Document of
The World Bank

Report No: 25716-KZ

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF US$40.39 MILLION

TO THE

GOVERNMENT OF KAZAKHSTAN

FOR THE

NURA RIVER CLEANUP PROJECT

March 27, 2003

Environment and Socially Sustainable Development Department
Europe and Central Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective March 27, 2003)

Currency Unit = Tenge
1 tenge = US$.00659
US$1 = 151.78 tenge

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

CAS	Country Assistance Strategy
CWR	Committee for Water Resources
DFID	UK Department for International Development
EA	Environmental Assessment
EMP	Environmental Management Plan
FM	Financial Management
FMCA	Financial Management Capacity Assessment
FMR	Financial Monitoring Report
ha	hectare
JEP	Joint Environment Program
IFAC	International Federation of Accountants
LIBOR	London Interbank Offered Rate
m3	cubic meters
mn	million
MoA	Ministry of Agriculture
MoF	Ministry of Finance
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organization
NPV	Net Present Value
PCG	Public Consultative Group
PHRD	Population and Human Resources Development
PMU	Project Management Unit
PV	Present Value
RFP	Request for Proposal
SA	Special Account
SOE	Statement of Expenditures
TC	Technical Coordinator of the PMU
VAT	Value Added Tax
WTP	Willingness to pay

Vice President:	Johannes Linn
Country Manager/Director:	Dennis de Tray
Sector Manager/Director:	Laura Tuck
Task Team Leader/Task Manager:	Piotr Krzyzanowski

KAZAKHSTAN
NURA RIVER CLEANUP PROJECT

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Annexes

KAZAKHSTAN
NURA RIVER CLEANUP PROJECT

Project Appraisal Document

Europe and Central Asia Region
ECSSD

Date: March 27, 2003
Sector Director: Laura Tuck
Country Director: Dennis de Tray
Project ID: P059803
Lending Instrument: Specific Investment Loan (SIL)

Team Leader: Piotr Krzyzanowski
Sector(s): Water supply (70%), Central government administration (25%), Information technology (5%)
Theme(s): Water resource management (P), Environmental policies and institutions (P)

Project Financing Data

[X] Loan **[ ] Credit** **[ ] Grant** **[ ] Guarantee** **[ ] Other:**

For Loans/Credits/Others:
Loan Currency: United States Dollar
Amount (US$m): $40.39 million
Borrower Rationale for Choice of Loan Terms Available on File: ☒ **Yes**
Proposed Terms (IBRD): Variable-Spread Loan (VSL)
Grace period (years): 5
Years to maturity: 15
Commitment fee: 0.75
Front end fee (FEF) on Bank loan: 1.00%
Payment for FEF: Capitalize from Loan Proceeds

Financing Plan (US$m): Source	Local	Foreign	Total
BORROWER	24.54	2.89	27.43
IBRD	38.89	1.50	40.39
Total:	63.43	4.39	67.82

Borrower: GOVERNMENT OF KAZAKHSTAN, MOF
Responsible agency: STATE COMMITTEE FOR WATER RESOURCES
State Committee for Water Resources
Address: 28-A Mozhaiskiy Str., 473201 Astana, Kazakhstan
Contact Person: Anatoly Ryabtzev, Chairman
Tel: 7-3122-241428 Fax: 7-3122-242 491 Email:
Contact Person:

Tel: : Fax: Email:

Estimated Disbursements (Bank FY/US$m):

FY	2004	2005	2006	2007	2008	2009		
Annual	7.43	11.92	9.71	0.00	5.66	5.67		
Cumulative	7.43	19.35	29.06	29.06	34.72	40.39		

Project implementation period: 6 years
Expected effectiveness date: 01/15/2004 **Expected closing date:** 09/30/2009

A. Project Development Objective

1. Project development objective: (see Annex 1)

The development objective of the project is to improve the welfare of the population in the Nura River Basin by cleaning up serious mercury pollution in and adjacent to the Nura River, providing a safe, secure and cost effective alternative source of water supply to meet growing needs of local water users, and restoring flow control in the river for flood management and ecological purposes.

2. Key performance indicators: (see Annex 1)

The key performance indicators that will be used to assess the fulfillment of the project's development objectives are:

- Reduction of mercury contamination in areas adjacent to population centers;
- Improvement in year-round water quality in the Nura River to meet internationally accepted standards for mercury content in drinking water;
- Availability of new sources of potable water supply for Astana and other communities along the Nura River;
- Year-round water supply to the Kurgalzhino Wetlands;
- Establishment of a functional River Basin Authority capable of planning and optimizing the use of the water resource;
- Establishment of a comprehensive system of water quality monitoring to provide ongoing protection of population.

B. Strategic Context

1. Sector-related Country Assistance Strategy (CAS) goal supported by the project: (see Annex 1)
Document number: 21607 KZ **Date of latest CAS discussion:** 01/16/2001

Consistent with the Government's priorities, the overarching objective of the Bank Group's Country Assistance Strategy for Kazakhstan is poverty reduction and the improvement of living standards. The current CAS focuses on four main areas:

- *Reforming the public sector* so that fiscal resources are managed in a transparent manner, and public services are effectively and efficiently delivered to the people.
- *Promoting broad-based private sector-led growth* to increase employment opportunities and incomes across a broad segment of the population.
- *Supporting the most vulnerable* through the enhancement of both temporary and permanent programs of income support for the poorest, as well as through reforms in the health and education sectors, rural roads, and improvements in the delivery of municipal and industrial water supply and sanitation.
- *Protecting the environment,* to reduce the damage to the quality of life for current and future generations. Addressing environmental degradation will require cleaning up contaminated rivers and water sources, restoring marginal lands, and improving management practices for water and sewerage. The Bank's strategy concentrates on addressing industrial pollution in the Northeastern industrial area, promoting integrated planning of water resources and addressing the security of water supply and access to clean water for vulnerable population.

The proposed Nura River project is specifically noted in the CAS as one of the projects under the third and fourth categories of assistance – support of vulnerable groups through improved delivery of basic

water, sewerage and heating services, and protection of the environment, in this case by cleaning up mercury pollution in an adjacent to the Nura river. The primary focus of the project is to clean up large concentrations of mercury that threaten the well-being of the local population both through direct exposure and through contamination of the water supply in the Nura River Basin. The presence of mercury represents an ongoing source of concern for local residents and officials who regard the Nura River as a "gutter." The source of the mercury pollution is the AO Karbide Synthetic Rubber factory at Temirtau (currently in bankruptcy, and no longer operating). An estimated 3,000 tons of mercury was used in industrial processing at the plant during its operating life, and much of it has accumulated not only at the plant site, but also in topsoil along the river banks and floodplains downstream of the city. The plant site itself needs urgent attention because of the imminent danger that its building will collapse, thereby exposing the surrounding area to even higher levels of mercury polllution. The local administration has initiated temporary emergency containment measures, but a more permanent solution is needed as quickly as possible.

