

Norlite Corporation



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WJZ-215-92

Mr. William Clarke
Regional Permit Administrator
New York State Department of
Environmental Conservation
Region 4
2176 Guilderland Ave.
Schenectady, New York 12306



Subject: Study of Precipitate Observed in the Salt Kill Creek

Dear Mr. Clarke:

Norlite is submitting with this letter a study plan to investigate the precipitate observed in the Salt Kill Creek. This plan was prepared in response to discussions at our meeting of September 23, 1992, as well as your letter of October 8, 1992.

The attached study plan is designed to evaluate the effect of the carbonate scrubbing solution used in Norlite's APC system on the natural hardness of the Salt Kill Creek. It is possible that the carbonate may be the cause of the precipitate formation. If this is the case, Norlite will determine as part of this study possible substitutes for carbonate, or will propose a reduction in the use of carbonate by using more lime in the baghouse.

Norlite would like to emphasize that the effect is not caused by metals or particulates in the scrubber blowdown, and is not a result of the approval by DEC of the higher LGF metals limits in advance of construction of wastewater treatment. The precipitate is almost certain to be calcium carbonate, based on the appearance of the precipitate. Norlite's soda ash usage has been higher with improvements made to the pH control system on both Kiln #1 and #2 APC systems following the effective date of the new Part 373 permit. This study will help to optimize the dosage and our pH control system so as not to result in this effect in the future.

As can be seen from the attached study plan, there is a significant amount of laboratory evaluation involved, followed by analytical work on different fractions generated in the laboratory studies. The study will take until mid-December to complete. Norlite is proceeding with this study immediately.



Mr. William Clarke
October 15, 1992
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If you have any questions, please contact Rich Schlauch at (803) 324-5310, or Bill Voshell.

Sincerely,

A handwritten signature in blue ink that reads "William J. Ziegler".

William J. Ziegler
Vice President of Health, Safety
and Environmental Affairs

WJZ:ncm

Attachment

cc: Carol Lamb-LaFay, DEC Region 4
Sanjay Saraiya, DEC Wolf Road

William Voshell
Richard Schlauch
Dallas Robinson
Mark Taylor
Donald Faul

**PROPOSAL TO STUDY SOURCE AND IMPACT OF SEDIMENTS
IN SALT KILL CREEK DOWNSTREAM OF THE NORLITE FACILITY**

OBJECTIVES

This proposal describes a procedure to determine the chemical composition of the sediment material that has been observed in the creek bed downstream of Norlite's Outfall 005 discharge. This material appears to be a fine precipitate which is not typical of the silt or clay deposits upstream of the Outfall 005 discharge point.

Observation of the characteristics of the Outfall 005 discharge over the past several months indicates that this effluent **does not contain** very high levels of suspended or settleable solids. If significant concentrations of precipitated material or silt are being deposited in the stream bed from Outfall 005 discharge, it is suspected that this is the result of excess alkalinity (i.e., dissolved carbonates) in the effluent which precipitate **after** combining with the natural hardness of the Salt Kill water (i.e., calcium and magnesium).

The following analytical testing and study is proposed to determine what the major chemical components of the typical stream sediments are (both upstream and downstream of Outfall 005). The study will further demonstrate, by both analysis and laboratory testing, what the potential is for the Outfall 005 discharge (i.e., scrubber blowdowns) combined with upstream Salt Kill water samples to form precipitates after they are mixed together at the typical volume ratio (i.e., 1 part by volume of 005 discharge to 7.5 parts by volume of Salt Kill flow). This volume ratio is based on a typical Outfall 005 flow of 60 gpm and Salt Kill flow of 1 cu ft/sec (i.e., 450 gpm). Any precipitated material that may be formed after combining the Outfall 005 discharge samples with the upstream Salt Kill samples will be characterized to determine chemical composition and concentration of the material in comparison with the stream bottom sediment samples.

Based on typical stream flow rate and Outfall 005 discharge flow rate, the mass of any precipitated material (demonstrated by this study to form after combination of the 005 discharge samples with the Salt Kill upstream samples) will be calculated. Additionally, based on the results of this study, recommendations will be made as to measures that will prevent or reduce the mass of any precipitated material that may be demonstrated to form by the admixing of Outfall 005 discharge with the upstream Salt Kill Creek water.

