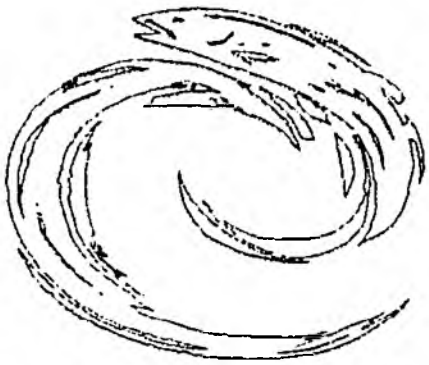
INVESTIGATE THE FEASIBILITY OF APPLYING QUALITY METHODS AND STANDARDS WITHIN THE WATER RESOURCES FUNCTION

P.A.BIRCHALL
WATER RESOURCES
MARCH 1993



NRA

NORTH WEST REGION

INVESTIGATE THE FEASIBILITY OF APPLYING QUALITY METHODS AND STANDARDS WITHIN THE WATER RESOURCES FUNCTION

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TECHNICAL MANAGER

(POLICY AND PERFORMANCES)

WATER RESOURCES

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CONTENTS

APPENDICES

INTRODUCTION

" The results of these company-wide Quality Control activities are remarkable , not only in ensuring the quality of industrial products but also in their great contribution to the company's overall business."

Dr. Kaoru Ishikawa 1981
Pioneer of the Quality Circles

The importance of quality as an objective within British industry is now widely recognised.

In today's business environment organisations, companies, and government authorities have to strive for a competitive edge . Quality , economy, effectiveness and efficiency, can provide the means to achieve it.

Customers are no longer regarding only the price of products or services as the major contributing factor to their final choice. Instead they are putting more emphasis on quality. It's obvious therefore that we are undergoing a period of change which affects any business, organisation and person, all of whom must strive for continuous quality improvement in order to remain competitive.

Quality systems in all types of business helps to improve the effectiveness , flexibility and competitiveness of that business as a whole and involves every department , activity, task and every single person at all levels. This requires all parts of the business must work together because every activity and every person affects and in turn is affected by others.

In terms of Water Resources , it is important that our customers, both internal and external, have confidence in the quality of our product and service. With future probabilities of sections of Water Resources being subject to **Market Testing** (In - House services in direct competition with the private sector) , quality will be an important tool in ensuring that we are able to compete on equal terms.

The introduction and implementation of a quality system within Water Resources is dependant upon a systematic approach to quality management. These systems are not readily available off the shelf , as they are influenced by our objectives, customer needs, the services we provide, and by existing procedures of the function.

Therefore to achieve maximum effectiveness and to satisfy customer expectations, it is essential that the quality system is appropriate to our activity and to our products and services offered.

WHAT IS OUALITY ?

The Oxford English Dictionary defines quality as :

" Degree or standard of Excellence, esp a high standard."

In fact we often use quality to signify "excellence" of product or service i.e. "Rolls-Royce quality" and "Top quality". For anyone who buys a Rolls-Royce, the car has quality which conforms to the price paid. For those who buy a Skoda, compared to the Rolls-Royce in terms of degree of excellence , it would be of inferior quality. However, the owner would have purchased the vehicle at a price that they could afford, when they wanted it, and would find the vehicle economical, practical and reliable. Therefore as the car meets the purchasers needs , to them it would be a quality product. The Managing Director or Chief Executive of a multimillion pound organisation would not purchase a Skoda as a company car even though it would be reliable and cost effective. The Skoda would be poor for the company image and would therefore be inappropriate for the use to which it would be intended. The vehicle does not meet the requirements of the MD therefore not a quality product. Therefore , the quality of a service or product is relative to the requirements of the intended user.

St.Michael is a name associated with quality. Customers shop at Marks and Spencers because they are guaranteed quality and reliability of product and service. In this instance customers have a quality awareness for their requirements.

It is necessary, therefore, to define quality in a way which is useful in its management . i.e. we must recognise the need to include in the assessment of quality, the requirements of the customer.

Quality then is simply "MEETING CUSTOMER REQUIREMENTS" or

" **FITNESS FOR PURPOSE** " Juran

It becomes necessary for companies, organisations and authorities to assess its customers , both internal and external, their needs and expectations and organise to fully satisfy them. To do this requires the implementation of a quality system.

The internationally recognised standard for quality systems BS 5750 / ISO 9000 defines quality as :

BS 5750 / ISO 9000 - Fitness for purpose and safe in the use sense.
Is the service provided or product designed and constructed to satisfy the customer needs.

Why is quality important?

In his 1992 Autumn statement, the Chancellor of the Exchequer enabled the private sector to meet public needs which have been traditionally met by the public sector. i.e Market Testing. This links well with the aims of the Citizens Charter.

The Citizens Charter contains 4 main themes. Quality , Choice , Standards And Value. It is important that customers have a choice, and see value for their money, (not necessarily the cheapest). The Citizen's Charter white paper made it clear that improvements in public service requires substantial expansion of competition, and these commitments were set out in the white paper "Competing for Quality" (Cm 1730, November 1991).

The objective therefore of Market Testing is to encourage fair competition between private and public sectors in order to give customers better value for money . This will undoubtedly result in some services, presently being supplied by public services, being met by private suppliers. Other services will remain In-House. Therefore in order to retain Water Resources services In-House , we need to be highly competitive.

In meeting customer needs , quality means providing exactly what the customer wants , when they want it, and at a price they can afford, thus providing complete satisfaction. If we are not able to respond in this way, the customer becomes dissatisfied , loses confidence and to put it bluntly, takes their business elsewhere. Other providers of the information or service will step in .

On 8th December 1992, at a Water Resources Awayday, staff looked at the possibilities of Market Testing , and the practical steps required to ensure that we retain our services in-house. It was generally felt that we need to be effective, justifying our work in terms of core activities.

We are able to set standards of service for these core activities, through PINs (Policy Implementation Notes), EC Directives, the Water Resources Act 1991, and BSI / ISO standards and others. Maintaining high standards of service ensures our competitiveness because any competitors bidding for our work would also be required to match our standards. Therefore we need to set ourselves achievable high standards and targets. These, coupled with our commitment, trust, local knowledge, and experience , should ensure that services we provide remain in-house. In order to provide value for money we need to ensure that the quality and standards we aim for meets the quality wanted. i.e it is not economical to use resources at a high cost , producing a "Rolls-Royce" service when lower standards will suffice. For example , if a customer requests a groundwater level measurement do we provide data resulting from a single dip test or provide data taken every 15 minutes via a datalogger. The latter option does not provide value for money if the single dip test will do.

A quality system , documented , will help us to address these requirements. The system will help us to identify exactly what we do and how we do it and whether it meets our own requirements of our corporate plan and NRA mission. After all , if we are to compete on a level playing field with the private sector, we must establish and implement a quality system to match or better those of our rivals.

Leading industrialists are repeatedly demonstrating that competitiveness , and survival, depends on very much more than just low prices. These include technical merit, aesthetic and functional characteristics, technical service, delivery, price and quality.

Any company can reduce its price in order to attempt to increase its market share. However, this tends to be very high risk, as other competitors will then follow suit to such an extent that quality and standard of service cannot be maintained. To be a successful service it is important to consistently demonstrate to our customers that we fully satisfy their needs.

Therefore if we fail in our duty to provide a quality and value for money service then the fear exists that the service we provide may be contracted out to the private sector.

So we should identify the need.

1. Define the service required to match that need.)
) These must be fixed for us
2. Define the quality required to match that need.) and our competitors.
3. Estimate the cost required to match that need.

Cost is where competition arises assuming 1 & 2 above are defined carefully enough.

WHO BENEFITS FROM THE INTRODUCTION OF A QUALITY SYSTEM ?

The introduction and implementation of a quality system benefits everyone who is associated with the organisation or department in which it operates. i.e The Authority, the employees and the customers. The perceived benefits are listed below:

Water Resources Department

1. Clearly stated quality.
2. Identification of our products and service.
3. Assurance that product and service meet a well defined need.
   i.e The NRA Mission and key Water Resources issues.
4. Provide us with clarity of objectives , therefore less wastage.
5. Better Value for money.
6. Clearly be seen to be Efficient, Economical and Effective.
7. Consistency of performance, independent of people.
8. Increased quality of data.
   7 & 8 above will lead to 9.
9. Increased customer support.
10. More freedom to manage.
11. Clearly documented system
12. Repeatability of tasks and activities. Doing it the same every time.

Employees

1. Increased employee motivation.
2. Pride and satisfaction.
3. Clearly defined procedures to follow in order to maintain standards.
4. Reliability of data on which to work.
5. Clear lines of development / career planning.
6. Defined training paths.
7. Sense of belonging : Feeling part of a team.
8. Commitment to quality.
9. Removes uncertainties.

