Ministry of the Environment and Land Protection

River Basin Authority

SERCHIO PILOT RIVER BASIN

LIFE PROGRAM- ENVIRONMENT

PROJECT ENTITLED

"*SERCHIO RIVER ALIMENTED WELL - FIELDS INTEGRATED REHABILITATION*"

TASK 1 "Serchio river basin characterization, definition of 2 areas with different detail of study and definition of the network of wells for measurement"

Sub Action 1.1.1 "Boundary Definition of studied areas"

DATE	REVIEW	NOTES
28_02_05	0	
20_03_05	1	Detail study areas
11_04_05	2	Integration of the large study area with the River Park area
19_04_05	3	San Pietro a Vico detail study area

Ministry of the Environment and Land Protection
Serchio River Basin Authority

Life Progect "*Serial-wellfir*" - TASK 1 – Sub-Action 1.1.1 "*Boundary Definition of studied area*"

1 – General Objectives of the Project

The present project proposes to achieve the following objectives:

1 Conduct an integrated restoration of an area at high risk of chemical pollution of groundwater destined for drinking water use;

2 Experiment with modern and appropriate innovative solutions addressed to the agricultural and industrial fields with the aim to reduce pollution by 40%;

3 Conduct a planning approach characterised by an integrated and concerted management that will be used, in order to increase the sustainability of agricultural and river park activities;

4 Characterise the existing processes of surface and deep aquifers, including the degradation dynamics of pollutants, with the aim to analyse the anthropogenic sources of diffuse pollution, determining the weak points of the system and the unsustainable agricultural techniques;

5 Define solutions to pollution problems, decided with all the local actors using participative methods to maximise the practical implementation of the proposal.

2 – Competence of the Ministry of the Environment and Land Protection

The Ministry of the Environment and Land Protection (henceforth referred to as the *Ministry*) will participate in the project through the Quality of Life Department and the Nature Protection Department.

The activities of the Ministry are conducted through the operational contribution of the Serchio River Basin Authority which, institutionally, depends on the Ministry.

The competence of the Ministry regards Task 1, entitled "*Serchio river basin characterization, definition of 2 areas with different detail of study and definition of the network of wells for measurement*" which foresees 3 actions entitled:

1.1 "*Characterization of the area*";

1.2 "*Hydrology and hydrogeology of the area*";

1.3 "*Interaction between river and aquifer*".

The current technical documentation refers to the sub-action 1.1.1 entitled "*Definition of Boundaries of studied area*".

Within sub-action 1.1.1 a cartographic project will be produced comprising, beyond the study area, a series of themes which are considered useful and fundamental to support the activities foreseen within the project (see paragraph 3.3).

The constituent themes of the cartographic project are organised as follows:

- large scale perimeterisation of the study area;
- perimeterisation of the detailed study area;
- basic cartography;
- hydrography;
- hydrogeological layout;
- anthropic layout;
- urban layout.

A crucial aspect of the cartographic project will be the acquisition and the contextualisation of the result produced within the *Accordo di Programma* for the protection of the study wells in the S. Alessio area.

In the following, technical-scientific methodologies will be described which have been carried out for the identification of the aforementioned study area.

3 – Sub-action 1.1.1, description of the cartographic results

3.1 –Large Scale Basin Study area

Definition

The aforementioned study area, at large scale, is defined as an area which given the hyrdro-geological characteristics and also the status of present anthropogenic activity, will be surveyed in order to identify the main dangers and to understand, also on the basis of the interaction between the water of the Serchio and its aquifers, the mechanisms for pollutant diffusion and transport.

In this area studies, surveys and programmes will be carried out for soil characterisation, identification of agricultural activities, hydrological and hydro-geological characterisation, quantitative and qualitative analysis of surface and ground waters, the identification of the main dangers and where the measures and actions to reduce contamination from pesticides will be implemented. This area includes a significant section of the Serchio River, its and underground study wells which are destined for drinking water use from San Pietro a Vico to Filettole.

Extension, scale and definition of the area boundaries

The area includes alluvial deposits of the Serchio middle valley and a part of the Lucca plains, from Ghivizzano, upstream of the river Lima confluence until Filettole. The cartographical reference scale for the individualisation is 1:50.000.
The extension of this area corresponds to about 52 Km^2 .
The area includes, in particular, the following zones:

- on the right bank: the floodplains downstream of the hills up to the wooded areas;
- on the left bank: from Ghivizzano to Ponte a Moriano the floodplains downstream and the hills up to the wooded areas; from Ponte a Moriano and until Filettole meets the Serchio River floodplains (between the levees);

Research and studies foreseen in the area

Within the selected area, according to that foreseen by the LIFE Project and together with the other project partners, various studies with different levels of detail will be carried out. In particular:

