

# **QUARTERLY PROGRESS REPORT**

**PACIFIC NORTHWEST  
WATER LABORATORY  
CORVALLIS, OREGON**

**April 1—June 30 1972**

**ENVIRONMENTAL PROTECTION AGENCY**

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NATIONAL ENVIRONMENTAL RESEARCH CENTER  
200 S.W. 35th STREET  
CORVALLIS, OREGON 97330



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Environmental Protection Agency  
200 S. W. 35th Street  
Corvallis, Oregon 97330

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## NATIONAL EUTROPHICATION RESEARCH PROGRAM

### Status of Projects and Significant Accomplishments

During this quarter NERP personnel continued to spend a great deal of its time assisting and consulting with the National Eutrophication Survey Program (NESP).

#### Work Plan ZCB. Assay Procedures for Determining Productivity Responses

The second series of Lake Michigan samples collected in April 1972, are being assayed for their algal growth potential. Singular phosphorus additives, ranging from 0.005 to 0.020 mg P/l, with and without the addition of nitrogen, trace metals, and iron were made to the lake water samples. Preliminary results obtained with Lake Michigan Sample No. 8623 indicated that when phosphorus was added (ranging from 0.005 to 0.020 mg P/l) and the concentrations of the other nutrients kept constant, there was a corresponding increase in algal productivity ranging from 0.04 to 9.40 mg dry wt/l. These data indicate that, at the time and place of the collection of the sample, phosphorus was algal growth-limiting in the lake water.

The marine algal assay research centered around the determination of the effects of various salinity and phosphorus concentrations upon the growth response of Dunaliella tertiolecta. Initial results show excellent correlation of increases in biomass produced to increasing concentration of both salinity and phosphorus (i.e., at 5 percent salinity and .046 mg P/l, 15.3 mg dry wt/l biomass was obtained. At 35 percent salinity and 0.370 mg P/l concentrations the yield of Dunaliella tertiolecta was increased to 226 mg dry wt/l.

Isolation of fresh water algae from the spring quarter sampling trip of the coastal and Cascade lakes is almost completed. Evaluation of the isolated algae as potential algal assay test organisms should begin next quarter.

Work Plan ZCA: Determination of the Environmental and Nutritional Requirements and Physiological Processes of Freshwater and Estuarine Algae and Plants

Preliminary investigation of selected trace metal requirements of three species of fresh water algae indicate the following approximate concentration levels of mercury, zinc, copper and cobalt that are algistatic to the growth of Selenastrum capricornutum and Anabaena flos-aquae in both Gorham and AAP culture medium. No specific results are available for Microcystis aeruginosa at this time. The following table indicates the approximate levels of Hg, Zn, Cu and Co (in  $\mu\text{g/l}$ ) which were algistatic to the test algae.

<u>Test Alga</u>	<u>ug Hg/l</u>		<u>ug Zn/l</u>		<u>ug Cu/l</u>		<u>ug Co/l</u>	
	<u>AAP MEDIUM</u>	<u>GORHAM MEDIUM</u>	<u>AAP MEDIUM</u>	<u>GORHAM MEDIUM</u>	<u>AAP MEDIUM</u>	<u>GORHAM MEDIUM</u>	<u>AAP MEDIUM</u>	<u>GORHAM MEDIUM</u>
<u>Selenastrum capricornutum</u>	50	70	90	$\geq$ 350	60	140	> 120	> 250
<u>Anabaena flos-aquae</u>	$\geq$ 30	$\geq$ 80	----	> 250	----	100	----	----

In all cases the algae grown in Gorham's medium required higher concentration levels of mercury, zinc, copper and cobalt to produce algistatic conditions. The algistatic heavy metal concentration levels were obtained by determining changes in chlorophyll a content of the test algae during a seven day incubation period and are considered to be preliminary.

Full scale studies utilizing the "Algal Assay Procedure: Bottle Test" are underway. The cultures are being spiked individually with mercury, copper, and zinc. Growth will be analyzed by cell numbers (electronic particle counter) and chlorophyll (fluorescence).

Algal photosynthesis and respiration studies will parallel the "Bottle Test" assays to determine the effects of the heavy metals upon these aspects of algal physiology.

#### Work Plan ZBP: Lake Restoration

Completion date of the tertiary treatment plant at Ely, Mn., was extended to September 18, 1972, after consideration of the contractor's request. This request was entirely reasonable and to the advantage of EPA since authority to provide operating and back-up laboratory positions are already long overdue. The completion date will have to be further extended due to a strike of construction workers which began on June 19.

Assistance on the treatment plant sludge disposal problem was received from EPA-AWTRL and EPA Solid Waste Disposal, Cincinnati. Inspection of disposal sites and meetings with State, County, City, and U. S. Forest Service personnel were held. The most expedient

approach for EPA from the standpoint of funds and time available will be sanitary landfill disposal of dewatered combined tertiary and digester sludges. The state has yet to give official approval. Potential methods of land surface spreading will also be pursued with the U. S. Forest Service as a possible future alternative.

Graver Company (process equipment supplier for tertiary plant) sent a chemist to the Ely laboratory and with cooperation of the staff of the Ely office, jar tests were carried out on municipal waste water to evaluate means for tertiary plant operation. The results again indicated 0.05 mg/l phosphorus final effluent concentration but very good process control will be necessary. Graver's report is pending, however we expect that treatment will involve lime and a polymer in the first contact unit followed by recarbonization to pH 9.2 and possibly a coagulant in the second contact unit. Filtration is essential as has been known.

Observations were made of the flow pattern (under ice conditions) of Rhodamine WT dye placed in the secondary wastewater outfall on March 27. Dye movement was first northwestward then eastward. The bulk of the dye was detected in 7 to 15 foot depths. On May 1, dye was detected in Shagawa River (lake outlet). No dye was detected in the west end of the lake.

Ely staff found that the analytical and data evaluation workload as currently proposed cannot be handled without additional staff as requested for plant and laboratory operation. Therefore, pending the reporting of these additional personnel, the schedule workload was temporarily reduced.

Total phosphorus in Shagawa Lake increased substantially through the winter and reached a maximum in mid-April at Brissons Point (BP) of 0.38 mg/l and mid-May at east end deep hole (EEDH) of 0.12 mg/l. Orthophosphate-P increased to a maximum of 0.06 mg/l at BP on April 5 and 0.08 mg/l at EEDH on April 11.

Orthophosphate concentrations in the euphotic zone greatly diminished after ice-out, presumably due to algal uptake. Concentrations of orthophosphate have been less than 0.010 mg/l phosphorus in the epilimnion since ice-out while total phosphorus has ranged from 0.016 to 0.050 mg/l.

Areal concentrations (average of 3 stations) of chlorophyll a peaked at 155 mg/m<sup>2</sup> about the first of June then declined to a minimum of 98 mg/m<sup>2</sup> the middle of June and increased to 144 mg/m<sup>2</sup> on July 6. Algae were stratified near the surface at the time of peak production in May, but not so in late June with wind-mixing being more frequent.

