TECHNICAL REPORT

INVESTIGATION OF

THE WAIPIO STABILIZATION PONDS

AND SURROUNDING AREA

Surveillance and Analysis Division

United States Environmental Protection Agency
Region IX
San Francisco, CA 94111

Report No: 004-73

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I. BACKGROUND

A. Statement of Problem

The Waipio Waste Stablization Ponds were constructed and put into operation in October 1971 as an interim measure to divert raw sewage discharge from West Loch and to provide primary or higher treatment to this waste prior to discharge into Middle Loch. Odors associated with these ponds resulted in numerous complaints, and it soon became apparent that the ponds were not functioning as originally intended. It was suspected that discharge from the Waipio Ponds was one of the major causes of the low dissolved oxygen condition in Middle Loch which resulted in an invertebrate kill during June 1972.

The Surveillance and Analysis Division (S&AD) was requested by the Enforcement Division, EPA, Region IX, to inspect the Waipio Ponds and report its findings with respect to treatment efficiency, effluent quality, impact upon the receiving waters, environmental nuisances, threats to public safety, and recommendations to eliminate existing and future problems.

B. Objectives and Scope

The scope of this investigation was limited to a visual inspection of each of the major dischargers to Middle Loch and an analysis of all available data on these wastewaters. Special emphasis was directed toward the Waipio Ponds.

C. Acknowledgements

The investigation was conducted by Daryl G. De Ruiter, Sanitary Engineer, Surveillance and Analysis Division, EPA, Region IX. Persons contacted during this visit include the following:

Charles M. Seeley - Director, Pacific Islands Office, EPA, Region IX.
Dennis Tulang - Environmental Engineer, Sanitary Engineering Branch, Hawaii State Department of Health.
Denis Lau - Environmental Engineer, Sanitary Engineering Branch, Hawaii State Department of Health.
George M. Uyema - Civil Engineer, Department of Public Works, Division of Sewers, City and County of Honolulu.
Raymond C. Y. Len - Mechanical Engineer, Department of Public Works, Division of Sewers, City and County of Honolulu.
John Murray - Director, Environmental Protection Data Base Office, Pearl Harbor Division, Pacific Division, Naval Facilities Engineering Command.
Donald Morris - Biologist, Environmental Protection Data Base Office, Pearl Harbor Division, Pacific Division, Naval Facilities Engineering Command.
Lou H. Herschler - Oahu Sugar Company, Waipahu, Hawaii.

II. STUDY AREA

A. Physical Description

Oahu is a tropical island which has sunshine throughout most of the year. Fanned from the northeast by prevailing tropical tradewinds, the island's temperature varies from a high of about 85 degrees to a low of 60 degrees, with an average daily span of 9 degrees. Normal relative humidity is 70 percent, except during occasional "kona" weather. (Kona weather is a local term used to describe weather conditions which occur during the change of seasons. A kona is a stormy rain-bearing wind from the southwest or south-southwest in Hawaii. It occurs about five times a year on the southwest slopes which are in the lee of the prevailing northeast trade winds.)

Elevation and geographic location have a significant effect on the amount of rainfall on Oahu. The average annual rainfall at the town of Waipahu, elevation 59 feet above sea level, is approximately 30 inches. At the Waiawa station, elevation 725 feet above sea level, the yearly average is about 160 inches. Such variations generally hold true throughout the Hawaiian Islands.

Pearl Harbor is a 9-square-mile estuary made up of three embayments or lochs. These lochs (East, Middle and West Loch) are drowned river valleys which have been modified by wave and current action. The upper reaches of the lochs are generally quite shallow (5 to 10 feet), while the lower reaches have been dredged and at some places exceed 50 feet in depth. A quarter-mile-wide entrance channel connects the inner harbor to the sea.

There are five streams which drain into Pearl Harbor; near each stream is an onshore spring. The area of the basin drained by the streams is 89.6 square miles. Mean flow estimates made in past surveys put the combined stream discharges at 56 mgd and the mean flow of spring discharges at 87 mgd.

B. Historical Development

Presented in this section is a chronological list of the major actions and developments that have directed the Waipio Pond situation to its present status:

1. On May 6, 1970, the Hawaii Department of Health announced the applicability of the Water Quality Standards for the water areas into which the Waipahu Sewage Pump Station Force Main discharges. On May 4, 1970, the Department received an application from the City and County of Honolulu for a permit to discharge for the Waipahu Sewage Pump Station Force Main. The application did not contain an implementation plan but indicated that a decision regarding such a plan would be made after the completion of the "Water Quality Program for Oahu" in April 1972. The Department of Health on September 14, 1970, informed the County that the April 1972 decision date was not acceptable. This letter gave the County until October 15, 1970 to submit a schedule of implementing actions and deadlines. The County then submitted an acceptable schedule for an interim solution to the Waipahu sewage wastes; that is, the construction of a stabilization pond to be completed by October 1971.

   A permit to discharge was issued by the Department of Health on October 26, 1970, based on the City/County of Honolulu's plan to construct the pond. One of the provisions in the permit was that raw sewage discharge be diverted from West Loch, Pearl Harbor, into Middle Loch within 30 days after issuance of the permit. The Department of Health on December 17, 1970, informed the City/County of Honolulu of its intention to revoke the permit due to failure to divert the sewage within the prescribed 30-day period, and a contested hearing was held on January 29, 1971.

   The Department of Health's decision for immediate removal of the raw sewage discharge from West Loch to Middle Loch was largely based on a

report by the Federal Water Pollution Control Administration (FWPCA) entitled "Report on Pollution of the Navigable Waters of Pearl Harbor." The FWPCA's investigation indicated that West Loch oyster beds were contaminated by salmonella and coliform bacteria due to the direct discharge from the Waipahu sewage pump station force main. The report made several recommendations, one of which was that raw sewage discharge be immediately diverted from West Loch to Middle Loch.

As a result of the contested hearings (a second portion was held on February 23, 1971), the Department of Health rescinded its intention to revoke the permit and allowed the original permit to remain in force, subject to construction of the stabilization pond being initiated by April 1971 and completed during October 1971. This decision was based largely on the fact that the increased time needed and the cost of the project to meet the Navy's specifications were not practicable.

2. On September 21-23, 1971, the EPA convened an enforcement conference concerning the pollution of the navigable waters of Pearl Harbor and its tributaries. The purpose of the conference was to bring together the State water pollution control agency, representatives of the EPA, and other interested parties to review the existing situation and the progress which had been made, to lay a basis for future action by all parties concerned, and to give the State, localities and industries an opportunity to take any remedial action under State and local law. The advantages derived from this conference were: 1) the identification of remaining deficiencies in pollution areas, 2) designation of responsibility and recommendations to eliminate these deficiencies, and 3) a workable timetable to allow implementation of these recommendations.

3. In October 1971, the Waipio Ponds were filled with sugar-rich irrigation tailing water from the Oahu Sugar Company and began receiving raw sewage from the Waipahu pump station.

4. On November 1, 1971, the Report of the Technical Review Group for the Waipio Stabilization Ponds was made available (see Appendix A-2). This report was prepared in conjunction with Recommendation 19 of the Pearl Harbor Enforcement Conference. It established guidelines to assure satisfactory operation of the Waipio Ponds with regard to treatment efficiency, safety, and nuisance control.

5. On January 4, 1972, the City/County of Honolulu began adding sodium nitrate to the ponds for odor control purposes. The exact dates, quantities, and method of application of this chemical are listed in Appendix D-1, Table III.

6. In a letter dated January 25, 1972, to Murray Stein, Chief Enforcement Officer-Water, EPA, Congresswoman Patsy T. Mink (D-Ha) indicated that in late December, her husband, John F. Mink, "made an on-site examination of the pond, and noted that...the effluent...was still black and highly contaminated" and requested that the EPA attend to this matter.

7. Russell Freeman of EPA, Region IX, met with representatives from the City and County of Honolulu and the State of Hawaii on February 1, 1972, concerning the correction of the Waipio Pond situation. One of his recommendations was that the ponds be aerated.

8. In a letter, dated February 17, 1972, to Dr. Walter B. Quisenberry, Director of the Hawaii State Department of Health, R. L. O'Connell, Director of the Enforcement Division of EPA, Region IX, noted that the ponds had failed to operate properly and that none of the recommendations of the committee had been adopted. He also recommended that the State "take immediate enforcement action to abate the nuisance and and water pollution conditions which are being caused by this facility."

9. Dr. Quisenberry formed a committee consisting of a representative from the City/County of Honolulu, the State Department of Health, and the EPA. This committee met on April 11, 1972 to evaluate the progress of the City/County of Honolulu in correcting the Waipio Pond problem. The improvements reported by Charles M. Seeley, EPA, Region IX representative, included: the addition of sodium nitrate for odor control, monitoring the ponds for dissolved oxygen content, scum removal from Pond I, installation of a diffused air system in Pond I, and the discontinuance of discharges from the Waipahu incinerator into the Waipio system.

10. On April 18, 1972, twenty-three 3/4" diameter PVC perforated air lines (approx. 10,000 lineal feet) had been installed 1½ feet above the bottom of Pond I at 20-foot spacing. However, the pressure loss through this system was so great that on September 5, an additional twenty-two 1¼' diameter PVC lines were installed between the existing lines. Air was supplied to the system by two 20-HP pumps and compressors with a rated capacity 1120 scfm. These were still functioning as of September 1972.

11. A severe kill of sessile and free-moving invertebrates was discovered in Middle Loch on June 15, 1972 by the Naval Undersea Center which was conducting a biological survey of Pearl Harbor. The three major groups of affected organisms were polychaetes, mollusks, and crustaceans. The suspected cause of the kill was an oxygen-scavenging substance which apparently entered Middle Loch in the vicinity of Pearl City STP (sewage treatment plant) diffusers. A more detailed description of this situation is presented in the Naval Undersea Center Report, Pearl Harbor Biological Survey - Summary Report for First Survey Cycle (August, 1972).

12. A massive oyster kill in West Loch with an estimated 99% mortality (34 million oysters) was suspected on July 5, 1972 and confirmed by a survey on July 10-12. A virologist from the U. S. Fish and Wildlife Lab in Oxford, Maryland suspected that a biotic agent such as a fungal infection or slime mold was the cause of the kill since no other variety of organisms was apparently affected.

13. On September 15, 1972, the State Department of Health held a public hearing to determine if the permit for the Waipio Ponds should be withdrawn because present flows were greater than authorized. The results of this hearing were:

    a. An accepted proposal from the City/County of Honolulu to install eight aerators (borrowed from Dole Pineapple Company) by October 15, 1972 to operate until April 1973.

    b. A three-month monitoring and evaluation period by the Department of Health following installation to determine effectiveness of this approach. If successful, the City/County of Honolulu would purchase and install thirty-one new aerators by June 1973.

    c. A temporary moratorium on new connections in service area (except for a few cases of hook-ups from existing homes), which will keep flows at present level (2.4 - 2.7 mgd).

    d. A probable re-hearing in one year on the question of a new permit to allow flows up to 3.6 mgd.

14. On September 26-29, 1972, an on-site investigation of the Waipio Ponds and other significant dischargers to Middle Loch was conducted by Daryl G. De Ruiter, Surveillance and Analysis Division, EPA, Region IX. A discussion of this investigation is presented later in Section III.

15. Eight 5-HP surface aerators (borrowed from Dole Pineapple Company) were installed in Pond I on December 21, 1972. According to Raymond Len, City and County of Honolulu, the addition of these aerators has eliminated the floatables problem, but is not sufficient to maintain a significant level of dissolved oxygen in the ponds.

C. Present Status

The conclusions and recommendations of the Pearl Harbor Enforcement Conference are contained in Appendix A-1. The following comments refer to those recommendations that pertain to facilities visited or discussed during this investigation.

1. Recommendations 4 & 5:

The entire Mamala Bay wastewater treatment and disposal system (which includes facilities for the complete conveyance, treatment, and disposal of all waste flows in the Pearl Harbor area) has been and will continue to be delayed due to Federal funding constraints. The original schedule calling for completion of the first phase of the Honouliiuli system by December 31, 1974 is no longer feasible.

The total preliminary estimated cost for the Honouliiuli system is $56.45 million. The following breakdown is based upon an October 1972 report prepared by the City/County of Honolulu:

Sewage Treatment Plant	$23.5 million
Ocean Outfall	$11.8 million
Interceptors, Force Mains, Pump Stations	$21.1 million
Total	$56.4 million

Based upon present allocations to the State of Hawaii and assuming a $1 billion increase in appropriations for each fiscal year after 1974

and constant percentage of State appropriation (neglecting inflation), construction on the last portion of the project would not begin until FY 1979. The time needed for construction would mean a project completion date of the mid-1980's. This is the most conservative estimate based upon funding levels and State priorities.

On the other hand, if full funding were made available through additional discretionary funds and/or reallocations, the complete project could conceivably be constructed and in operation by July 1, 1976. This represents the most optimistic completion date.

2. Recommendation 8:

The U. S. Army has let a contract for the construction of a new secondary treatment plant for Schofield Barracks and construction is under way. The Army is also presently evaluating several alternatives to reroute the effluent from Waikele Stream for direct discharge into Waiahole Ditch.

3. Recommendation 7:

The Oahu Sugar Company has agreed to utilize the effluents from the various sewage treatment plants discharging to the Waikele Stream and its tributaries for the irrigation of cane fields as subject to the conditions outlined in Appendix A-3.

