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VOLUME TWO
APPENDICES
PHASE I FINAL REPORT
NATIONAL DATA PROGRAM FOR THE MARINE ENVIRONMENT
1 DECEMBER 1967

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VOLUME TWO

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This study was financed by a contract with the National Council on Marine Resources and Engineering Development, Executive Office of the President. However, the findings, recommendations, and opinion in the report are those of the contractor and not necessarily those of the Council, nor do they imply any future Council study, recommendations, or position. It is hoped that this study will contribute to the full discussion of problem areas and issues in marine science affairs.
APPENDIX A

REVIEW AND COLLATION OF DATA MANAGEMENT PLANS OF SELECTED ORGANIZATIONS

A contract requirement of Phase I is the accumulation, review and collation of the data management plans of selected organizations involved in marine science programs. In accomplishing this goal, organizational plans were obtained through personal interviews, telephone conversations, and from existing literature. In some cases, the plans were general agency plans, not specifically oriented toward data management, whereas, others emphasized future data management plans. Table 1 lists organizations from which plans were obtained and further defines the type of plan and its format (this appendix).

The detailed process utilized in reviewing and collating the key elements of these plans is described in Section VIII. As stated there, the conclusions, recommendations and actions set forth in the plans were partitioned into 23 major subject areas as follows:

A. PHYSICAL OCEANOGRAPHY
B. BIOLOGICAL OCEANOGRAPHY
C. CHEMICAL OCEANOGRAPHY
D. METEOROLOGY
E. GEOLOGY
F. GEOPHYSICS
G. SURVEYS
H. FOOD AND FISHERIES
I. MINERALS AND DRUGS
J. WATER RESOURCES
K. RECREATION
L. POLLUTION
M. RADIOACTIVITY
N. ENGINEERING
O. DATA MANAGEMENT
P. PLATFORMS
Q. SENSORS, INSTRUMENT SYSTEMS
R. FACILITIES
S. LEGAL, MANAGEMENT
T. ORGANIZATION
U. EDUCATION, TRAINING
V. INTERNATIONAL PROGRAMS
W. MISCELLANEOUS

The results are presented in the following pages of Table 2, this appendix. In general, each page in the table covers a separate subject, although several subjects are combined on some of the later pages for brevity. The overall generalized conclusions are synthesized and drawn together in Section VIII. All of the first level of aggregation of the plan elements, however, is included in the following pages for a more detailed study.
A few more comments are in order regarding this collation process. Table 2 of this appendix contains a complete listing of each of these topics and the categories in which they have been placed. The number of organization plans listed in Table 2 is less than that shown in Table 1, however. The Department of the Interior, for instance, has one column heading in Table 2, but has six in Table 1, since all of the marine programs for this department have been combined into one document. Industry plans were generally not discussed in sufficient detail to justify this inclusion in the chart. This was also true for other organizations so that the 20 organization plans listed in Table 2 were those finally selected for collation. The accession number refers to the SDC marine literature library number and the bibliography included in Volume I of this report.

The three columns on the right-hand side of each page of Table 2, this appendix, under the heading "Impact on Data," list relative effects on data collection, data processing or data use of each topic. This relative effect is a subjective attempt to determine whether or not a planned item will affect future data management requirements and to what extent. The assessment was made by contractor personnel. As an example of the procedure followed in making the assessment of effects, take topic 1, page 9, Table A-2. "Survey current delineation" which is planned by the USCG, the Navy and ESSA, according to entries in the chart. It is believed that large amounts of data are being and will have to be collected in order to delineate all currents in the world oceans. Therefore, a "2", indicating a major impact, has been placed in the column entitled "collection."

Because of the subjective nature of this analysis, it is doubtful that complete agreement between reviewers could be obtained. The process did, however, serve the useful purpose of filtering the nearly 300 topics in Table 2, this appendix, and reducing the number to be considered to a somewhat smaller group as is described in Section VIII of Volume I of the report.

The collation and analysis carried out to date suggests that a further analysis be developed utilizing a matrix relating the plans of various organizations to the focus of recommendations found in the literature or resulting from interviews with users of oceanographic data. This suggests another tool which should become an ongoing function because of the dynamic nature of the marine science field.
TABLE A-1
PLANS OF ORGANIZATIONS REVIEWED FOR MARINE DATA MANAGEMENT STUDY, PHASE I

<table>
<thead>
<tr>
<th>FEDERAL GOVERNMENT</th>
<th>GENERAL PLANS</th>
<th>DATA MANAGEMENT PLAN</th>
<th>DOCUMENTED</th>
<th>VERBAL</th>
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<td>Fleet Numerical Weather Facility</td>
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<td>NAVSHIPS</td>
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<td>Research and Development Center</td>
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<td>Department of the Army</td>
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<td>Corps of Engineers</td>
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INSTITUTIONS AND UNIVERSITIES

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December 1, 1967

TABLE A-1
cont’d

DATA CENTERS

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**INTERNATIONAL ORGANIZATIONS**

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### TABLE A-2

**COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM**

**A. PHYSICAL OCEANOGRAPHY**

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<td>1. Survey current delineation</td>
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<tr>
<td>2. Study subsurface currents</td>
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</tr>
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<td>3. Survey water mass flow</td>
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<tr>
<td>4. Prediction of temperature in the ocean</td>
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<td>5. Study heat flow at air-sea interface</td>
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<td>6. Identify thermal fronts</td>
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<tr>
<td>7. Study internal waves</td>
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<tr>
<td>8. Study deep ocean surface waves</td>
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<tr>
<td>9. Develop surface wave prediction capability</td>
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<tr>
<td>10. Study waves, near shore</td>
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<td>11. Study wind-driven wave generation</td>
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<tr>
<td>12. Study tides</td>
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<tr>
<td>13. Improve tide prediction capability</td>
<td>27</td>
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<tr>
<td>14. Improve tidal current prediction</td>
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<tr>
<td>15. Obtain experimental verification of theoretical ocean circulation</td>
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<td>16. Obtain more Arctic bathymetry</td>
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<td>17. Obtain more Arctic ice information</td>
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</tr>
<tr>
<td>18. Study diffusion processes near deep bottom</td>
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<td>19. Study diffusion processes in bays, near coasts</td>
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<tr>
<td>20. Survey interchange of water between North Atlantic and adjacent areas</td>
<td>21</td>
</tr>
<tr>
<td>21. Develop ice prediction capability</td>
<td>21</td>
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</table>

Numbers in metric are document page numbers where **D** indicates a detailed recommendation or conclusion in discussion. **M** indicates the number of the manuscript. **A** indicates an additional report. **W** indicates a working paper.
### TABLE A-2
### cont'd

#### COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM

**A. PHYSICAL OCEANOGRAPHY** (cont'd)

<table>
<thead>
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<th>Accession No.</th>
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<td>22. Study ice drift</td>
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<td>23. Study ice deterioration</td>
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<td>24. Develop ice detection capability</td>
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<td>25. Study mixed layer depth</td>
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<tr>
<td>26. Study estuary dynamics</td>
<td></td>
</tr>
<tr>
<td>27. Assemble tsunami historical data</td>
<td>34</td>
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<tr>
<td>28. Study air-sea interaction - synoptic</td>
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<tr>
<td>29. Prepare sea surface temperature synoptic maps</td>
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<tr>
<td>30. Study thermocline depth short term fluctuation</td>
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<td>31. Prepare thermocline depth synoptic maps</td>
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<td>32. Prepare thermocline intensity synoptic maps</td>
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<tr>
<td>33. Prepare temperature line depth synoptic maps</td>
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<td>34. Prepare temperature bottom synoptic maps</td>
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<tr>
<td>35. Study benthic boundary</td>
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<tr>
<td>36. Study turbulence</td>
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</tr>
<tr>
<td>37. Determine sampling interval selection</td>
<td>2</td>
</tr>
<tr>
<td>38. Collect time series data</td>
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</tbody>
</table>

Numbers in matrix are document page numbers where **A Little** or **No Expert** recommendation or conclusion is listed.

* Accession Number = Use Shell Library

**Document Title**

| Department of General Services
| Scientific Services
| National Marine Data Program
| Data for a National Marine Data Program
| Scientific Services
| National Marine Data Program
| Data for a National Marine Data Program

December 1, 1967
## TABLE A-2
cont'd

### COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM

#### B. BIOLOGICAL OCEANOGRAPHY

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<thead>
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<td>55, 574, 90, 110, 144, 227, 260</td>
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<td>2. Study marine boring organisms</td>
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<tr>
<td>3. Study marine fouling organisms</td>
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<td>4. Investigate deep scattering caused by marine organisms</td>
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<td>5. Analyse biological sounds</td>
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<tr>
<td>6. Study biological luminescence</td>
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<td>7. Study poisonous marine organisms</td>
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<tr>
<td>8. Study predatory marine animals</td>
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<td>9. Investigate continental shelf ecology</td>
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<tr>
<td>10. Obtain biological organism distribution statistics</td>
<td>62, 63</td>
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<tr>
<td>11. Prepare plankton volume - symoptic maps</td>
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<td>12. Prepare biological mass - symoptic maps</td>
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<td>13. Obtain taxonomy data on marine biota</td>
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<tr>
<td>14. Study marine bactera</td>
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<td>15. Inventory migratory birds</td>
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<td>16. Investigate migratory bird ecology</td>
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<tr>
<td>17. Study migratory bird habitats</td>
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</table>

Numbers in matrix are document page numbers where:
- **C** = Conference, **L** = Lecture
- **R** = Recommended, **I** = Interested
- **M** = Master's Thesis
- **A** = Accession Number, **G** = Bibliography
- **W** = Master, **I** = Intern
### TABLE A-2
ccnt'd

**COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM**

#### C. CHEMICAL OCEANOGRAPHY

<table>
<thead>
<tr>
<th>RECOMMENDATION ON CONCLUSION</th>
<th>Accession No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Investigate organic film - sea surface</td>
<td>56</td>
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<tr>
<td>2. Study dissolved gas concentration</td>
<td>47</td>
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<tr>
<td>3. Study mineral alteration</td>
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<tr>
<td>4. Study hydrocarbon concentration</td>
<td></td>
</tr>
<tr>
<td>5. Study material exchange at air-sea interface</td>
<td></td>
</tr>
<tr>
<td>6. Study hydrogen sulfide concentration</td>
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</tr>
<tr>
<td>7. Investigate corrosion of metals</td>
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<tr>
<td>8. Obtain chemical nutrient distribution</td>
<td>12</td>
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<tr>
<td>9. Standardize chemical analysis techniques</td>
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<tr>
<td>10. Prepare salinity, surface-synoptic map</td>
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<tr>
<td>11. Prepare chemical parameters - synoptic map</td>
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<tr>
<td>12. Prepare salinity, 10m depth - synoptic map</td>
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<tr>
<td>13. Study chemical thermodynamics of sea water</td>
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### D. METHODOLOGY

#### RECOMMENDATION ON CONCLUSION

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<th>110</th>
<th>114</th>
<th>127</th>
<th>130</th>
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<tbody>
<tr>
<td>1. Obtain Arctic weather data</td>
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<td>2. Determine synoptic forecast requirements</td>
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<td>3. Study monsoon</td>
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<td>4. Prepare cloud cover - synoptic maps</td>
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<td>5. Improve and expand marine weather support to high seas shipping</td>
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<td>6. Establish a standard for weather support to all U.S. marine activities</td>
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<td>7. Improve weather support to marine activities in coastal waters, harbors</td>
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<td>8. Expand and accelerate the dissemination of observations, forecasts for small craft</td>
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<tr>
<td>9. Expand and accelerate collection and acquisition of marine observations</td>
<td>10, 15</td>
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<td>10. Develop service products to more clearly survey weather information</td>
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<td>11. Improve storm and hurricane warning systems</td>
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<td>12. Develop forecast capability at air-sea interface</td>
<td>1, 6</td>
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<td>13. Improve dissemination of weather data</td>
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<td>14. Obtain committed broadcast plan for prompt dissemination of information</td>
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<tr>
<td>15. Refine techniques for observing and forecasting visibility</td>
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**Notes:**
- Text in square brackets indicates page numbers where recommendation is discussed.
- Recommendation for action is discussed.
- See Bibliography.
- See Table 1.
### TABLE A-2
cont'd

**COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM**

**H. GEOLOGY**

<table>
<thead>
<tr>
<th>RECOMMENDATION ON CONCLUSION</th>
<th>Accession No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Study subbottom structure</td>
<td>37</td>
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<tr>
<td>2. Determine sediment thickness</td>
<td>N-6</td>
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<tr>
<td>3. Collect bottom sample and cores</td>
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<tr>
<td>4. Investigate sediment transport</td>
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<tr>
<td>5. Determine sediment age</td>
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<tr>
<td>6. Survey submarine canyons, trenches</td>
<td>N-6</td>
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<tr>
<td>7. Determine continental shelf - history and origin</td>
<td>N-6</td>
</tr>
<tr>
<td>8. Develop prediction of bottom conditions in unsurveyed areas capability</td>
<td>N-6</td>
</tr>
<tr>
<td>9. Determine shape of continental shelf more adequately</td>
<td>N-6</td>
</tr>
<tr>
<td>10. Determine submarine mountain topography more adequately</td>
<td>N-6</td>
</tr>
<tr>
<td>11. Conduct geophysical measurements to determine typical characteristics of mantle, crust</td>
<td>N-6</td>
</tr>
<tr>
<td>12. Study sedimentary rock formation affected by chemical processes</td>
<td>N-6</td>
</tr>
<tr>
<td>13. Study sedimentary rock formation affected by biological processes</td>
<td>N-6</td>
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<tr>
<td>14. Bed bottom topography; charts</td>
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<tr>
<td>15. Study coral skulls</td>
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<td>16. Study turbidity currents</td>
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<tr>
<td>17. Investigate littoral drift and determine source of littoral materials</td>
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<td>18. Study volcanoes - submarine</td>
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<tr>
<td>19. Increase bottom photography</td>
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<td>20. Develop automated index for geological data</td>
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</table>

Numbers in matrix are document page numbers where **A** Little or No Impact, **B** 1 Minor Impact, **C** Recommendation or conclusion is discussed. *Accession Number - See Bibliography*
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### Table A-2

**COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM**

#### F. GEOPHYSICS

<table>
<thead>
<tr>
<th>Recommendation or Conclusion</th>
<th>Accession No.</th>
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<tbody>
<tr>
<td>1. Investigate reversed magnetic polarization</td>
<td>56, 374, 90, 310, 344, 227, 236</td>
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<tr>
<td>2. Conduct seismic refraction surveys</td>
<td></td>
</tr>
<tr>
<td>3. Conduct gravity surveys</td>
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</tr>
<tr>
<td>4. Need more accurate gravity measurements</td>
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<td>5. Conduct magnetic surveys</td>
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<td>6. Determine heat flow at benthic boundary</td>
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<tr>
<td>7. Investigate acoustic energy scattering</td>
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<td>8. Investigate acoustic energy transmission paths in water</td>
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<tr>
<td>9. Investigate acoustic energy reflection</td>
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<tr>
<td>10. Prepare acoustic data banks</td>
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</tr>
<tr>
<td>11. Study seismic reflection</td>
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</tr>
<tr>
<td>12. Study natural ocean sounds (waves, wind, rain, earthquakes, marine animals)</td>
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<tr>
<td>13. Study industrial sounds (ships, submarines)</td>
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<tr>
<td>14. Determine energy transfer processes near large acoustic transmitters and receivers</td>
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<tr>
<td>15. Study and locate seismically active areas</td>
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</tbody>
</table>

*Numbers in matrix are document page numbers where recommendation or conclusion is discussed.

** Accession Number - See Bibliography

- ** Little or No Impact
- * Minor Impact
- Major Impact
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</table>
# TABLE A-2 cont'd

## COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM

### G. SURVEYS

<table>
<thead>
<tr>
<th>Recommendation on Conclusion</th>
<th>Accession No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oceanwide</strong></td>
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</tr>
<tr>
<td>1. Conduct SEAMAP</td>
<td>12</td>
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<tr>
<td>2. Survey dynamic ocean circulation</td>
<td>35</td>
</tr>
<tr>
<td>3. Survey air-sea interaction</td>
<td>31</td>
</tr>
<tr>
<td>4. Install major experimental networks in North Atlantic and North Pacific</td>
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</tr>
<tr>
<td>5. Survey sea surface temperature using infrared radiation thermometers</td>
<td>37</td>
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<tr>
<td>6. Install tide gauge station net - worldwide</td>
<td>13</td>
</tr>
<tr>
<td>7. Survey of world ocean using seismic refraction and reflection</td>
<td>13, 57</td>
</tr>
<tr>
<td>8. Survey coast lines</td>
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### Defined Areas

<table>
<thead>
<tr>
<th>Recommendation on Conclusion</th>
<th>Accession No.</th>
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</thead>
<tbody>
<tr>
<td>1. Prepare reconnaissance geological maps for the entire U.S. continental shelf</td>
<td>23, 6</td>
</tr>
<tr>
<td>2. Prepare reconnaissance geophysical maps for the entire U.S. continental shelf</td>
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</tr>
<tr>
<td>3. Prepare detailed geological maps for selected areas of the continental shelf</td>
<td>20</td>
</tr>
<tr>
<td>4. Prepare detailed geophysical maps for selected areas of the continental shelf</td>
<td>20</td>
</tr>
<tr>
<td>5. Obtain subsurface stratigraphic and structural data</td>
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</tr>
<tr>
<td>7. Continue ocean station measurements</td>
<td>37</td>
</tr>
<tr>
<td>8. Continue standard section measurements</td>
<td>27, 36</td>
</tr>
<tr>
<td>9. Conduct near coastal station measurements</td>
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<tr>
<td>10. Survey of U.S. continental shelf using seismic refraction and reflection</td>
<td>57</td>
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<tr>
<td>11. Study Gulf Stream</td>
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</table>

Numbers in matrix are document page numbers where
- **Little or No Import**: recommendation or conclusion is discussed
- *Accession Number - See Bibliography*
### TABLE A-2
**cont'd**

**COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM**

#### N. FOOD AND FISHERIES

<table>
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<th>RECOMMENDATION OR CONCLUSION</th>
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<th>76</th>
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<th>110</th>
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<tbody>
<tr>
<td>1. Improve procedures to estimate size, distribution, behavior of fish</td>
<td>11,15</td>
<td>175,19</td>
<td>F-10</td>
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<td>2. Research dynamics of fish population</td>
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<td>3. Research transfer of food through food web</td>
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<td>4. Develop processes for making fish protein</td>
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<td>5. Investigate breeding organisms in captivity in the laboratory</td>
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<tr>
<td>6. Conduct systematic biological surveys and mapping of the world ocean</td>
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<td>7. Increase production of phytoplankton by artificial fertilization</td>
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<td>8. Study geologic aspects of fish habitats</td>
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<tr>
<td>9. Study effects of geology on ecology of bottom fisheries</td>
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<td>10. Develop processing fish for market</td>
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<td>11. Develop fish markets</td>
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<td>12. Conduct fish market research</td>
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<td>13. Implement production of anadromous fish</td>
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<tr>
<td>14. Develop fishing gear</td>
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Numbers in matrix are document page numbers where