- hydrological and hydrogeological characterisation to be defined in the entire study area and extended also to the Lucca plains;
- definition of a groundwater monitoring network comprising the underground aquifers and part of the Lucca plain aquifer
- drafting of the piezometric map and of the groundwater conductibility through monitoring programmes to be carried out twice yearly for three consecutive years;
- drafting of a soil use map to be carried out in the entire large scale study area;
- chemical-physical characterisation of the soil to be carried out in specific areas within the defined area;
- flow measurement along the river in at least 3 sections during two distinct programmes and simultaneously with the first groundwater monitoring programmes;
- drafting of a conceptual model of the aquifer and definition of the interaction between the Serchio River and groundwater
- intrinsic vulnerability of the aquifers along the River Serchio and in the area near the potable study wells:

In the entire so-called large scale study area, the various types of real soil uses will be identified according to specific legend, with particular regard to the agricultural activities, and also, in the survey the productive activities situated along the Serchio River will be considered, upstream of the study wells; in the same area a programme for the chemical-physical characterisation of the soil will

also be conducted. The main aim of these surveys is to identify the status of anthropgenic pressure and in particular the agricultural areas whose crops could determine or contribute to soil dispersal of chemical pollutants.

Soil characterisation through the identification of current use and chemical-physical monitoring will be developed through the following phases:

a. Draw-up a non-detailed soil use map in the entire study area large scale, through the interpretation of aerial photos and/or satellites images available. The legend for use type, in particular that linked to agricultural uses, will be of the first screening and will form a basis to develop, in more limited areas, a more detailed classification.

b. Drafting of the detailed soil use map for areas of specific interest for the project aims (for example drinking water study wells, etc) through field surveys to identify agricultural cultivations

c. Chemical-physical soil characterisation through monitoring programmes with the measurements of the following parameters:

- Framework
- Crumb structure;
- pH;
- Electrical conductivity;
- Total limestone;
- treated Limestone;
- exchange basis (K, Ca, Mg, Na)
- Cationic exchange capability
- Basic saturation
- Total nitrogen
- Organic substances
- C/N ratio
- Assimilable phosphorous;
- nitric nitrogen and ammoniacal nitrogen
- Humidity equivalent (to determine Field Capacity and Fading Point);
- Saturated hydraulic conduction (Ksat).

Chemical-physical soil monitoring is conducted using the soil use map in those areas determined as having a greater possibility of contamination due to agricultural activities.

Identification of topological elements which the large scale study area must include

- The aquifer recharge areas below river bed level and of polluted study wells.
- The river bed, the high-water bed and the below river bed streams of the River Serchio being affected by the contamination of polluting substances.
- The drinking water study wells: study wells in San Pietro a Vico, S.Alessio, S.Maria a Colle, Nozzano and Filettole.
- The hilly area, along the right river basin of the River Serchio, up to the limits of the wooded area.

Definition of the hydrogeological characterisation area of the Lucca plains aquifer

For the hydrogeological characterisation of the study area, a wider area of the so called large scale basin has been determined which includes also the Lucca plains alluvial deposits up to Filettole in the west and Pollino in the south west.

The cartographic reference scale for the individuation is 1:50.000. The extension of this area corresponds to about 197 Km^2

Within that area piezometric monitoring will be carried out, as already specified, for the three years foreseen for the Life Project.

3.2 – Detailed Survey Area

Definition

The study areas for the detailed survey were perimetrical to the surroundings of the single study underground wells in San Pietro a Vico, Salicchi, San Alessio, Santa Maria in Colle, Nozzano and Filettole river beds, adopting the underground ridges as borders for each one, enlarged and defined by the River Basin Authority according to a hydrological criterion based on detailed piezometric surveys in the respective study wells.

Extension, scale and definition of the borders of the areas

In total, 5 detailed areas have been determined corresponding to 6 study wells for drinking water use which take from the groundwater table of the River Serchio floodplains. The total extension of the determined areas is about 5 Km^2. The cartographic scale of reference for the individualisation of each detailed area is 1:10.000. During the course of the study it may be necessary to use a greater scale (eg. 1:2.000).

The extension of these areas is shown in the following Table:

Well fields (location)	*surface area (hectares)*
San Pietro a Vico	17.3
Salicchi	24,6
S. Alessio	207,5
S. Maria a Colle	82,9
Nozzano and Filettole	174,5
TOTAL	**506,8 (5 km^2)**

Surveys and Studies foreseen in the detailed survey area

In such areas studies, surveys and programmes will be developed, which are targeted to soil characterisation, identification of agricultural activities, hydrological and hydrogeological characterisation, evaluation of the qualitative and quantitative status of groundwaters, mapping of the intrinsic vulnerability of the aquifers, individualisation of the main dangers and the determination of the pollutant transport and diffusion mechanisms in the saturated and unsaturated floodplain stratum.

In these areas, therefore, measures and actions to reduce pesticide contamination in water will be put into effect.