4. Recommendation 10:

As of December 31, 1972, the Waipahu dump has been officially closed. This facility presently receives only ash from the Waipahu incinerator. Trash is now hauled to alternate sites.

5. Recommendation 13:

The Oahu Sugar Company has submitted an acceptable plan designed toward 1) the elimination of mill waste and tailwater discharges to Pearl

Harbor or its tributaries, and 2) control of soil erosion from their lands to the maximum feasible extent. This program is included in Appendix A-4. The Oahu Sugar Company is well under way toward implementation of this plan.

6. Recommendation 19:

The Technical Review Group for the Waipio Stabilization Ponds has submitted a report (see Appendix A-2) detailing recommendations for the operation of that facility. However, these were not immediately carried out by the City/County of Honolulu, and the black, murky effluent and associated odors from the ponds resulted in considerable controversy.

The City/County of Honolulu has since installed aeration facilities and is in the process of expanding its aeration capability to cope with the high pond loadings.

III. INVESTIGATION

This section of the report describes the findings of the investigation which was conducted by EPA on September 26-29, 1972 (see Appendix G for photos):

A. Waipio Ponds

1. Original Design. (See Appendix for design calculations. Detailed drawings of the ponds are available for reference in the S&AD files.)

   The pond size was determined using an equation for facultative ponds developed by Herman and Gloyna (1958) for sewage treatment employing a 2-3.5 foot depth. A critical evaluation of this determination yields several discrepancies.

   a. The influent BOD_5 was found to be 160 mg/l based upon 2 days of 24-hour composite samples, whereas the design criterium was 200 mg/l (see Appendix C).

   b. The yearly average temperatures for Pond I and Pond II were 26.6°C and 26.4°C, respectively (based upon data from November 1971 through October 1972), whereas the design criterium was 30°C (see Appendix C).

   c. The 4-foot depth chosen is not within the depth range specified for this equation.

   d. The relationship used to predict the BOD removal was developed from data from controlled laboratory experiments and may not apply to this situation.

   e. The decision to install a two-cell system in series has the effect of doubling the BOD loading rate to the first cell. The result is an anaerobic pond instead of the facultative pond upon which the design equation is based. Thus, the relationship is no longer valid.

Appendix D-1 contains the schedule of operating depths for the ponds (Table I) and the subsequent sizes and loading characteristics at the present pond depths (Table II). The BOD_5 loading rate of 681 pounds per acre per day to Pond I with a 3.2-day detention time explains the anaerobic condition of the ponds.

2. Present Aeration Facilities:

The diffused aeration system in Pond I is not sufficient to maintain an aerobic environment. The pond substrate was a murky, gray-black color (photos WP-5 and WP-6) and contained no measurable amount of dissolved oxygen. Only a limited bubbling action was observed at the surface directly above the air lines (photos WP-1, WP-2 and WP-3), and the mixing effect due to aeration was negligible.

The schedule for adding sodium nitrate for odor control is listed in Appendix D-1, Table III. The odor emitted from the ponds at the time of the visit (12:30 p.m., September 26 and 3:00 p.m., September 27, 1972) was relatively mild.

3. Degree of Treatment:

Raw data on the Waipio Ponds and plots of BOD_5 vs. time and suspended solids vs. time are available in the S&AD files. A summary of these data is included in Appendix D-2. These data are based upon grab samples collected during the morning hours when flows are generally low. While these data are probably not indicative of average conditions, the downward trend in the effluent BOD_5 does reveal that the aeration equipment has had a beneficial effect on the performance of this facility. Adequate chlorination has also had a significant effect in reducing the final BOD_5. Since the latest aeration equipment was installed, the effluent BOD_5 has stabilized in the 60-70 mg/l range.

A City/County of Honolulu employee who was measuring dissolved oxygen and residual chlorine at the time of the EPA visit to the facility said that the condition of the ponds is quite erratic: i.e., the ponds appear murky and septic at times, while at other times they have a relatively clear substrate with good algae blooms. The erratic BOD_5 data confirms this observation. At the times of the EPA visit to the facility, phytoplankton growth was non-existent, although periphyton was present along the edge of the Pond II and the effluent structures (photos WP-9 and WP-10).

By comparing the BOD_5 data with the suspended solids data, one might roughly conclude that the effluent BOD_5 is relatively low when the suspended solids concentration is high, and vice versa. Since the effluent suspended solids concentration would be expected to increase when algae blooms occur, one might logically associate a higher degree of treatment with respect to BOD_5 reduction during conditions when algae proliferate.

4. Future Aeration Equipment:

As previously mentioned, eight 5-HP surface aerators, borrowed from Dole Pineapple Company, were installed in Pond I on December 21, 1972. Plans are presently being made by the City/County of Honolulu to purchase and install twenty-one 7½-HP surface aerators according to the following schedule:

Advertisement for bids	Jan. 25, 1973
Bid opening	Feb. 8, 1973
Awarding of contract & notification to proceed	Feb. 9, 1973

Delivery of the aerators is expected 90 days after the award of the contract, with installation to be completed by City/County of Honolulu personnel 5 weeks after delivery.

It is expected that some optimum number of aerators will convert the facility into a complete mix system in which odors will be no problem. This new system will sustain an active growth of microbiological organisms which will oxidize a significant portion of the organic waste load. The cell mass accumulated during this process will pass into the second cell where it will settle and undergo anaerobic fermentation at the bottom layer of the pond. The surface layer will be aerobic due to algal blooms and surface aeration. The net result will be a high quality effluent which is relatively low in organic materials.

5. Waipio Pond Discharge:

The effluent of Pond II is similar to that of Pond I: i.e., gray-black in color (photos WP-9, WP-10 and WP-11) and void of any dissolved oxygen. This effluent then enters the chlorine contact chamber (photo WP-11) with approximately 15 minutes detention where it is dosed with 10 p.p.m. of chlorine. The effluent from this unit cascades over a 4-foot drop (photo WP-14) where some oxygenation occurs (see Appendix D-3). Considerable foaming was observed at this point (photo WP-15) during the time of the EPA visit. Approximately 400 feet from the discharge weir, the pond effluent enters a sugar plantation irrigation ditch (photos WP-16, WP-17 and WP-180) which carries both the Waipio Pond effluent and irrigation tailing water to the west edge of the Middle Loch at a point about halfway up the Waipio Peninsula.

The quantity of irrigation tailing water discharge fluctuates according to irrigation needs. However, at the time of the visit to the Waipio Ponds, the contribution of waste flow from the tailing water was nearly equal to the contribution from the ponds. Specifically, this tailing water is the centrate of a centrifuge treatment process of the wash water from the Oahu Sugar Company in Waipahu. The centrate has a high oxygen demand and suspended solids content (see Appendix E).

At 3:00 p.m., September 27, a force main was discharging a high flow to the irrigation ditch (photos WP-19, WP-21, WP-22 and WP-23). This discharge had the same appearance as the wash water centrate. Fungus growth was observed in the drainage ditch near the point of discharge into Middle Loch. At low tide, a heavy sediment deposit could be seen reaching out from the mouth of the drainage ditch (photos WP-26 and WP-27). Because of the high silt content of the irrigation tailing water, it is believed to be the major contributor of this deposit.

6. Safety Features (Waipio Ponds):

A wire fence with a securely padlocked gate has been constructed around the Waipio ponds and chlorine contact chamber.

B. Waipahu Incinerator on Waipio Peninsula

As of March 30, 1972, the wastewater from the Waipahu incinerator has been diverted from the Waipio ponds to a storm drain. At the time of the visit to this facility (3:30 p.m., September 28), there was no discharge at all. The scrubber spray was completely evaporating, and the quenching water was being recycled.

C. Oahu Sugar Company

Water usage for this plant is approximately 15.5 mgd, most of which is used for the washing of raw sugar cane (photo OS-2). This wash water is treated by a centrifuging process (photo OS-3) for removal of silt and fiber. Approximately 1 mgd of sludge draw-off is pumped to sludge drying beds on the Waipio Peninsula. The 14.5 mgd of centrate is used for irrigating cane fields on the Waipio Peninsula. This quantity exceeds the irrigation requirements of this area, and most of the excess discharges to Walker Bay. Some, as mentioned previously, is discharged with the Waipio Pond effluent to the Middle Loch.

Facilities are being installed to divert approximately 5 mgd of the centrate to cane fields further inland. These facilities are to be completed by the end of 1973 to prevent discharge of tailing water to Middle Loch. The plan to construct a dam across Walker Bay and use this detention pond for treating tailing water has been abandoned. Holding ponds are to be constructed in this area also, and facilities are to be installed to divert irrigation water to cane fields further down the Waipio Peninsula.

D. Pearl City STP

This primary treatment plant discharges through a diffuser extending 2300 feet from the east shore of Middle Loch almost directly across from the point of the Waipio Pond discharge. The degree of treatment provided by this plant is difficult to ascertain because of the inadequacy of the monitoring program. Some of the shortcomings of this monitoring program are:

1. Analyses are performed on grab samples collected during the morning hours before the peak load arrives at the plant.

2. Influent (raw sewage) samples are collected in a chamber to which the trunk sewer discharges (photo PC-3). Digester supernatant also intermittently discharges to this chamber.

3. Effluent samples are obtained by means of a sampling line and pump connected to the discharge end of the effluent pipe. When this pump is out of order, the sample is collected from the chlorine contact chamber.

4. The flow recorder has been inoperative for a considerable period of time.

A well equipped laboratory is located at the Pearl City plant. Two certified lab personnel and one technician perform all the laboratory analyses for ten leeward Oahu STP's, including the Waipio Ponds.

The following table lists the average BOD_5 and suspended solids values (based upon morning grab samples) at the Pearl City STP for the months of July 1971 through May 1972:

	BOD_5 (mg/l)	Suspended Solids (mg/l)
Raw Sewage	142	176
Primary Effluent	161	66
Final Effluent	158	71

Based upon available data and a visual inspection of the facility (photos PC-3, PC-4, PC-8, PC-9, PC-10 and PC-11), it can be safely concluded that the degree of treatment provided by this facility is far less than would be expected from a well operated primary treatment plant.

Appendix F contains the Report on Operation and Maintenance of Wastewater Treatment Plant, EPA Form 7500-5 (4-72), which contains information gathered at the Pearl City STP.

IV. RESULTS

A. Conclusions

1. A fence has been constructed around the Waipio Ponds, as required by the report by the Technical Review Group.

2. The Waipio Ponds are severely under-designed as oxidation ponds and are consequently overloaded. The effluent quality reflects this overloaded condition.

3. The aeration facilities and addition of sodium nitrate have been successful in eliminating a large portion of the odors from the Waipio Ponds.

4. According to available data, the effluent BOD has been reduced as a result of aeration.

5. The quantity of air supplied by the diffused air system is not sufficient to maintain an aerobic environment in either pond. Treatment can be significantly upgraded with the addition of more aeration facilities.

6. The Pearl City STP effluent contributes a much greater amount of oxygen-demanding materials to Middle Loch than do the Waipio Ponds.

7. The irrigation tailwater discharge from the Oahu Sugar Company has a potentially high oxygen demand. It is quite possible that the low dissolved oxygen condition that apparently caused the invertebrate kill in Middle Loch could have been caused by a slug discharge of this tailwater. The tailwater also carries a heavy silt load to the Middle Loch.

B. Recommendations

1. General:

   a. EPA, Region IX, should assist the State of Hawaii in developing a water quality monitoring program for the State of Hawaii. Such a

program would be useful in identifying causes of such disasters as the oyster kill in West Loch and the invertebrate kill in Middle Loch.

b. A priority list for new waste treatment systems should be established as early as possible so that EPA funds can then be immediately used for construction of new facilities before inflation and rising construction costs mount. Lack of a concrete priority system has been responsible in the past for much of the delay in construction of the proposed facilities.

2. Waipio Ponds:

a. EPA, Region IX, should provide assistance to the City/County of Honolulu in developing a monitoring program for the Waipio Ponds.

b. The City/County of Honolulu should install a flow measuring device at the Waipio Ponds. (Flow is presently determined by a pump rating curve for the Waipahu pump station.)

c. The performance of the ponds with the new surface aerators should be evaluated to determine the maximum load that the ponds can treat reliably. Until such an evaluation is made, the number of new connections allowed to this system should be strictly limited to insure that the ponds are not further overloaded.

3. Pearl City STP:

a. A more reliable monitoring program should be developed.

b. The flow meter and recorder at the plant should be repaired.

c. An analytical quality control program should be initiated at the laboratory.

4. Oahu Sugar Company:

   a. Frequent surveillance should be performed on the progress of the Oahu Sugar Company in meeting its time schedule for the elimination of mill waste and tailwater discharges to Pearl Harbor and the soil erosion control program. A re-evaluation of the measures undertaken should be made after these become effective.

V. APPENDICES

EXECUTIVE SESSION

APPENDIX A-1

September 23, 1971

11:30 a.m.

MR. STEIN: This meeting is reconvened.

CONCLUSIONS AND RECOMMENDATIONS

The conferees have unanimously reached the following conclusions and recommendations:

1. Pollution subject to abatement under the Federal Water Pollution Control Act exists in the interstate and navigable waters of Pearl Harbor. This pollution is caused by waste discharges from municipal, industrial and Federal facilities, agricultural activities and urban development.

2. Measures taken thus far toward abatement of the pollution are inadequate to bring about its elimination within a reasonable period of time.

