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# **Environmental Policy and Technology Project**

**For the New Independent States  
of the Former Soviet Union**

**Contract No. CCN-0003-Q-00-3165-00**

**UKRAINE, BELARUS, AND  
MOLDOVA**

**FINAL REPORT**

**Delivery Order No. 9**

**Ukraine, Belarus, and Moldova**

**Mitigating Health and Economic Consequences of  
Environmental Mismanagement**

**Prepared for:**

**Bureau for Europe and the New Independent States**

**U.S. Agency for International Development**

**Prepared by:**

**Environmental Policy and Technology Project**

**A USAID Project Consortium Led by CH2M HILL**

## PREFACE

Under the 1992 Freedom Support Act, the United States Congress initiated a program to provide assistance to new independent states (NIS) of the former Soviet Union. Cooperative Agreements were signed between representatives of the U.S. government and each country in which assistance was to be undertaken. The U. S. Agency for International Development (USAID) was given the responsibility to coordinate all U. S. Government assistance to the NIS under the Act. The strategic objectives of USAID's assistance to the NIS were to promote:

1. Environmentally sound, sustainable economic development during the transition to a market based economy;
2. Reduction in pollution-related risks to health; and
3. Reduction of the threats to the global and regional environment.

Through competitive bidding, USAID awarded a multi-year contract to a team managed by CH2M HILL International Services, Inc. (CH2M HILL) to support implementation of an environmental assistance program to republics of the former Soviet Union. Under this contract, termed the Environmental Policy and Technology (EPT) Project, CH2M HILL was to assist USAID's missions in Moscow, Kyiv, and Almaty undertake a program to promote environmental improvements in the NIS.

The CH2M HILL team included the following organizations:

- Center for International Environmental Law
- Clark Atlanta University/HBCUMI Environmental Consortium
- Consortium for International Development
- Ecojuris
- Environmental Compliance, Inc.
- Harvard Institute for International Development
- Hughes Technical Services Company
- International Programs Consortium
- International Resources Group, Ltd.
- Interfax Newsagency
- K&M Engineering
- Ogden Environmental and Energy Services Company
- World Wildlife Fund (US).

The USAID mission in Kyiv supports environmental, and other, assistance programs to Ukraine, Belarus, and Moldova. CH2M HILL established an office in Kyiv, Ukraine to manage and support activities in these countries under the EPT Project. As appropriate, field offices were established at specific project sites within the countries. The project's headquarters office in Washington, D.C. provided overall direction and management support for project activities in all regions.

This report was prepared as a contractually required deliverable under the contract between USAID and CH2M HILL. Although work on this report was conducted in cooperation with the assisted governments and USAID, the findings and recommendations are those of the CH2M HILL team. They do not necessarily represent official positions of the governments of the assisted countries nor of USAID.

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## **Appendix**

Appendix A: Status of Deliverables

## Section 1 Introduction

### 1.1 Overview of the USAID/WESTNIS Environmental Assistance Program

The former Soviet Union sought production and production increases above all, particularly in heavy industries, agriculture, and defense related sectors of the economy. Natural resources were largely regarded as inexhaustible, and accordingly, not valued in use or seen as components of ecosystems which might be killed, damaged, or rendered less productive by mis-uses. The result was extensive environmental degradation, massive pollution, and ecosystem stress. These have had negative health consequences as well as deleterious effects on the viability of various industries.

Since independence, behaviors that caused despoilment of the environment have hardly changed. At the scale of the enterprise, including large farms, there remains little real incentive to save resources or reduce pollution. The current administrative and productive system confronts a legacy of past pollution. And, despite the reduction in immediate pollution dynamics in certain sectors which economic malaise has brought, the mitigation of a continuing flow of new pollution and destructive resource management is even less practical than before as the economy declines

Environmental information has been found to be unreliable. While vast amounts of statistical information are collected by numerous central and local institutions, these are most often generated using outdated collection and analytical techniques and simply do not add up.

The USAID Regional Mission for Ukraine, Belarus, and Moldova (USAID/WESTNIS) was established in 1993 and, faced with the Soviet Union's environmental legacy, began to develop an environmental program comprising three separate but interconnected activities:

- obtain effective environmental information;
- undertake integrated ecosystem restoration;
- address special industrial and environmental problems.

In October 1993, the Environmental Policy and Technology (EPT) Project contract, designed to support implementation of USAID's environmental assistance to the republics of the former Soviet Union, was awarded to a team managed by CH2M HILL International Services, Inc. (CH2M HILL). Four delivery orders for work to support the Aral Sea Program were executed under the EPT Project contract beginning in 1994:

Delivery Order No. 5 - *WESTNIS Environmental Program Phase I: Quick-Start Initiatives and Long-Term Program Specification and Start-Up;*

Delivery Order No. 9 - *Project for Ukraine, Belarus, and Moldova: Mitigating Health*

*and Economic Consequences of Environmental Mismanagement;*

Delivery Order No. 13 - *Industrial Pollution Control Assessments/Audits;*

Delivery Order No. 15 - *Infrastructure and Energy Efficiency, Ukraine.*

## **1.2 Introduction to Delivery Order No. 9**

Drawing in part on the information obtained during the performance of Delivery Order No. 5, USAID developed and, in September 1994, executed Delivery Order No. 9 (DO 9). This delivery order had as its objective:

*... to support an environmental management project in Ukraine, Belarus and Moldova. The project's aim is to improve human health conditions, promote sustainable economic development, and protect nature. Project Tasks are designed to mitigate adverse health and economic consequences caused by environmental neglect and mismanagement. More specifically, ...the project is to provide equipment, technical assistance, and training in connection with a variety of discrete tasks that are designed to either prevent/control sources of pollution or to mitigate the impacts of pollutants in each country. The project includes a strong emphasis on identification of pollutants, health risk assessment of the most serious pollutants, and prioritization of most applicable types of pollution mitigation techniques. In addition, the project includes a strong emphasis on technical assistance and training elements. Supply and installation of equipment will be included in some tasks.*

This report reviews the scope of work, deliverables and major accomplishments of and lessons learned from the work carried out under Delivery Order No. 9. The body of this report contains four main sections : II. Delivery Order Objectives and Scope; III. Deliverables; IV. Major Accomplishments; and V. Lessons Learned.

## Section 2 Delivery Order Objectives and Scope

### 2.1 Delivery Order Objectives

Delivery Order No. 9 had as its objective to support an environmental management project in Ukraine, Belarus, and Moldova and was designed to mitigate the adverse health and economic consequences caused by environmental neglect and mismanagement.

### 2.2 Evolution of Delivery Order Scope

Delivery Order No. 5 (DO 5), the contracting vehicle by which USAID initiated its environmental assistance program in Ukraine, Belarus and Moldova, was authorized on July 6, 1994, initially for a one-year period. One of the main objectives of this delivery order was to gather information which USAID could use to design its environmental assistance program in these countries. However, Delivery Order No. 9 was authorized three months later, on September 30, 1994, without the benefit of information gathered during the implementation of DO 5. DO 9 was substantially amended (via Modification 3) nearly a year later, on August 28, 1995. In the interim, USAID, by staged approval of Work Plan components, allowed commencement of some tasks, particularly in Moldova, while delaying commencement of others. Major revisions to the DO 9 scope of work resulting from Modification 3 included the elimination of all tasks in Belarus, amendments to tasks in Ukraine and Moldova, and removal of one task in Moldova.

Due to the nearly one-year hiatus, on September 30, 1996 (by Modification 5), extended the completion date of the DO 9 through September 28, 1997. It is the scope of work as outlined in Modification 3 to DO 9 that was actually implemented and is reported herein.

### 2.3 Delivery Order Scope

The scope of work of Delivery Order No. 9 (Modification 3) included seven tasks in Ukraine and four tasks in Moldova. The specific scopes of work for each of these tasks are outlined below.

#### 2.3.1 Tasks for Ukraine

1. Task U1 - Demonstration of Environmental Management of Industrial Waste and Industrial Waste Minimization in Donetsk

The purpose of this task was *...to undertake a demonstration project to promote more effective control of enterprise releases into the environment ... [and] ... to establish a foundation for a practical waste management program which can be undertaken by the [Donetsk] Oblast [office of the Ministry for Environmental Protection & Nuclear Safety]*. Work was divided into three major subtasks:

- Subtask 1 - Industrial Pollution Control Assessments/Audits: Provide training of Ministry for Environmental Protection & Nuclear Safety, Donetsk Oblast (MEPNS-DO) office, and industrial enterprise personnel, in environmental auditing, and then undertake several environmental audits (additional audits were to be undertaken as part of DO 13);
- Subtask 2 - Assessment of Hazardous Waste in the Oblast: Improve the capacity of MEPNS-DO to better-manage the generation, storage, and disposal of hazardous waste within its jurisdiction via a series of initiatives, including:
  - review of hazardous waste management practices in the oblast, assist MEPNS-DO design an automated data management system for hazardous waste management, and also assist the MEPNS-DO to conduct an inventory of hazardous waste and contaminated sites and rank the sites for priority action;
  - conduct workshops on hazardous waste management techniques, and hazardous waste fate, transport and treatability;
  - support a workshop on comparative risk decision-making, and support a site demonstration of comparative risk decision-making;
  - establish and support an advisory group for hazardous waste management issues;
  - establish a Technical Information Center on management of hazardous industrial waste management.
- Subtask 3 - Resident Donetsk Industrial Waste Management Program Manager: Provide advise to MEPNS-DO on hazardous waste management, and liaise with USAID and other donor organizations involved with hazardous waste management issues in Donetsk Oblast.

2. Task U2 - Urban Water Management Demonstration: Lviv

The purpose of this task was *...to address water supply, wastewater treatment, and disposal systems in the Municipality of Lviv ... [and] develop technical and management methodologies that will serve as models for nationwide implementation of municipal water and wastewater sector economic reforms and at the same time, reduce environmental health threats from poor drinking water quality*. The scope of work involved four subtasks and associated activities:

- Subtask 1 - Coordinate with PADCO (another USAID contractor): In addition to the environmental assistance program, USAID provided assistance in housing and municipal services to the City of Lviv. This assistance activity was implemented by Planning and Development Collaborative, International

(PADCO). Under this subtask, CH2M HILL and PADCO were to establish a mechanism for liaison, coordination, and cooperation regarding their respective activities, which were closely linked.

- Subtask 2 - Collect Data and Develop Guidelines for Priority Repair and Upgrade of System: In order to develop an assistance program, it was first necessary to understand the existing Lviv water utility (vodokanal) system, and identify possible priority assistance projects. This was to be accomplished by the following:
  - collect data on the current water supply systems;
  - evaluate data on operations, repairs and maintenance;
  - devise methodologies to estimate financial impacts of general operations, repairs, and water shortages, as well as to estimate the impacts of leakages and breaks on overall system water losses;
  - prepare guidelines on using economic analysis as a tool for decision-making;
  - conduct workshops for utilization of information from the study of the Lviv Vodokanal;
  - coordinate efforts to assist in development of a feasibility study for improving the Lviv water supply system, to be used in seeking funding from the World Bank.
- Subtask 3 - Develop Program to Increase Share of User Charges: In addition to evaluating upgrades to existing infrastructure, the financial viability of Lviv Vodokanal was to be assessed by undertaking the following:
  - collect data on metering billing and revenues;
  - study problems of system measurement;
  - develop and implement a demonstration to improve energy and water use;
  - coordinate efforts regarding a feasibility study.
- Subtask 4 - Institutional Assessment and Recommendations: On the basis of information gathered from the previous subtasks, measures were to be developed to strengthen the ability of the Lviv Vodokanal to better-meet the needs of its customers:

- develop a strategic policy regarding Vodokanal restructuring;
- conduct an institutional assessment of the Vodokanal;
- develop a program for institutional strengthening.

