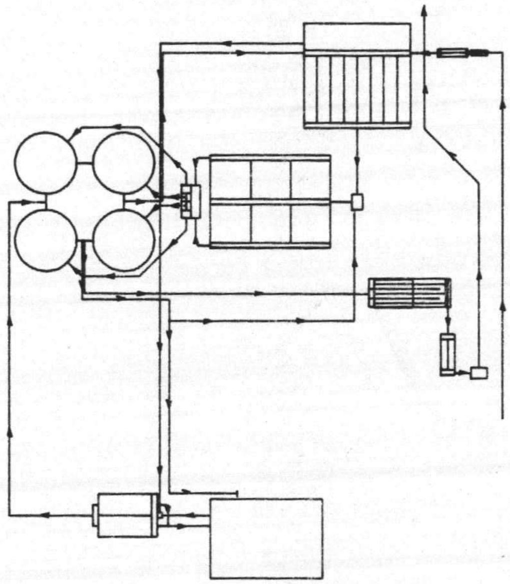
3

FINAL REPORT
WASTEWATER TREATMENT MASTER PLAN
PHASE I



MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT NO. N62470-90-D-6706

SEPTEMBER 1991

Prepared For:

DEPARTMENT OF THE NAVY
CIVIL BRANCH

Greenhorne & O'Mara, Inc.
4101 Lake Boone Trail
Suite 111
Raleigh, North Carolina 27607

UNITED STATES MARINE CORPS
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA 28542-5001

IN REPLY REFER TO:

90-24
PWO

OCT 30 1991

From: Commanding General, Marine Corps Base, Camp Lejeune

Subj: WASTEWATER MASTER PLAN

Encl: (1) Final Report, Wastewater Treatment Master Plan, Phase I

1. Enclosure (1) is the final report for the subject study. Enclosed are copies for your use.

2. Please note that all revisions to the earlier draft report are summarized in Section 6. Additionally, Section 6 contains the "Wastewater Plan of Action" that Camp Lejeune will pursue.

3. Your point of contact at Camp Lejeune is Mr. Alex Wood, Public Works Office, AV 484-3238, Comm 919-451-3238.

J A Mehula
J. A. MEHULA
By direction

Distribution:
CMC (Code LFL)
LANTDIV (Code 09A2123)
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PWO (Planning)

10-31
To Mr Warren
~~Copy to Planning~~ done
JWW

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Engineering
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GREENHORNE & O'MARA, INC. 4101 LAKE BOONE TRAIL THE SUMMIT SUITE 111 RALEIGH, NC 27607 PHONE 919-782-9088 FAX 919-782-9313

September 27, 1991

DEPARTMENT OF THE NAVY
Civil Branch - Building 1005
Marine Corps Base
Camp Lejeune, NC 28542

ATTN: Mr. Alex Wood

RE: **Wastewater Treatment Master Plan**
Contract #N62470-90-D-6706
Indefinite Delivery Contract for Engineering & Design Services
Marine Corps Base, Camp Lejeune, and Marine Corps Air Station, New River, Jacksonville, North Carolina

Dear Mr. Wood:

Greenhorne and O'Mara, Inc. is pleased to submit thirty (30) copies of this Final Report for the above project. As requested, we have added a new section (Section 6) which includes responses to questions and a summary of the decisions which have been made as a result of the study.

Please contact me or Mr. Peter Currie if you have any questions.

Sincerely,

GREENHORNE & O'MARA, INC.

Joseph E Garceau

Joseph E. Garceau, P.E.
Sr. Project Manager

JEG/jg

aeration lagoons
nitrification / denitrification
ammonia nitrogen
phosphorous removal

FINAL REPORT
WASTEWATER TREATMENT MASTER PLAN
PHASE 1

MARINE CORPS BASE

CAMP LEJEUNE, NORTH CAROLINA

CONTRACT NO. N62470-90-D-6706

SEPTEMBER 1991

Prepared For:

DEPARTMENT OF THE NAVY

CIVIL BRANCH

NORTH CAROLINA
PROFESSIONAL
SEAL
ENGINEER
JOSEPH E. CARREAU

Greenhorne & O'Mara, Inc.
4101 Lake Boone Trail - Suite 111
Raleigh, North Carolina 27607

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

TABLE OF CONTENTS

Note: See page iii for a list of revisions or additions to sections and appendices marked by an asterisk (*).

LIST OF EXHIBITS

LIST OF EXHIBITS

LIST OF REVISIONS AND ADDITIONS

SECTION	DESCRIPTION
3	Revised first paragraph on Page 3-1
4	Revised first paragraph on page 4-5 and moved to last paragraph on page 4-4
4	Revised summary of present worth values (after page 4-4) to exclude design and permit costs
4	Corrected typing error in last sentence of final paragraph on page 4-21
4	Corrected typing error in last sentence of first paragraph of Section 4.11 on page 4-27
6	Added new section - Summary

APPENDICES:

A	Revised schematic flow diagrams for Hadnot Point and Courthouse Bay plants
B	Added 6-27-91 meeting agenda
B	Added 8-1-91 meeting minutes
C	Revised all cost data to exclude design and permitting costs from construction costs and present worth values. Design and permitting costs are included in the detailed cost data for information only.

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INTRODUCTION

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New Bern, NC
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WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

INTRODUCTION

Established in May 1941, Camp Lejeune provides specialized training to prepare troops for amphibious and land combat operations. The Base houses the 2nd Marine Division, the nucleus of the Marine Corps' east coast force-in-readiness.

Camp Lejeune is located in Onslow County in southeastern North Carolina, approximately halfway between Wilmington and New Bern. The Camp Lejeune Complex, including the Marine Corps Base and the New River Air Station, covers approximately 110,000 acres on both sides of the New River. The western side of the Base lies between U.S. Highway 17 and the west bank of the New River. The eastern portion lies between the east bank of the New River, and N.C. Highways 24 and 172. The northern boundary adjoins the City of Jacksonville, and the southern boundary extends to the Atlantic Ocean.

The New River is the principal stream in Onslow County, draining an area of approximately 475 square miles. The State of North Carolina has indicated that discharges into portions of the New River and its tributaries are in conflict with its goal to upgrade water quality in the region. Wastewater discharge permits will be increasingly difficult to obtain as future effluent standards and ambient water quality designations become much more stringent. Most of Camp Lejeune and much of Onslow County drain to the river and its tributaries. In addition to the Camp Lejeune facilities, other wastewater treatment plants discharge to the New River. These discharges include wastewater plants operated by the City of Jacksonville and Weyerhaeuser, and a number of relatively low flow domestic waste treatment facilities.

In recent studies, the N.C. Department of Environment, Health, and Natural Resources, Division of Environmental Management (DEM) has found numerous violations of State water quality standards for pH, dissolved oxygen, dissolved gases, and chlorophyll-a in the upper portion of the river basin. These studies have indicated that the surface waters in the upper basin have reached their assimilative capacity. The river is no longer able to absorb all of the nutrients being discharged to it.

As a result of these findings, DEM has issued a mandate to include a 2 mg/l total phosphorous limitation to facilities discharging to the New River basin upstream of Grey Point. Additionally, DEM has enacted a procedure to prohibit new or expanded discharges of either oxygen consuming or nutrient-laden wastewater into the New River or its tributaries above its confluence with Northeast and Southwest Creeks. The procedure also calls for the application of more stringent permit limitations upon renewal of NPDES discharge permits for facilities in this area. The NPDES permits for six of the Marine Corps' wastewater treatment plants must be renewed at the end of January 1992. The permit for the remaining facility expires in February 1993.

The surface waters downstream of Grey Point are classified "SA" except at the discharge points for two of the existing treatment plants, Rifle Range and Courthouse Bay. The "SA" classification states that the best usage of these waters is shellfishing for market purposes. North Carolina statutes further classify these waters as High Quality Waters and prohibit their degradation. DEM has notified Camp Lejeune that the surface water discharge from the Onslow Beach facility into waters classified "SA" must be removed.

Where is this recommendation found?

Is this what the state said or what we say?

In consideration of these water quality concerns DEM has recommended that Camp Lejeune take steps to either modify their wastewater facilities to non-discharge systems or consolidate flows into one discharge served by a facility with state-of-the-art technology. This new facility would include nutrient removal, dechlorination, nitrification, and denitrification and would discharge to the New River in the vicinity of the existing Hadnot Point plant.

Camp Lejeune currently maintains seven separate wastewater treatment plants. Six of the plants discharge into the New River or its tributaries. The seventh plant, located at Onslow Beach, discharges to the Intracoastal Waterway. Currently permitted discharge rates for the treatment plants total slightly over 13 million gallons per day (MGD). The existing treatment plants are:

Location	Permitted Discharge	Permit No.	Expiration Date
Hadnot Point	8.000 MGD	NC0063029	Jan. 31, 1992
Camp Geiger	1.600 MGD	NC0062995	Feb. 28, 1993
Camp Johnson	1.000 MGD	NC0063011	Jan. 31, 1992
Tarawa Terrace	1.250 MGD	NC0063002	Jan. 31, 1992
Rifle Range	0.525 MGD	NC0063037	Jan. 31, 1992
Courthouse Bay	0.600 MGD	NC0063045	Jan. 31, 1992
Onslow Beach	0.195 MGD	NC0063053	Jan. 31, 1992
TOTAL	13.170 MGD		

Locations of the existing treatment plants are indicated in Figure 1.0. All of the Camp Lejeune plants are secondary treatment facilities with the exception of Camp Geiger, which has tertiary filters. The plants vary in age up to approximately 50 years and utilize trickling filter technology. Flow schematics and discharge permit limits for the individual plants are contained in Appendix A.

Camp Lejeune initiated a multi-phased Wastewater Treatment Master Plan to evaluate various alternative approaches to their overall wastewater treatment program. The Phase 1 portion of the study was conducted between November 1990 and July 1991, and is presented in this report. The study was performed by Greenhorne & O'Mara, Inc. (G&O) for the Atlantic Division Naval Facilities Engineering Command and coordinated by the office of the Director, Design Division, Public Works Office, Marine Corps Base, Camp Lejeune, North Carolina.

The following specific tasks were performed during the Phase 1 investigation:

Task 1 - Data Collection and Review

Task 2 - Development of Alternatives for WWTP's and Base Scenarios

Task 3 - Preliminary Evaluation of Scenarios

Task 4 - Comparison of Phase 1 Scenarios

The study tasks are described in detail in Sections 1 through 4. Section 5 presents the Phase 1 findings and recommendations. Existing plant data, meeting minutes, life-cycle cost analyses, and references are included in Appendices A through D, respectively.

Work on Phase 1 began in October 1990. Greenhorne & O'Mara gathered relevant information regarding the existing treatment plants, Base operations and future development plans, available treatment and disposal options, and environmental concerns. Data collected was utilized to develop specific alternatives for each treatment plant. Overall treatment scenarios and life-cycle cost analyses were compared and evaluated. Recommendations for addressing both the needs of the Base and concerns for environmental quality were then developed.

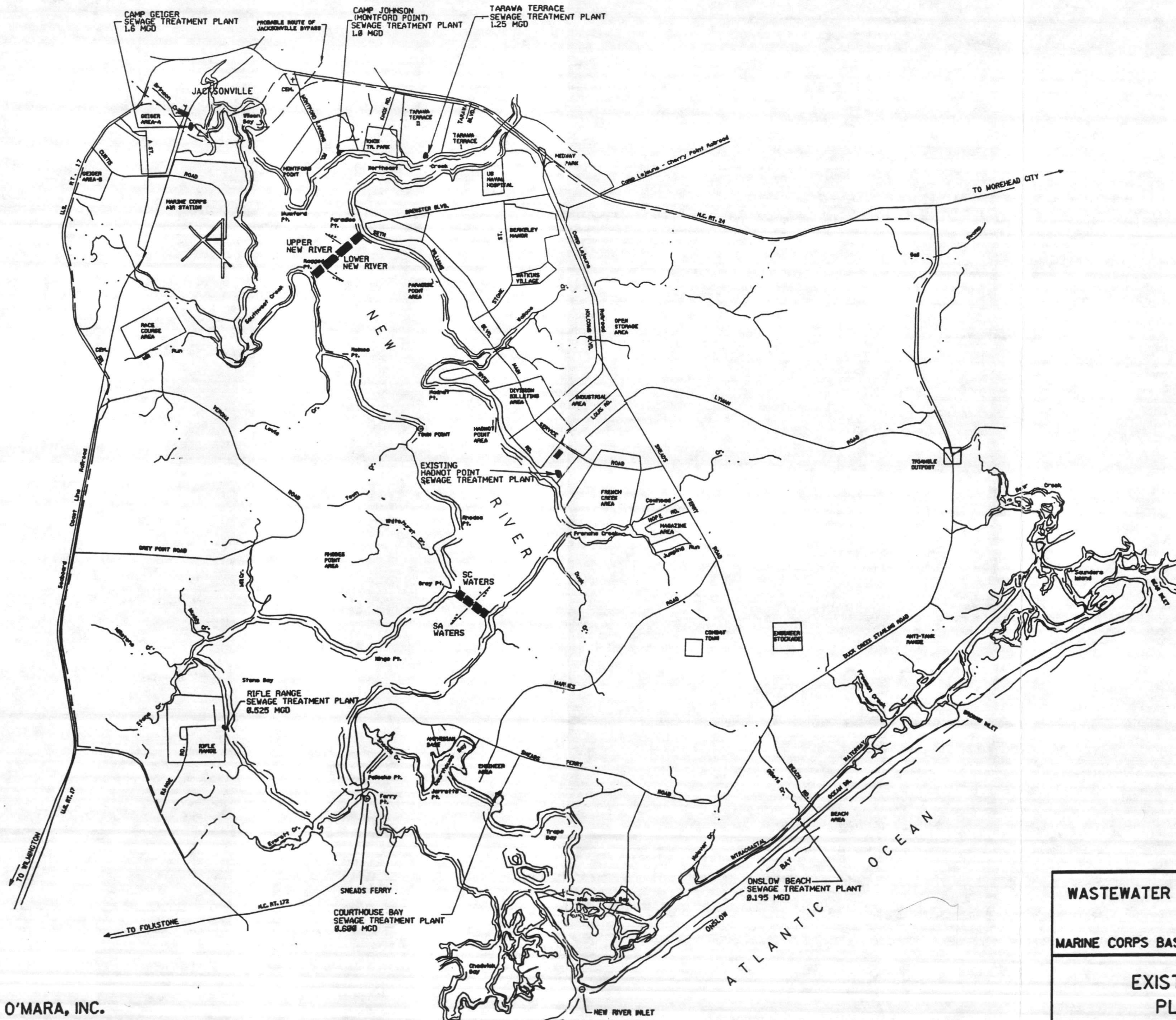
Recommended Alternative

The recommended alternative for Base wastewater facilities is construction of a new centralized 15 MGD secondary treatment plant with an effluent pump station and force main to convey treated effluent to the Atlantic Ocean. The recommended site for the treatment plant is in the Hadnot Point / French Creek area of the Base, at the northwest corner of Gonzales Boulevard and Main Service Road. Discharge is recommended through an ocean outfall to be located offshore from Onslow Beach.

Gonzales Blvd & Main Service Rd. Has this changed

Additional recommendations include initiation of the ocean outfall application process; negotiations with DEM to establish a consent agreement for continued operation of the existing facilities during development of the new facilities; initiation of detailed process and capacity studies prerequisite to treatment plant and pumping system design; evaluation of the existing sewer collection system; and the introduction of programs to conserve water, limit extraneous inflows to the wastewater management system, and remove nutrient discharges at their source.

1. Initiate ocean outfall application process
2. Negotiate w/DEM to establish a consent agreement for continued operation during development of new facilities
3. Initiate detailed process and capacity studies
4. Evaluate existing sewer collection system
5. Introduce programs to conserve water, limit extraneous flows, remove nutrients at their source. (think they mean eliminate or reduce)



GREENHORNE & O'MARA, INC.
RALEIGH, NORTH CAROLINA

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WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE CAMP LEJEUNE, N.C.

EXISTING TREATMENT
PLANT SITES

SCALE: N.T.S. FIGURE 1.0

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SECTION 1

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SECTION 1

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

1 - DATA COLLECTION

Background data regarding the project was collected from a number of sources. Initial meetings were held with representatives from the Marine Corps Base, the City of Jacksonville, and the North Carolina DEM in order to gain a clear understanding of the specific concerns of affected parties, review the project history, and determine sources of relevant data. Additional meetings were held during the course of the study to review gathered materials, clarify issues, and maintain a significant level of input. Detailed minutes of the meetings held during the study are contained in Appendix B. A listing of the background materials gathered and references utilized during the study is contained in Appendix D.

Environmental data and specific information regarding existing and planned Base facilities were provided by the Marine Corps through the Public Works Office. Regulatory information was provided by various public agencies, primarily the North Carolina Department of Environment, Health, and Natural Resources, Division of Environmental Management (DEM) and the U.S. Environmental Protection Agency (EPA). The City of Jacksonville, North Carolina provided detailed information regarding their wastewater treatment facilities and evolving land application program. Data regarding proposed technologies was obtained from published technical reports, equipment manufacturers, and selected municipal end-users.

who prepares and holds record copies of DMRS ?

G&O reviewed technical records maintained by the Base Public Works Office and Utilities Department. The Marine Corps facilitated direct contact with appropriate personnel in the Base Public Works, Utilities, Planning, Facilities, Training and Operations, and Environmental Management Departments in order to ensure the timely flow of relevant information.

These are not all Departments only Fac, T&O, & EMD

Site inspections were made at each of the treatment facilities and interviews were conducted with plant operations and supervisory personnel. Inspections of selected typical oil and grit separator facilities were made to assess their potential effects on the wastewater systems. Visits were made to potential land application and new treatment plant sites, and field reviews were made of potential force main routes.

Relevant information regarding the design and operation of the seven existing wastewater treatment plants was assembled and reviewed to establish a baseline for consideration of changes and modifications. This information includes copies of current NPDES discharge permits for the plants, daily discharge records for each plant for the preceding 5 years, and selected record drawings of plant construction projects.

State studies or own studies or both?

Criteria for treatment levels required for future discharges to the New River were obtained through meetings with DEM. Since actual discharge limits will not be available until completion of on-going studies, the following limits were recommended by DEM for planning purposes:

BOD(5)	-	5 mg/l
NH3-N	-	1 mg/l
Total N	-	4.0 mg/l Summer
		8.0 mg/l Winter
Phosphorus	-	0.5-1.0 mg/l

DEM believes that the concentration of total suspended solids (TSS) will be contained within acceptable limits by achieving the BOD concentration limit of 5 mg/l.

No field sampling or analysis was performed as a part of this phase of the project.

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SECTION 2

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

2 - ALTERNATIVES DEVELOPMENT

During Task 2 specific feasible alternatives were developed for each wastewater treatment plant. These alternatives were arranged in various combinations from which selected overall collection and treatment scenarios were chosen for possible consideration. The list of scenarios was discussed with Camp Lejeune and DEM officials and was narrowed to the five options evaluated during Task 3.

The following options were specifically included for consideration in developing alternatives for each plant:

1. Abandonment or scaling down of existing treatment plants.
2. Modifications of existing treatment plants.
3. Expansion of existing treatment plants.
4. Pumping of untreated sewage to existing, new, or modified plants for treatment and discharge.
5. Pumping treated effluent to existing, new or modified discharge points.
6. Land application.
7. A joint venture with the City of Jacksonville in its land application project.
8. Combinations of feasible disposal methods on a plant-specific basis.

Based on reviews of the collected data and discussions with representatives of the Marine Corps Base, DEM, and the City of Jacksonville, the following list of individual plant options was initially prepared for consideration:

1. HADNOT POINT:

1.1. Upgrade the existing plant and discharge to New River.
1.2. Construct a new plant and discharge to New River.
1.3. Upgrade the existing plant and discharge to land application.
1.4. Construct a new treatment facility and discharge to land application.

(Capacity for options 1 thru 4 depends on other plant scenarios.)

1.5. Pump all flow to City of Jacksonville facilities.

2. CAMP GEIGER:

   2.1. Pump raw sewage to Hadnot Point via Camp Johnson and Tarawa Terrace.
   2.2. Pump raw sewage to a new plant on the west side of New River.
   2.3. Pump raw sewage to City of Jacksonville facilities.
   2.4. Construct a land application system in the vicinity of the existing plant.

3. CAMP JOHNSON:

   3.1. Pump raw sewage to Hadnot Point via Tarawa Terrace.
   3.2. Pump raw sewage to a new plant on the west side of New River via Camp Geiger.
   3.3. Pump raw sewage to City of Jacksonville facilities.
   3.4. Construct a land application system in the vicinity of the existing plant.

4. TARAWA TERRACE:

   4.1. Pump raw sewage to Hadnot Point.
   4.2. Pump raw sewage to a new plant on the west side of New River via Camp Johnson and Camp Geiger.
   4.3. Pump raw sewage to City of Jacksonville facilities.
   4.4. Construct a land application system in the vicinity of the existing plant.

5. ONSLOW BEACH:

   5.1. Pump raw sewage to Hadnot Point.
   5.2. Pump raw sewage to Courthouse Bay.
   5.3. Construct a land application system in the vicinity of the existing plant.
   5.4. Pump raw sewage to a centralized land application facility for the southern plants.
   5.5. Relocate the existing discharge to the Atlantic Ocean.

6. COURTHOUSE BAY:

   6.1. Pump raw sewage to Hadnot Point.
   6.2. Pump raw sewage to a new plant on the west side of New River.
   6.3. Relocate the existing discharge to a point on New River between Grey Point and Duck Point. Upgrade the existing plant as required, with capacity dependent on Onslow Beach and Rifle Range scenarios.
   6.4. Construct a land application system in the vicinity of the existing plant.
   6.5. Pump raw sewage to a centralized land application facility for the southern plants.
   6.6. Pump raw sewage to the North Topsail Water & Sewer Authority.
   6.7. No change.

7. RIFLE RANGE:

7.1. Pump raw sewage to Hadnot Point.
7.2. Pump raw sewage to a new plant on the west side of New River.
7.3. Pump raw sewage to Courthouse Bay.
7.4. Construct a land application system in the vicinity of the existing plant.
7.5. Pump raw sewage to a centralized land application facility for the southern plants.
7.6. Pump raw sewage to the North Topsail Water & Sewer Authority.
7.7. No change.

In choosing combinations of these various options to recommend for further study, scenarios were developed that would provide for the evaluation of a wide range of feasible alternatives. Flexibility was retained to group options into other combinations if necessary. It was determined, for example, that land application for the total Base flow would not be feasible due to the large land area requirement of the treatment process and the shortage of available suitable land at the Base; however, by investigating individual land application for each plant, partial implementation of the process, where feasible, could be considered as a viable alternative in combination with other processes.

Due to the anticipated high costs for construction and operation of advanced treatment facilities, a centralized plant was given preference to upgrades of the separate plants in order to meet the planning limits for a New River discharge. Scenarios were developed to include evaluation of both a new centralized treatment plant and an expansion and upgrade of the existing Hadnot Point facility. Discussions were held with Base Planning officials regarding anticipated future development patterns. Because of the lack of any significant facilities planned west of the river, as well as potential conflicts with prime training areas, the siting of a treatment plant on the west side of the New River was eliminated from consideration.

Discussions with the City of Jacksonville indicated a limited capacity to accept flow from the Base. Total available capacity was set by the City at 3.0 MGD. Consideration of pumping untreated sewage to Jacksonville was, therefore, limited to the northern plants (Camp Geiger, Camp Johnson, and Tarawa Terrace).

Several unsuccessful attempts were made to initiate discussions with North Topsail Water and Sewer Authority regarding the feasibility of pumping flow from the Rifle Range area to the North Topsail land application facility. Additionally, discussions with the DEM Regional Office staff indicated that the design capacity of the North Topsail facility was expected to be decreased for site-related reasons.

Ocean discharge was given initial consideration as an option for the Onslow Beach facility only. High construction cost and the complexity of the regulatory process were felt to rule out an ocean outfall due to the small quantity of flow into the Onslow Beach plant. However, it was felt that an ocean outfall for the combined Base flow might prove cost-effective. In light of ever-tightening environmental regulations, the ocean outfall was also felt to be attractive as a future alternative to the New River discharge.

Other technologies, such as deep well injection and the use of artificial wetlands were given consideration and rejected as unfeasible. Deep well injection of wastewater is prohibited in North Carolina. The creation of artificial wetlands would require significant areas of suitable upland soils. The upland areas at Camp Lejeune are limited and subject to conflicting land use pressures. Base planners indicate that Camp Lejeune is approximately 60,000 acres short of suitable land required to fulfill its training mission. The use of existing ponds and wetlands in the treatment path was not evaluated since such use would constitute a discharge to surface waters.

Did this include GSRA?

The "No Change" alternative was not considered viable over the twenty year life cycle primarily due to the advancing age of the existing facilities. Additionally, it was felt that the discharges from the Rifle Range and Courthouse Bay plants could be expected to come under tighter future regulation because of their proximity to high quality waters.

Was any consideration given to utilizing GSRA as a land application site. This would appear to have utility since we plan to restore certain lands which were formerly wetlands.
It seems that GSRA would offer potential for land application.

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How about a new plant on the west side of the New River which discharges to a land application site in GSRA

How about the possibility that new or expanded flows will in the future not be allowed in any part of the New River? or that effluent limitations will become so stringent as to be beyond engineering or economic feasibility?

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

3 - PRELIMINARY EVALUATION OF SCENARIOS

During Task 3 a preliminary evaluation was made of the technical and economic feasibility of the scenarios which were selected in Task 2. Consideration was also given to pumping treated effluent from the existing wastewater plants to the ocean outfall. Two main problems were seen with this approach: 1) The advancing age of the existing plants along with existing operational problems suggest that upgrading of the plants will be required; and 2) The approach depends on EPA approval of the ocean outfall, a process which could take up to ten years. In addition, representatives of the North Carolina Division of Environmental Management have indicated that it is very unlikely that an ocean outfall will be approved without a backup alternative. Due to the anticipated high costs for construction and operation of upgraded facilities, this option was not studied further.

what is the source of this estimate

what does the State mean by a "backup alternative"?

The five scenarios chosen for evaluation are as follows:

SCENARIO 1: Upgrade existing Hadnot Point plant to accept all flows.

SCENARIO 2: Construct a new plant at Hadnot Point to accept all flows.

SCENARIO 3: Pump Camp Geiger, Camp Johnson and Tarawa Terrace to Jacksonville. Pump all other flows to Hadnot Point.

SCENARIO 4: Construct an Ocean Outfall from Hadnot Point for all flows.

SCENARIO 5: Individual land application for each plant.

The five scenarios were evaluated according to specific regulatory requirements and technical conditions, based on the following criteria:

1. The possibility that current, new and/or expanded effluent discharges will not be allowed in the upper New River or the Intracoastal Waterway where the Camp Geiger, Camp Johnson, Tarawa Terrace, and Onslow Beach wastewater treatment plants presently discharge.

2. More stringent effluent discharge limits will be implemented, including standards for phosphorous, nitrogen, heavy metals, ammonia, toxicity, etc. Future requirements may limit or eliminate discharges in the New River which will affect Hadnot Point, Courthouse Bay, and Rifle Range.

3. All wastewater treatment plant capacity increases may be denied.

Apparently this applies to proposed discharges to the New River

Each Scenario was considered independently and evaluated for a twenty (20) year life-cycle. Items evaluated include Capital Costs for Construction;

Labor Costs; Operation and Maintenance Costs; and Power Costs.

Construction costs for each Scenario range from approximately $36 million to just under $63 Million. Present worth values range from just over $86 million to approximately $114 million. Summaries of Construction Costs and Present Worth Values are included in Appendix C.

Selection of the three alternatives to be studied further in Task 4 was based on a combination of factors, such as Construction Costs, Present Worth Values, and other relevant factors, including regulatory requirements, project phasing potential, availability of funding, and possible environmental issues. Discussions among the concerned parties regarding these issues are documented in the meeting minutes contained in Appendix B. Specific elements of the Task 3 Scenarios are described in detail on the following pages.

3.1 PUMPING ROUTES

All of the Preliminary Phase 1 Scenarios involve the pumping of raw sewage and/or treated effluent. Pumping stations will be placed at or very near the existing treatment plant locations. Force main routes are described below and are indicated in Figures 3.1 and 3.3.

The pumps and force mains were sized to handle peak flows of 2.5 times the existing plant design flows at a minimum design velocity of 2 feet per second. Because of the lengthy force mains and associated extended retention times involved, odor control equipment is assumed to be required. Odor control is proposed by air injection at the wet well, with additional injection points at the mid points of the longer force mains.

Following is an outline of the proposed pumping arrangements and force main routes:

1. SCENARIO 1:

1.1. NORTH PLANTS TO HADNOT POINT

1.1.1. CAMP GEIGER TO TARAWA TERRACE

An 80 Horsepower (HP) duplex station will pump a design flow of 1.60 Million Gallons per Day (MGD) from the Camp Geiger Wastewater Treatment Plant (WWTP) through 29,850 LF of 20" force main to the Tarawa Terrace WWTP. The force main route starts at the Camp Geiger WWTP and runs along the railroad tracks, NC 24, and Iwo Jima Boulevard, until reaching the proposed aerated wet well at the Tarawa Terrace WWTP.

1.1.2. CAMP JOHNSON TO TARAWA TERRACE

A 25 HP duplex station will pump a design flow of 1.0 MGD from the

Camp Johnson WWTP through 8,500 LF of 16" force main to the Tarawa Terrace WWTP. The force main runs from the Camp Johnson WWTP across Scales Creek via an existing trestle. The line will then continue along Northeast Creek and then cross Frenchman's Creek to the proposed aerated wet well at the Tarawa Terrace WWTP.

1.1.3. TARAWA TERRACE TO HADNOT POINT

The design flows from Camp Geiger, Camp Johnson, and Tarawa Terrace are all combined at the Tarawa Terrace WWTP to form a total design flow of 3.85 MGD. The flow is carried through 35,500 LF of 30" force main from the Tarawa Terrace WWTP along Northeast Creek, the railroad tracks, Holcomb Boulevard, and Sneads Ferry Road to a proposed 36" Gravity Line located at Codgels Creek and Sneads Ferry Road. This gravity line will convey a combined flow of 5.17 MGD from the northern and southern plants approximately 8,500 LF along Codgels Creek to the Hadnot Point WWTP.

1.2. SOUTH PLANTS TO HADNOT POINT

1.2.1. RIFLE RANGE TO COURTHOUSE BAY

A 90 HP duplex station will pump a design flow of .525 MGD from the Rifle Range WWTP through 46,750 LF of 12" force main. The force main route begins at the Rifle Range WWTP and runs along the New River and Sneads Ferry Road, past the Marines Road intersection to the proposed aerated wet well at the Courthouse Bay WWTP.

1.2.2. ONSLOW BEACH TO COURTHOUSE BAY

A 50 HP duplex station will pump a design flow of 0.195 MGD from the Onslow Beach WWTP through 33,500 LF of 8" force main to the Courthouse Bay WWTP. The force main runs north from the Onslow Beach WWTP along Mockup Road and Sneads Ferry Road, to the proposed aerated wet well at the Courthouse Bay WWTP.

1.2.3. COURTHOUSE BAY TO HADNOT POINT

The design flows from Rifle Range, Onslow Beach and Courthouse Bay are combined at the Courthouse Bay WWTP to form a total design flow of 1.32 MGD. A 125 HP duplex station will pump the design flow from the Courthouse Bay WWTP through 46,375 LF of 18" force main along Marines Road and Sneads Ferry Road to the proposed 36" Gravity Line located at Codgels Creek and Sneads Ferry Road. This gravity line will convey the combined flow of 5.17 MGD from the northern and southern plants approximately 8,500 LF along Codgels Creek to the Hadnot Point WWTP.

2. SCENARIO 2:

The proposed location for the new Hadnot Point plant is in the vicinity of the existing ball fields on O Street, upstream along Codgels Creek from the existing Hadnot Point plant. For purposes of this evaluation, the pumping arrangements for the new plant are identical to the plant upgrade scenario (Scenario 1).

3. SCENARIO 3:

3.1. NORTH PLANTS TO JACKSONVILLE

The total design flow for the North Plants is equal to 3.85 MGD. However, since The City of Jacksonville only has the capacity to receive a total of 3.0 MGD from the Marine Corps Base, the flows for the North Plants have been decreased proportionally to allow for this limitation. If this scenario is selected for implementation, it will be necessary to establish conservation measures to limit the total discharge from the northern plants. Such measures include reduction of inflow and infiltration, use of water saving devices in base facilities, and the careful control of oil separator discharges.

3.1.1. CAMP GEIGER TO JACKSONVILLE

A 15 HP duplex station will pump a design flow of 1.30 MGD from the Camp Geiger WWTP through the existing 16" effluent force main across Brinson Creek. A proposed 18" Gravity Line will then carry the flow along Brinson Creek approximately 1200 feet to a proposed City of Jacksonville Booster Pump. A flow meter will be installed in the Gravity Line for Jacksonville's billing purposes.

3.1.2. TARAWA TERRACE TO CAMP JOHNSON

A 25 HP duplex station will pump a design flow of 1.1 MGD from the Tarawa Terrace WWTP through 8,500 LF of 16" force main to the Camp Johnson WWTP. The force main runs west from the Tarawa Terrace WWTP along Northeast Creek, crossing Scales Creek via an existing trestle to the proposed aerated wet well at the Camp Johnson WWTP.

3.1.3. CAMP JOHNSON TO JACKSONVILLE

A 30 HP duplex station will pump a combined design flow from Tarawa Terrace and Camp Johnson of 1.7 MGD through 8,550 LF of 20" force main from the Camp Johnson WWTP north along Montford Landing Road to NC 24. The force main will discharge to a proposed 18" Gravity Line, to be constructed parallel to the City of Jacksonville's existing 24" Gravity Line. This gravity line will carry the flow approximately 800 feet to the existing Hargett Street Pump Station site. A Flow Meter will be installed in the Gravity Line.

3.2. SOUTH PLANTS TO HADNOT POINT

With 3.0 MGD diverted to the City of Jacksonville, the capacity of the treatment plant at Hadnot Point may be significantly reduced. For purposes of this evaluation the plant is assumed to be a new 10 MGD advanced treatment facility. Additional discussion of the proposed treatment facilities is contained elsewhere in this report.

3.2.1. RIFLE RANGE TO COURTHOUSE BAY

The pumping requirements and force main route location for Rifle Range under this scenario are identical to those under Scenarios 1 and 2.

3.2.2. ONSLOW BEACH TO COURTHOUSE BAY

The pumping requirements and force main route location for Onslow Beach under this scenario are identical to those under Scenarios 1 and 2.

3.2.3. COURTHOUSE BAY TO HADNOT POINT

A 150 HP duplex station will pump a combined south plant design flow of 1.32 MGD from the Courthouse Bay WWTP through 50,400 LF of 18" force main along Marines Road, Sneads Ferry Road, Service Road, Gonzales Boulevard, and Conner Street to the Hadnot Point WWTP. The 36" gravity line along Codgels Creek proposed under Scenarios 1 & 2 is not utilized in Scenario 3.

4. SCENARIO 4:

4.1. ALL PLANTS TO HADNOT POINT

The pumping requirements and force main route location for all existing plants under this scenario are identical to those under Scenarios 1 and 2. The treatment plant at Hadnot Point is assumed to be a new 15 MGD secondary facility. Discussion of the proposed Hadnot Point treatment facilities is contained elsewhere in this report.

4.2. HADNOT POINT TO OCEAN OUTFALL

4.2.1. HADNOT POINT TO ONSLOW BEACH

A design flow of 15 MGD treated effluent will be pumped from the Hadnot Point WWTP through 45,650 LF of 36" force main to Onslow Beach.

4.2.2. OCEAN OUTFALL

The design flow of 15 MGD will be collected in a proposed aeration basin located at the Onslow Beach WWTP site prior to discharge. The 36" gravity ocean discharge line will extend approximately 1.5 miles (7,920 LF) offshore and terminate at a depth of approximately 30 feet.

Detailed cost data for the pumping facilities and a discussion of the assumptions on which cost estimates were based are contained in Appendix C.

3.2 WASTEWATER TREATMENT PLANT DESIGN PARAMETERS

Scenarios 1 through 4 include the construction of a wastewater treatment plant in the Hadnot Point area. Scenario 1 involves the upgrade and expansion of the existing Hadnot Point plant to a 15 MGD advanced treatment facility. Scenario 2 calls for the construction of a new 15 MGD advanced treatment plant in the vicinity of the existing plant. Scenario 3 requires the upgrade and expansion of the existing Hadnot Point plant to a 10 MGD advanced treatment facility. Scenario 4 involves construction of a 15 MGD secondary plant which must be upgradable to an advanced treatment facility. DEM has indicated that a contingency plan will be necessary if the ocean outfall option is pursued. Planning for an upgradable secondary plant allows for conversion to a New River discharge if the ocean discharge is not approved.

Actual discharge parameters for all of the plants are dependent on extensive sampling and modeling efforts beyond the scope of Phase 1. In order to perform preliminary evaluations and comparisons of the various plant options, the planning limits provided by DEM for discharges to the New River were used as a basis for preliminary plant design. Listed below is an outline of the design considerations for the advanced treatment facility. A schematic of the recommended treatment process appears in Figure 3.2.

Advanced Wastewater Treatment Plant Design Parameters:

1. Design Flow - 15 MGD

2. Assumed influent wastewater characteristics:

   BOD_5 = 210 mg/l
   TSS = 230 mg/l
   VSS = 172 mg/l
   TP = 10 mg/l
   TKN = 35 mg/l
   NH_3N = 20 mg/l

3. Required effluent wastewater characteristics:

   BOD_5 = 5 mg/l
   TSS = -
   NH_3N = 1 mg/l
   Total N = 4 mg/l summer, 8 mg/l winter
   TP = 0.5 - 1.0 mg/l
   DO = 6.0 mg/l

4. Design considerations:

   a) Retrofitting and expansion of the existing 8 MGD Hadnot Point wastewater treatment plant.
   b) Design a new WWTP in the vicinity of the existing Hadnot Point wastewater treatment plant.

c) Influents of the Rifle Range WWTP, Camp Geiger WWTP, Camp Johnson WWTP, Tarawa Terrace WWTP, Onslow Beach WWTP, and Courthouse Bay WWTP will be pumped to Hadnot Point WWTP or to a new WWTP for treatment.

5. Multi-stage biological activated sludge processes:

   a) A^2O process - DAVCO Inc. (Davco is licensed to handle the Air Products treatment technology).
   b) OMNIFLO Sequencing Batch Reactor - Jet Tech Inc.
   c) Bardenpho process - ElMCO Process Machinery Division of Envirotech Corporation
   d) Orbal Systems - Envirex Inc.
   e) Schreiber Process - Schreiber Corporation, Inc.

   These processes, known as Biological Nutrient Removal (BNR), are patented activated sludge systems.

6. Selected process for Camp Lejeune is the A^2O process marketed by DAVCO Inc. The selection is based on the following:

   a. Required effluent wastewater characteristics
   b. Shorter process detention time
   c. Capital and O & M costs.
   d. Demonstrated performance:
      The Wastewater Treatment Plant at Largo, Florida has the same design capacity (15 MGD) and same characteristics as the proposed Wastewater Treatment Plant at Camp Lejeune.

7. Unit Processes (see attached process schematic)

   a. Preliminary treatment:

      1. Mechanical Bar Screens.
      2. Aerated grit removal chamber.
         a. Grit chamber.
         b. Grit pumps.

   b. Primary Treatment:

      1. Primary Clarifiers.
      2. Primary Sludge Pumps.

   c. Biological Treatment:

      Advanced biological treatment will use the A^2O process patented by Air Products and Chemicals, Inc. to achieve BOD, nitrogen, and phosphorus removal.

      1. Anaerobic Zone :
         The first stage of the process is a completely mixed anaerobic zone. In this zone, fermentation reactions are

3.2 WASTEWATER TREATMENT PLANT DESIGN PARAMETERS

Scenarios 1 through 4 include the construction of a wastewater treatment plant in the Hadnot Point area. Scenario 1 involves the upgrade and expansion of the existing Hadnot Point plant to a 15 MGD advanced treatment facility. Scenario 2 calls for the construction of a new 15 MGD advanced treatment plant in the vicinity of the existing plant. Scenario 3 requires the upgrade and expansion of the existing Hadnot Point plant to a 10 MGD advanced treatment facility. Scenario 4 involves construction of a 15 MGD secondary plant which must be upgradable to an advanced treatment facility. DEM has indicated that a contingency plan will be necessary if the ocean outfall option is pursued. Planning for an upgradable secondary plant allows for conversion to a New River discharge if the ocean discharge is not approved.

Actual discharge parameters for all of the plants are dependent on extensive sampling and modeling efforts beyond the scope of Phase 1. In order to perform preliminary evaluations and comparisons of the various plant options, the planning limits provided by DEM for discharges to the New River were used as a basis for preliminary plant design. Listed below is an outline of the design considerations for the advanced treatment facility. A schematic of the recommended treatment process appears in Figure 3.2.

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   TKN = 35 mg/l
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3. Required effluent wastewater characteristics:

   BOD_5 = 5 mg/l
   TSS = -
   NH_3N = 1 mg/l
   Total N = 4 mg/l summer, 8 mg/l winter
   TP = 0.5 - 1.0 mg/l
   DO = 6.0 mg/l

4. Design considerations:

   a) Retrofitting and expansion of the existing 8 MGD Hadnot Point wastewater treatment plant.
   b) Design a new WWTP in the vicinity of the existing Hadnot Point wastewater treatment plant.

c) Influents of the Rifle Range WWTP, Camp Geiger WWTP, Camp Johnson WWTP, Tarawa Terrace WWTP, Onslow Beach WWTP, and Courthouse Bay WWTP will be pumped to Hadnot Point WWTP or to a new WWTP for treatment.

5. Multi-stage biological activated sludge processes:

   a) A^2O process - DAVCO Inc. (Davco is licensed to handle the Air Products treatment technology).
   b) OMNIFLO Sequencing Batch Reactor - Jet Tech Inc.
   c) Bardenpho process - ElMCO Process Machinery Division of Envirotech Corporation
   d) Orbal Systems - Envirex Inc.
   e) Schreiber Process - Schreiber Corporation, Inc.

   These processes, known as Biological Nutrient Removal (BNR), are patented activated sludge systems.

6. Selected process for Camp Lejeune is the A^2O process marketed by DAVCO Inc. The selection is based on the following:

   a. Required effluent wastewater characteristics
   b. Shorter process detention time
   c. Capital and O & M costs.
   d. Demonstrated performance:
      The Wastewater Treatment Plant at Largo, Florida has the same design capacity (15 MGD) and same characteristics as the proposed Wastewater Treatment Plant at Camp Lejeune.

7. Unit Processes (see attached process schematic)

   a. Preliminary treatment:

      1. Mechanical Bar Screens.
      2. Aerated grit removal chamber.
         a. Grit chamber.
         b. Grit pumps.

   b. Primary Treatment:

      1. Primary Clarifiers.
      2. Primary Sludge Pumps.

   c. Biological Treatment:

      Advanced biological treatment will use the A^2O process patented by Air Products and Chemicals, Inc. to achieve BOD, nitrogen, and phosphorus removal.

      1. Anaerobic Zone :
         The first stage of the process is a completely mixed anaerobic zone. In this zone, fermentation reactions are

initiated to convert organic nitrogen to ammonia, and to convert insoluble polyphosphates to soluble orthophosphate. Return activated sludge from the clarifier should be denitrified to the maximum extent possible. This zone must be mixed to maintain solids in suspension and to ensure that the return activated sludge is dispersed throughout the influent wastewater.

2. Anoxic Zone:
The second stage of the process is the anoxic zone. This zone is also mixed. The anoxic zone is not aerated. Nitrified mixed liquor from the aerobic zone is recirculated to the anoxic zone, where nitrates provide a source of oxygen to the microorganisms. These microorganisms remove oxygen from nitrates and release nitrogen gas as a byproduct. This nitrogen gas is then stripped out of solution by the aeration in the next zone (aerobic zone).

3. Aerobic Zone:
In this zone, rapid cell growth occurs and phosphorus is absorbed by these cells in abundance. Nitrogen, in the form of ammonia, is converted to nitrates, and then recirculated to the anoxic zone for denitrification. BOD is assimilated and converted to cell mass. This mixed liquor of living cells and inorganic solids (activated sludge) then flows to a clarifier, where the activated sludge settles and is recirculated to the anaerobic zone, while the clarified effluent is processed further before discharge.

4. Major equipment required:
   a) Tanks sized for required detention times.
   b) Mixers.
   c) Air blowers, diffusers and air piping.
   d) Recirculation pumps, controls and piping system.

d. Clarification:

Following biological treatment, the mixed liquor is settled under quiescent conditions. A portion of the settled sludge is returned to the anaerobic zone, and the remainder is wasted to an aerobic sludge digester. Circular clarifiers are recommended. Additional nitrogen removal is required, and the clarifier effluent will flow to the denitrification filter, prior to disinfection.

e. Chemical Feed System:

It is prudent to provide a backup chemical feed system for nutrient removal in the event of a process upset. Thus, an alum feed system is provided for phosphorus precipitation. Alum can be added to the aerobic zone effluent just prior to clarification. A small amount of alum will probably be needed on a daily basis to ensure that phosphorus concentrations are reduced to less than 1.0

mg/l. In addition, small amounts of polymer will assist in the flocculation and settling of precipitated phosphorus.

Polymer feed will also be provided for sludge conditioning at dissolved-air flotation (DAF) units and prior to belt filter press dewatering. Sludge conditioning polymer may a be different type of polymer than that used for aiding the clarification process. Methanol feed will be provided when denitrification filters will be needed to reduce total nitrogen concentration to 4.0 mg/l or less.

f. Denitrification Filter:

Clarified effluent will be low in suspended solids, BOD, phosphorus and ammonia nitrogen. The final aerobic zone of the biological treatment process will ensure that all ammonia nitrogen is converted to nitrate nitrogen. As nitrate is an extremely soluble ion, it is not possible to chemically precipitate it. Removal relies on the work of microorganisms which, under anaerobic or anoxic conditions, use the nitrate as source of oxygen and release nitrogen gas as a byproduct. This is the same process that occurs in the anoxic zone of the A^2O process, with the exception that the microorganisms are attached to a plastic "filter" media rather than suspended in the mixed liquor. In addition, at this point in the process, BOD has been reduced to such a point that there is insufficient "food" to adequately support these microorganisms, and hence, methanol is added as a source of readily available food. Occasionally the filter must be backwashed to remove excess microbial growth which would eventually clog the filter. The filter also incorporates an air scour to improve backwashing. The backwash water is then returned to the anoxic zone of the biological treatment process.

Disinfection/Dechlorination/Post-Aeration:

The final treatment processes of chlorination, dechlorination and post aeration precede final effluent disposal. Chlorine will be fed in solution through a diffuser into chlorine contact tanks. Chlorine addition will provide disinfection at highly efficient rates due to the high degree of pollutant removals in the biological advanced treatment process. Chlorine will be fed centrally from 1 ton cylinder mounted vacuum regulators with an automatic changeover module to provide continuous disinfection. Chlorine gas under vacuum will be dissolved into solution and metered in proportion to effluent flow rate by a standard automatic flow paced chlorinator with integral chlorine solution ejector. Duplex chlorine solution booster pumps will be provided to pump final effluent through the ejector and into the chlorine contact chambers. The dechlorination process is virtually identical to the chlorination process with regard to equipment requirements and operation. The exceptions are that sulfur dioxide gas is made into solution in a sulfonator ejector and initiated to convert organic nitrogen to ammonia, and to convert insoluble polyphosphates to soluble orthophosphate. Return activated sludge from the clarifier should be denitrified to the maximum extent possible. This zone must be mixed to maintain solids in suspension and to ensure that the return activated sludge is dispersed throughout the influent wastewater.

2. Anoxic Zone:
The second stage of the process is the anoxic zone. This zone is also mixed. The anoxic zone is not aerated. Nitrified mixed liquor from the aerobic zone is recirculated to the anoxic zone, where nitrates provide a source of oxygen to the microorganisms. These microorganisms remove oxygen from nitrates and release nitrogen gas as a byproduct. This nitrogen gas is then stripped out of solution by the aeration in the next zone (aerobic zone).

3. Aerobic Zone:
In this zone, rapid cell growth occurs and phosphorus is absorbed by these cells in abundance. Nitrogen, in the form of ammonia, is converted to nitrates, and then recirculated to the anoxic zone for denitrification. BOD is assimilated and converted to cell mass. This mixed liquor of living cells and inorganic solids (activated sludge) then flows to a clarifier, where the activated sludge settles and is recirculated to the anaerobic zone, while the clarified effluent is processed further before discharge.

4. Major equipment required:
   a) Tanks sized for required detention times.
   b) Mixers.
   c) Air blowers, diffusers and air piping.
   d) Recirculation pumps, controls and piping system.

d. Clarification:

Following biological treatment, the mixed liquor is settled under quiescent conditions. A portion of the settled sludge is returned to the anaerobic zone, and the remainder is wasted to an aerobic sludge digester. Circular clarifiers are recommended. Additional nitrogen removal is required, and the clarifier effluent will flow to the denitrification filter, prior to disinfection.

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mg/l. In addition, small amounts of polymer will assist in the flocculation and settling of precipitated phosphorus.

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h. Solids Handling:

1. Dissolved Air Flotation (DAF) Units:
Duplicate prefabricated steel wall dissolved air flotation thickener units will be furnished to concentrate the waste activated sludge prior to introduction to the aerobic digester. The DAF units will employ polymer addition to enhance performance.

2. Aerobic Digesters:
The thickened waste activated sludge and the primary sludge will be combined and pumped to the aerobic digesters for stabilization.

3. Belt Filter Presses:
Stabilized sludge will be pumped from the digesters to belt filter presses for dewatering. Polymer will be used for sludge conditioning prior to dewatering. Treated wastewater will be used for spray wash water for cleaning the belts.

i. Sludge Disposal Options:

a) Lime stabilization and land application for soil conditioning.
c) Incineration.
d) Composting.
c) Landfill disposal.

Detailed cost data for the treatment facilities and a discussion of the assumptions on which cost estimates were based are contained in Appendix C.

3.3 INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

Potential land application spray fields and lagoon sites for Camp Lejeune were selected based on the following criteria:

1. An assumption was made that the general area of the existing plants would continue to be the receiving point for the influent and, therefore, the spray fields and lagoons would be as close to these areas as possible.

2. Land use maps were studied to determine where suitable undeveloped land was available.

3. Soil Surveys were studied to estimate where suitable soils were available. For this preliminary study, requirements included (a) depth to groundwater greater than three feet and (b) soil permeabilities 0.2 to 6 in/hr.

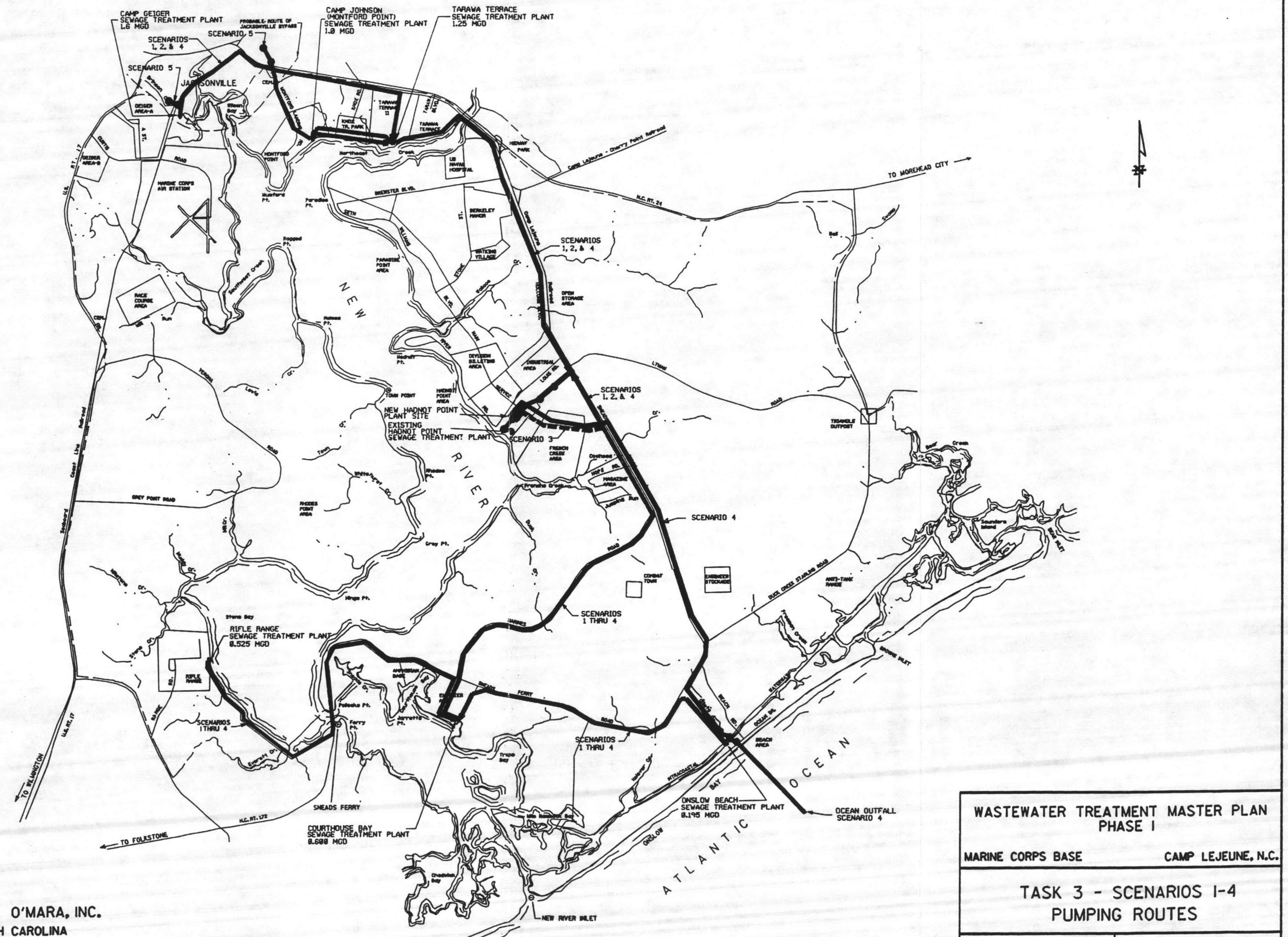
4. All areas deemed acceptable based on items 1 through 3, above, were delineated on soil maps.

5. Meetings were held with base planning, training, and other interested personnel to discuss possible conflicts with long term planning and training needs.

6. After conflicting areas were dismissed from further evaluation, sites were delineated based on area requirements determined in Task 3.

Site selection for land application systems is an iterative process; therefore, final site selection must be determined as result of actual field investigations by a qualified soil scientist.

Detailed cost data for the land application facilities and a discussion of the assumptions on which cost estimates were based are contained in Appendix C. Locations of the proposed land application sites are indicated in Figure 3.3. A schematic of the recommended typical land application treatment process appears in Figure 3.4.



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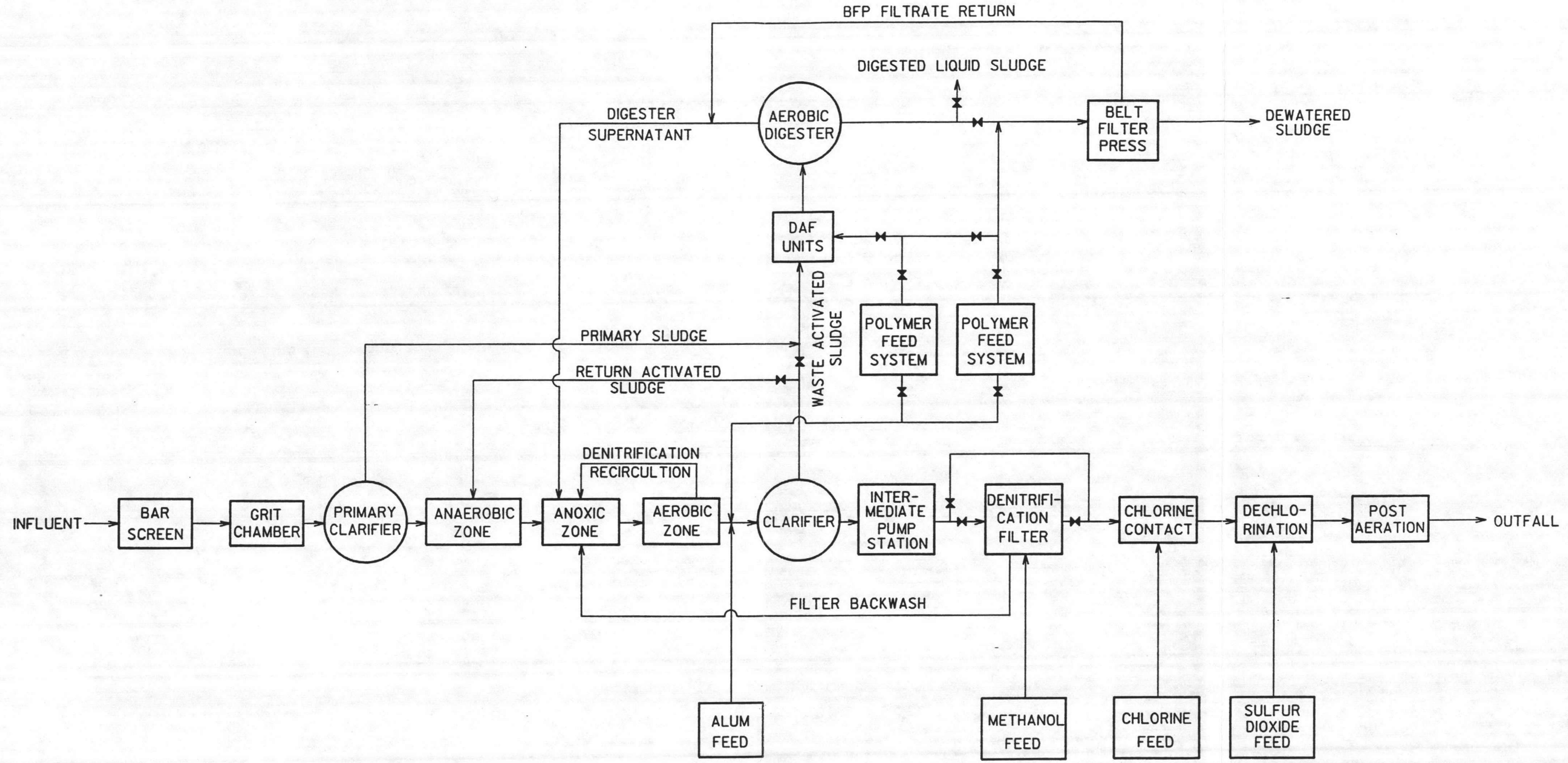
WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE | CAMP LEJEUNE, N.C.