3. Delays being encountered in abating the pollution are caused principally by the complexity of the problem and the need for closely coordinated action by various levels of government and industrial establishments. However, recent formation of a Pearl Harbor Task Force by Governor Burns has assisted greatly in bringing about this needed coordination.

4. The first phase of the Honouliuli system (as

generally described in the report, "Water Quality Program for Oahu," dated July 1971) shall consist of the following units:

a. An adequately sized sewage treatment plant providing at least 85 percent BOD removal and continuous disinfection of the effluent;

b. An ocean outfall;

c. Interceptor sewer lines and pumping stations serving the following areas: Waiau-Pearl City, Kunia-Waipahu, Honouliuli, Iroquois Point, and Barbers Point.

5. The first phase of the Honouliuli system as described above shall be constructed by the city and county of Honolulu in accordance with the following schedule:

a. By December 31, 1971, all necessary State Health Department permits to be obtained, design to begin, and plant site to be acquired;

b. By November 1, 1972, financing arrangements for the entire first phase to be completed and bids for construction of initial units to be advertised;

c. By March 1, 1973, construction contracts for initial units to be awarded;

d. By October 1, 1973, construction contracts

for all units of the first phase to be awarded;

e. By December 31, 1974 construction of all units of the first phase as described above to be completed.

6. The Navy sewage treatment facilities at Barbers Point Naval Air Station and Iroquois Point (Capehart) shall be abandoned, and these systems shall be connected to the Honouliuli system by December 31, 1974. In the interim the Navy shall identify and apply feasible operating procedures to upgrade the performance of existing treatment facilities at Barbers Point and Iroquois Point.

7. The city and county of Honolulu shall take the necessary action to exclude from the harbor the sewage presently reaching the harbor from the watershed of the Waikele Stream, in accordance with the following schedule:

a. By December 31, 1971 - A sewage disposal plan providing for irrigation or export from the watershed is to be selected;

b. By September 30, 1972 - A design is to be completed and necessary financing arranged.

c. By December 31, 1972 - The necessary site is is to be acquired, and bids for construction advertised;

d. By March 31, 1973 - All necessary construction contracts are to be awarded;

e. By December 31, 1974 - Construction is to be completed.

8. The Army shall defer initiation of construction of a new secondary sewage treatment plant at Schofield Barracks until December 31, 1971, to allow time for selection of a Waikele watershed plan as specified in paragraph 7 herein. If the plan selected requires a new Army plant, construction shall proceed immediately. Any sewerage project undertaken by the Army is to be consistent in scope and timing with the selected Waikele watershed plan and provide for payment by the Army of its pro-rata share of the costs of any joint facilities.

9. The Air Force shall, by July 1, 1973, complete design of an interceptor sewer project that is consistent with the selected Waikele watershed plan so as to permit abandonment of their existing Wheeler AFB treatment facilities. The Air Force shall complete construction of the project by December 31, 1974. In addition, the Air Force is to pay its pro-rata share of the costs of any joint facilities.

10. The city and county of Honolulu shall, by July 1, 1972, establish controls to prevent leaching

of pollutants from the Waipahu Dump into the waters of West Loch, and shall operate and maintain the Waipahu refuse disposal site so as to eliminate all other adverse environmental effects in a manner acceptable to the State Department of Health.

11. By December 31, 1971, the Navy shall develop a schedule to control vessel waste discharges into Pearl Harbor, shall provide for financing of such controls no later than July 1, 1972, and shall commence implementation of its schedule no later than September 1, 1972.

12. Erosion controls, as required by approved State-Federal water quality standards (Chapter 37A (6), State Public Health Regulations) shall be imposed on all State projects, and as a condition for issuance of all grading permits. It is also recommended that by July 1, 1972 the city and county of Honolulu amend its subdivision and grading ordinances to require that prior to issuance of permits, the permittee obtain a certification by the State Department of Health of the acceptability of the proposed erosion controls. It is further recommended that Federal loans and grants be withheld from housing, highway and other construction projects which do not provide for erosion controls satisfactory to the State Department of Health.

~~13. The Oahu Sugar Company~~ shall, by December 31,

1971, submit to EPA and SDOH an acceptable program including a time schedule of actions leading toward a) the elimination of mill waste and tailwater discharges to Pearl Harbor or its tributaries, and b) control of soil erosion from their lands to the maximum feasible extent. This program shall be in full operation by December 31, 1974.

14. Major pineapple growers shall, by December 31, 1971 submit to EPA and the SDOH an acceptable program including a time schedule of actions leading toward the control of soil erosion from their Pearl Harbor watershed lands to the maximum feasible extent. This program shall be in full operation by December 31, 1974.

15. the State Department of Agriculture shall, in cooperation with the Oahu Soil Conservation District, by July 1, 1972, develop a plan for a major study of soil erosion from undeveloped lands in the Pearl Harbor watershed. The study is to be completed not later than July 1, 1974. The plan is to be acceptable to the State Department of Health and the Environmental Protection Agency.

16. By July 1, 1972, the State Harbors Division, Department of Transportation, shall conduct an investigation of existing and proposed underground oil transmission lines to determine whether leakage is occurring or threatened and develop a program for maintenance and replacement to elimi-

nate any hazards to water quality that exist.

17. By March 1, 1972, the State Department of Health shall identify and prescribe control requirements on thermal discharges to Pearl Harbor by the Hawaiian Electric Company so as to achieve compliance with the thermal water quality standards by December 31, 1974. The Navy is to control the thermal discharges from its powerplants in a manner commensurate with the foregoing requirements.

18. The State shall, by July 1, 1972, review all existing and pending permits for waste discharges to the Pearl Harbor watershed, and shall add conditions as necessary to achieve consistency with the recommendations of this conference.

19. A joint city and county, State and Federal Technical Review Group shall be formed by October 1, 1971, for the purpose of reviewing the design and operation of the Waipio oxidation ponds. The EPA shall provide administrative services to the group. This review shall be completed and a report prepared within 30 days thereafter and shall contain recommendations for any modifications found necessary to assure satisfactory operation of this facility with regard to safety, treatment efficiency, and nuisance control. The city and county of Honolulu shall implement these recommendations in the manner and time period

specified by the Technical Review Group.

20. The parties listed below shall supply to the conferees (or conferee, as the case may be), semiannual progress reports with respect to the recommendations contained herein and specifically as identified below; the first report to be submitted on December 31, 1971.

Reporting Agency	Subject of Report paragraph numbers
Navy	6, 11, and 17
Army	8
Air Force	9
City & County of Honolulu	5, 7, and 12
State Dept. of Agriculture	15
State Dept. of Transportation	16
Hawaiian Electric Company	17
Oahu Sugar Company	13
Dole Company	14

21. The State Department of Health and the Environmental Protection Agency shall cooperate with the Navy in monitoring the waters of Pearl Harbor, and shall make their studies available to the public.

22. The Environmental Protection Agency should provide all possible support to the Governor's Task Force on Pearl Harbor in reaching the goal of achieving a protected environment which provides the greatest benefits to all

people. Support through technical assistance, studies, appropriate cost-sharing and stimulation of other Federal Agencies to participate should be provided in coordination with the Task Force.

23. The State of Hawaii urges that the Administrator, Environmental Protection Agency, recognize the great discrepance between the amount of Federal grant funds needed by Hawaii to complete the sewage treatment facility construction schedule which has been set and the funds expected to be allocated under current formulae and appropriations. The Administrator should take all possible steps to accelerate Federal financial support for these much needed projects.

This concludes the conclusions and recommendations of the conferees. I think that you can see that we have specifically laid out a curriculum. We have a lot of homework to be done, but I am confident that if we do this, we are going to arrive at clean water in Pearl Harbor.

I want to assure you, speaking for ourselves and the State, that we are going to follow through on this. We have a resident office here, as you know, and we are going to try to make sure that these deadlines are met. If the EPA Administrator approves these recommendations, we will be following these recommendations through and see that both the spirit and the letter of the recommendations

are met.

Given the magnitude of the problem here, I don't think that we can afford to be content with what is euphemistically known in the trade as "slippage," or generally known as falling behind and not cleaning up the environment.

At this point, we will entertain questions from the press, if there are any.

THE PRESS: What action, if any, will be taken if these recommendations are not met?

MR. STEIN: We have several courses of action. In industry, we can move on to the 1899 River and Harbor Act. That's a criminal section. Also, if an industry discharges into navigable waters it has to have a permit. The permit can either be granted or denied, and it's against the law to discharge now without a permit.

In the municipality, if there is a violation of the standards -- I think the recommendations are fully consistent with the Federal-State water quality standards -- we issue a 180-day notice. If that is not complied with, then we can go to court, or else we can call a public hearing and come up with recommendations. And again, after 180 days, if the hearing board's recommendations are not complied with, we can go to court.

REPORT OF THE TECHNICAL REVIEW GROUP FOR THE WAIPIO STABILIZATION PONDS

NOVEMBER 1, 1971

A joint City and County of Honolulu, State of Hawaii and Federal Technical Review Group was formed on October 1, 1971 for the purpose of reviewing the design and operation of the Waipio oxidation ponds. The following report contains the recommendations found necessary by the Review Group to assure satisfactory operation of that facility with regard to treatment efficiency, safety, and nuisance control.

A. Treatment Efficiency

The original purpose for construction of the facility was to a) divert raw sewage from the West Loch of Pearl Harbor to the Middle Loch[1] and b) provide primary or higher treatment for the new Middle Loch discharge.[2] This facility as designed is capable of satisfying the purpose for which it was constructed.[3] The ponds are currently under State permit to discharge until completion of the Honouliuli system or no later than 1975.

The loadings currently received by the facility approached the maximum level at which stabilization ponds have been predicted to operate satisfactorily. Operation and maintenance of the facility therefore becomes more critical than in ponds with lower loadings. The following

---

1 EPA Recommendation
2 USN Requirement
3 The Waipio facility has been designed and constructed based on the theoretical derivations established by Eckenfelder and O'Conner. The facility is designed to reduce the Biochemical Oxygen Demand (BOD) of the influent waste by 70 to 80 per cent.

recommendations are made in view of this high level of loading:

1. That a training program be instituted by the City and County of Honolulu to provide the operators of the Waipio facility with a review of stabilization pond theory, operation, and maintenance and that the EPA and State of Hawaii support this training.

2. That the ponds be monitored regularly for dissolved oxygen levels, and process efficiency.

3. That the ponds be normally visited no less than once a day by those persons responsible for the operation of the ponds.

4. That upon pond failure or upon an increase of 25 per cent of the present loading, the City and County of Honolulu make provisions to expand the facility or to improve the effectiveness of operation.

5. That flow measuring equipment be provided for the facility and flow records be maintained.

B. Safety

The facility is constructed upon private property and access to the area by the public is prohibited. However, it is possible for trespassers, including children, to reach the ponds by several unguarded routes. The following recommendations are made for the protection of the public:

1. That the facility be surrounded by fencing of wire-type construction.

2. That the facility be locked and signs be posted describing the nature of the facility and warning against trespassing.

3. That a safety education program be promoted by the communities in the area with special emphasis placed on the Waipio pond dangers.

C. Nuisance Control

The facility is remote from habitation. The prevailing winds blow in a direction away from that habitation. Therefore, nuisances from odor and insect pest will be eliminated during periods of normal weather. Days with light or Kona winds may, however, present problems in these areas. The following recommendations are made to insure comfort, physical efficiency, and a sense of well-being for the people in the Waipio area.

1. That scum control measures be practiced regularly to prevent nuisance and if necessary automatic equipment be installed for this purpose.

2. That access to the facility in all weather be provided to assure daily maintenance requirements are met.

3. That the ponds be monitored regularly for dissolved oxygen and when aerobic conditions no longer exist within the upper one-quarter of the ponds, that the actions recommended in A-4 be instituted.

It is also recommended that the City and County of Honolulu seek joint Federal/State/County funding of construction cost incurred by these recommendations through the provisions of Section 8 of Public Law 660.

As specified by the Conferees of the Pearl Harbor Pollution Conference, implementation of the above recommendations rests with the City and County of Honolulu. The Conferees shall meet the representatives of the City and County of Honolulu by January 15, 1972 to review the progress toward implementation of the above recommendations.

APPENDIX A-3

STATEMENT BY OAHU SUGAR COMPANY RELATIVE TO THE USE OF SEWAGE EFFLUENT FOR SUGAR CANE IRRIGATION - WAIAHOLE DITCH

We were first approached by engineers of the Oahu Water Quality Study Consortium last year about our possible use of sewage effluent for irrigation of cane. Our response at that time was a qualified yes subject to certain conditions. These can be summarized briefly as :

1. Sewage effluent would have to be made available to those areas of the plantation where such water could be used;
2. Adequate dilution with fresh water would be required to avoid application of excess nitrogen during the later stages of the cane growth (most of the second year of the crop);
3. The Company could not accept responsibility for the sewage effluent during non-irrigation periods, particularly, the rainy winter periods.

The Company is the major user of water on Oahu, about 225 mgd, two-thirds of which is pumped from the basal ground water at multiple locations. We have an adequate total supply of water for our needs although water distribution to some areas of cane is deficient at times. This has been brought about by loss of cane lands to residential subdivisions, the H-1 Highway, etc. and the replacement in part by the acquisition of new cane lands. Rather than develop new sources of water, the Company is installing new pumps and pipelines to improve its distribution capabilities. It is expectable that in future years Oahu Sugar Company's cane acreage will decrease under pressures of urban encroachment with an accompanying decrease in water requirements.