- **X** Little or No Impact
- **M** Minor Impact
- **M** Major Impact

* Accession Number - See Bibliography
## TABLE A-2 (continued)

**COLLABORATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM**

### I. MINERALS AND DRUGS

1. Determine location and delineate mineral deposits
2. Determine mineral deposit character
3. Develop submarine materials handling
4. Investigate sea floor mineral fragmentation and beneficiation
5. Conduct mineral processing research
6. Determine effect of mining operations on environment
7. Develop techniques for recovery of minerals from seawater
8. Study organism concentration of minerals

### J. WATER RESOURCES

1. Determine amount of fresh water reaching marine environment
2. Determine distribution of fresh water reaching marine environment in time and space
3. Investigate fresh water-salt water interface
4. Conduct desalination of saline waters research
5. Investigate hydrologic cycle

### K. RECREATION

1. Acquire coastal areas for public recreation
2. Develop easy access to areas for outdoor recreation

<table>
<thead>
<tr>
<th>RECOMMENDATION ON CONCLUSION</th>
<th>Accession No.</th>
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<tr>
<td>I. MINERALS AND DRUGS</td>
<td>56 17 90 210 344 227 226</td>
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<tr>
<td>1. Determine location and delineate mineral deposits</td>
<td>22</td>
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<tr>
<td>2. Determine mineral deposit character</td>
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<td>3. Develop submarine materials handling</td>
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<td>4. Investigate sea floor mineral fragmentation and beneficiation</td>
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<tr>
<td>5. Conduct mineral processing research</td>
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<tr>
<td>6. Determine effect of mining operations on environment</td>
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<tr>
<td>7. Develop techniques for recovery of minerals from seawater</td>
<td>21</td>
</tr>
<tr>
<td>8. Study organism concentration of minerals</td>
<td>22</td>
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</table>

<table>
<thead>
<tr>
<th>J. WATER RESOURCES</th>
<th>Accession No.</th>
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<tr>
<td>1. Determine amount of fresh water reaching marine environment</td>
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<tr>
<td>2. Determine distribution of fresh water reaching marine environment in time and space</td>
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<tr>
<td>3. Investigate fresh water-salt water interface</td>
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<tr>
<td>4. Conduct desalination of saline waters research</td>
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<tr>
<td>5. Investigate hydrologic cycle</td>
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<th>K. RECREATION</th>
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<tr>
<td>1. Acquire coastal areas for public recreation</td>
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<tr>
<td>2. Develop easy access to areas for outdoor recreation</td>
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*Numbers in matrix are document page numbers where:
** Little or No Impact
*Minor Imp
** Accession Number - See bibliography
* Water Imp
# TABLE A-2 cont'd

## COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM

### L. POLLUTION

<table>
<thead>
<tr>
<th>Recommendation on Conclusion</th>
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<td>1. Determine effects of pesticides and herbicides on nearshore and high-sea marine organisms</td>
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<td>2. Study partially treated sewage-circulation, diffusion in bays, estuaries, and near shore</td>
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<td>3. Develop solid waste disposal techniques</td>
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<td>4. Develop water quality criteria</td>
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<td>5. Investigate persistent inorganic pollutants</td>
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<td>6. Investigate lead from auto fuels pollution</td>
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<td>7. Determine industrial waste capacity of near shore areas</td>
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<td>8. Inventory waste discharge into marine environment</td>
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<td>9. Evaluate waste discharge on biota of coastal waters</td>
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### M. RADIOACTIVITY

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<tr>
<td>1. Determine distribution of fallout-derived isotopes in the sea</td>
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<td>2. Determine level of radioactivity in estuaries and coastal areas</td>
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### N. ENGINEERING

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<tr>
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<td>2. Rehabilitate beaches</td>
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<td>3. Develop underwater tools and manipulators</td>
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<td>4. Develop electronic components for underwater use</td>
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<td>5. Corroding, corrosion, strength of materials</td>
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</table>

Numbers in matrix are document page numbers where:

- **L** - Little or No Expert recommendation or conclusion is discussed
- **M** - Minor Expert
- **A** - Accession Number - See Bibliography

December 1, 1967
## National Marine Data Program

### Table A-2 (continued)

#### Data Management

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<td>3. Use modern computers in oceanography</td>
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<td>13. Catalog littoral drift</td>
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<td>14. Write computer programs - specialized</td>
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<td>15. Write computer programs - general purpose</td>
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<td>18. Store and retrieve satellite data</td>
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<td>19. Retrieve information about specimens</td>
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<td>20. Program for on-line manipulation of data base</td>
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#### COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM

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<td>4. Develop stable surface platforms, spar buoy (FLIP)</td>
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<td>6. Develop towed submersibles</td>
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<td>7. Design submersible for sea floor geological &amp; geophysical observations</td>
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<td>8. Use drifting ice for Arctic surveys</td>
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<td>9. Install towers and fixed manned stations</td>
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<td>12. Develop deep water buoy</td>
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<td>15. Construct larger vessels required for massive experimental equipment</td>
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<td>16. Use smaller vessels required for special tasks</td>
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<td>18. Estimate of ship time required</td>
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<td>21. Collect some oceanographic data during Apollo Application B Mission</td>
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Numbers in matrix are document page numbers where a recommendation or conclusion is discussed. ** Little or No Impact, Minor Impact, Major Impact. Accession Number - See Bibliography.
TABLE A-2
cont'd

COLLATION OF PLANS FOR THE
NATIONAL MARINE DATA PROGRAM

Q. SENSORS, INSTRUMENT SYSTEMS

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<th>RECOMMENDATION OR CONCLUSION</th>
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<td>1. Develop side scanning sonar</td>
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<td>2. Develop narrow focus acoustical profiling gear</td>
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<td>3. Develop ultra-sensitive magnetometers</td>
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<td>4. Develop ultra-sensitive gravimeters</td>
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<td>5. Develop remote sensing systems</td>
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<td>6. Make sound velocity measurements directly</td>
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<td>7. Use towed hydrophone arrays</td>
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<td>8. Develop sea surface slope measurement system</td>
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<td>9. Develop navigation systems</td>
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<td>10. Determine Arctic communications requirements</td>
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<td>11. Develop data acquisition package for buoys</td>
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<td>12. Increase bathymetric survey speed and resolution</td>
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<td>13. Develop long-range detection and communication acoustic systems</td>
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<td>14. Construct instruments for vessels of opportunity</td>
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<td>15. Install Salinity-Temperature-Depth recorders</td>
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<td>16. Install expendable BT</td>
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<td>17. Develop infrared radiation thermometer</td>
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<td>18. Develop Coast Guard sensor package</td>
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<td>19. Automate chemical analyzers</td>
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<td>20. Use passive sonar to determine plankton distribution</td>
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Numbers in matrix are document page numbers where
** Little or No Impact
Minor Impact
Major Impact

Accession Number - See Bibliography
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**Impact on Date**: 2

**Collection**: 2

**Processing**: 1

**Use**: 2
### TABLE A-2 cont'd

**COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM**

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<td>22. Develop inexpensive, simple data collection systems for small craft</td>
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<tr>
<td>23. Develop organic carbon measurement system (rapid, accurate)</td>
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<tr>
<td>24. Develop unmanned weather stations</td>
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<tr>
<td>25. Improve wave sensor, shipboard</td>
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<td>26. Improve wind sensor, shipboard</td>
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<td>27. Develop surf and breaker measurement device</td>
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<td>28. Improve sensors for sea surface temperature, shipboard</td>
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#### R. FACILITIES

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<tr>
<td>2. Construct submersible laboratories</td>
<td>M-8</td>
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<tr>
<td>3. Develop a nuclear power source</td>
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<tr>
<td>4. Organise Maury center for ocean science of the Navy</td>
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<tr>
<td>5. Install deep sea geophysical observatories (3)</td>
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<td>6. Install magnetic observatories over East Pacific: Rise (8)</td>
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<td>7. Require computer for Coast Guard Oceanographic Unit</td>
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<td>8. Organise an environmental computer facility, jointly operated (ESSA, CTAC, NOD)</td>
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<td>9. Establish marine forecast centers (6) (ESSA)</td>
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Numbers in matrix are document page numbers where:

- **Little or No Impact**
- **Minor Impact**
- **Major Impact**

**Accession Number - See Bibliography**
**TABLE A-2 cont'd**

**COLLATION OF PLANS FOR THE NATIONAL MARINE DATA PROGRAM**

**S. LEGAL, MANAGEMENT**

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<th>RECOMMENDATION ON CONCLUSION</th>
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<tbody>
<tr>
<td>1. Enforce federal regulations</td>
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<td>2. Clarify ownership of marine mineral deposits</td>
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<td>3. Develop incentive for private development of mineral deposits</td>
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<tr>
<td>4. Implement regulations to ensure compatibility of multiple use</td>
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<tr>
<td>5. Arrange access to public areas blocked by private property</td>
<td>8-6</td>
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<tr>
<td>6. Coordinate multi-jurisdictional management of multi-owned coastal areas</td>
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<tr>
<td>7. Establish continental shelf boundary</td>
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<td>8. Determine rights and duties of nations on shared continental shelf</td>
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</tr>
<tr>
<td>9. Determine rights and duties of nations for deep ocean use</td>
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<tr>
<td>10. Publish document reviewing the Law of the Sea</td>
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**T. ORGANIZATION**

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<tr>
<td>1. Federal Government foster partnership of several states</td>
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<tr>
<td>2. Write joint research contracts with universities and institutions</td>
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<tr>
<td>3. Develop multi-agency data collection and handling activities</td>
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<tr>
<td>4. Industry to develop and participate in operation of marine data management system</td>
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Numbers in matrix are document page numbers where **# Literature Expert**

Recommendation on conclusion is discussed

**Accession Number - See Bibliography**
TABLE A-2
cont'd

COLLATION OF PLANS FOR THE
NATIONAL MARINE DATA PROGRAM

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</table>

U. EDUCATION, TRAINING

1. Strengthen marine research capabilities of universities
   - Accession No. 18

2. Use specimens as three-dimensional library, basic to education process

V. INTERNATIONAL PROGRAMS

1. International Indian Ocean Expedition (IIIO)

2. International Cooperative Investigation of the Tropical Atlantic (ICITA)

3. Cooperative investigation of the Kuroshio
   - Accession No. X

4. Eastern Tropical Pacific Investigation (EASTROPAC)
   - Accession No. X

5. Inter-American Conference of Hydrobiology

6. Cooperative Investigation of the Variability of the Ocean (CIVO)
   - Accession No. 15 of (attach)

7. World Data Center for Oceanography
   - Accession No. 19

W. MISCHELLENOUS

1. Develop system for breathable air from water

2. Study physiology of man-in-the-sea
   - Accession No. 48

Numbers in matrix are document page numbers where

** Major Impact
* Accession Number - see Bibliography

** Little or No Impact

recommendation or conclusion is discussed
APPENDIX B

REVIEW AND COLLATION OF PERTINENT PRIOR STUDIES AND LITERATURE

The literature and other studies review was conducted in the same way as the prior plans review, Appendix A. As documents were reviewed by various members of the project team, important information was underlined. The underlined information was then reviewed to provide the topic headings listed under 23 subject headings in Table 1, this appendix. The same subject headings were used for this appendix as for Table 2, Appendix A. The numbers in the cells of the matrix are the page numbers in the documents where the topic is discussed.

The same subjective method of assessing the impact of each topic listed on collection, processing and use of marine data was used in assessing the literature and studies as for prior studies, Appendix A. As was done in that case, the general conclusions drawn from these studies and literature reviews are drawn together and discussed in Section VIII.

Of the many documents reviewed, 27 are included in Table 1, Appendix B. The inclusion of additional documents would make the table extremely large and, in general, it is believed that a large percentage of the recommendations and conclusions occurring in the literature which may affect a marine data management system are included. Since studies are continually being made, however, review and additions to the table should be made during Phase II and this approach should be established as an ongoing project by the organization responsible for a national marine data management program.
# TABLE B-1
COLLATION OF STUDIES AND OTHER LITERATURE FOR THE NATIONAL MARINE DATA PROGRAM

## A. PHYSICAL OCEANOGRAPHY

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<td>3. Current measurements very useful</td>
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<td>19. Ice, layer depth study</td>
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<td>20. Thermocline depth, high temperature fluctuation</td>
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* Accession Number - See Bibliography
** If Little or No Impact
*** Minor Impact
**** Major Impact
Numbers in matrix are document page numbers where recommendation or conclusion is discussed.
TABLE B-1 cont'd

COLLATION OF STUDIES AND OTHER LITERATURE FOR THE NATIONAL MARINE DATA PROGRAM

A. PHYSICAL OCEANOGRAPHY Cont'd

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<td>117, 269</td>
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<td>25. Sea state from displacement of clouds or cloud patterns</td>
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<td>26. Estuary dynamics study</td>
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<td>27. Diffusion processes in bays, near coasts study</td>
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B. BIOLOGICAL OCEANOGRAPHY

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<td>3. Biological luminescence - origin and use</td>
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<td>4. Biological organism distribution - statistics needed</td>
<td>416, 55, 70</td>
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<td>5. Seaweed location</td>
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<td>6. Chlorophyll concentration</td>
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<td>7. Poisonous marine organisms</td>
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<td>8. Study of large marine animals</td>
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<td>9. Systematic, taxonomic biology of marine organisms</td>
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<tr>
<td>10. Increase knowledge of environmental alteration on biota</td>
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# Accession Number - See Bibliography
## 1 Little or No Impact
### 1 Minor Impact
#### 2 Major Impact

Numbers in matrix are document page numbers where recommendation or conclusion is discussed.
### TABLE B-1 cont'd

**COLLATION OF STUDIES AND OTHER LITERATURE FOR THE NATIONAL MARINE DATA PROGRAM**

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<td>38 68 66 108 1 60 73 125 83 124 39 40</td>
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#### C. CHEMICAL OCEANOGRAPHY

1. Dissolved gas concentration needs investigation
2. Salinity, surface-synoptic map required
3. Salinity, 10m depth - synoptic map required
4. Chemical nutrient distribution required
5. Chemical data quality information prior to 1960 very questionable

#### D. METEOROLOGY

1. Establish Global Observation System - World Weather Watch
2. Numerical Prediction Model Development
3. Atmospheric Circulation
4. Turbulent Boundary-Layer transport
5. Improve storm and hurricane warning systems
6. Synoptic forecast requirements
7. Historical weather data summarized

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Accession Number - See Bibliography

- Little or No Impact
- Minor Impact
- Major Impact

Numbers in matrix are document page numbers where recommendation or conclusion is discussed.
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### TABLE B-1

#### COLLATION OF STUDIES AND OTHER LITERATURE FOR THE NATIONAL MARINE DATA PROGRAM

**E. GEOLGY**

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<td>8. Near shore composition</td>
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<td>9. Shape of continental shelf inadequately known</td>
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**F. GEOPHYSICS**

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<td>4. Acoustic energy transmission paths, reflection, and scattering in water</td>
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* Accession Number - See Bibliography

**y** Little or No Impact

1 Major Impact

2 Major Impact

Numbers in matrix are document page numbers where recommendation or conclusion is discussed.
TABLE 8-1
cont'd

COLLATION OF STUDIES AND OTHER LITERATURE FOR THE
NATIONAL MARINE DATA PROGRAM

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<td>5. Establish navigation system with O.1 p accuracy - worldwide</td>
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<td>2.6.</td>
<td>DIVIDED AREAS</td>
</tr>
<tr>
<td>2.6.</td>
<td>1. Study small scale processes</td>
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<tr>
<td>2.6.</td>
<td>2. Great Lakes surveys for selected areas of the continental shelf</td>
</tr>
<tr>
<td>2.6.</td>
<td>3. South polar area and Arctic Ocean Sea Ice Study</td>
</tr>
<tr>
<td>2.6.</td>
<td>4. Island seas, gulfs, estuaries, See Ice Study</td>
</tr>
<tr>
<td>2.6.</td>
<td>5. Chesapeake Bay Study &amp; Model</td>
</tr>
</tbody>
</table>

* Accession Number - See Bibliography
* 1 Little or No Impact
* 2 Minor Impact
* 3 Major Impact

Numbers in matrix are document page numbers where recommendation or conclusion is discussed.
### TABLE D-1 cont'd

Collation of Studies and Other Literature for the National Marine Data Program

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<tr>
<th>Recommendation or Conclusion</th>
<th>Accession No.</th>
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<tr>
<td>1. Research dynamic of fish populations</td>
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<td>2. Research transfer of food through food web</td>
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<td>1-119</td>
</tr>
<tr>
<td>3. Improve procedures to estimate size, distribution, behavior of fish</td>
<td>53</td>
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</tr>
<tr>
<td>4. Apply genetic techniques to study natural organisms populations</td>
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<tr>
<td>5. Laboratory studies for breeding organisms in captivity</td>
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<tr>
<td>6. Increase production of phytoplankton by artificial fertilization</td>
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<td>7. Develop production of anadromous fish</td>
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<td>8. Investigate transplanting organisms</td>
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<tr>
<td>9. Study culture of seawater organisms in ponds, sea enclosed areas</td>
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<tr>
<td>10. Study protection of living resources in estuaries and near coastal areas from impacts of other uses</td>
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<tr>
<td>11. Palynologic and ecological studies of communities in various ocean regions</td>
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<tr>
<td>12. Study marine diseases and parasites</td>
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<tr>
<td>13. Improve time and space prediction of oceanic properties and processes</td>
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<td>14. Conduct ecosystematic biological surveys and mapping of the world ocean</td>
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<td>15. Study effects of waste heat on near shore environment and food chain</td>
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<tr>
<td>16. Study effect of radioactivity in marine environment</td>
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<td>17. Identify alien species marine high value</td>
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<td>18. Develop processes for making fish protein</td>
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<td>19. Present information for commercial fishermen</td>
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<td>20. Develop fishing gear</td>
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<td>21. Improve fishing techniques</td>
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*Accession Number - See Bibliography

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<td>I. MINERAL AND DRUGS</td>
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<tr>
<td>1. Develop techniques for economic extraction of minerals from sea floor</td>
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<td>2. Conduct studies of sea floor deposits to evaluate potential as ores</td>
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<tr>
<td>3. Develop potential of sea for drugs</td>
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<tr>
<td>J. WATER RESOURCES</td>
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<tr>
<td>1. Fresh water reaching marine environment</td>
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<tr>
<td>2. Desalination of saline waters</td>
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<td>K. RECREATION</td>
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<td>1. Acquire coastal areas for public recreation</td>
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<td>2. Easy access to areas for outdoor recreation</td>
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<td>L. POLLUTION</td>
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<td>1. Effects of increase and changes in nutrient level on food chain</td>
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<td>2. Effects of pesticides and herbicides on near-shore and high-sea marine organisms</td>
<td>3-110 72 90</td>
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<tr>
<td>3. Partially treated sewage circulation, diffusion in bays, estuaries, and near shores</td>
<td>72 91</td>
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<tr>
<td>4. Viability of pathogenic organisms in marine waters</td>
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<td>5. Inventory waste discharge into marine environment</td>
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* Accession Number - See Bibliography
** Little or No Impact
 1 Minor Impact
 2 Major Impact

Numbers in matrix are document page numbers where recommendation or conclusion is discussed.
## Table B-1
**Collation of Studies and Other Literature for the National Marine Data Program**