3. Task U3 - Preparation of the Detailed Annotated Draft Biodiversity Conservation Strategy Outline and Development of Support Information Needed to Prepare Scopes of Work for Future Elaboration of a Biodiversity Conservation Strategy and Action Plan Project

The objective of this task was *...to provide technical assistance, advice, and transfer American experience on topics of special importance to the implementation of the National Program of Environment Protection and Rational Use of the Natural Resources of Ukraine - Biodiversity Conservation*. The scope of work for this task was to:

- investigate existing legislative documents and additional sources of information;
- prepare a detailed annotated draft Biodiversity Conservation Strategy outline;
- recommend criteria for selecting park management demonstration sites;
- identify two to three sites that meet those criteria;
- prepare a report that can support draft scopes of work for future activities in the development of a Biodiversity Conservation Strategy and Action Plan;
- procure computers and office equipment to support this task.

4. Task U4 - Water Quality Program Assessment and Abatement Kaniv Reservoir Project

The overall objective of this task was *...to assess water quality conditions of, and threats to the Kaniv Reservoir, and to introduce improved measures to evaluate pollution abatement and management strategies*. Within the framework of an interagency agreement between USAID and the U.S. Environmental Protection Agency (USEPA), the role of CH2M HILL was *...to provide USEPA with logistic and procurement support needed for the Agency to demonstrate appropriate water quality management techniques using the Kaniv Reservoir as a model project*. CH2M HILL's scope of work for this task was to:

- provide the services of local technical specialists to assist USEPA in implementing the project;
- procure laboratory and sampling equipment;
- rent boats, a mobile laboratory and other equipment necessary to implement the

project;

- assist with the development of a water quality database and Kaniv Reservoir water quality and quantity model.

#### 5. Task U5 - Ukraine-American Work Group Program

The objective of this task was "...to provide technical assistance, advice, and transfer American experience on topics of special importance to the implementation of the National Program of Environment Protection and Rational Use of the Natural Resources of Ukraine ... [and preparation of] legislation, regulations, and laws to implement policy decisions, and develop training exercises to quickly strengthen institutional capacity.

CH2M HILL was to coordinate a program of three Work Groups, dealing with:

- industrial waste management;
- urban water;
- agriculture and agricultural chemicals;

while another USAID contractor was to coordinate Work Groups on:

- environmental policy and sustainable development;
- international environmental cooperation.

Each Work Group was to draw upon local-level experience from USAID-funded and other environmental assistance programs in various parts of Ukraine and to raise environmental policy and institutional issues of national importance to the attention of key Ukrainian decision-makers. The Groups were to be comprised of Ukrainian and foreign experts and draw membership from governmental and non-governmental agencies.

For each Work Group under its jurisdiction, CH2M HILL was to

- provide EPT Project staff to serve as a Work Group coordinator and carry-out a wide range of coordination activities in support of the Work Groups, including organizing and tracking work group activities, monitoring logistics for workshops, disseminating publications, and maintaining contact with and (de)briefing Work Group members and representatives of relevant local and national Ukrainian organizations;
- provide administrative and logistical support;
- identify impact indicators for Work Group activities;

- provide technical experts for consultation and workshops;
- provide follow-ups to Work Group meetings and workshops;
- prepare and publishing documents as needed;
- review Work Group outputs, including reports and recommendations.

#### 6. Task U6 - Tatar Environmental Health Project

The objective of this task was ...*to improve environmental health conditions for the returning Tatar populations of Crimea [relative to meeting] ...additional demand ... [for] already minimal water supplies and wastewater facilities [in the City of Bachcisaraj]*. This was to be achieved implementing the following:

- procure pipe to replace that used by the City of Bachcisaraj to install a 9 kilometer section of water line from the Vilinski well field to Bachcisaraj;
- observe and report on the installed section of pipe, commenting specifically on installation, coating and pipe quality;
- provide basic water quality testing materials for the Bachcisaraj Sanitary Epidemiological Service laboratory;
- prepare an instruction pamphlet on home-level sanitation improvements and instructions;
- recommend and promote the demonstration of cost recovery techniques that can be used to recover costs necessary to operate and maintain the water distribution and sewage collection system.

#### 7. Task U7 - Program Management

The objective of this task was ... *to ensure that there is appropriate management support for the implementation of the tasks provided under this delivery order. This program management element shall supplement and complement additional management responsibilities which may be explicitly listed under any other subtask or activity of this or any subsequent delivery orders issued to the contractor.* This task included the following scope:

- provide a Project Manager, or Country Manager, for the Ukraine tasks of DO 9;
- provide a Regional Finance Director;

- prepare regional and country-specific office descriptions and staffing plans.

### 2.3.2 Tasks for Moldova

#### 1. Task M1 - Environmental Health Risk: Priority Setting and Training

The purpose of this task was ... *to assist environmental and health agencies in Moldova understand how to conduct environmental risk assessments, use information obtained from such assessments to identify major risks to human health due to pollution, and facilitate agency decision-making regarding which risks should be [the] subject of urgent attention.* This task involved designing and implementing a training program on the principles of comparative environmental risk decision-making.

#### 2. Task M2 - Farm Environmental Management Demonstration Project

The purpose of this task was to demonstrate environmentally sound ... *better agricultural management on farms through cost-saving and technology improvements, and environmental health considerations.* This was to be achieved by implementing several subtasks:

- Undertake an assessment of agricultural production techniques with respect to environmental consequences, with a particular focus on water pollution, together with an evaluation of the capability to conduct monitoring of environmental impacts of agricultural activities, and use this information to recommend projects that would demonstrate environmental and public health improvements, together with associated equipment that may be needed to help implement the project;
- Prepare a more detailed design for one of the recommended demonstration projects, and then implement the project;
- Prepare a report on results of the demonstration project, for subsequent use in an educational campaign to be conducted as part of Task M3;
- Conduct workshops on environmentally sound agricultural practices, targeted for both technical environmental practitioners as well as farm managers;
- Procure environmental monitoring and laboratory equipment.

#### 3. Task M3 - Educational Outreach Campaign for Environmental Awareness and Consensus Building

The purpose of this task was to enhance the effectiveness of Tasks M1 and M2 via a public information and education program. It included a series of workshops that were to be held in conjunction with designing activities associated with Tasks M1 and M2, as well as tours by students and teachers to the site(s) of the demonstration projects. Support was to be given to

the "American-Moldovan Total Emersion in English Summary Program: Ecology Program" sponsored, in part, by the U.S. Peace Corps, by developing and delivering courses on environmental impacts from, and the relationship to, agricultural production activities. An international Ecological Chemistry Conference was to be organized in Chisinau, including a "environmental poster competition" for students. Several public awareness brochures were to be prepared and printed, that focused on environmentally sound agricultural practices. Two university-level courses were to be designed on comparative risk assessment and risk management -- one for medical and the other for agricultural students.

4. Task M4 - Program Management

Like Task U7, the objective of this task again was ... *to ensure that there is appropriate management support for the implementation of the tasks provided under this delivery order.* The scope included providing a Project Manager, or Country Manager, for the Moldova tasks of DO 9, as well as a Regional Finance Director.

**Section 3**  
**Delivery Order Deliverables**

Reports /Deliverables of Delivery Order No. 9 and their status are presented in Appendix A.

## Section 4

# Delivery Order Accomplishments

Significant accomplishments achieved by under DO 9 in Ukraine and Moldova are outlined herein.

### 4.1 Tasks for Ukraine

DO 9 tasks focused primarily on environmental consequences of Ukraine's extensive industrial sector (particularly the coal and metallurgical activities), provision of water supplies to urban communities, and establishment of a formal mechanism to encourage consideration of sustainable development concepts during economic restructuring.

#### 4.1.1 Task U1 - Demonstration of Environmental Management of Industrial Waste and Industrial Waste Minimization in Donetsk

One of the key issues identified during implementation of DO 5 was the extensive degree of pollution associated with secondary industrial activities and the general lack of modern approaches to pollution prevention through environmental auditing, waste minimization, and effective environmental regulation. Important achievements of DO 9 regarding this task were the establishment of a Technical Information Center on industrial environmental management, improved understanding and application of environmental management techniques, especially through the use of environmental audits, and a greater awareness by the MEPNS-DO of regulatory approaches regarding hazardous waste management.

##### 4.1.1.1 Technical Information Center

Under the EPT Project, a Technical Information Center (TIC) on industrial environmental management was established in Donetsk on premises belonging to the Donetsk State Technical University. From this center, EPT Project activities regarding industrial waste management in Donetsk were undertaken. The TIC was equipped with a bi-lingual catalogued library of several hundred technical publications covering industrial waste issues and technologies, a connection to the Internet, databases on CD-ROM, and a collection of videotapes on environmental management topics for use by government, business, technical professionals, academia, and the general public. The TIC was also configured with seating and audio-visual aids to conduct seminars and workshops for up to 60 people. Modern pollutant-sampling and portable chemical analytical testing equipment were added in order to undertake sampling and limited analyzes associated with environmental audit training.

##### 4.1.1.2 Environmental Audits

A series of classroom (at the TIC) and field-based training courses on environmental auditing techniques, soil and water pollution assessment, and industrial waste management were conducted by expatriate EPT Project specialists, in conjunction with personnel from USEPA (Regions 4 & 5), for representatives of both regulatory agencies and industrial enterprises, largely from Donetsk Oblast. These resources and training activities were innovations in the sphere of industrial

environmental management for the region.

CH2M HILL's training program complemented environmental audits conducted by the World Environment Center (operating in Ukraine under a grant from USAID). CH2M HILL also conducted two environmental audits, one at a portion of the Enakievo Metallurgical Plant, and the other at Azovstal Metallurgical Plant. Whereas audits conducted by the World Environment Center had the primary objective of identifying opportunities to demonstrate waste minimization techniques, the audits conducted by CH2M HILL had the added objective of training local agency and industrial representatives in using auditing techniques as part of an overall approach for effective environmental management of industrial enterprises.

To facilitate actual environmental auditing, pollutant sampling and analytical chemical laboratory equipment, together with protective clothing, were procured using equipment funds set-aside by USAID in the DO 9 contract. This equipment was added to resources of the Technical Information Center.

#### 4.1.1.3 Hazardous Waste Management Techniques

Representatives from MEPNS-DO and several large industrial enterprises were introduced to industrial environmental management techniques through participation in Hazardous Waste Management workshops and, subsequently, to waste minimization/pollution prevention policies and procedures through participation in workshops on Environmental Auditing, Water and Soil Pollution Assessment, and Risk Assessment (Fate & Transport of Hazardous Wastes). Subsequently, MEPNS-DO commenced using techniques learned at the workshops to conduct its own environmental audits as well as requiring that the 65-largest polluting enterprises within the oblast submit environmental management plans based in part on self-audits. Health and safety procedures were also stressed during the audit training, and MEPNS-DO started to adopt these procedures, within the limited resources available to it.

