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NAS PENSACOLA
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RECOVERY WELL REHABILITATION DESIGN AND PRELIMINARY MAINTENANCE PLAN
INDUSTRIAL WASTEWATER TREATMENT PLANT NAS PENSACOLA FL
11/1/1994
RUST ENVIRONMENTAL & INFRASTRUCTURE INC

701.1

**FINAL
RECOVERY WELL REHABILITATION DESIGN
AND
PRELIMINARY MAINTENANCE PLAN**

**INDUSTRIAL WASTEWATER TREATMENT PLANT
NAVAL AIR STATION, PENSACOLA, FLORIDA**

PREPARED FOR

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHERN DIVISION
Charleston, South Carolina

PREPARED BY

RUST ENVIRONMENT AND INFRASTRUCTURE, INC.
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North Charleston, South Carolina 29406

RUST E&I PROJECT NO. 89656.000

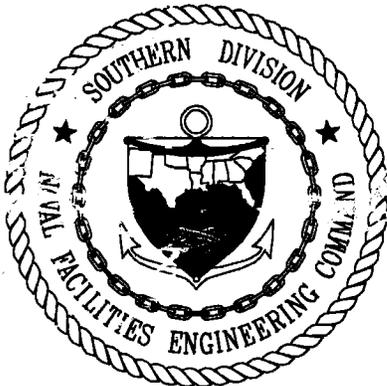
NOVEMBER 1994



**RECOVERY WELL REHABILITATION
DESIGN AND PRELIMINARY
MAINTENANCE PLAN**

**INDUSTRIAL WASTEWATER TREATMENT PLANT
NAVAL AIR STATION, PENSACOLA, FLORIDA**

NOVEMBER 1994



**NAVAL FACILITIES ENGINEERING COMMAND
SOUTHERN DIVISION
CHARLESTON, SOUTH CAROLINA**

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1.0 INTRODUCTION

This Recovery Well Rehabilitation Design and Preliminary Maintenance Plan describes the operations and details the procedures that will be followed by RUST Environment and Infrastructure (RUST E&I) and its subcontractors to conduct the field work for the recovery well rehabilitation at the Naval Air Station (NAS) in Pensacola, Florida. The goal is to restore specific capacity to acceptable sustainable levels in five (5) of the seven (7) recovery wells RW-3, RW-4, RW-5A, RW-6 and RW-7. This plan is presented in accordance with the Southern Division Naval Facilities Engineering Command (NAVFAC) Statement of Work dated May 20, 1994 for the Contract No. N62467-93-D-0662/1826/04.

The purpose of this plan is to present a phased approach to implement recovery well rehabilitation at the Industrial Wastewater Treatment Plant (IWTP) at NAS Pensacola, Florida. Phase 1 is the design of a recovery well rehabilitation and preliminary maintenance plan (presented herein). Phase 2 is the implementation of Phase I and finalizing the maintenance plan. Phase 3 is the implementation of periodic maintenance requirements through July 15, 1995.

2.0 PROJECT DESCRIPTION

2.1 Objectives

The primary objective of the activities described in this plan is to fulfill the requirements specified in the NAVFAC Statement of Work dated May 20, 1994 for the Contract No. N62467-93-D-0662/1826/04. The activity which has been contracted to RUST E&I is:

- 1) Phase 1 - Design of Recovery Well Rehabilitation and Preliminary Maintenance Plan for Recovery Wells RW-3, RW-4, RW-5A, RW-6 and RW-7.

The activities which will be contracted to RUST E&I are:

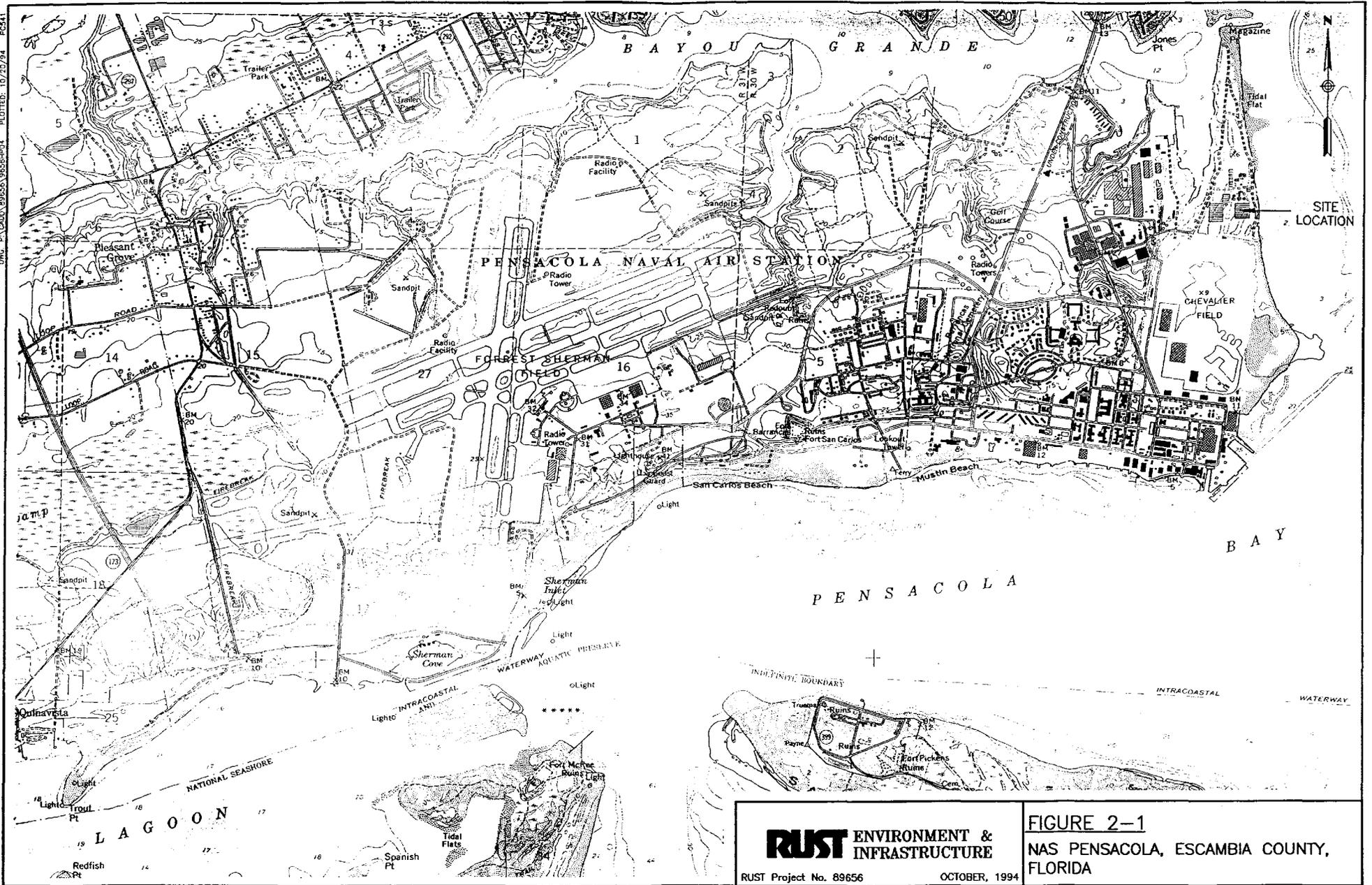
- 1) Phase 2 - Implementation of Recovery Well Rehabilitation and Finalizing the Maintenance Plan; and
- 2) Phase 3 - Implementation of Periodic Maintenance Requirements through July 15, 1995.