Concurrently, by reducing the levels of mercury in the Nura River, the project would contribute to the cost-effective and sustainable supply of water to the population in the Nura River Basin, as well as in the capital city of Astana. In addition, rehabilitation of the Intumak Dam and Reservoir, together with improved capacity for water resource planning and management, would improve flow control within the Nura Basin for flood management and protection of downstream wetlands, as well as for security of water supply. Finally, the project supports the Millenium Development Goals which include the provision of access to clean water and sanitation.

2. Main sector issues and Government strategy:

The Government is facing a number of challenges with respect to remediation of environmental degradation, cost-effective supply of potable water to the population, and ongoing protection of environmental resources. Key issues that are being addressed are the following:

Environmental Degradation: With independence, the Republic of Kazakhstan inherited a legacy of environmental damage caused by many years of output-focused development, with little regard to either economic viability or environmental impact. The most serious of these legacies constitute an ongoing threat to the well-being of the population, not only within the immediate area but also in many instances over a broad geographic region. In the case of the Nura river basin, confirmed data indicate that accumulation from more than 3000 tons of mercury remain in the topsoil of the flood plain, riverbed and banks and on the grounds of a now defunct industrial plant. Until such time as these environmental hazards are remediated, they act as a constraint on economic development. In 1998, the Government completed a National Environmental Action Plan (NEAP), which identified several key environmental concerns: i) a deficit of water resources; ii) the degradation of pasture and arable lands; iii) air pollution of urban territories; iv) environmental pollution in oil fields; v) pollution from industrial and municipal solid waste; vi) shortage of forests and protected territories; and vii) pollution of water bodies. The NEAP also highlighted a number of regional measures that warrant priority implementation. In the central and eastern part of the country, these included urgent measures to prevent loss of water sources in the basins of the Irtysh and Nura Rivers, including demercurization, clean–up of kerosene infiltration in underground water, protection of rivers from pollution originating in run-off/leakage from industrial dumps, and improvement of the regional water distribution system.

High Costs of Water Supply: The Republic of Kazakhstan also inherited a costly and elaborate system for water supply. Many water supply projects implemented under the Soviet system were intended to provide not only water for the population, but also irrigation water for agricultural schemes that subsequently proved to be uneconomic. The government is forced to maintain these costly networks as

they represent, in many cases, the sole source of water supply for neighboring households, industries and commercial enterprises. The problem is compounded by the fact that a number of private enterprises, having found that they can meet their water needs more cheaply from other sources, have disconnected from the network, increasing the residual burden on captive residual customers. Initially, the Government provided subsidies to the Vodakanals to mitigate the excessively high cost of water supply; however, this was clearly not a sustainable long term option. The Government's current strategy focuses on the following actions: (i) decentralizing responsibility for water and wastewater to municipalities to facilitate local initiatives and to reduce administrative costs; (ii) reducing/withdrawing subsidies to the Vodakanals to provide them with greater incentive to look for low-cost supplies; (iii) promoting private sector involvement in water supply (either through transfer of assets or management contracts) in order to introduce more efficient operating practices and technologies; and (iv) seeking ways to use more effectively available water resources, including cleaning up contaminated water where practical.

Sustainability of Water Supply: Large parts of the country, including many regions where there is significant economic activity, are arid, and dependence upon ground water is not feasible. However, many of the existing surface schemes are costly and technically complex. The Government is therefore attempting to identify and facilitate the development of alternative sources of water supply that could be used to meet both current and future needs at more attractive prices. To reduce the risks associated with failure of individual supply sources, the Government also seeks to ensure that major centers have access to at least two independent sources of water. It is also actively promoting demand management in order to alleviate the need for additional sources of supply. Unfortunately, the Nura river, which would otherwise be a good source for drinking and agricultural use, is contaminated with mercury from a now bankrupt industrial site. Concerns about sustainability of water supply can be effectively addressed through initiatives such as the proposed Nura River Clean-up project, with its associated rehabilitation of Intumak Dam, would make the river available for drinking and agricultural use, thereby providing incremental water to meet future demands in Astana, as well as a back-up source of water for adjacent communities, at a relatively reasonable cost.

Lack of Effective Integrated Water Resource Management: Long term solutions to meeting demands for water require an integrated approach on the part of the water resources, environmental and water supply sectors. Despite the presence of a relatively elaborate legal and institutional framework, integrated planning and management of water resources and water supply systems has received limited attention. Past approaches to meeting growing water demands were dominated by technical solutions, often without regard for either integrated planning or cost-effectiveness. Comprehensive and cross-sectoral water planning and management practices that take into account demands and impacts of all water-using sectors (including the environment), water quantity and quality, and conjunctive use of surface and groundwater do not exist. Since independence, the government has reacted strongly to large threats such as mercury pollution, but overall, new environmental policies and programs have proven overly ambitious and too general. They lack location specific requirements or cost benefit considerations, with the result that they are often ignored.

As an initial step in addressing these problems, the Government is establishing systems and institutions for integrated resource management on a river basin basis. Basin Management Authorities have been established throughout the country (including the Nura-Sarysu Basin). However, the capacity of these Authorities to remediate such problems as mercury pollution and to properly monitor and manage the use of water resources is limited. Institutional strengthening is needed, both in terms of training in basin management theories and practices, and support for basic data gathering and analysis.

Inadequate Legal Framework for Basin Management: Kazakhstan's 1993 Water Code provides an overall framework for the regulation of domestic, industrial and agricultural water use, and requires

compliance with environmental regulations. The Code also introduces the concept of water pricing, and stipulates rules on pollution control and water conservation. However, a number of changes need to be introduced into the Code to provide a sufficient legal framework for the effective development of River Basin Authorities, including definition of appropriate institutional and financing arrangements, and clarification of the rights and responsibilities of the Basin authorities with respect to water use planning, permitting, monitoring and control. The Committee for Water Resources (CWR) is currently developing a revised Code. A draft of the revisions was submitted for Government review in November, 2002. Following comment and amendment, a final draft of the revised Code would be submitted for Parliamentary approval.

Effectiveness of Pollution Control Measures: While the legislative basis has been established to provide for proper control and management of water quality, there are a number of issues that hinder effective implementation. In order to adequately protect the quality of water resources, a rational permit system for the polluting enterprises is needed, which takes into account water quality goals, the assimilative capacity of the receiving water body, and the ability of concerned enterprises to meet their environmental obligations. Water quality classification and mapping should be carried out, and an integrated river basin plan prepared to determine acceptable pollution loads to the river at various locations. In addition, realistic estimates of waste discharge should be prepared based on environmental audits at polluting enterprises. The current system of inspection and penalties is also ineffective in enforcing the stipulated effluent discharge limits. While fines are imposed, the collection system is poor and the cash flow arrangements between the center and the regions are such that only a small fraction of the collected fines are accessible to the regional authorities.