Customers. Internal and External.

1. Better value for money.
2. The customer needs are satisfied.
3. Confidence that the intended quality is being achieved in the service provided.
4. Confidence that the quality of service is being maintained.
5. Confidence that we are complying with statutory requirements.
6. Clear lines of communication.

   They know who to contact if problems arise or standards are not met.
7. Ultimately a BETTER WATER ENVIRONMENT.

Some benefits identified for the authority are efficiency, effectiveness and economy , but how can we become efficient , effective and economical by introducing a quality system?

A good example of this can be shown by modelling work carried out within catchment resources. A large percentage of staff time is allocated to verifying data accuracy. If a quality system was installed which would ensure quality data at source , then low flow studies , modelling work etc. would be progressed quicker, becoming more efficient i.e. doing it right , first time. Modelling staff would become more effective , concentrating on performing their key activity (modelling) rather than verifying data. This would result in less time taken to complete the study therefore lower costs would be associated with it. The work carried out would become economical and better value for money. The quality of data can influence the quality of decisions taken, and which of course could have an economical outcome associated with it. If poor quality data is used , then possible solutions may not only be sup-optimal but also be technically unsound , with potentially severe consequences.

In a recent paper entitled " Quality Control of River Flow Data at the Institute of Hydrology " the I.H. addresses this problem . Ensuring good quality data has benefits already identified for the authority and for its employees. They are able to work with reliable , accurate and consistent data which increases motivation and removes the uncertainties of wondering if what they are producing is a quality service. Employees can quickly become demotivated if errors are found and work is held up awaiting verification.

It has been previously mentioned that if customers are dissatisfied with the quality of service provided in the private sector , they would go elsewhere. They have a choice. However, for services and products supplied by Water Resources ,i.e flow data, groundwater protection, resource management etc. customers presently don't have a choice. We effectively have a monopoly on looking after water resources.

Therefore we need to provide confidence to the public, that their money is being managed , through a quality system, in a cost effective way , to produce real improvements to the water environment.

WHAT IS REQUIRED TO IMPLEMENT A QUALITY SYSTEM ?

BSI , the BRITISH STANDARDS INSTITUTION , have produced a set of guide-lines to producing and implementing a quality system.

The **BS 5750 / ISO 9000** series are the national standards which tell suppliers and manufacturers what is required of a quality orientated system, identifying basic principles and specifying the procedures and criteria to ensure that products or services meet the customers requirements.

It sets out how to establish, document and maintain an effective quality system which will demonstrate to our customers that we are committed to quality.

The structure, resources, responsibilities and procedures of the Water Resources department all influence management decisions which in turn affect the quality of our work. It is important therefore that all relevant processes are clearly documented so that they are easily understood by appropriate personnel.

The quality system should also take into account other functions , such as purchasing, and training, personnel and accounts.

BS 5750 : Quality Systems

Part 8. Guide to quality management and quality systems elements for services.

ISO 9004-2

This part of the BS 5750 / ISO 9000 series provides a response to our awareness of the importance of quality aspects of the service we provide as Water Resources, and contains the following:-

Guide

1 Scope

2 Normative references

3 Definitions

4 Characteristics of service

4.1 Service and Service delivery characteristics

i.e Delivery times , processing times, responsiveness, accuracy etc.

4.2 Control of service and service delivery characteristics

i.e. Operational Performance measurements, OPMs are essential to maintain service quality

5 Quality system principles

5.1 Key aspects of a quality system

i.e. The customer is the focal point of the interaction between the Management commitment, resources, and the quality system.

5.2 Management Responsibility

Successful implementation of this policy is dependant upon the management commitment. Establishing a set of quality objectives and activities.

5.3 Personnel and material resources

Management should provide sufficient and appropriate resources to implement the quality system and achieve objectives.

(Including motivation, training and development, Communication)

5.4 Quality system structure

(Including documentation, and internal quality audits)

5.5 Interface with customers

Establishing good communication and relationships with customers.

6 Quality system operational elements

6.1 Marketing process

6.2 Design Process

6.3 Service delivery Process

6.4 Service performance analysis and improvement

DOCUMENTATION

It is not proposed at this stage to discuss all the aspects and contents of the sections listed above. However, one important requirement of any quality system is documentation and as such it is proposed to examine this section in depth and provide recommendations for possible future implementations .

A recent review of current Water Resources documentation for procedures and practices has shown that this is an area which requires considerable enhancement .
When talking about documentation, the first criticism which seems to be raised is that it involves a massive increase in paperwork. This is not the case! The standard requires documentation where the absence of such documentation would have an adverse affect on quality i.e. Document what has to be done in order to ensure quality and no more than that.

The need for Documentation

Why do we need to document our quality system ?

The prime purpose of documentation is to provide an adequate description of the quality system whilst serving as a permanent reference for the implementation of that system. It helps to ensure that practices and procedures are performed right, first time, every time. It helps to identify what we do !
Its very easy to sit back on one's laurels and say " I've done it like this for years, I don't need to follow work instructions and procedures . " However, the NRA will still be here (in some form or other) when we are all long gone.

A simple way of looking at the need for a quality documented system can be shown by this simple model.

		COMMON SENSE: YES	COMMON SENSE: NO
DOCUMENTATION	YES	QUALITY DOCUMENTED SYSTEM	BUREAUCRACY
	NO	CREATIVE CHAOS	CHAOS

The use of a quality documented system is very much dependant on common sense. Of course it must be said here that one person's common sense may well be different from that of another. The type , format , use , information it contains, should reflect the need for which it is used. It is clear from the model that if an organisation runs with no documentation and with no common sense, then chaos results. Where documentation does exist but which there seems to be no common sense behind any of it , i.e. " Why on earth do we fill this in ?", we have total bureaucracy. I believe that as Water Resources staff have a degree of common sense but do not have a documented system with which to operate then we are currently in a state of creative chaos. A quality documented system results from the right combination of common sense and documentation and, as we are providing important products and services to our customers, the quality system will help identify if we are providing them efficiently, effectively and economically.

Benefits of a documentation system.

It demonstrates the commitment from the functions Regional Manager to quality by having a signed quality policy for Water Resources.

It can be beneficial to customers by demonstrating that a quality system has been systematically planned, installed and documented, thus giving them confidence in our ability to provide a quality service.

It provides improved control of practices.

It ensures that the risk of errors is reduced and those that do occur are corrected effectively.

Provides continuity of the quality system requirements and methods of compliance.

It provides a basis for Audits to check that the function is complying with agreed documented procedures and continues to meet the authority's needs.

It is a system which ensures that the function continues to maintain standards of service, in the absence of key personnel.

The activity of documenting the structure, responsibilities and procedures requires deep analysis of our function. The result of this analysis will frequently clear up anomalies which may have come to light.

Helps to define performance measures which are sensible, measurable and workable.

Benefits of Documentation for Water Resources Staff

A vital aspect of any organisation which allows it to operate efficiently is the communication between the staff. The documented system assists in communication in a number of ways.

It ensures that all Water Resources staff are aware of the functions commitment to quality, its policy , standards and requirements.

It defines the system, and responsibilities so that everyone knows what is going on.

It ensures that all staff have the necessary information available to enable them to carry out their job satisfactorily.

It is an essential element in staff training, particularly with the introduction of new staff.

It improves communication between other functions, sections and people.

Benefits to External Bodies.

It can demonstrate to our customers and other competing organisations that we have a quality system in place , which in turn will provide assurance that we can provide a quality service and so be competitive in terms of possible future market testing.

WHAT IS A QUALITY DOCUMENT ?

A quality document can be one of a wide range within the function.

For example :

System Documents

Quality manuals, Quality Policy Statement, Document Control

Personnel

Organisational Charts, Job Descriptions, Experience

Procedure Documents

Data collection, river gauging, data validation, etc.

Processing Documents

Work Instructions, step by step.

External Interface Documents

Contracts, purchase orders, Reports, Data Requests,etc.

