultural	Residential	Commercial	Industrial	Other (Specify)
65 %	10 %	10 %		5 %	10 %	

Local Watershed Erosion (check box): None ☑ Moderate ☐ Heavy ☐

Local Watershed NPS Pollution (check box): No evidence ☐ Some potential sources ☑ Obvious sources ☐

Point-Source Pollution (list location and describe):

Possibly The Tri-Gas Facility

Estimated System Width (range, m): 15 m	Estimated System Depth (range, m): 1m		yes
High Water Mark (m above bed): 0.2m	Velocity (range, m/s): 0.05-0.2	Impounded ☐ Channelized ☑	

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 Deposits: Sludge: ☐ Paper Fiber: ☐ Mud: ☑ Sand: ☐ Shell: ☐ Other: ☑ organic matter

Substrate Types	% coverage	# times sampled	method	Substrate Types	% coverage	# times sampled	method
Woody Debris (Snags)	5 %	5		Rock or Shell Rubble			
Leaf Packs mats	5 %	1		Sand			
Aquatic Vegetation	35 %	7		Mud/Muck	50 %	2	
Submerged Roots				Other: overhanging plants	5 %	5	
Undercut Banks				Other:			

WATER QUALITY

	Depth (m):	Temp. (°C):	pH (SU):	D.O. (mg/l):	Cond. (µmho/cm):			Secchi (m):
Top	0.5'	30.8	7.34	1.89	489.9			
Mid-depth	3'	30.7	7.22	1.42	516			
Bottom								1.0 L

System Type : Stream: ☐ (Surficial Aquifer Fed / Deep Aquifer Fed / Alluvial / Blackwater) Lake: ☐ Wetland: ☐ Estuary: ☐ Other: ☑ canal

Water Odors (check box): Normal: ☑ Sewage: ☐ Petroleum: ☐ Chemical: ☐ Other: ☐

Water Surface Oils (check box): Slick: ☐ Sheen: ☑ Globs: ☐ None: ☐

Clarity (check box): Clear: ☑ Slightly turbid: ☐ Turbid: ☐ Opaque: ☐

Color (check box): Tannic: ☑ Green (algae): ☐ Clear: ☐ Other: ☐

Weather Conditions:
≈ 95°F
Partly cloudy
Slight wind From the SE

Abundance:	Absent	Rare	Common	Abundant
Periphyton	☐	☐	☐	☑
Fish	☐	☐	☑	☐
Aquatic Macrophytes	☐	☐	☐	☑
Iron/sulfur Bacteria	☑	☐	☐	☐

SAMPLING TEAM:	SIGNATURE:	DATE:
Jeff Christie / Doug Strom		

Sample Source: Tri Gas Inc.
Location:
County:
Contact/District: TIM POWELL / SE
NPDES Permit #: FL00 Outfall #:

Sample Collection: Date 8/23/93 Time 1400
Test Beginning: Date 8/24/93 Time 1330
Test Ending: Date 8/26/93 Time 1400
Organism Batch #: 1060 Diluent Batch #: 28
Organism Age: < 24 hrs
Test Organism: Ceriodaphnia dubia

609189 93ALG-24-20
uploaded 3-26-93KP

Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through

Test Number: 1 of 2

Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0	23.3 @ 23.4	8.6 @ 22.8	1005 @ 1,000
	9.0 @ 9.0			9660 @ 10,000 @ 24.5 °C
24 hr	7.0 @ 7.0	24.5 @ 24.6	8.4 @ 24.4	1005 @ 1,000
	9.0 @ 9.0			9650 @ 10,000 @ 24.5 °C
48 hr	7.0 @ 7.0	25.9 @ 24.0	8.4 @ 25.9	1005 @ 1,000
	9.0 @ 9.0			9640 @ 10,000 @ 24.5 °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control	A	5	5	5	8.1		8.4	24.0		25.1	7.8		7.7	155		180
Control	B	5	5	5			8.4			25.1			7.7			180
Control	C	5	5	5			8.4			25.1			7.7			185
Control	D	5	5	5			8.4			25.1			7.8			180
100%	A	5	5	5	7.5		8.1	24.3		24.9	7.9		7.9	1445		1620
100%	B	5	5	5			8.1			24.9			7.9			1620
100%	C	5	5	5			8.1			24.9			7.9			1690
100%	D	5	5	5			8.1			24.8			7.9			1680
Measured/Loaded by:		TM	TM	TR	TM		TR	TM		TR	TM		TR	TM		TR
Recorded by:		TR	TR	TR	TR		TR	TR		TM	TR		TM	TR		TM

