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THE U. S.  
ENVIRONMENTAL  
PROTECTION AGENCY'S

QUALITY ASSURANCE PROGRAM



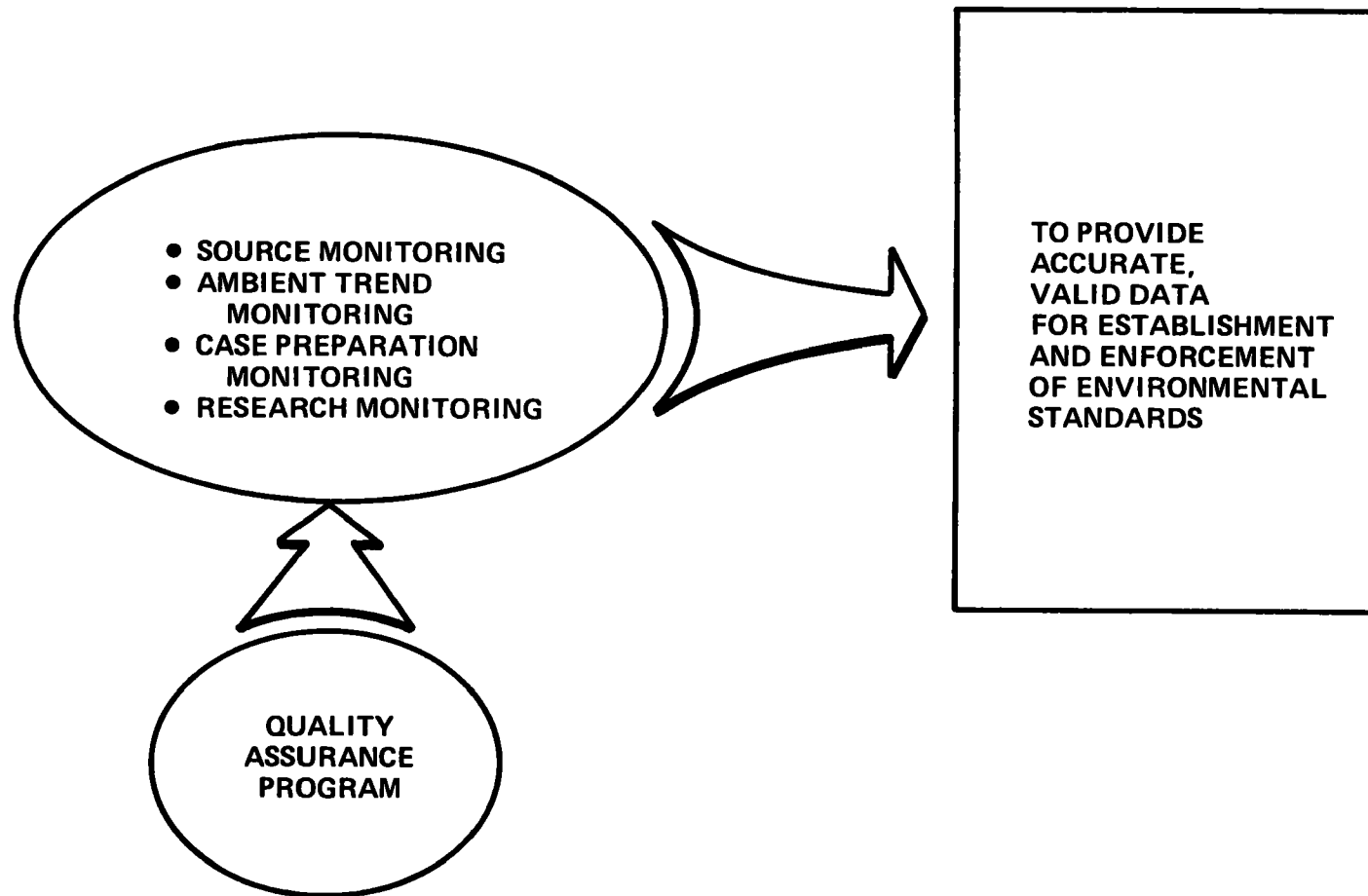
December 1972

THE U. S.  
ENVIRONMENTAL  
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QUALITY ASSURANCE PROGRAM

## QUALITY ASSURANCE AND MONITORING

BY LAW, THE PRIMARY FUNCTION OF EPA IS TO SET AND ENFORCE ENVIRONMENTAL STANDARDS. DATA FROM MONITORING ACTIVITIES ACROSS THE NATION PROVIDE THE BASIS FOR THAT STANDARD SETTING AND ENFORCEMENT. THE EPA QUALITY ASSURANCE PROGRAM HAS BEGUN OPERATION AND IS DESIGNED TO ASSURE THAT THE MONITORING DATA PROVIDED TO EPA DECISION MAKERS IS BOTH ACCURATE AND VALID. THE ROLE OF QUALITY ASSURANCE IN EPA MONITORING ACTIVITY IS THE SUBJECT OF THIS BRIEFING.

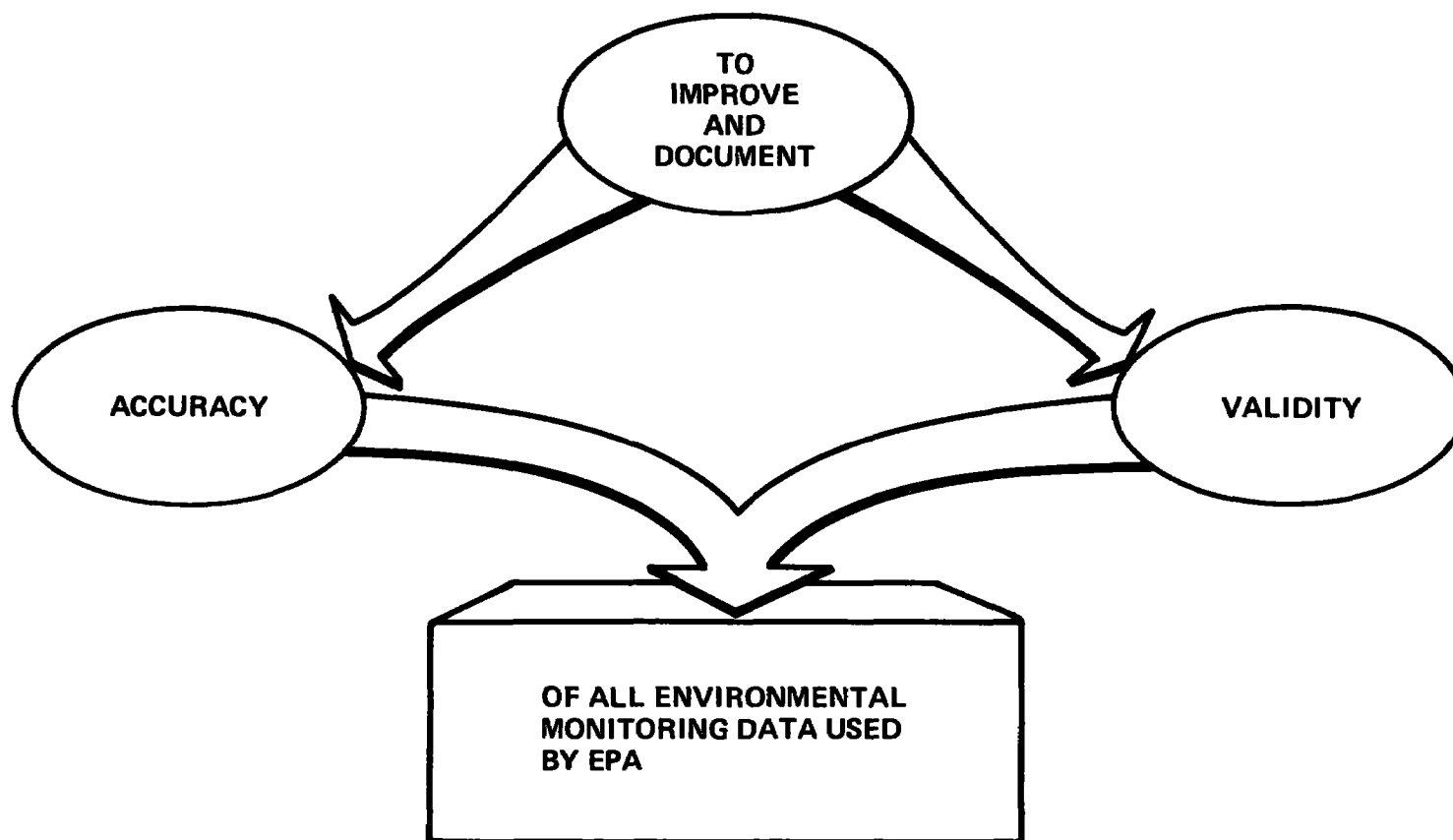
# QUALITY ASSURANCE AND MONITORING



### THE ROLE OF QUALITY ASSURANCE IN EPA

WHILE MONITORING TO ACQUIRE DATA ON THE ENVIRONMENT IS IMPORTANT, ACQUIRING DATA BY ITSELF IS NOT ENOUGH. IN ORDER TO ACHIEVE EPA'S GOALS IN ENVIRONMENTAL QUALITY, THE DATA USED IN RESEARCH AND ENFORCEMENT MUST BE BOTH ACCURATE AND VALID. THIS IS WHERE THE ROLE OF QUALITY ASSURANCE COMES INTO PLAY. THE EPA QUALITY ASSURANCE PROGRAM IS DESIGNATED TO CONTINUOUSLY IMPROVE AND DOCUMENT THE ACCURACY AND VALIDITY OF ALL MONITORING DATA USED BY EPA.

## THE ROLE OF QUALITY ASSURANCE IN EPA



### WHY HAVE EPA PROGRAMS FOR QUALITY ASSURANCE?

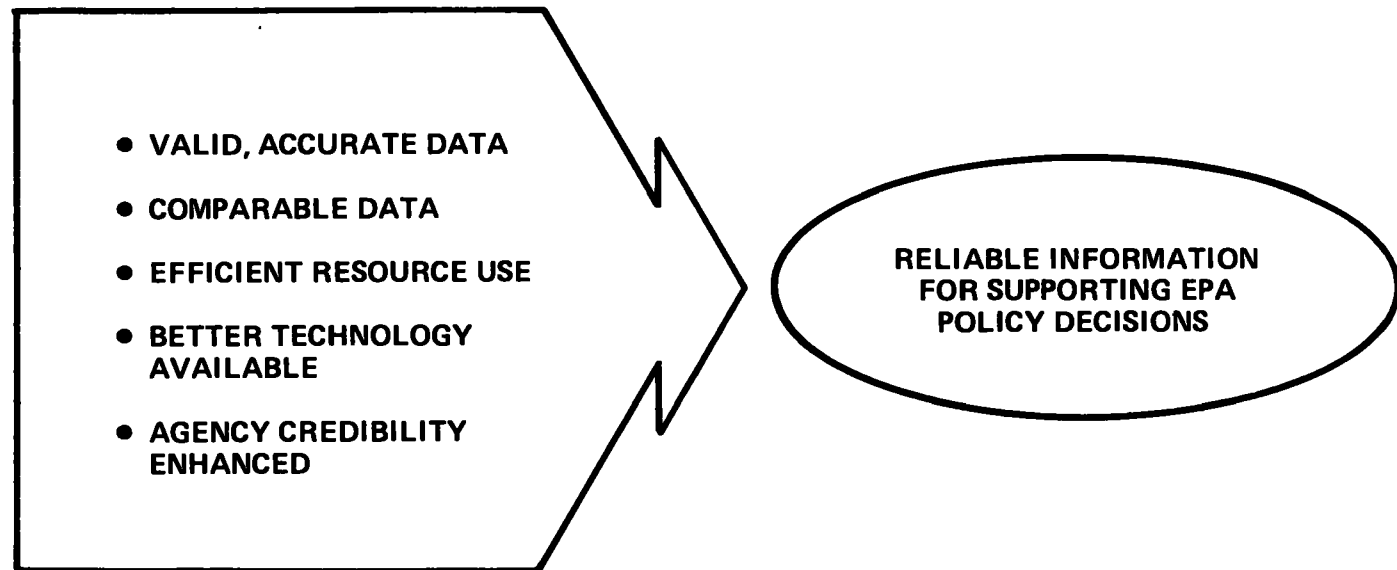
SOME OF THE REASONS FOR HAVING A QUALITY ASSURANCE PROGRAM ARE SELF-EVIDENT, BUT LET US REVIEW THEM AT THIS POINT.

