PD-ABU-577
112365

47864

Preliminary Economic Analysis of the Expected Operation and Maintenance Activities for EPT Project Facilities in Kazakstan, Uzbekistan, and Turkmenistan

Final Final

~~Subject to Revisions~~

An EPT Project Trip Report

by

Dennis Wichelns

For Travel to Almaty, Kazakstan

With Working Trips to:

Kzyl-Orda, Kazakstan
Ashgabat, Turkmenistan
and Tashkent, Uzbekistan

Prepared by Dennis Wichelns, Dept. of Environmental and Natural Resource Economics, University of Rhode Island, Kingston, Rhode Island 02881.
This trip was conducted as a part of a short-term consulting assignment with the USAID Environmental Policy and Technology Project in Almaty, Kazakstan.

October 29, 1996

A

Preliminary Economic Analysis of the Expected Operation and Maintenance Activities for EPT Project Facilities in Kazakstan, Uzbekistan, and Turkmenistan

1. Introduction

The goal of this trip was to gather information required to perform the economic and financial analysis described in Task 2D2 of Delivery Order 12, which requires that we estimate the operation and maintenance costs of water facilities addressed in Delivery Orders 2, 6, and 7. These include improvements to a well field and pumping stations in Kazakstan, improvements to water treatment plants in Uzbekistan, and construction of a reverse-osmosis plant in Turkmenistan. Task 2D2 also requires that we develop written recommendations for the long-term financing of the operation and maintenance activities in each country, to enhance the probability that those activities will be sustained in the future.

Interviews were conducted with engineers and policy officials to collect information describing expected operation and maintenance costs, and to learn about current plans for generating the revenue necessary to cover those costs. The quality of information collected in each country varies with the type of facilities and the nature of improvements implemented by the EPT Project. For example, the improvements to water treatment plants in Uzbekistan represent a very small component of the Tuyamuyun-Urgench and Tuyamuyun-Nukus water delivery systems. The operation and maintenance costs for those improvements are very small, relative to the total cost of operating each pipeline. In Kazakstan, the improvements to a well field and several pumping stations will enhance the efficiency of operating the Aral-Sarybulak Pipeline system, as older inefficient pumps and other components have been replaced with new equipment. The operation and maintenance costs for the reverse-osmosis plant in Turkmenistan must be estimated using engineering analysis, as that plant is not yet operating at full capacity.

Long-term financing of the operation and maintenance costs can be provided by subsidies from central or local governments, by revenues generated through the sale of water to residents and industries, or by a combination of these sources. The central governments of Kazakstan, Uzbekistan, and Turkmenistan have accepted responsibility for the long-term operation and maintenance of the EPT Project facilities in each country, as described in Memoranda of Understanding with the United States government. One goal of Task 2D2 is to provide information that will assist each government in determining the optimal mix of government

subsidies and water user charges to generate the revenue necessary to pay for operation and maintenance costs. We plan to develop a framework for evaluating alternative water pricing and subsidy policies in each country.

2. Estimating Operation and Maintenance Costs

The operation and maintenance costs for the EPT Project improvements in Kazakstan and Uzbekistan will be small portions of the total costs of operating and maintaining the water delivery systems in those countries. Preliminary O&M cost estimates for the Aral-Sarybulak Pipeline have been obtained from appropriate officials in Kzyl-Orda and Aralsk. Data tables including those estimates are being translated from Russian to English by EPT staff in Almaty. When available, the estimated O&M costs will be described in a written report. Preliminary estimates of the O&M costs for the EPT Project improvements to the water treatment facilities in Uzbekistan have been provided by the Moscow Office of CH2M-Hill. In addition, we have obtained preliminary estimates of the O&M costs for the Tuyamuyun-Urgench and Tuyamuyun-Nukus Pipeline systems from government officials in Uzbekistan and from reports prepared by donor agencies and their consultants.

Estimates of the operation and maintenance costs for the reverse-osmosis plant in Turkmenbashi Etrap will be prepared by EPT Engineers in Almaty. That facility is not yet operating at full capacity, but the cost information will describe our best estimates of the labor, chemicals, fuel, and other consumables required to operate and maintain the plant. We will also provide estimates of operating and maintaining the fleet of water delivery trucks that will transport water from the treatment plant to collective farms and villages in the Turkmenbashi Etrap.