### M. Radioactivity

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<th>Recommendation or Conclusion</th>
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<tr>
<td>1. Determine distribution of radioactive material at mouth of Columbia River</td>
<td>381, 68, 66, 108</td>
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<td>2. Study movement and mixing of an introduced contaminant - estuaries, near shore</td>
<td>1, 60, 73</td>
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<tr>
<td>3. Trace element input (natural), rate, route, distribution</td>
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<td>4. Distribution of fallout-derived isotopes in the sea</td>
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<td>5. Biological transport of stable trace elements</td>
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<td>6. Radiation-produced morphological damage to marine organisms</td>
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<tr>
<td>7. Level of radioactivity in estuaries and coastal areas</td>
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### N. Engineering

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<th>Recommendation or Conclusion</th>
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<td>1. Assemble and publish ocean engineering data</td>
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<tr>
<td>2. Deep sea currents - information needed</td>
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<td>3. Earthquake overpressure information needed</td>
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<td>4. Ice and icing effects on structures</td>
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<td>5. Fluctuations of major current streams</td>
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<td>6. Mechanical properties of ocean bottom sediments</td>
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<td>7. Trans-Ocean-Bottom exploration</td>
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<td>8. Biological effects on materials and structures</td>
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<td>9. Properties of materials at high pressure</td>
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*Accession Numbers - See Bibliography
104 Level of radioactivity in estuaries and coastal areas
105 Mechanical properties of ocean bottom sediments
107 Trans-Ocean-Bottom exploration
108 Biological effects on materials and structures
109 Properties of materials at high pressure

Numbers in matrix are document page numbers where recommendation or conclusion is discussed.
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<td>1. National Data Management System Study</td>
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<td>3. Gap in information transfer between universities and industry</td>
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<td>4. Need for cooperation between collectors, users, and storers of data</td>
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<td>5. Data requirements determination - (not defined or limited by sensor available)</td>
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<td>6. Data management requirements for surveys</td>
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<td>8. Data management for short-range synoptic environmental prediction</td>
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<td>9. Data management for operational efforts</td>
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<td>10. Prediction of data user requirements - data center problem</td>
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<td>11. Frequently required data parameters</td>
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<td>12. Geographic commonality of user data requirements</td>
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<td>13. Redundancy in data parameters</td>
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<td>14. Data management dictated by nature of the data</td>
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<td>15. Coordination of worldwide data gathering system</td>
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<td>16. Evaluation of worldwide data difficult to accomplish</td>
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<td>17. Data problem potentially great because of broad scope of oceanography</td>
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<td>18. Advisory panels for data management</td>
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<td>21. Geological data handling</td>
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*Accession Number - See Bibliography
**S Little or No Impact
$S Major Impact
Numbers in matrix are document page numbers where recommendation or conclusion is discussed
### TABLE B-1
**CONT'D**

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<th>TABLE OF STUDIES AND OTHER LITERATURE FOR THE NATIONAL MARINE DATA PROGRAM</th>
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**DATA MANAGEMENT Continued**

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<th>RECOMMENDATION OR CONCLUSION</th>
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<tbody>
<tr>
<td>22. Flexibility of data center to react to users' needs is a requirement</td>
<td>381 60 66 108 1 60 73 125 86 124 40 41</td>
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<td>23. Communication between data centers and users requires standardization and flexibility of format</td>
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<td>24. Data centers created to dispose of data backlog, regional data centers</td>
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<tr>
<td>25. MEDC developing capability for research in problems of data analysis and information retrieval</td>
<td>3 30 40</td>
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<td>26. Use of modern computers in oceanography</td>
<td>41 60 144</td>
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<td>27. Data display using automation - station data - live atlas</td>
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<td>28. Machine-produced atlas</td>
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<tr>
<td>29. Quality control of data</td>
<td>44,69</td>
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<td>30. Evaluation techniques for selection of significant data</td>
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<td>31. Data reliability</td>
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<td>32. Preservation of original data required</td>
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<td>33. New data requirements often retroactive on archival data</td>
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<td>34. Real time data processing investigation</td>
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<td>35. Flexible diagnostic programs required</td>
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<td>36. Flexible analysis programs required</td>
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<td>37. Automated shipboard data systems</td>
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<td>38. Navigation information required on data record</td>
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<td>39. Waste discharge data retrieval system</td>
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<td>40. Analog data mandatory for interpretation</td>
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<td>41. Simultaneous recording of several oceanographic parameters</td>
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* Accession Number - See Bibliography

**Notes:**
- Document Title
- Columns represent different data centers or regions.
- Columns may have different labels indicating different aspects of data management and use.
- The table summarizes recommendations and conclusions related to the data management of the national marine data program.

**Explanation:**
- The table classifies and evaluates the needs and requirements for effective data management in marine programs, focusing on the flexibility, communication, and use of modern computing technologies. It highlights the importance of standardization, quality control, and the need for real-time data processing.

**Additional Information:**
- The table is part of a larger document that includes recommendations and conclusions from various studies and literatures relevant to the national marine data program.
### TABLE 8-1

**COLLATION OF STUDIES AND OTHER LITERATURE FOR THE NATIONAL HATINS DATA PROGRAM**

#### O. DATA MANAGEMENT Continued

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<td>36. Parameter characteristics satisfied by many 3-year state-of-the-art collection</td>
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<td>39. Data volume problems and quantities</td>
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* Accession Number - See Bibliography
* O Little or No Impact
* Major Impact
* Comments are document page numbers where recommendation or conclusion is discussed.
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Collation of Studies and Other Literature for the National Marine Data Program

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* Accession Number - See Bibliography

**Note:**
- **L** - Little or No Impact
- **M** - Major Impact

Numbers in matrix are document page numbers where recommendation or conclusion is discussed.
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* Accession Number - See Bibliography
** Little or No Impact
1 Minor Impact
2 Major Impact
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## Collation of Studies and Other Literature for the National Marine Data Program

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<td>17. Make Indian Ocean Biological Center permanent</td>
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* Accession Number - See Bibliography
** # Little or No Impact
1 Major Impact
2 Major Impact

Numbers in matrix are document page numbers where recommendation or conclusion is discussed.
**TABLE B-1 cont'd**

COLLATION OF STUDIES AND OTHER LITERATURE FOR THE NATIONAL MARINE DATA PROGRAM

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<th>RECOMMENDATION OR CONCLUSION</th>
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<td>7. Continue basic research using ONR</td>
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<td>13. Study shoreline degradation - federal and local initiative</td>
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* Accession Number - See Bibliography
* synopsis or evaluation
1. Minor Report
2. Major Report
Numbers in matrix are document page numbers where recommendation or conclusion is discussed.
### TABLE II-1  
cont'd

**COLLATION OF STUDIES AND OTHER LITERATURE FOR THE NATIONAL MARINE MANTA PROGRAM**

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<thead>
<tr>
<th>Recommendation or Conclusion</th>
<th>Accession No.</th>
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<tr>
<td>1. Gea Grant Program should be oriented to national purposes</td>
<td>58</td>
</tr>
<tr>
<td>2. Inventory of general education programs in marine science</td>
<td>15</td>
</tr>
<tr>
<td><strong>V. INTERNATIONAL PROGRAMS</strong></td>
<td></td>
</tr>
<tr>
<td>1. International exchange and use of vessels by Department of State</td>
<td>176</td>
</tr>
<tr>
<td>2. Specialized Agency Activities</td>
<td>10</td>
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<tr>
<td>3. USAID promotes international expeditions, data exchange, radio</td>
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<tr>
<td>4. Frequency allocation Tsunami Warning System</td>
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<td>5. Antarctic cooperation as model for other international cooperation</td>
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<tr>
<td>6. International Indian Ocean Expedition (IIOE)</td>
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<td>7. World Ocean Center for Oceanography</td>
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<td>8. International Date Exchange</td>
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<td>9. Pacific Ocean Data Exchange</td>
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</table>

*Accession Number = See Bibliography

<table>
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<th>Major Impact</th>
<th>Remarks</th>
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Numbers in square are document page numbers where recommendation or conclusion is discussed.
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<td>301 68 66 108 1 60</td>
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<td>2. Prediction of marine environment</td>
<td>42 81</td>
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<tr>
<td>3. Identify areas of marine science which need strengthening</td>
<td>26</td>
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<tr>
<td>4. When synoptic data service available, user expansion anticipated</td>
<td>117</td>
</tr>
<tr>
<td>5. Weather Warning Service</td>
<td>86</td>
</tr>
<tr>
<td>6. Initiate design study to determine system for long range</td>
<td>66</td>
</tr>
<tr>
<td>and reliable environmental predictions</td>
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<tr>
<td>7. Mission analysis of world wide data gathering system</td>
<td>444</td>
</tr>
<tr>
<td>8. Statistics or state and private funding in oceanography being collected</td>
<td>30</td>
</tr>
<tr>
<td>9. Economic analysis of multiple uses needed</td>
<td>8</td>
</tr>
<tr>
<td>10. Automated chart preparation</td>
<td>9</td>
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<tr>
<td>11. Declassification of DOD-collected data</td>
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<tr>
<td>12. Coastal land inventory (use, future use, restrictions, etc.)</td>
<td>19</td>
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<tr>
<td>13. Album of satellite data should be prepared</td>
<td>2</td>
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<tr>
<td>14. Ship routing - minimum time, maximum safety</td>
<td>413</td>
</tr>
<tr>
<td>15. Determine geographical coordinates with greater accuracy</td>
<td>3-101 96</td>
</tr>
<tr>
<td>16. Submerged hazards (pipelines, cables, sunken vessels, etc.) position</td>
<td>3-20 3-120</td>
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<tr>
<td>17. Photogrammetry research and development</td>
<td>3-101</td>
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<tr>
<td>18. Survey of navigable water ways - quicker response required</td>
<td>3-120</td>
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<tr>
<td>19. Areal photography of shorelines</td>
<td>3-120</td>
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<tr>
<td>20. Charts should include measure of reliability and be standardized</td>
<td>10-101</td>
</tr>
<tr>
<td>21. Bottom photography required</td>
<td>3-121</td>
</tr>
</tbody>
</table>

* Accession Number - See Bibliography
** Little or No Impact
1 Minor Impact
2 Major Impact
Numbers in matrix are document page numbers where recommendation or conclusion is discussed.
APPENDIX C

PRIOR STUDY, PLANS AND LITERATURE ANALYSIS FORM

An analysis form was prepared at the beginning of the Phase I study for use in abstracting and compiling the information collected during the study, plans and literature review. A sample form is included as Table 1 in this appendix, which is filled in with the actual results of the review of one of the documents analyzed. The procedure followed was to underline pertinent information in the document as it was reviewed and then to copy the underlined information on to the abstract pages of the analysis (see pages 86 and 87) form. Each such entry is keyed to the document in two ways. First, the page in the document on which the information was found is listed on the right side of the left-hand column, as shown. Second, a four-digit code number is listed on the left side of the same column. The code is taken from the matrix on page 83. The matrix in turn codes two basic profiles of the abstracted item in terms which are pertinent to data management. For example, the reviewer issued four codes (2129, 2135, 2137 and 2143) to the abstract from page 106 listed in the next to the last paragraph on page 87. Since the discussion describes some of the functions of World Data Center A, the code 21 is used for all four entries. The variation in the last two digits of the four codes represents the functions performed, acquisition, storage, dissemination, and organization respectively.

The matrix is also employed to categorize broadly the nature of the content of the entire document being abstracted. This system was set up to provide rapid access to the source of the document data base using a computer and a general purpose retrieval program. In this way it becomes simple to search and locate the document and page number of all documents containing information pertinent to the 126 combinations of information defined by the matrix. The general purpose load and retrieval programs and computer time are currently available at SDC and they were applied during Phase I to an oceanographic data base, as described in Appendix D. Utilization of this capability should be considered during Phase II for implementation of a bibliographic retrieval capability for Marine Council use, employing a remote terminal if desired.

Table 1, described above, is a shortened and simplified version of the prior study, plans and literature analysis form included to illustrate the processes involved. Table 2 of this appendix illustrates a normal analysis form filled out in the detail which is more characteristic of the remainder of the documents reviewed.
<table>
<thead>
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<td>2</td>
<td>Does document describe:</td>
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<tr>
<td></td>
<td>Prior Study</td>
</tr>
<tr>
<td>3</td>
<td>Organization Plans</td>
</tr>
<tr>
<td>4</td>
<td>Other Literature</td>
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<tr>
<td>X</td>
<td>For use in the Marine Environment Data Study, is the document</td>
</tr>
<tr>
<td>5</td>
<td>Usable</td>
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<td>Document Location (Lib. Shelf - Gaylord File - etc.)</td>
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<td>9</td>
<td>Author</td>
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<td>Richmond, Benjamin S.</td>
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<td>10</td>
<td>Title</td>
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<td>&quot;Report of Oceanographic Data Exchange for the Year 1966&quot;</td>
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<td>11</td>
<td>Source (Includes Organization, Report Number, Journal, Vol., No., Date)</td>
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<td>Cost of Contract</td>
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</table>
In the table on this page, an attempt to format the reviewed literature or plans for machine retrieval has been made. If an article describes Research and Development for Data Acquisition, an X would be placed in the box opposite data acquisition and under R&D. The definitions of column and row headings are attached. It is planned to retrieve information by any of the headings listed. The table does not eliminate the need for an abstract, which should be attached, to describe the various parameters marked in the table. It is expected that the table would be filled in after the abstract has been written. Entries in the abstract should be preceded by a four-digit number made up of the two, two-digit numbers for the cell in the table with which they are associated, the column first and row second. For instance, if an X is entered for Data Archival Requirements, the number 2235 in the abstract should precede information relating to it.

To reduce review time, it is recommended that the reviewer underline words, phrases or paragraphs which should be lifted from the text for entry into the abstract and place the same four-digit number described in the previous paragraph in the text. The typist can then go through the document and enter this information in the abstract with the corresponding number.

Mark each box of the matrix which indicates the content of the publication. Additional descriptions should be included in the abstract to indicate why the appropriate boxes were marked.

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December 1, 1967

TABLE C-1
cont'd

DEFINITIONS OF TERMS USED FOR THE LITERATURE SEARCH QUESTIONNAIRE

Column Heading Definitions

21. Function - Any function performed by the items identified in the row headings should be included such as the function of constraints or an agency function.

22. Requirements - Any needs for items identified in row headings such as sensor requirements or data archival requirements should be identified.

23. Plans & Design - This covers any plans or design relating to any item in the row headings such as the design of a platform or the plans for data use.

24. R & D - If the article refers to research and development for an item in the row headings, this should be identified such as development of a data transmission system.

25. Operation - If the operation of a data center is described, there would probably be discussions of data archival operations, data retrieval operations, etc. In the case of an agency, its overall operation may be described.

26. Cost - If cost information concerning individual or group items listed in the row headings is described in the article, this should be identified in the appropriate column.

27. General - Any areas not covered by other column headings should be included in this column and should be discussed in the abstract.

Row Heading Definitions

28. Data Type - Description of parameter(s) recorded.

29. Data Acquisition* - Description of method of data capture by sensor. Indicate collection agency.

30. Data Recording* - Description of method of recording data after capture by sensor, such as strip chart recording or analog recording to magnetic tape.

31. Data Processing - Description of manual and computer processing for format conversions or mathematical and statistical computation. Indicate processing agency.

*) and (*) combined constitute data collection
<table>
<thead>
<tr>
<th>Table C-1 (cont'd)</th>
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</thead>
<tbody>
<tr>
<td>32. Data Use - Description of uses of collected data.</td>
</tr>
<tr>
<td>33. Data Retrieval - Description of methods used to retrieve data from a database, whether manual or automated.</td>
</tr>
<tr>
<td>34. Data Base Maintenance - Description of method used to maintain manual or automated filing system.</td>
</tr>
<tr>
<td>35. Data Archival - Description of methods used to maintain historical data.</td>
</tr>
<tr>
<td>36. Data Transmission - Description of data transmission paths used to transmit data along any of the routes from data acquisition to the ultimate user. This is a description of routes of data transmission not hardware for accomplishing transmission.</td>
</tr>
<tr>
<td>37. Data Dissemination - Description of methods used to disseminate data to ultimate users.</td>
</tr>
<tr>
<td>38. Data Quality - Description of quality, accuracy, precision and range requirements and limitations.</td>
</tr>
<tr>
<td>39. Sensors - Description of sensors, planned or existing.</td>
</tr>
<tr>
<td>40. Platforms - Description of platforms used to collect data.</td>
</tr>
<tr>
<td>41. Communications - Description of systems used to transmit data along any of the routes from data acquisition to the ultimate user.</td>
</tr>
<tr>
<td>42. Constraints - Description of effect of the following constraints on data program:</td>
</tr>
<tr>
<td>a. Political</td>
</tr>
<tr>
<td>b. Legal</td>
</tr>
<tr>
<td>c. Economic</td>
</tr>
<tr>
<td>d. Technological</td>
</tr>
<tr>
<td>e. Physical</td>
</tr>
<tr>
<td>43. Organization - Description of organizational activities related to data management.</td>
</tr>
<tr>
<td>44. Personnel - Description of personnel involved in data management programs.</td>
</tr>
<tr>
<td>45. Other - Any items not included in 38 through 44.</td>
</tr>
</tbody>
</table>
**TABLE C-1**

