THE GOVERNMENT OF PERU

TECHNICAL DIVISION of ENVIRONMENTAL SANITATION
of the MINISTRY OF HEALTH

Phase 2
REPORT ON WATER SURVEILLANCE PROGRAMME

APRIL
1986

DELAGUA LTD
PUBLIC HEALTH CONSULTANTS
CEPIS/PAHO/WHO LIMA

(Under assignment by the Overseas Development Administration
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List of Contents

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Abstract Summary

1) Phase 2 of the water surveillance programme covers the period January to March 1986. This constituted the planning, execution and follow-up activities associated with a training course for sanitary technicians and laboratory technicians.

2) Planning involved the consultation and approval of 6 health area directors, including visits to each area with the "regional" coordinator to select participants and discuss training requirements. The resource requirements for the course were planned with the support of staff of the old health region office in Huancayo. It may be noted that "regional" offices provide a valuable base for this type of activity and complete decentralisation to the areas would have been a very uneconomic way to undertake training.

3) The training course had originally been intended to cover the former Health Region XIII of Junin and Huancavelica, but the new decentralised infrastructure was implemented in January 1986. In recognition of the change the number of health areas participating in the course was increased to include Selva Central and Cerro de Pasco. The majority of new health areas are similar to the old hospital areas.

4) The training course in " Inspection and Surveillance of Water Supply Systems" was held in the Huancayo area from 27th January to the 5th February '86 inclusive and was attended by 35 participants and 2 observers.

5) During the course each health area team designed a chronogram for a diagnostic evaluation of all water supply systems in their areas.

6) Each team nominated an area coordinator for the water surveillance programme activities.

7) As follow-up actions, on returning to their areas the teams submitted their proposed chronogram of work to their area directors for approval. The coordinators are preparing an inventory of functional and non-functional laboratory equipment and a list of essential equipment and supplies needed for the implementation of the surveillance programme.

8) The consultants initiated the repair of Landrovers designated for use in the programme by supplying spare parts requested by the "regional" workshop in Huancayo.

9) The consultants supervised a full pilot rehabilitation project in the pilot area. This involved the design of a three-stage gravel prefilter and refurbishing sand filters and abstraction at Cocharcas near Huancayo.

2.1 Modifications to the **Terms of the Agreement**

The changes in infrastructure in the Ministry of Health, referred to in the previous, Phase 1 Progress Report, have had a number of important effects on the final wording of the Technical Cooperation agreement for the "Regional Training Programme for Water Quality Surveillance and Water Treatment". These in turn affect several details of the Terms of Reference of the Consultants. The final agreement, incorporating the changes (**highlighted**) were included in a letter of 20th of March 1986 sent by the British Embassy to the Ministry of Foreign Affairs in Lima, and are set out below:

I have the honour to refer to the Note of the Ministry of Foreign Affairs of 8th August 1985 concerning the "Regional Training Programme for Water Quality Surveillance and Water Treatment" and to propose that, having regard to the Agreement between the Government of the Republic of Peru and the Government of the United Kingdom of Great Britain and Northern Ireland (hereinafter referred to as the Government of the United Kingdom) on Technical Cooperation signed at Lima on 1 June 1966, the Peruvian and British Governments will cooperate in providing assistance for carrying out this project. The terms and conditions of the Agreement which will apply to this project are as follows:

Organizations Involved

a) Peru. The agency which will coordinate the project will be the **Technical Division for Environmental Sanitation (hereinafter referred to as DITESA),** acting on Behalf of the Ministry of Health, with support from the Health Areas of Huancayo, Tarma, Jauja, Huancavelica, **Selva Central y Cerro de Pasco**, and with coooperation from the Pan-American Center for Sanitary Engineering and Environmental Sciences (hereinafter referred to as CEPIS).

b) United Kingdom. The project, which will be for three years in the first instance and may be extended by mutual agreement between our two Governments, will be carried out with the direct participation of water supply scientists and public health experts from "DelAgua" and such other British organizations as the British Overseas Development Administration acting on Behalf of the Government of the United Kingdom may wish to make available.

Project Objectives

The objectives of the project will be:

a) To equip the **Health Area** laboratories in Huancayo, Tarma, Jauja, Huancavelica, **Selva Central and Cerro de Pasco**, with essential water testing equipment and supplies.

b) To train sanitary technicians and laboratory technicians in these Health Areas in appropriate methods of water analysis and sanitary inspection, as well as in equipment maintenance.

c) To expand, and where necessary, initiate routine water surveillance and inspection to cover the majority of water supplies.

d) To encourage the development of drinking water quality control laboratories **at the level of the areas.**

e) To establish a **Procedures Manual and Standards** for the use of sanitary and surveillance data in order to promote corrective maintenance of water treatment and supply systems.

f) To extend the existing collaborative rural water treatment project in order to assist in the rehabilitation, construction, operation and maintenance programmes of the Health Areas.

Project Implementation

The proposed phasing of the 3 year project is as follows:

Phase 1: Preliminary training and orientation of personel by means of a pre-plan training course in the Hospital Area of the Huancayo Health "Region" followed by data gathering.