TASK 3 - SCENARIOS 1-4
PUMPING ROUTES

SCALE: N.T.S. | FIGURE 3.1

FILENAME: EXI.SHT



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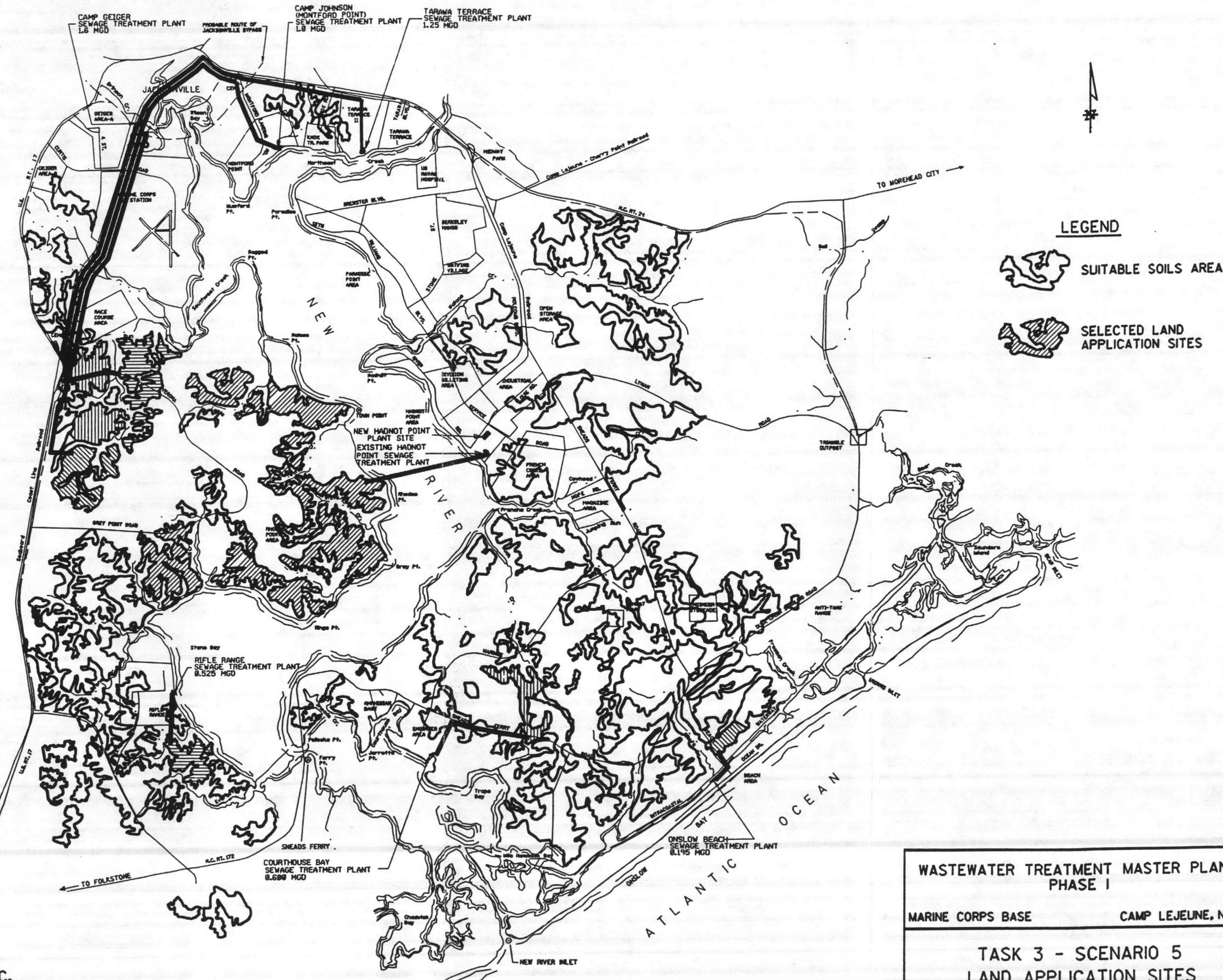
RALEIGH, NORTH CAROLINA

FILENAME: PROCESS.SHT

WASTEWATER TREATMENT MASTER PLAN PHASE I	
MARINE CORPS BASE	CAMP LEJEUNE, N.C.
PROCESS FLOW DIAGRAM ADVANCED TREATMENT	
SCALE: N.T.S.	FIGURE 3.2

This may be a spurious assumption and may have slanted the analysis of this alternative



WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE CAMP LEJEUNE, N.C.

TASK 3 - SCENARIO 5
LAND APPLICATION SITES

SCALE: N.T.S. FIGURE 3.3

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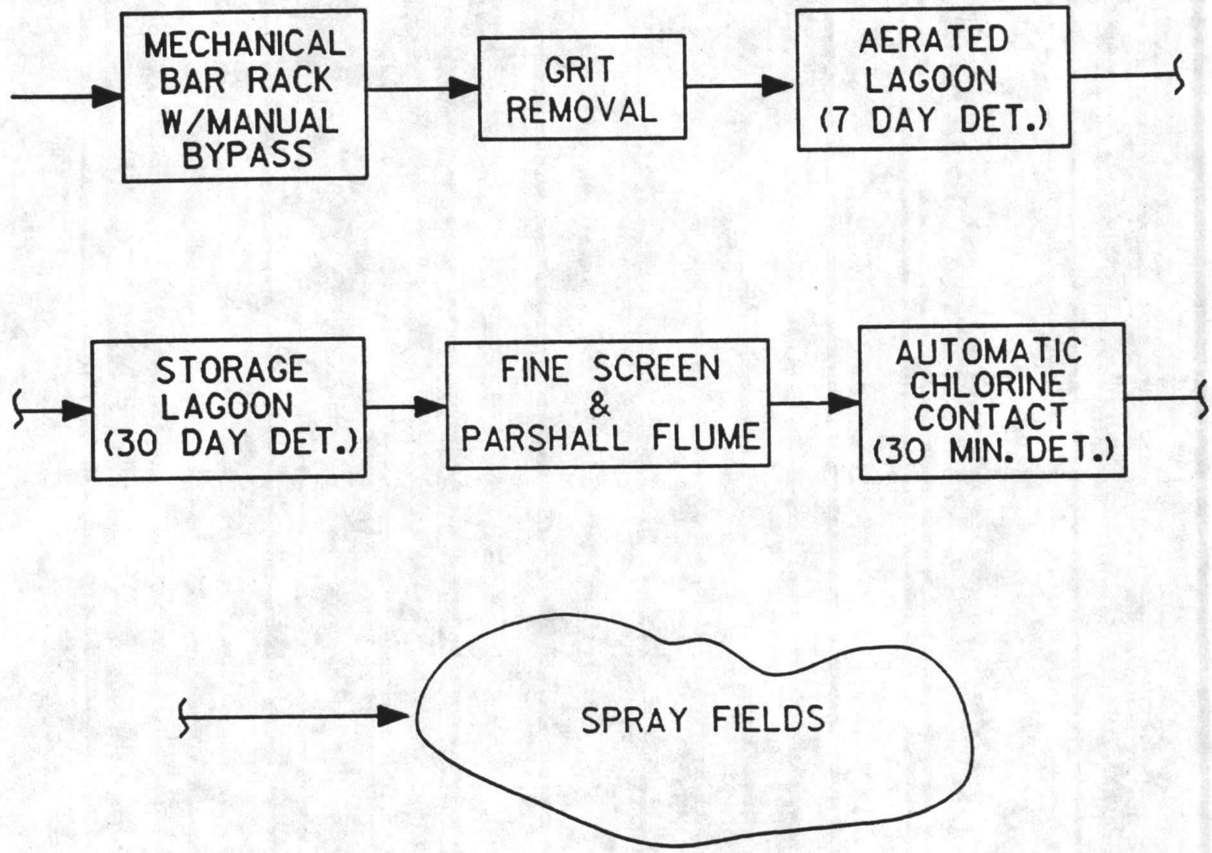
FILENAME: EX2.SHT



WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE CAMP LEJEUNE, N.C.

PROCESS FLOW DIAGRAM
LAND APPLICATION

GREENHORNE & O'MARA, INC.
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SCALE: N.T.S.

FIGURE 3.4

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SECTION 4

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SECTION 4

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

4 - COMPARISON OF PHASE 1 SCENARIOS

Three Scenarios from Task 3 were selected for comparative feasibility and economic analysis:

Alternate 1: A new centralized 15 MGD secondary treatment plant with an ocean outfall to accommodate all flows.

Alternate 2: A combination of pumping selected northern plant flows to Jacksonville, land application for the southern plants, and an upgrade and expansion of the existing Hadnot Point plant to 10 MGD advanced treatment for the remaining flows.

Alternate 3: A new centralized 15 MGD advanced treatment plant at Hadnot Point to accommodate all flows.

PUMPING ROUTES

All of the Task 4 Alternates involve the pumping of raw sewage and/or treated effluent. Pumping stations will be placed at or very near the existing treatment plant locations. Preliminary force main routes are described in Section 3 and are indicated in Figures 3.1 and 3.3.

During Task 4, the pumping routes selected in Task 3 were modified to reduce the required force main lengths by including more cross country locations and water crossings. The shorter routes required smaller diameter force mains and lowered pump horsepower. Consequently, with the exception of the Rifle Range force main, construction and operation costs were lower than those determined previously. Due to the high construction cost of crossing Stone Bay from the Rifle Range, the total life-cycle cost for this route increased.

As discussed in Task 3, odor control equipment is assumed to be required. Odor control is proposed by air injection at the wet well at each pump station, with additional injection points at the mid points of the longer force mains. In addition the proposed aeration basin just ahead of the Onslow Beach ocean outfall line has been replaced with an air injection pump to supply dissolved air to the treated effluent as it enters the outfall.

Revised pumping routes are shown in Figure 4.1.1, Figure 4.2.1, and Figure 4.3.1 for Alternates 1, 2, and 3 respectively. Task 4 pump and force main sizes are listed in Appendix C.

WASTEWATER TREATMENT PLANTS

Alternates 1 and 3 include the construction of a new wastewater treatment plant in the Hadnot Point / French Creek area. The proposed site for the new plants is shown in Figure 4.0. Under Alternate 2, the existing Hadnot Point Plant will be upgraded to an Advanced 10 MGD facility. All alternates utilize the existing equalization lagoon as the primary collection point for all of the wastewater. Recommended staffing requirements for the facilities are included below. Staffing estimates are based on calculations utilizing EPA Staffing Estimate Worksheets for each plant, with appropriate adjustments for specific plant characteristics.

Alternate 1

A new 15 MGD secondary treatment facility will be constructed in the vicinity of Main Service Road and Gonzales Boulevard. It is assumed that the effluent limits for this facility will be less stringent due to the proposed ocean outfall. The basis for design of the new 15 MGD secondary plant is identical to the 15 MGD advanced facility described in Section 3.2, with the following components excluded:

- A^2O Process Equipment
- Intermediate Pump Station
- Denitrification Filters
- Dechlorination Equipment

The A^2O Process Equipment and the Denitrification Filters will not be needed to meet the anticipated secondary effluent limits. Gravity flow of Secondary Effluent should be possible, thereby eliminating the need for the Intermediate Pumps. A pump station structure for Return Sludge Pumps and Digester Overflow Pumps will be included in the area between the proposed clarifiers. It is assumed that effluent toxicity will not be a problem due to the length of the ocean outfall line, eliminating the need for Dechlorination Equipment. The existing Hadnot Point Plant will be abandoned.

Recommended staffing for a new 15 MGD secondary plant is as follows:

Position Classification	No. of Employees Day Shift	Night Shift	Weekend Shift	Total
Operations	7	3	3	13
Maintenance	4	1	1	6
Supervisory	1	1	1	3
Clerical	1	-	-	1
Laboratory	2	-	-	2
Yard Work	2	-	-	2
TOTAL	17	5	5	27

Figures 4.1.2 and 4.1.3 show the proposed Process Flow Schematic and Wastewater Treatment Plant Site Plan for Alternate 1.

Alternate 2

The existing Hadnot Point Plant will be upgraded to provide advanced treatment for a projected flow of 10 MGD. The basis for design of the upgraded plant is identical to the 15 MGD advanced facility described in Section 3.2, modified as required to accommodate the lower flow. The basis for design of the land application systems at Rifle Range, Courthouse Bay, and Onslow Beach is identical to the system described in Section 3.3.

Recommended staffing for the upgraded 10 MGD advanced plant is as follows:

Position	No. of Employees			
Classification	Day Shift	Night Shift	Weekend Shift	Total
Operations	13	4	5	22
Maintenance	5	1	1	7
Supervisory	1	1	1	3
Clerical	1	-	-	1
Laboratory	2	-	-	2
Yard Work	2	-	-	2
TOTAL	24	6	7	37

Operation of the land application systems is expected to require two (2) qualified Operators for each location and a rotating farming and maintenance crew of four (4).

Figures 4.2.2 and 4.2.3 show the proposed Process Flow Schematic and Wastewater Treatment Plant Site Plan for Alternate 2.

Alternate 3

A new 15 MGD advanced treatment facility will be constructed in the vicinity of Main Service Road and Gonzales Boulevard. The basis for design of the new plant is identical to the 15 MGD advanced facility described in Section 3.2. The existing hadnot Point Plant will be abandoned.

Recommended staffing for the new 15 MGD advanced plant is as follows:

Position	No. of Employees			
Classification	Day Shift	Night Shift	Weekend Shift	Total
Operations	14	5	7	26
Maintenance	4	1	2	7
Supervisory	1	1	1	3
Clerical	1	-	-	1
Laboratory	2	-	-	2
Yard Work	2	-	-	2
TOTAL	24	7	10	41

Figures 4.3.2 and 4.3.3 show the proposed Process Flow Schematic and Wastewater Treatment Plant Site Plan for Alternate 3.

Analysis of the Task 4 Alternates included the following elements for evaluation:

1. Order-of-Magnitude Life Cycle costs.

2. Preliminary environmental evaluation to identify any major concerns that would eliminate an alternative.

3. Estimated time to design, permit, and construct facilities.

4. General regulatory requirements and permitting conditions.

5. Conformance to the Camp Lejeune Master Plan.

6. Site suitability, space available, and right-of-way requirements.

7. General constructability.

8. Other limits due to base operations and facility needs.

9. Other applicable and relevant local, State, and Federal regulations.

10. Complexity of operation and maintenance.

11. Reliability and failure considerations.

12. Ability to meet long-term disposal needs.

13. Efficiencies of nutrient removal.

14. Sludge generation, handling, and disposal.

15. Reliability of technology.

16. Ease of treatment capacity expansions.

4.1 Order of Magnitude Life Cycle Costs

Each Alternate was considered independently and evaluated for a twenty (20) year life-cycle. Items evaluated include Capital Costs for Construction; Labor Costs; Operation and Maintenance Costs; and Power Costs. The table on the following page indicates the present worth value for each Alternate.

The component present worth values, listed for the existing treatment plants, have been adjusted to indicate the individual plants' flow-weighted contributions to the overall cost of pumping, treatment, and disposal. Detailed cost data, including construction cost and non-weighted present worth summaries are contained in Appendix C. Design and permit costs are included for reference in the cost data but are not reflected in the summaries of construction costs and present worth values.

The environmental consequences related to the proposed Wastewater Treatment Alternates were studied for their potential to eliminate any alternatives from further consideration. Various State and Federal agencies were contacted for general information. The basis for the items investigated was derived from both the guidelines issued by the N.C. Department of Administration State Clearinghouse and those from the National Environmental Policy Act.

4.2.1 Environmental Consequences:

Alternate 1 - Secondary treatment plant for all flows with an ocean outfall

4.2.1.1 Changes in Land Use

No changes in land use will result from proposed piping routes of Alternate 1 as most would be constructed in shoulders of existing roads.

Changes would occur at the Hadnot Point plant due to additional land requirements. Approximately 50 acres of additional land at the intersection of Main Service Rd. and Gonzales Boulevard would be required for the new Hadnot Point plant proposed in Alternate 1. The area presently consists of undeveloped land between two creeks.

4.2.1.2 Wetlands

Pipe Routes

Along Roads: Proposed pipe routes follow existing Marine Corps Base (MCB) roads with the exception of river and creek crossings. Pipes installed in the road shoulders will require no permits as these areas are not designated wetlands according to the National Wetlands Inventory Maps issued by the U.S. Department of the Interior.

Overland: A few thousand feet of the proposed route between Camp Geiger and Camp Johnson will cross wetlands between Edwards Creek and Jacks Point. The crossing would likely qualify for Nationwide Permit 12.

River Crossings: Utility lines normally qualify for Nationwide Permit 12 but a series of conditions and management practices must be met. Major crossings in Alternate 1 would occur at the following locations:

- New River at Jacks Point
- Northeast Creek
- Wallace Creek
- Intracoastal Waterway (two)
- New River at Stone Bay (11,000 ft.)

Treatment Plant Site: The Hadnot Point plant proposed in Alternate 1 would be located in upland areas as designated on the referenced maps and would have no impact on wetlands.

4.2.1.3 Prime or Unique Agricultural Lands

Endangered Plant Species - All endangered plant species within the MCB occur within wetland or marsh areas. The improvements proposed for Alternate 1 could impose a minor impact on these species along pipe routes through wetlands between Camp Geiger and Camp Johnson from Edwards Creek to Jacks Point.

4.2.1.4 Public Lands

The improvements proposed in Alternate 1 would have no significant impact on areas of the MCB open to the general public. The proposed piping routes along roads and the proposed plant construction are not expected to have a significant effect on the general public other than minor traffic interruption during construction.

4.2.1.5 Scenic and Recreation Areas

The improvements proposed in Alternate 1 would have no significant impact on scenic or recreation areas of the MCB. Temporary effects however would be realized during construction of pipe lines and the treatment plant at the following locations:

- Picnic area at Frenchman's Creek and Northeast Creek between Camp Johnson and Tarawa Terrace
- Pipe crossing at Northeast Creek
- Pipe crossing of Intracoastal Waterway at Onslow Beach
- Pipe crossing of Onslow Beach shoreline for ocean outfall
- Pipe crossing of New River at Stone Bay from Rifle Range

4.2.1.6 Areas of Archaeological or Historical Value

Improvements proposed in Alternate 1 would have no significant impact on known Archaeological or Historic sites based on examination of the MCB Cultural Resources Map and the MCB Historic Preservation Plan dated 1990.

4.2.1.7 Air Quality

Construction activities associated with the improvements proposed in Alternate 1 would have no significant impact on the MCB air quality. Earthwork operations for utility trenches and for treatment plant structures would cause short term dust conditions and minor exhaust emissions from equipment.

Sludge disposal through incineration could have an impact on the MCB air quality. An air permit application and toxicity analysis of the incineration process would be required by the NC Division of Environmental Management. A "toxic review" of the surrounding air zone, as defined by the MCB, may also be required by the NCDEM to assess the effect of the proposed incineration process on the surrounding area.

Operation of the proposed treatment plant would have no significant impact on air quality as odor control measures are included in the Alternate 1 plant improvements.

4.2.1.8 Groundwater Quality

The improvements proposed in Alternate 1 would have no significant impact on the groundwater quality of the MCB. The proposed pipe routes consist of force mains and as such would require relatively shallow installations. The force mains would be pressure tested during construction to assure their integrity.

The construction proposed for the Hadnot Point plant will require groundwater monitoring systems to be approved by the NC Division of Environmental Management during the design review of the project. The groundwater monitoring systems would be designed as a result of a hydrogeologic investigation and would be capable of assessing the impact of any wastewater discharge into the groundwater. what is the purpose of GWM here?

4.2.1.9 Noise Levels

The improvements proposed in Alternate 1 would have no significant impact on noise levels at the MCB. Temporary levels may rise for short periods during construction but would not significantly disrupt normal activities.

4.2.1.10 Water Supplies

MCB Well Fields - Improvements proposed in Alternate 1 would have no significant impact on existing MCB water supply wells. Proposed pipe routes would be required by NCDEM to maintain 100 feet (50 feet with ductile iron pipe and pressure joints) of clearance from wells. In most cases this could be accomplished by locating wastewater piping on the opposite side of roads from existing water supply piping.

Other Water Supplies - No other known water supply sources would be impacted by the proposed improvements of Alternate 1.

4.2.1.11 Fish and Their Habitats

The wastewater pipe river crossings proposed in Alternate 1 would have temporary effects on fish nurseries and shellfish beds in the following locations:

- Northeast Creek - nursery area
- New River at Jacks Point - nursery area
- New River at Stone Bay - shellfish beds

This appears to be inconsistent

The NC Division of Marine Fisheries indicated that construction of utility crossings are routinely permitted through the nursery locations between September 1 and April 1. Marine Fisheries indicated, however, that they would have great concerns over the crossing of Stone Bay if it involved disturbance of shellfish beds. The crossing route from Rifle Range would have to be adjusted to avoid such a disturbance.

The approval of the ocean outfall discharge under the NPDES permit procedure would require studies to indicate that no "unreasonable degradation of the marine environment" would occur under the proposed discharge conditions,this determination is beyond the scope of this study however.

4.2.1.12 Wildlife and Their Habitats

Endangered Species:

Red Cockaded Woodpecker - Pipe routes proposed in Alternate 1 will pass through current ranges of the Red Cockaded Woodpecker along Sneads Ferry Rd. between Service Rd. and Courthouse Bay; as the proposed pipe would be placed in the shoulder of the existing roads however, no significant disturbance to the habitat is anticipated.

Alligators - The alligator habitat is generally restricted to wetland and marsh areas of the MCB. Improvements proposed in Alternate 1 may have minor, temporary impact during construction at river crossings and the wetland crossing between Camp Geiger and Camp Johnson.

Sea Turtles - Construction of the ocean outfall line from Onslow Beach could impose a minor, temporary impact to the turtle beach habitat during construction (consultation with the U.S Fish & Wildlife Service during the next phase of the study is recommended).

Whales - Construction of the ocean outfall line from the shoreline at Onslow Beach could impose a minor, temporary impact during construction (consultation with the U.S Fish & Wildlife Service during the next phase of the study is recommended).

4.2.1.13 Introduction of Toxic Substances

Improvements proposed in Alternate 1 would not introduce toxic substances to the MCB under normal operating conditions beyond the amounts permitted in the NPDES Wastewater Discharge Permit. Equipment failures could cause minor discharges of toxic substances but would not create a significant impact to the MCB.

4.2.1.14 Existing Utilities

IR Sites (Reclaimed Landfills) - The improvements proposed for Alternate 1 would pose no significant impact on existing "IR" sites. The proposed pipe route between Camp Geiger and Camp Johnson is near Site 36 but further investigation and adjustment to the actual pipe route would avoid disturbance to the site.

4.2.2 Environmental Consequences - Alternate 2:

Combination of pumping northern plant flows to Jacksonville, land application for the southern plants, and an upgrade of the existing Hadnot Point plant for the remaining flows.

4.2.2.1 Changes in Land Use

No changes in land use would result from proposed piping routes of Alternate 2 as most would be constructed in shoulders of existing roads.

The proposed improvements to the Hadnot Point plant would require the use of undeveloped land in upland area near the existing plant.

Changes in land use would occur however at proposed land application sites at the Onslow Beach, Courthouse Bay, and Rifle Range plant sites. Land used for land application treatment would be dedicated to crop management (timber) for the proposed life of the treatment plants.

4.2.2.2 Wetlands

Pipe Routes

Along Roads: Proposed pipe routes would follow existing MCB roads with the exception of river and creek crossings. Pipes installed in the road shoulders will require no permits as these areas are not designated Wetlands according to the National Wetlands Inventory Maps issued by the U.S. Department of the Interior.

Overland: The proposed route from Camp Geiger to a Jacksonville pump station crosses approximately 1200 feet of Wetland along Brinson Creek. Nationwide Permit 12 most likely will apply.

River Crossings: Utility lines normally qualify for Nationwide Permit 12 but a series of conditions regarding wildlife disturbance and management practices must be met. Major crossings in Alternate 1 would occur at the following locations:

- Northeast Creek(from Tarawa Terrace)
- Wallace Creek
- Intracoastal Waterway

River Outfall: The proposed outfall from Hadnot Point would require an Individual Permit since the pipe would not be fully covered in a trench.

Treatment Plant Sites

Hadnot Point: The proposed plant upgrade is located in an upland area and would not encroach on identified Wetlands.

Land Application: The areas proposed for land application are also located in upland areas as Wetlands are not suitable for land application.

4.2.2.3 Prime or Unique Agricultural Lands

Endangered Plant Species - All endangered plant species within the MCB occur within wetland or marsh areas. The proposed route from Camp Geiger to a Jacksonville pump station in Alternate 2 crosses approximately 1200 feet of Wetland along Brinson Creek; therefore, a minor impact on these species is possible.

4.2.2.4 Public Lands

The improvements proposed in Alternate 2 would have no significant impact on areas of the MCB open to the general public. The proposed piping routes along roads and the proposed plant construction are not expected to have a significant effect on the general public other than minor traffic interruption during construction.

4.2.2.5 Scenic and Recreation Areas

The improvements proposed in Alternate 2 would have no significant impact on scenic or recreation areas of the MCB. Temporary effects however would be realized during construction of pipe lines and plant improvements at the following locations:

- Pipe crossing at Northeast Creek
- Hadnot Point picnic area at old plant
- Pipe crossing of Intracoastal Waterway at Onslow Beach

4.2.2.6 Areas of Archaeological or Historical Value

Improvements proposed in Alternate 2 would have no significant impact on known Archaeological or Historic sites based on examination of the MCB Cultural Resources Map and the MCB Historic Preservation Plan dated 1990.

4.2.2.7 Air Quality

Construction activities associated with the improvements proposed in Alternate 2 would have no significant impact on the MCB air quality. Earthwork operations for utility trenches and for treatment plant structures would cause short term dust conditions and minor exhaust emissions from equipment.

Sludge disposal through incineration could have an impact on the MCB air quality. An air permit application and toxicity analysis of the incineration process would be required by the NC Division of Environmental Management. A "toxic review" of the surrounding air zone, as defined by the MCB, may also be required by the NCDEM to assess the effect of the proposed incineration process on the surrounding area.

Operation of the proposed treatment plant would have no significant impact on air quality as odor control measures are included in the Alternate 2 improvements.

4.2.2.8 Groundwater Quality

The proposed pipe installations of Alternate 2 would have no significant impact on the groundwater quality of the MCB. The proposed pipe routes consist of force mains and as such would require relatively shallow installations. The force mains would be pressure tested during construction to assure their integrity.

The improvements proposed at the Hadnot Point plant upgrade and at the land application sites would require protective liners and groundwater monitoring systems approved by the NC Division of Environmental Management during the design review of the project. The groundwater monitoring systems would be designed as a result of a hydrogeologic investigation and would be capable of assessing the impact of any wastewater discharge into the groundwater.

Application rates at the land application sites would be regulated based on the fluctuation of each site's maximum high water table.

4.2.2.9 Noise Levels

The improvements proposed in Alternate 2 would have no significant impact on noise levels at the MCB. Temporary levels would rise for short periods during construction but would not significantly disrupt normal activities.

4.2.2.10 Water Supplies

foot

Does not compute!

MCB Well Fields - Improvements proposed in Alternate 2 would have no significant impact on existing MCB water supply wells. Proposed pipe routes would be required by NCDEM to maintain 100 feet (50 feet with ductile iron pipe and pressure joints) of clearance from wells. In most cases this could be accomplished by locating wastewater piping on the opposite side of roads from existing water supply piping. Land application sites require a 100 feet buffer, protective liners, and groundwater monitoring wells to protect groundwater supply sources from potential contamination. The proposed land application sites of Alternate 2 comply with the requirements and would have no significant impact on well fields in their vicinity.

how do you utilize a protective liner at a land application site?

Other Water Supplies - No other known water supply sources would be impacted by the proposed improvements of Alternate 2.

4.2.2.11 Fish and Their Habitats

One wastewater pipe river crossing proposed in Alternate 2 would have a temporary effect on fish nurseries at Northeast Creek.

The NC Division of Marine Fisheries indicated that construction of utility crossings are routinely permitted through fish nursery locations between September 1 and April 1.

The proposed discharge at Hadnot Point would be restricted to the limits of the NPDES permit for the site. The permitted discharge limits ~~would maintain~~ the water quality as classified by the State and would have no significant impact on marine life.

are consistent with

I doubt that we can make the case that discharge limits will be successful in achieving any level of water quality at this point

4.2.2.12 Wildlife and Their Habitats

Endangered Species:

Red Cockaded Woodpecker - Pipe routes proposed in Alternate 2 will not pass through current ranges of the Red Cockaded Woodpecker. The land application site proposed for the Courthouse Bay plant however is almost entirely located in a current range. Mr. Charles Peterson, the MCB Wildlife Manager, has indicated that the U.S. Fish & Wildlife Service would require "formal consultation" and study under Section 7 of the Endangered Species Act to determine the consequences of land application on these sites.

Alligators - The alligator habitat is generally restricted to wetland and marsh areas of the MCB. Improvements proposed in Alternate 2 may have minor, temporary impact during construction at river crossings.

Sea Turtles and Whales - Improvements proposed in Alternate 2 would have no impact on the habitats of these species.

4.2.2.13 Introduction of Toxic Substances

Improvements proposed in Alternate 2 would not introduce toxic substances to the MCB under normal operating conditions beyond the amounts permitted in the NPDES Wastewater Discharge Permit. Equipment failures could cause minor discharges of toxic substances but would not create a significant impact to the MCB.

4.2.2.14 Existing Utilities

IR Sites (Reclaimed Landfills) - The proposed pipe routes for Alternate 2 would pose no significant impact on existing "IR" sites. The land application site at the Rifle Range plant however is in the vicinity of IR site 69 and would have to be designed to avoid any conflict.

<u>4.2.3 Environmental Consequences - Alternate 3:</u>

New advanced treatment plant at Hadnot Point for all flows.

4.2.3.1 Changes in Land Use

No changes in land use will result from proposed piping routes of Alternate 1 as most would be constructed in shoulders of existing MCB roads.

Changes would occur at the Hadnot Point plant due to additional land requirements. Approximately 50 acres of additional land at the intersection of Main Service Rd. and Gonzales Boulevard would be required for the new Hadnot Point plant proposed in Alternate 3. The area presently consists of undeveloped land between two creeks.

4.2.3.2 Wetlands

Pipe Routes

Along Roads: Proposed pipe routes follow existing MCB roads with the exception of river and creek crossings. Pipes installed in the road shoulders will require no permits as these areas are not designated wetlands according to the National Wetlands Inventory Maps issued by the U.S. Department of the Interior.

Overland: A few thousand feet of the proposed route between Camp Geiger and Camp Johnson will cross wetlands between Edwards Creek and Jacks Point. The crossing would likely qualify for Nationwide Permit 12.

River Crossings: Utility lines normally qualify for Nationwide Permit 12 but a series of conditions and management practices must be met. Major crossings in Alternate 1 would occur at the following locations:

- New River at Jacks Point
- Northeast Creek
- Wallace Creek
- Intracoastal Waterway
- New River at Stone Bay (11,000 ft.)

Treatment Plant Site: The Hadnot Point plant proposed in Alternate 3 would be located in upland areas as designated on the referenced maps and would have no impact on wetlands.

4.2.3.3 Prime or Unique Agricultural Lands

Endangered Plant Species - All endangered plant species within the MCB occur within wetland or marsh areas. The improvements proposed for Alternate 3 could impose a minor impact on these species along pipe routes through wetlands between Camp Geiger and Camp Johnson from Edwards Creek to Jacks Point.

4.2.3.4 Public Lands

The improvements proposed in Alternate 3 would have no significant impact on areas of the MCB open to the general public. The proposed piping routes along roads and the proposed plant construction are not expected to have a significant effect on the general public other than minor traffic interruption during construction.

4.2.3.5 Scenic and Recreation Areas

The improvements proposed in Alternate 3 would have no significant impact on scenic or recreation areas of the MCB. Temporary effects however would be realized during construction of pipe lines and plant improvements at the following locations:

- Picnic area at Frenchman's Creek and Northeast Creek between Camp Johnson and Tarawa Terrace
- Pipe crossing at Northeast Creek
- Pipe crossing of Intracoastal Waterway at Onslow Beach
- Pipe crossing of New River at Stone Bay from Rifle Range

4.2.3.6 Areas of Archaeological or Historical Value

Improvements proposed in Alternate 3 would have no significant impact on known Archaeological or Historic sites based on examination of the MCB Cultural Resources Map and the MCB Historic Preservation Plan dated 1990.

4.2.3.7 Air Quality

Construction activities associated with the improvements proposed in Alternate 3 would have no significant impact on the MCB air quality. Earthwork operations for utility trenches and for treatment plant structures would cause short term dust conditions and minor exhaust emissions from equipment.

Sludge disposal through incineration could have an impact on the MCB air quality. An air permit application and toxicity analysis of the incineration process would be required by the NC Division of Environmental Management. A "toxic review" of the surrounding air zone, as defined by the MCB, may also be required by the NCDEM to assess the effect of the proposed incineration process on the surrounding area.

Operation of the proposed treatment plant would have no significant impact on air quality as odor control measures are included in the Alternate 3 plant improvements.

4.2.3.8 Groundwater Quality

The improvements proposed in Alternate 3 would have no significant impact on the groundwater quality of the MCB. The proposed pipe routes consist of force mains and as such would require relatively shallow installations. The force mains would be pressure tested during construction to assure their integrity.

The construction proposed at the Hadnot Point plant site would require protective liners and groundwater monitoring systems approved by the NC Division of Environmental Management during the design review of the project. The groundwater monitoring systems would be designed as a result of a hydrogeologic investigation and would be capable of assessing the impact of any wastewater discharge into the groundwater.

4.2.3.9 Noise Levels

The improvements proposed in Alternate 3 would have no significant impact on noise levels at the MCB. Temporary levels may rise for short periods during construction but would not significantly disrupt normal activities.

4.2.3.10 Water Supplies

MCB Well Fields - The improvements proposed in Alternate 3 would have no significant impact on existing MCB water supply wells. Proposed pipe routes would be required by NCDEM to maintain 100 feet (50 feet with ductile iron pipe and pressure joints) of clearance from wells. In most cases this could be accomplished by locating wastewater piping on the opposite side of roads from existing water supply piping.

Other Water Supplies - No other known water supply sources would be impacted by the proposed improvements of Alternate 3.

4.2.3.11 Fish and Their Habitats

The wastewater pipe river crossings proposed in Alternate 3 would have temporary effects on fish nurseries and shellfish beds in the following locations:

- Northeast Creek - nursery area
- New River at Jacks Point - nursery area
- New River at Stone Bay - shellfish beds

The NC Division of Marine Fisheries indicated that construction of utility crossings are routinely permitted through the nursery locations between September 1 and April 1. Marine Fisheries indicated, however, that they would have great concerns over the crossing of Stone Bay if it involved disturbance of shellfish beds. The crossing route from Rifle Range would have to be adjusted to avoid such a disturbance.

The proposed discharge at Hadnot Point would be restricted to the limits of the NPDES permit for the site. The permitted discharge limits would maintain the water quality as classified by the State and would have no significant impact on marine life.

4.2.3.12 Wildlife and Their Habitats

Endangered Species:

Red Cockaded Woodpecker - Pipe routes proposed in Alternate 3 will pass through current ranges of the Red Cockaded Woodpecker along Sneads Ferry Rd. between Service Rd. and Courthouse Bay; as the proposed pipe would be placed in the shoulder of the existing roads however, no significant disturbance to the habitat is anticipated.

Alligators - The alligator habitat is generally restricted to wetland and marsh areas of the MCB. Improvements proposed in Alternate 3 may have minor, temporary impact during construction at river crossings and the wetland crossing between Camp Geiger and Camp Johnson.

Sea Turtles and Whales - The improvements proposed in Alternate 3 would have no impact on the habitats of these species.

4.2.3.13 Introduction of Toxic Substances

Improvements proposed in Alternate 3 would not introduce toxic substances to the MCB under normal operating conditions beyond the amounts permitted in the NPDES Wastewater Discharge Permit. Equipment failures could cause minor discharges of toxic substances but would not create a significant impact to the MCB.

4.2.3.14 Existing Utilities

IR Sites (Reclaimed Landfills) - The improvements proposed for Alternate 3 would pose no significant impact on existing "IR" sites. The proposed pipe route between Camp Geiger and Camp Johnson is near Site 36 but further investigation and adjustment to the actual pipe route would avoid disturbance to the site.

4.3 Estimated time to design, permit, and construct facilities

Pumping Routes:

The time for completion of actual design and construction of the proposed pump stations and force mains will be dependant upon the number of design and construction contracts are established to accomplish the work. The possible combinations range from six (6) separate contracts for each area, to a single contract for all of the work.

For purposes of estimating, it assumed that the design and construction of all the force mains and pump stations will be accomplished under the same contract. Design of the pump stations and force mains should last approximately six months. Permitting approval through DEM is expected to require up to 120 days. Completion of construction will be dependant on the number of pipeline crews employed by the contractor. Assuming two crews averaging approximately 500 lf per day, construction could be completed within six months of the notice to proceed.

Wastewater Treatment Plants:

The recommended treatment plant is a new 15 MGD secondary facility located on an undisturbed site near the intersection of Main Service Road and Gonzales Boulevard. Design of this facility is expected to take approximately 18 months. Permitting approval through DEM is expected to take up to 120 days. The construction phase may require 18 to 24 months to complete.

Ocean Outfall:

The study, design and permitting process for an ocean outfall is anticipated to take approximately five years. Construction time is estimated to take one to two years.

Land Application:

Design: Approximately 4 months for each facility

Permitting: Approximately 5 months for each facility

Construction: Approximately 12 months (Courthouse Bay)
Approximately 12 months (Rifle Range)
Approximately 6 months (Onslow Beach)

4.4 General regulatory requirements and permitting conditions

Pumping Routes and Wastewater Treatment Plants:

NC DEPARTMENT OF ENVIRONMENT HEALTH AND NATURAL RESOURCES:

Division of Environmental Management - An NPDES Discharge Permit Application will be required to be submitted for review of Construction Documents for Authorization to Construct.

Division of Environmental Management - An NPDES Discharge Permit Application for plant discharges into the New River will be required to be submitted for review prior to startup of the new or upgraded facilities.

Division of Environmental Management - Non-discharge Permit Applications for pump station and force main construction will be required to be submitted for review of Construction Documents for each individual project prior to start of construction.

Division of Environmental Management - Air Quality Permit for sludge disposal through incineration would be required by the NC Division of Environmental Management. A "toxic review" of the surrounding air zone, as defined by the MCB, may also be required by the NCDEM to assess the effect of the proposed incineration process on the surrounding area. Permit Application review normally can be completed in approximately 90 days after submission of the completed application.

Land Quality Section - An Erosion and Sedimentation Control Plan and a Financial Responsibility Form for land disturbing activities greater than one contiguous acre will be required for each individual project. Proposed improvements under Alternates 1, 2 and 3, should not cause unusual erosion or sedimentation problems. The review will be performed by the Wilmington office of the NCDEHNR Land Quality Section. Maximum review time by law is 30 days.

Division of Coastal Management, NC Coastal Area Management Act (CAMA), The Marine Corp is not required to file a "CAMA Permit", however a "Consistency Determination" from the MCB will be required under the conditions of 15 CFR 930 to assure that the requirements of CAMA are satisfied. The state must respond to the "Consistency Determination" submitted by the Base within 45 days from the submittal date. The construction of subaqueous pipe river crossings would normally be granted if conditions of Section 07H.0208 of the CAMA are satisfied.

NC DEPARTMENT OF TRANSPORTATION:

Right-of-Way Encroachment Agreement for Utilities will be required for installation of pipe lines in Rights-of-Way controlled by NCDOT. The permit review will be performed by the Jacksonville District office and the Wilmington Division office. The pipe installations proposed in this study are routine and no unusual problems are anticipated. Normal review time is 30 - 60 days.

US ARMY CORPS OF ENGINEERS:

Section 404 of Clean Water Act, Permit to discharge fill into wetlands or waters of U.S.

Nationwide Permits - utility crossing wetland
subaqueous river crossing
no review is required

Individual Permits - plant discharge outfall on river bottom
review time is 90 - 180 days

Ocean Outfall:

The State of North Carolina through the N.C. Department of Environment, Health, and Natural Resources must issue a National Pollutant Discharge Elimination System (NPDES) permit to the Marine Corp for operation of an ocean outfall. Effluent limitations will require a minimum of secondary treatment.

The Marine Corp will have to show whether or not the discharge will cause unreasonable degradation of the marine environment by considering the following from CFR 125, paragraph 122:

1. The quantities, composition and potential for bioaccumulation or persistence of the pollutants to be discharged;

2. The potential transport of such pollutants by biological, physical or chemical processes;

3. The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important to the food chain;

4. The importance of the receiving water area to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism;

5. The existence of special aquatic sites including, but not limited to marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas and coral reefs;

6. The potential impacts on human health through direct and indirect pathways;

7. Existing or potential recreational and commercial fishing, including fin-fishing and shellfishing;

8. Any applicable requirements of an approved Coastal Zone Management plan;

9. Such other factors relating to the effects of the discharge as may be appropriate;

10. Marine water quality criteria developed pursuant to section 304(a)(1).

The following information will be required to assist in determining whether or not a permit will be issued:

1. Analysis of the chemical constituents of the discharge;

2. Appropriate bioassays necessary to determine permissible concentration limits;

3. An analysis of the initial dilution;

4. Available process modifications that will reduce the quantities of pollutants to be discharged;

5. An analysis of the location where the pollutants are to be discharged, including the biological community and the physical description of the discharge facility;

6. Evaluation of available alternatives to the discharge of the pollutants including an evaluation of the possibility of land disposal.

Since construction will be funded by public monies environmental documentation will be required in accordance with the North Carolina Environmental Policy Act, NCGS 113A.

Land Application:

Land Application is the preferred method of wastewater treatment by the EPA. It must be proven that land application is not feasible before any other method of treatment will be allowed. Soil conditions and height of water table are the two most important parameters to be met in determining the feasibility of Land Application systems. Although costs should be considered, cost alone will not rule out Land Application as the preferable process.

Non-aerated lagoons are in use in Land Application systems in North Carolina. Aerated lagoons, however, are preferred NCDEM.

Experience by NCDEM with other facilities in the state has been that perennial crops, such as grasses, offer the greatest nutrient removal. None of the municipal land application facilities in North Carolina spray effluent on wooded lands.

4.5 Conformance to the Camp Lejeune Master Plan

Pumping Routes:

The actual location of the recommended force main between Camp Geiger and Camp Johnson will need to be coordinated with Base Planning in order to accommodate a proposed Capital Improvement Project (P807, FY '92) in the Montford Point area.

Portions of the force mains for the recommended pumping routes from Tarawa Terrace to Hadnot Point, Courthouse Bay to Hadnot Point, and Hadnot Point to Onslow Beach are located along Main Service Road. Design and construction of these force mains should be coordinated with Base Planning in order to accommodate a proposed widening of the road.

A proposed extension of Brewster Boulevard, including major intersection improvements at Holcomb Boulevard (P672, FY '94) is planned. If the proposed Task 3 pumping route from Tarawa Terrace to Hadnot Point is selected, it will pass through this area and will need to be coordinated with Base Planning.

Wastewater Treatment Plants:

Construction of the treatment plant at the recommended location will require the relocation of a planned warehouse (P548, FY '95) at the intersection of Main Service Road and Gonzales Boulevard (See Figure 4.0). Since the existing Hadnot Point plant may be abandoned, it may be possible to locate the warehouse at that location.

Ocean Outfall:

The construction of an ocean outfall off Onslow Beach would require a revision to the Land Use Plan for the Onslow Beach area. Should the outfall be constructed, the inlet would be constructed in the vicinity of the intersection of Beach Road and Ocean Drive. This would affect the recreation area presently in the Onslow Beach area; however, the effects should be minimal as the outfall line will be buried.

Land Application:

The areas selected as possible land application sites in Phase 1 are in areas that would provide minimal impact on the master plan. There could be some effects on training sites and operations, however.

4.6 Site suitability, space available, and right-of-way requirements

Pumping Routes:

Proposed pump stations will be located at existing treatment plant sites. With the exception of the Rifle Range, force mains will be located entirely on Camp Lejeune property.

The force main from Rifle Range to Courthouse Bay may require easements for crossing private property. An NCDOT Right-of-Way Encroachment Agreement for construction along NC 172 will be required. The proposed force main is a twelve inch (12") diameter line, and should meet the requirements for suspending from the existing bridge across the New River at Sneads' Ferry.

Wastewater Treatment Plants:

The proposed location for the treatment plant which will be constructed under Alternates 1 or Alternate 3 has adequate space for immediate construction of the facilities. In addition, the site is large enough to allow future expansion to be designed into the project.

Under Alternate 2, the existing Hadnot Point Plant will be upgraded to a 10 MGD advanced treatment plant. The site is constrained by an existing closed landfill between the Primary and Secondary areas of the plant. Further Expansion of the plant will be limited.

Ocean Outfall:

Based on the Camp Lejeune Master Plan, space is available at Onslow Beach for extending an ocean outfall from the area. The proposed ocean outfall corridor is perpendicular to Onslow Beach and begins about 300 feet southwest of the intersection of Beach Road and Ocean Drive. The outfall would require a thirty foot easement across the beach; however, the pipe would be buried where it crosses the beach. This would enable the area to continue to be used as a recreation area after construction is complete.

The ocean outfall is expected to extend approximately 1.5 miles offshore and terminate at a depth of approximately 30 feet. Extensive plume and ocean current studies will be required in order to determine the final location of the end of the outfall. The outfall would be extending into the danger area of Brown Island Target and Bombing Area BT-3; however, it would be approximately three statute miles southwest of the impact area. Discussions with base training personnel indicate that this would not hamper training exercises, nor should it endanger the outfall.

Land Application:

Land application sites are very limited in number on the Camp Lejeune property due to unsuitable soil conditions, height of water table, and the critical need for space for training exercises. Available areas of suitable soils are indicated on Figure 3.3.

Although space appears to be available for land application for the three southern plants, as shown on Figure 4.2.1, the impact upon training must be thoroughly investigated before a final decision can be reached to utilize these sites.

The sites that have been investigated are all wooded except the target ranges at Rifle Range. An actual site investigation may indicate that the wooded areas will have to be cleared and a perennial crop planted on the spray fields and therefore harvested. The target ranges at Rifle Range provide a possibility for land application of treated effluent. The soils on the ranges appear to be marginal at best, however, and an actual field investigation by a soil scientist is necessary to verify the suitability of the soils in this area.

4.7 General constructability

Pumping Routes:

No major problems are anticipated during construction of the proposed pump stations and force mains. Some difficulty may be encountered with the proposed river crossings and the existence of multiple underground utilities along Main Service Road. As stated previously, construction through certain areas will need to be scheduled to minimize disruption to aquatic species.

Wastewater Treatment Plants:

Treatment plant construction for Alternates 1 and 3 involve new construction on a new site. Construction of either of these facilities should present no significant problems for qualified contractors. The proposed Secondary Plant will need to be designed and constructed to allow a conversion to advanced treatment if Ocean Outfall is ultimately disallowed. In addition, modifications to the existing Equalization Lagoon and Pump Station will require contractors to schedule work to allow these items to remain in service during construction.

Construction of the treatment plant for Alternate 2 will be more difficult. Since this alternate requires an upgrade to an existing facility, it will be necessary to minimize disruption to existing process units in order to allow the plant to continue to operate during construction. The following existing treatment units will be abandoned or modified during the upgrade:

- Bar Screen and Comminutor Channel
- Main Pump Station
- Grit Collector at Equalization Lagoon
- Equalization lagoon and Pump Station
- Equalization Lagoon
- Primary Settling Tanks
- Trickling Filters
- Chlorine Contact Basin and Chlorine Building
- Sludge Digesters
- Sludge Drying Beds
- Yard Piping

The age of the existing plant, especially the primary section, could lead to additional problems which may be encountered during construction, such as leaks in existing structures, unknown underground conditions, asbsetos in the building structures, and others.

Ocean Outfall:

Construction of an ocean outfall can lead to excessive costs and delays if incorrect decisions are made during the design and construction processes. Potential problems include improper materials selection, the uncertainty of weather conditions along the North Carolina coast and construction related problems.

Conversations with several outfall contractors indicate that use of welded steel pipe would be their choice for an outfall material because of its ease of construction. Steel pipe can be welded up into 300' to 500' sections and transported on a barge to the construction site, lowered into the water and bolted together with flanges. Concrete pipe would have to be installed a section at a time with section lengths being 15 to 20 feet long. Concrete pipe also is much more susceptible to differential settling than the steel pipe.

Land Application:

Construction of the land application systems includes construction of primary facilities such as bar screen, grit chamber, lagoons, conveyance system to the spray fields, and construction of the spray fields, which could include clearing of woodland, but does not involve any unusual or elaborate construction techniques.

4.8 Other limits due to base operations and facility needs

There may be some inconvenience to Marine Corps training exercises during construction of the ocean outfall since it will be located in the danger zone of the Brown Island Target and Bombing Area. The construction area is not in the impact area proper and the inconvenience should be minimal.

Impact upon base training needs are the main concern of installing land application systems. The land area required for the spray fields for Rifle Range, Courthouse Bay, and Onslow Beach will eliminate approximately 540 acres of valuable training lands.

4.9 Other applicable and relevant local, State, and Federal regulations

- The Clean Water Act
- EPA NPDES Stormwater Permitting regulations (40 CFR Parts 122, 123, and 124 as amended)
- The EPA will play a major role in reviewing the application for the ocean outfall line, although the North Carolina Department of Environment, Health and Natural Resources issues the NPDES permit
- 40 CFR Part 125, Subpart M, Ocean Discharge Criteria
- Nationwide permits are issued by the U.S. Army Corps of Engineers (COE) as part of the NPDES permitting process; therefore, the applicant does not submit this application directly to the COE. Copies of NPDES permit and construction plans should be submitted to the U.S. Army Corps of Engineers for information purposes only.
- State of North Carolina Department of Environment, Health & Natural Resources, Division of Environmental Management, Administrative Code Section: 15A NCAC 2H.0100 - Wastewater Discharges to Surface Waters
- State of North Carolina Department of Environment, Health and Natural Resources, Division of Environmental Management, Administrative Code Section: 15NCAC 2H.0200 Wastewater Not Discharged to Surface Waters.

4.10 Complexity of operation and maintenance

Pumping Routes:

Proposed pump stations and force main will be designed to utilize standard technology and equipment for the conditions anticipated. Telemetry will be provided at the pump stations. Because of the lengthy force mains and associated extended retention times involved, odor control equipment is assumed to be required. Odor control is proposed by air injection at the wet wells, with additional injection points at the mid points of the longer force mains, including installation of an air injection pump to supply dissolved air to the treated effluent as it enters the ocean outfall.

Operation and maintenance of these items should be routine, allowing existing staff to be utilized.

Wastewater Treatment Plants:

The activated sludge and advanced treatment processes represent new technology for the Camp Lejeune public utility department. Although these processes are being utilized successfully elsewhere, it will be necessary to train the current plant operators in the selected process, and to hire additional qualified operators to facilitate operation and maintenance of the new or upgraded facilities. Consequently, some difficulties should be anticipated during initial startup and operation of the plant.

After the initial problems are overcome, and qualified staff have been retained and/or properly trained, operation and maintenance of the new plants should not present any major problems. In addition, the use of centrifugal blowers and fine bubble diffusers for aeration is expected to result in reduced power consumption.

Due to the layout of the existing Hadnot Point plant, with redundant pumping, and the age of many of the process units, operation of the plant will be somewhat more complex. Additional operation and maintenance costs are anticipated as well.

Ocean Outfall and River Crossings:

There is no mechanical equipment associated with the ocean outfall or the proposed river crossings; therefore, there should be no operational problems associated with either. Maintenance will include periodic recoating of the pipelines and occasional repairs as required.

Land Application:

Operation of a land application system can lead to the following types of operational and maintenance problems:

- Improper zoning of spray fields can lead to excessive irrigation and runoff problems,

- Plugging of spray nozzles is a potential problem without proper settling and screening of wastewater,

- Damage to spray nozzle risers during farming or maintenance operations. This can be reduced by designing flexible risers rather than stiff risers,

- Valving should be constructed from resilient, corrosion resistant material,

- At Camp Lejeune, a unique problem could be the potential for conflict with training exercises during operation of systems,

Other operational concerns include:

- Periodic monitoring, sampling and analysis of groundwater around the spray fields,

- Crop management must be dealt with on constant basis.

4.11 Reliability and failure considerations

Pumping Routes:

Standard equipment and procedures will be utilized for installation of the proposed pump stations and force mains. Extra care should be taken during the design and construction of pipelines in the vicinity of troop training areas and tank crossings to eliminate potential pipeline ruptures during training exercises.

Wastewater Treatment Plants:

The activated sludge process for secondary treatment utilizes proven technology. The plant should be designed to accommodate periodic maintenance of the various process units so that failure of one unit, such as a broken chain on a primary clarifier sludge collector, will not cause an hydraulic overload on the units remaining in service. With proper staffing, a new activated sludge facility will provide a reliable facility for meeting the Base's wastewater treatment needs.

The recommended processes for Camp Lejeune's advanced treatment plant are in use elsewhere and can be observed in operation. Some problems can be expected, however, as advances continue to be made in advanced treatment technology.

Ocean Outfall:

Potential failure considerations include a rupture of the pipe during hurricane or powerful storm and problems with installation which can be avoided with proper design and construction inspection.

Land Application:

Land application of wastewater is a reliable method of wastewater disposal if the system is properly designed and operated. The benefits of land application actually go beyond disposal of wastewater since the method involves the recovery of and reuse of water and the use of the nutrients found in wastewater for crop production.

The main points of failure consideration are 1) inadequate design and operation based on insufficient soils data, and 2) improper crop selection. Without adequate soils data, an incorrect application rate could be selected which could lead to excessive runoff and insufficient treatment of wastewater prior to permeating into the groundwater. Improper crop selection could also cause insufficient treatment of the wastewater due to lack of inadequate nutrient uptake.

double negative

4.12 Ability to meet long-term disposal needs

Pumping Routes:

The ability of the proposed pump stations and force mains to meet long-term disposal needs is dependant upon growth projections, and detailed capacity studies. The pumps and force mains in this study are based on current permitted flows.

Pumping of the Camp Geiger and Camp Johnson flows to Jacksonville (Alternate 2) will be limited to 3 MGD if this option is selected. Further growth at these locations will be subject to the available capacity at the Jacksonville land application site.

Wastewater Treatment Plants:

The proposed secondary and advanced treatment plants for Alternates 1 and 3 have been laid out to allow one hundred per cent expansion, should the Base require additional capacity in the future.

Further expansion of the proposed upgrade to the existing Hadnot Point plant will be very difficult due to the site constraints mentioned previously.

Ocean Outfall:

A properly designed and constructed ocean outfall should adequately accommodate additional long term disposal needs.

Land Application:

Land application of effluent wastewater provides a sound method for long term disposal needs since there is no discharge to sensitive inland waters. Future growth of the areas served by land application will be dependant on available suitable land for land treatment, and other criteria listed in elsewhere in this report.

4.13 Efficiencies of nutrient removal

Wastewater Treatment Plants:

A secondary treatment plant discharging through an ocean outfall will provide the most cost effective way of providing the anticipated nutrient removal requirements over the 20 year life cycle.

A river discharge will have much stricter effluent limits, requiring advanced treatment as detailed in Section 3.2. Further, there will be no guaranty that the Base will be allowed to continue discharging to the New River after one or two permit renewal cycles .

Land Application:

Land application provides the best method for nutrient removal through the natural uptake of nutrients by plant life. The average water quality expected from a slow rate land application system percolating through five feet of soil is as follows:

BOD	<2 mg/l
Suspended Solids	<1 mg/l
Ammonia Nitrogen as N	<0.5 mg/l
Total Nitrogen as N	<3 mg/l
Total Phosphorus as P	<0.1 mg/l

Source: Table 2-3, Process Design Manual for Land Treatment of Wastewater, EPA

4.14 Sludge generation, handling, and disposal

The common denominator of the three wastewater treatment alternatives under review is sludge management and disposal. Because of its ability to dewater difficult sludges such as waste activated sludge, a belt filter is proposed for the upgraded or new wastewater treatment plant at Hadnot Point. A disadvantage to using the belt filter is that it requires constant operator attention during filter cake discharge; however, the major advantage is that it does a very good job of dewatering a wide variety of sludges and produces a dryer cake than any other mechanical process.

The level of treatment required for discharge through an ocean outfall will have no effect on sludge generation, handling and disposal. The treatment plant will still generate the same amount of sludge as it would with inland waters discharge.

Three alternatives for sludge disposal were reviewed, incineration, in-vessel composting, and contract hauling/disposal. As a result of the Task 3 study of land application for treated effluent, land application of sludge was not considered.

Incineration:

Incineration provides the most effective method of sludge stabilization. During incineration the various organic materials are fully oxidized. Odor problems are essentially eliminated and all pathogens are eliminated. There is a potential for resource recovery. The disadvantages of incineration include public perception, potentially high concentrations of heavy metals and toxic compounds in the ash and potential air quality problems.

There are two basic types of incineration processes used to incinerate sludge. They are the multiple hearth incinerator and the fluidized bed incinerator.

The **multiple hearth incinerator** operates by allowing the sludges to fall by gravity through a number of grates or hearths which lie in increasingly hotter combustion zones. The flow of the ash through the system is assisted by mechanical rotating arms which rake through the ash. Combustion is accomplished at temperatures between 760° and 1800° F.

The **fluidized bed** operates by injecting the sludge into a hot bed of sand or other inert material. The heat is then transferred to the waste sludge at a combustion temperature of between 760° and 1100° F and oxidized.

The two types of incinerators offer the following advantages and disadvantages:

Incinerator Type:	Advantages:	Disadvantages:
Multiple Hearth	1) Simplicity of design 2) Ease of control 3) Will combust a wide variety of materials efficiently 4) Feed rate is variable 5) Most widely used	1) Requires more fuel to operate 2) More mechanical equipment needed 3) Long heating up and cooling down times

Fluidized Bed	1) Less mechanical moving parts	1) Air pollution equipment likely needed
	2) Lower fuel costs possible	2) Feed equipment has shown some inadequacies

Because of its wide use, ease of control and flexibility of operations the **multiple hearth incinerator** has been chosen as the incinerator alternative to be compared against composting and offsite hauling/disposal.

In-vessel Composting:

Composting is the biodegradation through aerobic decomposition and stabilization of the organic constituents of the waste sludge to a safe, potentially marketable product. Fungi and other bacteria work to decompose the organic material under the proper temperature, moisture, oxygen levels and other conditions.

Like incineration, composting can eliminate pathogens through the heat produced through the composting process in addition to decomposing the organic material.

The type of composting selected to compare to the other methods of sludge stabilization is **in-vessel composting** because it requires less space, conditions needed to promote the composting process are more easily controlled than other methods and odors are easier to control through removal by scrubbing.

Contract Hauling/Disposal:

Contract hauling/disposal is not really a disposal method since it simply transfers the problem to someone else although it can be an economical solution. However, evolving regulations banning land disposal of some sludges and other solid waste discourage recommending contract hauling/disposal as a viable long range alternative.

Land Application:

Although sludge management is not as constant an issue with land application as with conventional wastewater treatment it must be dealt with on a periodic basis. Sludge must be removed from the settling lagoons at approximately 5-year intervals; therefore, a sludge management plan must be prepared.

Recommendations:

There have been numerous **in-vessel composting** facilities constructed recently in the United States including one in Hickory, North Carolina;

therefore, many start-up and implementation problems have been resolved and the technology is continuing to evolve. Markets for the compost are available and the cost effectiveness of the equipment has led to the process being cost competitive with other methods.

A properly designed and operated **incinerator** can produce a residue that is effectively free of detrimental organic material. Benefits also include volume reduction of the solid waste that has to be disposed, reduced potential of groundwater pollution from landfilling putrescible organic material and resource recovery.

Because both **in-vessel composting** and **incineration** offer workable and reliable methods of sludge management it is recommended that a detail study of the two methods be undertaken to determine which alternative is ~~best~~ better ~~suitab~~le for Camp Lejeune.
suited (or more suitable)

4.15 Reliability of technology

Pumping Routes:

Standard equipment and procedures utilizing proven technology will be considered during design and construction of the proposed pump stations and force mains.

Wastewater Treatment Plants:

The activated sludge process for secondary treatment utilizes proven technology. With proper staffing, a new activated sludge facility will provide a reliable facility for meeting the Base's wastewater treatment needs.

The recommended processes for Camp Lejeune's advanced treatment plant are in use elsewhere and can be observed in operation. Some problems can be expected, however, as advances continue to be made in advanced treatment technology.

Ocean Outfall:

Ocean outfall technology has proven very reliable in the northeastern part of the country in similar water depths as those off Camp Lejeune. Representatives of municipalities that have outfalls indicate that there is a high level of reliability associated with ocean outfalls.

Ocean Outfall Wastewater Disposal Feasibility and Planning, April 30, 1979, prepared for the Coastal Plains Regional Commission and the Department of Administration of North Carolina indicates that " construction and operation of a well designed and operated sewage treatment plant that utilizes an ocean outfall and secondary treatment should not adversely affect the water column or fishery resources."