Records

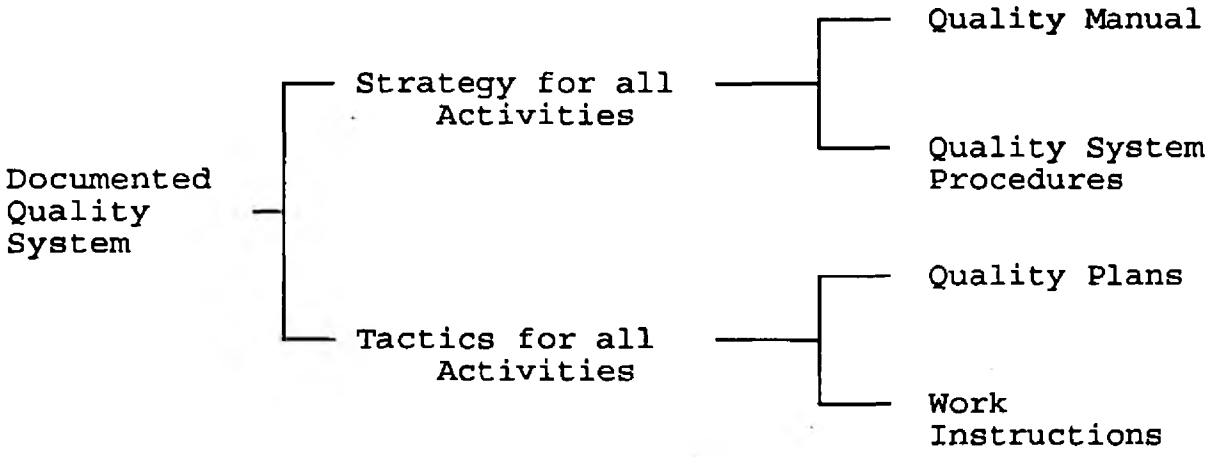
Test reports, Calibration Reports, Process Charts , Flow Diagrams, Files, reviews, training records, etc.

The documentation which is required is not an " Off The Shelf" set which could be used for any organisation. Instead, our function provides a service and products in our own unique way and the required documentation should reflect this. In essence, it is important for all Water Resources staff should feel that the quality documentation applies to them only, and it is for them to use. It is essential therefore that staff are involved as much as possible in the preparation of the system. i.e They will feel they have an ownership .

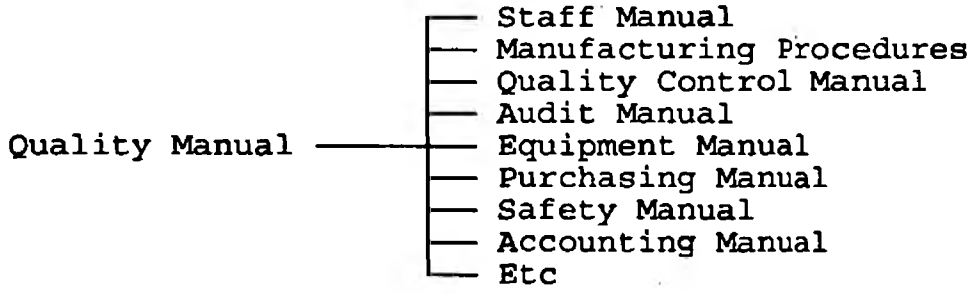
Structure

Some thought must be given to the structure of the documented system. Which ever structure is used must meet the requirements of our functions needs.

There are of course several structures that can be used. The use of a single manual is commonly used in small organisations. However , considering the size and diversity of operations carried out within the Water Resources function to produce a single manual would create a large document , difficult to manage and read. A good example of this is the Flood Warning Manual. This is quite a large and daunting manual to use, particularly for any newcomers to Flood Warning Team. Another system which has been used successfully is to split the structure into strategic and tactical documents. This produces a hierarchy of documents rather than a single manual.



Another alternative is to break the documentation down into discrete manuals with the quality manual acting as the index to where more detailed information will be found.



This system is similar to the current P.I.N.s being issued by Head Office .

Whichever structure is used it would need to be created once a review of all Water Resources procedures and operations has been carried out and would subsequently be designed to suit our own needs and existing documentation. i.e. PINs

PHYSICAL FORMAT

There are a number of points which need to be considered when deciding the physical format of the documented system.

For example:

Ease of assembly

Simple methods which all staff can follow.

Standard of Paper/Print

This will depend on who is the final recipient. i.e for office files, management files, or field operative.

Security

Will it fall to pieces whilst in use?

Protection

Will all parts of the documents be subject to heavy handling, contact with water, etc.

Ease of Updating

It must be possible to make amendments easily, removing and inserting pages.

The current procedure of issuing PINs from Head Office can be used as a template for our format.

Document Control

One of the most common failures of any system is the failure to control the documentation. Procedures which are inaccurate or out of date can effect the product or service we provide. It is essential therefore that a control system for documentation is established.

This system should include the following:-
Authority, Distribution, Amendments, Obsolete Documents, Copying, Identification, and Review.

Authority: Who has the responsibility to authorise procedures, issue and amend documents.
Distribution: Who are the recipients? Which extracts or sections will be copied and distributed if the recipient does not require the complete document.
Amendments: How will amendments be controlled to ensure that everyone receives a copy. i.e. receiving signatures etc. How should changes be identified ?.
Obsolete Documents : How will these be removed and destroyed?
Copying : How will this be managed to ensure that there are no uncontrolled copies in circulation.
Identification: How will various document types be identified, i.e date of issue, version number etc.
Review : A review of the system must be carried out regularly to ensure that it is operating efficiently.

PROCEDURES

What is a documented procedure ?

A **Procedure** is a description of what is to be done, by whom, when , in what order in order to achieve specified results. It should describe , the responsibilities, authorities and interrelationships of personnel who manage, perform , verify or review work affecting quality, how the different activities are to be performed, the documentation to be used and the controls to be applied.

A **Work Instruction** describes how a procedure is carried out, and usually cover the technical details of the individual tasks.

Format of Procedures.

All procedures to be effective should be consistent in their presentation so that users will become familiar with the layout and consistency of approach to each requirement.

As Water Resources presently does not have a documented system , procedures can be drawn up in to a format which suits our own needs. Within Hydrometry, staff are already appreciating the need for written procedures, particularly in terms of health and safety. Consequently, work has already begun on producing written procedures , an example of which is given in APPENDIX 1. This has been identified as a possible format for all future procedures.

Scope.

This outlines the department or group of personnel to whom the procedure refers.

References.

This section refers to other documents which have a bearing on the activity.

Purpose / Principles.

These are the objectives of the procedure.

Procedure.

These are the work instructions indicating what the activity consists of. This section should include who, when, where, how, and if necessary why the activity is taking place.

Other possible sections include: Safety, i.e. identified hazards at a site which staff should be aware of: Documentation, identifying forms or documents used in the activity: Definitions, where words or actions may not be clearly understood they can be clearly defined .

It is also possible to attach flow charts, check lists etc. if it is felt that they would help in the understanding of what is required.

A good example of a quality written procedures is or course BS 5750 and its associated parts. All of which include the above sections.

The Presentation Quality Manual

The quality documentation system is usually accompanied by a Presentation Quality Manual which contains the company wide information.

The minimum contents of the Presentation Quality Manual should be as follows:-

Title, Scope and Field of Application

Table of contents

How sections can be found and how they are coded.

Introductory Pages

This section should include general information concerning the Water Resources function and the quality manual itself.

The Quality Policy

The statement should be signed by the Regional Water Resources Manager.

This section should also demonstrate how the quality policy is made known, implemented and maintained.

Organisation

The internal structure of the Function

Elements of the Quality System

The description of the quality system should be set out logically revealing a well co-ordinated quality system. The order of described sections should be consistent with the order in the BSI standard.

Definitions

Definitions which are specific to the function

Amendment Record

Distribution List

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Having completed a review of Water Resources quality standards and procedures it soon became apparent that this is an area which requires enhancement. What was clear, however, is that Water Resources staff do undertake certain tasks and activities with quality in mind and work towards stipulated quality standards. In fact during the late 80s the Hydrometry section created a group of representatives entitled the " Quality Circle "

The aims and objectives of the quality circle were :-

- To get people involved in their work in a positive way
- To generate an awareness of the need for everyone to be concerned with quality.
- To develop the skills and abilities of the people in the organisation.

The idea was to identify problem areas which required a solution. Once identified facts were carefully collated in order to analyse the problem. A number of solutions were subsequently proposed to management for implementation.

The quality circle was therefore seen as a positive step into improving the quality of the product and services of the Hydrometric section.

Feedback from ex-members of the quality circle described how useful and enjoyable the exercise was. It is unfortunate that the process did not continue and develop for other sections within the Water Resources function. Perhaps once we have identified any problem areas with our activities , the quality circle group could be resurrected within all other sections to address these problems.

What the quality circle does prove however is that Water Resources staff are not newcomers to quality awareness and the concept of improving and maintaining quality. Today, Water Resources staff are working towards published quality standards.

For example,

Groundwater use the following standards :

BS 7022 : 1988

Geophysical logging of boreholes for hydrogeological purposes.

BS 6316 : 1992

Test Pumping of Water wells

WRc R&D Note 126 : 1992

Methodology for monitoring and sampling Groundwater.

APPENDIX 2 shows the Groundwater Sampling Record which is used and is designed with quality in mind. i.e questions reference the sampler.

Similar record sheets are used for Data Logger Installation and Downloading of Data. APPENDIX 3 & 4.