Algal counts on Shagawa River (lake outlet) at ice-out showed green flagellates were dominate - mostly Chlamydomonas and Euglena sp. Predominate during the spring bloom were Asterionella formosa, Anabaena circinalis, Melosira, Chlamydomonas, and Synedra. On July 5, 6 the phytoplankton population was predominately diatoms: Fragilaria crotonensis, Melosira, and Tabellaria. Also conspicuous were Anabaena circinalis and Aphanizomenon flos-aquae.



There was a clearly defined thermocline in Shagawa Lake by mid-May with a 9°C temperature gradient between the 10 ft. and 20 ft. depths by June 14. The stratification still existed on July 6 even though relatively high winds occurred during June. This is the first time that stratification such as this has been observed in Shagawa Lake. Anoxic conditions were observed below 25 ft. on June 13, 14 and continued to exist on July 6.

Tributary nutrient loading for Shagawa Lake was determined for the years 1967 thru 1971. Also determined was the contribution from rainfall, Stinky Ditch and excess city water. Graphs were plotted for limnological, climatological, treatment plant and tributary trends.

Work Plan ZCH: New Methods for the Removal and/or Inactivation  
of Nutrients in Lakes.

The Clines Pond sodium aluminate phosphorus inactivation experiment continues to be monitored every two weeks. Although marked improvement of the pond was observed throughout the 1971 growing season, this year the pond appears to have reverted to its pretreatment state. Heavy Anabaena blooms have occurred during the spring, with average Secchi disc values of about 50 cm. Dissolved oxygen in the bottom waters is low. It is not possible to determine whether inactivated phosphorus has been released, but it is known that the drainage basin of the pond has received agricultural fertilizer, and that commercial fish food was applied to the pond by the owner. Therefore, it is possible that the increased algal production this year is the result of these recently added nutrients.

## Work Plan ZCE: Sediment - Water Plant Nutrient and Toxic Element

### Interchange Processes and Control

Leaching experiments on Shagawa Lake sediments from four locations in the lake, initiated last quarter, were completed. Phosphorus release rates were much greater (1) under anaerobic conditions, and (2) from non-mixed sediment-water systems. In a non-mixed carboy and laminar flow systems phosphorus release was greater than in a stirred carboy system.

## Work Plan ZCJ: A Comparative Study of Eutrophication in Two Mountain Lakes.

The Diamond Lake study was resumed in the last week of May, two weeks following ice-out. Nutrient levels were about the same as those encountered on the initial sampling trip last year and a substantial diatom population was found. The second trip was on 26-28 June. At that time no algal bloom was in evidence, and Secchi disc values of 25 feet were obtained. Growth of submerged macrophytes was under way. In summary, so far we have observed no change in lake conditions from those of last year.

### Other Activities

Mr. Maloney visited with the Special Projects staff at Headquarters to discuss the lake survey program, including tributary sampling and aerial photography. He also met with the Deputy Assistant Secretary of Defense for Reserve Affairs and his staff to discuss tributary sampling by the National Guard and Reserve Units. Following he met with WERL personnel at Griffis Air Force Base, Rome, New York to discuss the lake

sampling and with personnel at the Rome Air Development Center to discuss the use and interpretation of aerial photography.

Ken Malueg attended a meeting in Vancouver, Washington regarding future restoration plans for Vancouver Lake, Washington. Bob Randall (Ely Staff Chemist) visited Corvallis to work and discuss with CLS analytical methodology and instrumentation. Interviews at Ely were held with reporters from KBAL-TV, Channel 3, Duluth, by the editor of Wilderness News (Minneapolis) and by the Minneapolis-Tribune newspaper regarding the Shagawa Lake project.

Mr. Maloney attended a modeling workshop at RTP, North Carolina and discussed mathematical modeling in the National Eutrophication Research Program.

Mr. Maloney attended the 6th International Conference on Water Pollution at Jerusalem, Israel and presented a paper entitled "Use of Algal Assays in Studying Eutrophication Problems."

Mr. Maloney, accompanied by Mr. Herb Quinn of the Office of International Affairs met in Tunis with the staff of the Institute National Scientifique Et Technique Oceanographic Et Pêche (INSTOP) to develop a joint research project (under the Special Foreign Currency Program) between EPA and the Government of Tunisia.

Visitors included Dr. Arlo Fast (Union Carbide Corp) who discussed aeration as a lake restoration technique and Dr. Eschenroeder (General Research Corp) who discussed future efforts he would like to pursue in developing predictive lake models.

William Sarville and Spencer Peterson successfully completed a course in SCUBA.

Deville's, Woahink, Marion, and Paulina Lakes were visited in search for suitable sites on which to carry out studies of nutrient flux to lakes from septic tanks. A mobile phosphorus-removal pilot treatment plant was obtained from Battelle-Northwest for use in lake restoration studies.

The following manuscripts were reviewed by NERP personnel:

1. Lake Aeration, by Arlo Fast of Union Carbide Corporation.
2. Horseshoe Lake Nutrient Inactivation Study, by various Wisconsin investigators.
3. OECD's "Report of the Planning Group on Measurements and Monitoring for Eutrophication Studies."

#### Grant and Contract Research

The following research grant and contract proposals were reviewed.

1. "Blue-Green Algal Bloom Induction"
2. "A Study of Eutrophication Potentials of Selected Surface Waters of the Northeast" (Proposed)
3. "Primary Productivity Limitation in Bear Lake, Utah"
4. "The Role of Sludge Worms in Nutrient Transport"
5. "De-eutrophication via Aeration in Cylindrical Macromicrocosms: biology, Dynamics, Effects and Their Implications Toward Large Ecosystems. Part I. Equipment and On-going Research and Part II. Cylinders and Set-up."
6. "Stratigraphic Techniques for Determining Baselines of Lake Pollution."
7. "Eutrophic Lake Reclamation by Physical and Chemical Manipulations."

8. "Studies on the Nitrogen Metabolism of the Blue-Green Algae."
9. "Aqueous Environmental Chemistry of Nitrogen and Phosphorus in Lake Mendota."
10. "Application of Algal Assays to Lake Renewal Projects."
11. "Relationship of Algal Extracellular Metabolites to Bloom Sequence in Fresh Water."
12. "Systems Studies of Water and Nutrient Transport."
13. "Routine Chemical Methods for Quantifying the Phosphorus Release Potential of Sediments."
14. "Relationship Between Chemical Control of Algae or Aquatic Weeds and Eutrophication."
15. "Nutrient Inputs to Natural Waters."
16. "Eutrophication Information Program."
17. "Synthetic Agricultural Fertilizers." (Proposal)
18. "National Lake Inventory."
19. "Nitrogen Transformation in Lake Sediments."
20. "Eutrophication of Surface Waters - Lake Tahoe (Indian Creek Reservoir)."
21. "Continuous Steady-State Algal Assay Methods for Eutrophication Studies."
22. "The Significance of Bacteria in Eutrophication of Lakes."

#### Reports, Papers, and Presentations

Tilstra, J. R., K. W. Malueg and W. C. Larson. "Removal of Phosphorus and Nitrogen from Wastewater Effluents by Induced Soil Percolation. J. WPCF. Vol. 44, No. 5, May 1972.