Several small private companies were established by persons who participated in the workshops and field training, offering environmental auditing services to industrial enterprises in Donetsk Oblast and elsewhere in Ukraine. These companies regularly used the TIC and sought advice from the expatriate resident adviser.

Information was provided to USAID on the methods of hazardous waste inventorying and reporting undertaken within Donetsk Oblast, which can be used when designing further assistance programs regarding hazardous waste management in Ukraine.

Based upon a proposal from the Hazardous Waste Advisory Group, the MEPNS-DO formed a new department responsible for dealing with solid hazardous waste issues. This department began to formalize its process of inspecting industrial facilities, and developed a standardized reporting format. Automated data processing (ADP) equipment (computer with printer, and word-processing and database software), was provided to MEPNS-DO. This equipment, combined with a MicroSoft Excel-based spreadsheet developed by the Donetsk resident advisor together with other expatriate and local experts, became the basis by which the MEPNS-DO's department of

solid hazardous waste management commenced recording environmental data reported by the 65-largest polluters within the oblast.

Representatives from MEPNS-DO (as well as from the Moldova Department of Environmental Protection) were instructed in environmental health risk assessment techniques, including the ADP equipment and computer software on toxic chemical databases, as a step in being able to prioritize hazardous waste sites and develop an appropriate response plan.

#### 4.1.1.4 Resident Advisor

CH2M HILL was able to provide an extremely well qualified individual, Dr. Nicholas Cheremisinoff, as expatriate resident advisor for the Donetsk industrial environmental management task. Dr. Cheremisinoff has a doctorate degree in chemical engineering, over 20 years practical experience in industrial processes and pollution control technology, is an adjunct professor in environmental engineering, and well-published author on industrial environmental pollution control and management. He quickly established a close working relationship with Dr. Kurulenko, head of the Donetsk Oblast office of the Ministry for Environmental Protection of Ukraine, as well as industrial engineering staff at the Donetsk State Technical University, which owns the premises in which the Technical Information Center was established. He provided frequent technical consultations to MEPNS-DO, and also liaised with University staff in development of appropriate curricula in environmental management.

#### 4.1.2 Task U2 - Urban Water Management Demonstration: Lviv

Another key aspect of DO 5 activities was the evaluation of municipal water utilities, which found that generally throughout Ukraine these utilities were unable to meet their obligations, which posed a serious health threat to the general population. Significant accomplishments of DO 9 associated with this task included development of a detailed understanding of the operations and organization of a municipal water utility in Ukraine, identification of cost-effective means to improve water service based on a good understanding of operations and institutional structure, and recognizing that improvement in the collection of payment and reduction of energy consumption are the most important issues that vodokanal throughout Ukraine face in improving their financial viability.

##### 4.1.2.1 Understanding Physical Operations of Lviv Vodokanal

Prior to independence, provision of municipal water services in Ukraine generally focused on undertaking large, capital-intensive projects such as new reservoirs and canals. As an example, the City of Lviv was planning to upgrade its water supply system, in order to provide water 24 hours per day to its residents, by developing new water sources (from well fields) and transmission and distribution pipelines with associated pumps and tanks, at a cost which they estimated would be in excess of \$500 million. After independence, such funding was not available from the central government nor city budget.

Under the EPT Project, USAID agreed to assist the city's water utility (Lviv Vodokanal, or LVK)

undertake a detailed self-evaluation of its activities, in order to identify opportunities for relatively inexpensive improvements in water service. It was found that the vodokanal did not have reliable data on water flows and usage nor overall operating costs, and was therefore unable to identify where and what type of improvements needed to be undertaken. Hence, the evaluation included measurement of water production, distribution, and consumption, using equipment provided by USAID. A public domain software program (available from the USEPA), called EPANET was used to analyze hydraulics of the Lviv water distribution system and identified constraints in water flows.

As a result of the evaluation, it was determined that the vodokanal was losing significant quantities of water, before it ever reached consumers, due to systemic pipeline leakages and ruptures, and that further, consumers did not conserve water as there was little incentive to do so. Instead of developing new water supply and conveyance systems, the vodokanal could better-fulfill its mandate by reducing water losses so that more of the water that it pumped would be available to consumers.

#### 4.1.2.2 Understanding Institutional Aspects of Lviv Vodokanal

Together with evaluating the physical infrastructure, a good understanding was also developed of the organizational, administrative, and financial aspects of Lviv Vodokanal. The financial review indicated that electricity consumption was the largest expense, amounting to 60-70 percent of annual operating costs, and in order to improve the vodokanal's viability, these costs needed to be reduced by implementing energy-conservation measures.

It was learned that the vodokanal does not bill customers on the basis of actual water consumption but instead on "norms" established for typical usage. These norms are often set without actual measurement to evaluate the appropriateness of such norms. Under the EPT Project, measuring equipment was provided that allowed the vodokanal to develop more typical water-usage norms. As part of a demonstration project, steps were also initiated to install water meters in a part of Lviv, in order for the vodokanal to bill customers for actual consumption.

With regard to residential customers, it was found that the vodokanal does not receive payment directly from consumers. Instead, payment for water charges is included in rent and other fees collected by an intermediary called a "zhek", which often withholds payments to the vodokanal in order to finance other expenditures such as building repairs. Vodokanals are unable to disconnect water supply to delinquent payers, as individual dwelling units are not fitted with separate shut-off valves. It was recommended that the vodokanal take over the system of billing and payment-collection, by-passing the zheks, in order to ensure that any payments received are at least directly sent to the vodokanal. Together with PADCO, the formation of housing condominium associations was encouraged, with separate water metering and valves that allow disconnection for non-payment of water bills.

Lviv Vodokanal, like most water utilities in Ukraine, is not an autonomous entity. It is a branch of the city government, subject to factors that influence decision-making other than rational economic management. It is unable to set water tariffs for residential customers, which affects

its ability to recover its operating costs. Consultations were held with senior vodokanal officials about means of privatizing and incorporating the utility in order to overcome this situation. In conjunction with activities of the Urban Water & Wastewater Work Group (established as part of DO 9, Task U5), a recommendation was prepared and submitted to the Cabinet of Ministers of Ukraine as well as widely disseminated among vodokanals throughout Ukraine on measures that should be undertaken at the national and local levels that would enhance vodokanal autonomy. Such autonomy is viewed as the best means of promoting vodokanal viability, thereby ensuring safe and reliable water and wastewater treatment services in Ukraine. Subsequently, several vodokanals, including Kharkiv and Zaporozhia, reported that they had commenced procedures to try and implement the recommendation.

A financial analysis of the vodokanal was prepared, using international accounting methods. Results of this analysis provided information that the World Bank sought from Lviv Vodokanal when reviewing the utility's application for a \$44 million capital improvement loan. The analysis method was shared with vodokanals in Odesa and Kharkiv which are also applying for funding from international financial institutions.

#### 4.1.2.3 Water Service Improvement Demonstration Projects

As a result of the self-evaluation of the vodokanal's infrastructure, several projects were identified which, if implemented, would demonstrate cost-effective means of improving water service in Lviv that could readily be replicated elsewhere in Ukraine. These projects were:

- Improvements in measurement of water abstraction, flow, and consumption, together with electricity consumed when pumping water. Improved measurement allow a better understanding of water losses and identification of priority repairs, as well as calculations of pay-back costs when considering installation of more energy-efficient equipment.
- Creation of a water distribution subsystem within the Pasichna district of Lviv, upgrades to the water infrastructure therein (including installation of energy-efficient pumps), and operation of this subsystem on a quasi-independent basis in order to better manage the delivery of water to local residents. With improved water service, the vodokanal would have a justification for setting more realistic tariffs, and expecting more higher payment collection rates.

Both of these demonstration projects were approved by USAID, and funded under DO 5 and DO 15.

#### **4.1.3 Task U3 - Preparation of the Detailed, Annotated, Draft Biodiversity Conservation Strategy Outline and Development of Support Information Needed to Prepare Scopes of Work for Future Elaboration of a Biodiversity Conservation Strategy and Action Plan Project**

The 1992 United Nations Convention on Biological Diversity provides an international framework

for the protection and sustainable use of biological resources, and includes provisions for the development of national biodiversity conservation strategies. USAID considered providing assistance to Ukraine with its preparation of a national biodiversity conservation strategy, development of a site to demonstrate effective management of a biologically protected area, and compliance with international biological treaty and convention obligations. It requested that CH2M HILL, under the EPT Project, prepare a scope of work for a consultant to actually implement the biological assistance to Ukraine. The scope of work for the consultant was prepared and submitted to USAID.

#### **4.1.4 Task U4 - Water Quality Program Assessment and Abatement, Kaniv Reservoir Project**

The Kaniv Reservoir Project was undertaken as part of a cooperative agreement between Ukraine's Ministry for Environmental Protection & Nuclear Safety (MEPNS), and the U.S. Environmental Protection Agency (USEPA). As USEPA did not have an established presence in Ukraine, logistical support was provided by CH2M HILL via the EPT Project. CH2M HILL procured and delivered, in a timely manner, the major portion of equipment (valued in excess of \$350,000) that was specified by USEPA for use in the project. It also retained a Ukrainian national to serve as project coordinator, engaged Ukrainian specialists to participate in the study, and facilitated field studies and sample analyzes.

The overall Kaniv Reservoir Project implemented by MEPNS and USEPA achieved the following results:

1. *Compilation and evaluation of existing Kaniv Reservoir data:* Data compiled and evaluated by MEPNS scientists for the period of 1990-1996 included water quality for the Reservoir and its major tributaries; water flow and climatic conditions, and point-source discharge. These data were used for an assessment of water quality conditions in the reservoir, and water quality model calibration.
2. *Provision of laboratory and sampling equipment and supplies to the MEPNS:* Training of MEPNS laboratory staff on this equipment was provided by USEPA during the study tour to U.S., as well as in Ukraine during travel by USEPA scientists.
3. *Training of Ukrainian specialists:* This was accomplished in 1995-1996 through a study tour and series of workshops. A study tour to USA in 1995 for 20 MEPNS managers and professionals was organized and accomplished by the USAID-funded contractor Academy for Educational Development and USEPA. In 1995 and 1996, two workshops on water quality management issues were held in Ukraine jointly by MEPNS and USEPA, with a support from the Academy for Educational Development. In the course of this activity, some 50 Ukrainian environmental specialists were trained in different areas of water quality management and control.
4. *Kaniv Reservoir water quality study:* To provide practical training on data collection for water quality model calibration, six water quality studies were carried out in 1995-1996: two

of them by MEPNS and USEPA scientists jointly, and the other four by MEPNS specialists. Collected data were used for water quality model calibration and completing the database on the reservoir's environmental conditions.