2.2 Site Description

NAS Pensacola occupies approximately 5800 acres on a peninsula in southern Escambia County, 5 miles southwest of the city of Pensacola (Figure 2-1). The sludge drying beds and surge pond are located on a peninsula in the northeast corner of NAS between Pensacola Bay and Bayou Grande (Figure 2-2). The drying beds and surge pond were associated with the IWTP which received wastewater generated by activities on NAS property.

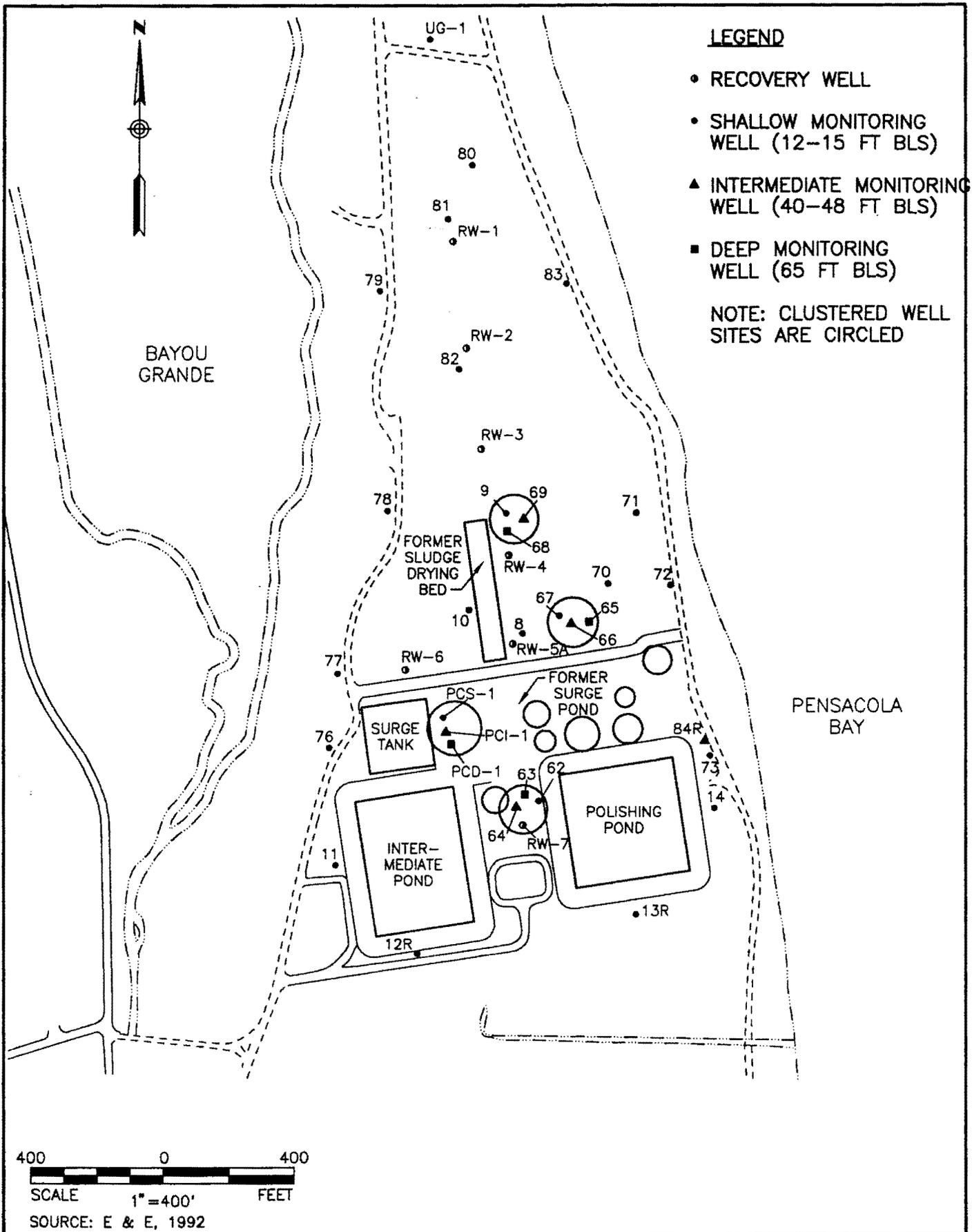
A total of 32 ground-water monitoring wells and seven (7) recovery wells are located at the IWTP (Figure 2-2). These wells are divided into three categories--shallow (12-15 feet below land surface (bls)), intermediate (40-48 feet bls), and deep (65-70 feet bls). The majority of the monitoring wells on the site are shallow, but four clusters include one each of the three depth categories. Nineteen (19) of these wells are used as ground-water sampling points under the current RCRA Post-Closure permit. Table 2-1 provides the well construction information for all of the on-site wells at the IWTP. Also included on this table are the water levels and calculated water level elevations for the IWTP wells measured on July 11, 1994, as well as the total well depth for each well.