- FIRST, VALID AND ACCURATE DATA ARE ASSURED
- SECOND, DATA GENERATED BY ALL PROGRAMS ARE COMPARABLE AND THE PROBLEM OF COMPARING APPLES AND ORANGES IS AVOIDED
- THIRD, UNNECESSARY DUPLICATION CAN BE AVOIDED AND THE MOST EFFICIENT USE OF RESOURCES IS POSSIBLE
- FOURTH, DETAILED SPECIFICATIONS FOR SAMPLING AND ANALYSIS EQUIPMENT RESULT IN BETTER MONITORING INSTRUMENTATION
- FIFTH, QUALITY ASSURANCE GIVES CONFIDENCE IN DATA AND ENHANCES THE OVERALL CREDIBILITY OF THE AGENCY

ALL OF THESE CONTRIBUTE TO ONE OVERRIDING PURPOSE OF A QUALITY ASSURANCE PROGRAM:

WITH STANDARDIZATION AND QUALITY CONTROL EPA HAS BETTER INFORMATION ON WHICH TO BASE POLICY DECISIONS FOR ENHANCEMENT OF ENVIRONMENTAL QUALITY.

## **WHY HAVE AN EPA PROGRAM FOR QUALITY ASSURANCE?**





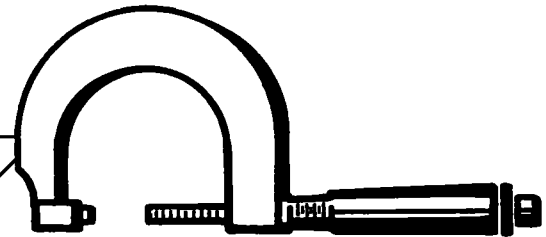
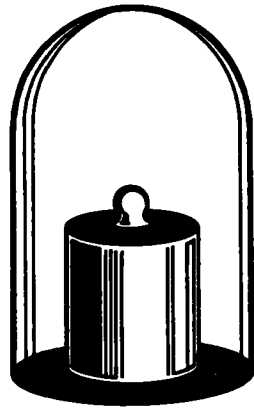
### QUALITY ASSURANCE PROGRAM ELEMENTS

EPA'S QUALITY ASSURANCE PROGRAM COMPRISES COMPREHENSIVE, MUTUALLY REINFORCING PROGRAMS OF STANDARDIZATION AND QUALITY CONTROL. IN THE STANDARDIZATION PROGRAM, REFERENCE METHODS ARE DEVELOPED FOR POLLUTANTS IN EACH MEDIUM, AND GUIDELINES FOR DETERMINATION OF METHOD EQUIVALENCY ARE ALSO DEVELOPED. IN ADDITION, GUIDELINES AND PROCEDURES ARE ISSUED FOR ALL PHASES OF SAMPLING AND ANALYSIS. THE QUALITY CONTROL PROGRAM IS A CONTINUOUS OPERATION INVOLVING CALIBRATION, INTERLABORATORY AND INTRALABORATORY TESTING, AND EVALUATION OF MONITORING PROGRAMS, LABS, NETWORKS AND PERSONNEL.

# ELEMENTS OF THE QUALITY ASSURANCE PROGRAM

STANDARDIZATION

QUALITY CONTROL



QUALITY ASSURANCE

LET US NOW LOOK MORE SPECIFICALLY AT THE TASKS WHICH MAKE UP THE EPA QUALITY ASSURANCE PROGRAM.

## **DESCRIPTION OF PROGRAM**

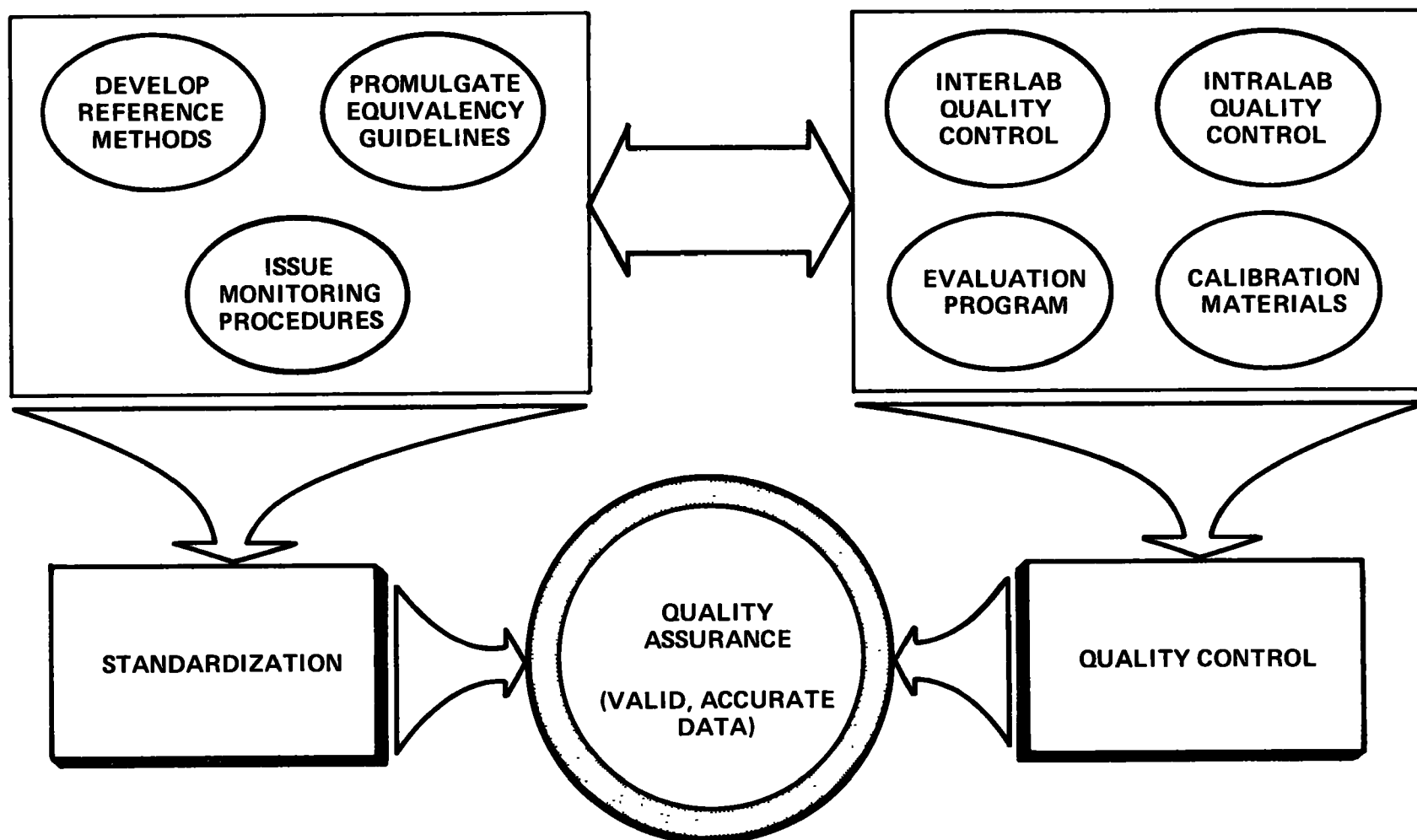
## OVERVIEW OF THE FUNCTIONS REQUIRED FOR QUALITY ASSURANCE

THE OVERALL QUALITY ASSURANCE PROGRAM COMPRISES TWO MAIN ELEMENTS: STANDARDIZATION AND QUALITY CONTROL. TO SIMPLIFY THE EXPLANATION OF PROGRAM FUNCTIONS, EACH OF THESE TWO MAIN ELEMENTS CAN BE THOUGHT OF AS INCLUDING THE GENERAL TASKS SHOWN. THE STANDARDIZATION TASKS INCLUDE (1) TESTING AND EVALUATION OF METHODS TO DEVELOP A REFERENCE METHOD FOR POLLUTANTS IN EACH MEDIUM; (2) DEVELOPING AND ISSUING GUIDELINES TO DETERMINE EQUIVALENCY OF ALTERNATE METHODS; AND (3) DEVELOPING AND ISSUING GUIDELINES AND PROCEDURES TO BE USED FOR ENVIRONMENTAL MONITORING.

THE OTHER ELEMENT OF QUALITY ASSURANCE -- QUALITY CONTROL -- INCLUDES (1) QUALITY CONTROL WITHIN LABORATORIES; (2) QUALITY CONTROL AMONG LABORATORIES; (3) A PROGRAM OF REGULAR EVALUATION OF ALL MONITORING ACTIVITIES; AND (4) ROUTINE CALIBRATION OF MONITORING INSTRUMENTS EMPLOYING STANDARD REFERENCE MATERIALS AND SAMPLES (SRMs AND SRSs).

STANDARDIZATION AND QUALITY CONTROL, OF COURSE, ARE CLEARLY RELATED. FOR EXAMPLE, INTERLABORATORY TESTING IS USED BOTH TO DEVELOP REFERENCE METHODS (STANDARDIZATION) AND TO EVALUATE LABORATORY PERFORMANCE (QUALITY CONTROL).

# OVERVIEW OF THE FUNCTIONS REQUIRED FOR QUALITY ASSURANCE



## OPERATING THE QUALITY ASSURANCE PROGRAM

### 1. STANDARDIZATION

REFERENCE METHODS WILL BE DEVELOPED THROUGH AN INTENSIVE PROGRAM OF HIGH QUALITY SCIENTIFIC LABORATORY AND FIELD PROCEDURES, INVOLVING COLLABORATIVE INVESTIGATION AND TESTING BY MANY ORGANIZATIONS. ON THE ORDER OF 1000 PRINCIPAL MEDIUM-POLLUTANT COMBINATIONS ARE TENTATIVELY IDENTIFIED AS REQUIRING REFERENCE METHODS.

PROCEDURES ARE BEING CAREFULLY DEVELOPED TO DETERMINE THE EQUIVALENCY OF METHODS USED OR PROPOSED BY ANY MONITORING PROGRAM TO THE REFERENCE METHOD.

MANUALS ARE BEING PREPARED FOR THE PRINCIPAL MONITORING ROUTINES, AND THEY WILL BE WIDELY DISSEMINATED TO ENCOURAGE UNIFORMITY IN THE OPERATION OF MONITORING PROGRAMS, THEREBY PRODUCING COMPARABLE DATA FROM DIFFERENT SOURCES.

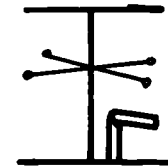
# OPERATING THE QUALITY ASSURANCE PROGRAM

## 1. STANDARDIZATION

**A**



DEVELOP AND PUBLISH  
REFERENCE METHODS

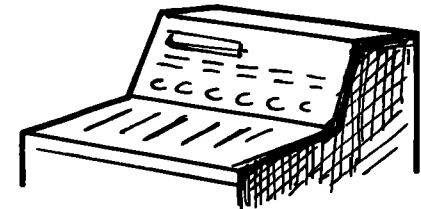
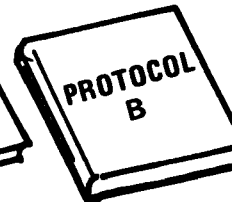
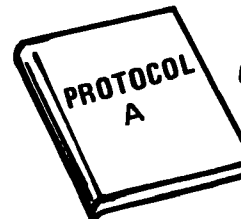


INTENSIVE SCIENTIFIC LAB AND FIELD WORK  
ABOUT 1000 MAIN  
POLLUTANT-MEDIUM  
COMBINATIONS

**B**



PROMULGATE EQUIVALENCY  
GUIDELINES

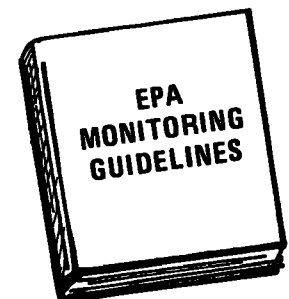
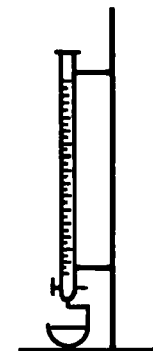
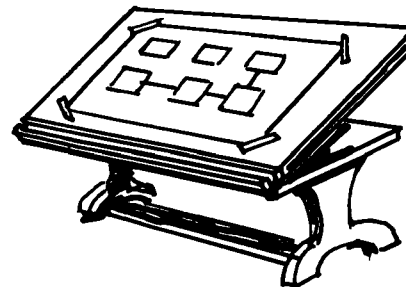


HOW TO DETERMINE WHETHER ANY METHOD  
IS EQUIVALENT TO THE REFERENCE METHOD

**C**



DEVELOP AND ISSUE MONITORING  
GUIDELINES AND PROCEDURES





## OPERATING THE QUALITY ASSURANCE PROGRAM

### 2. QUALITY CONTROL

ADEQUATE AND RESPONSIVE SUPPLY SYSTEMS ARE BEING DEVELOPED TO INSURE THAT EVERY LABORATORY AND STATION HAS AVAILABLE THE SRMs AND SRSs REQUIRED TO CALIBRATE ITS INSTRUMENTS. THIS WILL INCLUDE ACTUAL PRODUCTION, TESTING AND CERTIFICATION OF THE CALIBRATION MATERIALS.