5. *Development of water quality database:* This was accomplished in 1996 by Ukrainian specialists employed for this purpose by CH2M HILL. The database contains details on water quality, water flow, climatic conditions, and point-source discharge into Kaniv Reservoir's watershed, as well as the other appropriate data. The database is operated and maintained by the MEPNS.
6. *Development of Kaniv Reservoir water quality and quantity model:* This was also accomplished in 1996 by Ukrainian specialists employed for this purpose by CH2M HILL. An appropriate computer software was provided by USEPA to MEPNS for modification to suit local conditions.
7. *Improvement of wastewater treatment plant inspection techniques:* This was accomplished by MEPNS and USEPA jointly during water quality studies of Kaniv Reservoir in 1996.
8. *Development and implementation of management strategies using data from the model to make decisions that affect and improve water quality in the reservoir:* This activity was accomplished in 1996 by Ukrainian specialists. A Kaniv Reservoir Restoration Management Plan was developed on the basis of data compilation, evaluation, and the reservoir's water quality modeling.
9. *Extension of study to lower portion of Dnipro River:* Due to successful completion of the Kaniv Reservoir Project on the Dnipro River, USEPA and MEPNS agreed to undertake a similar study in the Dnipro Estuary. USAID again contracted with CH2M HILL via the EPT Project (DO 15) to provide logistical support.

#### **4.1.5 Task U5 - Ukraine-American Work Group Program**

Under DO 5, a *Ukraine-U.S. Environmental Forum* was held in Kyiv with the objective of identifying environmental topics of concern to Ukrainian delegates. A key request made at the *Forum* by the Ministry for Environmental Protection was to establish a series of work groups on environmental topics. Through these work groups, Ukrainian and U.S. experts could exchange ideas, refine the scope of technical assistance requirements, and undertake cooperative efforts. It was also agreed that the work groups could serve as a useful means of coordination with other international agencies and donors that were implementing environmental programs in Ukraine. Under DO 9, this work group program was initiated.

##### **4.1.5.1 Program to Promote Sustainable Development**

While the DO 9 scope envisaged three Work Groups, USAID/Kyiv comments on the initial *Work Group Implementation Plan* required that the Work Group Program be undertaken within the framework of an umbrella organization, similar to the U.S. President's Council on Sustainable Development. The *Work Group Implementation Plan* was therefore revised to allow creation of

the *U.S.-Ukraine Program to Promote Sustainable Development*, within which the work groups operate. The *Program to Promote Sustainable Development* was developed under DO 9 to include an Executive Council and Steering Committee, together with a Secretariat. The inaugural meeting of the Executive Council was held on March 25, 1996 and included high-level representatives of Ukrainian agencies with environmental and development responsibilities, other bi-lateral and multi-lateral donors and agencies operating in Ukraine, citizens' environmental organizations, and large enterprises. Subsequently, the name of the *Program* was amended to the *Program to Promote Sustainable Development in Ukraine*, in order to reflect international participation.

A major accomplishment of the *Program* was that it successfully served as the single most important means of facilitating donor coordination and communication among donors and agencies as well as among agencies themselves on environmental and related matters. Using information provided through the *Program*, several bi-lateral and multi-lateral agencies developed or refined their own assistance programs in Ukraine. It was a transparent process whereby the general public, via representation of citizens' environmental organizations, became aware of key environmental issues and how the government was addressing them. Due to its composition, the Executive Council served as a reputable forum through which recommendations on policy and legislative changes could be submitted to senior organs of Ukraine's government, particularly the Cabinet of Ministers.

#### 4.1.5.2 Industrial Environmental Management Work Group

DO 9 termed this the "Industrial Waste Management Work Group", but following USAID's review of the *Work Group Implementation Plan*, the name was amended to be more in keeping with the focus of group activities. This Group dealt with hazardous waste laws, and the introduction of an internationally accepted approach to environmental management at industrial enterprises.

The MEPNS was drafting laws on hazardous waste management, and transboundary transportation of hazardous materials. Ukraine has stated its intention to seek integration with the European Union (EU). A prerequisite is that all Ukraine's laws are harmonized with those of the EU. The Work Group assisted this process by providing Ukrainian-language translations of several key EU directives on hazardous waste management and reviewing and commenting on various draft versions of Ukraine's waste laws with a view to their harmony with those of the EU. Specific changes included the incorporation of definitions and terminology that provide legal and health-risk bases for waste classifications, adoption of the UN classification system for hazardous wastes, mandatory use by industry of proper labeling and placarding of hazardous waste shipments, and adoption of the Basal Convention restrictions on transporting hazardous wastes across country boundaries.

In addition, the Work Group introduced an approach to environmental management of industrial enterprises developed by the International Standards Organization, known as ISO 14,000. This uses a standardized methodology for environmental auditing and the preparation of a voluntary Environmental Management System (EMS) that is disclosed to regulatory agencies. The EMS then becomes the basis for negotiations between an enterprise and a regulatory agency to settle past violations of environmental regulations and an agreement for future compliance with such

requirements. Background information on ISO 14,000 was provided by the Work Group, and discussions were held on the use of standardized environmental auditing procedures by the MEPNS and the agency responsible for privatization, the State Property Fund.

#### 4.1.5.3 Urban Water and Wastewater Work Group

This Group focused on issues dealing with vodokanal financial viability and institutional reform.

An evaluation was conducted of vodokanal financial problems, which resulted in the preparation of recommendations on raising vodokanal revenues and lowering their tax burden. The recommendations were submitted to the Cabinet of Ministers and several state agencies via the Executive Council. Subsequent new draft tax legislation incorporated changed taxation and depreciation procedures to allow for increased vodokanal capital funding and reduction of tax burden. The Verkhovna Rada (Parliament) of Ukraine adopted the new tax law which incorporated the above provisions on May 22, 1997 and put it into effect July 1, 1997.

The Work Group developed a *Concept Paper on Water & Wastewater Sector Institutional Reform in Ukraine*, drawing upon results of its own studies as well as those undertaken by representatives of and consultants to the State Committee for Housing and Communal Services, USAID, The World Bank, and other international and state agencies. This concept paper provided an analysis of the current institutional situation in Ukraine's water sector, highlighting existing problems, and suggested a series of prioritized actions to improve overall management of the sector. The concept paper was disseminated among relevant Ukrainian state agencies, regional and municipal governments, and water utilities across the country.

A series of project proposals were identified, compiled, and disseminated to international donors which, if implemented as technical assistance programs or demonstration projects, would improve the professional and technical capabilities of state agencies involved in water sector development, as well as demonstrate low-cost improvements of urban water and sewerage services.

The World Bank and Ukraine's State Committee for Housing and Municipal Services proposed a joint *International Congress and Technical Exhibition on Ecology, Technology, and Economy of Water Supply and Sewerage Systems* on April 15-19, 1997. The *Congress* organizers sought funding from USAID, and this was provided via the EPT Project's Urban Water & Wastewater Work Group. The *Congress* was by far the largest and single most important gathering of Ukrainian water sector representatives during the past several years. It was attended by over 400 representatives of central and local government, vodokanals, USAID, The World Bank, and other international organizations. Issues discussed included those that Work Group has been involved with since inception. Several Work Group members presented papers at the *Congress*. CH2M HILL personnel working under the EPT Project presented papers on (i) improving vodokanal institutional and financial viability, and (ii) reducing energy consumption of vodokanals, using results of the EPT Project activities with Lviv Vodokanal.

#### 4.1.5.4 Sustainable Agriculture Work Group

While DO 9 termed this the “Agriculture and Agricultural Chemicals Work Group”, Group members quickly changed its name to “Sustainable Agriculture Work Group” to be in keeping with its focus and the theme of the *Program to Promote Sustainable Development*. Initially this Group helped launch the USAID-funded “Pests and Pesticides Management Project” implemented by the Virginia Institute of Technology in conjunction with USEPA (Region 5). In conjunction with the Industrial Environmental Management Work Group, a detailed plan was developed to address the issue of unsafe storage of in excess of 20,000 tons of obsolete agro-chemicals. This included preparation of an “issues paper” and its distribution to relevant Ukrainian authorities. A proposal was prepared to conduct a pilot inventory of stockpiled obsolete agro-chemicals and use the results to develop a Ukraine-wide action plan. The proposal was disseminated to the Cabinet of Ministers of Ukraine as well as international donors.

#### **4.1.6 Task U6 - Tatar Environmental Health Project**

Under DO 5, an evaluation was conducted of possible projects that could assist ethnic Tatars being repatriated to their ancestral homelands near the city of Bachcisaraj in Crimea. The evaluation identified provision of adequate water supplies, and improvement of environmental health conditions. These projects were then successfully implemented under DO 9, including:

- procurement of 9 kilometer of pipe to provide safe water for 50,000 repatriated Tatars;
- procurement of chemical laboratory equipment for the Bachcisaraj Sanitary Epidemiological Service laboratory;
- preparation, production, and distribution of public health education pamphlets regarding measures to minimize the risk of water-borne diseases;
- review of the Bachcisaraj Vodokanal operations and financial situation. Based on this review, recommendations were prepared on techniques to improve water service, including: increase supply by repairs to pumps, reduce water losses by minimizing leakage, reduce water consumption through implementation of conservation measures, and increase recovery of water distribution and sewerage collection bill payments in order to better-cover operation and maintenance costs. All these measures were similar to those developed for Lviv Vodokanal.

The U.S. Ambassador to Ukraine, together with USAID/Kyiv, received a letter of appreciation from Tatar representatives for USAID’s assistance.

#### **4.1.7 Task U7--Ukraine Program Management**

CH2M HILL successfully completed the scope of work and submitted deliverables for Task U7, including:

- preparation of the delivery order work plan;

- providing a Ukraine Country Manager;
- providing a Regional Finance and Administration Manager;
- preparing regional and country-specific office descriptions and staffing plans.

## **4.2 Tasks for Moldova**

Moldova is principally an agrarian economy, where many of the country's major environmental issues are associated with environmentally unsound agricultural practices. DO 9 tasks therefore focused on reducing environmental consequences of agricultural production, evaluating health risk associated with agro-chemical use, and heightening public awareness of environmental issues.

### **4.2.1 Task M1 - Environmental Health Risk: Priority Setting and Training**

Water pollution is believed by many Moldovan environmental health officials and the general public to be one of the country's foremost environmental problems. Environmental health risks have been attributed to the adverse impact of agricultural production on surface and ground water quality. Water and food contamination, resulting from overuse of agro-chemicals and improper management of farm wastes, has been implicated in the deterioration of public health.

As part of work performed under DO 5, an EPT Project health risk specialist, Dr. G. Charnley, attended and made a presentation at an environmental health risk conference in Moldova. Dr. Charnley reported that approaches used in Moldova to evaluate environmental health risk and make public health decisions on the basis of the risk assessment were not in keeping with modern, internationally accepted methods. For example, mortality and morbidity rates were linked to exposure and ingestion of agro-chemicals without a rigorous analysis of data nor careful consideration of other causes such as diet and personal lifestyle preferences such as high levels of alcohol and tobacco consumption. Further, obsolescent sampling and chemical analytical equipment for collecting and testing water, soil, and food render most of the available environmental data generally unsuitable for evaluating environmental health issues associated with agricultural production.

A 3-day workshop was therefore held as part of DO 9 to provide over 40 Moldovan environmental, agricultural, and public health officials, decision-makers, and researchers with information on modern concepts and methods of environmental risk management and decision-making. A follow-on workshop was held at which various computer software programs were introduced that dealt with comparative health risk, as well as databases on toxicity of hazardous substances and their health consequences.

A study tour for nine Moldovans was conducted in the U.S. that provided information to reinforce topics presented at the workshops. The tour included visits to and meetings with agricultural, environmental, and public health researchers and officials, as well as representatives of environmental citizens' organizations.