DWG. P. CADW. 89656A 9656-HP04 PLOTTED: 10/20/94 PC341



RUST ENVIRONMENT & INFRASTRUCTURE
 RUST Project No. 89656 OCTOBER, 1994

FIGURE 2-1
NAS PENSACOLA, ESCAMBIA COUNTY, FLORIDA



RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-2
LOCATION OF MONITORING AND RECOVERY WELLS

TABLE 2-1
CONSTRUCTION DETAILS OF MONITORING AND RECOVERY WELLS*
WATER LEVEL ELEVATIONS - JULY 11, 1994
NAS PENSACOLA WTP

WELL DESIGNATION	INSTALLATION DATE	TOTAL DEPTH DRILLED (ft)	SCREENED INTERVAL (ft)	DEPTH TO FILTER PACK (ft)	TOC ELEVATION (ft/msl)	TOTAL DEPTH BTOC (7/12/93)	DEPTH TO WATER (ft BTOC) (1/10/94)	WATER LEVEL ELEVATION (ft msl) (1/10/94)
SHALLOW ZONE WELLS								
GM-8	3/84	12.00	9.5 - 12.0	5.50	5.94	12.76	3.35	2.59
GM-9	3/84	12.00	9.3 - 11.8	5.30	5.47	12.76	2.94	2.53
GM-10	3/84	12.00	9.5 - 12.0	5.50	5.67	12.73	2.99	2.68
GM-11	3/84	12.00	9.3 - 11.8	5.50	5.75	12.72	3.16	2.59
GM-12R ^a	4/88	15.00	11.0 - 14.0	NA	9.66	17.46	6.39	3.27
GM-13R ^b	11/91	12.00	9.5 - 12.0	5.50	7.27	14.86	4.65	2.62
GM-14	3/84	12.00	8.9 - 11.4	5.00	4.40	12.77	2.42	1.98
GM-62	8/85	15.00	12.5 - 15.0	4.00	6.95	17.83	3.95	3.00
GM-67	8/85	15.00	12.5 - 15.0	8.00	6.23	17.85	3.76	2.47
GM-70	8/85	15.50	12.5 - 15.0	7.00	6.96	---	DRY ^c	DRY ^c
GM-71	8/85	12.50	10.0 - 12.5	7.00	6.60	12.85	4.66	1.94
GM-72	8/85	12.50	10.0 - 12.5	7.00	7.25	12.85	5.51	1.74
GM-73	8/85	15.00	12.5 - 15.0	7.00	12.23	17.86	10.44	1.79
GM-76	NA	13.50	11.0 - 13.5	6.00	7.72	12.84	5.84	1.88
GM-77	NA	13.50	11.0 - 13.5	5.00	4.55	12.9	3.55	1.00
GM-78	NA	13.00	10.5 - 13.0	8.00	6.86	12.88	4.51	2.35
GM-79	NA	12.50	10.0 - 12.5	7.00	4.60	12.85	2.66	1.94
GM-80	NA	13.50	11.0 - 13.5	8.00	4.56	12.9	2.47	2.09
GM-81	NA	12.50	10.0 - 12.5	8.00	4.21	12.87	1.99	2.22
GM-82	NA	12.50	10.0 - 12.5	7.00	3.59	13.62	1.70	1.89
GM-83	NA	12.50	10.0 - 12.5	8.00	4.74	12.84	3.39	1.35
PCS-1	3/90	20.00	15.0 - 19.75	14.00	11.22	22.34	8.25	2.97
UG-1	1981	10.40	5.4 - 10.4	NA	8.20	11.54	6.07	2.13
INTERMEDIATE ZONE WELLS								
GM-64	8/85	40.00	37.5 - 40.0	35.00	6.09	42.94	5.24	0.85
GM-66	8/85	40.00	37.5 - 40.0	31.00	7.33	42.85	5.26	2.07
GM-69	8/85	40.00	37.5 - 40.5	32.00	7.70	42.87	5.29	2.41
GM-84R ^d	2/92	49.00	43.0 - 48.0	36.00	12.26	49.35	10.49	1.77
PCI-1	3/90	45.00	40.0 - 44.75	39.00	11.08	46.74	8.26	2.82
DEEP ZONE WELLS								
GM-63	8/85	65.00	62.5 - 65.0	56.00	6.80	65.54	4.28	2.52
GM-65	8/85	65.00	62.5 - 65.0	58.00	6.51	67.86	3.89	2.62
GM-68	8/85	65.00	62.5 - 65.0	56.00	6.83	67.87	4.13	2.70
PCD-1	3/90	70.00	65.0 - 69.75	64.00	10.83	68.69	8.21	2.62
RECOVERY WELLS								
RW-1	10/86	30.00	15.0 - 30.0	NA	6.67	NA	2.31	4.36
RW-2	10/86	37.00	22.0 - 37.0	NA	5.71	NA	3.73	1.98
RW-3	10/86	37.00	22.0 - 37.0	NA	7.36	NA	15.61	-8.25
RW-4	10/86	39.00	24.0 - 39.0	NA	5.35	NA	0.74	4.61
RW-5A	11/93	40.00	24.5 - 39.5	21.0	3.99	40.5	2.48	1.51
RW-6	10/86	39.50	24.5 - 39.5	NA	2.43	NA	10.63	-8.2
RW-7	10/86	39.00	24.0 - 39.0	NA	3.16	NA	23.94	-20.78

- * GM-12 was originally installed in March 1984, but was damaged and replaced with GM-12R in April 1988.
- * GM-13 was originally installed in March 1984, but was damaged and replaced with GM-13R in November 1991.
- * Water level not collected due to siltation in well.
- * GM-84 was damaged and replaced with GM-84R in February 1992.
- * Installed by E&E, Geraghty and Miller, Inc., and Missimer and Associates, Inc.
- ¹ Depth to water measurements were made from top of metal well cap, not top of casing. Metal thickness approximately 0.10 inch.
- ² Replacement recovery well RW-5A constructed in November 1993.

Key:

- NA = Not available or not collected
- TOC = Top of casing
- msl = Mean sea level
- BTOC = Below top of casing

Source: RUST E&I, May, 1993; Ecology and Environment, Inc., September, 1992.