There is general recognition that the Pearl Harbor basal water supply is being drawn upon at or near its safe yield potential. Thus, Oahu Sugar Company is favorably inclined towards any efforts to import water or to recycle fresh water

(which it now does from the caprock areas of Ewa) or to utilize sewage effluents for irrigation. It has for a number of years used limited quantities of sewage effluents for sugar cane irrigation, including the effluent from Schofield. While the quantity of the sewage effluent proposed for irrigation is not significant to the plantation's overall present or future needs, it could be put to beneficial use if discharged to the Waiahole Ditch. But perhaps most important is today's recognition that water recycling, where feasible, should be carried out. Our Company has long endorsed this principal.

The Pearl Harbor Enforcement Conference held in September of this year unanimously reached various conclusions and recommendations, one of which involves the Waikele Stream, viz:

"7. The City and County of Honolulu shall take the necessary action to exclude from the harbor the sewage presently reaching the harbor from the watershed of the Waikele Stream, in accordance with the following schedule:

a. By December 31, 1971 -- A sewage disposal plan providing for irrigation or export from the watershed is to be selected.

. . . . . ."

There has been some opinion expressed that the secondary sewage effluent discharged by the Schofield treatment plant during non-irrigation periods of the rainy season could be tolerated in Pearl Harbor because of the greater dilution provided by the higher winter stream flows. Mr. Murray Stein, Chairman of the Enforcement Conference, stated, however, that such discharge would

Our Company's use of the sewage effluents from the several sewage treatment plants discharging into the Waikele Stream watershed is patently a key factor in the selection of the sewage plan to be determined by December 31, 1971. Subsequent to the Enforcement Conference, therefore, the Company's staff discussed this problem at considerable length. We were concerned about (1) the high cost to the taxpayers for sewerlines to transport sewage to the proposed Honouliuli treatment plant (e.g., the estimated cost for the Schofield sewerline alone is $7 million) and (2) the waste of a natural resource by failure to recycle the sewage effluent for irrigation.

We concluded that we could meet the two concerns stated above as well as the Enforcement Conference conclusions and recommendations under the following conditions:

1. That Oahu Sugar Company will accept the sewage effluents (secondary treatment) of the several sewage dischargers into the Waikele Stream drainage system if delivered to our Waiahole Ditch up to a maximum of 10 mgd (possibly more if further research shows that a lesser dilution ratio will not adversely affect yields of sugar);
2. That Oahu Sugar Company will spread said sewage effluents and the Waiahole Ditch water on its fields on a 7-day a week basis and during non-irrigation periods so as to avoid ultimate discharge into Pearl Harbor.
3. That the dischargers will provide temporary storage above our Waiahole Ditch with gravity discharge to the Ditch to store sewage effluents for those several days each year when heavy rainfall occurs to the extent that runoff may occur from our fields (estimated at three to four days storage requirements);

That Oahu Sugar Company's commitment to accept this sewage effluent will continue as long as the Company continues its sugar cane cultivation served by the Waiahole Ditch (estimated, but not guaranteed, to be for the next twenty-three years.)

Our analysis indicates that over the long run the value of the sewage effluents for irrigation use will be more or less offset by the costs of spreading the Waiahole water sewage effluents when not needed for irrigation. Initially, we expect our costs to exceed the benefits but as the sewage effluents increase with increased expansion of Mililani Town and the Waipio developments the pendulum should swing in the other direction. Accordingly, we do not consider this proposal as a bonanza to our Company but rather as a break-even proposition from an economic standpoint. We think that the final decision on this proposal must be based on the premise of not expending unnecessary public funds and the desirability of recycling natural resources as weighed against the possible hazard to our ground water resources.

November 1971

APPENDIX A-4

OAHU SUGAR COMPANY LTD.

AN Amfac COMPANY

P.O. BOX "O"
WAIPAHU, HAWAII 96797
TELEPHONE 677-3577

A-4

December 29, 1971

Conferees,
Enforcement Conference on Pearl Harbor
September 21-23, 1971
Honolulu, Hawaii

1) Dr. Walter B. Quisenberry, Director of Health
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, HI 96801,

(Through Mr. L. Russell Freeman
Director, Pacific Island Basins Office
Environmental Protection Agency
1481 S. King Street
Honolulu, Hawaii 96814)

2) Mr. Murray Stein,
Chief Enforcement Officer
Environmental Protection Agency,

3) Mr. Richard L. O'Connell
Enforcement Officer
Region IX
Environmental Protection Agency

Gentlemen:

REPORT - DECEMBER 31, 1971
ENFORCEMENT CONFERENCE ON PEARL HARBOR

Pursuant to the requirements of paragraph 13 of the conclusions and recommendations of the Conferees of the Enforcement Conference on Pearl Harbor we submit herewith our program for the abatement of irrigation tailwater into Pearl Harbor and its tributaries and the control of soil erosion. Paragraph 13 is quoted herewith:

> "The Oahu Sugar Company shall, by December 31, 1971, submit to EPA and SDOH an acceptable program including a time schedule of actions leading toward a) the elimination of mill waste and tailwater discharges to Pearl Harbor or its tributaries, and b) control of soil erosion from their lands to the maximum feasible extent.

Our program as presented herewith is divided into two operational plans; (1) Soil and Water Conservation Plan and (2) Water Pollution Abatement Plan. Various Exhibits are included, and will be referred to in the text by number. Some are attached to this report and the others included separately as a supplement to the text.

Before going into the detail of the plans, a brief description of Oahu Sugar Company and some of its operations are included as background for better understanding of the material to follow.

INTRODUCTION

Oahu Sugar Company started its farming operations in 1897 and has continued the cultivation and milling of sugarcane without cessation since that date. Last year Oahu Sugar Company acquired Ewa Plantation Company resulting in almost doubling the size of its cane acreage and sugar production. The cane lands are located adjacent to and above Pearl Harbor, principally, West Loch. They represent approximately 19,950 acres of a total of some 35,000 acres of land under the Company's control, and produce 120,000 tons of 96° sugar a year.

To serve these lands with needed irrigation water, the Company operates 26 pumping stations with 51 pumps and a gravity system that brings mountain water from the windward side of Oahu through the Koolau Range. Thirty-four pumps derive their water from artesian or basal sources, 14 pumps obtain water from the caprock and 3 pumps divert water from Waikele Stream. The yearly average of pumped water is about 195 mgd and that of the gravity water is about 32 mgd. or a total of approximately 227 mgd. Essentially all of this water is used for irrigation with about 25.0 mgd. being largely recycled water which is first used for condenser cooling, mill processing and finally cane washing in the Waipahu and Ewa mills. (In 1972 the Ewa Mill will be closed down and all cane will be processed by the Waipahu Mill.)

No cane trash or bagasse (fiber residue of the cane stalk) is discharged into Pearl Harbor or any of its tributaries. Bagasse is burned as fuel to produce steam and the rocks and cane trash are used for land fill. The principal problem insofar as water pollution is concerned is irrigation tailwater.

SOIL AND WATER CONSERVATION

Oahu Sugar Company has long been a cooperating member of the West Oahu Conservation District, and, more often than not, one of its staff members has served as Chairman of the District. Much valuable assistance and guidance has been received from the District and from personnel of the Soil Conservation Service with the result that many of the plantation practices today stem from their suggestions and recommendations.

Sugarcane is planted cross-slope in relatively deep furrows at maximum 1-1/2 percent grades. This practice prevents sheet runoff and, except in unusually heavy rainfalls, no runoff at all occurs from the fields. The "cloddy" type surface of the prepared fields with the prevailing high porosity soils provide optimum intake capabilities to absorb rainfall. Photograph "A", Exhibit I, shows the typical "contour furrows" of a recently planted field with the cane shoots just beginning to emerge in the bottom of the furrows.

Sugarcane in Hawaii is normally a two-year crop with plowing, harrowing, and new planting taking place about every eight years. In the intervening two-year cycles the land is only "reshaped" to renew the furrows permitting the cane to sprout up from the undisturbed roots left after harvesting. Planting and reshaping take place as soon as possible after harvesting so that the fields are "open" for a minimum of time. In four to five months the cane "closes in" to form a canopy to further protect the soil from heavy rainfall.

Sugarcane, as locally cultivated and harvested, is a very effective crop for retention of rainfall and prevention of soil erosion. This is borne out by the runoff studies conducted at the Waialua Sugar Company on Oahu by the Federal Water Pollution Control Administration in 1967-69. ("The Hawaii Sugar Industry Waste Study", Environmental Protection Agency, Region IX, San Francisco, California, pages 97-104.)

Most of the plantation's supply ditches are cement-lined or have cut-stone linings. Economics no longer make it possible to install cut-stone linings but we have had for many years a program of "guniting" ditches with cement mortar for soil erosion and water percolation control. Photograph "B", Exhibit I, shows a mortar lined ditch installed in 1970. Photograph "C" shows a section of a lined ditch bordering a cane field. This ditch serves not only to convey water but also to retain soil in the field and catch any runoff that might occur from the field.

Some thirty reservoirs of various capacities are used for water use regulation in the irrigation system. Several of these also provide some retention and regulation of storm flows together with some retention of settleable solids. Reservoir banks are grassed for erosion protection as are most of the unlined ditches. Kikuyu grass and nut grass have been found favorable for these purposes.

Soil removed from the cane by the cleaning plants and recovered by cyclones and a hydro-separator have been used for years to reclaim waste lands and bring them into productive use. Also leaf trash from the mills has been used for similar reclaimingof lands. Several hundreds of acres of such waste lands have been reclaimed to date and many additional acres made more productive by these reclamation procedures.

Our Company has for many years made use of recycled water--both the cane wash water from the mills after soil removal treatment and sewage effluents. We do this not only to supplement our water supply for irrigation but we sincerely believe in the principle of conservation of our natural resources.

We have worked with the engineers in their preparation of the Oahu Water Quality Program as to methods and means of using sewage effluents in our irrigation system. We have also cooperated fully with the City and County of Honolulu in their plans for eliminating sewage treatment plant effluents entering Pearl Harbor. The use of sewage plant effluents for sugarcane irrigation in the "Central Oahu Sewer System - Waikele Stream Watershed" is one of the alternatives in Paragraph 7 of the Conferees Conclusions and Recommendations of the Enforcement Conference on Pearl Harbor. As evidence of our willingness to cooperate in this respect we submit herewith as Exhibit II the letter to Mr. Murray Stein, Chief Enforcement Officer, Environmental Protection Agency, Washington, D. C. from Mr. Albert C. Zane, Director and Chief Engineer, Department of Public Works, City and County of Honolulu (December 1971.)

WATER POLLUTION CONTROL

We recognize the need for water pollution control and have long been concerned with finding the best solutions. Representatives of Oahu Sugar Company have participated in and attended numerous hearings, conferences, meetings and seminars on water pollution control since 1965 when the Board of Health regulations on water pollution control were first being considered. One of our staff members is currently a member of the Pearl Harbor Task Force.

Oahu Sugar Company has complied with all of the requirements of the State Department of Health pursuant to Chapters 37 and 37-A. On December 21, 1971 the "Plans and Specifications" implementation report covering our irrigation tailwater discharges was submitted to the State Department of Health. Applications for our three mill discharges at Waipahu, and the submission of the required waste water parameter analyses, have been made to the Corps of Engineers pursuant to the 1899 Refuse Act.

Our main source of water pollution originates in the cane cleaning plant where soil brought in with the harvested cane is removed by washing of the cane stalks with water sprays. Since this water is recycled for use in cane irrigation the pollution problem is transferred to the tail-ends of the irrigation system..

In irrigating cane, it is necessary to convey the water to the last row of cane until such time as sufficient water has percolated into the soil. This inevitably results in some tailwater discharge which can be kept to a minimum through careful water handling by experienced and well-trained irrigators. For higher fields the tailwater can be conveyed to lower fields for reuse in irrigating. However, for the lowest fields, and for those fields bordering gulches and for the perimeter fields of Waipio Peninsula, the tailwater must be contained or treated in sedimentation ponds before being discharged.

At the Waipahu Mill, the cane wash water (about 16.5 mgd) is passed through 36 cyclones which remove up to about 65 percent of the soil particles. These soil particles are then pumped as a mud slurry to settling ponds on Waipio Peninsula. After drying, this soil is used for land reclamation work. The cane wash water, after passing through the cyclones, is used for irrigation on Waipio Peninsula where most of the settleable solids settle out in the cane furrows. The tailwater at the ends of the fields, however, still contains a small percentage of the settleable solids and suspended collodial material which imparts a reddish-brown color to the water. In the upper fields, the water which is of good quality initially, picks up fine soil particles as it passes through the furrows--a reverse process to that which takes place with the cane wash water used for irrigation on Waipio Peninsula.

SOIL AND WATER CONSERVATION PLAN
(Prepared in cooperation with the West Oahu Soil & Water Conservation District)

Land use is approximately as follows:

Sugarcane - 19,950 acres.

Contributory Land (village, camp, residence, factory, office, ponds, haul roads, private road rights-of-way) - 2,513 acres.

Woodland - 7,985 acres.

Pasture - 412 acres.

Miscellaneous (unused gulches, palis, gravel pits, etc.) - 4,406 acres.

Leased Out Land - 1,372 acres.