Maloney, T. E., W. E. Miller and N. Blind. "Use of Algal Assays in Studying Eutrophication Problems." Presented before 6th International Conference on Water Pollution Research, Jerusalem, June 12, 1972.

## Plans for First Quarter FY 73

### Physiological Control

1. Continue the study of the trace metal requirements of the three AAP test alga.
2. Continue the evaluation of new test species for algal assays.
3. Continue development of an algal assay procedure for marine and estuarine waters.
4. A meeting of University and industrial researchers involved in the evaluation of the algal assay procedure will meet at this laboratory on August 16-17.

### Lake Restoration

1. Complete nutrient budget of Shagawa Lake for the years 1967 through 1971.
2. Obtain authorization and hire critically needed personnel for Shagawa Lake project.
3. Continue limnological investigation of Shagawa Lake.
4. Survey and construct bathymetric map of Shagawa Lake.

### Technology Development

1. Continue Diamond Lake study. C-14 productivity will be measured every two weeks, and a complete survey will be carried out once each month. A SCUBA survey of weed bed development will be run the last week in July.
2. The annual survey of Waldo Lake will take place in August.
3. Laboratory experiments on nutrient inactivation and sediment-water interchange will be initiated in July.
4. Monthly monitoring of Suttle Lake will continue.

5. Reports on the Cline's Pond nutrient inactivation experiment; ground water studies at Waldo Lake; the 1971 Diamond Lake studies; the Lake Sallie weed harvesting study; and the Shagawa Lake sediment-water P and N interchange experiments should be in completed manuscript form by the end of the quarter.

6. The contract with CH<sub>2</sub>M for an A&E study on experimental pond design and construction is being negotiated and progress on the study during the quarter is anticipated.

## NATIONAL EUTROPHICATION SURVEY PROGRAM

### Status of Project and Significant Accomplishments

The National Eutrophication Survey Program (NESP) activities at PNWL accelerated this quarter as the NESP staff began to come on board, beginning with the Data Coordinator and the Secretary on May 15. Six junior staff members were added on May 28, and staffing was essentially completed by June 26 when the Program Element Director and most of the remaining staff reported for duty. Because of the late staffing of the Survey Program, necessitated by the limited FY72 budget, continued reliance was placed on The National Eutrophication Research Program (NERP) and Consolidated Laboratory Services (CLS) personnel of PNWL, as well as other NERC-Corvallis personnel, for program assistance.

Lake sampling was begun in May by personnel of the Western Environmental Research Laboratory, Las Vegas (WERL), with assistance provided by CLS personnel of PNWL in field sampling analytical procedures, quality control, and instrumentation. NERC-Corvallis provided the assistance of limnologists from associate laboratories for the field effort. On-site inspections of WERL survey procedures and assistance in analytical techniques were provided by senior staff members of NERP and CLS.

One of the primary efforts of the NESP staff during the quarter was directed to assist Headquarters Special Projects Staff in the selection of 233 study lakes and impoundments in 10 states, with the concurrence and assistance of Region and State personnel.



The major effort of the staff was in the selection of 192 tributary sampling sites associated with 28 study lakes and impoundments in the New England states, exclusive of Maine. This effort involved confirmation of selected sites with Region and State personnel, identification and location of point waste sources, preparation of maps and site descriptions, and forwarding of the maps and site descriptions to the Special Projects Staff for reproduction and distribution to the various National Guard units that will be involved in tributary sampling. As the quarter closed, similar effort was being made in tributary sampling site selection for 205 water bodies in the states of Maine, New York, Michigan, Wisconsin, and Minnesota.

Staff attention was also given to the problems of obtaining adequate data on the effluent nutrient levels of the many, frequently small, wastewater treatment plants situated on tributaries to the study lakes and impoundments as well as obtaining satisfactory flow data for tributaries not presently gaged by the U.S. Geological Survey or by state authorities.

#### Plans for First Quarter, FY73

The first quarter of FY73 will be devoted to (1) selection of tributary sampling sites around study lakes in Michigan, Wisconsin, Minnesota, Maine and New York, (2) training National Guard units and initiating tributary sampling in the ten states studied in FY72, and (3) selecting study lakes and tributary sites in Region 4 states in

which sampling will begin in January 1973. Instructing National Guard units in tributary sampling procedures will require considerable assistance from EPA personnel from the National Marine Water Quality Laboratory in West Kingston, Rhode Island, and other Associate Laboratories in NERC-Corvallis in addition to the instructors from NESP, and other PNWL personnel.

## NATIONAL WASTE TREATMENT RESEARCH PROGRAM

### FOOD WASTES RESEARCH

#### Status of Projects and Significant Accomplishments

##### Work Plan AZQ: Technical Consultation and Data Dissemination

The effluent committee of the U. S. Brewers Association met with EPA's headquarters staff and Dennis Taylor to discuss future government effluent restrictions.

On two occasions, Kenneth Dostal and Harold Thompson met with Mike LaGraff of the headquarter's Effluent Guidelines and Standards Development Program and representatives of the canned and frozen fruit and vegetable processors. These meetings were held to establish procedures that will be utilized to develop a broad data base for determining standard raw waste loads and current treatment levels for the fruit and vegetable processing industry.

A meeting between headquarter's enforcement and Refuse Act Permit Program (RAPP) personnel and representatives of the canned and frozen fruit and vegetable processors was attended by Kenneth Dostal and Harold Thompson. RAPP Schedule A&B effluent guidelines for the fruit and vegetable processing industry were the subject of this meeting.

On May 24th a paper titled "New Fruit and Vegetable Processing Waste Management Systems" was presented by Harold Thompson at the 72nd National Meeting of the American Institute of Chemical Engineers.

All papers, with one exception, presented at the Third National Symposium on Food Processing Wastes have been received. The Proceedings of this symposium will be submitted for reproduction in the near future.

Work Plan FGF: Grant Monitoring

Visits were made to the following grant sites during the fourth quarter of Fiscal Year 1972:

1. Crowley Food, Inc., La Fargeville, NY - 12060 DXF
2. Dairy Research and Development Corp., Vernon, NY - 12060 DEQ
3. Widmer's Wine Cellars, Naples, NY - 12060 EVZ
4. Amber Laboratories Division, Juneau, WI - 12060 HRR
5. Western Potato Service, Inc., Grand Forks, ND - 12060 EIG
6. City of Grand Forks, ND - 12130 DJB

Grant proposals and preproposals on the following subjects were received during the past quarter:

1. Sludge disposal at the main plant of a meat packing plant.
2. Membrane processes in the treatment of potato protein waste water--reverse osmosis and ultrafiltration.
3. Azeotropic processing.
4. A wastewater treatment plant for a soybean products processing plant.
5. Treatment of concentrated wastewater from the citrus processing industry.
6. Pollution aspects of catfish production--review and projections.
7. Effluent guidelines for specialty food industry.
8. Cat fish farming wastes.

The current status of grants monitored under the Food Wastes Research Program is described on the following page:

1. 12060 EUZ - "Winery Wastewater--Characterization and Treatment."

Post construction studies are continuing.

2. 12060 EKQ - "Kent Cheese Company--Waste Treatment Facility."