PROCEDURES ARE BEING DEVELOPED AND DISSEMINATED FOR EACH LABORATORY AND STATION TO USE IN INSURING THE VALIDITY AND ACCURACY OF ITS OWN DATA.

PROGRAMS ARE BEING DESIGNED AND OPERATED FOR THE COMPARISON OF DATA FROM LABORATORY TO LABORATORY TO CONTINUOUSLY VERIFY THE SUITABILITY OF METHODS FOR USE UNDER VARYING CIRCUMSTANCES, AND TO INSURE THE COMPARABILITY OF DATA FROM DIFFERENT LABORATORIES.

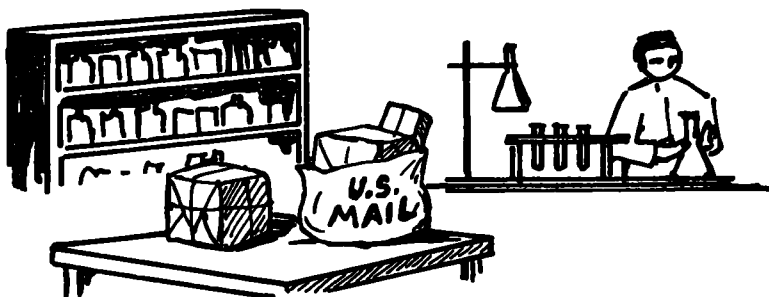
PROGRAMS ARE BEING DEVELOPED AND IMPLEMENTED TO EVALUATE THE PERFORMANCE OF LABORATORIES AND STATIONS BY INDEPENDENT PROCEDURES. EVALUATION OF EPA LABORATORIES WILL BE AUTHORITATIVE AND COMPULSORY; EVALUATION OF OUTSIDE INSTALLATIONS WILL BE PERFORMED AS A SERVICE TO THEM BY EPA.

# OPERATING THE QUALITY ASSURANCE PROGRAM

## 2. QUALITY CONTROL

### A

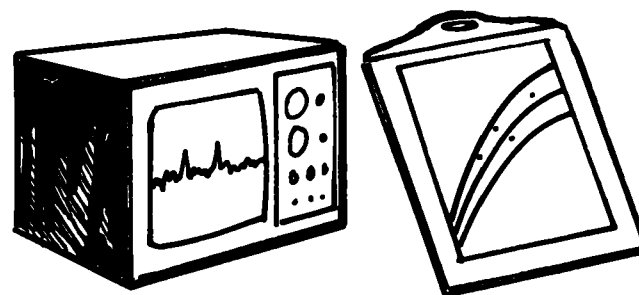
□ CALIBRATION MATERIALS



MAINTAIN EXTENSIVE INVENTORY  
AND SUPPLY SYSTEM

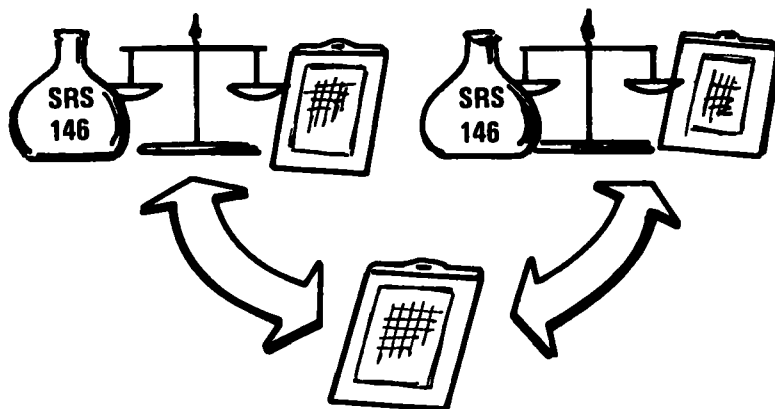
### B

□ INTRALABORATORY QUALITY CONTROL



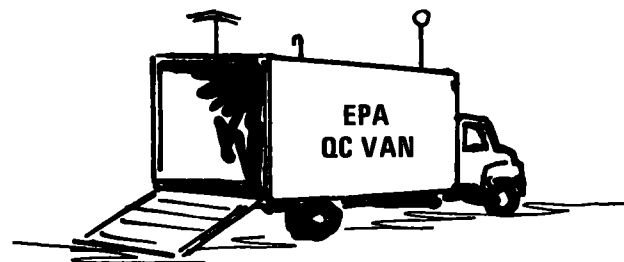
### C

□ INTERLABORATORY QUALITY CONTROL



### D

□ EVALUATION



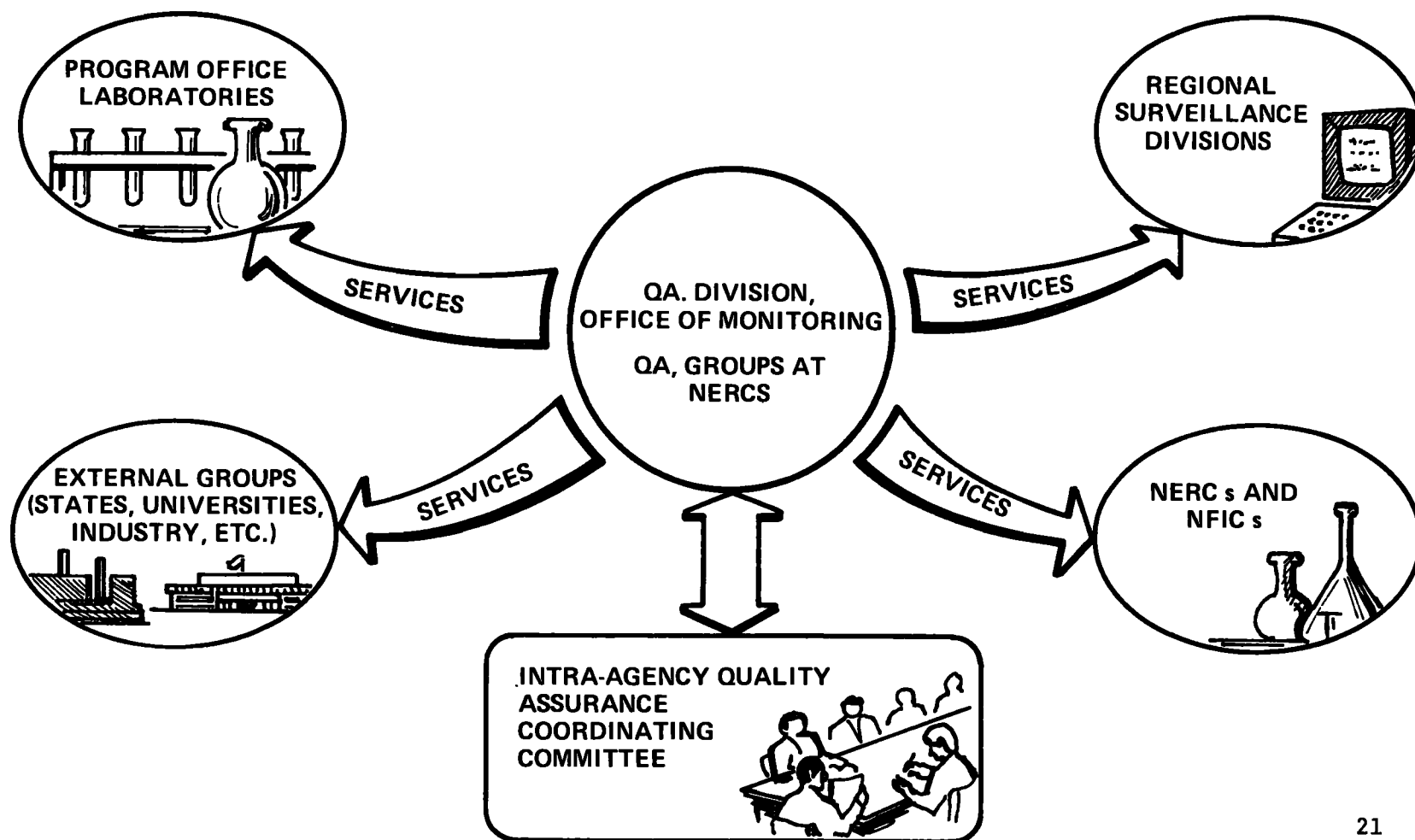
NOW THAT THE FUNCTIONS OF THE EPA QUALITY ASSURANCE PROGRAM HAVE BEEN EXPLAINED, THE QUESTION BECOMES, "WHO IS GOING TO DO IT?"

## **ORGANIZATION OF PROGRAM**

### QUALITY ASSURANCE ORGANIZATIONAL RESPONSIBILITIES

BECAUSE THE PROGRAM IS EPA-WIDE AND WILL ALSO TAKE IN STATES AND EXTERNAL ORGANIZATIONS ON A VOLUNTARY BASIS, VIRTUALLY EVERY OFFICE INVOLVED WITH MONITORING AND THE USE OF MONITORING DATA WILL HAVE SOME INPUTS. THE QUALITY ASSURANCE DIVISION IN THE OFFICE OF MONITORING AND THE QUALITY ASSURANCE GROUPS IN THE NERCs WILL DEVOTE FULL TIME TO DEVELOPING THE PROGRAM AND SERVING THE OPERATING UNITS. THEY WILL DEVELOP THE STANDARDIZATION PROTOCOLS AND PROVIDE TECHNICAL ASSISTANCE FOR IMPLEMENTATION. WHILE THE QUALITY ASSURANCE DIVISION AND THE NERCs ARE EXPECTED TO PERFORM THE BULK OF EPA'S STANDARDIZATION ACTIVITY, ANY MONITORING GROUP CAN PARTICIPATE IN STANDARDIZATION BY FOLLOWING THE GUIDELINES PROVIDED. IN THE AREA OF QUALITY CONTROL, THE QUALITY ASSURANCE DIVISION AND THE NERC QUALITY CONTROL GROUPS WILL HAVE THE DUAL ROLE OF PROVIDING SERVICES AND CONDUCTING EVALUATIONS. SERVICES WILL INCLUDE PROVIDING QUALITY CONTROL TOOLS AND ASSISTANCE TO ALL MONITORING PROGRAMS, WITH THE INDIVIDUAL PROGRAMS RESPONSIBLE FOR CONDUCTING QUALITY CONTROL IN THEIR AREAS OF RESPONSIBILITY. EVALUATION INCLUDES EXTERNAL CHECKS OF ALL MONITORING PROGRAMS TO ENSURE THAT ACCURATE, VALID DATA ARE BEING GENERATED. THE INTRA-AGENCY QUALITY ASSURANCE COORDINATING COMMITTEE, A BOARD MADE UP OF REPRESENTATIVES FROM ALL PROGRAM OFFICES AND THE REGIONS, PROVIDES THE MECHANISM FOR COORDINATION OF PROGRAMS.

# QUALITY ASSURANCE ORGANIZATIONAL RESPONSIBILITIES



IT MAY BE HELPFUL AT THIS POINT TO SHOW AN EXAMPLE OF HOW THE QUALITY ASSURANCE PROGRAM  
ACTUALLY OPERATES, FROM REFERENCE METHOD DEVELOPMENT TO QUALITY CONTROL IN THE FIELD.