3. Sector issues to be addressed by the project and strategic choices:

The project would directly address the main sector issues, as they relate to the Nura River Basin, in the following manner:

- Remediating environmental degradation, and alleviating current and potential risks to the local population, by cleaning up mercury pollution at and downstream from Temirtau, overseeing remediation efforts and monitoring their effects;

- Ensuring effective management of the land fill site where contaminated soil and other residues from the Karbide plant are to be contained;

- Improving the capacity to manage flows in the river, in order to alleviate downstream problems with seasonal flooding, and with irregular and often inadequate supply of water to the Kurgaldzhino wetlands;

- Enhancing the capacity for integrated management of the river (including pollution control) by: (i) supporting an improved regulatory framework for integrated management of the Nura-Sarysu Basin, and (ii) improving the resources management capacity of the Basin Authority; and (iii) enhancing the capacity of regional agencies to monitor and manage water quality, pollution levels, and health related aspects in the river;

- Ensuring sustainable and cost effective water supply for communities in the Nura River Basin, including the capital city of Astana.

Remediating Environmental Degradation: The estimated amount of mercury deposited in the Nura Basin is significant by any standard. Unconfirmed data indicate that more than 3,000 tons of mercury was used during the lifetime operation of the A/O Karbide plant at Temirtau, and accumulations remain in the topsoil of the floodplain, along the riverbed and banks, at the old wastewater treatment plant site, and on the grounds of the plant, which is located in the city center at Temirtau. Detailed technical evaluations and risk analyses suggest that it is neither feasible nor cost effective to attempt to remove all of the contaminants. However, there are a number of areas which represent either an immediate or longer term potential hazard to local population and to downstream communities that may rely on the river for water supply. The plant is of particular concern because it is nearing physical collapse, and large amounts of mercury currently contained in its buildings could become exposed at any time. There is a pressing need to clean up the mercury to prevent further exposure of the population, and to protect against further spread of contaminated material. Another priority is to remove mercury contamination at identified hot spots in the banks and floodplains along a 25 kilometer stretch of the Nura River, where seasonal flooding frequently leads to increased concentrations of mercury in the river, and contamination of groundwater and fisheries.

Flow Management: The project would also finance rehabilitation of the dam at the Intumak Reservoir, which is located approximately 80 km downstream from Temirtau. The Intumak Dam was built between 1982 and 1984 as part of a proposed irrigation scheme. However, the irrigation project was abandoned before the civil works for the dam had been completed. In particular, the regulating gates and the spillway were not completed in conformity with the design, and the reservoir is filled during flood season to less than three-fourths of its design capacity (180 million m^3 out of a capacity of 250 million m^3). Following the flood season, the water evacuates through the open gate structures, and the reservoir volume drops to approximately 20 million m^3. Recent engineering studies indicate that there has been some water penetration of the dam, and that works should be carried out to reinforce the main structure, in order to prevent a possible breach and release of floodwaters and contaminants downstream. At the same time, it has been proposed that the spillway and gates be completed so that the reservoir can be operated at design capacity, even though the irrigation need did not materialize. Given that approximately 80 percent of the annual flow in the river occurs over a two month period in the Spring, this would offer significant benefits in terms of downstream flood control and seasonal water storage. It would also ensure an adequate dry-season supply of water to the Kurgaldzhino Wetlands – an ecological area which is included under the Ramsar Convention in the list of sites with global significance.

Mercury Monitoring of the Intumak Dam and Reservoir:There is one proviso with respect to the proposed rehabilitation of the Dam and increased use of the reservoir. Water quality testing has shown a significant difference in the levels of mercury above and below the dam, indicating that much of the mercury contained in the runoff has been trapped in the reservoir. Generally speaking, the mercury is bound with ash from other industrial runoff, and is therefore in a stable state. There is a risk, however, that increasing the operating capacity of the reservoir could result in significant increases in the transformation of mercury from a metallic to an organic form, leading to releases of an extremely dangerous form of mercury into the environment. Research in other parts of the world has suggested that flooding of mercury-contaminated lands that are rich in organic matter results in greatly increased methylation rates. Therefore, as a precautionary measure, further sampling and testing of water quality and pollution levels within the reservoir would be carried out over a full calendar year, and the results analyzed by international experts in mercury methylation, to determine whether it is necessary to excavate mercury deposits in the reservoir prior to raising the operating level. *An international expert advisory group would review the recommendations on the mitigation actions needed prior to development at Intumak, and their concurrence with these recommendations would be a prior condition to disbursements related to the civil works to be financed under the project.* The budget for this

component includes sufficient funds to finance the relatively small expenditures anticipated in the event that dredging/excavation is required.

Institutional Strengthening of Basin Authorities: The project would also assist the Government in developing and implementing measures to strengthen the Nura-Sarysu River Basin Authority's monitoring network, water pollution control system and regulatory framework. The project will review the regulatory framework, including emission licensing procedures, pollution charges, and monitoring systems, with the aim of rationalizing the regulations and establishing conditions for effective pollution control. The project will strengthen the environmental permitting process by establishing a system based on efficiency and enforceability. These activities would support, and be coordinated with ongoing work (by DFID) related to the adoption of a new Water Code, rationalization of institutional responsibilities in water resource management issues, and institutional capacity building within the Committee for Water Resources and the Basin Authorities.

Sustainable water supply: For many years, the residents of the Nura River Basin unknowingly consumed the highly polluted waters, but when information about the mercury and other pollution surfaced, human use of Nura water virtually ceased. Upstream communities such as Karaganda now draw their water primarily from the Irtysh-Karaganda Canal, which transports water from the Irtysh River over a distance of 450 km with a total lift of 453 meters. The Canal was built in the 1960s to support the Soviet virgin lands development program, a massive, albeit ultimately unsuccessful agricultural development scheme. The cost of pumping is high, quality is compromised by pollution in the Irtysh River and by mineralization in storage reservoirs along the Canal, and the unit cost of water is increasing as water users along the canal seek other sources in response to tariff increases necessitated by cost recovery principles. Cleaning up the sources of ongoing mercury pollution of the Nura River would provide residents of these upstream communities with a considerably less costly source of water supply.

The newly created capital city of Astana also faces medium and long-term issues with respect to sustainable water supply. Astana currently relies on the Ishim River for its water supply. The Viacheslav Reservoir upsteam of the city provides medium-term storage. However, the city is expected to double in population over the next 10 years, from about 375,000 to 700,000 inhabitants, and notwithstanding a planned loss reduction program, water resources from the Ishim may not be sufficient to meet Astana's increased demand (particularly during periods of low flow). The options before the government are to either obtain additional water via a pipeline which links the Viacheslav Reservoir to the Irtysh-Karaganda Canal or clean up the mercury from the Nura River and use an existing canal which links the Nura to the Ishim River at Astana to deliver additional water to the local population. Again, the latter represents a less costly alternative. In addition, by providing a source of water supply to the capital that is completely independent of the Viacheslav Reservoir, the project would address concerns about security of supply.