Investigators' Signatures

Tina Mikulski
Tobin C. Rader

Reviewer

form updated 7/6/93

Water Quality Parameters	Salt Water/ Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:					
Lab Total Residual Cl2:	<0.03	<0.03	<0.03	DR-100	TM
Alkalinity:	125	70	60	Hach	TR
Hardness:	120	80	820	Hach	TR
Total Ammonia:	<0.017	<0.017	<0.017	ORION	MF

Ammonia Meter #98136 Ammonia Meter Slope: -57.9 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: ppt

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: IMC Orio Inc.
Location:
County:
Contact/District: TIM POWELL / SE
NPDES Permit #: FL00 Outfall #:

Sample Collection: Date 8/23/93 Time 1400
Test Beginning: Date 8/24/93 Time 1330
Test Ending: Date 8/28/93 Time 1050
Organism Batch #: 35 Diluent Batch #: 62811
Organism Age: 10 days
Test Organism: ~~Ceriodaphnia dubia~~ Cyprinella leedsi (FT)

60989 93AUG24-20

Test Type: Screening / Definitive
Static / Static Renewal / Flow-through

Test Number: 2 of 2

Remarks:

Instrument Calibrations:

	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	23.3 @ 23.4	8.6 @ 22.8	1005 @ 1,000 9660 @ 10,000 @ 24.5 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	24.5 @ 24.6	8.4 @ 24.4	1005 @ 1,000 9650 @ 10,000 @ 24.5 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.9 @ 24.0	8.4 @ 23.9	1005 @ 1,000 9640 @ 10,000 @ 24.5 °C

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) Cond. (µmhos/cm) 0 hr	24 h	48 h
Control A	41	5	5	5	7.7	8.1	8.4	24.2	23.9	24.1	7.8	9.2	8.1	245	250	250
Control B	85	5	5	5	7.7	8.1	8.4			24.1	7.8	9.2	8.1	245	250	250
100% A	87	5	5	5	7.5	7.7	7.9	24.6	23.9	24.2	7.9	8.9	8.0	1690	1655	1670
100% B	333	5	5	5	7.5	7.7	7.9			24.1	8.0	8.9	7.9	1695	1655	1670
Measured/Loaded by:		TM	TM	TR	TM	TM	TR	TM	TM	TR	TM	TM	TR	TM	TM	TR
Recorded by:		TR	TR	TR	TR	TR	TM	TR	TR	TM	TR	TR	TM	TR	TR	TM

Investigators' Signatures

Tina M. Kubalis
Tobin C. Redeker

Reviewer

Water Quality Parameters	Salt Water/ Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2:					
Lab Total Residual Cl2:	<0.03	<0.03	<0.03	DR-100	TM
Alkalinity:	125	70	60	Hach	TR
Hardness:	120	80	820	Hach	TR
Total Ammonia:	<0.017	<0.017	<0.017	ORION	MF

Ammonia Meter #98136 Ammonia Meter Slope: -57.9 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: ppt

form updated 7/8/93

Chemistry summary table for

Tri-Gas, Inc.	Effluent	Reference Site	Test Site
Organic Constituents			
Acetone (µg/L)		34	est. 50
Sediment Petroleum Hydrocarbons (µg/kg)		530,000	10,000,000
Metals (ug/L)			
Aluminum	111 I	100 U	100 U
Antimony	15 U	15 U	15 U
Arsenic	20 U	20 U	20 U
Cadmium	0.08 U	0.08 U	0.08 U
Copper	23	5 U	5 U
Chromium	10 U	10 U	10 U
Iron	82	415	243
Lead	15 U	15 U	15 U
Mercury	0.1 U	0.1 U	0.1 U
Nickel	5 U	5 U	5 U
Selenium	30 U	30 U	30 U
Silver	0.05 U	0.05 U	0.5 U
Zinc	72	5 U	5 U
Nutrients (mg/L)			
Ortho-phosphate	0.70	0.031 I	0.048 I
Total phosphorus	0.77	0.023 I	0.044
Ammonia	0.032 I	0.45 A	0.020 U
Nitrate+Nitrite	0.97	0.029 I	0.020 U
TKN	1.6	1.5 A	1.0
Other Parameters			
Habitat Assessment		48	44
D.O. (mg/L)		1.5	1.9
pH (SU's)	7.5	7.1	7.3
Conductivity (µmhos/cm)	1690	239	490
Temperature (°C)		30.1	30.8
Hardness (mg CaCO3)	486.6	92.3	166.7
Bioassay Fish	Not Toxic		
Bioassay Invertebrate	Not Toxic		
Algal Growth Potential (mg dry wt/L)	99.5	1.2	15.2

A - Value reported is the mean of two or more determinations

I - Value reported is less than the minimum quantitation limit, and greater than or equal to the minimum detection limit

U - Material analyzed for but not detected; value reported is the minimum detection limit

Typical Values for Selected Parameters in Florida Waters

Adapted from Joe Hand, FDER, personal communication, 1991
(data was collected between 1980 and 1989)