3. Government Subsidies and Water Prices

Revenues required to pay for the operation and maintenance costs of the EPT Project facilities can be provided by government subsidies, water user charges, or a combination of these sources. At present, the governments of Kazakstan and Uzbekistan provide a significant financial subsidy to water delivery organizations, in order to maintain a relatively low price for water delivered to residents in the Aral Sea region. The residential price of water is also subsidized indirectly by the relatively high price for water delivered to government organizations, industries, and collective farms in Kazakstan and Uzbekistan. The central governments also provide funding for capital improvements to water delivery systems when revenues from water sales are not sufficient to pay for these activities.

The current structure of water prices in Kazakstan and Uzbekistan includes separate prices for three categories of water users. Group 1 includes residential consumers, or the general population, while Group 2 includes state organizations, such as hospitals, schools, and government agencies. Collective

farms and state farms are also included in the second category. Group 3 includes private enterprises and industrial water users. Historically, the price of water sold to residents (Group 1) has been less than the cost of producing and delivering water, while the price of water sold to state organizations and industries has been much higher than the cost of production and delivery. Water prices are determined each year by dividing the expected total expenditure by the expected volume of water to be delivered to each group of customers, subject to the constraint that the residential price be maintained at a relatively low level.

The governments of Kazakstan and Uzbekistan have issued decrees that require water prices to rise, over time, to levels that will generate revenue for paying the operation and maintenance costs of pipeline authorities. The goal is to eliminate the implicit government subsidy to water delivery operations by generating sufficient revenues from water sales to pay for operation and maintenance costs. In Uzbekistan, water prices have already begun increasing according to a schedule that will achieve the government's goal of eliminating the implicit subsidy by the year 2000. The future path of water prices along the Aral-Sarybulak Pipeline is less certain, given current difficulties in collecting revenues from some water users.

It may be helpful, in both Kazakstan and Uzbekistan, to examine the underlying structure of water prices and consumption norms at the same time that the central governments are implementing higher water prices. The current method of estimating water prices and quantities delivered to each group of customers does not encourage any group to use water efficiently. For example, bulk water users are charged for a pre-determined volume of water that is estimated by multiplying the number of households in a settlement or collective farm by the consumption norm for households. State organizations and enterprises without water meters are also charged for a pre-determined volume of water, while the volume actually consumed is not measured. None of these customers has an economic incentive to use water efficiently because total expenditures for water are independent of the volume consumed. It would be useful to evaluate alternative water pricing structures that provide such an incentive, while maintaining compatibility with other aspects of the water delivery system.

The Government of Turkmenistan maintains an official policy that water, natural gas, and electricity should be provided at no charge to citizens of that country. Therefore, the government currently provides a complete subsidy of the cost to deliver water to households in the Aral Sea region. If the government maintains this policy with respect to water produced by the reverse-osmosis plant in Turkmenbashi, it will be necessary to provide the entire cost of operation and maintenance to the local authority operating the plant and the delivery system, each year. In addition, the central government will need to set aside funds for long-term capital replacement, annual repairs, and a reserve fund for unexpected expenditures. Alternatively, the government could consider relaxing its policy

of providing water at no charge, in order to generate a portion of the operation and maintenance costs through the sale of water to residents of collective farms and villages in the Turkmenbashi Etrap.

The EPT Project is currently paying for operation and maintenance of the reverse-osmosis plant in Turkmenbashi, but this activity is scheduled to end in December, 1996. At that time, the Government of Turkmenistan will assume responsibility for operation and maintenance, and for delivering water produced at the plant to collective farms and villages. It is imperative that some method of water allocation, involving allotments, prices, or a combination of these tools, be developed to ensure that the high-quality water produced by the plant is used appropriately. A preliminary water pricing and allocation plan should be presented with the draft water distribution plan for the Turkmenbashi facility, to assist the government in evaluating this critical component of operation and maintenance.

4. Preliminary Economic Analysis for Kazakstan and Uzbekistan

Water pricing structures are similar in Kazakstan and Uzbekistan, where separate prices are charged for residents, state organizations, and industrial enterprises. Historically, each government has attempted to maintain a very low price for residential water, while charging much higher prices to the second and third groups of water users. In both countries, water is delivered by pipeline authorities to local water delivery organizations or to individual state organizations and industrial enterprises. The pipeline authorities do not sell water directly to residential households.