Land Application:

Land application utilizes biological and physical-chemical treatment to produce a very high degree of wastewater renewal. The technology has been proven throughout the country and is the method of wastewater treatment most desired by the EPA; however, the system design is very site specific and finding suitable sites will be the biggest problem that must be confronted in the Camp Lejeune area.

4.16 Ease of treatment capacity expansions

Pumping Routes:

Expansion of the proposed pump stations and force mains is dependant upon growth projections, and detailed capacity studies. The pumps and force mains in this study are based on current permitted flows.

Pumping of the Camp Geiger and Camp Johnson flows to Jacksonville will be limited to 3 MGD if Alternate 2 is selected. Further growth at these locations will be subject to the available capacity at the Jacksonville land application site.

Wastewater Treatment Plants:

The proposed secondary and advanced treatment plants for Alternates 1 and 3 have been laid out to allow one hundred per cent expansion, should the Base require additional capacity in the future.

Brynn how do you react to this statement

Further expansion of the proposed upgrade to the existing Hadnot Point plant will be very difficult due to the site constraints mentioned previously.

Ocean Outfall:

Ease of treatment capacity expansions would be limited by the size of the outfall; therefore, the outfall should be sized for future anticipated flows through at least the life cycle period.

Brynn - whats your reaction to this statement

Land Application:

Ease of expansion is limited by the amount of suitable land available.

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Land application utilizes biological and physical-chemical treatment to produce a very high degree of wastewater renewal. The technology has been proven throughout the country and is the method of wastewater treatment most desired by the EPA; however, the system design is very site specific and finding suitable sites will be the biggest problem that must be confronted in the Camp Lejeune area.

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Brynn - whats your reaction to this statement

Land Application:

Ease of expansion is limited by the amount of suitable land available.

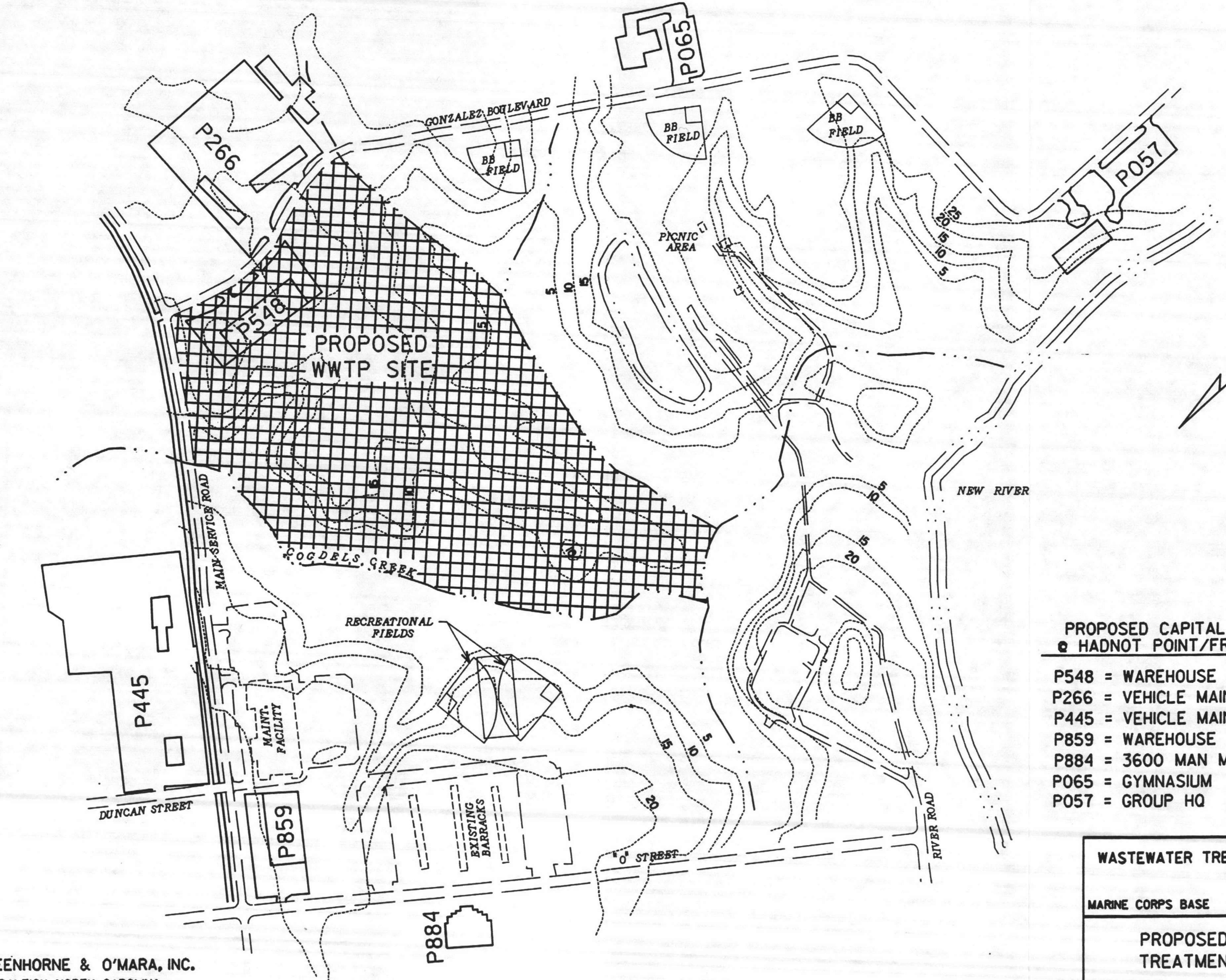
PROJECT: CAMP LEJEUNE WWTP MASTER PLAN - PHASE 1 TASK 4 - EVALUATION OF ALTERNATES

SUMMARY OF PRESENT WORTH VALUES (PUMPING & TREATMENT COSTS DISTRIBUTED)

DATE: 08-AUG-1991

ALTERNATE		CAMP GEIGER	CAMP JOHNSON	TARAWA TERRACE	RIFLE RANGE	ONSLOW BEACH	COURTHOUSE BAY	HADNOT POINT	TOTAL
ALTERNATE 1	SECONDARY WWTP & OCEAN OUTFALL FOR ALL FLOWS	$15,285,557	$8,341,931	$9,846,642	$7,793,491	$3,115,539	$5,309,941	$49,935,475	$99,628,576
ALTERNATE 2	JACKSONVILLE, HP UPGRADE & LAND APPLICATION	$18,372,173	$12,097,081	$13,742,813	$4,992,523	$2,755,361	$5,955,803	$66,803,942	$124,719,695
ALTERNATE 3	NEW PLANT AT HADNOT POINT FOR ALL FLOWS	$17,560,791	$9,763,952	$11,624,169	$8,540,052	$3,392,833	$6,163,153	$61,311,647	$118,356,598

FLOW DISTRIBUTION Plant:	Flow, MGD	All Plants at HP:	North Plants at CJ:	North Plants at TT:	South Plants at CHB:	Hadnot Point and TT:
Hadnot Point	8.000	60.7%	-	-	-	86.5%
Camp Geiger	1.600	12.1%	61.5%	41.6%	-	-
Camp Johnson	1.000	7.6%	38.5%	26.0%	-	-
Tarawa Terrace	1.250	9.5%	-	32.5%	-	13.5%
Rifle Range	0.525	4.0%	-	-	39.8%	-
Onslow Beach	0.195	1.5%	-	-	14.8%	-
Courthouse Bay	0.600	4.6%	-	-	45.5%	-
TOTAL	13.170	100.0%	100.0%	100.0%	100.0%	100.0%



PROPOSED CAPITAL IMPROVEMENTS @ HADNOT POINT/FRENCH CREEK

P548 = WAREHOUSE
P266 = VEHICLE MAINTENANCE FACILITY
P445 = VEHICLE MAINTENANCE FACILITY
P859 = WAREHOUSE
P884 = 3600 MAN MESS HALL
P065 = GYMNASIUM
P057 = GROUP HQ

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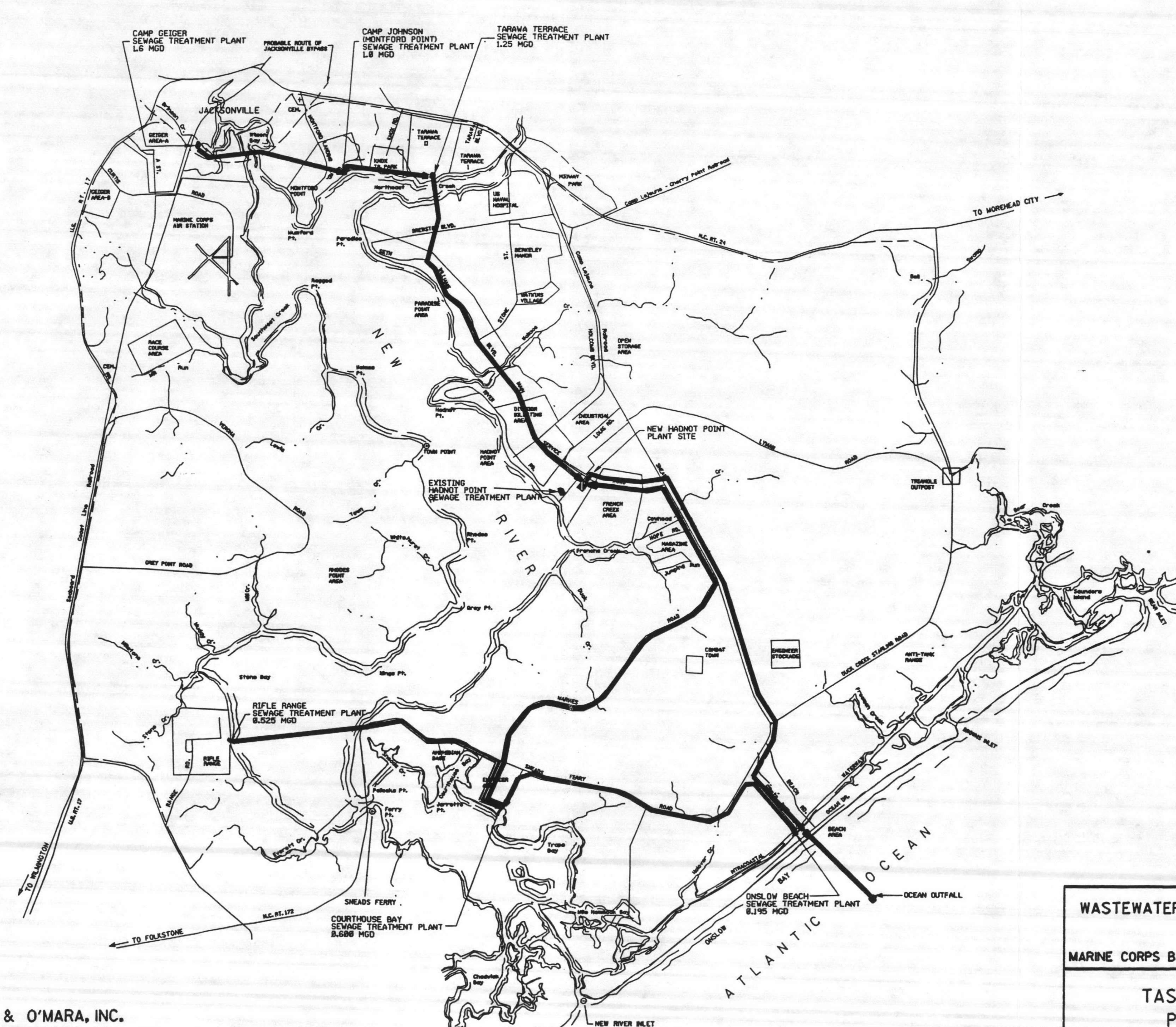
WASTEWATER TREATMENT MASTER PLAN PHASE I	
MARINE CORPS BASE	CAMP LEJEUNE, N.C.
PROPOSED WASTEWATER TREATMENT PLANT SITE	
SCALE: 1" = 400'	FIGURE 4.0

FILENAME: WWTPSITE.SHT



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FILENAME: SM1.SHT

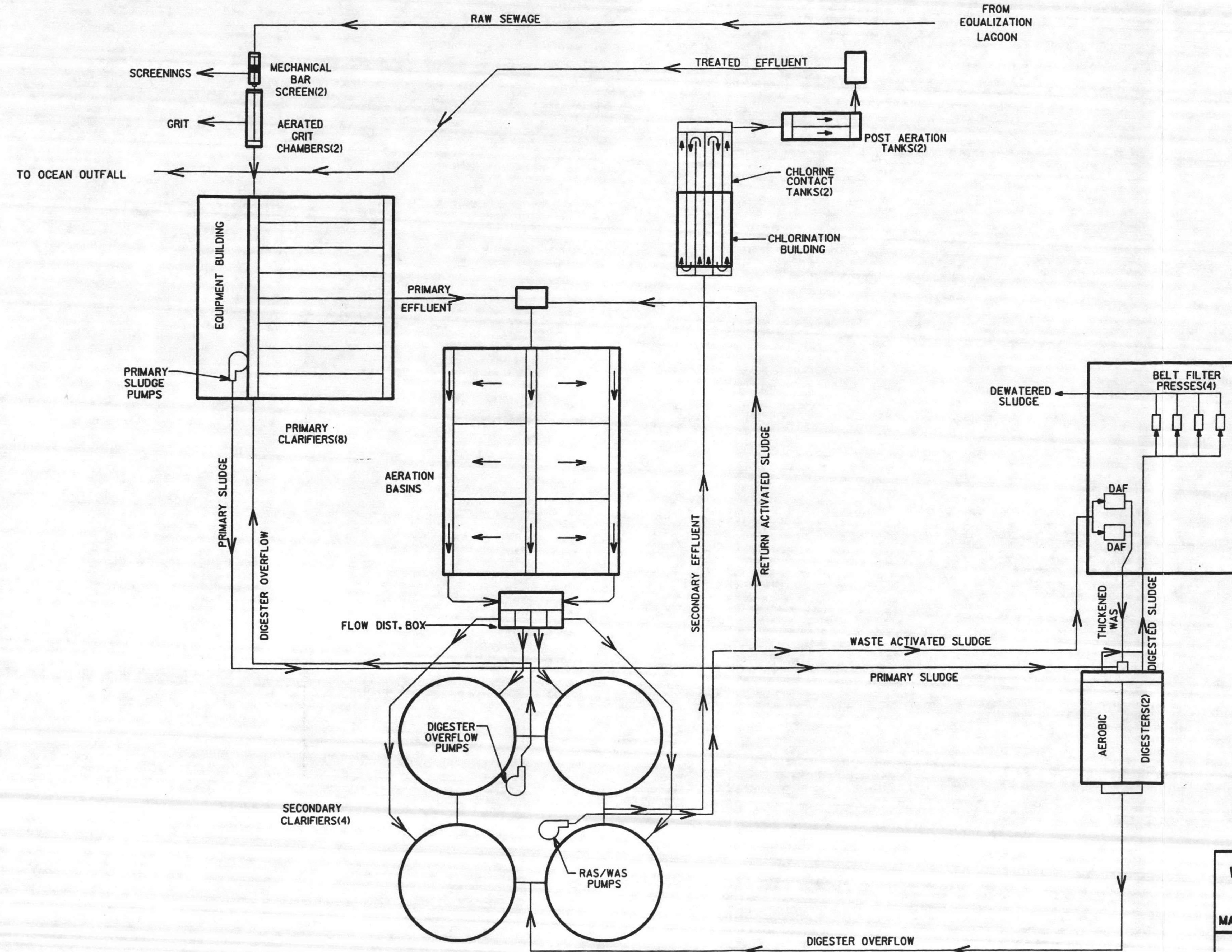
WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE CAMP LEJEUNE, N.C.

TASK 4 - ALTERNATE I
PUMPING ROUTES

SCALE: N.T.S.

FIGURE 4.1.1



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FILENAME: ALTISCH.SHT

WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE CAMP LEJEUNE, N.C.

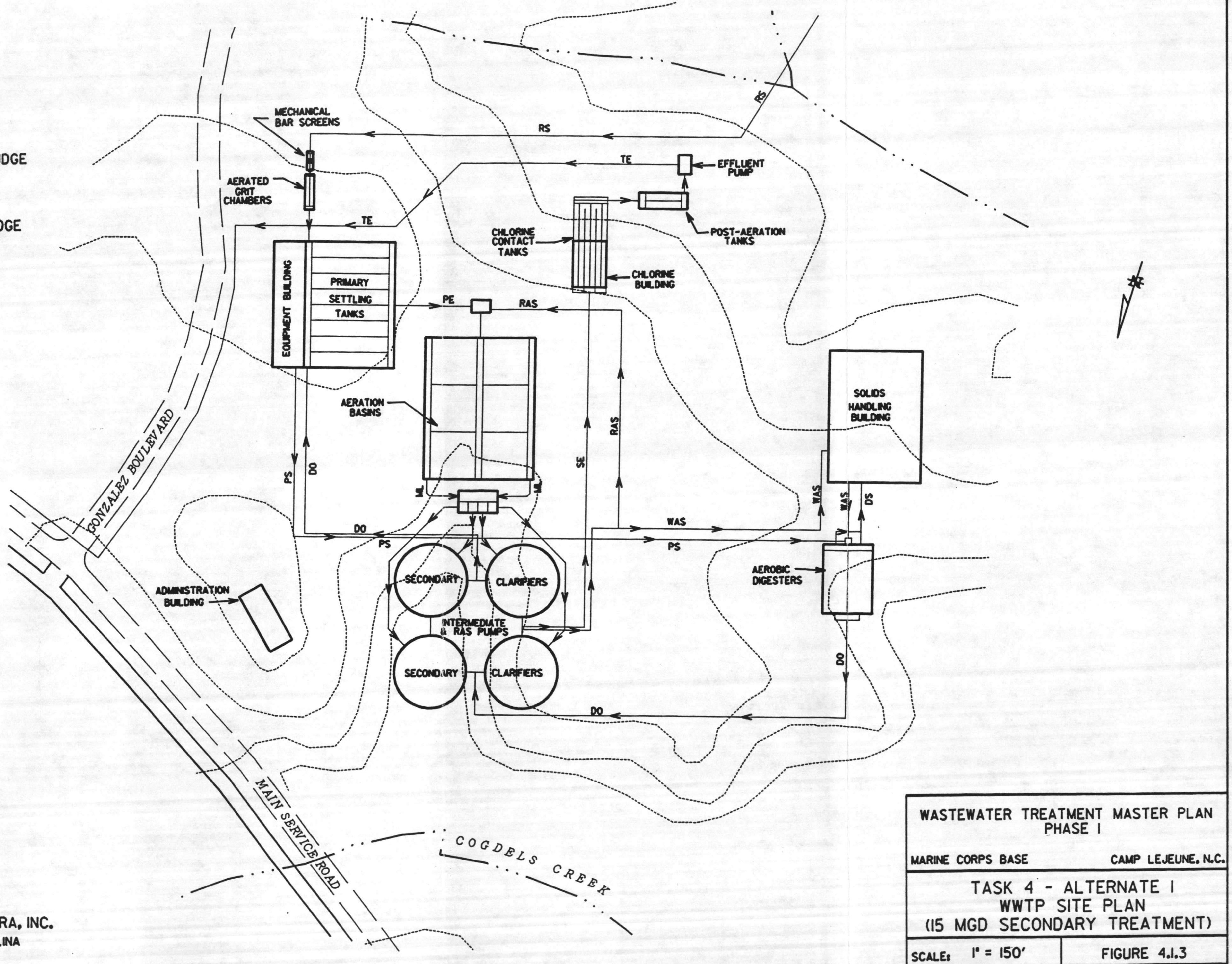
TASK 4 - ALTERNATE I
PROCESS FLOW SCHEMATIC
(15 MGD SECONDARY TREATMENT)

SCALE: 1" = 100'

FIGURE 4.1.2

PIPE DESIGNATIONS

DO = DIGESTER OVERFLOW
DS = DIGESTED SLUDGE
ML = MIXED LIQUOR
PE = PRIMARY EFFLUENT
PS = PRIMARY SLUDGE
RAS = RETURN ACTIVATED SLUDGE
RS = RAW SLUDGE
SE = SECONDARY EFFLUENT
TE = TREATED EFFLUENT
WAS = WASTE ACTIVATED SLUDGE



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FILENAME: SEC15MGD.SHT

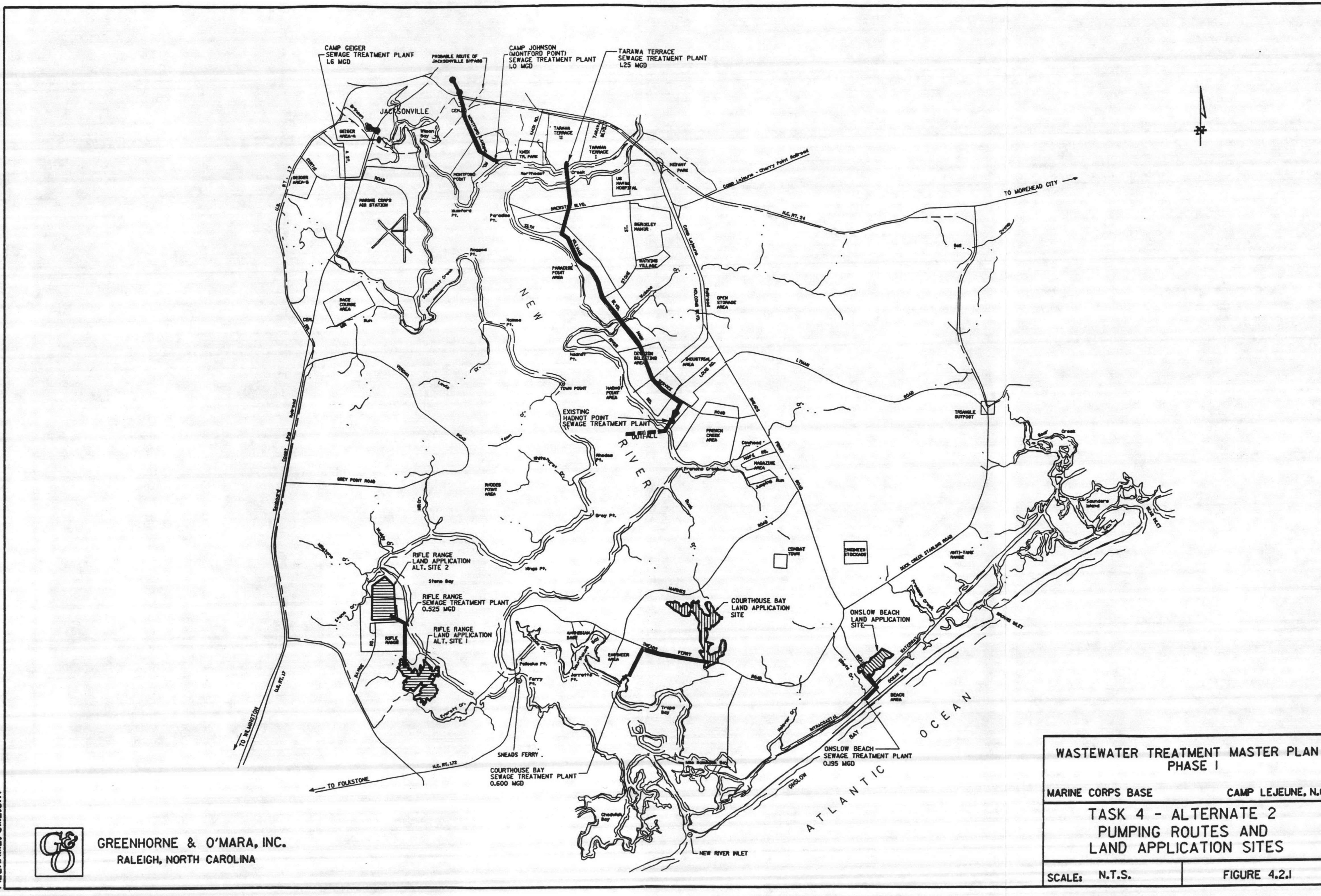
WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE CAMP LEJEUNE, N.C.

TASK 4 - ALTERNATE I
WWTP SITE PLAN
(15 MGD SECONDARY TREATMENT)

SCALE: 1" = 150'

FIGURE 4.1.3



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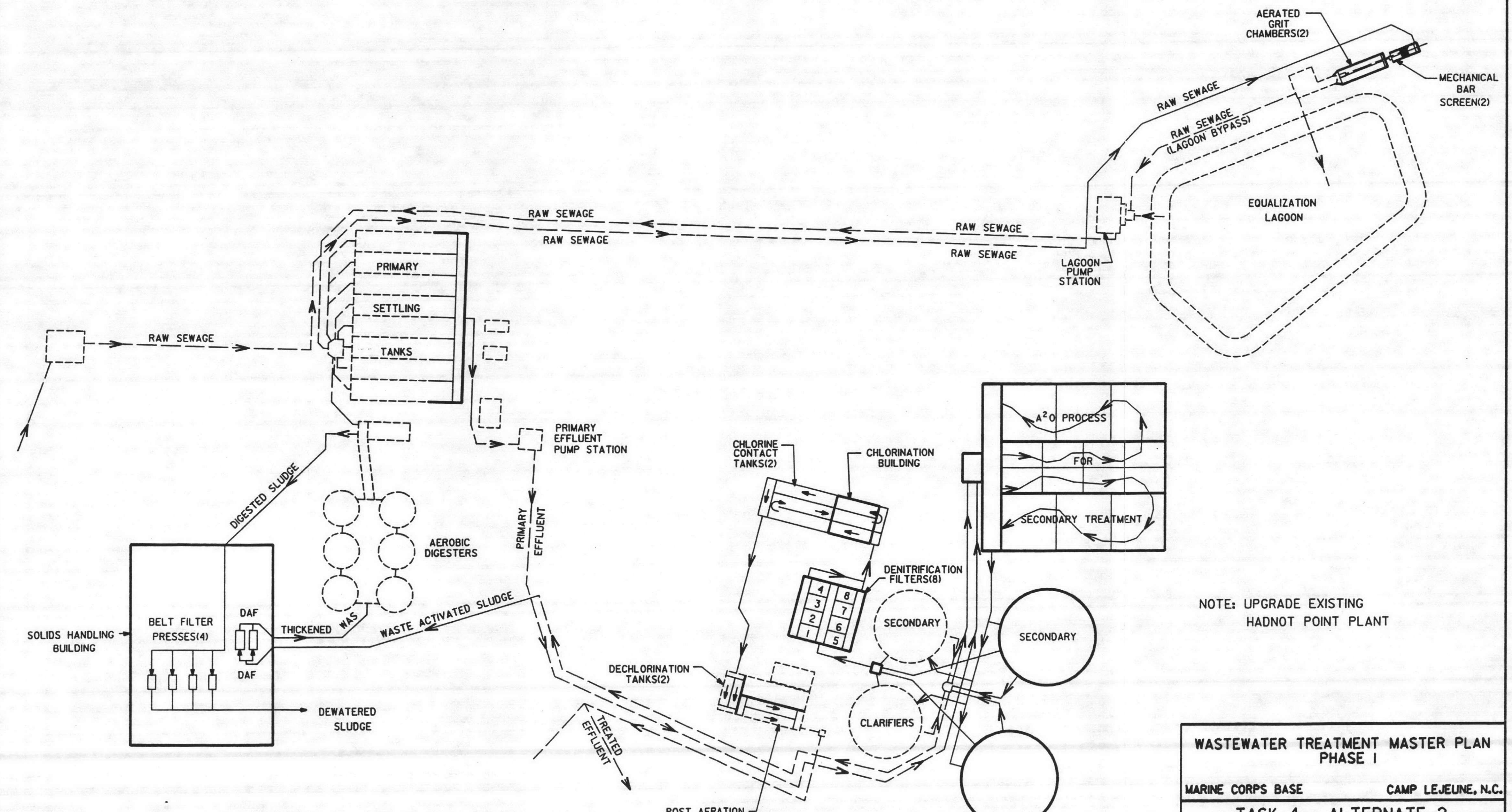
WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE — CAMP LEJEUNE, N.C.

TASK 4 - ALTERNATE 2
PUMPING ROUTES AND
LAND APPLICATION SITES

SCALE: N.T.S. — FIGURE 4.2.1



WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE CAMP LEJEUNE, N.C.

TASK 4 - ALTERNATE 2
PROCESS FLOW SCHEMATIC
(10 MGD ADVANCE TREATMENT)

SCALE: N.T.S. FIGURE 4.2.2

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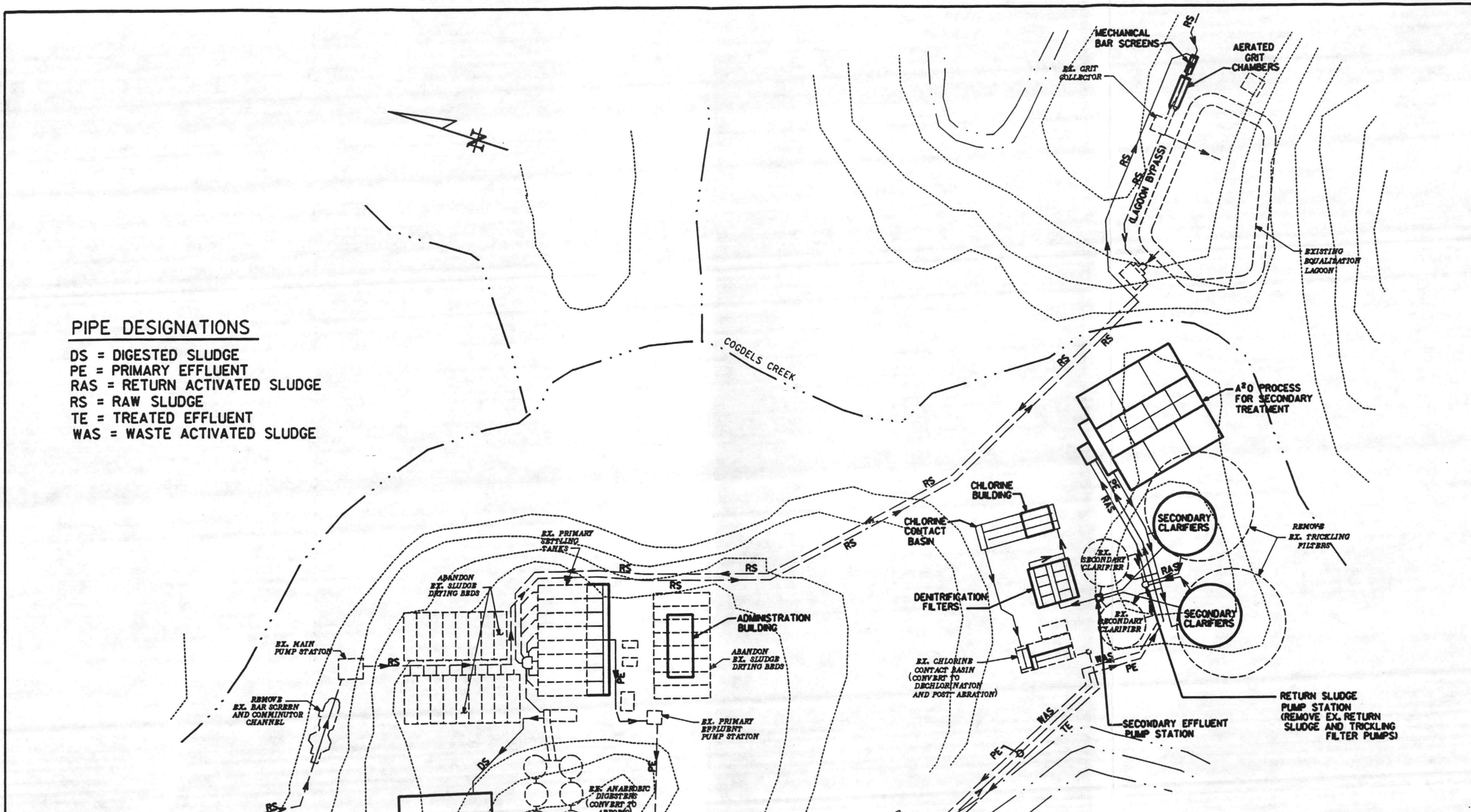
FILENAME: ALT2SCH.SHT



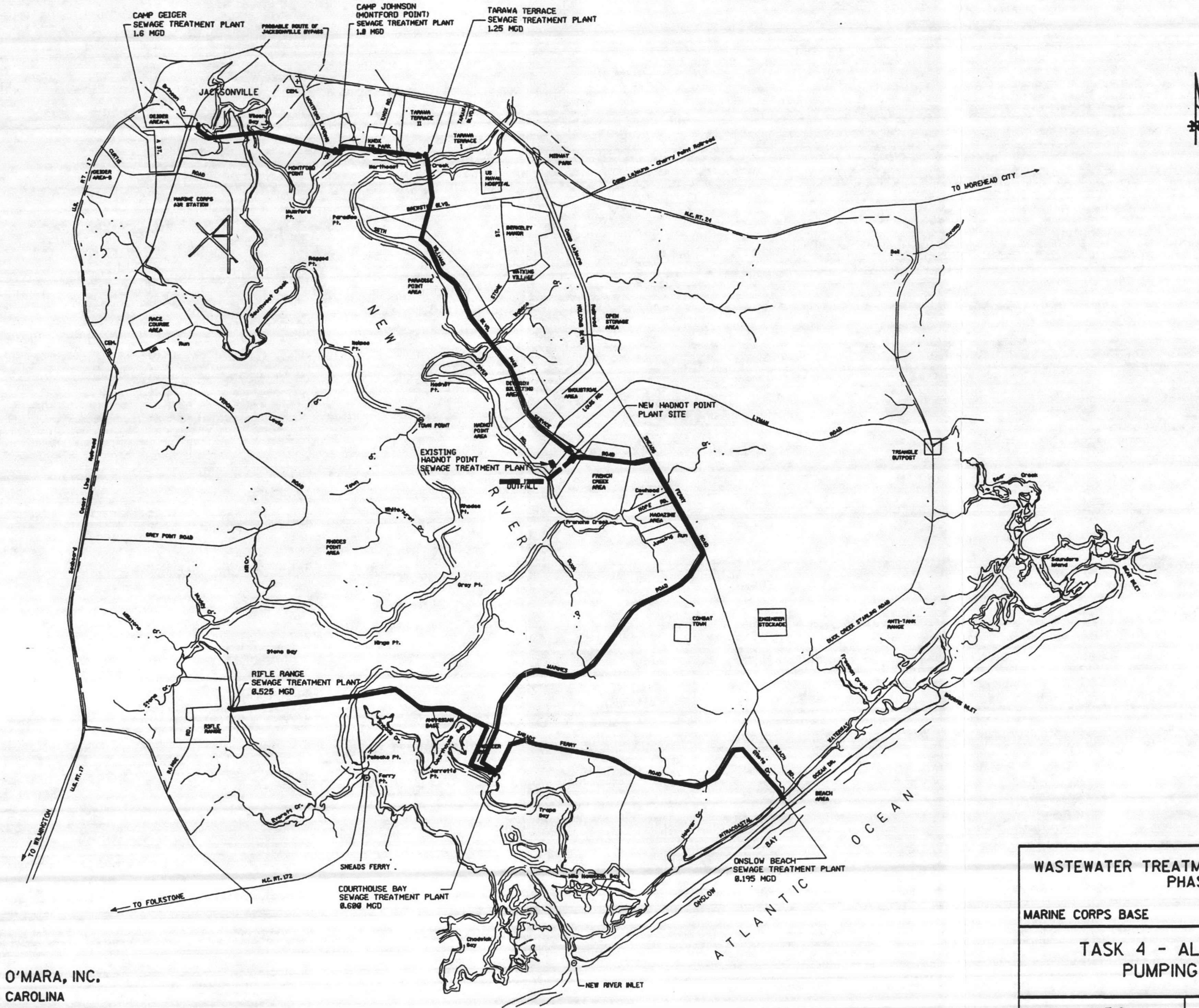
WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE | CAMP LEJEUNE, N.C.

TASK 4 - ALTERNATE 2
WWTP SITE PLAN
(10 MGD ADVANCED TREATMENT)

SCALE: 1" = 150' | FIGURE 4.2.3

FILENAME: ADVIOMGD.SHT



WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE CAMP LEJEUNE, N.C.

TASK 4 - ALTERNATE 3
PUMPING ROUTES

SCALE: N.T.S. FIGURE 4.3.1

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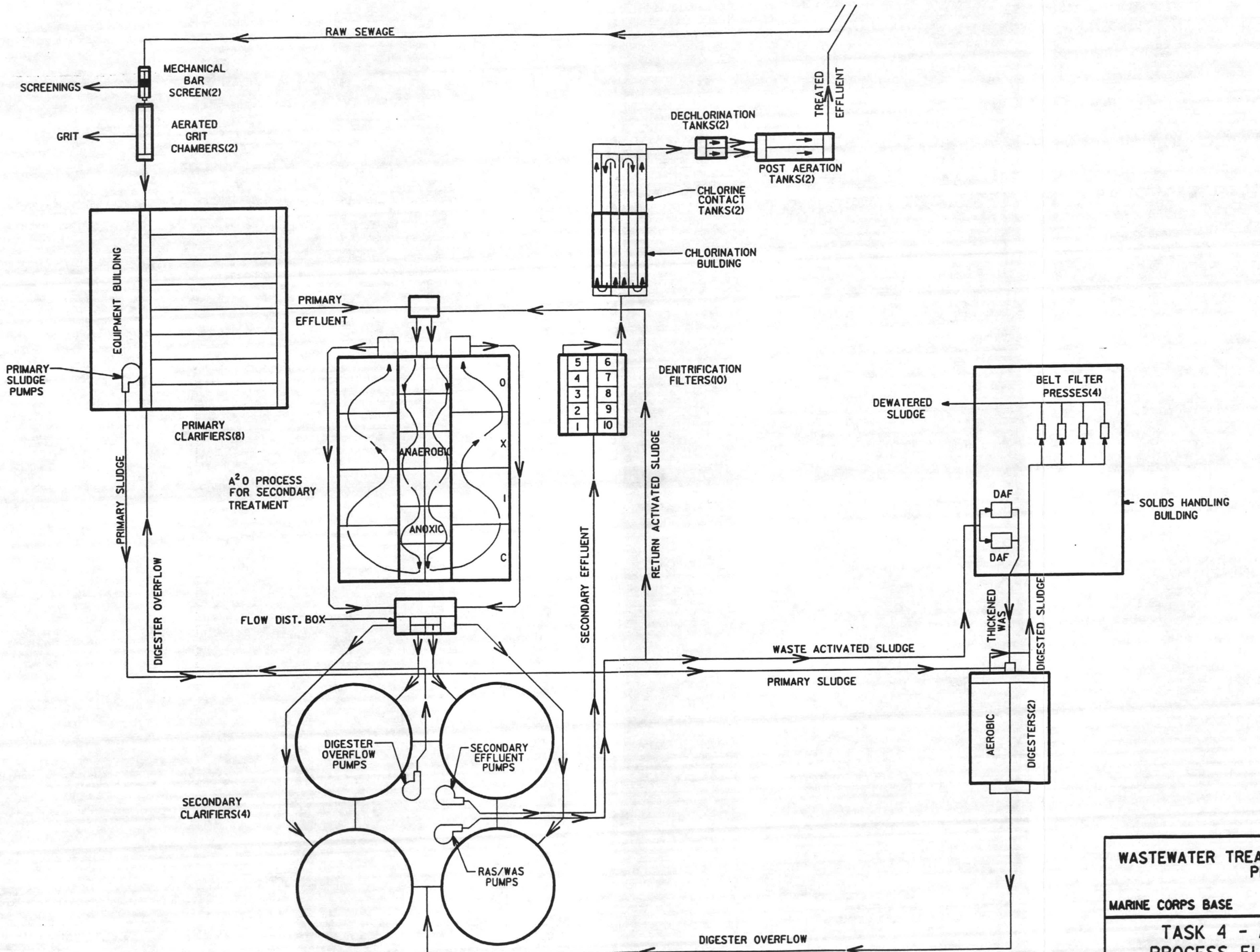
FILENAME: SM3.SHT



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GREENHORNE & O'MARA, INC.
RALEIGH, NORTH CAROLINA

WASTEWATER TREATMENT MASTER PLAN
PHASE I

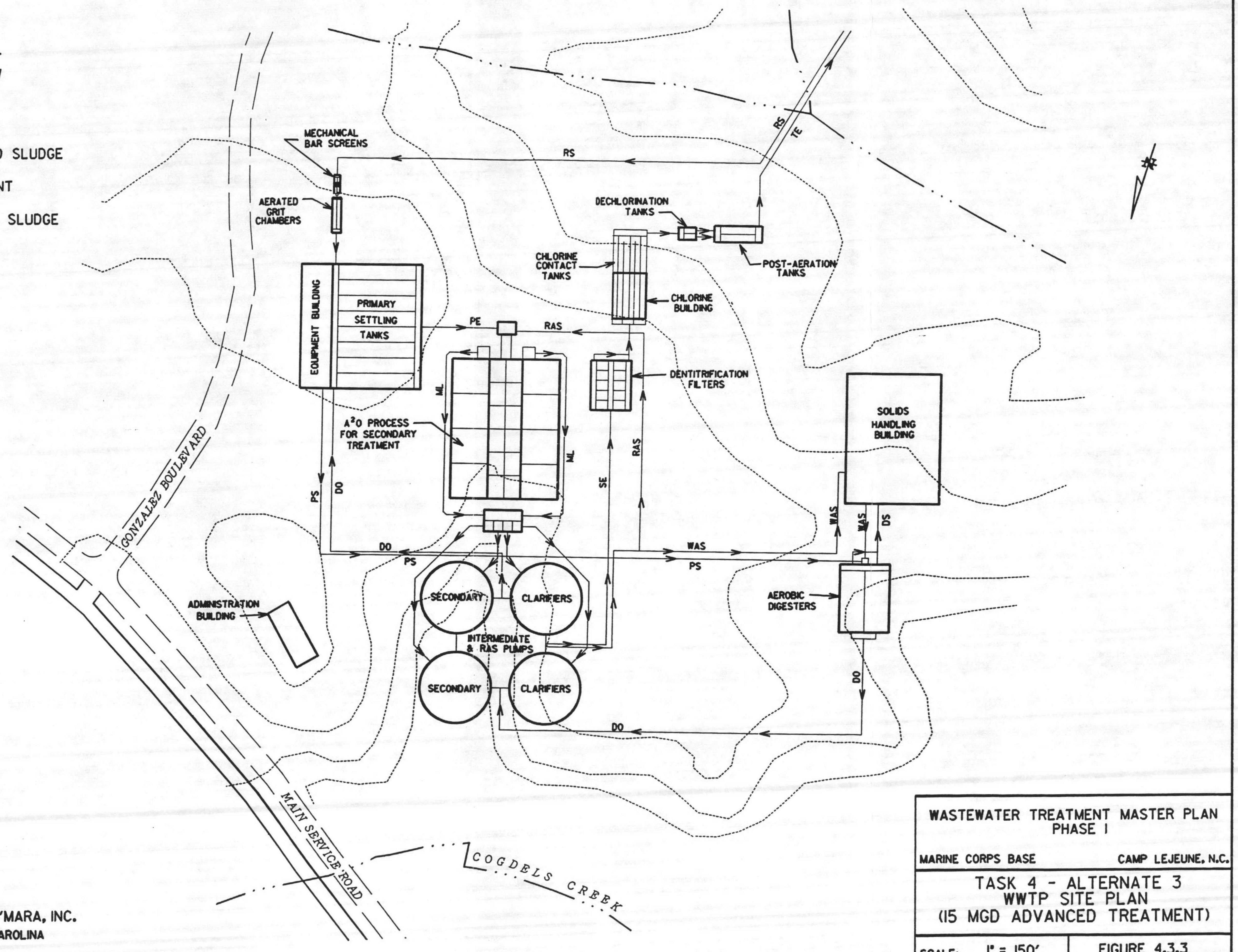
MARINE CORPS BASE — CAMP LEJEUNE, N.C.

TASK 4 - ALTERNATE 3
PROCESS FLOW SCHEMATIC
(15 MGD ADVANCED TREATMENT)

SCALE: 1" = 100' — FIGURE 4.3.2

PIPE DESIGNATIONS

DO = DIGESTER OVERFLOW
DS = DIGESTED SLUDGE
ML = MIXED LIQUOR
PE = PRIMARY EFFLUENT
PS = PRIMARY SLUDGE
RAS = RETURN ACTIVATED SLUDGE
RS = RAW SLUDGE
SE = SECONDARY EFFLUENT
TE = TREATED EFFLUENT
WAS = WASTE ACTIVATED SLUDGE



GREENHORNE & O'MARA, INC.
RALEIGH, NORTH CAROLINA

FILENAME: ADV15MGD.SHT

WASTEWATER TREATMENT MASTER PLAN
PHASE I

MARINE CORPS BASE | CAMP LEJEUNE, N.C.

TASK 4 - ALTERNATE 3
WWTP SITE PLAN
(15 MGD ADVANCED TREATMENT)

SCALE: 1" = 150' | FIGURE 4.3.3

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SECTION 5

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

5 - FINDINGS AND RECOMMENDATIONS

Based on the information obtained and evaluated during Phase 1 of this study, the Base's wastewater treatment requirements can be satisfied by implementation of Alternative 1, 2 or 3.

With the exception of the Red-Cockaded Woodpecker Habitat at the Land Application site for Courthouse Bay, no significant environmental issues were discovered in any of the Alternatives.

The pumping route from Rifle Range to Courthouse Bay as outlined in Task 3 is more cost effective than the route studied in Task 4.

From the Present Worth Values determined during Task 4, the final ranking of Alternates (from lowest Present Worth to highest) is:

Alternate 1: A new 15 MGD secondary treatment plant at Hadnot Point with an ocean outfall to accommodate all flows.

Alternate 3: A new 15 MGD advanced treatment plant at Hadnot Point with a river discharge to accommodate all flows.

Alternate 2: A combination of pumping selected northern plant flows to Jacksonville, land application for the southern plants, and an upgrade and expansion of the existing Hadnot Point plant to 10 MGD advanced treatment with a river discharge for the remaining flows.

Land application of all of the wastewater at Camp Lejeune is not feasible. In addition, selection of Alternate 2 will result in a mix of technologies for addressing the Base's wastewater treatment needs, making this a less desirable option. If Alternate 2 is selected, however, it will be desirable to consider placing a new 10 MGD advanced treatment plant at the location shown in Figure 4.0 and abandoning the existing Hadnot Point Plant.

Based on the above, the recommended alternative for Base wastewater facilities includes the following:

- Abandon the existing Camp Geiger, Camp Johnson, and Tarawa Terrace wastewater treatment plants; convert an existing tank at each facility to an aerated wet well; construct pump stations and force mains as detailed in Task 4 - Alternate 1 for conveying raw wastewater to the treatment plant site.

- Abandon the existing Courthouse Bay and Onslow Beach wastewater treatment plants; convert an existing tank at each facility to an aerated wet well; construct pump stations and force mains as detailed in Task 4 - Alternate 1 for conveying raw wastewater to the treatment plant site.

- Abandon the existing Rifle Range wastewater treatment plant; convert an existing tank to an aerated wet well; construct a pump station and force main as detailed in Task 3 - Scenario 1 for conveying raw wastewater to Courthouse Bay.

- Construct a new centralized 15 MGD secondary Wastewater Treatment Plant in the Hadnot Point / French Creek area of the Base, at the northwest corner of Gonzales Boulevard and Main Service Road. The plant will need to be easily upgradeable to provide advanced treatment in the event the ocean outfall is ultimately disallowed.

- Construct an effluent pump station at the new treatment plant to convey treated effluent through a force main to Onslow Beach.

- Construct an ocean outfall to discharge treated effluent approximately 1.5 miles offshore, in 30 feet of water.

In addition, the following items and/or actions should be considered as the Wastewater Master Plan progresses:

Have we identified the steps. we need a detailed POAM. Perhaps a critical path diagram

- Initiation of the ocean outfall application process;

- A public awareness campaign to educate the public regarding ocean outfalls.

- Negotiations with DEM to establish a consent agreement for continued operation of the existing facilities during Master Plan development and design and construction of the new facilities;

- Detailed process studies prerequisite to treatment plant and pumping system design, including solids handling options;

- Detailed flow capacity studies prerequisite to treatment plant and pumping system design; capacity studies should include evaluations of the effects of IR site improvements, oil and water separators, and infiltration and inflow on the wastewater system;

what does this mean

- Evaluation of the existing sanitary sewer collection system as it pertains to the proposed pumping routes and possible collection points;

- The introduction of programs to conserve water, limit extraneous inflows to the wastewater system, and remove nutrient discharges at their source;

- Evaluation of the effect of the new NPDES Stormwater Permit requirements on the construction and operation of the proposed wastewater improvements;

Bryan what do you see as impacts

- Evaluation of the need for Odor Control Facilities at the wastewater treatment plant;

- Further refinement of the costs determined during Phase 1; and

- The effect of Participation by the City Jacksonville in sending treated effluent to Camp Lejeune for discharge through the ocean outfall line.

Any of the preceding tasks could be included in Phase 2 of the Wastewater Treatment Master Plan. The Marine Corps should determine which, if any, are best handled internally, and which to assign to consultants.

was there to be a phase II

Prior to implementing Phase 2 of the Wastewater Treatment Master Plan, it will be important for the Marine Corps to determine the desirability of accepting Jacksonville's effluent for discharge through an ocean outfall. If Jacksonville participates in the project, it will be necessary to begin negotiations for a Service Agreement which will define the responsibilities of the Marine Corps and the City for construction and operation of the outfall.

I visited a plant at Camp McTureous on Okinawa built by the Japanese. An activated sludge, state of the art STP which was enclosed with a gas collection system and activated carbon filters, to remove odors.

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SECTION 6

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

6 - SUMMARY

The overall Phase 1 study was completed in July, 1991 and submitted to Camp Lejeune Officials for review. Work sessions were held on August 1 and August 8, 1991 to review and discuss the results of the study. Representatives of Camp Lejeune, LANTDIV, and Greenhorne & O'Mara attended the August 1 session. Camp Lejeune and LANTDIV officials attended the August 8 session. Meeting minutes for the August 1 work session have been incorporated into Appendix D.

During their review of the report, the Marine Corps requested clarification of requirements for the proposed New River discharge from the proposed 15 MGD advanced treatment plant at Hadnot Point (Alternate 3).

A preliminary meeting was held at the North Carolina Division of Environmental Management's Wilmington office on November 7, 1990. Officials from NCDEM presented a lengthy technical summary of conditions in the New River, portions of which are included in the meeting minutes (See Appendix B). NCDEM stated that "general indications from preliminary review of the field data are that advanced tertiary treatment will be required for discharges to the river. There appear to be better mixing conditions in the lower strata of the middle reaches of the river, with severe problems in the upper areas. Dead pockets of the river should be avoided."

As a result of the above information, a proposed New River outfall was included in the cost data for all Scenarios and Alternates which evaluated an advanced wastewater treatment plant. The outfall discharges in the same general area of the river as the existing Hadnot Point outfall, but is assumed to be located at the center of the river. Based on the USGS "Camp Lejeune, N.C." quad map, the outfall will extend approximately 5,500 linear feet from the shore.

The cost for the outfall is included in the Site Work portion of the detailed cost report for each advanced wastewater treatment plant (page C4.27 for Alternate 3 - New 15 MGD Advanced WWTP). For phased implementation of the recommended improvements, the river outfall should be considered in the final phase of construction, since it may only be required if the ocean outfall is not pursued or approved.

As with all options studied during the preparation of the Master Plan, the river outfall length and discharge location are preliminary. Final location and lengths should be determined during actual design of the facilities.

Camp Lejeune officials also requested additional information regarding the decision to eliminate upgrading the individual treatment plants to include advanced treatment, or pumping secondary effluent to Hadnot Point for discharge to the New River or to an ocean outfall line as potential solutions to the base's wastewater treatment requirements.

A list of options were specifically included for consideration in developing alternatives for each plant. This list of options is included in Section 2 - Alternatives Development (page 2-1).

Due to the anticipated high costs for construction and operation of advanced treatment facilities, a centralized plant was given preference to upgrades of the individual plants in order to meet the planning limits for a New River discharge. Additionally, preliminary work by NCDEM suggests that the deteriorated condition of the Upper New River will preclude any discharges there.

Scenarios were developed to include evaluation of both a new centralized treatment plant and an expansion and upgrade of the existing Hadnot Point facility. During Task 3 of the study, when detailed cost data was developed for the proposed wastewater treatment plants, it became apparent that construction of a new centralized plant would provide the Marine Corps with the most cost effective long term solution for their wastewater treatment and disposal requirements at Camp Lejeune.

From the data developed during Task 3, it can be concluded that the long term cost of individual upgrades to the seven existing plants will be at least equivalent to upgrading the existing Hadnot Point plant to a 15 MGD advanced treatment facility. In addition, it can be assumed that operation and maintenance costs will be higher than for the upgraded Hadnot Point plant due to the age of the facilities, and the possibility of duplication of resources, equipment, and manpower.

During Task 3, the ocean outfall was considered, along with a new or upgraded centralized wastewater treatment plant, primarily as an alternative discharge point to the New River discharge. However, Greenhorne & O'Mara also considered the possibilities of pumping secondary effluent to an ocean outfall from the existing treatment plants.

Two main problems were seen with this approach:

1) The advancing age of the existing plants along with existing operational problems suggest that upgrading of the plants will be required; and

2) The approach depends on EPA approval of the ocean outfall, a process which could take up to ten years.

In addition, representatives of the North Carolina Division of Environmental Management have indicated that it is very unlikely that an ocean outfall will be approved without a backup alternative. The most likely backup plan under this scenario would be individual upgrades to advanced treatment capability for the seven existing plants, thereby eliminating this option from further consideration.

Construction phasing of the alternative which would ultimately be selected for implementation was an important factor being considered throughout the course of the study. A primary goal of the project was to allow Camp Lejeune officials to combine portions of the options studied into fundable construction projects, which would satisfactorily address the requirements of the Marine Corps and the North Carolina Division of Environmental Management.

At the beginning of the study, scenarios were developed by Greenhorne & O'Mara and Camp Lejeune Officials that would provide for the selection of a wide range of feasible alternatives. Flexibility was retained to group options into other combinations if necessary as the study progressed. For example, portions of Scenario 3 and Scenario 5, studied during Task 3, were combined to create Alternate 2 in Task 4. As seen in Appendix C, Life Cycle Cost Analyses, cost matrices were developed for the individual plants for both construction costs and present worth values.

At several work session held at Camp Lejeune, Marine Corps and LANTDIV officials reviewed several options for phased implementation of the Master Plan. Through the work sessions they developed a three phased approach for funding the construction process. The preferred construction phasing is based on Option 1 of the combinations studied in the work sessions and is listed below [**comments in brackets added by Greenhorne & O'Mara**]:

PHASE I

Pump treated sewage from Camp Geiger and Camp Johnson to Tarawa Terrace.

Pump treated sewage from Tarawa Terrace (includes Camp Geiger and Camp Johnson flows) to new outfall in vicinity of existing Hadnot Point Wastewater Treatment Plant [**or to existing Hadnot Point outfall line**].

Pump raw sewage from Onslow Beach to Courthouse Bay.

Pump raw sewage from Rifle Range to Courthouse Bay. Alternative - Land application at Rifle Range for additional $300,000.

Pump raw sewage from Courthouse Bay to Hadnot Point (includes Onslow Beach and Rifle Range flows).

Construct new outfall line near existing Hadnot Point plant [**if required by NCDEM, otherwise, use existing Hadnot Point outfall until ocean outfall issue has been decided**]. Construct chlorination and dechlorination systems, post aeration and polishing basin, admin/laboratory building and site work. Design new outfall to be used in proposed new (15 MGD) plant. Interim flow from northern plants to be 3-5 MGD.

Shutdown and demolish Onslow Beach, Courthouse Bay and Rifle Range wastewater treatment plants.

PHASE II

Construct new 15 MGD secondary treatment plant [**with discharge through existing Hadnot Point outfall, if allowed by NCDEM**].

Modify outlying pumping stations (CG, TT, CJ) to handle raw sewage.

Shutdown and demolish Camp Geiger, Camp Johnson and Tarawa Terrace.

Shutdown and demolish Hadnot Point Plant.

PHASE III

Add advanced treatment to 15 MGD plant constructed in Phase II [**and construct new outfall to river**].

OR

Construct ocean outfall.

The above construction phasing is subject to changes that may result from reviews by the various organizations involved in the approval process (Commandant Marine Corps, NCDEM, Congress, EPA, and others).

The proposed plan of action to accomplish the above is listed below:

1) Local decision on option.

2) Brief Commandant of Marine Corps and resolve funding issue.

3) Brief State of North Carolina.
   - Permits
   - Special Order of Consent

4) Develop and Submit Cost Certification for FY94 MILCON Project.

5) Prepare Environmental Impact Statement under FY94 MILCON Project.

6) Begin Design of Phase I under FY94 MILCON Project.

7) Develop additional MILCON projects for Phase II and Phase III.

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APPENDIX A

WASTEWATER TREATMENT MASTER PLAN

Phase 1

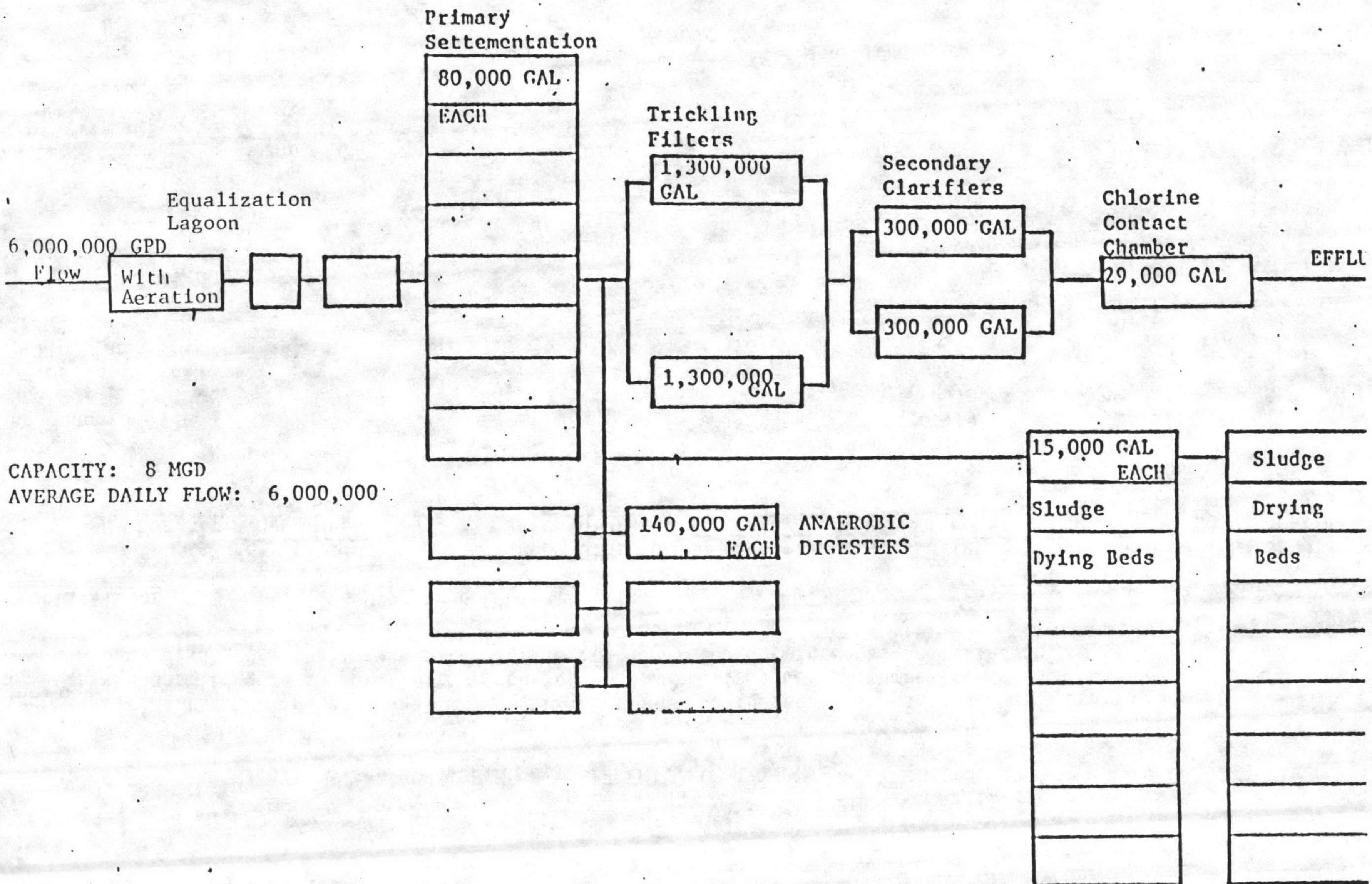
Marine Corps Base, Camp Lejeune, North Carolina

APPENDIX A

EXISTING TREATMENT PLANT DATA

HADNOT POINT WASTEWATER TREATMENT PLANT

BUILDING 22



CAPACITY: 8 MGD
AVERAGE DAILY FLOW: 6,000,000

TOTAL: 39,672 Sq Ft.