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Abstracted Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2745 .p.1</td>
<td>This report summarizes the oceanographic data exchange activities of World Data Center A, Oceanography, for the year 1966.</td>
</tr>
<tr>
<td>2729, 2737 p.2</td>
<td>The volume of data received during 1966 increased by 93% over that received in 1965. The volume of data supplied by this Center to other activities increased by 28% over that supplied in 1965.</td>
</tr>
<tr>
<td>2745 p.2</td>
<td>The total number of oceanographic stations held by the Center on 31 December 1966 was 99,535, compared with 74,264 for the same data in 1965. A tabulation of these data by years and countries is given in Table 2, which lists data received, the number of oceanographic stations by the years during which the data were gathered, and the countries under which these data are catalogued.</td>
</tr>
<tr>
<td>p.3</td>
<td>A summary of the number of oceanographic stations received during the period 1957 through 1963, and during the individual years 1964, 1965, and 1966 are given in Table 3 on page 10.</td>
</tr>
<tr>
<td>p.13</td>
<td>Catalogue numbers for data received through 31 December 1966 have been added to the list of the national oceanographic programs, given in the previous report (reference 5), and listed in the various issues of INTERNATIONAL MARINE SCIENCE (IMS). The list is arranged by countries in the same numerical sequence used in the CATALOGUE OF DATA. Under each country the cruises are given in the sequence of the issues of IMS. We have continued to attempt to match data received with the cruises listed in IMS on the basis of the most reasonable agreement of:</td>
</tr>
<tr>
<td></td>
<td>(1) Country and ship's name;</td>
</tr>
<tr>
<td></td>
<td>(2) Beginning and ending dates of the cruise;</td>
</tr>
<tr>
<td></td>
<td>(3) The region(s) where the data were taken.</td>
</tr>
<tr>
<td>2243 p.102</td>
<td>The main principles governing the responsibilities of the WDCs and the nature of data interchange are founded on the IGY &quot;Guide&quot; and the experience gained during the IGY.</td>
</tr>
<tr>
<td>2745 p.104</td>
<td>(a) World Data Centers for collection and distribution of data. For each discipline, there are two or three such centers which operate according to the principles set forth in the Guide to WDCs.</td>
</tr>
<tr>
<td>Identification Number</td>
<td>Abstracted Information</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>(Continued)</td>
<td></td>
</tr>
<tr>
<td>2745 p. 104</td>
<td>(i) World Data Center A, which consists of eleven subject-matter divisions and includes all disciplines.</td>
</tr>
<tr>
<td></td>
<td>(ii) World Data Center B, which consists of two subject-matter divisions and includes all disciplines.</td>
</tr>
<tr>
<td></td>
<td>(iii) World Data Center C, which consists of several discipline centers in several nations.</td>
</tr>
<tr>
<td></td>
<td>(b) Centers for certain kinds of analysis and synthesis resulting in issuance of indices, certain bulletins of summary information, etc. There are two groups of such centers and provision is made for others as needed.</td>
</tr>
<tr>
<td>2745 p. 104</td>
<td>(1) Permanent Services.</td>
</tr>
<tr>
<td>2745 p. 105</td>
<td>(1') Special World Geophysical Centers</td>
</tr>
<tr>
<td>2243 p. 106</td>
<td>The objects of establishing several IGY World Data Centers for collecting IGY observational data were: (1) to insure against catastrophic destruction of a single center, (2) to meet the geographical convenience of, and provide easy communication for, workers in different parts of the world.</td>
</tr>
<tr>
<td>2249 p. 106</td>
<td>Each WDC is responsible for: (1) endeavoring to collect a complete set of data in the field or discipline for which it is responsible, (2) the safekeeping of the incoming data, (3) correct copying and reproduction of data, maintaining adequate standards of clarity and durability, (4) supplying copies to other WDCs of data not received direct, (5) preparation of catalogues of all data in its charge, (6) making data in the WDCs available to the scientific community.</td>
</tr>
<tr>
<td>2235 p. 110</td>
<td>quality of data. WDCs are not generally responsible for accuracy of data in their possession.</td>
</tr>
</tbody>
</table>
### TABLE C-2

**MARINE ENVIRONMENT PRIOR STUDY, PLANS AND LITERATURE SEARCH ANALYSIS FORM**

<table>
<thead>
<tr>
<th>No.</th>
<th>Column</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Reviewer</td>
<td>A. M. Rugg</td>
</tr>
<tr>
<td>2.</td>
<td>Does document describe:</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Prior Study</td>
<td>X</td>
</tr>
<tr>
<td>4.</td>
<td>Organization Plans</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Other Literature</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>For use in the Marine Environment Data Study, is the document</td>
<td>Usable X</td>
</tr>
<tr>
<td>7.</td>
<td>Accession Number</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>Document Location</td>
<td>Shelf</td>
</tr>
<tr>
<td>9.</td>
<td>Author</td>
<td>Frazier, N.A.</td>
</tr>
<tr>
<td>10.</td>
<td>Title</td>
<td>&quot;A Study of the U. S. Coast and Geodetic Survey's Products and Services as Related to Economic Activity in the U. S. Continental Shelf Regions&quot;</td>
</tr>
<tr>
<td>12.</td>
<td>Index Terms (Key Words)</td>
<td>User requirements, Charts, Maps, Geodesy, Magnetism, Seismology</td>
</tr>
<tr>
<td>13.</td>
<td>Mission or Goals of Organizations as Applicable</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Contract Title</td>
<td>Same as Title</td>
</tr>
<tr>
<td>15.</td>
<td>Contract No.</td>
<td>-----</td>
</tr>
<tr>
<td>16.</td>
<td>Date</td>
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</tr>
<tr>
<td>17.</td>
<td>Length of Contract</td>
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</tr>
<tr>
<td>18.</td>
<td>Contracting Agency</td>
<td>U. S. Coast and Geodetic Survey</td>
</tr>
<tr>
<td>19.</td>
<td>Contractor</td>
<td>Battelle Memorial Institute</td>
</tr>
<tr>
<td>20.</td>
<td>Cost of Contract</td>
<td></td>
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</tbody>
</table>
In the table on this page, an attempt to format the reviewed literature or plans for machine retrieval has been made. If an article describes Research and Development for Data Acquisition, an X would be placed in the box opposite data acquisition and under R&D. The definitions of column and row headings are attached. It is planned to retrieve information by any of the headings listed. The table does not eliminate the need for an abstract, which should be attached, to describe the various parameters marked in the table. It is expected that the table would be filled in after the abstract has been written. Entries in the abstract should be preceded by a four-digit number made up of the two, two-digit numbers for the cell in the table with which they are associated, the column first and row second. For instance, if an X is entered for Data Archival Requirements, the number 2235 in the abstract should precede information relating to it.

To reduce review time, it is recommended that the reviewer underline words, phrases or paragraph which should be lifted from the text for entry into the abstract and place the same four-digit number described in the previous paragraph in the text. The typist can then go through the document and enter this information in the abstract with the corresponding number.

Mark each box of the matrix which indicates the content of the publication. Additional descriptions should be included in the abstract to indicate why the appropriate boxes were marked.

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<tr>
<th>Function</th>
<th>Requirements</th>
<th>Plans &amp; Design</th>
<th>R &amp; D</th>
<th>Operation</th>
<th>Cost</th>
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<td>Data Transmission</td>
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<td>Data Dissemination</td>
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<td>Data Quality</td>
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<td>Sensors</td>
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<td>Platforms</td>
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<tr>
<td>Other</td>
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</table>

December 1, 1967

TABLE C-2

cont'd

ABSTRACT

"A study of the U. S. Coast and Geodetic Survey's Products and services as related to economic activity in the U. S. Continental-shelf Regions" 93

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Abstacted Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2529 p.1</td>
<td>A 11-week study was made of the gross economic activity in the U. S. continental-shelf regions, the dependency of that activity upon U. S. Coast and Geodetic Survey (CGS) products and services, and the uses of and present needs of additional CGS products and services relating to the U.S. continental-shelf regions. Results are based on a digest of information obtained from: (1) interviews of about 70 private firms, 40 state and local organizations, 25 Federal organizations, and 9 universities; and (2) financial reports and other literature.</td>
</tr>
</tbody>
</table>

2226 p.1 Priority information needs ... in no particular order these are: (1) maps of bottom topography, (2) mineral composition and properties of bottom sediments and corals, (3) simultaneous measurements of current profiles over wide regions of near-shore and estuarine waters, and (4) ability to determine and/or recalculate more precisely the geographical coordinates of points at sea or with respect to the sea bottom.

p.III-20 Description of User Problems and Needs...Offshore oil and gas industry.

(1) ... Extensions...Triangulation of certain fixed platforms.

p.III-21 (2) ... Charts more up to date.

(3) ... Permanent marine positioning-control points.

(4) ... Earth-satellite systems for positioning.

(5) ... Advanced electronic systems for positioning.

(6) ... Place electronic positioning grids on its charts.

(1) ... Charts...for locations not now normally frequented.

(2) ... More detail on charts.
### TABLE C-2

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Abstracted Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2228 (Cont'd) p.III-21</td>
<td>(5) ... Locations of submerged pipelines.</td>
</tr>
<tr>
<td></td>
<td>(6) ... Charts or maps of the entire Gulf of Mexico should extend farther to the east and to the west.</td>
</tr>
<tr>
<td></td>
<td>(7) ... Ocean-current data on navigational charts should be more complete.</td>
</tr>
<tr>
<td></td>
<td>(1) ... Historical records of weather are needed.</td>
</tr>
<tr>
<td>p.III-22</td>
<td>(2) ... Studies of waves and wave action are needed.</td>
</tr>
<tr>
<td></td>
<td>(3) ... Historical data on waves</td>
</tr>
<tr>
<td></td>
<td>(4) ... Formation, flow, and shear pressures of ice floes.</td>
</tr>
<tr>
<td></td>
<td>(1) ... Data on the first few feet of bottom material are inadequate for.</td>
</tr>
<tr>
<td></td>
<td>(2) ... Data on properties of bottom material down to 100 feet below the seafloor is needed.</td>
</tr>
<tr>
<td></td>
<td>(3) ... Bottom and shoreline changes resulting from major hurricanes and storms should be put on charts as quickly as possible.</td>
</tr>
<tr>
<td></td>
<td>(4) ... Interactions of bottom currents and sediments.</td>
</tr>
<tr>
<td></td>
<td>... Widely spaced refraction (seismic) studies are needed.</td>
</tr>
<tr>
<td></td>
<td>... C&amp;GE should make geophysical survey data accessible ... before the data are entirely complete.</td>
</tr>
<tr>
<td>p.III-24</td>
<td>... Metals and Minerals</td>
</tr>
</tbody>
</table>
| p.II-36               | Some of the needs expressed are as follows:
<p>|                       | (1) ... Three-dimensional mapping |
|                       | (2) ... More research and development in photogrammetry |
|                       | (3) ... Wide-range sonar readings |
|                       | (4) ... Offshore-positioning devices |</p>
<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Abstracted Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2228 (Con't) p.III-36</td>
<td>(5) ... Data for regions farther out from shore</td>
</tr>
<tr>
<td></td>
<td>(6) ... Data-transmission centers</td>
</tr>
<tr>
<td></td>
<td>(7) ... Coring</td>
</tr>
<tr>
<td></td>
<td>(8) ... More publications of data</td>
</tr>
<tr>
<td></td>
<td>(9) ... Bottom-soil mechanics</td>
</tr>
<tr>
<td></td>
<td>(10) ... Systematic mapping and sampling</td>
</tr>
<tr>
<td></td>
<td>(11) ... Survey areas of interest.</td>
</tr>
</tbody>
</table>

p.III-39 ... Tsunami and Hurricane Protection

p.III-41 ... Major user problem is a lack of design criteria for protective construction.

... The ultimate objectives are the accumulate design criteria relative to:

(1) ... Wave action in coastal waters
(2) ... Shore processes
(3) ... Tide and surge dynamics
(4) ... Inlet and estuary dynamics
(5) ... Sources and transport of littoral materials.

p.III-42 ... Construction and Maintenance of Harbors, Channels, Intracoastal Waterways, and Beaches

p.III-44 ... Deficiencies in design criteria...for sediment mechanics, estuarine and inlet dynamics, and inshore ocean processes

... Effects of dredging on fishing grounds, oyster and clam beds, and wild life.

... Locating offshore deposits of sand.
<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Abstracted Information</th>
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</thead>
<tbody>
<tr>
<td>2228 p.III-45 (Cont'd)</td>
<td><strong>Shipbuilding</strong></td>
</tr>
<tr>
<td>p.III-47</td>
<td>Criteria to design ships that will adequately cope with the ocean-atmosphere-land mass processes.</td>
</tr>
<tr>
<td>p.III-48</td>
<td><strong>Ship Salvage</strong></td>
</tr>
<tr>
<td></td>
<td>Quicker response for surveying navigable waterways.</td>
</tr>
<tr>
<td>p.III-80</td>
<td><strong>Waste Disposal</strong></td>
</tr>
<tr>
<td>p.III-81</td>
<td>Data on currents provided by C&amp;G are not detailed enough</td>
</tr>
<tr>
<td>p.III-88</td>
<td>Tsunami problems can be grouped under five topics: (1) improved prediction for both the occurrence of a tsunami and of the maximum amplitude of the waves; (2) prevention of tsunami damage; (3) public education; (4) near-coast characteristics and effects of coastal configuration, and (5) historical data on tsunamis.</td>
</tr>
<tr>
<td>p.III-101</td>
<td><strong>Transportation</strong></td>
</tr>
<tr>
<td></td>
<td>Minimum-time path routing through forecasting of waves, winds, and currents.</td>
</tr>
<tr>
<td></td>
<td>Bottom data for better port approaches, and new current-measurement points.</td>
</tr>
<tr>
<td></td>
<td>Aerial photography of shorelines for property boundary determination.</td>
</tr>
<tr>
<td>p.III-110</td>
<td><strong>List of Needs of Fishing Industry Noted by Industry Representatives</strong></td>
</tr>
<tr>
<td></td>
<td>Estuarine circulation</td>
</tr>
<tr>
<td></td>
<td>Interaction of air-sea surfaces</td>
</tr>
<tr>
<td></td>
<td>Temperature and salinity measurements</td>
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</tbody>
</table>
# ABSTRACT

## TABLE C-2

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Abstracted Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2228 p-III- (Cont') 110</td>
<td>... Bathymetric surveys in more detail</td>
</tr>
<tr>
<td></td>
<td>... Better markers and leveling data (particularly West Coast)</td>
</tr>
<tr>
<td></td>
<td>... More recent and accurate charts</td>
</tr>
<tr>
<td></td>
<td>... Locations of bottom hazards</td>
</tr>
<tr>
<td></td>
<td>... Loran lines on charts</td>
</tr>
<tr>
<td></td>
<td>... Determine economic value and locations of various seaweeds</td>
</tr>
<tr>
<td></td>
<td>... Development of more efficient gear and vessels</td>
</tr>
<tr>
<td></td>
<td>... Increase markets for fishery products</td>
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<td></td>
<td>... Research on utilization of seafoods and by-products</td>
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<td></td>
<td>... Enforcement of fishing area restrictions and sea laws</td>
</tr>
<tr>
<td></td>
<td>... Contour mapping of ocean floor (to replace soundings on charts)</td>
</tr>
<tr>
<td></td>
<td>... Survey of seaweed resources along all coasts</td>
</tr>
<tr>
<td></td>
<td>... Locations of upwellings and reasons for same</td>
</tr>
<tr>
<td></td>
<td>... Tolerance levels of various marine species</td>
</tr>
<tr>
<td></td>
<td>... Current directions and rates of movement</td>
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<td></td>
<td>... Tides movement and times in usable forms</td>
</tr>
<tr>
<td></td>
<td>... Environmental preferences of various species</td>
</tr>
<tr>
<td></td>
<td>... Evaluation of validity of soundings on present charts</td>
</tr>
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<td></td>
<td>... Large-scale charting of critical areas</td>
</tr>
<tr>
<td></td>
<td>... Show land geography on appropriate portions of coast charts</td>
</tr>
<tr>
<td></td>
<td>... Detailed information on physical characteristics of the ocean in the Gulf of Mexico (particularly on continental shelf)</td>
</tr>
<tr>
<td>Identification Number</td>
<td>Abstracted Information</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>2228 p.III-(Con't) 110</td>
<td>- Rechart sea bottom of the Gulf continental shelf</td>
</tr>
<tr>
<td></td>
<td>- Add Loren stations (and lines on charts) in Gulf area</td>
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<tr>
<td></td>
<td>- Unmanned buoys to report sea conditions on the entire ocean</td>
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<tr>
<td></td>
<td>- Chemical and nutrient content of waters off coast</td>
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<tr>
<td></td>
<td>- Wind and sea states (on current basis) by seasons</td>
</tr>
<tr>
<td></td>
<td>- Improved tide and current information on West Coast</td>
</tr>
<tr>
<td></td>
<td>- Better geographic description of leases</td>
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<tr>
<td></td>
<td>- Make aerial photographs available to the public</td>
</tr>
<tr>
<td></td>
<td>- Measure of reliability assigned to chart information</td>
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<tr>
<td></td>
<td>- Charts based on standard grid and multiples of the same</td>
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<td></td>
<td>- Protection of bays from pollution and predators</td>
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<td></td>
<td>- Surveillance of illegal shellfishing areas</td>
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<tr>
<td></td>
<td>- Make information available that appears now only on Army or Navy charts Atlas of ocean environment presenting basic data and supplements or special charts of more recent information</td>
</tr>
<tr>
<td>p.III-117</td>
<td>- Defense and Space</td>
</tr>
<tr>
<td></td>
<td>- (1) Geodetic positioning</td>
</tr>
<tr>
<td></td>
<td>- (2) Environmental marine data, including up-to-date charts</td>
</tr>
<tr>
<td>p.III-126</td>
<td>- Industrial Research and Development</td>
</tr>
<tr>
<td></td>
<td>composition of sediments mechanics of seabottom materials</td>
</tr>
<tr>
<td>Identification Number</td>
<td>Abstracted Information</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>2228 p.III-127</td>
<td>... More precise navigation and bathymetry charts are needed. ... Subbottom structures, location of shipwrecks, earthquake areas, and bottom current general ocean-shelf information maintained in an information center as most useful. ... Positioning is a big problem and is of great importance--need a permanent grid or triangulation system in offshore similar to that on land. ... Accurate bottom-reference system -- using beacons, transponders, buoys, etc. ... Establishment of a geodetic datum for continental shelf. ... More accurate navigation system and reference -- extension of loran coverage. Place loran lines on C&amp;GS charts. ... Radar navigation system in harbors. ... Improve navigation aid. ... Underwater-sound navigation. ... Systematic mapping of world oceans -- broader C&amp;GS mission in general geophysical surveys. ... Would like to see C&amp;GS do in-house work on basic studies and theory, with a balance between two. ... Surveys for areas for waste disposal. ... Surveys to discover flat areas on the bottom which can be used for testing of sonar, to calibrate equipment, etc.</td>
</tr>
<tr>
<td>p.III-129</td>
<td>... Multiple uses for the continental shelf come into conflict.</td>
</tr>
<tr>
<td>p.III-130</td>
<td>... Problems and Needs Cited by Research and Development Investigators on the Continental-Shelf Regions.</td>
</tr>
</tbody>
</table>

... C&GS must concentrate on areas where they are the strongest -- geodetic control, sounding, etc. ...
### TABLE C-2
### cont'd

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Abstracted Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2228 p.III-</td>
<td>More accurate charts are needed than currently available</td>
</tr>
<tr>
<td>(Ocm't) 130</td>
<td>C&amp;G charts are adequate for navigation but perhaps not for special purposes and surveys. Shelf needs surpass what is available from charts.</td>
</tr>
<tr>
<td></td>
<td>Standardization of charts (C&amp;G, Navy, Army Engineers)</td>
</tr>
<tr>
<td></td>
<td>Conversion into the metric system</td>
</tr>
<tr>
<td></td>
<td>More bathymetric maps.</td>
</tr>
<tr>
<td></td>
<td>More detailed magnetic anomaly maps especially interesting areas. When such areas are discovered, C&amp;G should then deviate from their schedule and survey it.</td>
</tr>
<tr>
<td></td>
<td>More accurate sounding = 1 foot (for buoy design)</td>
</tr>
<tr>
<td></td>
<td>Ice-cap soundings for future importance</td>
</tr>
<tr>
<td></td>
<td>Extension of C&amp;G charts perhaps to Bermuda</td>
</tr>
<tr>
<td></td>
<td>Charting of shipwrecks</td>
</tr>
<tr>
<td></td>
<td>Update charts more frequently in areas of active changes</td>
</tr>
<tr>
<td></td>
<td>Chart earthquake belts from underwater seismic data</td>
</tr>
<tr>
<td></td>
<td>Provide special-purpose maps rather than crowding information</td>
</tr>
<tr>
<td></td>
<td>Knowledge of shelf -- topographic, sediments, structure. This knowledge could be used by others to make intelligent guesses at economic resources.</td>
</tr>
<tr>
<td></td>
<td>Quick systems of collection and distribution of oceanographic records on abnormal tides.</td>
</tr>
<tr>
<td></td>
<td>More information on storms -- occurrence, practical prediction system.</td>
</tr>
<tr>
<td></td>
<td>Wave-prediction system.</td>
</tr>
<tr>
<td></td>
<td>More information on tsunamis.</td>
</tr>
<tr>
<td></td>
<td>Better understanding of ocean environmental data.</td>
</tr>
</tbody>
</table>
### TABLE C-2

**Identification Number** | **Abstracted Information**
--- | ---
2226 p.III- (Cont'd) 130 | ... Systematic, seasonal, areal and depth ocean-data collections by buoy systems and analysis for buoy design and provide atlases based on this synoptic information.