Percentile Distribution

Parameter	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%
STREAMS (1617 stations)											
Phytoplankton Chlorophyll *a*	0.22	0.52	0.94	1.60	3.02	4.63	6.72	9.87	14.68	27.35	48.70
Periphyton Chlorophyll *a*	0.31	0.43	0.77	1.04	2.16	2.94	6.45	10.51	17.00	39.51	60.85
H-D Diversity	0.84	2.12	2.48	2.74	2.88	3.09	3.25	3.40	3.52	3.76	3.90
Qualitative Taxa Richness	9.00	12.00	17.00	20.00	22.00	24.50	26.00	28.00	31.00	37.00	53.00
H-D Taxa Richness	6.00	6.50	9.00	11.50	13.00	15.00	17.00	21.50	26.00	29.00	32.00
TKN	0.30	0.39	0.56	0.73	0.87	1.00	1.11	1.26	1.49	1.93	2.80
Ammonia	0.02	0.02	0.04	0.05	0.06	0.08	0.11	0.14	0.20	0.34	0.60
NO2-NO3	0.01	0.01	0.03	0.05	0.07	0.10	0.14	0.20	0.32	0.64	1.05
Total Phosphorus	0.02	0.03	0.05	0.06	0.10	0.13	0.18	0.25	0.39	0.74	1.51
Ortho Phosphorus	0.01	0.01	0.03	0.04	0.05	0.08	0.11	0.17	0.27	0.59	1.37
Turbidity	0.60	0.90	1.20	1.45	2.10	2.80	3.60	4.50	6.65	10.45	16.30
LAKES (477 stations)											
Phytoplankton Chlorophyll *a*	0.80	1.71	2.88	4.28	10.06	13.40	20.00	30.10	47.20	65.44	113.90
Dredge Diversity	0.71	0.97	1.43	1.74	1.98	2.12	2.21	2.59	2.85	3.15	3.17
Dredge Taxa Richness	3.00	5.00	6.50	7.00	9.00	10.00	11.00	13.00	15.00	17.00	21.00
TKN	0.36	0.49	0.67	0.83	1.08	1.26	1.40	1.51	1.68	2.11	3.46
NH3+NH4	0.01	0.02	0.02	0.03	0.04	0.06	0.08	0.12	0.15	0.21	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.04	0.05	0.10	0.14	0.23
Total Phosphorus	0.01	0.02	0.02	0.03	0.05	0.07	0.09	0.11	0.14	0.23	0.42
Ortho-Phosphorus	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.21	0.32
Turbidity	1.00	1.25	1.55	2.05	2.75	4.50	6.45	9.60	14.10	26.00	40.00
ESTUARIES (690 stations)											
Phytoplankton Chlorophyll *a*	2.14	3.28	4.49	5.13	6.00	6.93	7.94	9.60	12.40	17.60	22.20
Dredge Diversity	1.34	1.53	1.91	2.28	2.56	2.90	3.15	3.59	4.01	4.53	4.98
Dredge Taxa Richness	4.00	6.00	9.00	11.00	15.00	18.50	25.00	35.00	41.00	62.00	90.00
TKN	0.26	0.34	0.42	0.50	0.59	0.69	0.76	0.82	0.95	1.30	1.49
NH3+NH4	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.13	0.22	0.28
NO2-NO3	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.05	0.08	0.17	0.23
Total Phosphorus	0.01	0.02	0.06	0.07	0.10	0.11	0.14	0.17	0.23	0.43	0.59
Ortho-Phosphorus	0.01	0.02	0.03	0.04	0.04	0.05	0.07	0.09	0.12	0.21	0.44
Turbidity	3.50	4.00	4.50	5.05	5.40	5.60	6.30	6.80	8.00	11.40	11.75

Units:
Phytoplankton Chlorophyll *a* (ug/L), Periphyton Chlorophyll *a* (mg/m^2), Nutrients (mg/L), Turbidity (NTU), Taxa richness and diversity values are for macroinvertebrates

Benthic macroinvertebrate taxa list for Tri-Gas Inc., collected via Hester-Dendy artificial substrates in the unnamed receiving ditch, on 23 August, 1993. Densities, in number/m^2, represent the mean of three replicates.

	Reference Site	Test Site
Amphipoda		
Hyalella azteca	–	1
Diptera		
Atrichopogon sp.	1	–
Chaoborus sp.	2	–
Cladopelma sp.	2	–
Dicrotendipes simpsoni	1	1
Glyptotendipes sp. B Epler	2	–
Polypedilum illinoense	3	–
Ephemeroptera		
Tricorythodes albilineatus	–	1
Gastropoda		
Undetermined Hydrobiidae	1	1
Laevapex fuscus	–	1
Odonata		
Undetermined Anisoptera	1	–
Erythemis simplicicollis	–	1
Total	13	6

Benthic macroinvertebrate taxa list for Tri-Gas, Inc., collected via 20 discrete dip net sweeps in the unnamed receiving ditch, on 23 August, 1993.