Phase 2: Evaluation of Phase 1. Planning full "regional" pilot course and extension of surveillance throughout the **health areas** of Huancayo, Tarma, Jauja, Huancavelica, **Selva Central and Cerro de Pasco, which includes La Merced, Oxapamapa and Satipo.**

Phase 3: Equipping of laboratories and implemention of diagnosis and surveillance for water supply schemes.

Phase 4: Providing funds and time remain available, the expansion of training and surveillance to **other Health Areas.**

British Input

The Government of the United Kingdom will provide the following:

a) Staff: A team of consultants from DelAgua Ltd., consisting of:
   i) Principal water scientist (28 man months)
   ii) Field sanitary engineer (24 man months)
   iii)Senior water/**Public health** scientist (24 man months)
   Secretarial support in Peru (Partially in the United Kingdom for helping in the purchase of equipment).

b) Staff expenses: Stipends, air fares and local costs of the scientific and associated United Kingdom staff and their families.

c) Scientific equipment.
   i) The cost of laboratory equipment and field equipment up to a total associated cost limit of £55,000.
   ii) Didactic training materials up to a maximum cost of £10,000.
   iii)Field costs for transport of DelAgua instructors, surveillance teams, and associated implementation costs up to a maximum total of £43,000.

Peruvian Input

The Government of Peru will provide the following:

a) Staff: The following counterpart staff will be allocated to the programme on a part time basis:
   i) **Senior Engineer from DITESA**, to act as Manager and Coordinator.
   ii) Representatives of the **Health Areas** of Huancayo, Tarma, Jauja, Huancavelica, **Selva Central and Cerro de Pasco**.
   iii) Directors of the **Health Areas** of Huancayo, Tarma, Jauja, Huancavelica, **Selva Central and Cerro de Pasco.**
   iv) Heads of laboratories and technical staff from **DITESA and the Health Areas** of Huancayo, Tarma, Jauja, Huancavelica, **Selva Central and Cerro de Pasco.**

Additional staff will be allocated to the programme on a full time basis:
   i) General Coordinator and Coordinators of the Health Areas.
   ii)Sanitary technicians in each Health Area.

b) Secretarial support staff and stipends of Health Areas staff

c) Support in transport operational costs in all Health Areas.

d) Laboratory and office facilioties in all Health Areas.

e) Salaries of local staff (for training courses and programme implementation)

CEPIS/Lima will continue to provide the following:

a) Back-up laboratory support and advisory services, including data analysis.

b) General office base for the Overseas Development Administration staff.

c) Additional training support, including printing of manuals and other didactic materials.

Joint Coordination

Both Governments will appoint co-managers for the programme from their staffs, who will coordinate their activities with **DITESA**.

If the arrangements set out above are acceptable to the Government of the Republic of Peru, I have the honour to suggest that this Note and your reply to that effect will place on record the understanding of the Government of the United Kingdom in this matter which will come into operation on the date of your reply.

I avail myself of this opportunity to renew to Your Excellency the assurances of my highest consideration.

J W R Shakespeare
Her Britannic Majesty's Ambassador

2.2 Implications of the changes in the Agreement.

a)National Infrastructure

The new infrastructure in the Ministry of Health has effectively separated the national surveillance agency which is the Technical Division for Environmental Sanitation (**DITESA**) from the Division of Basic Rural Sanitation (DSBR) which is responsible for construction of rural water supply systems. This is an important and valuable change since it now conforms more closely with the WHO recommendation that

"the water supplier and surveillance agency should be separate bodies and independently controlled"

Clearly the change would be complete if DSBR were tranferred to the National Water Authority (SENAPA). However the important point for DITESA is that as **the surveillance agency** its **roles in drinking water surveillance** are now clearly defined as follows:

a)To advise, at the highest level, on policy and strategy which will ensure the development of sustained supplies of safe drinking water
b)To formulate and revise technical standards for the control of drinking water quality.
c)To supervise, control and evaluate the work of operator level quality control staff and of surveillance staff.
d)To promote the development of water quality control at the Health Area level.
e)To promote and advise on the implementation of water quality control and water surveillance laboratories.
f)To support and supervise the training of quality control and surveillance staff.

These roles are also implicit objectives in the Terms of the Agreement of the present programme and it is therefore appropriate that **a senior engineer from DITESA will coordinate** the programme.

b) National Reference Laboratories.

Another important change which has resulted from reorganisation is that DITESA is now directly responsible for 3 laboratories, including water and soil analysis. This retains intact the concept in the original project proposal for the development of the National Central Reference Laboratory for Water Surveillance controlled by DITESA.

c) Area Infrastructure

The policy of decentralisation to the health areas has removed the Regional office level of administration and left in considerable doubt the feasibility of implementing and staffing a Regional Reference Laboratory. A policy decision is pending and in the meantime only health area laboratories will be equipped for basic level surveillance.

3. "REGIONAL" TRAINING COURSE

3.1 PLANNING

Preliminary administrative agreements

On the 13th December '85 the president of the regional commission for reorganisation in Huancayo assigned Landrovers to the programme for each of 5 hospital areas Nºs. 47, 48, 49, 50, 51.

The consultants obtained the approval of the Director of DIGEMA (DITESA) to proceed with planning arrangements for the training course in the final weeks of December '85.

