

7. How much work has been done on this problem to date, by whom, and when was it started? Has an adequate literature review been made? What is the magnitude of the ongoing research effort and who is doing it? What cooperative work is being undertaken and by whom?

8. What work is being planned by others? (NOTE: This is probably the most difficult information to obtain.)

9. Can the answers be obtained from proposed research?

10. What will be the total cost of research and development and demonstration effort to obtain answers?

11. How long will it take to obtain answers? When will project be terminated?

12. What effort or information must be provided by others in order to complete research?

13. If new answers are found, will they have any significance?

14. How are the results to be disseminated? How will effort be coordinated with other related programs?

15. Should research be carried out at laboratory, pilot plant, or at field evaluation scale?

16. How much replication of effort should be carried out?

17. What types and levels of competence of personnel are required? Do we have these people?

18. What facilities, equipment, and instrumentation are required? Are these available?

19. Should the work be performed in-house, by grants, or by contracts? Where can the work best be done? If in-house, which laboratory? If contract, are there contractors with special or unique competence?

20. Are there other approaches to solving the problem? What are they?

21. Does proposed approach and methodology differ substantially from those recognized in the field of study? Why?

22. Has the proposed program been subjected to technical review?

23. Are there predictable technological developments in this or related fields which could substantially affect your research effort?

24. If program or project is approved, when can the next decision be made as to termination or continuation of work?

25. What is probability of success?

The implementation of approved program plans consists of the following aspects:

1. Development of detailed operational plans and resource requirements.
2. Review and approval of detailed plans.
3. Allocation of resources.
4. Reports and review of progress and resources utilization.
5. Evaluation of progress.
6. Redirect efforts as necessary to incorporate new decisions, results, and actions affecting program.
7. Publication and dissemination of results.
8. Integration of research efforts into total solution of problem.

ALLOCATION OF RESOURCES

The research and development program of the FWPCA is conducted through both in-house and extramural support. The in-house effort is conducted at laboratories at Corvallis, Oregon; Ada, Oklahoma; Athens, Georgia; College, Alaska; Duluth, Minnesota; and Cincinnati, Ohio, and although the permanent building has not been constructed, at Narragansett, Rhode Island. Additional research and development is conducted at field sites across the nation.

It is obvious that to have a successful research and development program, in addition to the competence available in the Federal Government, the best scientific and engineering talent in the nation including that available in the university and private research institutions, industries, and in state and municipal organizations, must be incorporated in the national effort to control water pollution. This we are doing through our extramural grants and contracts. It is important to note that approximately 80% of our research and development funds is spent in our extramural program.

Our experience has demonstrated the great importance and efficiency in conducting simultaneous and complementary in-house and extramural research proj-