A-1

Hadnot Point

M 3

A-2

Hadnot Point

A. (1). EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS Final

During the period beginning on the effective date of the Permit **and lasting until** expiration, **the permittee is authorized to discharge from outfall(s) serial number(s)** 001. **Such discharges shall be limited and monitored by the permittee as specified below:**

Effluent Characteristics	Discharge Limitations (1)				Monitoring Requirements		
	Kg/day (lbs/day)		Other Units (Specify)				
	Monthly Avg.	Weekly Avg.	Monthly Avg.	Weekly Avg.	Measurement Frequency	Sample Type	* Sample Location
Flow (1)			5.87 MGD		Continuous	Recording	I or E
BOD, 5Day, $20^{o}C$			30.0 mg/1	45.0 mg/1	Daily	Composite	E
Total Suspended Residue			30.0 mg/1	45.0 mg/1	Daily	Composite	E
NH_3 as N					Daily	Composite	E
Dissolved Oxygen (minimum)			5.0 mg/1	5.0 mg/1	Daily	Grab	E
Fecal Coliform (geometric mean)			14.0/100 ml	28.0/100 ml	Daily	Grab	E
Residual Chlorine					Daily	Grab	E
Temperature					Daily	Grab	E
Total Nitrogen (NO_2 + NO_3 + TKN)					Monthly	Composite	E
Total Phosphorus					Monthly	Composite	E
Oil and Grease			30.0 mg/1	60.0 mg/1 **	2/Month	Grab	E

*Sample locations: E - Effluent, I - Influent
**Daily Maximum Limitation

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(1) These discharge effluent limitations apply only to flows of 5.87 MGD of less. For flows greater than 5.87 MGD, see Part I, A. (2) of this permit.

The pH shall not be less than 6.0 **standard units nor greater than** 8.5 **standard units and shall be monitored** daily at the effluent by grab sample.

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

A. (2). EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS Final (with diffuser) Winter: November 1 - March 31

During the period beginning on the effective date of the Permit **and lasting until** expiration, **the permittee is authorized to discharge from outfall(s) serial number(s)** 001.
Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations[1]				Monitoring Requirements		
	Kg/day (lbs/day)		Other Units (Specify)				
	Monthly Avg.	Weekly Avg.	Monthly Avg.	Weekly Avg.	Measurement Frequency	Sample Type	* Sample Location
Flow[1]			8.0 MGD		Continuous	Recording	I or E
BOD, 5Day, $20^{o}C$			22.0 mg/l	33.0 mg/l	Daily	Composite	E
Total Suspended Residue			30.0 mg/l	45.0 mg/l	Daily	Composite	E
NH_3 as N			19.0 mg/l	28.5 mg/l	Daily	Composite	E
Dissolved Oxygen (minimum)			5.0 mg/l	5.0 mg/l	Daily	Grab	E
Fecal Coliform (geometric mean)			14.0/100 ml	28.0/100 ml	Daily	Grab	E
Residual Chlorine					Daily	Grab	E
Temperature					Daily	Grab	E
Total Nitrogen (NO_2 + NO_3 + TKN)					Monthly	Composite	E
Total Phosphorus					Monthly	Composite	E
Oil and Grease			30.0 mg/l	60.0 mg/l **	2/Month	Grab	E

*Sample locations: E - Effluent, I - Influent

**Daily Maximum Limit

1 These discharge limitations apply to flow rates greater than 5.87 MGD up to 8.0 MGD.

The pH shall not be less than 6.0 **standard units nor greater than** 8.5 **standard units and shall be monitored** daily at the effluent by grab sample.

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

H 3

A. (2). **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS** Final (with diffuser) Summer: April 1 - October 31

During the period beginning on the effective date of the Permit **and lasting until** expiration, **the permittee is authorized to discharge from outfall(s) serial number(s)** 001. **Such discharges shall be limited and monitored by the permittee as specified below:**

Effluent Characteristics	Discharge Limitations[1]				Monitoring Requirements		
	Kg/day (lbs/day)		Other Units (Specify)				
	Monthly Avg.	Weekly Avg.	Monthly Avg.	Weekly Avg.	Measurement Frequency	Sample Type	* Sample Location
Flow[1]			8.0 MGD		Continuous	Recording	I or E
BOD, 5Day, 20°C			22.0 mg/l	33,0 mg/l	Daily	Composite	E
Total Suspended Residue			30.0 mg/l	45.0 mg/l	Daily	Composite	E
NH_3 as N			13.0 mg/l	19.5 mg/l	Daily	Composite	E
Dissolved Oxygen (minimum)			5.0 mg/l	5.0 mg/l	Daily	Grab	E
Fecal Coliform (geometric mean)			14.0/100 ml	28.0/100 ml	Daily	Grab	E
Residual Chlorine					Daily	Grab	E
Temperature					Daily	Grab	E
Total Nitrogen (NO_2 + NO_3 + TKN)					Monthly	Composite	E
Total Phosphorus					Monthly	Composite	E
Oil and Grease			30.0 mg/l	60.0 mg/l **	2/Month	Grab	E

*Sample locations: E - Effluent, I - Influent

**Daily Maximum Limit

A-4

1 These discharge limitations apply to flow rates greater than 5.87 MGD up to 8.0 MGD.

The pH shall not be less than 6.0 **standard units nor greater than** 8.5 **standard units and shall be monitored** daily at the effluent by grab sample.

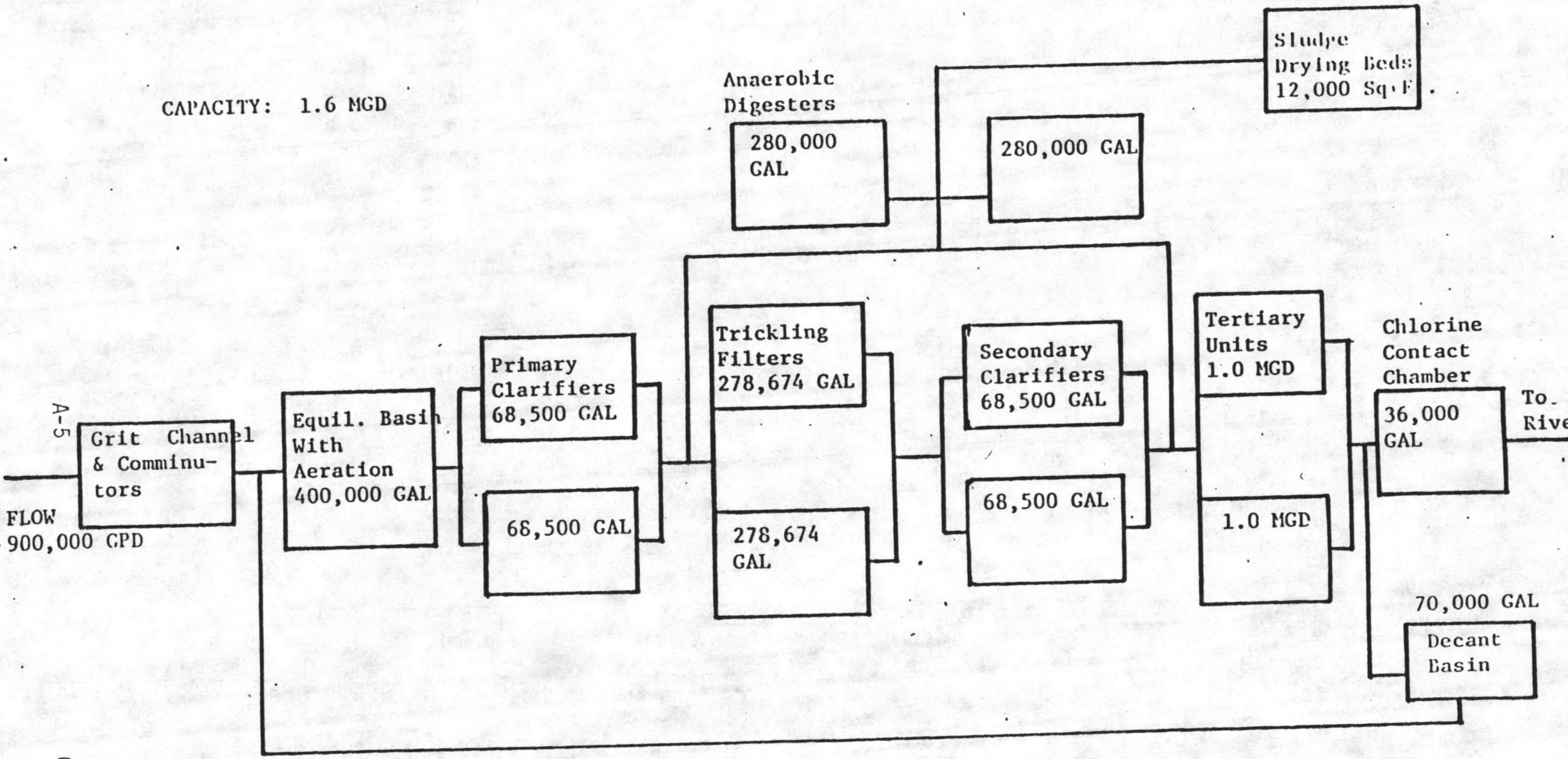
There shall be no discharge of floating solids or visible foam in other than trace amounts.

Hadnot Point

CAMP GEIGER WASTEWATER TREATMENT PLANT

BUILDING TC-563

CAPACITY: 1.6 MGD



A. (1). **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS** Final Summer: April 1 - October 31

During the period beginning on the effective date of the Permit **and lasting until** expiration or construction o a diffuser, **the permittee is authorized to discharge from outfall(s) serial number(s)** 001.
Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations				Monitoring Requirements		
	Kg/day (lbs/day)		Other Units (Specify)				
	Monthly Avg.	Weekly Avg.	Monthly Avg.	Weekly Avg.	Measurement Frequency	Sample Type	* Sample Location
Flow			1.6 MGD		Continuous	Recording	I or E
BOD, 5Day, $20^{o}C$			10.0 mg/1	15.0 mg/1	Daily	Composite	E
Total Suspended Residue			30.0 mg/1	45.0 mg/1	Daily	Composite	E
NH_3 as N			3.0 mg/1	4.5 mg/1	Daily	Composite	E
Dissolved Oxygen (minimum)			5.0 mg/1	5.0 mg/1	Daily	Grab	E,U,D
Fecal Coliform (geometric mean)			200.0/100 ml	400.0/100 ml	Daily	Grab	E,U,D
Residual Chlorine					Daily	Grab	E
Temperature					Daily	Grab	E,U,D
Total Nitrogen (NO_2 + NO_3 + TKN)					Monthly	Composite	E
Total Phosphorus					Monthly	Composite	E
Oil and Grease			30.0 mg/1	60.0 mg/1**	2/Month	Grab	E

*Sample locations: E - Effluent, I - Influent, U - Upstream, D - Downstream **Daily Maximum Limit

Upstream and downstream samples shall be grab samples.

Stream samples shall be collected three times per week during June, July, August and September and once per week during the remaining months of the year.

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The pH shall not be less than 6.0 **standard units nor greater than** 8.5 **standard units and shall be monitored** daily at the effluent by grab sample.

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

A-6

Camp Geiger

M 3

A. (1). **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS** Final Winter: November 1 - March 31

During the period beginning on the effective date of the Permit **and lasting until** expiration or construction of a diffuser, **the permittee is authorized to discharge from outfall(s) serial number(s)** 001.
Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations: Kg/day (lbs/day) Monthly Avg.	Kg/day (lbs/day) Weekly Avg.	Other Units (Specify) Monthly Avg.	Other Units (Specify) Weekly Avg.	Monitoring Requirements: Measurement Frequency	Sample Type	* Sample Location
Flow			1.6 MGD		Continuous	Recording	I or E
BOD, 5Day, $20^{\circ}C$			13.0 mg/l	19.5 mg/l	Daily	Composite	E
Total Suspended Residue			30.0 mg/l	45.0 mg/l	Daily	Composite	E
NH_3 as N			4.0 mg/l	6.0 mg/l	Daily	Composite	E
Dissolved Oxygen (minimum)			5.0 mg/l	5.0 mg/l	Daily	Grab	E,U,D
Fecal Coliform (geometric mean)			200.0/100 ml	400.0/100 ml	Daily	Grab	E,U,D
Residual Chlorine					Daily	Grab	E
Temperature					Daily	Grab	E,U,D
Total Nitrogen (NO_2 + NO_3 + TKN)					Monthly	Composite	E
Total Phosphorus					Monthly	Composite	E
Oil and Grease			30.0 mg/l	60.0 mg/l **	2/Month	Grab	E

*Sample locations: E - Effluent, I - Influent, U - Upstream, D - Downstream **Daily Maximum Limit

Upstream and downstream samples shall be grab samples.

Stream samples shall be collected three times per week during June, July, August and September and once per week during the remaining months of the year.

The pH shall not be less than 6.0 **standard units nor greater than** 8.5 **standard units and shall be monitored** daily at the effluent by grab sample.

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

A-7

Camp Geiger

A. (1). **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS** Final (with diffuser)

During the period beginning after construction of a diffuser **and lasting until** expiration, **the permittee is authorized to discharge from outfall(s) serial number(s)** 001. **Such discharges shall be limited and monitored by the permittee as specified below:**

Effluent Characteristics	Discharge Limitations (1) Kg/day (lbs/day) Monthly Avg.	Kg/day (lbs/day) Weekly Avg.	Other Units (Specify) Monthly Avg.	Other Units (Specify) Weekly Avg.	Monitoring Requirements Measurement Frequency	Sample Type	* Sample Location
Flow			1.6 MGD		Continuous	Recording	I or E
BOD, 5Day, 20^{o}C			30.0 mg/1	45.0 mg/1	Daily	Composite	E
Total Suspended Residue			30.0 mg/1	45.0 mg/1	Daily	Composite	E
NH_3 as N					Daily	Composite	E
Dissolved Oxygen (minimum)			5.0 mg/1	5.0 mg/1	Daily	Grab	E,U,D
Fecal Coliform (geometric mean)			200.0/100 ml	400.0/100 ml	Daily	Grab	E,U,D
Residual Chlorine					Daily	Grab	E
Temperature					Daily	Grab	E,U,D
Total Nitrogen (NO_2 + NO_3 + TKN)					Monthly	Composite	E
Total Phosphorus					Monthly	Composite	E
Oil and Grease			30.0 mg/1	60.0 mg/1**	2/Month	Grab	E

*Sample locations: E - Effluent, I - Influent, U - Upstream, D - Downstream
**Daily Maximum Limitation
Upstream and downstream samples shall be grab samples.

Stream samples shall be collected three times per week during June, July, August and September and once per week during the remaining months of the year.

(1) These effluent limitations apply only to a discharge from a 50-foot diffuser pipe.

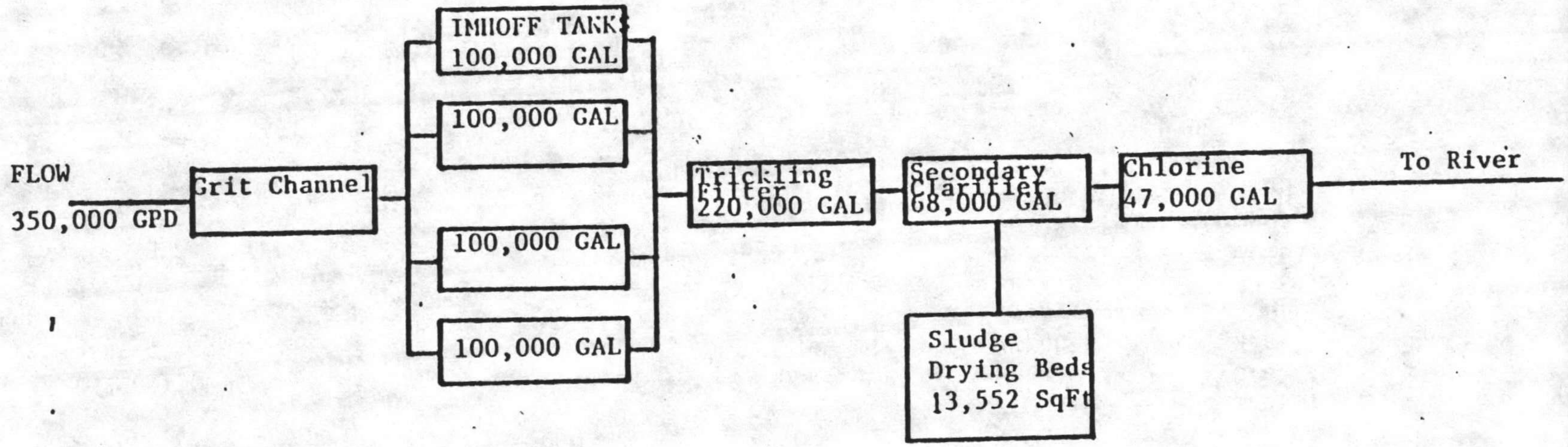
The pH shall not be less than 6.0 **standard units nor greater than** 8.5 **standard units and shall be monitored** daily at the effluent by grab sample.

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

CAMP JOHNSON WASTEWATER TREATMENT PLANT

BUILDING M-136

CAPACITY: 1.0 MGD



A. (1). EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS Final (with diffuser)

During the period beginning on the effective date of the Permit and lasting until expiration, the permittee is authorized to discharge from outfall(s) serial number(s) 001.
Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations				Monitoring Requirements		
	Kg/day (lbs/day)		Other Units (Specify)				
	Monthly Avg.	Weekly Avg.	Monthly Avg.	Weekly Avg.	Measurement Frequency	Sample Type	* Sample Location
Flow			1.0 MGD		Continuous	Recording	I or E
BOD, 5Day, $20^{\circ}C$			30.0 mg/l	45.0 mg/l	2/Month	Composite	E
Total Suspended Residue			30.0 mg/l	45.0 mg/l	2/Month	Composite	E
NH_3 as N					2/Month	Composite	E
Dissolved Oxygen (minimum)			5.0 mg/l	5.0 mg/l	Weekly	Grab	E
Fecal Coliform (geometric mean)			1000.0/100 ml	2000.0/100 ml	2/Month	Grab	E
Residual Chlorine					Daily	Grab	E
Temperature					Weekly	Grab	E
Total Nitrogen (NO_2 + NO_3 + TKN)					Quarterly	Composite	E
Total Phosphorus					Quarterly	Composite	E
Oil and Grease			30.0 mg/l	60.0 mg/l **	2/Month	Grab	E

*Sample locations: E - Effluent, I - Influent

**Daily Maximum Limit

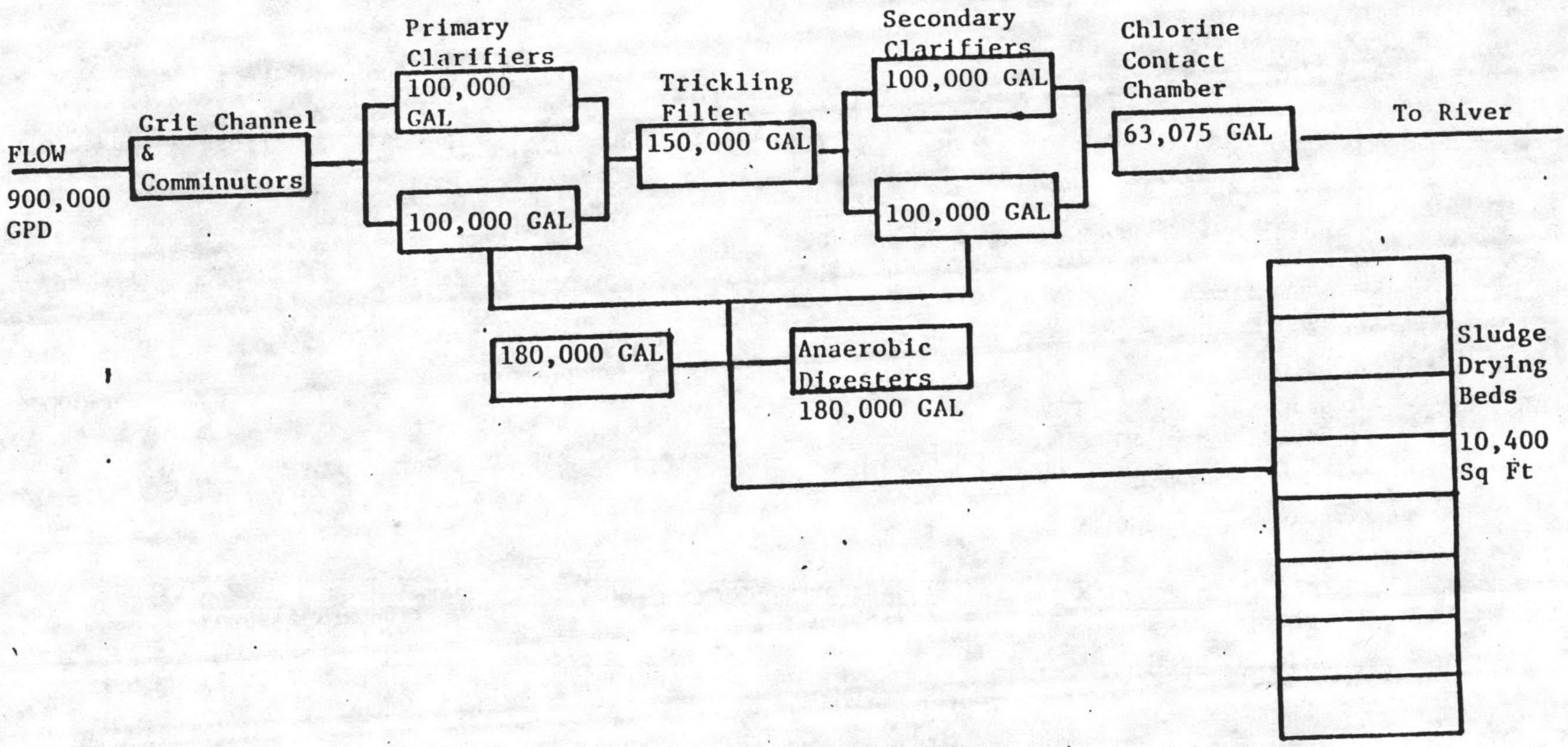
The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored 2/Month at the effluent by grab sample.

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

TARAWA TERRACE WASTEWATER TREATMENT PLANT

BUILDING TT-35

CAPACITY: 1.25 MGD



A. (1). EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS Final

During the period beginning on the effective date of the Permit and lasting until expiration, the permittee is authorized to discharge from outfall(s) serial number(s) 001. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations				Monitoring Requirements		
	Kg/day (lbs/day)		Other Units (Specify)				
	Monthly Avg.	Weekly Avg.	Monthly Avg.	Weekly Avg.	Measurement Frequency	Sample Type	* Sample Location
Flow			1.25 MGD		Continuous	Recording	I or E
BOD, 5Day, 20°C			30.0 mg/1	45.0 mg/1	Daily	Composite	E
Total Suspended Residue			30.0 mg/1	45.0 mg/1	Daily	Composite	E
NH_3 as N					2/Month	Composite	E
Dissolved Oxygen (minimum)			5.0 mg/1	5.0 mg/1	Daily	Grab	E
Fecal Coliform (geometric mean)			1000.0/100 ml	2000.0/100 ml	Daily	Grab	E
Residual Chlorine					Daily	Grab	E
Temperature					Daily	Grab	E
Total Nitrogen (NO_2 + NO_3 + TKN)					Monthly	Composite	E
Total Phosphorus					Monthly	Composite	E
Oil and Grease			30.0 mg/1	60.0 mg/1 **	2/Month	Grab	E

*Sample locations: E - Effluent, I - Influent

**Daily Maximum Limit

The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored daily at the effluent by grab sample.

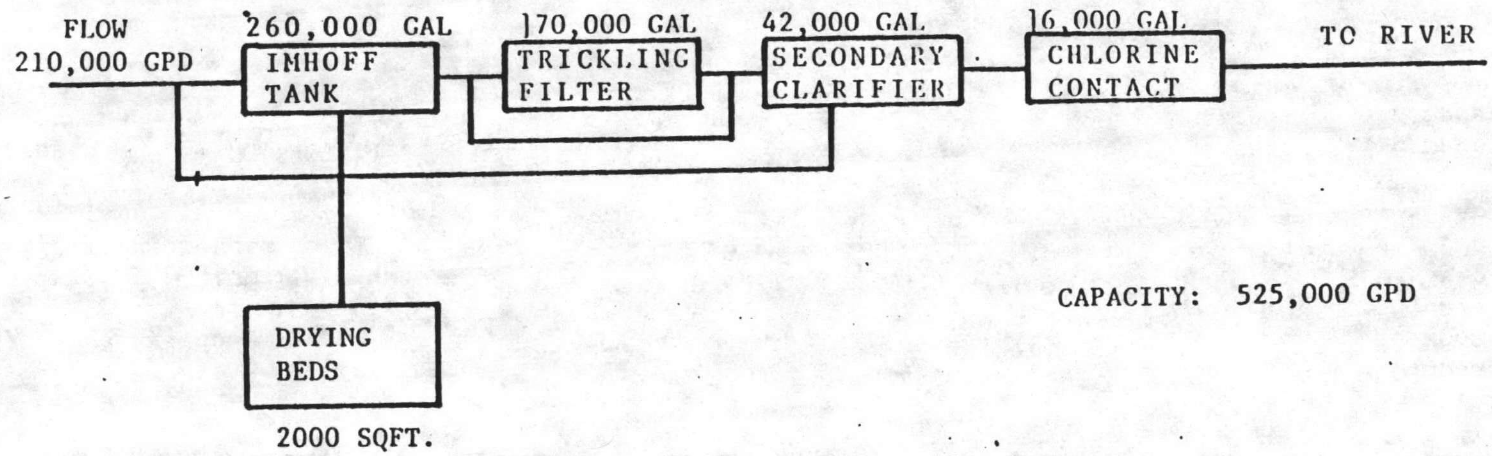
There shall be no discharge of floating solids or visible foam in other than trace amounts.

A-12

Tarawa Terrace

RIFLE RANGE WASTEWATER TREATMENT PLANT

BUILDING RR-92



CAPACITY: 525,000 GPD

A. (1). **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS** Final

During the period beginning on the effective date of the Permit **and lasting until** expiration, **the permittee is authorized to discharge from outfall(s) serial number(s)** 001. **Such discharges shall be limited and monitored by the permittee as specified below:**

Effluent Characteristics	Discharge Limitations				Monitoring Requirements		
	Kg/day (lbs/day)		Other Units (Specify)				
	Monthly Avg.	Weekly Avg.	Monthly Avg.	Weekly Avg.	Measurement Frequency	Sample Type	* Sample Location
Flow			0.525 MGD		Continuous	Recording	I or E
BOD, 5Day, 20°C			30.0 mg/l	45.0 mg/l	2/Month	Composite	E
Total Suspended Residue			30.0 mg/l	45.0 mg/l	2/Month	Composite	E
NH_3 as N					2/Month	Composite	E
Dissolved Oxygen (minimum)			5.0 mg/l	5.0 mg/l	Weekly	Grab	E
Fecal Coliform (geometric mean)			14.0/100 ml	28.0/100 ml	2/Month	Grab	E
Residual Chlorine					Daily	Grab	E
Temperature					Weekly	Grab	E
Total Nitrogen (NO_2 + NO_3 + TKN)					Quarterly	Composite	E
Total Phosphorus					Quarterly	Composite	E
Oil and Grease			30.0 mg/l	60.0 mg/l**	2/Month	Grab	E

*Sample locations: E - Effluent, I - Influent

**Daily Maximum Limit

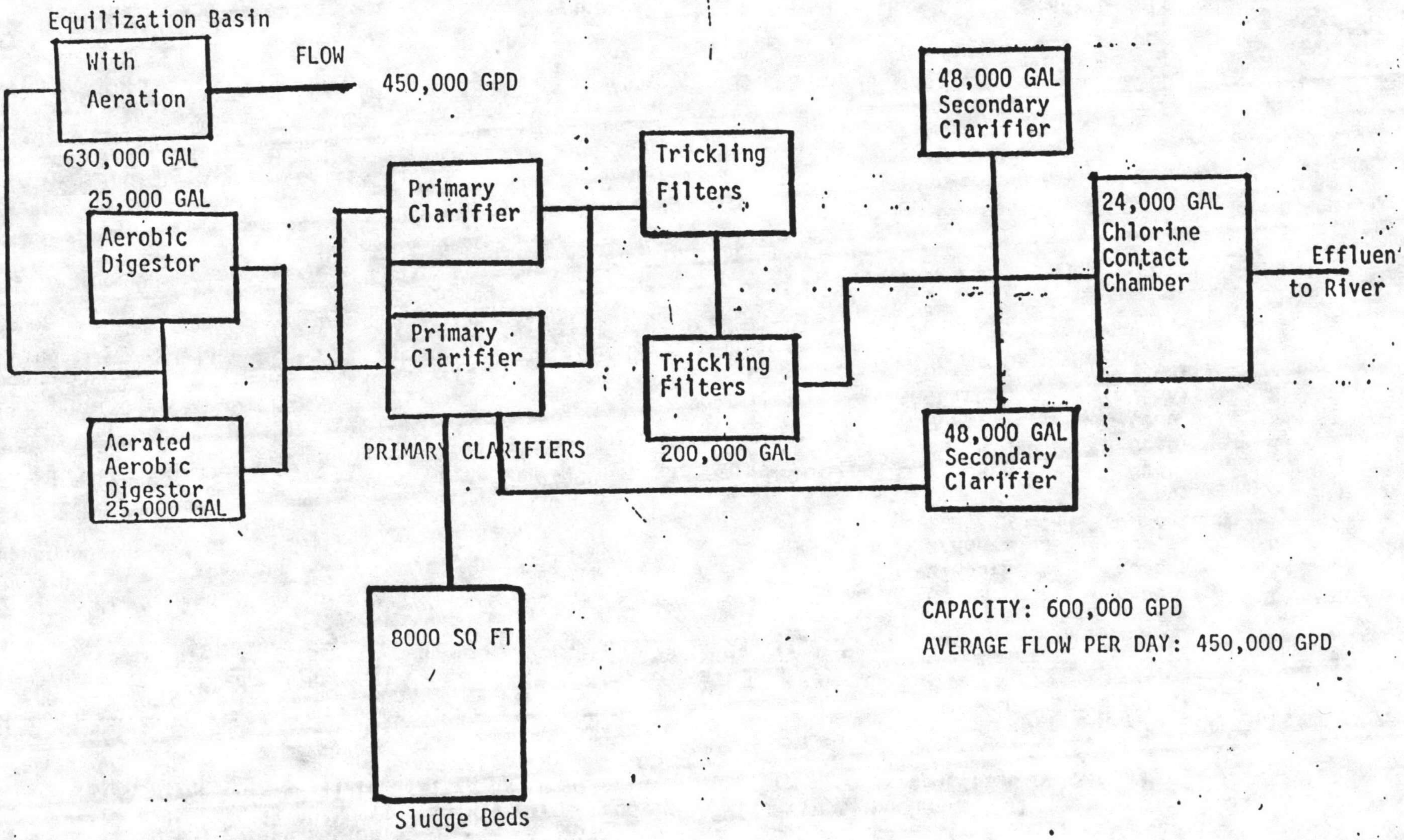
The pH shall not be less than 6.0 **standard units nor greater than** 8.5 **standard units and shall be monitored** 2/Month at the effluent by grab sample.

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

Rifle Range

COURTHOUSE BAY WASTEWATER TREATMENT PLANT

Building BB-204



CAPACITY: 600,000 GPD

AVERAGE FLOW PER DAY: 450,000 GPD

M 3

A. (1). EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS Final

During the period beginning on the effective date of the Permit and lasting until expiration, the permittee is authorized to discharge from outfall(s) serial number(s) 001.
Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations: Kg/day (lbs/day) Monthly Avg.	Kg/day (lbs/day) Weekly Avg.	Other Units (Specify) Monthly Avg.	Other Units (Specify) Weekly Avg.	Monitoring Requirements: Measurement Frequency	Sample Type	* Sample Location
Flow			0.600 MGD		Continuous	Recording	I or E
BOD, 5Day, 20°C			30.0 mg/l	45.0 mg/l	2/Month	Composite	E
Total Suspended Residue			30.0 mg/l	45.0 mg/l	2/Month	Composite	E
NH_3 as N					2/Month	Composite	E
Dissolved Oxygen (minimum)			5.0 mg/l	5.0 mg/l	Weekly	Grab	E
Fecal Coliform (geometric mean)			14.0/100 ml	28.0/100 ml	2/Month	Grab	E
Residual Chlorine					Daily	Grab	E
Temperature					Weekly	Grab	E
Total Nitrogen (NO_2 + NO_3 + TKN)					Quarterly	Composite	E
Total Phosphorus					Quarterly	Composite	E
Oil and Grease			30.0 mg/l	60.0 mg/l**	2/Month	Grab	E

A-16

*Sample locations: E - Effluent, I - Influent

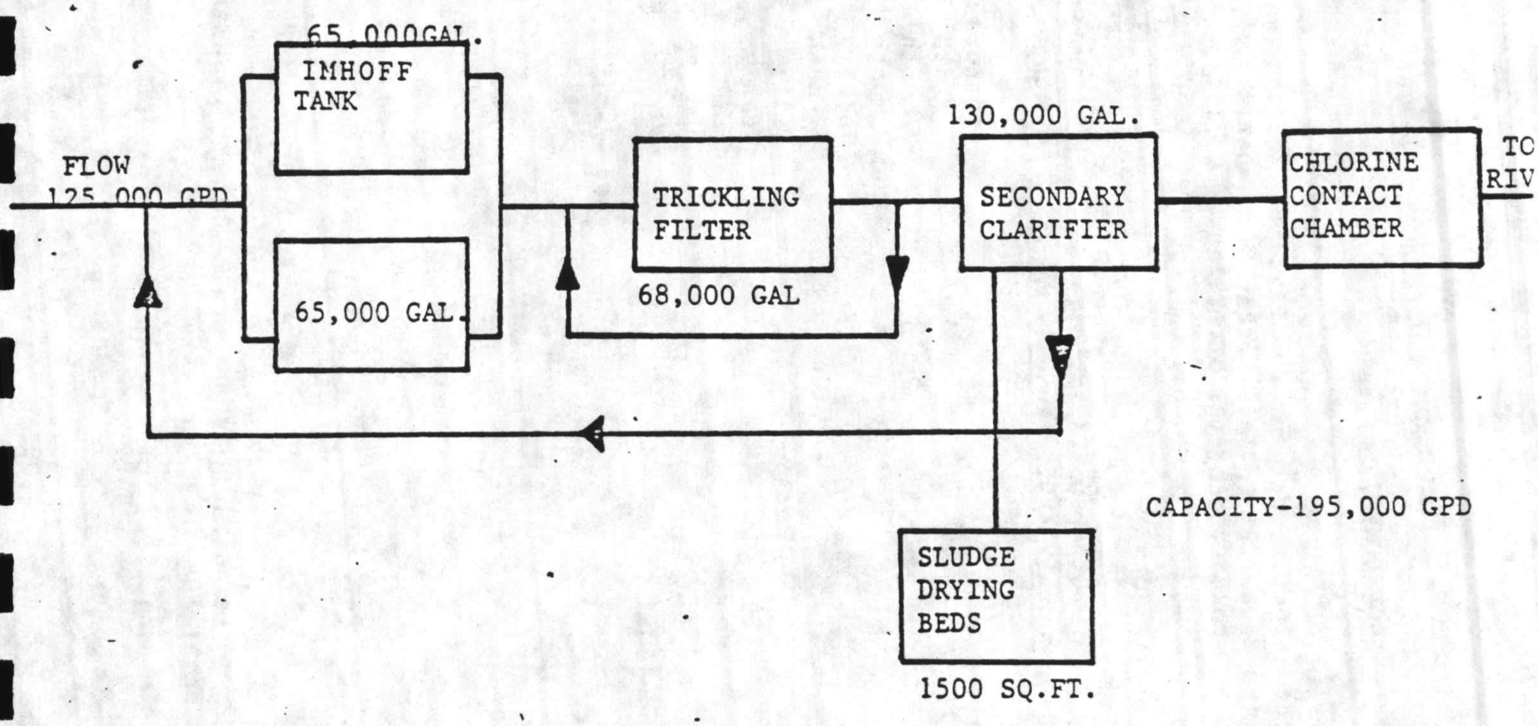
**Daily Maximum Limits

Courthouse Bay

The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored 2/Month at the effluent by grab sample.

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

ONSLOW BEACH WASTEWATER TREATMENT PLANT
BUILDING SBA-160



M 3

A. (1). EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS Final

During the period beginning on the effective date of the Permit and lasting until expiration, the permittee is authorized to discharge from outfall(s) serial number(s) 001. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations				Monitoring Requirements		
	Kg/day (lbs/day)		Other Units (Specify)				
	Monthly Avg.	Weekly Avg.	Monthly Avg.	Weekly Avg.	Measurement Frequency	Sample Type	* Sample Location
Flow			0.195 MGD		Continuous	Recording	I or E
BOD, 5Day, 20°C			30.0 mg/l	45.0 mg/l	2/Month	Composite	E
Total Suspended Residue			30.0 mg/l	45.0 mg/l	2/Month	Composite	E
NH_3 as N					2/Month	Composite	E
Dissolved Oxygen (minimum)			5.0 mg/l	5.0 mg/l	Weekly	Grab	E
Fecal Coliform (geometric mean)			14.0/100 ml	28.0/100 ml	2/Month	Grab	E
Residual Chlorine					Daily	Grab	E
Temperature					Weekly	Grab	E
Total Nitrogen (NO_2 + NO_3 + TKN)					Quarterly	Composite	E
Total Phosphorus					Quarterly	Composite	E
Oil and Grease			30.0 mg/l	60.0 mg/l **	2/Month	Grab	E

*Sample locations: E - Effluent, I - Influent

**Daily Maximum Limit

The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored 2/Month at the effluent by grab sample.

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

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DESCRIPTION:

Appendix B

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Confidential Records Management, Inc.
New Bern, NC
1-888-622-4425
9/08

APPENDIX B

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

APPENDIX B

MEETING MINUTES

Engineering
Architecture
Planning
Sciences
Surveying
Photogrammetry

GREENHORNE & O'MARA, INC. 4101 LAKE BOONE TRAIL THE SUMMIT SUITE 111 RALEIGH, NC 27607 PHONE 919-782-9088 FAX 919-782-9313

MINUTES OF MEETING

DATE: November 2, 1990 TIME: 10:00 A.M.

LOCATION: Building 1005, MCB, Camp Lejeune

RE: **Wastewater Treatment Study**
Project Start-Up Meeting

Attendees:	Alex Wood	- MCB, Public Works
	Carl Baker	- MCB, Utilities
	Brynn Ashton	- MCB, EMD Planning Division
	Gary Davis	- MCB, EMD Planning Division
	Elizabeth Betz	- MCB, EMD Env. Quality Monitoring
	Mack Davis	- MCB, Utilities
	Mack Frazelle	- MCB, Utilities
	Joe Garceau	- Greenhorne & O'Mara
	Pete Currie	- Greenhorne & O'Mara

The meeting was held in accordance with the project schedule in order to coordinate the project start-up, discuss specific concerns, and confirm sources of data available to the consultant.

Alex Wood is to be the primary contact for the MCB. He will route all correspondence on the project and direct G&O to appropriate sources of data. G&O may speak directly to other members of the MCB staff in order to obtain information pertinent to the project.

The proposed project schedule was found to be acceptable. Firm dates for proposed meetings are requested in writing from G&O as they become available.

G&O will be responsible for conducting meetings with NCDEM. Gary Davis and others (to be determined later) will attend the DEM meetings. Gary Davis has contacted Trevor Clements in the Raleigh office of DEM and asked him to contact G&O. Mr. Clements is familiar with DEM's modeling efforts on the New River, and the MCB would like him to be involved in the meetings.

The application for increased discharge at Hadnot Point has not been filed with DEM. Application requirements call for extensive testing to be done by the MCB. Mr. Ashton will meet with DEM to determine if partial processing of the application can be accomplished without all of the testing: the immediate concern is to determine discharge parameters for the increased flow rather than to obtain full approval of the application.

Various treatment scenario alternates were discussed in order to determine if any could be eliminated initially for obvious feasibility problems.

Mr. Ashton stated that because of the large investment in the Hadnot Point facility and the current good discharge conditions there it appears probable that the plant would not be abandoned. However, it was noted that overall project economics should be considered in making that decision.

Mr. Wood and Mr. Baker suggested that for funding reasons consideration should be given to phasing the project construction in several smaller sections. They also noted that DEM currently would like to see a 5-year compliance schedule.

A joint venture with the City of Jacksonville needs to be considered. Jacksonville, in some of their preliminary planning, has considered accommodating at least Camp Geiger in their facility upgrades. All contact so far with Jacksonville has been on an informal basis through Mr. Baker.

Treatment plants on both sides of the river have been discussed in previous meetings with DEM. However, no major development is anticipated on Base on the west side of the river.

The possibility of an ocean outfall at Onslow Beach was discussed. Previous ocean outfall proposals in the area have been ruled out for cost reasons. Previous studies indicate pumping from Onslow Beach to Hadnot Point to be the most economical approach.

Oil & grit separators on Base discharge to the treatment plants. Some function better than others. Plans are available (Bldgs. SA42 & SA38). See Mr. Ashton.

The Utilities Department is working on funding for an inflow and infiltration study for the Base collection system. New construction on the Base is supposed to include low water use devices. Some retrofitting of older construction has also been completed. The Utilities Department is currently working up a survey program to determine the extent and status of these devices.

Individual water and sewer use is not metered on Base, although a metering program is now underway. Usage rates in past design work have been based on typical standard design flows, with housing rates typically higher than normal. Current recorded flows may be misleading as approximately 16,000 troops have been deployed since mid-August. Individual electric use at the treatment facilities is not metered.

The Base Master Plan may not be reliable for growth projections for this study since it is a five year plan, currently in its fourth year. G&O should contact the Facilities Planning Office (Al Austin, 451-3034) for discussion of growth projections. In general, population is not expected to increase, with most "growth" being the modernization of facilities.

Land application has been studied in the past. The major obstacle has been land cost: most suitable area for land application is also prime training land. Current land costs are approximately $1000 per acre. It was noted that not enough suitable area could be found at Onslow Beach to treat the Beach flow. It was felt that some suitable areas might be found in buffer zones about the Base - the feasibility of using these areas would probably depend on the economics of pumping effluent to the sites.

Use of the woodpecker habitat area on Base was ruled out since land application requires crop harvesting. It was noted that the Base has a timber management program; therefore, crop management associated with land application may be considered as a workable alternative.

Use of the ranges for land application of the Rifle Range effluent was discussed; it was noted that dechlorinization would be necessary. G&O should consider pumping Rifle Range discharge to the North Topsail Water and Sewer Authority.

Sludge is now disposed of in the top two feet of the landfill. A landfill study is currently underway. Problems may arise for future sludge disposal due to the timing of cell closure in the landfill.

Various data were given to G&O, including NPDES Permit summary information, discharge records and Compliance Inspection Reports for each plant for the past 12 months, and copies of significant correspondence with DEM. Additionally, sources were identified for the immediate availability of other data, including the Base Master Plan, plant operational cost data, previous wastewater study reports, soils data, Jacksonville 201 Plan reports, and pump station data.

G&O was requested to provide an agenda for the scheduled November 7 meeting with the Wilmington office of DEM.

The Meeting adjourned at 11:00 A.M.

JEG/pbc

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GREENHORNE & O'MARA, INC. 4101 LAKE BOONE TRAIL THE SUMMIT SUITE 111 RALEIGH, NC 27607 PHONE 919-782-9088 FAX 919-782-9313

MINUTES OF MEETING

DATE: November 7, 1990 TIME: 10:00 A.M.

LOCATION: NC Division of Environmental Management
Regional Office, Wilmington, NC

RE: **Wastewater Treatment Study**
Project Start-Up and Data Collection

Attendees:
Dave Adkins - DEM, Wilmington
Ed Beck - DEM, Wilmington
Pat Durrett - DEM, Wilmington
Paul Rawls - DEM, Wilmington
Trevor Clements - DEM, Raleigh
Mike Scoville - DEM, Raleigh
Alex Wood - MCB, Public Works
Gary Davis - MCB, EMD Planning Division
Elizabeth Betz - MCB, EMD Env. Quality Monitoring
Carl Baker - MCB, Utilities
Mack Davis - MCB, Utilities
Mack Frazelle - MCB, Utilities
Joe Garceau - Greenhorne & O'Mara
Pete Currie - Greenhorne & O'Mara

The meeting was held in general accordance with the attached agenda in order to establish working relationships, present the project scope of work to DEM, gather data relevant to the study, and hear DEM comments on the regulatory aspects and environmental background of the project.

Mr. Davis presented a brief overview of the study. Mr. Garceau introduced the consultants and reviewed the project scope of work and project schedule. Copies of the scope and schedule were distributed to the DEM representatives. It was noted that the project schedule fits well with the timing of a Base SOC.

Mr. Adkins stated the DEM's appreciation for the MCB's continuing attention to the wastewater discharge issues at Camp Lejeune. He noted that a schedule for the timely implementation of improvements at the Base is very important to DEM. He also indicated DEM's willingness to be of assistance in the matter whenever requested.

In response to questions regarding the New River modeling, Mr. Clements presented a detailed overview of the DEM technical efforts since 1986:

> Initial testing of the upper reaches of the river indicated water quality degradation severe enough to consider the waters beyond their assimilative capacity. Further testing and modeling was then concentrated toward determining what areas of the river system would be able to assimilate wastewater loading.

A detailed study of the river was begun in 1989, with large amounts of field data gathered for the development of a flow dispersion model. The development of the model is expected to begin soon in the Raleigh offices of DEM. Mr. Scoville will be in charge of the effort, using the "WASP" Model, which is supported by EPA.

General indications from preliminary review of the field data are that advanced tertiary treatment will be required for discharges to the river. There appear to be better mixing conditions in the middle reaches of the river, with severe problems in the upper areas. Specific discharge limits will be dependent on the results of the dispersion model; however, preliminary indications are that limits will be on the order of 5 mg/l BOD, 1 mg/l ammonia nitrogen, and 0.5 to 1.0 mg/l phosphorus.

Mr. Adkins noted that the high costs and complexity of technology associated with the level of treatment anticipated would seem to point toward the development of a single treatment plant.

Land application regulations are currently under review at DEM, with final staff comments due in June 1991. DEM policy is that non-discharge alternatives, including land application, must be considered and found to be unacceptable before a discharge permit will be issued.

In general, land application has been found to work well on good soils with good design. DEM is finding that designs need to be conservative and cannot rely on average site application rates. Crop management plans are required for large land application projects, with full-time farm operators on staff. DEM is becoming more comfortable with land application and finding increasingly better results with the process over time.

North Topsail Water and Sewer Authority is to submit an engineering study to DEM in January 1991 to address concerns with its land application project. The system's capacity is expected to be reduced from 0.6 MGD because of site problems. Although DEM feels the problems can be overcome, no quick solution is anticipated.

The feasibility of an ocean outfall at Onslow Beach was discussed. DEM references federal guidelines for ocean outfalls, which require detailed investigations of at least ten issues. The complexity of the problem and the number of unknowns involved have led DEM to express doubt that any major facilities in the region will be permitted to discharge to the Ocean. Mr. Adkins noted that prevailing winds and public perception would also create problems at Onslow Beach.

The occurrence of grease in the MCB treatment plants is seen by DEM as an operations problem rather than a discharge problem. Suggestions were made for dealing with grease, including the installation of grease traps in series and increasing maintenance maintenance efforts.

DEM is not aware of any specific stormwater inflow problems on Base. Mr. Adkins recommended minimizing the amount of surface area served by oil and grit separators. He noted that although it was preferred to discharge these systems to the treatment plants, they may be diverted to subsurface disposal systems with non-discharge permits. Large storms may be allowed to overflow these systems. Proper maintenance is essential to their operation.

In order to resolve questions about the testing requirements for the Hadnot Point discharge permit application a meeting was scheduled for November 20 in the Raleigh office of DEM. Base personnel and DEM staff from the Wilmington office and the Permits Section will attend.

Since future discharge limits will not be available until completion of the New River model, the following limits were recommended by DEM for planning purposes:

BOD(5)	-	5 mg/l
NH3-N	-	1 mg/l
Total N	-	4.0 mg/l Summer
		8.0 mg/l Winter
Phosphorus	-	0.5-1.0 mg/l

What is the status of the New River model? Who is the state P.O.C?

It is felt by DEM that achieving the BOD limit will drive TSS to acceptable limits.

Dechlorination needs to be addressed in the facilities planning. (The MCB is currently addressing toxicity removal for the existing facilities.)

It was noted that the Base sludge handling facilities are inadequate and need to be addressed in planning. DEM is not aware of anything that would preclude land application of sludge. Air quality issues will need to be addressed if incineration is considered.

What is the problem w/ our sludge handling facilities

Mr. Adkins noted the requirement to eliminate the Onslow Beach discharge to SA waters and suggested that the elimination be given priority within the overall project schedule.

Mr. Adkins noted that Onslow Beach, Camp Geiger, Camp Johnson, and Tarawa Terrace were seen by DEM as the areas in need of immediate attention. He also noted that future water classification changes may follow for the Rifle Range and Courthouse Bay discharges.

Mr. Adkins stated that DEM was encouraged by the MCB's continued contact with the Town of Jacksonville. He noted again that the high level of treatment and associated high costs point toward the pooling of resources. Mr. Baker stated that the decision on a joint venture with Jacksonville would be determined by economics. Mack Davis noted that three bond issues in Onslow County had failed passage in the November 6 election and expressed concern for the passage of Jacksonville's sewer bond.

What is the status of the sewer bond referendum?

Mr. Adkins encouraged G&O to contact either the Wilmington or Raleigh offices of DEM whenever necessary and stated again DEM's willingness to assist in this matter.

The Meeting adjourned at 11:30 A.M.

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GREENHORNE & O'MARA, INC. 4101 LAKE BOONE TRAIL THE SUMMIT SUITE 111 RALEIGH, NC 27607 PHONE 919-782-9088 FAX 919-782-9313

MEETING AGENDA

FROM: Joseph E. Garceau

DATE: November 7, 1990 TIME: 10:00 A.M.

LOCATION: NC Division of Environmental Management
Regional Office, Wilmington, NC

RE: **Wastewater Treatment Study**
Project Start-Up and Data Collection

I. Introduction of Consultants

II. Project Overview:

A. Scope of Work (Copy Attached)

B. Project Schedule (Copy Attached)

III. Project-Specific Questions and Request for Data

A. From minutes of 25 Oct 89 meeting w/ MCB:

1. Has upper New River hydraulic & wasteload allocation study been completed ? Is a copy available ?
What is the schedule for the lower New River study ?

B. Future regulatory restrictions on land application ?

C. Is an ocean outfall at Onslow Beach feasible from a regulatory standpoint ?

D. How much of a problem is oil & grease ? Stormwater inflow ?

IV. Application for increased discharge at Hadnot Point.

V. Plant by plant discussion of facilities.

VI. DEM Comments and Input

CAMP LEJEUNE
WASTEWATER TREATMENT PLANT

MASTER PLAN
ENGINEERING STUDY
(PHASE I)

S C O P E O F W O R K

I. INTRODUCTION

At present, Camp Lejeune has seven (7) wastewater treatment plants, all of which discharge into the New River or its tributaries; Rifle Range (.6 MGD), Camp Geiger (1.6 MGD), Camp Johnson (1 MGD), Tarawa Terrace (1.25 MGD), Hadnot Point (8 MGD), Onslow Beach (.2 MGD) and Courthouse Bay (.6 MGD). The State has indicated that discharges into portions of the New River (and its tributaries) are in conflict with its goal to upgrade water quality. Permits for several of the plants will be increasingly difficult to obtain and future effluent standards and ambient water quality designations will be much more stringent. To guide Camp Lejeune officials in making the correct decisions, a multiphased study will be conducted to evaluate various alternatives.

II. PHASE I - ALTERNATIVES SELECTION AND EVALUATION

A. Feasibility and Economic Analysis

Task 1 - Data Collection and Review

All relevant information regarding the design and operation of the seven Wastewater Treatment Plants (WWTPs) at Camp Lejeune will be assembled and reviewed to establish a baseline for consideration of changes and modifications, including raw data from Building 65 (Laboratory), Building 670 (main water plant/treatment plant office), Building 1005 (Technical Records at Public Works Department). This information is to be provided by the Camp Lejeune staff at the commencement of the project and will include wastewater characterizations and discharge parameters for all WWTPs. No field sampling and analysis is planned for this project.

Task 2 - Development of Alternatives for WWTPs and Base Scenarios

This task will involve the development of specific feasible alternatives for each WWTP and develop a matrix of these plant specific alternatives. Selection of overall facility scenarios from this matrix of alternatives will be made and will be used in the Feasibility and Preliminary Economic Analysis. A final list of base scenarios will be submitted to Camp Lejeune and NCDEM officials for concurrence prior to completing Task 3.

Task 3 - Preliminary Evaluation of Scenarios

Perform a preliminary evaluation of the technical and economic feasibility of the scenarios which were selected in Task 2. The number of scenarios should be all inclusive of reasonable options for each WWTP, but bounded by a limit of 5. All scenarios will be comprised of state-of-the art or best demonstrated technology for wastewater treatment and discharge options. The specific regulatory requirements and technical conditions that provide the basis of evaluation will include the following criteria:

1. The possibility that current, new and/or expanded effluent discharges will not be allowed in the upper New River or the Intracoastal Waterway where the Camp Geiger, Camp Johnson, Tarawa Terrace, and Onslow Beach WWTPs presently discharge.

2. More stringent effluent discharge limits will be implemented, including standards for phosphorous, nitrogen, heavy metals, ammonia, toxicity, etc. Future requirements may limit or eliminate discharges in the New River which will affect Hadnot Point, Courthouse Bay, and Rifle Range.

Who hold the key to this all important tidbit of knowledge who has the authority to control or stop discharges to New River and through what process.

3. All WWTP capacity increases may be denied.

Examples of scenarios to be considered may include: Keep as many plants as possible and upgrade to needed discharge limits; consolidate all plants to one or two large plants; change some discharge points along New River, as necessary, to meet limits; and use land disposal for the up-river plants.

Also, the following list of options will be included for consideration:

1. Abandonment or scaling down of existing WWTPs.

2. Modifications of some existing plants.

3. Expansion of some of the existing WWTPs.

4. Pumping of untreated sewage to existing, new, or modified WWTP for treatment and discharge.

5. Pumping treated effluent to existing, new or modified discharge points.

6. Land application, including land area requirements, required plant modifications, and its impact on facility training operations. Future regulatory restrictions will be considered.

7. A combination of feasible disposal methods on a WWTP specific basis.

8. Joint venture with Town of Jacksonville on its land application project, including meeting with Jacksonville officials to discuss alternatives.

why is ocean outfall not mentioned here?

Task 4 - Comparison of Phase I Scenarios

A maximum of three alternatives will be selected to perform a comparative feasibility and economic analysis. This analysis will include the following elements for evaluation:

1. Order-of-Magnitude Life Cycle costs.
2. Preliminary environmental evaluation to identify any major concerns that would eliminate an alternative.
3. Estimated time to design, permit, and construct facilities.
4. General regulatory requirements and permitting conditions.
5. Comformance to the Camp Lejeune Master Plan.
6. Site suitability, space available, and right-of-way requirements.
7. General constructability.
8. Other limits due to base operations and facility needs.
9. Other applicable and relevant local, State, and Federal regulations.
10. Complexity of operation and maintenance.
11. Reliability and failure considerations.
12. Ability to meet long-term disposal needs.
13. Efficiencies of nutrient removal.
14. Sludge generation, handling, and disposal.
15. Reliability of technology.
16. Ease of treatment capacity expansions.

A Preliminary Phase I Report will be prepared to present the findings and recommend a single alternative for further detailed evaluation in Phase II.

III. PROJECT SCHEDULE AND MILESTONES

Event	Days from Start
Kick-off Meeting	1
Scoping Outline	31
Phase I Preliminary Report	180

GREENHORNE & O'MARA, INC.

CAMP LEJEUNE WASTEWATER TREATMENT STUDY - PHASE I

PROPOSED PROJECT SCHEDULE: 10-25-90

CAMP LEJEUNE WWTP STUDY Phase I	1990 OCT	NOV	DEC	1991 JAN	FEB	MAR	APR	MAY
Project Startup Meeting	M							
TASK 1 - Data Collection	>	>>						
Data Review Meeting		M						
TASK 2 - Alternatives Development		>>	>					
Review Meeting			M					
TASK 3 - Preliminary Evaluation of Scenarios			>>>	>>>>	>			
Review Meeting					M			
TASK 4 - Comparison of Phase I Scenarios					>>	>>>>	>>	
Review Meeting							M	
TASK 4 - Phase I Report							>>	
Phase I Report Presentation								M

LEGEND: TASK - >>>>
MEETING - M

With the exception of data collection meetings with DEM and the Town of Jacksonville, all meetings will be held at Camp Lejeune. **This schedule is contingent on the scheduling of meetings during the time periods indicated.**

CAMP LEJEUNE WASTEWATER TREATMENT STUDY - PHASE I

PROPOSED PROJECT SCHEDULE: 10-25-90

Project Startup Meeting: Week of 10-29-90.

Attendance by G&O and Base Personnel to coordinate the project, review specific concerns, and confirm sources of data.

TASK 1 - DATA COLLECTION: 10-29-90 thru 11-16-90.

Informal meetings to be scheduled with DEM, Wilmington and Town of Jacksonville.

Data Review Meeting: Week of 11-19-90.

Attendance by G&O and Base Personnel to review collected data and initiate discussion of alternatives.

TASK 2 - ALTERNATIVES DEVELOPMENT: 11-19-90 thru 12-07-90.

Review Meeting: Week of 12-10-90.

Attendance by G&O and Base Personnel to review scenario matrix. Attendance by DEM and Jacksonville as required by development of scenarios.

TASK 3 - PRELIMINARY EVALUATION OF SCENARIOS: 12-10-90 thru 2-08-91

Review Meeting: Week of 2-11-91.

Attendance by G&O and Base Personnel to consider recommendations for primary alternatives. Attendance by DEM and Jacksonville as required by results of Preliminary Evaluation.

TASK 4 - COMPARISON OF PHASE I SCENARIOS: 2-18-91 thru 4-12-91

Review Meeting: Week of 4-15-91.

Attendance by G&O and Base Personnel to consider final study recommendations. Attendance by DEM and Jacksonville as required by results of detailed scenario evaluations.

TASK 4 - PHASE I REPORT PREPARATION: 4-15-91 thru 4-26-91

Phase I Report Presentation: Week of 4-29-91.

Formal Presentation of Study Findings.

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GREENHORNE & O'MARA, INC. 4101 LAKE BOONE TRAIL THE SUMMIT SUITE 111 RALEIGH, NC 27607 PHONE 919-782-9088 FAX 919-782-9313

MINUTES OF MEETING

DATE: November 7, 1990 TIME: 2:30 P.M.