As a direct result of the workshops and U.S. study tour, the Moldovan Department of Environmental Protection established the Office for Environmental Communications and Public Information to coordinate interagency and institutional exchange of information regarding environmental health risk assessment and management. This office also initiated a public information effort, in conjunction with the Education Outreach activities conducted as part of DO 9, Task M3.

The Department of Environmental Protection established a Steering Committee, comprised of representatives from agricultural, health, and environmental protection agencies, to coordinate Moldovan government cooperation with the EPT Project's environmental health activities. A subcommittee on environmental health risk assessment and management terminology was established to prepare a list of terms on the subject for approval by the State Committee on Official Language and subsequent inclusion in curricula of institutions of higher education.

To help the Department of Environmental Protection and other agencies and scientific/academic institutions promote concepts and methods of environmental risk assessment and management, the manual *Elements of Toxicology and Chemical Risk Assessment* was translated into the local language (Romanian) and copied for distribution by the Department to various entities.

In conjunction with Task M2, modern chemical analytical equipment was provided to several government and scientific/academic institutions in order to improve the capability within Moldova to perform accurate laboratory analyzes for pollutants present at minute concentrations.

#### **4.2.2 Task M2--Farm Environmental Management Demonstration Project**

Early in the implementation of DO 9, an assessment of agricultural activities in Moldova found that current crop production practices did not consider public health consequences nor incorporate principles of sustained natural resource management. Excessive tillage by farm machinery and implements had resulted in severe soil erosion which in turn heavily contributed to contamination of surface and ground waters by sediment and adhered agro-chemicals. These tillage methods also consumed large quantities of fuel. While the use of agro-chemicals had declined due to economic constraints, modern alternatives to widespread agro-chemical application, such as integrated pest management techniques, were either still being researched or not accepted by farmers because their practicality had not been properly demonstrated.

From autumn 1995 to autumn 1996, projects that demonstrated more environmentally effective farming practices were undertaken in three major eco-climatic regions (Beltsy [northern], Orhei [central], and Cahul [southern]) having different seasonal temperatures, precipitation, soil type, and frost dates. Comparative cultivation of field crops (wheat, corn) were undertaken using conventional- and conservation-tillage practices. Conservation tillage methods included no-tillage, which is the direct planting of spring crop seed into un-tilled soil using a no-till planter to provide seedbed preparation, and reduced-tillage, which is either leaving soil undisturbed in fall and winter, or using a chisel plow in place of a moldboard plow for fall tillage, either of which are then followed in the spring with a single tillage operation using a land-finisher and no-till planter. Conventional farming in Moldova typically uses 4-7 field tillage operations before a crop is

planted, while conservation tillage requires no pre-planting tillaging, or only 1-2 tillage operations prior to planting. In order to demonstrate conservation tillage methods, tillage implements were purchased and delivered to each site, and their connections adapted to local farm tractors. Equipment to measure soil moisture and soil erosion was also provided as part of the demonstration projects.

The cultivation demonstration projects showed that conservation tillage can produce crop yields comparable to convention methods, but with at least a 30 percent reduction in soil erosion. The conservation tillage methods used substantially less labor and fuel, and allowed greater retention of soil moisture. For example, the follow results were recorded at the Orhei demonstration site:

	<u>Corn Yield</u> <u>(kg/ha)</u>	<u>Fuel Cost</u> <u>(\$/ha)</u>
Conventional Tillage	3,530	\$47
Conservation Tillage	3,590-3,890	\$11-15

As part of the demonstration projects, technical support was provided to the Institute of Biological Plant Protection of Moldova in the form of micro-climate monitoring stations that strengthened the Institute's capabilities to bring biological control methods under large-scale field applications, in order to replace widespread use of pesticides.

Two technical and four practical workshops were conducted in 1996, attended by over 200 persons, to inform local farmers, agricultural and environmental specialists, and representatives of citizens' environmental organizations of issues associated with, and results of, the demonstration projects.

To improve the capability of Moldovan environmental and public health agencies to monitor pollutant levels associated with agricultural activities, modern chemical analytical equipment was provided, valued in excess of \$300,000. This equipment was similar to that provided to Ukrainian agencies and institutions as part of Task U4 (Kaniv Reservoir - see above). Several Moldovan analytical chemists were trained on the equipment already installed in Ukraine prior to delivery of equipment in Moldova.

#### **4.2.3 Task M3-Educational Outreach Campaign for Environmental Awareness and Consensus Building**

To enhance the effectiveness of Tasks M1 and M2, a public information and education program was conducted regarding environmental awareness and natural resource management issues. At the outset, a series of workshops were conducted with representatives of various Moldovan entities in order to encourage their participation and plan the educational and outreach activities, which included:

- field tours to the demonstration sites of Task M2;

- Moldovan-American Total Emersion English summer program;
- ecological chemistry conference;
- public awareness publications;
- development of university courses and materials.

Nearly 250 students and teachers participated in nine field tours, the objectives of which were to present the concepts of conservation tillage, discuss economic and environmental benefits of the technology, and allow first-hand observation of results of using the technology. Three tours were arranged at each demonstration site: the first was for students at secondary schools, the second for "colleges", and the third for university-levels. Additional exposure to the messages being introduced by the tours was via newspaper, radio, and television coverage.

Technical support was given to approximately 100 students, representing 17 regions of Moldova, participating in the *Moldovan-American Total Emersion English Summer Program*, held July 5-19, 1995. This is program for English-language instruction in a recreational setting, operated by the U.S. Peace Corps. Via the EPT Project, environmental and health topics were included in the instruction curricula. As a result of assistance provided by the EPT Project, the environmental NGO "21<sup>st</sup> Century" applied for and was awarded a \$70,000 grant from the Soros Foundation to purchase a camp ground and establish a permanent facility for environmental education and training in Moldova. Education materials and equipment that the EPT Project provided for the Summer Program were turned-over to 21<sup>st</sup> Century for use in follow-on training at the "Environmental Camp".

Logistical and technical support was provided to the *International Symposium on Ecological Chemistry*, held in Chisinau in October 1995, and attended by about 120 people from 17 countries. The symposium, the first of its kind in Moldova, provided a forum for specialists from a wide array of disciplines to discuss and share information on chemical processes in the environment and how understanding of these processes can both help elucidate environmental contamination issues and provide opportunities for effective intervention. Four EPT Project specialists from the U.S. provided key presentations, while 18 Moldovans who regularly cooperated with the EPT Project participated in the Conference as members of the Organizing Committee and/or International Scientific Committee, presented papers at the Plenary Session as well as various symposia, and chaired Symposium sessions.

Several types of public awareness documents were prepared. These included a special edition of the periodical *Natura* in which EPT Project topics on environmental risk assessment and risk management, focusing on the interrelationships between agriculture, human health, and the environment, were highlighted. Also prepared was a 16-panel brochure that presented a general analysis of contemporary environmental and public health conditions and the current ecological situation in Moldova, of which 5,000 copies were prepared and disseminated.

University-level courses and materials on environmental health risk assessment and risk

management were developed and introduced in October 1995 into the curricula of six Moldovan universities. Because both the concepts and terminology of risk assessment and risk management are new to Moldova, the terminology had to first be prepared for review and approval by the Ministry of Education's National Center of Terminology. A reference manual was then prepared and translated into the national language (Romanian) for use in the universities. Some 20 public domain interactive software programs on agriculture, environment, and health, were also demonstrated and made available to over 50 institutions, organizations, and schools, with an anticipated user audience of over 5,000 persons.

#### **4.2.4 Task M4 - Moldova Program Management**

CH2M HILL successfully completed the scope of work and submitted deliverables for Task M4, including:

- preparation of the delivery order work plan;
- providing a Moldova Country Manager;
- providing a Regional Finance and Administration Manager (sharing responsibility for Ukraine-based tasks)
- preparing regional and country-specific office descriptions and staffing plans.

## Section 5

### Delivery Order Lessons Learned

In conducting DO 9 tasks in Ukraine and Moldova, several important issues were identified which USAID may care to consider when developing future environmental assistance projects. These lessons-learned are discussed below, by task.

#### 5.1 Tasks for Ukraine

##### 5.1.1 Task U1--Demonstration of Environmental Management of Industrial Waste and Industrial Waste Minimization in Donetsk

This task was initially envisaged mainly as strengthening the Donetsk Oblast office of the Ministry for Environmental Protection & Nuclear Safety with regarding to hazardous industrial waste management. However, in view of the prevailing economic and political situation, enforcement activities by local environmental regulatory authorities are almost meaningless. While MEPNS-DO officials were training in environmental auditing techniques, they lacked modern analytical equipment to undertake pollutant monitoring which could then serve as a basis for legal prosecution. If an environmental audit was conducted by local regulators, and an enforcement action initiated, the enterprise often claimed financial inability to pay any fine and would appeal to more powerful arms of regional and national government to continue operations, partly because of the need to provide employment opportunities. Hence the problems of industrial pollution would continue. Part-way through implementation of this task, the emphasis of conducting environmental audits was therefore changed in order to identify cost-effective waste minimization opportunities which would reduce enterprise operating costs while also reducing waste discharge.

When conducting audit training, it was difficult to gain the trust and permission of industrial enterprises to enter their premises to undertake an independent audit. The enterprises did not wish to have environmental agency personnel participate in the audits and in the disclosure of audit reports. Procedures were absent regarding protection of audit confidentiality. This situation was again overcome by promoting the economic benefits of pollution prevention through environmental auditing rather than its for regulatory purposes.

Because the magnitude of pollution problems existing at many of the industrial facilities are so great and in many cases require huge capital investments in order to implement changes, the large scale transition to cleaner technologies and the clean-up of past environmental legacies will be a long process. Additionally, there are several critical industry restructuring and rationalization issues that need to be addressed by national- and regional-level economic planners. In essence, environmental management initiatives in Donetsk Oblast should be integrated into regional economic policy development and implementation. It may have been better for USAID, given the limits of funding and time, to have attempted to demonstrate industrial environmental management techniques on a much smaller scale and more clearly differentiate its objectives for enterprises and regulatory agencies.

Use of the Industrial Environmental Management Work Group of the *Program to Promote Sustainable Development* proved to be very effective in highlighting at the national level issues identified by the EPT Project's industrial environmental management activities in Donetsk Oblast. By way of example, the need for a consistent approach to environmental auditing in Donetsk was recognized, and the voluntary techniques outlined in ISO 14,000 were identified as one such method. Via the Work Group, this approach was promoted for nationwide application, particularly for industries that were being privatized and seeking finance from international lenders and/or investors.

### **5.1.2 Task U2 - Urban Water Management Demonstration: Lviv**

From results achieved by Task U2 of DO 9, it is evident that USAID successfully developed an approach towards strengthening vodokanals that can be replicated elsewhere in the former Soviet Union and other countries transitioning from centrally planned economies. This replication can most probably be extended from municipal water utilities to other local government services, such as heating, transport, and waste management. A key component was the development of a detailed understanding of the infrastructure and operations of the vodokanal, which provided information previously unavailable to the utility that it needed in order to identify cost-effective improvements. The EPT Project then implemented an improvement (upgrade of water deliveries in the Pasichna district) and provided the vodokanal with many other improvement opportunities for which it could seek assistance and/or loans.