In Kazakstan, the Aral-Sarybulak Pipeline Authority sells water to bulk water suppliers who provide water service to residents of cities and settlements near Aralsk and Kazalinsk. The volume of water delivered to the bulk water suppliers is determined by multiplying the number of residents by an estimated residential water use rate in liters per capita per day. Water is measured at the turnout from the Aral-Sarybulak Pipeline to the bulk water supplier, but water delivered to individual households is not metered at this time. Many of the state organizations and enterprises that purchase water directly from the Pipeline Authority have installed water meters to ensure they are charged only for water actually delivered. The rate of installation of water meters at these organizations has increased in recent years, as the price of water for Groups 2 and 3 has increased.

has this cut down on revenue?

In Uzbekistan, the Tuyamuyun-Urgench and Tuyamuyun-Nukus Pipeline authorities sell water to vodokanals and agro-vodokanals that provide water service to residential, agricultural, and industrial customers. As in Kazakstan, there are very few residential meters, but many state organizations and enterprises have installed water meters to measure the volume actually delivered. The Government

of Uzbekistan has issued a decree requiring that new residences constructed in the future will be equipped with water meters. In addition, there is a plan to install water meters in some existing residences, subject to the availability of funds for meter installation.

under EPT or sponsored by GOU?

As noted above, the water pricing structures in Kazakstan and Uzbekistan are designed to provide relatively low residential prices of water, while raising sufficient funds to pay for operation and maintenance costs by charging relatively high prices to state organizations and industrial enterprises. While such a plan may be feasible in some situations, the current prices for water in Kazakstan and Uzbekistan provide incorrect signals to all three groups of water users. Residential users are charged a price that is less than the marginal cost of water delivery, while other users are charged a price that is much higher than the marginal cost of delivery. In terms of economic efficiency, residential consumers are likely using too much water, while state organizations and enterprises may be using too little water. In fact, some industrial enterprises have responded to increasing prices by terminating their service from the pipeline authority and switching to groundwater or some other water source. It may be useful to provide the pipeline authorities with technical assistance regarding the potential impact of water prices on the quantities demanded by customers in each group.

*

Economic efficiency requires that the price of water is equal to its marginal cost of production and delivery, to ensure that water users equate the incremental value of water with the marginal cost of production and delivery. Ideally, the price of water should be the same for residences and industries if the marginal cost of production and delivery is the same for each group. The goal of providing residential water at lower cost can be justified for social reasons, such as assisting households with very low incomes in the Aral Sea region. However, such a goal should be accomplished using public funds if it is the public that wishes to provide the subsidy. In addition, the subsidy should be designed in a manner that does not distort incremental water use decisions.

As noted above, the practice of charging very high prices to state organizations and industrial enterprises causes those customers to purchase less water from the pipeline authority than would be economically efficient. In addition, the artificially high water prices may reduce the level of economic activity provided by the enterprises and may cause some companies to locate in other regions where water costs are lower. Such a response can reduce the revenue received by the pipeline authority and reduce the number of jobs available for residents in the Aral Sea region.

The price structure for water delivered from pipeline authorities in Kazakstan and Uzbekistan should be modified to provide the correct economic incentives to domestic and industrial water users in both countries. The price of water should be set equal to the marginal cost of producing and delivering the water, with

appropriate consideration of a capital replacement fund and a reserve fund for unexpected expenditures. Subsidies to low-income households, or to other customers for whom the public desires to provide a subsidy, should be provided explicitly, using an appropriate policy instrument. For example, an increasing block-rate pricing structure can be used to provide a selected amount of water for essential domestic uses at a relatively low price, while charging a higher price for water delivered in excess of that amount.

The price of water delivered from the Kosaman and Berdykol Wellfields located northwest of Aralsk should include a scarcity component if the rate of natural recharge is less than the rate of withdrawal, or if the freshwater component of the aquifer will eventually be depleted or contaminated by saline water moving laterally into the Wellfields. The purpose of the scarcity component is to reflect the limited availability of the groundwater resource, from an intertemporal perspective. Revenues generated by the scarcity component should be deposited in an account for investments in alternative water sources to replace the groundwater aquifer when it is economically depleted.

