VPDES PERMIT PROGRAM FACT SHEET
FILE NO: 382

This document gives pertinent information concerning the VPDES Permit listed below. This permit is being processed as a **MAJOR INDUSTRIAL** permit.

1. **PERMIT NO.:** VA0004804 **EXPIRATION DATE:** October 15, 2012

2. **FACILITY NAME AND LOCAL MAILING ADDRESS**

Northrop Grumman Shipbuilding, Inc.
4101 Washington Avenue
Newport News, VA 23607-2770

FACILITY LOCATION ADDRESS (IF DIFFERENT)

NA

CONTACT AT FACILITY:
NAME: Frank H. Thorn
TITLE: Manager Environmental Engineering
PHONE: (757) 688-9247

CONTACT AT LOCATION ADDRESS
NAME: Same
TITLE:
PHONE: ( )

OWNER CONTACT: (TO RECEIVE PERMIT)
NAME: James R. Thornton
TITLE: Director, Environmental Health And Safety
COMPANY NAME: (IF DIFFERENT)
ADDRESS: Same

PHONE: (757)380-2000

CONSULTANT CONTACT:
NAME: NA
FIRM NAME:

ADDRESS:

PHONE: ( )

4. **PERMIT DRAFTED BY:** DEQ, Water Permits, Regional Office

Permit Writer(s): Deanna Austin DA Date(s): 4/15/09-7/23/09, 8/18/09
Reviewed By: Mark Sauer (M) Date(s): 7/24-30/09

5. **PERMIT ACTION:**

( ) Issuance ( ) Reissuance ( ) Revoke & Reissue (X) Owner Modification
( ) Board Modification (X) Change of Ownership/Name [Effective Date: 12/2/08]

6. **SUMMARY OF SPECIFIC ATTACHMENTS LABELED AS:**

Attachment____	Site Inspection Report/Memorandum
Attachment 1	Discharge Location/Topographic Map
Attachment____	Schematic/Plans & Specs/Site Map/Water Balance
Attachment 2	TABLE I - Discharge/Outfall Description
Attachment 3	TABLE II - Effluent Monitoring/Limitations
Attachment 4	Effluent Limitations/Monitoring Rationale/Suitable Data/Antidegradation/Antibacksliding
Attachment 5	Special Conditions Rationale
Attachment 6	Toxics Monitoring/Toxics Reduction/WET Limit Rationale
Attachment____	Material Stored
Attachment____	Receiving Waters Info./Tier Determination/STORET Data/Stream Modeling
Attachment____	303(d) Listed Segments
Attachment 7	TABLE III(a) and TABLE III(b) - Change Sheets
Attachment 8	NPDES Industrial Permit Rating Worksheet and EPA Permit Checklist
Attachment 9	Chronology Sheet
Attachment____	Public Participation

MODIFICATION REQUEST COMPLETE: April 15, 2009

*May 1, 2009 - date comments received from DSS
*July 30, 2009 - last change requested from NGS

7. **PERMIT CHARACTERIZATION**: (Check as many as appropriate)

(X) Existing Discharge
( ) Proposed Discharge
( ) Municipal
SIC Code(s)
(X) Industrial
SIC Code(s) 3731
( ) POTW
( ) PVOTW
(X) Private
( ) Federal
( ) State
( ) Publicly-Owned Industrial

(X) Effluent Limited
(X) Water Quality Limited
( ) WET Limit
( ) Interim Limits in Permit
( ) Interim Limits in Other Document
(X) Compliance Schedule Required
( ) Site Specific WQ Criteria
( ) Variance to WQ Standards
( ) Water Effects Ratio
(X) Discharge to 303(d) Listed Segment
(X) Toxics Management Program Required
( ) Toxics Reduction Evaluation
(X) Storm Water Management Plan
( ) Pretreatment Program Required
( ) Possible Interstate Effect
( ) CBP Significant Dischargers List

8. **RECEIVING WATERS CLASSIFICATION**: River basin information.

OUTFALLS ADDRESSED WITH THIS MODIFICATION ARE LISTED BELOW

Outfall No(s): 003, 005, 008, 009, 011, 013, 015, 017, 019, 020, 021, 022, 024, 026, 027, 030, 032, 034, 037, 038, 041, 044, 056, 073, 084, 094, 112, 119, 123, 132, 133, 134, 140, 142, 144, 154-157, 162-167

Receiving Stream:	SEE ATTACHED SHEET
River Mile:	SEE ATTACHED SHEET
Basin:	James River, Lower
Subbasin:	NA
Section:	1
Class:	II
Special Standard(s):	a, z, bb, NEW-19
Tidal:	YES
7-Day/10-Year Low Flow:	NA
1-Day/10-Year Low Flow:	NA
30-Day/5-Year Low Flow:	NA
Harmonic Mean Flow:	NA

9. **FACILITY DESCRIPTION:** Describe the type facility from which the discharges originate.

EXISTING industrial discharge resulting from the operation of a shipbuilding and repair facility.

10. **LICENSED OPERATOR REQUIREMENTS**: (X) No ( ) Yes Class:

11. **RELIABILITY CLASS**: Industrial Facility - NA

12. **SITE INSPECTION DATE**: **SEE 2007 REISSUANCE FACT SHEET** **REPORT DATE**:

Performed By:

13. **DISCHARGE(S) LOCATION DESCRIPTION**: Provide USGS Topo which indicates the discharge location, significant (large) discharger(s) to the receiving stream, water intakes, and other items of interest.

Name of Topo: Newport News North and South Quadrant No.: 065C and 035B

River Mile List for the Industrial Outfalls Included in the Permit Modification 2009
Northrop Grumman Shipbuilding (VA0004804)

Outfall Number	Latitude	Longitude	River Mile	Discharge Location
003	36°58'56.9"	-76°26'15.2"	2-JMS 003.49	James River
005	36°59'01.6"	-76°26'20.7"	2-JMS 003.60	James River
008	36°59'05.1"	-76°26'22.9"	2-JMS 003.70	James River
009	36°59'06.1"	-76°26'23.5"	2-JMS 003.73	James River
011	36°59'09"	-76°26'30"	2-JMS 003.79	James River
013	36°59'09.1"	-76°26'30.4"	2-JMS 003.78	James River
015	36°59'09.1"	-76°26'30.4"	2-JMS 003.79	James River
017	36°59'09.1"	-76°26'30.4"	2-JMS 003.86	James River
019	36°59'13.8"	-76°26'34.3"	2-JMS 003.90	James River
020	36°59'18.8"	-76°26'41.2"	2-JMS 004.07	James River
021	36°59'18.8"	-76°26'41.2"	2-JMS 004.07	James River
022	36°59'24"	-76°26'47.2"	2-JMS 004.22	James River
024	36°59'9.1"	-76°26'30.4"	2-JMS 004.34	James River
026	36°59'30.1"	-76°26'50.3"	2-JMS 004.41	James River
027	36°59'9.1"	-76°26'30.4"	2-JMS 004.97	James River
030	36°58'18"	-76°25'00"	2-NPC 000.68	Boat Harbor to James River
032	36°59'9.1"	-76°26'30.4"	2-JMS 004.00	James River
034	36°59'9.1"	-76°26'30.4"	2-JMS 005.01	James River
037	36°59'46.5"	-76°26'39.8"	2-JMS 004.00	James River
038	36°59'46"	-76°26'40"	2-JMS 004.00	James River
041	36°59'45.15"	-76°27'00"	2-JMS 004.64	James River
044	36°59'9.1"	-76°26'30.4"	2-JMS 004.13	James River
056	36°58'55"	-76°26'17"	2-JMS 003.47	James River
073	36°59'28"	-76°26'49"	2-JMS 004.35	James River
084	36°59'36"	-76°26'53"	2-JMS 004.55	James River
094	36°59'40"	-76°26'57"	2-JMS 004.56	James River
112	36°59'36"	-76°26'53"	2-JMS 004.75	James River
119	36°59'36"	-76°26'53"	2-JMS 004.80	James River
123	36°59'36"	-76°26'53"	2-JMS 005.01	James River
132	36°59'51"	-76°26'12"	2-NPC 000.68	Boat Harbor to James River
133	36°58'55"	-76°26'17"	2-NPC 000.68	Same as Above
134	36°59'58"	-76°26'16"	2-NPC 000.68	Same as Above
140	37°0'28"	-76°26'35"	2-NPC 000.68	Same as Above
142	37°0'31"	-76°26'37"	2-NPC 000.68	Same as Above
144	37°0'35"	-76°26'39"	2-NPC 000.68	Same as Above
154	36°59'48"	-76°26'10"	2-NPC 000.68	Same as Above
155	36°59'49"	-76°26'11"	2-NPC 000.68	Same as Above
156	36°59'52"	-76°26'13"	2-NPC 000.68	Same as Above
157	36°59'53"	-76°26'14"	2-NPC 000.68	Same as Above
162	36°58'52.5"	-76°26'15"	2-JMS 003.41	James River
163	36°58'52.5"	-76°26'15"	2-JMS 003.41	James River
164	36°58'59.3"	-76°26'17"	2-JMS 003.55	James River
165	36°58'59.3"	-76°26'17"	2-JMS 003.55	James River
166	36°59'5.4"	-76°26'27.3"	2-JMS 003.74	James River
167	36°59'5.4"	-76°26'27.3"	2-JMS 003.74	James River

SEE ATTACHMENT 1

14. **ATTACH A SCHEMATIC OF THE WASTEWATER TREATMENT SYSTEM(S) [IND. & MUN.]. FOR INDUSTRIAL FACILITIES, PROVIDE A GENERAL DESCRIPTION OF THE PRODUCTION CYCLE(S) AND ACTIVITIES. FOR MUNICIPAL FACILITIES, PROVIDE A GENERAL DESCRIPTION OF THE TREATMENT PROVIDED.**

NO CHANGES MADE TO THIS SECTION SEE THE 2007 REISSUANCE FACT SHEET FOR INFORMATION

15. **DISCHARGE DESCRIPTION**: Describe each discharge originating from this facility.

SEE **TABLE I** (OR CAN SUBSTITUTE PAGE 2C) - **SEE ATTACHMENT 2**

16. **COMBINED TOTAL FLOW**:

TOTAL: 30 MGD (for public notice)

PROCESS FLOW: 30 MGD (IND.)

NONPROCESS/RAINFALL DEPENDENT FLOW: 400 MG/Year (Est.)

DESIGN FLOW: _____ MGD (MUN.)

17. **STATUTORY OR REGULATORY BASIS FOR EFFLUENT LIMITATIONS AND SPECIAL CONDITIONS**: (Check all which are appropriate)

X State Water Control Law
X Clean Water Act
X VPDES Permit Regulation (9 VAC 25-31-10 et seq.)
X EPA NPDES Regulation (Federal Register)
_____ EPA Effluent Guidelines (40 CFR 133 or 400 - 471)
X Water Quality Standards (9 VAC 25-260-5 et seq.)
_____ Wasteload Allocation from a TMDL or River Basin Plan

18. **EFFLUENT LIMITATIONS/MONITORING**: Provide all limitations and monitoring requirements being placed on each outfall.

SEE TABLE II - ATTACHMENT 3

19. **EFFLUENT LIMITATIONS/MONITORING RATIONALE**: Attach any analyses of an outfall by individual toxic parameter. As a minimum, it will include: statistics summary (number of data values, quantification level, expected value, variance, covariance, 97th percentile, and statistical method); waste load allocation (acute, chronic and human health); effluent limitations determination; input data listing. Include all calculations used for each outfall and set of effluent limits and those used in any model(s). Include all calculations/documentation of any antidegradation or anti-backsliding issues in the development of any limitations; complete the review statements below. Provide a rationale for limiting internal waste streams and indicator pollutants. Attach chlorine mass balance calculations, if performed. Attach any additional information used to develop the limitations, including any applicable water quality standards calculations (acute, chronic and human health).

OTHER CONSIDERATIONS IN LIMITATIONS DEVELOPMENT:

VARIANCES/ALTERNATE LIMITATIONS: Provide justification or refutation rationale for requested variances or alternatives to required permit conditions/limitations. This includes, but is not limited to: waivers from testing requirements; variances from technology guidelines or water quality standards; WER/translator study consideration; variances from standard permit limits/conditions.

N/A

SUITABLE DATA: In what, if any, effluent data were considered in the establishment of effluent limitations and provide all appropriate information/calculations.

All suitable effluent data were reviewed.

ANTIDEGRADATION REVIEW: Provide all appropriate information/calculations for the antidegradation review.

The receiving stream has been classified as tier 1; therefore, no further review is needed. Permit limits have been established by determining waste load allocations which will result in attaining and/or maintaining all water quality criteria which apply to the receiving stream, including narrative criteria. These waste load allocations will provide for the protection and maintenance of all existing uses.

ANTIBACKSLIDING REVIEW: Indicate if antibacksliding applies to this permit and, if so, provide all appropriate information.

Backsliding applies to this permit but conforms to the anti-backsliding provisions of Section 402 (o) of the Clean Water Act, 9 VAC 25-31-220 L. of the VPDES Permit regulation and 40 CFR 122.44 (l).

SEE ATTACHMENT 4

20. **SPECIAL CONDITIONS RATIONALE**: Provide a rationale for each of the permit's special conditions.

SEE ATTACHMENT 5

21. **TOXICS MONITORING/TOXICS REDUCTION AND WET LIMIT SPECIAL CONDITIONS RATIONALE**: Provide the justification for any toxics monitoring program and/or toxics reduction program and WET limit.

SEE ATTACHMENT 6

22. **SLUDGE DISPOSAL PLAN**: Provide a description of the sludge disposal plan (e.g., type sludge, treatment provided and disposal method). Indicate if any of the plan elements are included within the permit.

N/A

23. **MATERIAL STORED**: List the type and quantity of wastes, fluids, or pollutants being stored at this facility. Briefly describe the storage facilities and list, if any, measures taken to prevent the stored material from reaching State waters.

NO CHANGES MADE TO THIS SECTION-SEE THE 2007 REISSUANCE FACT SHEET FOR INFORMATION

24. **RECEIVING WATERS INFORMATION**: Refer to the State Water Control Board's Water Quality Standards [e.g., River Basin Section Tables (9 VAC 25-260-5 et seq.). **Use 9 VAC 25-260-140 C (introduction and numbered paragraph) to address tidal waters where fresh water standards would be applied or transitional waters where the most stringent of fresh or salt water standards would be applied.** Attach any memoranda or other information which helped to develop permit conditions (i.e. tier determinations, PReP complaints, special water quality studies, STORET data and other biological and/or chemical data, etc.

NO CHANGES MADE TO THIS SECTION-SEE THE 2007 REISSUANCE FACT SHEET FOR INFORMATION

25. **305(b)/303(d) Listed Segments**: Indicate if the facility discharges to a segment that is listed on the current 303(d) list and, if so, provide all appropriate information/calculations.

This facility discharges directly to the James River. This receiving stream segment has been listed in Category 5 of the 305(b)/303(d) list for non-attainment of Dissolved Oxygen, PCB in Fish Tissue, A TMDL has not been prepared or approved for this stream segment. The permit contains a TMDL reopener clause which will allow the permit to be modified, in compliance with Section 303(d)(4) of the Act once a TMDL is approved.

NO CHANGES MADE TO THIS SECTION-SEE THE 2007 REISSUANCE FACT SHEET FOR INFORMATION

26. **CHANGES TO PERMIT**: Use **TABLE III(a)** to record any changes from the previous permit and the rationale for those changes. Use **TABLE III(b)** to record any changes made to the permit during the permit processing period and the rationale for those changes [i.e., use for comments from the applicant, VDH, EPA, other agencies and/or the public where comments resulted in changes to the permit limitations or any other changes associated with the special conditions or reporting requirements].

SEE ATTACHMENT 7

27. **NPDES INDUSTRIAL PERMIT RATING WORKSHEET:**

TOTAL SCORE: 135 **NO CHANGES MADE TO THE RATING WORKSHEET. SEE 2007 REISSANCE FACT SHEET FOR INFORMATION**

28. **DEQ PLANNING COMMENTS RECEIVED ON DRAFT PERMIT**: Document any comments received from DEQ planning.

The discharge is not addressed in any planning document but will be included when the plan is updated.

29. **PUBLIC PARTICIPATION:** Document comments/responses received during the public participation process. If comments/responses provided, especially if they result in changes to the permit, place in the attachment.

VDH/DSS COMMENTS RECEIVED ON DRAFT PERMIT: Document any comments received from the Virginia Dept. of Health and the Div. of Shellfish Sanitation and noted how resolved.

The VDH reviewed the application and waived their right to comment and/or object on the adequacy of the draft permit. Documentation received 4/28/09 from VDH.

The DSS has no comments on the application/draft permit. Email received from DSS on 5/1/09.

EPA COMMENTS RECEIVED ON DRAFT PERMIT: Document any comments received from the U.S. Environmental Protection Agency and noted how resolved.

EPA has no objections to the adequacy of the draft permit.

ADJACENT STATE COMMENTS RECEIVED ON DRAFT PERMIT: Document any comments received from an adjacent state and noted how resolved.

Not Applicable.

OTHER AGENCY COMMENTS RECEIVED ON DRAFT PERMIT: Document any comments received from any other agencies (e.g., VIMS, VMRC, DGIF, etc.) and noted how resolved.

Not Applicable.

OTHER COMMENTS RECEIVED FROM RIPARIAN OWNERS/CITIZENS ON DRAFT PERMIT: Document any comments received from other sources and note how resolved.

The application and draft permit have received public notice in accordance with the VPDES Permit Regulation, and no comments were received.

PUBLIC NOTICE INFORMATION: Comment Period: Start Date
End Date

Persons may comment in writing or by e-mail to the DEQ on the proposed modification of the permit within 30 days from the date of the first notice. Address all comments to the contact person listed below. Written or e-mail comments shall include the name, address, and telephone number of the writer, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The Director of the DEQ may decide to hold a public hearing if public response is significant. Requests for public hearings shall state the reason why a hearing is requested, the nature of the issues proposed to be raised in the public hearing and a brief explanation of how the requestor's interests would be directly and adversely affected by the proposed permit action.

All pertinent information is on file and may be inspected, and arrangements made for copying by contacting Ms. Deanna Austin at: Department of Environmental Quality (DEQ), Tidewater Regional Office, 5636 Southern Boulevard, Virginia Beach, VA 23462. Telephone: 757-518-2008 E-mail: deanna.austin@deq.virginia.gov

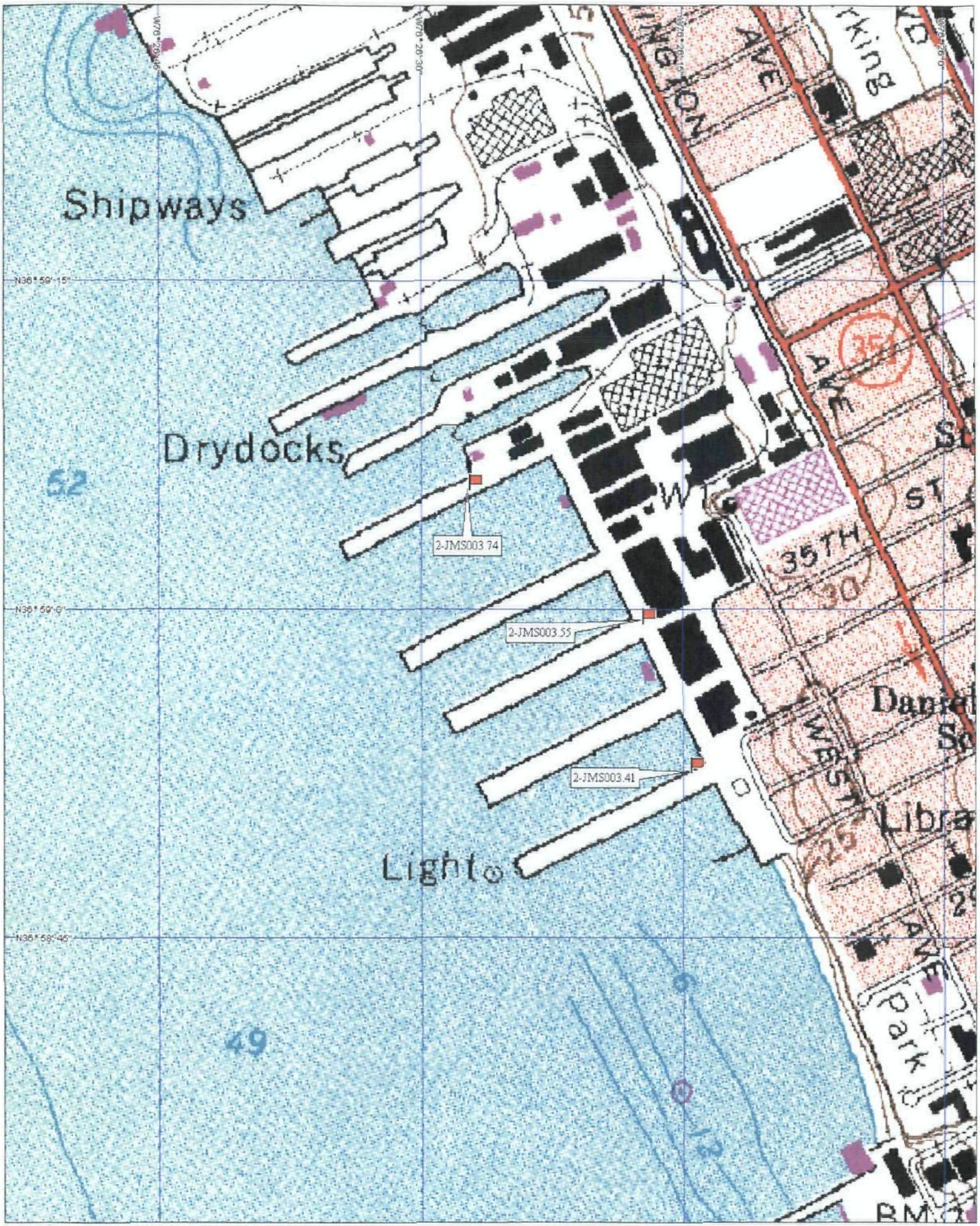
Following the comment period, the Board will make a determination regarding the proposed reissuance. This determination will become effective, unless the Director grants a public hearing. Due notice of any public hearing will be given.

30. **ADDITIONAL FACT SHEET COMMENTS/PERTINENT INFORMATION:**

ATTACHMENT 1

DISCHARGE LOCATION/TOPOGRAPHIC MAP

SEE 2007 REISSUANCE FACT SHEET FOR ALL OUTFALLS EXCEPT THE NEWLY ADDED OUTFALLS 162-167. MAP IS ATTACHED FOR THOSE NEW OUTFALLS.



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

200 ft Scale: 1 : 7,200 Detail: 14-7 Datum: WGS84

ATTACHMENT 2

DISCHARGE/OUTFALL DESCRIPTION

SEE 2007 REISSUANCE FACT SHEET

ALSO SEE SOURCE CONTRIBUTION STUDY IN ATTACHMENT 4

ALSO SEE THE MODIFICATION REQUEST RECEIVED 4/1/09

ATTACHMENT 3

TABLE II - EFFLUENT MONITORING/LIMITATIONS

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 003
Outfall Description: Air conditioner condensate from B-93, B-94 and B-17, Steam Condensate from various buildings, Ogontz valve discharges, and ice machine condensate
SIC CODE: 3731
(X) Final Limits ( ) Interim Limits Effective Dates - From: Modification Date To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Temperature (°C)	3		NA	NA	38	1/3 Months	I.S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY

I.S. = Immersion Stabilization

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31).

[a] Samples are to be collected during times when storm water is NOT contributing flow to the outfalls.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

The basis for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALLS # 005
Outfall Description: AC condensate, meter calibration water, fire protection system drainage, non-contact cooling water and steam condensate
SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Modification Date To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Temperature (°C)	3		NA	NA	38	1/3 Months	I.S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Total Recoverable Zinc (ug/l) [b] [c]	2		NA	NA	1335	1/3 Months	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY; I.S. = Immersion Stabilization

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31).

[a] Samples are to be collected during times when storm water is NOT contributing flow to the outfalls.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

[c] See Part I.B. for Schedule of Compliance. No monitoring or reporting required until after completion of the schedule.

The basis for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALLS # 006, 042, 043, 163, 165, and 167
Outfall Description: Outfall 006 (Steam Condensate, Fire Protection System Drainage, Vehicle Wash Water, Drinking Fountain Drainage, and AC Condensate). Deionizer Regeneration Water from the Nancy Lee Barge(042, 163, 165, 167), Deionizer Regeneration Water from B-1812 (043) and Boiler Feed Water from the Nancy Lee (042, 163, 165, 167).
SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Modification Date To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Temperature (°C)	3		NA	NA	38	1/3 Months	I.S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Total Suspended Solids (mg/l) [c]	3		NA	NA	60	1/ Year	Grab
Oil and Grease (mg/l) [c]	3		NA	NA	15	1/ Year	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY; I.S. = Immersion Stabilization

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31).
1/Year = Between January 1 and December 31

[a] Samples are to be collected during times when storm water is NOT contributing flow to the outfalls.
[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.
[c] Samples must be taken at times when vehicle wash water is the contribution source. Monitoring for this parameter applies only to outfall 006.

The basis for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALLS # 008

Outfall Description: ALL DISCHARGES ELIMINATED. OUTFALL REMOVED FROM THE PERMIT. ALL STORMRWATER IS DIRECTED TO OUTFALL 064

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALLS # 009

Outfall Description: ALL DISCHARGES ELIMINATED. OUTFALL REMOVED FROM THE PERMIT FOR INDUSTRIAL CONTRIBUTIONS. OUTFALL NOW LISTED ON STORMWATER PAGE.

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALLS # 011

Outfall Description: ALL DISCHARGES ELIMINATED. OUTFALL REMOVED FROM THE PERMIT

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 013, 017, 024, 027, 032, and 034
Outfall Description: Process Waste Water and Cooling Water from Graving Dock Drainage. Stormwater is also discharged.
SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Modification Date To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Total Suspended Solids (TSS) [mg/l] [b]	3		NA	NA	NL	1/3 Months	Grab
Total Petroleum Hydrocarbons (TPH) [mg/l] [b]	3		NA	NA	NL	1/3 Months	Grab
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Chlorine, Total Residual (TRC) [mg/l] [b] [c]	2		NA	NA	1.2	1/3 Months	Grab
Tributyltin (TBT) (ug/l) [b] [d]	2		NA	NA	0.720	1/3 Months	3 Grabs/24 Hours
Tributyltin (TBT) (grams/year) [d]	2		NA	NA	5	1/Year	Calculated

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter

(April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31). Sample results shall be submitted by the 10th of the month following the sampling period.

1/Year = Between January 1 and December 31.

[a] Sampling over the life of the permit shall be representative of all the different activities which potentially impact the quality of the discharge, especially including process water and first flush storm water generated from hull work . The activity from which the waste water originated must be specified within the comments section of each submitted monitoring report for the outfall. Hull work shall include, but not be limited to the activities of removing marine salts, marine growth, sediments and paint, deionized water from pipe flushing, or other hull cleaning activities with the potential to disturb coatings, including TBT, and generate contamination such as preparing hull areas for inspection or for work (e.g., cutting, welding, grinding). Process water also includes stormwater that comes in contact with the activities listed in this section while a vessel is in dock. If during a monitoring period there is no activity within a drydock, the drydock has been cleaned and there is no discharge other than storm water, no sampling is required.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

[c] Monitoring for chlorine is not required when chlorination is not occurring. However, during such events notification of no chlorination on the Discharge Monitoring Report (DMR) is required.

[d] See Part I.E.4. for information regarding Tributyltin sampling and analysis. Samples shall be collected whenever TBT work is done in the drydock.

The bases for the limitations codes are:

1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 015

Outfall Description: Steam Condensate, Industrial AC Condensate from Building 78, and river cooling water

SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Reissuance To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Temperature (^{0}C)	3		NA	NA	43	1/3 Months	I. S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/6 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/6 Months	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY, I.S. = Immersion Stabilization

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31). Sample results shall be submitted by the 10th of the month following the sampling period.

1/6 Months = In accordance with the following schedule: 1st half (January 1 - June 30); 2nd half (July 1 - December 31). Sample results shall be reported by the 10th of the month following the sampling period.

[a] Samples are to be collected during times when storm water is not contributing flow to the outfalls.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

The bases for the limitations codes are:

1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment.

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 019
Outfall Description: Steam Condensate, AC Condensate from Various Buildings, and deionized test water from B-161

SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Reissuance To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Temperature (^{o}C)	3		NA	NA	38	1/3 Months	I. S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY, I.S. = Immersion Stabilization

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31). Sample results shall be submitted by the 10th of the month following the sampling period.

[a] Samples are to be collected during times when storm water is not contributing flow to the outfalls.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

The bases for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment.

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 020
Outfall Description: Steam Condensate and AC Condensate from buildings 160 and 4557 (AC only from 4557) and Ogontz valve discharges
SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Modification Date To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Temperature (°C)	3		NA	NA	38	1/3 Months	I.S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/6 Months	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY; I.S. = Immersion Stabilization

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31).

1/6 Months = In accordance with the following schedule: 1st half (January 1 - June 30); 2nd half (July 1 - December 31). Sample results shall be reported by the 10th of the month following the sampling period.

[a] Samples are to be collected during times when storm water is NOT contributing flow to the outfalls.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

The basis for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 021
Outfall Description: Cooling Tower Blowdown, Air Conditioner Cooling Water, Submarine Cooling Water, Steam and AC Condensate, hydrostatic testing water from water hoses, and Ogontz Valve Discharge

SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Modification Date To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NL	NA	NL	1/Month	Estimate
pH (S. U.)	3		NA	6.0	9.0	1/Month	Grab
Temperature (°C)	3		NA	NA	43	1/Month	I.S.
Chlorine, Total Residual (TRC) [mg/l] [b]	2		1.2	NA	1.2	1/Month	Grab
Dissolved Copper(ug/l) [b]	3		NA	NA	NL	1/6 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/6 Months	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY, I.S. = Immersion Stabilization

1/6 Months = In accordance with the following schedule: 1st half (January 1 - June 30); 2nd half (July 1 - December 31). Sample results shall be reported by the 10th of the month following the sampling period.

[a] Samples are to be collected during times when storm water is not contributing flow to the outfall.
[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.
Monitoring for chlorine is not required when chlorination is not occurring. However, during such events notification of no chlorination on the Discharge Monitoring Report (DMR) is required.

The bases for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 026
Outfall Description: Steam Condensate, AC Condensate, non-contact water from air handling unit, and drinking fountain discharges
SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Modification Date To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Temperature (°C)	3		NA	NA	38	1/3 Months	I.S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY; I.S. = Immersion Stabilization

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31).

[a] Samples are to be collected during times when storm water is NOT contributing flow to the outfalls.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

The basis for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 030
Outfall Description: Process wastewater from cooling tower overflow from B-556, furnace discharges, Ogontz valve discharges, and AC condensate and steam condensate.
SIC CODE: 3731
(X) Final Limits ( ) Interim Limits Effective Dates - From: Modification Date To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Temperature (°C)	3		NA	NA	38	1/3 Months	I.S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY

I.S. = Immersion Stabilization

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31).

[a] Samples are to be collected during times when storm water is not contributing flow to the outfall.

[b] See Part I.C.4. and I.C.5. For quantification levels and reporting requirements, respectively.

The basis for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 037

Outfall Description: Steam Condensate from Drydock 4, groundwater relief discharges from the side walls of drydock 4, and Ogontz valve discharges

SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Modification To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Temperature (^{0}C)	3		NA	NA	38	1/3 Months	I. S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY, I.S. = Immersion Stabilization

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31). Sample results shall be submitted by the 10th of the month following the sampling period.

[a] Samples are to be collected during times when storm water is not contributing flow to the outfalls.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

The bases for the limitations codes are:

1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment.

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 038

Outfall Description: Steam Condensate from Drydock 4, groundwater relief discharges from the sidewalls of drydock 4, and Ogontz valve discharges

SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Reissuance To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Temperature (^{0}C)	3		NA	NA	38	1/3 Months	I. S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/6 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/6 Months	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY, I.S. = Immersion Stabilization

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31). Sample results shall be submitted by the 10th of the month following the sampling period.

[a] Samples are to be collected during times when storm water is not contributing flow to the outfalls.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

The bases for the limitations codes are:

1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment.

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 041, 162, 164, and 166
Outfall Description: Non-contact Cooling Water, Boiler Blowdown (These outfalls are located at the Nancy Lee Barge)
SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Modification Date To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Temperature (°C)	3		NL	NA	43	1/3 Months	I. S.
Dissolved Copper (Net) (ug/l) [b] [c]	3		NL	NA	NL	1/3 Months	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY; I.S. = Immersion Stabilization

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31). Sample results shall be submitted by the 10th of the month following the sampling period.

[a] Samples are to be collected during times when storm water is not contributing flow to the outfall.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

[c] Dissolved Copper, (Net) limit is the difference between Influent, Dissolved Copper and Dissolved Copper in the discharge. Sample collection for these parameters must be as close to the same time as possible.

The bases for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 044
Outfall Description: Process Waste Water and Cooling Water Discharges from the Floating DryDock
SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Reissuance To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/3 Months	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/3 Months	Grab
Total Suspended Solids (TSS) [mg/l] [b]	3		NA	NA	NL	1/3 Months	Grab
Total Petroleum Hydrocarbons (TPH) [mg/l] [b]	3		NA	NA	NL	1/3 Months	Grab
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Dissolved Zinc (ug/l) [b]	3		NA	NA	NL	1/3 Months	Grab
Tributyltin (TBT) [ug/l] [b] [c]	2		NA	NA	0.720	1/3 Months	3G/24Hr
Tributyltin (TBT) [c] [g/year]	2		NA	NA	5	1/Year	Calculated

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY; I.S. = Immersion Stabilization

3G/24HR = For tributyltin, a minimum of three separate grab samples of wastewater treatment plant effluent representative of the discharge shall be collected within one 24-hour period.

1/3 Months = In accordance with the following schedule: 1st quarter (January 1 - March 31); 2nd quarter (April 1 - June 30); 3rd quarter (July 1 - September 30); 4th quarter (October 1 - December 31). Sample results are to be submitted by the 10th of the month following the monitoring period.

1/Year = Between January 1 and December 31.

[a] Sampling over the life of the permit shall be representative of all the different activities which potentially impact the quality of the discharge, especially including process water and first flush storm water generated from hull work . The activity from which the waste water originated must be specified within the comments section of each submitted monitoring report for the outfall. Hull work shall include, but not be limited to the activities of removing marine salts, marine growth, sediments and paint, deionized water from pipe flushing, or other hull cleaning activities with the potential to disturb coatings, including TBT, and generate contamination such as preparing hull areas for inspection or for work (e.g., cutting, welding, grinding). Process water also includes stormwater that comes in contact with the activities listed in this section while a vessel is in dock. If during a monitoring period there is no activity within a drydock, the drydock has been cleaned and there is no discharge other than storm water, no sampling is required.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

[c] To be sampled each day when TBT work is being performed or TBT wastewaters generated. See special condition I.E. for additional information on TBT reporting.

The bases for the limitations codes are:

1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 056, 119, and 123

Outfall Description: ALL DISCHARGES ELIMINATED. OUTFALLS REMOVED FROM THE PERMIT BUT ARE ADDRESSED AS STORMWATER OUTFALLS 956, 819 AND 823

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 084
Outfall Description: Steam Condensate

SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Modification To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/Year	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/Year	Grab
Temperature (°C)	3		NA	NA	43	1/Year	I.S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/Year	Grab
Dissolved Zinc(ug/l) [b]	3		NA	NA	NL	1/Year	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY; I.S. = Immersion Stabilization

1/Year = Between January 1 and December 31.

[a] Samples are to be collected during times when storm water is not contributing flow to the outfalls.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

The bases for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 094
Outfall Description: Air Compressor Condensate from B-4730, Ogontz valve discharge, steam condensate and drinking fountain discharge
SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Reissuance To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/Year	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/Year	Grab
Temperature (°C)	3		NA	NA	43	1/Year	I.S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/Year	Grab
Total Recoverable Zinc(ug/l) [b] [c]	2		NA	NA	180	1/Year	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY; I.S. = Immersion Stabilization

1/Year = Between January 1 and December 31.

[a] Samples are to be collected during times when storm water is not contributing flow to the outfalls.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

[c] See Part I.B. for Schedule of Compliance. No monitoring or reporting required until after completion of the schedule.

The bases for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 112
Outfall Description: Steam Condensate, AC condensate, and River Cooling Water
SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Reissuance To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MGD)	3		NA	NA	NL	1/Year	Estimate
pH (S.U.)	3		NA	6.0	9.0	1/Year	Grab
Temperature (°C)	3		NA	NA	NL	1/Year	I.S.
Dissolved Copper (ug/l) [b]	3		NA	NA	NL	1/Year	Grab
Dissolved Zinc(ug/l) [b]	3		NA	NA	NL	1/Year	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY; I.S. = Immersion Stabilization

1/Year = Between January 1 and December 31.

[a] Samples are to be collected during times when storm water is not contributing flow to the outfalls.

[b] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

The bases for the limitations codes are:
1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 140, 142, or 144 (Represents Outfalls 134, 135, 136, 137, 138, 139, 141, 143, 145, 146, 158, and 159)
Outfall Description: Stormwater outfalls associated with industrial activity where monitoring is required. These outfalls are permitted to discharge only stormwater. Any one of the three outfalls may be monitored and reported on the DMR.
SIC CODE:

(X) Final Limits ( ) Interim Limits Effective Dates - From: Reissuance To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS [a]	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE
Flow (MG)	3		NA	NA	NL	1/ Year	EST [b]
pH (S.U.) [d]	3		NA	6.0	9.0	1/ Year	Grab
pH - precipitation event (S.U.) [e] [f]	3		NA	NL	NL	1/ Year	Grab
Total Suspended Solids (TSS) (mg/l) [c]	3		NA	NA	NL	1/ Year	Grab
Total Petroleum Hydrocarbons (TPH) (mg/l)	3		NA	NA	NL	1/Year	Grab
Dissolved Copper (ug/L) [c]	3		NA	NA	NL	1/ Year	Grab
Dissolved Zinc (ug/L) [c]	3		NA	NA	NL	1/ Year	Grab

NA = NOT APPLICABLE; NL = NO LIMIT, MONITORING REQUIREMENT ONLY

1/Year = Between January 1 and December 31.

Upon issuance of the permit, Discharge Monitoring Reports (DMRs) shall be submitted to the regional office at the frequency required by the permit regardless of whether an actual discharge occurs. In the event that there is no discharge for the monitoring period, then "no discharge" shall be reported on the DMR.

[a] See Part I.F.3 (General Stormwater Conditions) for additional stormwater sampling and reporting requirements.
[b] Estimate of the total volume of the discharge during the storm event.
[c] See Parts I.C.4. and I.C.5. for quantification levels and reporting requirements, respectively.

[d] If the pH value of the effluent is less than the minimum pH limitation above (6.0 S.U.), then the minimum pH limitation shall be equal to the rainfall pH value.

[e] Reporting shall only be required if the effluent pH is less than 6.0 S.U. The pH value of the precipitation causing a discharge shall be used for comparison to the effluent pH. Samples taken for this purpose shall be representative of the precipitation, and collected prior to contacting any soils, buildings or other impervious surfaces at the facility. The permittee shall sample and report this rainfall pH with the DMR.

[f] See Part I.C.9 for additional instructions regarding pH precipitation monitoring requirements.

The basis for the limitations codes are:

1. Technology (e.g., Federal Effluent Guidelines)
2. Water Quality Standards (9 VAC 25-260 et. seq.)
3. Best Professional Judgment

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 161

Outfall Description: ALL DISCHARGES ELIMINATED.

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 009, 029, 051, 053, 054, 055, 057, 059-067, 069, 070, 072, 073, 076, 081, 120, 121, 122, 124, 125, 126, 129, 130, 131, 150, 152, and 153
Outfall Description: Outfalls Discharging Storm Water that IS Associated with a Regulated Industrial Activity-No Chemical Parameter Monitoring Required

SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Reissuance To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE

These outfalls shall contain only storm water runoff associated with a regulated industrial activity. No process water shall be discharged from these outfalls.

No Chemical Parameter Monitoring shall be required for these outfalls.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

TABLE II - INDUSTRIAL EFFLUENT LIMITATIONS/MONITORING

OUTFALL # 132, 133, 154-157
Outfall Description: Outfalls Discharging Storm Water that IS NOT Associated with a Regulated Industrial Activity-No Chemical Parameter Monitoring Required

SIC CODE: 3731

(X) Final Limits ( ) Interim Limits Effective Dates - From: Reissuance To: Expiration

PARAMETER & UNITS	BASIS FOR LIMITS	MULTIPLIER OR PRODUCTION	EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
			MONTHLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE

These outfalls shall contain only storm water runoff NOT associated with a regulated industrial activity. No process water shall be discharged from these outfalls.

No Chemical Parameter Monitoring shall be required for these outfalls.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

ATTACHMENT 4

EFFLUENT LIMITATIONS/MONITORING RATIONALE/SUITABLE DATA/ ANTIDEGRADATION/ANTIBACKSLIDING

Newport News Shipbuilding VA0004804
Limitations/Monitoring Rationale

Northrop Grumman Shipbuilding Inc. requested a permit modification on March 31, 2009, received at DEQ on April 1, 2009. The modification request included 22 changes requested with the majority of the request being related to two completed studies. Additionally, a few requests were made by email during the modification process and are included with the modification request. The first study was a Metals Translator Study submitted on December 11, 2008. The metals translator study provided translator factors for 6 outfalls that have schedules of compliance due date for metals limits. The translator study was approved by the DEQ central office on 10/9/08 with revisions approved 12/3/08. After the 12/3/08 approvals, the final report dated 12/11/08 was submitted. The second study was a Rhodamine WT Dye Study Final Report was submitted on 2/11/09. This was a joint study with the shipyard and Virginia Institute of Marine Science (VIMS). The purpose was to evaluate the mixing and dilution performance within specified outfalls and the associated regulatory mixing zones. Five outfalls were selected for this study. The study results were approved by Allan Brockenbrough-DEQ Central Office on 4/15/09. Additionally a new CORMIX model was analyzed for outfall 037 and included with the 4/15/09 approval from central office. In addition to the two approved studies, the shipyard had a permit requirement to complete a source contribution study by 5/1/12. The source contribution study covered 13 outfalls and required all sources of industrial wastewater to be determined within the drainage areas of these 13 outfalls. The shipyard finished the study early and submitted the final report on 2/11/09. This report was also used in the permit modification development.

One of the modification request items was the addition of 6 new outfalls in order to properly permit the industrial discharges of the "Nancy Lee" steam barge. The 6 new outfalls represent 3 new locations for the use of the Nancy Lee. Each location has two outfalls associated with it just like the original outfall configuration for the Nancy Lee at 041/042.

Outfalls 003, 005, 019, 026, 030, and 084 have the newly approved metals translator results applied. Outfalls 003, 019, 020, 026, and 084 have the newly approved dilution factors from the dye study applied. Additionally, outfall 037 has a newly approved acute dilution ratio applied.

There is also modification to the warehousing areas located off of Warwick Blvd. A site visit was performed by D. Austin on 5/27/09 to confirm the activities currently taking place within the warehousing drainage areas.

Metals monitoring is in the dissolved form.since water quality standards for metals are in this form. All metals limitations are written in the total recoverable form. EPA requires metals limits to be in the total recoverable form.

Justification for any changes in monitoring requirements and limitations are shown below for all of the industrial outfalls. Only the parameters with changes associated with the modification are shown in this section. Stormwater outfalls with changes during this permit modification are discussed at the end of this section.

Outfalls: 003

Discharge: Air Conditioner Condensate from Buildings 93 and 94 and Steam Condensate from various buildings Air conditioner condensate from B-93, B-94 and B-17, Steam Condensate from various buildings, Ogontz valve discharges, and ice machine condensate

Outfall Changes: Building B-17 has been added to the list of buildings that contribute AC condensate to this outfall. Additionally, ogontz valve discharges and ice machine condensate were added to this outfall as source contributors. The VIMS dye study acute dilution ratio approved for this outfall is 77:1. This outfall also has a metals translator of 0.93 for zinc and 0.821 for copper approved. The acute dilution ration of 77:1 showed that the limits for total recoverable copper and total recoverable zinc are no longer needed.

Monitoring Requirement Changes:

Total Rec/Diss Copper **Total Rec/Diss Zinc**	Historical data at the outfall had shown a need for a copper and zinc limit during the last permit term. During the last permit reissuance(10/08), total recoverable copper and zinc limits were placed in the permit with a two year schedule of compliance for copper and a four year schedule for zinc. In response to the schedule, the facility decided to perform the VIMS dye study for a new acute dilution mixing ratio determination. In addition, this outfall received a metals translator for zinc and copper. The metals translators did not need to be used since the dilution of 77:1 showed that there was no limit need for copper or zinc. Monitoring for both copper and zinc will continue at this outfall but will be in dissolved form. The VA water quality standards (WQS) are listed in dissolved form for metals parameters. Monitoring will continue at 1/3 months to ensure WQS. If that the end of the permit term, data shows no WQS issues, the monitoring frequency can be reduced with the 2012 permit reissuance.

Outfalls: 005

Discharge: Fire Protection System Drainage, AC Condensate, Meter Calibration Water, non-contact cooling water, and Steam Condensate

Outfall Changes: Non contact cooling water was added and hydrologic test water removed per the source contribution study final report (2/11/09). The hydrologic test water was actually non-contact cooling water from the heat exchanger of a hydraulic test stand machine.
This outfall had a metals translator for zinc approved of 0.89. This was used with the already approved CORMIX model mixing dilution of 13.2:1 from the last permit reissuance.

Monitoring Requirement Changes:

Total Recoverable Zinc	With the addition of the metals translator factor of 0.89, the limit for zinc was increased from 1188 ug/l to 1335 ug/l. Calculations can be found in the STATS.exe sheet attached to this section. The acute dilution ratio of 13.2 was approved during the previous permit reissuance. When the limit was added during the last permit reissuance, a 4 year schedule of compliance was given since it was a new limit to the permit. The 4 year schedule will continue and the limit of 1335 ug/l will become effect in 10/2012.

Outfalls: 008

Discharge: None

Outfall Changes: All process wastewater discharges have been eliminated from this outfall. All drop inlets that were found to be in the area of outfall 008 are within the drainage area of outfall 064. This change is documented in the source contribution study (2/11/09).

Monitoring Requirement Changes:

All Parameters: All parameters have been removed for monitoring.

Outfalls: 009

Discharge: Stormwater Only

Outfall Changes: All process wastewater discharges have been eliminated from this outfall. This outfall now only discharges stormwater associated with industrial activity and is now listed in the stormwater outfall section.

Monitoring Requirement Changes:

All Parameters: All parameters have been removed for monitoring. The stormwater outfall is listed as "no chemical parameter monitoring required".

Outfalls: 011

Discharge: None

Outfall description: All process wastewater discharges have been eliminated. Both the cooling water and the basement sump discharges have been routed to HRSD. This routing took place in 2007.

Monitoring Requirement Changes:

All Parameters: All parameters have been removed for monitoring.

Outfalls: 013, 017, 024, 027, 032, and 034

Discharge: Process wastewater and cooling water from the graving docks. Stormwater is also discharged.

Outfall Changes: Pipe flushing discharges added to the types of process wastewater discharges covered under this section. Also there are changes associated with outfalls 013, 024, and 027 associated with total phosphorus monitoring. Added stormwater to the discharge description.

Monitoring Requirement Changes:

Total Phosphorus	The total phosphorus limit and monitoring was removed based upon information that the shipyard has no sources of phosphorus at these outfalls (letter date 5/14/2009). Additionally, the nutrient enriched water policy was altered so that these types of discharges (discharges of 1 MGD or greater into receiving streams that have been labeled as nutrient enriched) are not included. The decision to remove the TP monitoring and limit is BPJ based upon agency decision. DEQ Central Office is to work on a policy to address the backsliding issues.

Outfalls: 015

Discharge: Steam Condensate, AC condensate from Building 78, and river cooling water

Outfall Changes: River cooling water was added as a process wastewater discharge to this outfall. This was done per the modification request with additional information received by email on 5/26/09 and 6/1/09.

Monitoring Requirement Changes:

There are no monitoring changes to this outfall.

Outfall: 019

Discharge: Steam Condensate, AC Condensate from Various Buildings, and deionized test water from B-161

Outfall Changes: Added deionized test water from B-161 per the modification request as a source of process wastewater discharges.
Both the dye study and the metals translator study were performed for this outfall and approved. The dye study gives an acute dilution ratio of 10:1. The metals translator for copper is 0.75 and for zinc is 0.65. The acute dilution was enough for this outfall to not need copper or zinc limits. The metal translators were not used.

Monitoring Requirement Changes:

Total Rec/Diss Copper **Total Rec/Diss Zinc**	Historical data at the outfall had shown a need for a copper limit and zinc limit during the last permit term. During the last permit reissuance(10/08), total recoverable copper and zinc limits were placed in the permit with a two year schedule of compliance for copper and a four year schedule for zinc. In response to the schedule, the facility decided to perform the VIMS dye study for a new acute dilution mixing ratio determination. In addition, this outfall received a metals translator for zinc and copper. The metals translators did not need to be used since the dilution of 10:1 showed that there was no limit need for copper or zinc. Monitoring for both copper and zinc will continue at this outfall but will be in dissolved form. The VA water quality standards (WQS) are listed in dissolved form for metals parameters. Monitoring will continue at 1/3 months to ensure WQS. If that the end of the permit term, data shows no issue, the monitoring frequency can be reduced with the 2012 permit reissuance.

Outfalls: 020

Discharge: Steam Condensate and AC Condensate from buildings 160 and 4557 (AC only from 4557) and Ogontz valve discharges

Outfall Changes: AC condensate was removed for building 160 and ogontz valve discharge was added per the source contribution study.
The VIMS dye study was also performed on this outfall and resulted in an approved acute dilution ratio of 100:1.

Monitoring Requirement Changes:

Total Recov/Diss. Copper	The approved acute dilution ratio of 100:1 shows that no copper limit is needed. See the STATS.exe sheet attached for the calculation. Dissolved copper monitoring will be added at a frequency of 1/3 months to ensure water quality standards are being protected. If that the end of the permit term, data shows no issue, the monitoring frequency can be reduced with the 2012 permit reissuance.

Outfall: 021

Discharge: Cooling Tower Blowdown, Air Conditioner Cooling Water, Submarine Cooling Water, Steam Condensate, AC Condensate, hydrostatic test water from water hoses, and Ogontz Valve Discharges

Outfall Changes: Hydrostatic testing of water hoses was added to this outfall as a type of discharge per the modification request.

Monitoring Requirement Changes:

Total Phosphorus	The total phosphorus limit and monitoring was removed based upon information that the shipyard has no sources of phosphorus at these outfalls (letter date 5/14/2009). Additionally, the nutrient enriched water policy was altered so that these types of discharges (discharges of 1 MGD or greater into receiving streams that have been labeled as nutrient enriched) no longer require TP limits. The decision to remove the TP monitoring and limit is BPJ based upon agency decision. DEQ Central Office is to work on a policy to address the backsliding issues.

Outfall: 026

Discharge: Steam Condensate from buildings 1841, 262, and 4776 and AC condensate from building 1841, and drinking fountain discharges.

Outfall Changes: Drinking fountain discharges were added to this outfall per the source contribution study and the modification request.
Both the dye study and the metals translator study were performed for this outfall and approved. The dye study gives an acute dilution ratio of 10:1. The metals translator for copper is 0.45. The acute dilution was enough for this outfall to not need a copper limits. The translator was not used.

Monitoring Requirement Changes:

Total Recov/Diss. Copper	The approved acute dilution ratio of 10:1 shows that no copper limit is needed. See the STATS.exe sheet attached for the calculation. The total recoverable copper limit of 24 ug/l has been removed. Dissolved copper monitoring will be added at a frequency of 1/3 months to ensure water quality standards are being protected. If that the end of the permit term, data shows no issue, the monitoring frequency can be reduced with the 2012 permit reissuance.

Outfall: 030

Discharge: Process wastewater from cooling tower overflow from B-556, furnace discharges, Ogontz valve discharges, AC condensate and steam condensate.

Outfall description: The cooling tower blowdown from building 550 has been rerouted to HRSD in 2007 per the modification request. Cooling tower overflow from B-556, furnace discharges, and ogontz valve discharges have been added to this outfall per the source contribution study.
Both the dye study and the metals translator study were performed for this outfall and approved. The dye study gives an acute dilution ratio of 42:1. The metals translator for copper is 0.64. The acute dilution was enough for this outfall to not need a copper limits. The translator was not used.

Monitoring Requirement Changes:

Total Recov/Diss. Copper	The approved acute dilution ratio of 42:1 shows that no copper limit is needed. See the STATS.exe sheet attached for the calculation. The total recoverable copper limit of 19 ug/l has been removed. Dissolved copper monitoring will be added at a frequency of 1/3 months to ensure water quality standards are being protected. If that the end of the permit term, data shows no issue, the monitoring frequency can be reduced with the 2012 permit reissuance.

Outfalls: 037

Discharge: Ogontz valve discharges, Steam Condensate and Groundwater relief from Drydock 4. 037 drains the south side of the dock and 038 drains the northwest corner.

Outfall Changes: Groundwater relief discharge was added per the modification request and AC condensate was removed per the source contribution study. A new CORMIX model was submitted on 2/3/09 and approved by DEQ Central Office on 2/23/09. The new acute dilution ratio is 10:1.

Monitoring Requirement Changes:

Total Rec/Diss Copper Total Rec/Diss Zinc	Historical data at the outfall had shown a need for a copper limit and zinc limit during the last permit term. During the last permit reissuance(10/08), total recoverable copper and zinc limits were placed in the permit with a two year schedule of compliance for copper and a four year schedule for zinc. In response to the schedule, the facility decided to use CORMIX from 2006 and approved by Central office on 2/23/09. The acute dilution of 10:1 showed that there was no limit needed for copper or zinc. The total recoverable copper limit of 21 ug/l and total recoverable zinc limit of 207 ug/l have been removed. Monitoring for both copper and zinc will continue at this outfall but will be in dissolved form. The VA water quality standards (WQS) are listed in dissolved form for metals parameters. Monitoring will continue at 1/3 months to ensure WQS. If that the end of the permit term, data shows no issue, the monitoring frequency can be reduced with the 2012 permit reissuance.

Outfalls: 038

Discharge: Ogontz valve discharges, Steam Condensate and Groundwater relief from Drydock 4. 037 drains the south side of the dock and 038 drains the northwest corner.

Outfall Changes: Groundwater relief discharge was added per the modification request and AC condensate was removed per an email dated 6/22/09.

Monitoring Requirement Changes:

There are no changes to the monitoring requirements for this outfall.

Outfall: 041

Discharge: Noncontact cooling water from the Nancy Lee and boiler blowdown from the Nancy Lee Barge.

Outfall Changes: No changes were made to the outfall discharges

Monitoring Requirements:

Total Phosphorus	The total phosphorus limit and monitoring was removed based upon information that the shipyard has no sources of phosphorus at these outfalls (letter date 5/14/2009). Additionally, the nutrient enriched water policy was altered so that these types of discharges (discharges of 1 MGD or greater into receiving streams that have been labeled as nutrient enriched) no longer require TP limits. The decision to remove the TP monitoring and limit is BPJ based upon agency decision. DEQ Central Office is to work on a policy to address the backsliding issues.

Outfalls: 044

Discharge: Process wastewater, cooling water, fire protection system drainage

Outfall Changes: Pipe flushing discharges added to the types of process wastewater discharges covered under this section.

Outfalls: 056, 119 and 123

Discharge: Stormwater Only

Outfall Changes: All process wastewater discharges have been eliminated from these outfalls. These outfalls now only discharges stormwater associated with industrial activity and are listed as outfalls 956, 819, and 823. These outfalls had been previously permitted for stormwater, therefore the permit numbers will not change.

Monitoring Requirement Changes:

All Parameters: All parameters have been removed for monitoring. The stormwater outfalls are listed as "no chemical parameter monitoring required".

Outfalls: 084

Discharge: Steam Condensate

Outfall Changes: Non-contact cooling water from portable compressors has been removed per the modification request. Steam condensate was added per the modification request. The VIMS dye study was conducted for this outfall and an approved acute dilution ratio of 2.4:1 was achieved. Also, a metals translator for copper of 0.65 was approved but not needed as the data showed no limit was needed with the new mix. Additionally, it should be noted that the steam condensate that is left at this outfall is less than 10% of the originally listed discharges. Because of this, only data collected during the current permit term was used in limits determination. Steam condensate has been the only discharge at this outfall during the current permit term.

Monitoring Requirement Changes:

Total Recov/Diss. Copper	The approved acute dilution ratio of 2.4:1 shows that no copper limit is needed. See the STATS.exe sheet attached for the calculation. The total recoverable copper limit of 19 ug/l has been removed. Dissolved copper monitoring will be added at a frequency of 1/Year (same monitoring frequency as the other parameters at this outfall) to ensure water quality standards are being protected.

Outfalls: 094

Discharge: AC Condensate, Ogontz valve discharge, steam condensate, air compressor condensate from B-4730 and drinking fountain discharges

Outfall Changes: Cooling tower blowdown was removed from the discharge types. Ogontz valve discharges and drinking fountain discharges were added per the modification request. Steam Condensate and the air compressor condensate added per the source contribution study.

Monitoring Requirement Changes: There are no monitoring requirement changes to this outfall.

Outfalls: 112

Discharge: Steam Condensate, AC condensate and River Cooling Water

Outfall Changes: Air compressor cooling was deleted and steam condensate added per the modification request. River cooling water was added per the modification request with additional information received by email dated 6/1/09. AC condensate was added per email received 7/30/09. AC condensate will be from equipment used to cool areas when needed for painting activities and will be used on an infrequent basis.

Monitoring Requirement Changes:

Total Recov/Diss. Zinc	The industrial discharges that contributed to this outfall first receiving the zinc limit have been removed. The steam condensate is the only original flow left at this outfall and it is <10% of all the original flows. The river cooling water is a new discharge that has yet to begin at this outfall. Additionally,

value of <50 ug/l, showing that the discharge does not contribute zinc. The air compressor cooling water was believed to be the source of zinc. The total recoverable zinc limit of 180 ug/l has been removed. Dissolved zinc monitoring will be added at a frequency of 1/Year to ensure water quality standards are being protected.

Outfalls: 161

Discharge: No discharge. Process eliminated.

Outfall Changes: All process wastewater discharges have been eliminated from this outfall. The steam test facility has been dismantled.

Monitoring Requirement Changes:

All Parameters: All parameters have been removed for monitoring.

Outfall: 162, 164, and 166

Discharge: Noncontact boiler cooling water from the Nancy Lee and boiler blowdown from the Nancy Lee Barge.

Outfall Description: These outfalls are associated with the Nancy Lee Barge and are identical to outfall 041, which is the original location for the Nancy Lee. The Nancy Lee can be moved in order to provide support to operations at various locations. Outfall 162 is associated with Pier 2, 164 is associated with Pier 3, and 166 is associated with Pier 6. These outfall uses river water as the cooling tower source water. A mixing zone analysis was performed during the last permit modification for outfall 041 and an approved acute dilution ratio of 11.0 was achieved. This mix is carried over to these three identical outfalls because their locations in the river are very similar. Since the outfalls are attached to the barge, the depths of the outfalls are almost identical from location to location. See email correspondence dated 11/19/08 attached to this section for more information. The following monitoring requirements are the same as outfall 041.

Monitoring Requirements:

Flow To be measured in million gallons per day (MGD) with a sampling frequency of 1/3 months. Flow measurement is necessary for determining potential impact to a receiving stream. It is a standard parameter used universally in permits and is based on best professional judgment (BPJ).

pH Effluent pH limits are 6.0 standard units (S.U.) minimum and 9.0 S.U. maximum. This s a BPJ decision to protect water quality. Also, the Water Quality Standards (9 VAC 25-260-50) limits pH to the range of 6.0-9.0 for Coastal Waters of the State. pH limits and monitoring frequency will be 1/3 months.

Temperature A common pollutant from waste steam condensate or boiler discharges is heat. Increased temperature can have a negative impact on a receiving stream. Water Quality Standards (9 VAC 25-260-60) require a restriction in the rise above natural temperature of a receiving stream to not exceed 3°C. 43°C has been the temperature limit at outfall 041 and since these outfalls are the same, 43°C will be the limit. Monitoring

frequency is 1/3 Months for consistency with the other parameters monitored at these outfalls.

Dissolved Copper (Net) Dissolved Copper is to be monitored 1/3 months in ug/L. Based upon the mixing analysis results, the limit for this outfall was removed during the last permit Modification for outfall 041. A net copper value must be reported. A net value is the difference between the intake source value and the effluent concentration. The intake source is monitored because NNS is using river water as the source of cooling water aboard the Nancy Lee and then returning the water to the original source location. The 1/3 month sampling frequency is a change from the current permit.

Outfalls: 163, 165 and 167

Discharge: Deionizer Regeneration Water from the Nancy Lee Barge and Boiler Feed Water from the Nancy Lee

Outfall description: The Nancy Lee is used as a boiler and was permitted as outfalls 041/042 in the current permit. These outfalls were added per the ' modification request and represent the other areas of the shipyard where the Nancy Lee is used. Outfall 163 is located at Pier 2, 165 at Pier 3, and 167 at Pier 6. Because these outfalls are identical to outfall 042, the mix for outfall 042 is applied to these three outfalls (see email correspondence dated 11/19/08). An acute mix of 32:1 for outfall 042 was approved 6/19/07. The parameters monitored at outfall 042 will be monitored at these outfalls at the same frequency.

Monitoring Requirements:

Flow To be measured in million gallons per day (MGD) with a sampling frequency of quarterly Flow measurement is necessary for determining potential impact to a receiving stream. It is a standard parameter used universally in permits and is based on best professional judgment (BPJ).

pH Effluent pH limits are 6.0 standard units (S.U.) minimum and 9.0 S.U. maximum. This s a BPJ decision to protect water quality. Also, the Water Quality Standards (9 VAC 25-260-50) limits pH to the range of 6.0-9.0 for Coastal Waters of the State. The pH limits and monitoring frequency is 1/ 3 Months.

Temperature A common pollutant from waste steam condensate or boiler discharges is heat. Increased temperature can have a negative impact on a receiving stream. Water Quality Standards (9 VAC 25-260-60) require a restriction in the rise above natural temperature of a receiving stream to not exceed 3°C. During previous permit processing it was determined at outfall 042 that the WQS requirement could be met with a limit of 38°C. 38°C has historically been used in this permit for temperature limits. Monitoring frequency is 1/3 Months for consistency with the other parameters monitored at these outfalls.

Dissolved Copper Dissolved During the last permit term, a copper limit was needed at outfall 042. During the last permit modification (10/06), the copper limit was removed from outfall 042 due to results

Zinc	of a mixing zone study performed by NNS. Outfall 042 has an approved acute dilution ratio of 32.1 (approved 6/19/07). Monitoring for copper was required 1/3 Months at 042 to determine if limits are needed in the future to protect water quality standards. This monitoring is carried to these three outfalls that are associated with the Nancy Lee barge. Zinc monitoring frequency is the same as the other parameters measured at these outfalls. If there continues to be compliance with the WQS, the frequency of monitoring could be reduced with the next permit reissuance.

Stormwater Outfall Changes

Outfall 073: This outfall is located between drydock 10 and drydock 11. During recent source contribution studies, NGS determined that this outfall discharges to 024, therefore 073 will be removed from the permit. An email from NGS dated 7/23/09 is attached that details the change.