CONSERVATION PLAN
Revised December 1971

In order to provide for the protection and conservation of soil and water resources, practices as described below will be applied as rapidly as harvest and replant schedules will permit.

Specific practices for each field will be designed and installed as the fields are scheduled to be replanted. This will be done a few days after harvest by plantation personnel assisted by Soil Conservation Service technicians on request.

Conservation practices to be applied are as described below by land use.

CANELAND:

1. Protective Cover:

   Crop residue management to maintain as much cane trash as possible on the surface. Reduce or eliminate liliko raking on steep slopes and hilly areas. Weed control practices modified to maintain grass on drainage ditch and gulch banks.

2. Minimum Tillage - Weed Control:

   Ratoon fields--no discing or harrowing--the only tillage will be opening small furrows for seed in replant spots and interline subsoiling.

   Plant fields--surface tillage reduced to the minimum necessary for good cane growth. Maintain surface in cloddy and trashy condition after planting.

3. Contour Farming:

   Cane lines are planted in furrows on a graded contour. This grade is generally 1-1/2 percent or less. This reduces erosion and makes better use of irrigation water.

4. Sodded Waterways:

   Where natural drainages cannot be controlled by other practices and where needed to serve as outlets for diversions where natural outlets are not available. Plant pangola or kikuyu grass on 2' by 2' or closer spacing and fertilize for quick establishment.

   Constructed waterways will be designed as needed and mowed as needed to maintain capacity and condition.

5. Irrigation Water Management:

   Irrigation water will be managed at a rate and in such a manner that the crop can use it efficiently and that significant erosion does not occur.

6. Irrigation Ditch Lining:

   Lining ditches with impervious material to conserve water.

7. Irrigation Reservoirs:

8. Debris and Sediment Ponds or Basins:

Pits, ponds or dams constructed on water courses to trap and remove silt and sediment carried by drainage water.

9. Runoff Control System:

In-field diversions will be designed and built to carry runoff from the fields to natural gulches or constructed sodded waterways. In favorable topography, diversions will be spaced at 400 to 600 foot intervals. On irregular topography, they will be located to take advantage of the most favorable conditions for alignment, side slopes, and outlet. Outlets will be protected where necessary by sodding or structures, as required.

10. Retirement from Cultivation:

Areas of land with slopes over 20%, which are not practical to improve by land shaping, will be retired from cultivation as soon as plantation economics will permit. Land use will be determined at that time.

11. Other:

Improved harvesting methods being developed by the industry are expected to reduce field damage and leave more cover on the land. These benefits will be included in evaluation by the plantation of harvesting machines or other proposed changes in present operating methods.

PASTURELAND:

Pastureland owned by the plantation is leased to private livestock operators. These leases will require that a good cover of grass be kept on the land and noxious weeds controlled.

CONSERVATION TREATMENT UNIT NO. 1

Mapping Unit Symbols are: EmA, HeA, HxA, KmbA, KmA, KiA, KyA, KlaA, LuA, LvA, MuA, MvA, PhA, Ph, WaA, WkA, WzA.

This unit is located on nearly level land. Slopes generally are from 0 to 3 percent. Crop residue management and good farming practices are adequate to control erosion.

CONSERVATION TREATMENT UNIT NO. 2

Mapping Unit Symbols are: EaB, EmB, EuB, HnB, HeB, HxB, KfB, KiB, KiaB,

This unit is located on gentle slopes ranging from 3 to 8 percent. Erosion hazard is slight.

Conservation practices needed are crop residue management, cross slope farming, grassed waterways as needed, diversion terraces as needed, and irrigation water management.

CONSERVATION TREATMENT UNIT NO. 3

Mapping Unit Symbols are: EaC, EuC, JaC, KlaC, KiC, KyC, KiaC, KuC, KibC, LaC, LaC_3, LeC, MuC, MpC, MnC, MaC_2, PbC, WaC, WzC.

This unit includes slopes ranging from 8 to 15 percent. Erosion hazard is slight to moderate.

Conservation practices needed are crop residue management, cross slope farming, diversion terraces spaced at regular intervals as needed, grassed waterways and outlets, and irrigation water management.

CONSERVATION TREATMENT UNIT NO. 4

Mapping Unit Symbols are: KuD, KpD, MpO, MpD2, MuD, MoD2, McD2.

This unit includes slopes ranging from 15 to 25 percent. Erosion hazard is moderate.

Conservation practices needed are contour farming, crop residue management, forage cycle cropping with as many ratoon crops as possible. Minimum dozing during harvesting. Minimum tillage at all times.

CONSERVATION TREATMENT UNIT NO. 5

Mapping Unit Symbols are: rsY, rsT, LpE, Fd, Fl, 2sy, cR, HCMG, 2HEB, KpE, McF2, NRK, HeB, TR.

This land is generally not used for cropland. It can be safely used for grass, trees and other non-crop uses. It should be protected from burning. A good vegetative cover should be maintained.

Supplementary Exhibit A - Waipahu Quadrangle - Land Use Map.

" " B - " " Conservation Treatment Units

" " C - Schofield " Land Use Map

Supplementary Exhibit E - Puuloa Quadrangle Land Use Map

" " F - " " Conservation Treatment Units

" " G - Ewa " Land Use Map

" " H - " " Conservation Treatment Units

" " I - Layout of Canefields in Waipahu Section

" " J - Water system layout and locations of pumps and reservoirs in Waipahu Section

" " K - Layout of canefields and the locations of pumps and reservoirs in Ewa Section

WATER POLLUTION ABATEMENT PLAN

Almost four years ago the Company constructed its first experimental sump for removal of settleable solids from irrigation tailwater. The findings showed that settleable solids could be effectively removed but the fine colloidal soil particles including color could not be removed except after a long retention period.

Chemical treatment of the irrigation tailwaters was considered as was also the installation of pumps to pump the tailwater back to the interiors of the fields or to reservoirs. Because of the large number of potential irrigation tailwater discharge points, it was found that these methods were not feasible solutions. It was concluded that the answer lay in containment of the irrigation tailwaters.

To this end we have embarked on a program of constructing sumps and ponds as needed to contain the irrigation tailwaters with final disposal of such waters depending on percolation and evaporation. To reduce the tailwater discharges from the fields, a program was inaugurated to train the irrigators and their supervisors in methods of operations best suited to minimize tailwater discharges. This also brought out the need to make changes in some ditch distribution systems and the improvement and rearrangement of some gate installation.

Irrigation intervals (except during the rainy, winter season) range from about 10 days to 20 days. For small fields tailwater discharge may occur only once in every two weeks or so. For larger fields, depending on the topography and size of the field, tailwater discharges may occur on an average of every two or three days. The quantity of the discharge depends on many factors, among which are the size of the area served, the topography of the land, soil porosity and the skill of the irrigator in handling his irrigation flow. The rate of flow and time of flow of irrigation tailwaters are quite variable. Except in unusual circumstances, they will range between about 50 gpm and 150

Because of the many variables involved precise engineering design of the containment ponds is not very practicable and construction is usually determined in the field based on field layout data and operating judgment. First consideration is given to ditching and field edge diking to combine discharge points into one sump or pond. Sumps, as considered herein, are excavations dug by bulldozers in level ground to about the width of a bulldozer blade. The smallest may be about 14 feet wide, 150 feet long and 10 or more feet deep. Ponds are usually constructed in the low point of a cane field by excavating and using the material for diking around the pond. They may be relatively small or up to two acres in size.

Several of the sumps constructed on Waipio Peninsula have proven to be inadequate, primarily because of poor (impermeable) soil conditions. These have been, or will be, either enlarged or moved to other sites with more permeable soil.

Photographs "D" and "E" of Exhibit I, show examples of a sump and a large pond, located on Waipio Peninsula respectively adjacent to West Loch and Walker Bay.

Work completed to date:

27 sumps and ponds completed

3 ponds partly completed

20 discharge points eliminated by ditching and/or field edge diking to combine with other discharge points

Work to be completed - 1972-73:

9 sumps or ponds presently planned

2 sumps to be eliminated with the construction of the Walker Bay Stabilization Pond

4 Sumps to be enlarged or relocated

12 discharge points to be corrected by ditching, field edge diking and/or the construction of sumps or ponds. (For the most part these corrections cannot be finally determined until the canefields are harvested in 1972.)

The figures listed above indicate that a total of about 12 to 14 sumps or ponds remain to be constructed, all of which are scheduled for completion in 1972-73.

Supplementary Exhibit L shows the location of sumps and ponds and the discharge points yet to be corrected.

Walker Bay Stabilization Pond and Wild Bird Sanctuary

This pond will be made by constructing a dike (or dam) across Walker Bay to provide a surface area of approximately 15 acres. This pond, as a combination wild bird sanctuary and brackish water stabilization pond, was first proposed by a representative of the U.S. Department of Interior about two years ago during a tour of Waipio Peninsula with U.S. Navy officials. The State has also indicated interest in this pond as a partial replacement for the wild bird habitats which will be eliminated by the construction of the new Honolulu Airport reef runway recently approved by the State Department of Land and Natural Resources.

The pond will provide ample capacity at minimum velocities to achieve near 100 percent removal of settleable solids and practically all of the fine suspended solids and color. We believe that with the large volume of water and extensive surface area involved in this pond there will be no problem of oxygen depletion. Also, we believe the level of bacterial concentration in the overflow water from the pond will be reduced to or below acceptable limits.

The site of the proposed dam is shown on Supplementary Exhibit L. The profile of the Bay bottom based on soundings made last February is shown on Exhibit III. Typical cross-sections are shown in Exhibit IV. The dam will be approximately 1000 feet long with a 15-foot width at the top and a two-foot freeboard above high tide. Adequate gate controlled spillways will be provided. It is estimated that 16,000 cubic yards of material will be required for construction at an estimated cost of $20,000.

The U.S. Navy has given us tentative approval for this project. Approvals from the State Department of Health and the Corps of Engineers are yet to be obtained. Barring any problems in obtaining approval of this project we expect to complete the project by not later than December 31, 1973.

Additional Project

We are also installing a 10.0 mgd pump and pipeline to make possible the pumping of additional water, including 5.0 mgd of mill washwater, to the "upper irrigation system." This will reduce the quantity of wash water going to the Waipio Peninsula which is sometimes in excess of our needs during periods of rain or when sizeable acreages of cane are on "ripening" or being harvested. The estimated cost of this project for water pollution control is in excess of $100,000. Photograph "F", Exhibit I, shows this pipeline under construction (1971).

The above describes in some detail our on-going program for the elimination of mill waste and tailwater discharges to Pearl Harbor and its tributaries and the control of soil erosion from our lands. We trust that the information provided herein will meet with your acceptance and approval.

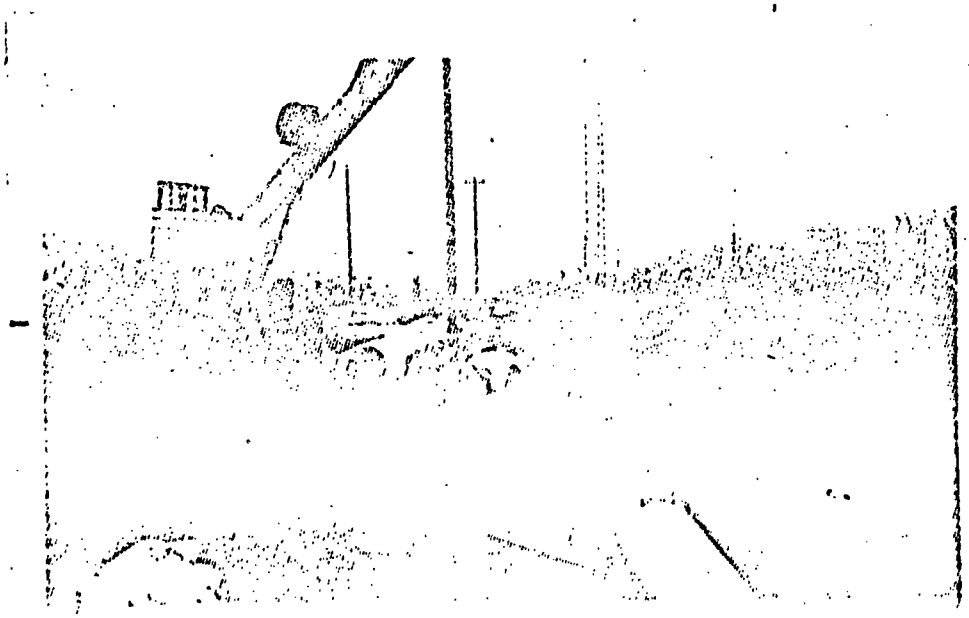
Very truly yours,

OAHU SUGAR COMPANY, LIMITED

John T. Humme
Vice President - Manager

LHH:cla
Enclosures

PHOTOGRAPH "E" Large pond on Waipio Peninsula for containment of irrigation tailwater.