Use of the Urban Water & Wastewater Work Group of the *Program to Promote Sustainable Development* again proved to be very effective in highlighting at the national level issues identified by the EPT Project's activities with Lviv Vodokanal as well as Bachcisaraj Vodokanal undertaken as part of Task U6. For example, it became evident that due to financial unviability and excessive central bureaucratic regulation, public health was threatened because of the inability of these utilities to fulfill their responsibility of providing municipal water sector services to their customers and that this situation was most probably common throughout Ukraine. Based upon the local findings, recommendations were prepared by the Work Group and accepted by the government regarding modification of the tax code and institutional reform of the water sector.

Another accomplishment was the leveraging by USAID of funding for different programs and cooperation with other donors in order to obtain more meaningful achievements. USAID combined funds from its environmental program (via CH2M HILL) with that from its housing and municipal services program (via PADCO) in order to extend the range of investigations in Lviv, obtain a more complete understanding of the issues, and implement a larger, more visible, set of assistance activities. Further, water sector improvements in Lviv were enhanced via cooperation with the Danish Environmental Protection Agency, which funded consultants under a World Bank initiative to evaluate opportunities to upgrade municipal wastewater treatment facilities.

### **5.1.3 Task U3 - Preparation of the Detailed, Annotated, Draft Biodiversity Conservation Strategy Outline and Development of Support Information Needed to Prepare Scopes of Work for Future Elaboration of a Biodiversity Conservation Strategy and Action Plan Project**

There are no substantive lessons-learned for Task U3, since USAID elected not to fund a biodiversity conservation strategy project and protected area demonstration plan.

### **5.1.4 Task U4 - Water Quality Program Assessment and Abatement, Kaniv Reservoir Project**

The Kaniv Reservoir Project, undertaken as part of cooperative agreement between MEPNS and USEPA, required that USEPA have an established presence in Ukraine to facilitate logistics, equipment procurement, and hiring of local experts. Partnering of USEPA, a government entity with an interagency agreement with USAID, and CH2M HILL's EPT Project consortium of private organizations working under contract to USAID, proved to be both a feasible and effective way for USAID to achieve implementation of the Kaniv Project. Such an arrangement should be considered for future work conducted by USEPA in the region.

### **5.1.5 Task U5--Ukraine-American Work Group Program**

While the *Program to Promote Sustainable Development in Ukraine* made significant achievements, it failed to obtain financial support from other donors or in-kind contributions from Ukrainian counterparts, both of which could have made it even more effective and sustained. Informal comment by other donors at times observed by the contractor was that the *Program* was viewed as a means of promoting U.S. agendas and that other donors wished to implement their own assistance projects without U.S. influence. While CH2M HILL identified means of obtaining other donor and host-country support and reported this to USAID, overcoming the misconception that the *Program* exclusively promoted U.S. agendas could, in the opinion of the contractor, only be accomplished by direct dialogue between representatives of USAID and the other donors. This is because other donors would not have viewed CH2M HILL as a credible official representative of the U.S. government in developing bi-lateral and multi-lateral cooperation agreements. If such dialogue did occur, it did so without CH2M HILL's knowledge and did not result in any financial or in-kind support.

An important element of the environmental work groups under the *Program to Promote Sustainable Development* was that issues identified during field implementation of USAID assistance projects could be effectively resolved by bringing them to the attention of national-level agencies, particularly through the preparation of policy recommendations and similar actions. While this was undertaken for EPT Project activities, other USAID projects which could have benefitted from the *Program* failed to do so. This most probably was due to the lack of internal coordination within USAID. Environmental topics inherently cut-across other programs, such as energy efficiency, agricultural productivity, municipal services, and privatization of industrial enterprises. With few exceptions, it was extremely difficult to engage USAID officials responsible for managing these programs, or the contractors tasked

with their implementation, in related activities of the environmental work groups and the *Program to Promote Sustainable Development*. Such cooperation could have been facilitated if the job descriptions of relevant USAID personnel and scopes of work of USAID contractors included specific statements about participation in the *Program*, as was the case with USAID's energy contractor in Ukraine, Hagler Bailly Consulting, Inc.

#### **5.1.6 Task U6--Tatar Environmental Health Project**

Two important issues were confronted during implementation of this task:

1. The request for assistance by USAID to the Tatar community came from the U.S. Ambassador to Ukraine. Due to political considerations, it was important to quickly achieve results. However, USAID's procedures meant that an environmental review of the project had to first be conducted, which in this case was an initial environmental evaluation followed by an environmental assessment (EA). The EA had to be conducted by an independent contractor (not CH2M HILL), which required developing the scope of work, engaging the contractor, preparing the EA, and evaluating the EA findings. Delays caused by these requirements significantly reduced the credibility of the U.S. assistance program to the Tatar community and other entities in Crimea and may have also resulted in other political problems between the U.S. and Ukraine unknown to CH2M HILL. It is therefore important for decision-makers at U.S. Embassies, and within USAID, to be constantly informed and reminded about USAID's environmental regulations and the implications for any project schedule.
2. A major component of this task was the procurement, from a Ukrainian vendor, of 9 km of water transmission pipe. Due to severe economic circumstances at the time of procurement, many companies were making payments in kind or had unpaid debts to their vendors. Vendors were prepared to discount these debts, especially if they were paid in hard currency, rather than write-off the debts. In the case of the pipe procurement, instead of directly paying the pipe manufacturer, CH2M HILL arranged to pay some of the debt of the pipe manufacturer to its supplier of natural gas, at a discount of 70%. In other words, for every \$100 of cost originally quoted by the pipe manufacturer (after winning a competitive bid), only \$70 was actually paid, and this amount was paid directly to the gas company. This reduced the amount of USAID funds needed to implement the task, and the principle could be widely used for any large USAID procurement in former Soviet republics and possibly elsewhere.

#### **5.1.7 Task U7 - Ukraine Program Management**

There are no substantive lessons-learned to report in the context of this task. This is because the task was primarily a funding of project management, which is a function required for successful implementation of any program and is generally accepted for all USAID activities.

## **5.2 Tasks for Moldova**

### **5.2.1 Task M1 - Environmental Health Risk: Priority Setting and Training**

As a result of visits to Moldova made as part of DO 5, it appeared that many Moldovans (both officials and the general public) believed that widespread application of agro-chemicals contributed to most cases of morbidity and mortality in the country. This view was often not shared by the agricultural community, which felt that agro-chemical usage had significantly contributed to the country's economy. In an attempt to resolve this divergence of views, DO 9 introduced risk assessment and risk management concepts to key decision-makers and the scientific community for the first time, in order to provide tools needed to prioritize key environmental risks and develop risk-management strategies. The techniques are complex, and while they were introduced to selected members of the scientific and academic community, inadequate time and funding was available for wider understanding of the concepts. To be more successful, application of the concepts should have actually been undertaken, at least in pilot projects or by selected topics or in limited geographic regions.

### **5.2.2 Task M2 - Farm Environmental Management Demonstration Project**

In order to introduce new agricultural techniques, field trials where conventional and new methods are compared in adjacent plots proved to be an extremely effective means of demonstrating new technology. Crop production demonstrations of any kind run the risk of inconclusive results due to factors beyond control of the implementor, such as weather conditions and degree of local cooperation. Therefore, establishing three demonstration sites in different eco-climatic regions greatly increased the likelihood of having a successful demonstration project. Engaging several agricultural scientific institutions in the demonstration greatly enhanced its credibility and sustained continuation of the technology beyond the life of the EPT Project.

While this task achieved impressive results, these were accomplished with considerable difficulty. The farm demonstration projects were dependent upon seasonal growing conditions. When equipment procurement could not be completed within one season, the projects had to be postponed until the next season, requiring an extension to the Moldova portion of the DO. Farming implements which had never been used before in Moldova had to be imported, which required considerable additional effort in dealing with local customs procedures. Further, the connections and hydraulic controls between these implements and the tractors used to haul them in the field had to be specially designed and manufactured once the equipment had arrived. Instruction manuals in the local language were not available, thereby limiting the immediate use of the implements. All these aspects contributed to project delays, which if replicated need to be carefully considered.

Opportunities to leverage the farm environmental management demonstration projects with other USAID activities in Moldova and Ukraine were missed:

1. USAID has other contractors and grantees whose scopes of work are primarily focused on agriculture. Attempts to interest USAID persons responsible for agricultural programs in considering the scope and results of the EPT Project farm demonstrations within their activities as well as share results of their programs with the EPT Project were unsuccessful. For example, USAID is supporting improved farm technology projects in Donetsk Oblast that could well have benefitted from the EPT Project's Moldovan experiences.
2. A key focus of USAID's programs in Ukraine and Moldova is improvements in energy efficiency. The very substantial reductions (up to 70%) in fuel usage demonstrated by the conservation tillage methods have national budget-level consequences in both countries that have been largely overlooked by USAID's strategic planners and program integraters.
3. Another key focus of USAID's programs in Ukraine and Moldova is improvements in public health. The reduced levels of sediment and absorbed/adhered agro-chemicals reaching sources of drinking water resulting from widespread application of conservation tillage practices have major beneficial public health implications which have also largely been overlooked by USAID.
4. Agriculture is the leading economic sector in both Moldova and Ukraine, and its improvement has been given considerable attention by USAID. Widespread application of conservation tillage in these countries, with its associated agricultural, environmental, energy, and public health benefits, is constrained by lack of necessary farm implements. These implements would be relatively easy to manufacture in Ukraine, given its highly industrialized economy. As part of USAID's efforts in the industrial sectors of Moldova and Ukraine to expedite privatization, assist development of small- and medium-sized domestic enterprises, encourage U.S. investment, enhance employment opportunities, and stimulate overall economic growth, greater consideration should have been given to promoting the need for, and the manufacture and distribution of, conservation tillage implements for which a ready domestic market exists.

### **5.2.3 Task M3 - Educational Outreach Campaign for Environmental Awareness and Consensus Building**

Often, international donor programs achieve impressive results for a specific beneficiary, but the accomplishments are not widely shared with other communities or sustained after cessation of funding. The objective of this task was the widespread dissemination of accomplishments of Tasks M1 and M2, as well as the continued use and refinement of techniques introduced by the delivery order. From observations during the DO period of performance, it is apparent that environmental education and awareness activities of Task M3 did greatly enhance the successes of environmental health risk (Task M1), and farm environmental management activities (Task M2), and that this approach could serve as a useful model for other donor programs. For example:

1. The development of university-level curricula on risk assessment and risk management at the introductory level will help ensure that future decision-makers are knowledgeable about the concepts and their usefulness, while more detailed courses will enable the development of health risk practitioners. However, as stated above with regard to Task M1, understanding of the concepts would have been greatly enhanced by the conduct of pilot applications.
2. The exposure of school and university students, and their teachers, to achievements of the farm environmental management demonstrations informed the next generation of adult citizens and decision-makers about the interrelationships between environmental, health, and economic issues. It also reinforced the message given to farmers who visited the demonstration sites and attended the technical and practical workshops, by ensuring that a wider audience became aware of the benefits demonstrated by the task. The enhancement of public awareness was further accomplished by using the field tours by students as opportunities to encourage the local printed and electronic news media to broadcast the demonstration results.

#### **5.2.4 Task M4 - Moldova Program Management**

There are no substantive lessons-learned to report in the context of this task. This is because the task was primarily a funding of project management, which is a function required for successful implementation of any program and is generally accepted for all USAID activities.