Hydrometry

Hydrometric staff endeavour to work towards various quality standards.

i.e. The relevant parts of BS 3680 Measurement of surface water and groundwater.

Licensing follow the guidelines and Operational performance measures as outlined in the National P.I.N.s (Policy Implementation Notes). i.e Licences of Entitlement TW/WR/001, Abstraction and Impounding Licences - Enforcement Policy TE/WR/005, The Measurement and monitoring of Water Abstraction , TE/WR/006.

In fact Head Office have supplied a series of PINs Volumes 1-9 , which cover many aspects of non - technical operations carried out by Water Resources staff, in particular, guidance on the Financial Memorandum , Scheme of Delegation, Purchasing, Contract Tendering, Personnel , Health and Safety etc. A Water Resources quality system would therefore need to be designed in such a way as to incorporate these P.I.N.s.

In Catchment Resources there are few procedures actually written down for staff members to follow. In fact the only procedure found was for Low Flow Estimation Methodology. APPENDIX 5

What is clear from the review is that most staff follow procedures which are not written down , their own experience has allowed them to perform the activities consistently. Our problem is simply what happens when these people move elsewhere. How can work procedures be passed on for future Water Resources Staff. What happens if key personnel are ill ?. Will other members of staff be able to perform the same operation , to the same standard ?. How do we specify these in terms of Market Testing. A good example of this are the flow charts , APPENDIX 6,7,8,9,10 , which shows quality checks are being carried out in the field by hydrometric and groundwater staff. However, these procedures are not written down .

Recommendation

It is recommended , therefore , that we must commit ourselves to implementing a quality system. After all , any increase in quality of standard of service we produce can only serve to benefit the department and the organisation as a whole. So we need to examine the following:

1) What will be our policy on quality ?

2) Who will be responsible for progressing the quality system ?.

3) Identifying who our actual customers are , both internal and external.

4) What are their requirements ?

5) Are we meeting these requirements ?

6) What do they think of the service we provide ?

7) What standards will we work towards ?

8) Do we wish to increase our standards ?

9) **Do we wish to decrease our standards ?**

9) Clearly identify and review our tasks and activities to see if they fulfil these requirements.

10) Flow chart all these activities. Hydrometry and groundwater staff have already helped by producing flow charts for some of their activities. These are shown in APPENDIX 6 - 10 .

11) On completion of flow charts , procedures can be written as part of the first stages of implementing a quality documented system.

12) Decide on the sort of system needed to control documentation and subsequent changes.

13) What records are required ?

14) Once installed how do we keep the system effective ?

15) Can we audit the system ?

These were just a few pointers to begin with.

Whilst writing this report , some of the above points of action are already being addressed by members of the hydrology staff based at Richard Fairclough House. Part of their tasks is to produce Hydrofax data for display around the region and area offices. The format of the display and information supplied is being reviewed so as to produce what the customer wants, (4, 5, 6) of the action list. A questionnaire has been circulated to approximately 50 internal customers . APPENDIX 11 . This is a useful exercise which should be repeated for all our activities and customers. Once again this shows that Water Resources staff are already quality conscious.

What is clear is that the definition and implementation of the system will not happen over night. If the chosen way forward is to fully implement quality effectively to a standard capable for accreditation to BS 5750 / ISO 9000 it will take months if not years to achieve. However, benefits will begin the moment we start and if we are committing ourselves to quality we need to start now . We need to get all staff aware of our commitment and produce something soon for them to see. Maybe a signed quality policy statement . Recreate the Quality Circle . Begin to identify what we do.

At this stage the idea of implementing a quality system appears to be a daunting concept , so in order to focus it we should start by identifying a single core activity per section, and then dissecting it to analyse how quality control can be applied to each element. As this would involve all sections , everyone would become aware of managements commitment to quality. They would also begin to feel an ownership of the system, imparting their own knowledge and experience into its design. This would be a useful exercise which would give us an objective view of how things are done . In terms of Market Testing , this process could show just how time consuming an activity was because of the quality considerations. It is recommended that this initial phase should concentrate on activities (1 from each section) which may be susceptible to Market Testing.

During a recent Water Resources Management Meeting on 21st January 1993, a list of possible activities which could be suitable for Market Testing was discussed. These included :-

Hydrometry :	Design of gauging stations
	Provision and maintenance of gauging stations
	Monitoring of boreholes, gauging stations and raingauges
	Rating of gauging stations
	Data processing and archiving
	Provision of data to internal and external customers
	Provision and maintenance of vehicles.
Resource-	
Planning	Yield and resource assessment
	Demand Forecasting
Licensing:	Determination of licences
	Licence Enforcement
	Licence database and provision of register.
Operational-	
Management:	Operation and Maintenance of NRA schemes
	Section 126 compliance
Resource -	
Protection :	Compliance with policy and standards.

We could consider any one of these activities for our initial process but it is generally felt that data quality (the quality of the field data which we acquire) is fundamental to the whole of the business of Water Resources. It is recommended that instead of prioritising the list above we examine activities which involves Data Collection.

These should be : **Groundwater Sampling**

River Gauging.

Hydrometric Data Validation

The activity list above shows that data collection includes a wide range of tasks. i.e Collection, processing , archiving , provision etc. and that the river gauging or sampling is only the initial step in a long interrelated system. Therefore having looked at these initial steps , the process then continues to expand to encompass all other related processes.

It is also recommended that in order to involve all sections , then in terms of Licensing we should be analysing the **Licence Enforcement**.

Having identified what tasks we perform in relation to these activities, it is recommended that the Quality Circle be resurrected and use members to analyse them in terms of Quality, The Three E's , and Market Testing. This will provide a good foundation for the process of implementing a quality system , bringing together all aspects discussed at the Water Resources Awayday on 8th December 1992.

One important factor which must be mentioned here is the resources required to implement a quality system. As previously stated , the implementation isn't going to happen over night. In fact a great number of mandays would need to be allocated. For example, using the national chart of accounts to identify tasks and produce flow charts, could take approximately 99 mandays to complete.

Depending upon the detail required this equates to 33 tasks , 3 days per task (but possibly less) to complete = 99 mandays .

The cost for this could be 99 mandays * grade 6 (Average) * 2 (Overheads)

= £ 14.5k

Therefore , it could be said that if we " Do Nothing " we would save £ 14.5k. Obviously , to fully implement a quality system will have associated costs far in excess of this .

It must be stated of course that in the long term the benefits could far outweigh the costs. i.e greater productivity of modelling work, faster turn-round times for data request, decrease in time for data validation, i.e become more efficient , effective and economical, benefits of which would pay for the implementation of the quality system. Once installed costs of auditing and maintaining the system would be much smaller than its initial design, and so benefits would be greater.

Hopefully, in this document, I have looked at what quality is, why we need it, why its important, and how we begin to implement a quality system. General feedback from most Water Resources staff is that they are enthusiastic on progressing the recommendations.

The document looks at implementing the system for the Water Resources department, but it could equally be applied to the NRA as a region, or NRA as a whole. If Head Office pursue further their commitment to quality systems for the NRA as a whole, then we must be in a position to integrate its requirements with our functions system. It would be ineffective to have two separate systems. However, the effort put in in advance would not be lost , more over a culture of quality management would actively be developing within Water Resources in the region. We must therefore carefully watch for any national initiatives towards quality standards.

Quality is an important tool for Water Resources in the future to remain competitive for Market Testing, and being able to provide confidence to our customers that we are managing our operations in an effective way which ultimately " MAKES A DIFFERENCE ON THE GROUND " , helping to protect and improve our most important natural resource in the North West of England, **WATER**.

Quality is therefore :

A POSITIVE CONTRIBUTION TO A BETTER BUSINESS

BSI Quality Assurance

NRA

APPENDIX 1

NATIONAL RIVERS AUTHORITY , NORTH WEST REGION.	
HYDROMETRIC INFORMATION MANAGEMENT	PROCEDURE NO.
	ISSUE DATE
HEALTH AND SAFETY	VERSION NO.
	PAGE 1 OF 2

1. SCOPE

1.1 Maintenance Tests and Examinations of Crewfit Automatic Self Inflating Life Jackets to be carried out by Hydrometric field staff.

2. REFERENCE

Refer to :-
2.1 Document ******* "Life Jacket Register of Inspection"
2.2 Manufacturers document No. *******
2.3 NRA Health and Safety manual Page.....

3. PRINCIPLE OF METHOD

3.1 This procedure is required in order to carry out monthly and annual inspections of Crewfit Automatic Self Inflating Life - Jackets in line with Health and Safety Regulations.