Outfalls 132-133, 154-157: These outfalls are located on the west side of Warwick Blvd and were permitted to drain the area around warehouses that were located between 51st and 57th Streets. Since the last permit reissuance, these warehouses that were located at these outfalls have been converted from warehousing to parking lots. These outfalls are now labeled as "not associated with industrial activity". This was confirmed by site visit on 5/27/09.

Outfalls 140, 142, 144: These outfalls are located on the west side of Warwick Blvd and drain the area around warehouses that are located between 51st and 57th Streets. The warehouse areas were inspected during on a 5/27/09 DEQ site visit. There are some materials are stored outside between the warehouses. Since these outfalls drain directly to a City of Newport News drainage ditch, it is recommended that sampling be added. Since the outfalls are substantially identical, one outfall can be used to represent the others. The previously reissued permit allowed the facility to sample either outfall 132, 133, or 134 for representative monitoring. Since outfalls 132 and 133 have been eliminated and outfall 134 has little activity, the facility will be allowed to sample 140, 142, or 144. Three outfalls were chosen due to the fact that most of the activity taking place near the warehouses is being done around these outfalls. The permittee will be required to list on the DMR which outfall was monitored. Monitoring was 1/ 6 Months but since the amount of activity has significantly decreased since the permit reissuance, monitoring will be 1/Year at these outfalls.

Outfalls 134-139, 141, 143, 145: These outfalls are located on the west side of Warwick Blvd and drain the around unmarked warehouses that are similar in storage to the outfalls listed directly above. The outfalls are located on Warwick Blvd between 63rd-69th Streets. These outfalls drain to the same City of Newport News drainage ditch as mentioned above. Since monitoring of 1 of 3 outfalls listed above will be added to the reissued permit, chemical parameter monitoring at these outfalls is not required at this time.

WQS approved dilution
90 x 77 = 6930

5/4/2009 8:21:54 AM

Facility = NGS-Outfall 003
Chemical = Zinc (d)
Chronic averaging period = 4
WLAa = 6930
WLAc =
Q.L. = 50
# samples/mo. = 1
# samples/wk. = 1

dilution approved by A.B. on 4/15/09

Summary of Statistics:

observations = 3
Expected Value = 138
Variance = 6855.84
C.V. = 0.6
97th percentile daily values = 335.811
97th percentile 4 day average = 229.603
97th percentile 30 day average= 166.435
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

Also has a metals translator of 0.93 approved by C.O. in 12/08.

No Limit is required for this material

The data are:

56.6
258 } 2007 reissuance data
99.4 2008 data point.

WQS approved dilution
9.3 x 77 = 716

5/4/2009 8:22:36 AM

Facility = NGS-Outfall 003
Chemical = Copper (d)
Chronic averaging period = 4
WLAa = 716
WLAc =
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

dilution approved by A.B. on 4/15/09

observations = 2
Expected Value = 16.05
Variance = 92.7369
C.V. = 0.6
97th percentile daily values = 39.0563
97th percentile 4 day average = 26.7038
97th percentile 30 day average= 19.3571
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

Outfall also has metals translator of 0.821 approved by Central office 12/08.

No Limit is required for this material

The data are:

24.3
7.8

Data from 2007 permit reissuance
No new data required under current permit
b/c Schedule of Compliance is in place until 10/09.

WQS

90 x 13.2 = 1188

5/4/2009 8:24:03 AM

Facility = NGS-Outfall 005
Chemical = Zinc (d)
Chronic averaging period = 4
WLAa = 1188
WLAc =
Q.L. = 50
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 11
Expected Value = 448.159
Variance = 470040.
C.V. = 1.529802
97th percentile daily values = 1934.96
97th percentile 4 day average = 1275.97
97th percentile 30 day average= 683.607
< Q.L. = 0
Model used = lognormal

Dilution approved during last permit term.

1188/0.89 = 1335 limit

A limit is needed based on Acute Toxicity
Maximum Daily Limit = 1188
Average Weekly limit = 1188
Average Monthly LImit = 1188

0.89 = metals translator approved by C.O. in 12/08.

The data are:

4240
115
293
165
282
724
107
144
144
128
141

#1

WQS approved dilution
9.3 ug/L x 10 = 93 ug/L

5/4/2009 9:27:47 AM

Facility = NGS-Outfall 019
Chemical = Copper (TR)
Chronic averaging period = 4
WLAa = 93
WLAc =
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

dilution approved by A.B. 4/15/09.

Summary of Statistics:

observations = 23
Expected Value = 16.7972
Variance = 168.908
C.V. = 0.773726
97th percentile daily values = 49.4264
97th percentile 4 day average = 31.6245
97th percentile 30 day average= 21.2605
< Q.L. = 2
Model used = delta lognormal

Also has a metals translator of 0.75 approved by C.O.

Translator not needed.

No Limit is required for this material

The data are:

15.1
23.1
8
8.1
21.5
11.6
7.5
23.2
7.1
28.6
9.6
18.5
60.5
10.8
31.6
11
11.4
7.7
0
0
8.7
7.6

Data from permit issuance 10/06 - 3/07

#2 51.3 019-Cu(TR)

data point from 10/07

WQS approved dilution
90 x 10 = 900

5/4/2009 9:29:23 AM

Facility = NGS-Outfall 019
Chemical = Zinc (d)
Chronic averaging period = 4
WLAa = 900
WLAc =
Q.L. = 50
# samples/mo. = 1
# samples/wk. = 1

Dilution approved by A.B 4/15/09.

Summary of Statistics:

observations = 10
Expected Value = 118.945
Variance = 3634.78
C.V. = 0.506865
97th percentile daily values = 260.810
97th percentile 4 day average = 184.351
97th percentile 30 day average= 139.649
< Q.L. = 0
Model used = lognormal

Outfall also has approved translator of 0.65. Not needed. No limit needed. Translator approved 12/08.

No Limit is required for this material

The data are:

67.7
51.6
98.7
98.4
115
103
169
80.2
291
114

WQS × approved dilution 100 = 9300 ug/L
9.3 ug/L

5/4/2009 11:25:57 AM

Facility = NGS-Outfall 020
Chemical = Copper (TR)
Chronic averaging period = 4
WLAa = 9300
WLAc =
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

Dilution approved 4/15/09 by A.B.

Summary of Statistics:

observations = 5
Expected Value = 17.52
Variance = 110.502
C.V. = 0.6
97th percentile daily values = 42.6334
97th percentile 4 day average = 29.1496
97th percentile 30 day average= 21.1300
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

7.6
28
23.5
7.5
21

Data collected during current permit term.

WQS approved dilution
9.3 ug/L x 10 = 93 ug/L

5/4/2009 9:42:45 AM

Facility = NNS-Outfall 026
Chemical = Copper (TR)
Chronic averaging period = 4
WLAa = 93
WLAc =
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

Dilution approved by A.B. 4/15/09.

Summary of Statistics:

observations = 20
Expected Value = 9.92375
Variance = 38.1271
C.V. = 0.622216
97th percentile daily values = 24.4721
97th percentile 4 day average = 16.1334
97th percentile 30 day average= 11.8977
< Q.L. = 4
Model used = delta lognormal

Also has a metals translator approved 12/08 of 0.45

No Limit is required for this material

The data are:

16.2
18.6
31.7
8.7
7
7.1
5.9
5.3
0
5.7
10.7
9.7
9.5
0
6.9
0
14.6
5.1
16.5
0

Data from 2007 Reissuance

Under a Schedule of Compliance, no new data.

WQS Approved dilution
9.3 ug/L X 42 = 391 ug/L

5/4/2009 11:31:00 AM

Facility = NGS-Outfall 030
Chemical = Copper (TR)
Chronic averaging period = 4
WLAa = 391
WLAc =
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

Dilution approved 4/15/09 by A.B.

Summary of Statistics:

observations = 4
Expected Value = 49.375
Variance = 877.640
C.V. = 0.6
97th percentile daily values = 120.149
97th percentile 4 day average = 82.1496
97th percentile 30 day average= 59.5488
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

22.5
78.2
69.2
27.6

Data from last permit term. All data collected after 10/31/06 and were TR Samples.

WQS approved dilution
9.3 x 10 = 93 ug/L

5/4/2009 9:51:37 AM

Facility = NGS-Outfall 037
Chemical = Copper (d)
Chronic averaging period = 4
WLAa = 93
WLAc =
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

Dilution approved ~~4/5/09~~ 2/23/09 DDA by A.B.
See email from Allan B.

Summary of Statistics:

observations = 23
Expected Value = 9.62910
Variance = 40.4809
C.V. = 0.660753
97th percentile daily values = 25.7255
97th percentile 4 day average = 16.0668
97th percentile 30 day average= 11.6631
< Q.L. = 7
Model used = delta lognormal

No Limit is required for this material

The data are:

21.9
23.4
5.5
9.4
8.3
0
9.8
32.1
0
8.5
0
9.5
0
10.9
0
14.9
7.3
5.9
0
7.8
7.8
5
0

Data from 2007 reissuance

Under schedule of compliance until 10/09.

WQS approved dilution
90 x 10 = 900 ug/L

5/4/2009 9:48:23 AM

Facility = NGS-Outfall 037
Chemical = Zinc (d)
Chronic averaging period = 4
WLAa = 900
WLAc =
Q.L. = 50
# samples/mo. = 1
# samples/wk. = 1

Dilution approved in 2/23/09 email from Allan B.

Summary of Statistics:

observations = 10
Expected Value = 92.9854
Variance = 3112.66
C.V. = 0.6
97th percentile daily values = 226.272
97th percentile 4 day average = 154.708
97th percentile 30 day average= 112.145
< Q.L. = 2
Model used = BPJ Assumptions, Type 1 data

No Limit is required for this material

The data are:

0
55.9
158
65.6
379
79.9
211
148
110
0

Data from 2007 Reissuance

from late 2007

WQS approved dilution

9.3 x 2.4 = 22.3 ug/L

7/20/2009 3:12:06 PM

Facility = NGS-Outfall 084
Chemical = Copper (d)
Chronic averaging period = 4
WLAa = 22.3
WLAc =
Q.L. = 5
# samples/mo. = 1
# samples/wk. = 1

dilution approved 4/15/09 by A.B - DEQ CO

Summary of Statistics:

Metals translator of 0.65 approved by DEQ CO in 12/08

observations = 3
Expected Value = 6.9
Variance = 17.1396
C.V. = 0.6
97th percentile daily values = 16.7905
97th percentile 4 day average = 11.4801
97th percentile 30 day average= 8.32176
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

7.3
6.7
6.7

Data collected 5/08 - 6/09

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Wednesday, March 25, 2009 2:11 PM
To: Austin,Deanna
Subject: FW: Outfall 026
Attachments: SCD Final Report 2-09.doc

Yes, it always works better if you actually follow thru with the attachment process. Got your voicemail. Its all good...Mark

---

From: Hiltke, Mark F.
Sent: Wednesday, March 25, 2009 1:50 PM
To: Deanna Austin (ddaustin@deq.virginia.gov)
Subject: Outfall 026

Deanna,

Section 3.3 of the final draft of the Contribution Source Determination Study lists non-contact cooling city water as a process discharge for a roof air handling unit. The unit was replaced years ago and now an air cooled AC unit cools the building. Only AC condensate discharges to the storm drain. Attached is a corrected copy.

By the way, should I expect a formal response from you on this final report?

Mark

Northrop Grumman, Inc.

Contribution Source Determination Plan
Final Report

VPDES Permit # VA0004804

Prepared by: Mark F. Hiltke
Submitted: February 10, 2009

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5.0 Attachments

1.0 Purpose

This final report is being submitted to the Department of Environmental Quality (DEQ) for approval as required by Part I.C.8. of permit #VA0004804.

2.0 Background

2.1 History

In 2006, DEQ performed a storm water inspection in the shipyard that resulted in concern by DEQ that crossover exists between certain outfalls. The inspection also determined certain process discharges of which the origin of flow could not be identified. In the 2006 report, DEQ writes "If the origin of the discharge is not known, it is possible that the process generating the discharge is not identified and additional discharge sources are occurring other than those in the permit." The corresponding Compliance Recommendation for Action was to "Identify all process wastewaters and discharges. Review and determine the flow patterns for both the surface runoff and subsurface pipes. Maps should be redeveloped to clearly show these patterns and discharge points." That same year, Newport News Shipbuilding and Dry Dock Company (NNS) submitted its VPDES permit renewal application. The permit became effective on October 16, 2007. As a result of the permit renewal negotiations, NNS is required, by permit, to determine all contribution sources to the following industrial outfalls: **003, 005, 009, 019, 020, 026, 030, 037, 084, 094, 112, 119** and **123.** The Contribution Source Determination (CSD) Plan was submitted to DEQ on January 31, 2008 and approved on February 22, 2008. The Semi-Annual Progress Report was submitted to DEQ on August 7, 2008 and approved on August 22, 2008.

2.2 Methodology

The outfalls listed above that require the source contribution determination have been assigned discharge limits for copper and zinc. **Attachment 1** summarizes the compliance strategy and prioritizes the completion schedule based on factors such as the metals limit concentration, compliance schedule, compliance action options and the source determination requirement. For example, outfall 030 is priority #1 because it requires Source Determination, has a low limit for copper, is on the 2 year compliance list and has limited compliance options. Outfalls 003, 026 and 019 are high on the priority list because they require Source Determination, are on the 2 year compliance list and have relatively low flow. The determination of all sources may result in the ability to eliminate these sources prior to the upcoming permit modification. NNS prefers to have the metals limits removed from the permit through source elimination. Since the timing of source determination and elimination may not fall within the permit compliance schedules, NNS is performing a Metals Translator Study and Mixing

Zone Dye Study for certain outfalls. The Metals Translator Study is complete. Field testing for the Mixing Zone Dye Study is complete

As discussed in section 3.0 of the CSD plan, accurate mapping of each outfall drainage system was required prior to determining the industrial discharge sources. **Attachment 2** describes the changes to the outfall boundaries that resulted from the mapping study portion of the plan. Since the August progress report, further investigation of the border area between 019 and 020 has resulted in significant changes to the boundary which is described in the revised attachment. As mentioned in the plan, each drop inlet (DI) has been assigned a unique number which will be shown on the new storm drain map.

Section 4.0 of this report provides a narrative response to the second set of comments from DEQ's July 18, 2008 Site Map Review. NNS will continue the Storm Drainage System Outfall Mapping Study in 2009. We intend to update the Storm Drainage System Map (#300083) in 2010.

3.0 Outfall Contribution Source Findings

Each outfall was evaluated for industrial discharge sources as described in section 4.0 of the CSD plan. The existing sources identified in the permit are discussed below, as well as all other sources determined from the study. A narrative description of the location of each source is provided as well as the DI number. The DI number will be a convenient locating tool when the new maps become available.

3.1 Outfall 030

Permit Listed Sources:
-Cooling Tower Blowdown from B550: Eliminated in 2007
-AC Condensate-Various Locations: Confirmed
-Steam Condensate-Various Locations: Confirmed

Other Sources:
-Cooling Tower Overflow from B556: City water dumps to stormdrain inlet 030(10A) during an upset condition such as a stuck float valve. Inlet located near the SE corner of B556.
-Furnace Discharge: City water kept in a small trench and is used to extinguish wooden sticks used in the foundry process. Discharges to ground inside B550.
-Unknown: An intermittent heavy flow from a 4" steel pipe inside DI 030(2D) located on the S side of B550. Lab analysis indicates the characteristics of city water. Working with Facilities to locate the source and eliminate.
-Ogontz valves: Various locations from city water main N side of B501 and 502

3.2 Outfall 003

Permit Listed Sources:
-AC Condensate from B93 and 94: Confirmed
-Steam Condensate from various buildings: Confirmed

Other Sources:
-AC Condensate from B17: SE corner into concrete trench.
-Utility Tunnel Sump Pump: Into DI 003(2), first inlet E of outfall.
-Hill Drainage: Steady flow into DI 003(7) located at the base of the hill W of B6. Lab analysis indicates the characteristics of ground water.
-Ice Machine Condensate: NE corner of B17, slow drip into concrete trench.
-Ogontz Valve: Hose discharge into DI trench 003(4C).

3.3 Outfall 026

Permit Listed Sources:
-Steam Condensate from various buildings: Confirmed.
-AC Condensate from various buildings: Confirmed.

Other Sources:
-Utility Tunnel Sump Pumps: 2 locations, 1 into DI 26(38H) W of ship shed 5. The other into DI 026(42) W of B1841.
-Drinking Fountain: Discharges to DI 026(47), NW corner of B284.

3.4 Outfall 019

Permit Listed Sources:
-Steam Condensate from various buildings: Confirmed
-AC Condensate from various buildings: Confirmed

Other Sources:
-Tunnel Sump Pump: Discharges to 019(16), located at the SE corner of B361.
-De-ionized Test Water: Discharges to 019(25D) located on the S side of B161. DI water is used to rinse and pressure test clean nuclear components. Small intermittent flow.

3.5 Outfall 037

Permit Listed Sources:
-Steam Condensate: Confirmed
-Ogontz Valve Discharges: Confirmed
-AC Condensate: Not contributing. Will be removed from permit.

Other Sources:
-Ground Water Relief: Water exerting pressure on the walls of the drydock is discharged to maintain structural integrity. This is listed on the Form 2C and represents 70% of the outfall discharge.

3.6 Outfall 020

Permit Listed Sources:
-AC Condensate: Confirmed
-Steam Condensate: Confirmed

Other Sources:
-Ogontz Valve Discharge: From trailer NW of B160

3.7 Outfall 009

Permit Listed Sources:
-Steam Condensate from B60: Eliminated

Other Sources:
-Steam Condensate Pump Overflow: Discharges to DI 009(8A) located on the E side of B21. Only discharges during upset condition when condensate pump is not operating properly.
-Tunnel Sump Pump: Discharges accumulated stormwater to DI 009(2) located just E of the outfall.

3.8 Outfall 005

Permit Listed Sources:
-Fire Protection System Drainage: Confirmed
-Air Conditioning Cooling Water: Unit has been replaced. Will be removed from permit.
-AC Condensate: Confirmed
-Steam Condensate: Confirmed
-Hydrostatic Test Water: This is actually non-contact cooling water for the heat exchanger of a hydraulic test stand machine. 7-10 GPM when operating. Apparently misinterpreted during the previous permit application
-Meter Calibration Water: Confirmed

Other Sources:
-None

3.9 Outfall 084

Permit Listed Sources:
-Noncontact Cooling Water from Compressors: Eliminated
-AC Condensate: Confirmed

Other Sources:

-Tunnel Sump Pump: 2 each; 1 discharges into DI 084(11B) located near the SE corner of B227. The other discharges into DI 084(19) located W of B276.
-Steam Condensate: Discharges to ground on the W side of B4601.

3.10 Outfall 094

Permit Listed Sources:
-Cooling Water from Compressors: Eliminated
-AC Condensate: Confirmed
-Cooling Tower Blowdown: Confirmed. Scheduled to be routed to HRSD in order to achieve Metals Limits Compliance.

Other Sources:
-Steam Condensate: Discharges to ground near DI 094(7E) located on the S side of B4730
-Air Compressor Condensate: Discharges into DI 094(9B) located on the N side of B4730
-Ogontz Valve Discharge: Discharges into DI 094(15C) located on the N side of B276.
-Drinking Fountain Discharge: Drain hose to DI094(3D) located at the NW corner of B4886.

3.11 Outfall 112

Permit Listed Sources:
-Cooling Water from Air Compressors: Eliminated
-AC Condensate: Confirmed

Other Sources:
-Hill Drainage: Enters the system from the east between 51st and 54th St.
-Steam Condensate: Discharges to DI 112(49) N of B274

3.12 Outfall 119

Permit Listed Sources:
-Cooling Water from Air Compressors: Eliminated

Other Sources:
-AC Condensate: Various locations

3.13 Outfall 123

Permit Listed Sources:
- Cooling Water from Air Compressors: Eliminated
-AC Condensate: Confirmed

Other Sources:
-None

4.0 Site Map Review Response-Second Set of Comments

Each outfall will be addressed in the same order as the July 18, 2008 letter. As mentioned in section 2.2, the Storm Drainage System Map (300083) is scheduled to be updated in 2010.

4.1 Outfall 123

The mapping study changed the outfall boundary and eliminated the crossover into outfall 112. The direction of flow will be shown on the new map. SP used to be for the boiler discharge from B1744. It has been eliminated from the permit and will be removed from the revised map.

4.2 Outfall 112

The mapping study changed the outfall boundary and eliminated the crossover near the electrical switchyard. The 15" line near the welding school flows west, then north into the main trunk. The mapping study determined that the 18" RCP does not cross over into outfall 094 near the steel production facility. Also, the crossover from outfall 094 near B1865 does not exist. The new map will be revised accordingly. The catch basin near B1796 flows north, towards the main trunk. The mapping study did not find the DI near B355.

4.3 Outfall 094

The crossover into outfall 084 near B1761 flows south as the 094 side is approximately 2' higher in elevation. Based on the configuration, it appears that flow could only occur in extreme storm conditions. The 24" RCP near the steel plate storage flows north, towards the main trunk. The SP shown on the north side of B276 is for the cooling tower discharge. This discharge will be routed to HRSD and the SP will be removed from the map. The 66" RCP near the tunnel flows south into the main trunk, then west to the river. Boundary changes based on the mapping study eliminated the crossover into outfall 112 near the steel storage area.

4.4 Outfall 026

The mapping study changed the boundary thus eliminating the 6" PVC crossover into outfall 112 and the 8" DIP crossover into outfall 023. The flow direction for the line south of B4777 is west, then south into the main trunk. The 12" line on the north side of drydock 11 flows west, then north into the main trunk. The mapping study has confirmed all DI's on the north side of drydock 11 within outfall 026.

4.5 Outfall 020 and 019

Extensive changes to the boundaries were made as a result of the mapping study. Attachment 2 addresses most of the comments in the letter. The revised map will address the remaining comments.

4.6 Outfall 030

The pipe that crosses over into outfall 126 does not connect to outfall 030.

4.7 Outfall 009

The crossovers into outfall 006 and 015 are still being studied. Once the connections are confirmed, the map will be updated accordingly.

4.8 Outfall 005 and 003

Based on the mapping study, significant boundary changes were made on both outfalls to eliminate the crossovers.

5.0 Attachments

NORTHROP GRUMMAN

Northrop Grumman Corporation
Shipbuilding

4101 Washington Avenue
Newport News, VA 23607
Telephone 757-380-2000

1000 Access Road
Pascagoula, MS 39567
Telephone 228-935-1122

RECEIVED – DEQ
FEB 11 2009
Tidewater Regional Office

February 10, 2009

Ms. Deanna Dodson Austin
Environmental Engineer Senior
Tidewater regional Office
Virginia Department of Environmental Quality
5636 Southern Boulevard
Virginia Beach, VA 23462

CERTIFIED MAIL: 7006 0810 0002 4014 6362

Subject: VPDES permit No. VA0004804 Contribution Source Determination Plan-Final Report

Dear Ms. Austin:

Enclosed is the Northrop Grumman Inc. Contribution Source Determination Plan final report. This report is being submitted to DEQ as required by Part I.C.8. of permit No. VA0004804.

If you have any questions, please feel free to contact me.

Sincerely,

Mark F. Hiltke
Environmental Engineer 3

Enclosure

cc. Read file (w/o enclosure)
File

RECEIVED – DEQ
FEB 11 2009
Tidewater Regional Office

Northrop Grumman, Inc.

Contribution Source Determination Plan
Final Report

VPDES Permit # VA0004804

Prepared by: Mark F. Hiltke
Submitted: February 10, 2009

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4.0 Response to the second set of comments in the DEQ July 18, 2008 Site Map Review letter

4.1 Outfall 123

4.2 Outfall 112

4.3 Outfall 094

4.4 Outfall 026

4.5 Outfall 020 and 019

4.6 Outfall 030

4.7 Outfall 009

4.8 Outfall 005 and 003

5.0 Attachments

1.0 Purpose

This final report is being submitted to the Department of Environmental Quality (DEQ) for approval as required by Part I.C.8. of permit #VA0004804.

2.0 Background

2.1 History

In 2006, DEQ performed a storm water inspection in the shipyard that resulted in concern by DEQ that crossover exists between certain outfalls. The inspection also determined certain process discharges of which the origin of flow could not be identified. In the 2006 report, DEQ writes "If the origin of the discharge is not known, it is possible that the process generating the discharge is not identified and additional discharge sources are occurring other than those in the permit." The corresponding Compliance Recommendation for Action was to "Identify all process wastewaters and discharges. Review and determine the flow patterns for both the surface runoff and subsurface pipes. Maps should be redeveloped to clearly show these patterns and discharge points." That same year, Newport News Shipbuilding and Dry Dock Company (NNS) submitted its VPDES permit renewal application. The permit became effective on October 16, 2007. As a result of the permit renewal negotiations, NNS is required, by permit, to determine all contribution sources to the following industrial outfalls: **003, 005, 009, 019, 020, 026, 030, 037, 084, 094, 112, 119** and **123.** The Contribution Source Determination (CSD) Plan was submitted to DEQ on January 31, 2008 and approved on February 22, 2008. The Semi-Annual Progress Report was submitted to DEQ on August 7, 2008 and approved on August 22, 2008.

2.2 Methodology

The outfalls listed above that require the source contribution determination have been assigned discharge limits for copper and zinc. **Attachment 1** summarizes the compliance strategy and prioritizes the completion schedule based on factors such as the metals limit concentration, compliance schedule, compliance action options and the source determination requirement. For example, outfall 030 is priority #1 because it requires Source Determination, has a low limit for copper, is on the 2 year compliance list and has limited compliance options. Outfalls 003, 026 and 019 are high on the priority list because they require Source Determination, are on the 2 year compliance list and have relatively low flow. The determination of all sources may result in the ability to eliminate these sources prior to the upcoming permit modification. NNS prefers to have the metals limits removed from the permit through source elimination. Since the timing of source determination and elimination may not fall within the permit compliance schedules, NNS is performing a Metals Translator Study and Mixing

Zone Dye Study for certain outfalls. The Metals Translator Study is complete. Field testing for the Mixing Zone Dye Study is complete

As discussed in section 3.0 of the CSD plan, accurate mapping of each outfall drainage system was required prior to determining the industrial discharge sources. **Attachment 2** describes the changes to the outfall boundaries that resulted from the mapping study portion of the plan. Since the August progress report, further investigation of the border area between 019 and 020 has resulted in significant changes to the boundary which is described in the revised attachment. As mentioned in the plan, each drop inlet (DI) has been assigned a unique number which will be shown on the new storm drain map.

Section 4.0 of this report provides a narrative response to the second set of comments from DEQ's July 18, 2008 Site Map Review. NNS will continue the Storm Drainage System Outfall Mapping Study in 2009. We intend to update the Storm Drainage System Map (#300083) in 2010.

3.0 Outfall Contribution Source Findings

Each outfall was evaluated for industrial discharge sources as described in section 4.0 of the CSD plan. The existing sources identified in the permit are discussed below, as well as all other sources determined from the study. A narrative description of the location of each source is provided as well as the DI number. The DI number will be a convenient locating tool when the new maps become available.

3.1 Outfall 030

Permit Listed Sources:
-Cooling Tower Blowdown from B550: Eliminated in 2007
-AC Condensate-Various Locations: Confirmed
-Steam Condensate-Various Locations: Confirmed

Other Sources:
-Cooling Tower Overflow from B556: City water dumps to stormdrain inlet 030(10A) during an upset condition such as a stuck float valve. Inlet located near the SE corner of B556.
-Furnace Discharge: City water kept in a small trench and is used to extinguish wooden sticks used in the foundry process. Discharges to ground inside B550.
-Unknown: An intermittent heavy flow from a 4" steel pipe inside DI 030(2D) located on the S side of B550. Lab analysis indicates the characteristics of city water. Working with Facilities to locate the source and eliminate.
-Ogontz valves: Various locations from city water main N side of B501 and 502

3.2 Outfall 003

Permit Listed Sources:
-AC Condensate from B93 and 94: Confirmed
-Steam Condensate from various buildings: Confirmed

Other Sources:
-AC Condensate from B17: SE corner into concrete trench.
-Utility Tunnel Sump Pump: Into DI 003(2), first inlet E of outfall.
-Hill Drainage: Steady flow into DI 003(7) located at the base of the hill W of B6. Lab analysis indicates the characteristics of ground water.
-Ice Machine Condensate: NE corner of B17, slow drip into concrete trench.
-Ogontz Valve: Hose discharge into DI trench 003(4C).

3.3 Outfall 026

Permit Listed Sources:
-Steam Condensate from various buildings: Confirmed.
-AC Condensate from various buildings: Confirmed.

Other Sources:
-Utility Tunnel Sump Pumps: 2 locations, 1 into DI 26(38H) W of ship shed 5. The other into DI 026(42) W of B1841.
-Roof Air Handling Unit: Non-contact city water discharges to DI 026(47), NW corner of B284.
-Drinking Fountain: Discharges to DI 026(47), NW corner of B284.

3.4 Outfall 019

Permit Listed Sources:
-Steam Condensate from various buildings: Confirmed
-AC Condensate from various buildings: Confirmed

Other Sources:
-Tunnel Sump Pump: Discharges to 019(16), located at the SE corner of B361.
-De-ionized Test Water: Discharges to 019(25D) located on the S side of B161. DI water is used to rinse and pressure test clean nuclear components. Small intermittent flow.

3.5 Outfall 037

Permit Listed Sources:
-Steam Condensate: Confirmed
-Ogontz Valve Discharges: Confirmed
-AC Condensate: Not contributing. Will be removed from permit.

Other Sources:

-Ground Water Relief: Water exerting pressure on the walls of the drydock is discharged to maintain structural integrity. This is listed on the Form 2C and represents 70% of the outfall discharge.

3.6 Outfall 020

Permit Listed Sources:
-AC Condensate: Confirmed
-Steam Condensate: Confirmed

Other Sources:
-Ogontz Valve Discharge: From trailer NW of B160

3.7 Outfall 009

Permit Listed Sources:
-Steam Condensate from B60: Eliminated

Other Sources:
-Steam Condensate Pump Overflow: Discharges to DI 009(8A) located on the E side of B21. Only discharges during upset condition when condensate pump is not operating properly.
-Tunnel Sump Pump: Discharges accumulated stormwater to DI 009(2) located just E of the outfall.

3.8 Outfall 005

Permit Listed Sources:
-Fire Protection System Drainage: Confirmed
-Air Conditioning Cooling Water: Unit has been replaced. Will be removed from permit.
-AC Condensate: Confirmed
-Steam Condensate: Confirmed
-Hydrostatic Test Water: This is actually non-contact cooling water for the heat exchanger of a hydraulic test stand machine. 7-10 GPM when operating. Apparently misinterpreted during the previous permit application
-Meter Calibration Water: Confirmed

Other Sources:
-None

3.9 Outfall 084

Permit Listed Sources:
-Noncontact Cooling Water from Compressors: Eliminated
-AC Condensate: Confirmed

Other Sources:
-Tunnel Sump Pump: 2 each; 1 discharges into DI 084(11B) located near the SE corner of B227. The other discharges into DI 084(19) located W of B276.
-Steam Condensate: Discharges to ground on the W side of B4601.

3.10 Outfall 094

Permit Listed Sources:
-Cooling Water from Compressors: Eliminated
-AC Condensate: Confirmed
-Cooling Tower Blowdown: Confirmed. Scheduled to be routed to HRSD in order to achieve Metals Limits Compliance.

Other Sources:
-Steam Condensate: Discharges to ground near DI 094(7E) located on the S side of B4730
-Air Compressor Condensate: Discharges into DI 094(9B) located on the N side of B4730
-Ogontz Valve Discharge: Discharges into DI 094(15C) located on the N side of B276.
-Drinking Fountain Discharge: Drain hose to DI094(3D) located at the NW corner of B4886.

3.11 Outfall 112

Permit Listed Sources:
-Cooling Water from Air Compressors: Eliminated
-AC Condensate: Confirmed

Other Sources:
-Hill Drainage: Enters the system from the east between 51st and 54th St.
-Steam Condensate: Discharges to DI 112(49) N of B274

3.12 Outfall 119

Permit Listed Sources:
-Cooling Water from Air Compressors: Eliminated

Other Sources:
-AC Condensate: Various locations

3.13 Outfall 123

Permit Listed Sources:
- Cooling Water from Air Compressors: Eliminated

-AC Condensate: Confirmed

Other Sources:
-None

4.0 Site Map Review Response-Second Set of Comments

Each outfall will be addressed in the same order as the July 18, 2008 letter. As mentioned in section 2.2, the Storm Drainage System Map (300083) is scheduled to be updated in 2010.

4.1 Outfall 123

The mapping study changed the outfall boundary and eliminated the crossover into outfall 112. The direction of flow will be shown on the new map. SP used to be for the boiler discharge from B1744. It has been eliminated from the permit and will be removed from the revised map.

4.2 Outfall 112

The mapping study changed the outfall boundary and eliminated the crossover near the electrical switchyard. The 15" line near the welding school flows west, then north into the main trunk. The mapping study determined that the 18" RCP does not cross over into outfall 094 near the steel production facility. Also, the crossover from outfall 094 near B1865 does not exist. The new map will be revised accordingly. The catch basin near B1796 flows north, towards the main trunk. The mapping study did not find the DI near B355.

4.3 Outfall 094

The crossover into outfall 084 near B1761 flows south as the 094 side is approximately 2' higher in elevation. Based on the configuration, it appears that flow could only occur in extreme storm conditions. The 24" RCP near the steel plate storage flows north, towards the main trunk. The SP shown on the north side of B276 is for the cooling tower discharge. This discharge will be routed to HRSD and the SP will be removed from the map. The 66" RCP near the tunnel flows south into the main trunk, then west to the river. Boundary changes based on the mapping study eliminated the crossover into outfall 112 near the steel storage area.

4.4 Outfall 026

The mapping study changed the boundary thus eliminating the 6" PVC crossover into outfall 112 and the 8" DIP crossover into outfall 023. The flow direction for the line south of B4777 is west, then south into the main trunk. The 12" line on the north side of drydock 11 flows west, then north into the main trunk. The mapping study has confirmed all DI's on the north side of drydock 11 within outfall 026.

4.5 Outfall 020 and 019

Extensive changes to the boundaries were made as a result of the mapping study. Attachment 2 addresses most of the comments in the letter. The revised map will address the remaining comments.

4.6 Outfall 030

The pipe that crosses over into outfall 126 does not connect to outfall 030.

4.7 Outfall 009

The crossovers into outfall 006 and 015 are still being studied. Once the connections are confirmed, the map will be updated accordingly.

4.8 Outfall 005 and 003

Based on the mapping study, significant boundary changes were made on both outfalls to eliminate the crossovers.

5.0 Attachments

NNS 2008-9 VPDES Updated Outfall Compliance Summary				
Outfall	**Cu Limit**	**Zn Limit**	**Priority**	**Compliance Action**
030	19 ug/L After MT new limit: 30 ug/L	none	#1-2 year compliance schedule	• Source Contribution Study complete. • Metals Translator: Cu TF=0.64 Zn TF=0.86 • Mixing Zone not an option. • Plan to route industrial discharge to HRSD
003	16 ug/L After MT new limit: 19.5 ug/L	153 ug/L After MT new limit: 165 ug/L	#2-2 year compliance schedule	• Source Contribution Study complete • Metals Translator: Cu TF=0.82 Zn TF=0.93 • Mixing Zone Dye Study field testing complete. Report pending
026	24 ug/L After MT new limit: 53 ug/L	none	#3-2 year compliance schedule	• Source Contribution Study complete • Metals Translator: Cu TF=0.45 Zn TF=0.63 • Previous Mixing Zone Study dilution ratio of 2.6 was achieved. • Mixing Zone Dye Study field testing complete Report pending
019	30 ug/L After MT new limit: 40 ug/L	288 ug/L After MT new limit: 443 ug/L	#4-2 year compliance schedule	• Source Contribution Study complete • Metals Translator: Cu TF= 0.75 Zn TF=0.65 • Previous Mixing Zone dilution ratio of 3.2 achieved. • Mixing Zone Dye Study field testing complete. Report pending
037	21 ug/L	207 ug/L	#5-2 year compliance schedule	• Source Contribution Study complete • Discontinued from Metals Translator Study • Previous Mixing Zone dilution ratio of 2.3 achieved • Intend to lower pipe at least 1.5 ft. below surface to achieve adequete dilution as

				recommended by previous Mixing Zone Study • Investigate if VIMS dye study could be used here.
020	87 ug/L	none	#6	• Source Contribution Study complete • Previous mixing zone dilution ratio of 14.8 achieved. • Metals Translator Study discontinued-no flow • This is an existing limit and we are subject to it 1st Q 2008 • Low/intermittant flow. • Mixing Zone Dye Study field testing complete. Report pending.
009	30 ug/L	450 ug/L	#7	• Source Contribution Study complete • Previous Mixing Zone dilution ratio of 5.0 achieved. • Recent repairs have eliminated all process discharges.
005	none	1188 ug/L After MT: new limit 1335 ug/L	#8	• Source Contribution Study complete • Metals Translator: Cu TF=0.65 Zn TF=0.89 • Previous Mixing Zone dilution ratio of 13.2 achieved.
049	19 ug/L	180 ug/L	#8-A	• Rheostat discharge @ OB-1. • Compliance required by 10/16/11 • Will not be in use until 2013 at the earliest • Intend to Cormix Model using existing data and submit during the next permit renewal in 2012.
084	19 After MT: new limit 29 ug/L	none	#9	• Source Contribution Study complete • Metals Translator: Cu TF=0.65 Zn TF=0.58 • Mixing Zone Dye Study field testing complete. Report

				pending
094	none	180	#10	• Source Contribution Study complete • Cooling tower discharge from B276 to be routed to HRSD • No flow observed other than the cooling tower discharge
112	none	180	#11	• Source Contribution Study complete • After-cooler discharge eliminated • No flow observed
119	19	180	#12	• Source Contribution Study complete • After-cooler discharge eliminated. • No flow observed
123	19	180	#13	• Source Contribution study in progress • After-cooler discharge eliminated. • No flow observed
011	144	none	NA	• Previous Mixing Zone dilution ratio of 15.5 achieved. • No flow reported each Quarter 2007. All discharges reportedly routed to HRSD. Once confirmed, request elimination from chemical monitoring during the permit mod.
008	34	none	NA	• All process discharges have been eliminated. Visually monitor. • Request elimination from chemical monitoring during permit mod. • Incorporate into outfall 064 during permit mod
045	none	180	NA	• Outfall is for rheostat operation @ pier 2. • Current plan is to eliminate this outfall during the 2012 permit renewal

056	19	180	NA	• Dynomometer testing has been eliminated @ B67. • Pump testing discharge routed to HRSD. • Remove from permit.

Northrop Grumman Shipbuilding-Newport News
VPDES Permit # VA0004804
2008 Contribution Source Determination Study
Narrative Description of Outfall Boundary Changes

Outfall 003

This outfall now encompasses the perimeter of building 17. Also, at the northwest corner, the outline was modified to encompass a drainage trench near the border of outfall 058. At the northeast corner of building 6, surface observation has determined that storm water drains east which creates a finger-like extension of outfall 005 into outfall 003. The existing sample point location has been evaluated and determined to be representative of the outfall drainage pattern.

Outfall 005

The previous map shows the area surrounding B75 as connected within outfall 062. The investigation has revealed that the drop inlet at the southwest corner of building 75 is connected to the main trunk of 005. Surface observation of storm water has determined flow to the south; therefore the 005 boundary has been relocated to incorporate the area surrounding building 75. Portions of the southern border have been relocated to the north side of B17, then splits to the south through the middle of B4678. The sample point has been determined to be the last accessible drop inlet not subject to tidal influence. This will be re-evaluated prior to the permit modification request.

Outfall 009

A slight modification to the outfall boundary was made at the east end of B4633 based on the direction of flow of surface storm water. The existing sample point has been evaluated and determined to be representative of the outfall drainage pattern.

Outfall 019

The outfall drainage boundary was altered to account for drainage repairs at the northeast corner of DD#3 (outfall 017). The area was flooding the utility tunnel, so new storm drains were created to direct the flow to DD#3. Essentially, 017 has been extended northeast from DD#3 into 019. The sample point has been moved 1 drop inlet to the west so that any flow from a 10" DIP entering the structure from the north can be included. The outfall was also extended north and northeast into 020 as the mapping study determined that the drain system on the south and east sides of B161 normally flow to 019. Also, a crossover connection into 020 was found under the southwest corner of B161. The crossover pipe is higher in elevation, so normal flow is to 019.

Outfall 020

As described above, a large portion of the south side of 020 was incorporated into 019. A cross connection between 020 and 021 has been discovered within the #3 unit gas tank farm located north of B186. Observations indicate that this connection remains dry as storm water flow tends to remain within each outfall. Just north of the gas tank farm, 3 storm manholes are located within the 021 drainage boundary, but they are minimally influenced by storm water within 021 as the flow tends to the northeast into 021 drop inlets. This area will be further studied during the upcoming mapping study for 021. The existing sample point is the last accessible drop inlet not subject to tidal influence at normal low tide and has been determined to be representative of the outfall drainage pattern.

Outfall 026

The investigation has revealed that storm water flows south in the area north of B4777, so the border of 026 was extended north to account for this. The area on the south side of 4777 was extended north to incorporate the new drop inlets there. At the northeast corner of the outfall area, the border was curved to account for surface storm water flow that was determined by visual observation.

Outfall 030

The outfall boundaries for 030 did not change after the investigation. The sample point is the last drop inlet on shipyard property and is the appropriate location for sampling. An exhaustive investigation was performed at this outfall which included camera surveillance of the entire piping system. A city water leak was discovered and is believed to be the primary contributing source of flow at this outfall.

Outfall 084

A slight modification was made to the south boundary around the area of B4777. The northwest corner of the area displays what has been determined to be an overflow pipe from outfall 094. The sample point is the last accessible drop inlet not subject to tidal influence at normal low tide and has been determined to be representative of the outfall drainage pattern.

Outfall 094

The southeast corner of the drainage area displays the change as described for outfall 026 above. A crossover connection to outfall 084 is located at the southwest corner. This has been determined to be an overflow pipe to 084. The sample point is the last accessible drop inlet not subject to tidal influence and has been determined to be representative of the outfall drainage pattern.

Outfall 112

The outfall drainage pattern did not change during this study, except for the noted change at the border with 026. The sample point is the last accessible drop inlet.

Outfall 119

No changes were made to this outfall as all structure connections were confirmed as shown on the existing storm drain map. Storm water samples are taken as a composite from 3 locations within the outfall because the entire drainage area is tidal during low tide.

Outfall 123

The entire area appears to be tidally influenced at all times. No changes were made to the drainage patterns.

NORTHROP GRUMMAN

Northrop Grumman Corporation
Shipbuilding

4101 Washington Avenue
Newport News, VA 23607
Telephone 757-380-2000

1000 Access Road
Pascagoula, MS 39567
Telephone 228-935-1122

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MAY 15 2009
Tidewater Regional Office

May 14, 2009

Ms. Deanna Dodson Austin
Environmental Engineer Senior
Tidewater regional Office
Virginia Department of Environmental Quality
5636 Southern Boulevard
Virginia Beach, VA 23462

CERTIFIED MAIL: 7006 0810 0002 4014 6447

Subject: VPDES permit No. VA0004804: No Phosphorous in Dry Dock Discharges

Dear Ms. Austin:

Northrop Grumman Shipbuilding, Inc.-Newport News (NGSB) has six permitted dry dock outfalls that discharge process wastewater to the James River. None of the process wastewaters contain phosphorous or phosphorous bearing compounds. As stated in the permit modification request, NGSB respectfully requests that phosphorous testing be removed from the chemical monitoring requirements for these outfalls.

If you have any questions, please feel free to contact me.

Sincerely,

Mark F. Hiltke
Environmental Engineer 3

Enclosure

cc. Read file

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Monday, June 22, 2009 2:09 PM
To: Austin,Deanna
Subject: Outfalls 112, 038 and 094

Deanna,

Here are the answers to your questions:

Outfall 112: There are no industrial process AC discharges from B1745. Only office cooling. Please remove air conditioning condensate from the permit

Outfall 038: There are no industrial process AC discharges within this outfall. Please remove air conditioning condensate from the permit.

Outfall 094: The cooling tower discharge from B276 is scheduled to be routed to HRSD before 7-13-09.

Call w/ any questions...Mark

M.F. Hiltke
O27 / EE
4-4067

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Monday, June 01, 2009 8:58 AM
To: Austin,Deanna
Subject: RE: River cooling discharges to outfalls 015 and 112

Inside the powerhouse, which is located in outfall 015, are four high pressure air compressors that generate 5000 psi air that is used to perform work throughout the shipyard. Generating this much pressure creates a lot of heat, which has been causing problems with the air supply. To fix, a heater exchanger is being installed at each compressor that will use river water to cool the high pressure air. The water and air are on different sides of the heat exchanger, so no contact is made. Each cooling system has a max flow rate of 35 gpm; so if they are all running at the same time the max discharge rate is 140 gpm. The discharge temperature of the river cooling water will be betwwen 95-110 deg F. The discharge location will be drop inlet 015(4a) located at the northeast corner of the powerhouse.

An identical system is being designed for the 4 compressors located at B1812. The discharge location is 112(3) on the south side of the building.

Let me know if this is good or if you need more...Mark

M.F. Hiltke
027 / EE
4-4067

From: Austin,Deanna [mailto:Deanna.Austin@deq.virginia.gov]
Sent: Monday, June 01, 2009 8:02 AM
To: Hiltke, Mark F.
Subject: River cooling discharges to outfalls 015 and 112

Mark,
Can you please send me an email documenting the addition of these discharges to these outfalls and provide a little bit of explanation about the discharge, like the uses of the cooling water, non-contact info, etc.
Thanks!

Deanna Austin
DEQ-TRO Water Permits
5636 Southern Blvd
Virginia Beach, VA 23462
Phone: 757-518-2008
Fax: 757-518-2009

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Friday, July 10, 2009 8:14 AM
To: Austin,Deanna
Cc: Thorn, Frank (Newport News)
Subject: Outfall 094 Cooling Tower Discharge

Deanna-

The cooling tower blowdown that used to be discharged to the storm drain on the north side of B276 has been routed to HRSD. As requested in the permit mod letter, please remove from outfall 094. Call w/ any questions...Mark

M.F. Hiltke
EE / O27
4-4067

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Tuesday, May 26, 2009 9:50 AM
To: Austin,Deanna
Subject: FW: Trim Cooler Discharges

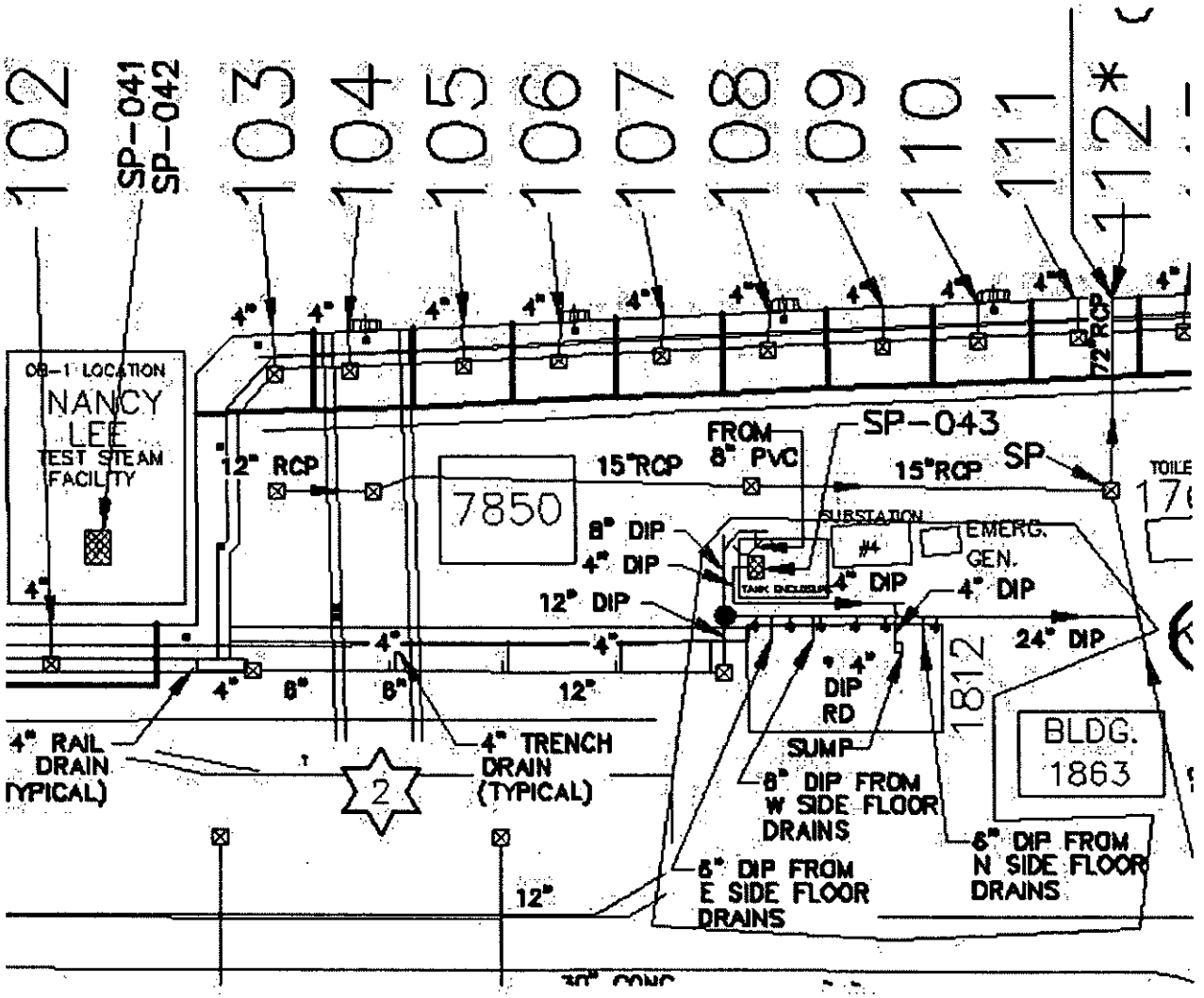
Deanna,

See below for detailed information regarding the non-contact cooling river water discharges. I've identified the drop inlet for the outfall 015(powerhouse) discharge as 015 (4a) and the outfall 112 drop inlet as 112(3). Please add these discharges to each outfall in the modified permit.

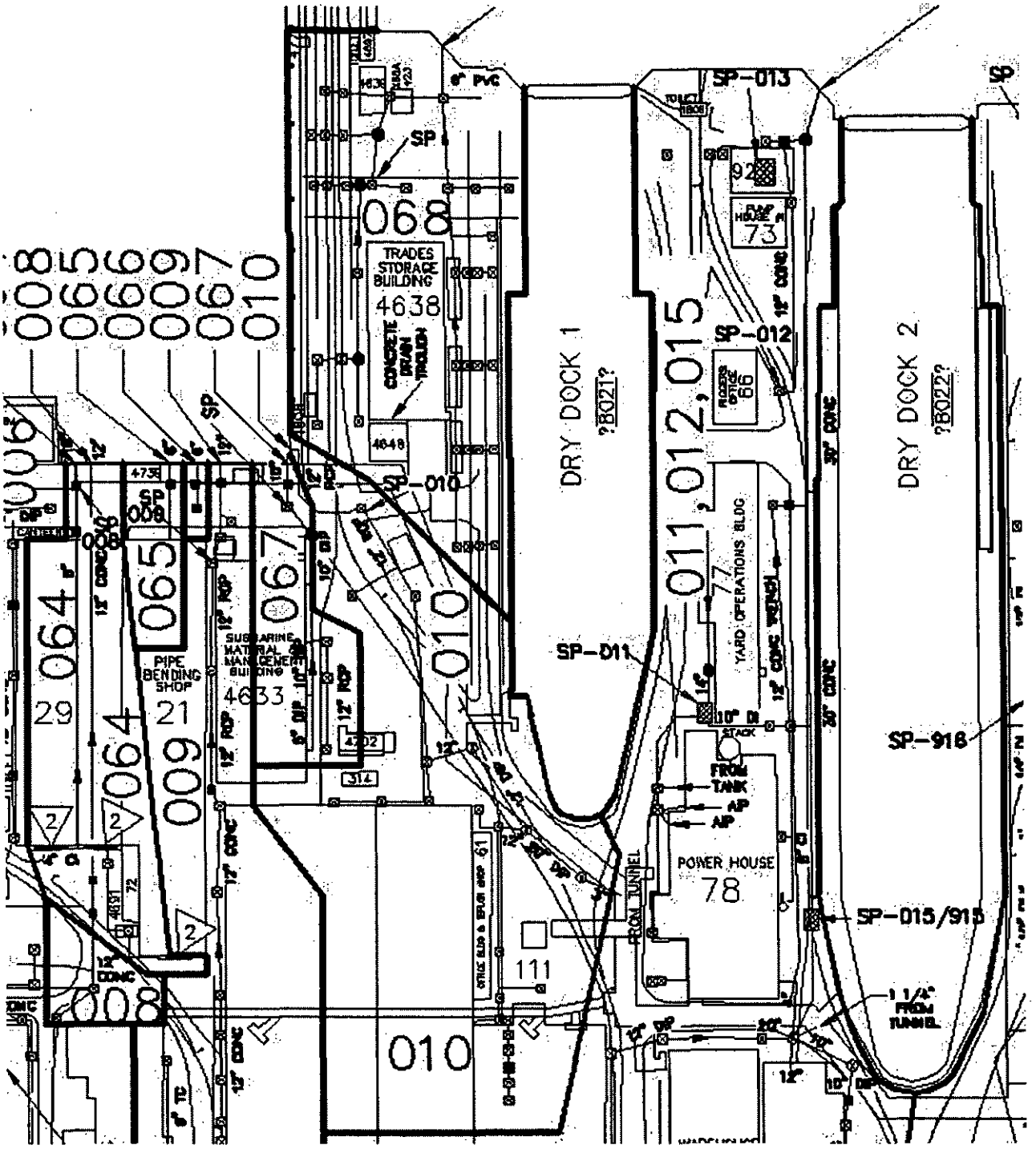
M.F. Hiltke
O27 / EE
534-4067

From: Burleson, Andy
Sent: Thursday, May 21, 2009 3:53 PM
To: Hiltke, Mark F.
Subject: Trim Cooler Discharges

The four trim coolers at B-1812 will use River Water as the cooling medium. Each cooler will use 35 gpm each, for a maximum flowrate of 140 gpm if all coolers are working at the same time. Typically, two will be running at the same time for a total of eight hours per day. These coolers will only be operational from May to October. They will discharge to the inlet immediately south of B-1812, which is tied to outfall 112 according to the map below (300083):



The four coolers at B-78 will have the same flow characteristics and will discharge to the inlet on the northeast corner of B-78 and ultimately to outfall 015.



Regards,
Andy Burleson, PE
Maintenance Engineering
Northrop Grumman Shipbuilding
Newport News, VA
757 534 0918

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Thursday, July 30, 2009 10:38 AM
To: Austin,Deanna
Subject: Outfall 112

Deanna-

As we discussed this morning, please add Air Conditioning Condensate to outfall 112. Thanks...Mark

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Thursday, June 04, 2009 2:28 PM
To: Austin,Deanna
Subject: Outfalls 019, 123 and 112

Deanna,

As we discussed on the phone, please remove AC condensate as a contributing industrial discharge for outfalls 019 and 123. Also, a sample of the steam condensate from outfall 112 resulted in < 50 ug/L Dissolved Zinc. I will submit a copy of the report with May's DMR

M.F. Hiltke
NGSB Environmental Engineer 3
534-4067

Zn sample taken
on 5/27/09 @ 10:31 AM.
DOA
6/22/09

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Thursday, June 18, 2009 11:55 AM
To: Austin,Deanna
Subject: Outfall 042

Deanna-

To document our discussion this morning:

Outfall 042 has 2 constituients that make up the discharge:

1) Deionizer Regeneration Water: Water that is generated when flushing or "regenerating" the resin beds in the deionizer

2) Boiler Feed Water: Out of spec DI water which cannot be turned into steam

As shown in the mod, the outfall 042 corresponding outfall numbers for Nancy Lee are 163(pier 2), 165(pier 3) and 167(pier 6)

M.F. Hiltke
NGSB Environmental Engineer 3
534-4067

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Friday, June 05, 2009 11:07 AM
To: Austin,Deanna
Subject: FW: Outfall 084

I think I gave this info verbally, but the May 1, 2008 sample for dissolved copper is 7.3 ug/l. I will scan the report and include in the May DMR...Mark

---

From: Hiltke, Mark F.
Sent: Monday, June 01, 2009 2:23 PM
To: Austin,Deanna
Subject: Outfall 084

Deanna,

I just conducted an extensive investigation throughout the grounds of outfall 084. A small steam condensate drip was located on the north side of B4777 and appeared to be evaporating on the concrete. No industrial AC condensate discharges were observed from B4777 or B232, so please remove from permit. I can safely say that the utility tunnel sump pump discharges constitute greater than or equal to 99% of the flow observed at the outfall 084 sample point.

M.F. Hiltke
NGSB Environmental Engineer 3
534-4067

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Tuesday, April 14, 2009 2:02 PM
To: Austin,Deanna
Subject: Outfall 084

Deanna-

Here is the sample info we just spoke about for outfall 084:

Lab #: 100042837
Sample date: 6/19/08
Total Recoverable Copper: **6.7 ug/L**

M.F. Hiltke
O27 / EE
534-4067

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Thursday, June 18, 2009 9:18 AM
To: Austin,Deanna
Subject: Outfall 084

Deanna,

As we discussed on the phone yesterday, the 6/2/09 sample from outfall 084 was analyzed for dissolved copper and the result was 6.7 ug/L. Per our agreement, NGSB will run another sample for dissolved copper to help further demonstrate the absence of excessive copper at this outfall. I will attach the analytical report(s) to the monthly DMR for June.

M.F. Hiltke
NGSB Environmental Engineer 3
534-4067

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Wednesday, June 17, 2009 9:53 AM
To: Austin,Deanna
Subject: Outfall 123

Deanna,

As I stated in the permit modification, the non-contact cooling water discharge from compressor equipment has been eliminated. The Contribution Source Determination Study did not find any industrial discharges within outfall 123. Only non-industrial air conditioning condensate is discharged within this outfall. Please eliminate industrial outfall status from this outfall and represent as storm only, with the number 823. I apologize as I meant to include this in the 3/31/09 mod request. Please call with any questions. Thank you.

M.F. Hiltke
NGSB Environmental Engineer 3
534-4067

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Monday, June 01, 2009 9:06 AM
To: Austin,Deanna
Subject: RE: Hidens Warehouses Sampling Location Change

Outfall 134 surrounds warhouse 642, which is still standing. Include it in the list that is to be represented by 140, 142 or 144.

From: Austin,Deanna [mailto:Deanna.Austin@deq.virginia.gov]
Sent: Monday, June 01, 2009 8:53 AM
To: Hiltke, Mark F.
Subject: RE: Hidens Warehouses Sampling Location Change

What about 134? That is in the group that is to be sampled. 132, 133 or 134? Let me know.

Deanna Austin
DEQ-TRO Water Permits
5636 Southern Blvd
Virginia Beach, VA 23462
Phone: 757-518-2008
Fax: 757-518-2009

From: Hiltke, Mark F. (Newport News) [mailto:Mark.F.Hiltke@ngc.com]
Sent: Wednesday, May 27, 2009 11:15 AM
To: Austin,Deanna
Cc: Thorn, Frank (Newport News)
Subject: Hidens Warehouses Sampling Location Change

Deanna-

Thanks for meeting with me this morning. After we observed the changes to the Hidens outfalls, I consulted the map and have the following suggestions:

Outfalls 132, 133, 154, 155, 156 and 157 have been converted into a parking lot. They should be re-designated as outfalls not associated with industrial activity.

Outfalls 140, 142 or 144 should be the new sample locations and shall be representative of the other remaining hidens warehouse outfalls; those listed on page 33 of 76 in the permit, minus the parking lot outfalls listed above.

Call w/ any questions...Mark

M.F. Hiltke
O27 / EE
534-4067

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Wednesday, November 19, 2008 2:15 PM
To: Austin,Deanna
Cc: Thorn, Frank (Newport News)
Subject: RE: New Outfall Numbers for the Nancy Lee

Thank you Deanna...Mark

From: Austin,Deanna [mailto:ddaustin@deq.virginia.gov]
Sent: Wednesday, November 19, 2008 1:42 PM
To: Hiltke, Mark F.
Cc: Brockenbrough,Allan
Subject: RE: New Outfall Numbers for the Nancy Lee

Mark,
DEQ is in agreement that the 3 new locations for the Nancy Lee barge do not need to be remodeled. The mixing zone dilution at 041 and 042 will be applied to the three new locations. If you have any questions, please let me know.

Deanna Austin
DEQ-TRO Water Permits
5636 Southern Blvd
Virginia Beach, VA 23462
Phone: 757-518-2008
Fax: 757-518-2009

From: Hiltke, Mark F. (Newport News) [mailto:Mark.F.Hiltke@ngc.com]
Sent: Thursday, November 13, 2008 12:47 PM
To: Austin,Deanna
Subject: New Outfall Numbers for the Nancy Lee

Hi Deanna

I'm following up on some outstanding issues. We discussed assigning new outfall numbers for the Nancy Lee for the pier 2, 3 and 6 steaming locations. The outstanding issue is whether the acute dilution ratio achieved from the last Cormix Modeling run can be applied to the other 3 steaming locations since the depth of the river is essentially identical. 30 feet was the river depth used for all outfalls in all previous modeling. NNS feels that re-modeling for the new locations would be redundant and unnecessary

I appreciate you guidance in this matter. Thanks...Mark

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Monday, November 17, 2008 3:43 PM
To: Austin,Deanna
Subject: RE: New Outfall Numbers for the Nancy Lee

Deanna-

The Cormix model for the Nancy Lee @ OB-1 was run using 30 feet as the river water depth. The depth is the same at the Pier 2, 3 and 6 steaming locations. That is my point; why re-model if all variables remain equal? Call me to discuss as I am putting together a project plan for another CH2MHill modeling run for 045, 049 and 037 and I need to know if we have to include the N. L. outfalls. Thanks...Mark

---

From: Austin,Deanna [mailto:ddaustin@deq.virginia.gov]
Sent: Thursday, November 13, 2008 1:13 PM
To: Hiltke, Mark F.
Subject: RE: New Outfall Numbers for the Nancy Lee

Did you already provide me the river depths at the three locations?

-----Original Message-----
From: Hiltke, Mark F. (Newport News) [mailto:Mark.F.Hiltke@ngc.com]
Sent: Thu 11/13/2008 12:47 PM
To: Austin,Deanna
Cc:
Subject: New Outfall Numbers for the Nancy Lee

Hi Deanna

I'm following up on some outstanding issues. We discussed assigning new outfall numbers for the Nancy Lee for the pier 2, 3 and 6 steaming locations. The outstanding issue is whether the acute dilution ratio achieved from the last Cormix Modeling run can be applied to the other 3 steaming locations since the depth of the river is essentially identical. 30 feet was the river depth used for all outfalls in all previous modeling. NNS feels that re-modeling for the new locations would be redundant and unnecessary

I appreciate you guidance in this matter. Thanks...Mark

Austin,Deanna

From: Hiltke, Mark F. (Newport News) [Mark.F.Hiltke@ngc.com]
Sent: Thursday, July 23, 2009 3:00 PM
To: Austin,Deanna
Cc: Thorn, Frank (Newport News)
Subject: Outfall 073

Deanna-
During our continued Outfall Mapping Study/Source Contribution Determination project we discovered that the stormwater drop inlets located within outfall 073 (area between drydocks 10 and 11) actually drain south into drydock #10. Outfall 024 represents the everyday drydock 10 and 11discharge. Therefore, NGSB requests that the area formally known as outfall 073 be incorporated into outfall 024. Please eliminate 073 from the permit.