LOCATION: Public Utilities Department
City of Jacksonville, North Carolina

RE: **MCB, Camp Lejeune, NC**
Wastewater Treatment Study
Project Start-Up and Data Collection

Attendees: Mack McRorie - City of Jacksonville
Ray Holder - City of Jacksonville
John Nigro - City of Jacksonville
Joe Garceau - Greenhorne & O'Mara
Pete Currie - Greenhorne & O'Mara

The meeting was held in order to establish a working contact between Greenhorne & O'Mara and the City of Jacksonville and to discuss general issues related to the proposal to pump wastewater from the MCB to the City's disposal facilities.

Mr. Garceau introduced the consultants and reviewed the MCB project scope of work and schedule. Copies of the scope and schedule (attached) were given to the City.

Mr. McRorie provided G&O with a copy of the Supplement to the City's 201 Facilities Plan Amendment, Dated July 1990 (loaned to G&O), a copy of the proposed force main route mapping, a map of the City's sanitary sewer collection system, and a copy of the City's proposed SOC schedule. He stated that approval of the FONSI for the 201 Plan is anticipated from NCDEM within the next 2 months.

Mr. McRorie stated that the City had early discussions with the MCB regarding the connection of Camp Geiger to the City project and has subsequently discussed the additional connection of Camp Johnson and Tarawa Terrace. The City's plan currently provides a capacity of 9 MGD in land area and piping, with an initial treatment design capacity of 6 MGD. The City's design consultants are preparing an alternate to provide an initial 9 MGD treatment capacity. Additionally, they are proposing a study of the City's wastewater treatment needs over the next 20 years.

The 9 MGD capacity is required in order to accept the Camp Geiger flow. The City feels that the addition of Camp Johnson would limit the facility's capacity to provide for area growth to a period of 10 to 12 years. The City is willing to consider the addition of Tarawa Terrace flows to their system, but rules out the addition of other flows (Hadnot Point).

The City's land application site consists of 6500 acres. Additional land that might be acquired is considered to be of increasingly poorer quality.

Is this option available today?

The City's Consent Order require's the land application facility to be operating by January 1, 1996. The City anticipates final design to begin in December 1990, with a decision on the MCB's proposed connections necessary by April 1991. Mr. Garceau noted that the MCB Study schedule calls for a preliminary recommendation of three alternates by February 1991, and a recommendation for the selected alternate by April, 1991.

Possible connection points for Geiger, Johnson, and Tarawa Terrace were discussed, referencing the City sewer system map:

- Camp Geiger - Connection at the proposed pump station on Brinson Creek at Washington St.
- Camp Johnson - Connection at the "Main" pump station on Chaney Creek at Marine Blvd.
- Tarawa Terrace - Connection at the 21" main in Lejeune Blvd. near Kaye Street.

The City noted that NCDOT plans for a US 258 bypass route could affect the proposed force main corridor along Brinson Creek to the land application site. Currently an EIS for the highway project is underway. The City maintains periodic contact with DOT consultants about the project.

Fixed rates presented in the 201 Plan were referenced for use in economic planning for the proposed connection(s).

G&O was advised to contact John Nigro regarding any additional questions on the matter.

The Meeting adjourned at 3:30 P.M.

cc: Mr. Alex Wood

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GREENHORNE & O'MARA, INC. 4101 LAKE BOONE TRAIL THE SUMMIT SUITE 111 RALEIGH, NC 27607 PHONE 919-782-9088 FAX 919-782-9313

MINUTES OF MEETING

DATE: November 20, 1990 TIME: 12:00 NOON

LOCATION: Greenhorne & O'Mara, Inc.
Raleigh, North Carolina

RE: **Wastewater Treatment Study**
Data Review & Preliminary Treatment Alternatives

Attendees:
Brynn Ashton - MCB, EMD Planning Division
Gary Davis - MCB, EMD Planning Division
Elizabeth Betz - MCB, EMD Env. Quality Monitoring
Christine Wallace - Naval Facilities Engineering Command
Joe Garceau - Greenhorne & O'Mara
Pete Currie - Greenhorne & O'Mara

The meeting was held to review the information gathered during Task 1 of the study and to initiate discussion of wastewater treatment alternatives. An outline of potential options for each plant, copy attached, was distributed and discussed.

Mr. Garceau noted that a major question to be considered is whether to upgrade the Hadnot Point plant at its existing location or to construct a new plant to take its place. Ms. Betz noted the presence of an old landfill site in and around the plant that would hinder expansion efforts. It was also noted that there may be considerable operational problems associated with an in-place expansion.

But we allowed that option to die.

Mr Garceau commented that the construction of a new plant on the west side of the New River is felt to be a weak alternative, especially if Camp Geiger is pumped to Jacksonville. Ms. Betz pointed out that there are areas of endangered species (woodpecker) habitat on the west side, as well as extensive training and impact areas. Mr. Ashton provided G&O with a copy of a base firing range map illustrating these training areas.

Mr. Garceau noted that the area requirement for land application of all of the base flow would be quite large. Based on very rough figures generated from the relative size of the Jacksonville facility, it appears that a total of nearly 9000 acres would be required for the current total design flow. Additionally, he noted the DEM's crop harvesting requirement for land application sites. Ms. Betz noted the conflict between suitable land application areas and prime training land as well as the abundance of wetland areas on base. Mr. Davis noted that additional land outside the base would be very difficult to acquire for land application sites.

Mr. Davis noted that land application sites may be available on base across the waterway from Onslow Beach. Additionally, it may be possible to use the ranges at the Rifle Range facility. The ranges are currently irrigated with potable water.

The ocean outfall option was discussed. It was felt that although the cost for an ocean outfall for only Onslow Beach would probably be prohibitive, an outfall for the total base discharge might be cost effective. Ms. Betz noted that at some future point the Hadnot Point discharge could come under additional regulatory restrictions due to impacts to SA waters, making an ocean outfall an attractive alternative. Mr. Garceau stated that G&O would contact NCDEM to discuss the ocean outfall option further.

The proposed rates for the Jacksonville facility were discussed. Mr. Ashton expressed concern that the bonds necessary to build the Jacksonville system will not pass the February vote.

A meeting to review the development of alternatives was scheduled for November 28 at Camp Lejeune. G&O will prepare a list of the most viable scenarios for discussion at the meeting.

The Meeting adjourned at 1:00 P.M.

CAMP LEJEUNE WASTEWATER TREATMENT MASTER PLAN

TREATMENT PLANT OPTIONS

1. HADNOT POINT:

   1.1. Upgrade plant and discharge to New River.

   1.2. Construct new plant and discharge to New River.

   1.3. Upgrade plant and discharge to land application site.

   1.4. Construct new treatment facility and discharge to land application.

   (Capacity for options 1 thru 4 depends on other plant scenarios.)

* 1.5. Pump all flow to Jacksonville.

2. CAMP GEIGER:

   2.1. Pump raw sewage to Hadnot Point (via Camp Johnson).

   2.2. Pump raw sewage to new plant on west side of New River.

   2.3. Pump raw sewage to Jacksonville.

* 2.4. Land application in vicinity of existing plant.

3. CAMP JOHNSON:

   3.1. Pump raw sewage to Hadnot Point (via Tarawa Terrace).

   3.2. Pump raw sewage to new plant on west side of New River (via Camp Geiger).

   3.3. Pump raw sewage to Jacksonville.

* 3.4. Land application in vicinity of existing plant.

4. TARAWA TERRACE:

4.1. Pump raw sewage to Hadnot Point.

4.2. Pump raw sewage to new plant on west side of New River (via Camp Johnson).

4.3. Pump raw sewage to Jacksonville.

* 4.4. Land application in vicinity of existing plant.

5. ONSLOW BEACH:

5.1. Pump raw sewage to Hadnot Point.

5.2. Pump raw sewage to Courthouse Bay.

* 5.3. Land application in vicinity of existing plant.

5.4. Pump raw sewage to (southern) land application site.

* 5.5. Relocate outfall to Atlantic Ocean.

6. COURTHOUSE BAY:

6.1. Pump raw sewage to Hadnot Point.

6.2. Pump raw sewage to new plant on west side of New River.

6.3. Relocate discharge to a point on New River between Grey Point and Duck Point. Upgrade plant as required, with capacity dependent on Onslow Beach and Rifle Range scenarios.

* 6.4. Land application in vicinity of existing plant.

6.5. Pump raw sewage to (southern) land application site.

* 6.6. Pump raw sewage to North Topsail Water & Sewer Authority.

* 6.7. No change.

7. RIFLE RANGE:

7.1. Pump raw sewage to Hadnot Point.

7.2. Pump raw sewage to new plant on west side of New River.

7.3. Pump raw sewage to Courthouse Bay.

* 7.4. Land application in vicinity of existing plant.

7.5. Pump raw sewage to (southern) land application site.

* 7.6. Pump raw sewage to North Topsail Water & Sewer Authority.

* 7.7. No change.

* Indicates option likely to be initially ruled out.

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GREENHORNE & O'MARA, INC. 4101 LAKE BOONE TRAIL THE SUMMIT SUITE 111 RALEIGH, NC 27607 PHONE 919-782-9088 FAX 919-782-9313

MINUTES OF MEETING

DATE: November 28, 1990 TIME: 10:00 A.M.

LOCATION: MCB, Camp Lejeune
Building 1

RE: **Wastewater Treatment Study**
Alternatives Development Review

Attendees:		
	Al Austin	- MCB, Facilities Department
	Lt. Col. C.R. Rivenbark	- MCB, Base Maintenance
	Lt. Col. B.J. Reed	- MCB, Training & Operations
	Carl Baker	- MCB, Utilities
	Mack Davis	- MCB, Utilities
	Mack Frazelle	- MCB, Utilities
	Julian Wooten	- MCB, Environmental Management
	Brynn Ashton	- MCB, EMD Planning Division
	Gary Davis	- MCB, EMD Planning Division
	Elizabeth Betz	- MCB, EMD Env. Quality Monitoring
	Alex Wood	- MCB, Public Works Office
	Larry Brandt	- MCB, PWO Planning
	Lt. Scott Brewer	- MCB, PWO Design
	Joe Garceau	- Greenhorne & O'Mara
	Pete Currie	- Greenhorne & O'Mara

The meeting was held to review the information gathered during Tasks 1 and 2 of the study and to identify wastewater treatment scenarios to be investigated during subsequent study tasks.

Mr. Wood introduced the consultants. Mr. Garceau reviewed the background of the project and distributed outlines of individual plant options and proposed treatment scenarios, copies attached. He noted that five scenarios were to be chosen for detailed study in the next study task.

Mr. Garceau commented that the investigation of the currently proposed scenarios would lead to the development of unit cost data for a number of the individual plant options. Based on this data, it would be possible to derive the cost for combinations of the outlined scenarios, if required, and to determine a least cost scenario. He also noted that recommendations for phasing of the project should develop over the course of the study.

Col. Rivenbark noted that separate treatment sites would result in higher unit costs due to maintenance and monitoring considerations. Gary Davis pointed out the large (9000 acre) land requirement for total discharge treatment by land application.

Col. Reed asked if project cost would be an acceptable justification for ruling out land application. Mr. Baker stated that DEM had indicated to him in previous conversation that they are receptive to economic considerations. Mr. Garceau noted that land application was the best economic alternative for the Town of Jacksonville.

Col. Rivenbark cautioned that the large tracts of vacant land on base must be assigned a value due to their use as training areas. Col. Reed noted that sizeable land area is taken up in safety buffer zones around the impact areas on base. He felt, from a training point of view, that use of these areas for land application would be acceptable. He noted that the restricted nature of these areas would limit crop management to forest uses only. Sweeps to clear unexploded ordinance would be required prior to any entry for crop maintenance or harvest. Gary Davis noted that there might be some problems with monitoring and sampling requirements because of restricted entry. He also noted the increased potential for groundwater contamination from ordinance.

Mr. Ashton noted that mapping of the base wetlands is available to aid in evaluation of the areas available for land application.

Mr. Frazelle commented on the apparent high costs of building and operating a large tertiary treatment plant, along with the associated sludge management program. In comparison, he felt that land application would prove to be less costly, especially in consideration of revenues gained from crop management.

what is the crop?

Mr. Garceau requested input regarding the choice of alternates for Hadnot Point: construction of a new plant vs. upgrade of the existing plant. He pointed out the potential for operational problems if the existing plant is upgraded in place. Due to the current plant layout and space restrictions it appears that in-place expansion and upgrade would involve separate flow trains and the formation of disjointed flow paths.

Mack Davis felt any operational problems could be handled, and stated that the flow equalization basin is currently providing good mixing of influent.

Mr. Wood and Mr. Ashton felt that funding might be a problem with construction of a new plant. Col. Rivenbark stated that construction of a new plant should not be considered unless it was found that expansion and upgrade of the existing plant was not possible. Mr. Baker noted that investigation of both options was necessary in order to compare costs.

Mr. Ashton stated that land could be made available for either new construction or plant expansion at Hadnot Point by using the existing park area or by removing old buildings in the vicinity the existing plant. Mr. Garceau noted that the land area requirements are not known now, but will be determined during the study.

Mr. Baker stated that an upgrade of the Courthouse Bay plant should not be pursued because of the condition of the plant and because of its discharge to SA waters. Mr. Garceau noted that the proposed upgrade includes a discharge relocation to SC waters above Grey point; the upgrade was proposed as an alternate plant for treating flows from Courthouse Bay, Rifle Range, and Onslow Beach.

Mr. Wood noted that NCDEM has indicated that the Rifle Range permit may also be short-lived because of its discharge to SA waters. Mack Davis asked about the possibility of pumping Rifle Range flows to the North Topsail Water and Sewer Authority facility. It was felt that limited capacity at the facility, along with the demand from North Topsail resort properties, would rule out the option. G&O will contact North Topsail for their input.

The possibility of irrigating the ranges as part of a land application system was discussed. Mr. Baker indicated that it may be possible to decrease flows into the plant by reduction of inflow and infiltration. He also noted that the Base should consider flow reduction in all other areas.

Rainwater runoff entering the sanitary sewer system via the oil and grit separators was discussed. Mr. Baker noted that the separator system at the Courthouse Bay boat basin handles more that the first 1/2" rainfall "flush" from the amphibious vehicle parking area and wash bays. Mack Davis stated that the pumps for the facility had been upgraded but still could not handle the inflow. Mr. Garceau commented that the design of the facility was apparently intended to bypass large stormwater discharges and that some adjustments to the separators may be necessary to avoid overloading the sanitary system. He also noted that G&O had scheduled time later in the day to make site inspections of several of the separators.

Mr. Austin, Lt. Brewer, and Ms. Betz expressed concern over changing regulations as they affect land application requirements as well as water quality designations. Mr. Baker noted that NPDES permits issued for the New River may be honored by DEM for only two five-year permit cycles. Additionally, discharge permits will be limited to one section of the river and will have very strict limits. It was generally agreed that environmental regulations will continue to tighten and that no long-term permit guarantees can be expected. These considerations were felt to make an ocean outfall attractive, perhaps as a future alternative to the river discharge of all flows at Hadnot Point. Col. Rivenbark noted that combinations of the various options might be an effective way of dealing with changing regulations.

20 yr cost analysis

Mack Davis asked if deep well injection of effluent had been considered. Ms. Betz noted that the process has been investigated in other regions, but did not know of any operational applications. Gary Davis noted that the process would be an unusual approach in Region IV. G&O will contact DEM to discuss the matter.

Mr. Garceau asked about projected future development on the base west of the New River. Mr. Ashton stated that very little in the way of facilities was anticipated and that all expansion in the area should be able to be serviced by septic systems or by pumping to Camp Geiger. Mr. Garceau noted that the proposal for construction of a new treatment plant west of the river was intended to serve Camp Geiger, Rifle Range, and any future expansion on that side of the base. Without significant future development, however, the alternate is much less attractive.

Based on the discussion, Mr. Garceau recommended that the first three and last two of the outlined scenarios be designated for investigation under Task 3 of the study. Gary Davis recommended to the group that direction be given to G&O to study the recommended five alternates and to contact DEM regarding deep well injection. Mr. Ashton also recommended that the five alternates be studied and advised the group that additional scenarios could be added to the study if necessary by revising the scope of work.

General discussion followed. It was noted that representatives of Base Facilities and the Wastewater Working Group were present, as well as all other interested departments (see list of Attendees). Following the discussion a unanimous decision was made to proceed with the study of the recommended scenarios:

1. Upgrade existing Hadnot Point plant to accept all flows.

2. Construct new plant at Hadnot Point to accept all flows.

3. Pump Camp Geiger, Camp Johnson and Tarawa Terrace to Jacksonville. Pump Rifle Range to North Topsail Water and Sewer Authority (if acceptable). Upgrade Hadnot Point to accept all remaining flows.

4. Construct Ocean Outfall from Hadnot Point to handle all flows.

5. Individual land application for each plant.

Additionally, G&O will contact NCDEM regarding the general feasibility of deep well injection.

Mr. Ashton asked the group to begin considering the schedule for starting Phase 2 of the study as soon as possible after the completion of Phase 1.

The Meeting adjourned at 11:30 A.M.

CAMP LEJEUNE WASTEWATER TREATMENT MASTER PLAN

PRELIMINARY TREATMENT SCENARIOS

November 28, 1990

1 Upgrade existing Hadnot Point plant to accept all flows.

2 Construct new plant at Hadnot Point to accept all flows.

3 Pump Camp Geiger, Camp Johnson and Terawa Terrace to Jacksonville. Pump all other flows to Hadnot Point.

4 Construct Ocean Outfall from Hadnot Point for all flows.

5 Individual land application for each plant.

CAMP LEJEUNE WASTEWATER TREATMENT MASTER PLAN

TREATMENT PLANT OPTIONS

1. HADNOT POINT:

   1.1. Upgrade plant and discharge to New River.

   1.2. Construct new plant and discharge to New River.

   1.3. Upgrade plant and discharge to land application site.

   1.4. Construct new treatment facility and discharge to land application.

   (Capacity for options 1 thru 4 depends on other plant scenarios.)

* 1.5. Pump all flow to Jacksonville.

2. CAMP GEIGER:

   2.1. Pump raw sewage to Hadnot Point (via Camp Johnson).

   2.2. Pump raw sewage to new plant on west side of New River.

   2.3. Pump raw sewage to Jacksonville.

* 2.4. Land application in vicinity of existing plant.

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* 3.4. Land application in vicinity of existing plant.

4. <u>TARAWA TERRACE</u>:

4.1. Pump raw sewage to Hadnot Point.

4.2. Pump raw sewage to new plant on west side of New River (via Camp Johnson).

4.3. Pump raw sewage to Jacksonville.

* 4.4. Land application in vicinity of existing plant.

5. <u>ONSLOW BEACH</u>:

5.1. Pump raw sewage to Hadnot Point.

5.2. Pump raw sewage to Courthouse Bay.

* 5.3. Land application in vicinity of existing plant.

5.4. Pump raw sewage to (southern) land application site.

* 5.5. Relocate outfall to Atlantic Ocean.

6. <u>COURTHOUSE BAY</u>:

6.1. Pump raw sewage to Hadnot Point.

6.2. Pump raw sewage to new plant on west side of New River.

6.3. Relocate discharge to a point on New River between Grey Point and Duck Point. Upgrade plant as required, with capacity dependent on Onslow Beach and Rifle Range scenarios.

* 6.4. Land application in vicinity of existing plant.

6.5. Pump raw sewage to (southern) land application site.

* 6.6. Pump raw sewage to North Topsail Water & Sewer Authority.

* 6.7. No change.

7. RIFLE RANGE:

7.1. Pump raw sewage to Hadnot Point.

7.2. Pump raw sewage to new plant on west side of New River.

7.3. Pump raw sewage to Courthouse Bay.

* 7.4. Land application in vicinity of existing plant.

7.5. Pump raw sewage to (southern) land application site.

* 7.6. Pump raw sewage to North Topsail Water & Sewer Authority.

* 7.7. No change.

* Indicates option likely to be initially ruled out.

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MINUTES OF MEETING

DATE: January 22, 1991 TIME: 10:00 A.M.

LOCATION: MCB, Camp Lejeune
Building 1

RE: **Wastewater Treatment Study**
Land Application Sites

Attendees:		
	Al Austin	- MCB, Facilities Department
	Lt. Col. B.J. Reed	- MCB, Training & Operations
	Lt. Col. R. Pugh	- MCB, Training & Operations
	Steve Miko	- MCB, Training & Operations
	Patty Higginbottham	- MCB, Training & Operations
	Carl Baker	- MCB, Utilities
	Gary Davis	- MCB, EMD Planning Division
	Alex Wood	- MCB, Public Works Office
	Larry Brandt	- MCB, PWO Planning
	Billy Dixon	- Greenhorne & O'Mara
	Pete Currie	- Greenhorne & O'Mara

The meeting was held to review potential sites for land application of wastewater. Mr. Wood introduced the consultants. Mr. Currie indicated that the meeting was intended to be a work session to assign Lost Training Opportunity Costs to various sites that have been identified as potential application sites. The sites have been identified during investigation of the Land Application Scenario by analysis of soils mapping. Mapped areas with soils types generally acceptable for land application have been outlined by G&O and were presented for discussion.

Lt. Col. Reed noted that the Base Master Plan indicates a current shortage of 60,000 acres for the Base training mission. He referenced earlier discussions (Meeting of 11-28-90) regarding the buffer zones surrounding impact areas, pointing out that the use of these areas for land application would have minimal conflict with training.

Mr. Dixon stated that the main problem in selecting suitable areas was the water table - substantial areas of land, including portions of the buffer areas have been ruled out for land application due to wet conditions. He also noted that the total area requirement for the Base is approximately 5000 acres.

Mr. Currie stated that the study approach would be to indicate the severity of training area conflicts by assigning replacement costs to the training lands proposed for use as treatment sites. He asked for input from Base Training and Operations in setting these costs.

Lt. Col. Reed indicated his understanding of the study approach and said his office would provide a summary of the subject areas, including acreage and replacement costs.

The suitable soil areas for each of the treatment plants were discussed in turn, referencing the annotated soils maps:

Hadnot Point:

A total of approximately 2800 acres of suitable soil area will be required for the Hadnot Point plant. Approximately 3100 acres has been identified in the general vicinity.

Mr. Brandt noted that areas west of Holcomb Blvd. could not be used because of conflicts with permanent facilities that are either currently under construction or planned for future construction.

General discussion followed regarding the areas east of Holcomb Blvd. It was noted that these areas include woodpecker habitat. Mr. Davis stated that the impacts to endangered species would have to be addressed during the environmental assessment for the project. A potential conflict with an alternate landfill site was also noted.

Lt. Col. Reed will include replacement costs for maneuver areas in the vicinity of ranges F-9 through F-12 in the data his office is to prepare.

Tarawa Terrace and Camp Johnson:

No training conflicts were noted in the area. Mr. Brandt noted the need to provide buffer space adjacent to the existing housing areas. He also noted that corridors under consideration by NCDOT for the proposed Jacksonville Bypass traverse the area to the north of the existing facilities at Camp Johnson.

Based on the soils maps, it appears that very little of the total area required for either plant would be located in the immediate area. Mr. Wood stated that the golf course at Paradise Point might be available for application. He noted that there is a relatively new irrigation system in place there, consisting of wells, storage ponds, piping, and sprinklers. This alternative would involve pumping across Northeast Creek.

Camp Geiger:

Considerable conflict with training areas was noted in the area west of the New River and south of the air station. In addition to the land used for bivouac, maneuvering, and fire ranges, a large high-explosive impact zone is located in the area. Training and Operations will assign replacement costs to these areas.

The need to address archeological sites in this area, as well as other areas of the Base, during the environmental assessment was pointed out.

Mr. Wood asked if it would be possible to pump discharge from Hadnot Point under the New River to land application sites in this area. Mr. Dixon stated that it would be possible, but that the cost of the subaqueous pipeline would be a major consideration.

Rifle Range:

except for the fact that they are heavily laden with lead

No training conflicts were anticipated in the Rifle Range area. The portions of the ranges beyond the firing lines were felt to be especially well suited from a training point of view. Lt. Col. Reed and Lt. Col. Pugh noted that the developed areas, maneuver areas, and landing zones should be avoided. In consideration of the relatively small land application area requirements this was not felt to be a problem.

Courthouse Bay:

Major conflicts with prime training areas generally east of Courthouse Bay were noted. Lt. Col. Reed pointed out that this area is extensively used in the main training mission of the base. In addition to bivouac and maneuver areas, landing zones, and gun positions, there are heavy equipment training areas involving substantial earth moving operations. Endangered species habitat areas were also noted.

Onslow Beach:

The same comments made for Courthouse Bay generally apply to Onslow Beach. No suitable soils were found on the beach island; all suitable areas are inland in the training areas. It was noted that the limited area required for the Onslow Beach plant could best be taken, from a training perspective, by utilizing suitable areas near gun positions.

The following other general comments were made:

Mr. Wood noted that preliminary landfill site selections had been made by reference to soils mapping. However, specific site investigations generally found a larger extent of wet areas than indicated on the maps.

Lt. Col. Pugh noted that the land replacement to be summarized under this task will be in addition to the land acquisition requirements of the Base Master Plan.

Training and Operations will provide the land area and replacement cost summaries to G&O within a week.

The Meeting adjourned at 11:30 A.M.

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MINUTES OF MEETING

DATE: February 7, 1991 TIME: 1:30 P.M.

LOCATION: NC Division of Environmental Management
Archdale Building, Raleigh, NC

RE: **Camp Lejeune Wastewater Treatment Study**
Progress Meeting - Scenario Evaluation

Attendees:

Trevor Clements	- DEM, Raleigh
Mike Scoville	- DEM, Raleigh
Preston Howard	- DEM, Wilmington
Dave Adkins	- DEM, Wilmington
Billy Dixon	- Greenhorne & O'Mara
Pete Currie	- Greenhorne & O'Mara

The meeting was held to review the status of the preliminary evaluation of treatment scenarios and to initiate discussion of project phasing. Mr. Currie presented an overview of the five scenarios currently being considered. He pointed out that the scenarios to be recommended for further study could include combinations of the current five.

Mr. Dixon discussed the land application area requirements. He noted that the soils maps indicated insufficient suitable area in the vicinity of Hadnot Point. He asked if force main crossings of the New River to suitable sites on the west side of the base would present a problem from a regulatory point of view. Mr. Howard stated he saw no problems as long as the piping was placed so as not to interfere with marine traffic. Mr. Dixon noted that insufficient suitable area was also indicated in the vicinity of Camp Johnson and Tarawa Terrace. He noted previous discussions with Camp Lejeune officials regarding the possibility of spray-irrigation of the golf course area at Paradise Point. Mr. Howard stated that golf course irrigation would be allowable at elevated treatment levels.

Mr. Currie noted that the land areas required for treatment by land application would include lands now used by the Marine Corps Base for training. He noted that the Base is now compiling a summary of the training value of the sites proposed as suitable for land application and commented that the Base is currently 60,000 acres short of land required for its training needs. In general discussion, DEM confirmed that cost analysis of suitable land application sites, regardless of their locations, would be required to quantify the feasibility of the land application scenario.

Did we consider off base application sites?

Mr. Dixon stated that the current design approach for the land application scenario is to place aeration lagoons at the existing treatment plants and to pump to storage lagoons at the application sites. He noted that this approach will require special phasing considerations in order to maintain the facilities in operation during the transition from the existing secondary treatments plants to the land application treatment.

Mr. Howard stated that DEM could be somewhat flexible with phasing details as long as an overall project schedule was established and adhered to.

Discussion followed regarding the ocean outfall scenario. Mr. Currie noted that the ocean outfall had been considered primarily as an alternative discharge point to the New River discharge, with a new or upgraded centralized treatment plant. However, he noted, recent staff discussions at G&O had considered the possibilities of pumping effluent to an ocean outfall from the existing treatment plants. He stated that two main problems were seen with this approach: The age of the existing plants and existing operational problems were felt to indicate that upgrading of the plants would be required. Additionally, the success of this approach would depend on EPA approval of the ocean outfall - a process that could take ten years. Mr. Howard stated that, in consideration of the length of time involved and the uncertainty of an EPA approval of an ocean outfall, it appears very unlikely that DEM would approve an ocean outfall scenario without a backup alternative.

How does mr Howard Reconcile the '94 SOC deadline for Jacksonville vs the '97 SOC deadline for Camp Lejeune?

Mr. Howard added that DEM would be more likely to consider a long-term schedule for implementing an ocean outfall if it was proposed as part of a regional solution to the wastewater treatment needs of Onslow County and Jacksonville, as well as Camp Lejeune.

In general discussion about timing, DEM indicated that non-discharge permits could be anticipated to take approximately 4 to 6 months to obtain. For the Hadnot Point discharge permit, river modeling was seen to be the critical timing element. Currently, the New River model is on DEM's spring agenda.

The meeting adjourned at 2:30 pm.

Do we have any results of the New River modeling yet.

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MINUTES OF MEETING

DATE: February 28, 1991 TIME: 10:00 A.M.

LOCATION: MCB, Camp Lejeune
Building 1005

RE: **Wastewater Treatment Study**
Scenario Evaluation Review

Attendees:	Al Austin	- MCB, Facilities
	Lt. Col. C.R. Rivenbark	- MCB, Base Maintenance
	Carl Baker	- MCB, Utilities
	Mack Davis	- MCB, Utilities
	Mack Frazelle	- MCB, Utilities
	David Southerland	- MCB, Utilities
	Brynn Ashton	- MCB, EMD Planning
	Gary Davis	- MCB, EMD Planning
	Alex Wood	- MCB, Public Works
	Larry Brant	- MCB, PWO Planning
	Lt. Scott Brewer	- MCB, PWO Design
	Steve Miko	- MCB, Training
	Joe Garceau	- Greenhorne & O'Mara
	Pete Currie	- Greenhorne & O'Mara

The meeting was held to review and discuss the results of the evaluation of the five treatment scenarios selected in the meeting of November 28, 1990. Mr. Wood introduced the consultants.

Mr. Garceau presented an overview of the five scenarios, referring to the draft report submitted February 22, 1991. He noted that the most feasible treatment alternatives include combinations of the five scenarios.

G&O stated that the total discharge to Jacksonville under Scenario 3 must be limited to 3.0 MGD. In evaluating this scenario, the design discharges from the northern plants (Geiger, Johnson & Tarawa Terrace) have been proportionally reduced to meet this limitation. The evaluated discharges are all greater than the average plant discharges during the period October 1989 through July 1990; however, daily peak discharges during that period occasionally exceeded these limits. G&O stated that water conservation and discharge limiting efforts would be required if all three northern plants were to be pumped to Jacksonville. Mr. Baker estimated that inflow and infiltration account for approximately 20% of the influent in the northern plants. He also indicated that the Base is considering how best to handle additional discharges from the oil separator systems.

G&O distributed revised copies of the summaries of present worth and construction cost contained in the report, outlines of the basis of cost for each of the Hadnot Point plant options, and detailed cost background data. Mr. Currie reviewed the summary data and outlined general procedures followed in generating the cost estimates.

Mr. Garceau noted that land application appears cost effective for the southern plants (Rifle Range, Onslow Beach & Courthouse Bay). He indicated that the cost analyses include Lost Training Opportunity Costs provided by Base Training officials. He pointed out that the cost summaries include lost training cost for only the land area required for treatment rather than the entire training area affected; costs for loss of the overall training areas are reflected in the supplementary detailed data. For Hadnot Point and the northern plants, the proposed land application sites affect large training areas in the Verona Loop area. It was noted that, with the exception of Camp Geiger, land application appears not to be cost effective for these plants even without the additional cost due to the loss of the entire training area.

Col. Rivenbark asked if any of the proposed land application sites include woodpecker habitat areas. Mr. Garceau stated that environmental issues for the proposed alternatives will be determined during the next task of the study.

Mack Davis commented that the proposed land application rate of 1" per week seems high for the area. G&O stated that the rate was used for planning since it had been used in the Jacksonville site calculations; final design values will depend on geotechnical surveys of individual sites. Mr. Davis noted that the Jacksonville calculations were being revised to vary with specific site conditions and had not been approved yet. He stated that approved sites in the area generally have rates less than 1" per week.

Mr. Garceau reviewed the assumptions made regarding the ocean outfall under Scenario 4. He noted that the scenario is cost effective because the proposed treatment plant is a secondary facility. He explained that the construction cost is high due to the expense of the outfall, but present worth is low due to relatively low O&M costs.

Mr. Austin asked about NCDEM's position regarding ocean outfalls. Mr. Currie related the comments made by DEM representatives during a meeting February 7, 1991 between G&O and DEM. Mr. Preston Howard (Wilmington Regional Office) stated that, in consideration of the length of time involved and the uncertainty of an EPA approval of an ocean outfall, it appears very unlikely that DEM would approve an ocean outfall scenario without a backup alternative. Mr. Howard added that DEM would be more likely to consider a long-term schedule for implementing an ocean outfall if it was proposed as part of a regional solution to the wastewater treatment needs of Onslow County and Jacksonville, as well as Camp Lejeune.

Mr. Baker noted that an ocean outfall was discussed approximately two years ago with Onslow County and the City of Jacksonville, but was not pursued, mainly because of high costs. He also noted that Onslow County appeared unready to develop a sanitary sewer authority at that time.

That was approximately Feb of 1989
Did we ask them how they felt in 1991?

Discussion followed regarding the proposed connection to Jacksonville. Mack Davis expressed concern about proceeding with a plan to pump waste to Jacksonville prior to DEM approval of the Jacksonville site and facilities. He also expressed concern about the potential for future site problems and the lack of MCB control over any such problems. Mr. Ashton noted that it appears relatively little construction cost would be lost if Camp Lejeune were to connect to Jacksonville initially, but later switch to pumping the northern plants to Hadnot Point if site problems arise.

Mr. Baker stated that the City would like a decision from Camp Lejeune on MCB intentions to connect to Jacksonville's system prior to finalizing their plans. Mr. Garceau noted that G&O discussed the design schedule with Jacksonville in November 1990. At that time the City anticipated final design to begin in December 1990, with flexibility to accommodate Camp Lejeune's decision within the Phase 1 project schedule (A preliminary decision on three alternates in February 1991, and a selected alternate by April, 1991).

Mr. Currie noted that DEM has indicated Jacksonville is responsible for proceeding with their land application system regardless of the outcome of the bond issue. Mr. Garceau noted that the Jacksonville usage fees would probably change if the bond does not pass. Mr. Baker commented that Jacksonville has no other economic alternative to the land application system.

How about shared cost of an ocean outfall?

The construction cost and present worth estimates for the Hadnot Point plant alternatives were discussed. It was noted that the plant upgrade is costly due to the need to completely change the treatment process. Mr. Garceau noted that the upgrade may become more cost effective with smaller design flows. He also noted that the overall costs appear high due to the amount of pumping required and stated that the unit operating costs for the upgrade are higher than for the new plant.

Mr. Currie pointed out the proposed location for the new plant, indicating that it was in the general area suggested by Camp Lejeune staff in an earlier meeting. The proposed location met with general approval.

Mr. Baker expressed an interest in discussing the operational aspects of the proposed treatment process in greater detail. Mr. Garceau referred Mr. Baker to G&O's process engineer, Mr. Turgay Ertugrul (301)982-2800 Ext 348, for further discussion at Mr. Baker's convenience.

Mr. Baker asked if DEM had stated a limit for the total discharge to be allowed at the Hadnot Point location. Mr. Currie stated that DEM had indicated no specific figure, but will depend on the proposed New River model to provide the basis for setting effluent limits. DEM's schedule calls for the modeling effort to begin this spring.

The model again!

Construction phasing for the project was discussed. Mr. Garceau noted that phasing works out well if the north plants are pumped to Jacksonville and the south plants are land applied. Mr. Baker commented that land application for Onslow Beach could be accomplished early in the project, noting the need to remove the existing Onslow Beach discharge quickly.

The following other specific input was received from the floor during the meeting:

Mack Davis pointed out the need to include the cost of monitoring and testing discharges to Jacksonville in the scenario analysis.

Mr. Brant noted that increases over time in Jacksonville sewer fees should be considered. Gary Davis noted that inflation should also be considered in electric power costs.

Mr. Brant noted that there may be some land acquisition costs incurred in the pumping route proposed between Rifle Range and Courthouse Bay.

Mr. Garceau recommended that the alternates to be selected for further study include pumping the northern plants to Jacksonville, land application of the southern sites, a new Hadnot Point plant for all flows, and an upgraded Hadnot Point plant for reduced flows. He noted that this would allow analysis of a wide range of alternatives for selection of the final alternate to be studied during Phase 2.

Mr. Austin stated that the alternatives selected for additional consideration should include least cost, environmentally compatible scenarios both with and without discharges to Jacksonville.

Col. Rivenbark expressed a preference for a new plant in view of its lower present worth, the relatively slight difference in construction cost, and the superior serviceability of a new facility.

Mr. Baker stated that he would like additional time to review the cost data prior to selecting the alternates, noting the different funding sources for construction and O&M.

Additional discussion followed regarding the ocean outfall. Mr. Ashton expressed reluctance to proceed with a new, costly, advanced treatment plant if an ocean outfall for a secondary plant could be approved in an additional few years. In view of the low present worth of the ocean outfall scenario it was felt that the matter should be given additional consideration. Further clarification of the regulatory aspects of the outfall was felt to be needed prior to rejecting the scenario. G&O noted that all contact to date regarding ocean outfalls had been with NCDEM and not with EPA.

What are the issues here.

Problem seems to be State has said it will not support ocean outfall w/o a back up. Land application seems to have been ruled out

How about pump Beach. RR to N. Topsail Beach. C.G. C.J. & TT to Jacksonville. Land apply at Onslow Beach or Pump to C H Bay; Pump CH Bay to HNP. until ocean outfall is approved Then connect all flows to ocean outfall.

Mr. Baker will set up a meeting for Base officials to discuss how to pursue the issue. Mr. Wood will contact G&O regarding the decision of that meeting; he will also transmit comments collected from the review of the scenario evaluation report materials. G&O will arrange a meeting with NCDEM and EPA regarding the ocean outfall if the Base wishes to pursue the matter. Time and place for the meeting will be discussed later with Mr. Wood and Mr. Baker.

The schedule for completion of Phase 1 will be updated on selection of the three alternates for further study.

Mr. Baker will contact Jacksonville regarding the project status.

The Meeting adjourned at 12:00 noon.

Feb. 28 > 4 months into the study and the consultant has not talked to EPA about an ocean outfall?

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MINUTES OF MEETING

DATE: April 1, 1991 TIME: 2:00 P.M.

LOCATION: MCB, Camp Lejeune
Building 1005

RE: **Wastewater Treatment Study**
Discussion of Ocean Outfall & Related Issues

Attendees:		
	Al Austin	- MCB, Facilities
	Carl Baker	- MCB, Utilities
	Brynn Ashton	- MCB, EMD Planning
	Gary Davis	- MCB, EMD Planning
	Alex Wood	- MCB, Public Works
	Preston Howard	- NCDEM, Wilmington
	Dave Adkins	- NCDEM, Wilmington
	Joe Garceau	- Greenhorne & O'Mara
	Pete Currie	- Greenhorne & O'Mara
	Billy Dixon	- Greenhorne & O'Mara

The meeting was held to discuss the results of the evaluation of the five treatment scenarios, with particular attention to the regulatory aspects of the Ocean Outfall alternative. Mr. Wood distributed descriptions of the scenarios and copies of the example alternative combinations from the Scenario Evaluation report. He explained that the Marine Corps Base is now deciding which three alternatives to study further, but is wary of making a decision without additional understanding of the regulatory climate. He stated that the alternates under consideration include the ocean outfall, limited land application, a small-scale joint-venture with the City of Jacksonville, and an advanced treatment facility at Hadnot Point.

Mr. Baker noted that the ocean outfall has been shown to be the option with the lowest long term cost, but has not been given full consideration because of the length of the permit process (originally felt to be 10 years) and the perceived reluctance of EPA to permit an outfall in Region IV. He stated that recent conversations Mr. Ashton has had with EPA have been generally positive and have indicated that the application period would probably be 3 to 5 years (See Page 2). He also noted that the Base feels that future water quality considerations in the New River may further restrict discharges, making the ocean outfall more attractive.

If we have not discussed OCEAN OUT fall w/ EPA what is the source of the perceived reluctance? Now we are saying 3 to 5 yrs vice 10

Mr. Baker noted that the alternatives being considered include combinations of options. Land application has not been completely ruled out and remains an option for Rifle Range, Onslow Beach, and, possibly, Courthouse Bay. The option to pump to Jacksonville remains viable; however, the Base does not wish to pump all 3 of the northern plants. It is felt that the 3 MGD flow limit may limit growth at the Air Station. Additionally, the Base feels that a contingency plan is needed in case of problems with the Jacksonville system. Mr. Baker noted that the project represents a very large expenditure for both Camp Lejeune and the Department of Defense.

There was A 1 April deadline to come to some agreement

with the City. Did we meet it? If not how can the option to pump to Jacksonville remain viable.

Mr. Ashton stated that he has visited the EPA Region IV office, speaking with Arthur Lenton, the Federal Facilities Coordinator, and a Mr. Wise, who has reviewed a number of applications for outfalls in Florida to the Gulf of Mexico. EPA stated that no outfalls have been approved in the Gulf, but noted that the Atlantic Ocean is better suited because of depth and current patterns. Permit application for an ocean outfall involves addressing a number of issues outlined in Part 403 of the Clean Water Act. The applicant must show that water quality will not be degraded and show that the outfall is the best alternative for wastewater disposal. EPA indicated that an ocean outfall for Camp Lejeune is technically very possible. Mr. Wise indicated a personal opinion that an ocean outfall may be the best alternative in view of the amount of flow and discharge limitations in the New River. EPA indicated that the timetable for outfall approval would involve approximately 2 years for the environmental assessment, 1 year for the application and review, and 1 to 2 years of general delays. EPA stated that the establishment of interim discharge limits during the application period would be up to NCDEM.

Section 403 ?

Mr. Howard stated that he knew of no blanket objections to the ocean outfall alternative within NCDEM. He stated that since preliminary information showed the ocean outfall to be a viable alternative, DEM would encourage the Base to pursue it. He said that the outfall may be the best long term environmental option. He also cautioned that the outfall is likely to be resisted by some environmental groups, but encouraged the direct pursuit of the most cost effective environmentally viable alternative.

This is inconsistent with the position stated in the minutes of the August 1 meeting

Mr. Baker stated that the Base has had informal conversations with the City of Jacksonville regarding joint use of the outfall and stated that the Base has no objection to a regional approach for the outfall. He indicated that it might be awkward, due to lack of precedent, for the Base to accept discharge from the municipal system, but felt an agreement could be worked out. It was generally agreed that both parties would benefit from a joint venture. Mr. Baker noted that a joint venture would probably require the formation of an administrative board. It was generally felt that Onslow County would not participate in a joint venture in the foreseeable future.

Mr. Adkins stated that the outfall facilities could be constructed in increments to handle future increases in flow. It was noted that increased flow would affect diffuser length, but would be unlikely to cause drastic changes in discharge limits. Mr. Howard stated that an authorization to construct could be issued for a facility with more capacity than the permitted discharge. Based on data generated during operation of the facility, a permit for increased discharge could be requested as needed in order to accommodate future growth.

It was generally agreed that the administration of the joint outfall system would be easier if there were separate treatment systems for the Base and Jacksonville prior to discharge through the outfall.

Mr. Baker noted that there may be military objections to the outfall because of conflicts with beach training. Mr. Adkins commented that the training conflicts related to the outfall should not be as severe as conflicts from land application facilities on the Base.

Mr. Garceau stated that the cost effectiveness of the ocean outfall is dependent on economies of scale and on the assumption of secondary treatment. Mr. Ashton stated that EPA was unsure of the level of treatment that will be required. Mr. Howard stated that problems associated with existing ocean outfalls are in older primary facilities rather than in facilities with secondary treatment.

The proposed Carteret County outfall was discussed. It was noted that the proposal was not pursued primarily because of high projected cost. Mr. Howard stated that the environmental objections in Carteret County were related to the growth in development that was anticipated due to the availability of the facilities. He noted that the Base outfall would have the advantage of being a solution to proven existing environmental problems in the New River and may not be subject to the same kind of public objections as the Carteret County facility.

Mr. Dixon asked what input neighboring states would have in the permit approval process. Mr. Howard stated that there may be some overlap of state authority through the Coastal Zone Management Act. He also commented that neighboring municipalities would have the same rights to comment on the proposal as the general public. He noted that any objections must demonstrate environmental damage in order to be seriously considered.

Mr. Howard stated that there is good literature available regarding ocean outfalls, written in non-technical terms, that may be helpful in the Base's understanding of the issues. He referenced studies by the Water Resources Research Institute; NC State University, East Carolina University, and the University of North Carolina; and a study for Manteo, NC.

In response to a question from Mr. Baker regarding timing of the project, Mr. Howard noted DEM's interest in seeing a regional solution and stated that his office realizes the difficulty involved in organizing the different groups involved. He stated that NCDEM would be flexible in working out a realistic schedule for compliance with the permit requirements. He indicated that a 4 to 8 year schedule for the project would not be a problem as long as it is firmly established and results in ultimate compliance. He recommended that the Base outline and provide justification for a proposed schedule in the application for an SOC.

would NC be amenable to deferring the City of Jacksonville deadline to enable a regional solution.

Mr. Austin stated that the earliest funding for construction would be in fiscal year 1995, although design can be funded earlier. Mr. Howard noted that the anticipated permit schedule for an ocean outfall accommodates that funding schedule.

Mr. Garceau noted that the schedule needs to accommodate the existing discharges from the small plants until a new central facility can be constructed. Mr. Baker added that the main concern is the Onslow Beach discharge. Mr. Howard stated that there are differing views within DEM regarding the matter, but his opinion is that the Onslow Beach discharge can be accommodated as long as the Base continues moving toward an overall solution. He stated that there is no need to spend additional construction money for interim facilities, but noted that existing operational problems will need to be addressed.

Mr. Baker stated that the Base would need to address toxicity problems, especially if the construction schedule reaches 6 to 8 years. Mr. Howard stated that DEM has not pressed the issue of toxicity because of the continuing progress the Base has made, but noted that they may want to selectively deal with it. Mr. Adkins noted that some of the testing requirements may be lifted by the SOC if it is known that the tests will consistently fail.

Mr. Baker stated that he has told Jacksonville that the Base will decide in June, shortly after the completion of Phase 1 of the Study, if they will pursue a joint venture. He has told them the Base will either want to pump part of its flow to Jacksonville, or will pursue an ocean outfall and invite Jacksonville to participate.

what happened

Mr. Baker stated that the Jacksonville staff has been open to working with the Base in planning, but that some members of the City Council have been anxious to proceed without Base participation. He noted that the City is concerned about maintaining the schedule outlined in their SOC and does not want to incur fines due to delays caused by planning a joint venture. Mr. Garceau noted that Jacksonville cannot wait for approval of the ocean outfall to begin design of their land application system. In response to an offer of assistance from Mr. Howard, Mr. Baker stated that an indication of flexibility from DEM to Jacksonville might be helpful.

This is the key to an ocean outfall

Mr. Howard stated that he would discuss schedules with the City staff and indicated that DEM could be flexible with the City's schedule in order to encourage cooperation between the City and the Base. He noted that Jacksonville would soon be under an SOC, but stated that the order could be easily amended. He commented that DEM has everything to gain by encouraging a joint venture. He recommended that the Base pursue the outfall regardless of Jacksonville's position if it proves to be the best option.

There was general discussion regarding land application at Rifle Range and Onslow Beach. It was noted that no growth is projected for either location and that land application appears to be the most viable alternative for both at this time. Mr. Garceau noted that land application has been shown to be feasible for only the southern plants. It was noted that c o n s t r u c t i o n could begin for these facilities as soon as funding becomes available if they emerge as selected alternatives. Mr. Howard stated that a separate schedule should be established for these facilities if they are removed from the ocean outfall option.

Mr. Howard noted that an overall contingency plan must be developed in case the ocean outfall is not permitted.

Regarding the proposal to pump Base flows to the Jacksonville land application system, Mr. Howard stated that pretreatment considerations for the land application system may require some additional monitoring but would not involve a traditional pre-treatment program as required for point discharges.

what staff agency at Camp Lejeune will prepare the permit application

Mr. Howard recommended that the Base consider applying for an SOC in the near future, but commented that there would be no benefit in planning the SOC schedule prior to the completion of Phase 1 of the WWTP Study. Mr. Baker stated that a recommendation from the Base Environmental Management Department and the Facilities Department to apply for the SOC is now being considered at the Base command level. A decision is anticipated within the next few weeks. Additional discussion followed regarding the legal details of stipulated penalties and the relationship of Congressional funding to the SOC schedule.

The application for renewal of discharge permits was discussed. Mr. Ashton stated that the permit application was necessary in order to have discharge limits set, but noted that the existing plants would not be able to meet the anticipated limits. Mr. Howard indicated that permits would be issued for the required limits regardless of the capabilities of the existing plants. The SOC will be the mechanism for dealing with the plants' inabilities to meet the discharge limits.

is there now a public review process for the SOC

Mr. Howard recommended that an application be submitted for both the current permitted flow and the expanded flow (15 MGD) at Hadnot Point and for the current permitted flows at all of the other plants. He stated that the plants will remain covered by permits regardless of the status of the New River modeling effort as long as application is made 180 days or more prior to the expiration date of the existing permits. It was noted that the results of the modeling would not be available prior to the completion of Phase 1 of the WWTP study.

Have we made application?

Mr. Adkins stated that the influent parameters listed in the applications for all of the plants can be assumed to be the same as those for Hadnot Point if the type of waste can reasonably be called the same. Any substantial difference in the type of waste should be noted in the application. G&O and the Base were referred to Trevor Clements' office (DEM, Raleigh) for additional details about the testing and modeling.

Mr. Baker stated that the Study should proceed in order to facilitate a decision by June. The schedule for the SOC will be developed shortly after the recommendation is received from Phase 1 of the Study. Phase 2 of the study will further refine the selected alternative, and will begin shortly after the completion of Phase 1. Mr. Garceau stated that today's meeting and previous discussions with Base Officials indicate that the following three alternates should be studied further:

- A secondary treatment plant with ocean outfall
- A combination of pumping northern plant flows to Jacksonville, land application for the southern plants, and an upgrade of the Hadnot Point plant for the remaining flows
- A new advanced treatment plant at Hadnot Point for all flows

The Marine Corps Base will confirm the selected alternatives in a letter to G&O. G&O will update the Study schedule and proceed with Task 4.

The Meeting adjourned at 4:00 P.M.

CAMP LEJEUNE WASTEWATER TREATMENT STUDY - PHASE I

UPDATED PROJECT SCHEDULE: 4-26-91

CAMP LEJEUNE WWTP STUDY Phase I	1990		+		1991				
	OCT	NOV	DEC+	JAN	FEB	APR	MAY	JUN	JUL
Project Startup Meeting	**M**								
TASK 1 - Data Collection	>	>>							
Data Review Meeting		**M**							
TASK 2 - Alternatives Development		>>	>						
Review Meeting			**M**						
TASK 3 - Preliminary Evaluation of Scenarios			>>	>>>	>				
Review Meeting					**M**				
TASK 4 - Comparison of Phase I Scenarios						>	>>>	>>	
Review Meeting								**M**	
TASK 4 - Phase I Report								>	>
Phase I Report Presentation									**M**

LEGEND: TASK - >>>>
MEETING - M

With the exception of data collection meetings with DEM and the Town of Jacksonville, all meetings will be held at Camp Lejeune. **This schedule is contingent on the scheduling of meetings during the time periods indicated.**

CAMP LEJEUNE WASTEWATER TREATMENT STUDY - PHASE I

UPDATED PROJECT SCHEDULE: 4-26-91

Project Startup Meeting: Week of 10-29-90.

Attendance by G&O and Base Personnel to coordinate the project, review specific concerns, and confirm sources of data.

TASK 1 - DATA COLLECTION: 10-29-90 thru 11-16-90.

Informal meetings to be scheduled with DEM, Wilmington and Town of Jacksonville.

Data Review Meeting: Week of 11-19-90.

Attendance by G&O and Base Personnel to review collected data and initiate discussion of alternatives.

TASK 2 - ALTERNATIVES DEVELOPMENT: 11-19-90 thru 12-07-90.

Review Meeting: Week of 12-10-90.

Attendance by G&O and Base Personnel to review scenario matrix. Attendance by DEM and Jacksonville as required by development of scenarios.

TASK 3 - PRELIMINARY EVALUATION OF SCENARIOS: 12-10-90 thru 2-08-91

Review Meeting: Week of 2-11-91.

Attendance by G&O and Base Personnel to consider recommendations for primary alternatives. Attendance by DEM and Jacksonville as required by results of Preliminary Evaluation.

TASK 4 - COMPARISON OF PHASE I SCENARIOS: 4-25-91 thru 6-21-91

Review Meeting: Week of 6-24-91.

Attendance by G&O and Base Personnel to consider final study recommendations. Attendance by DEM and Jacksonville as required by results of detailed scenario evaluations.

TASK 4 - PHASE I REPORT PREPARATION: 6-24-91 thru 7-05-91

Phase I Report Presentation: Week of 7-08-91.

Formal Presentation of Study Findings.

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MINUTES OF MEETING

DATE:	June 27, 1991	TIME:	10:30 A.M.

LOCATION: MCB, Camp Lejeune
Building 1005

RE: **Wastewater Treatment Study**
Task 4 Review: Comparison of Phase 1 Scenarios

Attendees:		
	Al Austin	- MCB, Facilities
	Carl Baker	- MCB, Utilities
	Mac Davis	- MCB, Utilities
	Mac Frazell	- MCB, Utilities
	Gary Davis	- MCB, EMD Planning
	Alex Wood	- MCB, Public Works
	Fred Cone	- MCB, Public Works
	Larry Brant	- MCB, PWO Planning
	Joe Garceau	- Greenhorne & O'Mara
	Pete Currie	- Greenhorne & O'Mara
	Billy Dixon	- Greenhorne & O'Mara
	Steve Bondor	- Greenhorne & O'Mara

The meeting was held in general accordance with the attached agenda in order for the consultant to update interested personnel from the Marine Corps Base on the progress of the comparison of the Phase 1 Scenarios and to receive input prior to finalizing the Phase 1 Report. Mr. Wood introduced the consultants.

Greenhorne & O'Mara (G&O) presented an overview of the Task 4 Alternates, including a discussion of the proposed pumping routes, treatment plant sites, and plant layout. Economic, environmental and regulatory concerns were outlined, and details of the land application and solids handling options were presented. G&O distributed copies of construction cost and present worth summaries for the Alternates.

The Public Works Office commented that the report should contain detailed backup data for the cost summaries. It was requested that the individual components of the Scenarios be presented in a way that will facilitate the comparison of various combinations of alternates. Additionally, it was noted that implementation of all of the final alternates should be feasible.

The Marine Corps noted that the City of Jacksonville is awaiting the results of the Study before finalizing decisions regarding their wastewater program. Jacksonville is interested in the possibility of participating in the ocean outfall, and is being encouraged by NCDEM to participate.

G&O noted that the ocean outfall (Alternate 1) appears to be the best long-term alternate. Although Alternate 2 has the lowest initial cost, Alternate 1 is the most cost-effective over a 20-year life cycle, based on present worth comparisons. Additionally, long term concerns such as future river discharge limits and capacity for Base expansion are best addressed by Alternate 1.

G&O outlined the EPA requirements for an ocean outfall discharge permit application. It was noted that the application and permitting process is expected to take 3 to 5 years. It was noted that the ocean outfall alternate includes construction of a secondary treatment plant that will be upgradable to advanced treatment if the ocean discharge is not approved.

General discussion followed regarding the discharge limits used for planning. It was noted that the New River model is nearing completion by DEM. Additionally, G&O is currently preparing the applications for renewal of the existing discharge permits; however, final effluent limits will not be established until after completion of Phase 1 of the Wastewater Master Plan.

Did these occur?

It was noted that NCDEM is planning to hold public meetings later in the summer in order to gauge public reaction to various treatment options, including ocean outfall. It was noted that, although an ocean outfall may be the most environmentally desirable option for the New River, public misconceptions regarding the nature of the discharge may present an obstacle to permitting.

There was discussion regarding the disposition of existing treatment facilities. G&O noted that the recommended process for nutrient removal will require replacement of the existing trickling filter process. G&O stated that portions of the existing facilities, such as the equalization basin, are proposed to remain; however, due to the physical layout and redundant pumping at the existing Hadnot Point plant, it is felt that a new plant will perform more economically than an upgrade. It was noted that evaluation of the existing plant operation costs is difficult due to the lack of power metering at the facility.

what are they

G&O noted the advantages in maintaining the same treatment process throughout the Base, as opposed to the split options of partial land application and partial advanced treatment. The Utilities Office commented that split options would impact staffing requirements, and requested that staffing details be provided in the final report.

G&O will submit the final report to the Marine Corps Base by July 12. The report will include a ranking of the Task 4 Alternates, recommendations for additional detailed studies, and a listing of needed decisions from the Base. After a two to four week review period G&O will conduct a formal presentation of the Study findings to the Base.

The Meeting adjourned at 12:00 noon.

GREENHORNE & O'MARA, INC.

MEETING AGENDA

DATE: June 27, 1991 / 10:30 A.M.

LOCATION: Public Works Office, Building 1005
Marine Corps Base, Camp Lejeune, NC

REFERENCE: Wastewater Treatment Plant Study - Phase 1
Task 4 Review: Comparison of Phase 1 Scenarios

ATTENDEES: Interested Marine Corps Base Personnel
Greenhorne & O'Mara, Inc.

ITEMS FOR DISCUSSION:

- Overview of Phase 1 Scenarios:

  Alternate 1. New secondary WWTP with ocean outfall for all flows.
  Alternate 2. Pump selected northern plant flows to Jacksonville, Land application for the southern plants, and Upgrade existing Hadnot Point plant for remaining flows.
  Alternate 3. New advanced WWTP at Hadnot Point for all flows.

- Economic Considerations

- Environmental Considerations

- Regulatory Considerations

- Additional Comments

- Recommendation of Final Alternative

- Additional Discussion

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GREENHORNE & O'MARA, INC. 4101 LAKE BOONE TRAIL THE SUMMIT SUITE 111 RALEIGH, NC 27607 PHONE 919-782-9088 FAX 919-782-9313

MINUTES OF MEETING

DATE: August 1, 1991 TIME: 12:30 P.M.

LOCATION: MCB, Camp Lejeune
Building 1

RE: **Wastewater Treatment Study**
Phase 1 Report Work Session

Attendees:

Louis Speas	- LANTDIV
Debbie Riddle	- LANTDIV
Ed Gallaher	- LANTDIV, Civil
Al Austin	- MCB, Facilities
B.W. Elston	- MCB, AC/S Fac.
Lt. Col. Randell	- MCB, Dep. AC/S Fac.
Cdr. Mehula	- MCB, PWO 1st time
Fred Cone	- MCB, PWO 2nd time
Carl Baker	- MCB, Utilities
Mack Davis	- MCB, Utilities
Mack Frazell	- MCB, Utilities
Brynn Ashton	- MCB, EMD Planning
Gary Davis	- MCB, EMD Planning
Alex Wood	- MCB, PWO
Larry Brant	- MCB, PWO Planning
Joe Garceau	- Greenhorne & O'Mara
Pete Currie	- Greenhorne & O'Mara

The meeting was held to review and discuss the results of the Phase 1 Report recently submitted by Greenhorne & O'Mara. Various issues were discussed, including the wastewater treatment plants, the ocean outfall, construction phasing and costs, and participation by the City of Jacksonville.

Mr. Ashton noted that the study points to construction of a new wastewater treatment plant at Hadnot Point and suggested that the first decision needed will be to accept or reject that idea. Mr. Garceau explained the difference between a standard secondary facility for ocean discharge (Alternate 1), and an advanced treatment facility as proposed for the river discharge option (Alternate 3). The basic requirements are the same for each type of plant. If an advanced treatment plant is selected, the aeration basins will need to be configured differently, and secondary effluent pumps, denitrification filters, and dechlorination tanks will have to be added.