On the 6th and 7th January '86 the consultants met with the Area Director for Huancayo and the Regional Programme Coordinator to agree dates and administrative arrangements for the training course. On the 7th and 8th January the strategy for the programme was discussed with and approved by the Regional Delegate, and on the 9th January these same topics were discussed with the Huancayo Regional Engineer and Director for the Environment.The following points were agreed, in an "Acta de Reunion" signed on the 7th January:

1.To establish a central coordination of the Programme at the level of the "Regional" Delegate.
2. To take immediate action in order to repair the vehicles assigned to the different Health Areas of the programme.
3.To immediately proceed to coordinate actions to develop the training course which would be held in January.
On the week beginning 13th January Landrover spare parts were checked, additional spares purchased in Lima, and all transferred to the "Regional" Huancayo workshop on 16th January (Appendix 5.4 - Spares lists).

On the 17th January the regional delegate, the regional coordinator,the director for the environment and consultants met with five of the health area directors. The programme was outlined, the problems of implementation discussed and the training course timetable agreed. It was agreed that 7 health areas would participate and that the regional coordinator should proceed with the detailed planning arrangements with the support of the consultants.

In planning the training course the following aspects were considered:

3.1.1 Estimate of manpower needs and priorities.

It was proposed in the Phase 1 Report that surveillance should be carried out as a team activity and that the team should comprise as a minimum an area coordinator, a sanitary technician and a laboraory technician. The ideal arrangement might be one in which each health area dedicated a taskforce to surveillance activities. The reality is that all sanitary and laboratory staff are multifunctional and it will be necessary to train, where available,at least twice the number of staff per area, to allow for wastage and transfer to other duties. In addition the regional capital, Huancayo will require additional support and resources to cover the substantially larger urban population and disproportionate number of smaller water supply systems located within the area. It was therefore concluded that the minimum number would be 21 (7 areas x 3 staff) but twice this number would be trained if available.

3.1.2 Selection & inventory of technical human resources within the region. The selection of sanitary and laboratory technicians for surveillance training depended on the population served by water supplies, the number of water supply systems per area, and their location. The complete regional inventory of technical staff was of little use since some 50 sanitary technicians occupied health centre posts which were strategically inconvenient. Hence the trainee selection was limited to staff based in the principal area hospitals i.e, Huancavelica, Huancayo, Jauja, Tarma, Junin, Selva Central (La Merced, Satipo, Oxapampa), and Cerro de Pasco (Appendix 5.1)

Relationship between health area populations, water supplies and trainees

Health area	Nº Code	Total population	Nº * Water supplies	Trainee surveillance staff
Huancavelica	40	181,600	18	3
Huancayo	35	549,062	>100	15
Jauja	34	189,805	55	2
Tarma	33	119,563	36	3
Junin	33	31,677	5	2
Selva Central	36			
- La Merced		280,688	21	3
- Satipo		22,000	6	2
- Oxapampa		25,000	8	2
Cerro de Pasco	32	?	?	3

* Nº of supplies include both rural and urban

3.1.3 Number and kind of occupational skills needed

Task analysis was used to define and ascribe the role of each member of the surveillance team and is summarised in the following table:

Summary of Tasks to be Ascribed to each member of the surveillance team

	Activity	Coordinator	Sanitary technician	Laboratary technician
1	Financial planning	+		
2	Chronogram of visits and administer vehicle use	+		
3	Inventory of equipment and consumables	+		+
4	Prepare and despatch monthly resume of results	+		
5	Manage data base/archive	+		
6	Prepare raw data sheets	+/-	+	+
7	Interview and communicate with "Junta Administradora"		+	+
8	Execute Sanitary Inspection		+	+/-
9	Execute water analysis		+	+
10	Maintain laboratory equipment and prepare reagents			+

The task analysis, together with the evaluation of the preplan, was used as the basis on which to assess the training requirements and thus develop the course curriculum.

3.1.4 Evaluation of training requirements and correction of performance deficiencies.

An evaluation of the preplan training and surveillance activities, referred to in the Phase 1 Report, indicated that a number of changes should be made in the "Regional" Training Course.

a) Whereas the basic analytical procedures were proficiently executed more attention needed to be given to the **basic concepts and practice of hygiene**. This applied not only to a theoretical understanding of the significance of the data produced in the context of the hygienic state and attendant health risks of the water supply systems under study, but also to the practical need to adopt an exemplary standard of hygiene in the health institution, the laboratory and the field.

b) The single most major deficiency in the preplan was the lack of information about the physical state of the water supply systems visited and tested. This was due partly to a lack of time in training, partly to the fact that few sanitary technicians were involved in the preplan, partly to lack of initiative and partly to a **lack of formalised sanitary inspection** report forms.

In summary the preplan course of three days was not adequate to cover necessary background information on public health, hygiene, water supply practice as well as the technical aspects of inspection and analysis. It was concluded that the new course should be increased to 10 days to cover all of these aspects in more detail both from a theoretical and practical viewpoint and should include teaching methods which would encourage more active participation e.g in planning their own area programmes.