Identification of topological elements

- drinking water study wells potentially affected by the contamination phenomenon: well fields of San Pietro a Vico, Salicchi, Sant'Alessio, Santa Maria a Colle, Nozzano and Filettole.
- The areas regarding the relative study wells
- The Serchio river park as established by the Lucca Council town-planning scheme.

3.3 – Maps and Information Layers

The cartographic project is completed by a series of further themes, shown in the following Tables, which are considered sound for the whole Life Project activities and which the Ministry together with the Serchio River Basin Authority will share with the other partners.

The printed map will be produced in 'pdf' format and in format shapes file, Arc View compatible, with reference coordinate Gauss Boaga.

The cartographic reference is C.T.R. of the Tuscany Region.

Basic Cartography

Cartographic element	*Format scale*	*availability*	*Date version*	*detail*	*Note*
Regional maps	1:10000 (projection Gauss-Boaga) (projection Gauss-Boaga)	Serchio RBA			
Regional maps	1:2000 (projection Gauss-Boaga)	Serchio RBA			
Orthophoto		Serchio RBA (*)	2000	Colour	
Orthophoto Aima		Serchio RBA (*)	1996	Black white	
Digital Elevation Model		Serchio RBA		Detail 5 mt	
Satellite imagery		Serchio RBA (*)	March-April '03	Quick Bird	

IDROLOGY

Cartographic element	***Format Scale***	***Availability***	***Date version***	***Detail***	***Note***
Serchio River Basin hydrographic network	shapes file (projection Gauss-Boaga)	Serchio RBA			
Basin and underbasins Perimiterisation	shapes file (projection Gauss-Boaga)	Serchio RBA			
Active riverbed, flood bed areas, cases of expansion and pertinent fluvial areas	shapes file (projection Gauss-Boaga)	Serchio RBA			
Areas of hydraulics danger	Shapes file (projection Gauss-Boaga)	Serchio RBA			
Qualitative monitoring network					
Hydrometric monitoring network		Serchio RBA			
Thermo pluviometric monitoring network		Serchio RBA			

HYDROLOGICAL STRUCTURE

Catographic element	*Format scale*	*Availability*	*Date version*	*Detail*	*Note*
Geological Map	1:100.000	Serchio RBA			
Hydrogeologic whole		Serchio RBA			
Hydrogeological sections	shapes file (projection Gauss-Boaga)	Serchio RBA			
Soil cover and lithology	(projection Gauss-Boaga)	Serchio RBA			
Rock outcrops	(projection Gauss-Boaga	Serchio RBA			
Piezometric map of the Lucca plains	shapes file (projection Gauss-Boaga)	Serchio RBA		Monitoring April, May & October 2004 Sampling Stations > 300	
Detailed piezometric map in the S. Alessio study well area	shapes file (projection Gauss-Boaga)	Lucca COuncil			
Map of underground water conductivity of Lucca plain		Serchio RBA	Year 2002	A further 300 monitoring wells, comprising geo-referenced withdrawal points (for drinking water and industrial uses)	
Map of the inherent vulnerabilities within the main study wells along the Serchio River	shapes file (projection Gauss-Boaga)	Serchio RBA			
Relation on the hydrogeology and on the hydrogeological model of the Lucca Plains and data on the water balance of the River Basin Authority property		Serchio RBA			

ANTHROPOGENIC (IDENTIFICATION OF IMPACTS AND ESTIMATION OF PRESSURES)

Catographic element	*Format Scale*	*Availability*	*Date version*	*detail*	*Note*
Civil and industrial waste water treatment plants	shapes file (projection Gauss-Boaga)				
Aqueduct and sewerage Adduction systems	shapes file (projection Gauss-Boaga)				

URBAN STRUCTURE

Catographic element	*Format Scale*	*Availabitlity*	*Date version*	*Detail*	*Note*
Underground system of the river park	Shapes file 1:10.000	Lucca Council			
inhabited places	1:10.000				
Eventual areas foreseen by Municipal Plain	1:10.000	Lucca Council			
road network	1:10.000				
Boundaries of the Serchio River Basin Authority	shapes file (projection Gauss-Boaga)	Serchio RBA			
Administrative limits (Regions, province, councils, ATO)	shapes file (projection Gauss-Boaga)	Competant body;			

ATTACHMENTS:

TASK 1 OPERATING PLAN ACTIVITIES

DETAILED MAP OF THE STUDY AREA "*LARGE SCALE BASIN*"

DETAILED MAP OF THE STUDY AREA "*DETAILTED BASIN*"

DETAILED MAP OF THE STUDY AREA "RIVER PARCK"

DETAILED MAP OF THE STUDY AREA: S. ALESSIO, S. PIETRO A VICO, SALICCHI

DETAILED MAP OF THE STUDY AREA: NOZZANO, FILETTOLE, S. MARIA COLLE