2.3 Previous Recovery Well Investigations

According to the Ecology and Environment, Inc. (E&E) report dated September 1992, Geraghty and Miller, Inc. (G&M) installed 28 monitoring wells and seven (7) recovery wells at the IWTP between 1984 and 1986 as part of a water quality assessment program. In November 1993, RUST E&I was retained to replace recovery well RW-5 and its pump station because it was malfunctioning due to build up of sludge material in the suction and discharge lines. Recovery well RW-5 was abandoned and replaced with recovery well RW-5A.

3.0 FIELD WORK OPERATIONS AND METHODS

3.1 Recovery Well Evaluation

The recovery well evaluation and rehabilitation plan is based on the assumption that the integrity of the recovery wells construction has not been compromised. As previously stated, one (1) recovery well RW-5 was abandoned and replaced as RW-5A. Although recovery well RW-5A was constructed and developed properly, the recovery system still had a problem with build up of sludge material in the suction and discharge line. In addition, recovery well RW-3 has begun to indicate a similar problem of black particles in the water. Therefore, it appears that the performance of the recovery well systems has been affected by the native formations rather than poor construction or location of the recovery wells. As such, chemical and physical rehabilitation options for the five (5) designated recovery wells are presented in this plan.

The five (5) recovery wells (RW-3, RW-4, RW-5A, RW-6 and RW-7) will be sampled by the subcontractor, Layne, Inc. (Layne) and analyzed using the Biological Activity Reaction Tests System (BARTS). BARTS is a simple and economic testing system that will enable a more accurate determination of the kind of rehabilitation program that will need to be implemented. Water samples will be collected and any color changes/growth, etc. will be monitored. These changes will be indicative of various forms of bacteria, iron, encrustation and coliform.

Samples will be collected at each recovery well at 0, 5, 30 and 60 minutes. Fifteen milliliters (ml) of water samples will be collected in the BARTS tube at each recovery well which will bring the BARTS ball (in the tube) up to the correct level. Nutrients will gradually diffuse up the water column to support this aerobic growth of bacteria.

Aerobic growth of bacteria will occur at the surface, at the medium between the BARTS ball and the wall of the BARTS tube. Once the oxygen has been used by the aerobes, this zone below the BARTS ball will become free of oxygen and anaerobic growth will dominate. Intense aerobic activity at the surface will exclude aerobic growth in the zone. Nutrient media for growth is provided as a sterile dried matrix on the floor of the tube. This process will occur over a two (2) to three (3) day incubation period.

After the incubation period, any color changes, growth and/or dried matrix will be noted. As previously stated, these changes are indicative of various forms of bacteria, iron, encrustation and coliform. Layne's in-house microbiologist and well rehabilitation specialist will be consulted as to the best method to be used at each recovery well for rehabilitation.

Upon receipt of BARTS sample results and the microbiologist review, RUST E & I will submit this information to NAVFAC Southern Division.

3.2 Rehabilitation Options

Each recovery well will require its own rehabilitation program which will be recommended by Layne's in-house microbiologist. The microbiologist will recommend appropriate volumes of chemicals and contact times for each recovery well. These recommendations will also take into account total depth, screened interval, diameter, well materials and filter pack of each recovery well.

Three (3) options are presented below. These options may be used individually or several may be used in conjunction with each other. These cleaning chemicals are mixed with water and placed into the wells via tremie pipe. The solution is alternately agitated and then allowed to stand for a period of time. As previously stated, the microbiologist will recommend appropriate volumes of chemicals and contact times per well. In addition, all treatments will be followed by chlorination which sterilizes the well. Upon completion of the recommended process, the chemicals will be pumped out of each well.

3.2.1 Option 1 - Well Klean II

Well Klean II is a "green" chemical that has been extremely successful in battling encrustation problems. Well Klean II is a low pH, Organic Bio-Cleaner used as a substitute for muriatic acid for rehabilitation of water wells. It dissolves and loosens the scale from pumps, pump parts, screen, and the surrounding aquifer. It is used to break down the natural cementing that often occurs from precipitation or encrustation. The MSDS sheet is included in Appendix A.

3.2.2 Option 2 - Sodium Hypochlorite

Sodium hypochlorite is a bleach that kills bacteria and penetrates through the growth and into the formation, loosening the growth and allowing the growth to be pumped out. The MSDS sheet is included in Appendix A.

3.2.3 Option 3 - Mechanical Agitation

Mechanical agitation is similar to a plunger. It scrapes the walls of the well casing and helps force the chemicals back into the formation.

3.3 Containment

In that water from the recovery wells is currently pumped to the IWTP, all water and solids that are pumped out of the recovery wells during rehabilitation will also be sent for treatment in the IWTP. Prior to implementation of rehabilitation activities, the environmental coordinator at the Public Works Center will be notified and approval will be requested to send the purged rehabilitation water directly to the IWTP. No pre-treatment of the purged water and rehabilitation chemicals will be provided prior to entering the IWTP.

3.4 Health and Safety

The subcontractor, Layne, will be responsible for their own Health and Safety Plan. Layne has provided rehabilitation services for NAS on their existing potable wells and is familiar with proper handling of the chemicals involved in the process. Material Safety Data Sheets (MSDS) are provided in Appendix A for chemicals mentioned herein.

RUST E&I will provide supervisor personnel to monitor all rehabilitation activities. RUST E&I personnel will not be directly involved with any of the rehabilitation process, so a site specific (job specific) Health and Safety Plan is not required. However, the approved Health and Safety Plan for the ground-water monitoring at the IWTP will be maintained on site in the event an emergency situation occurs.

4.0 PRELIMINARY MAINTENANCE PLAN

In order to ensure specific capacities are maintained at acceptable levels in each recovery well, a preliminary periodic maintenance plan is provided.

The recovery wells will be inspected during the on-going, bi-weekly Operations and Maintenance (O&M) site visits. Along with standard O&M activities, the physical conditions at each wellhead and the flow rates at each recovery well will be monitored. O & M inspections will also include an evaluation of the suction and discharge piping for restricted flow, as well as discharge pressure versus flow. It is also recommended that a BARTS sample be collected and submitted to Layne to monitor the effectiveness of the rehabilitation process. This information will enable RUST E&I to generate historical data for each recovery well and to track the growth rate of the contaminants on the well screens.