M.F. Hiltke
O27 / EE
4-4067

ATTACHMENT 5

SPECIAL CONDITIONS RATIONALE

ONLY THE CONDITIONS CHANGED DURING THIS MODIFICATION ARE ADDRESSED IN THIS SECTION

VPDES PERMIT PROGRAM
LIST OF SPECIAL CONDITIONS RATIONALE

Name of Condition:

B. Schedule of Compliance

Rationale: In accordance with the VPDES Permit Regulation, 9 VAC 25-31-250, and 40 CFR 122.47, the permit may, when appropriate, specify a schedule of compliance leading to compliance with the Clean Water Act, laws and regulations.

C. OTHER REQUIREMENTS OR SPECIAL CONDITIONS

3. Best Management Practices (BMPs)

Rationale: The VPDES Permit Regulation, 9 VAC 25-31-220 K., and 40 CFR 122.44 (k) allow BMPs for the control of toxic pollutants listed in Section 307 (a)(1), and hazardous substances listed in Section 311 of the Clean Water Act where numeric limits are infeasible or BMPs are needed to accomplish the purpose/intent of the law.

The BMPs appearing in the draft permit are carried forward to the reissuance and are the minimum actions believed necessary to approach achieving compliance with the terms and conditions of this permit.

BMP #28 was added to be consistent with all other shipyard permits within the region. It addresses in-water hull cleaning discharges, and, in part, the Uniform National Discharge Standards (UNDS).

D. TOXICS MANAGENENT PROGRAM (TMP)

Rationale: To determine the need for pollutant specific and/or whole effluent toxicity limits as may be required by the VPDES Permit Regulation, 9 VAC 25-31-220 D. and 40 CFR 122.44 (d). See Attachment 8 of this fact sheet for additional justification.

ATTACHMENT 6

TOXICS MONITORING/TOXICS REDUCTION/ WET LIMIT RATIONALE

MEMORANDUM

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

TIDEWATER REGIONAL OFFICE

5636 Southern Boulevard Virginia Beach, VA 23462

SUBJECT: TMP language for Change for Northrop Grumman Shipbuilding (VA0004804)

TO: File

FROM: Deanna Austin DCA

DATE: 7/22/09

COPIES: TRO File (PPP #382)

Outfall 008 has been eliminated from the permit, therefore it shall be eliminated from the TMP section.

Also, since the permit was open the amount of complete copies of the TMP reports that must be submitted was reduced to 1. EPA no longer wishes to receive copies of the TMP submittals.

No changes were made to the toxicity screening section.

D. TOXICS MANAGEMENT PROGRAM (TMP)

1. Biological Monitoring

a. In accordance with the schedule in E.2.below, the permittee shall conduct annual toxicity tests for the duration of the permit.
The permittee shall collect a grab sample of final effluent from outfalls 002, 003, 013, 019, 021, 024, 030, 032, 042, and 044 in accordance with the sampling methodology in Part I.A. of this permit. The grab samples for toxicity testing shall be taken at the same time as the monitoring for the outfall in Part 1.A. of this permit. The tests to use are:

For outfalls 003, 021, 030, and 042:

48 Hour Static Acute test using Americamysis bahia

48 Hour Static Acute test using Cyprinodon variegatus

For outfalls 002, 013, 019, 024, 032, and 044:

48 Hour Static Acute test using Americamysis bahia

b. The acute tests shall be performed with a minimum of 5 dilutions, derived geometrically, for the calculation of a valid LC_{50}. Express the results as TU_a (Acute Toxic Units) by dividing 100/ LC_{50} for reporting.

Test procedures and reporting shall be in accordance with the WET testing methods cited in 40 CFR 136.3.

c. In the event that sampling of any of the outfalls is not possible due to the absence of effluent flow during a particular testing period, the permittee shall perform a make-up sample during the next testing period.

d. The permittee may provide additional samples to address data variability during the period of initial data generation. These data shall be reported and may be included in the evaluation of the effluent toxicity. Test procedures and reporting shall be in accordance with the WET testing methods cited in 40 CFR 136.3.

e. The test dilutions shall be able to determine compliance with the following endpoints:

(1) For outfall 002: Acute LC_{50} of 42% equivalent to a TU_a of 2.4

(2) For outfalls 013, 021, 024, and 032: Acute LC_{50} of 3.7% equivalent to a TU_a of 27

(3) For outfall 042: Acute LC_{50} of 37% equivalent to a TU_a of 2.7

(4) For all other outfalls: Acute LC_{50} of 100% equivalent to a TU_a of 1.0

2. Reporting Schedule

The permittee shall report the results and supply one complete copy of the toxicity test reports to the Tidewater Regional Office in accordance with the schedule below. A complete report must

contain a copy of all laboratory benchsheets, certificates of analysis, and all chains of custody. **Attachment A** must be submitted with each complete report. All data shall be submitted within 60 days of the sample date.

(a)	**Conduct first annual TMP test for outfalls 003, 021, 030, and 042 using Americamysis bahia and Cyprinodon variegatus. Conduct first annual TMP tests for outfalls 002, 013, 019, 024, 032, and 044 using Americamysis bahia.**	**By December 31, 2008**
(b)	**Submit results of all biological tests**	**Within 60 days of the sample date and no later than January 10, 2009**
(c)	**Conduct subsequent annual TMP tests for the outfalls listed above in (a)**	**By December 31, 2009, 2010, and 2011**
(d)	**Submit subsequent annual biological tests**	**Within 60 days of the sample date and no later than January 10, 2010, 2011 and 2012**

ATTACHMENT A

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

TMP SUBMITTAL COVER SHEET

This form shall be completed for, and submitted with, each report of toxicity testing.

THIS REPORT SHALL CONTAIN THE FOLLOWING ITEMS	
	COMPLETED CHAIN OF SAMPLE CUSTODY
	CERTIFICATE OF ANALYSIS(ES)
	COMPLETE REPORT OF TOXICITY TESTING

VPDES PERMIT NUMBER: VA0004804

FACILITY NAME: Newport News Shipbuilding

FACILITY LOCATION: 4101 Washington Ave Newport News VA 23607

OUTFALL NUMBER (circle one): 002 003 013 019 021 024 030 032 042 044
058 068 071 097 127 151 812 819 823 904 915 954 956 994

REPORTING PERIOD (ex: 2008 Annual, 1st Qtr. 2008): _____

SAMPLE TYPE (circle one): Stormwater Wastewater

WASTEWATER SOURCE(S) (if process wastewater, provide a brief source description):

_____

_____

STORM EVENT INFORMATION (if applicable):

Sample Date and Time of Collection: _____

Time discharge began: _____

Storm event measurement (inches): _____

Time between sampling and
last measurable storm event (hours): _____

ADDITIONAL INFORMATION:
If this sample is a **make-up** sample or a **retest**, indicate which category of test and the reporting period this submittal applies to:

Report Type: (i.e., makeup, retest, etc.) _____

Reporting Period: _____

If the required TMP sample(s) were not collected provide a reason/rationale:

_____

CERTIFICATION:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. See 18 U.S.C. §1001 and 33 U.S.C. §1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

_____

Signature, printed name and title of Principal Officer or Authorized Agent / Date

ATTACHMENT 7

TABLE III(a) AND TABLE III(b) - CHANGE SHEETS

TABLE III(a)

VPDES PERMIT PROGRAM
Permit Processing Change Sheet

1. Effluent Limits and Monitoring Schedule: (List any changes FROM PREVIOUS PERMIT and give a brief rationale for the changes).

OUTFALL NUMBER	PARAMETER CHANGED	MONITORING LIMITS CHANGED FROM / TO	EFFLUENT LIMITS CHANGED FROM / TO	RATIONALE	DATE & INITIAL
003	Copper (TR) Zinc (TR) Copper (D) Zinc (D)	1/3M / No monitoring for total recoverable Cu and Zn No monitoring/ 1/3M	16 ug/L / No limit 153 ug/L / No limit	VIMS dye study mixing analysis and a metals translator study submitted by NGS and approved by DEQ. No limit needed with mix. Monitoring was added 1/3M to ensure water quality standards are being met. If monitoring shows no issues with WQS, a reduction in frequency can be made at reissuance.	5/6/09 DDA
011	ALL PARAMETERS	OUTFALL ELIMINATED FROM PERMIT		Discharges eliminated. Both the cooling water and the basement sump discharges have been routed to HRSD. The routing took place in 2007.	5/6/09 DDA
019	Copper (TR) Zinc (TR) Copper (D) Zinc (D)	1/3M / No monitoring for total recoverable Cu and Zn No monitoring/ 1/3M	30 ug/L / No limit 188 ug/L / No limit	VIMS dye study mixing analysis and a metals translator study submitted by NGS and approved by DEQ. No limit needed with mix. Monitoring was added 1/3M to ensure water quality standards are being met. The frequency of 1/3M was chosen based on BPJ since the mix for this outfall smaller than others and there is a need to ensure that standards are being protected even with the mix in place.	5/13/09 DDA

OUTFALL NUMBER	PARAMETER CHANGED	MONITORING LIMITS CHANGED FROM / TO	EFFLUENT LIMITS CHANGED FROM / TO	RATIONALE	DATE & INITIAL
005	Zinc (TR)		1188 ug/L / 1335 ug/L	A metals translator study for this outfall was submitted by NGS and approved by DEQ central office.	5/13/09 DDA
020	Copper (TR) Copper (D)	1/3M / No monitoring No monitoring/ 1/3M	87 ug/L / NL	VIMS dye study mixing analysis submitted by NGS and approved by DEQ. No limit needed with mix. Dissolved monitoring will continue to ensure WQS.	5/13/09 DDA
026	Copper (TR) Copper (D)	1/3M / No monitoring No monitoring / 1/3M	24 ug/L / NL	VIMS dye study mixing analysis and a metals translator study submitted by NGS and approved by DEQ. No limit needed with mix. Dissolved Cu monitoring added to ensure water quality standards are being protected.	5/13/09 DDA
030	Copper (TR) Copper (D)	1/3M / No monitoring No monitoring/ 1/3M	19 ug/L / NL	VIMS dye study mixing analysis and a metals translator study submitted by NGS and approved by DEQ. No limit needed with mix. Dissolved Cu monitoring added to ensure water quality standards are being protected	5/13/09 DDA
013 024 027 and 021 and 041	Total Phosphorus	1/Year / No monitoring	2.0 mg/L / NL	The total phosphorus limit and monitoring was removed based upon information that the shipyard has no sources of phosphorus at these outfalls. Also DEQ nutrient enriched waters policy was altered to not include these types of discharges. BPJ and agency decision is used to remove the TP limit.	5/14/09 DDA

OUTFALL NUMBER	PARAMETER CHANGED	MONITORING LIMITS CHANGED FROM / TO	EFFLUENT LIMITS CHANGED FROM / TO	RATIONALE	DATE & INITIAL
084	Copper (TR) Copper (D)	1/Year / No Monitoring No Monitoring / 1/Year	19 ug/L / NL	Approved CORMIX model submitted by NGS on 2/3/09 and approved by DEQ CO on 2/23/09. With new mix and data collected during this permit term, no limits are needed. Additionally this outfall has an approved metals translator. Additionally the steam condensate that is left is less than 10% of the originally listed discharges. Dissolved monitoring will continue to ensure WQS.	6/18/09 DDA
037	Copper (TR) Zinc (TR) Copper (D) Zinc (D)	1/3M / No monitoring 1/3M / No monitoring No Monitoring / 1/3M No Monitoring / 1/3M	21 ug/L / NL 207 ug/L / NL	Approved CORMIX Model submitted by NGS on 2/3/09 and approved by DEQ CO on 2/23/09. With new mix, no limits are needed, however, monitoring will continue to ensure water quality standards are being met.	5/14/09 DDA
008	All Parameters	No Monitoring		All process wastewaters have been removed and the drop inlets that are were in the area of outfall 008 were found to be within the drainage area of 064-Source contribution study performed by NGS.	5/21/09 DDA

OUTFALL NUMBER	PARAMETER CHANGED	MONITORING LIMITS CHANGED FROM / TO	EFFLUENT LIMITS CHANGED FROM / TO	RATIONALE	DATE & INITIAL
162, 164, 166 163, 165, 167	Flow, pH, Temp, Copper (d) net Flow pH Temp Copper (D) Zinc (D)	1/3 M -These are new outfalls		These are new outfalls and are the same as outfalls 041 and 042 for the Nancy Lee Barge. The Nancy Lee can be moved to these three additional locations throughout the yard. NGS submitted info that provides the same mix for the three locations as the mix for outfalls 041/042.	5/21/09 DDA
009	All parameters	No monitoring		All industrial wastewater contributions have been removed from this outfall and this outfall now discharges only stormwater. Info provided in the source contribution study.	5/21/09 DDA
132 and 133	All parameters	No monitoring		All industrial wastewater contributions have been removed from this outfall and this outfall now discharges only stormwater. Info provided in an email on 5/27/09 and confirmed through site visit on 5/27/09.	6/1/09 DDA
140, 142, and 144 134	Flow, pH, TSS, TPH, Cu(d), Zn(d)	No monitoring/ 1/Year All parameters changed to 1/Year-Some were 1/6M		Additional outfalls added to allow flexibility on which to sample based on where activity is taking place at the warehouses. Activity has been significantly decreased therefore monitoring is reduced to 1/Y. Also outfall 134 has been moved to be represented by 140, 142 or 144.	6/1/09 DDA

OUTFALL NUMBER	PARAMETER CHANGED	MONITORING LIMITS CHANGED FROM / TO	EFFLUENT LIMITS CHANGED FROM / TO	RATIONALE	DATE & INITIAL
056 and 119	All parameters	1/Year / No monitoring		All industrial wastewater contributions have been removed from this outfall and this outfall now discharges only stormwater. 956 and 819 already exist as stormwater outfalls for these industrial outfalls and will remain numbered as 956 and 819.	6/4/09 DDA
123	All parameters	1/Year / No monitoring		All industrial wastewater contributions have been removed from this outfall. This outfall does discharge non-industrial AC condensate and stormwater and is listed in the permit as 823. Stormwater monitoring will continue at 823.	6/18/09 DDA
112	Zn (TR) Zn (D)	1/Year / No monitoring No monitoring / 1 Year	180 ug/L / NL	Steam condensate is <10% of the original flow for which the zinc limit was calculated. NGS confirmed with a Zn sample on 5/27/09 that showed <50 ug/l Zn. The zinc limit was removed.	6/22/09 DDA

OTHER CHANGES:	RATIONALE:	DATE & INITIAL
Removed Cooling tower blowdown from outfall 094 and added Ogontz valve discharges and drinking fountain discharges to outfall 094 Added Air compressor condensate from B-4730 and steam condensate to outfall 094	Per the modification request. Per the source contribution study final report.	4/23/09 DDA
Removed air compressor cooling water from outfall 112 and added steam condensate to outfall 112. Added AC condensate to outfall 112	Per the modification request. Per email request received 7/30/09.	5/6/09 DDA
Added pipe flushing discharges to the graving drydocks-outfalls 013, 017, 024, 027, 032 and 034	Discharge is taking place at the drydocks and needed to be addressed as a permitted discharge	5/6/09 DDA
Outfall 009 converted to a stormwater only outfall.	All industrial discharges have been eliminated.	5/21/09 DDA
Added Ogontz valve discharge and ice machine condensate to outfall 003 Added AC condensate from building 17 to outfall 003	Per the modification request. Per the source contribution study.	5/21/09 DDA
Removed cooling tower blowdown from building 550 that discharge to outfall 030	This discharge has been routed to HRSD.	5/21/09 DDA
Removed non-contact cooling water from portable compressor equipment from outfalls 084 and 123.	This discharge has been eliminated throughout the shipyard. Per the modification request.	6/1/09 DDA
Added steam condensate discharge to outfall 084.	Per the modification request.	6/1/09 DDA
Added groundwater relief discharges to outfalls 037 and 038.	This water comes from the side walls of drydock 4. Per the modification request.	6/1/09 DDA
Added deionized test water from building 161 to outfall 019	Per the modification request.	6/1/09 DDA
Added drinking fountain discharge to outfall 026.	Per the modification request.	6/1/09 DDA

OTHER CHANGES:	RATIONALE:	DATE & INITIAL
Added hydrostatic testing of water hose discharge to outfall 021.	Per the modification request.	6/1/09 DDA
Added river cooling water to outfalls 015 and 112.	Per the modification request. Additional info received in email dated 6/1/09.	6/1/09 DDA
Outfalls 132, 133, 154, 155, 156, and 157 have been now labeled stormwater not associated with industrial activity.	The area surrounding these outfalls has been converted from warehousing to parking lots.	6/1/09 DDA
Added cooling tower overflow from building 556, furnace discharge and Ogontz valve discharge to outfall 030	Per the source contribution study received 2/11/09.	6/1/09 DDA
Added Ogontz valve discharges to outfall 020.	Per the source contribution study received 2/11/09.	6/4/09 DDA
Removed air conditioning cooling water and hydrostatic test water from outfall 005. Added non-contact cooling water for outfall 005	Both per the source contribution study received 2/11/09. There was a misinterpretation during the last permit application. The hydrostatic test water was actually the now-added non-contact cooling water for the heat exchanger of a hydraulic test stand machine.	6/4/09 DDA
Removed AC condensate from outfalls 037 and 038	037-per the source contribution study received 2/11/09. 038-per email received 6/22/09.	6/22/09 DDA
Added outfall 064 to the list of outfalls with industrially related stormwater.	Added due to the stormwater in the drainage area for outfall 008 being incorporated into outfall 064	6/22/09 DDA
Changed schedule of compliance to include only the outfalls left with limits that go into effect in 2011	All outfalls under the two year schedule of compliance have been modeled/mixed/metals translators and no longer will have limits to go into effect in 10/09. Only outfalls 005, 049, 054, and 094 remain under the 4 year schedule of compliance with limits taking effect in 10/11.	6/23/09 DDA
Removed outfall 008 from the TMP section.	Outfall 008 has been eliminated; therefore there is no industrial wastewater that requires a TMP.	6/23/09 DDA

OTHER CHANGES:	RATIONALE:	DATE & INITIAL
Facility Name Change	The facility name was changed from Newport News Shipbuilding and Drydock Company to Northrop Grumman Shipbuilding, Inc. The effective date was 12/2/08 and the name change request was received 2/9/09. The request was held since the modification was going to be done in 2009.	6/23/09 DDA
Added BMP 28 concerning Uniform National Discharge Standards.	This was done to keep consistency among the shipyard permits with the Tidewater Region.	7/23/09 DDA
Removed outfall 073.	This outfall was found not to exist. See email dated 7/21/09.	7/21/09 DDA
Added stormwater to the graving dock outfalls. Outfalls 013, 017, 024, 027, 032, and 034.	Stormwater has always discharged from these outfalls. Now addressed as a type of discharge.	7/22/09 DDA

TABLE III(b)

VPDES PERMIT PROGRAM
Permit Processing Change Sheet

1. Effluent Limits and Monitoring Schedule: (List any changes MADE DURING PERMIT PROCESS and give a brief rationale for the changes).

OUTFALL NUMBER	PARAMETER CHANGED	MONITORING LIMITS CHANGED FROM / TO	EFFLUENT LIMITS CHANGED FROM / TO	RATIONALE	DATE & INITIAL

OTHER CHANGES FROM:	RATIONALE:	DATE & INITIAL
Added pipe flushing discharge as a process wastewater type for outfall 044	To match the rest of the graving docks/drydocks.	DDA 8/18/09
Removed outfall 161 from the permit.	Per email dated 8/17/09. This outfall is no longer in use. Equipment has been dismantled.	DDA 8/18/09

ATTACHMENT 8

EPA PERMIT CHECKLIST

State "Transmittal Checklist" to Assist in Targeting Municipal and Industrial Individual NPDES Draft Permits for Review

Part I. State Draft Permit Submission Checklist

In accordance with the MOA established between the Commonwealth of Virginia and the United States Environmental Protection Agency, Region III, the Commonwealth submits the following draft National Pollutant Discharge Elimination System (NPDES) permit for Agency review and concurrence.

Facility Name: Newport News Shipbuilding and Drydock Company

NPDES Permit Number: VA0004804

Permit Writer Name: Deanna Austin

Date: 7/22/09

Major [X] **Minor** [ ] **Industrial** [X] **Municipal** [ ]

I.A. Draft Permit Package Submittal Includes:	**Yes**	**No**	**N/A**
1. Permit Application? (This is a modification)			X
2. Complete Draft Permit (for renewal or first time permit – entire permit, including boilerplate information)?	X		
3. Copy of Public Notice?		X	
4. Complete Fact Sheet?	X		
5. A Priority Pollutant Screening to determine parameters of concern?	X		
6. A Reasonable Potential analysis showing calculated WQBELs?	X		
7. Dissolved Oxygen calculations?			X
8. Whole Effluent Toxicity Test summary and analysis?	X		
9. Permit Rating Sheet for new or modified industrial facilities?	X		

I.B. Permit/Facility Characteristics	**Yes**	**No**	**N/A**
1. Is this a new, or currently unpermitted facility?		X	
2. Are all permissible outfalls (including combined sewer overflow points, non-process water and storm water) from the facility properly identified and authorized in the permit?	X		
3. Does the fact sheet **or** permit contain a description of the wastewater treatment process?	X		

I.B. Permit/Facility Characteristics - cont.	Yes	No	N/A
4. Does the review of PCS/DMR data for at least the last 3 years indicate significant non-compliance with the existing permit?	X		
5. Has there been any change in streamflow characteristics since the last permit was developed?		X	
6. Does the permit allow the discharge of new or increased loadings of any pollutants?		X	
7. Does the fact sheet **or** permit provide a description of the receiving water body(s) to which the facility discharges, including information on low/critical flow conditions and designated/existing uses?	X		
8. Does the facility discharge to a 303(d) listed water?	X		
a. Has a TMDL been developed and approved by EPA for the impaired water?		X	
b. Does the record indicate that the TMDL development is on the State priority list and will most likely be developed within the life of the permit?		X	
c. Does the facility discharge a pollutant of concern identified in the TMDL or 303(d) listed water?		X	
9. Have any limits been removed, or are any limits less stringent, than those in the current permit?		X	
10. Does the permit authorize discharges of storm water?	X		
11. Has the facility substantially enlarged or altered its operation or substantially increased its flow or production?		X	
12. Are there any production-based, technology-based effluent limits in the permit?		X	
13. Do any water quality-based effluent limit calculations differ from the State's standard policies or procedures?		X	
14. Are any WQBELs based on an interpretation of narrative criteria?		X	
15. Does the permit incorporate any variances or other exceptions to the State's standards or regulations?		X	
16. Does the permit contain a compliance schedule for any limit or condition?	X		
17. Is there a potential impact to endangered/threatened species or their habitat by the facility's discharge(s)?		X	
18. Have impacts from the discharge(s) at downstream potable water supplies been evaluated?			X
19. Is there any indication that there is significant public interest in the permit action proposed for this facility?		X	
20. Have previous permit, application, and fact sheet been examined?	X		

Part II. NPDES Draft Permit Checklist

Region III NPDES Permit Quality Checklist – for POTWs

(To be completed and included in the record only for POTWs)

II.A. Permit Cover Page/Administration	Yes	No	N/A
1. Does the fact sheet or permit describe the physical location of the facility, including latitude and longitude (not necessarily on permit cover page)?			
2. Does the permit contain specific authorization-to-discharge information (from where to where, by whom)?			

II.B. Effluent Limits - General Elements	Yes	No	N/A
1. Does the fact sheet describe the basis of final limits in the permit (e.g., that a comparison of technology and water quality-based limits was performed, and the most stringent limit selected)?			
2. Does the fact sheet discuss whether "antibacksliding" provisions were met for any limits that are less stringent than those in the previous NPDES permit?			

II.C. Technology-Based Effluent Limits (POTWs)	**Yes**	**No**	**N/A**
1. Does the permit contain numeric limits for ALL of the following: BOD (or alternative, e.g., CBOD, COD, TOC), TSS, and pH?			
2. Does the permit require at least 85% removal for BOD (or BOD alternative) and TSS (or 65% for equivalent to secondary) consistent with 40 CFR Part 133?			
a. If no, does the record indicate that application of WQBELs, or some other means, results in more stringent requirements than 85% removal or that an exception consistent with 40 CFR 133.103 has been approved?			
3. Are technology-based permit limits expressed in the appropriate units of measure (e.g., concentration, mass, SU)?			
4. Are permit limits for BOD and TSS expressed in terms of both long term (e.g., average monthly) and short term (e.g., average weekly) limits?			
5. Are any concentration limitations in the permit less stringent than the secondary treatment requirements (30 mg/l BOD5 and TSS for a 30-day average and 45 mg/l BOD5 and TSS for a 7-day average)?			
a. If yes, does the record provide a justification (e.g., waste stabilization pond, trickling filter, etc.) for the alternate limitations?			

II.D. Water Quality-Based Effluent Limits	Yes	No	N/A
1. Does the permit include appropriate limitations consistent with 40 CFR 122.44(d) covering State narrative and numeric criteria for water quality?			
2. Does the fact sheet indicate that any WQBELs were derived from a completed and EPA approved TMDL?			
II.D. Water Quality-Based Effluent Limits – cont.	**Yes**	**No**	**N/A**

3. Does the fact sheet provide effluent characteristics for each outfall?			
4. Does the fact sheet document that a "reasonable potential" evaluation was performed?			
a. If yes, does the fact sheet indicate that the "reasonable potential" evaluation was performed in accordance with the State's approved procedures?			
b. Does the fact sheet describe the basis for allowing or disallowing in-stream dilution or a mixing zone?			
c. Does the fact sheet present WLA calculation procedures for all pollutants that were found to have "reasonable potential"?			
d. Does the fact sheet indicate that the "reasonable potential" and WLA calculations accounted for contributions from upstream sources (i.e., do calculations include ambient/background concentrations)?			
e. Does the permit contain numeric effluent limits for all pollutants for which "reasonable potential" was determined?			
5. Are all final WQBELs in the permit consistent with the justification and/or documentation provided in the fact sheet?			
6. For all final WQBELs, are BOTH long-term AND short-term effluent limits established?			
7. Are WQBELs expressed in the permit using appropriate units of measure (e.g., mass, concentration)?			
8. Does the record indicate that an "antidegradation" review was performed in accordance with the State's approved antidegradation policy?			

II.E. Monitoring and Reporting Requirements	Yes	No	N/A
1. Does the permit require at least annual monitoring for all limited parameters and other monitoring as required by State and Federal regulations?			
a. If no, does the fact sheet indicate that the facility applied for and was granted a monitoring waiver, AND, does the permit specifically incorporate this waiver?			
2. Does the permit identify the physical location where monitoring is to be performed for each outfall?			
3. Does the permit require at least annual influent monitoring for BOD (or BOD alternative) and TSS to assess compliance with applicable percent removal requirements?			
4. Does the permit require testing for Whole Effluent Toxicity?			

II.F. Special Conditions	Yes	No	N/A
1. Does the permit include appropriate biosolids use/disposal requirements?			
2. Does the permit include appropriate storm water program requirements?			

II.F. Special Conditions – cont.	Yes	No	N/A
3. If the permit contains compliance schedule(s), are they consistent with statutory and regulatory deadlines and requirements?			

4. Are other special conditions (e.g., ambient sampling, mixing studies, TIE/TRE, BMPs, special studies) consistent with CWA and NPDES regulations?			
5. Does the permit allow/authorize discharge of sanitary sewage from points other than the POTW outfall(s) or CSO outfalls [i.e., Sanitary Sewer Overflows (SSOs) or treatment plant bypasses]?			
6. Does the permit authorize discharges from Combined Sewer Overflows (CSOs)?			
a. Does the permit require implementation of the "Nine Minimum Controls"?			
b. Does the permit require development and implementation of a "Long Term Control Plan"?			
c. Does the permit require monitoring and reporting for CSO events?			
7. Does the permit include appropriate Pretreatment Program requirements?			

II.G. Standard Conditions	Yes	No	N/A
1. Does the **permit** contain all 40 CFR 122.41 standard conditions or the State equivalent (or more stringent) conditions?			

List of Standard Conditions – 40 CFR 122.41

Duty to comply
Duty to reapply
Need to halt or reduce activity not a defense
Duty to mitigate
Proper O & M
Permit actions

Property rights
Duty to provide information
Inspections and entry
Monitoring and records
Signatory requirement
Bypass
Upset

Reporting Requirements
- Planned change
- Anticipated noncompliance
- Transfers
- Monitoring reports
- Compliance schedules
- 24-Hour reporting
- Other non-compliance

2. Does the permit contain the additional standard condition (or the State equivalent or more stringent conditions) for POTWs regarding notification of new introduction of pollutants and new industrial users [40 CFR 122.42(b)]?			

Part II. NPDES Draft Permit Checklist

Region III NPDES Permit Quality Review Checklist – For Non-Municipals

(To be completed and included in the record for all non-POTWs)

II.A. Permit Cover Page/Administration	Yes	No	N/A
1. Does the fact sheet **or** permit describe the physical location of the facility, including latitude and longitude (not necessarily on permit cover page)?	X		
2. Does the permit contain specific authorization-to-discharge information (from where to where, by whom)?	X		

II.B. Effluent Limits - General Elements	Yes	No	N/A
1. Does the fact sheet describe the basis of final limits in the permit (e.g., that a comparison of technology and water quality-based limits was performed, and the most stringent limit selected)?	X		
2. Does the fact sheet discuss whether "antibacksliding" provisions were met for any limits that are less stringent than those in the previous NPDES permit?	X		

II.C. Technology-Based Effluent Limits (Effluent Guidelines & BPJ)	**Yes**	**No**	**N/A**
1. Is the facility subject to a national effluent limitations guideline (ELG)?		X	
a. If yes, does the record adequately document the categorization process, including an evaluation of whether the facility is a new source or an existing source?			X
b. If no, does the record indicate that a technology-based analysis based on Best Professional Judgment (BPJ) was used for all pollutants of concern discharged at treatable concentrations?	X		
2. For all limits developed based on BPJ, does the record indicate that the limits are consistent with the criteria established at 40 CFR 125.3(d)?	X		
3. Does the fact sheet adequately document the calculations used to develop both ELG and /or BPJ technology-based effluent limits?	X		
4. For all limits that are based on production or flow, does the record indicate that the calculations are based on a "reasonable measure of ACTUAL production" for the facility (not design)?			X
5. Does the permit contain "tiered" limits that reflect projected increases in production or flow?		X	
a. If yes, does the permit require the facility to notify the permitting authority when alternate levels of production or flow are attained?			X
6. Are technology-based permit limits expressed in appropriate units of measure (e.g., concentration, mass, SU)?	X		

II.C. Technology-Based Effluent Limits (Effluent Guidelines & BPJ) – cont.	Yes	No	N/A
7. Are all technology-based limits expressed in terms of both maximum daily, weekly average, and/or monthly average limits?		X	
8. Are any final limits less stringent than required by applicable effluent limitations guidelines or BPJ?		X	

II.D. Water Quality-Based Effluent Limits	Yes	No	N/A
1. Does the permit include appropriate limitations consistent with 40 CFR 122.44(d) covering State narrative and numeric criteria for water quality?	X		
2. Does the record indicate that any WQBELs were derived from a completed and EPA approved TMDL?		X	
3. Does the fact sheet provide effluent characteristics for each outfall?	X		
4. Does the fact sheet document that a "reasonable potential" evaluation was performed?	X		
a. If yes, does the fact sheet indicate that the "reasonable potential" evaluation was performed in accordance with the State's approved procedures?	X		
b. Does the fact sheet describe the basis for allowing or disallowing in-stream dilution or a mixing zone?	X		
c. Does the fact sheet present WLA calculation procedures for all pollutants that were found to have "reasonable potential"?	X		
d. Does the fact sheet indicate that the "reasonable potential" and WLA calculations accounted for contributions from upstream sources (i.e., do calculations include ambient/background concentrations where data are available)?		X	
e. Does the permit contain numeric effluent limits for all pollutants for which "reasonable potential" was determined?	X		
5. Are all final WQBELs in the permit consistent with the justification and/or documentation provided in the fact sheet?	X		
6. For all final WQBELs, are BOTH long-term (e.g., average monthly) AND short-term (e.g., maximum daily, weekly average, instantaneous) effluent limits established?		X	
7. Are WQBELs expressed in the permit using appropriate units of measure (e.g., mass, concentration)?	X		
8. Does the fact sheet indicate that an "antidegradation" review was performed in accordance with the State's approved antidegradation policy?	X		

II.E. Monitoring and Reporting Requirements	Yes	No	N/A
1. Does the permit require at least annual monitoring for all limited parameters?	X		
a. If no, does the fact sheet indicate that the facility applied for and was granted a monitoring waiver, AND, does the permit specifically incorporate this waiver?			
2. Does the permit identify the physical location where monitoring is to be performed for each outfall?	X		
3. Does the permit require testing for Whole Effluent Toxicity in accordance with the State's standard practices?	X		

II.F. Special Conditions	Yes	No	N/A
1. Does the permit require development and implementation of a Best Management Practices (BMP) plan or site-specific BMPs?	X		
a. If yes, does the permit adequately incorporate and require compliance with the BMPs?	X		
2. If the permit contains compliance schedule(s), are they consistent with statutory and regulatory deadlines and requirements?	X		
3. Are other special conditions (e.g., ambient sampling, mixing studies, TIE/TRE, BMPs, special studies) consistent with CWA and NPDES regulations?	X		

II.G. Standard Conditions	Yes	No	N/A
1. Does the **permit** contain all 40 CFR 122.41 standard conditions or the State equivalent (or more stringent) conditions?	X		

List of Standard Conditions – 40 CFR 122.41

Duty to comply
Duty to reapply
Need to halt or reduce activity not a defense
Duty to mitigate
Proper O & M
Permit actions

Property rights
Duty to provide information
Inspections and entry
Monitoring and records
Signatory requirement
Bypass
Upset

Reporting Requirements
- Planned change
- Anticipated noncompliance
- Transfers
- Monitoring reports
- Compliance schedules
- 24-Hour reporting
- Other non-compliance

2. Does the permit contain the additional standard condition (or the State equivalent or more stringent conditions) for existing non-municipal dischargers regarding pollutant notification levels [40 CFR 122.42(a)]?	X		

Part III. Signature Page

Based on a review of the data and other information submitted by the permit applicant, and the draft permit and other administrative records generated by the Department/Division and/or made available to the Department/Division, the information provided on this checklist is accurate and complete, to the best of my knowledge.

Name	Deanna Dodson Austin
Title	Environmental Engineer Sr.
Signature	
Date	7/23/09

ATTACHMENT 9

CHRONOLOGY SHEET

Chronology

Friday, July 24, 2009

Facility Name: Northrop Grumman Shipbuilding Incorporated *VA0004804*

Event	*Date*	*Comment*
FS/SOB draft permit sent to State Agencies (list i:	—	NA-none requested
VMRC concurrence on draft permit:	—	NA-draft not requested.
Application fee deposited:	— 3/27/2009	
Application Administratively complete:	— 4/1/2009	
Application received at RO 1st time:	— 4/1/2009	Modification Request
Application totally / technically complete:	— 4/1/2009	
App sent to State Agencies (list in comment field):	— 4/21/2009	Sent to VDH, DSS, and VMRC
Comments rec'vd from State Agencies on App:	— 5/1/2009	Comments received from DSS, Comments from VDH received on 4/28/09. No response from VMRC-DSS did not have objections to the discharge.
Riparian owner list received:	— 5/8/2009	Riparian owner information gathered from NGS.
local gov't notified of receipt of app. (Iss/Mod):	— 5/11/2009	
Riparian landowners notified (Iss,Mod):	— 5/11/2009	
Site visit:	— 5/27/2009	
Draft permit developed:	— 7/23/2009	
Site inspection report:	— 7/23/2009	Included as part of the FS
Permit expires:	— 10/15/2012	

VIMS DYE STUDY AND APPROVAL

METALS TRANSLATOR STUDY AND APPROVAL

2009 Modification VA0004804

Austin,Deanna

From: Brockenbrough,Allan
Sent: Wednesday, April 15, 2009 12:18 PM
To: Austin,Deanna
Cc: Hiltke, Mark F. (Newport News)
Subject: Northrop Grumman
Attachments: Northrop Grumman Mixing Review.pdf

Deanna-

Attached is the final memo on the Northrop Grumman dye studies performed by VIMS (Outfalls 020, 084, 019, 026 and 003) as well as the mixing calculation performed by Whitman Requardt for Outfall 030. Note that my recommendation for Outfall 019 is different from what I previously sent you. Let me know of any questions.

Regards,

Allan

Allan Brockenbrough, II, P.E.
DEQ - Office of Water Permits and Compliance Assistance
PO Box 1105
Richmond, VA 23218
(804) 698-4147
(804) 698-4032 (fax)

COMMONWEALTH OF VIRGINIA
Department of Environmental Quality
Office of Water Permit Programs and Compliance Assistance

Subject: **Northrop Grumman Newport News Shipbuilding Mixing Studies**

To: **Deanna Austin, TRO**

From: **Allan Brockenbrough, OWPP** ABB

Date: **April 15, 2009**

I have reviewed the final report prepared by VIMS documenting the dye studies performed at the Northrop Grumman Newport News Shipbuilding facility last year. The report is entitled *Rhodamine WT Dye Field Studies in Support of Discharge Dilution Evaluations for Selected Northrop Grumman Newport News Shipbuilding Outfalls* and is dated January 12, 2009.

The study included the introduction of Rhodamine dye over a 12 hour period into five different outfalls. Dye concentrations were measured in a mixing chamber, at the outfall and at three locations in the receiving stream. Samples were taken prior to introduction of the dye, during the 12-hour dye introduction period and for 24 hours after the dye introduction was stopped. Samples were collected using ISCO samplers and analyzed in the VIMS laboratory. In situ measurements were also made using YSI datasondes. Dye concentrations in the effluent mixing chambers were then compared to concentrations at the outfall to establish mixing ratios that occur due to tidal action in the outfall pipe.

The dye studies were performed in response to concerns that previously performed CORMIX analyses did not adequately account for tidal mixing in the outfall pipe. The outfall numbers and the previously established mixing ratios are listed below in Table 1.

Table 1
Previously Established Mixing Ratios

Outfall No.	Previous Ratio	Basis	Document
020	14.8	CORMIX	6/8/06 DEQ Memorandum
084	2.0	DEQ default	N/A
019	3.2	CORMIX	6/19/07 DEQ email
026	2.6	CORMIX	6/19/07 DEQ email
003	1.7	CORMIX	1/4/06 DEQ memorandum

The ratios in Table 1 represent instream mixing ratios at the edge of the allocated impact zone. There are numerous differences in the conditions under which the dye studies were performed and the critical conditions that we typically use to establish effluent mixing. These differences make it difficult to use the results of the dye studies to settle on a single critical mixing condition for each outfall. Some of these differences include:

- Because we are dealing with 1-hr acute exposures, previous CORMIX runs were typically made at maximum effluent flow rates. The dye studies simulate median discharge rates.

- Discrepancies between YSI datasonde readings and ISCO collected samples run in the laboratory for the same period.

- Measurement of instream concentrations 1 meter below the surface rather than at the surface where the highest concentrations would be expected.

Particular features of the data set for each outfall dictate that a single decision criterion (e.g. establish mixing ratios using mean ISCO collected samples) is not appropriate. I have looked at each of the data sets and make the following recommendations:

Outfall 020
Simulated at 1 gpm compared to a historic mean of 1.3 gpm and a historic maximum of 5 mg/l. Dilution factors for the ISCO samples ranged from 98.0 to 115.7 (YSI outfall samples were below detection). **Recommend acute mixing ratio of 100:1.** This value is probably a bit high for an end-of-pipe ratio when maximum flows are considered but any reduction would be more than offset by the 14.8:1 instream mixing previously established with CORMIX.

Outfall 084
Simulated at 0.4 gpm compared to a historic mean of 0.4 gpm and a historic maximum of 2.0 gpm. Although the mixing chamber was tidally influenced, the effect must be from simply backing the effluent up in the outfall pipe as very little mixing occurred. Evaluation of mean, median, 3rd quartile and maximum dye concentrations all yielded a mixing ratio of 1.2:1 end-of-pipe. As no CORMIX modeling has ever been performed on 084, the default DEQ acute mixing ratio of 2.0 can subsequently be applied to yield and instream mixing ratio of 2.4:1. **Recommend acute mixing ratio of 2.4:1.**

Outfall 019
Simulated at 3.9 gpm compared to a historic mean of 6.3 gpm and a historic maximum of 30 gpm. In addition to the relatively low flows, this study may have been impacted by the rainfall that occurred during the study as well as a concurrent spring tide (new moon). Measured mixing ranged from a low of 25.3 using the YSI maximum outfall dye concentration to a high of 77.0 using the median YSI outfall concentration. **Recommend acute mixing ratio of 10:1** to account for less than representative effluent flows and instream mixing previously established with CORMIX.

Outfall 026
Simulated at 19.3 gpm compared to a historic mean of 40.9 and a historic maximum of 500. Historic data is skewed by a single value of 500. If excluded, the historic mean is 21 gpm and the historic maximum is 100 (occurred twice). This outfall was studied using actual *in situ* flows rather than metered flows because of safety concerns related to the location of the mixing chamber as well as the large supply of water that would be needed to simulate actual flows. Measured mixing ranged from 5.6 to 10.2. Maximum instream ISCO value indicates an additional 10:1 mixing 15 feet from the outfall at a depth of 1 meter. **Recommend acute mixing ratio of 10:1.**

Outfall 003
Simulated at 2.1 gpm compared to a historic mean of 15.9 gpm and a historic maximum of 100 gpm). Historic data for this outfall too is skewed by a single value of 100. Excluding this flow measurement yields a mean of 12.0 gpm and a maximum of 25 gpm (occurred twice). This outfall was also studied

using actual *in situ* flows rather than metered flows because of safety concerns related to the location of the mixing chamber. Measured end-of-pipe mixing ranged from 66.3 to 185.2 at a flow rate that is approximately 1/12th the current maximum flow (25 gpm). However monitoring indicated an additional instream mixing of at least 14. **Recommended acute mixing ratio of 77:1**.

Outfall 030

I've also reviewed the mixing calculations provided by Whitman, Requardt & Associates for Outfall 030. Outfall 030 discharges to 72-inch storm drain owned by the City of Newport News. The location of the discharge to the storm drain is approximately 8,400 feet from the storm drain outlet at the Small Boat Harbour. Whitman, Requardt & Associates calculated the mixing of Outfall 030 flows in the storm drain prior to discharge to the Small Boat Harbour. The calculations were based on an average flow of 5.5 gpm which represented the average of Outfall 030 flow estimates since the first quarter of 2007. Significant cooling tower blowdown flows were eliminated from the outfall prior to this period. I have recalculated the mixing using the maximum estimated flow (0.0216 MGD or 15 gpm) during this same period and **recommend that ratios of 42:1 and 58:1 be used for establishing acute and chronic wasteload allocations respectively**.

Please give a call with any questions about this review.

AB.

Austin,Deanna

From: Brockenbrough,Allan
Sent: Monday, February 23, 2009 1:35 PM
To: Hiltke, Mark F. (Newport News)
Cc: Austin,Deanna
Subject: RE: Outfall 037 Mixing Zone Calculations

Mark-

I've reviewed the previous CORMIX modeling provided by CH2MHill and have no objections to a 10:1 acute dilution ratio being used for the Outfall 037 discharge configuration provided with your email.

Feel free to give me a call with any questions.

Regards,

Allan

Allan Brockenbrough, II, P.E.
DEQ - Office of Water Permits and Compliance Assistance
PO Box 1105
Richmond, VA 23218
(804) 698-4147
(804) 698-4032 (fax)

From: Hiltke, Mark F. (Newport News) [mailto:Mark.F.Hiltke@ngc.com]
Sent: Tuesday, February 03, 2009 1:20 PM
To: Brockenbrough,Allan
Cc: Austin,Deanna
Subject: RE: Outfall 037 Mixing Zone Calculations

Allan-
Attached is a drawing of the configuration of outfall 037. The 6" discharge pipe shown was originally thought to discharge into the James River from above the surface. However, as shown in the drawing, the 6" pipe actually discharges into a 5' X 7' vault that extends down towards the bulkhead. The vault discharges to the James River @ 3'10" below Mean Low Water. Assuming the 10:1 dilution ratio discussed below effectively removes the metals limits from our permit, we request that the information below be used for the permit modification this year.

Please feel free to call and discuss...Mark

M. F. Hiltke

From: Brockenbrough,Allan [mailto:abrockenbrough@deq.virginia.gov]
Sent: Thursday, January 22, 2009 2:49 PM
To: Hiltke, Mark F.
Cc: Austin,Deanna
Subject: RE: Outfall 037 Mixing Zone Calculations

Mark-

We originally asked for another CORMIX run because we did not have a run at the 5 ft. depth proposed in your email of 9/5/08. The 2/6/2007 Technical Memorandum prepared by CH2MHill does include CORMIX runs at the currently proposed depth of 1.5 feet (0.5 m). Accordingly, you can proceed as proposed and we will use an acute dilution ration of 10:1 at a depth of 1.5 ft.

Sorry for the delayed response. See you tomorrow,

Allan

-----Original Message-----
From: Hiltke, Mark F. (Newport News) [mailto:Mark.F.Hiltke@ngc.com]
Sent: Tuesday, January 06, 2009 11:28 AM
To: Brockenbrough,Allan
Cc: Austin,Deanna
Subject: FW: Outfall 037 Mixing Zone Calculations

Dear Mr. Brockenbrough

Please review the below E-mail and advise. I do not have the software to review the modeling runs, but according to the summary reports the target dilution ratio of 5.3:1 is achieved if the discharge pipe is extended 1.5 feet. In a cost saving effort, we do not want to re-run the model unless absolutely necessary. If the previous modeling is valid, we intend to lower the pipe 1.5 feet below the surface in order to achieve the previously calculated dilution ratio.

If you need me to resend the modeling runs let me know. Thank you for your help in this matter.

M.H. Hiltke
NNS EE#3
(757) 534-4067

From: Hiltke, Mark F.
Sent: Friday, December 05, 2008 10:35 AM
To: 'Austin,Deanna'
Subject: Outfall 037 Mixing Zone Calculations

Hi Deanna-

The summary table attached shows that the target dilution ratio for achieving the 5.9 ppb WQ criteria for copper is 5.3:1. Under the recommendations section of the attached summary report, it states that the target dilution ratio can be achieved if the discharge pipe is extended 1.5 feet below the surface. I underlined the applicable section.

As you know, I'm trying not to have to re-run this model if possible. I'm seeking approval from DEQ for the above dilution ratio for copper if we extend the pipe 1.5 feet as shown by the CH2M Hill Study.

I have previously sent Allan B. the entire report with the modeling runs. Please call w/ any questions...Mark

M.F. Hiltke
NNS EE #3
534-4067

Austin,Deanna

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Attachments: Outfall 037 drawing.pdf

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M.H. Hiltke

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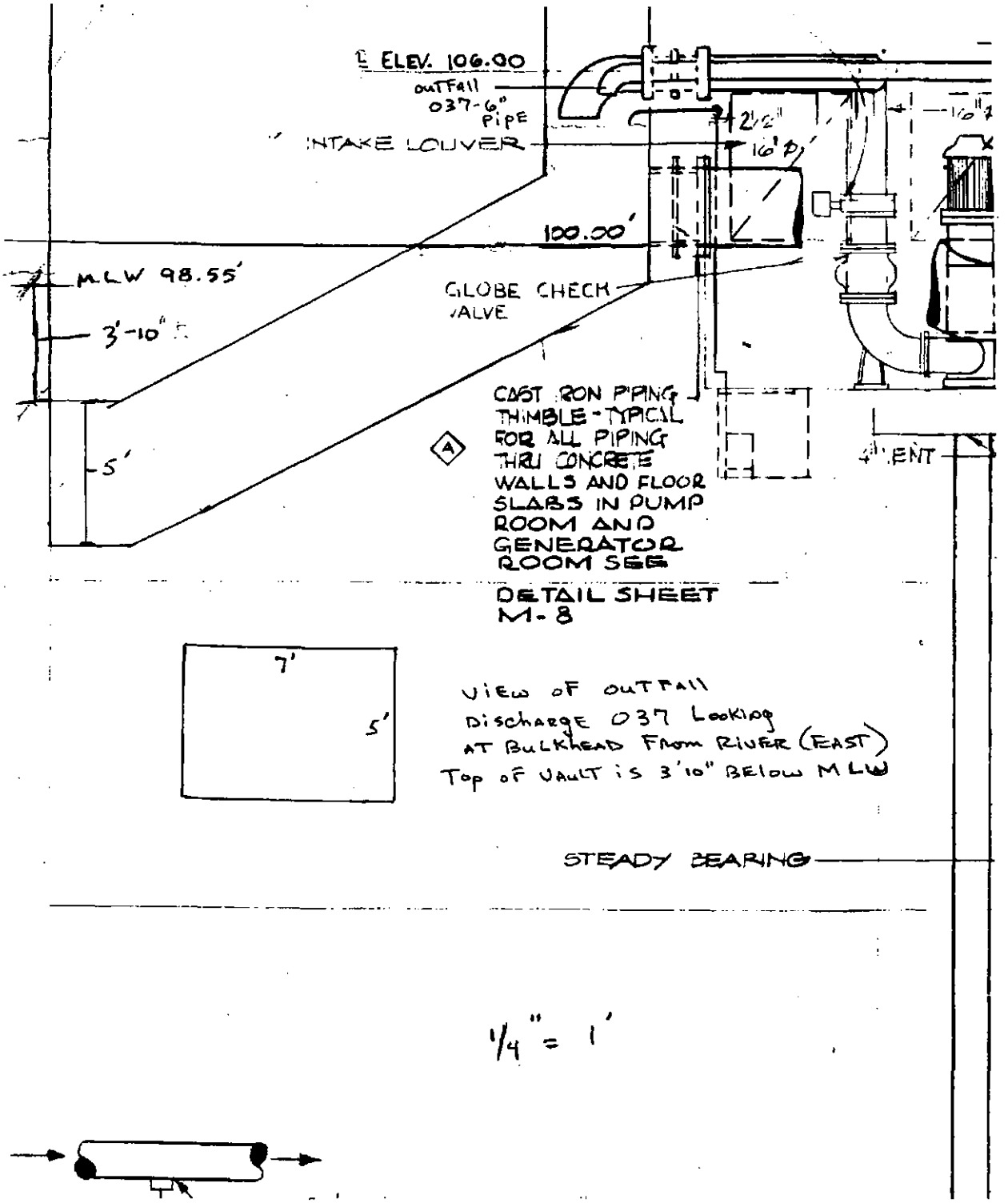
M.F. Hiltke
NNS EE #3
534-4067


℄ ELEV. 106.00
OUTFALL
037-6" PIPE
INTAKE LOUVER
2½"
16" D
16"
100.00'
MLW 98.55'
3'-10"
GLOBE CHECK VALVE
5'
CAST IRON PIPING THIMBLE - TYPICAL FOR ALL PIPING THRU CONCRETE WALLS AND FLOOR SLABS IN PUMP ROOM AND GENERATOR ROOM SEE
A
DETAIL SHEET M-8
4" VENT
7'
5'
VIEW OF OUTFALL DISCHARGE 037 LOOKING AT BULKHEAD FROM RIVER (EAST)
TOP OF VAULT IS 3'10" BELOW MLW
STEADY BEARING
1/4" = 1'

NORTHROP GRUMMAN

Northrop Grumman Corporation
Shipbuilding

4101 Washington Avenue
Newport News, VA 23607
Telephone 757-380-2000

1000 Access Road
Pascagoula, MS 39567
Telephone 228-935-1122

February 10, 2009

RECEIVED – DEQ
FEB 11 2009
Tidewater Regional Office

Ms. Deanna Dodson Austin
Environmental Engineer Senior
Tidewater regional Office
Virginia Department of Environmental Quality
5636 Southern Boulevard
Virginia Beach, VA 23462

CERTIFIED MAIL: 7006 0810 0002 4014 6355

Subject: VPDES permit No. VA0004804 Rhodamine WT Dye Study Final Report

Dear Ms. Austin:

Enclosed is the Rhodamine WT Dye Study final report. This report is being submitted to DEQ for consideration in support of the Schedules of Complance requirements outlined in Part 1.B. of permit number VA0004804.

If you have any questions, please feel free to contact me.

Sincerely,

Mark F. Hiltke
Environmental Engineer 3

Enclosure

cc. Read file (w/o enclosure)
File

Rhodamine WT Dye Field Studies in Support of Discharge Dilution Evaluations for Selected Northrop Grumman Newport News Shipbuilding Outfalls

Final Report

RECEIVED – DEQ
FEB 11 2009
Tidewater Regional Office

Submitted To

Whitman, Requardt & Associates, LLP
11870 Merchants Walk, Suite 100
Newport News, VA 23606

by

William Reay, Ph.D.
Harry Wang, Ph.D.
Gamble Sisson
and
Eduardo Miles

Virginia Institute of Marine Science
School of Marine Science
College of William and Mary
Gloucester Point, Virginia 23062

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I. Introduction

Northrop Grumman Newport News Shipbuilding (NGNN) has various industrial outfalls that discharge directly to tidal portions of the James River. In order to protect the integrity of the receiving waterbodies, industrial discharges are regulated by Virginia's Department of Environmental Quality (VaDEQ) and therefore must comply with Virginia water quality standards. Specifically for this study, copper and zinc are the limiting effluent constituents for the NGNN outfalls. In some circumstances it may not be necessary to meet all water quality criteria within the discharge pipes in order to protect a water body. In these cases, ambient pollutant concentrations may be allowed to exceed water quality criteria in limited areas, or regulatory mixing zones, immediately adjacent to the outfalls. Regulatory mixing zone water quality standards and criteria are applied at the boundary of the mixing zone, rather than within the mixing zone itself. There are two criteria applied to the mixing zones (Figure 1), these are: (1) acute criteria for intermittent flow and (2) chronic criteria for continuous flow. NGNN outfall discharges are intermittent and therefore acute criteria apply. Criterion Maximum Concentration (CMC), the acute water quality criterion recommended by U.S. EPA, is the highest concentration of a toxic substance or an effluent that does not cause acute effects to briefly (1 hr) exposed organisms.

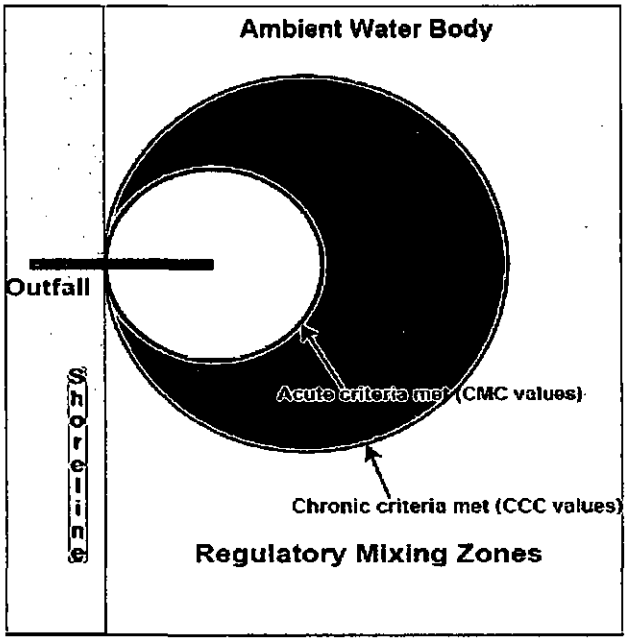

Figure 1. The regulatory mixing zones. Pink area represents the zone with acute criteria applied. CMC and CCC denote Criterion Maximum Concentration and Criterion Continuous Concentration, respectively. Schematic source: U.S. EPA/505/2-90-001.

Modeling methodologies are commonly used to estimate mixing zone dimensions. CORMIX is a USEPA-supported mixing zone decision support model for regulating mixing zone environmental impact assessment resulting from point source discharges. The CORMIX analysis is usually carried out under the assumption of steady-state conditions including steady discharge volume flux and ambient flow field conditions. True steady-state conditions are rarely observed in water environments. For example, ambient conditions are inherently unsteady within the James River near the NGNN outfalls due to influencing factors such as tidal action, wind generated waves and river discharge. For regulatory purposes, analysts sometimes consider conditions at slack tide (often zero ambient velocity) as representative of a "worst case" scenario. However, minimum initial dilution generally will not occur at slack tide, but shortly after slack tide when the plume re-entrains material remaining from the previous tidal cycle. In the tidal mode, CORMIX does not consider unsteady build-up of material over several tidal cycles and assumes a complete flushing of the historic plume in the near-field, which will occur within a single tidal cycle.

In 2006, a CORMIX modeling evaluation was conducted on selected NGNN outfalls in order to possibly avoid permit modifications (CH2M Hill 2006). Included in this study were Outfalls 019, 026, 037, 038 and 042. The dilution performance of each discharge was evaluated to assist NGNN in the decision on whether to relocate and where to locate (with respect to depth below the waters surface) outfalls in order to eliminate the need for effluent limits. Results suggested that four of the five outfalls, two included in

this study (Outfall IDs: 019 and 026), met target dilutions in their current configurations. It was recommended that outfalls not meeting target dilutions be submerged and positioned at a greater distance offshore from the bulkheads.

In March 2008, the Virginia Institute of Marine Science (VIMS) conducted a pilot field study to determine the temporal nature of freshwater discharges and tidal connectivity to the James River within selected outfall mixing chambers (Outfall ID: 020, 026 and 084)(Reay and Wang, unpublished). Water level and salinity information derived from the pilot study indicated that significant mixing, driven by tidal action, could occur between the inshore mixing chambers and the outfall discharge point located in the bulkhead abutting the James River. Using a simplified tidal prism approach (Officer 1976), it was estimated that a significant amount of dilution, ranging from approximately 2 :1 to a 10:1 ratio, occurred prior to the pollutant reaching the discharge point near the bulkhead. These findings suggest that pollutant concentrations at the discharge point near the bulkhead (used by CORMIX) can be substantially lower than those observed in the mixing chambers and reported to VaDEQ as a permit requirement. Based on this information, the proper concentrations to be used as the input to CORMIX should be a fraction of those recorded in the mixing chamber.

The purpose of this study was to conduct Rhodamine WT dye dilution tests in order to determine mixing patterns and dilution rates in selected outfalls that vary in orientation and configuration, and are influenced by temporally varying environmental conditions. This study utilized a continuous, constant rate injection dye dilution methodology and continuously monitored water quality and dye parameters at the primary mixing chambers, the outfall pipe where it discharges into the tidal James River, and at offshore sites within the delineated regulatory mixing zone. Dilution performance results of this study are anticipated to assist NGNN and VaDEQ in regulatory permitting decision-making regarding the selected outfalls.

II. Study Methodology

2.1 General Approach

To evaluate the mixing and dilution performance within specified outfalls (consisting of mixing chambers and discharge pipes) and associated regulatory mixing zones, Rhodamine WT dye studies were conducted under non-steady tidal conditions. Five NGNN outfalls were included in this study, as follows: Outfalls 084, 020, 019, 003 and 026. Studies were conducted between September and December 2008.

Prior to field studies, upgradient *in situ* flow was blocked from entering primary mixing chambers and rerouted so as not to impact the study. Outfall flow was re-established by injecting deionized water at rates approximating the median of historical discharge rates. Exception to this occurred at Outfalls 026 and 003 where *in situ* flows were used. Water and Rhodamine WT were injected continuously for a period of 12 hours into a primary mixing chambers beginning at or near high tide conditions. In most cases (i.e., Outfalls 020, 026, and 003), primary mixing chambers used in this study coincided with the VaDEQ permit sample collection points. Primary mixing chambers used for Outfalls 084 and 019 were down-gradient of VaDEQ permit sample collection points. Efforts were made to conduct studies during normal (defined as not extreme high or low) tidal conditions and relatively calm weather and sea state conditions.

Physical water quality and Rhodamine WT measurements were typically made at five locations, and included the primary mixing chamber, the shoreward end of the discharge pipe, and three offshore locations within the acute regulatory mixing zone. Water level measurements were collected at the primary mixing chamber, the shoreward end of the discharge pipe and at one location within or immediately adjacent to the regulatory mixing zone. Near continuous (5-minute intervals) measurements were made within the mixing chamber and shoreward end of the discharge pipe utilizing YSI 6600 multi-parameter datasondes and grab samples (30- to 60-minute intervals) that were collected at all five stations

utilizing ISCO samplers. In addition, a single YSI 6600 multi-parameter datasonde, collecting a full suite of water quality parameters, was deployed in the James River adjacent to the studied outfall. Samples were collected immediately prior to the injection of water and dye into the mixing chamber, during the 12-hour injection period, and for the ensuing 24 hours following cessation of Rhodamine WT injection.

2.2 Detailed Water and Dye Injection System Description

A schematic of the general water and dye injection system and placement of sample collection instrumentation is shown in Figure 2. The primary water injection system consisted of a 1895L (500gal) deionized water storage tank that provided water to the 379L (100gal) constant head tank by way of a 110V clear water pump (0.5 hp; 12 gal/min maximum discharge). Water from the constant head tank was discharged into the primary outfall mixing chamber by way of an additional 110V clear water pump. Valving allowed for adjustment of flow rates and recirculation of excess water back into the deionized water storage and constant head tanks. A set elevation discharge port, leading to the constant head tank overflow tank (114L, 30gal), allowed for the discharge of excess water within the constant head tank. A constant head tank was deemed necessary as varying hydraulic heads can have a direct impact on pump performance. Water discharge rates were selected to simulate median discharge rates as determined from historical discharge information for outflows (see Table 1 for summary statistics of outfall flow rates; individual estimates and graphics are provided in Appendix I). Exception occurred at Outfalls 026 and 003 where *in situ* flow rates were used. These outfalls exhibited elevated and highly variable historical discharge rates. Additionally, primary mixing chambers for these outfalls were located in high traffic areas where transport and pumping of deionized water would have resulted in less than desirable logistic and safety conditions. Flow rates of water entering primary mixing chambers were measured using a

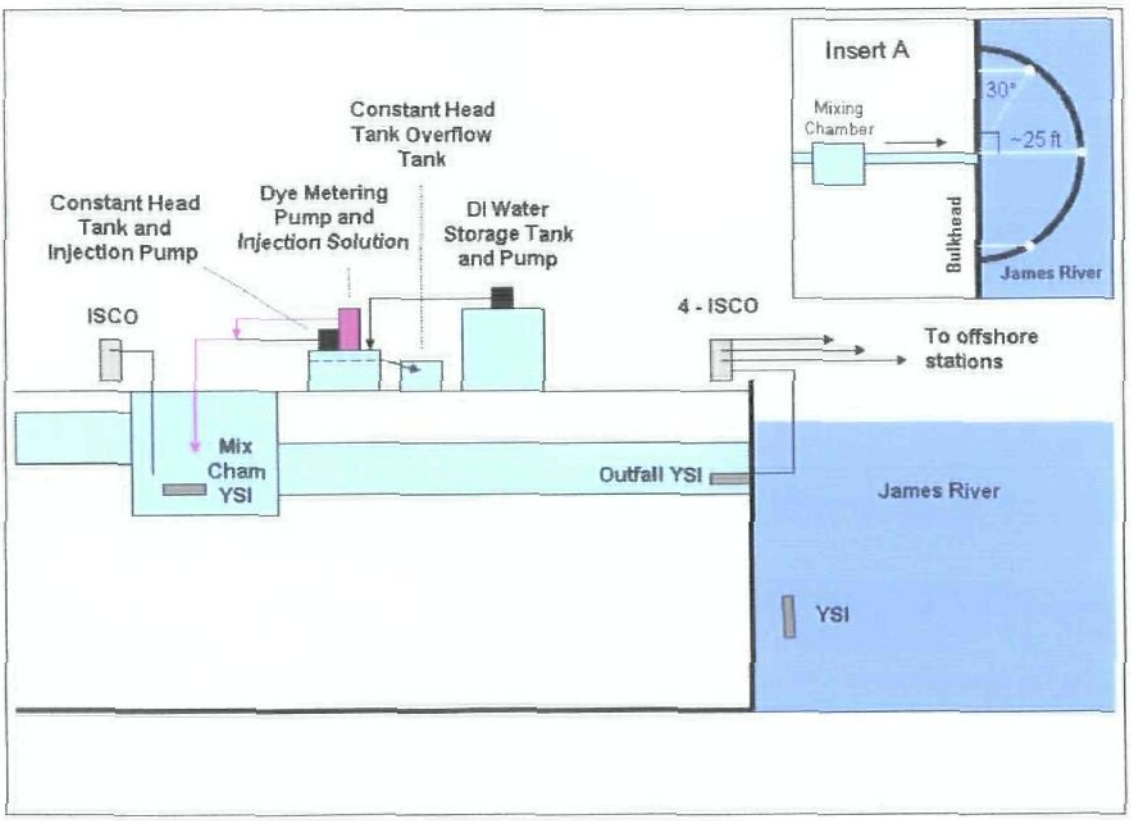

Figure 2. Schematic of the water and dye injection system and placement of sample collection instrumentation. Insert A depicts the locations of the offshore sampling stations based on a 7.6 m (25 ft) arc within the defined acute regulatory mixing zone.