First draft of final report has been reviewed and returned to grantee for revision.

3. 12060 FLL - "Activated Sludge--Bio Disc Treatment of Distilling Wastes." Data collection and evaluation on the operational parameters of the waste treatment facility was continued throughout the past quarter.

4. 12060 EHS - "Cannery Waste Treatment by Lagoons and Oxidation Ditch." The final report is being retyped before submittal for reproduction.

5. 12060 EHV - "Aerobic Secondary Treatment of Potato Processing Waste with Mechanical Aeration." Grant has been audited but not officially completed.

6. 12060 DSI - "State-of-the-Art, Sugar Beet Processing Waste Treatment." The final report has been reproduced and initial distribution completed.

7. 12060 ECF - "Water Pollution Abatement in the United States Seafood Industry--State-of-the-Art." Grant awaiting final audit.

8. 11060 EZR - "Complete Aerobic Treatment of Combined Domestic and Industrial Wastes with Mechanical Aeration." Grant has been audited but not officially closed.

9. 12060 EIG - "Full-Scale Demonstration and Evaluation of Potato Dry and Wet Caustic Peeling Processes." First draft of final report has been reviewed and returned to grantee for revision.

10. WP-01486-01 - "Status and Research Needs for Potato Waste Waters." This grant has been audited but not officially closed.
11. 12060 FAD - "Aerobic Treatment of Fruit Processing Wastes." Grant has been audited but not officially closed.
12. WPD 93-04-68 - "Anaerobic-Aerobic Sugar Beet Waste Treatment." Final report has been submitted for reproduction and distribution.
13. 12060 DXL - "Reduction of Salt Content of Food Processing Liquid Waste Effluent." Grant has been audited but not officially closed.
14. 12060 EDK - "Production and Disposal Practices for Liquid Wastes from Canning and Freezing Fruits and Vegetables." Final report has been reproduced and distributed.
15. 12060 EHT - "Use of Fungi Imperfecti in Waste Control." Grant has been audited but not officially closed.
16. 12060 EDZ - "Pilot Plant Installation for Use of Fungi Imperfecti on Vegetable Wastes." Grant has been audited but not officially closed.
17. 12060 FAK - "Concentration of Sugar Beet Wastes for Economic Treatment with Biological Systems." Grant has been audited but not officially closed.
18. 12060 FQE - "Dry Caustic Peeling of Tree Fruit to Reduce Liquid Waste Volume and Strength." Final audit has been conducted but grant has not been officially closed.
19. 11060 FJQ - "Pollution Abatement and By-Product Recovery in Shellfish and Fisheries Processing - Phase 1." Final audit requested.
20. 12060 EGU - "State-of-the-Art of Dairy Plant Wastes and Waste Treatment Systems." Final report has been reproduced and distributed.

21. 12060 FDR - "Disposal of Rum Distillery Wastes." Second draft on final report has been reviewed and returned to grantee for revision.

22. 12060 ESY - "Improvement of Treatment of Food Industry Waste." Second draft of final report under review.

23. 12060 EZP - "Cannery Waste Treatment by the Kehr Activated Sludge Process." Grant has been audited but not officially closed.

24. WPRD 151-01-68 - "Integrated Treatment of Liquid Wastes from Food Canning Operations." Final audit has been completed but not officially closed.

25. 12060 EHU - "Reconditioning and Reuse of Food Processing Brines." Grant has been audited but not officially closed.

26. 12060 DQV - "Removal and Recovery of Fatty Materials from Edible Fat and Oil Refinery Effluents." First draft of final report is being revised.

27. 12060 DEQ - "Elimination of Pollution by and Utilization of Protein Concentrates (Dried Whey) from Milk Residues of Cheese Making." Full scale waste treatment system has been constructed and data collection initiated.

28. 12060 DPE - "Treatment of Wastes from the Wet Milling Industry." Final report is being prepared.

29. 12060 DSB - "Demonstration of a Full-Scale Waste Treatment System for a Cannery." Final report has been published and distributed.

30. 12060 EAE - "Evaluation of Controlled Temperature and Forced Aeration in Trickling Filter Treatment of Food Canning Waste Waters." Final report has been reproduced and distributed. Grant has been audited but not officially closed.

31. 12060 DXF - "Development and Demonstration of an Ultrafiltration Plant for the Abatement of Pollution from Cottage Cheese Whey." Final report on Phase I completed and full-scale construction has been completed and Phase II data collection initiated.

32. 12060 FJK - "Acid Emulsion Breaking - Activated Sludge for Bakery Waste." Post-Construction studies underway.

33. 12060 ESC - "Separation, Dewatering and Disposal of Sugar Beet Transport Water Solids." First draft of final report on Phase I has been received.

34. 12060 FUR - "Membrane Separation of Soybean Whey for Product Recovery and Waste Treatment." Data collection completed. Evaluation and final report preparation underway.

35. 12060 FTC - "State-of-the-Art Study of Water Pollution Control from the Beverage Industry." The final report still under revision.

36. 11060 DLF - "Tertiary Treatment of Combined Domestic-Industrial Wastes." The final report still under preparation.

37. 11060 DJB - "Controlled Treatment of Combined Potato Processing Municipal Wastes by Anaerobic Fermentation, Aerobic Stabilization Process." Post-construction studies underway.

38. 11060 DUJ - "Dynamic Process Development for Biological Treatment of Whey Bearing Wastes." Final report submitted for reproduction.

39. 11060 ENF - "Vermont Cheese Industry Pollution Abatement." Original program scope is being revised.

40. 12060 PAV - "Low Water Volume Enzyme Deactivation of Vegetables Before Preservation." Final report is being prepared by the grantee.



41. 12060 HFY - "Dry Caustic Peeling of Clingstone Peaches on a Commercial Scale." First draft of final report is being revised.

42. 12060 FRW - "Water and Waste Management in Sweet Potato Processing." Grantee's funds have been temporarily suspended until their processing plant, which was destroyed by fire, is rebuilt.

43. 12060 HCW - "Submerged Combustion Evaporation System for Concentration of Brewery Spent Grain Liquors," Data collection still underway.

44. 12060 HPC - "Pilot Scale Treatment of Wine Stillage." Additional anaerobic units as well as the aerobic pilot plants were placed onstream.

45. 12060 HUQ (801007) - "Seafoods Processing Wastewater Characterization." Waste characterization studies underway.

46. 12060 HRR (800747) - "Acid Whey Fermentation Demonstration Pilot Plant." Data is currently being collected.

Four grants were awarded during the past three months. These grants are:

47. 800904 - "Shrimp Canning Waste Treatment Study," American Shrimp Cannors Association. The general objectives of this grant are to characterize and treat (pilot scale) waste water from the processing of shrimp.

48. 800250 - "Continuous Hot Air Blanching of Vegetables," National Cannors Association. The primary objective of this grant is to demonstrate the technical and economical feasibility of hot-air blanching of vegetables.

49. 800935 - "Rum Distillery Waste Treatment by Anaerobic Digestion," Bacardi Corporation. Pilot scale anaerobic treatment of rum distillery wastes will be evaluated by this grant.