This preliminary maintenance plan will continue for a 3-month evaluation period, after which time the methods and frequencies in the preliminary maintenance plan will be reviewed and revised, if necessary. Any revisions will be submitted to NAVFAC Southern Division for approval. At this time, the attention and the frequency of chemical and physical rehabilitation at each recovery well will be evaluated.

5.0 SCHEDULE

Upon approval of the Recovery Well Rehabilitation Design and Preliminary Maintenance Plan, and award of the Phase 2 (implementation of Phase 1) by NAVFAC, the Plan will be implemented.

6.0 REFERENCES

Ecology and Environment, Inc., 1992a. Generic Quality Assurance Project Plan, Contamination Assessments and remedial Activities, Naval Air Station, Pensacola, Florida.

Ecology and Environment, Inc., 1992b. Semi-Annual Report on Groundwater Monitoring, Industrial Wastewater Treatment Plant, Naval Air Station, Pensacola, Florida.

Geraghty and Miller, Inc., 1984. Verification Study, Assessment of Potential Ground-Water Pollution at Naval Air Station, Pensacola, Florida.

Geraghty and Miller, Inc., 1986. Characterization Study, Assessment of Potential Ground-Water Pollution at Naval Air Station, Pensacola, Florida.

APPENDIX A

MSDS SHEET

MATERIAL SAFETY DATA SHEET

PAGE 1 OF 3

SECTION I PRODUCT IDENTIFICATION

PRODUCT NAME: Well Klean II Concentrate
 CHEMICAL NAME: Water Treatment Chemical.
 MANUFACTURER: h. e. r. o. Incorporated
 1748 West Fillmore
 Phoenix, Arizona 85007-2229

EFFECTIVE DATE: 01/01/85 EMERGENCY PHONE: (602) 250-2816

SECTION II HAZARDOUS INGREDIENTS

MATERIAL	CAS NO.	AMOUNT	TLV	PEL (TWA)	STEL
* None of the ingredients used in this formulation are known to be hazardous ingredient under current Department of Labor OSHA - American Conference of Governmental Hygenists. Registry List of Toxic Effects - National Toxicological Program - International Agency for Research on Cancer, definitions. Further, there are no known restrictions under current TSCA nor EPA guidelines. *					

SECTION III PHYSICAL DATA

BOILING POINT: 100.5 deg. C. VAPOR PRESSURE: Zero mm Hg @60 deg. C.
 VAPOR DENSITY: (air=1) 1. SPECIFIC GRAVITY: 1.08.
 PERCENT VOLATILE BY VOLUME: Zero. EVAPORATION RATE: (I=I) 1.1
 pH: 3.6 FREEZE POINT: <0 deg. F.
 APPEARANCE & ODOR: Light amber. SOLUBILITY IN WATER: Complete.
 Mild like burnt sugar.

SECTION IV FIRE & EXPLOSIVE HAZARDS

FLASH POINT: Non-flammable. EXTINGUISHING MEDIA: N/A.
 FLAMMABILITY LIMITS LEL/UEL: N/A. METHOD USED: Closed cup.
 UNUSUAL FIRE & EXPLOSION HAZARDS: None.

SECTION V

HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE

EYE CONTACT: Moderately irritating to the eyes.

SKIN CONTACT: Non-irritating.

INHALATION: Prolonged exposure to vapors is non-irritating.

INGESTION: Found to be and considered non-toxic at less than 5000 mg/kg.

FIRST AID PROCEDURES

EYES: Flush with water for at least 15 minutes. If irritation persists, call a physician.

SKIN: Remove contaminated clothing, flush with water for at least 15 minutes, if irritation persists, contact a physician.

INGESTION: If swallowed, drink milk, raw egg white, mucilage, or gelatin solution. If these are not available drink large quantities of water. If irritation appears, contact a physician.

SECTION VI

REACTIVITY DATA

STABILITY: Stable.

INCOMPATIBILITY: Do not mix with other chemicals.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: N/A.

STORAGE: Store at room temperatures.

SECTION VII

SPILL OR LEAK PROCEDURES

STEPS TO CONTAIN: Wear appropriate protective clothing and or equipment. Neutralize with lime or soda ash, or a suitable absorbant may be used. Remove contaminated absorbant, flush spill area with water.

WASTE DISPOSAL: Comply with Local, State, and Federal regulations. If permissible, flush to drain Neutralize with lime or soda ash, if required, then flush to drain.

SECTION VIII

SPECIAL PROTECTION DATA

RESPIRATORY: None required.

EYES: None required but recommended.

SKIN: None required but recommended. Suggest rubber apron, and gloves.

ADDITIONAL COMMENTS: Eye washes and safety showers should be available when handling chemicals, but are not required with this product. Educate and train users and employees in the safe and proper use of this product and all products. Do not use products outside their labeled directions.

SECTION IX

SPECIAL PRECAUTIONS

Do not use inconsistent with labeling. Do not mix with other chemicals. Keep out of reach of children and un-trained users. Store at room temperature avoiding extreme heat or cold.

SECTION X

USERS RESPONSIBILITY

It is the responsibility of the buyer to maintain a safe workplace for the user. The user should consider the health & safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop protective work procedures for a safe environment.

SECTION XI

MANUFACTURERS STATEMENT & LIABILITY CLAUSE

The information contained herein is to the best of our knowledge and belief, accurate based on data available at this time. We accept no liability for damages incurred outside the spectrum of the label of the product.

SECTION XII

SHIPPING CLASSIFICATION

Cleaning compound - Item 40500 - Sub 3 - Class 55.

Material Safety Data Sheet- Well Klean Surfactant-C & Well Klean Surfactant-W

Section I PRODUCT IDENTIFICATION

Revision No.: 5

Revision Date: 4/30/90

Product Code: COE564561

File Number: CPE00420.0001

Product Name: Poly-Tergent(R) P-32A & P-17A (Well Klean C & W)

Synonyms: Poly(oxyethylene/oxypropylene) glycol

Chemical Family: Surfactant

Formula: $H(C_2H_4O)_x(C_3H_6O)_y(C_2H_4O)_zH$

Description: Cleaning compound

OSHA Hazard Classifications: Eye and skin irritant, mutagenic toxin

Section II COMPONENT DATA

Product Composition

CAS or Chemical Name: Poly(oxyethylene/oxypropylene) glycol

CAS Number: 9003-11-6

Percentage Range: 90 - 100%

Hazardous per 29 CFR 1910.1200: Yes

Exposure Standards: None established

Section III PRECAUTIONS FOR SAFE HANDLING AND STORAGE

Do not take Internally. Avoid contact with skin, eyes and clothing. Upon contact with skin or eyes, wash off with water.