PROCEDURE

I. Sample Collection

During a typical period of Norlite Kiln and scrubber operations, together with normal weather conditions (i.e., non-storm runoff), grab samples of the Outfall 005 discharge; the upstream and downstream Salt Kill waters; and upstream and downstream Salt Kill bottom sediments will be collected daily for a period of 5 consecutive days. The samples will be collected and combined as follows:

A. Each day a 2-liter grab sample of 005 discharge will be split into various portions as follows;

Sample A.1 - A 750-ml portion of the Outfall 005 grab sample will be composited each day into a 1-gallon 5-day composite and preserved only by refrigeration. A 200-ml portion of this grab sample will be added daily to a 1-liter glass jar, preserved with HNO_3 , to form a 5-day composite. The non-acidified portions will be designated Sample A-1 and the HNO_3 preserved portion will be designated Sample A.1 (HNO_3 preserved).

Sample A.2 - A one-liter portion of each daily 005 grab sample will be measured for pH and temperature and then settled in an Imhoff cone for 60-minutes to measure settleable solids concentrations. Then, 90-ml of the supernatant in the Imhoff cone is saved each day for preparing composite sample C (to be described) and 750 mls are combined into a 1-gallon 5-day composite designated Sample A.2. Also, a 50-ml portion of each daily supernatant is combined in a 250-ml glass jar preserved with HNO_3 . The non-acidified 1-gallon composite is designated Sample A.2 and the 250-ml acidified composite is designated Sample A.2 (HNO_3 preserved).

B. Each daily 2-liter grab sample of upstream Salt Kill water will be split into various portions as follows;

Sample B.1 - A 750-ml sample of upstream water will be composited each day into a 1-gallon 5-day composite of the daily grab samples and preserved by refrigeration. A 200-ml portion will be composited in a 1-liter glass jar preserved with HNO_3 . These will be designated composite Sample B.1 (i.e., 1-gallon non-acidified) and B.1 (HNO_3 preserved).

Sample B.2 - A 1-liter portion of each daily upstream creek sample will be measured for pH, temperature and settled in an Imhoff cone for 60-minutes to measure settleable solids concentration. A 660-ml portion of this supernatant sample is saved each day for preparing composite Sample C.

Also, a 200-ml portion of each daily supernatant will be combined into a 1-liter non-acidified 5-day composite designated as composite Sample B.2. Additionally, a 50-ml portion of each daily supernatant will be combined into a 250-ml glass jar preserved with HNO_3 and designated composite Sample B.2 (HNO_3 preserved).

C. Each day, combine the 90-ml of Imhoff cone supernatant saved from Outfall 005 (i.e., Sample A.2) with the 660-ml portion of supernatant saved from the upstream grab sample (i.e., Sample B.2) in a 1-gallon non-acidified 5-day composite designated composite Sample C.

D. Each daily grab sample of downstream creek water will be split into various portions as follows;

Sample D.1 - A 750-ml portion of the downstream creek daily grab will be composited daily into a 5-day 1-gallon composite and preserved by refrigeration. Also, a 200-ml portion of this sample will be combined daily in a 1-liter glass jar preserved with HNO_3 . The non-acidified 1-gallon sample will be designated composite Sample D.1 and the 1-liter acid preserved sample will be designated composite Sample D.1 (HNO_3 preserved).

E. Collect a 750-ml sample of the fine bottom silt and sediment from the upstream creek bed (consisting of approximately 50% by volume liquid and 50% by volume settled solids) each day by scooping the sediment off the bottom and measuring in a 1-liter graduated cylinder. Avoid collecting sand and pebbles with this sediment sample. Combine the daily 750-ml bottom sediment samples into a 1-gallon 5-day composite designated composite Sample E.

F. Collect a 750-ml sample of fine bottom silt and sediment from the downstream creek bed (consisting of approximately 50% by volume liquid and 50% by volume settled solids) each day by scooping the sediment off the bottom and measuring in a 1-liter graduated cylinder. Avoid collecting sand and pebbles with this sediment sample. Combine the daily 750-ml bottom sediment samples into a 1-gallon 5-day composite designated composite Sample F.

II. Sample Analysis

A. At the completion of the 5-day sampling procedure, all composite samples designated A.1, B.1, D.1, A.2, B.2 and D.2 (including both the 1-gallon non-acidified samples, as well as the HNO₃ preserved portions) will be sent directly to a New York State certified analytical laboratory for the following analyses:

1. All the 1-gallon (non-acidified) composites are shaken well prior to analysis and analyzed by standard wet chemical analysis for the following parameters;

- o Total hardness
- o Total alkalinity
- o Carbonate alkalinity
- o Bicarbonate alkalinity
- o Hydroxide alkalinity
- o Total silica (SiO₂)
- o Total sulfate
- o Total suspended solids
- o Total dissolved solids
- o pH value

All the above parameters are to be determined using procedures described in "Standard Methods for Analysis of Water and Wastewater."