Results of a groundwater modelling exercise suggest that under the proposed operating conditions, the Kosaman Wellfield may be impacted by saline water within 20 to 50 years and the Berdykol Wellfield may not be impacted by saline water for at least 50 years (Kazakstan Field Report: Groundwater Survey and Hydrogeologic Characterization of the Kosaman and Berdykol Wellfields, Kazakstan, January 1996). These estimates may be refined as operations continue and as water quality data are collected, over time. The scarcity component of water price may need to be adjusted as better estimates of the useful time horizon become available.

Efforts to implement an efficient water pricing structure, and the gains achieved by such a program, will be constrained by the current lack of water meters at households in the Aral Sea region. Volumetric measurement of water deliveries is required to achieve the full benefits of an efficient water pricing structure. Households cannot evaluate their water use pattern completely or implement an optimal response to water prices if they are not able to determine how much water is used each month. For the same reason, public efforts to encourage domestic water conservation efforts will also be limited by the lack of water meters. However, an increasing block-rate pricing structure can be useful in promoting the concept of efficient water use, particularly in the Aral Sea region, even if water deliveries to individual households cannot yet be measured.

An increasing block-rate pricing structure for water delivered to villages, settlements, vodokanals, and agro-vodokanals will inform these bulk water suppliers that the incremental cost of water will rise as the total volume delivered to each supplier increases. This will provide an incentive to the bulk water suppliers to promote water conservation efforts among residents and other customers in their service area. In addition, the bulk water suppliers will have

an incentive to install water meters in locations where the cost of installation can be justified, to encourage efficient water use. Meters would also enable the bulk water suppliers to charge individual customers for each unit of water delivered, using either a single water price or an increasing block-rate pricing structure.

The pipeline authorities in Kazakstan and Uzbekistan currently examine water cost and supply information to determine the prices charged for water, each year. That process should be enhanced to consider alternative pricing structures, such as increasing block-rate pricing. We will develop a water pricing model that can be used to examine alternative structures, and to select the best set of parameter values. The model will be useful in describing the potential revenue impacts of alternative pricing structures.

5. Preliminary Economic Analysis for Turkmenistan

The reverse-osmosis plant in Turkmenistan has been designed to deliver high-quality water for drinking and cooking to residents of the Turkmenbashi Etrap in the Dashovuz Velayet. The rated plant capacity of 750 m^3 per day should be sufficient to deliver about 7 to 10 liters per capita per day for drinking and cooking. Water for other purposes, such as bathing, gardening, and livestock watering is available from historical water sources including shallow wells and irrigation canals. Water from those sources is of much lower quality than water from the reverse-osmosis plant. Some form of water rationing, using either allotments, prices, or a combination of these tools, will be required to ensure that the high-quality water is used only for drinking and cooking.

The current draft distribution plan for water treated at the reverse-osmosis plant includes truck delivery of water to village centers in collective farms in the Turkmenbashi Etrap. Large water containers will be located at these centers and residents will be able to fill their own buckets or other vessels with water from the large containers. At present, there is no plan to limit these "withdrawals" to the planned delivery volume of 7 to 10 liters per capita per day. In the absence of an appropriate allocation program, there is no guarantee that residents will use only that amount of water for use in drinking and cooking. It is possible that the high-quality water may be used for other household purposes for which a lower quality water would be more appropriate.

A program of water prices should be implemented as soon as possible for water produced at the Turkmenbashi reverse-osmosis plant. The price of water may be established at a relatively low level initially, to minimize the financial impact on households in the region, but even a low price will be helpful in distinguishing the higher quality water from other available sources, and in motivating residents to use the high-quality water only for drinking and cooking. Over time, the price of water can be increased gradually to approach the full

cost of production and delivery, provided that household incomes in the region are sufficient to support such a price.

A partial subsidy for water can be established using a system of water coupons that enables all households to obtain 7 to 10 liters per capita per day (lcd) at a relatively low price. Each household could be allowed to purchase a set of monthly or annual water coupons that correspond to a withdrawal rate of 7 to 10 lcd. The price of the coupons could be established below the full cost of production and delivery, to provide the desired subsidy. Households wishing to purchase water in excess of 7 to 10 lcd would be required to pay full cost for additional water coupons. Such a system would provide a subsidy for the minimum daily water requirement for drinking and cooking, while also enabling households to purchase additional water if they are willing to pay the full cost of that water. The program would also include the correct incremental price of water beyond the minimal requirement for drinking and cooking.

doesn't deal of how to get from ¢ cost to low or other cost of H_2O.