Storage Conditions: Do not store at temperatures above 49°C (120°F). Product may discolor at higher temperatures.

Product Stability and Compatibility

Shelf Life Limitations: 12 months in drums; 24 months in bulk under proper storage conditions.

Incompatible Materials for Packaging: Contact with unlined mild steel will cause product discoloration.

Incompatible Materials for Storage or Transport: Do not store or ship with strong oxidizers.

Section IV PHYSICAL DATA

Appearance: Clear to hazy viscous liquid with slight yellow color

Freezing Point: -47 to 15°C (-53 to 59°F)

Boiling Point: Not applicable

Decomposition Temperature: 218°C (450°F)

Specific Gravity: 1.01-1.06

Bulk Density: 8.4-8.8 lbs./gal.

pH @ 25°C: 4.5-7.5

Vapor Pressure @ 25°C: <0.1 mm Hg

Solubility in Water: Complete below the cloud point (range 15-81°C)

Volatiles, Percent by Volume: <0.1%

Evaporation Rate: Not applicable

Vapor Density: No data

Molecular Weight: 2000-6000

Odor: Typical polyol odor

Coefficient of Oil/Water Distribution: No data

Section V PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

Personal Protection for Routine Use of Product

Respiratory Protection: Respirator protection not normally needed since the volatility and toxicity are low. If vapors, mists, or aerosols are generated, wear a NIOSH/MSHA approved respirator.

Ventilation: Local exhaust ventilation is recommended if vapors, mists or aerosols are generated. Otherwise, use general exhaust ventilation.

Skin and Eye Protective Equipment: Use chemical goggles and impermeable gloves.

Equipment Specifications (When Applicable)

Respirator Type: NIOSH/MSHA approved full facepiece organic vapor plus prefilter.

Protective Clothing Type (this includes: gloves, boots, apron, protective suit): Impervious

Section VI FIRE AND EXPLOSION HAZARD INFORMATION

Flammability Data

Flammable: No
Combustible: No
Pyrophoric: No
Flash Point: 227-246°C (440-475°F)
Test Method: Cleveland open cup

Autoignition Temperature: No data
Flammable Limits At Normal Atmospheric Temperature And Pressure (Percent Volume In Air):
LEL - no data; UEL - no data

NFPA Ratings: Not established

HMIS Ratings:

Health: 1
Flammability: 0
Reactivity: 1

Extinguishing Media: Alcohol foam, carbon dioxide, dry chemical, soda acid, water spray.

Fire Fighting Techniques And Comments: Use water to cool containers exposed to fire. See Section XI for protective equipment for fire fighting.

Section VII REACTIVITY INFORMATION

Conditions Under Which This Product May be Unstable

Temperatures above: 218°C (450°F) product may undergo thermal decomposition.
Mechanical shock or impact: No
Electrical (static) discharge: No
Hazardous polymerization: Will not occur
Incompatible materials: Strong oxidizers
Hazardous decomposition products: Carbon dioxide and carbon monoxide

Summary of Reactivity

Oxidizer: No
Pyrophoric: No
Organic peroxide: No
Water reactive: No

Section VIII FIRST AID

Eyes: Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Call a physician at once.

Skin: Immediately flush with water for 15 minutes. Wash the contaminated skin with soap and water. If irritation develops, call a physician. If clothing comes in contact with the product, the clothing should be laundered before re-use.

Ingestion: Immediately drink large quantities of water. Induce vomiting. Call a physician at once. Do not give anything by mouth if the person is unconscious or if having convulsions.

Inhalation: This product is not toxic by inhalation. Remove individual to fresh air.

Section IX TOXICOLOGY AND HEALTH INFORMATION

Routes of Absorption: Eye and dermal contact, ingestion.

Warning Statements and Warning Properties: Harmful if swallowed. May cause mild eye and mucous membrane irritation. May cause mild skin irritation.

Human Threshold Response Data

Odor Threshold: No data

Irritation Threshold: No data

Immediately Dangerous to Life or Health: The IDLH concentration has not been established for this product.

Signs, Symptoms, and Effects of Exposure

Inhalation: *Acute* — no significant adverse effects to health will occur from inhalation.
Chronic — there are no known or reported effects from chronic exposure.

Skin: *Acute* — skin contact may cause a mild irritation consisting of transient redness. This irritant effect would not be expected to result in permanent damage.
Chronic — there are no known or reported effects from chronic exposure except for effects similar to those experienced from single exposure.

Eyes: Contact with the eyes may cause a mild irritation consisting of reversible redness, swelling and mucous membrane discharge to the conjunctiva. No corneal involvement or visual impairment would be expected.

Ingestion: *Acute* — Ingestion may cause gastrointestinal discomfort with any or all of the following symptoms: nausea, vomiting, lethargy or diarrhea.
Chronic — There are no known or reported effects from chronic exposure except for effects similar to those experienced from single exposure.

Medical Conditions Aggravated by Exposure: None known or reported

Interactions with Other Chemicals which Enhance Toxicity: None known or reported

Animal Toxicology

Acute Toxicity:

- Inhalation LC 50: No available data, but toxicity is considered low via this route of exposure.
- Dermal LD 50: > 2 g/kg (rabbit)
- Oral LD 50: 1.72 g/kg (rat), based on similar product
- Irritation: May cause mild skin, eye and mucous membrane irritation.

Acute Target Organ Toxicity: No organs known to be damaged from exposure to this product.

Chronic Target Organ Toxicity: There are no known or reported effects from repeated exposure.

Reproductive and Developmental Toxicity: There are no known or reported effects on reproductive function or fetal development.

Carcinogenicity: This product is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP or EPA.

Mutagenicity: A similar product has been shown to be positive for mutagenicity in the Ames Salmonella/microsome mutagenesis assay.

Aquatic Toxicity: Fathead minnow, 96 hr. LC50: > 1000 ppm (based on a similar product).

Section X TRANSPORTATION INFORMATION

This material is not regulated as a DOT hazardous material.