4)**Training methods**

It was agreed that the course would employ a range of teaching methods and the approximate breakdown of the time allocated was as follows:

	Hours
-lectures	19
-video classes (including replays)	3
-seminars / discussions	8
-practical demonstrations (laboratory and field visits)	8
-group and individual practical work (field and laboratory)	20
-group tutorials (report preparation and oral presentations)	10
Total contact and study time	68 hours

3.1.5 Inventory of training Resources, Equipment and Supplies

Resource Item		Source / Supplier
-	lecture rooms	Study centre - Chupaca
-	residential accommodation	"
-	laboratory facilities	Hospital Carrion - Huancayo
-	transport for field visits	Health Region - Huancayo
-	Water supply systems	Ministry of Health and SENAPA
-	Training course budget	WHO - UNEP

Equipment list		
-	Overhead projector	Health Region - Huancayo
-	Slide projector	DelAgua
-	Video system	CESPAC - Lima
-	Screen & chalk boards	Study centre - Chupaca
-	Typewriter & photocopier	Health Region - Huancayo
-	Water testing equipment	DelAgua-(Appendix 5.3)

Training aids

-Publications & Reports	
Manual of operation of water supply	Ministry of Health
Peruvian Sanitary code Nº 17505	Ministry of Health
Surveillance of drinking water -1976	WHO-DelAgua
Volume III guidelines -1985	WHO-CEPIS
Field manual for water testing -1985	DelAgua-ODA
Training guide for operation and maintenance of gravity systems 1985	CESPAC-CARE
-35mm transparencies and overheads	DelAgua
-Water supply video film in 9 classes	CESPAC-CARE
-Sanitary inspection forms and water quality report	DelAgua-ODA
-Stationary and files	Health Region - Huancayo
-Chemical reagents and consumables	DelAgua-ODA (Appendix 5.3)

3.1.6 Allocation of responsibilities in the training course

	Ministry of Health				DelAgua
Activity	Reg. Admin	Regional Coordinator	Regional Engineer	Chief of Preservation	Team
Course Planning	+	+			+
Invitations to participants	+	+			
Budget Plan	+				+
-accounts	+				
-viaticos	+				
Field Visits coordination		+		+	
Accommodation reservation	+				+
Supply of					
-Stationary	+				
-training literature					+
-Equipment and reagents					+
Lectures/seminars		+	+	+	+
Practical supervision		+		+	+
Groupwork supervision		+		+	+

3.2 Execution

The pilot training course in

INSPECTION & SURVEILLANCE of WATER SUPPLY SYSTEMS

1) Location. The first "regional" training course in "Inspection and Surveillance of Water Supply Systems" was held as a residential course at the study centre of "La Perla", Chupaca, Huancayo and the Hospital Carrion, Huancayo.

2) Duration. The course was of 10 days;
at Chupaca.....from 27th to 31st January
in Huancayo.....from 1st to 5th February

3) Participants. All participants were Ministry of Health staff including sanitary technicians, laboratory chiefs and laboratory technicians mainly from the former Health Region of Junin and Huancavelica and the department of Cerro de Pasco. Two observers from the department of Lima attended the course including one from DITESA and one from Health Area Nº 25 Cayetano-Heredea. A total of (35) trainees attended excluding instructors, guest lecturers and observers. The participants comprised miscellaneous health administrative assistants and laboratory chiefs (10), sanitary inspectors (5), laboratory technicians (9), and sanitary technicians (13); from seven health areas. A full list of the participants appears in Appendix 5.1.

4) Instructors and Administrative Support

The Health Region supported the course with the assistance of

Dr Fermin Ruiz Soldevilla	-Regional Delegate
Dr Jose Portocarrero Romo	-Area Director (Huancayo)
QF Velia Rojas Palomina	-Regional Coordinator & Course Instructor
Ingº Jose Luis Lecca	-Director for the Environment
Sr Emilio Broy	-Chief of Preservation & Course Instructor
Sra Alicia Caro	-Chief of Training & Course Administrator
Srta Carmen Santana	-Accountancy

The DelAgua consultants supported the course with the assistance of

Dr Barry Lloyd	-Team Leader & Course Instructor
Ingº Mauricio Pardon	-Sanitary Engineer & Course Instructor
Mr Jamie Bartram	-Public Health Consultant & Course Tutor

3.2.1. **The Course Objectives** are subsumed within the programme objectives, but it is worth while defining the more immediate objectives of the course which were as follows:

a)To familiarise Health Area staff with the **planning, programming, supervision, execution and evaluation of water surveillance activities** in order to promote the implementation of the WHO Vol III Guidelines for Water Quality.

b) To provide an adequate understanding of the operation and maintenance of water supplies in order .....

c) to present the concepts of surveillance in the context of public health protection of water supplies by demonstrating the epidemiological relationship between water, hygiene and health.

c) To demonstrate how diagnostic sanitary inspection and water quality analytical data may be used **to improve the service level and quality of water supplies.**

d) To provide a **practical training** in the execution of sanitary inspection and water quality analysis so that each area can implement and sustain their own programmes of surveillance and improvement.