A system of water coupons would eliminate the need for truck drivers or other water delivery staff to handle cash transactions for water sold to residents. The coupons could be sold to residents at village centers or at a specified location within each collective farm, where the cash could be collected and managed appropriately. Residents would then exchange the coupons for water when they fill their containers at locations where water is stored for distribution.

The Turkmenbashi reverse-osmosis plant and the water distribution system should be managed by a water user association that has an economic incentive to operate and maintain the plant for many years in the future. Ideally, the water user association should be formed within the Turkmenbashi Etrap, where the water will be produced and sold. A steering committee consisting of one representative from each of the 25 collective farms and Turkmenbashi City could be formed to establish association policies, hire a manager and other staff, and to implement short-term and long-term measures for operating and maintaining the reverse-osmosis plant and the water distribution system.

How do they get there?

At the present time, the reverse-osmosis plant is managed under the authority of a Hydro-Geological Trust in the Dashovuz Velayet. However, the Velayet and the Trust have many other activities and priorities, and they have less of an economic interest in operating and maintaining the plant than do residents of the Turkmenbashi Etrap. It may be socially optimal for the Velayet to assign ownership of the reverse-osmosis plant and the water delivery equipment to a legitimate water user association formed ~~within the Turkmenbashi Etrap, as soon~~ as such an association is formed, and when a set of short-term and long-term operational plans has been approved by the steering committee. Technical assistance may be required to form the water user association and to develop and implement appropriate management strategies.

What to do in meantime?

*

The formation of a water user association to operate the reverse-osmosis plant and to deliver water throughout the Turkmenbashi Etrap may enable local residents to implement a system of water prices voluntarily, without causing the central government to modify its policy of providing water at no charge. The non-profit goal of the water user association would be to generate the revenue necessary for operating and maintaining the reverse-osmosis plant and the water delivery system, while minimizing the total cost of conducting these activities. The positive price of water would reflect the operation and maintenance costs, a capital replacement fund, and a reserve fund for unexpected expenditures. The price would not include any economic profit. In addition, residents would continue to obtain the bulk of their water supply from other sources that would continue to be free, as long as the government continues to implement its zero price policy.

A water user association formed within the Turkmenbashi Etrap may have difficulty generating sufficient revenue to cover the full cost of operation and maintenance during the initial years of its existence. Some time may be required for the plant to achieve full operation, for residents to express their demand for 7 to 10 lcd of the high-quality drinking water, and for an efficient water delivery system to be developed and implemented. However, the EPT Project has already purchased a two-to-three year supply of some consumable inputs for the reverse-osmosis plant. The availability of these inputs will greatly reduce initial operation and maintenance costs.

The Government of Turkmenistan has accepted responsibility for operating and maintaining the reverse-osmosis plant, as described in the Memorandum of Understanding that initiated the project in that country. It may be necessary and appropriate for the central government to provide a financial subsidy to the water user association, particularly in its initial years of operation, to enable residents to purchase water coupons at a price below the full cost of production and delivery. Such a subsidy is consistent with the initial goal of the EPT Project in Turkmenistan, which is to provide high-quality drinking water to residents in the Aral Sea region, where both the environment and the economy have been damaged by reduction of water inflows to the Sea. The amount of the subsidy provided by the central government to the water user association could be reduced, over time, as incomes in the Turkmenbashi Etrap increase with improving economic conditions.

6. Summary and Recommendations

All of the EPT Project facilities constructed in Kazakstan, Uzbekistan, and Turkmenistan are economically sustainable for many years in the future, provided that central governments and local water authorities commit the financial resources needed to pay for operation and maintenance activities, and to establish a capital replacement fund and a reserve fund for unexpected expenditures. A portion of the funds required for these efforts can be generated by selling water at appropriate prices to customers of each water project. A partial subsidy for water to satisfy basic drinking and cooking requirements might be provided by the central governments, particularly in regions where household incomes are below the national average. The subsidy instrument should be designed to minimize the distortion of incremental water use decisions, for the purpose of promoting efficient resource use. The value of the subsidy can be reduced, over time, as income levels improve with enhanced economic conditions.

big assumption in Turkm. Case.....