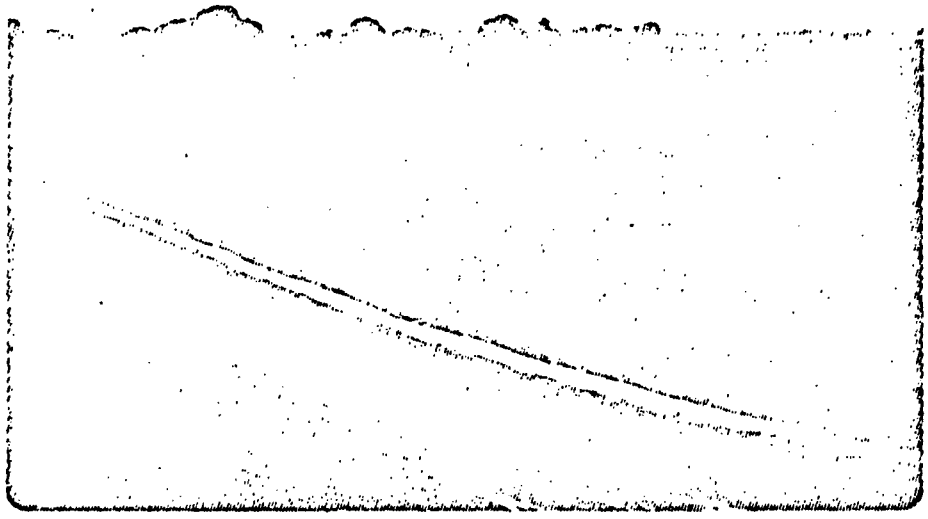


PHOTOGRAPH "F" Pump #2 pipeline under construction - 1971.

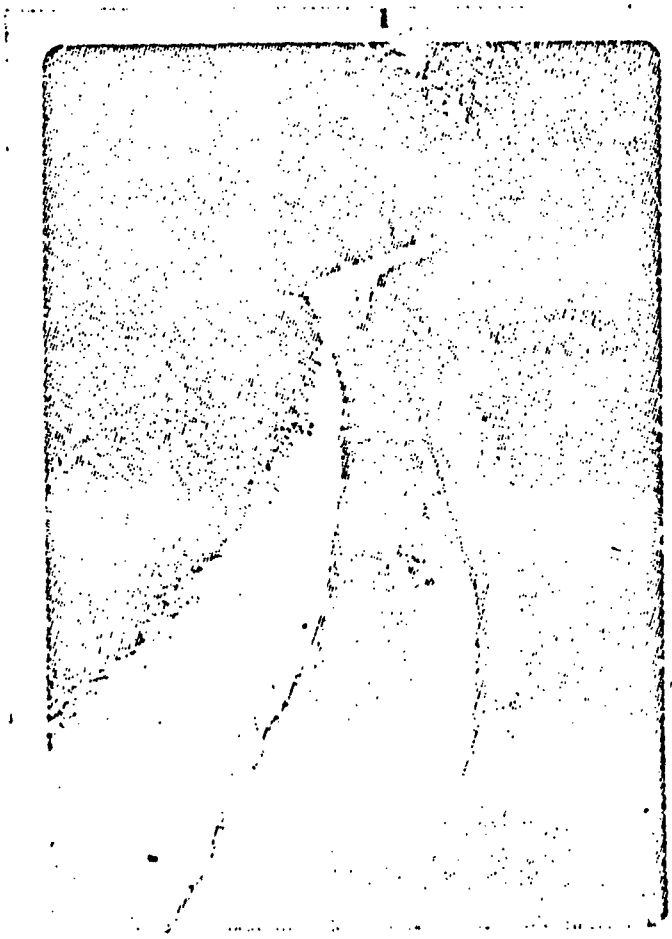
PHOTOGRAPH "C" Lined ditch bordering canefield showing protection against soil erosion and runoff.

PHOTOGRAPH "D" Sump on Waipio Peninsula for containment of irrigation tailwater.

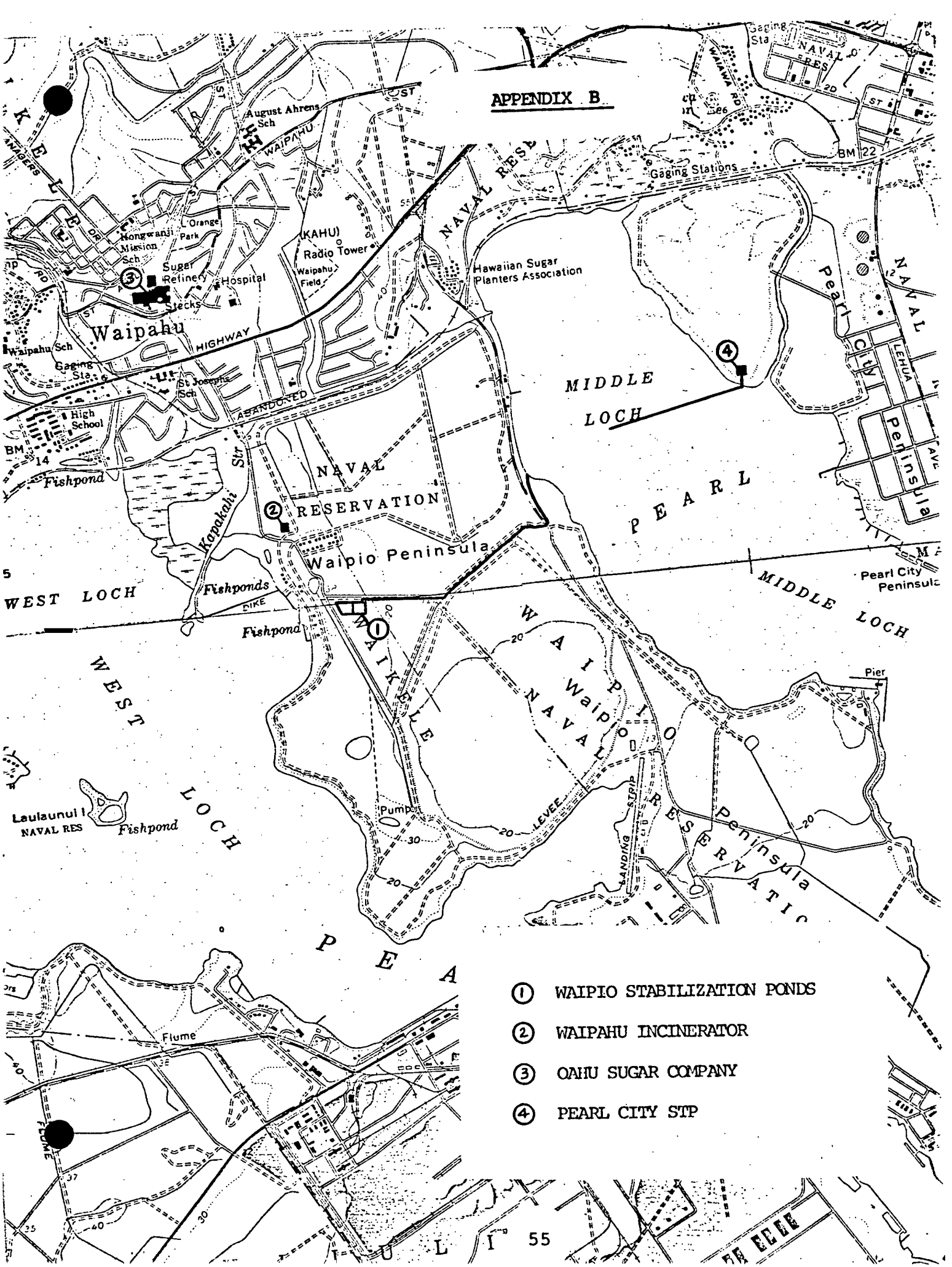
EXHIBIT I - 2



PHOTOGRAPH "A" "Contour furrows" of prepared cane field showing cross-slope cultivation.



PHOTOGRAPH "B" "Gunite" lining installed in


APPENDIX B
Waipahu
Waipahu Sch
August Ahrens Sch
Hongwanji Mission Sch
L'Orange Park
Sugar Refinery
Hospital
Stacks
(KAHU) Radio Tower
Waipahu Field
Hawaiian Sugar Planters Association
Gaging Stations
Gaging Sta 6
St Joseph's Sch
High School
ABANDONED
HIGHWAY
NAVAL RESERVATION
Fishpond
Kapakahi Str
Waipio Peninsula
Fishponds
DIKE
Fishpond
WEST LOCH
MIDDLE LOCH
PEARL
Pearl City Peninsula
WAIKELE
WAIPIO NAVAL RESERVATION
Pier
Pumps
LEVEE
LANDING STRIP
Laulaunui I
NAVAL RES
Fishpond
Flume
FLUME
1 WAIPIO STABILIZATION PONDS
2 WAIPAHU INCINERATOR
3 OAHU SUGAR COMPANY
4 PEARL CITY STP

APPENDIX C

DESIGN CRITERIA AND CALCULATIONS FOR THE WAIPIO WASTE STABILIZATION PONDS

WAIPIO WASTE STABILIZATION PONDS

DESIGN DATA

Qave	=	2.4 mgd
Qpeak	=	5.2 mgd
BOD_5	=	200 mg/l
Susp. Solids	=	150 mg/l
Pond Area	=	10.2 ac
Pond Depth	=	4 ft.
BOD Applied	=	4000 lb/day
	=	390 lb/acre/day
Detention Pd	=	5.2 days
Cl Contact Tank	=	3100 cu. ft.
Cl Det. Time	=	15 minutes
Cl Dosage	=	10 ppm
Cl Dosage	=	192 lb/day

Req'd Volume

W. W. Eckenfelder Jr. and D. J. O'Conner
"Biological Waste Treatment" p. 191

$$V = (5.37 \times 10^{-8} \times Nq \times Y \times 1.072^{35-T})$$

V = Lagoon volume in acre ft.

Nq = Sewage flow in gal/day

Y = Influent BOD in ppm

T = Temp in ^{o}C. $86^{o}F = 30^{o}C$

$$V = 5.37 \times 10^{-8} \times 2.4 \times 10^{6} \times 200 \times 1.072^{35-30}$$

$$= 5.37 \times 10^{-2} \times 2.4 \times 200 \times 1.416$$

$$= 5.37 \times 2.4 \times 2 \times 1.41$$

$$= 36.5 \text{ acre ft.}$$

Lagoon Area Req'd

$D = 2'$ $A = \frac{36.3}{2} = 18.7$ Ac

$D = 3'$ $A = \frac{36.3}{3} = 12.1$ Ac

$D = 3.5$ $A = \frac{36.3}{3.5} = 10.3$ Ac

$D = 4$ $A = \frac{36.3}{4} = 9.1$ Ac

If Area is 10.2 acres and D = 4'

$V = 10.2 \times 4 = 40.8$ acre ft.

BOD Applied

$BOD = 200 \times 10^{-6} \times 2.4 \times 10^{6} \times 8.3 = 4000$ #/day

$= \frac{4000}{10.2 \text{ Ac}} = 391$ #/acre/day

BOD Removal % = 100-0.05 L (Eckenfelder p. 191)

= 100-0.05 (391)

= 100-19.5

= 80.5%

Recheck Design

Actual BOD = 160 ppm

$V = 5.37 \times 10^{-8} \times 2.4 \times 10^{6} \times 160 \times 1.41$

$= 5.37 \times 2.4 \times 1.6 \times 1.41$

$= 29.1$ acre ft.

If A = 10.2 and D = 4.0 V = 40.8 Ac ft. provided

APPENDIX D-1

Table I. Schedule of Changes in Depth of Waipio Ponds:

Date		Depth of Pond I*	Depth of Pond II*
Start-Up	12/14/71	4 Ft.	4 Ft.
12/15/71	2/14/72	3 Ft.	3 Ft.
2/15/72	7/12/72	4 Ft.	4 Ft.
7/13/72	Present	5 Ft.	4 Ft.

* These depths are relative to the original design elevation of the bottoms of the ponds and do not take into consideration any accumulation of sediments.

Table II. Sizes and Loading Characteristics of Waipio Ponds:

	Pond I	Pond II
Surface Area (acres)	5.03	5.46
Depth (feet)	5.0	4.0
Volume (acre-feet)	23.6	20.8
Volume (cubic feet)	1,027,000	906,500
Flow (mgd)	2.4	---
Detention Time (days)	3.2	2.82
Influent BOD_5 (mg/l)	160	---
BOD_5 Loading Rate (lb/acre/day)	681	---

APPENDIX D-1 (Cont.)