3.2.2. Timetable and syllabus

Day 1 Monday 27 January

8.00 Registration of participants in Health Region Offices in Huancayo
9.00 Course inauguration by Dr Ruis Soldevilla and Dr Portocarrero Romo
10.0 Introduction: pre-plan resume and pilot programme proposals VR/BL
11.00 Transfer of participants to Study Centre at Chupaca
13.00 Lunch
14.00 Theory Introduction to WHO Volume III guidelines and principles of surveillance. BL
15.00 Water-related disease & epidemiological case studies BL
16.00 Video classes 1 &2 "Water and health"
17.00 Seminar discussion All
18.00 Dinner

Day 2 Tuesday 28 January

8.00 Theory Overview of the planning and programming of the surveillance programme in the region VR
9.00 Experience of preservation of water supplies in the region EB
10.0 Video class 3 "Gravity supply systems parts and functions"
11.0 Seminar discussion and replay of video All
12.0 Introduction to Sanitary Inspection of Supplies/Circulate forms MP
13.0 Lunch
14.0 Field Visit to Simple gravity system /Area group demonstration All of diagnostic/Source/Conduction/Res/Valves/Distribution
18.0 Dinner
19.0 Group Tutorials Planning surveillance chronograms All

Day 3 Wednesday 29 January

8.00 Theory Elements of water supply systems-problem areas MP
9.00 Video class 4 "Abstraction; protection,operation and maintenance"
10.0 Seminar discussion of source protection and hygiene All
11.0 Video class 5 "Reservoirs; operation and maintenance"
12.0 Seminar discussion of reservoirs and Day 2 diagnostic reports
13.0 Lunch
14.0 Theory Chlorination and disinfection practice BL
16.0 Demonstration of dose metering /chlorine demand /chlorine resid
17.30 Video class 6 "Operation and maintenance of distribution systems"
18.0 Dinner
19.0 Group work Developing sampling plans / Nomination of area coordinators All

Day 4 Thursday 30 January

8.00 Video classes 7 & 8"Domestic connections;operation and maintenance"
9.00 Theory Sources of contamination in supply systems BL
10.0 Basic concepts of quality control/WHO Vol. III BL
11.0 Communication skills Guest lecturer
12.0 Introduction to sampling strategy in urban zones VR
13.0 Lunch
14.0 Theory Introduction to the concept of critical parameter analysis BL
15.0 Demonstration ofwater analysis using the DelAgua test kit All
16.0 Theory Bacteriological analysis/fecal indicators BL
17.0 Practical Checklist of all components and equipment familiarisation
Battery charging and care of equipment All
18.0 Dinner
19.0 Video class 9 "Water supply administration" Discussion of problems of administration and tarif systems EB

Day 5 Friday 31 January

8.00 Field visit. Practical Surveillance : monitoring and inspection of complete gravity supply system by each area group All
13.0 Lunch
14.0 Field visit. Practical Surveillance: monitoring and inspection of a pumped system by each area group All
Incubation of samples
18.0 Dinner
19.0 Group work/ Continuation of Area Programme planning All

Day 6 Saturday 1 February

8.00 Practical Record and interpret bacteriological analysis/ hygienic disposal of cultures/complete report form All
10.0 Seminar; discussion and evaluation of results of previous day
12.0 Circulate participants guide and set task:- group reports on systems visited for presentations next week.
13.0 Lunch / Paccha Manca
16.0 Transfer participants to Huancayo hostals/ evening free

Day 7 Sunday 2 February

Free day

Day 8 Monday 3 February (Hospital Carrion - Auditorium)

8.00 Seminar; presentation of reports on the inspection and analysis of systems visited last week with recommendations for improvement
1) Inspection report - Sanitary technician (5 minutes)
2) Water quality report - Lab. technician/Analyst (5 Minutes)
3) Recommendations - Coordinator (5 Minutes)
4) Plan of action and debate - (10 Minutes) All

13.0 Lunch

14.0 Theory: water treatment systems,sedimenters,gravel and sand filters - basic design and operational errors MP
Development of treatment plant rehabilitation programmes MP
Seminar discussion ; water quality problems in Huancayo and other urban areas All

Day 9 Tuesday 4 February

8.00 Field Visit.Practical Surveillance of two treatment systems; one urban system (Huancayo), one rural (Palian or Hualhuas). Including inspection and analysis from source to tap. All

13.0 Lunch

Theory Hospital Carrion Auditorium

14.0 Policy of developing water supplies in rural communities JL/EB
15.0 Urban water treatment compared with rural systems JL
16.0 Importance of epidemiological data and health data records in measuring health impact of water supply improvement VR/PR

19.0 Course dinner

Day 10 Wednesday 5 February

8.00 Laboratory Practical Hospital Carrion
Complete reports with bacteriological results All
Preparation of culture media and reagents
Wash and sterilise Petri dishes,cultures and flasks BL/VR
Equipment maintenance
Inventorise all equipment and consumables for each area. AC

11.0 Discussion : laboratory hygiene, significance of data and final group reports, follow-up activities. BL/VR

12.30 Closure FR/PR

-Participants were introduced to the **theory and practice of the supply of potable water** in a series of lectures, demonstrations, video presentations field practicals, discussions and group workshops.

-Over the first five days of the course, 9 video classes, totalling 3 hours viewing time were shown.These illustrated **the maintenance and repair of rural water supply installations** and were each followed by opportunities for discussion with the instructors.

-The surveillance of water quality and inspection of supply systems as an essential part of the provision of safe, potable water in both urban and rural areas was covered using the full range of teaching methods.