We have collected preliminary data describing the expected operation and maintenance costs for each of the facilities constructed by the EPT Project. Those data will be analyzed and presented in a written report that will include discussion of a capital replacement fund and a reserve fund for each facility. These data will provide central governments with a current estimate of the funds required each year to operate the pumping stations and water treatment plants successfully, into the future.

We will also develop a framework for evaluating alternative water pricing policies that can be implemented to generate a portion of the revenue required to cover annual expenditures. The model can be used to analyze alternative pricing structures and to examine the impact of alternative water prices on the amount of revenue received by bulk water suppliers and pipeline authorities. The goal of this effort is to provide water policy officials with a useful framework for evaluating alternative policy options.

Pipeline authorities in Kazakstan and Uzbekistan currently deliver water to bulk water suppliers and vodokanals according to a price and quantity schedule that includes norms for "typical" water use rates by households, state organizations, and industrial enterprises. Separate prices for each of these groups are determined each year, after reviewing expected expenditures and water sales. The central governments of both countries have announced their intention to raise water prices to a level that recovers the costs of water delivery. However, it appears that the same price structure involving water norms and three categories of water users may remain in place.

It may be useful to discuss alternative water pricing structures that are designed to encourage efficient use of water resources in both Kazakstan and

Uzbekistan, given the current interest in modifying water prices to recover annual expenditures. In particular, we can describe the usefulness of a marginal cost pricing approach that will encourage all water customers to use water efficiently. Subsidies for low-income households can be implemented using an increasing block-rate pricing structure that provides a minimal amount of water at a price below the marginal cost of delivery, if desired.

An appropriate system of water prices will enable households, state organizations, and enterprises to choose the efficient volume of water for consumption, while facing the appropriate price for the resource. The norms that are currently used for estimating water deliveries can be replaced, over time, with an estimate of the relationship between water prices and quantities observed as customers respond to the new pricing structure.

The full benefits of a modified water pricing structure cannot be realized in situations where the volume of water used by individual consumers is not measured. Volumetric measurement is an essential element of an efficient water pricing program. However, the concept of marginal cost pricing is sufficiently important that an effort to implement such a program will be useful, even though water deliveries to most individual households in the Aral Sea region of both Kazakstan and Uzbekistan are not yet measured. Discussions regarding marginal cost pricing may even be useful in motivating bulk water suppliers and vodokanals to increase the pace at which water meters are installed at individual households.

Successful operation and maintenance of the reverse-osmosis plant in Turkmenistan may be enhanced by the formation of a local water user association within the Turkmenbashi Etrap. The association would include representatives from all of the collective farms and Turkmenbashi City. A steering committee would hire a manager and staff, and establish association policies for water delivery and pricing. The association would accept responsibility for operating and maintaining the reverse-osmosis plant and the fleet of delivery trucks and other equipment required for water distribution. A subsidy from the central government may be required to assist the water user association during the initial years of operation.

A system of water coupons can be implemented by the water user association to minimize the number of cash transactions in the field, and to enable the association or central government to provide a partial subsidy for water sales to low-income households. For example, the price of coupons could be established below the marginal cost of production and delivery for some portion of a household's minimum daily water requirement for drinking and cooking. The price of additional coupons could be established at the full cost of water production and delivery.

It is essential that some program of water prices, coupons, or allotments be implemented very soon in the Turkmenbashi Etrap, to ensure successful operation and maintenance of the reverse-osmosis plant. At present, there is no plan for limiting the delivery of water from the facility to the design rate of 7 to 10 liters per capita per day. Without such a plan, there is no guarantee that all households will have access to the high-quality water for drinking and cooking. If the water is provided at no charge, and with no allotment program, households will likely take more than 7 to 10 liters per capita per day, and use the additional water for bathing, gardening, or watering livestock.

Free delivery of water from the reverse-osmosis plant would send an incorrect message to households regarding the cost of producing and delivering the high-quality water and the relative value of such water in the region. At present, households can obtain lower quality water from irrigation canals and shallow wells at no charge. It is essential that the relative value of the high-quality water is established by either a water pricing program, an allotment program, or some combination of these policy tools. In the absence of such a plan, households would be rational in using the high-quality water from the reverse-osmosis plant interchangeably with lower quality water from other sources. Such a response would greatly diminish the benefits of constructing and operating the water treatment facility.