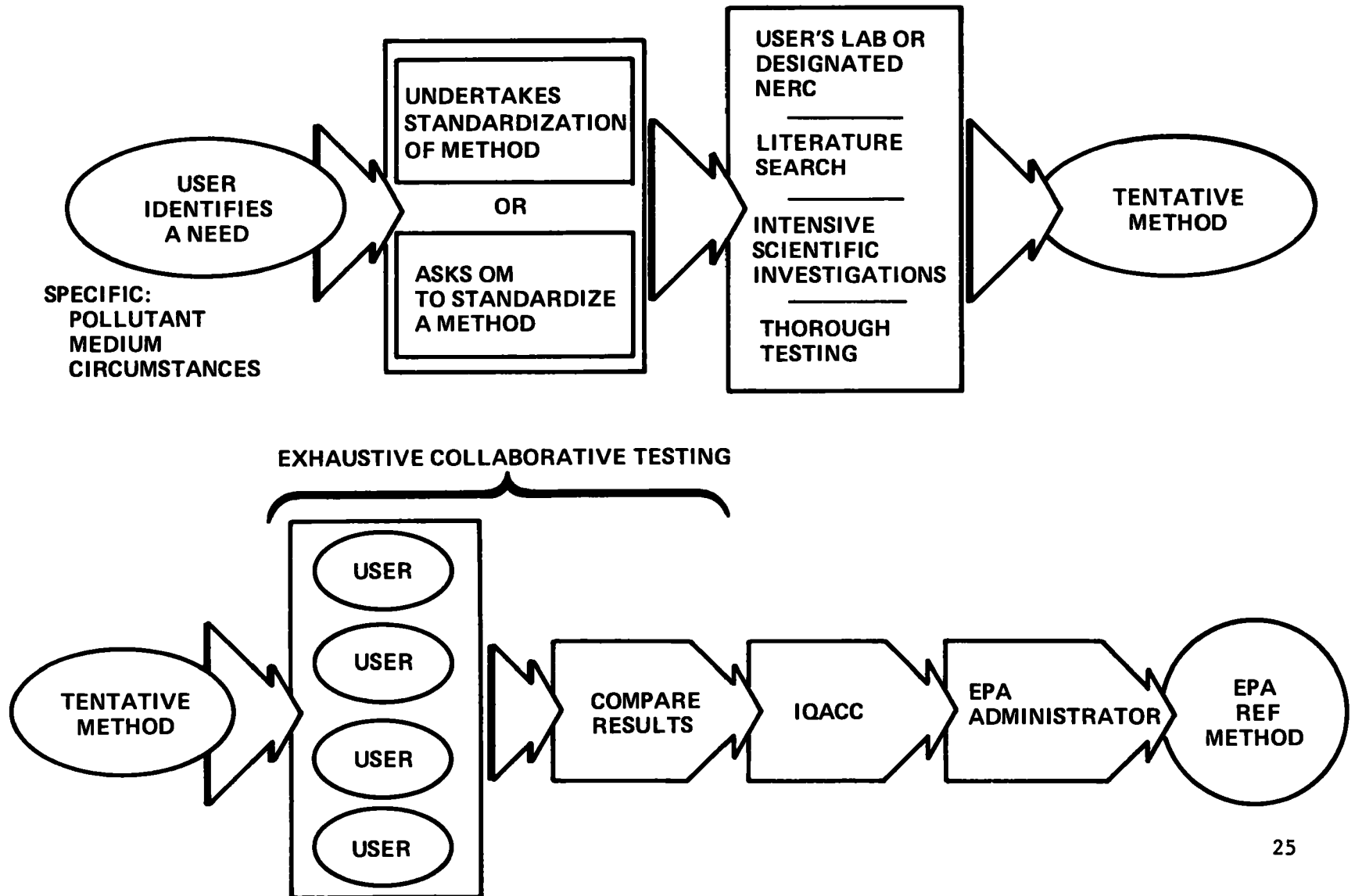
## **EXAMPLE OF QUALITY ASSURANCE IN OPERATION**



AN EXAMPLE OF HOW A REFERENCE METHOD IS ESTABLISHED

ANY MONITORING PROGRAM CAN DESIGNATE A CANDIDATE METHOD OR CAN ASK THE OFFICE OF MONITORING TO STANDARDIZE A METHOD TO FILL A SPECIFIC NEED. WHEN A METHOD HAS BEEN THOROUGHLY TESTED BY THE USER OR BY A LABORATORY DESIGNATED BY THE OFFICE OF MONITORING, AND HAS PASSED THE TESTS OF PRECISION, ACCURACY, AND UTILITY, IT BECOMES A TENTATIVE METHOD. THE TENTATIVE METHOD IS THEN SUBJECTED TO COLLABORATIVE TESTING BY LABORATORIES OFFERING A VARIETY OF OPERATING CONDITIONS. THE INTRA-AGENCY COMMITTEE THEN EVALUATES THE TEST RESULTS TO DETERMINE THAT THE STANDARDIZATION PROTOCOL HAS BEEN FOLLOWED AND THAT THE TEST RESULTS DEMONSTRATE THE PRECISION, ACCURACY AND UTILITY OF THE METHOD. ON THE COMMITTEE'S RECOMMENDATION, THE ADMINISTRATOR THEN ESTABLISHES IT AS AN EPA REFERENCE METHOD.

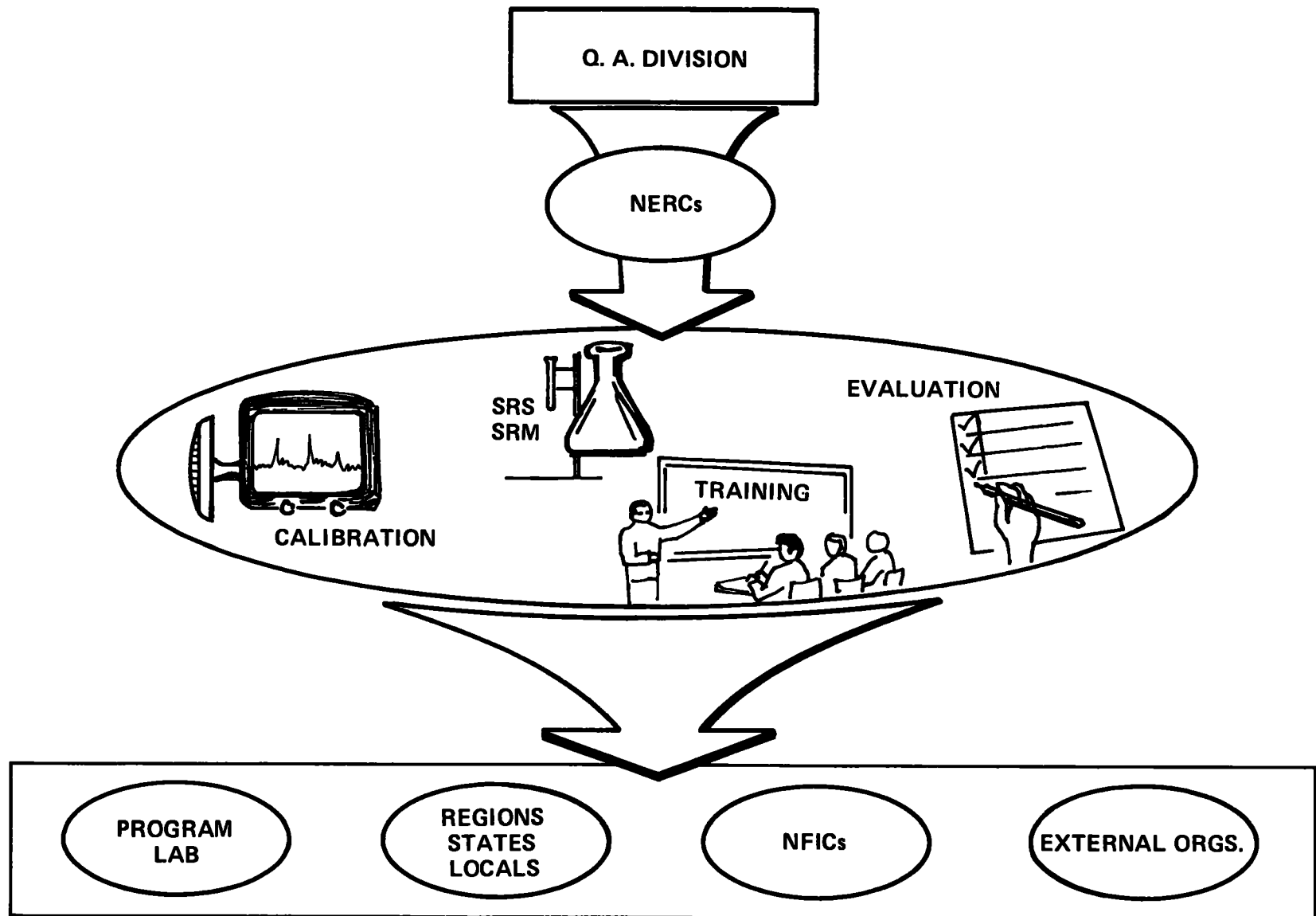
# AN EXAMPLE OF HOW A REFERENCE METHOD IS ESTABLISHED



### QUALITY CONTROL FUNCTIONS

ONCE THE REFERENCE METHOD IS DESIGNATED AND PUBLISHED, THE EMPHASIS OF THE QUALITY ASSURANCE PROGRAM SHIFTS TO QUALITY CONTROL. THE NATIONAL ENVIRONMENTAL RESEARCH CENTERS (NERCs), IN ADDITION TO CONTINUING PARTICIPATION IN THE CROSS-CHECK SAMPLE PROGRAM, WILL MAKE AVAILABLE SRMs AND SRSs FOR TESTS, PERFORM ROUTINE FIELD CALIBRATION SPOT CHECKS, OFFER QUALITY CONTROL TRAINING, AND INCLUDE CHECKS OF MONITORING IN THE EVALUATION PROGRAM.

# QUALITY CONTROL FUNCTIONS



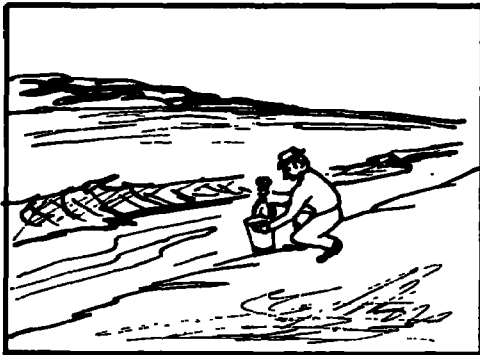
### QUALITY CONTROL IS INTEGRAL TO EACH MONITORING PROGRAM

THE INDIVIDUAL MONITORING PROGRAMS AND LABORATORIES HAVE A LARGE SHARE OF THE RESPONSIBILITY FOR QUALITY CONTROL. WHETHER OR NOT EPA HAD A FORMAL PROGRAM OF QUALITY CONTROL, VIRTUALLY NO LABORATORY OR MONITORING PROGRAM WOULD OPERATE WITHOUT A SYSTEM THAT INCLUDED CALIBRATION, CARE OF REAGENTS, PROPER SAMPLE HANDLING, ETC. IT MAY BE DIFFICULT TO ISOLATE THE ASPECTS OF MONITORING THAT SPECIFICALLY FALL INTO THE CATEGORY OF QUALITY CONTROL, BUT PRACTICALLY EVERYONE AT EVERY LEVEL OF A MONITORING ACTIVITY WILL SPEND A PART OF HIS EFFORTS ON QUALITY CONTROL.

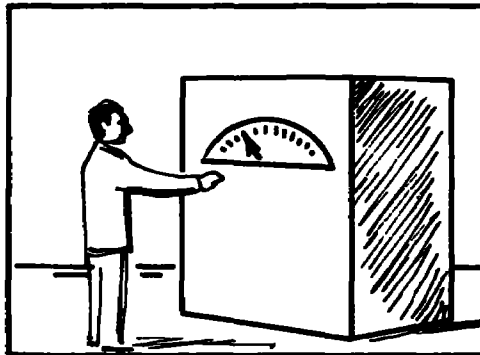
SOME OF THE SPECIFIC QUALITY CONTROL ACTIVITIES INCLUDE:

- MEASURING AND CONTROLLING THE PRECISION OF PROCEDURES AND INSTRUMENTS,
- MEASURING AND CONTROLLING THE ACCURACY OF ANALYTICAL RESULTS,
- INSURING DATA OUTPUT IS COMPUTER COMPATIBLE,
- PRESENTING DATA IN PROPER FORMAT,
- DOCUMENTING PERFORMANCE OF INSTRUMENTS AND ANALYSTS,
- DOCUMENTING TRAINING NEEDS, AND
- IDENTIFYING WEAK METHODOLOGY AND CONSEQUENT RESEARCH NEEDS.