C. Project Description Summary

1. Project components (see Annex 2 for a detailed description and Annex 3 for a detailed cost breakdown):

Component	Indicative Costs (US$ [illegible])	% of Total	Bank-financing ([illegible])	% of Bank-financing
1a. Landfill construction	10.88	16.0	6.24	15.4
1b. AO Karbide site clean up	22.50	33.2	14.68	36.3
1c. Nura river clean up	10.71	15.8	6.95	17.2
2. Completion of Intumak Reservoir spillway	19.13	28.2	11.80	29.2
3. Institutional Strengthening and Technical Monitoring	1.68	2.5	0.32	0.8
4. Project Management and Impact Monitoring	2.53	3.7	0.00	0.0
Total Project Costs	67.43	99.4	39.99	99.0
Front-end fee	0.40	0.6	0.40	1.0
Total Financing Required	67.83	100.0	40.39	100.0

Component 1: Nura Valley Mercury Clean-Up ($44.08 million) This component of the project would include financing for (i) construction of a secure landfill for proper containment of contaminated soil and materials, (ii) excavation of contaminated hotspots at the AO Karbide plant site at Temirtau (factory building, main drain, and adjacent waste disposal sites), and (iii) excavation of other highly contaminated areas including the Zhaur Swamp, and critical areas of mercury accumulation along the banks and floodplains of the Nura River, as well as the transport of the materials to the landfill site. A suitable landfill site has been identified at Opan, near Temirtau, adjacent to an existing landfill associated with the Ispatkarmet Metallurgical Plant, and the Government, through the Committee for Water Resources, has reached agreement with parties having an interest in the site over acquisition of title.

The project would also finance the initial operation of the landfill, and the establishment of a long-term monitoring and maintenance program. Additionally, as part of this component, funding would be provided for inspection and monitoring of the landfill construction and soil-excavation process by independent experts to ensure that the selected contractors meet all technical and environmental standards and safeguards.

Component 2: Intumak Reservoir Rehabilitation ($19.13 million). Component 2 would finance rehabilitation of the Intumak Reservoir, including reinforcement of the dam and completion of the spillway and gates to allow the dam to operate as a mechanism for flow control at its original design reservoir level. This would allow development and implementation of an integrated water resources management plan for Intumak and the upstream Samarkand and Sherubianur Dams and reservoirs. However, owing to uncertainty about the effect of raising the operating level at Intumak Reservoir on mercury methylation, a one-year monitoring program would be carried out as a precautionary measure, and the results analysed and modelled to assess the inherent risks. The program of required works, as well as the dam operational manual, would be developed based on the findings of this analysis and would be reviewed by an International Expert Advisory Group. *Any disbursement for civil works related to this component would be conditional on the agreement of the Expert Advisory Group.* In the event that the results of the monitoring and assessment indicate a risk of unacceptable levels of mercury methylation

associated with increased operating levels, completion of the spillway and gates would be postponed until mercury deposits in the bottom of the reservoir could be removed and transferred to the landfill. Provision has been made in the cost estimate for this component to cover the cost of any additional dredging works required. Component 3 includes funding for the design and implementation of the monitoring program, and the participation of the International Expert Advisory Group. While the exact amount of dredging would be based on the further monitoring and analysis, it is expected that the volume would be small in the context of the overall project, and the cost would be minor.

Component 3: Nura-Sarysu River Basin Authority Strengthening ($1.68 million) This component would finance technical assistance, training and equipment necessary to increase the institutional capacity of the Nura-Sarysu River Basin Authority, in order to strengthen its resource planning and management capacity, as well as to strengthen the water quality monitoring network, and water pollution control systems. Supplementary assistance from the Japanese government has also been solicited and a decision is expected by early 2003. The supplementary assistance would provide (with the participation of Japanese experts from the Minamata Institute) technical support in the design and implemenation of an immediate program to monitor and assess mercury pollution in the Intumak reservoir, as well as long term support for the development and implementation of a comprehensive water quality monitoring program. Water quality monitoring will address risks associated with the possibility of occasional recontamination of the river as a result of any residual mercury depositions and/or periodic high flood levels.

Component 4: Project Management and Monitoring ($2.53 million). This component would cover a number of activities related to project management and monitoring. One part of the component would finance the incremental operating costs of the Project Management Unit (PMU) which would be established to oversee and coordinate project implementation. A second part would finance technical assistance to the PMU, providing (i) training in areas such as procurement, disbursement, and project accounting, (ii) auditing of project accounts, (iii) assistance in the implementation of the environmental management plan, especially with regard to public awareness; and (iv) specialist assistance in areas such as hydrology, social sciences, and environmental management.

2. Key policy and institutional reforms supported by the project:

Policy reforms

The project will support work being undertaken by the British Department for International Development (DFID) to reform Kazakhstan's Water Code and to develop a water resources management plan for the Nura River Basin. This in turn supports a government initiative to develop a National Resources Management Plan, which will address, inter alia, Water Resources Development, Pollution Control, and Environmental Remediation. The amended Water Code, which has recently been submitted to the Council of Ministers for review, will provide a more comprehensive framework for proper water management in the nation, particularly with regard to the financial sustainability and independence of the CWR and the River Basin Authorities.

Institutional reforms
Completion of the Intumak Dam would allow more effective management of water resources in the Nura River Basin. However, in order to optimize the use of water resources and to make efficient investment decisions, the current institutional framework for water resources management needs to be strengthened. Effective coordination of the activities of the water resources and environmental agencies and the transition of the Nura-Sarysu River Basin Commission into a full-fledged river basin organization with the capacity and authority to implement recommended actions is expected to be a slow and long term process. The project intends to aid this process by (i) improving the planning capacity of the existing river basin department, (ii) strengthening capacity for monitoring water quantity and quality, including assessing health risks and consequences, where relevant (iii) improving the pollution control system including long-term supervision of a contaminated landfil, and (iv) bringing together the regional water resources and environmental authorities to work jointly in implementing the proposed project.

3. Benefits and target population:

The benefits of the project would derive from the project's intended outcomes: (i) removing serious mercury pollution in and adjacent to the Nura River, providing a safe, secure and cost effective source of water supply to meet growing needs of local water users, and (ii) improving flow control in the river for flood management and ecological purposes. In particular, the project would benefit: i) the residents of Temirtau City by increasing their ecological safety as a result of the containment of mercury pollution from the AO Karbide factory; ii) current rural residents whose health is at risk as a result of their using the Nura River as a direct drinking water source and for fishing and crop irrigation; iii) the residents of Astana City (currently estimated at 375,000 people), by providing them with a second source of water from the Nura River, that is less expensive than the current arrangements based on the Ishim River and the Irtysh-Karaganda Canal; iv) the residents of Temirtau and Karaganda (currently about 600,000 people), who currently rely on water from a combination of the Irtysh-Karaganda Canal, groundwater sources and the Nura River, by making available a less expensive and regular source of water; v) recreational visitors, including fishermen and hunters, along the Nura River banks and the buffer zone of the Kurgaldzhino Wetlands protected area; and vi) those members of the community who value biodiversity protection by improving Nura River water quality, which will reduce biodiversity degradation in the Kurgaldzhino Wetlands.