Teledyne 2150 flow meter with a low profile area velocity sensor (accuracy ± 2% of reading from 1.5-6.1 m/sec or 5-20 ft/sec) in Outfall 026 and manually by volume collection in Outfall 003.

A 12V constant displacement pump (12V QBG-MB series supplied by Fluid Metering, Inc.) with a flow rate range of 0.48 - 4.8 ml/min was used as a constant-rate dye injector. Injection pump flow rates were pre and post calibrated for each study. Two methods of dye solution injection were employed. For the low discharge outfalls (i.e., Outfalls 084, 020), the dye injection point occurred through a "T" connector located after the constant head tank water pump and prior to discharge in the mixing chamber. At higher flow outfalls (i.e.,Outfalls 019, 026, 003), dye was injected directly into the mixing chamber at the point of water input. 12V bilge pumps were used to continuously mix water and dye to produce uniform dye concentrations within the mixing chamber. Access was limited within mixing chambers and required following NNGN safety protocols.

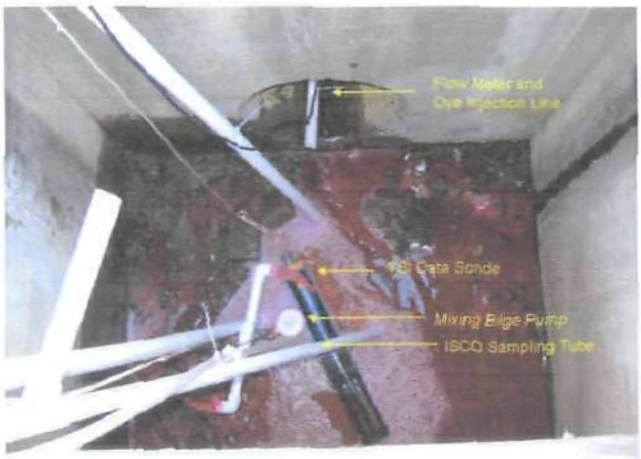

Figure 3. Outfall 003 mixing chamber highlighting deployed instruments and sampling equipment.

Rhodamine WT was selected for the dye study due to its desirable characteristics for water tracing (see Section 2.4). Rhodamine WT was obtained from Keystone Aniline Corporation (product: Keyacid rhodamine WT liquid) in a 20% solution (specific gravity 1.13; 1130 g/L or 9.41 lbs/gal). Factors influencing concentrations of dye injection solutions included water injection rates, first-order estimates of dilution rates and fluorescent sensor sensitivity (YSI) to Rhodamine dye. Dye injection rates and concentrations are provided in the results section for individual outfalls.

Table 1. Summary statistics of outfall flow rates as measured by NGNN in primary sampling chambers. Units are expressed as L/min with gal/min presented parenthetically.

	Outfall Identification Number				
Statistic	020	084	019	026[1]	003[2]
Mean	4.9 (1.3)	1.4 (0.4)	23.7 (6.3)	154.9 (40.9)	60.1 (15.9)
Median	3.8 (1.0)	0.0 (0.0)	15.1 (4.0)	37.9 (10.0)	37.9 (10.0)
Std. Dev.	4.4 (1.2)	2.8 (0.7)	25.6 (6.8)	384.5 (101.6)	74.8 (19.8)
1st Quartile	3.8 (1.0)	0.0 (0.0)	7.6 (2.0)	17.0 (4.5)	18.9 (5.0)
3rd Quartile	3.8 (1.0)	0.9 (0.3)	37.9 (10)	75.7 (20.0)	75.7 (20.0)
Min	0.0 (0.0)	0.0 (0.0)	3.8 (1.0)	7.6 (2.0)	11.4 (3.0)
Max	18.9 (5.0)	7.6 (2.0)	113.6 (30.0)	1892.5 (500.0)	378.5 (100.0)
N	24	7	24	24	23

Notes:

(1) Outfall 026 had a single high discharge measurement of 1892.5 L/min (500 gal/min) that skewed the data set. With this single high value removed, mean and median discharge was 79.3 L/min (21.0 gal/min) and 37.9 L/min (10 gal/min), respectively, with a count of 23.

(2) Outfall 003 had a single high discharge measurement of 378.5 L/min (100 gal/min) that skewed the data set. With this single high value removed, mean and median discharge was 45.6 L/min (12.0 gal/min) and 37.9 L/min (10 gal/min), respectively, with a count of 22.

2.3 Field Sample Collection and Measurement

This study utilized a variety of sampling and measurement methodologies to enhance spatial and temporal resolution of relevant information. In general, field measurement and collection of samples occurred at five locations during each outfall study. General sample locations were: (1) the primary mixing chamber, (2) the outfall discharge pipe where effluent enters into the James River, (3) at a point on a line 30° from the bulkhead to the left of the discharge pipe for a distance of 7.6 m (25 ft), (4) at a point on a line 90° from the bulkhead directly in front of the discharge pipe for a distance of 7.6 m (25 ft) and (5) at a point on a line 30° from the bulkhead to the right of the discharge pipe for a distance of 7.6 m (25 ft); see Insert A in Figure 2 for schematic and Figure 4 for actual field deployment of offshore stations. Sampling depth within the mixing chambers and discharge pipes was generally near the base to assure maximum number of samples collected. The three offshore sampling points were associated with floating platforms that collected samples one meter below the waters surface and followed a circular arc that fell within the outfall's acute regulatory mixing zone. Any variations to this general sampling scheme are described in the results section of individual outfalls. The offshore boundary of the acute water quality criteria mixing zone varied between outfalls and can be determined a number of ways depending on available information. For this study, the boundary of the acute water quality criteria mixing zone was estimated by two methods with use of the most restrictive condition; results are provided in the individual outfall sections. Methods included: (1) 50 times the discharge length scale in any spatial direction (note: discharge length scale is defined as the square-root of the cross-sectional area of the discharge outlet, and (2) five times the local water depth in any horizontal direction from the discharge outlet (USEPA 1991).

Figure 4. Deployment of Outfall 020 offshore stations.

Near continuous (5-minute interval) and *in situ* measurement of selected water quality parameters and Rhodamine WT fluorescence was conducted using YSI multi-parameter datasondes. In all studies, YSI datasondes were deployed in the primary mixing chambers and the most downstream portion of the outfall discharge pipe. Measured parameters at mixing chambers and discharge pipe included water depth, temperature, specific conductance, salinity (calculated), turbidity and Rhodamine WT fluorescence. In addition to the above stated YSI datasonde deployments, a single unit with a full suite of water quality sensors (i.e., water depth, temperature, specific conductance, pH, dissolved oxygen, turbidity and chlorophyll fluorescence) was anchored at an offshore location adjacent to the outfall. Calibrated datasondes were deployed prior to outfall studies and remained operational throughout the 36-hour study period.

Grab samples were collected by programmable ISCO 6712 full-size portable samplers and by hand. In all studies, ISCO samplers collected samples within the primary mixing chambers and the most downstream portion of the outfall discharge pipe. ISCO samplers were also deployed to collect samples from the three floating platforms offshore each outfall discharge pipe. Grab samples were collected immediately prior to dye injection, at the point of dye injection and then hourly for the 12-hour dye injection period and subsequent 24-hour period (total sampling period: 36 hours). Exception to this general protocol occurred at Outfall 003 where grab sample frequency was increased to 0.5-hour intervals during the 12-hour dye injection period. All grab samples were analyzed for Rhodamine WT dye fluorescence with salinity being measured on selected samples.

2.4 Tracer Dye Selection and Potential Interferences

Rhodamine WT was selected for this study due to its desirable characteristics for water tracing. These include: (1) high water solubility and good diffusivity, (2) high detectability (strong fluorescence), (3) reduced background fluorescence issues, (4) low sorptive tendencies, (5) low acidity, (6) reasonable stability in normal water environments and (7) low toxicity (Wilson et al. 1986).

Dye loss or degradation during tracer studies can occur for a variety of reasons. Principal reasons include extreme pH levels in ambient waters, photodecomposition, chemical destruction of dye by chlorine, and sorption on suspended sediment. Extreme pH levels, lower than 4.5 and greater than 10.5 standard units, have been shown to impact dye stability. pH levels of all discharge and receiving waters in this study remained between these values. Measured pH of injection water was 8.5 standard units for Outfalls 084, 020 and 019, 8.5 for Outfall 003 and 8.3 for Outfall 026; note: deionized water served as the discharge water source for Outfalls 084, 020, and 019. Receiving waters of the James River exhibited pH values ranging from 7.73 to 8.34 standard units during the individual studies. Photo-degradation was assumed to be negligible due to the short duration of the study (36 hr) and the low-light environment within the discharge pipes. Photodegradation can be an issue for studies conducted in open water over an extended (days) period. Additionally, samples were stored in the dark during lab analysis.

Turbidity, a measure of suspended solids, within mixing chambers was generally low (average: < 5 NTU) except for Outfall 019 (average: 16 NTU) which experienced runoff during a rain event late in the water and dye injection portion of the study. Mean turbidity within the James River adjacent to the studied outfalls ranged from 3 to 12 NTU; again Outfall 019 exhibited the highest mean value. It was not anticipated that degradation of Rhodamine WT by chlorine would be an issue during this study. In order to minimize effects, deionized water served as the discharge water source for Outfalls 084, 020, and 019. Free chlorine, measured with a HF Scientific Inc. photometer and PPD-2 reagent, was on the order of 0.01 mg/L for the deionized water and *in situ* discharge to Outfall 003 mixing chamber, and 0.02-0.03 mg/L for the *in situ* discharge to Outfall 026 mixing chamber.

2.5 Laboratory Methods

Upon return to the laboratory, grab samples were allowed to stabilize for a minimum of 24 hours, allowing calibration standards and field samples to be brought to a common temperature prior to analysis and negating a need for a temperature-correction factor. A filter fluorometer, Barnstead/Turner Quantech Digital (wide band model: FM109535), was used for spectral analysis of Rhodamine WT in ISCO and hand collected samples. The fluorometer utilized a glass cuvette (Volume: 11 cm^3; Diameter: 12 mm; Length: 100 mm), a quartz halogen lamp, and a 546 nm primary excitation filter and SC 585 secondary emission filter combination that is preferred when turbidity is present. Rhodamine WT standards were developed based on a serial dilution procedure outlined by Wilson et al. (1986). Final standard concentrations were 1, 5, 25, 50 and 100 µg/L of active ingredient or raw dye. Rhodamine WT standards and calibration curves were generated for each outfall study. The Rhodamine WT detection limit was on the order of 0.2 µg/L of active ingredient. Samples exhibiting high dye concentrations were diluted with deionized water to assure samples were measured below the level on nonlinearity. Rhodamine WT concentration was expressed as µg/L (ppb) of active ingredient or "raw" dye. When necessary, Rhodamine WT concentrations were adjusted by subtracting background readings from the samples. Background Rhodamine WT concentrations were typically 0.0 µg/L for injected deionized water (Outfalls 020, 084 and 019), 0.1-0.3 µg/L for upgradient *in situ* freshwater discharging into Outfalls 026 and 003, and typically 0-0.2 µg/L for ambient James River water.

Configuration and calibration of YSI 6600 datasondes followed standard YSI 6-Series protocols (YSI 2006) and utilized Ecowatch 3.18 supporting software. Water depth was measured with a non-vented pressure sensor that was calibrated to the atmosphere and corrected for local barometric pressure. Water

depth measurements were adjusted to correct for barometric pressure variations during the deployment period using local information from Sewells Point on the James River (National Data Buoy Center Station ID: SWPV2-8638610). Dissolved oxygen was calibrated to saturated air and corrected for barometric pressure. pH and turbidity (sensor 6136) were calibrated using two-point buffer (7 and 10 standard units) and standard (0 and 123 NTU) protocols, respectively. Conductivity probes were calibrated with a 10,000 microsiemen/cm standard. Chlorophyll (sensor 6025) and Rhodamine WT (sensor 6130) sensors were calibrated using a deionized water (0 µg/L) and Rhodamine WT standard dye solution (100 µg/L). The YSI 6130 rhodamine sensor (Range: 0 to 200 µg/L as true dye; Detection limit: 0.5 µg/L; Accuracy: ±1% µg/L or ± 5% of reading) was self-cleaning and auto-corrected for temperature and conductivity effects. YSI sensor Rhodamine WT concentrations were adjusted for turbidity by subtracting the value of 0.03 µg/L per NTU from the raw Rhodamine WT measurement.

2.6 Data Analysis

Continuous, constant rate injection dye dilution studies were conducted at five selected NGNN outfalls. In constant rate injection studies, the relationship between dye concentrations in the mixing chambers and outfall discharge pipes is provided in Equation 1.

$$Q_1 \times C_1 = Q_2 \times C_2 \qquad (1)$$

Where:

Q_1 = Flow rate at the mixing chamber (L/min)
C_1 = Dye concentration within the mixing chamber (µg/L)
Q_2 = Flow rate at the outfall discharge pipe (L/min)
C_2 = Dye concentration within the outfall discharge pipe (µg/L)

Solving for Q_2, the unknown in the study design, yields: $Q_2 = Q_1 \times \frac{C_1}{C_2}$

Where: $\frac{C_1}{C_2}$ is defined as the dilution factor.

The dilution factor is equal to the ratio of dye plateau concentration within the mixing chamber to dye plateau concentration within the outfall discharge pipe. The observation of peak concentration plateaus suggests that the injected dye has become relatively well mixed and reached an equilibrium concentration at the measurement points. This dilution factor provides a measure of mixing that occurs between the mixing chamber and the outfall discharge point at the bulkhead prior to entering the tidal James River.

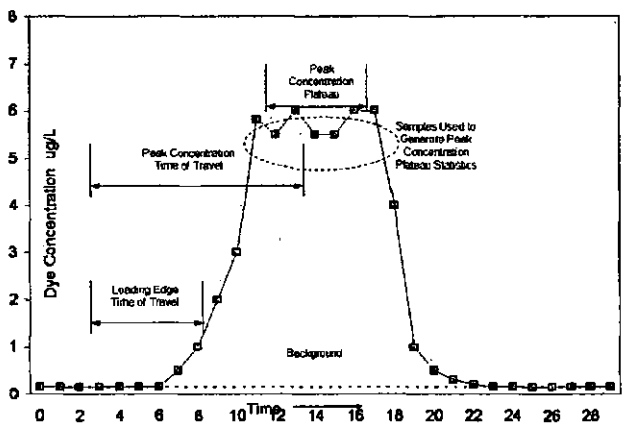

Figure 5. Representative time-concentration curve highlighting peak concentration plateau and leading edge and peak concentration time of travel.

Time-concentration curves (Rhodamine WT) were developed for the primary mixing chamber and discharge pipe for each of the studied outfalls. Additional time-concentration curves were generated for selected studies that exhibited tracer dye in the offshore waters or in a supplemented mixing chamber (Outfall 019). The time-concentration curves were used to identify samples that contributed to the peak concentration plateau and

estimate the time of travel based on leading edge (first observance of dye tracer) and peak dye concentrations (Figure 5). Only a limited number of samples are required to define the plateau concentration in continuous, constant rate injection dye studies. Dilution factors were calculated using mean, median, 3rd quartile (highest 25% of data) and maximum values of samples composing the peak concentration plateau. When appropriate data are available, both grab (ISCO) and near continuous (YSI) data are used.

III. Results

3.1 Outfall 020

The dye study for Outfall 020 was conducted from September 17, 2008 (11:00 EST) to September 19, 2008 (24:00 EST). Dye was injected into the primary mixing chamber for twelve hours beginning at 11:00 (EST) on 9/17/2008 and ending at 23:00 (EST) of the same day. With respect to water and weather conditions, a spring tide (full moon) occurred on September 15, 2008, sea state was relatively smooth and weather was fair throughout the study. The Outfall 020 site schematic is depicted in Figure 6.

The historic median discharge rate of 3.8 L/min (1.0 gal/min; see Table 1) was targeted for use during this study. The mean measured discharge rates during the dye and water injection portion of the study was 3.9 L/min (1.0 gal/min; N=12). Upgradient discharges to the Outfall 020 mixing chamber were blocked to assure no or minimal water entering the mixing chamber from upgradient sources. Measured dye injection rate and calculated concentration was 2.4 ml/min and 152 µg/L, respectively. Outfall 020 descriptors and calculated dilution factors are provided in Tables 2 and 3, respectively. Dye concentration and water depth times series for the primary mixing chamber are provided in Figure 7 and Figure 8 for the outfall discharge pipe, respectively. Rhodamine WT was not detected at any of the offshore sampling locations. The calculated water density times series is provided in Figure 9.

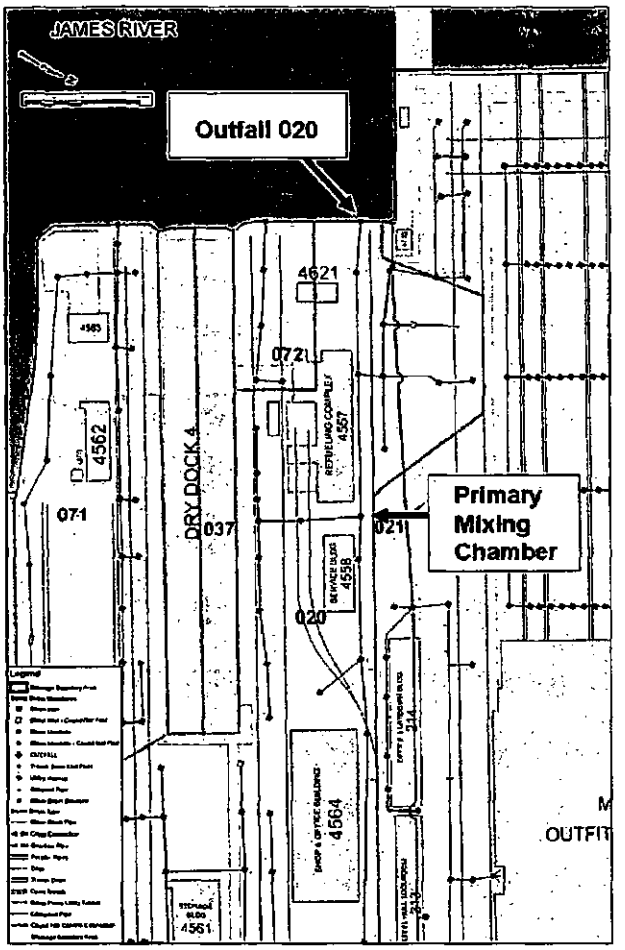

Figure 6. Site schematic for Outfall 020.

Notes: (1) 11 ISCO samples were not collected at James River Station 5 (30° right) due to equipment failure, and (2) 11 ISCO samples were not collected in the mixing chamber (Station 2) due to low water conditions.

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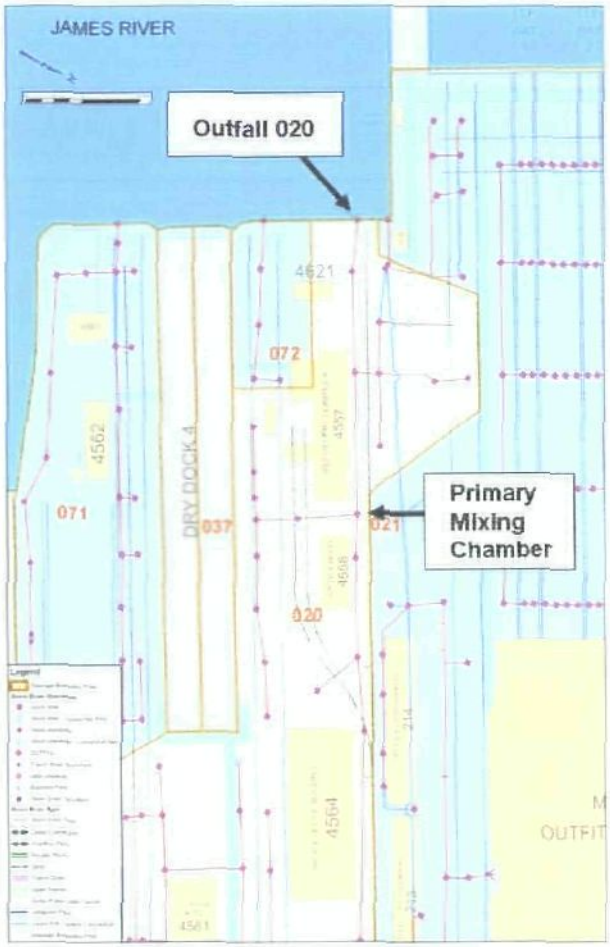

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Notes: (1) 11 ISCO samples were not collected at James River Station 5 (30° right) due to equipment failure, and (2) 11 ISCO samples were not collected in the mixing chamber (Station 2) due to low water conditions.

Table 2. Outfall 020 descriptors observed during study period.

Outfall Descriptors	
Tidal Influence Observed in Mixing Chamber	Yes
Number of Chambers between Mixing Chamber and Outfall	2
Distance of Mixing Chamber to Outfall	96 m (316 ft)
Diameter of Outfall Pipe	91 cm (36 in)
Discharge Pipe Elevation	Subtidal
Time of Travel (leading edge) hr:min	24:00
Time of Travel (peak) hr:min	24:00 - 25:35
Mixing Zone Water Depth	5.8 m (19.0 ft)
Acute criteria mixing zone boundary (based on outlet dimensions)[1]	40.5 m (132.9 ft)
Acute criteria mixing zone boundary (based on water depth)[1]	29.0 m (95.0 ft)

Notes:

(1) Based on the most restrictive condition, offshore sampling stations were approximately 26% the distance to the acute criteria mixing zone boundary.

Table 3. Outfall 020 mixing chamber and outfall plateau dye concentrations and calculated dilution factors.

Mixing Chamber µg/L or ppb	Outfall µg/L or ppb	Dilution Factor
$C_{1\ isco}$ Mean: 152 Median: 147 3rd Quartile: 155 Max: 172 N: 4	$C_{2\ isco}$ Mean: 1.5 Median: 1.5 3rd Quartile: 1.5 Max: 1.5 N: 2	$C_{1\ isco}/C_{2\ isco}$ Mean: 101.3 Median: 98.0 3rd Quartile: 103.3 Max: 115.7
$C_{1\ ysi}$[1] Mean: 178 Median: 178 3rd Quartile: 190 Max: 200 N: 24	$C_{2\ ysi}$ – N/A[2]	$C_{1\ ysi}/C_{2\ isco}$ Mean: 118.7 Median: 118.7 3rd Quartile: 126.7 Max: 133.3

Notes:

(1) 7 values (range: 201 to 209 µg/L) were deleted from YSI plateau concentration due to exceedance of sensor range limit (200 µg/L).

(2) N/A denotes not applicable due to YSI sensor operating below detection limits.

(3) *Mean background water fluorescence: Deionized injection water: 0.0 µg/L; James River: 0.0 µg/L.*

(4) VaDEQ approved (October 2006) mixing zone dilution ratio: 14.8.

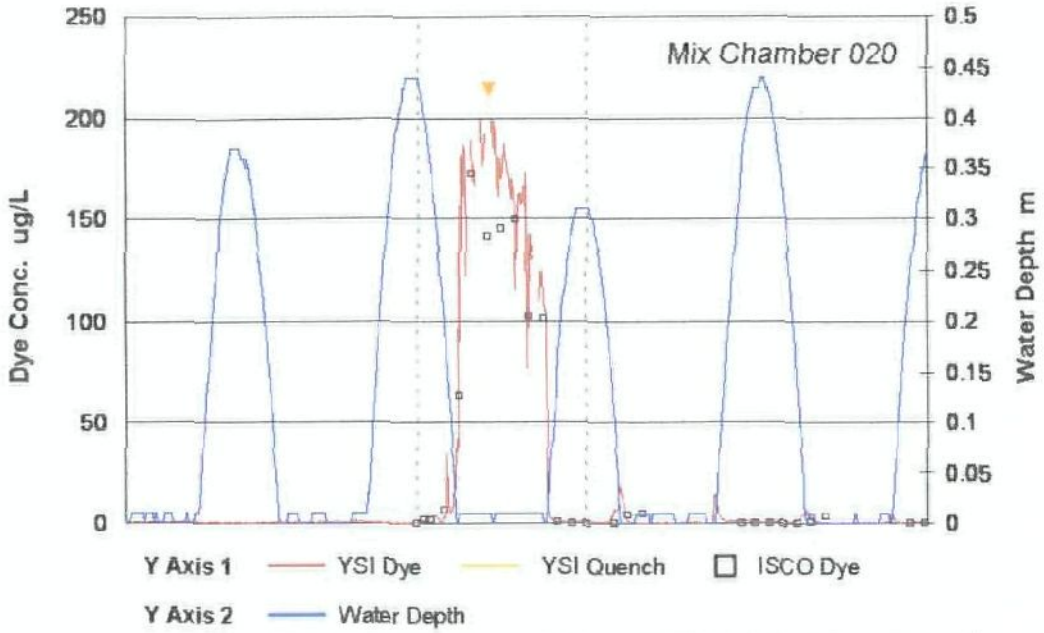

Figure 7. Dye concentration and water depth time series for Outfall 020 mixing chamber. Dashed gray lines represent time period of dye and water injection.

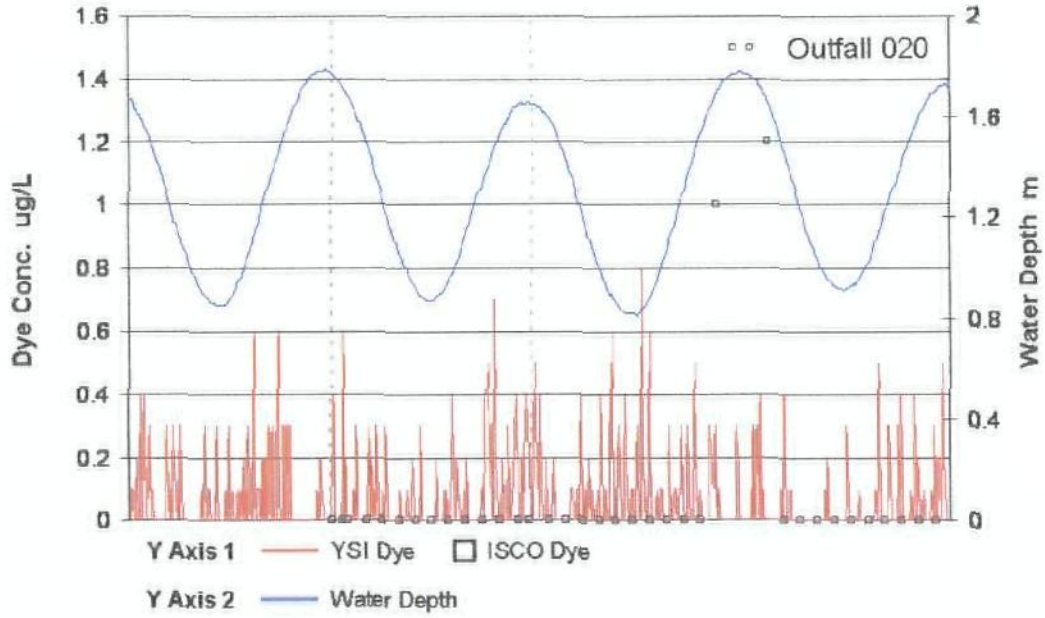

Figure 8. Dye concentration and water depth time series for Outfall 020 discharge pipe. Dashed gray lines represent time period of dye and water injection.

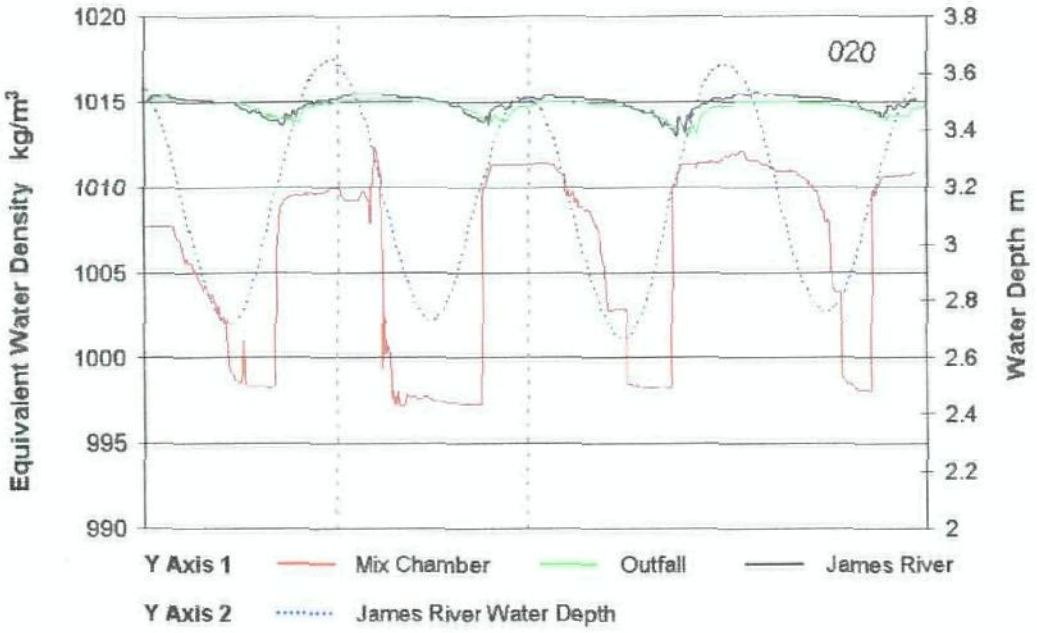

Figure 9. Water density times series for Outfall 020 as calculated by the one atmosphere international equation of state of seawater (UNESCO 1981). Dashed gray lines represent time period of dye and water injection.

3.2 Outfall 084

The dye study for Outfall 084 was conducted from October 3, 2008 (10:00 EST) to October 4, 2008 (22:00 EST). Dye was injected into the primary mixing chamber for twelve hours beginning at 10:00 (EST) on 10/3/2008 and ending at 22:00 (EST) of the same day. With respect to water and weather conditions, a spring tide (new moon) occurred on September 29, 2008, sea state was relatively smooth and weather was fair throughout the study. The Outfall 084 site schematic is depicted in Figure 10.

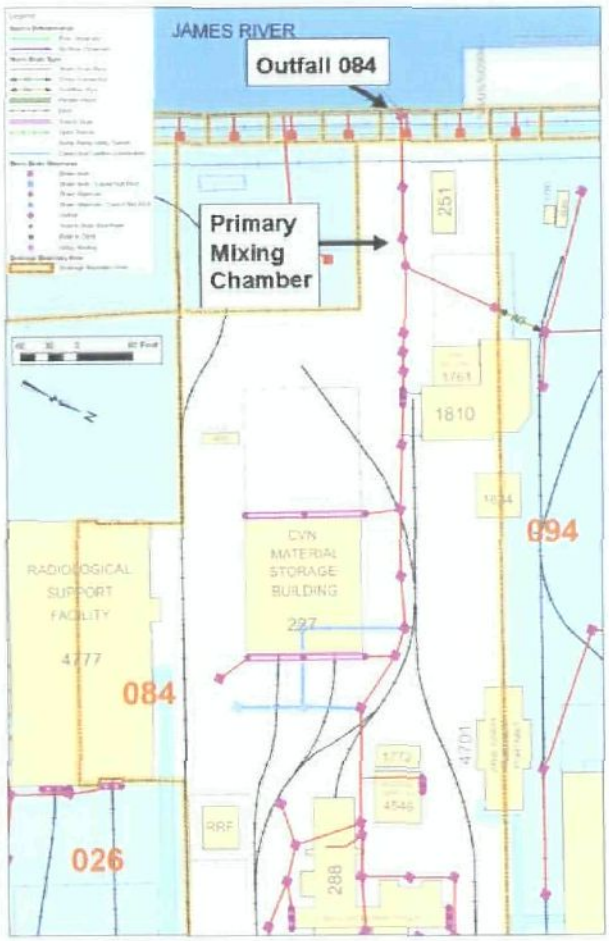

Figure 10. Site schematic for outfall 084.

Given that the historic median discharge was 0.0 L/min (0.0 gal/min; see Table 1), the historic mean value of 1.4 L/min (0.4 gal/min) was targeted. The mean measured discharge rates during the dye and water injection portion of the study was 1.4 L/min (0.4 gal/min; N=8). Measured dye injection rate and calculated concentration was 1.7 ml/min and 836 µg/L, respectively. Upgradient discharge to the Outfall 084 mixing chamber was not blocked due to no or minimal water entering the mixing chamber from upgradient sources. Outfall 084 descriptors and calculated dilution factors are provided in Tables 4 and 5, respectively. Dye concentration and water depth times series for the primary mixing chamber are provided in Figure 11 and Figure 12 for the outfall discharge pipe, respectively. Rhodamine WT was not detected at any of the offshore sampling locations. However, visual observation (W. Reay and G. Sisson) of Rhodamine WT did occur within a compact (< 1 m diameter) region directly below the outfall discharge; visual estimate of the dye concentration was on the order of ≤ 100 µg/L. Due to the low effluent flow volume, the dye quickly dissipated to unobservable levels within 1-2 meters distance from the outfall. The calculated water density times series is provided in Figure 13.

Notes: (1) 17 ISCO samples were not collected at outfall discharge pipe (Station 2) due to low water conditions.

Table 4. Outfall 084 descriptors observed during study period.

Outfall Descriptors	
Tidal Influence Observed in Mixing Chamber	Yes
Number of Chambers between Mixing Chamber and Outfall	2
Distance of Mixing Chamber to Outfall	41 m (134 ft)
Diameter of Outfall Pipe	46 cm (18 in)
Discharge Pipe Elevation	Intertidal (1° supratidal)
Time of Travel (leading edge) hr:min	2:55
Time of Travel (peak) hr:min	9:00
Mixing Zone Water Depth	5.5 m (18.0 ft)
Acute criteria mixing zone boundary (based on outlet dimensions)[1]	20.3 m (66.5 ft)
Acute criteria mixing zone boundary (based on water depth)[1]	27.4 m (90.0 ft)

Notes:

(1) Based on the most restrictive condition, offshore sampling stations were approximately 37% the distance to the acute criteria mixing zone boundary.

Table 5. Outfall 084 mixing chamber and outfall plateau dye concentrations and calculated dilution factors.

Mixing Chamber µg/L or ppb	Outfall µg/L or ppb	Dilution Factor
$C_{1\ isco}$ Mean: 797 Median: 792 3rd Quartile: 801 Max: 811 N: 3	$C_{2\ isco}$ Mean: 661 Median: 675 3rd Quartile: 679 Max: 682 N: 3	$C_{1\ isco}/C_{2\ isco}$ Mean: 1.2 Median: 1.2 3rd Quartile: 1.2 Max: 1.2
$C_{1\ ysi}$ – N/A[1]	$C_{2\ ysi}$ – N/A[2]	$C_{1\ isco}/C_{2\ ysi}$ – N/A

Notes:

(1) N/A denotes not applicable due to YSI plateau concentrations exceeding sensor range limit (200 µg/L).

(2) N/A denotes not applicable due to air exposure of YSI sensor during period of maximum dye concentration discharge.

(3) Mean background water fluorescence: Deionized injection water: 0.0 µg/L; James River: 0.0 µg/L.

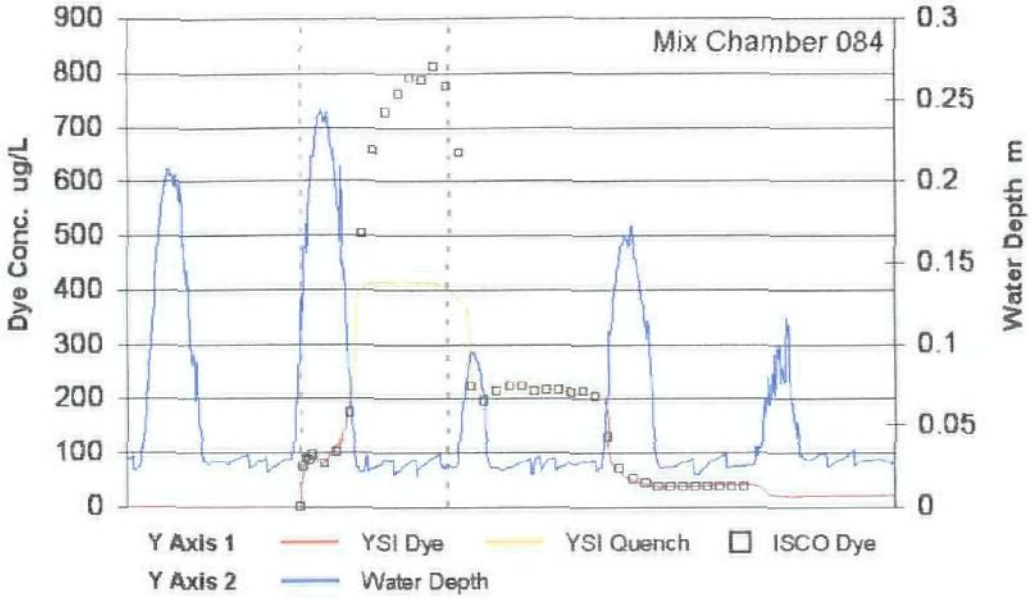

Figure 11. Dye concentration and water depth time series for Outfall 084 mixing chamber. Dashed gray lines represent time period of dye and water injection.

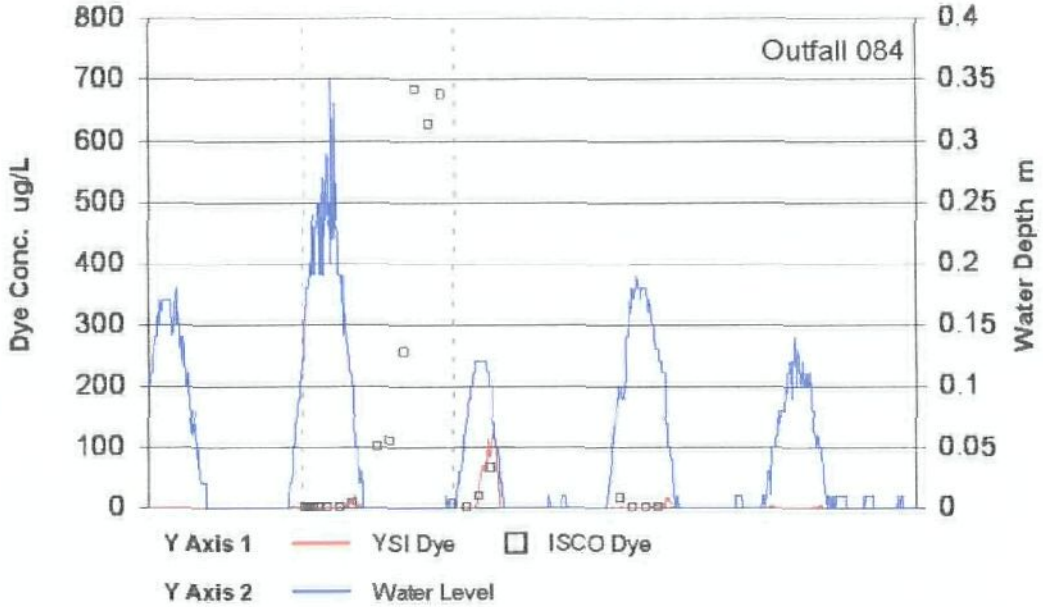

Figure 12. Dye concentration and water depth time series for Outfall 084 discharge pipe. Dashed gray lines represent time period of dye and water injection.

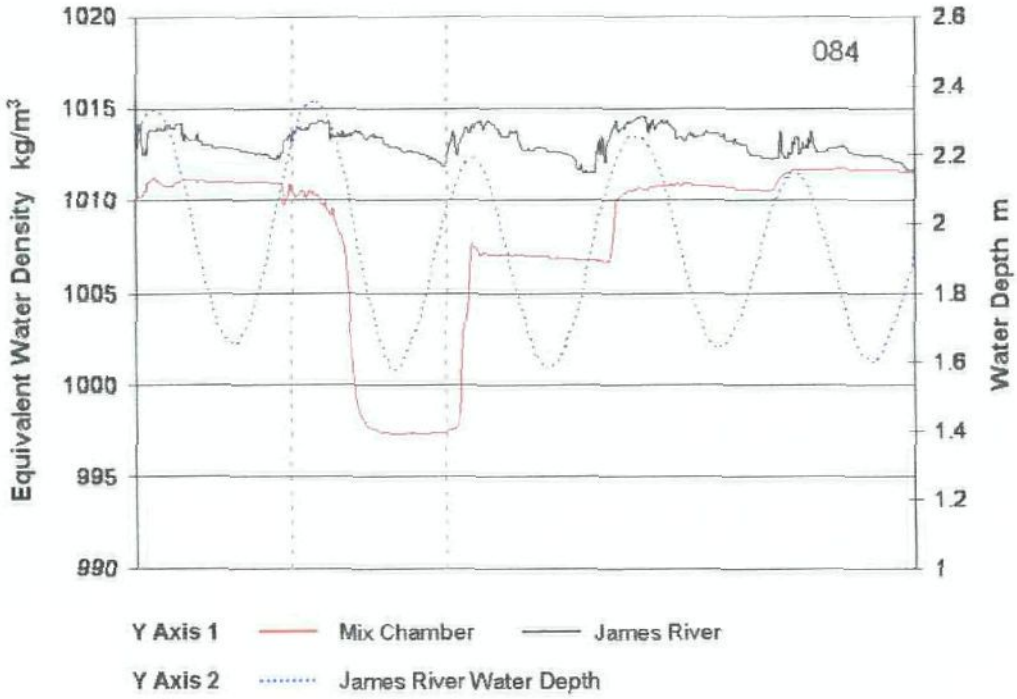

Figure 13. Water density times series for outfall 084 as calculated by the one atmosphere international equation of state of seawater (UNESCO 1981). Dashed gray lines represent time period of dye and water injection. Equivalent water density is not shown for the discharge pipe due to the specific conductivity sensor being exposed for significant time periods and suspect data collected during falling and low water conditions.

3.3 Outfall 019

The dye study for Outfall 019 was conducted from October 27 2008 (8:30 EST) to October 28, 2008 (20:30 EST). Dye was injected into the primary mixing chamber for twelve hours beginning at 8:30 (EST) on 10/27/2008 and ending at 20:30 (EST) of the same day. With respect to water and weather conditions, a spring tide (new moon) occurred on October 28, 2008, sea state varied from relatively smooth to slight-moderate in the later portion of the study, and weather varied from fair to stormy in the later half of the study. Rainfall, beginning at 16:40 (EST) and 8 hours and 10 minutes into the dye injection period, resulted in stormwater runoff at the study site. Rainfall continued from 16:40 (EST) on 10/27/2008 to approximately 23:00 (EST); total rainfall amount was 1.1 cm (0.44 in) for 10/27/2008. Minimal rainfall, 0.05 cm (0.02 in) was measured on the following day (11/28/2008) over a single hourly period (10:00 to 11:00 EST). The Outfall 019 site schematic is depicted in Figure 14.

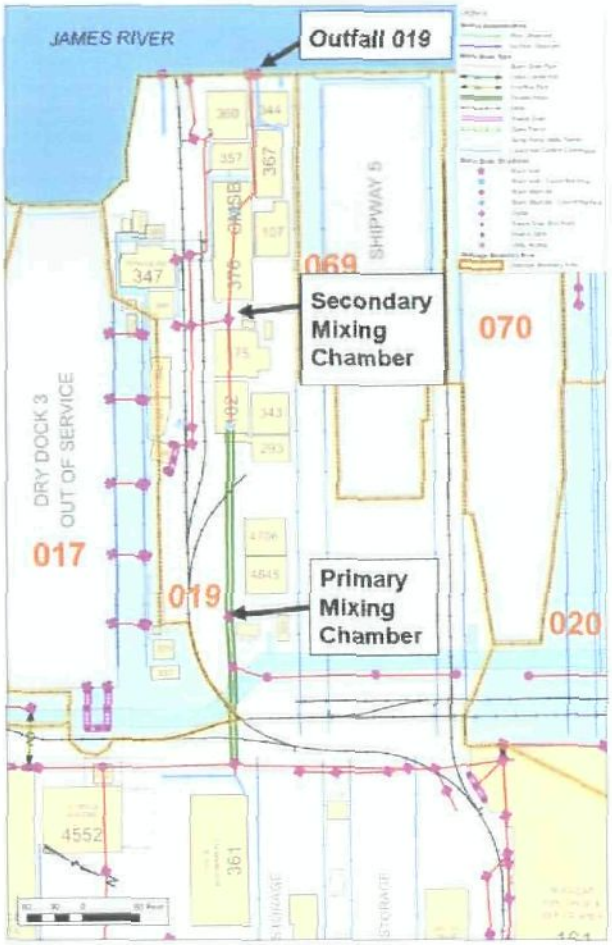

Figure 14. Site schematic for Outfall 019.

The historic median discharge rate of 15.1 L/min (4.0 gal/min; see Table 1) was targeted for use during this study. The mean measured discharge rates during the dye and water injection portion of the study was 14.8 L/min (3.9 gal/min; N=7). Upgradient discharges to the Outfall 019 mixing chamber were blocked to assure no or minimal water entering the mixing chamber from upgradient sources. Measured dye injection rate and calculated concentration was 4.9 ml/min and 2939 µg/L, respectively. Outfall 019 descriptors and calculated dilution factors are provided in Tables 6 and 7, respectively. Dye concentration and water depth times series for the primary mixing chamber is provided in Figure 15 and Figure 16 for the outfall discharge pipe, respectively. A downgradient secondary mixing chamber was also sampled during the study period and dye concentration and water depth time series are provided in Figure 17. Offshore samples were not collected during this study. The calculated water density times series is provided in Figure 18.

Notes:

Table 6. Outfall 019 descriptors observed during study period.

Outfall Descriptors	
Tidal Influence Observed in Mixing Chamber	Yes
Number of Chambers between Mixing Chamber and Outfall	3
Distance of Mixing Chamber to Outfall	178 m (583 ft)
Diameter of Outfall Pipe	61 cm (24 in)
Discharge Pipe Elevation	Subtidal
Time of Travel (leading edge) hr:min	5:45
Time of Travel (peak) hr:min	12:25
Mixing Zone Water Depth	4.6 m (15.0 ft)
Acute criteria mixing zone boundary (based on outlet dimensions)[1]	27.0 m (88.6 ft)
Acute criteria mixing zone boundary (based on water depth)[1]	22.9 m (75.0 ft)

Notes:

(1) Based on the most restrictive condition, offshore sampling stations were approximately 33% the distance to the acute criteria mixing zone boundary.

Table 7. Outfall 019 mixing chamber and outfall plateau dye concentrations and calculated dilution factors.

Mixing Chamber µg/L or ppb	Outfall µg/L or ppb	Dilution Factor
$C_{1\ isco}$ Mean: 3,035 Median: 3039 3rd Quartile: 3,055 Max: 3,064 N: 7	$C_{2\ isco}$ Mean: 45 Median: 43 3rd Quartile: 52 Max: 64 N: 6	$C_{1\ isco}/C_{2\ isco}$ Mean: 67.4 Median: 70.7 3rd Quartile: 58.8 Max: 47.9
$C_{1\ ysi}$ – N/A[1]	$C_{2\ ysi}$ Mean: 43 Median: 39 3rd Quartile: 53 Max: 121 N: 61	$C_{1\ isco}/C_{2\ ysi}$ Mean: 70.6 Median: 77.9 3rd Quartile: 57.6 Max: 25.3

Notes:

(1) N/A denotes not applicable due to YSI sensor quenching.

(2) VaDEQ approved (6/19/2007) mixing zone dilution ratio: 3.2.

(3) CH2M Hill 2006 model results: CORMIX predicted dilution: 2.3; Target dilution to meet acute Cu standard: 4.5.

(4) Mean background water fluorescence: Deionized injection water: 0.0 µg/L; James River: 0.3 µg/L.

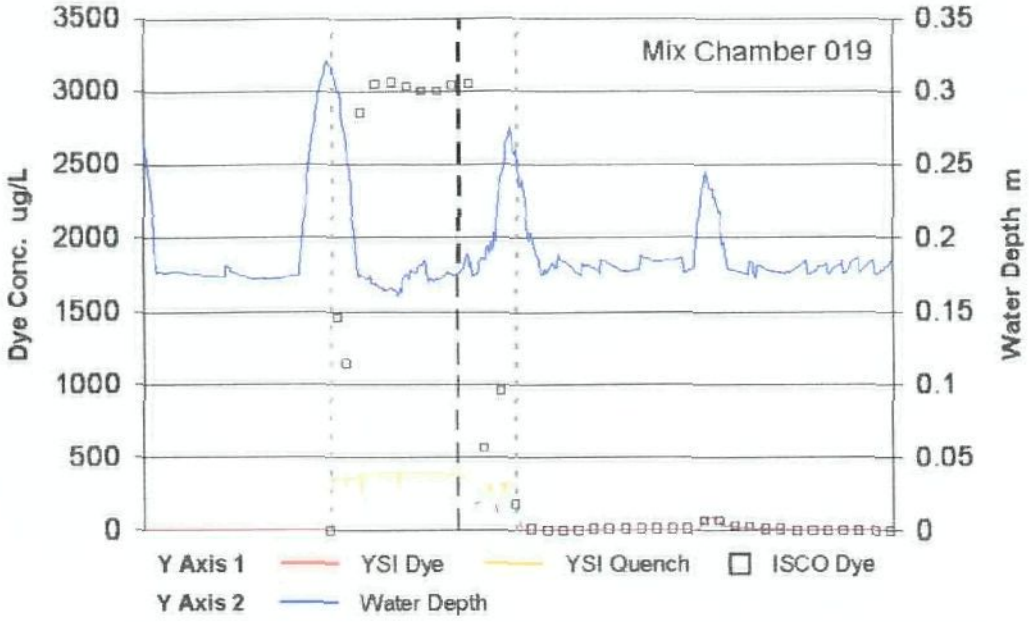

Figure 15. Dye concentration and water depth time series for Outfall 019 primary mixing chamber. Dashed gray lines represent time period of dye and water injection and dashed black line represents start of rainfall.

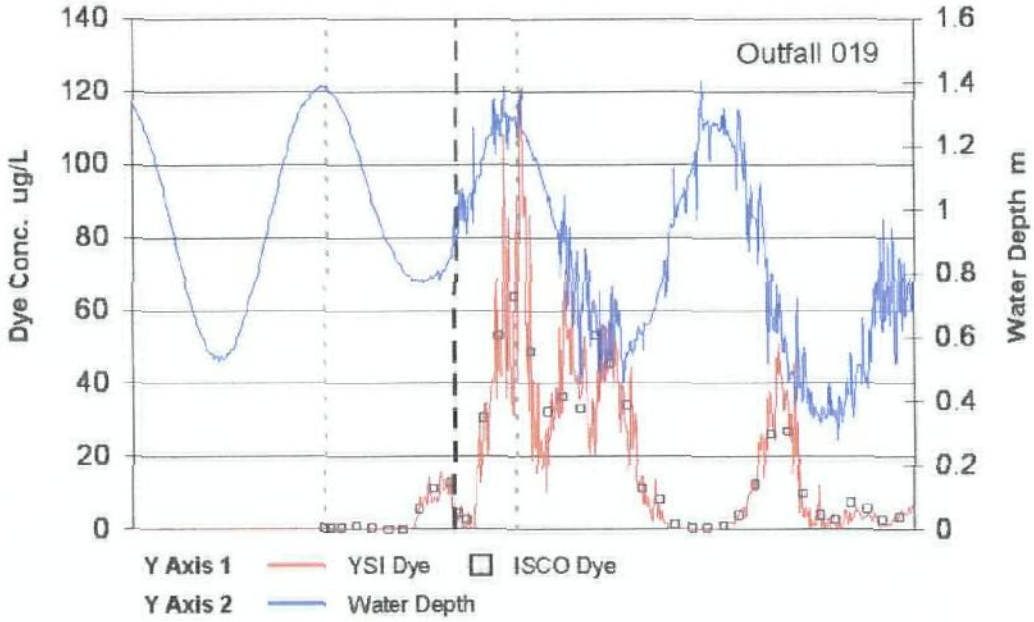

Figure 16. Dye concentration and water depth time series for Outfall 019 discharge pipe. Dashed gray lines represent time period of dye and water injection and dashed black line represents start of rainfall.

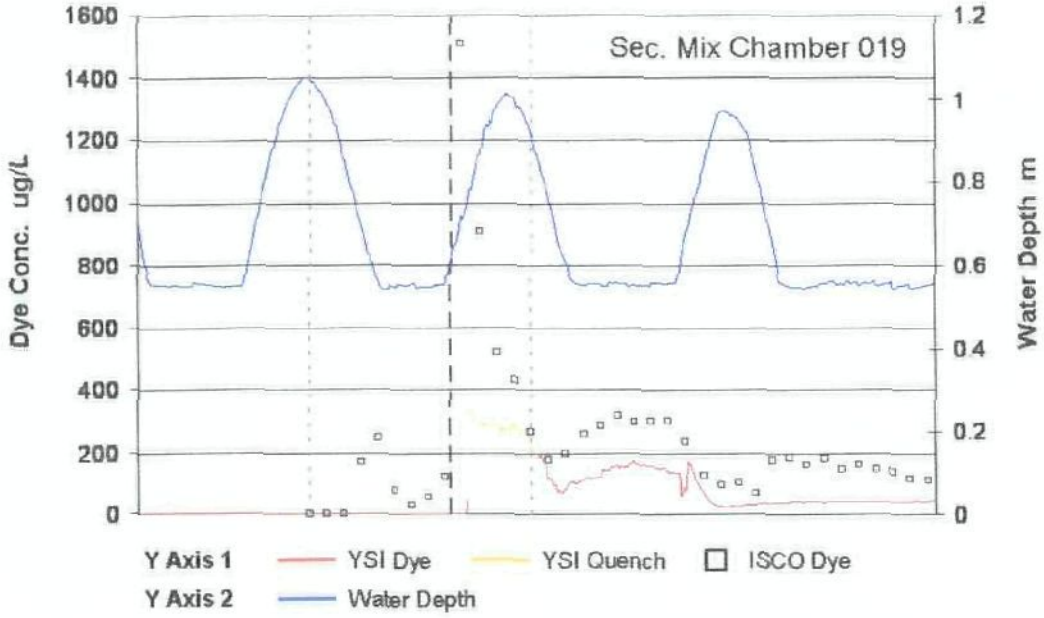

Figure 17 Dye concentration and water depth time series for Outfall 019 secondary mixing chamber. Dashed gray lines represent time period of dye and water injection and dashed black line represents start of rainfall.

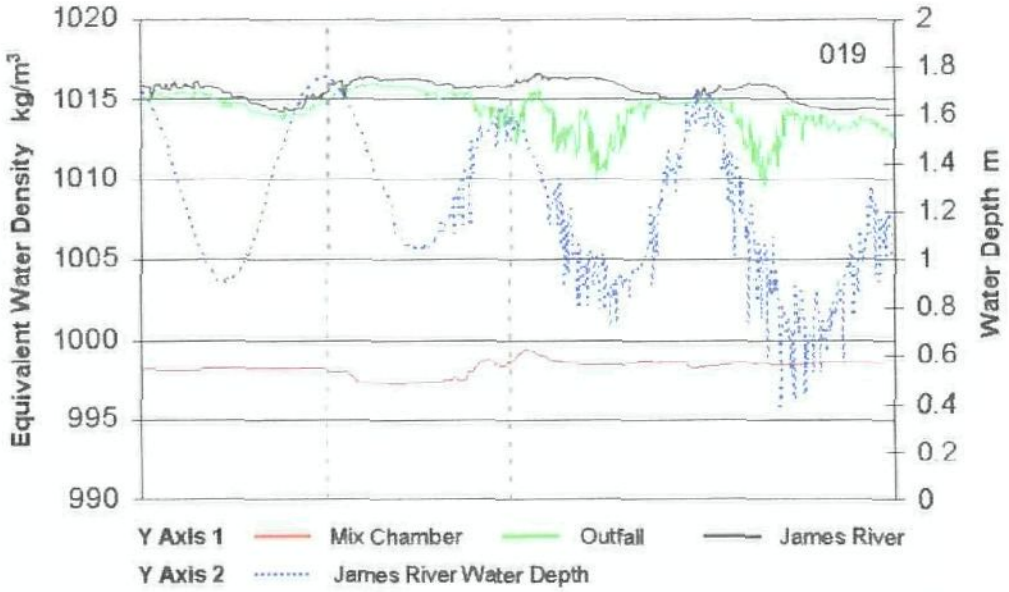

Figure 18. Water density times series for Outfall 019 as calculated by the one atmosphere international equation of state of seawater (UNESCO 1981). Dashed gray lines represent time period of dye and water injection.

3.4 Outfall 026

The dye study for Outfall 026 was conducted from November 19, 2008 (14:45 EST) to November 21, 2008 (2:45 EST). Dye was injected into the primary mixing chamber for twelve hours beginning at 14:45 (EST) on 11/19/2008 and ending at 2:45 (EST) on the following day. With respect to water and weather conditions, a spring tide (full moon) occurred on November 13, 2008, sea state was somewhat slight immediately prior to the study and then remained relatively smooth to calm throughout the study period. The Outfall 026 site schematic is depicted in Figure 19.

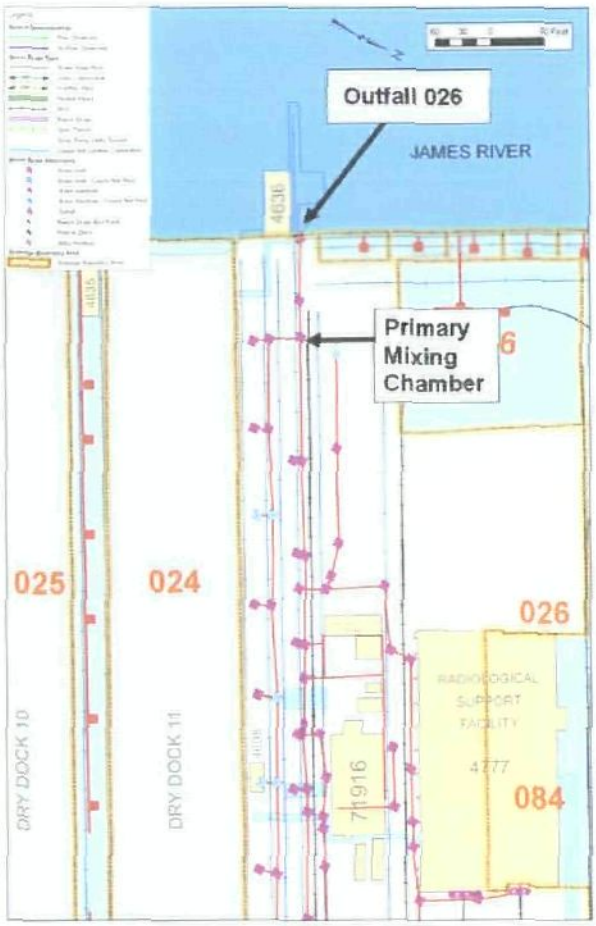

Figure 19. *Site schematic for Outfall 026.*

The mean measured *in situ* discharge rate during the dye and water injection portion of the study was 72.9 L/min (19.3 gal/min; Std Dev: 17.9 L/min, 4.7 gal/min; N=145). Measured discharge exhibited a relatively consistent, periodic pattern of peak discharge occurring approximately every 2.5 hours (Figure 20). This is somewhat greater than the historic median discharge rate of 37.9 L/min (10.0 gal/min; see Table 1).

Given that *in situ* flow was utilized during this study, no upgradient discharges were blocked from entering the mixing chamber.

Measured dye injection rate and calculated concentration was 4.3 ml/min and 1443 µg/L, respectively. Outfall 026 descriptors and calculated dilution factors are provided in Tables 8 and 9, respectively. Dye concentration and water depth times series for the primary mixing chamber are provided in Figure 21 and Figure 22 for the outfall discharge pipe, respectively. Rhodamine WT was detected at offshore sampling locations and a time series of offshore dye concentrations is depicted in Figure 23. Rhodamine WT was also visually observed (W. Reay and G. Sisson) within the offshore sampling area. The calculated water density times series is provided in Figure 24.

Notes:

Table 8. Outfall 026 descriptors observed during study period.

Outfall Descriptors	
Tidal Influence Observed in Mixing Chamber	Yes
Number of Chambers between Mixing Chamber and Outfall	1
Distance of Mixing Chamber to Outfall	42 m (137 ft)
Diameter of Outfall Pipe	53 cm (21 in)
Discharge Pipe Elevation	*Intertidal*
Time of Travel (leading edge) hr:min	0:15
Time of Travel (peak) hr:min	7:00
Mixing Zone Water Depth	6.1 m (20.0 ft)
Acute criteria mixing zone boundary (based on outlet dimensions)[1]	23.6 m (77.5 ft)
Acute criteria mixing zone boundary (based on water depth)[1]	30.5 m (100.0 ft)

Notes:

(1) Based on the most restrictive condition, offshore sampling stations were approximately 32% the distance to the acute criteria mixing zone boundary.

Table 9. Outfall 026 mixing chamber and outfall plateau dye concentrations and calculated dilution factors.

Mixing Chamber µg/L or ppb	Outfall µg/L or ppb	Dilution Factor C_1/C_2
$C_{1\ isco}$ Mean: 1062 Median: 3rd Quartile: Max: N: 1	$C_{2\ isco}$ Mean: 104 Median: 3rd Quartile: Max: N: 1	$C_{1\ isco}/C_{2\ isco}$ Mean: 10.2 Median: 3rd Quartile: Max:
$C_{1\ ysi}$ – N/A[1]	$C_{2\ ysi}$ Mean: 188 Median: 188 3rd Quartile: 189 Max: 190 N: 2	$C_{1\ isco}/C_{2\ ysi}$ Mean: 5.6 Median: 5.6 3rd Quartile: 5.6 Max: 5.6

Notes:

(1) N/A denotes not applicable due to YSI sensor quenching.