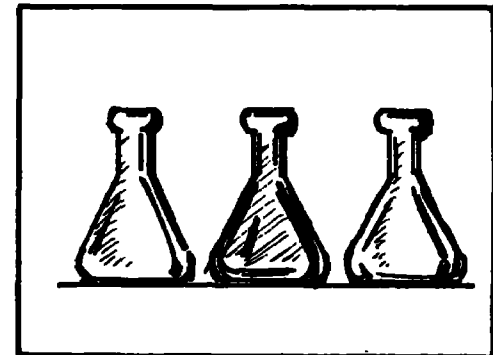
# QUALITY CONTROL IS INTEGRAL TO EACH MONITORING PROGRAM



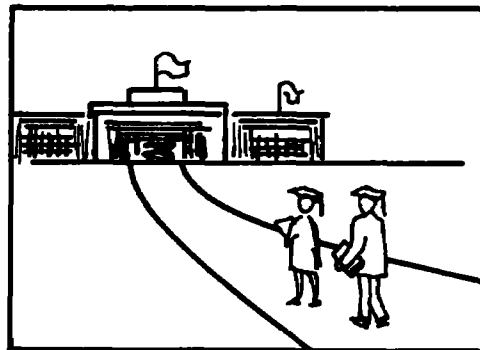
**SAMPLING ACCORDING  
TO PROCEDURES**



**CONTINUAL CALIBRATION  
USING SRM/SRS**



**ANALYZING REFERENCE  
SAMPLES**



**ADEQUATE TRAINING  
OF PERSONNEL**



**ALL OF THE DATA IS  
VERIFIED**

**QUALITY CONTROL IS A ROUTINE ACTIVITY REQUIRING UP TO 15% OF MONITORING RESOURCES**

### CONTINUOUS EVALUATION OF PERFORMANCE AND DATA

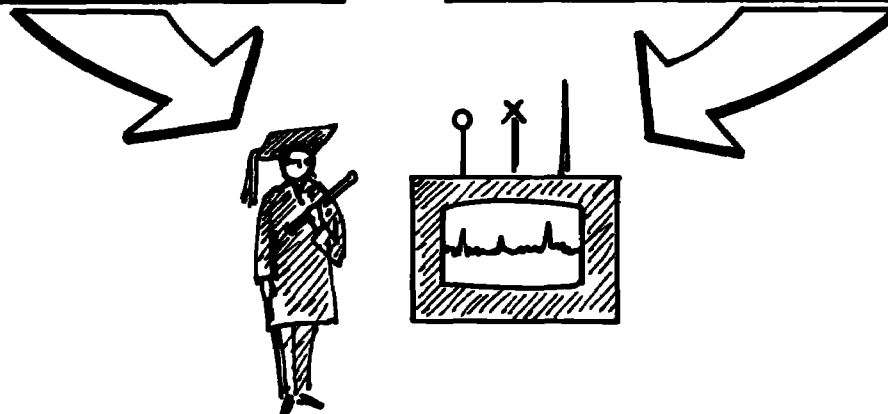
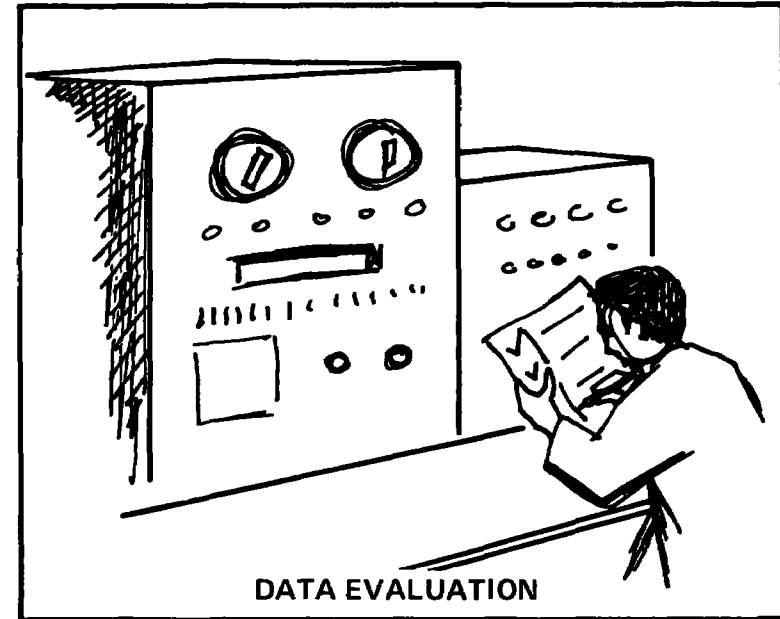
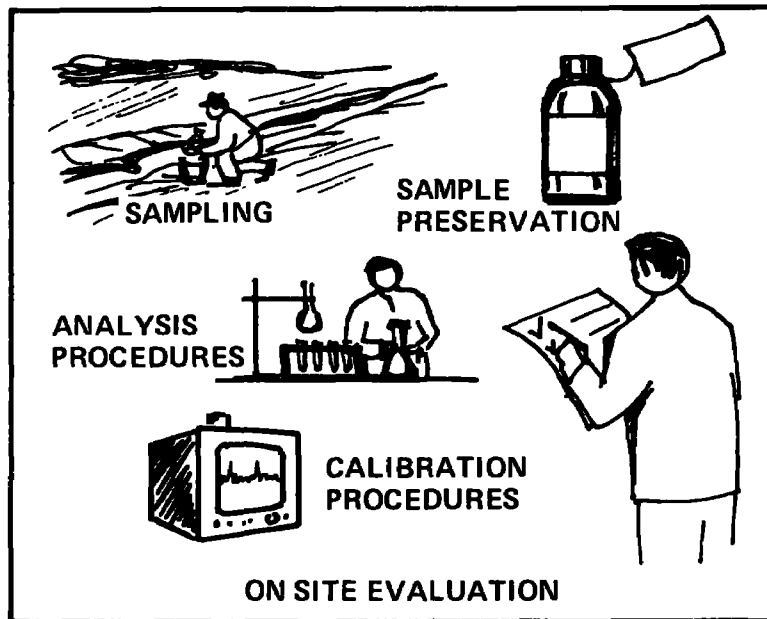
THE QUALITY CONTROL FUNCTION OF THE NERCs INCLUDES PERIODIC EVALUATION OF MONITORING ACTIVITIES TO MAKE SURE THEY ARE OPERATING EFFECTIVELY AND RELIABLY. THIS EVALUATION TAKES TWO FORMS: ON-SITE SPOT CHECKS OF PROCEDURES AND EQUIPMENT, AND EVALUATION OF DATA AND QUALITY CONTROL INFORMATION ROUTINELY SUBMITTED ALONG WITH MONITORING DATA.

AMONG THE SPECIFIC POINTS CHECKED IN THESE EVALUATIONS ARE:

- SAMPLE HANDLING AND VERIFICATION METHODS,
- SPECIFICS OF THE ANALYTICAL METHODS USED,
- TYPE AND SOURCE OF SRSs AND SRMs USED,
- FREQUENCY OF USE OF CONTROLS, AND
- ADEQUACY OF PARTICIPATION IN TRAINING ACTIVITIES.

AS A RESULT OF EVALUATIONS, A BASELINE OF INFORMATION CAN BE MAINTAINED ON THE PHYSICAL FACILITIES, EQUIPMENT, PROCEDURES AND PERSONNEL OF EACH LABORATORY AND AGENCY.

## CONTINUOUS EVALUATION OF PERFORMANCE AND DATA



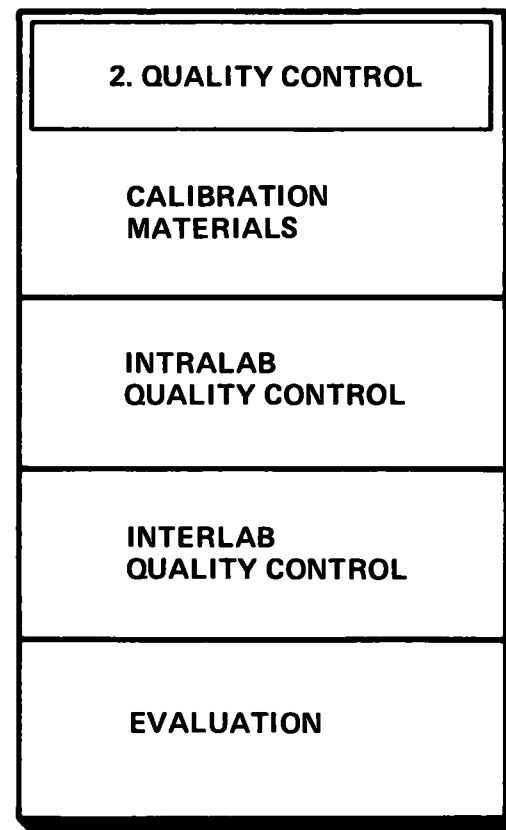
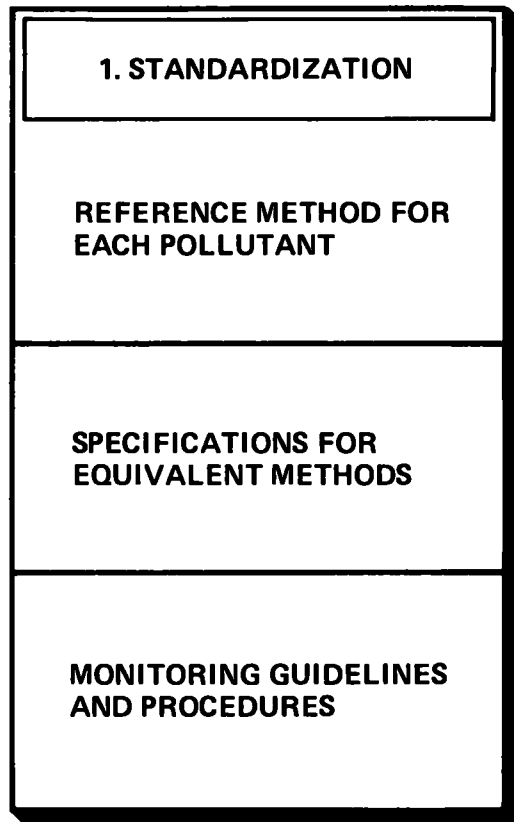
WEAKNESSES IDENTIFIED AND ELIMINATED  
THROUGH TRAINING AND BETTER INSTRUMENTATION



### SUMMARY OF QUALITY ASSURANCE FUNCTIONS

IN SUMMARY, THE TWO MAIN ELEMENTS OF QUALITY ASSURANCE ARE STANDARDIZATION AND QUALITY CONTROL. STANDARDIZATION INCLUDES ESTABLISHING REFERENCE METHODS, AND DEVELOPING GUIDELINES AND PROCEDURES FOR MONITORING ACTIVITIES. QUALITY CONTROL INCLUDES QUALITY CONTROL OPERATIONS WITHIN LABORATORIES AND NETWORKS AND BETWEEN LABORATORIES AND NETWORKS, AND A THOROUGH PROCESS FOR EVALUATION OF ALL MONITORING PROGRAMS.

# SUMMARY OF QUALITY ASSURANCE FUNCTIONS



QUALITY ASSURANCE, OF COURSE, IS NOT SOMETHING THAT MUST BE STARTED FROM SCRATCH. ALMOST ALL MONITORING PROGRAMS HAVE INCLUDED AT LEAST SOME ASPECTS OF STANDARDIZATION AND QUALITY CONTROL FOR SOME TIME. A BRIEF LOOK AT EACH MEDIUM WILL SHOW PRESENT QUALITY ASSURANCE STATUS, AND ALSO IDENTIFY AREAS WHERE MORE QUALITY ASSURANCE EFFORT IS REQUIRED.

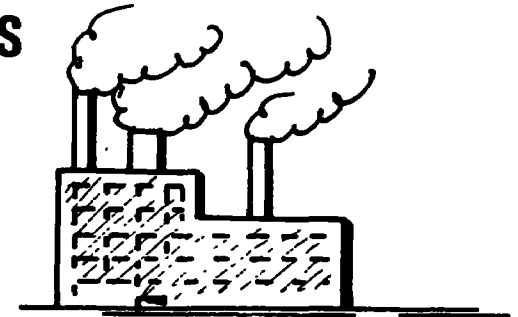
## **CURRENT STATUS**

STATUS -- AIR

STARTING WITH AIR, WE SEE THAT REFERENCE METHODS HAVE BEEN PUBLISHED FOR FOUR MAJOR POLLUTANTS (METHODS FOR TWO ADDITIONAL METHODS ARE UNDERGOING FURTHER TESTING), AND AN EQUIVALENCY GUIDELINES DOCUMENT IS ABOUT TO BE RELEASED. STILL NEEDED ARE REFERENCE METHODS FOR ABOUT 25 MORE POLLUTANTS, QUALITY CONTROL PROGRAM GUIDELINES, STANDARD REFERENCE MATERIALS AND SAMPLES, AND AN EVALUATION PROGRAM. THE ITEMS LISTED AS PRIORITY ARE THE MOST CRITICAL NEEDS FOR QUALITY ASSURANCE. THE BAR GRAPH AT THE BOTTOM OF THIS AND THE FOLLOWING VU-GRAPHS SHOWS THE RESOURCES REQUIRED TO FILL NEEDS ON AN ANNUAL BASIS. LEVEL 1 MEANS A MINIMUM PROGRAM TO MEET PRIORITY NEEDS, WHILE OPTIMUM MEANS A LEVEL OF FUNDING WHICH WOULD RESULT IN MEETING ALL QUALITY ASSURANCE REQUIREMENTS.