-Emphasis was placed on the **practical aspects of sanitary inspection and critical parameter water analysis** with particular attention to hygiene of the supplies and the personal hygiene of surveillance staff.
-To gain the necessary range of practical and field experience in sanitary inspection and critical parameter analysis the field visits were organised to include examples of the three fundamental types of supply system. This included simple gravity, gravity-fed with treatment (urban and rural) and pumped without treatment.
-The use of standard report forms for diagnosis and surveillance was emphasised and an ammended version of the WHO-recommended sanitary inspection form was field tested.
- By the end of the course, each team had executed diagnostic inspections and critical parameter analyses of at least four water supply systems and each individual had developed a satisfactory degree of competence in sanitary inspection and use of the DelAgua portable water testing equipment.

Group work planning
- During the evenings, the participants separated into their health area teams for group work. One session was used as an opportunity for discussion of the problems of the "Junta Administradoras" and administration of water supply.
-The majority of sessions were used to design a plan of action. Each area team designed a chronological programme for diagnosis and surveillance of water supply systems for their own health area. A two-part action programme was developed to include an initial diagnostic survey of all water supply systems, to be followed by a programme of sustained, routine surveillance.
-The Health Area working groups each nominated an area coordinator from within their respective teams.

4.FOLLOW-UP ACTION PLAN.

1)-It was intended that the working group's draft surveillance proposals should be submitted for subsequent discussion and approval by their respective area directors. An essential step in this preparation will be the assessment of available resources and additional requirements. It was agreed that each area coordinator should therefore **prepare a definitive chronogram of diagnostic visits and budget once official approval had been granted.**

2)-The groups reported on the central laboratory and peripheral laboratory and transport services available in their Health Areas and detailed the resources needed. Peripheral laboratories (Oxapampa, Satipo & Junin) would require little more than DelAgua test kits and a means of transport suitable for the locality (which in some areas could be provided by existing hospital facilities). The central laboratories have facilities for preparation of reagents and would collate the Area data. Each group would **prepare an inventory of existing resources and essential requirements.**

3)-In preparation for the **implementation of area diagnostic studies** it would be necessary to **equip the teams, ensure that transport and operating costs were available.** This would be the responsibility of the regional coordinator supported by the consultants.

4)-Once surveillance was underway it would be the responsibility of each **area coordinator to provide monthly reports** to the area directors and engineers and to the consultants.

5)-It was agreed that on receipt of the monthly report the consultants would arrange for the aid-funded share of operating costs to be paid to the health area.

6)-The consultants will arrange to visit each area on a monthly basis to evaluate and assist the progress of each surveillance team.

7)-The consultants would also assist the regional engineers to promote pilot rehabilitation projects in selected areas.

8)-The consultants would seek additional financial support to fund a follow-up workshop for surveillance staff active within the programme in the last quarter of 1986. It is proposed that:-

- each area will present a review of progress for evaluation

-the mechanisms for a major rehabilitation and preservation programme be examined.

- the consultants and invited contributors present a review of progress with small scale treatment technologies including the design, operation and maintenance of gravel prefilters, slow sand filters and chlorinators.

9)-The consultants would assist the health areas to develop a protocol for gathering water-related disease data with a view to assessing the health impact of the programme in the longer term.

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

Appendix 5.1 List of Participants by Health Area and Coordinators Nominated During the Course

Area de Salud Nº 40 : Huancavelica (Hospital area 47)

Adolfo Cardenas Retamozo (Coordinator)	Sanitary inspector
Jesus Vidales Gomez	Cajero Pagador
Adrian Sullca Boza	Administrative technician

Area de Salud Nº 35 : Huancayo (Hospital area 48)

Atilio A. Rodriguez Chavez (Rural Coordinator)	Public Health Assistant
Abel S. Caso Caballero (Urban Coordinator)	Assistant San. Inspector
Eddy L. Rojas Romero	Laboratory technician
Javier W. Santos Surichaqui	Laboratory assistant
Hugo Z. Correa Rodriguez	Sanitary technician
Jose T. Ibarra Mucha	Sanitary technician
Zenon Flores Zarco	Sanitary technician
Cesar E. Rodriguez Chavez	Sanitary technician
Teofanes H. Benites Mejia	Sanitary technician
Evidio A. Huaman Cochachi	Sanitary technician
Cesar Bejar Vasquez	Public health field technician
Carlos Castillo Melgar	Administrator/Environmental
Hugo R. Solis Meza	Sanitary technician
Robert O. Lopez Valverde	Sanitary inspector
Victor Vergara Villafuerte	Sanitary technician

Area de Salud Nº 34 : Jauja (Hospital area 49)

Elmer M. Manyari Verastegui (Coordinator)	Sanitary technician
Pedro R. Palacios Perez	Laboratory technician

Area de Salud Nº 33 : Tarma y Junin (Hospital area 50 & 52)

Victor H. Ayzanoa Runachagua (Coordinator)	Laboratory technician
Jesus G. Diaz Ortiz	Sanitary promoter
Walter R. Oseanoa Condor	Sanitary technician
Ramon D. Quijada Baldeon (Sub-coordinator for Junin)	Sanitary technician
Juan Yauri Loyola	Laboratory technician

Area de Salud Nº 36 : Selva Central	(Hospital area 51)
(La Merced)	
Melita E. Sovero Landeo (Coordinator)	Pharmaceutical chemist
Francisco G. Adriazen Rosas	Laboratory technician
Cesar A. Villanueva Astuvilca	Sanitary technician
(Oxapampa)	
Beatriz Tupino Canto	Laboratory technician
Arturo O. Schipper Schrader	Sanitary technician
(Satipo)	
Luis D. Mendoza Torres	Laboratory technician
Victor R. Bravo Flores	Vaccinator-Malaria prog.