Table III. Addition of Sodium Nitrate:

Date		$NaNo_3$ Addition	Method of Dispersion
1/4/72		2900 lb.	Scattered over surface of Pond I
1/11/72		2600 lb.	Scattered over surface of Pond I
3/23/72		2000 lb.	Scattered over surface of Pond I
3/30/72		2000 lb.	Scattered over surface of Pond I
3/31/72	Present	300 lb. daily	100 lb. at Waipahu pumping station 200 lb. on surface of Pond I

APPENDIX D-2

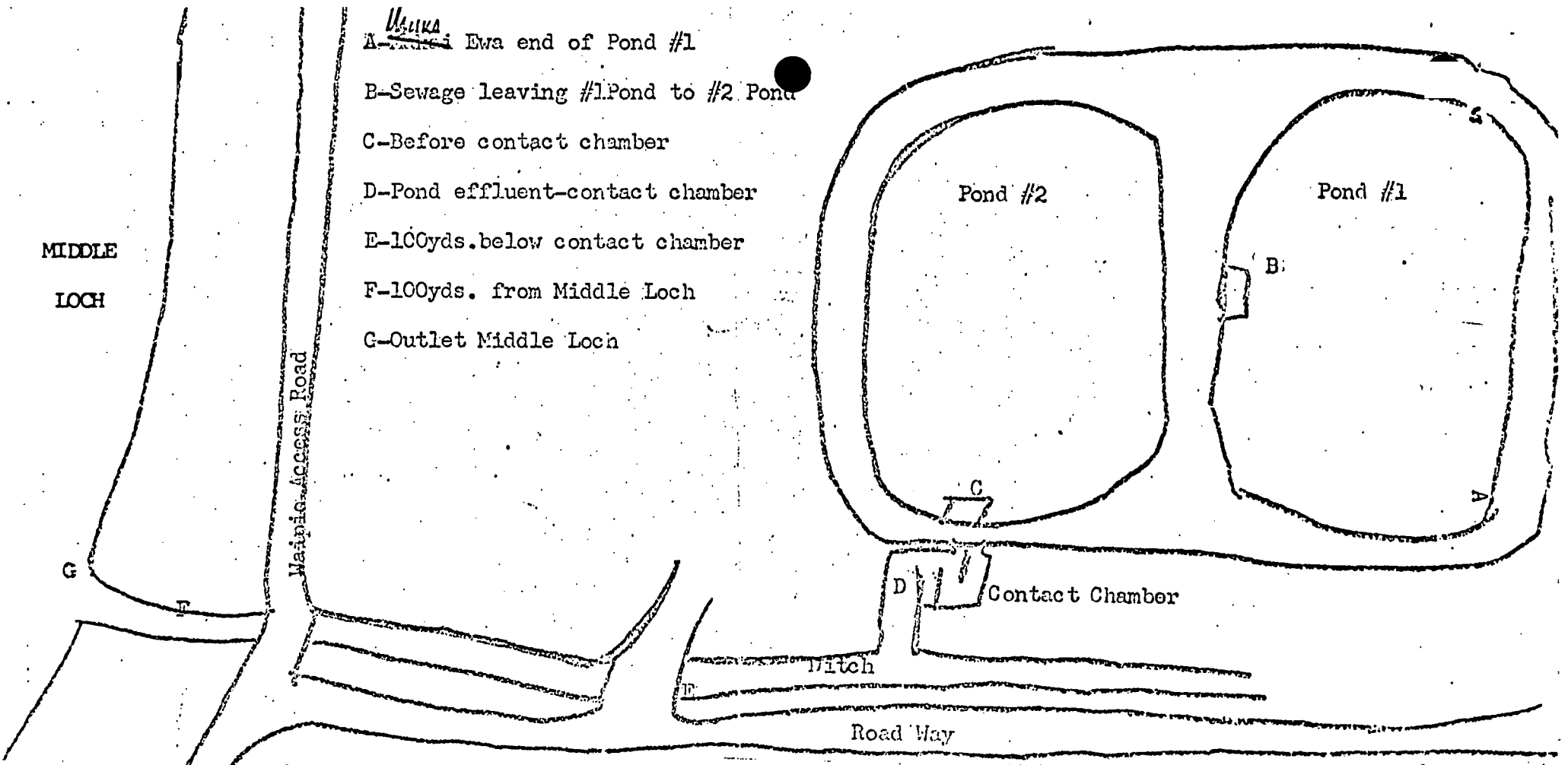
Summary of Data

Waipio Waste Stabilization Ponds

September 27, 1971 -- November 6, 1972

Analyses By The City & County of Honolulu

	BOD_5			Suspended Solids		
	No Aeration 9/27-4/18	3/4-inch Pipes Added 4/18-9/5	1¼-inch Pipes Added 9/5-11/6	No Aeration 9/27-4/18	3/4-inch Pipes Added 4/18-9/5	1¼-inch Pipes Added 9/5-11/6
Pond I Effluent						
Low	83	92	84	14	16	12
High	144	156	136	65	88	72
Median	123	120	107	38	36	32
Average	121	121	106	39	41	33
Pond II Effluent						
Low	74	63	63	12	16	12
High	113	113	110	60	116	60
Median	96	95	83	36	36	32
Average	95	93	84	34	41	33
Chlorine Cont. Cha. Effl.						
Low	78	36	45	12	8	8
High	120	111	83	56	72	72
Median	95.5	84	62.5	32	36	32
Average	96	80	63	32	37	34



DATE/SAMPLING POINT	A	B	C	D	E	F	G
	Dissolved Oxygen (PPM)						
11/17/71	0.0	0.0					
11/23/71	0.0	0.0		0.0			
4/12/72	0.0	1.8	0.0	0.0	1.3	0.0	
8/3/72	0.0	0.0		0.5			
8/21/72			0.0		1.6	3.4	2.2

APPENDIX D-3

ULTRAMAR CHEMICAL WATER LABORATORY
P. O. BOX 48, HONOLULU, HAWAII 96810, TELEPHONE 533-4411

JOB NO. 7216
DATE 08-10-71
PAGE 1 OF 2

LABORATORY ANALYSIS REPORT

TO: Oahu Sugar Company ATTN.: Mr. L. Herschler
SAMPLES OF:

SAMPLING DATE: 08-05-71 TIME: A. M. RECEIPT DATE 08-05-71 TIME A. M.
SAMPLED BY: Client SAMPLE TYPE: GRAB ✓ COMPOSITE PERIOD
REMARKS:

CLIENT SAMPLE NO.						
LABORATORY SAMPLE NO.						
SAMPLE DESCRIPTION		13 Pump #7	14 Wastewater	15 Mud Pump	16 Flow Drain	
BOD 5	mg/l	5.1	372	1731	67.2	
COD	mg/l	82.0	1480	5440	1210	
Total Solids	mg/l	458	2412	27,814	564	
Volatile Solids	mg/l	90	898	7138	388	
Total Dissolved Solids	mg/l	438	644	27,600	529	
Total Suspended Solids	mg/l	18	1635	301	4	
Total Phosphorus	mg/l	1.44	28.50	350.00	0.80	
Kjeldahl Nitrogen	mg/l	4.00	13.60	46.40	20.20	
Ammonia Nitrogen	mg/l	2.44	8.30	25.40	7.30	
Nitrate Nitrogen	mg/l	2.23	7.50	26.80	0.60	
Alkalinity as $CaCO_3$	mg/l	53.0	52.0	235.6	90.0	
Color, True	CPU	0	83	205	5	
Total Coliform	col/100	<100	10,000,000	12,000,000	600	
Fecal Coliform	col/100	<100	3,000,000	6,000,000	200	
pH		7.34	6.38	6.85	7.00	
		Cobalt Platinum				

LABORATORY REMARKS: Organic Carbon determination shall be performed on samples (s) later.

ENVIRONMENTAL PROTECTION AGENCY

REPORT ON OPERATION AND MAINTENANCE OF WASTEWATER TREATMENT PLANT

DATE OF INSPECTION

Form Approved
OMB No. 158-R0035

A. GENERAL INFORMATION

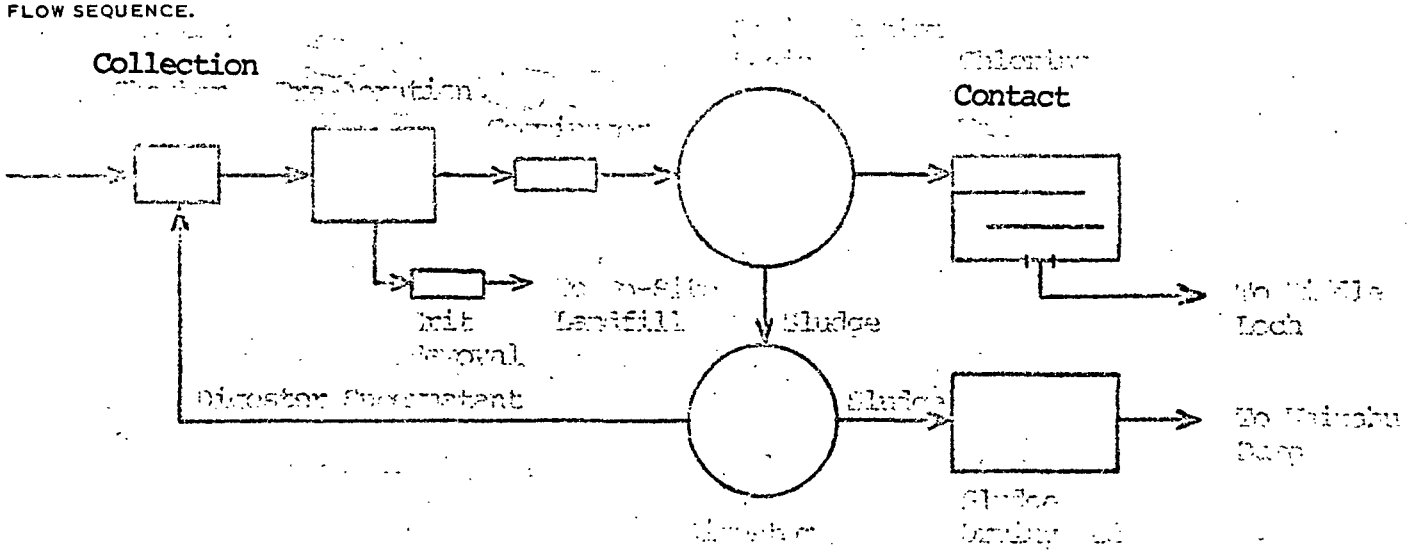
1. PLANT

(a.) NAME	(b.) OWNER	(c.) LOCATION

2. TYPE OF PLANT	3. PROJECT NO.	4. AVG. DESIGN FLOW *(mgd)*	5. DESIGN POPULATION EQUIVALENT

6. COLLECTION SYSTEM						7. DATE PRESENT PLANT BEGAN OPERATING	8. STATE PERMIT NO.
	COMBINED		SEPARATE		BOTH		

9. IN THE SPACE PROVIDED BELOW, FURNISH A SIMPLIFIED FLOW DIAGRAM OR A WRITTEN DESCRIPTION OF THE PLANT UNITS IN FLOW SEQUENCE.



10. IDENTIFY RECEIVING WATERS

11. IDENTIFY PERTINENT STREAM STANDARDS AND/OR USES OF THE RECEIVING WATERS

12. GIVE THE EFFLUENT STANDARDS AND/OR REQUIREMENTS FOR STATE OPERATING PERMIT

B. CURRENT PLANT LOADING

1. ANNUAL AVG DAILY FLOW RATE *(mgd)*	2. PEAK FLOW RATE *(mgd)*		3. POPULATION SERVED
	DRY WEATHER	WET WEATHER	

4. ANNUAL AVG BOD_5 OF RAW SEWAGE *(mg/l)*	5. ANNUAL AVG SUSPENDED SOLID OF RAW SEWAGE *(mg/l)*

6. PRINCIPAL TYPES OF INDUSTRIAL WASTE DISCHARGED TO MUNICIPAL SYSTEM	7. POPULATION EQUIVALENT *(BOD)* OF INDUSTRIAL WASTES

8. POPULATION EQUIVALENT *(SS)* OF INDUSTRIAL WASTES	9. VOLUME OF INDUSTRIAL WASTES *(mgd)*

10. [illegible]LTRATION PROBLEMS

C. PLANT PERFORMANCE

1. LABORATORY ANALYSIS *(Total plant)*

(a.) REPORTING PERIOD — FROM *(Month, day, year)* — TO *(Month, day, year)*

MONTHLY ITEMS (b.)		FLOW (MGD)	SETTLEABLE SOLIDS (ml/l) (c.)			SUSPENDED SOLIDS (mg/l) (d.)			BOD_5 (mg/l) (e.)			PHOSPHORUS AS TOTAL P (mg/l) (f.)			NITROGEN AS N (mg/l) (g.)		
			INFLUENT	EFFLUENT	% REMOVAL	INFLUENT	EFFLUENT	% REMOVAL	INFLUENT	EFFLUENT	% REMOVAL	INFLUENT	EFFLUENT	% REMOVAL	INFLUENT	EFFLUENT	% REMOVAL
SELECT DATA FROM MONTH HAVING MAXIMUM AVG FLOW — MONTH / YEAR	MONTHLY AVERAGE FLOW																
	DAY OF MAX FLOW *(date)*																
	DAY OF MIN FLOW *(date)*																
SELECT DATA FROM MONTH HAVING MINIMUM AVG FLOW — MONTH / YEAR	MONTHLY AVERAGE FLOW																
	DAY OF MAX FLOW																
	DAY OF MIN FLOW																

2. LABORATORY ANALYSIS *(Effluent Only)*

(a.)		FLOW (MGD)	(b.) DO (mg/l)	(c.) CHLORINE RESIDUAL (mg/l)	(d.) COLIFORM (Per 100 ml) TOTAL	(d.) COLIFORM (Per 100 ml) FECAL	(e.) OTHER
SELECT DATA FROM MONTH HAVING MAXIMUM AVG FLOW — MONTH / YEAR	MONTHLY AVERAGE FLOW						
	DAY OF MAX FLOW *(date)*_____						
	DAY OF MIN FLOW *(date)*_____						
SELECT DATA FROM MONTH HAVING MINIMUM AVG FLOW — MONTH / YEAR	MONTHLY AVERAGE FLOW						
	DAY OF MAX FLOW						
	DAY OF MIN FLOW						