4. Institutional and implementation arrangements:

The project is expected to be implemented over a period of six years, from Sepember 2003 until March 2009. The Loan Closing Date would be September 30, 2009. Disbursements are expected to conform fairly closely to standard disbursement profiles for projects of this duration, with the exception of above average disbursement in the initial years owing to the urgency of remediation works at the AO Karbide plant site, and a possible hiatus in mid-project prior to the commencement of civil works at Intumak Dam.

Executing Agency and Implementation Arrangements. The Committee for Water Resources (CWR), under the Ministry of Agriculture (MoA), would have overall responsibility for project implementation. General oversight would be provided by an Inter-Ministerial Committee which has been established to oversee the implementation of the NEAP, and which includes representation from the Ministry of the Environment and the Ministry of Economy.

Committee for Water Resources. The CWR, a national agency, carries out water resources planning and management on a basin basis and regulates the interests of all branches, including ecological and water supply infrastructure requirements. The Chairman of the CWR would be responsible for coordinating project implementation with concerned Ministries and other relevant agencies, including local authorities

and local environmental agencies.

Project Management Unit. Within the CWR, a Project Management Unit (PMU) has been established, headed by a Technical Coordinator (TC), to carry out day-to-day management of the project. The PMU will be located in Astana within the CWR, and will handle the project's financial management system, undertake the evaluation of bids, and prepare loan withdrawal applications. The TC will also supervise a team of technical specialists to be located in Karaganda, within the premises of the Nura River Basin Authority, whose function will be to oversee the technical day-to-day implementation of civil works, water quality and soil monitoring and establishment and operation of the landfill associated with the clean-up of mercury under the proposed project.

The PMU would be supported by a team of international engineering specialists with strong experience in project management, who would assist with procurement and with contract management and supervision, including inspection and acceptance of works and authorization of payment certificates, which they would pass through the TC to the Chairman of the CWR for approval and processing. Funding for Design and Construction Supervision has been included in the budget for the mercury clean-up component of the Project.

The PMU would be financed through the CWR's budget, to be approved by the Ministry of Finance, beginning in calendar year 2004. The TC has already been appointed and grant funds are currently being used to support him and other PMU staff during project preparation. A satisfactory Project Implementation Plan and Operations Manual have been prepared and reviewed by the Bank.

Public Consultative Group (PCG). The group formed during the public consultations of the EIA under the leadership of the Deputy Akim of Karaganda and local members of the Mazhilis would be formalized and expanded. It would serve as a mechanism to keep the local population informed of project activities and progress and would provide a forum for dialogue between the public, NGOs, the Director of the Nura River Basin Authority, and the PMU. The PCG would also provide input into performance monitoring with respect to the project's environmental and social development goals by providing feedback on project issues and proposing revisions, if necessary, to ongoing project support activities.

International Expert Advisory Group. An international team of experts would be formed, consisting of specialists in fields such as mercury toxicology, risk assessment, environmental impact assessment, hydrology, public health and ground remediation engineering, to provide advice on project activities and monitoring. This group would also be responsible for reviewing the findings and recommendations arising from the monitoring of pollution levels in the Intumak Reservoir and reviewing the recommended program for dam and reservoir rehabilitation.

Implementation Progress Reporting. The PMU would submit quarterly reports in an appropriate format to the CWR and MoA, the Inter-Ministerial Committee, and the Bank, no later than three weeks after the end of each quarter. The quarterly report would cover the progress and expected completion date for civil works and equipment/goods contracts, progress on institutional components, training and studies, and activities of the PMU's engineering, monitoring and evaluation, procurement and financial consultants. The PMU would also submit annual reports to the same bodies no later than January 31 of each year. The report will contain two sections, an annual progress report and an annual work plan. Quarterly reports and press releases associated with critical milestones of the project would also be submitted to the public consultative body.

Procurement. (See Annex 6). Civil works, goods and technical assistance financed by the Loan will be

procured in accordance with the Bank's guidelines. The general strategy for project implementation is to procure the equipment, civil works and services in larger packages, making contractors responsible for supply and installation of equipment. This would minimize coordination needs on the part of the implementing agency and simplify project implementation, thereby reducing the risk of project delays. Details of the procurement arrangements are given in Annex 6.

Accounting, Financial Reporting and Auditing. A preliminary Financial Management Capacity Assessment (FMCA) was carried out for the project in December of 2002, and updated in February, 2003. Necessary improvements for strengthening the financial management capacity of the project entities were identified and discussed with the counterparts as part of the FMCA. These improvements have been implemented. The Bank's Financial Management Specialist has certified the project as meeting minimum financial management requirements of the Bank.

Financial Management System: It is proposed that project accounts and financial reporting to the Bank will be the responsibility of the PMU. At the time of the FMS assessment, the proposed financial management systems, including organizational structure, internal controls, accounting, and reporting fell short of fully satisfying the financial management requirements of the Bank. A modified system has since been established which will: (i) have appropriate internal controls; (ii) reliably record and report all assets, liabilities, and financial transactions of the project; and (iii) provide sufficient financial information for managing and monitoring project activities. Project Financial Management Reports (FMRs) will be submitted to the Bank quarterly and annually. Formats of the FMRs and the timing of submission of the first FMR were confirmed at negotiations. Detailed accounts will be kept for each project component. Appropriate staffing for financial management functions (including training and technical assistance as required) was discussed under the FMCA.

Auditing: The project financial statements, the Special Account, and Statements of Expenditure (SOE) will be audited annually during project implementation, in accordance with International Standards on Auditing (ISA), by independent private auditors acceptable to the Bank. Copies of the audit report will be submitted to the Bank within six months of the close of the Borrower's fiscal year. Terms of Reference and selection of the auditor will be reviewed by the Bank every year. Costs of the project audit are included in the Project Management component of the project. However, because the Ministry of Finance has chosen to contract for audits of all projects and implementing agencies under an umbrella arrangement, procurement of auditors will be carried out at the level of the Ministry rather than the PMU.

Project Monitoring and Evaluation: Project monitoring indicators have been identified (see Annex 1) and agreed with the Borrower. The Borrower had determined base values for each of these indicators, and submitted them to the Bank. Values of these indicators will be updated each year, and forwarded as part of the annual implementation progress report.

A monitoring plan will be implemented under the project to gather data on: mercury fate in the Intumak Reservoir, population health, mercury releases, bioassay health, etc. which will provide the means to carefully monitor the impact of project interventions in the short-, medium- and long-term.

Bank supervision of the project will include physical inspection of the progress of implementation works, review of procurement, disbursement and accounting activities, review of progress with respect to institutional reforms, and interim evaluation of progress against monitoring indicators. On completion of the project, the Bank and Borrower will jointly prepare an Implementation Completion Report.