# QUALITY ASSURANCE STATUS

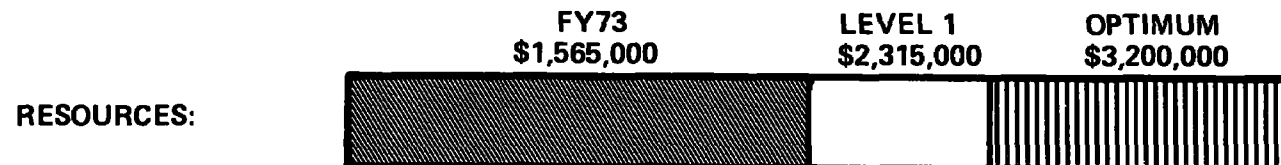
MEDIUM: AIR



- ACCOMPLISHED:**
- REFERENCE METHODS FOR SO<sub>2</sub>, CO, O<sub>x</sub>, AND TSP
  - EQUIVALENCY GUIDELINES DOCUMENT DRAFTED
  - TRAINING AND TECH. AID

- NEEDED:**
- REFERENCE METHODS FOR 25 MORE POLLUTANTS
  - PROCEDURES FOR SOURCE AND EMISSION TESTS
  - QUALITY CONTROL PROGRAM GUIDELINES
  - SRM/SRS DELIVERY SYSTEM
  - EVALUATION PROGRAM

- PRIORITIES:**
- REFERENCE METHODS & SRMs FOR HAZARDOUS POLLUTANTS
  - SAMPLING GUIDELINES FOR AMBIENT AND SOURCE MEAS.
  - REFERENCE METHODS FOR SOURCE TESTING (CAT. II SOURCES)
  - DEVELOP INTER-LABORATORY TESTING PROGRAM



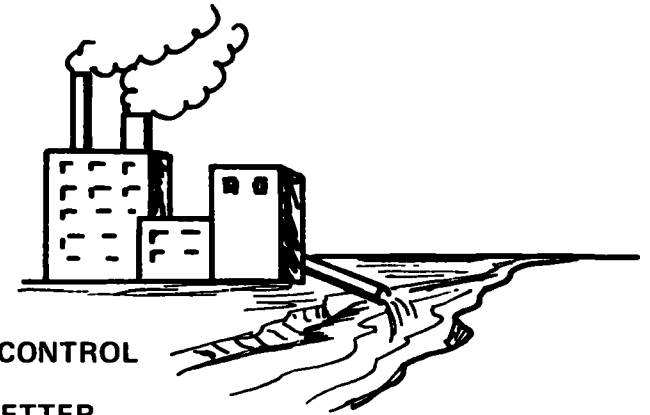
STATUS -- WATER

IN THE AREA OF WATER POLLUTION MONITORING, SEVERAL COMPENDIA OF METHODS ARE PUBLISHED. THERE IS A PROGRAM OF QUALITY CONTROL WITHIN AND AMONG LABORATORIES, INCLUDING DISTRIBUTION OF SOME STANDARD REFERENCE SAMPLES, AND A QUALITY ASSURANCE NEWSLETTER IS PUBLISHED.

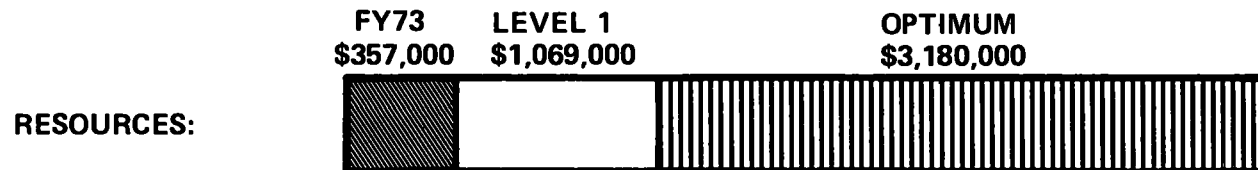
STILL NEEDED IN WATER PROGRAMS ARE DESIGNATION OF OFFICIAL REFERENCE METHODS, EQUIVALENCY GUIDELINES, IMPROVED SRM/SRS DISTRIBUTION, MORE TRAINING AND TECHNICAL ASSISTANCE, AND EVALUATION PROGRAM FOR LABORATORIES AND PERSONNEL.

# QUALITY ASSURANCE STATUS

MEDIUM: WATER



- ACCOMPLISHED:**
- METHODS COMPENDIA
  - INTRA- AND INTER-LAB QUALITY CONTROL
  - SRS DISTRIBUTION
  - QUALITY ASSURANCE NEWSLETTER
- NEEDED:**
- OFFICIAL REFERENCE METHODS
  - EQUIVALENCY GUIDELINES
  - MORE TRAINING AND TECH. AID TO REGIONS
  - EVALUATION PROGRAM
- PRIORITIES:**
- SAMPLING & SAMPLE PRESENTATION GUIDELINES
  - REFERENCE METHODS FOR EFFLUENT MONITORING
  - MICROBIOLOGICAL METHODS
  - SRMs & SRSs FOR WASTE WATERS





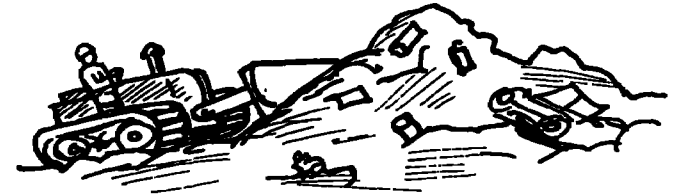
STATUS - SOLID WASTE

IN SOLID WASTE, 18 METHODS ARE ABOUT TO BE PUBLISHED.

STILL NEEDED ARE DESIGNATION OF OFFICIAL REFERENCE METHODS, EQUIVALENCY GUIDELINES FOR OTHER METHODS, QUALITY CONTROL PROGRAM GUIDELINES, A QUALITY ASSURANCE TRAINING AND TECHNICAL ASSISTANCE PROGRAM, AND AN EVALUATION PROGRAM.

# QUALITY ASSURANCE STATUS

MEDIUM: SOLID WASTE



ACCOMPLISHED: • 18 METHODS TO BE PUBLISHED

NEEDED: • OFFICIAL REFERENCE METHODS  
• EQUIVALENCY GUIDELINES  
• QUALITY CONTROL PROGRAM GUIDELINES  
• TRAINING AND TECH. AID  
• EVALUATION PROGRAM

PRIORITIES: • METHODS FOR LEACHATES

RESOURCES:

TO BE DETERMINED

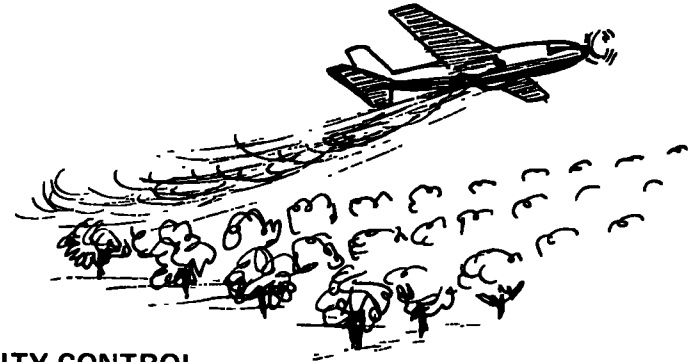
### STATUS -- PESTICIDES

PESTICIDES PROGRAMS HAVE PRODUCED A PARTIAL COMPENDIUM OF METHODS, AND A QUALITY CONTROL PROGRAM BOTH WITHIN AND AMONG LABORATORIES (PRESENTLY LIMITED TO THE COMMUNITY STUDIES PROGRAM) IS IN OPERATION. SRMs ARE AVAILABLE (ALTHOUGH GREATER AVAILABILITY OF STANDARD REFERENCE SAMPLES IS NEEDED). THERE ARE ALSO PROGRAMS FOR QUALITY ASSURANCE TRAINING AND TECHNICAL ASSISTANCE.

STILL REQUIRED ARE DESIGNATION OF OFFICIAL REFERENCE METHODS, EQUIVALENCY GUIDELINES, QUALITY CONTROL PROGRAM GUIDELINES, AND AN EVALUATION PROGRAM.

# QUALITY ASSURANCE STATUS

MEDIUM: PESTICIDES



- ACCOMPLISHED:**
- METHODS COMPENDIUM
  - INTRA- AND INTER-LAB QUALITY CONTROL
    - SRM's AVAILABLE
    - TRAINING AND TECH. AID
- NEEDED:**
- OFFICIAL REFERENCE METHODS
  - EQUIVALENCY GUIDELINES
    - QUALITY CONTROL PROGRAM GUIDELINES
      - MORE TRAINING AND TECH. AID TO REGIONS
      - EVALUATION PROGRAM
- PRIORITIES:**
- SRM CERTIFICATION
  - STANDARDIZE AUTOMATED METHODS



#### STATUS - RADIATION

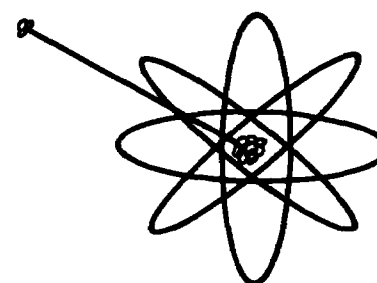
IN RADIATION QUALITY ASSURANCE, A COMPENDIUM OF METHODS HAS BEEN PUBLISHED, AN INTERLAB CROSS-CHECK SAMPLE PROGRAM HAS BEEN IN OPERATION, AND THERE IS AN ACTIVE METHODS EVALUATION PROGRAM.

STILL NEEDED IN RADIATION MONITORING PROGRAMS ARE DESIGNATION OF OFFICIAL REFERENCE METHODS, EQUIVALENCY GUIDELINES, QUALITY CONTROL PROGRAM GUIDELINES, MORE QUALITY ASSURANCE TRAINING AND TECHNICAL ASSISTANCE, AND AN EVALUATION PROGRAM.

(THE NOISE POLLUTION PROGRAMS HAVE JUST BEGUN AND THEY WILL REQUIRE A COMPLETE QUALITY ASSURANCE PROGRAM.)

# QUALITY ASSURANCE STATUS

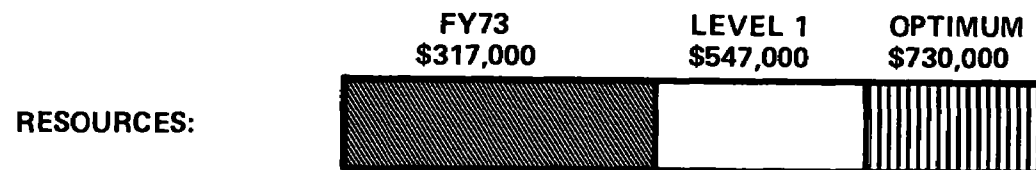
MEDIUM: RADIATION



- ACCOMPLISHED:**
- COMPENDIUM OF METHODS
  - CROSS-CHECK SAMPLE PROGRAM
  - METHODS EVALUATION PROGRAM

- NEEDED:**
- OFFICIAL REFERENCE METHODS
  - EQUIVALENCY GUIDELINES
    - QUALITY CONTROL PROGRAM GUIDELINES
    - MORE TRAINING AND TECH. AID TO REGIONS
    - EVALUATION PROGRAM

- PRIORITIES:**
- SAMPLING GUIDELINES
  - REFERENCE METHODS FOR POINT SOURCE DISCHARGES



NOW THAT THE STATUS HAS BEEN REVIEWED, LET US LOOK AT THE SPECIFIC PROJECTS AND RESOURCES  
REQUIRED TO MEET PLANNED QUALITY ASSURANCE OBJECTIVES.