Section XI SPILL AND LEAKAGE PROCEDURES

For all transportation accidents, call Chemtrec at 800-424-9300.

Reportable Quantity: Not applicable

Spill Mitigation Procedures: Evacuation procedures must be placed into effect. Hazardous concentrations in air may be found in local spill area. Utilize emergency response personal protective equipment prior to the start of any response. Remove all sources of ignition. Stop source of spill as soon as possible and notify appropriate personnel.

Air Release: Vapors may be suppressed by the use of water fog. Contain all liquid for treatment and/or disposal as a (potential) hazardous waste.

Water Release: This material is heavier than and soluble in water. Notify all downstream water users of possible contamination. Divert water flow around spill if possible and safe to do so. If unable to divert, create an overflow dam to contain material. Continue to handle as described in land spill.

Land Spill: Create a dike or trench to contain materials. Spill materials may be absorbed using sand, clay or commercial absorbent. Do not place spill materials back in their original container. Containerize and label all spill materials properly. Decontaminate all clothing and the spill area using strong detergent and flush with large amounts of water.

Spill Residues: Dispose of per guidelines under Section XII, waste disposal.

Personal protection for emergency spill and fire-fighting situations:

Additional respiratory protection is necessary when a spill or fire involving this product occurs. You are recommended to use a cartridge type NIOSH approved respirator with organic vapor cartridges.

Additional protective clothing must be worn to prevent personal contact with this material. Those items include but are not limited to boots, gloves, hard hat, splash-proof goggles, full face shield and impervious clothing, i.e., chemically impermeable suit.

Compatible materials for response to this material are neoprene, chlorinated polyethylene, polyvinyl chloride, butyl rubber, viton, polyvinyl alcohol and saranex.

Section XII WASTE DISPOSAL

If this product becomes a waste, it does not meet the criteria of a hazardous waste as defined under 40 CFR 261, in that it does not exhibit the characteristics of hazardous waste of Subpart C, nor is it listed as a hazardous waste under Subpart D.

As a nonhazardous liquid waste, it should be disposed of in accordance with local, state and federal regulations by incineration.

Care must be taken to prevent environmental contamination from the use of this material. The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes.

Section XIII ADDITIONAL REGULATORY STATUS INFORMATION

Toxic Substances Control Act: This substance is listed on the Toxic Substances Control Act inventory.

Superfund Amendment and Reauthorization Act Title III: Hazard categories, per 40 CFR 370.2:
Health: Immediate (acute)
Physical: None

Emergency Planning and Community Right to Know, per 40 CFR 355, APP.A:
Extremely hazardous substance — threshold planning quantity: None established
Supplier Notification Requirements, per 40 CFR 372.45: None established

HARCROS CHEMICALS INC
KANSAS CITY, KANSAS

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: [REDACTED] DATE: 11/19/93 PAGE 01
PRODUCT CODE: 16-10717-00

CAS # 007681-52-9

FORMULA: NaOCl

CHEMICAL FAMILY: Hypochlorite

CHEMICAL NAME AND SYNONYMS: Sodium Hypochlorite Solution; Javel
Water Bleach; Soda Water Bleach; Hypo;
Chlorine Bleach; Vertex Concentrate;
Sunny Sol; Super Shock; Dixichlor

SUPPLIERS NAME: Harcros Chemicals Inc
5200 Speaker Rd
Kansas City, Ks 66106
SUPPLIERS PHONE NUMBER: 913-321-3131
TRANSPORTATION EMERGENCY PHONE NUMBER: 1-800-424-9300

S.A.R.A. INFORMATION

HAZARDS: Fire:Yes Pressure:No Reactivity:Yes Acute:Yes Chronic:No
PHYSICAL DATA: Mixture:Yes Pure:No Solid:No Liquid:Yes Gas:No

SECTION I Hazardous Ingredients

Ingredient	Percent	TLV
Sodium Hypochlorite (CAS # 7681-52-9)	Approx 12 to 13%	N/E *
Sodium Hydroxide (Caustic Soda) (CAS # 1310-73-2)	1 to 3%	PEL/TLV 2 mg/m(3) ceiling OSHA/ACGIH
* Chlorine (Available) (CAS # 7782-50-5)	Approx 12 to 13% by wt. Approx 15% by vol.	STEL 1 ppm OSHA/ACGIH

SECTION II Health Hazards

Threshold Limit Value: As indicated in Section I.

Potential Effects of Exposure:

Acute - Irritating effects increase with strength of solution and time of exposure.

Chronic - Constant irritant to eyes, throat.

Eyes: Causes severe eye irritation.

Skin: Irritation, reddening, damage with long or repeated exposure.

Inhalation: Fumes from exposed solution very irritating to mucous membranes, may cause sneezing. Grossly excessive exposure can cause bronchitis, and pneumonia, and corrosion of the respiratory tract in severe cases.

Ingestion: Causes irritation of membranes of the mouth and throat, stomach pain and possible ulceration. In severe cases can produce circulatory collapse, lethargy, delirium, convulsions, and coma. Ingestion of small quantities (a few tablespoons) can be fatal to children.
Oral LD(50) (rat): 13 g/kg with 5.25% NaOCl and 5 g/kg with 12.

HARCROS CHEMICALS INC
KANSAS CITY, KANSAS

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: SODIUM HYPOCHLORITE 12.5%+CL2 DATE: 11/19/93 PAGE 02
PRODUCT CODE: 16-10717-00

SECTION II Health Hazards
NaOCl (Sodium Hypochlorite).

CONTINUED

First aid:

Eyes: Flush with water for 15 minutes while holding eyelids open.
Get medical attention as soon as possible.

Skin: Flush with water while removing contaminated clothing and shoes. Follow by washing with soap and water. DO NOT reuse clothing or shoes until cleaned. If irritation persists, get medical attention.

Inhalation: Remove person to fresh air. If distress persists call a physician immediately.

Ingestion: If accidentally swallowed, drink water or milk and obtain medical attention promptly. DO NOT induce vomiting, or administer baking soda or acidic antidotes. If vomiting occurs spontaneously, keep head lower than hips to prevent aspiration into lungs.

Other Information: Not listed as carcinogen or potential carcinogen by NTP, IARC or OSHA.

ADVICE TO PHYSICIAN: Antidote - give Sodium Thiosulfate orally.