4. PROCEDURE

4.1 Monthly Inspection

4.1.1 Visually inspect the webbing and stitching for signs of chaffing or wear.

4.1.2 Visually inspect the bladder for signs of wear or contamination with oils or greases.

4.1.3 Unscrew and remove the CO_2 gas cylinder, check seal at top of cylinder.

4.1.4 Unscrew and remove the automatic capsule , inspect the capsule to check that it is not obstructed and that the capsule has not fired.

4.1.5. Inspect the firing head and test its operation, check that the firing pin travels forward freely.

4.1.6. Manually inflate the bladder and check for leaks. Deflate the bladder by reversing the cap on top of the oral inflation tube.
Replace the cap correctly.

PREPARED BY AUTHORISED BY

4.1.7 Rearm the inflating device.

4.1.8 Check the whistle.

4.1.9 Re-fold the life-jacket.

4.1.10 Enter the results of the inspection in the Life Jacket Register of Inspection . Document No. *******

4.2 Annual Inspection

4.2.1. As per monthly inspection 4.1.1 and 4.1.2.

4.2.2. Test operate the inflation of the life-jacket by immersing it in clean water, The life-jacket must inflate within 5 seconds.

4.2.3 Allow the jacket to dry manually.

4.2.4 Remove the used automatic capsule and gas cylinder.

4.2.5 Check the operation of the firing pin.

4.2.6 Rearm the inflating device.

4.2.7 Refold the life-jacket.

4.2.8 Enter the results of the inspection in the Life Jacket Register of Inspection . Document No. *******

5. SAFETY

5.1 Any repairs to the life-jacket must only be made by the Manufacturer.

5.2 Any defects discovered during the inspection or test must be reported to the Section Head

5.3 Completed registers should be retained for 1 year.

PREPARED BY AUTHORISED BY

Groundwater Sampling Record

APPENDIX 2

SITE NAME: ----------

SPT number	Date ddmmyy	Time hhmm
908		

Sampler		Sample Number	

Purpose Code	Material Code	Weather
NSC	2E	ZZZZZZ

Temp 'C	Flow Ml/d	Flow Est. Ml/d	DO% satn

Comments

Extra Field Results

Extra Tests Requested

Full / Partial Anal. F

SAMPLER:

-Is there a header record already on the system ? Y/N

-If no, have you set one up (it is YOUR responsibility) Y/N

Date sample into lab: ----/----/----

Date analysis received from lab: ----/----/----

Notes:

1. Purpose Code:
   - NSC Z = general use, routine purposes for release to the public
   - R = waste disposal monitoring
   - P = private sources -confidential
2. Comments:
   - specify if depth or pumped sample
   - include pumping rate, duration of pumping/recovery
3. Extra Field Results:

   Determinand Codes
   - 0006 = sample depth
   - 9053 = water level
   - 9054 = total depth
4. Full Analysis: SGA + toxic metals + COD

NRA

GROUNDWATER DATA LOGGER INSTALLATION SHEET.

REASON FOR THE LOGGER INSTALLATION.

(A) GROUNDWATER MONITORING NETWORK. ☐ PLEASE TICK

(B) PUMPING TEST. ☐ APPROPIATE

(C) SPECIAL INVESTIGATION. ☐ BOX.

LOGGER INSTALLED BY. _____

BOREHOLE SITE NAME. _____

W.R.B. Nº _____

DATE LOGGER INSTALLED. _____

MODEL OF LOGGER _____ LOGGING CAPACITY _____

LOGGER SERIAL Nº _____ LOGGING FREQUENCY. _____

TRANSDUCER SERIAL Nº _____

TRANSDUCER TYPE _____ BAR RATING _____ BAR.

TRANSDUCER SENSITIVITY VALUE _____ MV/V/BAR.

TRANSDUCER CABLE LENGTH. _____ METRES.

TRANSDUCER INSTALLED AT A DEPTH OF _____ M.B.D.

BOREHOLE T.D. AT TIME OF INSTALLATION _____ M.B.D.

BOREHOLE R.W.L. AT TIME OF INSTALLATION. _____ M.B.D.

DESCRIPTION OF DIPPING DATUM. _____

COMMENTS. _____

_____

_____

DATE LOGGER REMOVED _____

LOGGER REMOVED BY. _____

DATA LOGGER DOWNLOAD RECORD SHEET.

APPENDIX 4

BH. SITE NAME. _____

WRB N°. _____ RWL. _____ MBD. TIME _____ : _____ GMT.

LOGGER DOWNLOAD DATE _____ LOGGER BATTERY. _____ %

MICROSCRIBE N° _____ DIRECTORY FILE N° _____

DOWNLOAD DATA PERIOD FROM. _____ : _____ G.M.T.

" " " TO _____ : _____ G.M.T.

N° OF READINGS LOGGER SET FOR. _____ FREQUENCY. _____

N° OF LINEAR READINGS RECORDED. _____

MINIMUM READING . MBD. MAXIMUM READING . MBD.

DATE & TIME OF LAST LOGGED READING. _____ : _____ GMT.

LAST LOGGED WATER LEVEL _____ MBD. _____ : _____ GMT.

LOGGER SCREEN LEVEL AT TIME OF DIPPING . MBD. ("A")

DIPPED WATER LEVEL READING . MBD. ("B")

"A" WL, . M MINUS "B" WL, . M = . M ERROR

MULTIPHASE Y / N

N° OF PHASES

PHASE	TIME FREQ	N° READINGS	PHASE	TIME FREQ	N° READINGS	PHASE	TIME FREQ	N° READINGS.

COMMENTS. _____

NEW PERIOD START TIME : GMT.

TRANSDUCER SENSITIVITY VALUE . MV/V/bar

LOGGER REFERENCE LEVEL (DIPPED READING) . MBD.

READING FREQUENCY REQUESTED. _____

N° OF READINGS LOGGER SET FOR. _____

FIRST READING NOTED AT . MBD : GMT.

DIPPED " " " . " : GMT.

SIGNATURE

WORKING COPY

APPENDIX 5

LOW FLOW METHODOLOGY

MDO 13-6-90

1. GAUGING STATION

For a low flow estimate at a gauging station use the estimate derived from the data if available and there is confidence in the measured data.
At present the only figures readily available are those quoted in the Low Flows Vol 2 and I.H. hydrological yearbooks, however not all gauging stations are listed. Updates from I.H. for these and other gauging stations are expected in 1990.

2. UNGAUGED SITE

For all other sites an estimate of low flow statistics must be obtained using the I.H. Low Flow System, with reference to nearby gauged sites if the data is available.
This document attempts to outline the procedure of obtaining all the necessary information to provide a low flow estimate at any site on a river system.
The Low Flow estimate consists of the Natural component and the Artifical component. The following steps explain how to obtain these two components.

2.1 Natural component

- Obtain the grid reference
- Locate stream length on the maps
- Obtain a) downstream ID code
  b) upstream ID codes
- Interpolate estimates to the point of interest for 95%, modal, mean.
- Draw a quick sketch with u/s and d/s values to provide a quick check on the figures. Check that the interpolated value does infact lie between the u/s and d/s values.

2.2 Artificial components

2.2.1 Reservoirs

NOTE: natural lakes are treated separately.

- Look for the FIRST reservoir pencilled in on the I.H. maps upstream of the point of interest on EVERY tributary.
- Obtain the stream ID code of the dam, and therefore the natural component for 95%, modal and mean.
- Subtract the reservoired catchment estimates from the natural component for the point of interest.
- Ignore all other artificial components in the catchment upstream of the reservoir.
- Obtain the figure of any compensation flow downstream of the dam and add this single figure to all statistics (95%, modal,

mean)

* Repeat for the first reservoir on each tributary upstream of the point of interest.

NOTE : In complex situations check where the compensation is released, eg. Rivington.

2.2.2 Natural Lakes with Abstraction

If a lake has a natural outflow which is determined by the level in the lake, it is treated as a natural lake with abstraction. In the case of Ennerdale the Lake acts as a natural Lake when the lake level is above the weir crest, but acts as a reservoir when drawn down below the weir crest. The procedure for Low Flows on R. Ehen is given in Appendix1. If any other similar cases become apparent, they must be analysed as necessary.

The procedure for natural lakes is as follows:

* Determine the abstraction figure
* Determine any "hands off" figure
* Determine the natural component at the Lake
* If the 'natural' estimate at the Lake is less than the "hands off" do not subtract the abstraction, otherwise subtract the abstraction.

2.2.3 Licenced Abstractions

* Obtain a list of all the licenced abstractions above the point of interest
* Progress through the list eliminating any abstractions which have a negliable impact on the statistics, using the list compiled by Darren to help.