## **PROGRAM DEVELOPMENT**



### STANDARDIZATION PROGRAM IMPLEMENTATION

IMPLEMENTATION OF THE QUALITY ASSURANCE PROGRAM INVOLVES A NUMBER OF SPECIFIC PROJECTS IN STANDARDIZATION AND QUALITY CONTROL, SOME OF WHICH WILL BE SHORT-TERM, SINGLE EFFORTS AND SOME OF WHICH WILL BE LONG-TERM, CONTINUING EFFORTS. IN STANDARDIZATION, THERE ARE FOUR MAIN PROJECTS:

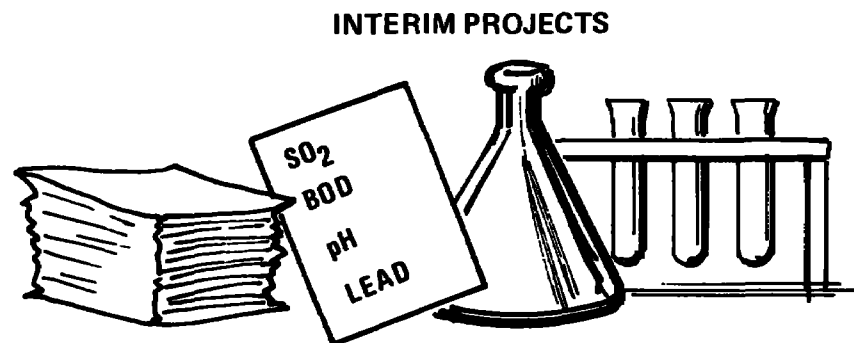
(1) PROGRAM MANAGEMENT INCLUDES PLANNING AND MONITORING STANDARDIZATION ACTIVITY, AND COORDINATING WITH ALL ORGANIZATIONS INVOLVED. (2) INTERIM PROJECTS INVOLVE SHORT-TERM TASKS TO MEET IMMEDIATE STANDARDIZATION NEEDS, SUCH AS COMPILING COMPENDIA OF SAMPLING PROCEDURES AND ANALYTICAL METHODS TO BE USED UNTIL REFERENCE METHODS ARE ESTABLISHED. (3) PROTOCOL DEVELOPMENT RESULTS IN ISSUANCE OF GUIDELINES AND PROCEDURES MANUALS FOR MONITORING AND FOR DETERMINING METHOD EQUIVALENCY.

(4) REFERENCE METHODS DEVELOPMENT IS THE MAJOR PROJECT OF STANDARDIZATION. HERE, A COMPREHENSIVE AGENCY-WIDE PROGRAM OF SCIENTIFIC TESTING AND EVALUATION IS CARRIED OUT TO ESTABLISH THOSE ANALYTICAL METHODS WHICH WILL BE THE REFERENCE FOR ALL DATA USED BY EPA. AT A COST OF ABOUT \$100,000 PER REFERENCE METHOD, AND WITH POTENTIALLY AS MANY AS 1,000 METHODS TO BE ESTABLISHED FOR ALL MEDIA, THIS WILL BE THE LARGEST CONTINUING PROJECT OF STANDARDIZATION.

# STANDARDIZATION PROGRAM IMPLEMENTATION

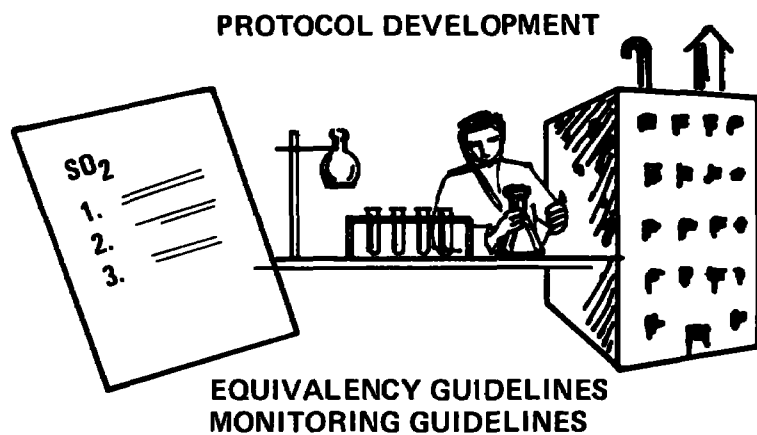


PROGRAM MANAGEMENT



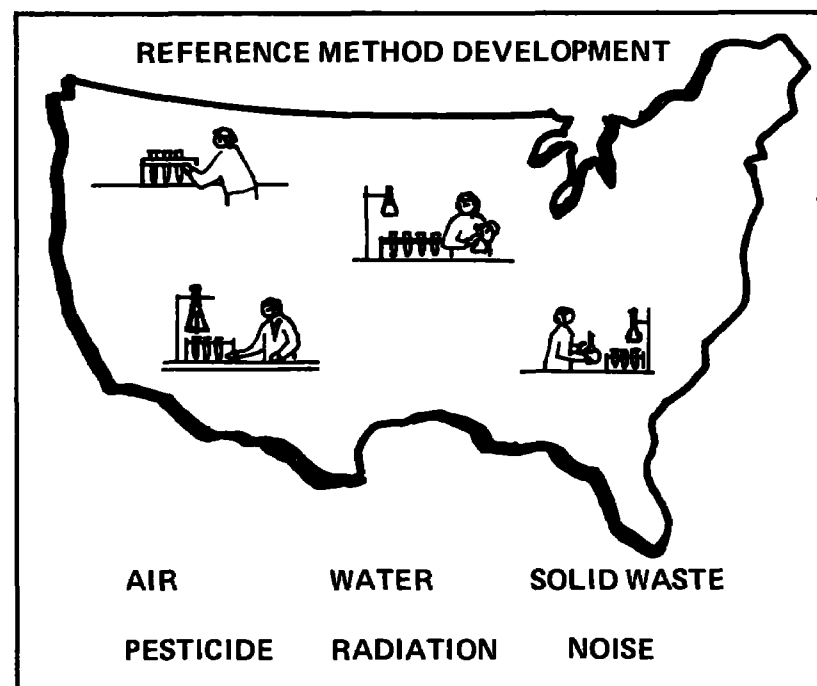
SAMPLING COMPENDIUM

ANALYSIS COMPENDIUM



PROTOCOL DEVELOPMENT

EQUIVALENCY GUIDELINES  
MONITORING GUIDELINES



REFERENCE METHOD DEVELOPMENT

AIR

WATER

SOLID WASTE

PESTICIDE

RADIATION

NOISE

TOTAL ANNUAL RESOURCE REQUIREMENTS BY PROJECT (STANDARDIZATION)

THE ESTIMATED ANNUAL RESOURCE REQUIREMENTS FOR STANDARDIZATION ARE BROKEN OUT BY PROJECT ON THIS TABLE. THE FIRST THREE PROJECTS SHOWN ARE FOR PROTOCOL DEVELOPMENT AND SHORT-TERM PROJECTS. FOR REFERENCE METHOD DEVELOPMENT, ONLY TOTAL FIGURES FOR MAN YEARS AND FUNDS WERE AVAILABLE. THE BOTTOM LINE SHOWS THE TOTAL COST OF STANDARDIZATION IN MAN YEARS AND FUNDS. CLEARLY THE BULK OF STANDARDIZATION RESOURCES IS TARGETTED FOR DEVELOPING REFERENCE METHODS.

## TOTAL ANNUAL RESOURCE REQUIREMENTS BY PROJECT (STANDARDIZATION)\*

	FIRST YEAR				SECOND YEAR			
	OM		NERC		OM		NERC	
	MY	\$1000	MY	\$1000	MY	\$1000	MY	\$1000
PROGRAM MANAGEMENT	2.4	86	--	--	6.7	240	--	--
INTERIM PROJECTS	2.3	78	4.5	135	2.3	82	1.5	45
GUIDELINES DEVELOPMENT	1.1	38	1.5	45	2.0	72	2.0	60
	MY		\$1000		MY		\$1000	
METHODS DEVELOPMENT	103		3100		130		3900	
TOTAL	115		3481		144.5		4399	

\*NOT INCLUDING STANDARDIZATION CARRIED ON OUTSIDE OFFICE OF MONITORING.

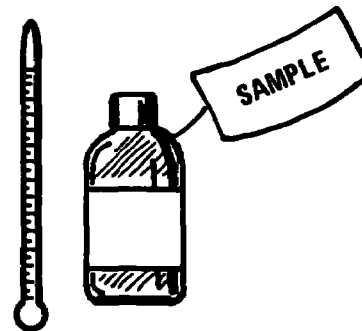
### QUALITY CONTROL PROGRAM IMPLEMENTATION

THE OTHER ELEMENT OF QUALITY ASSURANCE -- QUALITY CONTROL -- IS COMPRISED OF THE SIX MAIN PROJECTS SHOWN HERE. THE FIRST, ESSENTIALLY ONE-TIME, EFFORT WILL BE TO ISSUE QUALITY CONTROL GUIDELINES MANUALS FOR ALL MONITORING ACTIVITIES TO USE IN THEIR DAY-TO-DAY ACTIVITIES. INCLUDED WILL BE SAMPLE HANDLING PROCEDURES, TESTING PROCEDURES AND VALIDATION CHECKS. THE CALIBRATION MATERIALS PROJECT INVOLVES PRODUCTION AND TESTING OF SRMs AND SRSs, AND ESTABLISHING A SUPPLY AND DELIVERY SYSTEM FOR ALL ENVIRONMENTAL LABORATORIES. INTRALABORATORY QUALITY CONTROL INVOLVES ACTUAL QUALITY CONTROL OPERATIONS WITHIN ALL PARTICIPATING LABORATORIES. THE INTERLABORATORY QUALITY CONTROL PROJECT INCLUDES CROSS-CHECKING OF SAMPLES AND TESTING AMONG LABORATORIES TO ENSURE THAT UNIFORM AND VALID RESULTS ARE BEING ACHIEVED. THE EVALUATION PROJECT IS A MEANS OF COMPARING PROFICIENCY ON A NATIONWIDE BASIS BY ROUTINE CHECKS SO THAT PROBLEM AREAS CAN BE IDENTIFIED AND CORRECTED. EVALUATION WILL BE COMPULSORY FOR EPA MONITORING ACTIVITIES, AND OFFERED AS A SERVICE TO PARTICIPATING NON-EPA GROUPS. FINALLY, THE COMMUNICATION AND EDUCATION PROJECT ENSURES THAT THE LATEST INFORMATION ON METHODS, TECHNIQUES, AND INSTRUMENTS IS BROUGHT TO THE ATTENTION OF ALL USERS IN A TIMELY MANNER.

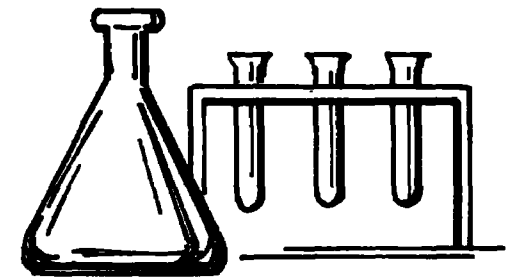
# QUALITY CONTROL PROGRAM IMPLEMENTATION



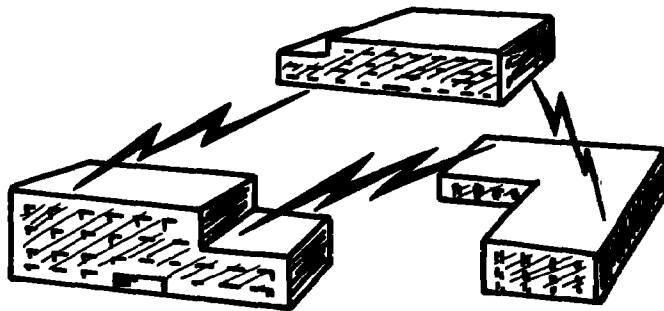
Q. C. GUIDELINES



CALIBRATION  
MATERIALS



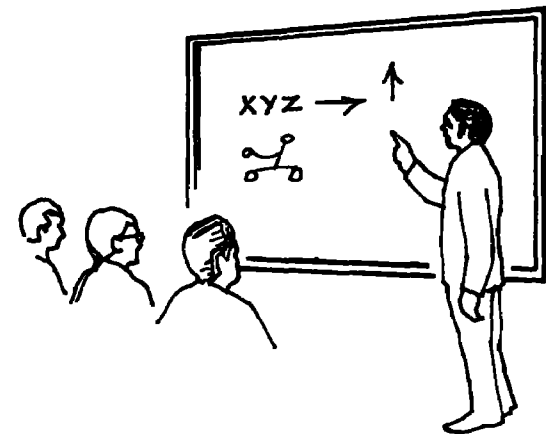
INTRALAB Q. C.