Mr. Garceau indicated that the option to upgrade the individual plants to advanced treatment was eliminated early in the study due to the advancing age of the facilities, and the anticipated high costs for construction and operation. In addition, earlier studies by other consultants for Camp Johnson and Onslow Beach showed that pumping raw sewage to Hadnot Point was more cost-effective. Mr. Speas stated that it will probably be best to eliminate the Onslow Beach plant and pump raw sewage to Hadnot Point, since the plant is so isolated. Mr. Baker noted that removal of the discharges from Rifle Range and Courthouse Bay will probably be required in the near future.

Mr. Cone expressed a concern about eliminating the existing plants. Mack Davis stated that although the Hadnot Point Plant is very old, all of the pumps are less than three years old. A suggestion was made to use the existing plants as pretreatment facilities prior to pumping to a new plant at Hadnot Point. Another option discussed involved pumping treated effluent from the existing treatment plants direct to an ocean outfall. Mr. Garceau said that these options were deleted from serious consideration early in the study, since it was believed they would not prove cost-effective. Mr. Cone asked for clarification in the report. Mr. Garceau indicated that G&O will provide additional clarification in the final issue of the report.

Late on the scene!

Mr. Speas stated that over the long term, there may continue to be problems associated with water quality concerns for a river discharge of the treated effluent from Camp Lejeune. He noted that an ocean outfall will provide the best long term solution. The ocean is the largest body of water available and should result in the most favorable effluent limits. Mr. Elston expressed doubts that an ocean outfall will be approved due to the political sensitivity of the issue and the precedent it would set for other possible discharges. It was noted that public opinion may heavily influence the NC Division of Environmental Management (NCDEM) as the permit process moves along. Mr. Garceau suggested that the Marine Corps Base consider implementing a public awareness campaign to help educate the public regarding an ocean outfall for treated effluent.

Public outreach

In additional discussion it was indicated that although the NCDEM has stated a strong desire for a regional approach to wastewater treatment, the Base does not wish to take the lead, and is considering an independent solution for their wastewater treatment requirements. Mr. Garceau stated that NCDEM may not support a Base-only solution involving an ocean outfall as strongly as they would a regional outfall. Base personnel expressed the opinion that a 15 MGD facility is large enough to warrant pursuit of an ocean outfall on its own merit. Pursuit of the ocean outfall should allow flexibility for construction phasing and will allow a relatively long SOC schedule. Mr. Ashton indicated that pursuit of the ocean outfall will be expensive and will require an environmental study to satisfy EPA

This is also late news in view of documentation in the administrative record contained within this study

There is nothing in the administrative record to support the evolution or development of this position. From the record, it appears to have had its genesis at this August 1 meeting.

requirements. Mr. Baker believes NCDEM will require the Marine Corps to begin the ocean outfall study immediately if this option is selected.

A number of options for possible construction phasing were discussed. Mr. Baker expressed concern for the ability to phase the work into stand-alone projects, especially for the wastewater treatment plant. He noted that removal of the Onslow Beach and Camp Geiger outfalls are a high priority of the NCDEM, and should be accomplished as early as possible to show a good faith effort by the Marine Corps Base.

Mr. Garceau stated that Alternate 2 provides the best immediate potential for construction phasing, but is the least favorable alternate for the Base's long term wastewater treatment needs. He suggested building a secondary plant with phased capacity initially to handle the Hadnot Point flows, with construction of the ultimate treatment capacity, and the northern and southern pump stations and force mains in later phases.

Mr. Speas proposed eliminating the Onslow Beach facility and the northern plants as the first priority. He suggested that this could be achieved by pumping treated effluent to the Hadnot Point outfall as an interim solution. He noted that this approach would indicate that the Marine Corps is taking action to address NCDEM's concerns.

More discussion of possible phasing took place; however, no decisions were made. Mr. Cone said that the timing of the projects in relation to MILCON funding requirements must be considered as well. Construction phasing should be planned to take place within the available funding. Mr. Baker noted that due to funding considerations it would be in the best interest of the NCDEM to agree to the Marine Corps' proposed schedule. He suggested construction of a new secondary plant at Hadnot Point followed by construction of the northern and southern pump stations and force mains.

Statements of probable construction costs were reviewed. Mr. Currie distributed revised copies of Appendix C to all in attendance. Ms. Riddle stated that design costs are funded separately. They are not included in MILCON funding requests and should not be reflected in the construction cost and present worth summary sheets listed in the report. Mr. Garceau said that the final copy of the report will be adjusted accordingly. Design and permit costs will be included for information, but will be excluded from construction cost and present worth value summaries.

Mr. Elston asked about the contingency amount in the cost data. Mr. Garceau stated that a high contingency cost was used due to the preliminary nature of the study. Ms. Riddle indicated that LANTDIV normally uses a 5% contingency for construction projects. Mr. Garceau said that G&O normally starts out with a high contingency in the early stages of a project, and reduces it with each successive design phase. He stated that it is too early in this project to use a lower contingency.

The current MILCON funding request for the Camp Lejeune wastewater treatment system is for $25 Million for FY94. LANTDIV suggested that it may be possible to revise the request to $30 Million, but at the expense of other Marine Corps Programs. They noted that it is important for the Base to stay on track with the MILCON funding schedule. Cost certification for the project is needed by this fall for FY94 funding. Mr. Cone asked Mr. Brant to develop realistic project costs, with input from G&O, to submit to Marine Corps Headquarters.

Mr. Baker noted that Camp Lejeune is in the sewage treatment business out of necessity. If any joint venture with Jacksonville is pursued, it will be necessary to have the capability of separate notices of violation in the event of problems, especially if Jacksonville participates in an ocean outfall line. He has already discussed the matter with NCDEM, and indicated that an agreement can be worked out if needed. Mr. Elston stated that there are serious reservations to pursuing any kind of joint venture with Jacksonville and that Base personnel are considering recommending no Jacksonville participation to the Commanding General.

The Meeting adjourned at 3:30 P.M.

What is the cause or source of the reservations? Where do they emonate from

This is not consistent with the position which has been well established in the administrative record. It appears that there has been a failure in communication at MCB Camp Lejeune which has resulted in development of a study, and related external discussions which border on comittments, based upon articulated positions which may not have reflected the position of the command. This may spell trouble when this document is scrutinized by the public and environmental interest groups.

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APPENDIX C

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WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

APPENDIX C

LIFE CYCLE COST ANALYSES

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

LIFE CYCLE COST ANALYSES

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

PUMPING FACILITIES - BASIS FOR CONCEPTUAL COST

Following is an outline of the assumptions on which the preliminary estimation of present worth values for the proposed pumping facilities are based. Specific costs were obtained from published EPA documents, consultation with construction contractors and equipment suppliers, and hypothetical costs based on typical preliminary designs.

Pump Stations:

All pump stations are assumed to be wet well / dry pit installations. Costs include pumps, piping, valves, controls, electrical connection and standby power. Odor control will be accomplished by air injection at the wet well and at other points on the force main as required.

Force Mains and Gravity Lines:

Costs are based on estimated lengths of piping required at standard unit costs for the degree of construction difficulty anticipated. All railroad crossings and all major road crossings are assumed to be bored; all stream crossings are assumed to be made with ductile iron ball and socket river crossing pipe.

Maintenance:

Pump station and odor control equipment maintenance includes monthly inspections, pump and motor rebuilds at five year intervals, and impeller replacement at 10 year intervals. Routine maintenance includes vehicle operation costs and miscellaneous supplies.

Power Costs:

Pump and odor control power requirements are estimated based on design horsepower and motor efficiencies recommended by the manufacturers. Power costs are based on rates recommended by Carolina Power & Light Company: Base monthly rate of $ 9.25 per kilowatt and variable rate of $ 0.037 per kilowatt-hour.

Jacksonville Sewer Rates:

City of Jacksonville fees are based on a fixed debt recovery charge of $ 2.03 per thousand gallons of treatment capacity and a variable charge of $ 1.57 per thousand gallons of usage. For purposes of this evaluation, both capacity and usage are assumed equal to design flow.

Life Cycle Analysis:

All estimated costs were annualized using an interest rate of 10%. Present worth values were calculated for 20 year life cycles, with an interest rate of 10%.

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

TREATMENT PLANTS - BASIS FOR CONCEPTUAL COST

Following are outlines of the assumptions on which the preliminary estimation of present worth values for the proposed Hadnot Point treatment plants are based. Specific costs were obtained from published EPA documents, consultation with construction contractors and equipment suppliers, and hypothetical costs based on typical preliminary designs.

Detailed outlines of the proposed facilities are provided for the new 15 MGD advanced treatment plant, and the upgrade and expansion of the existing plant to 10 MGD and 15 MGD advanced plants.

During Task 3, preliminary estimates of probable construction cost for the new 10 MGD advanced treatment facility were derived from the new 15 MGD plant data using a straight-line ratio of treatment capacity.

The basis of cost for the new 15 MGD secondary plant is identical to the 15 MGD advanced facility with the following components removed:

- A^2O Process Equipment
- Intermediate Pump Station
- Denitrification Filters
- Dechlorination Equipment

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

NEW 15 MGD ADVANCED WASTEWATER TREATMENT PLANT - BASIS FOR CONCEPTUAL COST

I. Preliminary Treatment

A. Influent Pump Station

1. Vertical Sewage Pumps
2. Pump Station Structure
3. Piping, Valves, & Misc.

B. Bar Screens

1. Mechanical cleaned Bar Screens (2)
2. Influent Channel - 2 channels @ 5' W and 9' depth.
3. Screening conveyor (1)
4. Screening containers (3)
5. Screening Building - 36' x 36' to house bar screens, conveyor and screening loading area
6. Grating and Railing

C. Aerated Grit Chambers

5. Two grit chambers - each at 10' W x 12' depth, and 50' L with all required equipment.
6. Air requirements - 150 cfm
7. Three grit pumps - located in the Equipment Building
8. Grit dewatering equipment.
9. Grating and Railing

II. Primary Treatment

A. Primary Clarifiers

1. Rectangular primary clarifiers (8)
   Each at 25' W x 125' L and 10' depth.
   Weir length = 130' including equipment and structure.
2. Recessed impeller type, constant speed sludge pumps (8).
3. Grating and railing.

III. Secondary Treatment

A. A^2O Process

1. Structure size - 174′ W x 225′ L and 16′ depth.
2. Mixers (12)
3. Fine bubble aeration system including piping, diffusers and supports.
4. Recycle pumps (4).
5. Blowers (5) - use 300 HP blowers to supply air to entire plant.
6. Grating & Railing.
7. License Fee.

B. Secondary Flow Distribution Box

1. Structure.
2. Grating and rails.

C. Secondary Clarifiers

1. Clarifiers (4) - Each at 115′ diameter & 12′ depth; weir length 360′.
2. Clarifier Equipment (4) including walkway and railing.
3. Return activated sludge pumps (6).

IV. Advanced Treatment

A. Intermediate Pump Station

1. Vertical mixed-flow pumps (4), set in the wet well with discharge head and pump motor set on the operating floor above the wet well.
2. Structure including building.

B. Denitrification Filters

1. Filters (10), equipment including grating, handrails, control panels, air compressors and sand.
2. Concrete structure 67′ W x 80′ L, and 23′ H.
3. Filter backwash pumps (2).
4. Filter backwash collection structure.

V. Disinfection and Post Aeration

A. Chlorination System

1. Chlorine contact tank structure, 54' W, 142' L, 9' Depth.
2. Chlorination/Chlorine storage building, 54' x 54'.
3. Chlorination equipment.
4. Treated wastewater system to provide plant water located in chlorination building, including hydropneumatic tank, treated wastewater pumps (2), air compressors, and controls.

B. Dechlorination

1. Dechlorination equipment.
2. Dechlorination structure.

C. Post Aeration

1. Post aeration structure; 26' W x 67' L, 15' depth.
2. Aeration equipment including piping, diffusers and supports.
3. Grating and handrails.

VI. Solids Handling

A. Solids Building

1. DAF Units (2) including equipment, grating and handrails each at 350 square feet.
2. Belt filter presses (4) - 2 meter presses.
3. Dewatered sludge conveyor (1).
4. Sludge truck loading area.
5. Sludge pumps (4) for sludge feed to belt filter presses.
6. Polymer system for sludge conditioning for belt filter presses (duplicated system).
7. Polymer system for DAF units (duplicated system).
8. Compressed air system for DAF units and also for belt filter presses (duplicated system).
9. Treated wastewater booster pumps for the belt filter presses.
10. Solids building to house DAF units, belt filter presses, polymer feed systems, compressor sludge pumps and controls.
11. Odor Control System for DAF Room.
12. Odor Control System for Belt Filter Press Room.

B. Aerobic Digesters

1. Aeration equipment including piping.
2. Aerobic digester structure (100' W x 80' L x 27' depth).
3. Grating and handrails.

VII. Chemical Feed System

A. Chemical Feed Building

1. Alum Feed equipment and Alum Storage.
2. Alum pumping, piping and controls.
3. Methanol feed equipment and methanol storage.
4. Methanol feed piping and pumps.
5. Caustic Soda (for pH adjustment), feed equipment and storage.
6. Caustic Soda pumping, piping and controls.
7. Chemical Feed Building.

VIII. Wastewater Collection and Pumping

A. Pump Station - collecting drains, sewers and pumping to the head of the plant.

1. Submersible pump station structure.
2. Wastewater pumps (2).
3. Pump controls.

IX. Administration Building/Plant Laboratory

1. Lab Equipment.
2. Building space for administration and lab.
3. Administration - offices, locker rooms and lunch/class room and bathrooms.

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

UPGRADE OF EXISTING HADNOT POINT PLANT TO 15 MGD ADVANCED FACILITY

BASIS FOR CONCEPTUAL COST

The existing plant is a trickling filter type plant and will require major upgrading in order to convert into an activated sludge process with Biological Nutrient Removal (BNR) capability.

I. Preliminary Treatment

A. Upgrade Existing Influent Pump Station
1. Remove Exist. Pumps, Piping, Etc.
2. Vertical Sewage Pumps
3. Piping, Valves, & Misc.

B. Existing Influent Channel/Grit Chamber

1. Modify influent channel to install a mechanically cleaned bar screen and a parallel manually operated bar screen.
2. Screening conveyor (1)
3. Screening containers (2)

C. Construct a new influent channel sized for 8.0 MGD to accommodate the flows pumped from other WWTP sites.

1. Set influent channel so that wastewater pumping is not required.
2. Aerated grit chamber sized for 8.0 MGD flow.
3. Grit pumps.
4. Grit dewatering equipment.
5. A mechanically cleaned bar screen and a parallel manually operated bar screen.
6. Screening conveyor (1)
7. Screening containers (2)
8. Grating and Railing

II. Primary Treatment

A. New primary clarifiers designed for 8.0 MGD

1. Rectangular primary clarifiers (4)
   Each at 25' W x 125' L and 10' depth
2. Recessed impeller type, constant speed sludge pumps (4).
3. Grating and railing.

B. Utilize existing primary clarifiers.

C. Utilize existing flow equalization basin.

D. Primary effluent pump station

1. Vertical mixed flow pumps (4) set in the wet well with discharge head and pump motor set on the operating floor above the wet well.
2. Structure including building.

III. Secondary Treatment

A. A^2O Process

1. Structure size - 174′ W x 225′ L and 16′ depth.
2. Mixers (12)
3. Fine bubble aeration system including piping, diffusers and supports.
4. Recycle pumps (4).
5. Blowers (5) - use 300 HP blowers to supply air to entire plant.
6. Grating & Railing.
7. License Fee.

B. Secondary Flow Distribution Box

1. Structure.
2. Grating and rails.

C. Secondary Clarifiers

1. Clarifiers (4) - Each at 115′ diameter & 12′ depth; weir length 360′.
2. Clarifier Equipment (4) including walkway and railing.
3. Return activated sludge pumps (6).

IV. Advanced Treatment

A. Denitrification Filters

1. Filters (10), equipment including grating, handrails, control panels, air compressors and sand.
2. Concrete structure 67′ W x 80′ L, and 23′ H.
3. Filter backwash pumps (2).
4. Filter backwash collection structure.

V. Disinfection and Post Aeration

A. Chlorination System

1. Chlorine contact tank structure, 54′ W, 142′ L, 9′ Depth.
2. Chlorination/Chlorine storage building, 54′ x 54′.
3. Chlorination equipment.
4. Treated wastewater system to provide plant water located in chlorination building, including hydropneumatic tank, treated wastewater pumps (2), air compressors, and controls.

B. Dechlorination

1. Dechlorination equipment.
2. Dechlorination structure.

C. Post Aeration

1. Post aeration structure; 26′ W x 67′ L, 15′ depth.
2. Aeration equipment including piping, diffusers and supports.
3. Grating and handrails.

VI. Solids Handling

A. Solids Building

1. DAF Units (2) including equipment, grating and handrails each at 350 square feet.
2. Belt filter presses (4) - 2 meter presses.
3. Dewatered sludge conveyor (1).
4. Sludge truck loading area.
5. Sludge pumps (4) for sludge feed to belt filter press.
6. Polymer system for sludge conditioning for belt filter presses (duplicated system).
7. Polymer system for DAF units (duplicated system).
8. Compressed air system for DAF units and also for belt filter presses (duplicated system).
9. Treated wastewater booster pumps for the belt filter presses.
10. Solids building to house DAF units, belt filter presses, polymer feed systems, compressor sludge pumps and controls.
11. Odor Control System for DAF Room.
12. Odor Control System for Belt Filter Press Room.

B. Aerobic Digesters

1. Convert existing anaerobic digesters to aerobic digesters.
2. Install aeration equipment including piping.
3. Convert existing secondary clarifiers to aerobic digesters for additional capacity.
4. Grating and handrails.

VII. Chemical Feed System

A. Chemical Feed Building

1. Alum Feed equipment and Alum Storage.
2. Alum pumping, piping and controls.
3. Methanol feed equipment and methanol storage.
4. Methanol feed piping and pumps.
5. Caustic Soda (for pH adjustment), feed equipment and storage.
6. Caustic Soda pumping, piping and controls.
7. Chemical Feed Building.

VIII. Wastewater Collection and Pumping

A. Pump Station - collecting drains, sewers and pumping to the head of the plant.

1. Submersible pump station structure.
2. Wastewater pumps (2).
3. Pump controls.

IX. Administration Building/Plant Laboratory

1. Lab Equipment.
2. Building space for administration and lab.
3. Administration - offices, locker rooms and lunch/class room and bathrooms.

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

UPGRADE OF EXISTING HADNOT POINT PLANT TO 10 MGD ADVANCED FACILITY

BASIS FOR CONCEPTUAL COST

The existing plant is a trickling filter type plant and will require major upgrading in order to convert into an activated sludge process with Biological Nutrient Removal (BNR) capability.

I. Preliminary Treatment

A. Upgrade Existing Influent Pump Station

1. Remove Exist. Pumps, Piping, Etc.
2. Vertical Sewage Pumps
3. Piping, Valves, & Misc.

B. Abandon Existing Influent Channel/Grit Chamber

C. Utilize existing Equalization Lagoon

1. Modify Lagoon Pump Station & piping to accommodate all flows
2. Remove existing pumps (2) & replace with larger capacity units

B. Bar Screens

3. Mechanically cleaned Bar Screens (2)
4. Influent Channel - 2 channels @ 4' W and 5' depth.
5. Screening conveyor (1)
6. Screening containers (3)
5. Screening Building - 36' x 36' to house bar screens, conveyor and screening loading area
6. Grating and Railing

D. Aerated Grit Chambers

1. Two grit chambers - each at 15' W x 7.5' depth, and 40' L with all required equipment.
2. Air requirements - 110 cfm
3. Three grit pumps
4. Grit dewatering equipment
5. Grating and Railing
6. Remove existing Grit equipment and modify structure as required

II. Primary Treatment

A. Modify existing primary clarifiers to accommodate 10.0 MGD

1. Extend rectangular primary clarifiers (8) each by 25' at the effluent end and add an effluent channel
2. Install new sludge collectors, motors, etc.
3. Modify existing primary sludge pumps
4. Grating and railing.

B. Modify existing primary effluent pump station for 10.0 MGD

1. Pumps, controls, etc.

III. Secondary Treatment

A. A^2O Process

1. Structure size - 174' W x 170' L and 16' depth.
2. Mixers
3. Fine bubble aeration system including piping, diffusers and supports.
4. Recycle pumps (4).
5. Blowers (3) - use 250 HP blowers to supply air to secondary section of plant.
6. Grating & Railing.
7. License Fee.

B. Secondary Clarifiers

1. Keep existing 76' diameter clarifiers in service
2. Install new clarifiers - (2) Each at 100' diameter & 12' depth
3. Clarifier Equipment (2) including walkway and railing.

C. Return Sludge Pump Station

1. Remove existing Return Sludge and Trickling Filter Recycle Pumps and pump station structure.
2. Install new return activated sludge pumps (4), piping, and valves

IV. Advanced Treatment

A. Secondary Effluent Pump Station

1. Remove existing distribution box & piping
2. Construct new pump station structure
3. Install new secondary effluent pumps (4), piping, and valves

B. Denitrification Filters

1. Filters (8), equipment including grating, handrails, control panels, air compressors and sand.
2. Concrete structure 67' W x 64' L, and 23' H.
3. Filter backwash pumps (2).
4. Filter backwash collection structure.

V. Disinfection and Post Aeration

A. Chlorination System

1. Chlorine contact tank structure, 40' W, 120' L, 9' Depth.
2. Chlorination/Chlorine storage building, 40' x 45'.
3. Chlorination equipment.
4. Treated wastewater system to provide plant water located in chlorination building, including hydropneumatic tank, treated wastewater pumps (2), air compressors, and controls.

B. Convert Existing Chlorination Basin

1. Dechlorination

   a. Dechlorination equipment.
   b. Dechlorination structure.
   c. Grating and Handrails

2. Post Aeration

   a. Post aeration structure;
   b. Aeration equipment including piping, diffusers and supports.
   c. Grating and handrails.

VI. Solids Handling

A. Solids Building

1. DAF Units (2) including equipment, grating and handrails each at 350 square feet.
2. Belt filter presses (3) - 2 meter presses.
3. Dewatered sludge conveyor (1).
4. Sludge truck loading area.
5. Sludge pumps (3) for sludge feed to belt filter press.
6. Polymer system for sludge conditioning for belt filter presses (duplicated system).
7. Polymer system for DAF units (duplicated system).
8. Compressed air system for DAF units and also for belt filter presses (duplicated system).
9. Treated wastewater booster pumps for the belt filter presses.

10. Solids building to house DAF units, belt filter presses, polymer feed systems, compressor sludge pumps and controls.
11. Odor Control System for DAF Room.
12. Odor Control System for Belt Filter Press Room.
13. Blowers (3) - use 250 HP blowers to supply air to primary and solids handing section of plant.

B. Aerobic Digesters

1. Convert existing anaerobic digesters to aerobic digesters.
2. Install aeration equipment including piping.

VII. Chemical Feed System

A. Chemical Feed Building

1. Alum Feed equipment and Alum Storage.
2. Alum pumping, piping and controls.
3. Methanol feed equipment and methanol storage.
4. Methanol feed piping and pumps.
5. Caustic Soda (for pH adjustment), feed equipment and storage.
6. Caustic Soda pumping, piping and controls.
7. Chemical Feed Building.

VIII. Wastewater Collection and Pumping

A. Pump Station - collecting drains, sewers and pumping to the head of the plant.

1. Submersible pump station structure.
2. Wastewater pumps (2).
3. Pump controls.

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

OCEAN OUTFALL - BASIS FOR CONCEPTUAL COST

- Richard Norman of the Hampton Roads Sanitation District was project manager during the construction of the Atlantic Treatment Plant Outfall in Virginia Beach. The pipeline is a 66" diameter concrete pipe 7920 feet long with an additional 2640 feet of diffuser. It was buried about 10 feet deep through the surf zone and 5 to 6 feet deep after the surf zone. The low bid in 1981 to construct was 12.3 million dollars. This translates to $1165 per foot in 1981 dollars.

- William Fine, Director of Engineering of the Ocean County Utilities Authority in Ocean County, New Jersey discussed the three outfalls his authority owns and operates. Mr. Fine is advocate of not burying the outfall except through the surf zone. The three outfalls he oversees are 48", 48" and 54" steel pipes. He indicated that the costs of burial are a approximately three times the cost of placing the pipe on the bottom. His experience is that maintenance costs of the outfalls where the pipe is not buried are low compared with the capital costs of burying the pipe. All three of his outfalls were constructed in the mid 1970's. He estimated that the costs in 1977 were about $300 per foot unburied and $1000 per foot buried.

- Mike Ganas of Boswell Engineering has been a resident engineer on several outfall projects and is currently head of underwater inspections for Boswell. In telephone conversation, Mr. Ganas did not advocate the placement of unburied outfalls. Regardless of the higher costs for buried pipe, he felt that it would be necessary to bury the pipe for fear of destruction of the outfall during a hurricane. This concern was enhanced by the susceptibility of the N.C. coast to hurricanes and the relatively shallow depths under consideration. He indicated that because labor is not unionized in the Camp Lejeune area construction costs could be significantly lower than in the northern states. He estimated that construction costs could be as high as $10,000,000 or about $1250 per foot.

- Using Figure 10, "Reinforced Concrete Pipe Outfall" (ENR Index = 2000) from Ocean Outfall Wastewater Disposal Feasibility and Planning, and an average ENR Index for the first six months of 1991 of 4785 a maximum cost of $2280 per foot for a 60" RCP outfall laid on gravel in a trench can be expected; a minimum cost of $900 per foot; and a most probable cost of $1500 per foot can be expected.

- An ocean outfall was proposed for Dare County, N.C. in 1982. The outfall was proposed to be 1.1 miles long and its construction cost was estimated to be 7.8 million dollars. (From Draft EIS, Carteret Co. Wastewater Treatment and Disposal) This translates to $1343 per foot.

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

LAND APPLICATION - BASIS FOR CONCEPTUAL COST

The costs for the land application wastewater treatment systems proposed were derived from costs curves published in EPA Document 430/9-75-003, entitled "COST OF LAND TREATMENT SYSTEMS", revised September 1979. The cost data cover average plant flow rates between 0.1 and 100 mgd although they are more applicable for flow rates between 0.5 and 50 mgd. The average flow at each of the Camp Lejeune plants falls within the 0.5 and 50 mgd range. It is expected that the accuracy of the cost curves would be within 15 percent of the actual costs.

The base year for the cost curves was February 1973. The costs were indexed to September 1990 using the Engineering News Record Cost Index.

The curves were derived from published data, surveys of existing land application systems, consultation with construction contractors and hypothetical costs based on typical preliminary designs. A list of assumptions follows for each unit process.

PREAPPLICATION TREATMENT

1. Capital Costs include flow channel and superstructure, bar rack, grinder(for screenings), grit chambers, grit handling equipment, and Parshall flume w/ flow recording equipment.
2. Volume of screenings assumed to be 1 - 3 cubic feet per mgd of flow and grit 2 - 5 cubic feet / mgd.

AERATION LAGOON

1. Aeration lagoon is a partial mix lagoon, 10 horsepower / millon gallons
2. 7 day detention time
3. 10 foot water depth
4. High speed surface aerators
5. Capital costs include:
   a. Excavation, embankment from native material
   b. 9 inches slope of dike
   c. 12 feet service road width
   d. Fencing, hydraulic control works
   e. Aeration and electrical equipment
   f. PVC liner
6. Electrical power cost = to $.06 per kwh after indexing

PUMPING

1. Total Head assumed to be 50 feet
2. Capital costs are related to peak flow in mgd. O & M costs are related to average flow
3. Capital costs include:
   a. Fully enclosed wet well/dry well type structure
   b. Pumping equipment with standby facilities
   c. Piping and valves within the structure
   d. Controls and electrical work
4. Labor costs include operation, preventative maintenance and minor routine repairs
5. Materials costs include repair work performed by outside contractor and replacement of parts

FORCE MAINS

1. Depth of cover = 4 to 5 feet
2. Wet soil conditions
3. All excavation in earth
4. Capital costs include
   a. Pipe and fittings
   b. Excavation
   c. Laying and jointing
   d. Select imported bedding and initial backfill
   e. Subsequent backfill of native material
   f. Testing and cleanup
5. Materials costs include periodic cleaning by contractor

STORAGE

1. Dikes formed from native excavated material
2. Inside slope of dike, 3:1; outside slope, 2:1; 12 foot wide crest of dike
3. Rectangular reservoir on level ground
4. Reservoir divided into multiple cells
5. PVC liner
6. 12 foot deep reservoir with 3 foot freeboard
7. Labor includes maintenance of dike
8. Materials costs includes bottom scraping and patching of liner by contractor after 10 years
9. Storage time assumed to be 30 days

FIELD PREPARATION

1. Moderately wooded
2. No capital return included for value of timber removed from site
3. All debris disposed of on-site

SPRAY DISTRIBUTION

1. All pipe buried
2. Lateral spacing, 100 feet
3. Sprinkler spacing, 80 feet
4. Application rate, 0.2 inches per hour
5. 16.6 gpm flow to sprinklers under 70 psi
6. Flow to laterals controlled by automatic hydraulically operated valves
7. Laterals buried 18 inches
8. Main lines buried at 36 inches
9. All pipe 4 inches in diameter and smaller is PVC
10. All larger pipe is ABC
11. Materials cost includes replacement of sprinklers and air compressors for valve controls after 10 years

ADMINISTRATIVE AND LABORATORY FACILITIES

1. Capital costs include:
   a. Administration and laboratory building
   b. Laboratory equipment
   c. Garage and shop facilities
2. Labor costs include:
   a. Laboratory analyses and reporting
   b. Collection of samples
   c. Maintenance of buildings
3. Materials costs include:
   a. Chemicals and laboratory supplies
   b. General administrative supplies

MONITORING WELLS

1. 25 foot deep wells
2. 4 inch diameter drilled wells
3. Labor costs include preventative maintenance and minor repairs by staff

SERVICE ROADS AND FENCING

1. Costs of service roads and fencing given versus field area based on typical system layouts
2. 12 foot wide service roads, with gravel surface, around perimeter of area and within larger fields
4. 4 foot high stock fence around perimeter of area
5. Material costs includes major repair after 10 years

DISINFECTION

1. Capital costs include:
   a. Chlorination facilities with flash mixing and contact basin
   b. Chlorine storage
   c. Flow measuring device
2. Maximum dosage capacity, 10 mg/l; average dose, 5 mg/l
3. Contact time = 30 minutes

LAND

1. Land area requirements based on 1 inch per week application rate and Figure 3-5, "TOTAL LAND REQUIREMENT (INCLUDES LAND FOR APPLICATION, ROADS, STORAGE AND BUILDINGS)" as published in EPA Document 625/1-77-008 entitled "PROCESS DESIGN MANUAL FOR LAND TREATMENT OF MUNICIPAL WASTEWATER"

2. Land costs of $6,500 per acre provided by the Camp Lejeune Marine Corp Air Station

3. Cost analyses for land application of flows from Hadnot Point and the northern plants (Camp Geiger, Camp Johnson, and Tarawa Terrace) include alternate calculations for training land costs associated with the loss of the total range areas affected. These calculations appear in the cost detail under the heading "ADDITIONAL LAND LOST DUE TO LAND APPLICATION". The "RATIO METHOD" assumes all plants will utilize land application, and computes the proportion of lost training land attributed to the subject facility. The "ONLY PLANT METHOD" assumes that only the subject facility utilizes land application and is solely accountable for the lost training costs. These alternate calculations are not reflected in the summaries of construction cost and present worth.

4. Land cost is excluded from the construction cost totals, but is included in the calculation of present worth.

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

LIFE CYCLE COST ANALYSIS

TASK 3

PROJECT: CAMP LEJEUNE WWTP MASTER PLAN - PHASE 1 TASK 3 - SCENARIO EVALUATION

SUMMARY OF PRESENT WORTH VALUES (PUMPING & TREATMENT COSTS DISTRIBUTED)

DATE: 08-AUG-1991

	SCENARIO	CAMP GEIGER	CAMP JOHNSON	TARAWA TERRACE	RIFLE RANGE	ONSLOW BEACH	COURTHOUSE BAY	HADNOT POINT	TOTAL
SCENARIO 1	UPGRADE HADNOT POINT FOR ALL FLOWS	$16,843,523	$9,653,068	$11,152,365	$7,843,858	$3,308,276	$5,902,978	$58,153,151	$112,857,218
SCENARIO 2	NEW PLANT AT HADNOT POINT FOR ALL FLOWS	$16,303,416	$9,315,501	$10,730,407	$7,666,636	$3,242,451	$5,700,438	$55,452,618	$108,411,466
SCENARIO 3	CG, CJ, TT TO JACKSONVILLE ALL OTHERS TO HP	$14,913,963	$6,949,406	$13,798,585	$7,598,743	$3,217,233	$5,622,847	$52,970,348	$105,071,126
SCENARIO 4	OCEAN OUTFALL FOR ALL FLOWS	$13,593,707	$7,621,933	$8,613,446	$6,777,512	$2,912,205	$4,684,297	$41,904,072	$86,107,171
SCENARIO 5	INDIVIDUAL LAND APPLICATION FOR EACH PLANT	$15,106,646	$15,894,107	$18,249,816	$5,035,723	$2,826,401	$6,420,080	$50,214,657	$113,747,430

FLOW DISTRIBUTION Plant:	Flow, MGD	All Plants at HP:	North Plants at TT:	TT and CJ at Camp Johnson:	South Plants at CHB:	Hadnot Point w/out North:
Hadnot Point	8.000	60.7%	-	-	-	85.8%
Camp Geiger	1.600	12.1%	41.6%	-	-	-
Camp Johnson	1.000	7.6%	26.0%	35.3%	-	-
Tarawa Terrace	1.250	9.5%	32.5%	64.7%	-	-
Rifle Range	0.525	4.0%	-	-	39.8%	5.6%
Onslow Beach	0.195	1.5%	-	-	14.8%	2.1%
Courthouse Bay	0.600	4.6%	-	-	45.5%	6.4%
TOTAL	13.170	100.0%	100.0%	100.0%	100.0%	100.0%

PROJECT: CAMP LEJEUNE WWTP MASTER PLAN - PHASE 1 TASK 3 - SCENARIO EVALUATION

SUMMARY OF PRESENT WORTH VALUES

DATE: 08-AUG-1991

	SCENARIO	CAMP GEIGER	CAMP JOHNSON	TARAWA TERRACE	RIFLE RANGE	ONSLOW BEACH	COURTHOUSE BAY	HADNOT POINT	TOTAL
SCENARIO 1	UPGRADE HADNOT POINT FOR ALL FLOWS	$2,568,495	$731,175	$6,363,081	$2,678,753	$1,389,808	$3,391,281	$95,734,625	$112,857,218
SCENARIO 2	NEW PLANT AT HADNOT POINT FOR ALL FLOWS	$2,568,495	$731,175	$6,363,081	$2,678,753	$1,389,808	$3,391,281	$91,288,873	$108,411,466
SCENARIO 3	CG, CJ, TT TO JACKSONVILLE ALL OTHERS TO HP	$14,913,963	$7,709,183	$13,038,809	$2,678,753	$1,389,808	$3,630,155	$61,710,455	$105,071,126
SCENARIO 4	OCEAN OUTFALL FOR ALL FLOWS	$2,568,495	$731,175	$6,363,081	$2,678,753	$1,389,808	$3,391,281	$68,984,578 (See * Below)	$86,107,171
SCENARIO 5	INDIVIDUAL LAND APPLICATION FOR EACH PLANT	$15,106,646	$15,894,107	$18,249,816	$5,035,723	$2,826,401	$6,420,080	$50,214,657	$113,747,430

* HADNOT POINT - SCENARIO 4

NEW SECONDARY PLANT	$41,758,543
EFF. TO ONSLOW BEACH	$7,970,396
EFF. TO OCEAN OUTFALL	$19,255,638
TOTAL	$68,984,578

PROJECT: CAMP LEJEUNE WWTP MASTER PLAN - PHASE 1 TASK 3 - SCENARIO EVALUATION

SUMMARY OF CONSTRUCTION COSTS (PUMPING COSTS DISTRIBUTED)

DATE: 08-AUG-1991

	SCENARIO	CAMP GEIGER	CAMP JOHNSON	TARAWA TERRACE	RIFLE RANGE	ONSLOW BEACH	COURTHOUSE BAY	HADNOT POINT	TOTAL
SCENARIO 1	UPGRADE HADNOT POINT FOR ALL FLOWS	$4,600,228	$2,070,708	$1,846,334	$3,401,495	$1,565,960	$1,277,045	$38,459,625	$53,221,395
SCENARIO 2	NEW PLANT AT HADNOT POINT FOR ALL FLOWS	$4,600,228	$2,070,708	$1,846,334	$3,401,495	$1,565,960	$1,277,045	$41,484,525	$56,246,295
SCENARIO 3	CG, CJ, TT TO JACKSONVILLE ALL OTHERS TO HP	$309,000	$295,115	$1,134,685	$3,473,682	$1,592,772	$1,359,545	$27,656,200	$35,821,000
SCENARIO 4	OCEAN OUTFALL FOR ALL FLOWS	$4,600,228	$2,070,708	$1,846,334	$3,401,495	$1,565,960	$1,277,045	$48,185,525	$62,947,295
SCENARIO 5	INDIVIDUAL LAND APPLICATION FOR EACH PLANT	$7,105,104	$6,901,680	$8,014,900	$2,408,706	$1,396,753	$2,975,960	$23,169,947	$51,973,050

FLOW DISTRIBUTION Plant:	Flow, MGD	All Plants at HP:	North Plants at TT:	TT and CJ at Camp Johnson:	South Plants at CHB:	Hadnot Point w/out North:
Hadnot Point	8.000	60.7%	-	-	-	85.8%
Camp Geiger	1.600	12.1%	41.6%	-	-	-
Camp Johnson	1.000	7.6%	26.0%	35.3%	-	-
Tarawa Terrace	1.250	9.5%	32.5%	64.7%	-	-
Rifle Range	0.525	4.0%	-	-	39.8%	5.6%
Onslow Beach	0.195	1.5%	-	-	14.8%	2.1%
Courthouse Bay	0.600	4.6%	-	-	45.5%	6.4%
TOTAL	13.170	100.0%	100.0%	100.0%	100.0%	100.0%

PROJECT: CAMP LEJEUNE WWTP MASTER PLAN - PHASE 1 TASK 3 - SCENARIO EVALUATION

SUMMARY OF CONSTRUCTION COSTS (STATEMENT OF PROBABLE CONSTRUCTION COST)

DATE: 08-AUG-1991

	SCENARIO	CAMP GEIGER	CAMP JOHNSON	TARAWA TERRACE	RIFLE RANGE	ONSLOW BEACH	COURTHOUSE BAY	HADNOT POINT	TOTAL
SCENARIO 1	UPGRADE HADNOT POINT FOR ALL FLOWS	$2,236,920	$593,640	$5,686,710	$2,284,080	$1,150,920	$2,809,500	$38,459,625	$53,221,395
SCENARIO 2	NEW PLANT AT HADNOT POINT FOR ALL FLOWS	$2,236,920	$593,640	$5,686,710	$2,284,080	$1,150,920	$2,809,500	$41,484,525	$56,246,295
SCENARIO 3	CG, CJ, TT TO JACKSONVILLE ALL OTHERS TO HP	$309,000	$836,160	$593,640	$2,284,080	$1,150,920	$2,991,000	$27,656,200	$35,821,000
SCENARIO 4	OCEAN OUTFALL FOR ALL FLOWS	$2,236,920	$593,640	$5,686,710	$2,284,080	$1,150,920	$2,809,500	$48,185,525 (See * Below)	$62,947,295
SCENARIO 5	INDIVIDUAL LAND APPLICATION FOR EACH PLANT	$7,105,104	$6,901,680	$8,014,900	$2,408,706	$1,396,753	$2,975,960	$23,169,947	$51,973,050

* HADNOT POINT - SCENARIO 4

NEW SECONDARY PLANT	$22,603,025
EFF. TO ONSLOW BEACH	$6,469,500
EFF. TO OCEAN OUTFALL	$19,113,000
TOTAL	$48,185,525

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

Task 3 Cost Analysis

Treatment Plants

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 1 - UPGRADE EXISTING WWTP TO 15 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT		LS		640,000.00
PRIMARY TREATMENT		LS		1,411,000.00
SECONDARY TREATMENT		LS		5,632,500.00
ADVANCED TREATMENT		LS		3,178,500.00
DISINFECTION AND POST AERATION		LS		1,307,625.00
SOLIDS HANDLING		LS		2,872,000.00
CHEMICAL FEED SYSTEM		LS		365,000.00
WASTEWATER COLLECTION AND PUMPING		LS		61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY		LS		825,000.00
SITE WORK		LS		6,726,000.00
EQUIPMENT BUILDING		LS		1,635,000.00
Subtotal - Bare Construction Cost				24,653,625.00
Contractors Overhead & Profit	(	30%)		7,396,100.00
Contingencies	(	20%)		6,409,900.00
TOTAL CONSTRUCTION COST				$38,459,625.00
Engineering	(	15%)		5,768,900.00
Permits				50,000.00
TOTAL PROJECT COST				44,278,525.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 1 - UPGRADE EXISTING WWTP TO 15 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of WWTP Construction				$4,517,453.12
WWTP O&M COST				
Net Annual Operating Expenses per adjusted EPA curve				$5,850,000.00
Adjustment Factor For Age of Facility				1.15
Total WWTP Annual Maintenance				$6,727,500.00
SUMMARY OF ANNUAL COSTS				
WWTP Construction				4,517,453.12
WWTP O&M Cost				6,727,500.00
Total Annual Cost				$11,244,953.12
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - UPGRADE EXISTING WWTP TO 15 MGD (ADVANCED) (Excluding Engineering and Permit Costs)				$95,734,624.92

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 1 - UPGRADE EXISTING WWTP TO 15 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT				
UPGRADE EXISTING INFLUENT PUMP STATION				
Remove Exist. Pumps, Piping, Etc.		LS		40,000.00
Vertical Sewage Pumps	4	EA	30,000	120,000.00
Piping, Valves, & Misc.		LS		30,000.00
Subtotal - Influent Pump Station				190,000.00
EXISTING INF. CHANNEL/GRIT CHAMBER				
Modify Influent Channel		LS		20,000.00
Screenings Conveyor	1	EA	25,000	25,000.00
Screenings Containers	2	EA	2,000	4,000.00
Mechanical Bar Screens	1	EA	120,000	120,000.00
Electrical Controls		LS		10,000.00
Subtotal - Exist. Influent Channel				179,000.00
AERATED GRIT CHAMBERS				
Aerated Grit Chamber Struct.		LS		27,000.00
Grit Chamber Equipment	1	EA	65,000	65,000.00
Grit Pumps	2	EA	7,500	15,000.00
Screenings Conveyor	1	EA	25,000	25,000.00
Screenings Containers	2	EA	2,000	4,000.00
Mechanical Bar Screens	1	EA	120,000	120,000.00
Electrical Controls		LS		10,000.00
Grates and Handrails		LS		5,000.00
Subtotal - Grit Chambers				271,000.00
PRIMARY TREATMENT				
PRIMARY CLARIFIERS				
Clarifier Structure	1,400	CY	450	630,000.00
Rectangular Clarifier Eqpt.	4	EA	100,000	400,000.00
Primary Sludge Pumps	4	EA	10,000	40,000.00
Grates and Handrails		LS		50,000.00
Sluice Gates	4	EA	9,000	36,000.00
Electrical		LS		15,000.00
Subtotal - Primary Clarifiers				1,171,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 1 - UPGRADE EXISTING WWTP TO 15 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PRIMARY EFFLUENT PUMP STATION				
Pumps	4	EA	25,000	100,000.00
P.S. Structure/Building		LS		120,000.00
Piping, Valves, & Misc.		LS		20,000.00
Subtotal - Primary Eff. P.S.				240,000.00
SECONDARY TREATMENT				
a2o PROCESS				
Structure (174' x 225' x 16')	3,800	CY	450	1,710,000.00
Miscellaneous Equipment, incl:		LS		1,950,000.00
Mixers	12	EA		
Fine Bubble Aeration System				
Recycle Pumps	4	EA		
Blowers (300 HP)	5	EA		
Grates and Handrails				
Licensing Fee				
Misc. Mechanical Items				
Subtotal - a2o Process				3,660,000.00
SECONDARY DISTRIBUTION BOX				
Structure		LS		35,000.00
Grates and Handrails		LS		7,500.00
Subtotal - Distribution Box				42,500.00
SECONDARY CLARIFIERS				
Clarifier Structure (115' Dia.)	4	EA	290,000	1,160,000.00
Circular Clarifier Equipment	4	EA	170,000	680,000.00
Return Sludge Pumps & Controls	6	EA	15,000	90,000.00
Subtotal - Secondary Clarifiers				1,930,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 1 - UPGRADE EXISTING WWTP TO 15 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ADVANCED TREATMENT				
DENITRIFICATION FILTERS				
Filter Assemblies		LS		2,750,000.00
Filter Struct. (67' x 80' x 23')	900	CY	450	405,000.00
Filter Backwash Pumps	2	EA	8,000	16,000.00
Filter Backwash Collection System		LS		7,500.00
Subtotal - Denitrification Filters				3,178,500.00
DISINFECTION AND POST AERATION				
CHLORINATION SYSTEM				
Chamber Struct. (54' x 142' x 9')	700	CY	450	315,000.00
CL2 Building (54' x 54')		LS		160,000.00
Chlorination Equipment		LS		195,000.00
Treated Wastewater System		LS		60,000.00
Non-Reinforced Conc. Wall	275	EA	275	75,625.00
Mechanical		LS		30,000.00
Electrical		LS		45,000.00
Subtotal - Disinfection and Post Aeration				880,625.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 1 - UPGRADE EXISTING WWTP TO 15 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
DECHLORINATION				
Dechlorination Equipment		LS		170,000.00
Dechlorination Structure		LS		30,000.00
Misc. Mechanical Items		LS		20,000.00
Gates				
Valves				
Piping				
Etc.				
Subtotal - Dechlorination				220,000.00
POST AERATION				
Structure (26' x 67' x 15')	260	CY	450	117,000.00
Aeration Equipment		LS		60,000.00
Grates and Handrails		LS		10,000.00
Misc. Mechanical Items		LS		20,000.00
Subtotal - Post Aeration				207,000.00
SOLIDS HANDLING				
SOLIDS HANDLING BUILDING				
DAF Units	2	EA	275,000	550,000.00
Belt Filter Presses (2 meter)	4	EA	200,000	800,000.00
Dewatering Sludge Conveyor	1	EA	30,000	30,000.00
Sludge Truck Loading Area		LS		50,000.00
Sludge Pumps	4	EA	25,000	100,000.00
Duplex Sludge Polymer System		LS		50,000.00
Duplex DAF Polymer System		LS		50,000.00
Duplex Compressed Air System		LS		30,000.00
Treated Wastewater Booster Pumps		LS		20,000.00
Solids Handling Bldg. Structure		LS		500,000.00
DAF Odor Control System		LS		100,000.00
Belt Filter Press Odor Control System		LS		100,000.00
Interior Piping		LS		30,000.00
Electrical/Mechanical		LS		250,000.00
Subtotal - Solids Handling				2,660,000.00
AEROBIC DIGESTERS				
Convert Ex. Anaerobic to Aerobic		LS		42,000.00
Aeration System		LS		100,000.00
Convert Ex. Secondary to Aerobic		LS		20,000.00
Grates and Handrails		LS		25,000.00
Misc. Mechanical Items		LS		25,000.00
Subtotal - Aerobic Digesters				212,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 1 - UPGRADE EXISTING WWTP TO 15 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CHEMICAL FEED SYSTEM				
CHEMICAL FEED BUILDING				
Alum Feed/Storage Equipment		LS		35,000.00
Alum Pumping System		LS		25,000.00
Methanol/Feed Storage Equipment		LS		40,000.00
Methanol Pumping System		LS		25,000.00
Caustic Soda/Feed Storage Equipment		LS		30,000.00
Caustic Soda Pumping System		LS		25,000.00
Chemical Feed Building		LS		150,000.00
Electrical/Mechanical		LS		35,000.00
Subtotal - Chemical Feed Building				365,000.00
WASTEWATER COLLECTION AND PUMPING				
PUMP STATION				
Submersible P.S. Structure		LS		30,000.00
Submersible Pumps	2	EA	8,000	16,000.00
Pump Controls		LS		5,000.00
Miscellaneous Items		LS		10,000.00
Subtotal - Wastewater Collection				61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY				
Lab Equipment		LS		300,000.00
Building Structure		LS		450,000.00
Offices & Miscellaneous Items		LS		75,000.00
Subtotal - Admin. Bldg/Lab				825,000.00
SITE WORK				
Yard Piping		LS		1,200,000.00
Connection to Exist. Outfall	1	EA	1,000	1,000.00
36" DIP Stream Crossing	5,500	LF	750	4,125,000.00
Misc. Site Work		LS		1,400,000.00
Subtotal - Site Work				6,726,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 1 - UPGRADE EXISTING WWTP TO 15 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
EQUIPMENT BUILDING				
Emergency Generators	3	EA	200,000	600,000.00
Equipment Building Structure		LS		375,000.00
Mechanical		LS		40,000.00
Electrical/Control Center		LS		250,000.00
Automatic Transfer Switch	1	EA	20,000	20,000.00
Motor Control Center	1	EA	100,000	100,000.00
Generator System Switchgear	1	EA	250,000	250,000.00
Subtotal - Equipment Building				1,635,000.00
Subtotal - Bare Construction Cost				24,653,625.00
Contractors Overhead & Profit		(30%)		7,396,100.00
Contingencies		(20%)		6,409,900.00
TOTAL CONSTRUCTION COST				$38,459,625.00
Engineering		(15%)		5,768,900.00
Permits				50,000.00
TOTAL PROJECT COST				44,278,525.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

ITEM	SCENARIO 2 - NEW 15 MGD WWTP (ADVANCED) QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT		LS		908,500.00
PRIMARY TREATMENT		LS		2,342,000.00
SECONDARY TREATMENT		LS		5,632,500.00
ADVANCED TREATMENT		LS		3,418,500.00
DISINFECTION AND POST AERATION		LS		1,307,625.00
SOLIDS HANDLING		LS		3,222,500.00
CHEMICAL FEED SYSTEM		LS		365,000.00
WASTEWATER COLLECTION AND PUMPING		LS		61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY		LS		825,000.00
SITE WORK		LS		6,875,000.00
EQUIPMENT BUILDING		LS		1,635,000.00
Subtotal - Bare Construction Cost				26,592,625.00
Contractors Overhead & Profit	(	30%)		7,977,800.00
Contingencies	(	20%)		6,914,100.00
TOTAL CONSTRUCTION COST				$41,484,525.00
Engineering	(	15%)		6,222,700.00
Permits				50,000.00
TOTAL PROJECT COST				47,757,225.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 2 - NEW 15 MGD WWTP (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of WWTP Construction				$4,872,756.74
WWTP O&M COST				
Net Annual Operating Expenses per adjusted EPA curve				$5,850,000.00
Adjustment Factor For Age of Facility				1.00
Total WWTP Annual Maintenance				$5,850,000.00
SUMMARY OF ANNUAL COSTS				
WWTP Construction				4,872,756.74
WWTP O&M Cost				5,850,000.00
Total Annual Cost				$10,722,756.74
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - NEW 15 MGD WWTP (ADVANCED) (Excluding Engineering and Permit Costs)				$91,288,872.76

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 2 - NEW 15 MGD WWTP (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT				
INFLUENT PUMP STATION				
Vertical Sewage Pumps	4	EA	30,000	120,000.00
Pump Station Structure		LS		125,000.00
Piping, Valves, & Misc.		LS		30,000.00
Subtotal - Influent Pump Station				275,000.00
BAR SCREENS				
Mechanical Bar Screens	2	EA	120,000	240,000.00
Influent Channel Structure		LS		10,000.00
Screenings Conveyor	1	EA	25,000	25,000.00
Screenings Containers	3	EA	2,000	6,000.00
Screenings Bldg. (36' x 36')		LS		55,000.00
Electrical/Mechanical		LS		25,000.00
Subtotal - Bar Screens				361,000.00
AERATED GRIT CHAMBERS				
Chamber Struct. (50' x 10' x 12')	2	EA	27,000	54,000.00
Grit Chamber Equipment	2	EA	65,000	130,000.00
Grit Pumps	3	EA	7,500	22,500.00
Slide Gate	2	EA	8,000	16,000.00
Grates and Handrails		LS		10,000.00
Sluice Gates	2	EA	10,000	20,000.00
Electrical Controls		LS		20,000.00
Subtotal - Grit Chambers				272,500.00
PRIMARY TREATMENT				
PRIMARY CLARIFIERS				
Clarifier Structure	2,800	CY	450	1,260,000.00
Rectangular Clarifier Eqpt.	8	EA	100,000	800,000.00
Primary Sludge Pumps	8	EA	10,000	80,000.00
Grates and Handrails		LS		100,000.00
Sluice Gates	8	EA	9,000	72,000.00
Electrical		LS		30,000.00
Subtotal - Primary Clarifiers				2,342,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 2 - NEW 15 MGD WWTP (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SECONDARY TREATMENT				
a2o PROCESS				
Structure (174' x 225' x 16')	3,800	CY	450	1,710,000.00
Miscellaneous Equipment, incl:		LS		1,950,000.00
Mixers	12	EA		
Fine Bubble Aeration System				
Recycle Pumps	4	EA		
Blowers (300 HP)	5	EA		
Grates and Handrails				
Licensing Fee				
Misc. Mechanical Items				
Subtotal - a2o Process				3,660,000.00
SECONDARY DISTRIBUTION BOX				
Structure		LS		35,000.00
Grates and Handrails		LS		7,500.00
Subtotal - Distribution Box				42,500.00
SECONDARY CLARIFIERS				
Clarifier Structure (115' Dia.)	4	EA	290,000	1,160,000.00
Circular Clarifier Equipment	4	EA	170,000	680,000.00
Return Sludge Pumps & Controls	6	EA	15,000	90,000.00
Subtotal - Secondary Clarifiers				1,930,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 2 - NEW 15 MGD WWTP (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ADVANCED TREATMENT				
INTERMEDIATE PUMP STATION				
Vertical Mixed Flow Pumps	4	EA	25,000	100,000.00
Pump Station Structure		LS		120,000.00
Piping, Valves, & Misc.		LS		20,000.00
Subtotal - Intermediate Pump Station				240,000.00
DENITRIFICATION FILTERS				
Filter Assemblies		LS		2,750,000.00
Filter Struct. (67' x 80' x 23')	900	CY	450	405,000.00
Filter Backwash Pumps	2	EA	8,000	16,000.00
Filter Backwash Collection System		LS		7,500.00
Subtotal - Denitrification Filters				3,178,500.00
DISINFECTION AND POST AERATION				
CHLORINATION SYSTEM				
Chamber Struct. (54' x 142' x 9')	700	CY	450	315,000.00
CL2 Building (54' x 54')		LS		160,000.00
Chlorination Equipment		LS		195,000.00
Treated Wastewater System		LS		60,000.00
Non-Reinforced Conc. Wall	275	EA	275	75,625.00
Mechanical		LS		30,000.00
Electrical		LS		45,000.00
Subtotal - Disinfection and Post Aeration				880,625.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 2 - NEW 15 MGD WWTP (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
DECHLORINATION				
Dechlorination Equipment		LS		170,000.00
Dechlorination Structure		LS		30,000.00
Misc. Mechanical Items		LS		20,000.00
Gates				
Valves				
Piping				
Etc.				
Subtotal - Dechlorination				220,000.00
POST AERATION				
Structure (26' x 67' x 15')	260	CY	450	117,000.00
Aeration Equipment		LS		60,000.00
Grates and Handrails		LS		10,000.00
Misc. Mechanical Items		LS		20,000.00
Subtotal - Post Aeration				207,000.00
SOLIDS HANDLING				
SOLIDS HANDLING BUILDING				
DAF Units	2	EA	275,000	550,000.00
Belt Filter Presses (2 meter)	4	EA	200,000	800,000.00
Dewatering Sludge Conveyor	1	EA	30,000	30,000.00
Sludge Truck Loading Area		LS		50,000.00
Sludge Pumps	4	EA	25,000	100,000.00
Duplex Sludge Polymer System		LS		50,000.00
Duplex DAF Polymer System		LS		50,000.00
Duplex Compressed Air System		LS		30,000.00
Treated Wastewater Booster Pumps		LS		20,000.00
Solids Handling Bldg. Structure		LS		500,000.00
DAF Odor Control System		LS		100,000.00
Belt Filter Press Odor Control System		LS		100,000.00
Interior Piping		LS		30,000.00
Electrical/Mechanical		LS		250,000.00
Subtotal - Solids Handling				2,660,000.00
AEROBIC DIGESTERS				
Structure (100' x 80' x 27')	950	CY	450	427,500.00
Aeration System		LS		80,000.00
Grates and Handrails		LS		30,000.00
Misc. Mechanical Items		LS		25,000.00
Subtotal - Aerobic Digesters				562,500.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 2 - NEW 15 MGD WWTP (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CHEMICAL FEED SYSTEM				
CHEMICAL FEED BUILDING				
Alum Feed/Storage Equipment		LS		35,000.00
Alum Pumping System		LS		25,000.00
Methanol/Feed Storage Equipment		LS		40,000.00
Methanol Pumping System		LS		25,000.00
Caustic Soda/Feed Storage Equipment		LS		30,000.00
Caustic Soda Pumping System		LS		25,000.00
Chemical Feed Building		LS		150,000.00
Electrical/Mechanical		LS		35,000.00
Subtotal - Chemical Feed Building				365,000.00
WASTEWATER COLLECTION AND PUMPING				
PUMP STATION				
Submersible P.S. Structure		LS		30,000.00
Submersible Pumps	2	EA	8,000	16,000.00
Pump Controls		LS		5,000.00
Miscellaneous Items		LS		10,000.00
Subtotal - Wastewater Collection				61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY				
Lab Equipment		LS		300,000.00
Building Structure		LS		450,000.00
Offices & Miscellaneous Items		LS		75,000.00
Subtotal - Admin. Bldg/Lab				825,000.00
SITE WORK				
Yard Piping		LS		1,200,000.00
36" DIP Outfall	1,000	EA	150	150,000.00
36" DIP Stream Crossing	5,500	LF	750	4,125,000.00
Misc. Site Work		LS		1,400,000.00
Subtotal - Site Work				6,875,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 2 - NEW 15 MGD WWTP (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
EQUIPMENT BUILDING				
Emergency Generators	3	EA	200,000	600,000.00
Equipment Building Structure		LS		375,000.00
Mechanical		LS		40,000.00
Electrical/Control Center		LS		250,000.00
Automatic Transfer Switch	1	EA	20,000	20,000.00
Motor Control Center	1	EA	100,000	100,000.00
Generator System Switchgear	1	EA	250,000	250,000.00
Subtotal - Equipment Building				1,635,000.00
Subtotal - Bare Construction Cost				26,592,625.00
Contractors Overhead & Profit		(30%)		7,977,800.00
Contingencies		(20%)		6,914,100.00
TOTAL CONSTRUCTION COST				$41,484,525.00
Engineering		(15%)		6,222,700.00
Permits				50,000.00
TOTAL PROJECT COST				47,757,225.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 3 - NEW 10 MGD WWTP (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT		LS		605,700.00
PRIMARY TREATMENT		LS		1,561,300.00
SECONDARY TREATMENT		LS		3,755,000.00
ADVANCED TREATMENT		LS		2,279,000.00
DISINFECTION AND POST AERATION		LS		871,700.00
SOLIDS HANDLING		LS		2,148,300.00
CHEMICAL FEED SYSTEM		LS		243,300.00
WASTEWATER COLLECTION AND PUMPING		LS		40,700.00
ADMINISTRATIVE BLDG./PLANT LABORATORY		LS		550,000.00
SITE WORK		LS		4,583,300.00
EQUIPMENT BUILDING		LS		1,090,000.00
Subtotal - Bare Construction Cost				17,728,300.00
Contractors Overhead & Profit	(	30%)		5,318,500.00
Contingencies	(	20%)		4,609,400.00
TOTAL CONSTRUCTION COST				$27,656,200.00
Engineering	(	15%)		4,148,400.00
Permits				50,000.00
TOTAL PROJECT COST				31,854,600.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 3 - NEW 10 MGD WWTP (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of WWTP Construction				$3,248,486.87
WWTP O&M COST				
Net Annual Operating Expenses per adjusted EPA curve				$4,000,000.00
Adjustment Factor For Age of Facility				1.00
Total WWTP Annual Maintenance				$4,000,000.00
SUMMARY OF ANNUAL COSTS				
WWTP Construction				3,248,486.87
WWTP O&M Cost				4,000,000.00
Total Annual Cost				$7,248,486.87
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - NEW 10 MGD WWTP (ADVANCED) (Excluding Engineering and Permit Costs)				$61,710,454.88