D. Project Rationale

1. Project alternatives considered and reasons for rejection:

Do nothing. An argument can be made that the latent mercury should be left undisturbed both at the AO Karbide plant site and in the topsoil along the banks and floodplains of the Nura River. However, the risk analysis done during the feasibility study indicated that this option should be rejected due to the increasing risk that the mercury cannot remain contained. Mercury currently contained in the AO Karbide plant's buildings could be released in the short-term if the roof collapses. In addition, mercury hot spots on the riverbanks and floodplain are likely to further contaminate the water during spring floods. The do-nothing scenario also ignores the medium-term need for an alternate water supply for Astana, which requires remediation of the mercury contamination in the Nura and measures to protect the river from further contamination.

Focus on AO Karbide plant site only. Another option is to focus only on the immediate need for environmental remediation of the AO Karbide plant site, without any intervention in restoring the floodplains or riverbanks. The feasibility study indicates, however, that there are hotspots with very high mercury concentrations in the floodplain and in some sections of the Nura River's banks. These sites should be remediated in order to ensure potability of Nura River water and to avoid contamination of the water supply from floods.

Focus on clean-up only Consideration was also given to limiting the project to the clean-up of mercury contamination. However, the rehabilitation of Intumak Dam is an important component of the project, not only in that it would serve as a sediment trap for any residual volumes of mercury that found their way into the river, but also because of the potential economic and ecological benefits of being able to implement an integrated program of flow management in the Nura Basin using the dam and reservoir capacity at Intumak.

Technical options for remediation. Technical options for remediation of the contaminated areas include in-situ remediation, excavation, and isolation. Due to the significant amounts of chemicals and/or energy that would be needed, and the location of the contaminated soil in the riverbeds and banks of the Nura, in-situ remediation is not feasible. Isolation is not favored since the groundwater would remain vulnerable. The feasibility study recommends removal and safe storage.

Landfill siting. Various sites for the landfill were considered in the EA. The proposed Opan site was selected based on many considerations, including transportation, geology, hydrogeology, natural habitats, social impacts, and development cost.

Alternative water supply sources for Astana. Incremental pumping of water from the Irtysh-Karaganda Canal, while technically feasible, carries a high cost (estimated operating costs are in the order of US$ 0.27 per cubic meter), and does not offer a fully independent alternative supply. Groundwater resources in the vicinity suffer from high salinity levels, and would be prohibitively costly to treat to a level suitable for human consumption.

2. Major related projects financed by the Bank and/or other development agencies (completed, ongoing and planned).

Sector Issue	Project	Latest Supervision (PSR) Ratings (Bank-financed projects only)	
		Implementation Progress (IP)	Development Objective (DO)
Bank-financed			
Environment, Water Resources Management	Regional: GEF Aral Sea Water and Environmental Management	S	S
Environment, Water Resources Management	Kazakhstan: Syr Darya Control and Northern Aral Sea Phase 1 Project	S	S
Water Supply	Kazakhstan: Pilot Water Supply Project	S	S
Water Supply and Sanitation	Kazakhstan: Atyrau Pilot Water Supply and Sanitation Project	S	S
Water Supply and Sanitation	Kazakhstan: Northeast Water Supply and Sanitation Project (under preparation)		
Water supply, sewerage	Armenia municipal water and Waste waster	S	S
Environment	Azerbaijan - Urgent Environmental Investment Project	S	S
Environment, water and sanitation	Bulgaria - Environmental Remediation Pilot Project	S	S
Environment, water supply, sewerage	Lithuania - Siauliai Environment Project	S	S
Water supply and sanitation, flood	Georgia - Tbilisi Water Supply and Sanitation Project	S	S
Water, sanitation and flood protection	Azerbaijan - Greater Baku Water Supply Rehabilitation Project	S	S
Water, sanitation and flood protection	Croatia - Istria Water Supply and Sewerage Project	S	S
Other development agencies			
EU/TACIS Environment	Regional : Water Resources Management and Agricultural Production Project		
UNDP/GEF Environment	Kazakhstan : Integrated		

	Conservation of Globally Significant Migratory Bird Wetland Habitats		
USAID Water Supply	Rehabilitate Aralsk and Kazalinsk pumping stations		
Degremont (French) Water Supply	Rehabilitate parts of the water system of the town of Kzyl-Orda		
JBIC/JICA	Astana Water Supply		

IP/DO Ratings: HS (Highly Satisfactory), S (Satisfactory), U (Unsatisfactory), HU (Highly Unsatisfactory)

3. Lessons learned and reflected in the project design:

Experience from project implementation in Kazakhstan and other Central Asian countries has shown that: i) rigorous economic and environmental criteria should be applied in project planning and design; ii) project scope and design should take into account the difficulties in coordinating among key government agencies; iii) competent and efficient national management staff is necessary and should be recruited prior to project effectiveness to ensure the viability and sustainability of the project; iv) timely provision of counterpart funding is imperative; v) provision of timely and adequate technical assistance is essential; vi) procurement, financial management and construction quality control need to be given proper emphasis in project implementation; and, vii) local institutions need to be fully involved in project preparation and design.

This project has taken these lessons into account in both preparation and design by: i) hiring international consultants to undertake thorough economic, environmental and social analyses, vetting their conclusions with broad consultations and workshops, and including local consultants in all activities; ii) making extensive use of the Inter-Ministerial Committee to ensure coordination; iii) ensuring that the PMU will be staffed adequately prior to effectiveness; iv) verifying that, given the recent revenue receipts by the Government, adequate counterpart resources are not likely to be a constraint and the budget process is followed for inclusion of the loan in the Government budget; v) ensuring that competent training and technical assistance is provided in support of project implementation, procurement, monitoring and supervision; and, vi) integrating local counterparts into each team during project preparation and design, and ensuring that all relevant stakeholders have been included in the decision-making meetings of the Inter-Ministerial Committee. Because of the risks and uncertainties inherent in the proposed project, an international engineering consultant firm has been engaged to prepare detailed engineering design and bidding documents. In addition, international experts will be engaged to provide guidance on technical issues such as mercury methylation processes and toxicology and dam safety issues.

4. Indications of borrower commitment and ownership:

The borrower is strongly committed to the project, considering it a high priority investment due to: i) its environmental benefit; and ii) the long-term need for an alternate drinking water supply for the capital city. This commitment is demonstrated by the fact that the borrower has: i) obtained PHRD funds to undertake project preparation work; and ii) obtained JEP financing to prepare detailed engineering designs and bidding documents. The Government proposes to include the project in its public investment program for 2004, and has provided written indication of this intention as a condition of Board Presentation of the project. The Government has also taken steps to ensure ownership of a landfill site appropriate to hold contaminated soil and other residue from clean-up activities.