50. 801221 - "Ecostatic Cane Processing System--Pilot Phase," County of Hawaii. The primary objective of this grant is to develop an economical system which will eliminate liquid-borne wastes from sugar cane processing.

Plans for First Quarter - Fiscal Year 1973

1. Continue grant monitoring.
2. Continue work on industrial effluent limitations.

PAPER AND FOREST INDUSTRIES RESEARCH

Status of Projects and Significant Accomplishments

Work Plan GJG: Technical Consultation and Data Dissemination

Information and assistance by the section was continued to the regional offices and other government agencies. Requests from San Francisco, Boston, and Seattle Regional Offices for information were handled. Continued effort was made on the study of wood preservation wastes. Mr. Scott met with personnel from the Office of Saline Water in Denver, Colorado. A visit and tour of the Weyerhaeuser Company's operations at Springfield, Oregon, was made by the whole PFI section. Mr. Scott attended the annual Environmental Meeting of TAPPI in Houston, Texas, and will be serving on next year's meeting committee. During an OSU School of Forestry Young Growth Management short course, Dr. Groman presented two papers. He also visited the Pressure Treating Lumber Company in Sheridan, Oregon, along with Mr. Rossman, a new employee in the section. The seminar on source sampling by the Air Pollution Control Associates PNWI Section in Portland was attended by

Mr. Rossman. Dr. Gallup from the Industrial Pollution Control Branch, Washington, DC, visited the lab and was shown projects in Camas, Washington, and Lebanon, Oregon. A meeting on the Miami Conservancy District's automated regional treatment facilities was attended by Dr. Willard in Chicago. He also presented a paper on air and steam stripping of pulp mill wastes at Purdue University's Industrial Waste Conference in Lafayette, Indiana. A paper on a rotating biological treatment system for hardboard wastes was co-authored by Willard, Scott, and Eckerle for the Forest Product Research Association's annual meeting in Dallas, Texas. Dr. Knittel attended a meeting on Klebsiella at the Denver National Field Investigation Office. Present progress of identifying the significance of this organism in pulp and paper mill effluents was presented.

Work Plan FCK: Paper Mill Influence on Bacterial Quality

Work has continued on the cultural comparison of Klebsiella pneumoniae isolated from pulp mill effluents and those K. pneumoniae obtained from American type culture collection. This comparison has shown that from a substrate utilization standpoint there is no difference between these cultures.

Preliminary results of nucleic acid analysis on DNA isolated from these cultures also points out that there is, so far, no demonstrable difference.

#### Work Plan GJH: Suspended Solids Removal by Mechanical Means

The program to evaluate microscreening of unbleached sulfite suspended solids at Crown Zellerbach's Lebanon, Oregon, mill continued throughout the quarter. The first two phases of the project, microscreening raw wastewater and aerated lagoon, receiving primary settled waste, effluent have been completed using 10, 42, and 100 micron screens. Suspended solids, settleable matter (by weight and volume), BOD, and soluble BOD were determined. The aeration tank influent has been shifted from primary effluent to raw wastewater. The presence of large chips in the raw wastewater has caused some flow stoppage and delays. The use of larger lines and a coarse sidehill screen appears to be eliminating the problems at this time.

#### Work Plan ZEB: Biological Systems for High Efficiency Treatment of Hardboard Wastewater

The investigation of treating hardboard wastewaters using a rotating disc device has been carried out at a plant in Corvallis, Oregon. With the addition of mineral nutrients, a removal of 90% BOD and 70% dissolved organic carbon was attained at a loading of 0.52 gal/sq ft/day or 0.20 mg BOD applied/mg S.S. The final effluent contained a flocculent biomass that settled very rapidly. Current results were presented in a paper given at the Annual Meeting of Forest Products Research Association in Dallas, Texas, on June 21.

Work Plan FCD: Grant and Contract Monitoring

Grant applications and research proposals reviewed during the quarter related to the following:

Pyrolysis of Industrial Waste for Oil and Activated Carbon Production

Industrial Waste Study of Wood Preserving Wastes

Water Reuse in a Paper Reprocessing Plant

Two projects were prepared for funding through the NERC-Corvallis Center: "A Test Method for Volatile Component Stripping of Wastewater in Cooling Towers" and "Pulping Chemicals Recovery and External Waste Treatment Comparison."

Four new projects were assigned project officers from the section. These new grants were:

S 800520 - R. H. Scott - "Closed Process Water Loop in NSSC Pulp Production" - Green Bay Packaging, Green Bay, WI.

S 800915 - H. Kirk Willard - "Fate of Nitrogen Fertilizers in Forest Soil: Conversions, Movement, and Losses" - Crown Zellerbach, Camas, WA

S 801206 - J. S. Ruppertsberger - "Water Reuse in Paper Processing Plant" - Big Chief Roofing, Ardmore, OK

S 801207 - R. H. Scott - "Treatment of Sulfite Evaporator Condensates for Recovery of Volatile Components"- Institute of Paper Chemistry, Appleton, WI

Other active grants showed the following progress during the quarter:

1. 12100 EZV - Reactivation and final data analysis. Additional work is being accomplished to complete this project as determined in the final report draft review.

2. 12100 EBG - The final report draft was submitted and reviewed on this log rafting project. A meeting was held on the required changes and agreements reached on included material and recommendations.

3. 12040 EEL - "Reverse Osmosis is Concentration of Dilute Pulp and Paper Effluents." The final report was printed and distributed.

4. 12040 FUB - "Recycle of Papermill Wastewater for Application of Reverse Osmosis." This final report was printed.

6. 12130 GER - "Optimization of Combined Industrial/Municipal Waste Treatment through Automation and Reuse." Engineering design, plans, and specifications have been completed.

7. 12040 GQD - "Coliform Growth and Control in Aerated Stabilization Basins." Studies on mill scale chlorination have begun with the completion of pilot plant chlorination studies.

8. 12040 DBD - "Color and Mineral Removal from Kraft Bleach Wastes." The project has been extended to allow additional sampling of trials on a new resin.

During the quarter, considerable effort was exerted on planning the new Research Objective Achievement Plans for the next six years. Detailed tasks were included which should develop the necessary technology to operate closed-loop pulp and paper operations.

### Plans for First Quarter, FY 1973

1. Continue R&D grant monitoring and review for approved ROAP areas.
2. Provide consulting services upon request to regional offices, headquarters and the states.
3. Continue work on the investigation of screen size effect on suspended solids removal from sulfite waste and work to determine the potential health hazard that Klebsiella may present.

## NATIONAL THERMAL POLLUTION RESEARCH PROGRAM

### Status of Projects and Significant Accomplishments

Again, as in last quarter, a large percentage of staff effort has been devoted to review of Environmental Impact Statements on nuclear power plants, preparation of technical testimony for the Houston Lighting and Power suit, and consultation to Headquarters and Regional Offices on discharge permit applications. Preparation of Research Objective Achievement Plans (ROAPs) took considerable time.

#### ROAP 10 BAL: Beneficial and/or Multiple Use of Industrial Water Involving Cooling

Guy Nelson began literature review of complete recycle of liquid streams in power plants. A visit to Centralia Power Plant where cooling tower blowdown is used as makeup to ash handling and coal washing facilities is planned.