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 4 - NEW 15 MGD WWTP (SECONDARY)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT		LS		908,500.00
PRIMARY TREATMENT		LS		2,342,000.00
SECONDARY TREATMENT		LS		1,972,500.00
ADVANCED TREATMENT		LS		0.00
DISINFECTION AND POST AERATION		LS		1,307,625.00
SOLIDS HANDLING		LS		3,222,500.00
CHEMICAL FEED SYSTEM		LS		365,000.00
WASTEWATER COLLECTION AND PUMPING		LS		61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY		LS		725,000.00
SITE WORK		LS		1,950,000.00
EQUIPMENT BUILDING		LS		1,635,000.00
Subtotal - Bare Construction Cost				14,489,125.00
Contractors Overhead & Profit	(	30%)		4,346,700.00
Contingencies	(	20%)		3,767,200.00
TOTAL CONSTRUCTION COST				$22,603,025.00
Engineering	(	15%)		3,390,500.00
Permits				400,000.00
TOTAL PROJECT COST				26,393,525.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 4 - NEW 15 MGD WWTP (SECONDARY)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of WWTP Construction				$2,654,942.84
WWTP O&M COST				
Net Annual Operating Expenses per adjusted EPA curve				$2,250,000.00
Adjustment Factor For Age of Facility				1.00
Total WWTP Annual Maintenance				$2,250,000.00
SUMMARY OF ANNUAL COSTS				
WWTP Construction				2,654,942.84
WWTP O&M Cost				2,250,000.00
Total Annual Cost				$4,904,942.84
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - NEW 15 MGD WWTP (SECONDARY) (Excluding Engineering and Permit Costs)				$41,758,543.37

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 4 - NEW 15 MGD WWTP (SECONDARY)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT				
INFLUENT PUMP STATION				
Vertical Sewage Pumps	4	EA	30,000	120,000.00
Pump Station Structure		LS		125,000.00
Piping, Valves, & Misc.		LS		30,000.00
Subtotal - Influent Pump Station				275,000.00
BAR SCREENS				
Mechanical Bar Screens	2	EA	120,000	240,000.00
Influent Channel Structure		LS		10,000.00
Screenings Conveyor	1	EA	25,000	25,000.00
Screenings Containers	3	EA	2,000	6,000.00
Screenings Bldg. (36' x 36')		LS		55,000.00
Electrical/Mechanical		LS		25,000.00
Subtotal - Bar Screens				361,000.00
AERATED GRIT CHAMBERS				
Chamber Struct. (50' x 10' x 12	2	EA	27,000	54,000.00
Grit Chamber Equipment	2	EA	65,000	130,000.00
Grit Pumps	3	EA	7,500	22,500.00
Slide Gate	2	EA	8,000	16,000.00
Grates and Handrails		LS		10,000.00
Sluice Gates	2	EA	10,000	20,000.00
Electrical Controls		LS		20,000.00
Subtotal - Grit Chambers				272,500.00
PRIMARY TREATMENT				
PRIMARY CLARIFIERS				
Clarifier Structure	2,800	CY	450	1,260,000.00
Rectangular Clarifier Eqpt.	8	EA	100,000	800,000.00
Primary Sludge Pumps	8	EA	10,000	80,000.00
Grates and Handrails		LS		100,000.00
Sluice Gates	8	EA	9,000	72,000.00
Electrical		LS		30,000.00
Subtotal - Primary Clarifiers				2,342,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 4 - NEW 15 MGD WWTP (SECONDARY)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SECONDARY TREATMENT				
a2o PROCESS				
Structure (174' x 225' x 16')	0	CY	450	0.00
Miscellaneous Equipment, incl:		LS		0.00
Mixers	0	EA		
Fine Bubble Aeration System				
Recycle Pumps	0	EA		
Blowers (300 HP)	0	EA		
Grates and Handrails				
Licensing Fee				
Misc. Mechanical Items				
Subtotal - a2o Process				0.00
SECONDARY DISTRIBUTION BOX				
Structure		LS		35,000.00
Grates and Handrails		LS		7,500.00
Subtotal - Distribution Box				42,500.00
SECONDARY CLARIFIERS				
Clarifier Structure (115' Dia.)	4	EA	290,000	1,160,000.00
Circular Clarifier Equipment	4	EA	170,000	680,000.00
Return Sludge Pumps & Controls	6	EA	15,000	90,000.00
Subtotal - Secondary Clarifiers				1,930,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 4 - NEW 15 MGD WWTP (SECONDARY)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ADVANCED TREATMENT				
INTERMEDIATE PUMP STATION				
Vertical Mixed Flow Pumps	0	EA	25,000	0.00
Pump Station Structure		LS		0.00
Piping, Valves, & Misc.		LS		0.00
Subtotal - Intermediate Pump Station				0.00
DENITRIFICATION FILTERS				
Filter Assemblies		LS		0.00
Filter Struct. (67' x 80' x 23'	0	CY	450	0.00
Filter Backwash Pumps	0	EA	8,000	0.00
Filter Backwash Collection System		LS		0.00
Subtotal - Denitrification Filters				0.00
DISINFECTION AND POST AERATION				
CHLORINATION SYSTEM				
Chamber Struct. (54' x 142' x 9	700	CY	450	315,000.00
CL2 Building (54' x 54')		LS		160,000.00
Chlorination Equipment		LS		195,000.00
Treated Wastewater System		LS		60,000.00
Non-Reinforced Conc. Wall	275	EA	275	75,625.00
Mechanical		LS		30,000.00
Electrical		LS		45,000.00
Subtotal - Disinfection and Post Aeration				880,625.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 4 - NEW 15 MGD WWTP (SECONDARY)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
DECHLORINATION				
Dechlorination Equipment		LS		170,000.00
Dechlorination Structure		LS		30,000.00
Misc. Mechanical Items		LS		20,000.00
Gates				
Valves				
Piping				
Etc.				
Subtotal - Dechlorination				220,000.00
POST AERATION				
Structure (26' x 67' x 15')	260	CY	450	117,000.00
Aeration Equipment		LS		60,000.00
Grates and Handrails		LS		10,000.00
Misc. Mechanical Items		LS		20,000.00
Subtotal - Post Aeration				207,000.00
SOLIDS HANDLING				
SOLIDS HANDLING BUILDING				
DAF Units	2	EA	275,000	550,000.00
Belt Filter Presses (2 meter)	4	EA	200,000	800,000.00
Dewatering Sludge Conveyor	1	EA	30,000	30,000.00
Sludge Truck Loading Area		LS		50,000.00
Sludge Pumps	4	EA	25,000	100,000.00
Duplex Sludge Polymer System		LS		50,000.00
Duplex DAF Polymer System		LS		50,000.00
Duplex Compressed Air System		LS		30,000.00
Treated Wastewater Booster Pumps		LS		20,000.00
Solids Handling Bldg. Structure		LS		500,000.00
DAF Odor Control System		LS		100,000.00
Belt Filter Press Odor Control System		LS		100,000.00
Interior Piping		LS		30,000.00
Electrical/Mechanical		LS		250,000.00
Subtotal - Solids Handling				2,660,000.00
AEROBIC DIGESTERS				
Structure (100' x 80' x 27')	950	CY	450	427,500.00
Aeration System		LS		80,000.00
Grates and Handrails		LS		30,000.00
Misc. Mechanical Items		LS		25,000.00
Subtotal - Aerobic Digesters				562,500.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 4 - NEW 15 MGD WWTP (SECONDARY)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CHEMICAL FEED SYSTEM				
CHEMICAL FEED BUILDING				
Alum Feed/Storage Equipment		LS		35,000.00
Alum Pumping System		LS		25,000.00
Methanol/Feed Storage Equipment		LS		40,000.00
Methanol Pumping System		LS		25,000.00
Caustic Soda/Feed Storage Equipment		LS		30,000.00
Caustic Soda Pumping System		LS		25,000.00
Chemical Feed Building		LS		150,000.00
Electrical/Mechanical		LS		35,000.00
Subtotal - Chemical Feed Building				365,000.00
WASTEWATER COLLECTION AND PUMPING				
PUMP STATION				
Submersible P.S. Structure		LS		30,000.00
Submersible Pumps	2	EA	8,000	16,000.00
Pump Controls		LS		5,000.00
Miscellaneous Items		LS		10,000.00
Subtotal - Wastewater Collection				61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY				
Lab Equipment		LS		250,000.00
Building Structure		LS		400,000.00
Offices & Miscellaneous Items		LS		75,000.00
Subtotal - Admin. Bldg/Lab				725,000.00
SITE WORK				
Yard Piping		LS		950,000.00
Misc. Site Work		LS		1,000,000.00
Subtotal - Site Work				1,950,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
HADNOT POINT WWTP

DATE: 07-AUG-1991

SCENARIO 4 - NEW 15 MGD WWTP (SECONDARY)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
EQUIPMENT BUILDING				
Emergency Generators	3	EA	200,000	600,000.00
Equipment Building Structure		LS		375,000.00
Mechanical		LS		40,000.00
Electrical/Control Center		LS		250,000.00
Automatic Transfer Switch	1	EA	20,000	20,000.00
Motor Control Center	1	EA	100,000	100,000.00
Generator System Switchgear	1	EA	250,000	250,000.00
Subtotal - Equipment Building				1,635,000.00
Subtotal - Bare Construction Cost				14,489,125.00
Contractors Overhead & Profit	(	30%)		4,346,700.00
Contingencies	(	20%)		3,767,200.00
TOTAL CONSTRUCTION COST				$22,603,025.00
Engineering	(	15%)		3,390,500.00
Permits				400,000.00
TOTAL PROJECT COST				26,393,525.00

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

Task 3 Cost Analysis

Pumping Routes

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIOS 1 & 2 - ALL FLOWS TO HADNOT POINT

DATE: 06-AUG-1991

SCENARIOS 1 & 2 - CAMP GEIGER TO TARAWA TERRACE

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
80 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		387,500.00
Odor Control Equipment, Installed		LS		71,600.00
Subtotal - Pump Station				459,100.00
FORCE MAIN				
20" DIP	29,250	LF	40.00	1,170,000.00
Stream Crossing	550	LF	400.00	220,000.00
Bored Crossing (RR)	50	LF	300.00	15,000.00
Subtotal - Force Main				1,405,000.00
Subtotal Construction Cost				$1,864,100.00
Contingencies			20%	372,820.00
TOTAL CONSTRUCTION COST				$2,236,920.00
Engineering			15%	335,538.00
TOTAL PROJECT COST				2,572,458.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$262,747.78

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIOS 1 & 2 - ALL FLOWS TO HADNOT POINT

DATE: 06-AUG-1991

SCENARIOS 1 & 2 - CAMP GEIGER TO TARAWA TERRACE

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$4,250.00
PUMP STATION POWER COST				
Pump Horsepower				80
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			89	853
O/C Horsepower				30
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			30	720
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$59.08
O/C Energy Cost/Day				$35.98
PS Annual Power Cost				$34,696.73
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				262,747.78
Pump Station Maintenance				4,250.00
PS Power Cost				34,696.73
Total Annual Cost				$301,694.52
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - CAMP GEIGER TO TARAWA TERRACE (Excluding Engineering Cost)				$2,568,495.49

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SCENARIOS 1 & 2 - CAMP JOHNSON TO TARAWA TERRACE				
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
25 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		172,500.00
Odor Control Equipment, Installed		LS		29,800.00
Subtotal - Pump Station				202,300.00
FORCE MAIN				
16" DIP	8,280	LF	30.00	248,400.00
Stream Crossing	220	LF	200.00	44,000.00
Subtotal - Force Main				292,400.00
Subtotal Construction Cost				$494,700.00
Contingencies			20%	98,940.00
TOTAL CONSTRUCTION COST				$593,640.00
Engineering			15%	89,046.00
TOTAL PROJECT COST				682,686.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$69,728.73

SCENARIOS 1 & 2 - CAMP JOHNSON TO TARAWA TERRACE				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$2,850.00
PUMP STATION POWER COST				
Pump Horsepower				25
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			28	267
O/C Horsepower				15
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			15	360
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$18.46
O/C Energy Cost/Day				$17.99
PS Annual Power Cost				$13,304.86
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				69,728.73
Pump Station Maintenance				2,850.00
PS Power Cost				13,304.86
Total Annual Cost				$85,883.60
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - CAMP JOHNSON TO TARAWA TERRACE (Excluding Engineering Cost)				$731,175.46

SCENARIOS 1 & 2 - TARAWA TERRACE TO HADNOT POINT				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
180 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		680,000.00
Odor Control Equipment, Installed		LS		108,200.00
Subtotal - Pump Station				788,200.00
FORCE MAIN & GRAVITY LINE				
30" DIP FM	34,765	LF	65.00	2,259,725.00
Stream Crossing	635	LF	600.00	381,000.00
Bored Crossing (Street)	100	LF	350.00	35,000.00
36" RCP Gravity Line	8,500	LF	150.00	1,275,000.00
Subtotal - Force Main				3,950,725.00
Subtotal Construction Cost				$4,738,925.00
Contingencies			20%	947,785.00
TOTAL CONSTRUCTION COST				$5,686,710.00
Engineering			15%	853,006.50
TOTAL PROJECT COST				6,539,716.50
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$667,958.82

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SCENARIOS 1 & 2 - TARAWA TERRACE TO HADNOT POINT				
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$6,850.00
PUMP STATION POWER COST				
Pump Horsepower				180
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			200	1920
O/C Horsepower				55
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			55	1320
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$132.94
O/C Energy Cost/Day				$65.96
PS Annual Power Cost				$72,596.24
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				667,958.82
Pump Station Maintenance				6,850.00
PS Power Cost				72,596.24
Total Annual Cost				$747,405.06
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - TARAWA TERRACE TO HADNOT POINT (Excluding Engineering Cost)				$6,363,080.60

SCENARIOS 1& 2 - RIFLE RANGE TO COURTHOUSE BAY				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
90 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		352,500.00
Odor Control Equipment, Installed		LS		113,400.00
Subtotal - Pump Station				465,900.00
FORCE MAIN				
12" DIP	44,600	LF	25.00	1,115,000.00
Stream Crossing	2,150	LF	150.00	322,500.00
Subtotal - Force Main				1,437,500.00
Subtotal Construction Cost				$1,903,400.00
Contingencies			20%	380,680.00
TOTAL CONSTRUCTION COST				$2,284,080.00
Engineering			15%	342,612.00
TOTAL PROJECT COST				2,626,692.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$268,287.18

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SCENARIOS 1& 2 - RIFLE RANGE TO COURTHOUSE BAY				
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$2,400.00
PUMP STATION POWER COST				
Pump Horsepower				90
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			100	960
O/C Horsepower				45
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			45	1080
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$66.47
O/C Energy Cost/Day				$53.96
PS Annual Power Cost				$43,958.09
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				268,287.18
Pump Station Maintenance				2,400.00
PS Power Cost				43,958.09
Total Annual Cost				$314,645.27
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - RIFLE RANGE TO COURTHOUSE BAY (Excluding Engineering Cost)				$2,678,752.58

SCENARIOS 1 & 2 - ONSLOW BEACH TO COURTHOUSE BAY				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
50 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		165,000.00
Odor Control Equipment, Installed		LS		71,600.00
Subtotal - Pump Station				236,600.00
FORCE MAIN				
8" DIP	33,000	LF	20.00	660,000.00
Stream Crossing	500	LF	125.00	62,500.00
Subtotal - Force Main				722,500.00
Subtotal Construction Cost				$959,100.00
Contingencies			20%	191,820.00
TOTAL CONSTRUCTION COST				$1,150,920.00
Engineering			15%	172,638.00
TOTAL PROJECT COST				1,323,558.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$135,186.63

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SCENARIOS 1 & 2 - ONSLOW BEACH TO COURTHOUSE BAY				
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$1,450.00
PUMP STATION POWER COST				
Pump Horsepower				50
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			56	533
O/C Horsepower				30
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			30	720
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$36.93
O/C Energy Cost/Day				$35.98
PS Annual Power Cost				$26,609.73
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				135,186.63
Pump Station Maintenance				1,450.00
PS Power Cost				26,609.73
Total Annual Cost				$163,246.36
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - ONSLOW BEACH TO COURTHOUSE BAY (Excluding Engineering Cost)				$1,389,808.28

SCENARIOS 1 & 2 - COURTHOUSE BAY TO HADNOT POINT(VIA GRAVITY LINE)				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
125 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		475,000.00
Odor Control Equipment, Installed		LS		150,000.00
Subtotal - Pump Station				625,000.00
FORCE MAIN				
18" DIP	46,000	LF	35.00	1,610,000.00
Stream Crossing	250	LF	300.00	75,000.00
Bored Crossing (Street)	125	LF	250.00	31,250.00
Subtotal - Force Main				1,716,250.00
Subtotal Construction Cost				$2,341,250.00
Contingencies			20%	468,250.00
TOTAL CONSTRUCTION COST				$2,809,500.00
Engineering			15%	421,425.00
TOTAL PROJECT COST				3,230,925.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$330,002.82

SCENARIOS 1 & 2 - COURTHOUSE BAY TO HADNOT POINT(VIA GRAVITY LINE)				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$4,000.00
PUMP STATION POWER COST				
Pump Horsepower				125
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			139	1333
O/C Horsepower				70
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			70	1680
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$92.32
O/C Energy Cost/Day				$83.94
PS Annual Power Cost				$64,335.75
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				330,002.82
Pump Station Maintenance				4,000.00
PS Power Cost				64,335.75
Total Annual Cost				$398,338.57
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - COURTHOUSE BAY TO HADNOT POINT(VIA GRAVITY LINE) (Excluding Engineering Cost)				$3,391,280.80

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 3 - CG, CJ, & TT TO JACKSONVILLE,
ALL OTHERS TO HADNOT POINT

DATE: 06-AUG-1991

SCENARIO 3 - CAMP GEIGER TO JACKSONVILLE

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
15 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		150,000.00
Subtotal - Pump Station				150,000.00
FORCE MAIN				
(Retain Existing)				
Subtotal - Force Main				0.00
OFFSITE PIPING				
18" Gravity Sewer	1,200	LF	75.00	90,000.00
Bored Crossing (RR)	50	LF	250.00	12,500.00
Flow Meter		LS		5,000.00
Subtotal - Offsite Piping				107,500.00
Subtotal Construction Cost				$257,500.00
Contingencies			20%	51,500.00
TOTAL CONSTRUCTION COST				$309,000.00
Engineering			15%	46,350.00
TOTAL PROJECT COST				355,350.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$36,295.02

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 3 - CG, CJ, & TT TO JACKSONVILLE,
ALL OTHERS TO HADNOT POINT

DATE: 06-AUG-1991

SCENARIO 3 - CAMP GEIGER TO JACKSONVILLE

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$3,250.00
PUMP STATION POWER COST				
Pump Horsepower				15
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			17	160
O/C Horsepower				0
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			0	0
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$11.08
O/C Energy Cost/Day				$0.00
PS Annual Power Cost				$4,043.50
CITY OF JACKSONVILLE SEWER FEES				
Daily Debt Recovery Charge	1,300.00	KGAL	2.03	2,639.00
Daily Variable Sewer Charge	1,300.00	KGAL	1.57	2,041.00
Annual Jacksonville Fees				$1,708,200.00
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				36,295.02
Pump Station Maintenance				3,250.00
PS Power Cost				4,043.50
City of Jacksonville Sewer Fees				1,708,200.00
Total Annual Cost				$1,751,788.53
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - CAMP GEIGER TO JACKSONVILLE (Excluding Engineering Cost)				$14,913,963.24

SCENARIO 3 - TARAWA TERRACE TO JACKSONVILLE VIA CAMP JOHNSON

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
25 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		172,500.00
Odor Control Equipment, Installed		LS		29,800.00
Subtotal - Pump Station				202,300.00
FORCE MAIN				
16" DIP	8,280	LF	30.00	248,400.00
Stream Crossing	220	LF	200.00	44,000.00
Subtotal - Force Main				292,400.00
Subtotal Construction Cost				$494,700.00
Contingencies			20%	98,940.00
TOTAL CONSTRUCTION COST				$593,640.00
Engineering			15%	89,046.00
TOTAL PROJECT COST				682,686.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$69,728.73

SCENARIO 3 - TARAWA TERRACE TO JACKSONVILLE VIA CAMP JOHNSON				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$3,100.00
PUMP STATION POWER COST				
Pump Horsepower				25
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			28	267
O/C Horsepower				15
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			15	360
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$18.46
O/C Energy Cost/Day				$17.99
PS Annual Power Cost				$13,304.86
CITY OF JACKSONVILLE SEWER FEES				
Daily Debt Recovery Charge	1,100.00	KGAL	2.03	2,233.00
Daily Variable Sewer Charge	1,100.00	KGAL	1.57	1,727.00
Annual Jacksonville Fees				$1,445,400.00
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				69,728.73
Pump Station Maintenance				3,100.00
PS Power Cost				13,304.86
City of Jacksonville Sewer Fees				1,445,400.00
Total Annual Cost				$1,531,533.60
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - TARAWA TERRACE TO JACKSONVILLE (Excluding Engineering Cost)				$13,038,808.85

SCENARIO 3 - CAMP JOHNSON TO JACKSONVILLE ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
30 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		225,000.00
Odor Control Equipment, Installed		LS		29,800.00
Subtotal - Pump Station				254,800.00
FORCE MAIN				
20" DIP	8,550	LF	40.00	342,000.00
Subtotal - Force Main				342,000.00
OFFSITE PIPING				
18" Gravity Sewer	600	LF	75.00	45,000.00
Bored Crossing (Street)	200	LF	250.00	50,000.00
Flow Meter		LS		5,000.00
Subtotal - Offsite Piping				100,000.00
Subtotal Construction Cost				$696,800.00
Contingencies			20%	139,360.00
TOTAL CONSTRUCTION COST				$836,160.00
Engineering			15%	125,424.00
TOTAL PROJECT COST				961,584.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$98,215.04

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SCENARIO 3 - CAMP JOHNSON TO JACKSONVILLE				
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$4,250.00
PUMP STATION POWER COST				
Pump Horsepower				30
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			33	320
O/C Horsepower				15
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			15	360
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$22.16
O/C Energy Cost/Day				$17.99
PS Annual Power Cost				$14,652.70
CITY OF JACKSONVILLE SEWER FEES				
Daily Debt Recovery Charge	600.00	KGAL	2.03	1,218.00
Daily Variable Sewer Charge	600.00	KGAL	1.57	942.00
Annual Jacksonville Fees				$788,400.00
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				98,215.04
Pump Station Maintenance				4,250.00
PS Power Cost				14,652.70
City of Jacksonville Sewer Fees				788,400.00
Total Annual Cost				$905,517.74
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - CAMP JOHNSON TO JACKSONVILLE (Excluding Engineering Cost)				$7,709,182.96

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SCENARIO 3 - RIFLE RANGE TO COURTHOUSE BAY				
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
90 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		352,500.00
Odor Control Equipment, Installed		LS		113,400.00
Subtotal - Pump Station				465,900.00
FORCE MAIN				
12" DIP	44,600	LF	25.00	1,115,000.00
Stream Crossing	2,150	LF	150.00	322,500.00
Subtotal - Force Main				1,437,500.00
Subtotal Construction Cost				$1,903,400.00
Contingencies			20%	380,680.00
TOTAL CONSTRUCTION COST				$2,284,080.00
Engineering			15%	342,612.00
TOTAL PROJECT COST				2,626,692.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$268,287.18

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SCENARIO 3 - RIFLE RANGE TO COURTHOUSE BAY				
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$2,400.00
PUMP STATION POWER COST				
Pump Horsepower				90
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			100	960
O/C Horsepower				45
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			45	1080
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$66.47
O/C Energy Cost/Day				$53.96
PS Annual Power Cost				$43,958.09
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				268,287.18
Pump Station Maintenance				2,400.00
PS Power Cost				43,958.09
Total Annual Cost				$314,645.27
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - RIFLE RANGE TO COURTHOUSE BAY (Excluding Engineering Cost)				$2,678,752.58

SCENARIO 3 - ONSLOW BEACH TO COURTHOUSE BAY				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
50 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		165,000.00
Odor Control Equipment, Installed		LS		71,600.00
Subtotal - Pump Station				236,600.00
FORCE MAIN				
8" DIP	33,000	LF	20.00	660,000.00
Stream Crossing	500	LF	125.00	62,500.00
Subtotal - Force Main				722,500.00
Subtotal Construction Cost				$959,100.00
Contingencies			20%	191,820.00
TOTAL CONSTRUCTION COST				$1,150,920.00
Engineering			15%	172,638.00
TOTAL PROJECT COST				1,323,558.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$135,186.63

SCENARIO 3 - ONSLOW BEACH TO COURTHOUSE BAY				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$1,450.00
PUMP STATION POWER COST				
Pump Horsepower				50
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			56	533
O/C Horsepower				30
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			30	720
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$36.93
O/C Energy Cost/Day				$35.98
PS Annual Power Cost				$26,609.73
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				135,186.63
Pump Station Maintenance				1,450.00
PS Power Cost				26,609.73
Total Annual Cost				$163,246.36
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - ONSLOW BEACH TO COURTHOUSE BAY (Excluding Engineering Cost)				$1,389,808.28

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SCENARIO 3 - COURTHOUSE BAY TO HADNOT POINT				
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
150 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		475,000.00
Odor Control Equipment, Installed		LS		150,000.00
Subtotal - Pump Station				625,000.00
FORCE MAIN				
18" DIP	50,000	LF	35.00	1,750,000.00
Stream Crossing	350	LF	300.00	105,000.00
Bored Crossing (Street)	50	LF	250.00	12,500.00
Subtotal - Force Main				1,867,500.00
Subtotal Construction Cost				$2,492,500.00
Contingencies			20%	498,500.00
TOTAL CONSTRUCTION COST				$2,991,000.00
Engineering			15%	448,650.00
TOTAL PROJECT COST				3,439,650.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$351,321.74

SCENARIO 3 - COURTHOUSE BAY TO HADNOT POINT

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$4,000.00
PUMP STATION POWER COST				
Pump Horsepower				150
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			167	1600
O/C Horsepower				70
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			70	1680
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$110.78
O/C Energy Cost/Day				$83.94
PS Annual Power Cost				$71,074.93
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				351,321.74
Pump Station Maintenance				4,000.00
PS Power Cost				71,074.93
Total Annual Cost				$426,396.66
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - COURTHOUSE BAY TO HADNOT POINT (Excluding Engineering Cost)				$3,630,155.16

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 4 - OCEAN OUTFALL FOR ALL FLOWS

DATE: 07-AUG-1991

SCENARIO 4 - HADNOT POINT TO ONSLOW BEACH

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
110 HP Triplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		1,375,000.00
Subtotal - Pump Station				1,375,000.00
FORCE MAIN				
36" DIP	44,750	LF	75.00	3,356,250.00
Stream Crossing	850	LF	750.00	637,500.00
Bored Crossing (RR)	50	LF	450.00	22,500.00
Subtotal - Force Main				4,016,250.00
Subtotal Construction Cost				$5,391,250.00
Contingencies			20%	1,078,250.00
TOTAL CONSTRUCTION COST				$6,469,500.00
Engineering			15%	970,425.00
TOTAL PROJECT COST				7,439,925.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$759,905.04

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 4 - OCEAN OUTFALL FOR ALL FLOWS

DATE: 07-AUG-1991

SCENARIO 4 - HADNOT POINT TO ONSLOW BEACH

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance				$15,800.00
PUMP STATION POWER COST				
Pump Horsepower				330
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				24.00
Pump Energy Required, kw & kwh			367	8800
O/C Horsepower				0
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			0	0
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$439.71
O/C Energy Cost/Day				$0.00
PS Annual Power Cost				$160,494.72
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				759,905.04
Pump Station Maintenance				15,800.00
PS Power Cost				160,494.72
Total Annual Cost				$936,199.76
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - HADNOT POINT TO ONSLOW BEACH (Excluding Engineering Cost)				$7,970,396.31

SCENARIO 4 - OCEAN OUTFALL ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
OCEAN OUTFALL COST				
FORCE MAIN TERMINUS				
Aeration Basin		LS		50,000.00
Aeration Equipment, Installed		LS		37,500.00
Subtotal				87,500.00
GRAVITY LINE				
36" RCP Ocean Outfall	7,920	LF	2,000.00	15,840,000.00
Subtotal - Piping				15,840,000.00
Subtotal Construction Cost				$15,927,500.00
Contingencies			20%	3,185,500.00
TOTAL CONSTRUCTION COST				$19,113,000.00
Engineering			15%	2,866,950.00
TOTAL PROJECT COST				21,979,950.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$2,245,005.81

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SCENARIO 4 - OCEAN OUTFALL				
MAINTENANCE COST				
Total Annual Maintenance				$8,000.00
POWER COST				
Aeration Horsepower				15
Aeration Motor Efficiency, %				75
Aeration Run Time, hrs/day				24.00
Aeration Energy Required, kw & kwh			20	480
Cost/kw & Cost/kwh			0.31	0.04
Aeration Energy Cost/Day				$23.98
Annual Power Cost				$8,754.26
SUMMARY OF ANNUAL COSTS				
Construction				2,245,005.81
Maintenance				8,000.00
Power Cost				8,754.26
Total Annual Cost				$2,261,760.07
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - OCEAN OUTFALL (Excluding Engineering Cost)				$19,255,638.44

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

Task 3 Cost Analysis

Land Application

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
	HADNOT POINT LAND APPLICATION			
CAPITAL COSTS FOR CONSTRUCTION				
Preapplication Treatment		LS		$308,400.00
Areation Pond (7 day detention)		LS		918,425.00
Pumping Facilities		LS		642,500.00
Transmission (30" F.M.)	11,200	LF	124.00	1,388,800.00
Storage (30 Days)		LS		2,665,090.00
Disinfection		LS		233,870.00
Pumping Facilities		LS		642,500.00
Field Preparation		LS		308,400.00
Spray Distribution		LS		10,537,000.00
Administration & Lab		LS		372,650.00
Monitoring Wells		LS		31,354.00
Fencing & Roads		LS		1,259,300.00
Subtotal Construction Cost				$19,308,289.00
Contingency			20%	3,861,657.80
TOTAL CONSTRUCTION COST				$23,169,946.80
Engineering			15%	3,475,492.02
Land	2,850.00	AC	6,500.00	18,525,000.00
TOTAL PROJECT COST				45,170,438.82
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$2,721,533.26
Annual Cost of Land				2,175,939.55
ANNUAL OPERATOR COSTS				
Preapplication Treatment		LS		$33,410.00
Areation Pond (7 day detention)		LS		37,008.00
Pumping Facilities		LS		17,476.00
Storage (30 Days)		LS		2,468.00
Disinfection		LS		13,364.00
Pumping Facilities		LS		17,476.00
Spray Distribution		LS		238,586.00
Administration & Lab		LS		35,980.00
Monitoring Wells		LS		4,112.00
Total Annual Operator Costs				$399,880.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
		HADNOT POINT LAND APPLICATION		
ANNUAL MATERIAL COSTS				
Preapplication Treatment		LS		$7,068.00
Areation Pond (7 day detention)		LS		5,397.00
Pumping Facilities		LS		4,728.00
Transmission (30" F.M.)	11,200	LS	23.00	257,600.00
Storage (30 Days)		LS		7,402.00
Disinfection		LS		20,046.00
Pumping Facilities		LS		4,728.00
Spray Distribution		LS		47,718.00
Administration & Lab		LS		14,392.00
Monitoring Wells		LS		874.00
Fencing & Roads		LS		46,877.00
Total Annual Material Costs				$416,830.00
ANNUAL POWER COSTS				
Areation Pond (7 day detention)		LS		$92,520.00
Pumping Facilities		LS		91,492.00
Total Annual Power Costs				$184,012.00

SUMMARY OF ANNUAL COSTS

Annual Cost of Construction (Excluding Engineering Cost)		$2,721,533.26
Annual Cost of Land		2,175,939.55
Operator Cost		399,880.00
Materials Cost		416,830.00
Power Cost		184,012.00
Total Annual Cost		$5,898,194.81
PRESENT WORTH		
Interest Rate, %	10	
Life Cycle, Years	20	
Present Worth Factor P/A		8.5136
PRESENT WORTH - HADNOT POINT LAND APPLICATION (Excluding Engineering Cost)		$50,214,657.31

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
				HADNOT POINT LAND APPLICATION
ADDITIONAL LAND LOST DUE TO LAND APPLICATION (RATIO METHOD)	3,141	AC	6,500.00	20,416,500.00
ANNUAL COST / LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Additional Land Lost Due to Land Application				$2,398,114.43
Total Annual Cost Including Additional Land Lost				$8,296,309.24
PRESENT WORTH INCLUDING LAND LOST DUE TO LAND APPLICATION				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor, P/A				8.5136
PRESENT WORTH - INCL. ADD. LAND LOST DUE TO LAND APPLICATION				$70,631,157.31
ADDITIONAL LAND LOST DUE TO LAND APPLICATION (ONLY PLANT METHOD)	6,078	AC	6,500.00	39,507,000.00
ANNUAL COST / LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Additional Land Lost Due to Land Application				$4,640,477.40
Total Annual Cost Including Additional Land Lost				$10,538,672.20
PRESENT WORTH INCLUDING LAND LOST DUE TO LAND APPLICATION				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor, P/A				8.5136
PRESENT WORTH - INCL. ADD. LAND LOST DUE TO LAND APPLICATION				$89,721,657.31

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PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
				CAMP GEIGER LAND APPLICATION
CAPITAL COSTS FOR CONSTRUCTION				
Preapplication Treatment		LS		$102,800.00
Areation Pond (7 day detention)		LS		192,680.00
Pumping Facilities		LS		308,400.00
Transmission (14" F.M.)	22,500	LF	59.00	1,327,500.00
Storage (30 Days)		LS		522,353.00
Disinfection		LS		102,800.00
Pumping Facilities		LS		308,400.00
Field Preparation		LS		82,240.00
Spray Distribution		LS		2,441,500.00
Administration & Lab		LS		143,920.00
Monitoring Wells		LS		15,677.00
Fencing & Roads		LS		372,650.00
Subtotal Construction Cost				$5,920,920.00
Contingency			20%	1,184,184.00
TOTAL CONSTRUCTION COST				$7,105,104.00
Engineering			15%	1,065,765.60
Land	550.00	AC	6,500.00	3,575,000.00
TOTAL PROJECT COST				11,745,869.60
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$834,562.85
Annual Cost of Land				419,918.16
ANNUAL OPERATOR COSTS				
Preapplication Treatment		LS		$20,560.00
Areation Pond (7 day detention)		LS		21,588.00
Pumping Facilities		LS		7,196.00
Storage (30 Days)		LS		1,481.00
Disinfection		LS		5,757.00
Pumping Facilities		LS		7,196.00
Spray Distribution		LS		9,553.00
Administration & Lab		LS		18,915.00
Monitoring Wells		LS		2,056.00
Total Annual Operator Costs				$94,302.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

CAMP GEIGER LAND APPLICATION

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ANNUAL MATERIAL COSTS				
Preapplication Treatment		LS		$3,084.00
Areation Pond (7 day detention)		LS		2,283.00
Pumping Facilities		LS		1,070.00
Transmission (14" F.M.)	22,500	LS	13.00	292,500.00
Storage (30 Days)		LS		1,850.00
Disinfection		LS		5,921.00
Pumping Facilities		LS		1,070.00
Spray Distribution		LS		58,378.00
Administration & Lab		LS		6,580.00
Monitoring Wells		LS		437.00
Fencing & Roads		LS		11,139.00
Total Annual Material Costs				$384,312.00
ANNUAL POWER COSTS				
Areation Pond (7 day detention)		LS		$24,672.00
Pumping Facilities		LS		16,654.00
Total Annual Power Costs				$41,326.00

SUMMARY OF ANNUAL COSTS

Annual Cost of Construction (Excluding Engineering Cost)		$834,562.85
Annual Cost of Land		419,918.16
Operator Cost		94,302.00
Materials Cost		384,312.00
Power Cost		41,326.00
Total Annual Cost		$1,774,421.01
PRESENT WORTH		
Interest Rate, %	10	
Life Cycle, Years	20	
Present Worth Factor P/A		8.5136
PRESENT WORTH - CAMP GEIGER LAND APPLICATION (Excluding Engineering Cost)		$15,106,646.32

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	CAMP GEIGER LAND APPLICATION TOTAL
ADDITIONAL LAND LOST DUE TO LAND APPLICATION (RATIO METHOD)	609	AC	6,500.00	3,958,500.00
ANNUAL COST / LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Additional Land Lost Due to Land Application				$464,963.92
Total Annual Cost Including Additional Land Lost				$2,239,384.93
PRESENT WORTH INCLUDING LAND LOST DUE TO LAND APPLICATION				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor, P/A				8.5136
PRESENT WORTH - INCL. ADD. LAND LOST DUE TO LAND APPLICATION				$19,065,146.32
ADDITIONAL LAND LOST DUE TO LAND APPLICATION (ONLY PLANT METHOD)	8,378	AC	6,500.00	54,457,000.00
ANNUAL COST / LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Additional Land Lost Due to Land Application				$6,396,498.79
Total Annual Cost Including Additional Land Lost				$8,170,919.79
PRESENT WORTH INCLUDING LAND LOST DUE TO LAND APPLICATION				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor, P/A				8.5136
PRESENT WORTH - INCL. ADD. LAND LOST DUE TO LAND APPLICATION				$69,563,646.32

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PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

CAMP JOHNSON LAND APPLICATION

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
Preapplication Treatment		LS		$77,100.00
Areation Pond (7 day detention)		LS		173,475.00
Pumping Facilities		LS		257,000.00
Transmission (10" F.M.)	54,000	LF	47.00	2,538,000.00
Storage (30 Days)		LS		328,318.00
Disinfection		LS		84,810.00
Pumping Facilities		LS		257,000.00
Field Preparation		LS		53,970.00
Spray Distribution		LS		1,542,000.00
Administration & Lab		LS		128,500.00
Monitoring Wells		LS		15,677.00
Fencing & Roads		LS		295,550.00
Subtotal Construction Cost				$5,751,400.00
Contingency			20%	1,150,280.00
TOTAL CONSTRUCTION COST				$6,901,680.00
Engineering			15%	1,035,252.00
Land	390.00	AC	6,500.00	2,535,000.00
TOTAL PROJECT COST				10,471,932.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$810,668.74
Annual Cost of Land				297,760.15
ANNUAL OPERATOR COSTS				
Preapplication Treatment		LS		$19,918.00
Areation Pond (7 day detention)		LS		17,348.00
Pumping Facilities		LS		3,598.00
Storage (30 Days)		LS		1,234.00
Disinfection		LS		4,369.00
Pumping Facilities		LS		3,598.00
Spray Distribution		LS		37,795.00
Administration & Lab		LS		14,392.00
Monitoring Wells		LS		2,056.00
Total Annual Operator Costs				$104,308.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

CAMP JOHNSON LAND APPLICATION

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ANNUAL MATERIAL COSTS				
Preapplication Treatment		LS		$2,827.00
Areation Pond (7 day detention)		LS		1,774.00
Pumping Facilities		LS		514.00
Transmission (10" F.M.)	54,000	LS	11.00	594,000.00
Storage (30 Days)		LS		1,388.00
Disinfection		LS		4,138.00
Pumping Facilities		LS		514.00
Spray Distribution		LS		5,968.00
Administration & Lab		LS		4,883.00
Monitoring Wells		LS		437.00
Fencing & Roads		LS		8,020.00
Total Annual Material Costs				$624,463.00
ANNUAL POWER COSTS				
Areation Pond (7 day detention)		LS		$15,420.00
Pumping Facilities		LS		14,296.00
Total Annual Power Costs				$29,716.00

SUMMARY OF ANNUAL COSTS

Annual Cost of Construction (Excluding Engineering Cost)		$810,668.74
Annual Cost of Land		297,760.15
Operator Cost		104,308.00
Materials Cost		624,463.00
Power Cost		29,716.00
Total Annual Cost		$1,866,915.89
PRESENT WORTH		
Interest Rate, %	10	
Life Cycle, Years	20	
Present Worth Factor P/A		8.5136
PRESENT WORTH - CAMP JOHNSON LAND APPLICATION (Excluding Engineering Cost)		$15,894,107.41

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	CAMP JOHNSON LAND APPLICATION UNIT PRICE	TOTAL
ADDITIONAL LAND LOST DUE TO LAND APPLICATION (RATIO METHOD)	422	AC	6,500.00	2,743,000.00
ANNUAL COST / LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Additional Land Lost Due to Land Application				$322,191.75
Total Annual Cost Including Additional Land Lost				$2,189,107.64
PRESENT WORTH INCLUDING LAND LOST DUE TO LAND APPLICATION				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor, P/A				8.5136
PRESENT WORTH - INCL. ADD. LAND LOST DUE TO LAND APPLICATION				$18,637,107.41

ADDITIONAL LAND LOST DUE TO LAND APPLICATION (ONLY PLANT METHOD)	8,538	AC	6,500.00	55,497,000.00
ANNUAL COST / LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Additional Land Lost Due to Land Application				$6,518,656.80
Total Annual Cost Including Additional Land Lost				$8,385,572.69
PRESENT WORTH INCLUDING LAND LOST DUE TO LAND APPLICATION				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor, P/A				8.5136
PRESENT WORTH - INCL. ADD. LAND LOST DUE TO LAND APPLICATION				$71,391,107.41

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PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
		TARAWA TERRACE LAND APPLICATION		
CAPITAL COSTS FOR CONSTRUCTION				
Preapplication Treatment		LS		$89,950.00
Areation Pond (7 day detention)		LS		230,844.00
Pumping Facilities		LS		269,850.00
Transmission (12" F.M.)	60,750	LF	47.00	2,855,250.00
Storage (30 Days)		LS		403,362.00
Disinfection		LS		92,520.00
Pumping Facilities		LS		269,850.00
Field Preparation		LS		64,250.00
Spray Distribution		LS		1,927,500.00
Administration & Lab		LS		133,640.00
Monitoring Wells		LS		15,677.00
Fencing & Roads		LS		326,390.00
Subtotal Construction Cost				$6,679,083.00
Contingency			20%	1,335,816.60
TOTAL CONSTRUCTION COST				$8,014,899.60
Engineering			15%	1,202,234.94
Land	450.00	AC	6,500.00	2,925,000.00
TOTAL PROJECT COST				12,142,134.54
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$941,427.10
Annual Cost of Land				343,569.40
ANNUAL OPERATOR COSTS				
Preapplication Treatment		LS		$20,560.00
Areation Pond (7 day detention)		LS		18,071.00
Pumping Facilities		LS		5,783.00
Storage (30 Days)		LS		1,253.00
Disinfection		LS		4,819.00
Pumping Facilities		LS		5,783.00
Spray Distribution		LS		47,317.00
Administration & Lab		LS		16,063.00
Monitoring Wells		LS		2,056.00
Total Annual Operator Costs				$121,705.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TARAWA TERRACE LAND APPLICATION TOTAL
ANNUAL MATERIAL COSTS				
Preapplication Treatment		LS		$2,827.00
Areation Pond (7 day detention)		LS		1,855.00
Pumping Facilities		LS		884.00
Transmission (12" F.M.)	60,750	LS	11.00	668,250.00
Storage (30 Days)		LS		1,639.00
Disinfection		LS		4,820.00
Pumping Facilities		LS		884.00
Spray Distribution		LS		7,471.00
Administration & Lab		LS		5,622.00
Monitoring Wells		LS		437.00
Fencing & Roads		LS		9,137.00
Total Annual Material Costs				$703,826.00
ANNUAL POWER COSTS				
Areation Pond (7 day detention)		LS		$19,275.00
Pumping Facilities		LS		13,814.00
Total Annual Power Costs				$33,089.00

SUMMARY OF ANNUAL COSTS

Annual Cost of Construction (Excluding Engineering Cost)		$941,427.10
Annual Cost of Land		343,569.40
Operator Cost		121,705.00
Materials Cost		703,826.00
Power Cost		33,089.00
Total Annual Cost		$2,143,616.50
PRESENT WORTH		
Interest Rate, %	10	
Life Cycle, Years	20	
Present Worth Factor P/A		8.5136
PRESENT WORTH - TARAWA TERRACE LAND APPLICATION (Excluding Engineering Cost)		$18,249,815.68

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
			TARAWA TERRACE LAND APPLICATION	
ADDITIONAL LAND LOST DUE TO LAND APPLICATION (RATIO METHOD)	516	AC	6,500.00	3,354,000.00
ANNUAL COST / LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Additional Land Lost Due to Land Application				$393,959.58
Total Annual Cost Including Additional Land Lost				$2,537,576.08
PRESENT WORTH INCLUDING LAND LOST DUE TO LAND APPLICATION				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor, P/A				8.5136
PRESENT WORTH - INCL. ADD. LAND LOST DUE TO LAND APPLICATION				$21,603,815.68
ADDITIONAL LAND LOST DUE TO LAND APPLICATION (ONLY PLANT METHOD)	8,478	AC	6,500.00	55,107,000.00
ANNUAL COST / LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Additional Land Lost Due to Land Application				$6,472,847.54
Total Annual Cost Including Additional Land Lost				$8,616,464.04
PRESENT WORTH INCLUDING LAND LOST DUE TO LAND APPLICATION				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor, P/A				8.5136
PRESENT WORTH - INCL. ADD. LAND LOST DUE TO LAND APPLICATION				$73,356,815.68

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PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

RIFLE RANGE LAND APPLICATION

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
Preapplication Treatment		LS		$51,400.00
Areation Pond (7 day detention)		LS		150,925.00
Pumping Facilities		LS		218,450.00
Transmission (8" F.M.)	4,500	LF	28.00	126,000.00
Storage (30 Days)		LS		186,068.00
Disinfection		LS		69,390.00
Pumping Facilities		LS		218,450.00
Field Preparation		LS		30,840.00
Spray Distribution		LS		642,500.00
Administration & Lab		LS		107,940.00
Monitoring Wells		LS		12,542.00
Fencing & Roads		LS		192,750.00
Subtotal Construction Cost				$2,007,255.00
Contingency			20%	401,451.00
TOTAL CONSTRUCTION COST				$2,408,706.00
Engineering			15%	361,305.90
Land	210.00	AC	6,500.00	1,365,000.00
TOTAL PROJECT COST				4,135,011.90
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$282,925.70
Annual Cost of Land				160,332.39
ANNUAL OPERATOR COSTS				
Preapplication Treatment		LS		$19,275.00
Areation Pond (7 day detention)		LS		13,662.00
Pumping Facilities		LS		3,509.00
Storage (30 Days)		LS		1,012.00
Disinfection		LS		3,104.00
Pumping Facilities		LS		3,509.00
Spray Distribution		LS		21,321.00
Administration & Lab		LS		10,794.00
Monitoring Wells		LS		1,645.00
Total Annual Operator Costs				$77,831.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

	RIFLE RANGE LAND APPLICATION			
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ANNUAL MATERIAL COSTS				
Preapplication Treatment		LS		$2,570.00
Areation Pond (7 day detention)		LS		1,215.00
Pumping Facilities		LS		378.00
Transmission (8" F.M.)	4,500	LS	8.00	36,000.00
Storage (30 Days)		LS		810.00
Disinfection		LS		2,699.00
Pumping Facilities		LS		378.00
Spray Distribution		LS		3,321.00
Administration & Lab		LS		3,509.00
Monitoring Wells		LS		350.00
Fencing & Roads		LS		5,073.00
Total Annual Material Costs				$56,303.00
ANNUAL POWER COSTS				
Areation Pond (7 day detention)		LS		$8,096.00
Pumping Facilities		LS		6,006.00
Total Annual Power Costs				$14,102.00

SUMMARY OF ANNUAL COSTS

Annual Cost of Construction (Excluding Engineering Cost)		$282,925.70
Annual Cost of Land		160,332.39
Operator Cost		77,831.00
Materials Cost		56,303.00
Power Cost		14,102.00
Total Annual Cost		$591,494.09
PRESENT WORTH		
Interest Rate, %	10	
Life Cycle, Years	20	
Present Worth Factor P/A		8.5136
PRESENT WORTH - RIFLE RANGE LAND APPLICATION (Excluding Engineering Cost)		$5,035,722.63

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
	COURTHOUSE BAY LAND APPLICATION			
CAPITAL COSTS FOR CONSTRUCTION				
Preapplication Treatment		LS		$56,540.00
Areation Pond (7 day detention)		LS		153,210.00
Pumping Facilities		LS		226,160.00
Transmission (8" F.M.)	9,150	LF	41.00	375,150.00
Storage (30 Days)		LS		224,875.00
Disinfection		LS		69,390.00
Pumping Facilities		LS		226,160.00
Field Preparation		LS		35,980.00
Spray Distribution		LS		771,000.00
Administration & Lab		LS		113,080.00
Monitoring Wells		LS		12,542.00
Fencing & Roads		LS		215,880.00
Subtotal Construction Cost				$2,479,967.00
Contingency			20%	495,993.40
TOTAL CONSTRUCTION COST				$2,975,960.40
Engineering			15%	446,394.06
Land	240.00	AC	6,500.00	1,560,000.00
TOTAL PROJECT COST				4,982,354.46
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$349,555.19
Annual Cost of Land				183,237.01
ANNUAL OPERATOR COSTS				
Preapplication Treatment		LS		$19,532.00
Areation Pond (7 day detention)		LS		14,110.00
Pumping Facilities		LS		3,624.00
Storage (30 Days)		LS		972.00
Disinfection		LS		3,239.00
Pumping Facilities		LS		3,624.00
Spray Distribution		LS		23,901.00
Administration & Lab		LS		11,720.00
Monitoring Wells		LS		1,645.00
Total Annual Operator Costs				$82,367.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
		COURTHOUSE BAY LAND APPLICATION		
ANNUAL MATERIAL COSTS				
Preapplication Treatment		LS		$2,570.00
Areation Pond (7 day detention)		LS		1,296.00
Pumping Facilities		LS		417.00
Transmission (8" F.M.)	9,150	LS	11.00	100,650.00
Storage (30 Days)		LS		879.00
Disinfection		LS		3,008.00
Pumping Facilities		LS		417.00
Spray Distribution		LS		3,586.00
Administration & Lab		LS		3,855.00
Monitoring Wells		LS		350.00
Fencing & Roads		LS		5,799.00
Total Annual Material Costs				$122,827.00
ANNUAL POWER COSTS				
Areation Pond (7 day detention)		LS		$9,252.00
Pumping Facilities		LS		6,862.00
Total Annual Power Costs				$16,114.00

SUMMARY OF ANNUAL COSTS

Annual Cost of Construction (Excluding Engineering Cost)		$349,555.19
Annual Cost of Land		183,237.01
Operator Cost		82,367.00
Materials Cost		122,827.00
Power Cost		16,114.00
Total Annual Cost		$754,100.21
PRESENT WORTH		
Interest Rate, %	10	
Life Cycle, Years	20	
Present Worth Factor P/A		8.5136
PRESENT WORTH - COURTHOUSE BAY LAND APPLICATION (Excluding Engineering Cost)		$6,420,080.16

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
				ONSLOW BEACH LAND APPLICATION
CAPITAL COSTS FOR CONSTRUCTION				
Preapplication Treatment		LS		$30,840.00
Areation Pond (7 day detention)		LS		110,028.00
Pumping Facilities		LS		154,200.00
Transmission (6" F.M.)	3,700	LF	31.00	114,700.00
Storage (30 Days)		LS		106,964.00
Disinfection		LS		46,260.00
Pumping Facilities		LS		154,200.00
Field Preparation		LS		13,878.00
Spray Distribution		LS		205,600.00
Administration & Lab		LS		102,800.00
Monitoring Wells		LS		6,271.00
Fencing & Roads		LS		118,220.00
Subtotal Construction Cost				$1,163,961.00
Contingency			20%	232,792.20
TOTAL CONSTRUCTION COST				$1,396,753.20
Engineering			15%	209,512.98
Land	90.00	AC	6,500.00	585,000.00
TOTAL PROJECT COST				2,191,266.18
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$164,062.11
Annual Cost of Land				68,713.88
ANNUAL OPERATOR COSTS				
Preapplication Treatment		LS		$17,990.00
Areation Pond (7 day detention)		LS		14,283.00
Pumping Facilities		LS		1,955.00
Storage (30 Days)		LS		692.00
Disinfection		LS		1,905.00
Pumping Facilities		LS		1,955.00
Spray Distribution		LS		9,437.00
Administration & Lab		LS		7,517.00
Monitoring Wells		LS		823.00
Total Annual Operator Costs				$56,557.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
SCENARIO 5 - INDIVIDUAL LAND APPLICATION FOR ALL PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	ONSLOW BEACH LAND APPLICATION TOTAL
ANNUAL MATERIAL COSTS				
Preapplication Treatment		LS		$2,313.00
Areation Pond (7 day detention)		LS		677.00
Pumping Facilities		LS		151.00
Transmission (6" F.M.)	3,700	LS	7.00	25,900.00
Storage (30 Days)		LS		406.00
Disinfection		LS		1,479.00
Pumping Facilities		LS		151.00
Spray Distribution		LS		1,311.00
Administration & Lab		LS		2,155.00
Monitoring Wells		LS		175.00
Fencing & Roads		LS		2,776.00
Total Annual Material Costs				$37,494.00
ANNUAL POWER COSTS				
Areation Pond (7 day detention)		LS		$3,007.00
Pumping Facilities		LS		2,154.00
Total Annual Power Costs				$5,161.00

SUMMARY OF ANNUAL COSTS

Annual Cost of Construction (Excluding Engineering Cost)		$164,062.11
Annual Cost of Land		68,713.88
Operator Cost		56,557.00
Materials Cost		37,494.00
Power Cost		5,161.00
Total Annual Cost		$331,987.99
PRESENT WORTH		
Interest Rate, %	10	
Life Cycle, Years	20	
Present Worth Factor P/A		8.5136
PRESENT WORTH - ONSLOW BEACH LAND APPLICATION (Excluding Engineering Cost)		$2,826,400.88

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

LIFE CYCLE COST ANALYSIS

TASK 4

PROJECT: CAMP LEJEUNE WWTP MASTER PLAN - PHASE 1 TASK 4 - EVALUATION OF ALTERNATES

SUMMARY OF PRESENT WORTH VALUES (PUMPING & TREATMENT COSTS DISTRIBUTED)

DATE: 08-AUG-1991

ALTERNATE		CAMP GEIGER	CAMP JOHNSON	TARAWA TERRACE	RIFLE RANGE	ONSLOW BEACH	COURTHOUSE BAY	HADNOT POINT	TOTAL
ALTERNATE 1	SECONDARY WWTP & OCEAN OUTFALL FOR ALL FLOWS	$15,285,557	$8,341,931	$9,846,642	$7,793,491	$3,115,539	$5,309,941	$49,935,475	$99,628,576
ALTERNATE 2	JACKSONVILLE, HP UPGRADE & LAND APPLICATION	$18,372,173	$12,097,081	$13,742,813	$4,992,523	$2,755,361	$5,955,803	$66,803,942	$124,719,695
ALTERNATE 3	NEW PLANT AT HADNOT POINT FOR ALL FLOWS	$17,560,791	$9,763,952	$11,624,169	$8,540,052	$3,392,833	$6,163,153	$61,311,647	$118,356,598

FLOW DISTRIBUTION

Plant:	Flow, MGD	All Plants at HP:	North Plants at CJ:	North Plants at TT:	South Plants at CHB:	Hadnot Point and TT:
Hadnot Point	8.000	60.7%	-	-	-	86.5%
Camp Geiger	1.600	12.1%	61.5%	41.6%	-	-
Camp Johnson	1.000	7.6%	38.5%	26.0%	-	-
Tarawa Terrace	1.250	9.5%	-	32.5%	-	13.5%
Rifle Range	0.525	4.0%	-	-	39.8%	-
Onslow Beach	0.195	1.5%	-	-	14.8%	-
Courthouse Bay	0.600	4.6%	-	-	45.5%	-
TOTAL	13.170	100.0%	100.0%	100.0%	100.0%	100.0%

PROJECT: CAMP LEJEUNE WWTP MASTER PLAN - PHASE 1 TASK 4 - EVALUATION OF ALTERNATES

SUMMARY OF PRESENT WORTH VALUES

DATE: 08-AUG-1991

ALTERNATE		CAMP GEIGER	CAMP JOHNSON	TARAWA TERRACE	RIFLE RANGE	ONSLOW BEACH	COURTHOUSE BAY	HADNOT POINT	TOTAL
ALTERNATE 1	SECONDARY WWTP & OCEAN OUTFALL FOR ALL FLOWS	$1,938,468	$1,208,005	$6,296,211	$3,147,293	$1,389,808	$3,442,516	$82,206,276 (See * Below)	$99,628,576
ALTERNATE 2	JACKSONVILLE, HP UPGRADE & LAND APPLICATION	$18,372,173	$12,097,081	$3,304,697	$4,992,523	$2,755,361	$5,955,803	$77,242,057	$124,719,695
ALTERNATE 3	NEW PLANT AT HADNOT POINT FOR ALL FLOWS	$1,938,468	$1,208,005	$6,296,211	$3,147,293	$1,389,808	$3,442,516	$100,934,298	$118,356,598

* HADNOT POINT - ALTERNATE 1

NEW SECONDARY PLANT	$55,233,769
EFF. TO ONSLOW BEACH	$7,761,869
EFF. TO OCEAN OUTFALL	$19,210,638
TOTAL	$82,206,276

PROJECT: CAMP LEJEUNE WWTP MASTER PLAN - PHASE 1 TASK 4 - EVALUATION OF ALTERNATES

SUMMARY OF CONSTRUCTION COSTS (PUMPING & TREATMENT COSTS DISTRIBUTED)

DATE: 08-AUG-1991

ALTERNATE		CAMP GEIGER	CAMP JOHNSON	TARAWA TERRACE	RIFLE RANGE	ONSLOW BEACH	COURTHOUSE BAY	HADNOT POINT	TOTAL
ALTERNATE 1	SECONDARY WWTP & OCEAN OUTFALL FOR ALL FLOWS	$11,667,516	$6,257,872	$7,349,379	$6,389,911	$2,440,896	$3,969,155	$35,358,436	$73,433,165
ALTERNATE 2	JACKSONVILLE, HP UPGRADE & LAND APPLICATION	$309,000	$670,560	$7,614,879	$2,365,506	$1,325,713	$2,745,380	$29,546,746	$44,577,785
ALTERNATE 3	NEW PLANT AT HADNOT POINT FOR ALL FLOWS	$10,393,797	$5,461,798	$6,354,286	$5,971,972	$2,285,661	$3,491,511	$28,989,841	$62,948,865

FLOW DISTRIBUTION Plant:	Flow, MGD	All Plants at HP:	North Plants at CJ:	North Plants at TT:	South Plants at CHB:	Hadnot Point and TT:
Hadnot Point	8.000	60.7%	-	-	-	86.5%
Camp Geiger	1.600	12.1%	61.5%	41.6%	-	-
Camp Johnson	1.000	7.6%	38.5%	26.0%	-	-
Tarawa Terrace	1.250	9.5%	-	32.5%	-	13.5%
Rifle Range	0.525	4.0%	-	-	39.8%	-
Onslow Beach	0.195	1.5%	-	-	14.8%	-
Courthouse Bay	0.600	4.6%	-	-	45.5%	-
TOTAL	13.170	100.0%	100.0%	100.0%	100.0%	100.0%