5. Value added of Bank support in this project:

This is an environmentally sensitive project, which requires international expertise in risk assessment, engineering, and impact assessment, as well as proper operation and monitoring and evaluation. The Bank has coordinated many specialized teams of consultants, funded through various mechanisms, to help guide the government. Mercury pollution is a unique problem, and as such, successful remediation relies upon international expertise and advice. Bank involvement is critical, since it: i) introduces international best practice into the design and implementation of environmental remediation and water management projects; ii) results in improved quality of project design and implementation, particularly in environmental management and stakeholder involvement; iii) ensures proper technical standards for remediation efforts and operation and maintenance; iv) provides support for the introduction of international best practice in pollution management systems and regulatory frameworks; v) strengthens appropriate procurement procedures, leading to more competitive bidding and lower costs; and vi) strengthens the CWR's implementation capacity.

E. Summary Project Analysis (Detailed assessments are in the project file, see Annex 8)

1. Economic (see Annex 4):

○ Cost benefit NPV=US$ million; ERR = % (see Annex 4)

○ Cost effectiveness

○ Other (specify)

The proposed project represents a cost-effective solution to two issues: (i) the need to remove hazardous mercury deposits from the AO Karbide plant site and from the flood plains of the Nura River, and (ii) the need to provide a secure and safe drinking water supply to residents of Astana as well as communities adjacent to the river. With respect to the first issue, detailed studies were carried out during project preparation to (i) define an appropriate level of intervention based on an assessment of the costs of adopting alternative standards with respect to cleanup versus the risks that untreated sites would lead to unacceptable dissemination of pollutants; and (ii) identify an optimum site for the landfill based on tradeoffs between the cost of development and maintenance versus the cost of transporting contaminated materials to the site. The proposed project is being engineered on the basis of these findings.

With respect to the second issue, removing mercury pollution from the Nura River, together with implementation of a proper water management regime in the Basin, the project represents the most cost-effective means of augmenting the water supply for the city of Astana. The current water source, the Ishim River, does not provide adequate flow to meet the needs of projected population levels. If the Nura River is judged unacceptable owing to mercury contamination, it would be necessary to pump additional water from the Irtysh-Karaganda canal in order to ensure long-term water supply. The ongoing cost of pumping incremental water from the Irtysh River (over an elevation change of 450 meters) to the Viacheslav Reservoir is estimated at approximately US$ 0.16 per cubic meter, while the cost of transporting incremental water from the Reservoir to the city is estimated at $0.11 per cubic meter. By contrast, the Nura could provide up to 90 million cubic meters per year of additional water (equivalent to approximately 90 percent of projected demands) to Astana at a cost of approximately US$ 0.07 per cubic meter.

In addition to the cost effectiveness analysis, analytical work was carried out to quantify the potential magnitude of water supply benefits that might accrue as a result of better water quality and flow management. Quantifiable benefits of the project are highly probabilistic, depending on hydrology, the rate of rehabilitation of water supply systems in Astana, Karaganda and Temirtau, and the rate of demand growth (which is in turn partially dependent on demand management programs). Within these parameters, the project's quantifiable benefits derive from the avoided cost of drawing water from the Irtysh-Karaganda Canal. Based on conservative assumptions with respect to the extent to which the Nura

clean-up could lead to avoided use of the Irtysh-Karaganda system, the project could, on completion, result in annual net savings in the cost of water supply averaging US$ 5.2 million for Astana, $6.7 million for Temirtau, and $6.8 million for Karaganda. Present Value of these benefits (at 12% discount rate) would total US$ 76.9 million through to 2018.

While water supply cost savings represent the primary quantifiable benefits of the project, there are also measurable benefits, in terms of willingness to pay, associated with regularity of water supply, access to recreation and hunting opportunities, and enhanced biodiversity. These benefits are estimated to have an PV of $3.2 million through to 2018. Including all benefits, NPV for the project, after deducting capital and operating costs, would be $30.6 million - yielding an ERR of 22.7%. Given the uncertainties surrounding water water supply benefits, switching values were computed, and it was found that the project's ERR would still exceed 12% if water supply benefits fell to 49% of the value estimated above.

2. Financial (see Annex 4 and Annex 5):
NPV=US$ 24.9 million; FRR = 17.2 % (see Annex 4)
The mercury clean up program is expected to be financed from public investment funds. In keeping with the Government's policy of financial self-sufficiency for water supply utilities, capital and operating costs of connecting the Astana water supply system to the Nura River would be financed through user charges.

Financial benefits of the project would parallel the quantifiable economic benefits related to lower-cost water supply. The flow of these benefits is uncertain. Insofar as water users pay the full costs of water supply, savings would flow to user groups. However, to the extent that the government is obliged to provide subsidies in order to offset the exceedingly high cost of Irtysh-Karaganda water supply, financial benefits could flow to the government in the form of savings in required transfers to water users. Without reference to the flow of benefits, the Net Present Value of the financial cash flows (at 10 percent discount rate) is estimated at US$ 24.9 million over the period of the loan, and the FRR at 17.2 percent.

Fiscal Impact:

The mercury clean-up program will be financed from the central government budget, as will the ongoing operations of the various water resources management agencies. As such, the central government will be expected both to finance the local share of project funding (including ongoing operations and monitoring) and also to cover the debt service costs of the IBRD loan. The total amounts to be paid out by the Government over the life of the project include: (i) US$ 24.6 million in investment costs, of which $11.3 million is taxes; (ii) recurrent costs of US$ 3.9 million, and (iii) debt service of US$55.8 million of which US$15.4 million is interest and commitment fees. Incremental fiscal impacts include the estimated project cost, including interest and other service charges, less the VAT and customs duties that have been included in the cost estimate but which would accrue to the central government. The Net Present Value of this cost stream over the period of the loan is US$ 36.7 million (based on a discount rate of 10%), with a maximum impact of US$8.2 million in year 6 of the project (assuming debt repayment terms of 15 years, including 5 years grace, at an interest rate of 5%). On the positive side, the budget may, as a result of the project, avoid the cost associated with pumping additional water from the Irtysh-Karaganda Canal to meet the growing water supply requirements of Astana. While these costs could arguably be passed on in the form of user fees, the marginal cost of water associated with this supply option (approximately US$ 0.27 per cubic meter) is likely to be beyond the financial capacity of most users, and as such it may be necessary for the government to provide a capital, and possibly an operating subsidy.

3. Technical:
From the technical perspective, the proposed project design is relatively straightforward, using

established technologies for each of the main components.

- Mercury Clean-Up. The technology chosen for the mercury cleanup is simple excavation, due to the dispersed nature of the contamination and the fact that large volumes of chemicals and/or energy would be needed to undertake in-situ remediation. Excavation practices and transport to the landfill will be conducted under strict conditions, ensuring worker and public safety as well as environmental protection. An expert consultant will be hired to oversee operations.
- Dam Rehabilitation. The dam repair works indicate specific measures that must be undertaken in order to rehabilitate the Intumak Reservoir. No major technical challenges are expected.
- Landfill Design. A modular design has been selected for the landfill, located in an appropriate site vis-à-vis potential groundwater and air pollution.