... Surface-current studies in relation to bottom topography

... Chart currents with depth to bottom (vertical profiles)

... More tide gauges in remote areas (away from population)

... More tidal and current prediction as functions of depth

... More correlation between tide prediction and precise leveling

... More systematic sampling of environmental programs

... Lock into reliability of old datum

... Examine leveling network on West Coast and tie them to one datum.

... Systematic studies of shelf with research institutes as part of it.

... Active participation and cooperation of research institutes with C&GS survey programs--C&GS provide ship, they provide people

... Cooperation of C&GS with commercial fisheries to look for scattering layer.

... C&GS should be thinking of future problems 50 years from now.

... Fishing industries are suffering from lack of sufficient shelf information and from water pollution.

... Cooperation of C&GS with Bureau of Mines to chart and locate mineral deposit.

... Detailed topographic maps using sparker and near-bottom varying depth sounder.
December 1, 1967

TABLE C-2
cont'd

Identification Number

2228 131
(Cont'd) p.III

Abstracted Information

... Study of substructure and mapping it.

... More of bottom photography.

... Systematic bottom coring and sampling.

... More information on mechanical property, physical properties distribution of bottom sediments for anchoring design, cables, acoustic, ASE, minerals and scientific purposes.

... Deep drilling and more of it systematically.

... Marine life on bottom.

... Marine biology and its effect on sonar.

... Grid system for core sampling for systematic approach to mineral prospecting.

... Bottom surveys with small submersibles

... Use small submersible as a platform and tool to get to bottom information

... Progress on shelf has been held back because of inadequacy of shelf information.

... Government and CGS should lead the way for exploitation of the shelf and not wait until industrial requirements are upon them.

... Present status in position control is inadequate; it should be provided by a Government agency.

... Government can take the risk of total shelf explorations.

... Original boat sheets should be furnished in full size (as they were in the past) to researchers who ask for them rather than reducing them photographically.

... Catalog or pamphlet of CGS publications and how to obtain further information if needed.
TABLE C-2
cont'd

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Abstracted Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2228 p.III (Cont) 131</td>
<td>... Three-dimensional visual aid maps on oceanography -- for management (unfamiliar with oceanography) to grasp easily.</td>
</tr>
<tr>
<td></td>
<td>... Continental-shelf data information center and CAM as a part of it.</td>
</tr>
<tr>
<td></td>
<td>... Publication of CAM data soon after collection.</td>
</tr>
<tr>
<td>2745 p.I</td>
<td>... Continuation of present CAM programs either because of the level or the absence of CAM activity will not meet these needs on a timely basis.</td>
</tr>
<tr>
<td></td>
<td>Project Objectives</td>
</tr>
<tr>
<td></td>
<td>The principal objectives of this study were:</td>
</tr>
<tr>
<td></td>
<td>(1)... To identify present level of gross economic activities in the continental-shelf regions</td>
</tr>
<tr>
<td></td>
<td>(2)... To estimate the worth of CAM products and services relating to the continental-shelf regions.</td>
</tr>
<tr>
<td></td>
<td>(3)... To identify the technical problems and data needs bearing on future developments in continental-shelf regions.</td>
</tr>
<tr>
<td></td>
<td>(4)... To consider the capability of CAM, in terms of present CAM programs, to meet the needs in Item (2) in the future.</td>
</tr>
<tr>
<td></td>
<td>(5)... To estimate future levels of economic activity in the continental-shelf regions.</td>
</tr>
<tr>
<td></td>
<td>(6)... To delineate present and future continental-shelf regions of commercial interest.</td>
</tr>
</tbody>
</table>

| 2732 p.I-3            | Users are represented by ten major groups:                                             |
|                       | (1)... Mining and Petroleum                                                             |
|                       | (2)... Marine Engineering                                                              |
|                       | (3)... Recreation                                                                      |
### TABLE C-2
### cont'd

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Abstracted Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2732 p.I-3 (Cont)</td>
<td>(4)... Health and Welfare</td>
</tr>
<tr>
<td></td>
<td>(5)... Transportation</td>
</tr>
<tr>
<td></td>
<td>(6)... Food and Agriculture</td>
</tr>
<tr>
<td></td>
<td>(7)... Defense and Space (including U. S. Coast Guard)</td>
</tr>
<tr>
<td></td>
<td>(8)... Research and Development</td>
</tr>
<tr>
<td></td>
<td>(9)... Other Industry (not included in above categories)</td>
</tr>
<tr>
<td></td>
<td>(10)... State and Local Agencies.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>... User Dependency Upon C&amp;G Products and Services</td>
</tr>
<tr>
<td>Degree</td>
<td>Definition</td>
</tr>
<tr>
<td>Essential</td>
<td>User activity would be seriously reduced or discontinued in the absence of C&amp;G products and services</td>
</tr>
<tr>
<td>Fundamental</td>
<td>User activity is built on C&amp;G products and services. Lack of these, however, would not necessarily result in discontinuation of activity but would require major adjustments.</td>
</tr>
<tr>
<td>Advantageous</td>
<td>User activity could continue only with some difficulty or minor adjustments if C&amp;G products and services were not available.</td>
</tr>
<tr>
<td>Convenient</td>
<td>User activity makes use of C&amp;G products and services but would not be hampered by lack of same</td>
</tr>
<tr>
<td>Nonessential</td>
<td>User activity is not dependent on C&amp;G products and services.</td>
</tr>
</tbody>
</table>
### Abstract #1

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Abstraced Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2745 p.I-6 (Cont)</td>
<td>... Separate subsections have been devoted to each of ten major groups. Within each subsection results are presented within four major topics:</td>
</tr>
<tr>
<td></td>
<td>(1) ... Estimate of Present Economic Activity</td>
</tr>
<tr>
<td></td>
<td>(2) ... Estimate of Worth of U. S. C&amp;GS Products and Services</td>
</tr>
<tr>
<td></td>
<td>(3) ... Description of User Problems and Needs</td>
</tr>
<tr>
<td></td>
<td>(4) ... Estimate of Future Economic Activity.</td>
</tr>
<tr>
<td>2243 p.III</td>
<td>... C&amp;GS can improve its present service by:</td>
</tr>
<tr>
<td></td>
<td>(1) ... Initiating a continuing customer analysis of C&amp;GS products</td>
</tr>
<tr>
<td></td>
<td>(2) ... Presentation of data in forms to better meet user requirements</td>
</tr>
<tr>
<td></td>
<td>(3) ... Utilizing more effectively present C&amp;GS field representatives to update information on user requirements.</td>
</tr>
<tr>
<td>p.II-10</td>
<td>... C&amp;GS efforts are minimal in bottom topographic mapping and systematic sampling and analysis of bottom materials. Synoptic current profile data over wide regions of near-shore and estuarine waters is apparently inconsistent. C&amp;GS does not have a program... marine geodesy</td>
</tr>
<tr>
<td>2143 p.II-1</td>
<td>... C&amp;GS activities</td>
</tr>
<tr>
<td></td>
<td>... Hydrography Program</td>
</tr>
<tr>
<td></td>
<td>... Ocean Studies Program</td>
</tr>
<tr>
<td></td>
<td>... Geomagnetic Program</td>
</tr>
<tr>
<td></td>
<td>... Seismology Program</td>
</tr>
<tr>
<td></td>
<td>... Geodesy Program</td>
</tr>
</tbody>
</table>
**TABLE C-2**

*cont’d*

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Abstracted Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2232 p.II-8</td>
<td>(1) Maps of bottom topography</td>
</tr>
<tr>
<td></td>
<td>(2) Mineral composition and properties of bottom sediments and cores.</td>
</tr>
<tr>
<td></td>
<td>(3) Simultaneous measurements of current profiles over wide regions.</td>
</tr>
<tr>
<td></td>
<td>(4) Ability to determine and/or reoccupy more precisely the geographical coordinates of points on the sea bottom and of ships during surveying, data gathering, and other operations at sea (positioning at sea in a geodetic sense rather than in a navigational sense).</td>
</tr>
<tr>
<td>2228 p.III-136-137</td>
<td>The identification of earthquake belts is also necessary.</td>
</tr>
<tr>
<td></td>
<td>(1) Bottom topography</td>
</tr>
<tr>
<td></td>
<td>(2) Positioning control</td>
</tr>
<tr>
<td></td>
<td>(3) Seasonal information on currents with depth</td>
</tr>
<tr>
<td></td>
<td>(4) Bottom sediments and their type and strength</td>
</tr>
<tr>
<td></td>
<td>(5) Marine life on bottom</td>
</tr>
<tr>
<td></td>
<td>(6) Tides</td>
</tr>
<tr>
<td></td>
<td>(7) Subbottom profiler (sparker surveys)</td>
</tr>
<tr>
<td></td>
<td>(8) Various ocean environmental data</td>
</tr>
<tr>
<td></td>
<td>(9) Description of slumps on the slope through bottom topography and coring</td>
</tr>
<tr>
<td></td>
<td>(10) Seabottom interface studies</td>
</tr>
</tbody>
</table>
The growth of oceanographic data collection as a result of increased data capture activities and the merging of existing collections, offers to the researcher new opportunities for broad scope investigation, statistical analysis and hypothesis development. At the same time, and as a function of this growth, the problem of identifying and examining data subsets of potential use becomes substantial. The common problem facing the analyst at the outset of an oceanographic study is the problem of learning what data are available, how in gross terms the data are configured, and whether there are sufficient data of the proper sort to support the desired further detailed investigation. The search for appropriate material and pre-examination of its usefulness is often a frustrating and time-consuming process. It is fortunate in this situation that these problems, in the field of oceanography, are logically similar to the data retrieval problems encountered in other fields for which there have recently been developed some powerful general purpose data management tools. These tools are extremely useful for the handling of well-structured data collection such as, for instance, physical oceanographic data bases which consist of lists of phenomenological measurements, each list characterizing conditions at some point at some time.

It might be useful, for instance, for a researcher to be able to quickly check the vertical distribution of salinity or temperature at selected stations in order to decide if the data should be included in his sample. Through use of a device such as the general display system being developed at SDC, he would be able, after causing the data base of interest to be loaded into the system, to proceed by light-pen use to call for successive two-dimensional scatter plots of temperature versus depth and salinity versus depth. Visibly spurious data could be deleted. If he liked, he could (again by use of light-pen) call for an nth order curve to be fitted to the data.

To illustrate some of these capabilities a small oceanographic station data base was obtained from NODC covering one and one-half Marzen squares and containing about 800 oceanographic stations. The information was loaded into SDC's Q-32 time-sharing computer and a series of experiments were performed which are described briefly and illustrated on the following pages.
This illustration shows a scope plot, which in this case happens to be \( \sigma_t \) versus sound velocity. Five light-pen actions were required—two each to specify the X and Y variables as selected from the displayed list of data base variables, and one to give the display command. The system has chosen the scaling on the basis of the range of retrieved data.

\*\( \sigma_t \) is a shorthand expression for the parameter of density \( \sigma \). It is described in the following manner: \( \sigma_t = (\sigma - 1) 1000 \). For example, for a density of 1.02531, \( \sigma_t = 25.31 \).
This illustration shows the curve centered and expanded on both axes as the result of light-pen adjustments to the X and Y scales. The title (at top) has been inserted via keyboard.
This illustration shows a readout of the $x$, $y$ values of a selected point (marked automatically after light-penning by a cross). The digital values are shown below the curve.
This illustration shows a blow-up of the knee of the curve achieved by again modifying the X and Y scales by light-pen.
Other options include the saving for later retrieval, and superimposition if desired, of any of the interim displays. It is possible at any time in the sequence to return to the initial display by activating "start over." The entire experimental process illustrated by the pictures consumed only about five minutes of the investigator's time.

The availability of such a device to a research would enable him to readily investigate the potential usefulness of available data, to get started earlier, and to avoid initiating studies that the availability and quality of data would not support.

The display system just demonstrated is the product of a current SDC developmental project that began with an existing data management system which employs a teletype for user interaction and added to it a display generation and interaction capability. The precursor system called LUCID provides all the tools necessary to perform the common file-processing functions of describing the entries in a data base, loading them into the machine, asking questions about them, performing calculations on them, having them presented for analysis, obtaining hard-copy reports, and maintaining the data base. The user may be asked by the system to supply parameters, control information, file names, operations to be performed, and format desired. He, in turn, may ask the system to define a term, to comment on a process he does not understand, to tell him what steps of a procedure are available, to explain error messages, or to give him other tutorial help. The system is worth examining at this point to indicate the sort of services obtainable from a general purpose interactive data management system employing a keyboard only. An oceanographic data base might have items such as the following:

<table>
<thead>
<tr>
<th>SYNONYM</th>
<th>ELEMENT NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>DECK</td>
<td>POSITIVE INTEGER</td>
</tr>
<tr>
<td>E2</td>
<td>(NODC REF)</td>
<td>POSITIVE INTEGER</td>
</tr>
<tr>
<td>E3</td>
<td>(CONSEC NO)</td>
<td>POSITIVE INTEGER</td>
</tr>
<tr>
<td>E4</td>
<td>YEAR</td>
<td>POSITIVE INTEGER</td>
</tr>
<tr>
<td>E5</td>
<td>NO</td>
<td>POSITIVE INTEGER</td>
</tr>
<tr>
<td>E6</td>
<td>DAY</td>
<td>POSITIVE INTEGER</td>
</tr>
<tr>
<td>E7</td>
<td>HOUR</td>
<td>POSITIVE INTEGER</td>
</tr>
<tr>
<td>E8</td>
<td>LAT</td>
<td>POSITIVE INTEGER</td>
</tr>
<tr>
<td>E9</td>
<td>NEM-NS</td>
<td>CATEGORY</td>
</tr>
<tr>
<td>E10</td>
<td>LONG</td>
<td>POSITIVE INTEGER</td>
</tr>
<tr>
<td>E11</td>
<td>NEM-EW</td>
<td>CATEGORY</td>
</tr>
</tbody>
</table>
SYNONYM | ELEMENT NAME --- DESCRIPTION
--- | ---
E12 | (HARSSEN SQ) --- POSITIVE INTEGER
E13 | (DEO SQ) --- POSITIVE INTEGER
E14 | (BOTTOM DEPTH M) --- POSITIVE INTEGER
E15 | SHIP --- NAME
E16 | (DEPTH OBS M) --- POSITIVE INTEGER
E17 | (SAL 100THS PPT) --- POSITIVE INTEGER
E18 | (OXY 100THS ML/L) --- POSITIVE INTEGER
E19 | (PO4 100THS MICROG-AT/L) --- POSITIVE INTEGER
E20 | (NO2 100THS MICROG-AT/L) --- POSITIVE INTEGER
E21 | (NO3 100THS MICROG-AT/L) --- POSITIVE INTEGER
E22 | (SILICATE 100THS MICROG-AT/L) --- POSITIVE INTEGER
E23 | (CURR DIR TENS DEG) --- POSITIVE INTEGER
E24 | (CURR SP 100THS KTS) --- POSITIVE INTEGER
E25 | (CLD AMT 9THS) --- POSITIVE INTEGER
E26 | (WAVE HCT 100THS M) --- POSITIVE INTEGER
E27 | (PRES HCT GEOPOTENT M) --- POSITIVE INTEGER
E28 | (PRODUCTIVITY GC/M-SQ/DAY 100THS) --- POSITIVE INTEGER
E29 | (VOL FILTERED M-CUR) --- POSITIVE INTEGER
E30 | (ORGANISMS 2 CM ML) --- POSITIVE INTEGER
E31 | (WIND SP 100THS KTS) --- POSITIVE INTEGER
E32 | (WIND DIR TENS DEG) --- POSITIVE INTEGER
E33 | (WAVE DIR TENS DEG) --- POSITIVE INTEGER
E34 | (SD VEL 100THS M/S+1000) --- POSITIVE INTEGER
E35 | (WAVE PER SEC) --- POSITIVE INTEGER
E36 | (TYPE BOTTOM) --- NAME
E37 | TEMP --- POSITIVE
E38 | (SEA TEMP 100THS C) --- INTEGER
E39 | (SIGMA T 100THS) --- INTEGER
E40 | (ORGANISMS CM ML) --- POSITIVE INTEGER
E41 | (TEMP AIR 100THS C) --- INTEGER

SYNONYMS MAY BE USED INSTEAD OF ELEMENT NAMES
The data base listing, as above, is requestable after data base loading and
is immediately printed in response to a DESCRIBE ELEMENTS command. Distinct
values of any element are printed in response to a SHOW command.

SHOW (TYPE BOTTOM) or SHOW B36 yields:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>(GRY LOW CARBONATE MUD)</td>
</tr>
<tr>
<td>V2</td>
<td>(GLOBigerina Ooze)</td>
</tr>
<tr>
<td>V3</td>
<td>(ARGILLACEOUS GLOB Ooze)</td>
</tr>
<tr>
<td>V4</td>
<td>(YELLOW-BLACK GLOB Ooze)</td>
</tr>
<tr>
<td>V5</td>
<td>(LOW CARBONATE LUTITE)</td>
</tr>
<tr>
<td>V6</td>
<td>(MUDY SAND)</td>
</tr>
<tr>
<td>V7</td>
<td>(BLUE MUD)</td>
</tr>
<tr>
<td>V8</td>
<td>(GRAY MUD)</td>
</tr>
<tr>
<td>V9</td>
<td>(SANDY MUD)</td>
</tr>
<tr>
<td>V10</td>
<td>(MUD)</td>
</tr>
<tr>
<td>V11</td>
<td>(COURSE SAND)</td>
</tr>
<tr>
<td>V12</td>
<td>(BLACK MUD)</td>
</tr>
<tr>
<td>V13</td>
<td>(DK GRAY SILTY CLAY)</td>
</tr>
<tr>
<td>V14</td>
<td>(GRAY SILTY CLAY)</td>
</tr>
<tr>
<td>V15</td>
<td>(SAND GREENISH MUD)</td>
</tr>
</tbody>
</table>

If the location of low carbonate lutite were desired, the statement could be
entered PRINT LAT, LONG, WHERE (TYPE BOTTOM) :R (LOW CARBONATE LUTITE) or
shorter, PRINT E8, E10, WHERE E36 EQ V5. The result might be:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E8</td>
<td>400</td>
<td>E10</td>
</tr>
<tr>
<td>E8</td>
<td>600</td>
<td>E10</td>
</tr>
<tr>
<td>E8</td>
<td>408</td>
<td>E10</td>
</tr>
<tr>
<td>E8</td>
<td>......</td>
<td></td>
</tr>
</tbody>
</table>

If a researcher were interested in isentropic analysis which involves investi-
gation of the distribution of various properties on a constant density surface,
he might wish to examine the salinity values lying between the sigma-t surfaces
of 22.70 and 23.00. In addition he would like to know the depth of occurrence
of the sigma-t values. In order to do this he would order: PRINT (MARSDEN SQ),
(SAL 100THS PPT), (DEPTH OBS M), (SIGMA T 100THS), WHERE (SIGMA T 100THS)
GR= 2269 and (SIGMA T 100THS) L5 2301.