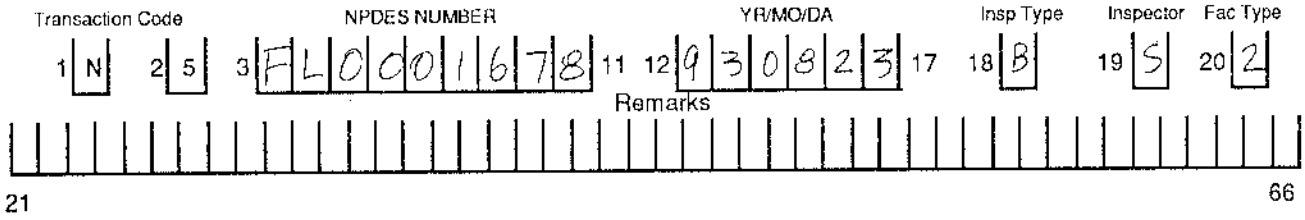
	Reference Site	Test Site
Acarina		
Arrenurus sp.	24	72
Hydrodroma sp.	–	168
Koenikea sp.	48	72
Neumania sp.	72	24
Oxus sp.	24	–
Sperchon sp.	–	24
Amphipoda		
Hyalella azteca	240	264
Coleoptera		
Dubiraphia sp.	96	–
Decapoda		
Palaemonetes paludosus	360	144
Ablabesmyia sp. B Epler	113	–
Asheum beckae	263	–
Cladopelma sp.	75	163
Dicrotendipes simpsoni	113	–
Endochironomus subtendens	–	163
Glyptotendipes sp. B Epler	1053	–
Goeldichironomus sp.	–	82
G. amazonicus	38	–
G. carus	75	–
Larsia decolorata	–	5298
Odontomesa sp.	48	48
Palpomyia grp. sp.	–	360
Parachironomus carinatus	263	163
P. directus	263	82
P. hirtalatus	113	–
Polypedilum halterale grp.	75	–
P. illinoense	376	82
P. trigonus	–	82
P. tritum	–	82
P. sp. A Epler	38	–
Pseudochironomus sp.	1316	2038
Stilocladius sp.	–	571
Tanytarsus sp.	–	163
T. sp. E Epler	–	489
T. sp. C Epler	188	1223
Tribelos fuscicorne	38	–
Zavreliella marmorata	38	–
Undetermined dipteran pupa	360	816
Ephemeroptera		
Caenis diminuta	–	24

Gastropoda		
Laevapex sp.	96	–
Micromenetus dilatatus	120	408
Physella sp.	–	72
Planorbella duryi	24	168
Undetermined Hydrobiidae	24	1656
Hemiptera		
Microvelia sp.	–	72
Neogerris hesione	24	–
Ranatra sp.	24	–
Odonata		
Enallagma sp.	72	–
E. pollutum	–	24
Erythemis simplicicollis	24	336
Ischnura sp.	192	–
Perithemis tenera seminole	–	24
Oligochaeta		
Aulodrilus pigueti	24	–
Bratislava unidentata	–	1216
Dero sp.	–	2646
D. digitata	24	644
D. nivea	216	–
D. pectinata	–	1359
D. trifida	–	72
Haemonais waldvogeli	72	1144
Limnodrilus hoffmeisteri	24	–
Pristina leidyi	–	143
Pelecypoda		
Sphaerium or *Musculium* sp.	72	–
Platyhelminthes		
Dugesia sp.	72	–
Trichoptera		
Oecetis sp.	24	–
Oxyethira sp.	24	–
Total	6862	22,681

Phytoplankton taxa list and densities (#/mL) for Tri-Gas, Inc., collected via subsurface grabs above and below the discharge in an unnamed canal, on 23 August, 1993.

	Reference Site	Test Site
Diatoms		
Gomphonema sp.	64	–
Melosira sp.	64	–
Navicula sp.	451	–
Nitzschia sp.	64	–
Plagiotropis sp.	64	–
Synedra sp.	64	–
Chlorophyta		
Ankistrodesmus sp.	64	–
Carteria sp.	129	–
Mougeotia sp.	129	–
Scenedesmus sp.	64	64
Cyanophyta		
Anabaena sp.	64	–
Aphanothece sp.	1096	129
Chroococcus sp.	1224	516
Lyngbya sp.	64	64
Microcystis sp.	258	129
Oscillatoria sp.	258	64
Euglenophyta		
Euglena sp.	–	64
Total	4121	1030

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



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