Many of the recommendations described in this report will require time and effort to implement, in consultation with government officials and pipeline authorities. Innovative water pricing structures and water user associations cannot be implemented immediately, but it should be possible to build support for such programs among central governments and local authorities with appropriate analysis of policy alternatives. It may be useful to begin this process very soon in all three countries, given the pace at which the construction projects are nearing completion.

Appendix A: Trip Schedule and Itinerary

October 5 to 7	Traveled from United States to Almaty, Kazakstan. Reviewed EPT reports and other documents.
October 7	Almaty. Met with EPT staff in Almaty and reviewed additional reports in the EPT office.
October 8	Almaty. Met with EPT staff, attended meeting at USAID office, and interviewed official at State Water Resources Committee.
October 9	Almaty. Met with HIID Resident Advisor, met with EPT staff, and reviewed additional documents and reports.
October 10	Almaty. Attended meeting at USAID, met with EPT staff, and reviewed additional reports.
October 11	Almaty. Met with USAID representative and reviewed additional reports in the office.
October 12	Almaty. Reviewed additional reports.
October 13	Almaty. Reviewed additional reports.
October 14	Almaty. Met with representative from Asian Development Bank, reviewed additional reports, and departed for Kzyl-Orda in late evening.
October 15	Kzyl-Orda. Met with staff of the Aral-Sarybulak Pipeline Authority to discuss operation and maintenance costs, and departed for Almaty in late evening.
October 16	Almaty. Met with World Bank economists to discuss pertinent issues in Kazakstan and Uzbekistan, and reviewed additional reports.
October 17	Almaty. Reviewed additional documents and began working on a written report.
October 18	Almaty. Met with EPT staff, worked on written report, and met with representative from USAID. Departed Almaty for Ashgabad in very late evening.
October 19	Ashgabad. Reviewed additional documents and worked on written report.
October 20	Ashgabad. Reviewed additional reports.
October 21	Ashgabad. Reviewed additional reports and met with officials in the Cabinet of Ministers.

October 22	Ashgabad. Reviewed additional reports and departed for Tashkent in late afternoon.
October 23	Tashkent. Met with officials and staff in several government agencies.
October 24	Tashkent. Met with official in government agency and went to World Bank office to review library materials.
October 25	Almaty. Met with EPT staff, reviewed additional documents, and worked on written report.
October 26	Almaty. Met with EPT staff, attended meeting at USAID, and worked on written report.
October 27	Almaty. Reviewed additional documents and worked on written report.
October 28	Almaty. Worked on written report.
October 29	Departed Almaty for United States.

Appendix B: Persons Visited

In Kazakstan

Znalil Zalgadaro, State Committee on Water Resources
Michael Boyd, Resident Advisor with Harvard Inst. for Intl. Development
Adrian Hutchens, Sheladia Consultants, Asian Development Bank
Esen Mikeev, Chief Engineer, Kzylordaselkhozvodoprovod Kyzylorda
Vitali Sheck, Director, ODSP Aral Kzyl-Orda
Natalia Beisenova, Economist, World Bank Office in Almaty

In Uzbekistan

Komildgan Saidov, General Director of the Republic Industries Union for Maintenance and Development of Regional Water Suppliers, Ministry of Municipal Services

Fakhritdin Miryusupov, Main Engineer, RWA Maintenance and Development of Regional Water Supply Systems, Ministry of Municipal Services

Ekrin Yuldashev, Deputy Minister, Ministry of Communal Services

Albert Rafikov, Chief of the Department for the Coordination of Socioeconomics, Research, and Investment, Interstate Council on the Problems of the Aral Sea Basin, Executive Committee

Alexander Mironenkov, Head of Agroindustrial Investments Department, State Committee on Forecasting and Statistics of the Cabinet of Ministers

Pulat Zakirov, Manager of Project Implementation Group, Water Supply, Sanitation, and Health Project

In Turkmenistan

Gurbansakhat Babaev, Chairman, Department of Water Resources and Water Management

Bashkovshy, Assistant to the Chairman, Dept. of Water Resources and Water Management

Omar Niyazovich Niyazov, Deputy Head of Hydrogeological-Reclamation Field Studies and Projects