Resulting in an output of:

<table>
<thead>
<tr>
<th>E12</th>
<th>2</th>
<th>E17</th>
<th>3498</th>
<th>E16</th>
<th>10</th>
<th>E39</th>
<th>2270</th>
</tr>
</thead>
<tbody>
<tr>
<td>E12</td>
<td>2</td>
<td>E17</td>
<td>3499</td>
<td>E16</td>
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If the record were desired for permanent retention, use of the option BLOCK
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This sort of system is extremely useful for obtaining quickly the answer to
specific questions put to a data base. Because of the concordance-like structure
employed in building the data bases and the use of direct access (disc) storage
for the data base of reference all variables are equally accessible. Rapid
searches of a full data base on any variable or logical combination of variables
are possible. The retrieval language is simple and easily learned. The
person needing the data can acquire it for himself without having to explain
his requirements to an intermediary. This contributes to efficiency as well
as savings in time. It is also important to note that the LUCID system contains
a data base format definition and data base loading and updating mechanism that
are readily controllable from the same teletype console used for retrieval inter-
action.

SR = Greater than    LS = Less than
As a result of interviews or literature review, the volume of some parameters of marine data collected by selected organizations was obtained and has been tabulated in Appendix E, Tables E-1 through E-6. Organizations for which this information is available include NAVOCEANO; University of Washington; Scripps Institution of Oceanography; Biological Laboratory, Honolulu, Bureau of Commercial Fisheries; California Cooperative Oceanic Fisheries Investigations; and International Expeditions. The source of the data for each cable is listed on the table. During Phase II, it will be important to determine the volume of marine data files for all organizations being contacted and whether or not they duplicate other files. For the data listed in this appendix, it is not known whether any duplication exists or not. Several of the illustrations in this report are based on the data tabulated in this appendix.
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SOURCE: MR. C. H. CLINE, CHIEF, DEEP OCEAN SURVEYS DIV., OCEANOGRAPHIC SURVEYS DEPT., OCEANOGRAPHY, NAVOCANO 9/27/67 (VERBAL COMMUNICATION)
MR. R. F. MORGAN, HYDROGRAPHIC AUTOMATION BRANCH, TECHNICAL PRODUCTION DEPT., HYDROGRAPHY, NAVOCANO 8/2/67 (VERBAL COMMUNICATION)
MR. RAYMOND J. MC GOUGH, PROJ. MGR., ASWNS, OCEANOGRAPHIC PREDICTION DIV., MARINE SCIENCES DEPT., OCEANOGRAPHY, NAVOCANO 7/18/67 & 3/27/67 (VERBAL COMMUNICATION)
MR. DALE TIDICK, DEVELOPMENTAL SURVEYS DIVISION, OCEANOGRAPHIC SURVEYS DEPT., OCEANOGRAPHY, NAVOCANO 10/10/67 (VERBAL COMMUNICATION)

ESTIMATED BY THE
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MR. C. H. CLINE, CHIEF, DEEP OCEAN SURVEYS DIV., OCEANOGRAPHIC SURVEYS DEPT., OCEANOGRAPHY, NAVOCANO 9/27/67 (VERBAL COMMUNICATION)
MR. R. E. MORGAN, HYDROGRAPHIC AUTOMATION BRANCH, TECHNICAL PRODUCTION DEPT., HYDROGRAPHY, NAVOCANO 9/27/67 (VERBAL COMMUNICATION)
MR. RAYMOND J. MC GOWEN, PROJ. MGR., ASWPS, OCEANOGRAPHIC PREDICTION DIV., MARINE SCIENCES DEPT., OCEANOGRAPHY, NAVOCANO 7/10/67 AND 9/27/67 (VERBAL COMMUNICATION)
MR. DALE TIDRICK, DEVELOPMENTAL SURVEYS DIVISION, OCEANOGRAPHIC SURVEYS DEPT., OCEANOGRAPHY, NAVOCANO 10/10/67 (VERBAL COMMUNICATION)

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**Estimated Volume of Marine Data Collected**

**The U.S. Naval Oceanographic Office, 1949 - 1974**
| DATA COLLECTED | C OFFICE, 1949-1974 |

**NOTE:** SOME CLASSIFIED AND UNCLASSIFIED DATA ARE KNOWN TO BE MISSING FROM THIS CHART.

**LEGEND:**
- CLASSIFIED DATA

**PAGE 1 OF 4**
| YEAR | ORGANIZATION | DUNNE CAST | MECHANICAL BT | S - T - D | MECHANICAL BT | XRF - DEEP (x 10^3) | XRF - HELICOPTER (x 10^3) | BOTTOM TEMPERATURE | BOTTOM SAMPLES, CORES | BOTTOM SAMPLES, CORES | PLANITON TOTAL | BIOLOGICAL STATION | TOTAL |
|------|--------------|------------|---------------|---------|---------------|----------------|----------------|------------------|----------------|----------------|----------------|----------------|------------------|-------|
| 1964 | OCEANOGRAPHIC | 1,094      | 2,739         | 556     | 70            | 491            | 104             | 160              | 41             |                 |                 |                 |                   |       |
|       | NEAR SHORE   | 308        |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | HYDROGRAPHIC |            |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
| 1964 TOTAL | 1,094      | 2,739       | 556          |         | 70            | 491            | 104             | 160              | 41             |                 |                 |                 |                   |       |
| 1965 | OCEANOGRAPHIC | 1,079      | 6,635         | 206     | 18            | 190            | 71              | 48               | 7              |                 |                 |                 |                   |       |
|       | NEAR SHORE   | 188        |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | HYDROGRAPHIC |            |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
| 1965 TOTAL | 1,079      | 6,635       | 206          |         | 18            | 190            | 71              | 48               | 7              |                 |                 |                 |                   |       |
| 1966 | OCEANOGRAPHIC | 550        | 1,205         | 1,040   | 171           | 313            | 47              | 95               | 90             |                 |                 |                 |                   |       |
|       | NEAR SHORE   | 299        |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | DEEP OCEAN   |            |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | HYDROGRAPHIC |            |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
| 1966 TOTAL | 550        | 1,205       | 1,040        |         | 171           | 313            | 47              | 95               | 90             |                 |                 |                 |                   |       |
| 1967 | OCEANOGRAPHIC | 550        | 1,200         | 1,000   | 200           | 300            | 50              | 100              | 20             |                 |                 |                 |                   |       |
|       | NEAR SHORE   | 300        |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | DEEP OCEAN   | 120        |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | AGOR (4)     | 300        | 180           | 4,000   | .3            |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | HYDROGRAPHIC |            |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | ASWEPs (3)   |            |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
| 1967 TOTAL | 970        | 5,209       | 1,000        | .3      | 200           | 550            | 90              | 141              | 20             |                 |                 |                 |                   |       |
| 1968 | OCEANOGRAPHIC | 550        | 1,200         | 1,000   | 200           | 300            | 50              | 100              | 20             |                 |                 |                 |                   |       |
|       | NEAR SHORE   | 300        |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | DEEP OCEAN   | 120        |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | AGOR         | 300        | 180           | 4,000   | .3            |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | HYDROGRAPHIC |            |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | ASWEPs (3)   |            |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
| 1968 TOTAL | 970        | 5,200       | 1,000        | 100,3   | 20            | 600            | 50              | 141              | 20             |                 |                 |                 |                   |       |
| 1969 | OCEANOGRAPHIC | 550        | 1,200         | 1,000   | 200           | 300            | 50              | 100              | 20             |                 |                 |                 |                   |       |
|       | NEAR SHORE   | 300        |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | DEEP OCEAN   | 120        |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | AGOR         | 300        | 180           | 4,000   | .3            |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | HYDROGRAPHIC |            |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
|       | ASWEPs (3)   |            |               |         |               |                 |                 |                  |                |                 |                 |                 |                   |       |
| 1969 TOTAL | 970        | 5,200       | 1,000        | 175,3   | 20            | 600            | 50              | 141              | 20             |                 |                 |                 |                   |       |

**SOURCE:**
- MR. C. H. CLINE, CHIEF, DEEP OCEAN SURVEYS DIV., OCEANOGRAPHIC SURVEYS DEPT., OCEANOGRAPHY, NAVOCEANO 9/27/67 (VERBAL COMMUNICATION)
- MR. R. K. JORDAN, HYDROGRAPHIC AUTOMATION BRANCH, TECHNICAL PRODUCTION DEPT., HYDROGRAPHY, NAVOCEANO 5/27/67 (VERBAL COMMUNICATION)
- MR. RAYMOND J. WEGG, PROJ. MGR., ASWEPs, OCEANOGRAPHIC PREDICTION DIV., MARINE SCIENCES DEPT., OCEANOGRAPHY, NAVOCEANO 7/11/67 AND 9/27/67 (VERBAL COMMUNICATION)
- MR. DALE TIDRICK, DEVELOPMENTAL SURVEYS DIVISION, OCEANOGRAPHIC SURVEYS DEPT., OCEANOGRAPHY, NAVOCEANO 10/12/67 (VERBAL COMMUNICATION)

**ESTIMATE BY THE U.S.**
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**NOTE:** SOME CLASSIFIED AND UNCLASSIFIED DATA ARE KNOWN TO BE MISSING FROM THIS CHART.

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CLASSIFIED DATA

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Source: Mr. C. H. Cline, Chief, Deep Ocean Surveys Div., Oceanographic Surveys Dept., Oceanography, NAVEOCEANO 9/27/67 (Verbal Communication)
Mr. R. S. Morgan, Hydrographic Automation Branch, Technical Production Dept., Hydrography, NAVEOCEANO 9/27/67 (Verbal Communication)
Mr. Dale Tidrick, Developmental Surveys Division, Oceanographic Surveys Dept., Oceanography, NAVEOCEANO 10/11/67 (Verbal Communication)
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**ESTIMATED VOLUME OF MARINE DATA COLLECTED BY THE U.S. NAVAL OCEANOGRAPHIC OFFICE, 1949-1979**
| MAGNETIC BASS | CURRENT OBSERVATIONS - DROGUES, STATIONS | CURRENT OBSERVATIONS - TRIPODS, STATIONS | CURRENT WATER (HOURS) | CURRENT WATER (HOURS) | TEMPERATURE, SALINITY, SOUND VELOCITY | SALINITY SAMPLES | BARRIER HEIGHT (1,000 MILES) | DENSITY SPOONING SHIP (1,000 MILES) | DENSITY SPOONING SHIP (1,000 MILES) | SEA SURFACE TEMPERATURE, CURRENTS, REPORTS | TOTAL MAGNETIC INTENSITY - SHIP | TOTAL MAGNETIC INTENSITY - AIRCRAFT (1,000 MILES) | SEISMIC PROFILE: SHIP (1,000 MILES) | SEISMIC PROFILE: AIRCRAFT (1,000 MILES) | GRAVITY PROFILE, SHIP (1,000 MILES) | GRAVITY PROFILE, AIRCRAFT (1,000 MILES) | SELECTED OBSERVATIONS, AIRCRAFT (1,000 MILES) | SELECTED OBSERVATIONS, AIRCRAFT (1,000 MILES) |
|--------------|-------------------------------------|-------------------------------------|----------------|----------------|---------------------------------|----------------|----------------|-------------------------------|-------------------------------|-----------------------------------|----------------|-------------------------------|----------------|-------------------------------|----------------|-------------------------------|
| 50           | 150                                 | 10,000                              | 30             | 600            | 10                              | 550            | 400            | 100                           | 60                           | 228                 | 300            | 15                           | 18                           | 225                 | 150*                        |
| 50           | 450                                 | 19                                  | 10,000         | 30             | 600            | 10                              | 950            | 200            | 100                           | 228             | 200                 | 300            | 15                           | 18                           | 225                 | 200+                        |
| 50           | 450                                 | 19                                  | 10,000         | 30             | 600            | 10                              | 550            | 200            | 100                           | 300             | 300                 | 300            | 15                           | 18                           | 225                 | 400+                        |
| 50           | 450                                 | 19                                  | 10,000         | 30             | 600            | 10                              | 950            | 200            | 100                           | 228             | 225                 | 300            | 15                           | 18                           | 225                 | 400+                        |
| 50           | 450                                 | 19                                  | 10,000         | 30             | 600            | 10                              | 550            | 200            | 100                           | 300             | 300                 | 300            | 15                           | 18                           | 225                 | 400+                        |
| 50           | 450                                 | 19                                  | 10,000         | 30             | 600            | 10                              | 550            | 200            | 100                           | 300             | 300                 | 300            | 15                           | 18                           | 225                 | 400+                        |
| 50           | 450                                 | 19                                  | 10,000         | 30             | 600            | 10                              | 950            | 200            | 100                           | 228             | 225                 | 300            | 15                           | 18                           | 225                 | 400+                        |
| 50           | 450                                 | 19                                  | 10,000         | 30             | 600            | 10                              | 550            | 200            | 100                           | 300             | 300                 | 300            | 15                           | 18                           | 225                 | 400+                        |
| 50           | 450                                 | 19                                  | 10,000         | 30             | 600            | 10                              | 950            | 200            | 100                           | 228             | 225                 | 300            | 15                           | 18                           | 225                 | 400+                        |
| 50           | 450                                 | 19                                  | 10,000         | 30             | 600            | 10                              | 550            | 200            | 100                           | 300             | 300                 | 300            | 15                           | 18                           | 225                 | 400+                        |
| 50           | 450                                 | 19                                  | 10,000         | 30             | 600            | 10                              | 950            | 200            | 100                           | 228             | 225                 | 300            | 15                           | 18                           | 225                 | 400+                        |
| 50           | 450                                 | 19                                  | 10,000         | 30             | 600            | 10                              | 550            | 200            | 100                           | 300             | 300                 | 300            | 15                           | 18                           | 225                 | 400+                        |

**WE DATA COLLECTED**

**PHIC OFFICE, 1949-1974**

**NOTE:** SOME CLASSIFIED AND UNCLASSIFIED DATA ARE KNOWN TO BE MISSING FROM THIS CHART.

**LEGEND:**

CLASSIFIED DATA

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PAGE 4 OF 4
### TABLE E-2

**U. S. BUREAU OF COMMERCIAL FISHERIES**  
**BIOLOGICAL LABORATORY, HONOLULU (HNL)**

**PARTIAL SUMMARY OF CRUISE INFORMATION**

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UNIVERSITY OF WASHINGTON
OCEANOGRAPHY DEPARTMENT

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*75% of cruises were completed by the R/V Brown Bear (BB)

SOURCE: Oceanic Observations of the Pacific (1952-1959 Data Volumes, University of California Press)
### TABLE E-4

**SCIENCE INSTITUTION OF OCEANOGRAPHY (SIO)**

**PARTIAL SUMMARY OF CRUISE INFORMATION**

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**December 1, 1967**

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<tr>
<td></td>
<td>16 Years</td>
<td>45 cruises</td>
<td>269</td>
<td>7</td>
<td>2077</td>
<td>11,509</td>
<td>3027</td>
<td>1,184</td>
<td>1909</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average/Year</td>
<td>3 cruises</td>
<td>178</td>
<td>2</td>
<td>130</td>
<td>719</td>
<td>189</td>
<td>74</td>
<td>119</td>
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</tr>
<tr>
<td></td>
<td>Average/Cruise</td>
<td>63</td>
<td>46</td>
<td>18</td>
<td>256</td>
<td>67</td>
<td>26</td>
<td>42</td>
<td></td>
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</tr>
</tbody>
</table>

SOURCES: Oceanic Observations of the Pacific (1951-1959 Data Volumes, University of California Press, Scripps Institution of Oceanography Data Processing Section)
# TABLE E-5

**CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATION (COOFI)**

**PARTIAL SUMMARY OF CRUISE INFORMATION**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>CRUISE</th>
<th>DATE AT SEA</th>
<th>NUMBER OF SHIPS</th>
<th>TOTAL NUMBER OF OCEANOGRAPHIC CASTS</th>
<th>AVERAGE NUMBER OF MUNGER BOTTLES/STATION</th>
<th>TOTAL NUMBER OF HANSEN-THERMOFAX CASTS</th>
<th>TOTAL NUMBER OF PLANKTON TOWS</th>
<th>TOTAL NUMBER OF STATIONS MEASURING NUTRIENTS (PO_4-P)</th>
<th>TOTAL NUMBER OF STATIONS MEASURING OXYGEN (O_2)</th>
<th>EPA SURFACE TEMPERATURE UNDERWAY</th>
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<tbody>
<tr>
<td>1956</td>
<td>501-5111</td>
<td>366</td>
<td>5</td>
<td>1300</td>
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<td>4082</td>
<td>939</td>
<td>675</td>
<td>1233</td>
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<tr>
<td>1957</td>
<td>511-5112</td>
<td>333</td>
<td>6</td>
<td>1399</td>
<td>13</td>
<td>4536</td>
<td>1168</td>
<td>729</td>
<td>1096</td>
<td>QANTUMUS THERMOFAX</td>
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<tr>
<td>1958</td>
<td>520-5211</td>
<td>390</td>
<td>5</td>
<td>1484</td>
<td>14</td>
<td>3186</td>
<td>1647</td>
<td>0</td>
<td>1259</td>
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<tr>
<td>1959</td>
<td>530-5312</td>
<td>317</td>
<td>5</td>
<td>1363</td>
<td>15</td>
<td>5527</td>
<td>1467</td>
<td>0</td>
<td>754</td>
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<td>1960</td>
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<td>382</td>
<td>5</td>
<td>718</td>
<td>16</td>
<td>6059</td>
<td>1534</td>
<td>0</td>
<td>97</td>
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<tr>
<td>1961</td>
<td>550-5512</td>
<td>300</td>
<td>6</td>
<td>659</td>
<td>9</td>
<td>4509</td>
<td>1520</td>
<td>0</td>
<td>520</td>
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<td>1962</td>
<td>560-5612</td>
<td>317</td>
<td>6</td>
<td>533</td>
<td>16</td>
<td>5666</td>
<td>1741</td>
<td>0</td>
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<td>1963</td>
<td>570-5712</td>
<td>355</td>
<td>6</td>
<td>758</td>
<td>17</td>
<td>5923</td>
<td>1043</td>
<td>0</td>
<td>735</td>
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<td>1964</td>
<td>580-5812</td>
<td>409</td>
<td>6</td>
<td>999</td>
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<td>2374</td>
<td>1902</td>
<td>0</td>
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<td>1965</td>
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<td>351</td>
<td>7</td>
<td>947</td>
<td>18</td>
<td>2767</td>
<td>1933</td>
<td>50</td>
<td>678</td>
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<tr>
<td>1966</td>
<td>600-6010</td>
<td>337</td>
<td>6</td>
<td>930</td>
<td>18</td>
<td>1936</td>
<td>1938</td>
<td>0</td>
<td>337</td>
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<td>1967</td>
<td>610-6112</td>
<td>819</td>
<td>4</td>
<td>472</td>
<td>18</td>
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<td>470</td>
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<td>1968</td>
<td>620-6211</td>
<td>197</td>
<td>4</td>
<td>534</td>
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<td>1154</td>
<td>686</td>
<td>0</td>
<td>438</td>
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<tr>
<td>1969</td>
<td>630-6312</td>
<td>197</td>
<td>4</td>
<td>220</td>
<td>10</td>
<td>727</td>
<td>634</td>
<td>278</td>
<td>101</td>
<td>THERMOGRAPH</td>
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</table>
### TABLE E-6