*PROJECT: CAMP LEJEUNE WWTP MASTER PLAN - PHASE 1 TASK 4 - EVALUATION OF ALTERNATES

SUMMARY OF CONSTRUCTION COSTS (STATEMENT OF PROBABLE CONSTRUCTION COST)

DATE: 08-AUG-1991

ALTERNATE		CAMP GEIGER	CAMP JOHNSON	TARAWA TERRACE	RIFLE RANGE	ONSLOW BEACH	COURTHOUSE BAY	HADNOT POINT	TOTAL
ALTERNATE 1	SECONDARY WWTP & OCEAN OUTFALL FOR ALL FLOWS	$1,654,920	$983,760	$5,619,840	$2,916,900	$1,150,920	$2,898,000	$58,208,825 (See * Below)	$73,433,165
ALTERNATE 2	JACKSONVILLE, HP UPGRADE & LAND APPLICATION	$309,000	$670,560	$2,998,200	$2,365,506	$1,325,713	$2,745,380	$34,163,425	$44,577,785
ALTERNATE 3	NEW PLANT AT HADNOT POINT FOR ALL FLOWS	$1,654,920	$983,760	$5,619,840	$2,916,900	$1,150,920	$2,898,000	$47,724,525	$62,948,865

* HADNOT POINT - ALTERNATE 1

NEW SECONDARY PLANT	$32,672,825
EFF. TO ONSLOW BEACH	$6,468,000
EFF. TO OCEAN OUTFALL	$19,068,000
TOTAL	$58,208,825

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

Task 4 Cost Analysis

Treatment Plants

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 1

DATE: 07-AUG-1991

NEW 15 MGD SECONDARY WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT		LS		833,500.00
PRIMARY TREATMENT		LS		2,342,000.00
SECONDARY TREATMENT		LS		4,922,500.00
ADVANCED TREATMENT		LS		0.00
DISINFECTION AND POST AERATION		LS		1,087,625.00
SOLIDS HANDLING		LS		7,022,500.00
CHEMICAL FEED SYSTEM		LS		365,000.00
WASTEWATER COLLECTION AND PUMPING		LS		61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY		LS		725,000.00
SITE WORK		LS		1,950,000.00
EQUIPMENT BUILDING		LS		1,635,000.00
Subtotal - Bare Construction Cost				20,944,125.00
Contractors Overhead & Profit	(	30%)		6,283,200.00
Contingencies	(	20%)		5,445,500.00
TOTAL CONSTRUCTION COST				$32,672,825.00
Engineering	(	15%)		4,900,900.00
Permits				400,000.00
TOTAL PROJECT COST				37,973,725.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 1

DATE: 07-AUG-1991

NEW 15 MGD SECONDARY WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of WWTP Construction				$3,837,737.76
WWTP O&M COST				
Net Annual Operating Expenses per adjusted EPA curve				$2,650,000.00
Adjustment Factor For Age of Facility				1.00
Total WWTP Annual Maintenance (Incl. Incineration)				$2,650,000.00
SUMMARY OF ANNUAL COSTS				
WWTP Construction				3,837,737.76
WWTP O&M Cost				2,650,000.00
Total Annual Cost				$6,487,737.76
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - NEW 15 MGD WWTP (SECONDARY) (Excluding Engineering and Permit Costs)				$55,233,768.86

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 1

DATE: 07-AUG-1991

NEW 15 MGD SECONDARY WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT				
UPGRADE EXISTING LAGOON PUMP STATION				
Remove Exist. Pumps, Piping, Etc.		LS		50,000.00
Vertical Sewage Pumps	4	EA	30,000	120,000.00
Piping, Valves, & Misc.		LS		30,000.00
Subtotal - Lagoon Pump Station				200,000.00
BAR SCREENS				
Mechanical Bar Screens	2	EA	120,000	240,000.00
Influent Channel Structure		LS		10,000.00
Screenings Conveyor	1	EA	25,000	25,000.00
Screenings Containers	3	EA	2,000	6,000.00
Screenings Bldg. (36' x 36')		LS		55,000.00
Electrical/Mechanical		LS		25,000.00
Subtotal - Bar Screens				361,000.00
AERATED GRIT CHAMBERS				
Chamber Struct. (50' x 10' x 12')	2	EA	27,000	54,000.00
Grit Chamber Equipment	2	EA	65,000	130,000.00
Grit Pumps	3	EA	7,500	22,500.00
Slide Gate	2	EA	8,000	16,000.00
Grates and Handrails		LS		10,000.00
Sluice Gates	2	EA	10,000	20,000.00
Electrical Controls		LS		20,000.00
Subtotal - Grit Chambers				272,500.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 1

DATE: 07-AUG-1991

NEW 15 MGD SECONDARY WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PRIMARY TREATMENT				
PRIMARY CLARIFIERS				
Clarifier Structure	2,800	CY	450	1,260,000.00
Rectangular Clarifier Eqpt.	8	EA	100,000	800,000.00
Primary Sludge Pumps	8	EA	10,000	80,000.00
Grates and Handrails		LS		100,000.00
Sluice Gates	8	EA	9,000	72,000.00
Electrical		LS		30,000.00
Subtotal - Primary Clarifiers				2,342,000.00
SECONDARY TREATMENT				
AERATION BASIN				
Structure (174' x 225' x 16')	3,400	CY	450	1,530,000.00
Miscellaneous Equipment		LS		1,250,000.00
Blowers (300 HP)				
Fine Bubble Aeration System				
Grates and Handrails				
Misc. Mechanical Items				
Subtotal - Aeration Basins				2,780,000.00
SECONDARY DISTRIBUTION BOX				
Structure		LS		35,000.00
Grates and Handrails		LS		7,500.00
Subtotal - Distribution Box				42,500.00
SECONDARY CLARIFIERS				
Clarifier Structure (115' Dia.)	4	EA	290,000	1,160,000.00
Circular Clarifier Equipment	4	EA	170,000	680,000.00
Subtotal - Secondary Clarifiers				1,840,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 1

DATE: 07-AUG-1991

NEW 15 MGD SECONDARY WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
INTERMEDIATE PUMP STATION				
Pump Station Structure		LS		90,000.00
Secondary Effluent Pumps	0	EA	15,000	0.00
Return Sludge Pumps	5	EA	15,000	75,000.00
Digester Overflow Pumps	3	EA	10,000	30,000.00
Piping, Valves, & Misc.		LS		40,000.00
Electrical		LS		25,000.00
Subtotal - Intermediate Pump Station				260,000.00
ADVANCED TREATMENT				
DENITRIFICATION FILTERS				
Filter Assemblies		LS		0.00
Filter Struct. (67' x 80' x 23')	0	CY	450	0.00
Filter Backwash Pumps	0	EA	8,000	0.00
Filter Backwash Collection System		LS		0.00
Subtotal - Denitrification Filters				0.00
DISINFECTION AND POST AERATION				
CHLORINATION SYSTEM				
Chamber Struct. (54' x 142' x 9')	700	CY	450	315,000.00
CL2 Building (54' x 54')		LS		160,000.00
Chlorination Equipment		LS		195,000.00
Treated Wastewater System		LS		60,000.00
Non-Reinforced Conc. Wall	275	CY	275	75,625.00
Mechanical		LS		30,000.00
Electrical		LS		45,000.00
Subtotal - Disinfection and Post Aeration				880,625.00
DECHLORINATION				
Dechlorination Equipment		LS		0.00
Dechlorination Structure		LS		0.00
Misc. Mechanical Items		LS		0.00
Gates				
Valves				
Piping				
Etc.				
Subtotal - Dechlorination				0.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 1

DATE: 07-AUG-1991

NEW 15 MGD SECONDARY WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
POST AERATION				
Structure (26' x 67' x 15')	260	CY	450	117,000.00
Aeration Equipment		LS		60,000.00
Grates and Handrails		LS		10,000.00
Misc. Mechanical Items		LS		20,000.00
Subtotal - Post Aeration				207,000.00
SOLIDS HANDLING				
SOLIDS HANDLING BUILDING				
DAF Units	2	EA	275,000	550,000.00
Belt Filter Presses (2 meter)	4	EA	200,000	800,000.00
Dewatering Sludge Conveyor	1	EA	30,000	30,000.00
Sludge Truck Loading Area		LS		50,000.00
Sludge Pumps	4	EA	25,000	100,000.00
Duplex Sludge Polymer System		LS		50,000.00
Duplex DAF Polymer System		LS		50,000.00
Duplex Compressed Air System		LS		30,000.00
Treated Wastewater Booster Pumps		LS		20,000.00
Solids Handling Bldg. Structure		LS		500,000.00
DAF Odor Control System		LS		100,000.00
Belt Filter Press Odor Control System		LS		100,000.00
Interior Piping		LS		30,000.00
Electrical/Mechanical		LS		250,000.00
Multiple Hearth Incineration		LS		3,800,000.00
Subtotal - Solids Handling				6,460,000.00
AEROBIC DIGESTERS				
Structure (100' x 80' x 27')	950	CY	450	427,500.00
Aeration System		LS		80,000.00
Grates and Handrails		LS		30,000.00
Misc. Mechanical Items		LS		25,000.00
Subtotal - Aerobic Digesters				562,500.00
CHEMICAL FEED SYSTEM				
CHEMICAL FEED BUILDING				
Alum Feed/Storage Equipment		LS		35,000.00
Alum Pumping System		LS		25,000.00
Methanol/Feed Storage Equipment		LS		40,000.00
Methanol Pumping System		LS		25,000.00
Caustic Soda/Feed Storage Equipment		LS		30,000.00
Caustic Soda Pumping System		LS		25,000.00
Chemical Feed Building		LS		150,000.00
Electrical/Mechanical		LS		35,000.00
Subtotal - Chemical Feed Building				365,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 1

DATE: 07-AUG-1991

NEW 15 MGD SECONDARY WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
WASTEWATER COLLECTION AND PUMPING				
PUMP STATION				
Submersible P.S. Structure		LS		30,000.00
Submersible Pumps	2	EA	8,000	16,000.00
Pump Controls		LS		5,000.00
Miscellaneous Items		LS		10,000.00
Subtotal - Wastewater Collection				61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY				
Lab Equipment		LS		250,000.00
Building Structure		LS		400,000.00
Offices & Miscellaneous Items		LS		75,000.00
Subtotal - Admin. Bldg/Lab				725,000.00
SITE WORK				
Yard Piping		LS		950,000.00
Misc. Site Work		LS		1,000,000.00
Subtotal - Site Work				1,950,000.00
EQUIPMENT BUILDING				
Emergency Generators	3	EA	200,000	600,000.00
Equipment Building Structure		LS		375,000.00
Mechanical		LS		40,000.00
Electrical/Control Center		LS		250,000.00
Automatic Transfer Switch	1	EA	20,000	20,000.00
Motor Control Center	1	EA	100,000	100,000.00
Generator System Switchgear	1	EA	250,000	250,000.00
Subtotal - Equipment Building				1,635,000.00
Subtotal - Bare Construction Cost				20,944,125.00
Contractors Overhead & Profit	(	30%)		6,283,200.00
Contingencies	(	20%)		5,445,500.00
TOTAL CONSTRUCTION COST				$32,672,825.00
Engineering	(	15%)		4,900,900.00
Permits				400,000.00
TOTAL PROJECT COST				37,973,725.00

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PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 2

DATE: 07-AUG-1991

UPGRADE EXISTING WWTP TO 10 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT		LS		860,750.00
PRIMARY TREATMENT		LS		987,000.00
SECONDARY TREATMENT		LS		3,785,000.00
ADVANCED TREATMENT		LS		2,632,250.00
DISINFECTION AND POST AERATION		LS		865,625.00
SOLIDS HANDLING		LS		5,297,000.00
CHEMICAL FEED SYSTEM		LS		270,000.00
WASTEWATER COLLECTION AND PUMPING		LS		61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY		LS		700,000.00
SITE WORK		LS		5,476,000.00
EQUIPMENT BUILDING		LS		965,000.00
Subtotal - Bare Construction Cost				21,899,625.00
Contractors Overhead & Profit	(	30%)		6,569,900.00
Contingencies	(	20%)		5,693,900.00
TOTAL CONSTRUCTION COST				34,163,425.00
Engineering	(	15%)		5,124,500.00
Permits				50,000.00
TOTAL PROJECT COST				39,337,925.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 2

DATE: 07-AUG-1991

UPGRADE EXISTING WWTP TO 10 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of WWTP Construction				$4,012,823.08
WWTP O&M COST				
Net Annual Operating Expenses per adjusted EPA curve				$4,400,000.00
Adjustment Factor For Age of Facility				1.15
Total WWTP Annual Maintenance (Incl. Incineration)				$5,060,000.00
SUMMARY OF ANNUAL COSTS				
WWTP Construction				4,012,823.08
WWTP O&M Cost				5,060,000.00
Total Annual Cost				$9,072,823.08
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - UPGRADE EXISTING WWTP TO 10 MGD (ADVANCED) (Excluding Engineering and Permit Costs)				$77,242,057.42

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 2

DATE: 07-AUG-1991

UPGRADE EXISTING WWTP TO 10 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT				
UPGRADE EXISTING INFLUENT PUMP STATION				
Remove Exist. Pumps, Piping, Etc.		LS		40,000.00
Vertical Sewage Pumps	4	EA	30,000	120,000.00
Piping, Valves, & Misc.		LS		30,000.00
Subtotal - Influent Pump Station				190,000.00
EXISTING INF. CHANNEL/GRIT CHAMBER				
Remove Exsting Structure		LS		7,500.00
New 36" RCP	110	LF	75	8,250.00
Misc. Cleanup, etc.		LS		2,500.00
Subtotal - Exist. Influent Channel				18,250.00
UPGRADE EXISTING LAGOON PUMP STATION				
Remove Exist. Pumps, Piping, Etc.		LS		20,000.00
Vertical Sewage Pumps	2	EA	30,000	60,000.00
Piping, Valves, & Misc.		LS		15,000.00
Subtotal - Lagoon Pump Station				95,000.00
BAR SCREENS				
Mechanical Bar Screens	2	EA	100,000	200,000.00
Influent Channel Structure	1	EA	7,500	7,500.00
Screenings Conveyor	1	EA	25,000	25,000.00
Screenings Containers	3	EA	2,000	6,000.00
Screenings Bldg. (36' x 36')		LS		55,000.00
Electrical/Mechanical		LS		10,000.00
Subtotal - Bar Screens				303,500.00
AERATED GRIT CHAMBERS				
Remove Ex. Eqpt. & Modify Structure		LS		5,000.00
New Chamber Struct. (40' x 15' x 7.5')		LS		40,500.00
Grit Chamber Equipment	2	EA	65,000	130,000.00
Grit Pumps	3	EA	7,500	22,500.00
Slide Gate	2	EA	8,000	16,000.00
Grates and Handrails		LS		10,000.00
Sluice Gates	2	EA	10,000	20,000.00
Electrical Controls		LS		10,000.00
Subtotal - Grit Chambers				254,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 2

DATE: 07-AUG-1991

UPGRADE EXISTING WWTP TO 10 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PRIMARY TREATMENT				
UPGRADE EX. PRIMARY CLARIFIERS				
Extend Clarifier Structure by 25'		LS		50,000.00
Rectangular Clarifier Eqpt.	8	EA	80,000	640,000.00
Primary Sludge Pumps	4	EA	10,000	40,000.00
Grates and Handrails		LS		50,000.00
Sluice Gates	8	EA	9,000	72,000.00
Electrical		LS		15,000.00
Subtotal - Primary Clarifiers				867,000.00
UPGRADE EX. PRIMARY EFFLUENT PUMPS				
Pumps	4	EA	25,000	100,000.00
Piping, Valves, & Misc.		LS		20,000.00
Subtotal - Primary Eff. P.S.				120,000.00
SECONDARY TREATMENT				
a2o PROCESS				
Structure (174' x 170' x 16')	2,900	CY	450	1,305,000.00
Miscellaneous Equipment, incl:		LS		1,500,000.00
Blowers (250 HP)	3	EA		
Fine Bubble Aeration System				
Grates and Handrails				
Misc. Mechanical Items				
Mixers				
Recycle Pumps				
Licensing Fee				
Subtotal - a2o Process				2,805,000.00
SECONDARY CLARIFIERS				
Remove Ex. Trickling Filters		LS		40,000.00
Clarifier Structure (100' Dia.)	2	EA	260,000	520,000.00
Circular Clarifier Equipment	2	EA	155,000	310,000.00
Subtotal - Secondary Clarifiers				870,000.00
RETURN SLUDGE PUMP STATION				
Modify Ex. Pump Station Structure		LS		15,000.00
Remove Ex. Pumps (4)		LS		5,000.00
New Return Sludge Pumps	4	EA	17,500	70,000.00
Piping, Valves, & Misc.		LS		10,000.00
Electrical		LS		10,000.00
Subtotal - Return Sludge Pump Station				110,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 2

DATE: 07-AUG-1991

UPGRADE EXISTING WWTP TO 10 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ADVANCED TREATMENT				
SECONDARY EFFLUENT PUMP STATION				
Remove Ex. Dist. Box & Piping		LS		10,000.00
New Pump Station Structure		LS		25,000.00
Secondary Effluent Pumps	3	EA	12,500	37,500.00
Piping, Valves, & Misc.		LS		10,000.00
Electrical		LS		10,000.00
Subtotal - Secondary Effluent Pump Station				82,500.00
DENITRIFICATION FILTERS				
Filter Assemblies		LS		2,200,000.00
Filter Struct. (67' x 64' x 23')	725	CY	450	326,250.00
Filter Backwash Pumps	2	EA	8,000	16,000.00
Filter Backwash Collection System		LS		7,500.00
Subtotal - Denitrification Filters				2,549,750.00
DISINFECTION AND POST AERATION				
CHLORINATION SYSTEM				
Chamber Struct. (40' x 120' x 9')	450	CY	450	202,500.00
CL2 Building (40' x 45')		LS		100,000.00
Chlorination Equipment		LS		130,000.00
Treated Wastewater System		LS		50,000.00
Non-Reinforced Conc. Wall	175	CY	275	48,125.00
Mechanical		LS		25,000.00
Electrical		LS		30,000.00
Subtotal - Chlorination System				585,625.00
DECHLORINATION & POST-AERATION				
Modify Ex. Chlorine Basin Structure		LS		50,000.00
Convert Ex. Chlorine Bldg. to Storage		LS		15,000.00
Dechlorination Equipment		LS		125,000.00
Aeration Equipment		LS		45,000.00
Grates and Handrails		LS		15,000.00
Misc. Mechanical Items		LS		30,000.00
Subtotal - Dechlorination & Post-Aeration				280,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 2

DATE: 07-AUG-1991

UPGRADE EXISTING WWTP TO 10 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
SOLIDS HANDLING				
SOLIDS HANDLING BUILDING				
DAF Units	2	EA	275,000	550,000.00
Belt Filter Presses (2 meter)	3	EA	200,000	600,000.00
Dewatering Sludge Conveyor	1	EA	30,000	30,000.00
Sludge Truck Loading Area		LS		40,000.00
Sludge Pumps	3	EA	25,000	75,000.00
Duplex Sludge Polymer System		LS		40,000.00
Duplex DAF Polymer System		LS		40,000.00
Duplex Compressed Air System		LS		30,000.00
Treated Wastewater Booster Pumps		LS		15,000.00
Solids Handling Bldg. Structure		LS		500,000.00
DAF Odor Control System		LS		100,000.00
Belt Filter Press Odor Control System		LS		80,000.00
Blowers (250 HP) & Aeration System		LS		450,000.00
Interior Piping		LS		30,000.00
Electrical/Mechanical		LS		250,000.00
Multiple Hearth Incineration		LS		2,400,000.00
Subtotal - Solids Handling				5,230,000.00
AEROBIC DIGESTERS				
Convert Ex. Anaerobic to Aerobic		LS		42,000.00
Misc. Mechanical Items		LS		25,000.00
Subtotal - Aerobic Digesters				67,000.00
CHEMICAL FEED SYSTEM				
CHEMICAL FEED BUILDING				
Alum Feed/Storage Equipment		LS		25,000.00
Alum Pumping System		LS		17,500.00
Methanol/Feed Storage Equipment		LS		27,500.00
Methanol Pumping System		LS		17,500.00
Caustic Soda/Feed Storage Equipment		LS		20,000.00
Caustic Soda Pumping System		LS		17,500.00
Chemical Feed Building		LS		120,000.00
Electrical/Mechanical		LS		25,000.00
Subtotal - Chemical Feed Building				270,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 2

DATE: 07-AUG-1991

UPGRADE EXISTING WWTP TO 10 MGD (ADVANCED)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
WASTEWATER COLLECTION AND PUMPING				
PUMP STATION				
Submersible P.S. Structure		LS		30,000.00
Submersible Pumps	2	EA	8,000	16,000.00
Pump Controls		LS		5,000.00
Miscellaneous Items		LS		10,000.00
Subtotal - Wastewater Collection				61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY				
Lab Equipment		LS		300,000.00
Building Structure		LS		350,000.00
Offices & Miscellaneous Items		LS		50,000.00
Subtotal - Admin. Bldg/Lab				700,000.00
SITE WORK				
Yard Piping		LS		600,000.00
Connection to Exist. Outfall	1	EA	1,000	1,000.00
36" DIP Stream Crossing	5,500	LF	750	4,125,000.00
Misc. Site Work		LS		750,000.00
Abandon Ex. Sludge Drying Beds				
Abandon/Remove Ex. Piping				
Subtotal - Site Work				5,476,000.00
EMERGENCY POWER				
Modify Ex. Structure		LS		40,000.00
Remove Ex. Generators		LS		25,000.00
New Emergency Generators	2	EA	200,000	400,000.00
Mechanical		LS		25,000.00
Electrical/Control Center		LS		175,000.00
Automatic Transfer Switch	1	EA	20,000	20,000.00
Motor Control Center	1	EA	80,000	80,000.00
Generator System Switchgear	1	EA	200,000	200,000.00
Subtotal - Equipment Building				965,000.00
Subtotal - Bare Construction Cost				21,899,625.00
Contractors Overhead & Profit		(	30%)	6,569,900.00
Contingencies		(	20%)	5,693,900.00
TOTAL CONSTRUCTION COST				$34,163,425.00
Engineering		(	15%)	5,124,500.00
Permits				50,000.00
TOTAL PROJECT COST				39,337,925.00

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PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 3

DATE: 07-AUG-1991

NEW 15 MGD ADVANCED WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT		LS		833,500.00
PRIMARY TREATMENT		LS		2,342,000.00
SECONDARY TREATMENT		LS		5,877,500.00
ADVANCED TREATMENT		LS		3,178,500.00
DISINFECTION AND POST AERATION		LS		1,307,625.00
SOLIDS HANDLING		LS		7,022,500.00
CHEMICAL FEED SYSTEM		LS		365,000.00
WASTEWATER COLLECTION AND PUMPING		LS		61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY		LS		825,000.00
SITE WORK		LS		7,145,000.00
EQUIPMENT BUILDING		LS		1,635,000.00
Subtotal - Bare Construction Cost				30,592,625.00
Contractors Overhead & Profit	(30%)			9,177,800.00
Contingencies	(20%)			7,954,100.00
TOTAL CONSTRUCTION COST				$47,724,525.00
Engineering	(15%)			7,158,700.00
Permits				50,000.00
TOTAL PROJECT COST				54,933,225.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 3

DATE: 07-AUG-1991

NEW 15 MGD ADVANCED WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of WWTP Construction				$5,605,704.80
WWTP O&M COST				
Net Annual Operating Expenses per adjusted EPA curve				$6,250,000.00
Adjustment Factor For Age of Facility				1.00
Total WWTP Annual Maintenance (Incl. Incineration)				$6,250,000.00
SUMMARY OF ANNUAL COSTS				
WWTP Construction				5,605,704.80
WWTP O&M Cost				6,250,000.00
Total Annual Cost				$11,855,704.80
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - NEW 15 MGD WWTP (ADVANCED) (Excluding Engineering and Permit Costs)				$100,934,298.25

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 3

DATE: 07-AUG-1991

NEW 15 MGD ADVANCED WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PRELIMINARY TREATMENT				
UPGRADE EXISTING LAGOON PUMP STATION				
Remove Exist. Pumps, Piping, Etc.		LS		50,000.00
Vertical Sewage Pumps	4	EA	30,000	120,000.00
Piping, Valves, & Misc.		LS		30,000.00
Subtotal - Lagoon Pump Station				200,000.00
BAR SCREENS				
Mechanical Bar Screens	2	EA	120,000	240,000.00
Influent Channel Structure		LS		10,000.00
Screenings Conveyor	1	EA	25,000	25,000.00
Screenings Containers	3	EA	2,000	6,000.00
Screenings Bldg. (36' x 36')		LS		55,000.00
Electrical/Mechanical		LS		25,000.00
Subtotal - Bar Screens				361,000.00
AERATED GRIT CHAMBERS				
Chamber Struct. (50' x 10' x 12	2	EA	27,000	54,000.00
Grit Chamber Equipment	2	EA	65,000	130,000.00
Grit Pumps	3	EA	7,500	22,500.00
Slide Gate	2	EA	8,000	16,000.00
Grates and Handrails		LS		10,000.00
Sluice Gates	2	EA	10,000	20,000.00
Electrical Controls		LS		20,000.00
Subtotal - Grit Chambers				272,500.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 3

DATE: 07-AUG-1991

NEW 15 MGD ADVANCED WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PRIMARY TREATMENT				
PRIMARY CLARIFIERS				
Clarifier Structure	2,800	CY	450	1,260,000.00
Rectangular Clarifier Eqpt.	8	EA	100,000	800,000.00
Primary Sludge Pumps	8	EA	10,000	80,000.00
Grates and Handrails		LS		100,000.00
Sluice Gates	8	EA	9,000	72,000.00
Electrical		LS		30,000.00
Subtotal - Primary Clarifiers				2,342,000.00
SECONDARY TREATMENT				
a2o PROCESS				
Structure (174' x 225' x 16')	3,800	CY	450	1,710,000.00
Miscellaneous Equipment		LS		1,950,000.00
Blowers (300 HP)	5	EA		
Fine Bubble Aeration System				
Grates and Handrails				
Misc. Mechanical Items				
Mixers	12	EA		
Recycle Pumps	4	EA		
Licensing Fee				
Subtotal - a2o Process				3,660,000.00
SECONDARY DISTRIBUTION BOX				
Structure		LS		35,000.00
Grates and Handrails		LS		7,500.00
Subtotal - Distribution Box				42,500.00
SECONDARY CLARIFIERS				
Clarifier Structure (115' Dia.)	4	EA	290,000	1,160,000.00
Circular Clarifier Equipment	4	EA	170,000	680,000.00
Subtotal - Secondary Clarifiers				1,840,000.00

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

Task 4 Cost Analysis

Pumping Routes

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 3

DATE: 07-AUG-1991

NEW 15 MGD ADVANCED WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
INTERMEDIATE PUMP STATION				
Pump Station Structure		LS		90,000.00
Secondary Effluent Pumps	5	EA	15,000	75,000.00
Return Sludge Pumps	5	EA	15,000	75,000.00
Digester Overflow Pumps	3	EA	10,000	30,000.00
Piping, Valves, & Misc.		LS		40,000.00
Electrical		LS		25,000.00
Subtotal - Intermediate Pump Station				335,000.00
ADVANCED TREATMENT				
DENITRIFICATION FILTERS				
Filter Assemblies		LS		2,750,000.00
Filter Struct. (67' x 80' x 23'	900	CY	450	405,000.00
Filter Backwash Pumps	2	EA	8,000	16,000.00
Filter Backwash Collection System		LS		7,500.00
Subtotal - Denitrification Filters				3,178,500.00
DISINFECTION AND POST AERATION				
CHLORINATION SYSTEM				
Chamber Struct. (54' x 142' x 9	700	CY	450	315,000.00
CL2 Building (54' x 54')		LS		160,000.00
Chlorination Equipment		LS		195,000.00
Treated Wastewater System		LS		60,000.00
Non-Reinforced Conc. Wall	275	EA	275	75,625.00
Mechanical		LS		30,000.00
Electrical		LS		45,000.00
Subtotal - Disinfection and Post Aeration				880,625.00
DECHLORINATION				
Dechlorination Equipment		LS		170,000.00
Dechlorination Structure		LS		30,000.00
Misc. Mechanical Items		LS		20,000.00
Gates				
Valves				
Piping				
Etc.				
Subtotal - Dechlorination				220,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 3

DATE: 07-AUG-1991

NEW 15 MGD ADVANCED WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
POST AERATION				
Structure (26' x 67' x 15')	260	CY	450	117,000.00
Aeration Equipment		LS		60,000.00
Grates and Handrails		LS		10,000.00
Misc. Mechanical Items		LS		20,000.00
Subtotal - Post Aeration				207,000.00
SOLIDS HANDLING				
SOLIDS HANDLING BUILDING				
DAF Units	2	EA	275,000	550,000.00
Belt Filter Presses (2 meter)	4	EA	200,000	800,000.00
Dewatering Sludge Conveyor	1	EA	30,000	30,000.00
Sludge Truck Loading Area		LS		50,000.00
Sludge Pumps	4	EA	25,000	100,000.00
Duplex Sludge Polymer System		LS		50,000.00
Duplex DAF Polymer System		LS		50,000.00
Duplex Compressed Air System		LS		30,000.00
Treated Wastewater Booster Pumps		LS		20,000.00
Solids Handling Bldg. Structure		LS		500,000.00
DAF Odor Control System		LS		100,000.00
Belt Filter Press Odor Control System		LS		100,000.00
Interior Piping		LS		30,000.00
Electrical/Mechanical		LS		250,000.00
Multiple Hearth Incineration		LS		3,800,000.00
Subtotal - Solids Handling				6,460,000.00
AEROBIC DIGESTERS				
Structure (100' x 80' x 27')	950	CY	450	427,500.00
Aeration System		LS		80,000.00
Grates and Handrails		LS		30,000.00
Misc. Mechanical Items		LS		25,000.00
Subtotal - Aerobic Digesters				562,500.00
CHEMICAL FEED SYSTEM				
CHEMICAL FEED BUILDING				
Alum Feed/Storage Equipment		LS		35,000.00
Alum Pumping System		LS		25,000.00
Methanol/Feed Storage Equipment		LS		40,000.00
Methanol Pumping System		LS		25,000.00
Caustic Soda/Feed Storage Equipment		LS		30,000.00
Caustic Soda Pumping System		LS		25,000.00
Chemical Feed Building		LS		150,000.00
Electrical/Mechanical		LS		35,000.00
Subtotal - Chemical Feed Building				365,000.00

PROJECT: CAMP LEJEUNE WWTP STUDY
WWTP STATEMENT OF PROBABLE CONSTRUCTION COST
TASK 4 - ALTERNATE 3

DATE: 07-AUG-1991

NEW 15 MGD ADVANCED WWTP

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
WASTEWATER COLLECTION AND PUMPING				
PUMP STATION				
Submersible P.S. Structure		LS		30,000.00
Submersible Pumps	2	EA	8,000	16,000.00
Pump Controls		LS		5,000.00
Miscellaneous Items		LS		10,000.00
Subtotal - Wastewater Collection				61,000.00
ADMINISTRATIVE BLDG./PLANT LABORATORY				
Lab Equipment		LS		300,000.00
Building Structure		LS		450,000.00
Offices & Miscellaneous Items		LS		75,000.00
Subtotal - Admin. Bldg/Lab				825,000.00
SITE WORK				
Yard Piping		LS		1,200,000.00
36" DIP Outfall	2,800	LF	150	420,000.00
36" DIP Stream Crossing	5,500	LF	750	4,125,000.00
Misc. Site Work		LS		1,400,000.00
Subtotal - Site Work				7,145,000.00
EQUIPMENT BUILDING				
Emergency Generators	3	EA	200,000	600,000.00
Equipment Building Structure		LS		375,000.00
Mechanical		LS		40,000.00
Electrical/Control Center		LS		250,000.00
Automatic Transfer Switch	1	EA	20,000	20,000.00
Motor Control Center	1	EA	100,000	100,000.00
Generator System Switchgear	1	EA	250,000	250,000.00
Subtotal - Equipment Building				1,635,000.00
Subtotal - Bare Construction Cost				30,592,625.00
Contractors Overhead & Profit		(30%)		9,177,800.00
Contingencies		(20%)		7,954,100.00
TOTAL CONSTRUCTION COST				$47,724,525.00
Engineering		(15%)		7,158,700.00
Permits				50,000.00
TOTAL PROJECT COST				54,933,225.00

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PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATES 1 & 3 - ALL FLOWS TO HADNOT POINT

DATE: 07-AUG-1991

ALTERNATES 1 & 3 - CAMP GEIGER TO CAMP JOHNSON

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
60 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		282,500.00
Odor Control Equipment, Installed		LS		71,600.00
Subtotal - Pump Station				354,100.00
FORCE MAIN				
20" DIP	11,750	LF	40.00	470,000.00
Stream Crossing	1,350	LF	400.00	540,000.00
Bored Crossing (RR)	50	LF	300.00	15,000.00
Subtotal - Force Main				1,025,000.00
Subtotal Construction Cost				$1,379,100.00
Contingencies			20%	275,820.00
TOTAL CONSTRUCTION COST				$1,654,920.00
Engineering			15%	248,238.00
TOTAL PROJECT COST				1,903,158.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$194,386.28

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATES 1 & 3 - ALL FLOWS TO HADNOT POINT

DATE: 07-AUG-1991

ALTERNATES 1 & 3 - CAMP GEIGER TO CAMP JOHNSON

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance		LS		$4,000.00
PUMP STATION POWER COST				
Pump Horsepower				60
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			67	640
O/C Horsepower				30
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			30	720
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$44.31
O/C Energy Cost/Day				$35.98
PS Annual Power Cost				$29,305.40
SUMMARY OF ANNUAL COSTS				
Construction: Pump Stations & Force Mains				194,386.28
Pump Station Maintenance				4,000.00
PS Power Cost				29,305.40
Total Annual Cost				$227,691.68
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - CAMP GEIGER TO CAMP JOHNSON (Excluding Engineering Cost)				$1,938,467.61

ALTERNATES 1 & 3 - CAMP JOHNSON TO TARAWA TERRACE				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
60 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		282,500.00
Odor Control Equipment, Installed		LS		29,800.00
Subtotal - Pump Station				312,300.00
FORCE MAIN				
24" DIP	7,650	LF	50.00	382,500.00
Stream Crossing	250	LF	500.00	125,000.00
Subtotal - Force Main				507,500.00
Subtotal Construction Cost				$819,800.00
Contingencies			20%	163,960.00
TOTAL CONSTRUCTION COST				$983,760.00
Engineering			15%	147,564.00
TOTAL PROJECT COST				1,131,324.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$115,552.08

ALTERNATES 1 & 3 - CAMP JOHNSON TO TARAWA TERRACE				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance		LS		$3,600.00
PUMP STATION POWER COST				
Pump Horsepower				60
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			67	640
O/C Horsepower				15
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			15	360
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$44.31
O/C Energy Cost/Day				$17.99
PS Annual Power Cost				$22,739.70
SUMMARY OF ANNUAL COSTS				
Construction: Pump Stations & Force Mains				115,552.08
Pump Station Maintenance				3,600.00
PS Power Cost				22,739.70
Total Annual Cost				$141,891.78
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - CAMP JOHNSON TO TARAWA TERRACE (Excluding Engineering Cost)				$1,208,004.74

ALTERNATES 1 & 3 - TARAWA TERRACE TO HADNOT POINT ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
180 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		680,000.00
Odor Control Equipment, Installed		LS		108,200.00
Subtotal - Pump Station				788,200.00
FORCE MAIN				
30" DIP	6,000	LF	65.00	390,000.00
30" DIP (Congested Area)	22,900	LF	75.00	1,717,500.00
Stream Crossing	2,950	LF	600.00	1,770,000.00
Bored Crossing (Street)	50	LF	350.00	17,500.00
Subtotal - Force Main				3,895,000.00
Subtotal Construction Cost				$4,683,200.00
Contingencies			20%	936,640.00
TOTAL CONSTRUCTION COST				$5,619,840.00
Engineering			15%	842,976.00
TOTAL PROJECT COST				6,462,816.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$660,104.30

ALTERNATES 1 & 3 - TARAWA TERRACE TO HADNOT POINT				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance		LS		$6,850.00
PUMP STATION POWER COST				
Pump Horsepower				180
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			200	1920
O/C Horsepower				55
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			55	1320
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$132.94
O/C Energy Cost/Day				$65.96
PS Annual Power Cost				$72,596.24
SUMMARY OF ANNUAL COSTS				
Construction: Pump Stations & Force Mains				660,104.30
Pump Station Maintenance				6,850.00
PS Power Cost				72,596.24
Total Annual Cost				$739,550.53
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - TARAWA TERRACE TO HADNOT POINT (Excluding Engineering Cost)				$6,296,210.60

ALTERNATES 1 & 3 - RIFLE RANGE TO COURTHOUSE BAY				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
45 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		175,000.00
Odor Control Equipment, Installed		LS		72,000.00
Subtotal - Pump Station				247,000.00
FORCE MAIN				
12" DIP	18,150	LF	25.00	453,750.00
Stream Crossing	11,500	LF	150.00	1,725,000.00
Bored Crossing (Street)	50	LF	100.00	5,000.00
Subtotal - Force Main				2,183,750.00
Subtotal Construction Cost				$2,430,750.00
Contingencies			20%	486,150.00
TOTAL CONSTRUCTION COST				$2,916,900.00
Engineering			15%	437,535.00
TOTAL PROJECT COST				3,354,435.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$342,617.98

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ALTERNATES 1 & 3 - RIFLE RANGE TO COURTHOUSE BAY				
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance		LS		$1,800.00
PUMP STATION POWER COST				
Pump Horsepower				45
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			50	480
O/C Horsepower				30
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			30	720
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$33.23
O/C Energy Cost/Day				$35.98
PS Annual Power Cost				$25,261.89
SUMMARY OF ANNUAL COSTS				
Construction: Pump Stations & Force Mains				342,617.98
Pump Station Maintenance				1,800.00
PS Power Cost				25,261.89
Total Annual Cost				$369,679.87
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - RIFLE RANGE TO COURTHOUSE BAY (Excluding Engineering Cost)				$3,147,293.15

ALTERNATES 1 & 3 - ONSLOW BEACH TO COURTHOUSE BAY				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
50 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		165,000.00
Odor Control Equipment, Installed		LS		71,600.00
Subtotal - Pump Station				236,600.00
FORCE MAIN				
8" DIP	33,000	LF	20.00	660,000.00
Stream Crossing	500	LF	125.00	62,500.00
Subtotal - Force Main				722,500.00
Subtotal Construction Cost				$959,100.00
Contingencies			20%	191,820.00
TOTAL CONSTRUCTION COST				$1,150,920.00
Engineering			15%	172,638.00
TOTAL PROJECT COST				1,323,558.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$135,186.63

ALTERNATES 1 & 3 - ONSLOW BEACH TO COURTHOUSE BAY				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance		LS		$1,450.00
PUMP STATION POWER COST				
Pump Horsepower				50
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			56	533
O/C Horsepower				30
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			30	720
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$36.93
O/C Energy Cost/Day				$35.98
PS Annual Power Cost				$26,609.73
SUMMARY OF ANNUAL COSTS				
Construction: Pump Stations & Force Mains				135,186.63
Pump Station Maintenance				1,450.00
PS Power Cost				26,609.73
Total Annual Cost				$163,246.36
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - ONSLOW BEACH TO COURTHOUSE BAY (Excluding Engineering Cost)				$1,389,808.28

ALTERNATES 1 & 3 - COURTHOUSE BAY TO HADNOT POINT

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
125 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		475,000.00
Odor Control Equipment, Installed		LS		150,000.00
Subtotal - Pump Station				625,000.00
FORCE MAIN				
18" DIP	47,000	LF	35.00	1,645,000.00
Stream Crossing	400	LF	300.00	120,000.00
Bored Crossing (Street)	100	LF	250.00	25,000.00
Subtotal - Force Main				1,790,000.00
Subtotal Construction Cost				$2,415,000.00
Contingencies			20%	483,000.00
TOTAL CONSTRUCTION COST				$2,898,000.00
Engineering			15%	434,700.00
TOTAL PROJECT COST				3,332,700.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$340,397.99

ALTERNATES 1 & 3 - COURTHOUSE BAY TO HADNOT POINT				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance		LS		$4,000.00
PUMP STATION POWER COST				
Pump Horsepower				125
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			139	1333
O/C Horsepower				60
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			60	1440
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$92.32
O/C Energy Cost/Day				$71.95
PS Annual Power Cost				$59,958.63
SUMMARY OF ANNUAL COSTS				
Construction: Pump Stations & Force Mains				340,397.99
Pump Station Maintenance				4,000.00
PS Power Cost				59,958.63
Total Annual Cost				$404,356.62
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - COURTHOUSE BAY TO HADNOT POINT(VIA GRAVITY LINE) (Excluding Engineering Cost)				$3,442,515.84

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATE 1 - OCEAN OUTFALL FOR ALL FLOWS

DATE: 07-AUG-1991

ALTERNATE 1 - HADNOT POINT TO ONSLOW BEACH

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
280 HP Triplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		1,520,000.00
Subtotal - Pump Station				1,520,000.00
FORCE MAIN				
36" DIP	43,000	LF	75.00	3,225,000.00
Stream Crossing	800	LF	750.00	600,000.00
Bored Crossing (RR)	100	LF	450.00	45,000.00
Subtotal - Force Main				3,870,000.00
Subtotal Construction Cost				$5,390,000.00
Contingencies			20%	1,078,000.00
TOTAL CONSTRUCTION COST				$6,468,000.00
Engineering			15%	970,200.00
TOTAL PROJECT COST				7,438,200.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$759,728.85

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATE 1 - OCEAN OUTFALL FOR ALL FLOWS

DATE: 07-AUG-1991

ALTERNATE 1 - HADNOT POINT TO ONSLOW BEACH

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST				
Total Pump Station Annual Maintenance		LS		$15,800.00
PUMP STATION POWER COST				
Pump Horsepower				280
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				24.00
Pump Energy Required, kw & kwh			311	7467
O/C Horsepower				0
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			0	0
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$373.09
O/C Energy Cost/Day				$0.00
PS Annual Power Cost				$136,177.34
SUMMARY OF ANNUAL COSTS				
Construction: Pump Stations & Force Mains				759,728.85
Pump Station Maintenance				15,800.00
PS Power Cost				136,177.34
Total Annual Cost				$911,706.19
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - HADNOT POINT TO ONSLOW BEACH (Excluding Engineering Cost)				$7,761,868.74

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

Task 4 Cost Analysis

Land Application

ALTERNATE 1 - OCEAN OUTFALL ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
OCEAN OUTFALL COST				
FORCE MAIN TERMINUS				
Aeration Equipment, Installed		LS		50,000.00
Subtotal				50,000.00
GRAVITY LINE				
36" RCP Ocean Outfall	7,920	LF	2,000.00	15,840,000.00
Subtotal - Piping				15,840,000.00
Subtotal Construction Cost				$15,890,000.00
Contingencies			20%	3,178,000.00
TOTAL CONSTRUCTION COST				$19,068,000.00
Engineering			15%	2,860,200.00
TOTAL PROJECT COST				21,928,200.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$2,239,720.13

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
ALTERNATE 1 - OCEAN OUTFALL				
MAINTENANCE COST				
Total Annual Maintenance		LS		$8,000.00
POWER COST				
Aeration Horsepower				15
Aeration Motor Efficiency, %				75
Aeration Run Time, hrs/day				24.00
Aeration Energy Required, kw & kwh			20	480
Cost/kw & Cost/kwh			0.31	0.04
Aeration Energy Cost/Day				$23.98
Annual Power Cost				$8,754.26
SUMMARY OF ANNUAL COSTS				
Construction				2,239,720.13
Maintenance				8,000.00
Power Cost				8,754.26
Total Annual Cost				$2,256,474.38
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - OCEAN OUTFALL (Excluding Engineering Cost)				$19,210,638.44

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATE 2 - CAMP GEIGER & CAMP JOHNSON TO JACKSONVILLE
TARAWA TERRACE TO HADNOT POINT

DATE: 07-AUG-1991

ALTERNATE 2 - CAMP GEIGER TO JACKSONVILLE

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
15 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		150,000.00
Subtotal - Pump Station				150,000.00
FORCE MAIN				
(Retain Existing)				
Subtotal - Force Main				0.00
OFFSITE PIPING				
18" Gravity Sewer	1,200	LF	75.00	90,000.00
Bored Crossing (RR)	50	LF	250.00	12,500.00
Flow Meter		LS		5,000.00
Subtotal - Offsite Piping				107,500.00
Subtotal Construction Cost				$257,500.00
Contingencies			20%	51,500.00
TOTAL CONSTRUCTION COST				$309,000.00
Engineering			15%	46,350.00
TOTAL PROJECT COST				355,350.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$36,295.02

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATE 2 - CAMP GEIGER & CAMP JOHNSON TO JACKSONVILLE
TARAWA TERRACE TO HADNOT POINT

DATE: 07-AUG-1991

ALTERNATE 2 - CAMP GEIGER TO JACKSONVILLE

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST		LS		$3,250.00
Effluent Monitoring Annual Cost		LS		$12,000.00
Total Pump Station Annual Maintenance				$15,250.00
PUMP STATION POWER COST				
Pump Horsepower				15
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			17	160
O/C Horsepower				0
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			0	0
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$11.08
O/C Energy Cost/Day				$0.00
PS Annual Power Cost				$4,043.50
CITY OF JACKSONVILLE SEWER FEES				
Daily Debt Recovery Charge	1,600.00	KGAL	2.03	3,248.00
Daily Variable Sewer Charge	1,600.00	KGAL	1.57	2,512.00
Annual Jacksonville Fees				$2,102,400.00
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				36,295.02
Pump Station Maintenance				15,250.00
PS Power Cost				4,043.50
City of Jacksonville Sewer Fees				2,102,400.00
Total Annual Cost				$2,157,988.53
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - CAMP GEIGER TO JACKSONVILLE (Excluding Engineering Cost)				$18,372,172.83

ALTERNATE 2 - CAMP JOHNSON TO JACKSONVILLE				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
25 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		172,500.00
Odor Control Equipment, Installed		LS		29,800.00
Subtotal - Pump Station				202,300.00
FORCE MAIN				
16" DIP	8,550	LF	30.00	256,500.00
Subtotal - Force Main				256,500.00
OFFSITE PIPING				
18" Gravity Sewer	600	LF	75.00	45,000.00
Bored Crossing (Street)	200	LF	250.00	50,000.00
Flow Meter		LS		5,000.00
Subtotal - Offsite Piping				100,000.00
Subtotal Construction Cost				$558,800.00
Contingencies			20%	111,760.00
TOTAL CONSTRUCTION COST				$670,560.00
Engineering			15%	100,584.00
TOTAL PROJECT COST				771,144.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$78,763.73

ALTERNATE 2 - CAMP JOHNSON TO JACKSONVILLE				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST		LS		$2,850.00
Effluent Monitoring Annual Cost		LS		$12,000.00
Total Pump Station Annual Maintenance				$14,850.00
PUMP STATION POWER COST				
Pump Horsepower				25
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			28	267
O/C Horsepower				15
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			15	360
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$18.46
O/C Energy Cost/Day				$17.99
PS Annual Power Cost				$13,304.86
CITY OF JACKSONVILLE SEWER FEES				
Daily Debt Recovery Charge	1,000.00	KGAL	2.03	2,030.00
Daily Variable Sewer Charge	1,000.00	KGAL	1.57	1,570.00
Annual Jacksonville Fees				$1,314,000.00
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				78,763.73
Pump Station Maintenance				14,850.00
PS Power Cost				13,304.86
City of Jacksonville Sewer Fees				1,314,000.00
Total Annual Cost				$1,420,918.59
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - CAMP JOHNSON TO JACKSONVILLE (Excluding Engineering Cost)				$12,097,080.95

ALTERNATE 2 - TARAWA TERRACE TO HADNOT POINT (EXISTING WWTP UPGRADE)				
ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
PUMP STATION & PIPING COST				
PUMP STATION				
70 HP Duplex Pump Station Wet well / dry pit installation, incl: piping, valves, controls, electrical & standby power.		LS		375,000.00
Odor Control Equipment, Installed		LS		72,000.00
Subtotal - Pump Station				447,000.00
FORCE MAIN				
18" DIP	6,000	LF	35.00	210,000.00
18" DIP (Congested Area)	23,600	LF	40.00	944,000.00
Stream Crossing	2,950	LF	300.00	885,000.00
Bored Crossing (Street)	50	LF	250.00	12,500.00
Subtotal - Force Main				2,051,500.00
Subtotal Construction Cost				$2,498,500.00
Contingencies			20%	499,700.00
TOTAL CONSTRUCTION COST				$2,998,200.00
Engineering			15%	449,730.00
TOTAL PROJECT COST				3,447,930.00
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Pump Station & Piping Construction				$352,167.45

ALTERNATE 2 - TARAWA TERRACE TO HADNOT POINT (EXISTING WWTP UPGRADE)

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
PUMP STATION MAINTENANCE COST		LS		
Total Pump Station Annual Maintenance				$4,000.00
PUMP STATION POWER COST				
Pump Horsepower				70
Pump Motor Efficiency, %				90
Pump Run Time, hrs/day				9.60
Pump Energy Required, kw & kwh			78	747
O/C Horsepower				30
O/C Motor Efficiency, %				75
O/C Run Time, hrs/day				24.00
O/C Energy Required, kw & kwh			30	720
Cost/kw & Cost/kwh			0.31	0.04
Pump Energy Cost/Day				$51.70
O/C Energy Cost/Day				$35.98
PS Annual Power Cost				$32,001.06
SUMMARY OF ANNUAL COSTS				
Gravity Sewers, Pump Stations & Force Mains				352,167.45
Pump Station Maintenance				4,000.00
PS Power Cost				32,001.06
Total Annual Cost				$388,168.51
PRESENT WORTH				
Interest Rate, %	10			
Life Cycle, Years	20			
Present Worth Factor P/A				8.5136
PRESENT WORTH - TARAWA TERRACE TO HADNOT POINT (Excluding Engineering Cost)				$3,304,697.35

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATE 2 - INDIVIDUAL LAND APPLICATION FOR SOUTHERN PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	RIFLE RANGE LAND APPLICATION UNIT PRICE	TOTAL
CAPITAL COSTS FOR CONSTRUCTION				
Preapplication Treatment		LS		$51,400.00
Areation Pond (7 day detention)		LS		150,925.00
Pumping Facilities		LS		218,450.00
Transmission (8" F.M.)	4,500	LF	20.00	90,000.00
Storage (30 Days)		LS		186,068.00
Disinfection		LS		69,390.00
Pumping Facilities		LS		218,450.00
Field Preparation		LS		30,840.00
Spray Distribution		LS		642,500.00
Administration & Lab		LS		107,940.00
Monitoring Wells		LS		12,542.00
Fencing & Roads		LS		192,750.00
Subtotal Construction Cost				$1,971,255.00
Contingency			20%	394,251.00
TOTAL CONSTRUCTION COST				$2,365,506.00
Engineering			15%	354,825.90
Land	210.00	AC	6,500.00	1,365,000.00
TOTAL PROJECT COST				4,085,331.90
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$277,851.45
Annual Cost of Land				160,332.39
ANNUAL OPERATOR COSTS				
Preapplication Treatment		LS		$19,275.00
Areation Pond (7 day detention)		LS		13,662.00
Pumping Facilities		LS		3,509.00
Storage (30 Days)		LS		1,012.00
Disinfection		LS		3,104.00
Pumping Facilities		LS		3,509.00
Spray Distribution		LS		21,321.00
Administration & Lab		LS		10,794.00
Monitoring Wells		LS		1,645.00
Total Annual Operator Costs				$77,831.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATE 2 - INDIVIDUAL LAND APPLICATION FOR SOUTHERN PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	RIFLE RANGE LAND APPLICATION UNIT	UNIT PRICE	TOTAL
ANNUAL MATERIAL COSTS				
Preapplication Treatment		LS		$2,570.00
Areation Pond (7 day detention)		LS		1,215.00
Pumping Facilities		LS		378.00
Transmission (8" F.M.)	4,500	LF	8.00	36,000.00
Storage (30 Days)		LS		810.00
Disinfection		LS		2,699.00
Pumping Facilities		LS		378.00
Spray Distribution		LS		3,321.00
Administration & Lab		LS		3,509.00
Monitoring Wells		LS		350.00
Fencing & Roads		LS		5,073.00
Total Annual Material Costs				$56,303.00
ANNUAL POWER COSTS				
Areation Pond (7 day detention)		LS		$8,096.00
Pumping Facilities		LS		6,006.00
Total Annual Power Costs				$14,102.00

SUMMARY OF ANNUAL COSTS

Annual Cost of Construction (Excluding Engineering Cost)		$277,851.45
Annual Cost of Land		160,332.39
Operator Cost		77,831.00
Materials Cost		56,303.00
Power Cost		14,102.00
Total Annual Cost		$586,419.83
PRESENT WORTH		
Interest Rate, %	10	
Life Cycle, Years	20	
Present Worth Factor P/A		8.5136
PRESENT WORTH - RIFLE RANGE LAND APPLICATION (Excluding Engineering Cost)		$4,992,522.63

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATE 2 - INDIVIDUAL LAND APPLICATION FOR SOUTHERN PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
			COURTHOUSE BAY LAND APPLICATION	
CAPITAL COSTS FOR CONSTRUCTION				
Preapplication Treatment		LS		$56,540.00
Areation Pond (7 day detention)		LS		153,210.00
Pumping Facilities		LS		226,160.00
Transmission (8" F.M.)	9,150	LF	20.00	183,000.00
Storage (30 Days)		LS		224,875.00
Disinfection		LS		69,390.00
Pumping Facilities		LS		226,160.00
Field Preparation		LS		35,980.00
Spray Distribution		LS		771,000.00
Administration & Lab		LS		113,080.00
Monitoring Wells		LS		12,542.00
Fencing & Roads		LS		215,880.00
Subtotal Construction Cost				$2,287,817.00
Contingency			20%	457,563.40
TOTAL CONSTRUCTION COST				$2,745,380.40
Engineering			15%	411,807.06
Land	240.00	AC	6,500.00	1,560,000.00
TOTAL PROJECT COST				4,717,187.46
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$322,471.35
Annual Cost of Land				183,237.01
ANNUAL OPERATOR COSTS				
Preapplication Treatment		LS		$19,532.00
Areation Pond (7 day detention)		LS		14,110.00
Pumping Facilities		LS		3,624.00
Storage (30 Days)		LS		972.00
Disinfection		LS		3,239.00
Pumping Facilities		LS		3,624.00
Spray Distribution		LS		23,901.00
Administration & Lab		LS		11,720.00
Monitoring Wells		LS		1,645.00
Total Annual Operator Costs				$82,367.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATE 2 - INDIVIDUAL LAND APPLICATION FOR SOUTHERN PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	COURTHOUSE BAY LAND APPLICATION TOTAL
ANNUAL MATERIAL COSTS				
Preapplication Treatment		LS		$2,570.00
Areation Pond (7 day detention)		LS		1,296.00
Pumping Facilities		LS		417.00
Transmission (8" F.M.)	9,150	LF	8.00	73,200.00
Storage (30 Days)		LS		879.00
Disinfection		LS		3,008.00
Pumping Facilities		LS		417.00
Spray Distribution		LS		3,586.00
Administration & Lab		LS		3,855.00
Monitoring Wells		LS		350.00
Fencing & Roads		LS		5,799.00
Total Annual Material Costs				$95,377.00
ANNUAL POWER COSTS				
Areation Pond (7 day detention)		LS		$9,252.00
Pumping Facilities		LS		6,862.00
Total Annual Power Costs				$16,114.00

SUMMARY OF ANNUAL COSTS

Annual Cost of Construction (Excluding Engineering Cost)		$322,471.35
Annual Cost of Land		183,237.01
Operator Cost		82,367.00
Materials Cost		95,377.00
Power Cost		16,114.00
Total Annual Cost		$699,566.37
PRESENT WORTH		
Interest Rate, %	10	
Life Cycle, Years	20	
Present Worth Factor P/A		8.5136
PRESENT WORTH - COURTHOUSE BAY LAND APPLICATION (Excluding Engineering Cost)		$5,955,802.84

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATE 2 - INDIVIDUAL LAND APPLICATION FOR SOUTHERN PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
		ONSLOW BEACH LAND APPLICATION		
CAPITAL COSTS FOR CONSTRUCTION				
Preapplication Treatment		LS		$30,840.00
Areation Pond (7 day detention)		LS		110,028.00
Pumping Facilities		LS		154,200.00
Transmission (6" F.M.)	3,700	LF	15.00	55,500.00
Storage (30 Days)		LS		106,964.00
Disinfection		LS		46,260.00
Pumping Facilities		LS		154,200.00
Field Preparation		LS		13,878.00
Spray Distribution		LS		205,600.00
Administration & Lab		LS		102,800.00
Monitoring Wells		LS		6,271.00
Fencing & Roads		LS		118,220.00
Subtotal Construction Cost				$1,104,761.00
Contingency			20%	220,952.20
TOTAL CONSTRUCTION COST				$1,325,713.20
Engineering			15%	198,856.98
Land	90.00	AC	6,500.00	585,000.00
TOTAL PROJECT COST				2,109,570.18
ANNUAL COSTS FOR LIFE CYCLE				
Interest Rate, %	10			
Life Cycle, Years	20			
Capital Recovery Factor A/P				0.1175
Annual Cost of Construction				$155,717.78
Annual Cost of Land				68,713.88
ANNUAL OPERATOR COSTS				
Preapplication Treatment		LS		$17,990.00
Areation Pond (7 day detention)		LS		14,283.00
Pumping Facilities		LS		1,955.00
Storage (30 Days)		LS		692.00
Disinfection		LS		1,905.00
Pumping Facilities		LS		1,955.00
Spray Distribution		LS		9,437.00
Administration & Lab		LS		7,517.00
Monitoring Wells		LS		823.00
Total Annual Operator Costs				$56,557.00

PROJECT: CAMP LEJEUNE WWTP STUDY
STATEMENT OF PROBABLE CONSTRUCTION COST
ALTERNATE 2 - INDIVIDUAL LAND APPLICATION FOR SOUTHERN PLANTS

DATE: 08-AUG-1991

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL
		ONSLOW BEACH LAND APPLICATION		
ANNUAL MATERIAL COSTS				
Preapplication Treatment		LS		$2,313.00
Areation Pond (7 day detention)		LS		677.00
Pumping Facilities		LS		151.00
Transmission (6" F.M.)	3,700	LF	7.00	25,900.00
Storage (30 Days)		LS		406.00
Disinfection		LS		1,479.00
Pumping Facilities		LS		151.00
Spray Distribution		LS		1,311.00
Administration & Lab		LS		2,155.00
Monitoring Wells		LS		175.00
Fencing & Roads		LS		2,776.00
Total Annual Material Costs				$37,494.00
ANNUAL POWER COSTS				
Areation Pond (7 day detention)		LS		$3,007.00
Pumping Facilities		LS		2,154.00
Total Annual Power Costs				$5,161.00

SUMMARY OF ANNUAL COSTS

Annual Cost of Construction (Excluding Engineering Cost)		$155,717.78
Annual Cost of Land		68,713.88
Operator Cost		56,557.00
Materials Cost		37,494.00
Power Cost		5,161.00
Total Annual Cost		$323,643.66
PRESENT WORTH		
Interest Rate, %	10	
Life Cycle, Years	20	
Present Worth Factor P/A		8.5136
PRESENT WORTH - ONSLOW BEACH LAND APPLICATION (Excluding Engineering Cost)		$2,755,360.88

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DESCRIPTION:

Appendix D

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APPENDIX D

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

APPENDIX D

REFERENCES

WASTEWATER TREATMENT MASTER PLAN

Phase 1

Marine Corps Base, Camp Lejeune, North Carolina

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