2. All the HNO₃ preserved portions of these composite samples are analyzed by New York State approved ICP or AA methods for the following metals;

- o Total calcium
- o Total magnesium
- o Total iron
- o Total manganese
- o Total aluminum

B. At the completion of the 5-day sampling period, all composite samples designated C., E. and F. will be sent to a laboratory for liquid-solid separation by bench test procedures as follows;

Step 1. Laboratory Separations

1. Each composite sample (i.e., C., E. and F.) is well shaken, measured for pH, and then strained through a U.S. Standard 100-mesh (i.e., 0.15 mm opening) stainless steel sieve. The retained solids (if any) are collected, weighed and placed in separate glass jars (unpreserved) and designated Sample C.1, E.1 and F.1 to correspond with the original composite sample.

2. The portion of each composite sample that passes through the 100-mesh sieve is then individually filtered through a pre-weighed and pre-rinsed Whatman #42 filter paper by vacuum flask fitted with a buchner funnel. The vacuum is applied until the free liquid stops coming from the solids residue cake on the filter paper. Each filter cake is then weighed with the filter paper and the filter paper weight subtracted from the total. The filter papers are removed and each solids residue is placed in a separate glass jar designated Sample C.2, E.2 and F.2.

Step 2. Sample Residue Analysis

A. All solid residues including Samples C.1, E.1, F.1, C.2, E.2 and F.2 are analyzed by x-ray diffraction methods for the following elements:

- o Total calcium
- o Total magnesium
- o Total iron
- o Total manganese
- o Total aluminum
- o Total carbon
- o Total oxygen
- o Total silicon
- o Total sulfur

RELEVANT DETERMINATIONS

By performing the above described analysis and laboratory tests, the following can be determined:

I. Creek Parameter Composition Compared to Outfall 005 Parameter Composition

Analysis of raw samples of Outfall 005, upstream Salt Kill and downstream Salt Kill samples (i.e., Samples A.1, B.1 and D.1) for conventional surface water parameters that may cause formation of suspended solids (such as hardness, alkalinity, metals, suspended and dissolved solids and pH value) will indicate the potential amount of precipitation that can be calculated for a variety of the two stream admixing volume ratios.

II. Raw Sample Quality Compared to Settled Sample Quality

Analysis of settled sample supernatants of Outfall 005, and upstream and downstream Salt Kill samples (i.e., Samples A.2, B.2 and D.2) indicate the relative concentration of each parameter in the streams that are in solution (dissolved) as compared to the total parameter concentrations. This will enable an accurate evaluation of exactly which parameters are precipitating after admixing of the 005 discharge with the Salt Kill in addition to which parameters are already precipitated in each stream.

This information will be used to calculate the mass of suspended solids contributed by Outfall 005 as well as the mass of suspended solids contributed by the Salt Kill itself after admixing of the two streams.

III. Field Blend Evaluation of Outfall 005 with Salt Kill Samples

By blending the settled supernatants of Outfall 005 grab samples with Salt Kill grab sample supernatants (i.e., Sample C), the exact composition and mass of the material generated after admixing of these two streams at the typical flow volume ratio can be determined. This is accomplished by filtering the precipitated material from Sample C and performing an elemental analysis (by x-ray diffraction) of the composition of the solid residue.

The elemental composition of the precipitated material generated in this field blending test can then be compared with the suspended solids composition calculated by the difference between wet chemical and metals analyses of the raw and settled supernatant downstream Salt Kill samples (i.e., Samples D.1 vs. D.2). This comparison will verify the accuracy of the volume ratio used to field blend samples of Outfall 005 with upstream Salt Kill (i.e., ratio of Samples A.2 and B.2 used in the blend).

IV. Comparison of Upstream and Downstream Salt Kill Bottom Sediments

Elemental analysis of the solids sediment from upstream and downstream creek bed samples will give a direct indication of the type of material possibly contributed by the Outfall 005 point source. However, the concentrations and mass of these contributed materials cannot be readily established by direct analysis alone because of the variable and heterogenous nature of the creek bed. Concentration and mass contributions must be verified by the analyses performed on all the other samples collected and analyzed (i.e., Samples A.1, B.1, D.1, A.2, B.2, D.2 and C).

The composition determined for representative composite bottom sediments should, however, verify the reliability of the water-wastewater blending tests and direct creek analysis evaluations as to the source of these sediments.

CONCLUSIONS AND RECOMMENDATIONS

I. Source and Composition of Creek Bed Sediments

This study will conclude what the source/s and composition of the creek bed sediments are immediately downstream of the Norlite facility.