SECTION III Special Protection Information

Respiratory Protection: When fumes present use NIOSH-approved respirator with a chlorine canister or supplied air respirator, consult your equipment supplier.

Ventilation Required: No special ventilation is needed unless the product is exposed to decomposition conditions; i.e. in a spill or in an acid condition.

Protective Clothing:

Eyes: Splash-proof goggles should be used when dispensing sodium hypochlorite in this concentration.

Skin: Rubber gloves for handling, rubber apron and boots if splashing may occur, and in emergency spill situations.

Additional Protective Measures: Safety shower, eye bath and washing facilities should be available.

SECTION IV Fire & Explosion Hazard Data

Flash Point (Method): Non-flammable

Flammable Limits (% Volume in Air):

Upper: N/A

Lower: N/A

CONTINUED ON PAGE 03

HARCROS CHEMICALS INC
KANSAS CITY, KANSAS

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: SODIUM HYPOCHLORITE 12.5%+CL2 DATE: 11/19/93 PAGE 03
PRODUCT CODE: 16-10717-00

SECTION IV Fire & Explosion Hazard Data CONTINUED
Extinguishing Media: Use water to cool containers, knock down fumes if released.

Special Fire Fighting Procedures: Avoid fumes from spilled or exposed liquid, dilute copiously, ventilate, and be prepared to use respiratory protection if needed. Acid contamination will produce very irritating fumes similar to chlorine gas.

Unusual Fire and Explosion Hazards: Product decomposes when heated; decomposition products may cause containers to rupture or explode. Vigorous reaction possible with organic materials or oxidizing agents; may result in a fire.

SECTION V Physical Data

Boiling Point: Decomposes

Specific Gravity (H₂O=1): Approx. 1.2

Vapor Pressure (MM HG.): N/E

Vapor Density (AIR=1): N/E

Evaporation Rate (_____ =1): N/A

Solubility in Water: Soluble

Percent Volatile by Volume: Variable including water vapor and products of decomposition.

pH: Approx. 12 - 13

Molecular Weight: 74.45

Appearance and Odor: Light yellowish green liquid with chlorine odor.

SECTION VI Reactivity Data

Stability: Solutions of sodium hypochlorite are fairly stable in concentrations below 1%. Stability decreases with concentration, heat, light exposure, decrease in pH, and contamination with heavy metals, such as nickel, cobalt, copper and iron.

Incompatibility: Avoid contamination with heavy metals (act as catalysts), reducing agents, organics, ether, amines, ammonium acetate, cellulose, ammonia, acids, or acid pH.

Hazardous Decomposition Products: Hypochlorous acid (HOCL), chlorine, hydrochloric acid. Composition depends upon temperature and decrease in pH. Additional decomposition products, which depend upon pH, temperature and time, are sodium chloride, sodium chlorate and oxygen.

Hazardous Polymerization: Will not occur

CONTINUED ON PAGE 04

HARCROS CHEMICALS INC
KANSAS CITY, KANSAS

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: SODIUM HYPOCHLORITE 12.5%+CL2 DATE: 11/19/93 PAGE 04
PRODUCT CODE: 16-10717-00

SECTION VII Spill and Leak Procedures

Steps to be taken if material is released or spilled:

Dike to contain spill, DO NOT allow to enter sewers or streams. Flush with water to dilute as much as possible, avoid heat and contamination with acid materials. If using absorbent to soak up a small spill avoid sawdust and other combustibles.

Waste Disposal Method:

Reduce by adding reducing agents such as bisulfites or ferrous salt solutions. Some heat will be produced. May neutralize with reducing agents. Keep on alkaline side and dilute with copious quantities of water. Principal end product is salt water (NaCl). Dispose in conformance with applicable local, state, and federal regulations.

EPA - Resource Conservation and Recovery Act (RCRA) Regulations
As produced, this material is a product and not a waste. If discarded or intended to be discarded as is, it is a corrosive hazardous waste as defined in RCRA (40 CFR 261.22). The EPA hazardous waste number is D002.

SECTION VIII D.O.T. Shipping Information

Proper Shipping Name:

HYPOCHLORITE SOLUTIONS

Hazard Class:

8, UN1791, PGIII

Label Requirements:

CORROSIVE

Reportable Quantity:

SHIPMENTS OF 00080 GAL OR MORE ARE REPORTABLE

Other Information:

SECTION IX Additional Information

This information may be of importance to you:

Sodium Hypochlorite is manufactured only in solution form. "Household bleach" contains not more than 7% Sodium Hypochlorite (+6.67 wt. % available chlorine) with about 6-1.75% excess Sodium Hydroxide for stability control. Industrial bleach contains from 7% to 15% Sodium Hypochlorite (6.67-13.06 weight % available chlorine) with 1-3% excess Sodium Hydroxide for stability control. Household Bleach is much less hazardous, the less stringent safety measures given on the household bleach container should be observed.

Sodium Hypochlorite does not exist as such in the vapor phase, unless as a component of a mist or fumes. This product is listed in the Toxic Substances Control Act (TSCA) inventory of chemical substances.

HARCROS CHEMICALS INC
KANSAS CITY, KANSAS

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PRODUCT NAME: SODIUM HYPOCHLORITE 12.5%+CL2 DATE: 11/19/93 PAGE 05
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SECTION IX Additional Information

CONTINUED

Store in vented, closed clean, non-corrodable containers in a cool, dry location, away from direct sunlight and not adjacent to chemicals which may react with the product if spillage occurs. If closed containers become heated, they should be vented to release decomposition products (mainly oxygen under normal decomposition). DO NOT mix or contaminate with ammonia, hydrocarbon acids, alcohols, ethers.

Long storage periods should be avoided as product degrades with age.

Minimize skin contact. Wash with soap and water before eating, drinking, smoking or using toilet facilities.

Containers of this material may be hazardous when emptied. "Empty" containers retain product residues. Observe all hazard precautions outlined in this sheet.

NPCA HMIS 102C

***** END OF REPORT *****

NAME: GENE TURNER

DATE ISSUED: 04/06/1993
DATE REVISED:

< = LESS THAN
> = MORE THAN

N/A = NOT APPLICABLE
N/D = NOT DETERMINED
N/E = NOT ESTABLISHED

UNK = UNKNOWN

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