#### ROAP 16 ACQ: Wet Closed-Cycle Cooling Systems--Salt and Fresh Water

RFP on blowdown control techniques submitted and approved for publication. Advertising will start on August 1, 1972, with contract awarded by October 1, 1972. Literature review for inhouse portion of report has already begun.

#### ROAP 21 AJH: Predictive Model for Aquatic Thermal Pollution

The work on the towing channel for simulating thermal plumes has been going along with measurable success. Discharge tanks and manifolds as well as instrumentation problems have been worked out.



Jim Chasse's efforts since he recently joined WTPRP staff have been exclusively directed to helping Dr. Winiarski on thermal plume simulation.

#### Thermal Power Plant Discharge Guidelines

Industrial Waste Studies Program. Work is continuing on the guidelines in cooperation with Edison Electric Institute. A meeting was held in Headquarters, April 25, 1972, and Alden Christianson of our staff attended. This meeting was for the purpose of devising a questionnaire that EEI has indicated they would distribute to member power plants to obtain information on constituent pollutants, treatability, treatment efficiency and costs. All of this is required for input to the establishment of effluent guidelines. Follow-up will include contacting other power groups for possible distribution of questionnaires; line up EPA consultants and contact design-engineering firms to (1) generate additional data, and/or (2) review and validate data gathered from others.

#### Technical Assistance

The following environmental Impact Statements were reviewed.

1. Edwin I. Hatch, Units 1 and 2
2. Quad Cities, Addendum, Units 1 & 2
3. J. M. Stuart Plant
4. Shoreham
5. Monticello
6. Aguirre, No. 1
7. Wm. H. Zimmer Station
8. Fort Calhoun, Unit 1

9. Browns Ferry--Additional Comments
10. Joseph M. Farley, Units 1 & 2
11. Maine Yankee Atomic Power Plant
12. Oconee Nuclear Station, Units 1 & 2
13. Fort St. Vrain
14. Watts Bar Nuclear Plant
15. Indian Point, Unit 2
16. Vermont Yankee Nuclear Power Station

Further consultation to Headquarters included:

1. May 18, 1972, Dr. Tichenor traveled to Washington for a committee meeting on the development of guidelines for implementing EPA's policy on thermal discharges. This committee is responsible for preparing a report presenting technical guidelines to EPA Regional personnel responsible for evaluating thermal discharges on a case-by-case basis.

2. Industrial Waste Studies Program. See section on Thermal Power Plant Discharge Guidelines.

3. June 7 and 8, Drs. Tichenor and Shirazi participated in the preparation of a handbook, "Selected Techniques for Case-by-Case Evaluation of Thermal Discharges." This work was conducted at the request of the Office of Technical Analysis in the Office of Enforcement and General Counsel (see 1 above).

4. Various proposals received and reviewed.

5. Polish Special Foreign Currency Research Program reviewed and Mr. Rainwater has been appointed Project Officer. See trip to Poland under plans for first quarter, FY-73.

Consultation to Regions:

1. At the request of Gary Rochelle, Control Systems Division, NERC, RTP, NTPRP solicited comments from NWQL, NMWQL, AWTL-Cincinnati, and various persons in Headquarters on Impact of Air Pollution Control Systems on Water Quality. A compilation of this information was forwarded to RTP April 13, 1972.
2. Critique on desk-top study of potential for heat recovery from thermal discharges applied to advanced waste treatment completed for AWTL, Cincinnati.
3. Dr. Shirazi traveled to Dallas, June 21-23, to finalize the report on the use of the Galveston Bay Hydraulic Model for the Houston Lighting and Power case.
4. Discussions with Region VII personnel on evaluation of thermal discharges.
5. Technical assistance to Region V in the form of an evaluation of temperature prediction models as applied to the Ohio River in the vicinity of the J. M. Stuart plant.
6. Water Modeling Workshop, June 6 & 7 at RTP, at the request of Dr. Wiser. Mr. Rainwater presented a brief report on modeling activities within NTPRP.
7. Mr. Rainwater met with Regional Office personnel, Region IX, and representatives and consultants for Hawaii Electric Company re discharge permits for Hawaii Electric.

### Grant and Contract Research

#### ROAP 21 AJH: Predictive Model for Aquatic Thermal Pollution

1. Environmental Systems Laboratory, Inc., Grant No. 16130 GSD, "Study for the Stochastic Calculation in Water Equilibrium Temperature," **is** continuing.
2. Oregon State University, 16130 FOK, "Controlling Pollution in Small Streams." Final report received.
3. Cornell University, 16130 DIP, "Heat and Water Vapor Exchange between Water Surface and Atmosphere." Final report in preparation.
4. Oregon State University, 16130 DGM, "Thermal Plume Dispersion," is continuing.
5. MIT, 16130 DJU, revised surface jet model user's manual-- in preparation.

#### ROAP 16 ACQ: Wet Closed-Cycle Cooling Systems--Salt and Fresh Water

1. Hittman Associates, 16130 HKK, "Thermal Pollution Control Nomographs," is continuing.
2. Washington State University, "Analysis of Engineering Alternatives for Environmental Protection from Thermal Discharges," is continuing--no-cost extension granted.
3. Environmental Systems Corporation, 16130 GNK, "Explicit Calibration of the PILLS System," is ongoing.
4. The Center for the Environment and Man, Contract 14-12-837. Received final report.

ROAP 10 BAL: Beneficial and/or Multiple Use of Industrial Water  
Involving Cooling

1. Mr. Christianson and Mr. Herman Miller, EWEB, Grant #16130 EIK, put together Intended Approach Toward Work Funding, and Completion of the EWEB demonstration project.

Reports, Papers, Meetings

1. Paper entitled, "Dry Cooling Towers for Steam Electric Power Plants in Arid Regions," will be published this year in Journal of International Water Pollution Research. Final draft has been reviewed and sent to publisher.

2. Workbook on Thermal Plume Prediction, Vol. 1: Submerger Discharges, by Mostafa A. Shirazi and Lorin R. Davis, has been submitted for publication in the Water Pollution Control Research Series. This report will be used as text for the Workshop on Plume Prediction, to be held at PNWL July 11-14, 1972. Fifty preliminary copies were printed for this purpose.

3. Dr. Shirazi attended a course on Estuarine Modeling at OSU, June 12-16, 1972. Dr. Leendertse of Rand Corporation lectured on recent advances on estuarine modeling for tidal dynamics, as well as for water quality.

4. Alden Christianson attended the American Nuclear Society, Special Session on Geothermal Energy, Las Vegas, Nevada, June 19-20, 1972, to keep abreast of current geothermal development and related pollution potential.