The following abstractions are of no interest to Low Flows:

- Abstractions with 100% return to RIVER (note returns to Sewer do produce a nett abstraction)
- Domestic purposes (these tend to be very small)
- Any abstraction which is so small as to not effect the final answer to 3 significant figures.
- Any abstractions that are only used infreqently (eg a few times a year)

* All spray irrigation abstractions are to be totalled separately and used at the maximum or apply a percentage as appropriate.
* For the remaining abstractions a nett abstraction should be obtained , using the annual licenced amount not daily or hourly. The percentage returned should be estimated from the licence,returns or inspections sheets. Any abstractions which do not appear straight forward should be investigated by looking at the appropriate document or speaking to a member of the licencing team.
* Care should be taken to take into account residual flow conditions, and nett abstractions when the natural flow is less than the abstraction.
* Note that once a decision has been made on how to deal with a

particular abstraction this is unlikely to change unless the licence changes, therefore past Low flow calculations on the same river are helpful. Be aware of new licences granted since the last analysis though.

2.2.4 Sewage Treatment Works

- Locate on the Aqua maps all STW upstream of the point of interest, remembering to ignore catchments upstream of reservoirs.
- Obtain the design DWF and actual DWF if available
- If there are large differences between the design and actual DWF consult EQ+PC staff, otherwise use the design figure.
- Add the DWF to the natural component.

The final Low flow estimate will consist of Natural and Artificial components as appropriate.

Natural - Reservoir + Compensation - Abstractions + STW Discharges

2.3 Gauged Information

The system will eventually be developed whereby nearby gauging station information can be used to adjust the information in the catchment

3 Small Catchments

Estimates for stream lengths that are not represented on the IH system must be calculated using ADF from rainfall information.

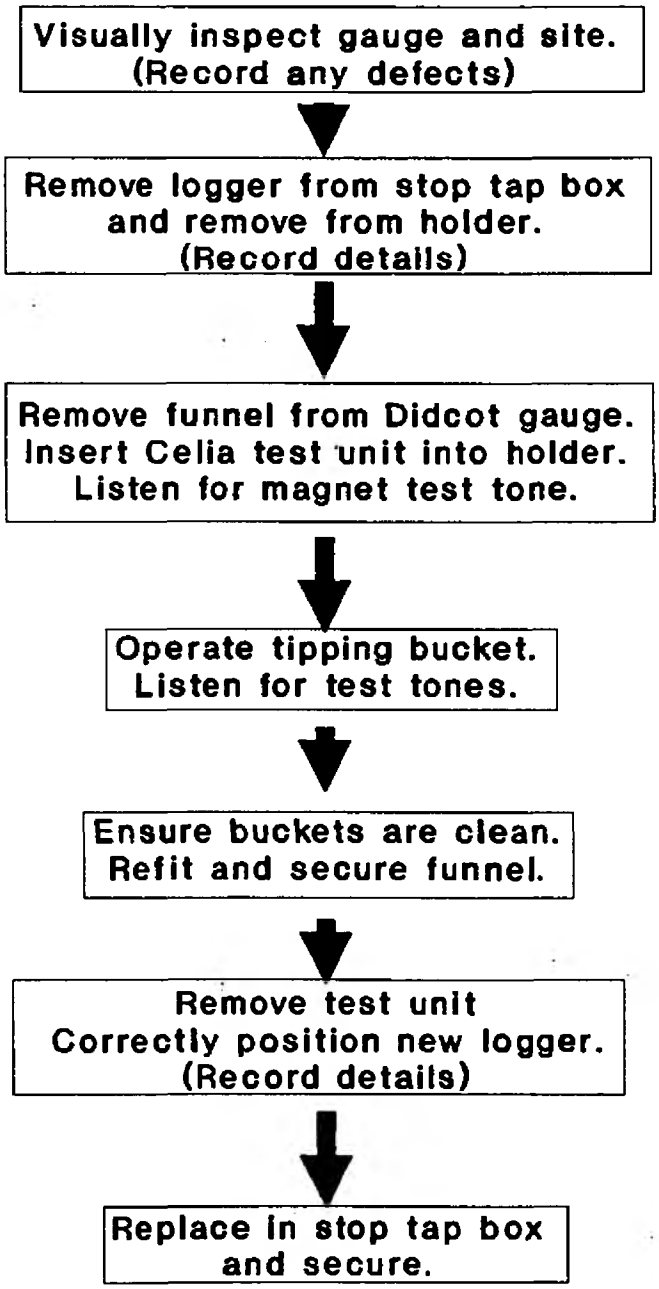
- Identify catchment boundary on appropriate map.
- Calculate the catchment area
- Determine the average annual rainfall
- Determine the average annual evaporation
- Calculate the average daily flow (AAR-AAE)*AREA/365 (Ml/d) [AAR (mm), AAE (mm), AREA (sq km)]
- Determine the ratio ADF:95%,and ADF:modal at the nearest point on the IH system and apply to ADF to get estimate of 95% and modal.

3a) SMALL CATCHMENT 1 KM^2 OR LESS FOUND ON IH DIGITISED NETWORK. QUOTE IH FLOWS BUT ADVISE MEASUREMENT REQ'D.

SMALL CATCHMENT 1 KM^2 OR LESS NOT DIGITISED DO NOT QUOTE, BUT ADVISE MEASUREMENT REQ'D.

(N.B. CHECKING BY CATCHMENT AREA CANNOT BE CONSIDERED RELIABLE, BELOW 1 KM^2)

"CELIA" RAIN GAUGE LOGGER CHANGE: FLOW CHART



HYDROMETRY NORTH 27-11-92

"Celia" Rain Gauge Logger Change:Method Description.

1. On approach, visually inspect gauge for level and for any obvious damage or undue sheltering from objects or vegetation which may adversely affect the site record. Ensure any stock fence or compound around gauge is sound.

2. Using correct tool remove stop tap box cover and pull out "Celia" logger in its holder.

3. Remove the current operational logger from its holder noting date and time if necessary.

4. Remove the three Allen screws securing the collecting funnel of the "Didcot" rain gauge and carefully remove the same, checking the funnel spout for blockages and clear if required.

5.* Note the amount of any rainfall left in the tipping bucket and collect.

6. Fit "Celia" test unit into holder and ensure that there is an audible two second tone from the test unit indicating that the holder magnet is O.K.

7. Operate the tipping bucket, ensuring that a high pitch tone emanates from the test unit for each tip. this indicates that the rain gauge magnetic switches are functioning correctly.

8. Ensure tipping buckets are clean, free from debris and undamaged.

9.* Replace water in tipping bucket. (As point 5.)

10. Correctly position, replace and secure rain gauge collecting funnel.

11. Remove "Celia" test unit from holder.

12. Write site details and date on label of new logger unit. (As per office requirements)

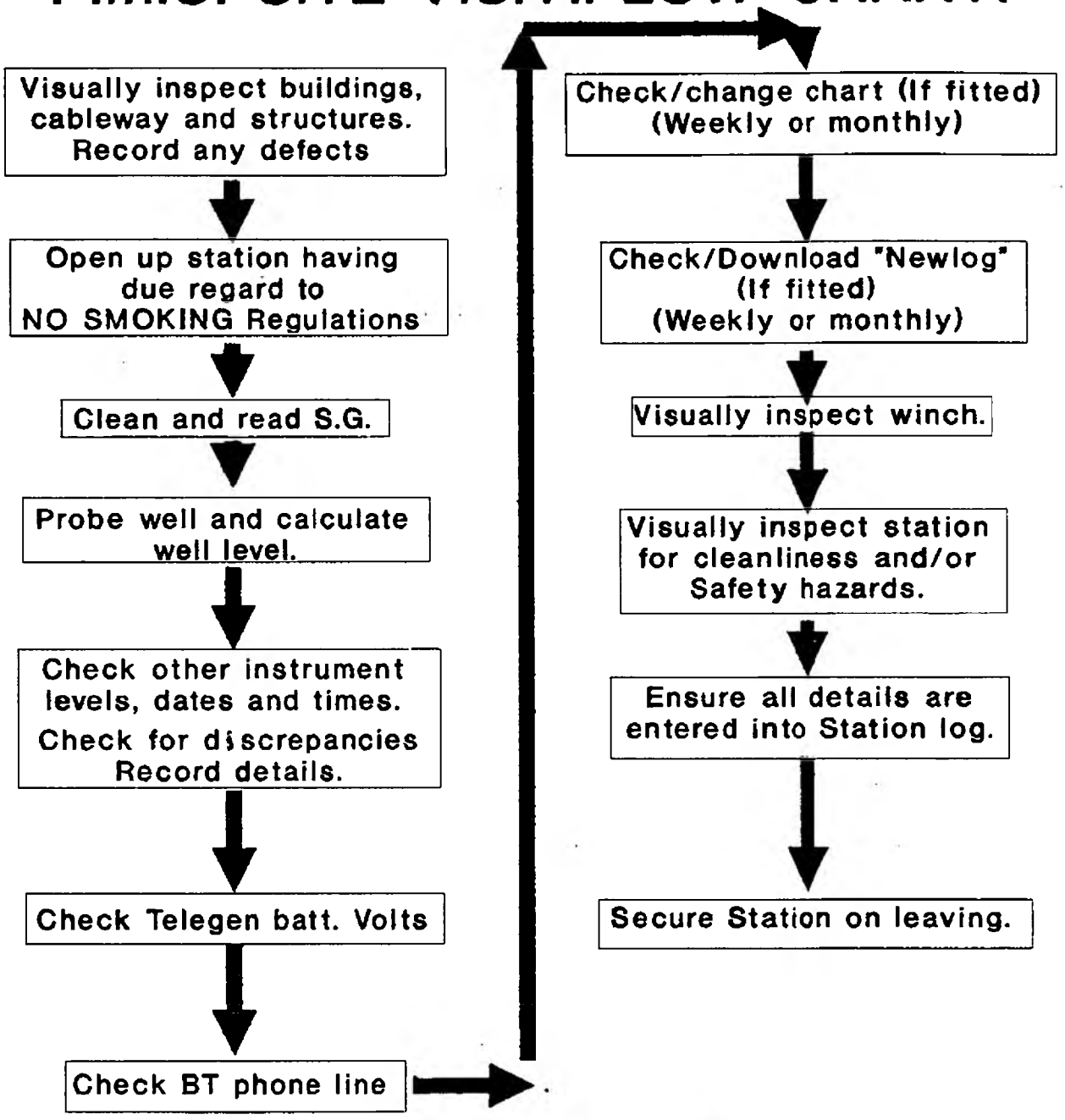
13. Correctly position and install new logger to "Celia" holder.