(2) VaDEQ approved (6/19/2007) mixing zone dilution ratio: 2.6.

(3) CH2M Hill 2006 model results: CORMIX predicted dilution: 1.4; Target dilution to meet acute Cu standard: 5.0.

(4) Mean background water fluorescence: In situ injection water: 0.2 µg/L; James River: 0.2 µg/L.

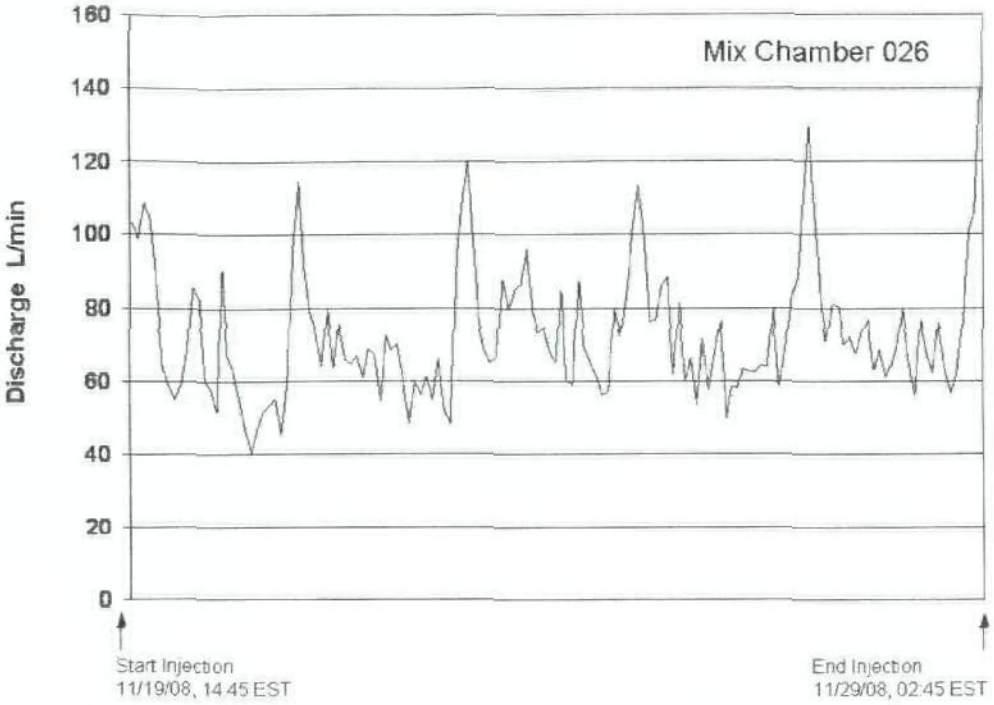

Figure 20. Upgradient *in situ* discharge into Outfall 026 mixing chamber during period of dye injection.

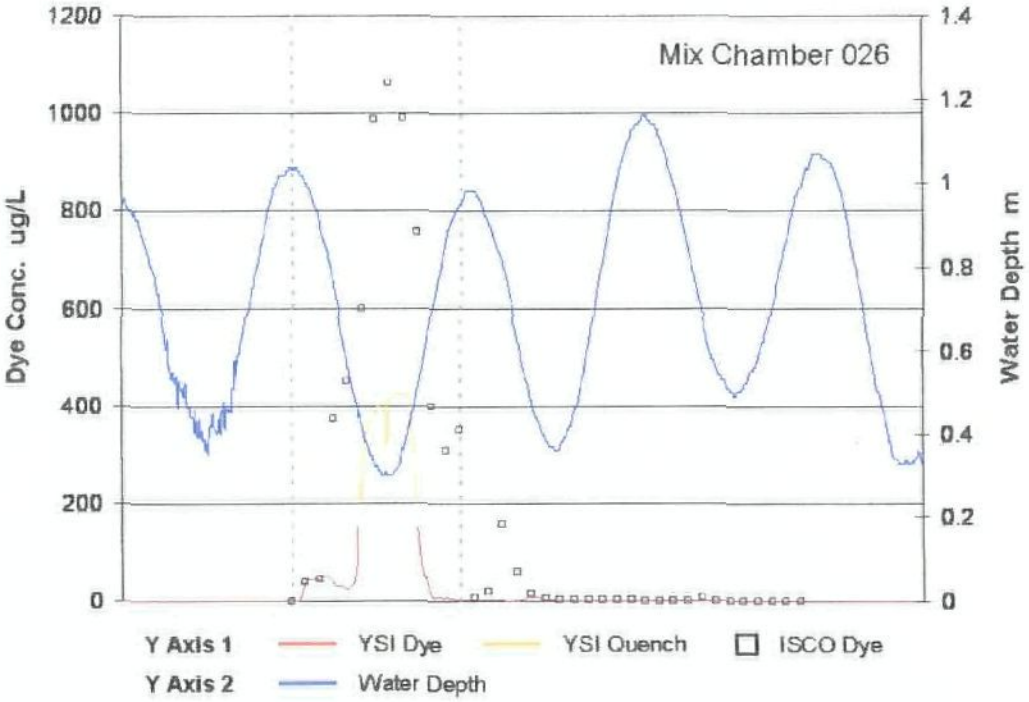

Figure 21. Dye concentration and water depth time series for Outfall 026 primary mixing chamber. Dashed gray lines represent time period of dye and water injection.

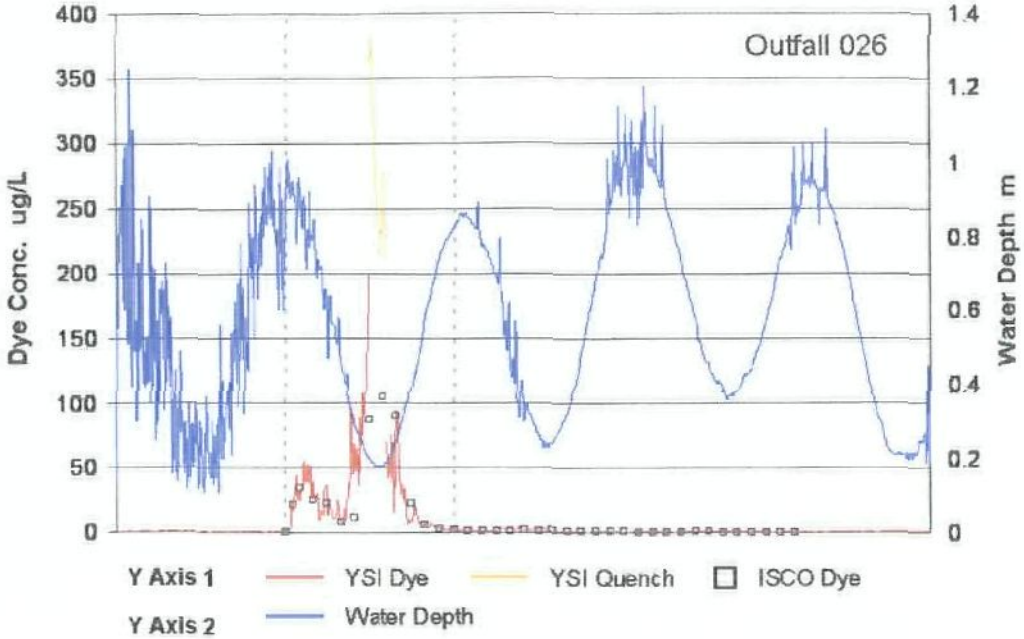

Figure 22. Dye concentration and water depth time series for Outfall 026 discharge pipe. Dashed gray lines represent time period of dye and water injection.

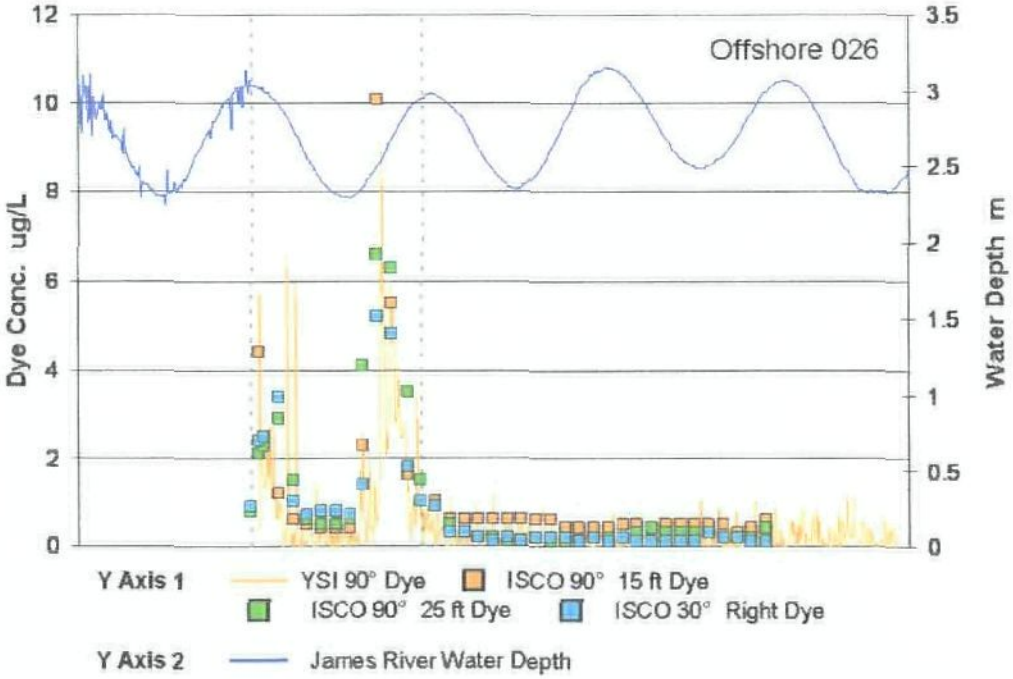

Figure 23. Dye concentration and water depth time series for Outfall 026 offshore sampling points. Dashed gray lines represent time period of dye and water injection.

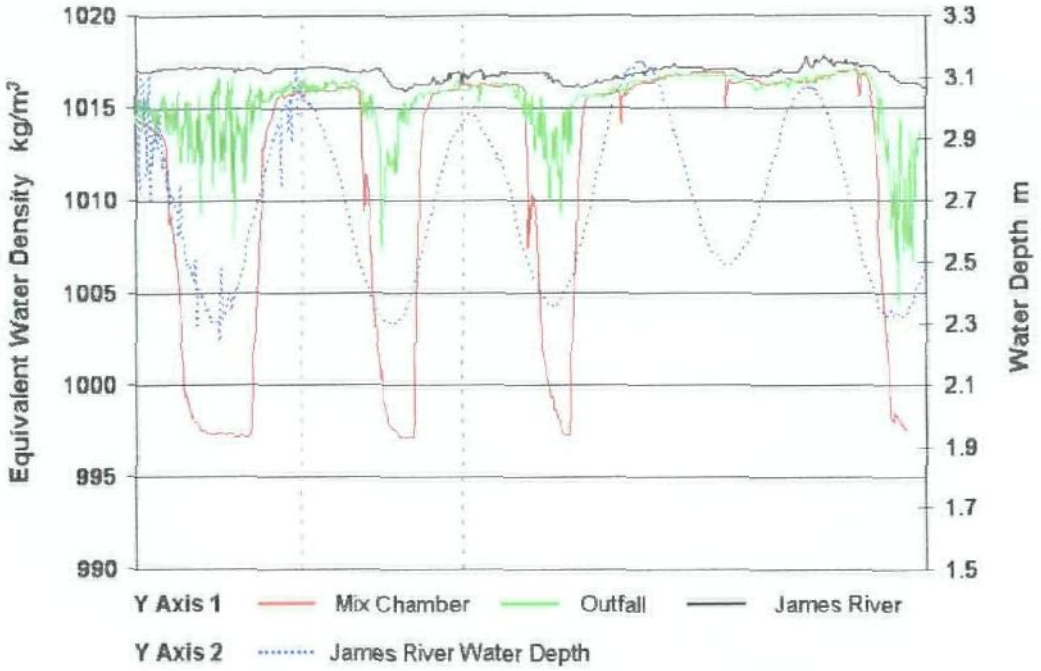

Figure 24. Water density times series for Outfall 026 as calculated by the one atmosphere international equation of state of seawater (UNESCO 1981). Dashed gray lines represent time period of dye and water injection.

Outfall ID: 003

The dye study for Outfall 003 was conducted from December 3, 2008 (12:30 EST) to December 5, 2008 (0:00 EST). Dye was injected into the primary mixing chamber for twelve hours beginning at 12:30 (EST) on 12/3/2008 and ending at 00:30 (EST) of the following day. With respect to water and weather conditions, a spring tide (new moon) occurred on 11/27/2008, sea state was relatively calm and buffered due to pilings on extensive pier and shoreline bulkhead structures, and weather was fair throughout the study. The Outfall 003 site schematic is depicted in Figure 25.

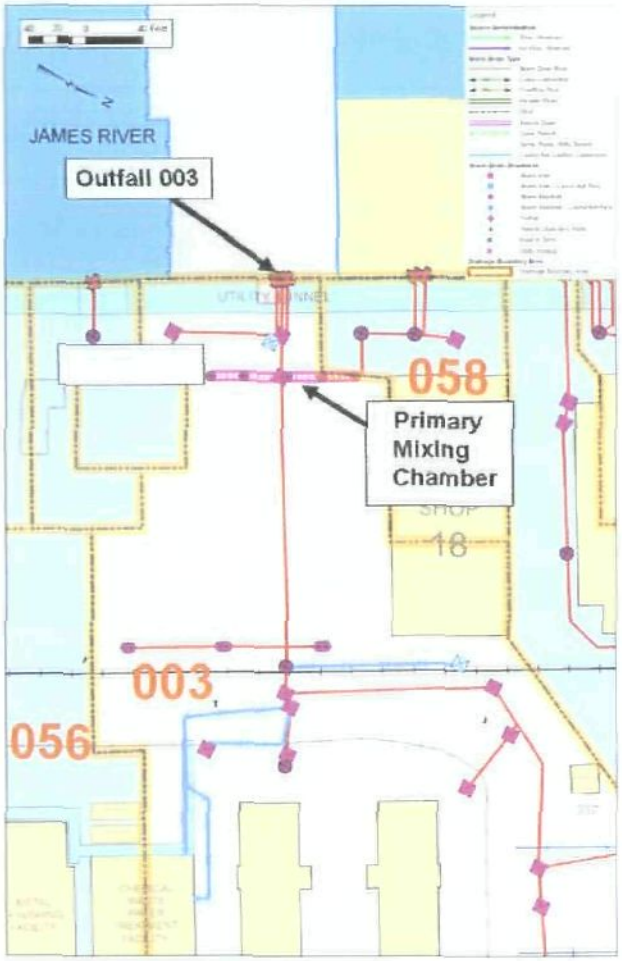

Figure 25. Site schematic for Outfall 003.

The mean measured *in situ* discharge rate during the dye and water injection portion of the study was 8.0 L/min (2.1 gal/min; N=5). This is lower than the historic median discharge rate of 37.9 L/min (10.0 gal/min; see Table 1). Given that *in situ* flow was utilized during this study, no upgradient discharges were blocked from entering the mixing chamber. Measured dye injection rate and calculated concentration was 4.3 ml/min and 13,187 µg/L, respectively. Outfall 003 descriptors and calculated dilution factors are provided in Tables 10 and 11, respectively. Dye concentration and water depth times series for the primary mixing chamber is provided in Figure 26 and Figure 27 for the outfall discharge pipe, respectively. Rhodamine dye was detected at offshore sampling locations and a time series of offshore dye concentrations is depicted in Figure 28. The calculated water density times series is provided in Figure 29.

Notes:

Table 10. Outfall 003 descriptors observed during study period.

Outfall Descriptors	
Tidal Influence Observed in Mixing Chamber	No
Number of Chambers between Mixing Chamber and Outfall	1
Distance of Mixing Chamber to Outfall	21 m (70 ft)
Diameter of Outfall Pipe	46 cm (18 in)
Discharge Pipe Elevation	Subtidal
Time of Travel (leading edge) hr:min	2:00
Time of Travel (peak) hr:min	4:40
Mixing Zone Water Depth	9.2 m (30.0 ft)
Acute criteria mixing zone boundary (based on outlet dimensions)[1]	20.3 m (66.5 ft)
Acute criteria mixing zone boundary (based on water depth)[1]	45.7 m (150.0 ft)

Notes:

(1) Based on the most restrictive condition, offshore sampling stations were approximately 37% the distance to the acute criteria mixing zone boundary.

Table 11. Outfall 003 mixing chamber and outfall plateau dye concentrations and calculated dilution factors.

Mixing Chamber µg/L or ppb	Outfall µg/L or ppb	Dilution Factor C_1/C_2
$C_{1\ isco}$ Mean: 11,665 Median: 11,692 3rd Quartile: 12,180 Max: 12,472 N: 23	$C_{2\ isco}$ Mean: 63 Median: 70 3rd Quartile: 86 Max: 101 N: 18	$C_{1\ isco}/C_{2\ isco}$ Mean: 185.2 Median: 166.3 3rd Quartile: 142.6 Max: 124.5
$C_{1\ ysi}$ – N/A[1]	$C_{2\ ysi}$ Mean: 84 Median: 80 3rd Quartile: 101 Max: 188 N: 142	$C_{1\ isco}/C_{2\ ysi}$ Mean: 139.9 Median: 146.2 3rd Quartile: 121.6 Max: 66.3

Notes:

(1) N/A denotes not applicable due to YSI sensor quenching.

(2) VaDEQ approved (1st Quarter 2006) mixing zone dilution ratio: 1.7.

(3) Mean background water fluorescence: In situ injection water: 0.0 µg/L; James River: 0.2 µg/L.

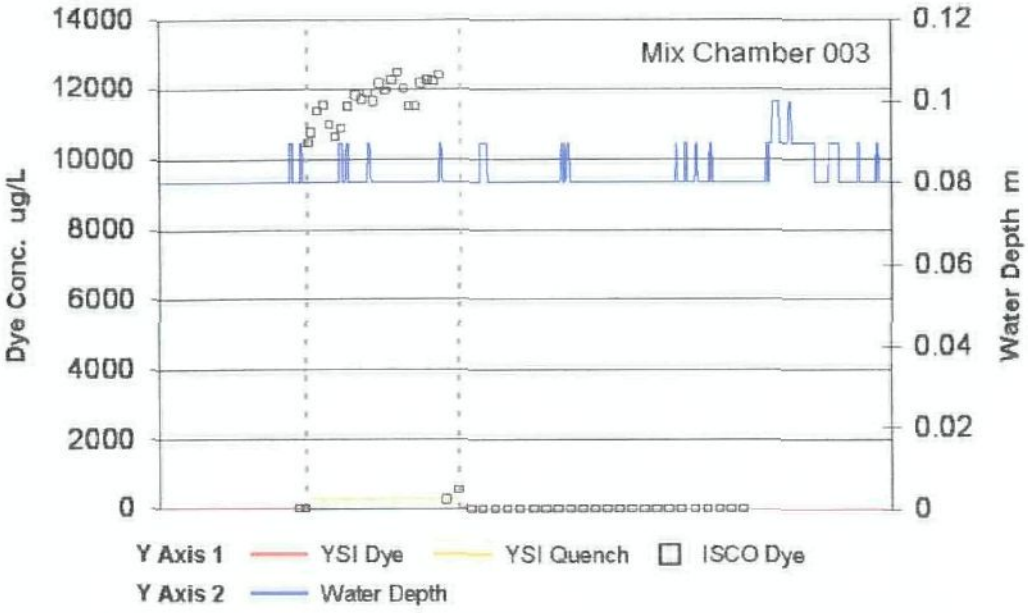

Figure 26. Dye concentration and water depth time series for Outfall 003 primary mixing chamber. Dashed gray lines represent time period of dye and water injection.

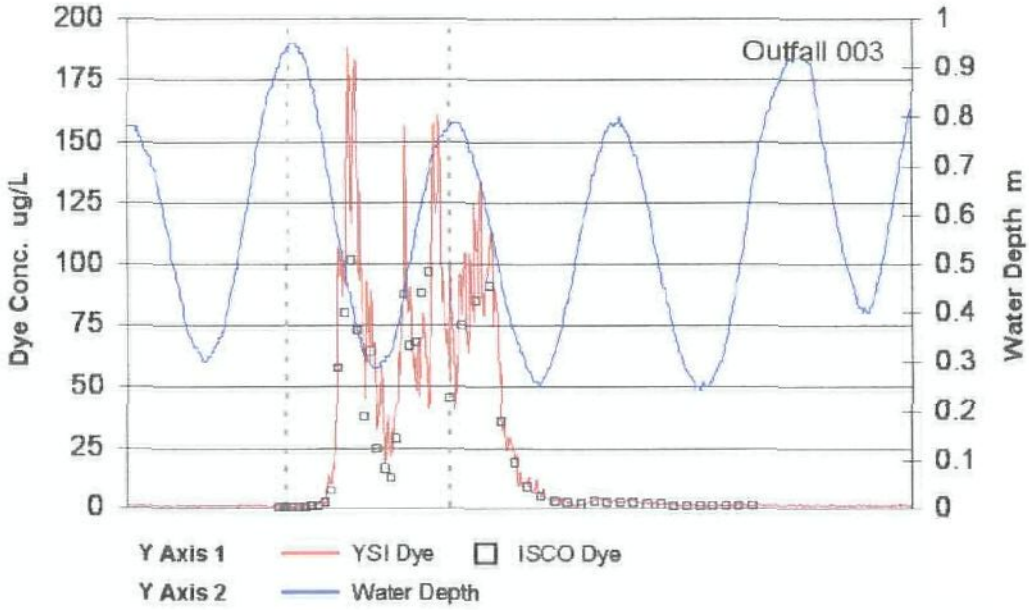

Figure 27. Dye concentration and water depth time series for Outfall 026 discharge pipe. Dashed gray lines represent time period of dye and water injection.

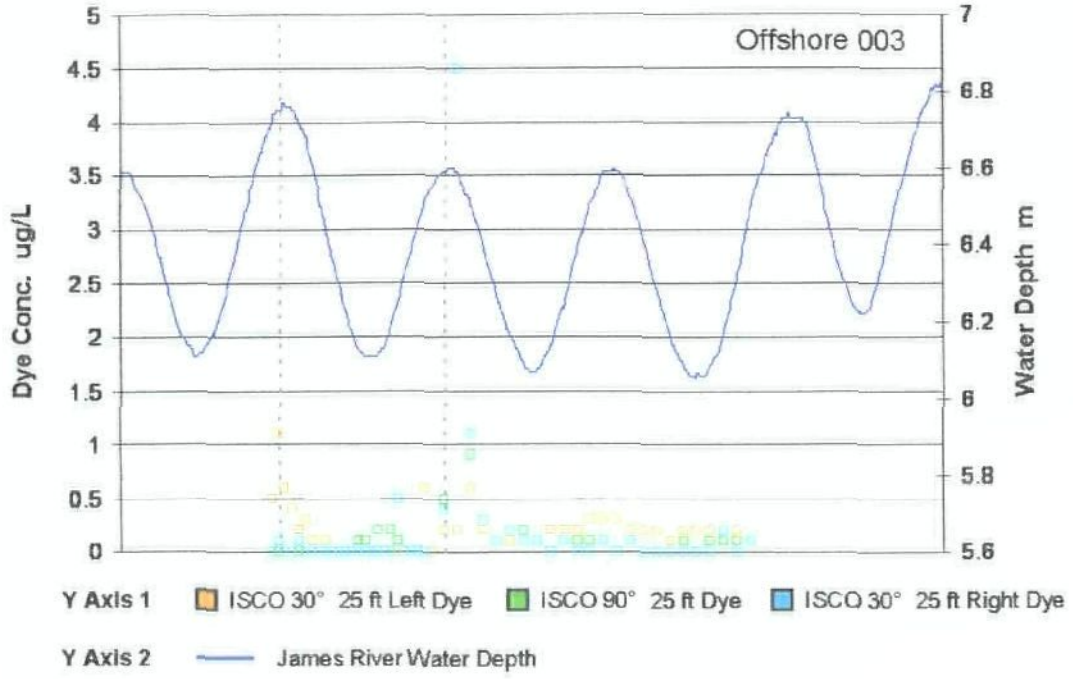

Figure 28. Dye concentration and water depth time series for Outfall 003 offshore sampling points. Dashed gray lines represent time period of dye and water injection.

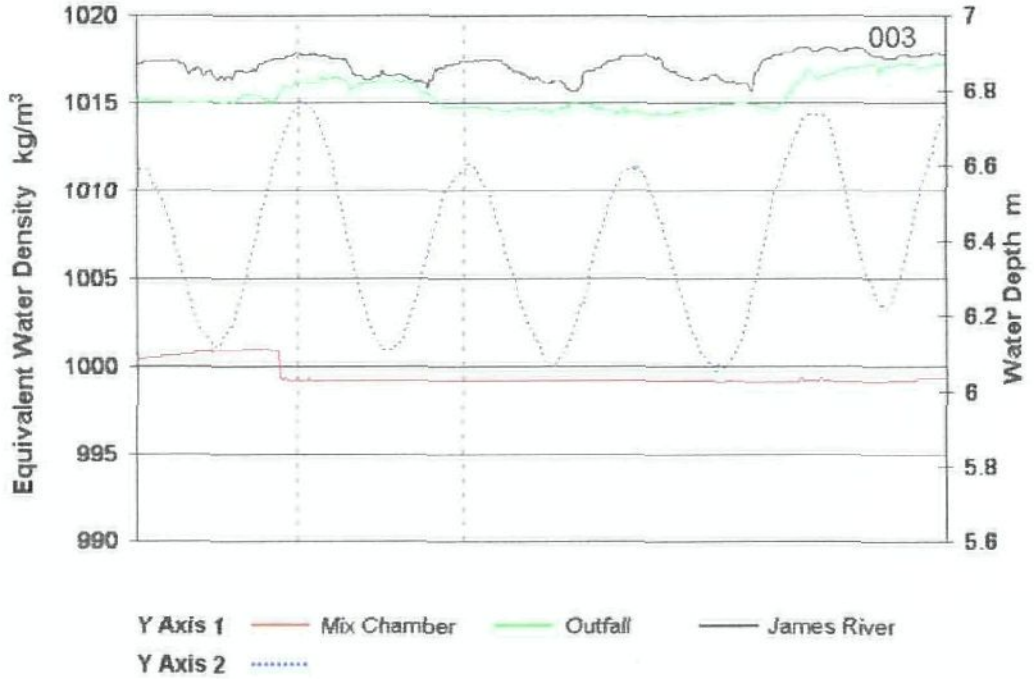

Figure 29. Water density times series for Outfall 003 as calculated by the one atmosphere international equation of state of seawater (UNESCO 1981). Dashed gray lines represent time period of dye and water injection.

V. Acknowledgements

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Appendix I

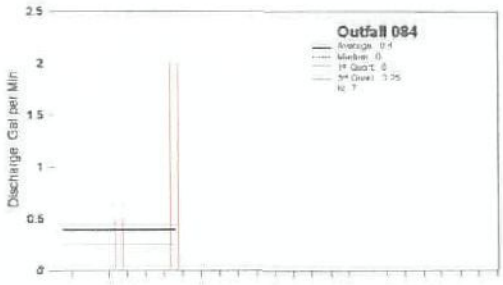
Northrop Grumman Shipbuilding-Newport News
2008 Mixing Zone Dye Study
Flow Data

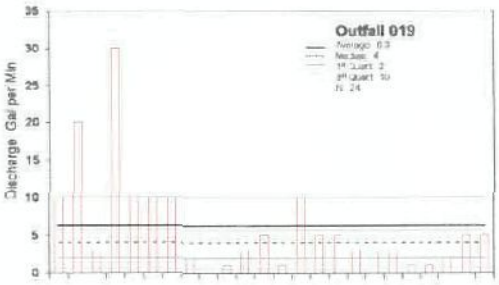
The following data was taken from VPDES permit #VA0004804 newly issued permit fact sheet and the Discharge Monitoring Reports (DMR's) for 2007 and 2008. All data reported to DEQ in estimated Million Gallons per Day (MGD), but shown as estimated Gallons per Minute (GPM) below.

Date	Outfall 003	Outfall 019	Outfall 020	Outfall 026	Outfall 084[1]
1Q 2002	10	10	1	20	No flow
2Q 2002	10	20	1	20	
3Q 2002	25	3	No flow	500	
4Q 2002	100	30	No flow	100	No flow
1Q 2003	25	10	1	20	
2Q 2003	20	10	1	15	
3Q 2003	10	10	1	3	
4Q 2003	20	2	3	3	
1Q 2004	20	2	1	10	No flow
2Q 2004	20	1	1	3	
3Q 2004	5	3	1	10	
4Q 2004	20	5	3	3	
1Q 2005	5	1	3	5	
2Q 2005	3	10	5	50	
3Q 2005	3	5	1	3	0.5
4Q 2005	No data	5	1	20	
1Q 2006	10	3	No flow	50	No flow
2Q 2006	3	3	1	10	
3Q 2006	10	3	2	10	
4Q 2006	No data	No data	No data	No data	
1Q 2007	3	1	No flow	10	No flow
2Q 2007	3	1	1	10	
3Q 2007	10	2	1	100	
1Q 2008	15	5	1	2	
2Q 2008	15	5	1	5	2

Notes:

(1) Outfall 084 required annual flow reporting only.





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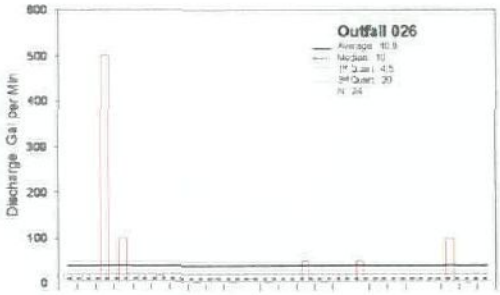
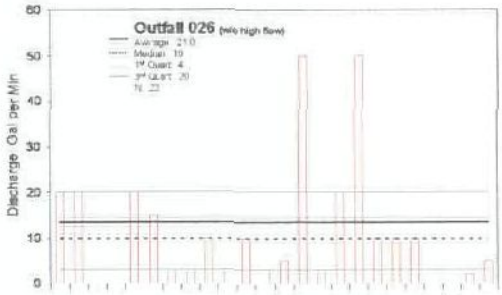
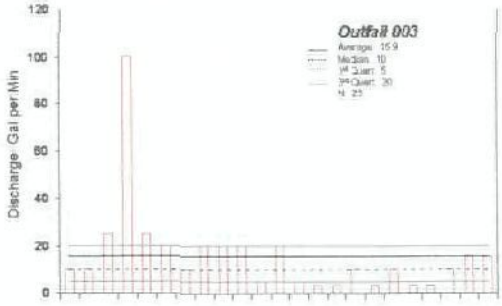
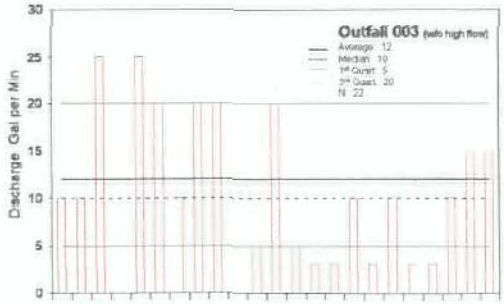








Austin,Deanna

From: Stewart,Roger
Sent: Wednesday, December 03, 2008 10:06 AM
To: Austin,Deanna
Subject: RE: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA FINAL 20081203.doc

No problem. It was nice working with you and Tom.

-----Original Message-----
From: Austin,Deanna
Sent: Wednesday, December 03, 2008 9:33 AM
To: Stewart,Roger
Subject: RE: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA FINAL 20081203.doc

Thanks Roger!!

-----Original Message-----
From: Stewart,Roger
Sent: Wed 12/3/2008 9:01 AM
To: Austin,Deanna; Barron,Alex
Cc: Glover,Darryl
Subject: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA FINAL 20081203.doc

I meet with Tom Numbers this morning to go over the data and here's what I think is the final final....

In summary not much relief for 003 and 019 Copper.

<<NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA FINAL 20081203.doc>>

Austin,Deanna

From: Stewart,Roger
Sent: Wednesday, December 03, 2008 9:02 AM
To: Austin,Deanna; Barron,Alex
Cc: Glover,Darryl
Subject: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA FINAL 20081203.doc

Attachments: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA FINAL 20081203.doc

NOTES ON
TISTICAL ANALYS

meet with Tom Numbers this morning to go over the data and here's what I think is the final final....

In summary not much relief for 003 and 019 Copper.

OUTFALL: 003

Non-transformed and EXP transformed dissolved Copper do not fit a normal distribution. The 90th percentiles are 23 and 28 for dissolved Copper and total recoverable Copper. The f_D Copper value as calculated from the 90th percentile values for dissolved and total recoverable is 0.821.

Options for 003 Copper: Use translator of 0.821 or collect more data.

OUTFALL: 005

The non-transformed dissolved Copper data fit the normal distribution, Shapiro-Wilk's W=.85635, p=.05164

The non-transformed total recoverable Copper data fit the normal distribution, Shapiro-Wilk's W=.83441, p=.02668

Option for 005 Copper: Data are OK to calculate a translator.

The non-transformed and EXP transformed dissolved and total recoverable Zinc data are not normality distributed. The 95th percentiles are 1414, 1471, 0.996 for dissolved Zinc, total recoverable Zinc, and f_D, respectively. The f_D Zinc value as calculated from the 95th percentile values for dissolved and total recoverable is 0.961.

The non-transformed and log transformed Zinc f_D fit a normal distribution, Shapiro-Wilk's W=.95151, p=.66334, Shapiro-Wilk's W=.94688, p=.60443, respectively.

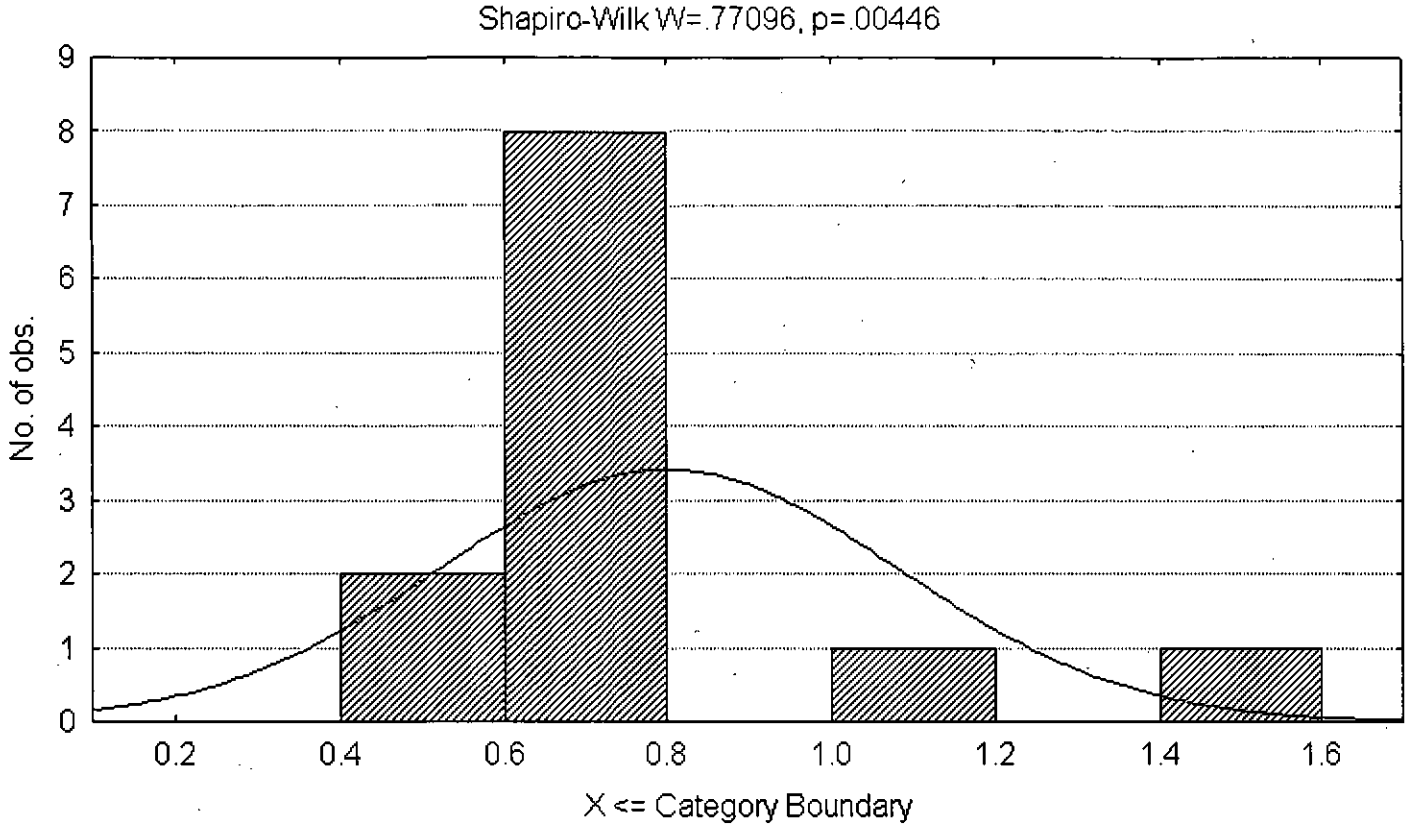
Options for 005 Zinc: Data are OK to calculate a translator.

OUTFALL: 019

Non-transformed Arc Sign Square Root and EXP transformed dissolved Copper do not fit a normal distribution. The 90th percentiles are 5, 14, 0.75 for dissolved Copper, total recoverable Copper, and f_D, respectively. Options for 003 Copper: Use translator of 0.75 or collect more data.

Histogram: arcsine square root

The Shapiro-Wilk W test is used in testing for normality. If the W statistic is significant, then the hypothesis that the respective distribution is normal should be rejected. The Shapiro-Wilk W test is the preferred test of normality <../N/Normality%20tests.htm> because of its good power properties as compared to a wide range of alternative tests (Shapiro, Wilk, & Chen, 1968).



Austin,Deanna

From: Barron,Alex
Sent: Thursday, October 23, 2008 9:34 AM
To: Stewart,Roger; Austin,Deanna
Subject: RE: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA.doc

Yes, looks Ok to me too.

-----Original Message-----
From: Stewart,Roger
Sent: Thursday, October 23, 2008 8:50 AM
To: Austin,Deanna; Barron,Alex
Subject: RE: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA.doc

Sure I think we're ready Alex????

-----Original Message-----
From: Austin,Deanna
Sent: Thursday, October 23, 2008 8:41 AM
To: Stewart,Roger
Subject: RE: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA.doc

Do you want me to forward your notes so they can add the info to their final report?

Deanna Austin
DEQ-TRO Water Permits
5636 Southern Blvd
Virginia Beach, VA 23462
Phone: 757-518-2008
Fax: 757-518-2009

-----Original Message-----
From: Stewart,Roger
Sent: Thursday, October 23, 2008 8:39 AM
To: Austin,Deanna
Subject: RE: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA.doc

Nothing written only a partial verbal

-----Original Message-----
From: Austin,Deanna
Sent: Thursday, October 23, 2008 8:34 AM
To: Stewart,Roger
Subject: RE: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA.doc

Roger, Have you shared any of this info with Tom Numbers yet?

Deanna Austin
DEQ-TRO Water Permits
5636 Southern Blvd
Virginia Beach, VA 23462
Phone: 757-518-2008
Fax: 757-518-2009

-----Original Message-----
From: Stewart,Roger
Sent: Thursday, October 23, 2008 8:30 AM
To: Barron,Alex
Cc: Austin,Deanna
Subject: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA.doc

Austin,Deanna

From: Stewart,Roger
Sent: Thursday, October 23, 2008 8:30 AM
To: Barron,Alex
Cc: Austin,Deanna
Subject: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA.doc

Attachments: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA.doc

NOTES ON
TISTICAL ANALYS

orrected translator for 019

OUTFALL: 003

Non-transformed and EXP transformed dissolved Copper do not fit a normal distribution. The 95th percentiles are 42, 43, 1.00 for dissolved Copper, total recoverable Copper, and f_D, respectively. The f_D Copper value as calculated from the 95th percentile values for dissolved and total recoverable is 0.977.

Options for 003 Copper: Use translator of 0.977 or collect more data.

OUTFALL: 005

The non-transformed dissolved Copper data fit the normal distribution, Shapiro-Wilk's W=.85635, p=.05164

The non-transformed total recoverable Copper data fit the normal distribution, Shapiro-Wilk's W=.83441, p=.02668

Option for 005 Copper: Data are OK to calculate a translator.

The non-transformed and EXP transformed dissolved and total recoverable Zinc data are not normality distributed. The 95th percentiles are 1414, 1471, 0.996 for dissolved Zinc, total recoverable Zinc, and f_D, respectively. The f_D Zinc value as calculated from the 95th percentile values for dissolved and total recoverable is 0.961.

The non-transformed and log transformed Zinc f_D fit a normal distribution, Shapiro-Wilk's W=.95151, p=.66334, Shapiro-Wilk's W=.94688, p=.60443, respectively.

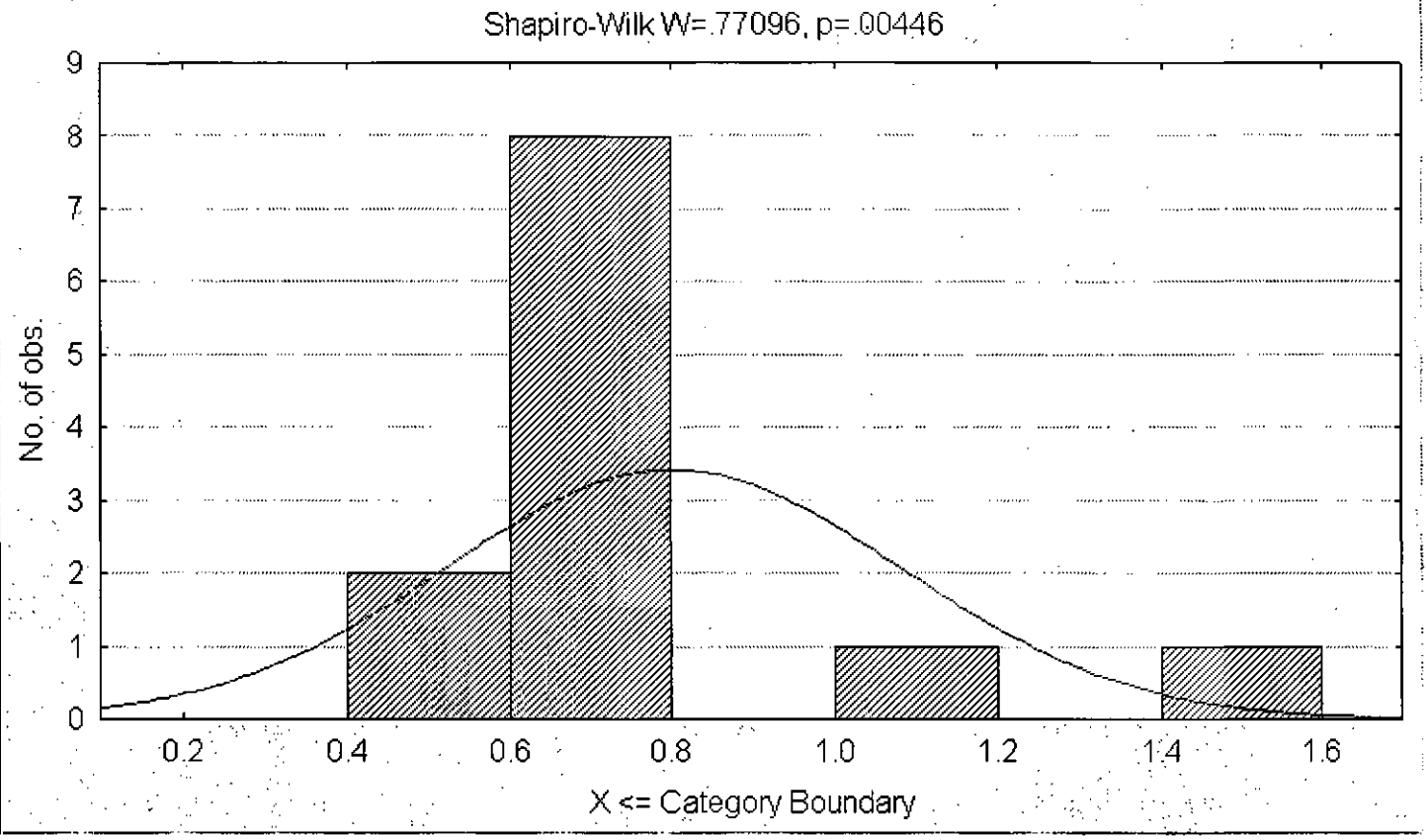
Options for 005 Zinc: Data are OK to calculate a translator.

OUTFALL: 019

Non-transformed Arc Sign Square Root and EXP transformed dissolved Copper do not fit a normal distribution. The 90th percentiles are 5, 14, 0.75 for dissolved Copper, total recoverable Copper, and f_D, respectively. Options for 003 Copper: Use translator of 0.75 or collect more data.

Histogram: arcsine square root

The Shapiro-Wilk W test is used in testing for normality. If the W statistic is significant, then the hypothesis that the respective distribution is normal should be rejected. The Shapiro-Wilk W test is the preferred test of normality <.../N/Normality%20tests.htm> because of its good power properties as compared to a wide range of alternative tests (Shapiro, Wilk, & Chen, 1968).



Austin,Deanna

From: Stewart,Roger
Sent: Thursday, October 09, 2008 1:12 PM
To: Austin,Deanna
Cc: Barron,Alex
Subject: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA.doc

Attachments: NOTES ON STATISTICAL ANALYSIS OF CHEMICAL TRANSLATOR DATA.doc

NOTES ON
TISTICAL ANALYS

ello Deanna,

Here are our notes on the review of ERM's CT for NN. As far as Alex and I are concerned only the Copper for 003 is in question.

Please let me know what you think and how you want to handle this. I'll be out from this afternoon until Wednesday...

roger

OUTFALL: 003

Non-transformed and EXP transformed dissolved Copper do not fit a normal distribution. The 95th percentiles are 42, 43, 1.00 for dissolved Copper, total recoverable Copper, and f_D, respectively. The f_D Copper value as calculated from the 95th percentile values for dissolved and total recoverable is 0.977.

Options for 003 Copper: Use translator of 0.977 or collect more data.

OUTFALL: 005

The non-transformed dissolved Copper data fit the normal distribution, Shapiro-Wilk's W=.85635, p=.05164

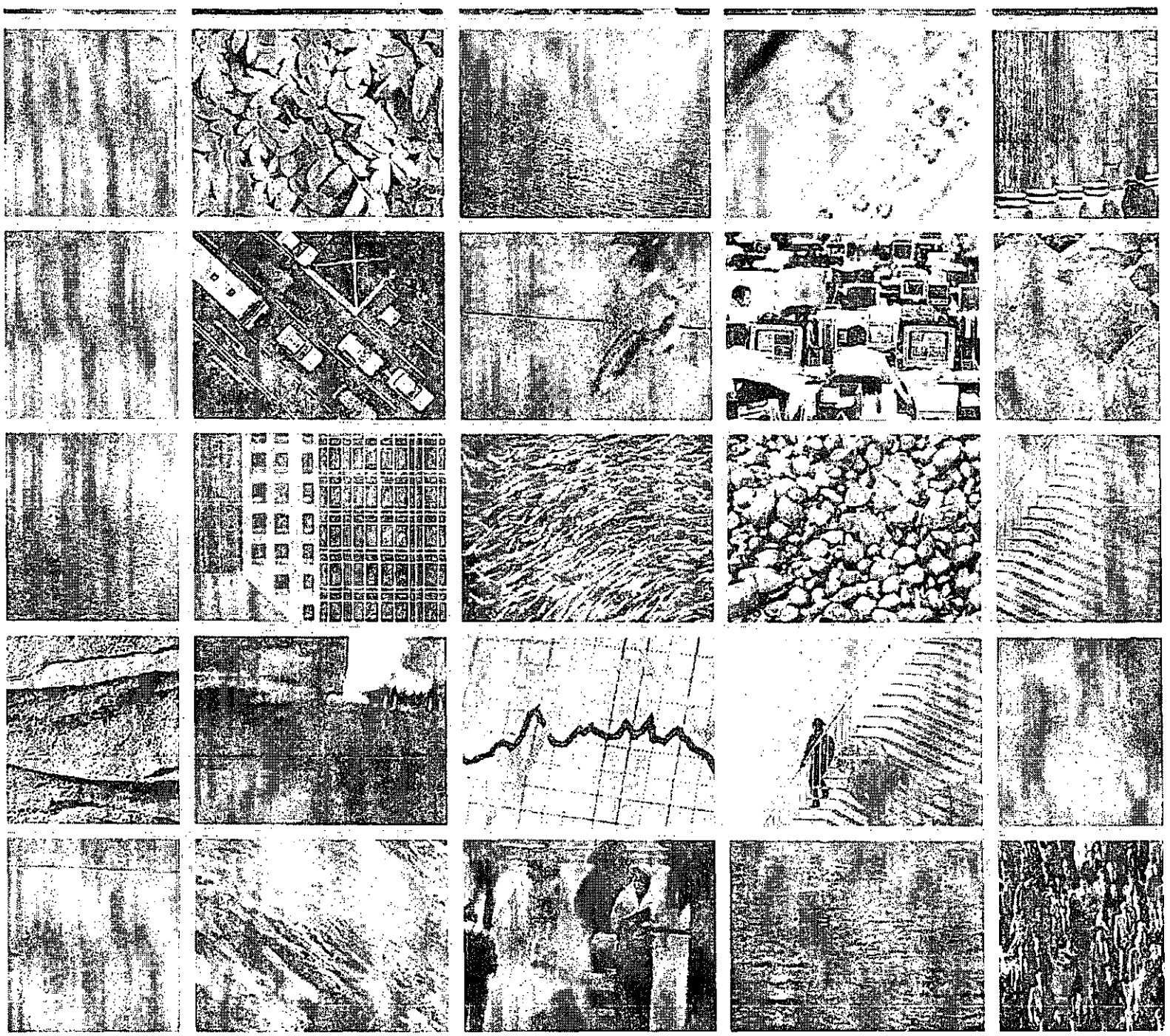
The non-transformed total recoverable Copper data fit the normal distribution, Shapiro-Wilk's W=.83441, p=.02668

Option for 005 Copper: Data are OK to calculate a translator.

The non-transformed and EXP transformed dissolved and total recoverable Zinc data are not normality distributed. The 95th percentiles are 1414, 1471, 0.996 for dissolved Zinc, total recoverable Zinc, and f_D, respectively. The f_D Zinc value as calculated from the 95th percentile values for dissolved and total recoverable is 0.961.

The log transformed Zinc f_D fit a normal distribution, Shapiro-Wilk's W=.94688, p=.60443

Options for 005 Zinc: Data are OK to calculate a translator.



Metals Translator Study

December 2008

Presented to:
Northrop Grumman Newport News
Newport News, Virginia

Submitted 12/12/08. via CD
Replaces Study first
Submitted on 9/5/08.
See PPR 382
file.
DDA

Environmental Resources Management
1011 E. Main St. Suite 227
Richmond, VA 23219
(804) 253-1090
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1.0 *INTRODUCTION*

This document presents a Metals Translator Study for the Northrop Grumman Newport News' (NGNN) Shipbuilding Facility (the facility) located in Newport News, Virginia. The study was undertaken to determine if Translator Factors for both copper and zinc could be developed in support of the facility's Virginia Pollutant Discharge Elimination System (VPDES) Schedules of Compliance for Total Recoverable Metals for Permit No. VA0004804. The US Environmental Protection Agency (EPA) has provided guidance on the development of translator factors in a June 1996 guidance document, "The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion" (Guidance Manual). In several VPDES permits and in recent discussions, Virginia Department of Environmental Quality (VADEQ) has indicated their consideration of results calculated through metal translator studies in evaluating and setting permit limits. This information will be beneficial to NGNN in its current permit modification cycle and discharge compliance in the future.

2.0 *STUDY APPROACH AND METHODS*

2.1 *STUDY APPROACH*

The Metal Translator Factor is the ratio of the concentrations of dissolved metal to total recoverable metal downstream of a discharge or outfall. However, to determine this for a specific site, one must evaluate the partitioning of the metal in the downstream waters using a significant number of representative concentration data points, while also evaluating the relationship of the dissolved metal concentration with total suspended solids (TSS), an adsorbent for the metal. EPA's guidance manual outlines the procedures for calculating the translator factor for different statistical distributions of the data, as well as, different relationships with TSS concentrations.

Because the levels of copper and zinc in the discharge NGNN discharges are low (e.g. 20 - 200 parts per billion (ppb)), small variations can affect the calculations significantly. For this reason, EPA's guidance manual recommends that the sampling and analytical techniques for determining total recoverable and dissolved copper be designed for trace metals analysis. EPA Method 1669, "Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels", outlines the procedures necessary to minimize contamination during sampling and handling, thus providing a more accurate translator factor. This method is much more rigorous in terms of avoiding contamination. It requires the use of two people for the sampling operations, one with "clean" hands, and one with "dirty" hands. It also calls for special reagents, sampling containers, filters and quality assurance/quality control (QA/QC) procedures such as field and equipment blank testing during the sampling. The designated "clean hands" person only handles the sample right before the actual sample is obtained and immediately packages it for transport to the lab.

2.2 *SAMPLING LOCATION, FREQUENCY AND DURATION*

Nine (9) locations were scheduled for weekly sampling for an eleven (11) week interval. US EPA recommends at least ten sample events to obtain a proper statistical range. One (1) duplicate sample was also taken at a predetermined sampling location each week. Between the fifth and sixth sampling events, a preliminary review of the data was undertaken to ensure that the ultimate objective could be achieved. In addition, while reviewing the sampling locations and wastewater sources, the number of locations was reduced from nine (9) to seven (7) sampling locations. Also an additional outfall was eliminated due a continued low flow condition.

2.3 *SAMPLING SCHEDULE*

The sampling schedule is presented in Table 2-1 below.

Table 2-1 Sampling Location and Schedule

Outfall No.	Location	Sampling Date (2008)
003	East of Pier #3	14Feb, 20Feb, 28Feb, 5Mar, 12Mar, 8May, 14May, 22May, 29May, 4Jun, 11Jun
005	East of Pier #5	14Feb, 20Feb, 28Feb, 5Mar, 12Mar, 8May, 14May, 22May, 29May, 4Jun, 11Jun
019	North of Dry-dock #3	14Feb, 20Feb, 28Feb, 5Mar, 12Mar, 8May, 14May, 22May, 29May, 4Jun, 11Jun
020	North of Dry-dock #4	14Feb, 20Feb, 28Feb, 5Mar, 12Mar, 8May, 14May, 23May (no samples taken 29May, 4Jun, 11Jun due to no flow)
023	South of Dry-dock #10	14Feb, 20Feb, 28Feb, 5Mar, 12Mar
026	North of Dry-dock #11	14Feb, 20Feb, 28Feb, 5Mar, 12Mar, 8May, 14May, 22May, 29May, 4Jun, 11Jun
030	Foundry Area	14Feb, 20Feb, 28Feb, 5Mar, 12Mar, 8May, 14May, 22May, 29May, 4Jun, 11Jun
037	South of Dry-dock #4	14Feb, 20Feb, 28Feb, 5Mar, 12Mar
084	South of Building 4730	14Feb, 20Feb, 28Feb, 5Mar, 12Mar, 8May, 14May, 22May, 29May, 4Jun, 11Jun

2.4 *SAMPLING METHODOLOGY*

Samples were collected in conformance with both US EPA and VADEQ protocols. Universal Laboratories, located in Hampton Virginia, a Virginia certified laboratory, worked with ERM to develop a sampling methodology, provided one of the sampling personnel as well as, completed the sample analysis. This included field protocols that were consistent with EPA Method 1669 and involved one sampler designated as "clean hands" and a second sampler referred to as "dirty" hands. Emphasis was placed on clean sampling and analysis. The Metals Translator study plan is provided in Appendix A, and was provided to the VADEQ for their review and comment prior to the initiation of work.

In addition, sample containers used for the NGNN sampling event were pre-cleaned and stored under rigorous protocols to ensure the containers were free of contamination prior to transport to the sample location. This protocol included special handling procedures and additional quality

assurance sampling is outlined in the Metals Translator Sampling Plan contained in Appendix A.

During a sampling location site visit prior to the initiation of the actual sampling, access to the sampling locations was reviewed with representatives from NGNN Plant Operations, NGNN Environmental, Universal Labs and ERM. NGNN Plant Operations personnel would provide access to specific sampling locations where needed. In addition, a method to obtain "clean" samples was discussed at each location. Low flows where sampled up the pipe without hitting the sidewall or the bottom of the pipe to avoid the sampling of sediments. Continuous flow conditions where the pipe invert was almost full, as well as, pumped discharges which were activated by elevation (level control) or pollutant concentration (conductivity) were additional conditions at the time of sampling. In each case, a unique sampling technical/approach was discussed with input from the NGNN Environmental representative that routinely performs the effluent discharge sampling. In all cases, we attempted to sample during a time most representative of NGNN normal sampling activities. Finally, because some of the facility's discharge pipes are impacted by tidal influences, the outfall sampling order varied weekly to reduce/eliminate tidal influences in the sampling locations.

The sampling techniques proposed for these various locations were consolidated and reviewed with VADEQ before they were formalized in the Site Sampling and Management Plan.

Mr. Roger Stewart of the VADEQ witnessed a sampling event on 28 February 2008. Mr. Stewart participated in an additional discussions during the program implementation about proper sampling and data analysis/interpretation.

2.5 *SAMPLE ANALYSIS*

Samples were taken to the Universal Laboratories facility in Hampton, Virginia where they were received under a chain of custody protocol. Samples were received and stored until analysis was initiated utilizing Universal Labs Quality Assurance/ Quality Control protocols. Each of the samples was analyzed for:

- dissolved copper;
- total recoverable copper;
- dissolved zinc;
- total recoverable zinc;
- TSS;

- hardness; and
- pH.

Quality control samples were also obtained and analyzed. These included field, trip and equipment blanks. Results of these samples are contained in the full data package contained in Appendix B.

Further, it was agreed that at the approximate midpoint of the scope of work, and initial data review would be undertaken to determine the viability of the Translator Factor. Sample locations (outfalls) that were not deemed viable by ERM and/or NGNN, were eliminated from additional sampling events.

3.0 *RESULTS*

3.1 *ANALYTICAL DATA*

Sample analytical data was provided on a normal "turn around" interval. Sample results were reported to ERM after Universal Laboratories completed their validation, consistent with their Laboratory Data Validation procedure.

In addition, ERM evaluated the resulting analytical data to insure the potential key factors of metal variability were within the normal range. These included TSS, pH and hardness.

The analytical results for the sampling events are summarized in Appendix B.

Method detection limits and reporting limits were indicated on each set of analytical data results.

3.2 *TRANSLATOR CALCULATION*

The Metals Translator Factors are determined as the ratio of dissolved fraction divided by the total recoverable fraction, as shown in Appendix C.

3.3 *TOTAL SUSPENDED SOLIDS/TRANSLATOR RELATIONSHIP*

In accordance with the EPA guidance, the individual translators need to be evaluated against the total suspended solids (TSS) for each event to determine if the translator is dependent on TSS. This is due to the assumption that as TSS increases, the dissolved fraction decreases because of the increased number of binding sites.

As can be seen in Figures 3-1 and 3-2 presented below, the translator and TSS do not correlate and therefore, the translator is not dependent on TSS. This visual observation is statistically evaluated by calculation of the correlation coefficient. The correlation coefficient measures the direction and strength of a linear association among two variables and is always between -1 and +1. A correlation coefficient of +1 or -1 indicates that the data correlates. Alternatively, a correlation of 0 or a number closer to 0 indicates that the data does not correlate. The coefficient for the copper and zinc translator is 0.58 and 0.53, respectively, which further confirms

that the translator factors are not dependent on TSS. Therefore, TSS was not considered further in this evaluation.

Figure 3-1
Translator and Suspended Solids Correlation for Copper

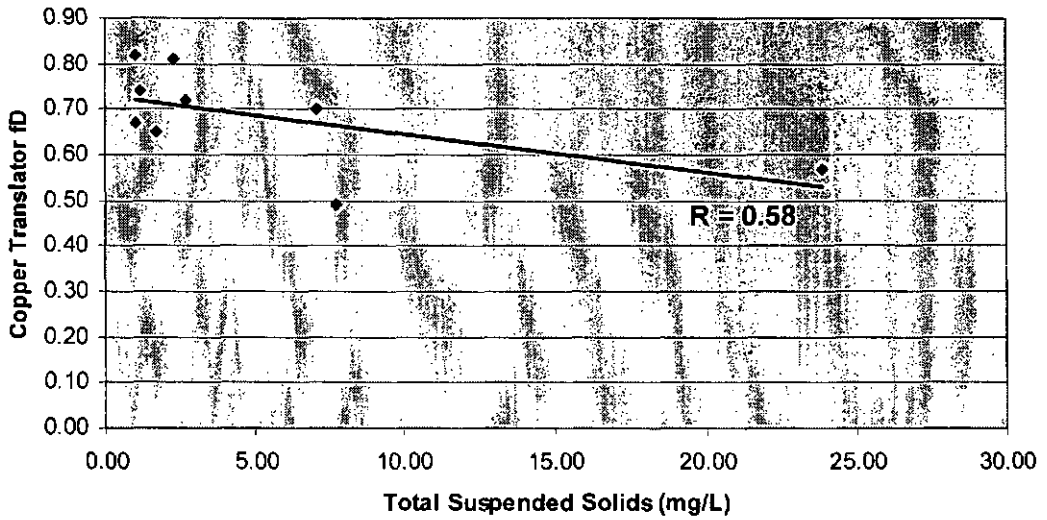
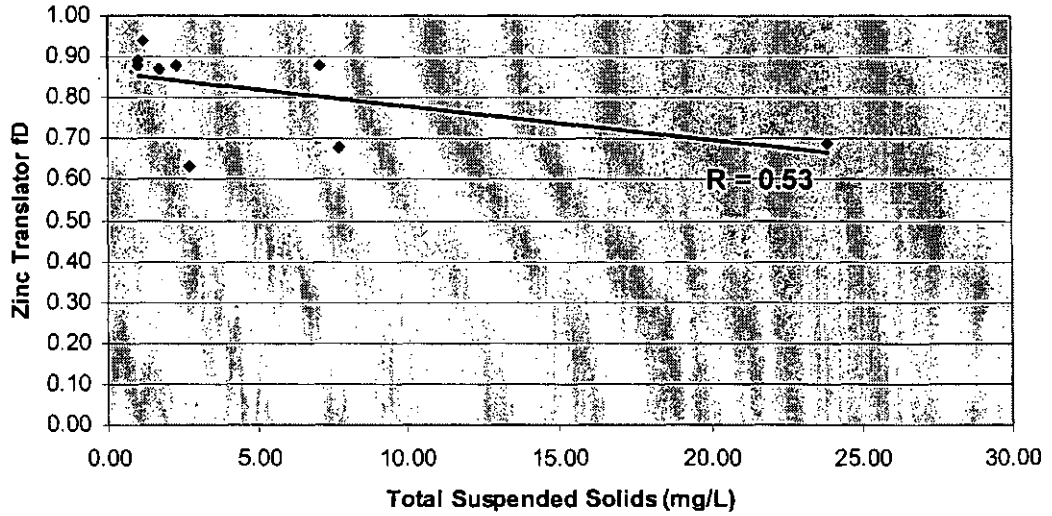


Figure 3-2
Translator and Suspended Solids Correlation for Zinc



3.4 *ADDITIONAL ANALYTICAL PARAMETERS*

In addition to TSS, each sample was also analyzed for pH and hardness. It is desirable that the range for both of these additional parameters remain constant. pH was maintained within a close range with the exception of the first sampling event. Hardness was more variable. Therefore, no direct correlation between the variability of these additional parameters and the analytes concentration was found. Further, this variability would validate the Translator Factors as "statistically more robust".