### Visits, Visitors

1. On May 3, Mr. James McElroy, meteorologist at RTP, visited NTPRP to discuss mutual research interest.
2. Bill Schofield, RTP, visited NTPRP May 5 to discuss EROS, ROAPs, Work Plans and contract specifications for the salt water cooling demonstration at Turkey Point.
3. Mr. Larry Ollinger of EPA, Ft. Lauderdale, Florida, met with Dr. Shirazi on April 26-27 to discuss plume analysis for an assignment he had for the Athens Lab.
4. Dr. Amiran Roffman, Westinghouse Electric Corporation, visited May 16 re state-of-the-art on cooling systems.
5. Dr. John Drayley, Argonne National Lab, visited NTPRP May 16 for discussion of plume analysis.
6. Dr. Tichenor visited Region VII on June 9 for demonstration of Cherne Thermal Rotor Cooling System (Cherne Industrial, Inc.).
7. Dr. Shirazi visited Louisiana State University on June 20 to confer with LSU staff on modeling.

### Plans for First Quarter, FY-73

1. Dr. Tichenor will present a paper, "Evaluating Thermal Pollution Control Alternative," at the Institute of River Mechanics, Colorado State University, August 2, 1972.
2. Mr. Rainwater will present a paper, "Federal Standards and Thermal Considerations," at the University of Wisconsin's Cooling Towers Institute, August 9, 1972.

3. In September, Mr. Rainwater will travel to Warsaw, Poland to participate in Special Foreign Currency Workshop for U. S. Project Officers and Polish principal investigators of new projects; and to make site visits where work will be performed. Stops are planned in England, Germany and Sweden to learn more of their work in Thermal Pollution Control especially with respect to dry cooling systems.

4. Continue inhouse portion of state-of-the-art report on blowdown control.

5. Review Environmental Impact Statements.

6. Industrial Waste Survey Guidelines.

## NATIONAL COASTAL POLLUTION RESEARCH PROGRAM

### Status of Projects and Significant Accomplishments

#### Work Plan DBH: Estuarine and Ocean Outfalls

The Interagency Agreement between NCPRP and the Environmental Prediction Research Facility, U. S. Navy, Monterey, California, requested last quarter was approved. The agreement concerns development and testing of a numerical model of pollution dispersion in the New York Bight area.

Chief, Physical Oceanography Branch served as a coordinator with the Department of Oceanography and Civil Engineering, Oregon State University, on a short course held in June. About 20 students attended the course on digital computer techniques for tidal modeling of well-mixed estuaries and shallow bays.

Equipment for the coastal flushing and circulation experiment was received, tested, and calibrated. Deployment of the instruments is scheduled for mid-July. The instruments will remain on the ocean bottom for about 30 days.

Work on drift flow models continued. As part of the report, a model developed for use off Florida was examined. Several serious errors in the report discussing the application of the model were discovered and brought to the attention of the originators of the report through the Southeast Region.



EPA Region X Working Paper #80 entitled "User's Guide and Documentation for Outfall Plume Model" was revised to improve the model's sensitivity for low Froude Number Outfalls with small angles of inclination. Holders of this working paper who have not received an errata covering this change are requested to contact this office.

Work Plan ZAH: PCB, Biocides, and Other Persistent Organic  
Compound Distributions and Fates in Coastal Waters

Dr. Blazeovich attended an interagency meeting of PCBs in the environment in Duluth, Minnesota on May 22-23, 1972. Presentations of present efforts were given by fourteen laboratories followed by a work session concerning recent advances in analytical techniques used to identify and quantify PCBs.

Dr. Blazeovich attended EPA's gas chromatograph/mass spectrometer club meeting at Dallas, Texas on June 8, 1972. He also travelled to Berkeley, California on June 14, 1972, to give technical assistance to Mr. Rittall who was conferring with a grantee.

A ten week sampling program of Corvallis waste treatment plant was conducted to estimate the present levels of persistent chlorinated hydrocarbons in influent, effluent and sludge and to develop a method to estimate total outputs of persistent organics from a sewage treatment plant.

Samples of influent, effluent and sludge from West Point and Renton waste treatment plants in the Puget Sound area were analyzed to determine levels of persistent chlorinated hydrocarbons. Some sediment samples from this area were analyzed for the same.

Analysis of sludge samples from New York Bight was initiated. This work will be done in conjunction with experiments on fates of barge dumping in the area.

Work Plan ZAI: Mercury, Cadmium, Arsenic, and other Heavy Metals  
Distributions and Fates in Coastal Waters

1. Dr. H. B. Mark, University of Cincinnati, EPA consultant on instrumentation, advised National Coastal Pollution Research Program on desirability of certain pulse height analysis equipment in view of our trace element research needs.
2. Experimental work on radioactive mercury uptake by crabs, clams and oysters has been carried out in our environmental simulator.
3. Work is continuing on a neutron activation procedure for the analysis of taconite.

Remote Sensing

We received official notification that we were relieved of responsibility for coordination and participation in the Bendix and University of Michigan ERTS-A projects.

Consulting Services

Work Plan ZAR: Technical Consultation on Coastal Pollution Problems

Consultations were held with Drs. B. Brungs and D. Mount as to what radioactive tracer studies work we could handle with our present equipment and manpower for taconite studies. The need is for a combined tracer and activation analysis method.

During the last quarter work has continued relative to the effects of taconite tailings dispersal to the waters of Lake Superior.

Several meeting were attended in which NCPRP personnel assisted in the planning stages for a separate field venture to be conducted in 1972 during which a five week shutdown of all plant operations will occur.

Chief, Physical Oceanography Branch, attended a SEA USE Council meeting in Seattle. A day was spent reviewing work of the Environmental Prediction Research Facility on modeling of ocean and near shore circulation.

Dr. Baumgartner attended a meeting of the Committee on Tidal Hydraulics at the Waterways Experiment Station in Vicksburg, Mississippi on June 14-15. While there he also conferred with the Corps of Engineers Research Committee preparing a research plan for water quality, effects of dredging, and dredge spoils disposal. He recommended to the Committee that the Corps of Engineers Waterways Experiment Station conduct research on redistribution of dredge spoils discharged to coastal waters.

Dr. Baumgartner initiated a brief study to update the documentation of research needs in the Pacific Northwest. Douglas T. Martin, who joined the Coastal staff June 26, will be working on this project.

Advice on outfall models was given to the Southeast Region personnel for use on the east coast of Florida. Several models were explained and discussed for use in impact statements and their evaluation.

It was learned that the State-of-the-Art report on estuarine modeling is being used at at least seven universities as a reference or text.

#### Grant and Contract Research

##### Work Plan ZAH: PCB, Biocides, and Other Persistent Organic Compound Distributions and Fates in Coastal Waters

A University of California, Berkeley, grant entitled "The Significance of Waste Water Floatables in Coastal Waters," was approved for continuance and has been modified to include examinations of PCB and pesticide content of surface films which appear above ocean discharge lines. The first year's effort was concentrated on the development of an analytical procedure for the determination of the hexane-extractable portion of such films and the value of such a procedure as an environmental monitoring technique. Initial results indicate that the procedure developed was successful; however, additional field testing is required before a final evaluation can be made.

##### Work Plan XAA: Barge Dump Disposal of Wastes in Ocean and Coastal Waters

The research grant to Tetra Tech Inc. of Pasadena, California, is progressing on schedule and an elaborate mathematical model should be operational by September 1972. The model will incorporate a convective descent, a collapse, and a long term dispersion phase into one program with considerations of ambient current and density structures. The wastes will be characterized into several phases (maximum 8) by density and settling characteristics, and a resuspension capability will be available.