**INTERNATIONAL EXPLORATIONS**

**PARTIAL SUMMARY OF CRUISE INFORMATION**

INTERNATIONAL COOPERATIVE INVESTIGATION OF THE TROPICAL ATLANTIC (ICITA)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>CRUISE</th>
<th>DAYS AT SEA</th>
<th>NUMBER OF SHIPS</th>
<th>TOTAL NUMBER OF OCEANOGRAPHIC CASTS</th>
<th>AVERAGE NUMBER OF BOTTLE/STATION</th>
<th>TOTAL NUMBER OF ECHTTHYONOGRAPHS CASTS</th>
<th>TOTAL NUMBER OF PLOWEY TOWS</th>
<th>TOTAL NUMBER OF STATIONS MEASURING PHOSPHATE (PO₄-P)</th>
<th>TOTAL NUMBER OF STATIONS MEASURING OXYGEN (O₂)</th>
<th>SEA SURFACE TEMPERATURE UNDERWAY</th>
<th>COUNTRIES</th>
</tr>
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<tr>
<td>1953-1954</td>
<td>IQUAMAT I</td>
<td>126</td>
<td>11</td>
<td>532</td>
<td>--</td>
<td>3137</td>
<td>503</td>
<td>594</td>
<td>717</td>
<td>ARGENTINA, CHILE, BRAZIL, GERMANY, NIGERIA, REPUBLIC OF CONGO, REPUBLIC OF IVORY COAST, SPAIN, UNITED KINGDOM, USA, USER</td>
<td></td>
</tr>
<tr>
<td>1955-1956</td>
<td>IQUAMAT II</td>
<td>211</td>
<td>11</td>
<td>532</td>
<td>--</td>
<td>2143</td>
<td>501</td>
<td>406</td>
<td>532</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1955-1956</td>
<td>IQUAMAT III</td>
<td>128</td>
<td>7</td>
<td>261</td>
<td>--</td>
<td>1672</td>
<td>376</td>
<td>96</td>
<td>333</td>
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<td><strong>TOTAL:</strong></td>
<td></td>
<td><strong>364</strong></td>
<td><strong>21</strong></td>
<td><strong>1594</strong></td>
<td></td>
<td><strong>6951</strong></td>
<td><strong>1760</strong></td>
<td><strong>1196</strong></td>
<td><strong>1507</strong></td>
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**NORTH PACIFIC EXPEDITION (NORPAC)**

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<th>YEAR</th>
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<th>DAYS AT SEA</th>
<th>NUMBER OF SHIPS</th>
<th>TOTAL NUMBER OF OCEANOGRAPHIC CASTS</th>
<th>AVERAGE NUMBER OF BOTTLE/STATION</th>
<th>TOTAL NUMBER OF ECHTTHYONOGRAPHS CASTS</th>
<th>TOTAL NUMBER OF PLOWEY TOWS</th>
<th>TOTAL NUMBER OF STATIONS MEASURING PHOSPHATE (PO₄-P)</th>
<th>TOTAL NUMBER OF STATIONS MEASURING OXYGEN (O₂)</th>
<th>VARIABLE THERMOGRAPH HUCKET ET</th>
<th>COUNTRIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>NORPAC</td>
<td>735</td>
<td>21</td>
<td>1002</td>
<td>2-16</td>
<td>3224</td>
<td>1641</td>
<td>567</td>
<td>1002</td>
<td></td>
<td>CANADA, JAPAN, USA</td>
</tr>
</tbody>
</table>

**SOURCE:**
National Oceanographic Data Center (IQUAMAT I-III Data Reports)
Oceanographic Observations of the Pacific (NORPAC Data Volume, University of California Press)
This appendix lists all organizations and individuals contacted during Phase I. They are grouped in categories of: Federal, Universities and Institutions, States and Industry. In some cases, several contacts were made with one individual or organization but they are only listed once in the table. A formal interview was held with some, including completion of the questionnaire. Interaction with others included exchanges of letters and telephone conversations. Virtually all of these organizations must be reviewed in greater depth during Phase II and others, not listed, must also be included.
DIVISION OR BRANCH

DEPARTMENT OF DEFENSE - NAVY

Navy Ocean Science Program (NOSEP) Cont’d

- Naval Weather Service Command
- Ocean Science & Technology Group, ONR
- Ocean Sciences & Engineering Division, NRL
- Marine Sciences Department
- Hydrographic Surveys Department
- Oceanographic Data Department
- Hydrographic Plan Office, Target Programs

NOIC

Acquisition Branch

Services Branch

Advanced Developments Staff

DEPARTMENT OF DEFENSE - ARMY

Corps of Engineers

U.S. Lake Survey

Coastal Engineering Research Center

DEPARTMENT OF COMMERCE

ESDA

Environmental Data Service

Marine Climatology Branch

Data Information

National Weather Records Center, Asheville, NC

Climatic Operations Branch

Data Verification Section

Data Reduction Section

National Environmental Satellite Center

Maritime Administration

Office of Research and Development

Shipbuilding

PERSON INTERVIEWED

FEDERAL GOVERNMENT

TITLE

DATE

Mr. Harry O. Davis
Mr. D. F. Martineau
Mr. R. Mekrits
Mr. A. R. Gordon, Jr.
Mr. M. R. Ullom
Mr. R. H. Randal
Mr. Fred Anderson, Jr.
Mr. Thomas Austin
Mr. Harold Dubach
Mr. Albert M. Bargenki
Mr. James Churgin
Mr. Thomas Stout
Mr. Thomas Winterfeld
Mr. Henry Odum

Meteorologist

Acting Director

Director

Director

Director

Director

Deputy Director

Head

Head

Head

Head

Head

Director

Director

Supervisor

Special Assistant

Director

Acting Director

Director

Chief

Chief

Chief

Program Manager

7/18/67

7/18/67

7/18/67

7/13/67

7/18/67

7/13/67

7/18/67

7/6/67

7/6/67

7/6/67

7/6/67

7/6/67

7/6/67

7/6/67

8/3/67

8/3/67

8/7/67

8/7/67

8/7/67

3/22/67

7/6/67

8/3/67

8/5/67

8/7/67

8/3/67

8/3/67

8/23/67

8/23/67

8/23/67

8/23/67

8/4/67

8/22/67

8/22/67
DEPARTMENT OF THE INTERIOR

Marine Resources Development Program
Mr. Howard Eckles
Program Manager 7/17/67

U. S. Geological Survey
Office of Marine Geology and Hydrology
Mr. Josh Tracey
Deputy Chief 7/20/67

Bureau of Commercial Fisheries
Division of Biological Sciences
Mr. Joseph King
Chief 7/17/67

Branch of Marine Fisheries
Mr. Jim Johnson
Assistant Director 7/21/67

Biological Research
Dr. J. Lockwood Chamberlin
Chief 7/17/67

Environmental Oceanographic Research
Dr. Glenn Flittner
Sr. Scientist 7/13/67

Bureau of Commercial Fisheries - La Jolla
Fishery Oceanography Center
Dr. E. H. Ahlstrom
Tuna Forecast 7/13/67

Mr. David Knares
Biologist 7/13/67

Fisheries Research

Bureau of Sport Fisheries and Wildlife
Branch Fish ECO System Research
Mr. Bruce Kinsey
Chief 7/23/67

Division of Fisheries Research

Dr. John F. Coates
Director 7/23/67

Program Analysis
Dr. Milton Sachs
Chief 7/23/67

Distillation Division
Dr. F. R. Coley
Chief 7/23/67

U. S. Bureau of Mines
Mining Research
Mr. Paul B. Pruey
Chief 7/23/67

Federal Water Pollution Control Administration
Mr. Jim Hill
Assistant Director 7/23/67

Streams and Rivers
Mr. T. A. Waster
3/23/67

Division of Pollution Surveillance
Mr. P. Taylor
3/23/67

Mr. J. McDermott
3/23/67

DEPARTMENT OF TRANSPORTATION

U. S. Coast Guard
Coast Guard Oceanographic Unit

Mr. R. P. Dinsmore
Commanding Officer 7/2/67

EXECUTIVE OFFICE OF THE PRESIDENT

Smithsonian Institution
Office of Oceanography and Limnology
Dr. I. E. Wallen
Director 8/1/67

Museum of Natural History
Dr. Donald Squires
Deputy Director 8/3/67

Oceanographic Sorting Center (306C)
Betty J. Landrum
Supervisor 3/2/67

Records Department
Mr. Nicholas Suszyński
Director 10/12/67

Information Systems Division
Mr. Kenneth Ebbe
10/12/67

Museum of Natural History
<table>
<thead>
<tr>
<th>DIVISION OR BRANCH</th>
<th>PERSON INTERVIEWED</th>
<th>TITLE</th>
<th>DATE</th>
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<tbody>
<tr>
<td>EXECUTIVE OFFICE OF THE PRESIDENT, Cont'd</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Aeronautics Space Administration Earth Resources Programs</td>
<td>Mr. Theodore A. George</td>
<td>Manager</td>
<td>8/3/67</td>
</tr>
<tr>
<td>Atomic Energy Commission Environmental Sciences Division of Biology and Medicine</td>
<td>Dr. C. L. Getzberg Mr. Arnold Joseph</td>
<td>Marine Biologist</td>
<td>9/27/67</td>
</tr>
<tr>
<td>LEGISLATIVE BRANCH</td>
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</tr>
<tr>
<td>Library of Congress Library Reference Service</td>
<td>Mr. George Doumani</td>
<td></td>
<td>7/20/67</td>
</tr>
<tr>
<td>UNIVERSITIES AND INSTITUTIONS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scripps Institution of Oceanography</td>
<td>Dr. Wm. A. Nierenberg Dr. F. N. Spiess</td>
<td>Director Associate Director</td>
<td>7/13/67 7/13/67</td>
</tr>
<tr>
<td>Marine Food Chain Research Group Institute of Marine Resources Physical and Chemical Oceanography Oceanography</td>
<td>Dr. J. D. H. Strickland Dr. Warren Wooster Dr. Douglas L. Inman Mr. John Wyllie</td>
<td>Head Professor Sr. Marine Technician</td>
<td>7/13/67 7/13/67 7/13/67</td>
</tr>
<tr>
<td>Woods Hole Oceanographic Institution</td>
<td>Mrs. Frances Wilkes Mr. J. L. Reid</td>
<td>Research Oceanographer</td>
<td>7/13/67</td>
</tr>
<tr>
<td>Department of Geophysics Department of Biology Physical Oceanography Data Center</td>
<td>Dr. Paul M. Fyke Dr. Arthur F. Maxwell Mr. J. &quot;H&quot; Stenebrough</td>
<td>Director Associate Director Technical Assistant to the Director</td>
<td>8/23/67 8/23/67 8/23/67</td>
</tr>
<tr>
<td>University of Rhode Island Narragansett Marine Laboratory</td>
<td>Elizabeth T. Bruce Dr. Mary Beams F. Arthur H. Miller Mr. W. M. Dunkle</td>
<td>Assoc. Scientist Sr. Scientist Assoc. Scientist Head</td>
<td>8/23/67 8/23/67 8/23/67</td>
</tr>
<tr>
<td>Columbia University Lamont Geological Observatory Hudson Laboratory</td>
<td>Dr. Saul B. Pfitz</td>
<td>Assoc. Director Director</td>
<td>8/24/67 8/24/67</td>
</tr>
<tr>
<td>DIVISION OR BRANCH</td>
<td>PERSON INTERVIEWED</td>
<td>UNIVERSITY AND INSTITUTIONS</td>
<td>TITLE</td>
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<tr>
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<td>----------------------------------------------------------------</td>
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<tr>
<td>Johns Hopkins University</td>
<td>Dr. Donald W. Pritchard</td>
<td>Department of Oceanography and Chesapeake Bay Institute</td>
<td>Director</td>
</tr>
<tr>
<td>University of Michigan</td>
<td>Dr. D. C. Chandler</td>
<td>Great Lakes Research Division</td>
<td>Director</td>
</tr>
<tr>
<td>American Geological Institute</td>
<td>Mr. Foster D. Smith, Jr.</td>
<td>Science and Information</td>
<td>Director</td>
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<tr>
<td>State of California</td>
<td>Col. T. R. Gillenwaters</td>
<td></td>
<td>Marine Science Advisor to Governor</td>
</tr>
<tr>
<td>California State Fisheries Laboratory</td>
<td>Mr. Harold B. Clemens</td>
<td></td>
<td>Assistant Director</td>
</tr>
<tr>
<td>National Security Industrial Association</td>
<td>OMG R. J. Jorgenson</td>
<td>ASW and OST Committee</td>
<td>Executive Secretary</td>
</tr>
<tr>
<td>International Telephone and Telegraph</td>
<td>Mr. C. M. Elbert</td>
<td>Avionics Division Engineering</td>
<td>Manager</td>
</tr>
<tr>
<td>Dow Chemical Company</td>
<td>Mr. D. E. Yanka</td>
<td>Government Affairs Department</td>
<td>Manager</td>
</tr>
<tr>
<td>Moore-McCormack Inc.</td>
<td>Captain Fennick</td>
<td></td>
<td>Marine</td>
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<tr>
<td></td>
<td>Captain Ryan</td>
<td></td>
<td>Superintendent</td>
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<tr>
<td></td>
<td>Captain Savastio</td>
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</tr>
</tbody>
</table>
A questionnaire was prepared at the beginning of Phase I for the purpose of gathering pertinent information concerning current and future data requirements and plans of marine organizations. Based on preliminary interview results it underwent three revisions during Phase I to improve the information collection processes. The final revision is included in this appendix.

The resulting questionnaire can be used by any organization, since it has been designed to determine data requirements, location, flow and volume, whether the organization is a data collector, processor, disseminator or user. The first section of the questionnaire is designed to obtain general information concerning the organization. The remaining sections deal specifically with the data collection, storage, processing and dissemination functions.
MARINE DATA QUESTIONNAIRE

A. GENERAL INFORMATION

1. Date ________________
   Year   Month   Day

   Person Completing Form or Interviewee

2. Name ____________________

3. Title ____________________

4. Phone Number ____________________

   Organization

5. Name ____________________

6. Mailing Address ____________________

   Street Address ____________________

8. Organization Mission and Goals
Which of the following categories describes the organization's activities? Please place an X by each program area in which the organization is involved.

10. _____ Resource Development
11. _____ Mineral
12. _____ Petroleum
13. _____ Chemical
14. _____ Food
15. _____ Drug
16. _____ Other (specify)
17. _____ Engineering
18. _____ Marine
19. _____ General Ocean
20. _____ Coastal
21. _____ Conservation
22. _____ Recreation
23. _____ Health and Welfare
24. _____ Transportation
25. _____ Synoptic Oceanography
26. _____ Oceanographic Prediction
27. _____ Map and Chart Preparation
28. _____ Applied Research
29. _____ Basic Research
30. _____ Physical Oceanography
31. _____ Chemical Oceanography
32. _____ Biological Oceanography
33. _____ Geology & Geophysics
34. _____ Air-Sea Interaction
35. _____ Other (specify)
36. _____ Legal
37. _____ Defense and Space
38. _____ Data Center
39. _____ Instrument Development
40. _____ Equipment Development
41. _____ Other (specify)

Copy of Organization Chart

42. Names of Departments
43. Names of Department Heads
44. The relationship each department has in the organization's marine operations.
45. Additional description of organization

Rank from 1 to 4 the relative importance of the following activities for the organization:

46. ______ Collector of marine data
47. ______ User of marine data
48. ______ Processor/disseminator of marine data (data center)
49. ______ Disseminator of marine data

Are there limitations on the collection of data? If so, please rank the following parameters from 1 to 6 according to relative importance.

50. ______ Political
51. ______ Legal
52. ______ Economic
53. ______ Technological
54. ______ Physical
55. ______ Other (specify)

56. If the answer is yes to any of the above, please explain.
57. Have prior studies concerning data management been made by your organization? _____ If so, are they published? _____ Are they available to SDC? _____

58. What are the current plans of your organization concerning data management? If available in printed form, is a copy available to SDC? _____ If not printed, please describe them.

59. Do you know of new sampling programs, instruments or systems now under development which will provide additional data in large volume in the future? If so, please describe and estimate the increased volume and the time when increased volume will occur.
60. Are data exchanged with other countries? If so, please complete.

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<tr>
<th>Data Type (See Attachment A)</th>
<th>Country with which data are exchanged</th>
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<tr>
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<td></td>
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</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

61. What is the time response requirement for data received from other sources?

62. Is there a system in your organization for document indexing, storage and retrieval in use now? If so, please describe. Is the indexing system documented? If so, are copies available to SME for loan or retention?
### COST OF DATA HANDLING

<table>
<thead>
<tr>
<th>Item*</th>
<th>Initial (dollars)</th>
<th>Annual Maintenance (dollars)</th>
<th>Annual Operation (dollars)</th>
<th>Comments</th>
</tr>
</thead>
</table>

*Please list items used for data collection, storage, processing, etc., including type, manufacturer or description of instruments, equipment, platforms (ships, buoys), computer hardware, computer software, remote terminals, etc.*
B. DATA COLLECTION

If your organization is involved in marine data collection please complete the attached Data Collection form. Attachments A and B have been included to serve as guidelines in filling out rows 13 and 18. If the list is inadequate for your purposes it would be appreciated if you would make additions as necessary.

In addition to completing the summary sheet it would be helpful if the answers to the following questions could be supplied.

What are the types, duration, and frequency of your surveys or cruises?

1. Type
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________

2. Duration
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
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3. Frequency
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________

4. Does your organization participate in cooperative cruises and surveys, either on a local, state, national or international basis? _______________
   If so, what type of surveys and cruises and how frequently?
Arrays and networks of sensors are often used to collect data. It would be helpful if you would include information regarding the data that is obtained in this manner on the attached Data Collection Summary form. Additionally, if several sensors are used simultaneously, are:

5. Sensor outputs combined into a single output?
6. Sensor outputs recorded individually?
7. Other combinations of recording or summation used (specify)?

8. Please add any description of arrays which will add to an understanding of the data types and volumes involved.

If you collect classified or proprietary data, please indicate by a check mark in the appropriate rows on the attached Data Collection table.