3.5 *DETERMINATION OF NORMALITY*

The data collected for the outfalls are all within a tight range and have very little variance. However, all of the data was reviewed to determine if it was considered log normal and a valid Translator Factor. Alternative calculation could be completed if the data was not log normal. This was done on data from three outfalls (No. 003,005 and 019). This resulted in revisions to two of the translator factor calculations (Dissolved Copper at Outfalls No. 003 and 019). A summary of these calculations is presented in Appendix D.

At Outfall 003, the Dissolved Copper data was not log-normal, but all other parameters were log-normal. Therefore a Margin of Safety percentile (90th) was used for the calculation of a revised Copper Translator Factor of 0.82.

At Outfall 005, all the data was found to be non log normal. However, the data did fit a normal distribution using Shapiro-Wilk's (W=0.83441 and p=0.02668). The Translator Factor remained unchanged.

At Outfall 019, the Dissolved Copper was found to be non-log normal and did not fit other log normal calculations (Arc Sign Root). Therefore the 90th percentile Margin of Safety was applied to the calculated Translator factor resulting in a revised factor of 0.75.

3.6 *TRANSLATOR DEVELOPMENT*

If the translator data set is determined to be log normal, as assumed, and not dependent on TSS, then the translator factor will be calculated in accordance with the EPA Metal Translator Guidance as the geometric mean of the individual translator factors. The data collected for the outfalls fit both of these criteria, so therefore, calculating the geometric mean is appropriate for this Metals Translator.

The geometric mean calculation for each sampling location is provided in Appendix C and is summarized below.

Table 3-1 *Geometric Mean for Each Sampling Location*

Outfall No.	Geometric Mean for Copper	Geometric Mean for Zinc
003	0.66	0.93
005	0.65	0.89
019	0.46	0.65
026	0.45	0.63
030	0.64	0.86
084	0.65	0.58

Note that Geometric Means were not calculated for Outfall No. 20, 23, and 37 due to an insufficient data. Outfalls No. 23 and 37 were not sampled after the midpoint data evaluation (five sample events). Also, through the eleven sampling events, only eight samples were able to be obtained from Outfall No 20, due to the low flow conditions. This number was not within the statistically acceptable range as defined by US EPA, and a Translator Factor was not calculated.

4.0 TRANSLATOR FACTORS AND CONCLUSIONS

Based upon the field sampling and subsequent data review, ERM was able to calculate Translator Factors for six outfalls (sampling locations). These Translator Factors for Copper and Zinc, developed in conformance with EPA Guidance can be used in upcoming VPDES permit negotiations. The following are the calculated metals Translator Factors, existing effluent limit and corresponding effluent limit utilizing the Translator Factor for each of the following outfall locations.

Table 4-1 Revised Limits Using Translator Factors

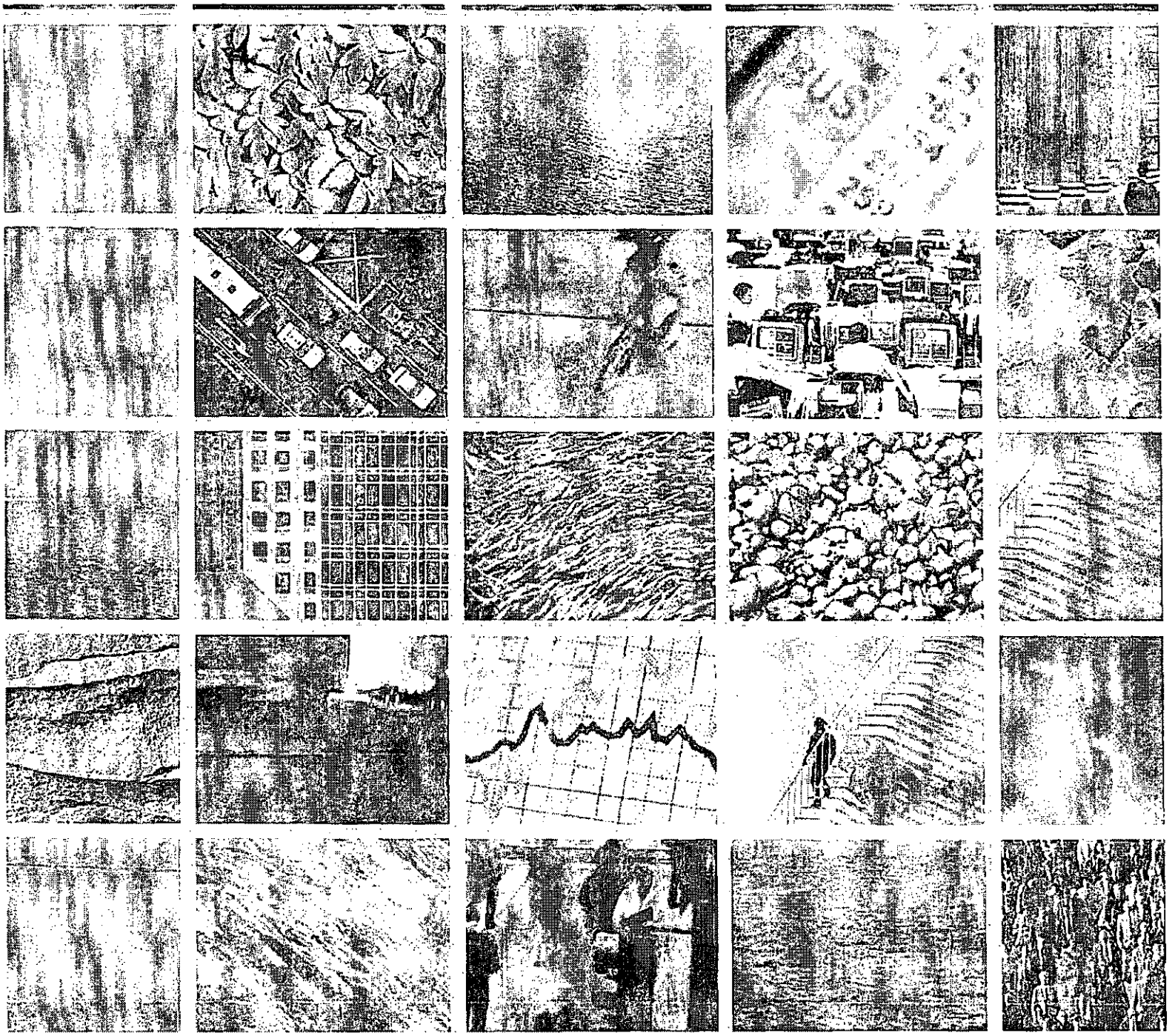
Outfall No.	Existing Copper Permit Limit (ug/L)	Copper Translator Factor	Revised Limit Applying Factor (ug/L)	Existing Zinc Permit Limit (ug/L)	Zinc Translator Factor	Revised Limit Applying Factor (ug/L)
003	16	0.82*	19.5	153	0.93	165
005	NL	0.65	NL	1,188	0.89	1,335
019	30	0.75*	40	288	0.65	443
026	24	0.45	53	NL	0.63	NL
030	19	0.64	30	NL	0.86	NL
084	19	0.65	29	NL	0.58	NL

NL - No Limit

* - Based on log normal calculation

ERM has conducted this study at the request of NGNN in support of the Schedules of Compliance for Total Recoverable Metals requirement as written in Part 1.B of VPDES Permit No. VA0004804. It is understood that this report will be submitted to VADEQ as part of an overall strategy for the achievement of compliance with the final limitations.

Appendix A
Metals Translator Sampling Plan



Sampling Plan
Copper and Zinc Translator Study

Presented to:
Northrop Grumman Newport News
4101 Washington Avenue
Newport News, Virginia

Northrop Grumman Newport News
Newport News, VA

January 16, 2008

Environmental Resources Management
1011 E. Main St. Suite 227
Richmond, VA 23219
(804) 253-1090
www.erm.com

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ERM

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1.0 PROJECT DESCRIPTION

1.1 GENERAL OVERVIEW

This document presents field sampling and laboratory techniques to collect and analyze total and dissolved Copper (Cu) and Zinc (Zn) by clean metals techniques. This scope of work is being completed for Environmental Resources Management, Inc. (ERM) and Universal Laboratories (UL) in support of site specific protocols for Northrop Grumman Corporation (Northrop Grumman), in Newport News, Virginia. Ultimately, it is Northrop Grumman's desire to develop a "translator factor", which is a conversion between each metal's total recoverable-based criterion and a dissolved metals concentration, if possible.

1.2 SAMPLE COLLECTION AND ANALYSIS

ERM, UL and Northrop Grumman have reviewed the proposed sampling locations and schedule to achieve the desired analytical data necessary to support a metals translator calculation. Through a series of site visits and discussions with Northrop Grumman and the Virginia Department of Environmental Protection (VDEQ), access to the sampling location, sampling protocols and the sample locations (see Table 1) were agreed to.

Sample collection and analysis will follow VDEQ Memorandum 96-09 Obtaining Dissolved Metals Data Amendment #1, and USEPA Method 1669 with exceptions as noted.

All sample containers and sampling equipment will be tested and proven clean of the contaminant of interest (Copper and Zinc) prior to sampling. An acceptable blank, as described in Section 2.2, is one free from contamination below the minimum level specified in this project:

EPA Method 200.7 for Copper MDL =0.001 mg/L

EPA Method 200.7 for Zinc MDL = 0.001 mg/L

> *Note: The philosophy behind contamination control is to ensure that any object or substance that contacts the sample is nonmetallic and free from any material that may contain copper or zinc.*

Further, Northrop Grumman's current discharge limitations are presented in µg/L.

The ease of contaminating water samples with the metals of interest, Copper and Zinc, cannot be overemphasized. Techniques and equipment used should maximize the ability of the sampling team to collect samples reliably and eliminate sample contamination.

UL and ERM field staff will obtain effluent water samples from various outfalls at the shipyard. The sampling frequency will be weekly for the duration of eleven weeks, randomly alternating times and days of the week, where practicable and/or weather permitting. At the five week interval, an interim assessment will be completed to determine that the translator factor data is validating a relationship between the dissolved and total metals concentration. The following samples will be collected at each location:

(1) 2-liter poly container for Total Suspended Solids (TSS) and hardness;
(1) 500 ml pre-cleaned for Total Copper and Zinc; and
(1) 500 ml pre-cleaned for Dissolved Copper and Zinc.

Specific sampling locations and sampling techniques will be used:

2.0 QUALITY ASSURANCE OBJECTIVES

2.1 ANALYTICAL METHODS AND DETECTION LEVELS

Parameter	Method	Method Detection Level
Copper	EPA 200.7	0.001 mg/L*
Zinc	EPA 200.7	0.005 mg/L
Total Suspended Solids	Standard Method 2540 D	1.0 mg/L
Hardness	Standard Method 2340 C	2.0 mg/l

** with concentration techniques can go to 0.0005 mg/L if the dissolved concentration is near the report limit of 0.001 mg/L*

2.2 QUALITY ASSURANCE SAMPLES REQUIRED

The prepared samples will be analyzed by the methods listed above; Quality Assurance/Quality Control (QA/QC) samples to be analyzed are listed below with the frequencies.

2.2.1 *Equipment Blanks*

Before using any sampling equipment at a sampling location, the laboratory is required to generate equipment blanks to demonstrate that the equipment is free from contamination.

2.2.2 *Field Blanks*

To demonstrate that sample contamination has not occurred during the field sampling and processing, at least one (1) field blank will be generated for every sampling event. Field blanks are collected before sample collection.

2.2.3 *Field Duplicate*

To assess the precision of the field sampling and analytical processes, at least one (1) field duplicate sample will be collected for every ten (10) samples that are collected or per sampling event.

2.2.4 *Laboratory Method Blank*

A digestion blank will be analyzed with each analytical batch.

2.2.5 *Laboratory Control Samples (LCS)*

A blank spike will be analyzed with each analytical batch.

2.2.6 *Matrix Spike (MS)*

A Matrix Spike is an aliquot of sample that is spiked with a known quantity of copper and zinc added in the laboratory. This sample in conjunction with the Matrix Spike Duplicate (MSD) measure the precision and accuracy of each analytical batch.

2.2.7 *Matrix Spike Duplicate (MSD)*

A Matrix Spike Duplicate is a duplicate aliquot of sample that is spiked with a known quantity of copper and zinc added in the laboratory. This sample in conjunction with the matrix spike measures the precision and accuracy of each analytical batch.

3.0 FIELD SAMPLING

3.1 EQUIPMENT REQUIRED

- Pre-cleaned and tarred plastic containers prepared according to USEPA Methods 1669 (500mi double bagged)
- 2-liter poly containers for TSS
- Variable speed peristaltic pump
- Gelman filter Capsule
- Pre-cleaned pump tubing
- Pre-cleaned sample tubing
- Sampling wand
- PVC Field notebook
- pH meter
- Carboy/Container with DI water for Field Blank (see Section 2.2 for frequency)
- Carboy for waste (2 gallons)

3.2 FIELD SAMPLING PROCEDURE

3.2.1 *Sampling Personnel*

Field sampling will be conducted in accordance with EPA Method 1669. Below are some of the key procedures from the EPA Method that will be followed on this project. All operations involving contact with the sample bottle and with transfer of sample from the collection device to the sample bottle are handled by the individual designated as "clean hands". The individual designated as "dirty hands" is responsible for all activities that do not involve direct contact with the sample.

Sampling personnel are required to wear clean non-talc gloves at all times when handling sampling equipment and containers.

3.2.2 *Samples*

Dissolved metals samples will be filtered and preserved with nitric acid in the laboratory. Totals metals samples will be preserved with nitric acid.

3.2.3 *Gelman Filter Capsule*

Each Gelman Filter Capsule will be conditioned by pumping at least one (1) liter of laboratory de-ionized (DI) water through just prior to filtering the sample. The filtrate can be discarded in the waste container.

3.2.4 *Continuous Flow Sampling*

Certain sites will require modifications to this sampling protocol, but always continuing with these clean hands/dirty hands approach. Certain outfalls have been determined to be low flow and this wand approach may not be sufficient to obtain samples. For these outfalls, it has been decided to use a pre-cleaned and tested vessel. This vessel will be positioned in front of the pipe to collect water and the wand will be placed in the vessel to obtain samples. This is very case specific and the best sampling approach will be determined during the first event. This document will be revised for any outfall specific sampling equipment and will be detailed for each outfall where the procedure below is revised/amended.

The continuous flow sampling uses a variable speed peristaltic pump to pump sample into the bottle through polytetrafluoroethylene (PTFE) tubing. The intake of the sample tubing will he inserted into the polyvinylchloride (PVC) sampling wand and submerged approximately two (2) inches below the surface.

The sampling team will use the following procedure:

- clean hands and dirty hands put on multiple layers of personal protection gloves;
- the sampling team (two person team) will remove the bags containing the tubing, plastic wrap, and pump from the coolers or storage containers in which they are packed for transport;
- dirty hands removes the pump from its storage bag and opens the bag containing the pump and sample tubing;
- dirty hands installs the pump tubing while clean hands holds the ends and install the filter;
- both clean hands and dirty hands change gloves;

- dirty hands reaches into the storage cooler and opens the outer bag containing the sample container which is full DI water;

- clean hands places the sample container on the work bench previously set-up, and removes one end of the loop connection on top of the container;

- clean hands connects the end of the pump tubing to the free fitting on top of the sample bottle, then inverts the bottle;

- dirty hands starts the pump to process the entire contents of the sample container through the tubing and filter;

- dirty hands stops the pump before the filter goes dry;

- clean hands disconnects the pump tubing from the empty sample bottle and reconnects the same end to a second sample bottle containing DI water, again inverting the sample bottle;

- dirty hands starts the pump again to process the blank water allowing approximately 125 ml to be expelled as waste to remove any trace of the conditioning water;

- clean hands attaches the first sample bottle to the end of the filter to collect the remainder of the DI water as the field blank;

- clean hands disconnects the blank bottle from the filter once it is full, reconnects sample loop on the sample bottle, returns the bottle to the inside bag, and zips the bag. Clean hands then places the zipped bag into the outer bag held by dirty hands;

- clean hands inserts the sample tubing in the notch of the PVC sampling wand while dirty hands holds the wand;

- the wand will be in place for a short time to allow any solids that were disturbed during submersion to settle;

- dirty hands starts the pump allowing it to process approximately 125ml of sample water from the filter to be expelled as waste to purge the tubing and filter of the DI water;

- both clean hands and dirty hands change gloves;

- dirty hands reaches into the storage cooler and opens the bag containing the sample container;

- clean hands places the sample container on the work bench previously set-up, and removes one end of the loop connection on top of the container;

- clean hands connects the free end of the loop to fitting on the filter and dirty hands turns on the pump;

- clean hands reconnects sample loop on the sample bottle, returns the bottle to the inside bag, and zips the bag. Clean hands then places the zipped bag into the outer bag held by dirty hands;

- dirty hands zips the outer bag, and places it into a clean ice-filled cooler for transport; and

- repeat the above steps without the filter for the total metals sample.

The order of the sampling will be: rinse filter, obtain dissolved copper and zinc/hardness samples, remove filter.

Repeat steps without the filter in the following order: total copper and zinc/hardness, then TSS.

3.3 *SAMPLE TRANSPORTATION*

The samples will be packed on ice and the Chain of Custody documents and field notes will be completed before transportation to the laboratory.

Total recoverable metals will be digested and analyzed as per UL SOP#156 (Attached), with all appropriate QA samples analyzed.

Dissolved samples will be processed according to UL SOP#256 (Attached), with all appropriate QA samples analyzed.

Tables

Table 1

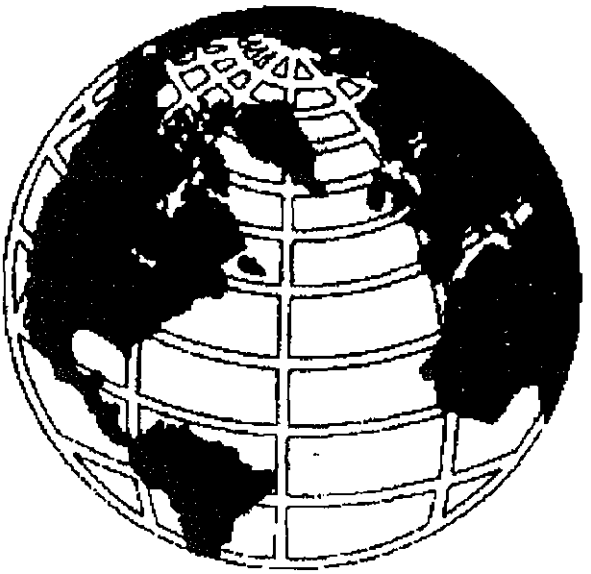
NGNN Translator Study

Sample Locations

Outfall No.	Location
003	*East of Pier #3*
005	*East of Pier #5*
019	*North of Drydock #3*
020	*North of Drydock #4*
023	*South of Drydock #10*
026	*North of Drydock #11*
030	*Foundry Area*
037	*South of Drydock #4*
009	*South of Building 60*
084	*South of Building 4730*

Appendix A
Universal Laboratories SOPs

STANDARD OPERATING PROCEDURE FOR TOTAL AND DISSOLVED METALS DIGESTION



Prepared by Cameron Childress
for Universal Laboratories

Reviewed By:

Carol Klemm Date 1/11/08
LABORATORY MANAGER

Date 1/11/08
DEPARTMENT LEAD

Approved By:

Date 1/11/08
QUALITY DIRECTOR

Safety: Refer to Safety & Health Manual

1.0 SCOPE AND APPLICATION

This method provides sample preparation procedures for the determination of total recoverable and dissolved analytes in ground water, surface waters, drinking water, and wastewater; to include all aqueous samples containing suspended or particulate materials ≤ 1% (w/v). Samples can then be analyzed by ICP, Flame, or Graphite.

2.0 SUMMARY OF METHOD

Samples are refluxed for 30 minutes in a mixture of nitric acid and hydrochloric acids. After extraction, most samples are diluted to 25mLs with DI water.

3.0 INTERFERENCES

3.1 Contamination is a primary concern. The work area should be wiped down each day to eliminate environmental contamination.

3.2 Glass may cause a positive interference for boron and silica analysis and therefore only plastic or quartz lab ware should be used from the time of collection to completion of analysis, if boron and silica will be determined.

3.3 Concentrations of silver above 0.1mg/L may be lost during digestion and therefore smaller portions of sample should be used for this analysis.

4.0 SAMPLE COLLECTION, PRESERVATION, and STORAGE

4.1 For determination of dissolved metals, the sample must be filtered through a 0.45um membrane filter. Acidify the filtrate with 1:1 Nitric acid immediately following the filtration to a pH of less than 2.

4.2 For the determination of total recoverable elements in aqueous samples, acidify with 1:1 Nitric acid at the time of collection or as soon as possible thereafter to a pH of less than 2. If samples can not be acidified upon collection, then acidify samples and hold for 16 hours before withdrawing and aliquot for processing.

5.0 EQUIPMENT AND SUPPLIES

5.1 Digestion tube – Environmental Express 50mL or equivalent.

5.2 Ribbed watch glass

5.3 Pipetter – Eppendorf

5.4 Pipet tips

5.5 Hotblock – Environmental Express 50mL or equivalent held at 85°C.

5.6 Filter and Plunger – Environmental Express 2um size to remove suspended matter.

5.7 Nitrile gloves

5.8 Thermometer at 85°C

6.0 REAGENTS AND STANDARDS

6.1 Nitric Acid - Trace metals grade. Store in a hood.

6.2 1:1 Hydrochloric Acid – Trace metals grade. Put 500mL DI water in acid bottle, measure out 500mL Hydrochloric Acid. Slowly add the Hydrochloric acid to the water while mixing. Store in a hood.

6.3 DI water

6.4 ICAP 7 –mixed element standards traceable to NIST or equivalent

6.5 ICAP 19 - mixed element standards traceable to NIST or equivalent
6.6 NaOH – to neutralize the acid waste bucket

7.0 QUALITY CONTROL

7.1 Digest a Blank each day of digestions.
7.2 Digest an LCS each day of digestions.
7.3 Digest a matrix spike (MS) and matrix spike duplicate (MSD) each day of digestions and at least every 10% after the first ten samples. If there is not enough sample for a MS and MSD, digest one MS and one duplicate or digest an extra LCS as a duplicate.

8.0 PROCEDURE

8.1 Print out prep metals log and find all samples. As the steps below are completed, fill in all necessary information.
8.2 Label all necessary digestion tubes with sample ID and date.
8.3 Add 50mL of well mixed, acid preserved sample to plastic digestion tube. For blanks and LCSs, add 50mL of DI water to plastic digestion tube.
8.4 Add 250uL of ICAP 7 and ICAP 19 to all MS, MSD, and LCS tubes.
8.5 Add 1.0mL of HNO_3 and 0.5mL of 1+1 HCl. If digestate will be used for Graphite analysis, omit the HCl.
8.6 Place tubes in heating block.
8.7 Heat at approximately, but no higher than 85°C. Samples should not boil.
8.8 Reduce volume to about 10mL.
8.9 Cover with a watch glass and reflux gently for 30 minutes making sure sample does not rapidly boil.
8.10 Allow to cool and bring to 50mL with DI water.
8.11 If needed, filter making sure not to contaminate sample while filtering.
8.12 Seal container & transfer to AA room for analysis.

9.0 REFERENCES

EPA 200.2

10.0 WASTE MANAGEMENT

Digested samples are stored in the metals analytical room for thirty days. After thirty days, all digestates are disposed of in the acid waste bucket in the wet chemistry section. When the acid waste bucket becomes full, add enough NaOH to the bucket to achieve a pH>7 then drain into the sink while the water is running.

Appendix B
Results of Laboratory Samples and Field Blanks

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 400

Richmond Va. 23219

ATTN: Thomas Numbers

Proj. No. 0071121

REPORT OF ANALYSIS PACKAGE

Order ID: 0802185

(REPORT DATE)
04-Mar-08

This report contains the analytical results for Project Id:Northrop Gruman
designated as UL Order Id: 0802185 and received on Friday, February 15, 2008
The samples were received and analyzed according to the methods listed in this report

Use "Clean Metals" techniques when handling these samples!!!!!

The data in this report has been reviewed and validated by:

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

UL Sample Number: **0802185-001** Site: **OF-003**
Client Sample ID: **OF-003**
Matrix: Wastewater
Comments for 0802185-001
No comments

Grab Date/Time: 2/14/2008 09:10:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.042	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.043	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.261	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.264	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	8.3	S.U.		0.1	2/14/2008 09:14:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	121	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	3.4	mg/L	1	1	2/19/2008 13:45:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

UL Sample Number: 0802185-002 Site: OF-019
Client Sample ID: OF-019
Matrix: Wastewater
Comments for 0802185-002
No comments

Grab Date/Time: 2/14/2008 10:08:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.002	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Copper (Total)	0.004	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Zinc (dissolved)	0.390	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Zinc (Total)	0.444	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Method: SM 4500 H/B						
Field pH	8.4	S.U.		0.1	2/14/2008 10:12:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	72	mg/L	2	2	3/3/2008 09:28:00	AB
Method: SM-2540 D						
Total Suspended Solids	4.4	mg/L	1	1	2/19/2008 13:45:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

UL Sample Number: 0802185-003 Site: OF-020
Client Sample ID: OF-020
Matrix: Wastewater
Comments for 0802185-003
No comments

Grab Date/Time: 2/14/2008 10:45:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.013	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.016	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.458	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.503	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	8.9	S.U.		0.1	2/14/2008 10:51:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	102	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	3.9	mg/L	1	1	2/19/2008 13:45:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 61706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

UL Sample Number: **0802185-004** Site: **OF-026**
Client Sample ID: **OF-026**
Matrix: Wastewater
Comments for 0802185-004
No comments

Grab Date/Time: 2/14/2008 11:26:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method:	**EPA 200.7**					
Copper (dissolved)	**0.001**	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Copper (Total)	**0.010**	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Zinc (dissolved)	**0.063**	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Zinc (Total)	**0.146**	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Method:	**SM 4500 H/B**					
Field pH	**8.3**	S.U.		0.1	2/14/2008 11:35:00	JN
Method:	**SM-2340 C**					
Hardness as CaCO3-EDTA	**110**	mg/L	2	2	3/3/2008 09:28:00	AB
Method:	**SM-2540 D**					
Total Suspended Solids	**83**	mg/L	1	1	2/20/2008 13:06:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

UL Sample Number: 0802185-005 Site: OF-030
Client Sample ID: OF-030
Matrix: Wastewater
Comments for 0802185-005
No comments

Grab Date/Time: 2/14/2008 13:27:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	**0.034**	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	**0.042**	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	**0.293**	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	**0.310**	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	**8.2**	S.U.		0.1	2/14/2008 13:35:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	**78**	mg/L	2	2	3/3/2008 09:28:00	AB
Method: SM-2540 D						
Total Suspended Solids	≤	mg/L	1	1	2/20/2008 13:06:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

UL Sample Number: **0802185-006** Site: **OF-005**
Client Sample ID: **OF-005**
Matrix: Wastewater
Comments for 0802185-006
No comments

Grab Date/Time: 2/14/2008 14:15:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.002	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.004	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.131	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.141	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	8.0	S.U.		0.1	2/14/2008 14:20:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	86	mg/L	2	2	3/3/2008 09:28:00	AB
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	2/20/2008 13:06:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

UL Sample Number: **0802185-007** Site: **OF-037**
Client Sample ID: **OF-037**
Matrix: Wastewater
Comments for 0802185-007
No comments

Grab Date/Time: 2/14/2008 14:40:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	**0.002**	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Copper (Total)	**0.002**	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Zinc (dissolved)	**0.133**	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Zinc (Total)	**0.136**	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Method: SM 4500 H/B						
Field pH	**8.1**	S.U.		0.1	2/14/2008 14:50:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	**643**	mg/L	2	2	3/3/2008 09:28:00	AB
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	2/20/2008 13:06:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

UL Sample Number: 0802185-008 Site: OF-023
Client Sample ID: OF-023
Matrix: Wastewater
Comments for 0802185-008
No comments

Grab Date/Time: 2/14/2008 15:20:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.008	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.009	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.604	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.658	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	8.0	S.U.		0.1	2/14/2008 15:30:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	50	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	2.3	mg/L	1	1	2/20/2008 13:06:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

UL Sample Number: **0802185-009** Site: **Field Blank**

Client Sample ID: **Field Blank**

Matrix: Wastewater

Comments for 0802185-009

No comments

Grab Date/Time: 2/14/2008 15:55:0

Composite Start: N/A

Composite Stop: N/A

Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Copper (Total)	<	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Zinc (dissolved)	<	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Zinc (Total)	<	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

UL Sample Number: **0802185-010** Site: **OF-084**
Client Sample ID: **OF-084**
Matrix: Wastewater
Comments for 0802185-010
No comments

Grab Date/Time: 2/14/2008 16:20:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Copper (Total)	<	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Zinc (dissolved)	**0.022**	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Zinc (Total)	**0.040**	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Method: SM 4500 H/B						
Field pH	**8.2**	S.U.		0.1	2/14/2008 16:31:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	**204**	mg/L	2	2	3/3/2008 09:28:00	AB
Method: SM-2540 D						
Total Suspended Solids	**3.2**	mg/L	1	1	2/16/2008 11:56:00	AB

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

UL Sample Number: **0802185-011**
Client Sample ID: **OF-084 DUP**
Matrix: Wastewater
Comments for 0802185-011
No comments

Site: **OF-084 DUP**

Grab Date/Time: 2/14/2008 16:30:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Copper (Total)	**0.001**	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Zinc (dissolved)	**0.028**	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Zinc (Total)	**0.061**	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Method: SM-2340 C						
Hardness as CaCO3-EDTA	**190**	mg/L	2	2	3/3/2008 09:28:00	AB

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID **0802185**

UL Sample Number: **0802185-013** Site: **Equipment Blank**
Client Sample ID: **ZAQ**
Matrix: Wastewater
Comments for 0802185-013
No comments

Grab Date/Time: 2/15/2008
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	2/11/2008 14:38:00	EF
Copper (Total)	<	mg/L	0.00072		2/11/2008 14:38:00	EF
Zinc (dissolved)	<	mg/L	0.00066	0.005	2/11/2008 14:38:00	EF
Zinc (Total)	<	mg/L	0.00066		2/11/2008 14:38:00	EF

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802185

Analytical Methods Reference

Description:	PrepMethod:	Method	Reference
Field Services			
QA Summary Report		Manual	
Site Visit		Manual	
Field Technician		Manual	
Wastewater			
Copper (Dissolved)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A
Copper (Total)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A
Field pH		SM 4500 H/B	18th Edition
Hardness as CaCO3-EDTA		SM-2340 C	18th Edition
Total Suspended Solids		SM-2540 D	18th Edition
Zinc (Dissolved)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A
Zinc (Total)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A

GLOSSARY OF TERMS AND ABBREVIATIONS

RL (Reporting Limit):

The RL can be raised when consideration of sample volume and matrix interferences are taken into account, generally this number is near or equal to the lowest calibration standard run with the analytical batch.

MDL (Method Detection Limit):

The constituent concentration that, when processed through the complete method, produces a signal with a 99% probability that it is different from the blank.

"<" This denotes the constituent was not detected above the RL

"J"Qualifier

This qualifier is used to indicate an estimated value based on the measured result is outside the calibration range. In most cases the result is above calibration curve and is beyond dilution capabilities. Actual result is probably higher than estimated result given.

"B" Qualifier

This qualifier is used when the concentration of the sample is less than three (3) times that of what is found in the method blank. This does not necessarily indicate that there is a contamination problem, but should be interpreted that the level found in the sample is inconsequential.

"NR" Qualifier

This qualifier indicates that there was NO RESULT generally due to matrix interferences or laboratory problems.

Universal Laboratories

Quality Control Summary

QC Batch # 080229004
Order ID: 0802185; 0802254

	Copper				Zinc			
	True Value	Obtained	% Recovery	RPD	True Value	Obtained	% Recovery	RPD
Blank	0.0000	-0.0040			0.0000	0.0002		
Midrange	0.5000	0.4803	96%		0.5000	0.4959	99%	
Third Party	0.5000	0.5054	101%		0.5000	0.5116	102%	
Blank Spike	1.0000	0.9435	94%		1.0000	0.9056	91%	
Blank	0.0000	-0.0002			0.0000	0.0001		
Blank	0.0000	0.0000			0.0000	0.0001		
Blank Spike	1.0000	0.9460	95%		1.0000	1.0310	103%	
Blank Spike Dup	1.0000	0.9467	95%	<1%	1.0000	1.0400	104%	1%
Midrange	0.5000	0.4767	95%		0.5000	0.4975	99%	
Blank	0.0000	0.0008			0.0000	0.0015		
Blank Spike	1.0000	0.9533	95%		1.0000	1.0520	105%	
Blank Spike Dup	1.0000	0.9338	93%	2%	1.0000	1.0820	108%	3%
Blank	0.0000	0.0003			0.0000	0.0016		
Blank	0.0000	0.0004			0.0000	0.0009		
Matrix Spike	1.0000	1.1727	117%		1.0000	1.1398	114%	
Matrix Spike Dup	1.0000	1.1947	119%	3%	1.0000	1.1728	117%	3%
Midrange	0.5000	0.4763	95%		0.5000	0.5044	101%	
Matrix Spike	1.0000	1.1769	118%		1.0000	1.1574	116%	
Matrix Spike Dup	1.0000	1.1849	118%	1%	1.0000	1.1834	118%	2%
Blank	0.0000	0.0002			0.0000	0.0015		
Midrange	0.5000	0.4719	94%		0.5000	0.4992	100%	
Blank	0.0000	-0.0001			0.0000	0.0016		
Blank Spike	0.5000	0.5106	102%		0.5000	0.5349	107%	
Blank Spike Dup	0.5000	0.5035	101%	1%	0.5000	0.5346	107%	<1%
Midrange	0.5000	0.4783	96%		0.5000	0.5036	101%	
Blank	0.0000	0.0002			0.0000	0.0016		
Matrix Spike	1.0000	1.1814	118%		1.0000	1.1542	115%	
Matrix Spike Dup	1.0000	1.0924	109%	8%	1.0000	1.0712	107%	8%
Blank	0.0000	0.0005			0.0000	0.0009		
Midrange	0.5000	0.4868	97%		0.5000	0.4990	100%	
Matrix Spike	1.0000	1.1433	114%		1.0000	1.1151	112%	
Matrix Spike Dup	1.0000	1.1103	111%	3%	1.0000	1.0981	110%	2%
Blank	0.0000	0.0004			0.0000	0.0014		
Midrange	0.5000	0.4649	93%		0.5000	0.4964	99%	
Blank	0.0000	-0.0002			0.0000	0.0029		

Quality Director _____ Date 3/5/08

gave acct invoice 3/6/08

CHAIN-OF-CUSTODY

UNIVERSAL LABORATORIES

Company	ERM
Street/Box	
City/State	
Phone	Fax
Contact:	
Job No.	P.O. No.

20 Research Drive
Hampton, VA 23666

Phone: (757) 865-0880
Fax: (757) 865-8014

Analysis Required

Sample ID	Date/Time	Sampled By	Matrix	Sample Type	Field Notes	Preservative CuID, ZnID	Preservative CuIT, ZnIT, HRD	Preservative TSS	Preservative FeH	Preservative	Preservative	Preservative	Preservative	Log Number
OF-003	2-14-08 0910	JN	WW	C G		1	1	1	X					0802185
OF-019	1008			C G		1	1	1	X					
OF-020	1045			C G		1	1	1	X					
OF-026	1126			C G		1	1	1	X					
OF-030	1327			C G		1	1	1	X					
OF-005	1415			C G		1	1	1	X					
OF-037	1440			C G		1	1	1	X					
OF-023	1520			C G		1	1	1	X					
Field Blank	1555			C G	* Cu, Zn only No HRD	1	1							
OF-084	1620			C G		1	1	1	X					
OF-084 Dup	1630			C G		1	1							
				C G										

Comments: * Sampled utilizing "Clean Metal" techniques

Cooler Temp at LI 3°C Pres √ Tu lab

Possible Hazards: Disposal: Lab ☐ Client ☐ Charge ☐

Due Date:

Express Service

Express Service Approval

Relinquished By	Signature [signature]	Company UL	Date/Time 2/15/08 1015
Received By	Signature [signature]	Company UL	Date/Time 2-15-08 1015
Relinquished By	Signature	Company	Date/Time
Received By	Signature	Company	Date/Time
Relinquished By	Signature	Company	Date/Time
Received By	Signature	Company	Date/Time

Work Order No.

Delivery Order

Trans ☐ P.U. ☐ Grab ☐ Comp ☐

Shipping/Delivery Charges

Composite Start / Composite Stop

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 400

Richmond Va. 23219

ATTN: Thomas Numbers

REPORT OF ANALYSIS PACKAGE

Order ID: 0802254

(REPORT DATE)
05-Mar-08

This report contains the analytical results for Project Id:Northrop Gruman
designated as UL Order Id: 0802254 and received on Wednesday, February 20, 2008
The samples were received and analyzed according to the methods listed in this report

Use "Clean Metals" techniques when handling these samples!!!!

The data in this report has been reviewed and validated by:

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

UL Sample Number: 0802254-001 Site: Field Blank
Client Sample ID: Field Blank
Matrix: Wastewater
Comments for 0802254-001
No comments

Grab Date/Time: 2/20/2008 10:12:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Copper (Total)	<	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Zinc (dissolved)	<	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Zinc (Total)	<	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51708 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

JL Sample Number: 0802254-002 Site: OF-003
Client Sample ID: OF-003
Matrix: Wastewater
Comments for 0802254-002
No comments

Grab Date/Time: 2/20/2008 09:00:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.003	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.005	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.058	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.059	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	7.3	S.U.		0.1	2/20/2008 09:08:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	176	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	2/25/2008 13:03:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

JL Sample Number: 0802254-003 Site: OF-019
Client Sample ID: OF-019
Matrix: Wastewater
Comments for 0802254-003
No comments

Grab Date/Time: 2/20/2008 13:45:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.003	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.031	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.044	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	7.5	S.U.		0.1	2/20/2008 13:51:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	105	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	7.1	mg/L	1	1	2/25/2008 13:03:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

JL Sample Number: 0802254-004 Site: OF-020

Client Sample ID: OF-020

Matrix: Wastewater

Comments for 0802254-004

No comments

Grab Date/Time: 2/20/2008 14:20:0

Composite Start: N/A

Composite Stop: N/A

Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.009	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.011	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.140	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.152	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	8.1	S.U.		0.1	2/20/2008 14:27:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	408	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	5.2	mg/L	1	1	2/25/2008 13:03:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

JL Sample Number: 0802254-005 Site: OF-026
Client Sample ID: OF-026
Matrix: Wastewater
Comments for 0802254-005
No comments

Grab Date/Time: 2/20/2008 15:02:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.003	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.003	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.140	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.149	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	7.8	S.U.		0.1	2/20/2008 15:11:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	137	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	4.7	mg/L	1	1	2/25/2008 13:03:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

JL Sample Number: **0802254-006** Site: **OF-030**
Client Sample ID: **OF-030**
Matrix: Wastewater
Comments for 0802254-006
No comments

Grab Date/Time: 2/20/2008 10:12:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.005	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.008	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.225	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.247	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	7.6	S.U.		0.1	2/20/2008 10:23:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	69	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	2/24/2008 11:46:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

JL Sample Number: 0802254-007 Site: OF-030 Dup
Client Sample ID: OF-030 Dup
Matrix: Wastewater
Comments for 0802254-007
No comments

Grab Date/Time: 2/20/2008 10:12:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.004	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.006	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.230	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.231	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM-2340 C						
Hardness as CaCO3-EDTA	71	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1		3/5/2008 11:14:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

JL Sample Number: **0802254-008** Site: **OF-005**
Client Sample ID: **OF-005**
Matrix: Wastewater
Comments for 0802254-008
No comments

Grab Date/Time: 2/20/2008 09:30:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh .

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	**0.002**	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	**0.004**	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	**0.120**	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	**0.137**	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	7.3	S.U.		0.1	2/20/2008 09:40:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	77	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	2/24/2008 11:46:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

JL Sample Number: 0802254-009 Site: OF-037
Client Sample ID: OF-037
Matrix: Wastewater
Comments for 0802254-009
Cu (total) instrument reading 0.014 rounded to 0.001 Cu (diss) instrument reading 0.0015 rounded to 0.002

Grab Date/Time: 2/20/2008 13:15:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjob

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.002	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Copper (Total)	0.001	mg/L	0.00072	0.001	2/29/2008 16:54:00	CC
Zinc (dissolved)	0.097	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Zinc (Total)	0.100	mg/L	0.00066	0.005	2/29/2008 16:54:00	CC
Method: SM 4500 H/B						
Field pH	7.6	S.U.		0.1	2/20/2008 13:22:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	416	mg/L	2	2	3/3/2008 09:28:00	AB
Method: SM-2540 D						
Total Suspended Solids	1.0	mg/L	1	1	2/24/2008 11:46:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

JL Sample Number: 0802254-010 Site: OF-023
Client Sample ID: OF-023
Matrix: Wastewater
Comments for 0802254-010
No comments

Grab Date/Time: 2/20/2008 11:06:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.007	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.007	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.085	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.089	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	7.2	S.U.		0.1	2/20/2008 11:15:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	111	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	1.6	mg/L	1	1	2/24/2008 11:46:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

JL Sample Number: **0802254-011** Site: **OF-084**
Client Sample ID: **OF-084**
Matrix: Wastewater
Comments for 0802254-011
No comments

Grab Date/Time: 2/20/2008 15:30:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.002	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	0.004	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	0.032	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	0.055	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Method: SM 4500 H/B						
Field pH	8.1	S.U.		0.1	2/20/2008 15:40:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	170	mg/L	2	2	2/29/2008 15:08:00	EG
Method: SM-2540 D						
Total Suspended Solids	3.3	mg/L	1	1	2/24/2008 11:46:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

JL Sample Number: **0802254-012** Site: **Equipment Blank**

Client Sample ID: **EQUIPMENT BLANK**

Matrix: Wastewater

Comments for 0802254-012

No comments

Grab Date/Time: 2/20/2008

Composite Start: N/A

Composite Stop: N/A

Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	2/18/2008 11:29:00	EF
Copper (Total)	<	mg/L	0.00072	0.001	2/18/2008 11:29:00	EF
Zinc (dissolved)	<	mg/L	0.00066	0.005	2/18/2008 11:29:00	EF
Zinc (Total)	<	mg/L	0.00066	0.005	2/18/2008 11:29:00	EF

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802254

Analytical Methods Reference

Description:	PrepMethod:	Method	Reference
Field Services			
QA Summary Report		Manual	
Wastewater			
Copper (Dissolved)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A
Copper (Total)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A
Field pH		SM 4500 H/B	18th Edition
Hardness as CaCO3-EDTA		SM-2340 C	18th Edition
Total Suspended Solids		SM-2540 D	18th Edition
Zinc (Dissolved)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A
Zinc (Total)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A

GLOSSARY OF TERMS AND ABBREVIATIONS

RL (Reporting Limit):

The RL can be raised when consideration of sample volume and matrix interferences are taken into account, generally this number is near or equal to the lowest calibration standard run with the analytical batch.

MDL (Method Detection Limit):

The constituent concentration that, when processed through the complete method, produces a signal with a 99% probability that it is different from the blank.

"<" This denotes the constituent was not detected above the RL

"J"Qualifier

This qualifier is used to indicate an estimated value based on the measured result is outside the calibration range. In most cases the result is above calibration curve and is beyond dilution capabilities. Actual result is probably higher than estimated result given.

"B" Qualifier

This qualifier is used when the concentration of the sample is less than three (3) times that of what is found in the method blank. This does not necessarily indicate that there is a contamination problem, but should be interpreted that the level found in the sample is inconsequential.

"NR" Qualifier

This qualifier indicates that there was NO RESULT generally due to matrix interferences or laboratory problems.

Universal Laboratories

Quality Control Summary

QC Batch # 080301001
Order ID: 0802185; 0802254

	Copper				Zinc			
	True Value	Obtained	% Recovery	RPD	True Value	Obtained	% Recovery	RPD
Blank	0.0000	-0.0008			0.0000	-0.0013		
Midrange	0.5000	0.4945	99%		0.5000	0.5110	102%	
Third Party	0.5000	0.4533	91%		0.5000	0.463	93%	
Blank Spike	1.0000	0.9585	96%		1.0000	0.9268	93%	
Blank	0.0000	-0.0006			0.0000	-0.0018		
Matrix Spike	1.0000	0.9498	95%		1.0000	0.9264	93%	
Matrix Spike Dup	1.0000	0.9286	93%	2%	1.0000	0.9102	91%	2%
Blank	0.0000	-0.0003			0.0000	-0.0019		
Midrange	0.5000	0.5016	100%		0.5000	0.5279	106%	
Matrix Spike	1.0000	0.7818	78%		1.0000	0.8412	84%	
Matrix Spike Dup	1.0000	0.8210	82%	5%	1.0000	0.8709	87%	4%
Blank	0.0000	-0.0003			0.0000	-0.0018		
Midrange	0.5000	0.5004	100%		0.5000	0.5270	105%	
Blank Spike	1.0000	0.9453	95%		1.0000	0.9338	93%	
Blank Spike Dup	1.0000	0.9465	95%	<1%	1.0000	0.9383	94%	1%
Blank	0.0000	-0.0005			0.0000	-0.0026		
Midrange	0.5000	0.4962	99%		0.5000	0.5323	106%	
Blank Spike	1.0000	0.9542	95%		1.0000	0.9332	93%	
Blank Spike Dup	1.0000	0.9368	94%	1%	1.0000	0.9301	93%	<1%
Midrange	0.5000	0.5009	100%		0.5000	0.5365	107%	
Blank	0.0000	-0.0002			0.0000	-0.0002		

Quality Director _____ Date 3/5/08

Universal Laboratories

20 Research Drive Hampton, Va.
Phone: (757)-865-0890 Fax: (757) 865-8014

EXPRESS LOG-IN CHAIN OF CUSTODY

UL ORDER ID **0802254**

Order Comment: ***Use "Clean Metals" techniques when handling these samples!!!!***

Pre-Log Date: Tuesday, February 19, 2008

Samples Must Be Received on or Before:

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID:

Project Notes:

QuoteID:
Permit Number:
ProjectLocation:

Customer Contact: Dave Johnson

Phone Number:
FaxNumber: (804) 253-1091

0802254-001 Field Blank -030 — Sample Date/Time 02 120 108 10:12 — Sampler Initials JN
Field Reading

Wastewater

				Container Type	Preservative
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0802254-002 OF-003 — Sample Date/Time 02 120 108 09:00 — Sampler Initials JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0802254-003 OF-019 — Sample Date/Time 02 120 108 13:45 — Sampler Initials JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0802254-004 OF-020 — Sample Date/Time 02 120 108 14:20 — Sampler Initials JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID:

Project Notes:

QuoteID:
Permit Number:
ProjectLocation:

Customer Contact: Dave Johnson

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0802254-005 **OF-026** **Sample Date/Time** 02 120 108 15:02 / / : **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0802254-006 **OF-030** **Sample Date/Time** 02 120 108 10:12 / / : **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0802254-007 **OF-030 Dup** **Sample Date/Time** 02 120 108 10:12 / / : **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0802254-008 **OF-005** **Sample Date/Time** 02 120 108 09:30 / / : **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

ERM ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

Customer Contact: Dave Johnson

Phone Number:
FaxNumber: (804) 253-1091

ProjectID:

Project Notes:

QuoteID:
Permit Number:
ProjectLocation:

Comments:

CN int check | Phenol in check | NH3 int check | BOD int check

Cooler Temp @ Log-in 2°C
Preservation In lab

Relinquished By Signature:	***Company:*** UL	***Date/Time:*** 02/20/08 1638
Received By Signature:	***Company:*** UL	***Date/Time:*** 2/20/08 1638
Relinquished By Signature:	***Company:***	***Date/Time:***
Received By Signature:	***Company:***	***Date/Time:***
Relinquished By Signature:	***Company:***	***Date/Time:***
Received By Signature:	***Company:***	***Date/Time:***

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

Customer Contact: Dave Johnson

Phone Number:
FaxNumber: (804) 253-1091

ProjectID:

Project Notes:

QuoteID:
Permit Number:
ProjectLocation:

0802254-009 **OF-037** Sample Date/Time 02/20/08 13:15 Sampler Initials JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0802254-010 **OF-023** Sample Date/Time 02/20/08 11:06 Sampler Initials JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0802254-011 **OF-084** Sample Date/Time 02/20/08 15:30 Sampler Initials JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 696-2162
FAX: (757) 865-8014

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 400

Richmond Va. 23219

ATTN: Thomas Numbers

REPORT OF ANALYSIS PACKAGE

Order ID: 0802395

(REPORT DATE)
12-Mar-08

This report contains the analytical results for Project Id: Northrop Gruman designated as UL Order Id: 0802395 and received on Thursday, February 28, 2008 . The samples were received and analyzed according to the methods listed in this report

The data in this report has been reviewed and validated by: Carol Kleemann

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

JL Sample Number: **0802395-001** Site: **OF-003**
Client Sample ID: **OF-003**
Matrix: Wastewater
Comments for 0802395-001
No comments

Grab Date/Time: 2/28/2008 11:45:0
Composite Start: N/A
Composite Stop: N/A
Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	**0.002**	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	**0.003**	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	**0.038**	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	**0.038**	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	**7.3**	S.U.		0.1	2/28/2008 11:50:00	DT
Method: SM-2340 C						
Hardness as CaCO3-EDTA	**204**	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	3/3/2008 12:40:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

JL Sample Number: 0802395-002 Site: OF-019
Client Sample ID: OF-019
Matrix: Wastewater
Comments for 0802395-002
No comments

Grab Date/Time: 2/28/2008 09:20:0
Composite Start: N/A
Composite Stop: N/A
Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.003	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.004	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.025	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.036	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	6.5	S.U.		0.1	2/28/2008 09:35:00	DT
Method: SM-2340 C						
Hardness as CaCO3-EDTA	126	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	11	mg/L	1	1	3/3/2008 12:40:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

UL Sample Number: 0802395-003 Site: OF-020
Client Sample ID: OF-020
Matrix: Wastewater
Comments for 0802395-003
No comments

Grab Date/Time: 2/28/2008 09:55:0
Composite Start: N/A
Composite Stop: N/A
Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.006	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.008	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.095	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.112	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.2	S.U.		0.1	2/28/2008 10:10:00	DT
Method: SM-2340 C						
Hardness as CaCO3-EDTA	688	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	1.1	mg/L	1	1	3/3/2008 12:40:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

JL Sample Number: **0802395-004** Site: **OF-026**

Client Sample ID: **OF-026**

Matrix: Wastewater

Comments for 0802395-004

No comments

Grab Date/Time: 2/28/2008 10:45:0

Composite Start: N/A

Composite Stop: N/A

Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.001	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.010	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.011	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.4	S.U.		0.1	2/28/2008 10:50:00	DT
Method: SM-2340 C						
Hardness as CaCO3-EDTA	295	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	4.4	mg/L	1	1	3/3/2008 12:40:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

JL Sample Number: 0802395-005 Site: OF-030

Client Sample ID: OF-030

Matrix: Wastewater

Comments for 0802395-005

No comments

Grab Date/Time: 2/28/2008 14:00:0

Composite Start: N/A

Composite Stop: N/A

Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.002	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.004	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.105	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.234	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.1	S.U.		0.1	2/28/2008 14:05:00	DT
Method: SM-2340 C						
Hardness as CaCO3-EDTA	89	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	3/4/2008 12:57:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 643 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

JL Sample Number: 0802395-006 Site: OF-005
Client Sample ID: OF-005
Matrix: Wastewater
Comments for 0802395-006
No comments

Grab Date/Time: 2/28/2008 13:20:0
Composite Start: N/A
Composite Stop: N/A
Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	3/10/2008 14:23:00	CC
Copper (Total)	<	mg/L	0.00072	0.001	3/10/2008 14:23:00	CC
Zinc (dissolved)	0.092	mg/L	0.00066	0.005	3/10/2008 14:23:00	CC
Zinc (Total)	0.118	mg/L	0.00066	0.005	3/10/2008 14:23:00	CC
Method: SM 4500 H/B						
Field pH	7.0	S.U.		0.1	2/28/2008 13:25:00	DT
Method: SM-2340 C						
Hardness as CaCO3-EDTA	91	mg/L	2	2	3/11/2008 15:42:00	AB
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	3/4/2008 12:57:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

JL Sample Number: 0802395-007 Site: OF-037
Client Sample ID: OF-037
Matrix: Wastewater
Comments for 0802395-007
No comments

Grab Date/Time: 2/28/2008 14:30:0
Composite Start: N/A
Composite Stop: N/A
Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.002	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.002	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.130	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.141	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.4	S.U.		0.1	2/28/2008 14:35:00	DT
Method: SM-2340 C						
Hardness as CaCO3-EDTA	438	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	3/4/2008 12:57:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

JL Sample Number: 0802395-008 Site: OF-023
Client Sample ID: OF-023
Matrix: Wastewater
Comments for 0802395-008
No comments

Grab Date/Time: 2/28/2008 15:00:0
Composite Start: N/A
Composite Stop: N/A
Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.004	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.006	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.058	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.066	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.2	S.U.		0.1	2/28/2008 15:05:00	DT
Method: SM-2340 C						
Hardness as CaCO3-EDTA	67	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	1.4	mg/L	1	1	3/4/2008 12:57:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

JL Sample Number: 0802395-009 Site: OF-084
Client Sample ID: OF-084
Matrix: Wastewater
Comments for 0802395-009
No comments

Grab Date/Time: 2/28/2008 15:30:0
Composite Start: N/A
Composite Stop: N/A
Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.001	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.007	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.015	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.9	S.U.		0.1	2/28/2008 15:35:00	DT
Method: SM-2340 C						
Hardness as CaCO3-EDTA	244	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	2.0	mg/L	1	1	3/5/2008 11:14:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

JL Sample Number: 0802395-010 Site: OF-003 Dup
Client Sample ID: OF-003 Dup
Matrix: Wastewater
Comments for 0802395-010
No comments

Grab Date/Time: 2/28/2008 11:45:0
Composite Start: N/A
Composite Stop: N/A
Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.003	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.003	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.036	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.039	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM-2340 C						
Hardness as CaCO3-EDTA	211	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	3/5/2008 11:14:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

JL Sample Number: **0802395-011** Site: **Field Blank**

Client Sample ID: **Field Blank**

Matrix: Wastewater

Comments for 0802395-011

No comments

Grab Date/Time: 2/28/2008 11:30:0

Composite Start: N/A

Composite Stop: N/A

Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	<	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	<	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	<	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC

ANALYTICAL DATA REPORT

ORDER ID 0802395

JL Sample Number: **0802395-013** Site: **Equipment Blank**

Client Sample ID: **Equipment Blank**

Matrix: Wastewater

Comments for 0802395-013

No comments

Grab Date/Time: 2/28/2008

Composite Start: N/A

Composite Stop: N/A

Collected By:

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Copper (Total)	<	mg/L	0.00072	0.001	2/27/2008 10:35:00	CC
Zinc (dissolved)	<	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC
Zinc (Total)	<	mg/L	0.00066	0.005	2/27/2008 10:35:00	CC

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0802395

Analytical Methods Reference

Description:	PrepMethod:	Method	Instrument:
Field Services			
QA Summary Report		Manual	
Field Technician		Manual	
Wastewater			
Copper (Dissolved)	EPA 200.2	EPA 200.7	ICP-1
Copper (Total)	EPA 200.2	EPA 200.7	ICP-1
Field pH		SM 4500 H/B	pH Meter (field)
Hardness as CaCO3-EDTA		SM-2340 C	None-Wet Chem
Total Suspended Solids		SM-2540 D	
Zinc (Dissolved)	EPA 200.2	EPA 200.7	ICP-1
Zinc (Total)	EPA 200.2	EPA 200.7	ICP-1

GLOSSARY OF TERMS AND ABBREVIATIONS

RL (Reporting Limit):

The RL can be raised when consideration of sample volume and matrix interferences are taken into account, generally this number is near or equal to the lowest calibration standard run with the analytical batch.

MDL (Method Detection Limit):

The constituent concentration that, when processed through the complete method, produces a signal with a 99% probability that it is different from the blank.

"<" This denotes the constituent was not detected above the RL

"J"Qualifier

This qualifier is used to indicate an estimated value based on the measured result is outside the calibration range. In most cases the result is above calibration curve and is beyond dilution capabilities. Actual result is probably higher than estimated result given.

"B" Qualifier

This qualifier is used when the concentration of the sample is less than three (3) times that of what is found in the method blank. This does not necessarily indicate that there is a contamination problem, but should be interpreted that the level found in the sample is inconsequential.

"NR" Qualifier

This qualifier indicates that there was NO RESULT generally due to matrix interferences or laboratory problems.