II. Concentration and Mass of Sediment Formation

Through sample analyses and mass balance calculations, the rate of sediment deposition will be determined. The effect of creek flow rate and scrubber blowdown composition variations on sediment deposition will be determined.

III. Operational Adjustments

Recommendations for improvement and reduction of the deposition of creek bed sediment immediately downstream of the Norlite facility will be made.

These recommendations will include possible process variable changes such as:

- A. Operation at a lower blowdown pH (i.e., pH 6.5 to 7.5) rather than a higher pH (i.e., pH 8 to 9) to reduce the precipitation of calcium carbonate in the creek.
- B. Reduction of sodium carbonate feed rate to the scrubbers by increased use of lime to the baghouses.
- C. Substitution of sodium hydroxide (i.e., caustic soda) for sodium carbonate (i.e., soda ash) for all or part of the alkalinity required to control scrubber recycle pH above the required level of 8.0.

The above process variables will be evaluated by comparing laboratory tested dosages of sodium carbonate required to initiate precipitation (in the Salt Kill water) with theoretical concentration calculations based on analysis of the individual samples collected in this study.

NORLITE FACILITY

SALT KILL CREEK SEDIMENT STUDY
SAMPLE ANALYSIS PLAN

PARAMETERS ANALYZED	SAMPLES ANALYZED	MATRIX	NUMBER SAMPLES
Wet Chemistry Methods; Total Hardness Total Alkalinity CO ₃ Alkalinity HCO ₃ Alkalinity OH Alkalinity SiO ₂ Total Sulfate TSS TDS pH	A.1, B.1, D.1 A.2, B.2, D.2	Aqueous Aqueous	6
ICP Spectrophotometry Total Calcium Total Magnesium Total Iron Total Manganese Total Aluminum	A.1, B.1, D.1 A.2, B.2, D.2	Aqueous Aqueous	6
X-Ray Diffraction Total Calcium Total Iron Total Aluminum Total Carbon Total Oxygen Total Silicon Total Sulfur	C.1, E.1, F.1 C.2, E.2, F.2	<u>SOLIDS</u> Soil/Silt Silt/Filter Cake	6

TOTAL SAMPLES ANALYZED

12

NORLITE FACILITY
SALT KILL CREEK SEDIMENT STUDY
SAMPLE DESIGNATION/DESCRIPTION MATRIX

A.1 OUTFALL 005 WASTEWATER DISCHARGE	B.1 UPSTREAM SALT KILL CREEK WATER	C. BLEND OF 1-PART A.2 + 7.3 PARTS B.2	D.1 DOWNSTREAM SALT KILL CREEK WATER	E. SEDIMENT UPSTREAM SALT KILL CREEK BED	F. SEDIMENT DOWNSTREAM SALT KILL CREEK BED
A.2 SUPERNATANT OF OUTFALL 005 DISCHARGE	B.2 SUPERNATANT OF UPSTREAM SALT KILL WATER	C.1 COARSE SOLIDS + 100 MESH FROM SAMPLE C.	D.2 SUPERNATANT OF DOWNSTREAM SALT KILL WATER	E.1 +100 MESH SOLIDS STRAINED FROM SAMPLE E.	F.1 +100 MESH SOLIDS STRAINED FROM SAMPLE F.
		C.2 FINE SOLIDS - 100 MESH FILTER CAKE FROM SAMPLE C.		E.2 -100 MESH SOLIDS RESIDUE FILTERED FROM SAMPLE E.	F.2 -100 MESH SOLIDS RESIDUE FILTERED FROM SAMPLE F.

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October 30, 1992

Mr. William J. Clarke
Regional Permit Administrator
NYSDEC - Region 4
2176 Guilderland Avenue
Schenectady, New York 12306

NOV 10 1992

Dear Mr. Clarke:

This letter is to inform the Department that Norlite Corporation has initiated sampling and analysis for the mid-pond. In years past, the mid-pond served as a polishing pond prior to discharge to the Salt Kill under a prior DEC SPDES permit. The analyses should confirm that the solids are consistent with those excavated from the former shale fines settling pond and which were placed into our non hazardous landfill permitted under 6NYCRR 360. Results of those analyses will be forwarded to your office once they are received. This sampling also constitutes "groundbreaking" for the scheduled installation of the \$3.1 million wastewater treatment facility under DEC SPDES permit #4-0103-16/20-0.

Should there be any questions, call me at 518/235-0401.

Sincerely,

NORLITE CORPORATION

William Voshell

William Voshell
Director of Compliance