9. Are examples of marine data types collected by your organization available?
10. For permanent retention by SDC?
11. Can they be borrowed?
12. In the literature? If so, where __________________________
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<td>13. Data Type</td>
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<td>(See Attachment A)</td>
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<td>14. Method of Collection</td>
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<tr>
<td>(Sensor or System Name i.e., Nansen Cast, BT)</td>
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<td>15. Manufacturer and Model Number</td>
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<tr>
<td>16. Platform Used for Data Collection (Ship, Buoy, etc.)</td>
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<tr>
<td>17. Frequency of Data Collection (i.e., 10 BT's/Day)</td>
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<td>18. Data Collection Format</td>
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<td>(See Attachment B)</td>
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<td>19. Data Transmission Mode</td>
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<td>(Mail, Teletype, etc.)</td>
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<td>Current Volume/Year</td>
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<td>21. 1969</td>
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<td>22. 1970</td>
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<td>24. 1980</td>
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<td>25. Are Data Preprocessed Prior to Recording and Storage? If so, how? (i.e., sensor instruments, preprocessing, computer, manual, etc.)</td>
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<td>26. Use of Data (research, forecasting, planning, etc.)</td>
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<td>27. Classified</td>
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<td>28. Proprietary</td>
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</tbody>
</table>
C. DATA USE

If your organization utilizes marine data provided by other sources, please complete the attached Data Use form. Attachments A and B have been included to serve as guidelines in filling out rows 1 and 3. If the list is inadequate for your purposes it would be appreciated if you would make additions as necessary.

If you receive classified or proprietary data, please indicate by a check mark in the appropriate rows.
### DATA USE

<table>
<thead>
<tr>
<th>1. Data Type</th>
<th>(See Attachment A)</th>
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</thead>
<tbody>
<tr>
<td>2. From Whom are Data Received</td>
<td></td>
</tr>
<tr>
<td>3. Data Format</td>
<td>(See Attachment B)</td>
</tr>
<tr>
<td>4. Data Transmission Mode</td>
<td>(Mail, Teletype, etc.)</td>
</tr>
<tr>
<td>5. Frequency of Receipt</td>
<td>(No/week, No/Month, etc.)</td>
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<tr>
<td>Input Volume/Year</td>
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<td>6. 1968</td>
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<td>9. 1975</td>
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<td>10. 1980</td>
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<tr>
<td>11. Are Data Preprocessed Prior to Receipt? How? (i.e., sensor instruments, preprocessing, computer, manual, etc.)</td>
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<tr>
<td>12. Use of Data (research, forecasting, planning, etc.)</td>
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<tr>
<td>13. Classified</td>
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<tr>
<td>14. Proprietary</td>
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</tbody>
</table>
D. DATA PROCESSING AND STORAGE

If your organization is involved in the data processing and storage aspects of murine data management, please complete the attached summary sheet. Attachments A and B have been included as guidelines in filling out rows 6 and 8. If the list is inadequate for your purposes, it would be appreciated if you would make additions to it as necessary.

In addition to completing the summary sheet, it would be helpful if the answers to the following questions could be supplied.

Do your data files duplicate those maintained by other organizations? If so, please list the data files and the organization where duplicates are available.

<table>
<thead>
<tr>
<th>1. Data Type (From Attachment A)</th>
<th>2. Date Volume</th>
<th>3. Organization, Location</th>
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</table>
If any of your marine data files and outputs are classified or are of a proprietary nature, please indicate by a check mark in the appropriate rows on the attached summary sheet.

If there is a system for ultimate declassification, or release of classified data, please describe for each data type.

<table>
<thead>
<tr>
<th>Data Type</th>
<th>System for Declassification</th>
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</table>
### DATA PROCESSING AND STORAGE

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<tr>
<td>6. Data Type</td>
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<tr>
<td>(See Attachment A)</td>
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<tr>
<td>7. Source of Data</td>
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<td>8. Storage Media</td>
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<tr>
<td>(See Attachment B)</td>
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<tr>
<td>9. Where are Data Stored?</td>
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<td>Storage Volume/Year</td>
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<td>10.</td>
<td>1968</td>
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<td>14.</td>
<td>1980</td>
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<td>Purged Data Volume from Files/Year</td>
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<td>15.</td>
<td>1968</td>
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<td>16.</td>
<td>1969</td>
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<td>18.</td>
<td>1975</td>
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<td>19.</td>
<td>1980</td>
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<tr>
<td>20. What is Done with Purged Data?</td>
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<tr>
<td>21. What is Estimated Maximum Data Storage Volume?</td>
<td></td>
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<tr>
<td>22. Data Processing Functions</td>
<td></td>
<td></td>
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<tr>
<td>23. Frequency of Data Processing</td>
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<tr>
<td>24. What is the Time Lag Between Data Collection and Receipt at the Data Center?</td>
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<tr>
<td>25. Are copies of Data Sent to NDC?</td>
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<tr>
<td>26. Classified</td>
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<tr>
<td>27. Proprietary</td>
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</tbody>
</table>
E. DATA DISSEMINATION

If your organization is involved in disseminating marine data, please complete the attached summary sheet. Attachments A and B have been included to serve as guidelines in filling out rows 6 and 7.

If the list proves to be inadequate for your purposes, it would be appreciated if you would make additions to it as necessary.

In addition to completing the summary sheet, it would be helpful if the answers to the following questions could be supplied:

1. Is a special form used to request your data? If so, are copies available for retention by SDC? ______

   Are examples of your data outputs available?

2. ______ For permanent retention by SDC?

3. ______ Can they be borrowed?

4. ______ In the literature? If so, where? ___________________________

If you disseminate classified or proprietary data, please indicate by a check mark in the appropriate row on the attached summary sheet.
<p>| | |</p>
<table>
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<tbody>
<tr>
<td><strong>5.</strong> Data Type</td>
<td><em>(See Attachment A)</em></td>
</tr>
<tr>
<td><strong>6.</strong> Dissemination Media</td>
<td><em>(See Attachment B)</em></td>
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<tr>
<td><strong>7.</strong> Dissemination Volume/Year</td>
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<td>7. 1968</td>
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<td>11. 1980</td>
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<tr>
<td><strong>12.</strong> Data Transmission Mode</td>
<td><em>(i.e., Mail, Teletype, etc.)</em></td>
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<td><strong>13.</strong> Frequency of Dissemination</td>
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<tr>
<td><strong>14.</strong> Are Data Outputs Scheduled or Requested?</td>
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<tr>
<td><strong>15.</strong> Recipient of Data</td>
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<tr>
<td><strong>16.</strong> Time Delay Between Request for and Dissemination of Data</td>
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<tr>
<td><strong>17.</strong> Classified</td>
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<tr>
<td><strong>18.</strong> Proprietary</td>
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</tbody>
</table>
F. COMPUTER HARDWARE AND SOFTWARE

Are computers used for:

1. _____ Computation?
2. _____ Data Storage and Retrieval?

Hardware

If computers are used, please complete the following:

<table>
<thead>
<tr>
<th>3. Type</th>
<th>4. Function of Computer (i.e., computation)</th>
<th>5. Location</th>
<th>6. Approx. Time Used/Month</th>
<th>7. Rental per Month or Purchase Price</th>
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FIVE-YEAR FUTURE REQUIREMENTS

<table>
<thead>
<tr>
<th>8. Type</th>
<th>9. Function of Computer (i.e., computation)</th>
<th>10. Location</th>
<th>11. Approx. Time Used/Month</th>
<th>12. Rental per Month or Purchase Price</th>
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**FIVE-YEAR FUTURE REQUIREMENTS**

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DATA FLOW CHART

If your organization collects and transmits data to other user agencies, it would be appreciated if you would fill out the attached Data Flow Chart Summary as completely as possible. In addition, it would be helpful if you could provide SDC with a schematic drawing of the data flow from your organization to other organizations on the attached table.

An example of a completed Data Flow Chart Summary and Schematic Data Flow Diagram is shown below.

Please use a separate summary sheet to describe future data flow patterns which do not currently exist.

DATA FLOW CHART SUMMARY

<table>
<thead>
<tr>
<th>Organization Producing Data</th>
<th>U. S. Coast Guard</th>
<th>Date</th>
<th>7/30/67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Interviewed</td>
<td>Cmdr. R. Dinmore</td>
<td>Reviewed with C.O.</td>
<td>10/06/67</td>
</tr>
<tr>
<td>Title</td>
<td>Commanding Officer, Coast Guard Oceanographic Unit, Building 159-E</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td>Navy Yard Annex, Washington, D. C. 20390</td>
<td></td>
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</tbody>
</table>

Data sent to the following from Coast Guard Ships:

<table>
<thead>
<tr>
<th>Organization</th>
<th>How Sent</th>
<th>Data Type</th>
<th>Data Format</th>
<th>Volume</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOWC</td>
<td>Mail</td>
<td>Mech. B. T.</td>
<td>Glass Slide</td>
<td>92/day*</td>
<td>Taken every 6 hours</td>
</tr>
<tr>
<td>NAVOCEANO</td>
<td>Mail</td>
<td>Fathogram</td>
<td>Analog Strip Chart</td>
<td>360,000 miles/year</td>
<td></td>
</tr>
<tr>
<td>Bu. Commercial Fisheries &amp; National Sorting Center (Smithsonian)</td>
<td>Mail</td>
<td>Plankton Tow</td>
<td>Specimen</td>
<td>4/day</td>
<td></td>
</tr>
</tbody>
</table>

SCHEMATIC FLOW CHART

COAST GUARD OCEANOGRAPHIC DATA
DATA FLOW CHART SUMMARY

Current ______ Future ______

Organization Producing Data ______  Date ______

Information Supplied by: _____________________________
Title _____________________________
Address _____________________________

Data sent to the following:

<table>
<thead>
<tr>
<th>Organization</th>
<th>How Sent</th>
<th>Data Type</th>
<th>Data Format</th>
<th>Volume</th>
<th>Frequency</th>
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### ATTACHMENT A

#### PARTIAL LIST OF DATA TYPES

**Data Normally Recorded Regardless of Measurements Made**

<table>
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<tr>
<th>Physical</th>
<th>Chemical</th>
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</table>
Biological

Kingdom - Animalia, Plantae, Protista
Subkingdom
Phylum
Class
Order
Genus
Species
Phytoplankton
Zooplankton
Bacteria
Protozoa
Algae
Plants
Rotifers
Insects
Crustacea
Mollusca
Coral
Other Invertebrates
Fish
Marine Mammals
Photographs
Specimen
Fouling Organisms
Bioluminescence

Geological and Geophysical

Bottom Samples
Type of Dredge
Sediment Description
Bottom Heat Flux
Bottom Photographs
Sediment Transport
Sediment Distribution
Geochemistry
Sedimentation
Bathymetry
Texture
Composition
Color
Carbon Content
Carbonate Content
Biostratigraphic Age
Subbottom Seismic Profiles
Magnetic Field
Gravitational Field
Seismograms
Seismic Velocities

Water Color
Biochemical Analysis
Pigment Content
Dissolved and Particulate Organic Carbon
Sonar Graphs
Commercial Fishing Reports
Sonar Graphs
Sport Fishing Catch Reports
Fish Tagging
Fish School Sightings
Bird Flock Sightings
Biological Sound Frequency
Biological Sound Intensity
Chlorophyll
Bio-Assays
Plankton Tow or Trawl
Type of Sampler
Direction of Tow
Depth of Tow
Volume of Water Strained
Net Condition
Winch Hauling Rate
Collector
Occurrence of Fish Eggs & Larvae
Others

Seismicity
Permeability
Porosity
Gamma Log
S P Log
Resistivity Log
Bottom Oxygen Uptake
Sediment pH
Sediment Eh
Seafloor Volcano
Location
Size
Seafloor Guyot
Location
Depth
Size
Glaciologic Effects
Drill Cores
Type of Corer
Others
Meteorology

- Air Temperature
- Wind Velocity
- Wind Force
- Wind Direction
- Humidity
- Ozone Content
- Radiosonde Observation (wind profile)
- Sunlight Intensity
- Storm Frequency
- Storm Severity
- Cloud Type
- Cloud Cover
- Visibility
- Insolation
- Others

Pollution

- Pesticides
- Tetra Ethyl Lead
- Industrial Chemicals
- Waste Heat
- Radioactive Waste
- Detergents
- Organic Waste
- Biological Oxygen Demand
- Coliform Bacteria
- Phenols
- Solids - Settleable
- Solids - Suspended
- Fecal Coliform Bacteria
- Fecal Streptococci Bacteria
- Pathogens
- Viruses
- Organic Nitrogen
- Others

Acoustic Properties

- Sound Velocity
- Absorption
- Intensity
- Frequency
- Others

Electrical Properties

- Conductivity
- Dielectric Constant
- Attenuation
- Others
### Optical Properties

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<td>Scattering</td>
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<td>Refraction</td>
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### Sea Ice

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<td>Ice Drift Speed</td>
<td>Iceberg Shape</td>
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### Engineering

### Engineering Properties of Bottom

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<th>Wet Unit Weight</th>
<th>Compressive Strength</th>
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<td>Water Content</td>
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<td>Void Ratio</td>
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<td>Saturated Void Ratio</td>
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<td>Porosity</td>
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<td>Liquid Limit</td>
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<td>Elastic Limit</td>
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<td>Modulus of Elasticity</td>
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<td>Cohesion</td>
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<td>Angle of Internal Friction</td>
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<td>Density</td>
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<td>Wave Refraction, Reflection, Diffraction</td>
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<td>Frequency</td>
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<td>Region of Occurrences</td>
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Socioeconomic

Ownership
International Treaties
International, National, Interstate Negotiations and Agreements
Requirements for National Defense
Federal Laws
State Laws
Local Laws
Law Enforcement
Population
Industrial Output
Water Withdrawal
Municipal
Industrial

Marinas
Recreation Demand
Port Charges
Labor Availability
Transport Availability
Import Tariffs
Obstruction Position
Cables
Pipelines
Sunken Wrecks
Recreation Areas
Shipping Lanes
Restricted Area Boundaries
Others

Miscellaneous

Photographs
Microwave Images
Infrared Images

Television Images
Others
ATTACHMENT B

DATA FORMATS

Handwritten or printed forms
Scientific Publications
Technical Reports
Magnetic Tape, Digital
Magnetic Tape, Analog
Paper Tape
Punch Cards
Listing of Descriptive Data
Digital Printout
Visual Analog Records
Charts or Maps
Specimens (Biological, Geological, etc.)
Photographs
Infrared Image
Microwave Image
Microfilm
Microfiche
Other (specify)
From a very cursory review of current marine data collection and handling practices, a few recommendations for immediate consideration emerged from Phase I as follows:

1. **In the area of sensing instruments:**

   Encourage a systems approach to sensing instrument development programs.

   Today, most sensing instruments are developed to meet relatively narrowly defined objectives. Many do not produce electrical output signals. To make progress toward system goals, each new sensing instrument development should incorporate the following thinking as applicable:

   - Encourage electrical output signals, preferably of standard amplitude ranges, as is done in most telemeter instrument developments.
   - Encourage built-in calibrators, operable on remote command.
   - Encourage the provision of standard signal conditioning packages including buffer amplifiers to raise low level analog signals to standardized recording levels.
   - Encourage consideration of system cost/benefit effects of designing the instrument to provide direct digital output.

2. **In the area of cruise ship instrumentation:**

   a. **Encourage the further development of standard recording systems for all marine data in electrical signal form.** Such systems should:

      - Contain a master date-time generator and displays for recording on all data recording mechanisms throughout the ship (central recorders, special-purpose recorders like the fathometer, even on handlogged data forms). This generator should also put out cruise identification frequently.
Provide multiple channel input capacity, selectable in modular sets to fit the cruise mission. Use one or more standard tape recorders as needed.

Incorporate time multiplexing to efficiently handle very low bandwidth and sampled signals.

Incorporate provisions for recording ship track information, verbally or automatically.

Provide analog strip-chart play-outs of recorded variables to enable quality assurance, correlation of events and scientific calculations.

Incorporate one or more voice channels for recording field operating conditions, key changes in techniques being tried, etc., in order to enable ease of playback interpretation and editing and to assure against loss of this vital information.

Consider lending simplified versions of this equipment to investigators operating on even the smallest ships. The advantages of a truly simple-to-operate, field-worthy, modular unit to the investigator in most cases provide sufficient incentive for him to foster its use. The advantages to the National Marine Data Program are manifold, but hinge around increasing the accuracy and correlatability of marine observations and thus the building of knowledge of the marine environment for achievement of national goals.

b. Develop an inexpensive shipboard unit for semi-automatic navigation satellite tracking in order to provide accurate ship track information.

Consider lending these units to investigators using even the smallest ships. The advantage to the investigators of having accurate track information should in most cases provide sufficient incentive for them to take care of and operate the units. The advantage to the National Marine Data Program is of course, another increment in the upgrading of overall marine data accuracy and the correspondingly increased capability to correlate the cruise information with other data gathered from that region.

c. Develop sealed "Black Box" oceanographic recording units for emplacement on ships of opportunity. These units, recording such variables as sea surface temperature, should provide useful information, but they pose many problems as well. Among them are: time synchronization at beginning of cruise, loss of time clock
synchronization during and after ship's power outages; mishandling of probes unless they are beyond reach of the crew; difficulty of correlating recorded data with ship track information. But above all the problem is lack of direct benefit to the vessel operator. He therefore has no incentive to care for the device or submit the recordings promptly.

It is this fundamental benefit problem which will undoubtedly limit the utility of Ships of Opportunity as marine data observation platforms. One hope lies in the sealed black box approach similar to that used successfully by the Air Force in their crash recorder program and the newly adopted airline recorder designed to monitor flight variables. In both cases, the recorder operation is beyond the control of the pilot. It simply comes on when the master switch is thrown.

Outwardly, these precedents may sound similar to the ship problem and thereby give promise. In reality, however, a fundamental difference still exists. The operators of the aircraft, i.e., the Air Force and the airlines want the information provided by the black box. They therefore see that installation of sensors, cables, etc., is proper and that frequent inspections are performed. Only the pilots are inclined to drag their feet. In the case of ships, however, neither the ship operator nor the ship captain has such an incentive. Hence, the assurance of usable results is a far more difficult problem for Ships of Opportunity than for the case of aircraft recorders.
This report documents the Phase I Study of the National Data Program for the Marine Environment. This study was sponsored by the National Council on Marine Resources and Engineering Development. The end product of Phase I is a Study Approach for Phase II. In support of this approach, findings were derived from:

1. A review and analysis of the findings and recommendations of pertinent prior studies. Twenty-seven documents were reviewed.

2. A survey of the relevant literature on the informational structure, storage and retrieval, and reduction to useful forms of marine information. Four hundred and thirty-nine documents were surveyed.

3. A collation of the plans of selected agencies for the development of improved marine data handling capability. Seventeen plans were reviewed.

Additional Phase I activities were as follows:

1. A questionnaire was developed to assess the size and characteristics of the marine data problem. (See continuation sheet)
2. Interviews were conducted with:

- 75 persons in 28 Federal Agencies.
- 20 persons in six Scientific Institutions.
- 10 persons in seven Regional Authorities and in Industry.

These interviews included organizations whose activities spanned the entire spectrum of marine data functions; collection, processing, storage and retrieval, dissemination and use.

3. A detailed methodology was developed for structuring the Phase II design efforts. This methodology was applied during Phase I for the preliminary analysis of:

- National Marine Science Program Objectives
- Functional Requirements
- Data Program Requirements
- Constraints
- Effectiveness Analysis of Data Programs
- Cost/Benefit/Effectiveness Analysis of Data Programs
- Data System Requirements
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