Area de Salud Nº 32 : Cerro de Pasco	Department of Cerro
Clodomiro Gonzales Guillen (Coordinator)	Sanitary Inspector
Jorge L. Briceno De la Cruz	Sanitary Inspector
Miriam A. Salinas Castro	Laboratory Technician

Appendix 5.2 Course Expenditure

Item	Inti
DelAgua	
Planning visits; fuel and lubricants	1800.
Hostals and subsistence 6-9 January	1651
Hostals and subsistence 16-18 January	1023.5
Hostals and subsistence 22-23 January	554.1
Miscellaneous; electric plugs,screw drivers,toilet paper	251.0
Ministry of Health	
Planning visits (advance Regional coordinator)	2000
Course costs;	
Stationary	381.5
Field costs; fuel and lubricants-	2,791.
spares	3,591.5
Participants; travelling expenses and subsistence	15,162.5
Local staff travel; Huancayo-Chupaca	40.5
Postage; comite Nº 12	15.0
Maintenance and repairs/vehicles	860.0
Photocopying	127.
CEPIS/Lima;	
Printing charges	1,520.4
CESPAC/Lima;	
Video and guide	1,084.5
Chupaca;	
Entel Peru/telephone	224.34
advance booking	8,000.0
accommodation and meals	15,000.0
Chifa: Course dinner;	3,200.0
Total expenditure	**Inti 59,277.84**
	USD Equivalent 4,234

Appendix 5.3 Laboratory equipment and consumables supplied

ITEM	CANTIDAD	RESPUESTOS	Valor £
1.Maletin con incubador y bateria	9	1	6500
2.Placas petri aluminio con soporte	3 x 15 x 10		150
3.Caja con tomacorrientes	9	1	120
3 a. y de pared	9	1	30
3 b. Cargador de 220v	9	1	450
4.Comparador de cloro residual y pH	9	5	100
5.Tubos de medicion de turbidez x 2	9	5	243.8
6.Medidor de conductividad y ºC	8	1 + 1multi	2200
7.Electrodo de conductividad	8	1	415
8. Electrodo de temperatura	8	1	200
9. Vaso de muestreo y cable de acero	9	1	74
10.Vaso de vacio de acero inoxidable	9	1	60
11.Dispositivo de filtracion de acero	9	1	135
inoxidable y collarin de sujecion	9	1	
12.Base de aluminio del dispositivo	9	1	250
de filtracion y empaquetadura negro	9	9 + 2	5
13.Empaquetaduras superior	9	9 + 2	8
y inferior	9	9 + 2	8
14. Disco de bronce de soporte de	9	9 + 2	29
filtro de membrana			
15. Forceps de acero inoxidable	9	1	20
16. Bombin de succion	9	1	74
17. Encendedor	9	1	13.2
Valor total del equipo, no incluye transporte			£11085
INSUMOS	----------	----------	----------
18.Filtros de membrana	5000		1500
19.Almohadillos y dispensers	5000	5xdispensers	250
20. Medio de cultivo y	8	2	210
botellas de polipropileno	30		12
21. Envase de metal con metanol	10	1litro metan	26
22. Reactivos DPD 1	5000		178.6
DPD 3	5000		178.6
23. Reactivo fenol rojo (pH)	5000		178.6
24. Servilletas descartables o	10		3
trapo limpio			
25. Hojas de reporte diario	500		14
26. Llaves de maletin	20		
Recibido por el Ministerio de Salud (5/2/86).....		Total insumos	£2550.8