Appendix A  
**Status of Deliverables**

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Task	Delivery Order Deliverables	Status of Deliverables
<b>All Tasks</b>		
All	Work plan	Draft and final work plans provided: <i>Delivery Order #09: Draft Work Plan, Ukraine Tasks. October 1995</i> <i>Delivery Order #09: Draft Work Plan, Moldova Tasks. October 1995</i> <i>Delivery Order #09: Work Plan, Ukraine Tasks. May 1996</i> <i>Delivery Order #09: Work Plan, Moldova Tasks. May 1996</i>
All	Monthly status reports	Reports provided: <i>EPT Project Weekly Reports on Accomplishments and Issues, 1995, 1996, 1997</i> <i>EPT Project Deliverables Updates, 1997, 1998</i> <i>EPT Project Monthly Summary Reports, 1993, 1994, 1995</i> <i>EPT Project Quarterly Summary Reports, 1996, 1997, 1998</i>
<b>TASKS FOR UKRAINE</b>		
<b>Donetsk Industrial Waste Management</b>		
U1	Work plan	Included in: <i>Delivery Order #09: Draft Work Plan, Ukraine Tasks. October 1995</i> <i>Delivery Order #09: Work Plan, Ukraine Tasks. May 1996</i>
U1	Monthly status reports	Reports provided: <i>EPT Project Weekly Reports on Accomplishments and Issues, 1995, 1996, 1997</i> <i>EPT Project Deliverables Updates, 1997, 1998</i> <i>EPT Project Monthly Summary Reports, 1993, 1994, 1995</i> <i>EPT Project Quarterly Summary Reports, 1996, 1997, 1998</i>
U1	Draft training plan	Plan provided: <i>Draft Workshop/Seminar Plan</i>
U1	Audit training manual	Manual provided as part of: <i>Ukraine: Environmental Audit Training: Training Manual and Workshops, Donetsk, May-June 1996</i>
U1	Training sessions	Completed. Results reported in: <i>Ukraine: Environmental Audit Training: Training Manual and Workshops, Donetsk, May-June 1996</i>
U1	Round 1 draft audit report	Audits conducted at 2 facilities. Results reported in: <i>Ukraine: Draft Report, Round 1 Environmental Audit - Azovstal Metallurgical Plant, Mariupol</i> <i>Ukraine: Draft Report, Round 1 Environmental Audit - Water and Wastewater Operations of Enakievo Metallurgical Plant</i>
U1	Round 1 final audit report	Reports provided: <i>Ukraine: Final Report, Round 1 Environmental Audit - Azovstal Metallurgical Plant, Mariupol</i> <i>Ukraine: Final Report, Round 1 Environmental Audit - Water and Wastewater Operations of Enakievo Metallurgical Plant</i>
U1	Summary report on waste management practices	Report provided: <i>Ukraine: Waste Management Practices by Industries in Donetsk Oblast</i>
U1	Draft workshop/seminar plan	Plan provided: <i>Draft Workshop/Seminar Plan</i>
U1	Workshop on waste management practices	Completed. Workshop materials provided and results reported in: <i>Ukraine: Summary and Trip Report on Hazardous Waste Management Workshops, 15-16 and 20-21 February, 1996</i>
U1	Report on the make-up of the advisory group	Report provided: <i>Ukraine: Make-up of the Advisory Group on Industrial Waste Classification</i>
U1	Report on design of automated data processing (ADP) for hazardous waste inventory	Report provided: <i>Ukraine: Assessment of Hazardous Waste Issues in Donetsk Oblast: Automated Data Management, Hazardous Waste Inventory, and Site Ranking</i>
U1	Request for approval to procure ADP support hardware/software	Completed
U1	Delivery, installation of ADP support equipment	Completed
U1	Report on installation and performance of ADP systems	Included in: <i>Ukraine: Assessment of Hazardous Waste Issues in Donetsk Oblast: Automated Data Management, Hazardous Waste Inventory, and Site Ranking</i>

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Task	Delivery Order Deliverables	Status of Deliverables
U1	Summary report on hazardous waste inventory	Included in: <i>Ukraine: Assessment of Hazardous Waste Issues in Donetsk Oblast: Automated Data Management, Hazardous Waste Inventory, and Site Ranking</i>
U1	Summary report on the initial ranking of hazardous waste sites in the Oblast	Included in: <i>Ukraine: Assessment of Hazardous Waste Issues in Donetsk Oblast: Automated Data Management, Hazardous Waste Inventory, and Site Ranking</i>
U1	Draft workshop/seminar plan	Plan provided: <i>Draft Workshop/Seminar Plan</i>
U1	Workshops on fate and transport, treatability, and stabilization	Completed. Results reported in: <i>Ukraine: Summary Report on Water and Soil Pollution Assessment Workshop, Donetsk, September 1996</i>
U1	Feasibility report on the establishment of a Technical Information Center in the Oblast, identifying alternatives to make center self-sustaining	Report provided: <i>Ukraine: Feasibility Report, Donetsk Technical Information Center on Industrial Waste Management</i>
U1	Report on the start-up of the Technical Information Center	Report provided: <i>Ukraine: Startup Report, Donetsk Technical Information Center on Industrial Waste Management</i>
U1	Draft training plan	Plan provided: <i>Draft Training Plan</i>
U1	Training/workshop sessions on risk decision-making	Completed in collaboration with USEPA (Region 4). Results reported in: <i>Ukraine: Summary and Trip Report on Hazardous Waste Management Workshops, 15-16 and 20-21 February, 1996</i>
U1	Evaluation of alternative sites to conduct demonstration	Completed. Results reported in: <i>Ukraine: Assessment of Hazardous Waste Issues in Donetsk Oblast: Comparative Risk Site Demonstration</i>
U1	Summary report on outcome of demonstration	Report submitted: <i>Ukraine: Assessment of Hazardous Waste Issues in Donetsk Oblast: Comparative Risk Site Demonstration</i>
U1	Lessons learned report	Included in: <i>Final Report Delivery Order No. 9: Ukraine, Belarus, and Moldova: Mitigating Health and Economic Consequences of Environmental Mismanagement</i>
<b>Lviv Urban Water and Wastewater</b>		
U2	Work plan	Included in: <i>Delivery Order #09: Draft Work Plan, Ukraine Tasks. October 1995</i> <i>Delivery Order #09: Work Plan, Ukraine Tasks. May 1996</i>
U2	Report - Identification and recommendation for equipment	Included in: <i>AIP 20 - Procure and Deliver Equipment to Support Lviv Vodokanal Demonstration Project</i>
U2	Monthly status reports	Reports provided: <i>EPT Project Weekly Reports on Accomplishments and Issues, 1995, 1996, 1997</i> <i>EPT Project Deliverables Updates, 1997, 1998</i> <i>EPT Project Monthly Summary Reports, 1993, 1994, 1995</i> <i>EPT Project Quarterly Summary Reports, 1996, 1997, 1998</i>
U2	Report - Coordination of activities with PADCO and others	Report provided: <i>Ukraine: Co-ordination with Other Contractors Working with the Lviv Vodokanal</i>
U2	Report - General schematic of the water system	Report provided: <i>Ukraine: General Schematic of the Lviv Water System</i>
U2	Report - Summary of initial data on the current system	Report provided: <i>Ukraine: Summary of Initial Data on Current System of Lviv Vodokanal</i>
U2	Report - Summary of interim data on the current system,	Report provided: <i>Ukraine: Summary of Interim Data on Current System of Lviv Vodokanal</i>
U2	Report - Summary of final data on the current system	Report provided: <i>Ukraine: Summary of Final Data on Current System of Lviv Vodokanal</i>
U2	Report - Report on financial impacts	Report provided: <i>Ukraine: Financial Impacts of the Lviv Vodokanal Water System</i>

Task	Delivery Order Deliverables	Status of Deliverables
U2	Manual - Guidelines for economic analysis	Manual provided: <i>Ukraine: Manual - Guidelines for Economic Analysis of Vodokanal Viability and Operations</i>
	Workshops - 5 1-day workshops	Completed. Results reported in: <i>Ukraine: Summary Report on Lviv Vodokanal Workshops 1 &amp; 2, October 25 and 27, 1995</i> <i>Ukraine: Summary Report on Lviv Vodokanal Workshops 3 &amp; 4, March 27 and 28, 1996</i> <i>Ukraine: Summary Report on Lviv Vodokanal Workshop 5, June 14, 1996</i>
U2	Report - Summary of data on metering, billing, and revenues	Report provided: <i>Ukraine: Summary of Data on Metering, Billing, and Revenues of Lviv Vodokanal</i>
U2	Report - Problems of system measurement	Report provided: <i>Ukraine: Problems of System Measurement of Lviv Vodokanal</i>
U2	Report - Demonstration program proposal	Two reports provided: <i>Ukraine: Proposals for Demonstration Projects that Would Improve Water Metering and Measurement in the City of Lviv</i> <i>Ukraine: Proposal to Demonstrate an Improvement to Water Supply Operations in the City of Lviv</i>
U2	Report - Summary of the results of the demonstration program	Report provided: <i>Ukraine: Summary of the Results of the Demonstration Program to Improve Lviv's Water Supply Through Upgrades to the Pasichna Pumping Facility</i>
U2	Manual - Methodology for strategic policy and institutional strengthening	Manual provided: <i>Ukraine: Manual: Methodology for Strategic Policy &amp; Institutional Strengthening of Lviv Vodokanal</i>
U2	Report - Strategic policy and institutional strengthening for Lviv	Report provided: <i>Ukraine: Strategic Policy &amp; Institutional Strengthening for Lviv Vodokanal</i>
U2	Report - Project final report	Report provided: <i>Ukraine: Project Final Report, Lviv Vodokanal Activities</i>
U3	Work plan	Included in: <i>Delivery Order #09: Draft Work Plan, Ukraine Tasks. October 1995</i> <i>Delivery Order #09: Work Plan, Ukraine Tasks. May 1996</i>
U3	Monthly status report	Reports provided: <i>EPT Project Weekly Reports on Accomplishments and Issues, 1995, 1996, 1997</i> <i>EPT Project Deliverables Updates, 1997, 1998</i> <i>EPT Project Monthly Summary Reports, 1993, 1994, 1995</i> <i>EPT Project Quarterly Summary Reports, 1996, 1997, 1998</i>
U3	Report - Detailed annotated draft Biodiversity Conservation Strategy outline	Included in: <i>Study Design (with cost details)(without cost details): Ukraine Biodiversity Conservation Strategy &amp; Protected Area Management Demonstration</i>
U3	Report - Preliminary selection of demonstration sites for model protected area management plan	Included in: <i>Study Design (with cost details)(without cost details): Ukraine Biodiversity Conservation Strategy &amp; Protected Area Management Demonstration</i>
U3	Report - Overall findings to support future work	Included in: <i>Study Design (with cost details)(without cost details): Ukraine Biodiversity Conservation Strategy &amp; Protected Area Management Demonstration</i>
U3	Procurement - Computer as necessary to support Task U3	Deleted per COTR Technical Direction that computer equipment was not necessary to support Task U3
U3	Report - Draft project report	Report provided: <i>Draft Study Design (with cost details)(without cost details): Ukraine Biodiversity Conservation Strategy &amp; Protected Area Management Demonstration</i>
U3	Report - Final project report	Report provided: <i>Study Design (with cost details)(without cost details): Ukraine Biodiversity Conservation Strategy &amp; Protected Area Management Demonstration</i>