INTERLAB Q. C.



EVALUATION



COMMUNICATIONS AND TRAINING

TOTAL ANNUAL RESOURCE REQUIREMENTS BY PROJECT (QUALITY CONTROL)

THIS TABLE SHOWS THE QUALITY CONTROL RESOURCE NEEDS FOR THE FIRST AND SECOND YEAR OF OPERATION. BESIDES SPECIFIC PROJECT REQUIREMENTS, THE MAN YEARS AND FUNDS ARE SHOWN DIVIDED BETWEEN THE OFFICE OF MONITORING AND NERCs ON THE ONE HAND, AND THE REGIONS ON THE OTHER. THE LAST LINE SHOWS THE TOTAL ANNUAL REQUIREMENTS FOR QUALITY CONTROL.

## TOTAL ANNUAL RESOURCE REQUIREMENTS BY PROJECT (QUALITY CONTROL)

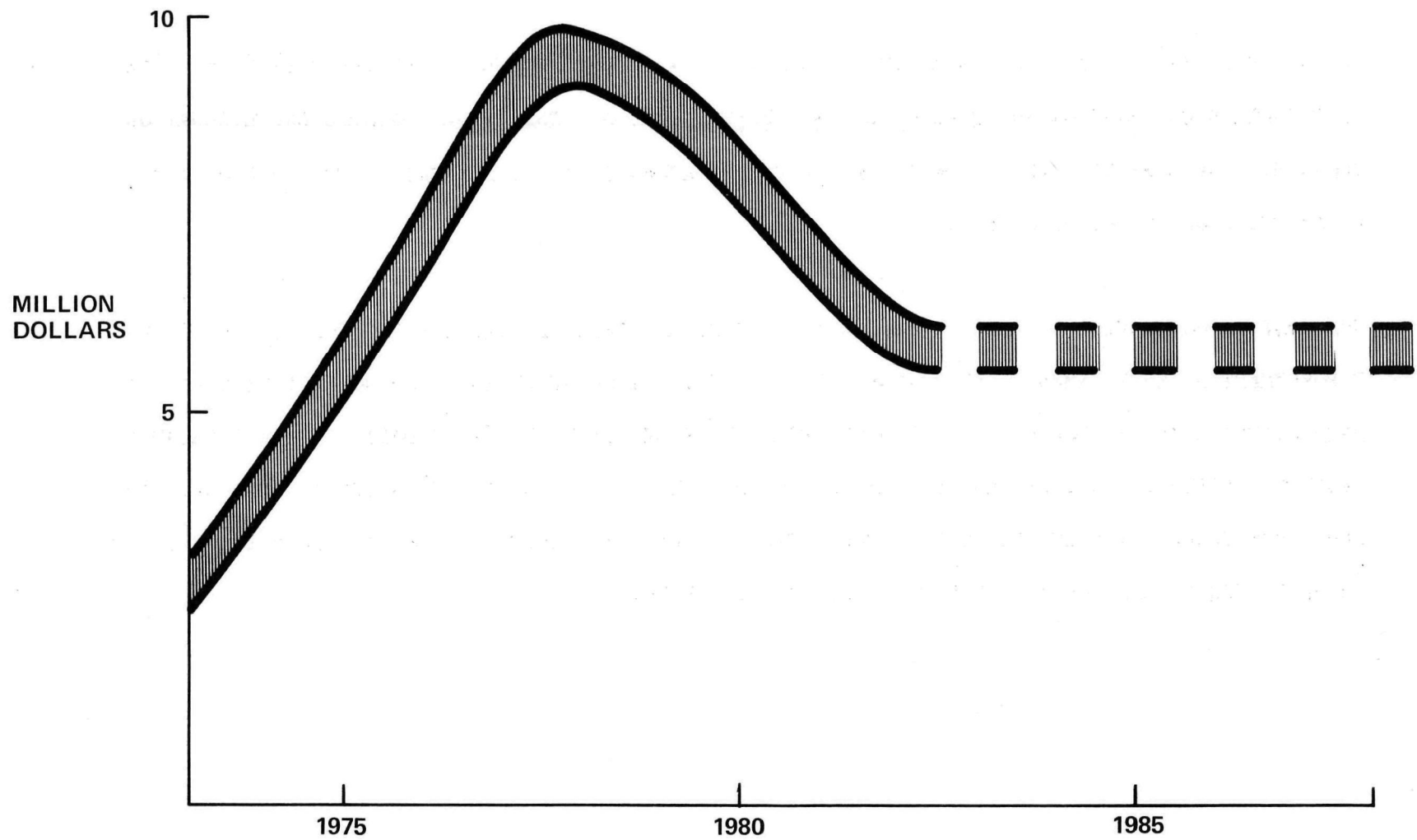
	FIRST YEAR				SECOND YEAR			
	OM AND NERC		REGIONS		OM AND NERC		REGIONS	
	MY	\$1000	MY	\$1000	MY	\$1000	MY	\$1000
GUIDELINES	5.5	703.5			6.1	799.4		
SRM <sub>s</sub> AND SRS <sub>s</sub>	9.2	593.5			13.6	859.4		
INTRALABORATORY QC	2.2	57.0	35	700	2.5	64.7	50	1000
INTERLABORATORY QC	15.0	700.0	15	300	22.4	1023.5	25	600
FIELD EVAL. OF INSTRUMENTS	8.8	336.0	10	200	14.5	714.7	10	250
SITE AND LAB EVALUATION	3.5	164.0	10	1900	8.1	379.4	20	500
CERTIFICATION	1.1	44.0			6.1	229.4		
COORD. AND COMMUNICATION	2.2	87.0			3.4	118.8		
TRAINING	4.5	125.0			8.5	214.7		
TOTAL	52.0	2810.0	70	3100	85.2	4404.0	105	2350



### RESOURCE REQUIREMENTS PROJECTIONS

THIS CONCLUDING RESOURCES VU-GRAPH SHOWS THE ESTIMATED RESOURCE REQUIREMENTS FOR QUALITY ASSURANCE PROJECTED FOR THE NEXT 15 YEARS. BECAUSE OF THE MANY UNCERTAINTIES OF COST PROJECTIONS AND FUTURE LEGISLATIVE REQUIREMENTS, THE CURVES ARE ONLY APPROXIMATIONS, BUT THE TRENDS SHOWN ARE CONSIDERED REALISTIC. THE MAJOR EFFORT OF ESTABLISHING METHODS AND DEVELOPING GUIDELINES WILL PEAK OUT AFTER AN INITIAL HEAVY INVESTMENT, AND THEREAFTER QUALITY ASSURANCE WILL CONTINUE AS A MORE ROUTINE EFFORT TO GUARANTEE VALID AND ACCURATE DATA.

## RESOURCE REQUIREMENTS TREND PROJECTION

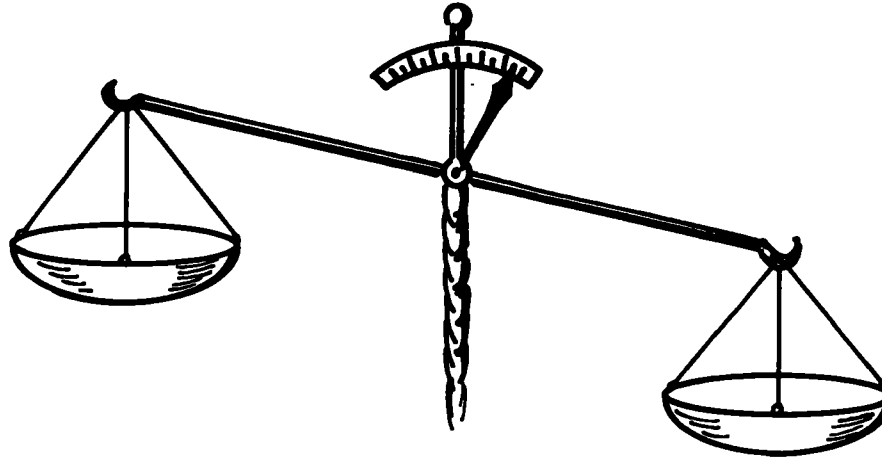


### COSTS OF QUALITY ASSURANCE VERSUS COSTS OF NO QUALITY ASSURANCE

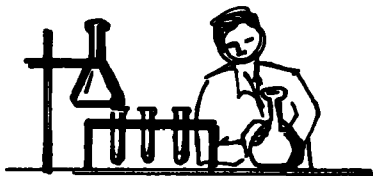
WE HAVE SEEN THAT AN ADEQUATE QUALITY ASSURANCE PROGRAM MUST INCLUDE INTENSIVE SCIENTIFIC WORK, AN ORGANIZED CALIBRATION AND QUALITY CONTROL EFFORT, AND A SUBSTANTIAL TRAINING AND EVALUATION PROGRAM. THE COST OF QUALITY CONTROL ALONE MAY BE ABOUT 10 TO 15 PERCENT OF THE COST OF THE ENTIRE MONITORING EFFORT OF EPA.

THE COST OF NOT HAVING RELIABLE DATA FOR THE ESSENTIAL NEEDS OF EPA IS EVEN HIGHER. SUCCESSFUL ENFORCEMENT OF ENVIRONMENTAL STANDARDS THROUGH COURT ACTION REQUIRES INCONTROVERTIBLE DATA. AN UNDERSTANDING OF THE POLLUTION MECHANISMS FOR POLICY DECISIONS REQUIRES DATA WHICH ARE SCIENTIFICALLY RELATED TO PROVIDE THAT UNDERSTANDING, AS WELL AS DATA WHICH ARE ACCURATE AND VALID IN THE FIRST PLACE. THE ENTIRE COST OF COLLECTING ANY DATA IS WASTED IF THE DATA DO NOT CONTRIBUTE TO OPERATIONAL NEEDS OR IF THE DATA CANNOT BE RELIED ON.

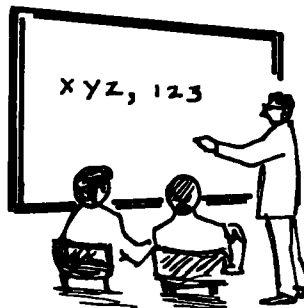
## COSTS OF Q.A. VS. COSTS OF NO Q.A.



10 - 15% OF MONITORING MONEY AND  
MANPOWER DEVOTED TO QUALITY CONTROL

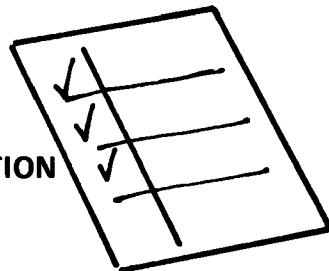


INTENSIVE  
SCIENTIFIC  
TESTING



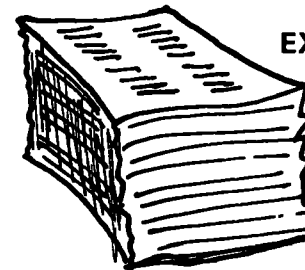
TRAINING

EVALUATION

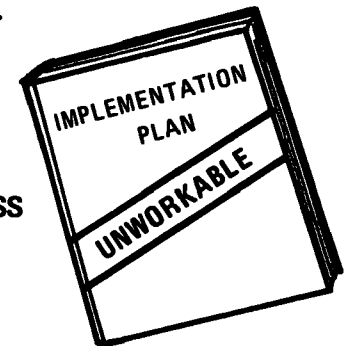


COSTS OF NOT HAVING RELIABLE DATA

ENFORCEMENT  
CASES  
LOST IN COURT



EXPENSIVELY  
COLLECTED  
DATA USELESS



FAULTY POLICY DECISIONS

### CONCLUSION

THROUGH COMPREHENSIVE, CLEAR PROGRAMS OF STANDARDIZATION AND QUALITY CONTROL DEVELOPED AND IMPLEMENTED BY THE DIVISION OF QUALITY ASSURANCE AND THE NERCs, AND SUPPORTED BY ALL ORGANIZATIONS ENGAGED IN ENVIRONMENTAL MONITORING, EPA WILL CONTINUALLY ENHANCE THE ACCURACY AND VALIDITY OF ITS DATA. QUALITY ASSURANCE PROVIDES BETTER DATA, AND BETTER DATA ENABLE EPA TO MAKE THE BEST POSSIBLE DECISIONS FOR THE ACHIEVEMENT AND MAINTENANCE OF ENVIRONMENTAL QUALITY.