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

Universal Laboratories

Quality Control Summary

QC Batch # 080310005
Order ID: 0802395; 0803024

	Copper				Zinc			
	True Value	Obtained	% Recovery	RPD	True Value	Obtained	% Recovery	RPD
Blank	0.0000	0.0007			0.0000	0.0003		
Midrange	0.5000	0.4908	98%		0.5000	0.4985	100%	
Third Party	0.5000	0.4885	98%		0.5000	0.4923	98%	
Blank Spike	1.0000	1.0720	107%		1.0000	1.0290	103%	
Matrix Spike	1.0000	1.0535	105%		1.0000	1.0290	103%	
Matrix Spike Dup	1.0000	1.0665	107%	2%	1.0000	1.0480	105%	2%
Blank	0.0000	0.0001			0.0000	0.0003		
Blank	0.0000	0.0004			0.0000	0.0002		
Midrange	0.5000	0.5247	105%		0.5000	0.5373	107%	
Matrix Spike	1.0000	1.0281	103%		1.0000	1.0636	106%	
Matrix Spike Dup	1.0000	0.9832	98%	5%	1.0000	1.0256	103%	3%
Blank	0.0000	0.0000			0.0000	0.0003		
Midrange	0.5000	0.4642	93%		0.5000	0.4888	98%	
Matrix Spike	1.0000	0.9126	91%		1.0000	0.9282	93%	
Matrix Spike Dup	1.0000	0.9254	92%	1%	1.0000	0.9492	95%	2%
Blank	0.0000	0.0000			0.0000	0.0004		
Midrange	0.5000	0.4758	95%		0.5000	0.4999	100%	
Matrix Spike	1.0000	0.9569	96%		1.0000	0.9722	97%	
Matrix Spike Dup	1.0000	0.9432	94%	2%	1.0000	0.9552	95%	2%
Blank	0.0000	0.0001			0.0000	0.0003		
Midrange	0.5000	0.4696	94%		0.5000	0.4925	99%	
Blank	0.0000	0.0003			0.0000	0.0002		
Blank Spike	0.5000	0.4665	93%		1.0000	0.4915	98%	
Blank Spike Dup	0.5000	0.4751	95%	2%	1.0000	0.4754	95%	3%
Midrange	0.5000	0.4723	94%		0.5000	0.4982	100%	
Blank	0.0000	0.0003			0.0000	0.0001		

Quality Director _____ Date 3/12/08

Universal Laboratories

2d Research Drive Hampton, Va.
Phone: (757)-865-0860 Fax: (757) 865-8014

EXPRESS LOG-IN CHAIN OF CUSTODY

UL ORDER ID **0802395**

Order Comment:

Pre-Log Date: Wednesday, February 27, 2008

Samples Must Be Received on or Before:

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Weissenge

Phone Number:
FaxNumber: (804) 253-1091

0802395-001 OF-003 — Sample Date/Time 2 / 28 / 08 11 : 45 — Sampler Initials DT
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0802395-002 OF-019 — Sample Date/Time / / 09 : 20 / / : — Sampler Initials
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0802395-003 OF-020 — Sample Date/Time / / 09 : 55 / / : — Sampler Initials
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0802395-004 OF-026 — Sample Date/Time / / 10 : 45 / / : — Sampler Initials
Field Reading

Container Type Preservative

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Weissenge

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0802395-005 **OF-030** **Sample Date/Time** 2 / 28 / 08 14:00 / / : **Sampler Initials** DT
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0802395-006 **OF-005** **Sample Date/Time** / / 13:20 / / : **Sampler Initials**
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0802395-007 **OF-037** **Sample Date/Time** / / 14:50 / / : **Sampler Initials**
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0802395-008 **OF-023** **Sample Date/Time** / / 15:00 / / : **Sampler Initials**
Field Reading

Container Type Preservative

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Weissenge

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0802395-009 **OF-084** **Sample Date/Time** 2 / 28 / 08 15:30 / / : **Sampler Initials** [illegible]
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0802395-010 **OF-003 Dup** **Sample Date/Time** / / 11:45 / / : **Sampler Initials**
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0802395-011 **Field Blank** **Sample Date/Time** / / 11:30 / / : **Sampler Initials**
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0802395-012 **Field Services** **Sample Date/Time** / / : / / : **Sampler Initials**
Field Reading

					Container Type	Preservative
Field Services	QAREP	QA Summary Report	TECH	Field Technician	N/A	N/A

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Weissenge

Phone Number:
FaxNumber: (804) 253-1091

Comments:

Cooler Temp @ Log-in 3°C
Preservation In lab

CN int check | Phenol in check | NH3 int check | BOD int check

Relinquished By Signature:	*Company:* VL	*Date/Time:* 2-28-08/1645
Received By Signature:	*Company:*	*Date/Time:*
Relinquished By Signature:	*Company:*	*Date/Time:*
Received By Signature:	*Company:*	*Date/Time:*
Relinquished By Signature:	*Company:*	*Date/Time:*
Received By Signature:	*Company:*	*Date/Time:*

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 400

Richmond Va. 23219

ATTN: Thomas Numbers

REPORT OF ANALYSIS PACKAGE

Order ID: 0803024

(REPORT DATE)
12-Mar-08

This report contains the analytical results for Project Id:Northrop Gruman designated as UL Order Id: 0803024 and received on Wednesday, March 05, 2008
The samples were received and analyzed according to the methods listed in this report

The data in this report has been reviewed and validated by:

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: 0803024-001 Site: OF-003
Client Sample ID: OF-003
Matrix: Wastewater
Comments for 0803024-001
No comments

Grab Date/Time: 3/5/2008 08:40:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.023	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.028	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.386	mg/L	0.00066	0.005	3/10/2008 14:23:00	CC
Zinc (Total)	0.417	mg/L	0.00066	0.005	3/10/2008 14:23:00	CC
Method: SM 4500 H/B						
Field pH	7.6	S.U.		0.1	3/5/2008 08:50:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	106	mg/L	2	2	3/11/2008 15:42:00	AB
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	3/9/2008 12:42:00	EG

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: 0803024-002 Site: OF-019
Client Sample ID: OF-019
Matrix: Wastewater
Comments for 0803024-002
No comments

Grab Date/Time: 3/5/2008 11:10:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.003	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.007	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.064	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.077	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.4	S.U.		0.1	3/5/2008 11:20:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	40	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	1.4	mg/L	1	1	3/9/2008 12:42:00	EG

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: 0803024-003 Site: OF-020
Client Sample ID: OF-020
Matrix: Wastewater
Comments for 0803024-003
No comments

Grab Date/Time: 3/5/2008 13:20:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.009	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.013	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.145	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.176	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.9	S.U.		0.1	3/5/2008 13:32:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	93	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	2.0	mg/L	1	1	3/9/2008 12:42:00	EG

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: **0803024-004** Site: **OF-026**
Client Sample ID: **OF-026**
Matrix: Wastewater
Comments for 0803024-004
No comments

Grab Date/Time: 3/5/2008 14:00:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	**0.009**	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	**0.056**	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	**0.062**	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	**0.370**	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	**7.3**	S.U.		0.1	3/5/2008 14:07:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	**104**	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	**194**	mg/L	1	1	3/10/2008 13:30:00	LS

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: 0803024-005 Site: OF-030
Client Sample ID: OF-030
Matrix: Wastewater
Comments for 0803024-005
No comments

Grab Date/Time: 3/5/2008 10:00:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.008	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.019	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.135	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.174	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.5	S.U.		0.1	3/5/2008 10:13:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	64	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	2.7	mg/L	1	1	3/8/2008 12:31:00	EG

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: 0803024-006 Site: OF-005
Client Sample ID: OF-005
Matrix: Wastewater
Comments for 0803024-006
No comments

Grab Date/Time: 3/5/2008 09:30:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.002	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.003	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.098	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.120	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.5	S.U.		0.1	3/5/2008 09:40:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	90	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	3/8/2008 12:31:00	EG

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: **0803024-007** Site: **OF-037**
Client Sample ID: **OF-037**
Matrix: Wastewater
Comments for 0803024-007
No comments

Grab Date/Time: 3/5/2008 15:20:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	**0.003**	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	**0.007**	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	**0.121**	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	**0.166**	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	**7.7**	S.U.		0.1	3/5/2008 15:28:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	**320**	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	**<**	mg/L	1	1	3/8/2008 12:31:00	EG

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51708 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: **0803024-008** Site: **OF-023**
Client Sample ID: **OF-023**
Matrix: Wastewater
Comments for 0803024-008
No comments

Grab Date/Time: 3/5/2008 10:45:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.002	mg/L	0.00072	0.001	3/10/2008 14:23:00	CC
Copper (Total)	0.004	mg/L	0.00072	0.001	3/10/2008 14:23:00	CC
Zinc (dissolved)	0.310	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.355	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.3	S.U.		0.1	3/5/2008 10:56:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	37	mg/L	2	2	3/11/2008 15:42:00	AB
Method: SM-2540 D						
Total Suspended Solids	2.6	mg/L	1	1	3/9/2008 12:42:00	EG

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: 0803024-009 Site: OF-084
Client Sample ID: OF-084
Matrix: Wastewater
Comments for 0803024-009
No comments

Grab Date/Time: 3/5/2008 12:50:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.005	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.028	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.041	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.197	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	8.0	S.U.		0.1	3/5/2008 12:59:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	146	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	12	mg/L	1	1	3/9/2008 12:42:00	EG

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: **0803024-010** Site: **OF-005 Dup**
Client Sample ID: **OF-005 Dup**
Matrix: Wastewater
Comments for 0803024-010
No comments

Grab Date/Time: 3/5/2008 09:41:0
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	0.002	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	0.004	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	0.099	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	0.121	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Method: SM 4500 H/B						
Field pH	7.5	S.U.		0.1	3/5/2008 09:43:00	JN
Method: SM-2340 C						
Hardness as CaCO3-EDTA	86	mg/L	2	2	3/10/2008 11:48:00	AB
Method: SM-2540 D						
Total Suspended Solids	<	mg/L	1	1	3/8/2008 12:31:00	EG

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: **0803024-011** Site: **Field Blank**

Client Sample ID: **Field Blank**

Matrix: Wastewater

Comments for 0803024-011

No comments

Grab Date/Time: 3/5/2008 09:30:0

Composite Start: N/A

Composite Stop: N/A

Collected By: newjoh

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Copper (Total)	<	mg/L	0.00072	0.001	3/7/2008 15:49:00	CC
Zinc (dissolved)	<	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC
Zinc (Total)	<	mg/L	0.00066	0.005	3/7/2008 15:49:00	CC

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51708 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

UL Sample Number: **0803024-012** Site: **Equipment Blank**
Client Sample ID: **Equipment Blank**
Matrix: Wastewater
Comments for 0803024-012
No comments

Grab Date/Time: 3/3/2008
Composite Start: N/A
Composite Stop: N/A
Collected By: thodan

Parameter	Test Result	Units	MDL	RL	Analysis Date/Time	Analyst
Method: EPA 200.7						
Copper (dissolved)	<	mg/L	0.00072	0.001	3/3/2008 16:18:00	CC
Copper (Total)	<	mg/L	0.00072	0.001	3/3/2008 16:18:00	CC
Zinc (dissolved)	<	mg/L	0.00066	0.005	3/3/2008 16:18:00	CC
Zinc (Total)	<	mg/L	0.00066	0.005	3/3/2008 16:18:00	CC

 Virginia Drinking Water Lab# 00030 North Carolina Drinking Water Lab # 51706 North Carolina Wastewater/Groundwater Lab # 543 VDEQ Lab #000003

ANALYTICAL DATA REPORT

ORDER ID 0803024

Analytical Methods Reference

Description:	PrepMethod:	Method	Reference
Field Services			
QA Summary Report		Manual	
Field Technician		Manual	
Wastewater			
Copper (Dissolved)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A
Copper (Total)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A
Field pH		SM 4500 H/B	18th Edition
Hardness as CaCO3-EDTA		SM-2340 C	18th Edition
Total Suspended Solids		SM-2540 D	18th Edition
Zinc (Dissolved)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A
Zinc (Total)	EPA 200.2	EPA 200.7	40 CFR part 136 App. A

GLOSSARY OF TERMS AND ABBREVIATIONS

RL (Reporting Limit):

The RL can be raised when consideration of sample volume and matrix interferences are taken into account, generally this number is near or equal to the lowest calibration standard run with the analytical batch.

MDL (Method Detection Limit):

The constituent concentration that, when processed through the complete method, produces a signal with a 99% probability that it is different from the blank.

"<" This denotes the constituent was not detected above the RL

"J" Qualifier

This qualifier is used to indicate an estimated value based on the measured result is outside the calibration range. In most cases the result is above calibration curve and is beyond dilution capabilities. Actual result is probably higher than estimated result given.

"B" Qualifier

This qualifier is used when the concentration of the sample is less than three (3) times that of what is found in the method blank. This does not necessarily indicate that there is a contamination problem, but should be interpreted that the level found in the sample is inconsequential.

"NR" Qualifier

This qualifier indicates that there was NO RESULT generally due to matrix interferences or laboratory problems.

Universal Laboratories

20 Research Drive Hampton, Va.
Phone: (757)-865-0880 Fax: (757) 865-8014

EXPRESS LOG-IN CHAIN OF CUSTODY

UL ORDER ID **0803024**

Order Comment:

Pre-Log Date: Tuesday, March 04, 2008

Samples Must Be Received on or Before:

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Weissenge

Phone Number:
FaxNumber: (804) 253-1091

0803024-001 OF-003 — Sample Date/Time 03/05/08 08:40 — Sampler Initials JN
Field Reading

Wastewater (3)

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0803024-002 OF-019 — Sample Date/Time 03/05/08 11:10 — Sampler Initials JN
Field Reading

Wastewater (3)

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0803024-003 OF-020 — Sample Date/Time 03/05/08 13:20 — Sampler Initials JN
Field Reading

Wastewater (3)

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0803024-004 OF-026 — Sample Date/Time 03/05/08 14:00 — Sampler Initials JN
Field Reading

(3)

Container Type Preservative

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Weissenge
Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
	TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH		N/A	N/A

0803024-005 **OF-030** **Sample Date/Time** 03 / 05 / 08 10 : 00 / / : **Sampler Initials** JN
Field Reading

				Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
	TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
3	CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH		N/A	N/A

0803024-006 **OF-005** **Sample Date/Time** 03 / 05 / 08 09 : 30 / / : **Sampler Initials** JN
Field Reading

				Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
	TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
3	CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH		N/A	N/A

0803024-007 **OF-037** **Sample Date/Time** 03 / 05 / 08 15 : 20 / / : **Sampler Initials** JN
Field Reading

				Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
	TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
3	CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH		N/A	N/A

0803024-008 **OF-023** **Sample Date/Time** 03 / 05 / 08 10 : 45 / / : **Sampler Initials** JN
Field Reading

Container Type **Preservative**

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Weissenge

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0803024-009 **OF-084** **Sample Date/Time** 03 / 05 / 08 12 : 50 **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
3	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0803024-010 **OF-005 Dup** **Sample Date/Time** 03 / 05 / 08 09 : 41 **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
3	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0803024-011 **Field Blank** **Sample Date/Time** 03 / 05 / 08 09 : 30 **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
2	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0803024-012 **Equipment Blank** **Sample Date/Time** / / : / / : **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
2	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

1011 East Main Street, Suite 400
Richmond Va. 23219

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Weissenge

Phone Number:
FaxNumber: (804) 253-1091

0803024-013	Field Services	Sample Date/Time	03 / 05 / 08 : / / :	Sampler Initials	JV
		Field Reading			

Field Services	QAREP QA Summary Report	TECH Field Technician	Container Type	Preservative
			N/A	N/A

Comments:

Cooler Temp @ Log-in
Preservation

CN int check Phenol in check NH3 int check BOD int check

Relinquished By Signature:	*Company:* UL	*Date/Time:* 03/05/08 1630
Received By Signature:	*Company:*	*Date/Time:*
Relinquished By Signature:	*Company:*	*Date/Time:*
Received By Signature:	*Company:*	*Date/Time:*
Relinquished By Signature:	*Company:*	*Date/Time:*
Received By Signature:	*Company:*	*Date/Time:*

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0803147**

(REPORT DATE)
19-Mar-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0803147-001**
Sample ID: OF-003
Grab Date/Time: 3/13/2008 08:40
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-003
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	3/14/2008 10:40:00	EF
Copper (Total)	EPA 200.7	**0.002**	mg/L	0.001	3/14/2008 10:40:00	EF
Zinc (dissolved)	EPA 200.7	**0.040**	mg/L	0.005	3/14/2008 10:40:00	EF
Zinc (Total)	EPA 200.7	**0.047**	mg/L	0.005	3/14/2008 10:40:00	EF
Field pH	SM 4500 H/B	**7.6**	S.U.	0.1	3/13/2008 08:51:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**198**	mg/L	2	3/17/2008 09:12:00	AB
Total Suspended Solids	SM-2540 D	<	mg/L	1	3/16/2008 10:38:00	LS

Comments for Sample ID 0803147-001
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912 0803147-001

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0803147**

(REPORT DATE)
19-Mar-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0803147-002**
Sample ID: OF-019
Grab Date/Time: 3/12/2008 08:30
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-019
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	3/14/2008 10:40:00	EF
Copper (Total)	EPA 200.7	**0.002**	mg/L	0.001	3/14/2008 10:40:00	EF
Zinc (dissolved)	EPA 200.7	**0.025**	mg/L	0.005	3/14/2008 10:40:00	EF
Zinc (Total)	EPA 200.7	**0.041**	mg/L	0.005	3/14/2008 10:40:00	EF
Field pH	SM 4500 H/B	**7.8**	S.U.	0.1	3/12/2008 08:40:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**122**	mg/L	2	3/17/2008 09:12:00	AB
Total Suspended Solids	SM-2540 D	**5.6**	mg/L	1	3/16/2008 10:38:00	LS

Comments for Sample ID 0803147-002
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0803147-002

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0803147**

(REPORT DATE)
20-Mar-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0803147-003**
Sample ID: OF-020
Grab Date/Time: 3/12/2008 09:00
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-020
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.005**	mg/L	0.001	3/14/2008 10:40:00	EF
Copper (Total)	EPA 200.7	**0.008**	mg/L	0.001	3/14/2008 10:40:00	EF
Zinc (dissolved)	EPA 200.7	**0.133**	mg/L	0.005	3/14/2008 10:40:00	EF
Zinc (Total)	EPA 200.7	**0.149**	mg/L	0.005	3/14/2008 10:40:00	EF
Field pH	SM 4500 H/B	**8.2**	S.U.	0.1	3/12/2008 09:10:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**888**	mg/L	2	3/17/2008 09:12:00	AB
Total Suspended Solids	SM-2540 D	**2.7**	mg/L	1	3/16/2008 10:38:00	LS

Comments for Sample ID 0803147-003
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003

North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543

EPA LAB CODE VA00912

0803147-003

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0860
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0803147

(REPORT DATE)
19-Mar-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: 0803147-004
Sample ID: OF-026
Grab Date/Time: 3/13/2008 10:40
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-026
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	3/14/2008 10:40:00	EF
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	3/14/2008 10:40:00	EF
Zinc (dissolved)	EPA 200.7	**0.017**	mg/L	0.005	3/14/2008 10:40:00	EF
Zinc (Total)	EPA 200.7	**0.027**	mg/L	0.005	3/14/2008 10:40:00	EF
Field pH	SM 4500 H/B	**8.1**	S.U.	0.1	3/13/2008 10:53:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**270**	mg/L	2	3/17/2008 09:12:00	AB
Total Suspended Solids	SM-2540 D	**3.4**	mg/L	1	3/16/2008 10:38:00	LS

Comments for Sample ID 0803147-004
No comments

Respectfully Submitted,
Carol Klemen

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0803147-004

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0860
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0803147**

(REPORT DATE)
19-Mar-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0803147-005**
Sample ID: OF-030
Grab Date/Time: 3/13/2008 09:45
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-030
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.005**	mg/L	0.001	3/14/2008 10:40:00	EF
Copper (Total)	EPA 200.7	**0.009**	mg/L	0.001	3/14/2008 10:40:00	EF
Zinc (dissolved)	EPA 200.7	**0.160**	mg/L	0.005	3/14/2008 10:40:00	EF
Zinc (Total)	EPA 200.7	**0.183**	mg/L	0.005	3/14/2008 10:40:00	EF
Field pH	SM 4500 H/B	**8.0**	S.U.	0.1	3/13/2008 09:56:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**80**	mg/L	2	3/17/2008 09:12:00	AB
Total Suspended Solids	SM-2540 D	**3.1**	mg/L	1	3/16/2008 10:36:00	LS

Comments for Sample ID 0803147-005
No comments

Respectfully Submitted,

Carol Klemmer

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0803147-005

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2182
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0803147

(REPORT DATE)
19-Mar-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: 0803147-006
Sample ID: OF-005
Grab Date/Time: 3/13/2008 09:10
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-005
Matrix: Wastewater

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	3/14/2008 10:40:00	EF
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	3/14/2008 10:40:00	EF
Zinc (dissolved)	EPA 200.7	**0.132**	mg/L	0.005	3/14/2008 10:40:00	EF
Zinc (Total)	EPA 200.7	**0.149**	mg/L	0.005	3/14/2008 10:40:00	EF
Field pH	SM 4500 H/B	**7.6**	S.U.	0.1	3/13/2008 09:20:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**92**	mg/L	2	3/17/2008 09:12:00	AB
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	3/16/2008 10:38:00	LS

Comments for Sample ID 0803147-006
No comments

Respectfully Submitted,
Carol Kleeman

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0803147-006

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0803147**

(REPORT DATE)
19-Mar-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0803147-007**
Sample ID: OF-037
Grab Date/Time: 3/12/2008 14:40
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-037
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	3/14/2008 10:40:00	EF
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	3/14/2008 10:40:00	EF
Zinc (dissolved)	EPA 200.7	**0.060**	mg/L	0.005	3/14/2008 10:40:00	EF
Zinc (Total)	EPA 200.7	**0.074**	mg/L	0.005	3/14/2008 10:40:00	EF
Field pH	SM 4500 H/B	**8.0**	S.U.	0.1	3/12/2008 14:51:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**284**	mg/L	2	3/17/2008 09:12:00	AB
Total Suspended Solids	SM-2540 D	<	mg/L	1	3/16/2008 10:38:00	LS

Comments for Sample ID 0803147-007
No comments

Respectfully Submitted,

Carol Kleemann

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0803147**

(REPORT DATE)
19-Mar-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0803147-008**
Sample ID: OF-023
Grab Date/Time: 3/12/2008 13:50
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-023
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.004**	mg/L	0.001	3/14/2008 10:40:00	EF
Copper (Total)	EPA 200.7	**0.004**	mg/L	0.001	3/14/2008 10:40:00	EF
Zinc (dissolved)	EPA 200.7	**0.073**	mg/L	0.005	3/14/2008 10:40:00	EF
Zinc (Total)	EPA 200.7	**0.094**	mg/L	0.005	3/14/2008 10:40:00	EF
Field pH	SM 4500 H/B	**8.1**	S.U.	0.1	3/12/2008 13:59:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**184**	mg/L	2	3/17/2008 09:12:00	AB
Total Suspended Solids	SM-2540 D	**3.7**	mg/L	1	3/16/2008 10:38:00	LS

Comments for Sample ID 0803147-008
No comments

Respectfully Submitted,
Carol Kleemann

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0803147-008

UNIVERSAL LABORATORIES

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TOLL-FREE: (800) 695-2182
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0803147**

(REPORT DATE)
19-Mar-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0803147-009**
Sample ID: OF-084
Grab Date/Time: 3/12/2008 13:10
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-084
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	3/14/2008 10:40:00	EF
Copper (Total)	EPA 200.7	**0.001**	mg/L	0.001	3/14/2008 10:40:00	EF
Zinc (dissolved)	EPA 200.7	**0.016**	mg/L	0.005	3/14/2008 10:40:00	EF
Zinc (Total)	EPA 200.7	**0.028**	mg/L	0.005	3/14/2008 10:40:00	EF
Field pH	SM 4500 H/B	**8.0**	S.U.	0.1	3/12/2008 13:17:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**222**	mg/L	2	3/17/2008 09:12:00	AB
Total Suspended Solids	SM-2540 D	**3.2**	mg/L	1	3/16/2008 10:38:00	LS

Comments for Sample ID 0803147-009
No comments

Respectfully Submitted,
Carol Klessmann

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 643
EPA LAB CODE VA00912
0803147-009

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0803147**

(REPORT DATE)
19-Mar-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0803147-010**
Sample ID: OF-026 dup
Grab Date/Time: 3/13/2008 11:05
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-026 dup
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	3/14/2008 10:40:00	EF
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	3/14/2008 10:40:00	EF
Zinc (dissolved)	EPA 200.7	**0.017**	mg/L	0.005	3/14/2008 10:40:00	EF
Zinc (Total)	EPA 200.7	**0.024**	mg/L	0.005	3/14/2008 10:40:00	EF
Field pH	SM 4500 H/B	**8.0**	S.U.	0.1	3/13/2008 11:09:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**246**	mg/L	2	3/17/2008 09:12:00	AB
Total Suspended Solids	SM-2540 D	**2.9**	mg/L	1	3/16/2008 10:38:00	LS

Comments for Sample ID 0803147-010
No comments

Respectfully Submitted,
Carol Klemmer

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0803147-010

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 885-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0803147

(REPORT DATE)
19-Mar-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: Field Blank
Matrix: Wastewater

UL Sample Number: 0803147-011
Sample ID: Field Blank
Grab Date/Time: 3/13/2008 10:30
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	3/14/2008 10:40:00	EF
Copper (Total)	EPA 200.7	<	mg/L	0.001	3/14/2008 10:40:00	EF
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	3/14/2008 10:40:00	EF
Zinc (Total)	EPA 200.7	0.007	mg/L	0.005	3/14/2008 10:40:00	EF

Comments for Sample ID 0803147-011
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0803147

(REPORT DATE)
19-Mar-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0803147-013**
Sample ID: Equipment Blank
Grab Date/Time: 3/11/2008
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: Equipment Blank
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	3/10/2008 14:23:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	3/10/2008 14:23:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	3/10/2008 14:23:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	3/10/2008 14:23:00	CC

Comments for Sample ID 0803147-013
No comments

Respectfully Submitted,
Carol Klessner

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0803147-013

Universal Laboratories

20 Research Drive Hampton, Va.
Phone: (757) 865-0680 Fax: (757) 865-8014

EXPRESS LOG-IN CHAIN OF CUSTODY

UL ORDER ID **0803147**

Order Comment:

Pre-Log Date: Tuesday, March 11, 2008

Samples Must Be Received on or Before:

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

0803147-001 OF-003 — Sample Date/Time 03 / 13 / 08 08:40 — Sampler Initials

Field Reading

Wastewater

			Container Type	Preservative
HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH		N/A	N/A

0803147-002 OF-019 — Sample Date/Time 03 / 12 / 08 08:30 — Sampler Initials

Field Reading

Wastewater

			Container Type	Preservative
HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH		N/A	N/A

0803147-003 OF-020 — Sample Date/Time 03 / 12 / 08 09:00 — Sampler Initials

Field Reading

Wastewater

			Container Type	Preservative
HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH		N/A	N/A

0803147-004 OF-026 — Sample Date/Time 03 / 13 / 08 10:40 — Sampler Initials

Field Reading

Container Type Preservative

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0803147-005 **OF-030** **Sample Date/Time** 03 / 13 / 08 09 : 45 __/__/__ __:__ **Sampler Initials**
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0803147-006 **OF-005** **Sample Date/Time** 03 / 13 / 08 09 : 10 __/__/__ __:__ **Sampler Initials**
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0803147-007 **OF-037** **Sample Date/Time** 03 / 12 / 08 14 : 40 __/__/__ __:__ **Sampler Initials**
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0803147-008 **OF-023** **Sample Date/Time** 03 / 12 / 08 13 : 50 __/__/__ __:__ **Sampler Initials**
Field Reading

Container Type Preservative

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0803147-009 **OF-084** **Sample Date/Time** 03 / 12 / 08 13 : 10 **Sampler Initials**
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0803147-010 ~~OF-019~~ dup **Sample Date/Time** 03 / 13 / 08 11 : 05 **Sampler Initials**
OF-026 dup.
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0803147-011 **Field Blank** **Sample Date/Time** 03 / 13 / 08 10:30 **Sampler Initials**
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0803147-012 **Field Services** **Sample Date/Time** 03 / 13 / 08 **Sampler Initials**
Field Reading

					Container Type	Preservative
Field Services	QAREP	QA Summary Report	TECH	Field Technician	N/A	N/A

0803147-013 **Equipment Blank** **Sample Date/Time** / / **Sampler Initials**
Field Reading

Container Type	Preservative

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 400
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

Comments:

Cooler Temp @ Log-in 3°C

Preservation

CN int check | Phenol in check | NH3 int check | BOD int check

Relinquished By Signature:	*Company:* UL	*Date/Time:* 03/13/08 1330
Received By Signature:	*Company:* UL	*Date/Time:* 3/13/08 13:30
Relinquished By Signature:	*Company:*	*Date/Time:*
Received By Signature:	*Company:*	*Date/Time:*
Relinquished By Signature:	*Company:*	*Date/Time:*
Received By Signature:	*Company:*	*Date/Time:*

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805093**

(REPORT DATE)
27-May-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-003
Matrix: Wastewater
Comments for Order:

UL Sample Number: **0805093-001**
Sample ID: OF-003
Grab Date/Time: 5/8/2008 10:30
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.001**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.041**	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	**0.042**	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	**7.6**	S.U.	0.1	5/8/2008 10:40:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**184**	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	<	mg/L	1	5/11/2008 11:40:00	AK

Comments for Sample ID 0805093-001
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805093-001

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20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0860
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805093

(REPORT DATE)
27-May-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: 0805093-002
Sample ID: OF-019
Grab Date/Time: 5/8/2008 09:15
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-019
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	0.002	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	0.042	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	0.057	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	7.7	S.U.	0.1	5/8/2008 09:22:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	122	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	5.7	mg/L	1	5/10/2008 11:33:00	AB

Comments for Sample ID 0805093-002
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805093-002

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805093

(REPORT DATE)
27-May-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: 0805093-003
Sample ID: OF-020
Grab Date/Time: 5/8/2008 08:40
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-020
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.006**	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.012**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.080**	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	**0.121**	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	**8.1**	S.U.	0.1	5/8/2008 08:48:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**2234**	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	**32**	mg/L	1	5/11/2008 11:40:00	AK

Comments for Sample ID 0805093-003
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

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FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805093**

(REPORT DATE)
27-May-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: 0805093-004
Sample ID: OF-026
Grab Date/Time: 5/8/2008 09:55
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-026
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.004**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.028**	mg/L	0.005	5/22/2008 09:49:00	EF
Zinc (Total)	EPA 200.7	**0.041**	mg/L	0.005	5/22/2008 09:49:00	EF
Field pH	SM 4500 H/B	**8.0**	S.U.	0.1	5/8/2008 10:02:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**293**	mg/L	2	5/25/2008 10:40:00	AB
Total Suspended Solids	SM-2540 D	**3.5**	mg/L	1	5/10/2008 11:33:00	AB

Comments for Sample ID 0805093-004
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

0805093-004

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805093

(REPORT DATE)
27-May-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: 0805093-005
Sample ID: OF-030
Grab Date/Time: 5/8/2008 11:20
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project #: N/A
Site: OF-030
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.009**	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.015**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.335**	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	**0.390**	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	**7.7**	S.U.	0.1	5/8/2008 11:26:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**86**	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	**4.9**	mg/L	1	5/11/2008 11:40:00	AK

Comments for Sample ID 0805093-005
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0860
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805093**

(REPORT DATE)
27-May-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-005
Matrix: Wastewater

UL Sample Number: **0805093-006**
Sample ID: OF-005
Grab Date/Time: 5/8/2008 10:55
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.004**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**1.101**	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	**1.221**	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	**7.4**	S.U.	0.1	5/8/2008 11:01:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**94**	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	**1.3**	mg/L	1	5/11/2008 11:40:00	AK

Comments for Sample ID 0805093-006
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

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20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805093

(REPORT DATE)
27-May-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: 0805093-007
Sample ID: OF-084
Grab Date/Time: 5/8/2008 11:50
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-084
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.001**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.026**	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	**0.035**	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	**8.1**	S.U.	0.1	5/8/2008 11:54:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**239**	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	**2.2**	mg/L	1	5/10/2008 11:33:00	AB

Comments for Sample ID 0805093-007
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805093-007

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805093

(REPORT DATE)
27-May-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: 0805093-008
Sample ID: OF- 026 DUP
Grab Date/Time: 5/8/2008 10:04
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF- 026 DUP
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.004**	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.004**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.040**	mg/L	0.005	5/22/2008 09:49:00	EF
Zinc (Total)	EPA 200.7	**0.041**	mg/L	0.005	5/22/2008 09:49:00	EF
Field pH	SM 4500 H/B	**7.9**	S.U.	0.1	5/8/2008 10:07:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**293**	mg/L	2	5/25/2008 10:40:00	AB
Total Suspended Solids	SM-2540 D	**3.7**	mg/L	1	5/10/2008 11:33:00	AB

Comments for Sample ID 0805093-008
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912 0805093-008

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805093

(REPORT DATE)
27-May-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: Field Blank
Matrix: Wastewater
Comments for Order:

UL Sample Number: 0805093-009
Sample ID: Field Blank
Grab Date/Time: 5/8/2008 09:50
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	5/15/2008 14:08:00	CC

Comments for Sample ID 0805093-009
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805093-009

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805093

(REPORT DATE)
27-May-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: 0805093-010
Sample ID: Equipment Blank
Grab Date/Time: 5/5/2008 11:00
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: Equipment Blank
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	5/5/2008 13:19:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	5/5/2008 13:19:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	5/5/2008 13:19:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	5/5/2008 13:19:00	CC

Comments for Sample ID 0805093-010
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805093-010

Universal Laboratories
23 Research Drive Hampton, Va.
Phone (757) 865-0993 Fax (757) 865-3014

EXPRESS LOG-IN CHAIN OF CUSTODY

UL ORDER ID **0805093**

Order Comment:

Pre-Log Date: Wednesday, May 07, 2008

Samples Must Be Received on or Before:

ERMRICH E&M Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

0805093-001 **OF-003** — **Sample Date/Time** 05/08/08 10:30 — **Sampler Initials** JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0805093-002 **OF-019** — **Sample Date/Time** 05/08/08 09:15 — **Sampler Initials** JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0805093-003 **OF-020** — **Sample Date/Time** 05/08/08 08:40 — **Sampler Initials** JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0805093-004 **OF-026** — **Sample Date/Time** 05/08/08 09:55 — **Sampler Initials** JN
Field Reading

Container Type **Preservative**

Company: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0805093-005 **OF-030** Sample Date/Time 05 / 08 / 08 11 : 20 / / : Sampler Initials JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0805093-006 **OF-005** Sample Date/Time 05 / 08 / 08 10 : 55 / / : Sampler Initials JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0805093-007 **OF-084** Sample Date/Time 05 / 08 / 08 11 : 50 / / : Sampler Initials JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0805093-008 **duplicate** -OF-026 Sample Date/Time 05 / 08 / 08 10 : 04 / / : Sampler Initials JN
Field Reading

Container Type Preservative

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0805093-009 **Field Blank** **Sample Date/Time** 05 / 08 / 08 09:50 **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0805093-010 **Equipment Blank** **Sample Date/Time** 5 / 5 / 08 11:00 **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0805093-011 **Field Services** **Sample Date/Time** 05 / 08 / 08 **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Field Services	QAREP	QA Summary Report	TECH	Field Technician	N/A	N/A

Comments:

Cooler Temp @ Log-in 2°C
Preservation In lab

CN int check Phenol in check NH3 int check BOD int check

Relinquished By Signature:	***Company:*** DL	***Date/Time:*** 05/08/08 1310
Received By Signature:	***Company:*** DL	***Date/Time:*** 5/8/08 1310
Relinquished By Signature:	***Company:***	***Date/Time:***
Received By Signature:	***Company:***	***Date/Time:***
Relinquished By Signature:	***Company:***	***Date/Time:***
Received By Signature:	***Company:***	***Date/Time:***

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805176

(REPORT DATE)
27-May-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-003
Matrix: Wastewater

UL Sample Number: 0805176-001
Sample ID: OF-003
Grab Date/Time: 5/14/2008 08:25
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.001**	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.002**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.068**	mg/L	0.005	5/22/2008 09:49:00	EF
Zinc (Total)	EPA 200.7	**0.070**	mg/L	0.005	5/22/2008 09:49:00	EF
Field pH	SM 4500 H/B	**7.0**	S.U.	0.1	5/14/2008 08:32:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**200**	mg/L	2	5/25/2008 10:40:00	AB
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	5/19/2008 13:06:00	LS

Comments for Sample ID 0805176-001
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805176-001

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20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805176

(REPORT DATE)
27-May-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-019
Matrix: Wastewater

UL Sample Number: 0805176-002
Sample ID: OF-019
Grab Date/Time: 5/14/2008 09:50
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	0.002	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	0.043	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	0.050	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	7.0	S.U.	0.1	5/14/2008 10:02:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	120	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	2.8	mg/L	1	5/18/2008 12:50:00	LS

Comments for Sample ID 0805176-002
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805176

(REPORT DATE)
27-May-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-020
Matrix: Wastewater
Comments for Order:

UL Sample Number: **0805176-003**
Sample ID: OF-020
Grab Date/Time: 5/14/2008 10:20
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.006**	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.009**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.106**	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	**0.110**	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	**7.2**	S.U.	0.1	5/14/2008 10:29:00	JN
Hardness as CaCO3-EDTA	SM-2340 C.	**1901**	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	**2.7**	mg/L	1	5/18/2008 12:50:00	LS

Comments for Sample ID 0805176-003
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-5014

REPORT OF ANALYSIS

Order ID: **0805176**

(REPORT DATE)
27-May-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-026
Matrix: Wastewater
Comments for Order:

UL Sample Number: **0805176-004**
Sample ID: OF-026
Grab Date/Time: 5/14/2008 10:45
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.021**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.052**	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	**0.097**	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	**7.3**	S.U.	0.1	5/14/2008 10:52:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**218**	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	**2.9**	mg/L	1	5/17/2008 11:12:00	AB

Comments for Sample ID 0805176-004
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805176-004

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805176

(REPORT DATE)
27-May-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-030
Matrix: Wastewater
Comments for Order:

UL Sample Number: 0805176-005
Sample ID: OF-030
Grab Date/Time: 5/14/2008 09:30
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.016**	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.027**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.232**	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	**0.254**	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	**7.0**	S.U.	0.1	5/14/2008 09:37:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**108**	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	5/18/2008 12:50:00	LS

Comments for Sample ID 0805176-005
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-9014

REPORT OF ANALYSIS

Order ID: 0805176

(REPORT DATE)
27-May-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-005
Matrix: Wastewater
Comments for Order:

UL Sample Number: 0805176-006
Sample ID: OF-005
Grab Date/Time: 5/14/2008 08:45
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	0.004	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	0.005	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	0.136	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	0.158	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	7.1	S.U.	0.1	5/14/2008 08:48:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	118	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	<	mg/L	1	5/19/2008 13:06:00	LS

Comments for Sample ID 0805176-006
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805176-006

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805176**

(REPORT DATE)
27-May-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805176-007**
Sample ID: OF-084
Grab Date/Time: 5/14/2008 11:10
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-084
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.033**	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	**0.053**	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	**7.7**	S.U.	0.1	5/14/2008 11:18:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**186**	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	**1.5**	mg/L	1	5/18/2008 12:50:00	LS

Comments for Sample ID 0805176-007
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805176**

(REPORT DATE)
27-May-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Grumman
Project # N/A
Site: duplicate
Matrix: Wastewater

UL Sample Number: **0805176-008**
Sample ID: duplicate
Grab Date/Time: 5/14/2008 08:50
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	**0.005**	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	**0.142**	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	**0.172**	mg/L	0.005	5/15/2008 14:08:00	CC
Field pH	SM 4500 H/B	**7.1**	S.U.	0.1	5/14/2008 08:56:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**94**	mg/L	2	5/20/2008 14:09:00	AB
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	5/19/2008 13:06:00	LS

Comments for Sample ID 0805176-008
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912 0805176-008

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805176

(REPORT DATE)
27-May-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: Field Blank
Matrix: Wastewater

UL Sample Number: 0805176-009
Sample ID: Field Blank
Grab Date/Time: 5/14/2008 08:40
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	5/15/2008 14:08:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	5/15/2008 14:08:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	5/15/2008 14:08:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	5/15/2008 14:08:00	CC

Comments for Sample ID 0805176-009
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805176

(REPORT DATE)
27-May-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: Equipment Blank
Matrix: Wastewater

UL Sample Number: **0805176-010**
Sample ID: Equipment Blank
Grab Date/Time: 5/14/2008
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	5/12/2008 12:55:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	5/12/2008 12:55:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	5/12/2008 12:55:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	5/12/2008 12:55:00	CC

Comments for Sample ID 0805176-010
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805176-010

Universal Laboratories
20 Research Drive Hampton, Va.
Phone (757)-865-0030 Fax (757) 865-2014

EXPRESS LOG-IN
CHAIN OF CUSTODY

UL ORDER ID **0805176**

Order Comment:

Pre-Log Date: Tuesday, May 13, 2008

Samples Must Be Received on or Before:

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

0805176-001 **OF-003** **Sample Date/Time** 08 / 14 / 08 08:25 / / :
Field Reading
Sampler Initials JN

Wastewater 2 + 1

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0805176-002 **OF-019** **Sample Date/Time** 08 / 14 / 08 09:50 / / :
Field Reading
Sampler Initials JN

Wastewater 2 + 1

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0805176-003 **OF-020** **Sample Date/Time** 08 / 14 / 08 10:20 / / :
Field Reading
Sampler Initials JN

Wastewater 2 + 1

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0805176-004 **OF-026** **Sample Date/Time** 08 / 14 / 08 10:45 / / :
Field Reading
Sampler Initials JN

Container Type **Preservative**

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

Wastewater 2+1

HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH		N/A	N/A

0805176-005 **OF-030** **Sample Date/Time** 05 / 14 / 08 09:30 **Sampler Initials** JN
Field Reading

Wastewater 2+1

			Container Type	Preservative
HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH		N/A	N/A

0805176-006 **OF-005** **Sample Date/Time** 05 / 14 / 08 08:45 **Sampler Initials** JN
Field Reading

Wastewater 2+1

			Container Type	Preservative
HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH		N/A	N/A

0805176-007 **OF-084** **Sample Date/Time** 05 / 14 / 08 11:10 **Sampler Initials** JN
Field Reading

Wastewater 2+1

			Container Type	Preservative
HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH		N/A	N/A

0805176-008 **duplicate** -005 **Sample Date/Time** 05 / 14 / 08 08:50 **Sampler Initials** JN
Field Reading

2+1

Container Type **Preservative**

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0805176-009 **Field Blank** **Sample Date/Time** 05 / 14 / 08 08:40 **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
2	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0805176-010 **Equipment Blank** **Sample Date/Time** / / : / / : **Sampler Initials**
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
2	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0805176-011 **Field Services** **Sample Date/Time** 05 / 14 / 08 : / / : **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Field Services	QAREP	QA Summary Report	TECH	Field Technician	N/A	N/A

Comments:

Cooler Temp @ Log-in On Ice
Preservation Check in lab.

CN int check Phenol in check NH3 int check BOD int check

Relinquished By Signature:	***Company:*** DL	***Date/Time:*** 05/14/08 1200
Received By Signature:	***Company:*** UL	***Date/Time:*** 05/14/08 12:00
Relinquished By Signature:	***Company:***	***Date/Time:***
Received By Signature:	***Company:***	***Date/Time:***
Relinquished By Signature:	***Company:***	***Date/Time:***
Received By Signature:	***Company:***	***Date/Time:***

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0860
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805294

(REPORT DATE)
09-Jun-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: 0805294-001
Sample ID: OF-003
Grab Date/Time: 5/22/2008 08:30
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-003
Matrix: Wastewater

Comments for Order: ***The tide was too high to sample OF-020 5/22/08. Had to return early 5/23/08 to get sample.***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/3/2008 11:30:00	CC
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	6/3/2008 11:30:00	CC
Zinc (dissolved)	EPA 200.7	**0.040**	mg/L	0.005	6/3/2008 11:30:00	CC
Zinc (Total)	EPA 200.7	**0.043**	mg/L	0.005	6/3/2008 11:30:00	CC
Field pH	SM 4500 H/B	**7.5**	S.U.	0.1	5/22/2008 08:37:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**216**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	5/25/2008 11:37:00	AB

Comments for Sample ID 0805294-001
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805294**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-019
Matrix: Wastewater

UL Sample Number: **0805294-002**
Sample ID: OF-019
Grab Date/Time: 5/22/2008 09:30
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order: ***The tide was too high to sample OF-020 5/22/08. Had to return early 5/23/08 to get sample.***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/3/2008 11:30:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	6/3/2008 11:30:00	CC
Zinc (dissolved)	EPA 200.7	**0.005**	mg/L	0.005	6/3/2008 11:30:00	CC
Zinc (Total)	EPA 200.7	**0.008**	mg/L	0.005	6/3/2008 11:30:00	CC
Field pH	SM 4500 H/B	**7.5**	S.U.	0.1	5/22/2008 09:36:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**147**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**4.2**	mg/L	1	5/25/2008 11:37:00	AB

Comments for Sample ID 0805294-002
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805294-002

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805294**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805294-003**
Sample ID: OF-020
Grab Date/Time: 5/23/2008 08:04
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-020
Matrix: Wastewater

Comments for Order: ***The tide was too high to sample OF-020 5/22/08. Had to return early 5/23/08 to get sample.***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.006**	mg/L	0.001	6/3/2008 11:30:00	CC
Copper (Total)	EPA 200.7	**0.008**	mg/L	0.001	6/3/2008 11:30:00	CC
Zinc (dissolved)	EPA 200.7	**0.074**	mg/L	0.005	6/3/2008 11:30:00	CC
Zinc (Total)	EPA 200.7	**0.074**	mg/L	0.005	6/3/2008 11:30:00	CC
Field pH	SM 4500 H/B	**7.8**	S.U.	0.1	5/23/2008 08:08:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**2278**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**7.1**	mg/L	1	5/25/2008 11:37:00	AB

Comments for Sample ID 0805294-003
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805294-003

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20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0860
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805294

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805294-004**
Sample ID: OF-026
Grab Date/Time: 5/22/2008 10:05
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-026
Matrix: Wastewater

Comments for Order: ***The tide was too high to sample OF-020 5/22/08. Had to return early 5/23/08 to get sample.***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/3/2008 11:30:00	CC
Copper (Total)	EPA 200.7	**0.004**	mg/L	0.001	6/3/2008 11:30:00	CC
Zinc (dissolved)	EPA 200.7	**0.003**	mg/L	0.005	6/3/2008 11:30:00	CC
Zinc (Total)	EPA 200.7	**0.007**	mg/L	0.005	6/3/2008 11:30:00	CC
Field pH	SM 4500 H/B	**7.8**	S.U.	0.1	5/22/2008 10:14:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**214**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**2.2**	mg/L	1	5/26/2008 11:52:00	AB

Comments for Sample ID 0805294-004
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805294-004

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20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805294**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805294-005**
Sample ID: OF-030
Grab Date/Time: 5/22/2008 10:25
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-030
Matrix: Wastewater

Comments for Order: ***The tide was too high to sample OF-020 5/22/08. Had to return early 5/23/08 to get sample.***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.006**	mg/L	0.001	6/3/2008 11:30:00	CC
Copper (Total)	EPA 200.7	**0.009**	mg/L	0.001	6/3/2008 11:30:00	CC
Zinc (dissolved)	EPA 200.7	**0.155**	mg/L	0.005	6/3/2008 11:30:00	CC
Zinc (Total)	EPA 200.7	**0.169**	mg/L	0.005	6/3/2008 11:30:00	CC
Field pH	SM 4500 H/B	**7.4**	S.U.	0.1	5/22/2008 10:29:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**126**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**1.5**	mg/L	1	5/26/2008 11:52:00	AB

Comments for Sample ID 0805294-005
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

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20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0860
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805294**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-005
Matrix: Wastewater

UL Sample Number: **0805294-006**
Sample ID: OF-005
Grab Date/Time: 5/22/2008 09:00
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order: ***The tide was too high to sample OF-020 5/22/08. Had to return early 5/23/08 to get sample.***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/4/2008 18:01:00	CC
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	6/4/2008 18:01:00	CC
Zinc (dissolved)	EPA 200.7	**1.230**	mg/L	0.005	6/4/2008 18:01:00	CC
Zinc (Total)	EPA 200.7	**1.269**	mg/L	0.005	6/4/2008 18:01:00	CC
Field pH	SM 4500 H/B	**7.3**	S.U.	0.1	5/22/2008 09:07:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**124**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	5/26/2008 11:52:00	AB

Comments for Sample ID 0805294-006
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805294-006

UNIVERSAL LABORATORIES

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805294**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805294-007**
Sample ID: OF-084
Grab Date/Time: 5/22/2008 11:20
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-084
Matrix: Wastewater

Comments for Order: ***The tide was too high to sample OF-020 5/22/08. Had to return early 5/23/08 to get sample.***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.004**	mg/L	0.001	6/3/2008 11:30:00	CC
Copper (Total)	EPA 200.7	**0.005**	mg/L	0.001	6/3/2008 11:30:00	CC
Zinc (dissolved)	EPA 200.7	**0.006**	mg/L	0.005	6/3/2008 11:30:00	CC
Zinc (Total)	EPA 200.7	**0.020**	mg/L	0.005	6/3/2008 11:30:00	CC
Field pH	SM 4500 H/B	**7.7**	S.U.	0.1	5/22/2008 11:32:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**105**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**1.2**	mg/L	1	5/26/2008 11:52:00	AB

Comments for Sample ID 0805294-007
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805294-007

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 895-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805294**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805294-008**
Sample ID: OF-030 Dup
Grab Date/Time: 5/22/2008 10:30
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-030 Dup
Matrix: Wastewater

Comments for Order: ***The tide was too high to sample OF-020 5/22/08. Had to return early 5/23/08 to get sample.***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.006**	mg/L	0.001	6/3/2008 11:30:00	CC
Copper (Total)	EPA 200.7	**0.008**	mg/L	0.001	6/3/2008 11:30:00	CC
Zinc (dissolved)	EPA 200.7	**0.157**	mg/L	0.005	6/3/2008 11:30:00	CC
Zinc (Total)	EPA 200.7	**0.168**	mg/L	0.005	6/3/2008 11:30:00	CC
Field pH	SM 4500 H/B	**7.3**	S.U.	0.1	5/22/2008 10:37:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**109**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**1.6**	mg/L	1	5/26/2008 11:52:00	AB

Comments for Sample ID 0805294-008
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805294-008

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805294**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805294-009**
Sample ID: Field Blank
Grab Date/Time: 5/22/2008 10:20
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: Field Blank
Matrix: Wastewater

Comments for Order: ***The tide was too high to sample OF-020 5/22/08. Had to return early 5/23/08 to get sample.***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/4/2008 06:44:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	6/3/2008 11:30:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	6/4/2008 06:44:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	6/3/2008 11:30:00	CC

Comments for Sample ID 0805294-009
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51708
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805294-009

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805294**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805294-010**
Sample ID: Equipment Blank
Grab Date/Time: 5/19/2008 10:18
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: Equipment Blank
Matrix: Wastewater

Comments for Order: ***The tide was too high to sample OF-020 5/22/08. Had to return early 5/23/08 to get sample.***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	5/20/2008 12:35:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	5/20/2008 12:35:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	5/20/2008 12:35:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	5/20/2008 12:35:00	CC

Comments for Sample ID 0805294-010
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805294-010

Universal Laboratories

Quality Control Summary

QC Batch # 080604013
Order ID: 0805294

	Copper				Zinc			
	True Value	Obtained	% Recovery	RPD	True Value	Obtained	% Recovery	RPD
Blank	0.0000	0.0009			0.0000	0.0039		
Midrange	0.5000	0.4849	97%		0.5000	0.4844	97%	
Third Party	0.5000	0.4812	96%		0.5000	0.4835	97%	
Midrange	0.5000	0.4642	93%		0.5000	0.4704	94%	
Blank	0.0000	0.0001			0.0000	0.0000		
Blank Spike	1.0000	1.0060	101%		1.0000	1.0010	100%	
Matrix Spike	1.0000	0.9915	99%		1.0000	1.0476	105%	
Matrix Spike Dup	1.0000	0.9914	99%	<1%	1.0000	1.0426	104%	1%
Blank	0.0000	0.0001			0.0000	0.0000		
Midrange	0.5000	0.4775	96%		0.5000	0.4882	98%	
Matrix Spike	1.0000	0.9912	99%		1.0000	1.0556	106%	
Matrix Spike Dup	1.0000	0.9861	99%	<1%	1.0000	1.0416	104%	2%
Blank	0.0000	0.0000			0.0000	0.0000		
Midrange	0.5000	0.4720	94%		0.5000	0.4787	96%	
Blank	0.0000	0.0002			0.0000	0.0000		

Quality Director S. Winter Date 6/5/08

Universal Laboratories
20 Research Drive Hampton, Va
Phone: (757) 865-0830 Fax: (757) 865-8014

EXPRESS LOG-IN CHAIN OF CUSTODY

UL ORDER ID **0805294**

Order Comment:

Pre-Log Date: Wednesday, May 21, 2008

Samples Must Be Received on or Before:

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

0805294-001 **OF-003** — **Sample Date/Time** 05/22/08 08:30 — **Sampler Initials** JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0805294-002 **OF-019** — **Sample Date/Time** 05/22/08 09:30 — **Sampler Initials** JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0805294-003 **OF-020** — **Sample Date/Time** 05/23/08 08:04 — **Sampler Initials** JN
Field Reading

Wastewater

				Container Type	Preservative
HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH			N/A	N/A

0805294-004 **OF-026** — **Sample Date/Time** 05/22/08 10:05 — **Sampler Initials** JN
Field Reading

Container Type Preservative

FERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

5294-009 **Field Blank** **Sample Date/Time** 05/22/08 10:20 **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0805294-010 **Equipment Blank** **Sample Date/Time** 5/19/08 10:18 **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0805294-011 **Field Services** **Sample Date/Time** 05/22/08 **Sampler Initials** JN
Field Reading

					Container Type	Preservative
Field Services	QAREP	QA Summary Report	TECH	Field Technician	N/A	N/A

Comments: Add Tech for 5/23/08 OF-020

Cooler Temp @ Log-in 2°C
Preservation In lab

CN int check Phenol in check NH3 int check BOD int check

Relinquished By Signature:	*Company:* UL	*Date/Time:* 05/23/08 0902
Received By Signature:	*Company:* UL	*Date/Time:* 5/23/08 0902
Relinquished By Signature:	*Company:*	*Date/Time:*
Received By Signature:	*Company:*	*Date/Time:*
Relinquished By Signature:	*Company:*	*Date/Time:*
Received By Signature:	*Company:*	*Date/Time:*

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2182
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0805450

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: 0805450-001
Sample ID: OF-003
Grab Date/Time: 5/29/2008 08:50
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-003
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.005**	mg/L	0.001	6/4/2008 18:01:00	CC
Copper (Total)	EPA 200.7	**0.006**	mg/L	0.001	6/4/2008 18:01:00	CC
Zinc (dissolved)	EPA 200.7	**0.064**	mg/L	0.005	6/4/2008 18:01:00	CC
Zinc (Total)	EPA 200.7	**0.065**	mg/L	0.005	6/4/2008 18:01:00	CC
Field pH	SM 4500 H/B	**7.6**	S.U.	0.1	5/29/2008 08:57:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**216**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	5/30/2008 11:13:00	AK

Comments for Sample ID 0805450-001
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805450**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-019
Matrix: Wastewater
Comments for Order:

UL Sample Number: **0805450-002**
Sample ID: OF-019
Grab Date/Time: 5/29/2008 10:20
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.001**	mg/L	0.001	6/4/2008 06:44:00	CC
Copper (Total)	EPA 200.7	**0.005**	mg/L	0.001	6/4/2008 06:44:00	CC
Zinc (dissolved)	EPA 200.7	**0.080**	mg/L	0.005	6/4/2008 06:44:00	CC
Zinc (Total)	EPA 200.7	**0.108**	mg/L	0.005	6/4/2008 06:44:00	CC
Field pH	SM 4500 H/B	**7.4**	S.U.	0.1	5/29/2008 10:30:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**126**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**3.2**	mg/L	1	5/30/2008 11:13:00	AK

Comments for Sample ID 0805450-002
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003

North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543

EPA LAB CODE VA00912

0805450-002

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805450**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805450-004**
Sample ID: OF-026
Grab Date/Time: 5/29/2008 11:00
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-026
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/4/2008 18:01:00	CC
Copper (Total)	EPA 200.7	**0.006**	mg/L	0.001	6/4/2008 18:01:00	CC
Zinc (dissolved)	EPA 200.7	**0.025**	mg/L	0.005	6/4/2008 18:01:00	CC
Zinc (Total)	EPA 200.7	**0.037**	mg/L	0.005	6/4/2008 18:01:00	CC
Field pH	SM 4500 H/B	**7.3**	S.U.	0.1	5/29/2008 11:04:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**168**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**2.0**	mg/L	1	5/30/2008 11:13:00	AK

Comments for Sample ID 0805450-004
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805450-004

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2182
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805450**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805450-005**
Sample ID: OF-030
Grab Date/Time: 5/29/2008 09:45
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-030
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.025**	mg/L	0.001	6/4/2008 06:44:00	CC
Copper (Total)	EPA 200.7	**0.039**	mg/L	0.001	6/4/2008 06:44:00	CC
Zinc (dissolved)	EPA 200.7	**0.343**	mg/L	0.005	6/4/2008 06:44:00	CC
Zinc (Total)	EPA 200.7	**0.387**	mg/L	0.005	6/4/2008 06:44:00	CC
Field pH	SM 4500 H/B	**7.3**	S.U.	0.1	5/29/2008 09:55:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**128**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	5/30/2008 11:13:00	AK

Comments for Sample ID 0805450-005
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003

North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543

EPA LAB CODE VA00912

0805450-005

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0860
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805450**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805450-006**
Sample ID: OF-005
Grab Date/Time: 5/29/2008 09:15
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-005
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/4/2008 06:44:00	CC
Copper (Total)	EPA 200.7	**0.004**	mg/L	0.001	6/4/2008 06:44:00	CC
Zinc (dissolved)	EPA 200.7	**1.015**	mg/L	0.005	6/4/2008 06:44:00	CC
Zinc (Total)	EPA 200.7	**1.049**	mg/L	0.005	6/4/2008 06:44:00	CC
Field pH	SM 4500 H/B	**7.3**	S.U.	0.1	5/29/2008 09:25:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**134**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	5/30/2008 11:13:00	AK

Comments for Sample ID 0805450-006
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805450**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0805450-007**
Sample ID: OF-084
Grab Date/Time: 5/29/2008 11:15
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-084
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.001	6/4/2008 06:44:00	CC
Copper (Total)	EPA 200.7	**0.006**	mg/L	0.001	6/4/2008 06:44:00	CC
Zinc (dissolved)	EPA 200.7	**0.037**	mg/L	0.005	6/4/2008 06:44:00	CC
Zinc (Total)	EPA 200.7	**0.047**	mg/L	0.005	6/4/2008 06:44:00	CC
Field pH	SM 4500 H/B	**7.5**	S.U.	0.1	5/29/2008 11:23:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**94**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**1.0**	mg/L	1	5/30/2008 11:13:00	AK

Comments for Sample ID 0805450-007
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805450-007

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805450**

(REPORT DATE)
09-Jun-08

TO: ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-003 Dup
Matrix: Wastewater

UL Sample Number: 0805450-008
Sample ID: OF-003 Dup
Grab Date/Time: 5/29/2008 08:59
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.005**	mg/L	0.001	6/4/2008 06:44:00	CC
Copper (Total)	EPA 200.7	**0.005**	mg/L	0.001	6/4/2008 06:44:00	CC
Zinc (dissolved)	EPA 200.7	**0.064**	mg/L	0.005	6/4/2008 06:44:00	CC
Zinc (Total)	EPA 200.7	**0.066**	mg/L	0.005	6/4/2008 06:44:00	CC
Field pH	SM 4500 H/B	**7.6**	S.U.	0.1	5/29/2008 09:06:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**220**	mg/L	2	6/9/2008 10:22:00	AB
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	5/30/2008 11:13:00	AK

Comments for Sample ID 0805450-008
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0860
TOLL-FREE: (800) 895-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805450**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # . N/A
Site: Field Blank
Matrix: Wastewater

UL Sample Number: **0805450-009**
Sample ID: Field Blank
Grab Date/Time: 5/29/2008 08:40
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/4/2008 06:44:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	6/4/2008 06:44:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	6/4/2008 06:44:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	6/4/2008 06:44:00	CC

Comments for Sample ID 0805450-009
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0805450-009

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0805450**

(REPORT DATE)
09-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: Equipment Blank
Matrix: Wastewater

UL Sample Number: **0805450-010**
Sample ID: Equipment Blank
Grab Date/Time: 5/27/2008 09:50
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	5/27/2008 11:33:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	5/27/2008 11:33:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	5/27/2008 11:33:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	5/27/2008 11:33:00	CC

Comments for Sample ID 0805450-010
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

Universal Laboratories

Quality Control Summary

QC Batch # 080604014
Order ID: 0805450

	Copper				Zinc			
	True Value	Obtained	% Recovery	RPD	True Value	Obtained	% Recovery	RPD
Blank	0.0000	0.0006			0.0000	0.0026		
Midrange	0.5000	0.4801	96%		0.5000	0.4879	98%	
Third Party	0.5000	0.481	96%		0.5000	0.4873	97%	
Blank	0.0000	0.0000			0.0000	0.0000		
Blank Spike	1.0000	1.0410	104%		1.0000	1.0260	103%	
Matrix Spike	1.0000	0.9945	99%		1.0000	1.0218	102%	
Matrix Spike Dup	1.0000	1.0415	104%	5%	1.0000	1.0918	109%	7%
Blank	0.0000	0.0000			0.0000	0.0000		
Matrix Spike	1.0000	1.0054	100%		1.0000	1.0484	105%	
Matrix Spike Dup	1.0000	1.0164	102%	2%	1.0000	1.0724	107%	2%
Midrange	0.5000	0.4774	95%		0.5000	0.4906	98%	
Blank	0.0000	0.0000			0.0000	0.0000		
Blank	0.0000	0.0000			0.0000	0.0000		
Midrange	0.5000	0.4805	96%		0.5000	0.4960	99%	
Midrange	0.5000	0.4812	96%		0.5000	0.4963	99%	
Blank	0.0000	0.0000			0.0000	0.0000		

Quality Director: [illegible] Date: 6/5/08

Universal Laboratories
[illegible] Research Drive Hampton, Va
Phone: (757)-865-0330 Fax: (757) 865-[illegible]

EXPRESS LOG-IN
CHAIN OF CUSTODY

UL ORDER ID **0805450**

Order Comment:

Pre-Log Date: Wednesday, May 28, 2008
Samples Must Be Received on or Before:

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219

ProjectID: Northrop Gruman
Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers
Phone Number:
FaxNumber: (804) 253-1091

0805450-001 **OF-003** — **Sample Date/Time** 05/29/08 08:50 — **Sampler Initials** JN
Field Reading

Wastewater			Container Type	Preservative
HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH		N/A	N/A

(4)

0805450-002 **OF-019** — **Sample Date/Time** 05/29/08 10:20 — **Sampler Initials** JN
Field Reading

Wastewater			Container Type	Preservative
HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH		N/A	N/A

(4)

0805450-003 **OF-020** — **Sample Date/Time** 05/29/08 — **Sampler Initials** JN
Field Reading * NO Flow

Wastewater			Container Type	Preservative
HRD	Hardness as CaCO3-EDTA		HDPE	HNO3 pH<2
TSS	Total Suspended Solids		HDPE	Refrigerate, 4 C
CUID	Copper (Dissolved)	ZNID Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
CUIT	Copper (Total)	ZNIT Zinc (Total)	HDPE (acid wash	HNO3 pH<2
FPH	Field pH		N/A	N/A

(4)

0805450-004 **OF-026** — **Sample Date/Time** 05/29/08 11:00 — **Sampler Initials** JN
Field Reading

Container Type **Preservative**

(4)

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0805450-005 **OF-030** Sample Date/Time 05 / 29 / 08 09:45 Sampler Initials JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
(3)	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0805450-006 **OF-005** Sample Date/Time 05 / 29 / 08 09:15 Sampler Initials JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
(3)	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0805450-007 **OF-084** Sample Date/Time 05 / 29 / 08 11:15 Sampler Initials JN
Field Reading

					Container Type	Preservative
Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
(3)	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

0805450-008 **duplicate** -OF -003 Sample Date/Time 05 / 29 / 08 08:59 Sampler Initials JN
Field Reading

Container Type Preservative

ERMRICH ERM Inc. (Richmond)
1011 East Main Street, Suite 227
Richmond Va. 23219

ProjectID: Northrop Gruman

Project Notes: *clean metals project*

QuoteID: Q0802022
Permit Number:
ProjectLocation:

Customer Contact: Thomas Numbers

Phone Number:
FaxNumber: (804) 253-1091

Wastewater	HRD	Hardness as CaCO3-EDTA			HDPE	HNO3 pH<2
	TSS	Total Suspended Solids			HDPE	Refrigerate, 4 C
	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2
	FPH	Field pH			N/A	N/A

05450-009 **Field Blank** Sample Date/Time 05/29/08 08:40 Sampler Initials JN
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
(2)	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0805450-010 **Equipment Blank** Sample Date/Time Sampler Initials
Field Reading

					Container Type	Preservative
Wastewater	CUID	Copper (Dissolved)	ZNID	Zinc (Dissolved)	HDPE (acid wash	Filter HNO3 ph<2
(2)	CUIT	Copper (Total)	ZNIT	Zinc (Total)	HDPE (acid wash	HNO3 pH<2

0805450-011 **Field Services** Sample Date/Time 05/29/08 Sampler Initials JN
Field Reading

					Container Type	Preservative
Field Services	QAREP	QA Summary Report	TECH	Field Technician	N/A	N/A

Comments: * OF-020 No Flow

Cooler Temp @ Log-in 4°C
Preservation I-1 lab

CN int check Phenol in check NH3 int check BOD int check

Relinquished By Signature:	Company: UL	Date/Time: 05/29/08 1200
Received By Signature:	Company: UL	Date/Time: 5/29/08 1208
Relinquished By Signature:	Company:	Date/Time:
Received By Signature:	Company:	Date/Time:
Relinquished By Signature:	Company:	Date/Time:
Received By Signature:	Company:	Date/Time:

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666
1-800-695-2162
(757) 865-0880
Fax: (757) 865-8014
E-mail: info@universallaboratories.net

Date:	Thursday, June 19, 2008
Pages:	Page 1 of 10
To:	Thomas Numbers ERM Inc. (Richmond)
Fax#:	(804) 253-1091
From:	☐ Dan Thornton ☐ Mike Jennings
Subject:	Results for Project Northrop Gruman designated as UL Order Id 0806060 and received on Wednesday, June 04, 2008

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-001

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-001**
Sample ID: OF-003
Grab Date/Time: 6/4/2008 13:10
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-003
Matrix: Wastewater
Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.044**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.047**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.3**	S.U.	0.1	6/4/2008 13:15:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**220**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-001
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-001

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2182
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-002**
Sample ID: OF-019
Grab Date/Time: 6/4/2008 12:42
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Grumman
Project # N/A
Site: OF-019
Matrix: Wastewater
Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.005**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.016**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.024**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.077**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.3**	S.U.	0.1	6/4/2008 12:49:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**105**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**31**	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-002
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-002

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20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-004**
Sample ID: OF-026
Grab Date/Time: 6/4/2008 14:40
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-026
Matrix: Wastewater

Comments for Order: *No Flow OF-020*

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.011**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.012**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.6**	S.U.	0.1	6/4/2008 14:47:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**168**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**1.8**	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-004
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-004

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TOLL-FREE: (800) 695-2182
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-005**
Sample ID: OF-030
Grab Date/Time: 6/4/2008 14:00
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-030
Matrix: Wastewater

Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.008**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.009**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.175**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.183**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.4**	S.U.	0.1	6/4/2008 14:07:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**107**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-005
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-005

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20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-006**
Sample ID: OF-005
Grab Date/Time: 6/4/2008 13:30
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-005
Matrix: Wastewater
Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.004**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**1.039**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**1.043**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.2**	S.U.	0.1	6/4/2008 13:40:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**94**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-006
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-006

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TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-007**
Sample ID: OF-084
Grab Date/Time: 6/4/2008 12:00
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-084
Matrix: Wastewater

Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.023**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.025**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.6**	S.U.	0.1	6/4/2008 12:10:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**33**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	<	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-007
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-007

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20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-084 DUP
Matrix: Wastewater

UL Sample Number: **0806060-008**
Sample ID: OF-084 DUP
Grab Date/Time: 6/4/2008 12:11
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.024**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.025**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.6**	S.U.	0.1	6/4/2008 12:20:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**34**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-008
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-008

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-009**
Sample ID: Field Blank
Grab Date/Time: 6/4/2008 11:50
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: Field Blank
Matrix: Wastewater
Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.008**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.008**	mg/L	0.005	6/17/2008 15:18:00	CC

Comments for Sample ID 0806060-009
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-009