Work Plan ZAI: Mercury, Cadmium Arsenic and Other Heavy Metals  
Distribution and Fates in Coastal Waters

A grant has been made to University of Georgia, Skidaway Institute of Marine Sciences (H. Windom, Principal Investigator) to study the input of heavy metals in estuary regions of the southeast coast and transport in coastal currents to marsh areas.

Work Plan DBH: Estuarine and Ocean Outfalls

The grant with the University of Washington to study the circulation and flushing of fiords was approved and forwarded to Washington. It has not yet been funded.

The grant with Dr. Bella of Oregon State University to study tidal flats in estuarine water quality analysis has been completed and the final report is being written.

The grant with Keck Laboratory of Hydraulics and Water Resources, under the direction of Dr. Brooks, has been completed and is being written up in final report form.

Other

Dr. Richard C. Swartz, Biological Oceanographer, came on board July 10. He will be stationed at Newport.

William P. Muellenhoff has been awarded a Graduate Assistantship with the National Coastal Pollution Research Program for the coming fiscal year.

Douglas T. Martin, Sanitary Engineer, joined the Coastal Staff on June 26. He also will be stationed at Newport.

### Plans for First Quarter FY 73

Instruments will be implanted and retrieved off the Oregon Coast for the coastal flushing and circulation project. Initial data evaluation and processing will begin upon recovery.

The first draft of the drift flow report will be completed.

Final negotiations with the Navy regarding New York Bight modeling will be scheduled.

As far as possible a combined tracer uptake-neutron activation analysis methodology will be prepared for the material taconite. Samples of effluent from various New York Bight will be studied to evaluate heavy metal **sources**.

## CONSOLIDATED LABORATORY SERVICES PROGRAM

### Status of Projects and Significant Accomplishments

#### General

The major effort has been devoted to the National Eutrophication Survey Program in Chemistry, Computer Services, Biology and sample handling.

Efforts of staff is being directed to produce a **turnaround** of ten days for all analysis. In selected cases on demand a more rapid turnaround time can be provided.

SHAVES continues to be an effective tool to assist in managing the laboratory. A closer attention to backlog information by the staff is assisting the manager to direct his attention to problems.

#### Automated Analytical Systems

Significant progress is being made on handling data from Technicon II. The data originating from the Technicon II system goes to paper tape and from the paper tape directly into computer storage for report to a project leader. The necessary AQC constraints have been programmed.

Problems still plague us in the automated Kjeldahl analysis. Assistance has been requested from AQCL, in NERC-Cincinnati.

The arsenic interference in the phosphorus analysis has been eliminated with the addition of meta bisulfite and thiosulfate in the appropriate steps of the automated flow scheme.

All the Automated Systems have been renovated in-house in anticipation of the sample load from the National Eutrophication Lake Survey Program.

### Specialized Analysis

Two systems are being used for total organic carbon analysis. The Beckman system is being used for analysis of unpreserved samples where the difference between time of collection and time of analysis is short. The OIC system is capable of accepting a sample preserved in the field with mercuric chloride or a sample sealed in the field in an ampoule.

Work is continuing in analysis of the gases  $N_2$ ,  $O_2$ ,  $CO_2$ , and  $A_2$  dissolved in water. CLS has acquired a Van Slyke apparatus, a Natelson apparatus and use of a saturometer. Comparative studies will be made using all systems and the gas chromatographic technique. The staff will evaluate all the techniques and report specific details found.

### Atomic Absorption Spectrophotometry

A great deal of difficulty has been experienced with the tantalum ribbon flameless sampler. A technician was sent to the factory development laboratory to discuss the operational problems. The primary purpose in acquiring the instrument is the analysis of metals in algal cells.

A more sensitive digestion technique using a heating step is producing better recoveries and has been recommended by AQCL as the most suitable procedure for mercury analysis.



### Computer Services

The computer services group has been primarily concerned with systems approach for the National Eutrophication Survey Program. The production of STORET numbers for stations and tags for samples has been of primary concern.

### Analytical Quality

Control charts have been produced from precision and recovery data on replicates and spikes and accuracy data from standards. The Hewlett Packard programmable calculator is being used to produce AQC charts.

Work has continued on placing SHAVES programs on the "Boeing Computer," (EPA contractor). A primary high priority effort has been placed on direct assimilation of data by the computer from Technicon II. The programming and interface will result in saving of time and manpower.

### Biology

The bioassay toxicity studies on spent sulfite liquor are continuing using a larval stage of an insect form for the National Waste Treatment Program.

Routine phytoplankton samples were handled from the Eutrophication Program.

Assistance was given to National Eutrophication Survey Program in negotiating contract on algal species identification.

### Microbiology

Minimum activity and only a few samples were processed during this quarter.

### Accomplishments

Completed evaluation of the use of powder pillows of  $\text{MnSO}_4$ , KI and sulfamic acid in field determinations of DO.

Designed and scheduled fabrication of sampler for use in the sampling of tributaries for the NESP. Assisted in the tributary sampling program for NESP. Participated in contract negotiations on algal species identifications for NESP.

### Reports, Papers, and Presentations

Krawczyk, D. F., and Byram, K. "The Use of a Management System in Operating an Analytical Laboratory" submitted to American Laboratory.

Griffis W. "The Chemistry of Water Pollution: Determination of Carbon in Environmental Systems" presented at the 30th Two Year College Chemistry Conference held in conjunction with the ACS - Northwest Regional Meeting, 6/16/72.

Krawczyk, D. F. "Analytical Quality Control Program in Environmental Protection Agency" presented at 30th Two Year College Chemistry Conference held in conjunction with the ACS - Northwest Regional Meeting, 6/16/72.

Krawczyk, D. F. "Interpretation of Chemical Data" presented at the Training Course Chemical Analysis for Water Quality, 6/29/72.

Krawczyk, D. F. "Sample Collection and Handling Procedures" presented at the Training Course Chemical Analysis for Water Quality, 6/26/72.

Krawczyk, D. F. "Protecting our Environment" presentation made to 3rd grade class, Lincoln School, 4/03/72.

### Annual Summary (FY 72)

The following is a list of samples received and tests performed in FY 72:

Program	<u>Chemistry</u> Samples   Tests	<u>Microbiology</u> Samples   Tests	<u>Biology</u> Samples
NCPRP	690      1039		
NERP	3557      29669		343
NWTRP	1635      5493		37
NTPRP	1      5		
WETS	<u>380</u> <u>430</u>		
Research Total	6263      36,636		
Facilities	158      336		
AQC	156      1702	3      270	2
Region	<u>1013</u> <u>8670</u>	<u>170</u> <u>281</u>	<u>    </u>
Total	7590      47,344	173      551	382
Total Samples	8145		
Total Tests	47,895		

#### Plans for First Quarter FY 73

Analysis of samples from National Eutrophication Survey Program will continue to carry number one priority.

Calibration data for Turner fluormeter for determination of chlorophyll a will be obtained using test algal species from NERP program.