14. Replace logger, in its holder, into stop tap box.

15. Refit and tighten stop tap box cover.

*Items 5 & 9 may or may not be carried out.

F.M.S. SITE VISIT:FLOW CHART.



Hydrometry North 30-11-92

F.M.S. SITE VISIT. INSTRUMENT CHECK AND CHART CHANGE :- METHOD DESCRIPTION.

1. On approach to station visually inspect station site for any signs of damage or acts of vandalism to station building(s), cableways, structure or weirs which may adversely affect the efficient working of the F.M.S.

2. Open up station bearing in mind "NO SMOKING" regulations, allow station building to vent.

3. Proceed to staff gauge, clean as required, noting any possible movement or disturbance.

4. Read staff gauge and note reading.

5. Return to station and using diptone probe station well.

6. Subtract probe reading from station datum well and determine station well level. Record details in station log book.

7. Activate telegen, (if fitted) to display in turn its well level, time and date. Check for discrepancies in data. Record levels in station log book.

8. If there are discrepancies look for any obvious causes, eg blocked inlet, trapped float wires etc, if possible rectify, if not, note problem. Record details in station log book.

9. Remove telegen cover and test the "on load" battery voltages. If below 7.5V replace batteries. Record battery volts in station log book. Replace Telegen cover.

10. Insert portable phone into BT socket and check phone line. If line is faulty isolate telegen from line to ensure where fault lies. Remove portable phone, take appropriate action.

11. IF WEEKLY AUTO CHART FITTED:-
    a) Remove chart drum.

    b) Wind up clockwork mechanism of instrument clock **OR** press "Batt Test" button of electric clock.

    c) Fill in table of details on chart to remove. Inspect trace for abnormalities to record and note any. Remove "old" chart.

    d) Fill in table of details on "new" chart and fix chart to drum.

    e) Check float wire and pen carriage move freely.

f) Position drum to instrument and position pen to correct time, date and level.) Secure instrument lid or cover.

12. IF MONTHLY AUTO CHART FITTED:-
As weekly chart change, if weekly visit:-

a) Open instrument cover door, wind up clockwork mechanism of instrument clock OR press "battery test" button on electric clock.

b) Record details of time and date and compare with auto time. Record details of SG, well, Telegen levels and compare to Auto chart level, adjust Auto details as required.

c) Check that float wire and pen carriage move freely. Ensure pen is making trace and secure instrument door.

13. IF "NEWLOG" LOGGER FITTED
INSPECTION VISIT

a) Plug in comms link of Psion with appropriate soft-ware and switch Psion "on" exe.

b) Select "status" on menu then exe "State" on sub-menu.

c) Display reads "Talking" then should read "Logging". Check time and date.

d) Return to sub-menu and select "Input" and exe. This should display current level value.

e) Record details on station Log sheet.

f) Return to main menu and switch Psion "Off"

g) Unplug Comms link and replace "Newlog" output socket dust cover.

DATA DOWNLOAD VISIT.
As above a)-d)
h) Return to main menu.

i) Select "Start/Stop" and exe. Display reads "Stop Logging Y/N". Select Y.

j) Return to main menu.

k) Select "Status" and exe. Select "State" and exe. Display reads "Talking" then reads "Standby", this confirms logger has stopped logging.

l) Return to main menu.

m) Select "Data" and exe. Select "Read" and exe, select "Y". Psion then reads data and when finished displays "Transfer OK".

n) Return to main menu and switch Psion "Off". Replace Rampak and repeat l) and m).

o) Return to main menu.

p) Select "Start/Stop" and exe. Display reads "Talking" and should then display "Logging". This confirms the logger has started logging.

Repeat e)-f)-g).

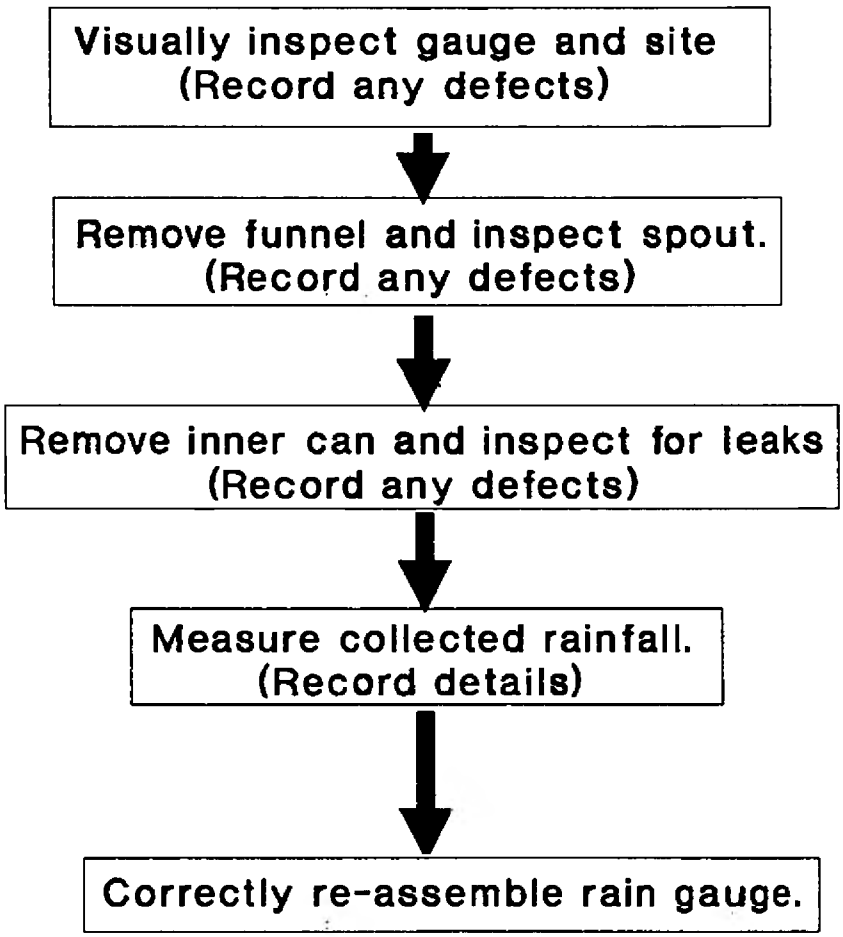
14. Visually inspect winch to ensure traveller trolley and cable are locked in position and that there is no obvious damage.

15. Check station for general cleanliness and any safety hazards.

16. Ensure all details are filled in on the station log sheet.

17. Secure all means of access to station on leaving.

RAIN GAUGE OBSERVATION: FLOW CHART



Rain Gauge Observation:Method Description.

1.On approach, visually inspect gauge for level, obvious damage or undue sheltering from objects or vegetation. Ensure any stock fence or compound around gauge is sound.

2.Remove raingauge top and ensure funnel spout is sound and that there are no blockages.