(f.) ARE EFFLUENT STANDARDS ESTABLISHED? ☐ YES ☐ NO

(g.) ARE EFFLUENT STANDARDS BEING MET? ☐ YES ☐ NO

(h.) ARE MONTHLY OPERATING RECORDS FILED WITH STATE AGENCY? ☐ YES ☐ NO

★ GPO: 1972—722-095

3. DOES PLANT HAVE ALTERNATE ELECTRIC POWER SOURCE?
☐ DUAL FEED ☐ GENERATOR ☒ NONE

4. ADEQUATE ALARM SYSTEM FOR POWER OR EQUIPMENT FAILURES? ☐ YES ☐ NO

5. EQUIPMENT PROGRAM	ADEQUATE	INADEQUATE
(a.) ROUTINE MAINTENANCE SCHEDULES	--	
(b.) RECORDS OF MAINTENANCE,REPAIRS & REPLCMT	--	
(c.) SPARE PARTS INVENTORY	--	

6. IS PLANT EFFLUENT BEING CHLORINATED? ☒ YES ☐ NO

7. DOES SEWAGE BY-PASS PLANT IN WET WEATHER? ☒ YES ☐ NO

8. DOES SEWAGE BY-PASS PLANT IN DRY WEATHER? ☐ YES ☒ NO

9. AGENCIES NOTIFIED OF EACH BYPASS
C & C Division of Sewers; State Board of Health

10. BYPASS FREQUENCY *(Monthly)*

11. AVG DURATION OF BYPASS *(Hrs)*

12. REASON FOR BYPASSING

13. CAN BYPASS SEWAGE BE CHLORINATED? ☐ YES ☐ NO

14. DO SEWER OVERFLOWS OCCUR UPSTREAM OF PLANT? ☐ YES ☒ NO

15. ANY ODOR COMPLAINTS BEYOND PLANT PROPERTY? *(If yes, explain)*
No

16. OBSERVED APPEARANCE OF EFFLUENT, RECEIVING STREAM OR DRAINAGE WAY

17. IS A CONSULTING ENGINEER RETAINED OR AVAILABLE FOR CONSULTATION ON OPERATING AND MAINTENANCE PROBLEMS?
☐ YES ☐ NO *(If yes, check one of the following)* ☐ CONTINUING BASES ☐ REQUEST BASES

18. DO OPERATORS AND OTHER PERSONNEL ROUTINELY ATTEND SHORT COURSES, SCHOOL OR OTHER TRAINING? ☐ YES ☐ NO

(a.) If yes, cite course sponsor, and date of last course.
C & C of Honolulu and Center for Governmental Development 7-17-72 through 7-28-72

(b.) If no, are there any courses available in this area?

(c.) Is there an established procedure for training new operators?
Yes

19. IS LAB TESTING ADEQUATE FOR THE CONTROL REQUIRED FOR THIS SIZE AND TYPE OF PLANT AND USES OF RECEIVING WATERS?
☐ YES ☐ NO *(If No, explain)*

20. EXPLAIN MAIN DIFFICULTY EXPERIENCED WITH INDUSTRIAL WASTES

21. PERMANENT RECORD FILE
(a.) PLANT OPERATION AND MAINTENANCE MANUAL? ☐ YES ☐ NO (b.) AS BUILT PLANS AND SPECIFICATIONS? ☐ YES ☐ NO
(c.) MANUFACTURERS OPERATION & MAINTENANCE SPECIFICATIONS? ☐ YES ☐ NO (d.) FLOW CHARTS? ☐ YES ☐ NO

22. ESTIMATED WEEKLY MAN-HOURS FOR LAB WORK INCLUDING MAINTENANCE OF RECORDS AND PREPARATION OF REPORTS

23. ANNUAL BUDGET FOR MAINTAINING AND OPERATING PLANT

SALARIES & WAGES	ELECTRICITY	CHEMICALS	MAINTENANCE	STAFFING & TRAINING	OTHER	TOTAL
	[illegible]					

24. STABILIZATION PONDS

(a.) WEEDS CUT AND VEGETATION GROWTH IN PONDS REMOVED? ☐ YES ☐ NO

(b.) BANKS AND DIKES MAINTAINED? *(Erosion, etc.)* ☐ YES ☐ NO

(c.) ANY REPORTS OF GROUND WATER CONTAMINATION FROM POND? *(If yes, give details)* ☐ YES ☐ NO

(d.) SEEPAGE REPORTED? ☐ YES ☐ NO

(e.) ADEQUATE DEPTH CONTROL? ☐ YES ☐ NO

(f.) EFFLUENT RELEASE IS ☐ CONTINUOUS ☐ INTERMITTENT ☐ SEASONAL

★ GPO: 1972—722-094

D. LABORATORY CONTROL

CODING INSTRUCTION

Enter test codes opposite appropriate items. If any of the below tests are used to monitor industrial wastes, place an "X" in addition to the test code.

1 - 7 or more per week
2 - 4, 5 or 6 per week
3 - 1, 2 or 3 per week
4 - as required
5 - 2 or 3 per month
6 - 1 per month
7 - Quarterly
8 - Semi-Annually
9 - Annually

ITEM (a.)	RAW (b.)	PRIMARY EFFLUENT (c.)	MIXED LIQUOR (d.)	FINAL (e.)	(f.) SLUDGE RAW	(f.) SLUDGE SUPERNATANT	DIGESTER (g.)	RECEIVING STREAM (h.)
1. BOD	3	3		3				
2. SUSPENDED SOLIDS	3	3		3				
3. SETTLEABLE SOLIDS	3			3				
4. SUSPENDED VOLATILE								
5. DISSOLVED OXYGEN	3	3		3				
6. TOTAL SOLIDS				3				
7. VOLATILE SOLIDS								
8. pH	3			3				
9. TEMPERATURE	3			3				
10. COLIFORM DENSITY	5			5				
11. RESIDUAL CHLORINE				3				
12. VOLATILE ACIDS								
13. M B STABILITY								
14. ALKALINITY								
15.								
16.								
17.								
18.								
19.								

COMMENTS

3 laboratory personnel (2 certified) are responsible for monitoring data for 10 leeward Oahu S.T.P.'s.

E. PLANT PERSONNEL INVENTORY

PERSONNEL CLASSIFICATION (a.)	EMPLOYMENT (b.) ACTUAL MAN-HOURS PER WEEK	EMPLOYMENT (b.) ACTUAL NUMBER	EMPLOYMENT (b.) NUMBER BUDGETED	EMPLOYMENT (b.) NO. RECOMMENDED	(c.) CERTIFICATION VOLUNTARY/MANDATORY NO. RECOMMENDED OR REQUIRED BY STATE	(c.) CERTIFICATION ACTUAL NO. CERTIFIED	TRAINING REQUIRED NEXT 12 MONTHS (d.) NEW HIRES	TRAINING REQUIRED NEXT 12 MONTHS (d.) UPGRADE (Promotion or skill improvement
1. MANAGEMENT/SUPERVISOR								
2. OPERATOR	129	1 optr 2 asst	optr			1		
3. LABORATORY								
4. MAINTENANCE								
5. OTHER PLANT WORKERS	93	2						
6. OTHER OFFICE/CLERICAL								
7. TOTAL	222	5				1		

* GPO: 1972-722-093

F. GUIDE - VISUAL OBSERVATION - UNIT PROCESS

RATING CODES: S = Satisfactory; U = Unsatisfactory; M = Marginal; IN = In Operation; OUT = Out of Operation

	CONDITION OR APPEARANCE	RATING	COMMENTS
GENERAL	GROUNDS	S	
	BUILDINGS	S	
	POTABLE WATER SUPPLY PROT	S	Back-flow prevention for influent main to plant.
	SAFETY FEATURES		
	BYPASSES	I	Available for use during storm runoff.
	STORM WATER OVERFLOWS	S	
PRELIMINARY	MAINTENANCE OF COLLECTION SYSTEMS		
	PUMP STATION		
	VENTILATION		
	BAR SCREEN		Available for use when comminutor is bypassed.
	DISPOSAL OF SCREENINGS	S	To trenches on plant property
	COMMINUTOR	S	
	GRIT CHAMBER	S	Detention unit removes grit.
	DISPOSAL OF GRIT	S	To trenches on plant property.
PRIMARY	SETTLING TANKS	M	40 min. detention
	SCUM REMOVAL	S	Scum pumped to digester
	SLUDGE REMOVAL	S	
	EFFLUENT	S	
SLUDGE DISPOSAL	DIGESTERS	S	22+22 days detention
	TEMPERATURE AND pH		Temp. = 97°F pH = 6.65 & 11:30, 9/22/72
	GAS PRODUCTION		Used by digester heater, process burner
	HEATING EQUIPMENT	Out	Under repair
	SLUDGE PUMPS		Gravity line to sludge drying beds
	DRYING BEDS	S	Sand beds
	VACUUM FILTER		None
	INCINERATION		None
	DISPOSAL OF SLUDGE	S	To available dump (digester supernatant goes to aeration tank.)
OTHER	FLOW METER AND RECORDER	N/A	
	RECORDS		Data obtained by analyses of grab samples
	LAB CONTROLS		Analysis by standard methods
SECONDARY-TERTIARY *(List items as required)*			
CHLORINE	EFFLUENT	S	
	CHLORINATORS	Out	Automatic unit temporarily out of operation
	EFFECTIVE DOSAGE	?	None currently
	CONTACT TIME		
	CONTACT TANK	M	Short circuiting occurring

G. NOTATIONS BY EVALUATOR

1. ARE THERE ANY PENDING ACTIONS *(Enforcement Conference, change in Water Quality Standards, etc.)* THAT WOULD REQUIRE UPGRADING OF TREATMENT BY THIS PLANT? ☐ YES ☒ NO *(If yes, explain)*

2. IS ANY FOLLOW-UP ACTION REQUIRED TO: (1) CORRECT DEFICIENCIES IN THE PLANT OR ITS OPERATION, (2) RESOLVE INDUSTRIAL WASTE PROBLEMS, (3) STAFF DEFICIENCIES OR TRAINING NEEDS? ☒ YES ☐ NO *(If yes, describe)*

3. IS PURPOSE OF INSPECTION TO DETERMINE IF NEW CONSTRUCTION COMPLIES WITH FEDERAL REQUIREMENTS FOR THE PROVISION OF AN OPERABLE FACILITY? ☐ YES ☒ NO

4. GENERAL RATING

ACCEPTABLE	
CONDITIONAL ACCEPTANCE	
UNACCEPTABLE	

EVALUATION PERFORMED BY	TITLE	ORGANIZATION	DATE
Daryl G. DeRuiter	Sanitary Engineer	EPA, Region IX	9/29/72

INFORMATION FURNISHED BY	TITLE	ORGANIZATION	DATE
Art F. Galton	Asst. S.T.P. Operator	C & C of Honolulu	9/29/72

* GPO: 1972-722-091

APPENDIX G

Photographs

Waipio Stabilization Ponds

Photo No.	
WP-1	View of Pond I from northwest corner (9-27-72, P.M.)
WP-2	View of Pond I from west end (9-27-72, P.M.)
WP-3	Scum accumulation along west end of Pond I (9-27-72, P.M.)
WP-5	Close-up of east edge of Pond I near effluent weir (9-27-72, P.M.)
WP-6	Pond I effluent weir (9-27-72, P.M.)
WP-7	Influent to Pond II (9-27-72, P.M.)
WP-8	View from west end of Pond II (9-27-72, P.M.)
WP-9	Close-up of north edge of Pond II (9-27-72, P.M.)
WP-10	Pond II effluent structure (9-27-72, P.M.)
WP-11	Pond II effluent weir (9-27-72, P.M.)
WP-12	View of chlorine contact chamber (9-27-72, P.M.)
WP-13	Chlorine contact chamber effluent (9-27-72, P.M.)
WP-14	Chlorine contact chamber discharge (9-27-72, P.M.)
WP-15	Beginning of Waipio Pond effluent ditch (9-27-72, P.M.)
WP-16	Confluence of Waipio Pond effluent and Oahu Sugar Company tailing water discharge (9-27-72, P.M.)
WP-17	Upstream of confluence (9-27-72, P.M.)
WP-18	Downstream of confluence (9-27-72, P.M.)

APPENDIX G (con't)

Waipio Stabilization Ponds (cont.)

Photo No.

WP-19 Force main discharging to irrigation ditch (9-27-72, P.M.)

WP-21 Force main discharging to irrigation ditch (9-27-72, P.M.)

WP-22 Force main discharging to irrigation ditch (9-27-72, P.M.)

WP-23 Force main discharging to irrigation ditch (9-27-72, P.M.)

WP-24 Irrigation ditch containing Waipio Pond effluent and irrigation tailing water near point of discharge to Middle Loch (9-27-72, P.M.)

WP-26 Point of discharge of irrigation ditch to Middle Loch (9-26-72, P.M.)

WP-27 Point of discharge of irrigation ditch to Middle Loch (9-26-72, P.M.)

Oahu Sugar Company

OS-2 Initial washing of raw cane (9-28-72, P.M.)

OS-3 Centrifuges (9-28-72, P.M.)

Pearl City STP

PC-3 Influent collection chamber (9-29-72, A.M.)

PC-4 Preaeration tank (9-29-72, A.M.)

PC-8 Primary sedimentation tank (9-29-72, A.M.)

PC-9 Primary sedimentation tank effluent (9-29-72, A.M.)

APPENDIX G (cont.)

Pearl City STP

Photo No.

PC-10 Chlorine contact chamber (9-29-72, A.M.)

PC-11 Chlorine contact chamber effluent (9-29-72, A.M.)

Note: Other pictures taken on this inspection were not included in this report either to avoid duplication or because they did not relate to the contents of this report. Slides of these additional pictures are maintained in the S & A files.