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-010**
Sample ID: Equipment Blank
Grab Date/Time: 6/4/2008
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: Equipment Blank
Matrix: Wastewater

Comments for Order: *No Flow OF-020*

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/3/2008 11:30:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	6/3/2008 11:30:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	6/3/2008 11:30:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	6/3/2008 11:30:00	CC

Comments for Sample ID 0806060-010
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-010

Universal Laboratories

Quality Control Summary

QC Batch # 080618002
Order ID: 0806060; 0806147

	Copper				Zinc			
	True Value	Obtained	% Recovery	RPD	True Value	Obtained	% Recovery	RPD
Blank	0.0000	0.0007			0.0000	0.0006		
Midrange	0.5000	0.4847	97%		0.5000	0.4976	100%	
Third Party	0.5000	0.5303	106%		0.5000	0.5416	108%	
Blank	0.0000	0.0004			0.0000	0.0033		
Blank Spike	1.0000	1.0650	106%		1.0000	1.0410	104%	
Blank	0.0000	0.0005			0.0000	0.0001		
Matrix Spike	1.0000	1.0314	103%		1.0000	1.0260	103%	
Matrix Spike Dup	1.0000	1.0224	102%	<1%	1.0000	1.0160	102%	<1%
Blank	0.0000	0.0008			0.0000	0.0000		
Midrange	0.5000	0.4513	90%		0.5000	0.4746	95%	
Matrix Spike	1.0000	0.9852	98%		1.0000	1.0321	103%	
Matrix Spike Dup	1.0000	0.9716	97%	1%	1.0000	1.0171	102%	<1%
Blank	0.0000	0.0005			0.0000	0.0000		
Midrange	0.5000	0.5044	101%		0.5000	0.4747	95%	
Matrix Spike	1.0000	0.9231	92%		1.0000	0.9858	99%	
Matrix Spike Dup	1.0000	0.9418	94%	2%	1.0000	1.0098	101%	2%
Blank	0.0000	0.0006			0.0000	0.0001		
Midrange	0.5000	0.4834	97%		0.5000	0.4716	94%	
Matrix Spike	1.0000	0.9306	93%		1.0000	1.0146	101%	
Matrix Spike Dup	1.0000	0.9304	93%	<1%	1.0000	1.0226	102%	1%
Blank	0.0000	0.0008			0.0000	0.0001		
Midrange	0.5000	0.4771	95%		0.5000	0.4709	94%	
Midrange	0.5000	0.4751	95%		0.5000	0.4730	95%	
Blank	0.0000	0.0006			0.0000	0.0004		

Quality Director _____ Date 6/18/08

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20 Research Drive Hampton, Va 23666
1-800-695-2162
(757) 865-0880
Fax: (757) 865-8014
E-mail: info@universallaboratories.net

Date:	Thursday, June 19, 2008
Pages:	Page 1 of 10
To:	Thomas Numbers ERM Inc. (Richmond)
Fax#:	(804) 253-1091
From:	☐ Dan Thornton ☐ Mike Jennings
Subject:	Results for Project Northrop Gruman designated as UL Order Id 0806147 and received on Wednesday, June 11, 2008

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-001

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-001**
Sample ID: OF-003
Grab Date/Time: 6/11/2008 08:30
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-003
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.009**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.046**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.064**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.8**	S.U.	0.1	6/11/2008 08:40:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**190**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	<	mg/L	1	6/12/2008 13:00:00	LW

Comments for Sample ID 0806147-001
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-001

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-002**
Sample ID: OF-019
Grab Date/Time: 6/11/2008 09:45
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-019
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.006**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.014**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.013**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.026**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.7**	S.U.	0.1	6/11/2008 09:51:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**113**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**8.4**	mg/L	1	6/12/2008 08:48:00	AB

Comments for Sample ID 0806147-002
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-002

UNIVERSAL LABORATORIES

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TOLL-FREE: (800) 685-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-004**
Sample ID: OF-026
Grab Date/Time: 6/11/2008 10:35
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-026
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.004**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.015**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.016**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**8.0**	S.U.	0.1	6/11/2008 10:49:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**183**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**1.8**	mg/L	1	6/12/2008 13:00:00	LW

Comments for Sample ID 0806147-004
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-004

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REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-005**
Sample ID: OF-030
Grab Date/Time: 6/11/2008 09:15
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-030
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.009**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.012**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.190**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.214**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.8**	S.U.	0.1	6/11/2008 09:24:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**109**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**1.3**	mg/L	1	6/12/2008 08:48:00	AB

Comments for Sample ID 0806147-005
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-005

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: OF-005
Matrix: Wastewater
Comments for Order:

UL Sample Number: **0806147-006**
Sample ID: OF-005
Grab Date/Time: 6/11/2008 08:55
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.004**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.005**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**1.414**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**1.471**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.5**	S.U.	0.1	6/11/2008 09:01:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**92**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	6/12/2008 13:00:00	LW

Comments for Sample ID 0806147-006
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-006

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0860
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-007**
Sample ID: OF-084
Grab Date/Time: 6/11/2008 11:00
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-084
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.021**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.021**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**8.0**	S.U.	0.1	6/11/2008 11:09:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**65**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	6/12/2008 13:00:00	LW

Comments for Sample ID 0806147-007
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

0806147-007

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-008**
Sample ID: OF-019 Dup
Grab Date/Time: 6/11/2008 09:54
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: duplicate
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.006**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.013**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.011**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.027**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.7**	S.U.	0.1	6/11/2008 09:58:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**118**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**8.2**	mg/L	1	6/12/2008 08:48:00	AB

Comments for Sample ID 0806147-008
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912 0806147-008

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-009**
Sample ID: Field Blank
Grab Date/Time: 6/11/2008 09:39
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: Field Blank
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	6/17/2008 15:18:00	CC

Comments for Sample ID 0806147-009
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-009

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 895-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: Equipment Blank
Matrix: Wastewater

UL Sample Number: **0806147-010**
Sample ID: Equipment Blank
Grab Date/Time: 6/11/2008
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/9/2008 10:46:00	EF
Copper (Total)	EPA 200.7	<	mg/L	0.001	6/9/2008 10:46:00	EF
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	6/9/2008 10:46:00	EF
Zinc (Total)	EPA 200.7	<	mg/L	0.005	6/9/2008 10:46:00	EF

Comments for Sample ID 0806147-010
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-010

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666
1-800-695-2162
(757) 865-0880
Fax: (757) 865-8014
E-mail: info@universallaboratories.net

Date:	Thursday, June 19, 2008
Pages:	Page 1 of 10
To:	Thomas Numbers ERM Inc. (Richmond)
Fax#:	(804) 253-1091
From:	☐ Dan Thornton ☐ Mike Jennings
Subject:	Results for Project Northrop Gruman designated as UL Order Id 0806060 and received on Wednesday, June 04, 2008

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-001

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-001**
Sample ID: OF-003
Grab Date/Time: 6/4/2008 13:10
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-003
Matrix: Wastewater
Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.044**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.047**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.3**	S.U.	0.1	6/4/2008 13:15:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**220**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	<	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-001
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-001

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20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-0014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-002**
Sample ID: OF-019
Grab Date/Time: 6/4/2008 12:42
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-019
Matrix: Wastewater

Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.005**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.016**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.024**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.077**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.3**	S.U.	0.1	6/4/2008 12:49:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**105**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**31**	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-002
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-004**
Sample ID: OF-026
Grab Date/Time: 6/4/2008 14:40
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-026
Matrix: Wastewater

Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.011**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.012**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.6**	S.U.	0.1	6/4/2008 14:47:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**168**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**1.8**	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-004
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003

North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543

EPA LAB CODE VA00912

0806060-004

UNIVERSAL LABORATORIES

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-005**
Sample ID: OF-030
Grab Date/Time: 6/4/2008 14:00
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-030
Matrix: Wastewater

Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.008**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.009**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.175**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.183**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.4**	S.U.	0.1	6/4/2008 14:07:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**107**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-005
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-005

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 685-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0806060

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-006**
Sample ID: OF-005
Grab Date/Time: 6/4/2008 13:30
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-005
Matrix: Wastewater

Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.004**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**1.039**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**1.043**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.2**	S.U.	0.1	6/4/2008 13:40:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**94**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-006
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

0806060-006

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-007**
Sample ID: OF-084
Grab Date/Time: 6/4/2008 12:00
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-084
Matrix: Wastewater

Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.023**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.025**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	7.6	S.U.	0.1	6/4/2008 12:10:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	33	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	<	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-007
No comments

Respectfully Submitted

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-007

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-008**
Sample ID: OF-084 DUP
Grab Date/Time: 6/4/2008 12:11
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-084 DUP
Matrix: Wastewater

Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.024**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.025**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.6**	S.U.	0.1	6/4/2008 12:20:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**34**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	6/7/2008 12:01:00	LS

Comments for Sample ID 0806060-008
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003

North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543

EPA LAB CODE VA00912

0806060-008

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806060-009**
Sample ID: Field Blank
Grab Date/Time: 6/4/2008 11:50
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: Field Blank
Matrix: Wastewater

Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.002**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.008**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.008**	mg/L	0.005	6/17/2008 15:18:00	CC

Comments for Sample ID 0806060-009
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003

North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543

EPA LAB CODE VA00912

0806060-009

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806060**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

Project ID: Northrop Gruman
Project # N/A
Site: Equipment Blank
Matrix: Wastewater

UL Sample Number: **0806060-010**
Sample ID: Equipment Blank
Grab Date/Time: 6/4/2008
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Comments for Order: ***No Flow OF-020***

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/3/2008 11:30:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	6/3/2008 11:30:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	6/3/2008 11:30:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	6/3/2008 11:30:00	CC

Comments for Sample ID 0806060-010
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806060-010

Universal Laboratories

Quality Control Summary

QC Batch # 080618002
Order ID: 0806060; 0806147

	Copper				Zinc			
	True Value	Obtained	% Recovery	RPD	True Value	Obtained	% Recovery	RPD
Blank	0.0000	0.0007			0.0000	0.0006		
Midrange	0.5000	0.4847	97%		0.5000	0.4976	100%	
Third Party	0.5000	0.5303	106%		0.5000	0.5416	108%	
Blank	0.0000	0.0004			0.0000	0.0033		
Blank Spike	1.0000	1.0650	106%		1.0000	1.0410	104%	
Blank	0.0000	0.0005			0.0000	0.0001		
Matrix Spike	1.0000	1.0314	103%		1.0000	1.0260	103%	
Matrix Spike Dup	1.0000	1.0224	102%	<1%	1.0000	1.0160	102%	<1%
Blank	0.0000	0.0008			0.0000	0.0000		
Midrange	0.5000	0.4513	90%		0.5000	0.4746	95%	
Matrix Spike	1.0000	0.9852	98%		1.0000	1.0321	103%	
Matrix Spike Dup	1.0000	0.9716	97%	1%	1.0000	1.0171	102%	<1%
Blank	0.0000	0.0005			0.0000	0.0000		
Midrange	0.5000	0.5044	101%		0.5000	0.4747	95%	
Matrix Spike	1.0000	0.9231	92%		1.0000	0.9858	99%	
Matrix Spike Dup	1.0000	0.9418	94%	2%	1.0000	1.0098	101%	2%
Blank	0.0000	0.0006			0.0000	0.0001		
Midrange	0.5000	0.4834	97%		0.5000	0.4716	94%	
Matrix Spike	1.0000	0.9306	93%		1.0000	1.0146	101%	
Matrix Spike Dup	1.0000	0.9304	93%	<1%	1.0000	1.0226	102%	1%
Blank	0.0000	0.0008			0.0000	0.0001		
Midrange	0.5000	0.4771	95%		0.5000	0.4709	94%	
Midrange	0.5000	0.4751	95%		0.5000	0.4730	95%	
Blank	0.0000	0.0006			0.0000	0.0004		

Quality Director _____ Date 6/18/08

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20 Research Drive Hampton, Va 23666
1-800-695-2162
(757) 865-0880
Fax: (757) 865-8014
E-mail: info@universallaboratories.net

Date:	Thursday, June 19, 2008
Pages:	Page 1 of 10
To:	Thomas Numbers ERM Inc. (Richmond)
Fax#:	(804) 253-1091
From:	☐ Dan Thornton ☐ Mike Jennings
Subject:	Results for Project Northrop Gruman designated as UL Order Id 0806147 and received on Wednesday, June 11, 2008

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-001

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: 0806147

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-001**
Sample ID: OF-003
Grab Date/Time: 6/11/2008 08:30
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-003
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.009**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.046**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.064**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.8**	S.U.	0.1	6/11/2008 08:40:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**190**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	<	mg/L	1	6/12/2008 13:00:00	LW

Comments for Sample ID 0806147-001
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

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TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-002**
Sample ID: OF-019
Grab Date/Time: 6/11/2008 09:45
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-019
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.006**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.014**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.013**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.026**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.7**	S.U.	0.1	6/11/2008 09:51:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**113**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**8.4**	mg/L	1	6/12/2008 08:48:00	AB

Comments for Sample ID 0806147-002
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030, VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-004**
Sample ID: OF-026
Grab Date/Time: 6/11/2008 10:35
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-026
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.004**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.015**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.016**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**8.0**	S.U.	0.1	6/11/2008 10:49:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**183**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**1.8**	mg/L	1	6/12/2008 13:00:00	LW

Comments for Sample ID 0806147-004
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912 0806147-004

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-005**
Sample ID: OF-030
Grab Date/Time: 6/11/2008 09:15
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-030
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.009**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.012**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.190**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.214**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.8**	S.U.	0.1	6/11/2008 09:24:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**109**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**1.3**	mg/L	1	6/12/2008 08:48:00	AB

Comments for Sample ID 0806147-005
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-005

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-006**
Sample ID: OF-005
Grab Date/Time: 6/11/2008 08:55
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-005
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.004**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.005**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**1.414**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**1.471**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.5**	S.U.	0.1	6/11/2008 09:01:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**92**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**<**	mg/L	1	6/12/2008 13:00:00	LW

Comments for Sample ID 0806147-006
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-006

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REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-007**
Sample ID: OF-084
Grab Date/Time: 6/11/2008 11:00
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: OF-084
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.003**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.021**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.021**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**8.0**	S.U.	0.1	6/11/2008 11:09:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**65**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	<	mg/L	1	6/12/2008 13:00:00	LW

Comments for Sample ID 0806147-007
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-007

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-008**
Sample ID: OF-019 Dup
Grab Date/Time: 6/11/2008 09:54
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: duplicate
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	**0.006**	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	**0.013**	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	**0.011**	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	**0.027**	mg/L	0.005	6/17/2008 15:18:00	CC
Field pH	SM 4500 H/B	**7.7**	S.U.	0.1	6/11/2008 09:58:00	JN
Hardness as CaCO3-EDTA	SM-2340 C	**118**	mg/L	2	6/19/2008 11:50:00	LS
Total Suspended Solids	SM-2540 D	**8.2**	mg/L	1	6/12/2008 08:48:00	AB

Comments for Sample ID 0806147-008
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-008

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

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TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-009**
Sample ID: Field Blank
Grab Date/Time: 6/11/2008 09:39
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: Field Blank
Matrix: Wastewater
Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/17/2008 15:18:00	CC
Copper (Total)	EPA 200.7	<	mg/L	0.001	6/17/2008 15:18:00	CC
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	6/17/2008 15:18:00	CC
Zinc (Total)	EPA 200.7	<	mg/L	0.005	6/17/2008 15:18:00	CC

Comments for Sample ID 0806147-009
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-009

UNIVERSAL LABORATORIES

20 Research Drive Hampton, Va 23666

TELEPHONE: (757) 865-0880
TOLL-FREE: (800) 695-2162
FAX: (757) 865-8014

REPORT OF ANALYSIS

Order ID: **0806147**

(REPORT DATE)
19-Jun-08

TO: **ERM Inc. (Richmond)**
1011 East Main Street, Suite 227
Richmond Va. 23219
ATTN: Thomas Numbers

UL Sample Number: **0806147-010**
Sample ID: Equipment Blank
Grab Date/Time: 6/11/2008
Composite Start: N/A
Composite Stop: N/A
Collected By: newjoh

Project ID: Northrop Gruman
Project # N/A
Site: Equipment Blank
Matrix: Wastewater

Comments for Order:

Parameter	Method	Test Result	Units	UL Report Limit	Analysis Date/Time	Analyst
Copper (dissolved)	EPA 200.7	<	mg/L	0.001	6/9/2008 10:46:00	EF
Copper (Total)	EPA 200.7	<	mg/L	0.001	6/9/2008 10:46:00	EF
Zinc (dissolved)	EPA 200.7	<	mg/L	0.005	6/9/2008 10:46:00	EF
Zinc (Total)	EPA 200.7	<	mg/L	0.005	6/9/2008 10:46:00	EF

Comments for Sample ID 0806147-010
No comments

Respectfully Submitted,

Virginia Drinking Water Lab# 00030
VDEQ Lab #000003
North Carolina Drinking Water Lab # 51706
North Carolina Wastewater/Groundwater Lab # 543
EPA LAB CODE VA00912
0806147-010

Appendix C
Summary of Analytical Results and Calculations

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 003

		Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
	Discharge Limit		16			153		6.0 - 9.0		
	Normal Range		37-5		258-99.4	258-105				
	Date Sample Taken			Analysis Results						
1	14-Feb-08	42	43	0.977	261	264	0.989	8.3	121.0	3.4
2	20-Feb-08	3	5	0.600	58	59	0.983	7.3	176.0	<1
3	28-Feb-08	2	3	0.667	38	38	1.000	7.3	204.0	<1
	2/28/2008 Dup	3	3	1.000	36	39	0.923		211.0	<1
4	5-Mar-08	23	28	0.821	386	417	0.926	7.6	106.0	<1
5	12-Mar-08	1	2	0.500	40	47	0.851	7.6	198.0	<1
6	8-May-08	1	1	1.000	41	42	0.976	7.6	184.0	<1
7	14-May-08	1	2	0.500	68	70	0.971	7.0	200.0	<1
8	22-May-08	2	3	0.667	40	43	0.930	7.5	216.0	<1
9	29-May-08	5	6	0.833	64	65	0.985	7.6	216.0	<1
	Dup	5	5	1.000	64	66	0.970	7.6	220.0	<1
10	4-Jun-08	2	2	1.000	44	47	0.936	7.3	220.0	<1
11	11-Jun-08	1	9	0.111	46	64	0.719	7.8	190.0	<1

Average Translator Factor	0.74	0.94
Translator Impacted Effluent Limit	21.497	163.588

Value exceeded current discharge limit

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 005

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		NL			1188		6.0 - 9.0		
Normal Range				245-141	29.3-107				
Date Sample Taken			Analysis Results						
14-Feb-08	2	4	0.500	131	141	0.929	8.0	86.0	<1
20-Feb-08	2	4	0.500	120	137	0.876	7.3	77.0	<1
28-Feb-08	1	1	1.000	92	116	0.793	7.0	91.0	<1
5-Mar-08	2	3	0.667	98	120	0.817	7.5	90.0	<1
Dup	2	4	0.500	99	121	0.818	7.5	86.0	<1
12-Mar-08	2	3	0.667	132	149	0.886	7.6	92.0	<1
8-May-08	3	4	0.750	1101	1221	0.902	7.4	94.0	1.3
14-May-08	4	5	0.800	136	158	0.861	7.1	118.0	<1
Dup	3	5	0.600	142	172	0.826	7.1	94.0	<1
22-May-08	2	3	0.667	1230	1269	0.969	7.3	124.0	<1
29-May-08	2	4	0.500	1015	1049	0.968	7.3	134.0	<1
4-Jun-08	3	4	0.750	1039	1043	0.996	7.2	94.0	<1
11-Jun-08	4	5	0.800	1414	1471	0.961	7.5	92.0	<1

Average Translator Factor	0.67	0.89
Translator Impacted Effluent Limit	0.000	1331.244

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor
NL=No Limit

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 019

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		30			288		6.0 - 9.0		
Normal Range		28.6-7.1		146-114	291-51.6				
Date Sample Taken			Analysis Results						
14-Feb-08	2	4	0.500	390	444	0.878	8.4	72.0	4.4
20-Feb-08	<1	3	0.333	31	44	0.705	7.5	105.0	7.1
28-Feb-08	3	4	0.750	35	36	0.972	6.5	126.0	11.0
5-Mar-08	3	7	0.429	64	77	0.831	7.4	40.0	1.4
12-Mar-08	1	2	0.500	25	41	0.610	7.8	122.0	5.6
8-May-08	1	2	0.500	42	57	0.737	7.7	122.0	5.7
14-May-08	1	2	0.500	43	50	0.860	7.0	120.0	2.8
22-May-08	1	1	1.000	5	8	0.625	7.5	147.0	4.2
29-May-08	1	5	0.200	80	108	0.741	7.4	126.0	3.2
4-Jun-08	5	16	0.313	24	77	0.312	7.3	105.0	31.0
11-Jun-08	6	14	0.429	13	26	0.500	7.7	113.0	8.4
Dup	6	13	0.462	11	27	0.407	7.7	118.0	8.2

Average Translator Factor	0.49	0.68
Translator Impacted Effluent Limit	60.867	422.610

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 020

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		87			NL		6.0 - 9.0		
Normal Range		133-23.5							
Date Sample Taken			Analysis Results						
14-Feb-08	13	16	0.813	458	503	0.911	8.9	102.0	3.9
20-Feb-08	9	11	0.818	140	152	0.921	8.1	408.0	5.2
28-Feb-08	6	8	0.750	95	112	0.848	7.2	688.0	1.1
5-Mar-08	9	13	0.692	145	176	0.824	7.9	93.0	2.0
12-Mar-08	5	8	0.625	133	149	0.893	8.2	1100.0	2.7
8-May-08	6	12	0.500	80	121	0.661	8.1	2234.0	32.0
14-May-08	6	9	0.667	106	110	0.964	7.2	1901.0	2.7
23-May-08	6	8	0.750	74	74	1.000	7.8	2278.0	7.1

NL= No Limit

Average Translator Factor	0.70	0.88
Translator Impacted Effluent Limit	123.961	0.000

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 023

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		NL			NL		6.0 - 9.0		
Normal Range		17.6-5		225-50					
Date Sample Taken			Analysis Results						
14-Feb-08	8	9	0.889	604	658	0.918	8.0	50.0	2.3
20-Feb-08	7	7	1.000	85	89	0.955	7.2	111.0	1.6
28-Feb-08	4	6	0.667	58	66	0.879	7.2	67.0	1.4
5-Mar-08	2	4	0.500	310	355	0.873	7.3	37.0	2.6
12-Mar-08	4	4	1.000	73	94	0.777	8.1	184.0	3.7

NL= No Limit

Average Translator Factor	0.81	0.88
Translator Impacted Effluent Limit	0.000	0.000

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 026

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		24			NL		6.0 - 9.0		
Normal Range		31.7-5			381-113				
Date Sample Taken			Analysis Results						
14-Feb-08	1	10	0.100	63	146	0.432	8.3	110.0	83.0
20-Feb-08	3	3	1.000	140	149	0.940	7.8	137.0	4.7
28-Feb-08	<1	1	1.000	10	11	0.909	7.4	295.0	4.4
5-Mar-08	9	56	0.161	62	370	0.168	7.3	104.0	194.0
12-Mar-08	<1	3	0.333	17	27	0.630	8.1	270.0	3.4
Dup	2	3	0.667	17	24	0.708	8.0	246.0	2.9
8-May-08	3	4	0.750	28	41	0.683	8.0	293.0	3.5
Dup	4	4	1.000	40	41	0.976	7.9	293.0	3.7
14-May-08	3	21	0.143	52	97	0.536	7.3	218.0	2.9
22-May-08	2	4	0.500	3	7	0.429	7.8	214.0	2.2
29-May-08	2	6	0.333	25	37	0.676	7.3	168.0	2.0
4-Jun-08	2	3	0.667	11	12	0.917	7.6	168.0	1.8
11-Jun-08	3	4	0.750	15	16	0.938	8.0	183.0	1.8

NL= No Limit

Average Translator Factor	0.57	0.69
Translator Impacted Effluent Limit	42.142	0.000

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 030

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		19			NL		6.0 - 9.0		
Normal Range		78.2-22.5							
Date Sample Taken			Analysis Results						
14-Feb-08	34	42	0.810	293	310	0.945	8.2	78.0	<1
20-Feb-08	5	8	0.625	225	247	0.911	7.6	69.0	<1
20-Feb-08 (Dup)	4	6	0.667	230	231	0.996	Not Provided	71.0	<1
28-Feb-08	2	4	0.500	105	234	0.449	7.1	89.0	<1
5-Mar-08	8	19	0.421	135	174	0.776	7.5	64.0	2.7
12-Mar-08	5	9	0.556	160	183	0.874	8.0	80.0	3.1
8-May-08	9	15	0.600	335	390	0.859	7.7	86.0	4.9
14-May-08	16	27	0.593	232	254	0.913	7.0	108.0	<1
22-May-08	6	9	0.667	155	169	0.917	7.4	126.0	1.5
Dup	6	8	0.750	157	168	0.935	7.3	109.0	1.6
29-May-08	25	39	0.641	343	387	0.886	7.3	128.0	<1
4-Jun-08	8	9	0.889	175	183	0.956	7.4	107.0	<1
11-Jun-08	9	12	0.750	190	214	0.888	7.8	109.0	1.3

NL= No Limit

Average Translator Factor	0.65	0.87
Translator Impacted Effluent Limit	29.172	0.000

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 037

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		21			207		6.0 - 9.0		
Normal Range		32.1-5		375-50	379-50				
14-Feb-08	2	2	1.000	133	136	0.978	8.1	643.0	<1
20-Feb-08	2	1	1.000	97	100	0.970	7.6	416.0	1.0
28-Feb-08	2	2	1.000	130	141	0.922	7.4	438.0	<1
5-Mar-08	3	7	0.429	121	166	0.729	7.7	320.0	<1
12-Mar-08	2	3	0.667	60	74	0.811	8.0	284.0	<1

Average Translator Factor	0.82	0.88
Translator Impacted Effluent Limit	25.640	234.712

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 084

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		19.000			NL		6.0 - 9.0		
Normal Range									
Date Sample Taken			Analysis Results						
14-Feb-08	1	1	1.000	22	40	0.550	8.2	204.0	3.2
14-Feb-08 (Dup)	1	1	1.000	28	61	0.459	Not Provided	190.0	Not Provided
20-Feb-08	2	4	0.500	32	55	0.582	8.1	170.0	3.3
28-Feb-08	.72	1	0.720	7	15	0.467	7.9	244.0	2.0
5-Mar-08	5	28	0.179	41	197	0.208	8.0	146.0	12.0
12-Mar-08	1	1	1.000	16	28	0.571	8.0	222.0	3.2
8-May-08	1	1	1.000	26	35	0.743	8.1	239.0	2.2
14-May-08	1	3	0.333	33	53	0.623	7.7	186.0	1.5
22-May-08	4	5	0.800	6	20	0.300	7.7	105.0	1.2
29-May-08	3	6	0.500	37	47	0.787	7.5	94.0	1.0
4-Jun-08	2	3	0.667	23	25	0.920	7.6	33.0	<1
Dup	2	3	0.667	24	25	0.960	7.6	34.0	<1
11-Jun-08	3	3	1.000	21	21	1.000	8.0	65.0	<1

Average Translator Factor	0.72	0.63
Translator Impacted Effluent Limit	26.374	0.000

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: Field Blank

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit							
Normal Range							
Date Sample Taken			Analysis Results				
14-Feb-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
20-Feb-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
28-Feb-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
5-Mar-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
12-Mar	<1	<1	<5	7.000	Not Provided	Not Provided	Not Provided
8-May-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
14-May-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
22-May-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
29-May-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
4-Jun-08	<1	2.000	8.000	8.000	Not Provided	Not Provided	Not Provided
11-Jun-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided

Appendix D
Normality Calculation

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 003

		Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
	Discharge Limit		16			153		6.0 - 9.0		
	Normal Range		37-5		258-99.4	258-105				
	Date Sample Taken			Analysis Results						
1	14-Feb-08	42	43	0.977	261	264	0.989	8.3	121.0	3.4
2	20-Feb-08	3	5	0.600	56	59	0.983	7.3	176.0	<1
3	28-Feb-08	2	3	0.667	38	38	1.000	7.3	204.0	<1
	2/28/2008 Dup	3	3	1.000	36	39	0.923	[illegible]	211.0	<1
4	5-Mar-08	23	28	0.821	330	417	0.926	7.6	106.0	<1
5	12-Mar-08	1	2	0.500	40	47	0.851	7.6	198.0	<1
6	8-May-08	1	1	1.000	41	42	0.976	7.6	184.0	<1
7	14-May-08	1	2	0.500	68	70	0.971	7.0	200.0	<1
8	22-May-08	2	3	0.667	40	43	0.930	7.5	216.0	<1
9	29-May-08	5	6	0.833	64	65	0.985	7.6	216.0	<1
	Dup	5	5	1.000	64	66	0.970	7.6	220.0	<1
10	4-Jun-08	2	2	1.000	44	47	0.936	7.3	220.0	<1
11	11-Jun-08	1	9	0.111	46	64	0.719	7.8	190.0	<1

Average Translator Factor	0.74	0.94
Translator Impacted Effluent Limit	21.497	163.588

Value exceeded current discharge limit

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

outlier test

Copper-dissolved	Log-Data:	outlier test statistic		critical value (n=11, 95% confidence)	result
	0.000	0.8208	<	2.234	not outlier
	0.000				
	0.000				
duplicate	0.000				
samples	0.693				
removed	0.693				
	0.693				
	1.099				
	1.609				
	3.135				
	3.738	2.0733	<	2.234	not outlier
mean	1.060				
stdev	1.2915				

Shapiro-Wilk test for normality

log data	reverse ranked	difference	coefficients	b_i
0.000	3.738	3.738	0.5601	2.0935
0.000	3.135	3.135	0.3315	1.0394
0.000	1.609	1.609	0.2260	0.3637
0.000	1.099	1.099	0.1429	0.1570
0.693	0.693	0.000	0.0695	0.0000
0.693	0.693	0.000	0.0000	0.0000
0.693	0.693	0.000		
1.099	0.000	-1.099		
1.609	0.000	-1.609		
3.135	0.000	-3.135		
3.738	0.000	-3.738		
1.060	mean		Σb	3.6536
1.2915	stdev			
10	n-1			
0.850	critical w (95%)		w statistic	0.8003345

NON-LOGNORMAL

>>>>>

Copper-total					
	0.000	1.6216		2.234	not outlier
	0.693				
	0.693				
	0.693				
	1.099				
	1.099				
	1.609				
	1.792				
	2.197				
	3.332	2.1145	<	2.176	not outlier
	3.761	2.3323	>	2.234	possible outlier
mean	1.543				
stdev	0.9513				

0.000	3.332	3.332	0.5739	1.9123522
0.693	2.197	1.504	0.3291	0.4949919
0.693	1.792	1.099	0.2141	0.2352129
0.693	1.609	0.916	0.1224	0.112154
1.099	1.099	0.000	0.0399	0
1.099	1.099	0.000		
1.609	0.693	-0.916		
1.792	0.693	-1.099		
2.197	0.693	-1.504		
3.332	0.000	-3.332		
1.321	mean		Σb	2.7547109
0.9512608	stdev			
9	n-1			
0.842	critical w (95%)		w statistic	0.9317734

LOGNORMAL

>>>>>

Zinc-dissolved					
	3.638	0.9907	<	2.234	not outlier
	3.689				
	3.689				
	3.714				
	3.784				
	3.829				
	4.060				
	4.159				
	4.220	1.5981	<	2.110	not outlier
	5.505	2.6519	>	2.176	possible outlier
	5.660	3.0274	>	2.234	possible outlier
mean	4.209				
stdev	0.5769				

3.638	4.220	0.582	0.5888	0.3426354
3.689	4.159	0.470	0.3244	0.1524692
3.689	4.060	0.372	0.1976	0.073421
3.714	3.829	0.115	0.0947	0.0108971
3.784	3.784	0.000	0	0
3.829	3.714	-0.115		
4.060	3.689	-0.372		
4.159	3.689	-0.470		
4.220	3.638	-0.582		
3.865	mean		Σb	0.5794226
0.2221417	stdev			
8	n-1			
0.829	critical w (95%)		w statistic	0.8504343

LOGNORMAL

>>>>>

Zinc-total					
	3.638	1.1570	<	2.234	not outlier
	3.738				
	3.761				
	3.850				
	3.850				
	4.078				
	4.159				
	4.174				
	4.248	1.3663	<	2.110	not outlier
	5.575	2.6360	>	2.176	possible outlier
	6.033	3.1422	>	2.234	possible outlier
mean	4.282				
stdev	0.5572				

3.638	4.248	0.611	0.5888	0.3597033
3.738	4.174	0.437	0.3244	0.1416712
3.761	4.159	0.398	0.1976	0.0785822
3.850	4.078	0.227	0.0947	0.0215338
3.850	3.850	0.000	0	0
4.078	3.850	-0.227		
4.159	3.761	-0.398		
4.174	3.738	-0.437		
4.248	3.638	-0.611		
3.944	mean		Σb	0.6014904
0.2228499	stdev			
8	n-1			
0.829	critical w (95%)		w statistic	0.9106313

LOGNORMAL

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 005

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		NL			1188		6.0 - 9.0		
Normal Range				245-141	29.3-107				
Date Sample Taken			Analysis Results						
14-Feb-08	2.000	4.000	0.500	131	141	0.929	8.0	86.0	<1
20-Feb-08	2.000	4.000	0.500	120	137	0.876	7.3	77.0	<1
28-Feb-08	0.720	0.720	1.000	92	116	0.793	7.0	91.0	<1
5-Mar-08	2.000	3.000	0.667	98	120	0.817	7.5	90.0	<1
Dup	2.000	4.000	0.500	99	121	0.818	7.5	86.0	<1
12-Mar-08	2.000	3.000	0.667	132	149	0.886	7.6	92.0	<1
8-May-08	3.000	4.000	0.750	1101	1221	0.902	7.4	94.0	1.3
14-May-08	4.000	5.000	0.800	136	158	0.861	7.1	118.0	<1
Dup	3.000	5.000	0.600	142	172	0.826	7.1	94.0	<1
22-May-08	2.000	3.000	0.667	1230	1269	0.969	7.3	124.0	<1
29-May-08	2.000	4.000	0.500	1015	1049	0.968	7.3	134.0	<1
4-Jun-08	3.000	4.000	0.750	1039	1043	0.996	7.2	94.0	<1
11-Jun-08	4.000	5.000	0.800	1414	1471	0.961	7.5	92.0	<1

Average Translator Factor	0.67	0.89
Translator Impacted Effluent Limit	0.000	1331.244

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor
NL=No Limit

Outlier test

Cu(dissolved)	0.328504027	2.4017	2.234	**possible outlier**
ln(data)	0.693147181	0.7338	2.176	**not outlier**
duplicates removed	0.693147181			
ranked	0.693147181			
	0.693147181			
	0.693147181			
	0.693147181			
	1.098612289			
	1.098612289			
	1.386294361			
	1.386294361	1.2477	2.234	**not outlier**
		w statistic	critical w (from table)	

Cu(total)	-0.325504027	2.8365	2.234	**possible outlier**	
	1.098612289	1.2838	2.176	**not outlier**	
	1.098612289				
	1.098612289				
	1.386294361				
	1.386294361				
	1.386294361				
	1.386294361				
	1.386294361				
	1.609437912				
	1.609437912	0.7775	2.234	**not outlier**	
		w statistic	critical w (from table)		

Zn(dissolved	4.521788577	1.0625	2.234	**not outlier**	
	4.584967479				
	4.787491743				
	4.875197323				
	4.882801923				
	4.912654886				
	6.922643891				
	6.946013991				
	7.003974137				
	7.114769448				
	7.254177846	1.2077	2.234	**not outlier**	
		w statistic	critical w (from table)		

Zn(total)	4.753590191	1.0043	2.234	**not outlier**	
	4.787491743				
	4.919980926				
	4.94875989				
	5.003946306				
	5.062595033				
	6.949856455				
	6.955592608				
	7.107425474				
	7.145984468				
	7.293697721	1.2158	2.234	**not outlier**	
		w statistic	critical w (from table)		

Shapiro-Wilk test for Lognormality

ranked	reverse ranke	difference	coefficient	b_i
0.693147181	1.38629436	0.6931472	0.5739	0.3977972
0.693147181	1.38629436	0.6931472	0.3291	0.2281147
0.693147181	1.09861229	0.4054651	0.2141	0.0868101
0.693147181	1.09861229	0.4054651	0.1224	0.0496289
0.693147181	0.69314718	0	0.0399	0
0.693147181	0.69314718	0		
1.098612289	0.69314718	-0.4054651		
1.098612289	0.69314718	-0.4054651		
1.386294361	0.69314718	-0.6931472		
1.386294361	0.69314718	-0.6931472		
			Σb	0.7623509
0.912869638	mean		W (table)	0.842
0.299431007	st dev		W stat	0.7202343
9	n-1		NON-LOGNORMAL	

1.098612289	1.60943791	0.5108256	0.5739	0.2931528
1.098612289	1.60943791	0.5108256	0.3291	0.1681127
1.098612289	1.38629436	0.2876821	0.2141	0.0615927
1.386294361	1.38629436	0	0.1224	0
1.386294361	1.38629436	0	0.0399	0
1.386294361	1.38629436	0		
1.386294361	1.38629436	0		
1.386294361	1.09861229	-0.2876821		
1.609437912	1.09861229	-0.5108256		
1.609437912	1.09861229	-0.5108256		
			Σb	0.5228683
1.34461845	mean		W (table)	0.8420
0.191630489	st dev		W stat	0.82720
9	n-1		NON-LOGNORMAL	

4.521788577	7.25417785	2.7323893	0.5601	1.5304112
4.584967479	7.11476945	2.529802	0.3315	0.8386294
4.787491743	7.00397414	2.2164824	0.2260	0.500925
4.875197323	6.94601399	2.0708167	0.1429	0.2959197
4.882801923	6.92264389	2.039842	0.0695	0.141769
4.912654886	4.91265489	0	0.0000	0
6.922643891	4.88280192	-2.039842		
6.946013991	4.87519732	-2.0708167		
7.003974137	4.78749174	-2.2164824		
7.114769448	4.58496748	-2.529802		
7.254177846	4.52178858	-2.7323893		
			Σb	3.3076543
5.928469267	mean		W (table)	0.8500
1.187284958	st dev		W stat	0.7761
10	n-1		NON-LOGNORMAL	

4.753590191	7.29369772	2.5401075	0.5601	1.4227142
4.787491743	7.14598447	2.3584927	0.3315	0.7818403
4.919980926	7.10742547	2.1874445	0.2260	0.4943625
4.94875989	6.95559261	2.0068327	0.1429	0.2867764
5.003946306	6.94985646	1.9459101	0.0695	0.1352408
5.062595033	5.06259503	0	0.0000	0
6.949856455	5.00394631	-1.9459101		
6.955592608	4.94875989	-2.0068327		
7.107425474	4.91998093	-2.1874445		
7.145984468	4.78749174	-2.3584927		
7.293697721	4.75359019	-2.5401075		
			Σb	3.1209342
6.017533062	mean		W (table)	0.65
1.137160698	st dev		W stat	0.7532264
10	n-1		NON-LOGNORMAL	

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 019

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_b	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_b	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		30			288		6.0 - 9.0		
Normal Range		28.6-7.1		146-114	291-51.6				
Date Sample Taken			Analysis Results						
14-Feb-08	2	4	0.500	390	444	0.878	8.4	72.0	4.4
20-Feb-08	1	3	0.333	31	44	0.705	7.5	105.0	7.1
28-Feb-08	3	4	0.750	35	36	0.972	6.5	126.0	11.0
5-Mar-08	3	7	0.429	64	77	0.831	7.4	40.0	1.4
12-Mar-08	1	2	0.500	25	41	0.610	7.8	122.0	5.6
8-May-08	1	2	0.500	42	57	0.737	7.7	122.0	5.7
14-May-08	1	2	0.500	43	50	0.860	7.0	120.0	2.8
22-May-08	1	1	1.000	5	8	0.625	7.5	147.0	4.2
29-May-08	1	5	0.200	80	108	0.741	7.4	126.0	3.2
4-Jun-08	5	16	0.313	24	77	0.312	7.3	105.0	31.0
11-Jun-08	6	14	0.429	13	26	0.500	7.7	113.0	8.4
Dup	6	13	0.462	11	27	0.407	7.7	118.0	8.2

Average Translator Factor	0.49	0.68
Translator Impacted Effluent Limit	60.867	422.610

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

	outlier test			lognormal test				
Copper (Dissolved)	0	0.801179362	2.234 not outlier	0	1.79175947	1.7917595	0.5601	1.0035645
	0			0	1.60943791	1.6094379	0.3315	0.5335287
	0			0	1.09861229	1.0986123	0.2260	0.2482864
	0			0	1.09861229	1.0986123	0.1429	0.1569917
	0			0	0.69314718	0.6931472	0.0695	0.0481737
	0			0	0	0	0.0000	0
	0.693147181			0.693147181	0	-0.6931472		
	1.098612289			1.098612289	0	-1.0986123		
	1.098612289			1.098612289	0	-1.0986123		
	1.609437912			1.609437912	0	-1.6094379		
	1.791759469	1.708644093	2.234 not outlier	1.791759469	0	-1.7917595		
							Σb	1.9905449
				critical W	0.850		W stat	0.7774
						NON-LOGNORMAL		
Copper (Total)	0	1.588326678	2.234 not outlier	0	2.77258872	2.7725887	0.5601	1.5529269
	0.693147181			0.693147181	2.63905733	1.9459101	0.3315	0.6450692
	0.693147181			0.693147181	1.94591015	1.252763	0.2260	0.2831244
	0.693147181			0.693147181	1.60943791	0.9162907	0.1429	0.1309379
	1.098612289			1.098612289	1.38629436	0.2876821	0.0695	0.0199939
	1.386294361			1.386294361	1.38629436	0	0.0000	0
	1.386294361			1.386294361	1.09861229	-0.2876821		
	1.609437912			1.609437912	0.69314718	-0.9162907		
	1.945910149			1.945910149	0.69314718	-1.252763		
	2.63905733			2.63905733	0.69314718	-1.9459101		
	2.772588722	1.6589399	2.234 not outlier	2.772588722	0	-2.7725887		
							Σb	2.6320524
				critical W	0.850		W stat	0.9503
						LOGNORMAL		
Zinc (Dissolved)	1.609437912	1.81784638	2.234 not outlier	1.609437912	5.96614674	4.3567088	0.5601	2.4401926
	2.564949357			2.564949357	4.38202663	1.8170773	0.3315	0.6023611
	3.17805383			3.17805383	4.15888308	0.9808293	0.2260	0.2216674
	3.218875825			3.218875825	3.76120012	0.5423243	0.1429	0.0774981
	3.433987204			3.433987204	3.73766962	0.3036824	0.0695	0.0211059
	3.555348061			3.555348061	3.55534806	0	0.0000	0
	3.737669618			3.737669618	3.4339872	-0.3036824		
	3.761200116			3.761200116	3.21887582	-0.5423243		
	4.158883083			4.158883083	3.17805383	-0.9808293		
	4.382026635			4.382026635	2.56494936	-1.8170773		
	5.966146739	2.166924788	2.234 not outlier	5.966146739	1.60943791	-4.3567088		
							Σb	3.3628252
				critical W	0.850		W stat	0.9460
						LOGNORMAL		
Zinc (Total)	2.079441542	1.940977033	2.234 not outlier	2.079441542	6.09582456	4.016383	0.5601	2.2495761
	3.258096538			3.258096538	4.68213123	1.4240347	0.3315	0.4720675
	3.583518938			3.583518938	4.34380542	0.7602865	0.2260	0.1718247
	3.713572067			3.713572067	4.34380542	0.6302334	0.1429	0.0900603
	3.784189634			3.784189634	4.04305127	0.2588616	0.0695	0.0179909
	3.912023005			3.912023005	3.91202301	0	0.0000	0
	4.043051268			4.043051268	3.78418963	-0.2588616		
	4.343805422			4.343805422	3.71357207	-0.6302334		
	4.343805422			4.343805422	3.58351894	-0.7602865		
	4.682131227			4.682131227	3.25809654	-1.4240347		
	6.095824562	2.149188203	2.234 not outlier	6.095824562	2.07944154	-4.016383		
							Σb	3.0015196
				critical W	0.850		W stat	0.9343
						LOGNORMAL		

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 020

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		87			NL		6.0 - 9.0		
Normal Range		133-23.5							
Date Sample Taken			Analysis Results						
14-Feb-08	13	16	0.813	458	503	0.911	8.9	102.0	3.9
20-Feb-08	9	11	0.818	140	152	0.921	8.1	408.0	5.2
28-Feb-08	6	8	0.750	95	112	0.848	7.2	688.0	1.1
5-Mar-08	9	13	0.692	145	176	0.824	7.9	93.0	2.0
12-Mar-08	5	8	0.625	133	149	0.893	8.2	1100.0	2.7
8-May-08	6	12	0.500	80	121	0.661	8.1	2234.0	32.0
14-May-08	6	9	0.667	106	110	0.964	7.2	1901.0	2.7
23-May-08	6	8	0.750	74	74	1.000	7.8	2278.0	7.1

NOT

NL= No Limit

Average Translator Factor	0.70	0.88
Translator Impacted Effluent Limit	123.961	0.000

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 023

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		NL			NL		6.0 - 9.0		
Normal Range		17.6-5		225-50					
Date Sample Taken			Analysis Results						
14-Feb-08	8	9	0.889	604	658	0.918	8.0	50.0	2.3
20-Feb-08	7	7	1.000	85	89	0.955	7.2	111.0	1.6
28-Feb-08	4	6	0.667	58	66	0.879	7.2	67.0	1.4
5-Mar-08	2	4	0.500	310	355	0.873	7.3	37.0	2.6
12-Mar-08	4	4	1.000	73	94	0.777	8.1	184.0	3.7
	NOT								

NL= No Limit

Average Translator Factor	0.81	0.88
Translator Impacted Effluent Limit	0.000	0.000

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 028

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_b	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_b	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		24			NL		6.0 - 9.0		
Normal Range		31.7-5			381-113				
Date Sample Taken			Analysis Results						
14-Feb-08	1.00000	10	0.100	63	146	0.432	8.3	110.0	83.0
20-Feb-08	3	3	1.000	140	149	0.940	7.8	137.0	4.7
28-Feb-08	1	1	1.000	10	11	0.909	7.4	295.0	4.4
5-Mar-08	9	56	0.161	62	370	0.168	7.3	104.0	194.0
12-Mar-08	1	3	0.333	17	27	0.630	8.1	270.0	3.4
Dup	2	3	0.667	17	24	0.708	8.0	246.0	2.9
8-May-08	3	4	0.750	28	41	0.683	8.0	293.0	3.5
Dup	4	4	1.000	40	41	0.976	7.9	293.0	3.7
14-May-08	3	21	0.143	52	97	0.536	7.3	218.0	2.9
22-May-08	2	4	0.500	3	7	0.429	7.8	214.0	2.2
29-May-08	2	6	0.333	25	37	0.676	7.3	168.0	2.0
4-Jun-08	2	3	0.667	11	12	0.917	7.6	168.0	1.8
11-Jun-08	3	4	0.750	15	16	0.938	8.0	183.0	1.8

NL= No Limit

Average Translator Factor	0.57	0.69
Translator Impacted Effluent Limit	42.142	0.000

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

	outlier test			Shapiro Wilk Lognormality Test				
Copper (Dissolved)	0	1.20751649	2.234 not outlier	0	2.1972246	2.197224577	0.5601	1.23066549
	0			0	1.0986123	1.098612289	0.3315	0.36418997
	0			0	1.0986123	1.098612289	0.2260	0.24828638
	0.693147181			0.69314718	1.0986123	0.405465108	0.1429	0.05794096
	0.693147181			0.69314718	1.0986123	0.405465108	0.0695	0.02817983
	0.693147181			0.69314718	0.6931472	0	0.0000	0
	1.098612289			1.09861229	0.6931472	-0.40546511		
	1.098612289			1.09861229	0.6931472	-0.40546511		
	1.098612289			1.09861229	0	-1.09861229		
	1.098612289			1.09861229	0	-1.09861229		
	2.197224577	2.158259778	2.234 not outlier	2.19722458	0	-2.19722458		
							Σb	1.92926263
				critical W	0.850		W stat	0.8734
						LOGNORMAL		
Copper (Total)	0	1.554497657	2.234 not outlier	0	4.0253517	4.025351691	0.5601	2.25459948
	1.098612289			1.09861229	3.0445224	1.945910149	0.3315	0.64506921
	1.098612289			1.09861229	2.3025851	1.203972804	0.2260	0.27209785
	1.098612289			1.09861229	1.7917595	0.693147181	0.1429	0.09905073
	1.386294361			1.38629436	1.3862944	0	0.0695	0
	1.386294361			1.38629436	1.3862944	0	0.0000	0
	1.386294361			1.38629436	1.3862944	0		
	1.791759469			1.79175947	1.0986123	-0.69314718		
	2.302585093			2.30258509	1.0986123	-1.2039728		
	3.044522438			3.04452244	1.0986123	-1.94591015		
	4.025351691	2.142350957	2.234 not outlier	4.02535169	0	-4.02535169		
							Σb	3.27081728
				critical W	0.850		W stat	0.9023
						LOGNORMAL		
Zinc (Dissolved)	1.098612289	1.938500075	2.234 not outlier	1.09861229	4.9416424	3.843030134	0.5601	2.15248118
	2.302585093			2.30258509	4.1431347	1.840549633	0.3315	0.6101422
	2.397895273			2.39789527	4.1271344	1.729239112	0.2260	0.39080804
	2.708050201			2.7080502	3.9512437	1.243193517	0.1429	0.17765235
	2.833213344			2.83321334	3.3322045	0.498991166	0.0695	0.03467989
	3.218875825			3.21887582	3.2188758	0	0.0000	0
	3.33220451			3.33220451	2.8332133	-0.49899117		
	3.951243719			3.95124372	2.7080502	-1.24319352		
	4.127134385			4.12713439	2.3978953	-1.72923911		
	4.143134726			4.14313473	2.3025851	-1.84054963		
	4.941642423	1.629082327	2.234 not outlier	4.94164242	1.0986123	-3.84303013		
							Σb	3.36576366
				critical W	0.850		W stat	0.9763
						LOGNORMAL		
Zinc (Total)	1.945910149	1.374020636	2.234 not outlier	1.94591015	5.913503	3.967592857	0.5601	2.22224876
	2.397895273			2.39789527	5.0039463	2.606051033	0.3315	0.86390592
	2.48490665			2.48490665	4.9836066	2.498699972	0.2260	0.56470619
	2.772588722			2.77258872	4.574711	1.802122256	0.1429	0.25752327
	3.295836866			3.29583687	3.7135721	0.417735201	0.0695	0.0290326
	3.610917913			3.61091791	3.6109179	0	0.0000	0
	3.713572067			3.71357207	3.2958369	-0.4177352		
	4.574710979			4.57471098	2.7725887	-1.80212226		
	4.983606622			4.98360662	2.4849066	-2.49869997		
	5.003946306			5.00394631	2.3978953	-2.60605103		
	5.913503006	1.7343097	2.234 not outlier	5.91350301	1.9459101	-3.96759286		
							Σb	3.93741674
				critical W	0.850		W stat	0.9515
						LOGNORMAL		

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 030

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		19			NL		6.0 - 9.0		
Normal Range		78.2-22.5							
Date Sample Taken			Analysis Results						
14-Feb-08	34	42	0.810	293	310	0.945	8.2	78.0	<1
20-Feb-08	5	8	0.625	225	247	0.911	7.6	69.0	<1
20-Feb-08 (Dup)	4	6	0.667	230	231	0.996	Not Provided	71.0	<1
28-Feb-08	2	4	0.500	105	234	0.449	7.1	89.0	<1
5-Mar-08	8	19	0.421	135	174	0.776	7.5	64.0	2.7
12-Mar-08	5	9	0.556	160	183	0.874	8.0	80.0	3.1
8-May-08	9	15	0.600	335	390	0.859	7.7	86.0	4.9
14-May-08	16	27	0.593	232	254	0.913	7.0	108.0	<1
22-May-08	6	9	0.667	155	169	0.917	7.4	126.0	1.5
Dup	6	8	0.750	157	168	0.935	7.3	109.0	1.6
29-May-08	25	39	0.641	343	387	0.886	7.3	128.0	<1
4-Jun-08	8	9	0.889	175	183	0.956	7.4	107.0	<1
11-Jun-08	9	12	0.750	190	214	0.888	7.8	109.0	1.3

NL= No Limit

Average Translator Factor	0.65	0.87
Translator Impacted Effluent Limit	29.172	0.000

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

	outlier test			lognormality test				
Copper (Dissolved)	0.693147181	1.853800278	2.234 not outlier	0.693147181	3.526360525	2.8332133	0.5601	1.5868828
	1.609437912			1.609437912	3.218875825	1.6094379	0.3315	0.5335287
	1.609437912			1.609437912	2.772588722	1.1631508	0.2260	0.2628721
	1.791759469			1.791759469	2.197224577	0.4054651	0.1429	0.057941
	2.079441542			2.079441542	2.197224577	0.117783	0.0695	0.0081859
	2.079441542			2.079441542	2.079441542	0	0.0000	0
	2.197224577			2.197224577	2.079441542	-0.117783		
	2.197224577			2.197224577	1.791759469	-0.4054651		
	2.772588722			2.772588722	1.609437912	-1.1631508		
	3.218875825			3.218875825	1.609437912	-1.6094379		
	3.526360525	1.723486468	2.234 not outlier	3.526360525	0.693147181	-2.8332133		
							Σb	2.4494104
				critical W	0.850		W stat	0.9565
						LOGNORMAL		
Copper (Total)	1.386294361	1.707437126	2.234 not outlier	1.386294361	3.737669618	2.3513753	0.5601	1.3170053
	2.079441542			2.079441542	3.663561646	1.5841201	0.3315	0.5251358
	2.197224577			2.197224577	3.295836866	1.0986123	0.2260	0.2482864
	2.197224577			2.197224577	2.944438979	0.7472144	0.1429	0.1067769
	2.197224577			2.197224577	2.708050201	0.5108256	0.0695	0.0355024
	2.48490665			2.48490665	2.48490665	0	0.0000	0
	2.708050201			2.708050201	2.197224577	-0.5108256		
	2.944438979			2.944438979	2.197224577	-0.7472144		
	3.295836866			3.295836866	2.197224577	-1.0986123		
	3.663561646			3.663561646	2.079441542	-1.5841201		
	3.737669618	1.529699799	2.234 not outlier	3.737669618	1.386294361	-2.3513753		
							Σb	2.2327068
				critical W	0.850		W stat	0.9448
						LOGNORMAL		
Zinc (Dissolved)	4.65396035	1.69660741	2.234 not outlier	4.65396035	5.837730447	1.1837701	0.5601	0.6630296
	4.905274778			4.905274778	5.814130532	0.9088558	0.3315	0.3012857
	5.043425117			5.043425117	5.680172609	0.6367475	0.2260	0.1439049
	5.075173815			5.075173815	5.446737372	0.3715636	0.1429	0.0530964
	5.164785974			5.164785974	5.416100402	0.2513144	0.0695	0.0174664
	5.247024072			5.247024072	5.247024072	0	0.0000	0
	5.416100402			5.416100402	5.164785974	-0.2513144		
	5.446737372			5.446737372	5.075173815	-0.3715636		
	5.680172609			5.680172609	5.043425117	-0.6367475		
	5.814130532			5.814130532	4.905274778	-0.9088558		
	5.837730447	1.418958102	2.234 not outlier	5.837730447	4.65396035	-1.1837701		
							Σb	1.178783
				critical W	0.850		W stat	0.9625
						LOGNORMAL		
Zinc (Total)	5.129898715	1.14102662	2.234 not outlier	5.129898715	5.966146739	0.836248	0.5601	0.4683825
	5.159055299			5.159055299	5.958424693	0.7993694	0.3315	0.264991
	5.209486153			5.209486153	5.736572297	0.5270861	0.2260	0.1191215
	5.209486153			5.209486153	5.537334267	0.3278481	0.1429	0.0468495
	5.365976015			5.365976015	5.509388337	0.1434123	0.0695	0.0099672
	5.455321115			5.455321115	5.455321115	0	0.0000	0
	5.509388337			5.509388337	5.365976015	-0.1434123		
	5.537334267			5.537334267	5.209486153	-0.3278481		
	5.736572297			5.736572297	5.209486153	-0.5270861		
	5.958424693			5.958424693	5.159055299	-0.7993694		
	5.966146739	1.615126886	2.234 not outlier	5.966146739	5.129898715	-0.836248		
							Σb	0.9093116
				critical W	0.850		W stat	0.8982
						LOGNORMAL		

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 037

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_D	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_D	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		21			207		6.0 - 9.0		
Normal Range		32.1-5		375-50	379-50				
14-Feb-08	2	2	1.000	133	136	0.978	8.1	643.0	<1
20-Feb-08	2	1	1.000	97	100	0.970	7.6	416.0	1.0
28-Feb-08	2	2	1.000	130	141	0.922	7.4	438.0	<1
5-Mar-08	3	7	0.429	121	166	0.729	7.7	320.0	<1
12-Mar-08	2	3	0.667	60	74	0.811	8.0	284.0	<1
	NOT								

Average Translator Factor	0.82	0.88
Translator Impacted Effluent Limit	25.640	234.712

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: 084

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Copper f_b	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	Zinc f_b	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit		19.000			NL		6.0 - 9.0		
Normal Range									
Date Sample Taken			Analysis Results						
14-Feb-08	1	1	1.000	22	40	0.550	8.2	204.0	3.2
14-Feb-08 (Dup)	1	1	1.000	28	61	0.459	Not Provided	190.0	Not Provided
20-Feb-08	2	4	0.500	32	55	0.582	8.1	170.0	3.3
28-Feb-08	.72	1	0.720	7	15	0.467	7.9	244.0	2.0
5-Mar-08	5	28	0.179	41	197	0.208	8.0	146.0	12.0
12-Mar-08	1	1	1.000	16	28	0.571	8.0	222.0	3.2
8-May-08	1	1	1.000	26	35	0.743	8.1	239.0	2.2
14-May-08	1	3	0.333	33	53	0.623	7.7	186.0	1.5
22-May-08	4	5	0.800	6	20	0.300	7.7	105.0	1.2
29-May-08	3	6	0.500	37	47	0.787	7.5	94.0	1.0
4-Jun-08	2	3	0.667	23	25	0.920	7.8	33.0	<1
Dup	2	3	0.667	24	25	0.960	7.6	34.0	<1
11-Jun-08	3	3	1.000	21	21	1.000	8.0	65.0	<1

Average Translator Factor	0.72	0.63
Translator Impacted Effluent Limit	26.374	0.000

Values less than one (<1) were present as one (1) for worst case assumption/ calculation of Translator Factor

	outlier test			lognormality test				
Copper (Dissolved)	-0.328504067	1.345374197	2.234 not outlier	-0.32850407	1.60943791	1.937942	0.5601	1.0854413
	0			0	1.38629436	1.3862944	0.3315	0.4595566
	0			0	1.09861229	1.0986123	0.2260	0.2482864
	0			0	1.09861229	1.0986123	0.1429	0.1569917
	0			0	0.69314718	0.6931472	0.0695	0.0481737
	0.693147181			0.69314718	0.69314718	0	0.0000	0
	0.693147181			0.69314718	0	-0.6931472		
	1.098612289			1.09861229	0	-1.0986123		
	1.098612289			1.09861229	0	-1.0986123		
	1.386294361			1.38629436	0	-1.3862944		
	1.609437912	1.562064961	2.234 not outlier	1.60943791	-0.32850407	-1.937942		
							Σb	1.9984497
				critical W	0.850		W stat	0.8989
						LOGNORMAL		
Copper (Total)	0	1.007968586	2.234 not outlier	0	3.33220451	3.3322045	0.5601	1.8663677
	0			0	1.79175947	1.7917595	0.3315	0.5939683
	0			0	1.60943791	1.6094379	0.2260	0.363733
	0			0	1.38629436	1.3862944	0.1429	0.1981015
	1.098612289			1.09861229	1.09861229	0	0.0695	0
	1.098612289			1.09861229	1.09861229	0	0.0000	0
	1.098612289			1.09861229	1.09861229	0		
	1.386294361			1.38629436	0	-1.3862944		
	1.609437912			1.60943791	0	-1.6094379		
	1.791759469			1.79175947	0	-1.7917595		
	3.33220451	2.228527841	2.234 not outlier	3.33220451	0	-3.3322045		
							Σb	3.0221704
				critical W	0.850		W stat	0.8616
						LOGNORMAL		
Zinc (Dissolved)	1.791759469	1.944179037	2.234 not outlier	1.79175947	3.71357207	1.9218126	0.5601	1.0764072
	1.945910149			1.94591015	3.61091791	1.6650078	0.3315	0.5519501
	2.772588722			2.77258872	3.49650756	0.7239188	0.2260	0.1636057
	3.044522438			3.04452244	3.4657359	0.4212135	0.1429	0.0601914
	3.091042453			3.09104245	3.25809654	0.1670541	0.0695	0.0116103
	3.135494216			3.13549422	3.13549422	0	0.0000	0
	3.258096538			3.25809654	3.09104245	-0.1670541		
	3.465735903			3.4657359	3.04452244	-0.4212135		
	3.496507561			3.49650756	2.77258872	-0.7239188		
	3.610917913			3.61091791	1.94591015	-1.6650078		
	3.713572067	1.074139932	2.234 not outlier	3.71357207	1.79175947	-1.9218126		
							Σb	1.8637646
				critical W	0.850		W stat	0.8568
						LOGNORMAL		
Zinc (Total)	2.708050201	1.282003984	2.234 not outlier	2.7080502	4.00733319	1.299283	0.5739	0.7456585
	2.995732274			2.99573227	3.97029191	0.9745596	0.3291	0.3207276
	3.044522438			3.04452244	3.8501476	0.8056252	0.2141	0.1724843
	3.218875825			3.21887582	3.68887945	0.4700036	0.1224	0.0575284
	3.33220451			3.33220451	3.55534806	0.2231436	0.0399	0.0089034
	3.555348061			3.55534806	3.33220451	-0.2231436		
	3.688879454			3.68887945	3.21887582	-0.4700036		
	3.850147602			3.8501476	3.04452244	-0.8056252		
	3.970291914			3.97029191	2.99573227	-0.9745596		
	4.007333185	1.276233805	2.176 **not outlier**	4.00733319	2.7080502	-1.299283		
	5.283203725	2.398797939	2.234 **possible outlier**					
							Σb	1.3053023
				critical W	0.842		W stat	0.9484
						LOGNORMAL		

Northrop Grumman: Cumulative Results for Metal Translator Study
Outfall No.: Field Blank

	Copper (Dissolved) (ug/L)	Copper (Total) (ug/L)	Zinc (Dissolved) (ug/L)	Zinc (Total) (ug/L)	pH (S.U.)	Hardness (mg/L)	TSS (mg/L)
Discharge Limit							
Normal Range							
Date Sample Taken	Analysis Results						
14-Feb-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
20-Feb-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
28-Feb-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
5-Mar-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
12-Mar	<1	<1	<5	7.000	Not Provided	Not Provided	Not Provided
8-May-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
14-May-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
22-May-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
29-May-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided
4-Jun-08	<1	2.000	8.000	8.000	Not Provided	Not Provided	Not Provided
11-Jun-08	<1	<1	<5	<5	Not Provided	Not Provided	Not Provided