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Task	Delivery Order Deliverables	Status of Deliverables
U4	Work plan	Included in: <i>Delivery Order #09: Draft Work Plan, Ukraine Tasks. October 1995</i> <i>Delivery Order #09: Work Plan, Ukraine Tasks. May 1996</i>
U4	Monthly status reports	Reports provided: <i>EPT Project Weekly Reports on Accomplishments and Issues, 1995, 1996, 1997</i> <i>EPT Project Deliverables Updates, 1997, 1998</i> <i>EPT Project Monthly Summary Reports, 1993, 1994, 1995</i> <i>EPT Project Quarterly Summary Reports, 1996, 1997, 1998</i>
U4	Report - Equipment procurement	Report provided: <i>Ukraine: Kaniv Reservoir Project, Equipment Procurement Report</i>
U4	Procurement - Laboratory equipment	Completed. Results reported in: <i>Ukraine: Kaniv Reservoir Project, Equipment Procurement Report</i>
<b>Work Group Program</b>		
U5	Work plan	Included in: <i>Delivery Order #09: Draft Work Plan, Ukraine Tasks. October 1995</i> <i>Delivery Order #09: Work Plan, Ukraine Tasks. May 1996</i>
U5	Monthly status reports	Reports provided: <i>EPT Project Weekly Reports on Accomplishments and Issues, 1995, 1996, 1997</i> <i>EPT Project Deliverables Updates, 1997, 1998</i> <i>EPT Project Monthly Summary Reports, 1993, 1994, 1995</i> <i>EPT Project Quarterly Summary Reports, 1996, 1997, 1998</i>
U5	Report - Summary issues analysis: Waste Management Work Group	Included in: <i>Ukraine: Work Group Implementation Plan: Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. February 1996</i> <i>Ukraine: Work Group Implementation Plan (Revised): Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. March 1996</i> <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Report - Meeting summaries: Waste Management Work Group	Included in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Report - Recommended impact indicators: Waste Management Work Group	Report provided: <i>Ukraine: Recommended Impact Indicators: Environmental Work Groups, and Ukraine-U.S. Program to Promote Sustainable Development</i>
U5	Draft training plan: Waste Management Work Group	Included in: <i>Ukraine: Work Group Implementation Plan: Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. February 1996</i> <i>Ukraine: Work Group Implementation Plan (Revised): Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. March 1996</i> <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Training sessions: Waste Management Work Group	Completed. Results reported in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Publications: Waste Management Work Group	Included in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Report - Work group output assessments: Waste Management Work Group	Included in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>

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Task	Delivery Order Deliverables	Status of Deliverables
U5	Report - Summary issues analysis: Urban Water Resources Work Group	Included in: <i>Ukraine: Work Group Implementation Plan: Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. February 1996</i> <i>Ukraine: Work Group Implementation Plan (Revised): Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. March 1996</i> <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Report - Meeting summaries: Urban Water Resources Work Group	Included in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Report - Recommended impact indicators: Urban Water Resources Work Group	Report provided: <i>Ukraine: Recommended Impact Indicators: Environmental Work Groups, and Ukraine-U.S. Program to Promote Sustainable Development</i>
U5	Draft training plan: Urban Water Resources Work Group	Included in: <i>Ukraine: Work Group Implementation Plan: Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. February 1996</i> <i>Ukraine: Work Group Implementation Plan (Revised): Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. March 1996</i> <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Training sessions: Urban Water Resources Work Group	Included in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Publications: Urban Water Resources Work Group	Included in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Report - Work group output assessments: Urban Water Resources Work Group	Included in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Report - Summary issues analysis: Agriculture and Pesticide Work Group	Included in: <i>Ukraine: Work Group Implementation Plan: Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. February 1996</i> <i>Ukraine: Work Group Implementation Plan (Revised): Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. March 1996</i> <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Report - Meeting summaries: Agriculture and Pesticide Work Group	Included in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Report - Recommended impact indicators: Agriculture and Pesticide Work Group	Report provided: <i>Ukraine: Recommended Impact Indicators: Environmental Work Groups, and Ukraine-U.S. Program to Promote Sustainable Development</i>
U5	Draft training plan: Agriculture and Pesticide Work Group	Included in: <i>Ukraine: Work Group Implementation Plan: Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. February 1996</i> <i>Ukraine: Work Group Implementation Plan (Revised): Urban Water Resources, Industrial Waste Management, Agriculture &amp; Pesticides. March 1996</i> <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Training sessions: Agriculture and Pesticide Work Group	Included in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>

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Task	Delivery Order Deliverables	Status of Deliverables
U5	Publications: Agriculture and Pesticide Work Group	Included in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
U5	Report - Work group output assessments: Agriculture and Pesticide Work Group	Included in: <i>Ukraine: Assessment of Environmental Work Group Outputs and Progress of Ukraine-U.S. Program to Promote Sustainable Development: Activities in 1996</i>
<b>Tatar Environmental Health</b>		
U6	Work plan	Included in: <i>Delivery Order #09: Draft Work Plan, Ukraine Tasks. October 1995</i> <i>Delivery Order #09: Work Plan, Ukraine Tasks. May 1996</i>
U6		Reports provided: <i>EPT Project Weekly Reports on Accomplishments and Issues, 1995, 1996, 1997</i> <i>EPT Project Deliverables Updates, 1997, 1998</i> <i>EPT Project Monthly Summary Reports, 1993, 1994, 1995</i> <i>EPT Project Quarterly Summary Reports, 1996, 1997, 1998</i>
U6	Procurement - Water pipe	Completed
U6	Procurement - Laboratory equipment	Completed
U6	Training - Use of laboratory equipment	Completed
U6	Report - Project completion report	Included in: <i>Final Report Delivery Order No. 9: Ukraine, Belarus, and Moldova: Mitigating Health and Economic Consequences of Environmental Mismanagement</i>
<b>Project Management</b>		
U7	Position description - Project Manager	Description provided: <i>Position Description: Ukraine Project Manager</i>
U7	Position Description - Regional Finance Director	Description provided: <i>Position Description: Regional Finance Director</i>
U7	Organization and staffing plan	Plan provided: <i>Organization and Staffing Plan</i>
<b>TASKS FOR MOLDOVA</b>		
<b>Environmental Risk</b>		
M1	Work plan	Included in: <i>Delivery Order #09: Draft Work Plan, Moldova Tasks. October 1995</i> <i>Delivery Order #09: Work Plan, Moldova Tasks. May 1996</i>
M1	Monthly status reports	Reports provided: <i>EPT Project Weekly Reports on Accomplishments and Issues, 1995, 1996, 1997</i> <i>EPT Project Deliverables Updates, 1997, 1998</i> <i>EPT Project Monthly Summary Reports, 1993, 1994, 1995</i> <i>EPT Project Quarterly Summary Reports, 1996, 1997, 1998</i>
M1	ERDMP workshop design	Design provided: <i>Moldova: Environmental Risk Decision Making Workshop Design</i>
M1	ERDMP workshop delivery	Completed. Results reported in: <i>Moldova: ERDMP Workshop Summary Report</i>
M1	Workshop summary report	Report provided: <i>Moldova: ERDMP Workshop Summary Report</i>
M1	Study tour outline and proposed agenda	Included in: <i>Itinerary: Moldova Study Tour to U.S., July 7 -23, 1997</i>
M1	Study tour summary report	Report provided: <i>Moldova: U.S.-Based Study Tour, July 1995</i>
<b>Farm Environmental Management Demonstration</b>		
M2	Work plan	Included in: <i>Delivery Order #09: Draft Work Plan, Moldova Tasks. October 1995</i> <i>Delivery Order #09: Work Plan, Moldova Tasks. May 1996</i>

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Task	Delivery Order Deliverables	Status of Deliverables
M2	Monthly status reports	Reports provided: <i>EPT Project Weekly Reports on Accomplishments and Issues, 1995, 1996, 1997</i> <i>EPT Project Deliverables Updates, 1997, 1998</i> <i>EPT Project Monthly Summary Reports, 1993, 1994, 1995</i> <i>EPT Project Quarterly Summary Reports, 1996, 1997, 1998</i>
M2	Report on agricultural technical capabilities and practices	Report provided: <i>Moldova: Agricultural Technical Capabilities and Practices Assessment</i>
M2	Report on analytical capabilities and capacity to conduct environmental monitoring from agricultural sources	Report provided: <i>Moldova: Assessment of Chemical Analytical Capabilities for Environmental Monitoring in Moldova</i>
M2	Preliminary report on recommended demonstrations	Report provided: <i>Moldova: Field Demonstration Site Selection Report</i>
M2	Agricultural Demonstration Design Report	Report provided: <i>Moldova: Farm Environmental Management Demonstration Project Design</i>
M2	Agricultural Demonstration Report	Report provided: <i>Moldova: Farm Environmental Management Demonstration Project, Summary Report</i>
M2	Report on technical workshops	Report provided: <i>Moldova: Agricultural Technical Workshop II, June 26-27, 1996</i>
M2	Report on practical workshops	Report provided: <i>Moldova: Practical Training Workshops (Seminars), June and October 1996</i>
M2	Report on monitoring needs	Two reports provided: <i>Recommendation on the Procurement of Chemical Analytical Equipment to Support Improved Environmental Monitoring in Moldova</i> <i>Analytical Equipment Recommendations for Moldova</i>
<b>Educational Outreach Campaign</b>		
M3	Work plan	Included in: <i>Delivery Order #09: Draft Work Plan, Moldova Tasks. October 1995</i> <i>Delivery Order #09: Work Plan, Moldova Tasks. May 1996</i>
M3	Monthly status reports	Reports provided: <i>EPT Project Weekly Reports on Accomplishments and Issues, 1995, 1996, 1997</i> <i>EPT Project Deliverables Updates, 1997, 1998</i> <i>EPT Project Monthly Summary Reports, 1993, 1994, 1995</i> <i>EPT Project Quarterly Summary Reports, 1996, 1997, 1998</i>
M3	Planning workshop report	Report provided: <i>Moldova: Educational Outreach Planning Workshops, Summary Report</i>
M3	Field tour report	Report provided: <i>Moldova: Educational Field Tours Summary Report, May, June and October 1996</i>
M3	Summary report on American-Moldovan Total Immersion in English Summer Program: Ecology Program support	Report provided: <i>Moldova: Moldovan-American Total Immersion in English Summer Camp, June 5-17, 1995</i>
M3	Summary report on assistance provided in organizing and implementing the international Ecological Chemistry Conference in Chisinau	Report provided: <i>Moldova: Ecological Chemistry Conference, October 1-4, 1995</i>
M3	Pre-publication mock up of public awareness brochures	Completed
M3	Publication of public awareness brochures	Included in: <i>Moldova: Educational Outreach Publications</i>
M3	Outline of two university level courses on risk management	Included in: <i>Moldova: Risk Assessment/Risk Management Course Materials</i>
M3	Course description and materials	Included in: <i>Moldova: Risk Assessment/Risk Management Course Materials</i>
<b>Program Management</b>		
M4	Project Manager position description	Description provided: <i>Position Description: Moldova Project Manager</i>
M4	Field Finance Director position description	Description provided: <i>Position Description: Regional Finance Director</i>