Appendix 5.4 Preliminary list of parts supplied for repair of vehicle

Programa Vigilancia DelAgua- Abastecimiento Respuestos LandRover

Nombre	JAUJA(1472)	Respuestos Landrover	
Cantidad de Componentes	Codigo	Descripcion	£
6	537269	Pistones	160.68
1	RTC1720	Juegos de metales de vancada	30.45
1	RTC 1721	Juegos de metales de biela	34.65
6	273163	Bocinas de biela	12.6
1	274116	Juegos de metales de levas	10.5
6	511834	Guias de valvulas admision	9.48
6	511833	Guias de valvulas escape	6.01
1	564334	Ensamblaje de bomba de aceite	60.53
1	598214	Eje de bronze	42.01
1	GEG1214	Juego de empaquetadoras	19.04
1	605106	Juego de empaquetadoras	30.17
1	542492	Reten de cigueñal posterior	2.55
3	531873	Juego de balancines	72.45
3	531874	Juego de balancines	72.45
3	536872	Juego de balancines	66.93
3	536873	Juego de balancines	66.93
1	266662	Cadena de distribucion	11.87
1	275234	Templador de cadena	0.86
1	606098	Accesorios del carburador	20.67
1	GFE111	Filtro de aceite	3.2
1	GWP305	Bomba de agua	25.01
1	568189	Bomba de gasolina	64.11
1	NRC6474	Amortiguador de direccion	13.65
1	GCP129	Disco d'embrague	27.76
1	GFB243	Faja de ventilador	7.98
1	GCS101	Juego de platinos del distribuidor	0.64
1	GCS111	Condensedor	0.91
1	GDC115	Tapa de distribuidor	6.17
6	GSP4382	Bujias calientes RTC3571	7.02
1	GGB504	Carbones para alternador	
1	18G8620	Rodajes de alternador	2.33
8	548205	Bocina de muelles	5.2
2	GSA392	Armotiguadores delanteros	62.01
2	GSA393	Armotiguadores posteriores	62.01
1	RTC210	Faros de peligro	2.77
3	AEU1058	Faros ambar	6.81
1	589284	Faro blanco	1.95
2	750X16	Llantas	99.01
		Jauja subtotal	£1130.24
		Abastecido de Brown Church UK	
	enero 86	FIRMA.....	

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Programa Vigilancia DelAgua- Abastecimiento Respuestos LandRover

Nombre:	HUANCAVELICA (1478)		costo
		Respuestos Landrover	libras
Cantidad de componentes	Codigo	Descripcion	esterling
1	GLR338	Chapa/seguro de capo	1.25
1	90/577723	Muelles delanteros	6.82
2	279970	Muelles posteriores	6.01
2	GSA393	Amortiguadores posteriores	62.01
1	GSA392	Amortiguadores delanteros	31.01
2	750 x 16	Llantas	99.01
1	569338	Unidad servo de frenos	84.61
1	GWC305G	Bombines de freno - posterior	21.67
	(243296)	izquierdo	
1	GWC306G	Bombines de freno - posterior	21.67
1	GCC181	Plato de embrague	43.11
1	GWC306G	Juego de Reparacion de bombines	21.67
2	GCP129	Bombines de embrague esclavos	27.76
1	8G8600	Cilindro de embrague esclavo	2.74
2	275744	Crucetas 2xGUJ117	25.01
2	591231	Crucetas 2xGUJ118	16.01
4	GHS202	Retenes de Bocamaza \GHS202	3.5
4	GFG106	Retenes	
4	FRC1780	Retenes de caja de cambios (4586)	5.6
1	606098	Accesorios de carburador	20.67
1	GCS101	Platinos	0.64
1	GSC111	Condensador	0.91
1	GRA102	Rotor	1.12
6	GSP4382	Bujias RTC 3571	7.02
1	GGB504	Escobias/carbones de alternador	1.31
			£511.1
		Abastecido de Brown Church UK	
	MISCELANEA	Vehiculo registration no.	
8	90/577723	Grilletes de muelle (1256)	27.28
8	90/577721	Delantero (1256)	36.96
30	537742	Pernos (1256)	
30	252165	Tuercas (1256)	
8/44	548205	Bocinas de muelles (todos)	5.2
1	542494	Juego de reten de cigueñal	17.08
		posterior	
2	GCC181	Cubierta de embrague	43.11
2	GEG1214	(Juegos de empaquetadura de motor	38.08
2	605106	G.Set	60.34
		Subtotal	£228.05
		Abastecido por Brownchurch UK	

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Appendix 5.5 -Pilot rehabilitation project resume-Cocharcas

October '85. Agree terms of reference.
Agree Cocharcas as target site with CARE.
Carry out sanitary survey of existing system.
Prepare designs of horizontal gravel prefilters for approval.

November '85. Preparatory meetings with community 'junta administradora'
Contract builders and agree work schedule. Select and negotiate land for prefilter construction site adjacent to existing slow sand filters.

December'85. Remove perimeter walls of existing treatment plant and commence site excavation for prefilters.
Lay foundations and commence construction of prefilter walls.

January '86. Complete p.f. wall construction and commence transfer of gravel for grading on site.
Install new piping,cleaning gates and valves.

February'86 Complete grading, washing and installation of gravel.
Excavate desludge canal, line, cover and carry out hydraulic tests.

March '86 Refurbish slow sand filters; remove old under-drainage,replace with new pipe work and gravel; replace filter sand with correctly graded clean sand
Commence training operator.

April '86 Refurbish flow control at captacion and recommission system. Commence performance evaluation.

Programa Vigilancia DelAgua- Abastecimiento Respuestos LandRover

Nombre:	CHONGOS ALTO Reg:1256	Respuestos Landrover	Costo libras
Cantidad de componentes	Codigo	Descripcion	esterling
44	548205	Bocina de muelles (inc.respuestos)	28.6
01		Paquete de muelles delantero)	
01	AEU 1124	Distribuidor completo	73.14
01	568189	Bomba de gasolina	128.4
02	18G8620	Rodajes del alternador	4.66
01	244711	Bendix de arrancador	15.27
01	NRC 6474	Amortiguador de direccion	27.3
02	RTC 210	Faro de peligro	5.54
02	7.5 x 16c	Llantas	99.01
		Chongos alto subtotal	£381.9
		Abastecido de Brown Church UK enero 86	

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