3.DAILY GAUGE.

a.Remove inner canister and visually check both canister and main body of rain gauge are dry and free of leaks.(Except in the case where the inner canister collecting bottle may have overflowed.)

b.Pour collected rainfall into measure, read and record rainfall details and note any damage or maintainance the site or gauge may require.

c.Ensure gauge and canister are dry, replace glass collecting bottle into canister and replacecanister into the main body of the rain gauge.

d.Replace rain gauge top ensuring funnel spout is correctly positioned in the glass collecting bottle and that the top is pushed fully home.

4.MONTHLY GAUGE

a.Remove the inner canister and visually check both the canister and the main body of the gauge are free of leaks. Ensure the inner canister is fitted with either a frost protector or rubber bung. Remove the frost protector.

b.Pour collected rainfall into measure, read and record rainfall details and note any damage or any maintainance that the site or gauge may require.

c.Ensure gauge and outer of canister are dry then replace the frost protector. Replace the inner canister into the main body of the rain gauge.

d.Replace rain gauge top ensuring funnel spout is correctly located in the inner collecting canister and that the top is pushed fully home.

Data logger Installation Procedure

APPENDIX 9

OFFICE

SELECT BH, SITE: OBTAIN BH, WRB Nº & DIMENSIONS EG: DIAMETER & TOTAL DEPTH.
ASSESS VANDALISM RISK
DECIDE DEPTH OF TRANSDUCER INSTALLATION

WORKSHOP.

SELECT SUITABLE LOGGER TYPE EG: CTL 1 OR CTL 2. →

SELECT SUITABLE TRANSDUCER TYPE EG: PDCR 830 OR PDCR 35/D BAR RANGE, CABLE LENGTH. →

CHECK & TEST LOGGING EQUIPMENT: BATTERY CONDITION, MODE, TRANSDUCER CABLE VISUAL

OBTAIN OR PREPARE SUITABLE LOGGER HOUSING EG: SADDLE OR CABINET & MAKE LIST OF TOOLS & EQUIPMENT REQUIRED FOR THE LOGGER INSTALLATION.

AT BH, SITE.

REMOVE BH CAP & CHECK BH, REST WATER LEVEL & TOTAL DEPTH PREPARE TRANSDUCER, REMOVE COIL CURVES FROM CABLE, FIT SMALL WEIGHT TO TRANSDUCER & ATTACH SAFETY RETAING CORD FROM CABLE TO LOGGER & CONNECT TRANSDUCER →

INSTALL TRANSDUCER IN BH TO THE REQUIRED DEPTH USING MICROSCIBE SCREEN AS A VISUAL AID TO ENSURE TRANSDUCER IS AT THE CORRECT DEPTH.
INSTALL LOGGER IN CABINET OR BH.

WHERE POSSIBLE THE TRANSDUCER SHOULD BE LEFT TO HANG IN THE BH FOR 48 HRS PRIOR TO THE PROGRAMMING THE LOGGER WITH THE REFERENCE LEVEL.
THIS ALLOWS THE TRANSDUCER CABLE TO STRAIGHTEN & ENSURE GREATER ACCURACY.

PROGRAM LOGGER WITH CURRENT REFERENCE LEVEL (DIPPED WATER LEVEL)
MODE: LINEAR, MULTIPHASE, B.S. 6316.
SELECT START TIME & LOGGING FREQUENCY
OBSERVE & NOTE 1st LOGGED READING.

COMPLETE LOGGER INSTALLATION SHEET WITH ALL RELEVANT EQUIPMENT SERIAL NUMBERS AND SITE INFORMATION & INITIAL : BY INSTALLER & FILE.

DATA LOGGER Download Procedure.

APPENDIX 10

OFFICE

OBTAIN ALL REQUIRED EQUIPMENT FOR DOWN-LOADING DATA LOGGERS - EG: DIPPER, 2 CLEARED & FULLY CHARGED MICROSCRIBES & LEADS, SPARE LOGGER & TRANSDUCER, CABINET KEYS, SPANNERS TOOL BOX, UMBRELLA, FIELD NOTE BOOK, DOWNLOAD SHEETS,

AT. BH SITE

DOWNLOADING LOGGER PROCEDURE.

CONNECT MICROSCRIBE TO LOGGER & OBTAIN LOGGER STATUS MODE. NOTE THE FOLLOWING INFORMATION FROM THE MICROSCRIBE SCREEN [THE LOGGER BATTERY CONDITION % THE N° OF LOGGED READINGS TAKEN & THE CURRENT LOGGER WL] [DIP BH WL COMPARE & NOTE THE 2 READINGS TO CHECK ERROR FACTOR.] [STOP LOGGER, & DOWNLOAD DATA ONTO MICROSCRIBE, VIEW SCREEN DOWNLOADING N°'S TO ENSURE THAT ALL READINGS ARE DOWN LOADED] [NOTE MICROSCRIBE N° & ENTER CONTROLER MENU, NOTE DIRECTORY FILE N° & VIEW FILE JUST DOWN LOADED, NOTE PERIOD START DATE & TIME & THE MAX & MIN READINGS] [GO TO THE LAST LOGGED READING & NOTE PERIOD FINISH DATE & TIME & LAST LOGGED WATEL LEVEL READING ALSO NOTE THAT THE LAST READING N° IS THE SAME AS THE TOTAL N° OF READINGS TAKEN; THIS ENSURES THAT ALL THE READINGS HAVE BEEN DOWNLOADED.] ONCE THE OPERATOR IS SATISFIED THAT ALL THE DATA HAS BEEN DOWNLOADED TO THE MICROSCRIBE SUCCESFULLY, THEN THE LOGGER CAN BE CLEARED OF DATA IN PREPARATION FOR RE-PROGRAMMING.]

RE-PROGRAMMING LOGGER PROCEDURE.

WITH MICROSCRIBE & LOGGER STILL CONNECTED & LOGGER CLEARED OF DATA THEN THE RE-PROGRAMMING OF LOGGER CAN PROCEDE] ENTER LOGGER STATUS MODE & ENSURE LOGGER IS CLEAR OF DATA] SYNCHRONIZE MICROSCRIBE & LOGGER TIME GMT.] ENTER BH IDENTIFICATION WRB N°] ENTER TRANSDUCER SENSITIVITY VALUE] DIP BH WL & ENTER READING INTO REFERENCE LEVEL.] ENTER LOGGER START DATE & TIME GMT.] SELECT LOGGING MODE REQUIRED LINEAR, MULTIPHASE, BS 6316.] ENTER READING FREQUENCY & N° OF READ-INGS REQUIRED.] PRIME LOGGER & RETURN TO STATUS MODE & WATCH & NOTE FIRST LOGGED READING ON MICROSCRIBE SCREEN & CHECK AGAINST DIPPED READING] RETURN TO MAIN MENU & SWITCH OFF MICROSCRIBE & DISCONNECT FROM LOGGER.] ENSURE THE CABINET OR BOREHOLE CAP IS SECURE BEFORE LEAVING SITE.]

COMPLETE DATA LOGGER DOWNLOAD RECORD SHEET & SIGN.

PASS MICROSCRIBE & COMPLETED DATA LOGGER DOWNLOAD RECORD SHEET TO C. D. SHARP FOR DUMPING OF DATA TO ARCHIVE.

HYDROFAX QUESTIONNAIRE (1993)

1. WHAT IS "HYDROFAX" - DO YOU KNOW? *YES *NO?
(* please delete as applicable)

2. ARE YOU AWARE THAT WE CAN PROVIDE DISPLAYS OF:

a) RESERVOIR STOCKS - REGIONAL ONLY ?
b) RIVER LEVELS +/or FLOWS - REGIONAL +/or LOCAL ?
c) RAINFALL - REGIONAL +/or LOCAL ?
d) LONG RANGE WEATHER FORECAST (GRAPHICS) ?
e) LONG RANGE WEATHER FORECAST (REPORT) ?
f) WEATHER FORECAST, ACCURACY ANALYSIS (ANNUAL) (NEW) ?
g) GROUNDWATER LEVELS (NEW) ?

3. ARE YOU AN OBSERVER/USER OF "HYDROFAX" *YES *NO?

4. DO YOU REQUIRE ANY ADDITIONAL INFO. *YES *NO?
(if so , what do you require?)----------

---

5. IS ONE NOTICEBOARD SUFFICIENT *YES *NO?

6. WHAT ALTERNATIVES WOULD YOU SUGGEST ?

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7. DO YOU NEED SPECIALISED DATA *YES *NO?
(if so, what do you require?)

8. YOU PREFER A MORE INDIVIDUAL APPPROACH *YES *NO?

9. IF YOU USE "HYDROFAX" REGULARLY
IS THE STANDARD OF SERVICE SUFFICIENT *YES *NO?

(if not, what improvements do you suggest?)

COMMENTS

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please complete the above and return to Sue Carpenter by 4/3/93 if possible, thanking you for your assistance,
Barry Storey and Sue Carpenter , Hydrology, RFH 26/2/93.

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NRA

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