There are some technical uncertainties related to the construction of the spillway and gates at Intumak (see Section C1). During project preparation, the concern was raised that proposals to increase the operating capacity of the Intumak Reservoir (in order to provide additional seasonal storage of water) could lead to more serious environmental problems in the form of increased methylation of mercury deposits that have accumulated in the bottom of the reservoir. It was agreed that, as a precuationary measure, additional monitoring and expert analysis would be carried out before undertaking any civil works, and expert consensus on the safety of raising the reservoir operating level without first removing mercury deposition will be a condition for any disbursement against dam civil works. Provision has also been made in the cost estimate for this component to finance any additional dredging/soil removal that may be recommended based on the results of the monitoring and expert assessment.

4. Institutional:

4.1 Executing agencies:

The State Committee for Water Resources (CWR) under the Ministry of Agriculture would be the executing agency for the project, on behalf of the Government. The CWR is organized on a basin level, operating through basin water management agencies, which in turn depend on oblast and regional committees to administer regulations and standards and manage projects. Within the project area, the CWR exercises its responsibilities through the Astana and Karaganda Regional Water Resources Committees and the Ishim and Nura-Sarysu River Basin Authorities. The CWR would have primary responsibility for project coordination and would implement the project through the PMU.

The major limitations of the current institutional structure may be summarized as follows: (i) organizational capacities to address institutional, economic, social and technical issues are weak and do not match well with assigned responsibilities; (ii) budgetary resources are not adequate to sustain monitoring activities; during past years agencies have been forced to cut staff as well as the number of monitoring stations and number of samples for analysis, and stop conducting verification of information provided by users (i.e. water intakes and waste discharges); and (iii) lack of information sharing and exchange among agencies precludes comprehensive planning. These issues are addressed through the proposed implementation arrangements and through institutional support (see section C4 above).

4.2 Project management:

The PMU, under the CWR, will have its main offices in Astana. However, a branch office will be located in Karaganda in order to ensure close day-to-day supervision of the project, and coordination with local stakeholders. Proposed staffing of the PMU in Astana includes a technical coordinator, financial specialist, disbursements office, procurement specialist, and public relations advisor. The technical coordinator and procurement consultant are currently in place, together with an accountant.

Staff in Karaganda at any given time will depend on the then-current needs of the project. However, provision is made for a full-time specialist in basin management and social science, and half-time involvement of specialists in hydrology, environment, and water quality.

4.3 Procurement issues:

Procurement will be carried out in accordance with Bank Guidelines. The proposed procurement plan is outlined in Annex 6. The general strategy is to procure the equipment, civil works and services in larger packages, making contractors responsible for supply and installation of equipment. This would minimize coordination needs on the part of the implementing agency and simplify project implementation, mitigating the risk of project delays.

The Government proposes to finance all consulting services, training and incremental operating costs, using Bank Guidelines and agreed procedures as set out in Annex 6. The Bank, at its discretion, may monitor the work as necessary to satisfy themselves that it is being carried out according to appropriate standards, and is based on acceptable data. The Government has agreed to take into account Bank's comments in this regard to ensure satisfactory project implementation in terms of cost, quality, and completion time.

Any procurement of civil works related to the rehabilitation of the Intumak dam and reservoir would be conditional on completion of detailed monitoring and analysis of mercury pollution within the reservoir, and the positive recommendations of the International Expert Advisory Group with respect to the design of the rehabilitation component.

4.4 Financial management issues:

An assessment of the Financial Management arrangements for the Project was undertaken during 18 to 19 December 2002 (updates of the FMAC were conducted in February 2003 and April 2003) to determine whether the financial management (FM) arrangements are acceptable to the Bank. It is concluded that the PMU currently satisfies the Bank's minimum financial management requirements.

5. Environmental: Environmental Category: A (Full Assessment)

5.1 Summarize the steps undertaken for environmental assessment and EMP preparation (including consultation and disclosure) and the significant issues and their treatment emerging from this analysis.

The proposed cleanup project has been classified as a Category A project, since it could cause significant environmental impacts affecting an area broader than the sites or facilities subject to remediation. The Committee for Water Resources procured the services of an independent team of international and domestic environmental consultants with extensive international experience in both Environmental Assessment (EA) and contaminated site cleanup. The EA team consulted with the World Bank, local stakeholders, and local and regional government authorities. The EA report was submitted to Infoshop, and the Executive Summary was provided to the Executive Directors in May, 2002. The final EA (with small revisions) was submitted in October 2002.

Contaminated ground cleanup is a complex process, and less predictable or amenable to conventional engineering project management than are other types of pollution control or infrastructure development. This is especially true where a large number and diversity of sites must be addressed over a broad area, and where the primary contaminant of concern is toxic, mobile, persistent and bioaccumulative. The need for careful planning, specialized precautions, and mitigating measures to prevent, minimize or respond to inadvertent releases of mercury compounds and associated pollutants are all key concerns of the Environmental Assessment (EA) and Environmental Management Plan (EMP).

5.2 What are the main features of the EMP and are they adequate?

The EMP presents thorough mitigation measures applicable to the stages of mercury contamination cleanup recommended in the final Feasibility Study. These include:

- Site management and institutional controls – limiting access to cleanup sites and restricting land and water uses where appropriate
- Health and safety protection for cleanup workers and nearby residents – medical monitoring, airborne mercury monitoring, personnel training, use of personal protective equipment, decontamination of equipment, communications
- Contingency planning and emergency response – on-site emergency response, community emergency response, incident reporting, practicing responses, first aid procedures and equipment, training, spill control and countermeasure plan
- Mitigation measures for removing mercury from buildings – recommended tools and techniques, including vacuum technology and cleanup kits, specialized for mercury removal
- Soil removal mitigation measures – timing of operations to avoid wet weather, flooding and high winds; covering of excavation areas and stockpiled soils to prevent mercury vapor and dust emissions and rain erosion, underlining of soil stockpiles to prevent leaching into clean soil and groundwater, installation of berms and ditches to control surface water run-on and run-off
- Soil transport mitigation measures – waste characterization and segregation, labeling and manifesting of trucks, safe loading and unloading, wetting wastes and covering trucks with canopies to prevent dust generation, emergency response, truck decontamination, truck maintenance
- Landfill mitigation measures – separate landfill cells for wastes with high moisture and/or high concentrations of mercury, liners equivalent to international standards; further evaluation of the need for leachate and gas collection and treatment; cover meeting international standards, waste analysis and acceptance procedures, facility inspection plan, contingency and emergency response plan, personnel training plan, environmental monitoring plan, and closure and post-closure plan.

The EMP also outlines a series of environmental monitoring programs, aimed at measuring contamination in air, soil, surface water, sediments, ground water, drinking water, fish, crops, livestock, and humans before, during and after cleanup. Monitoring parameters, locations, frequencies and methods are provided for each cleanup program activity.

A program of capacity building is proposed, including organizational development, staffing, training and equipment procurement relating to health and safety, contingency planning and emergency response, environmental mitigation and monitoring, and social assessment and public consultation. Institutional arrangements, schedules and costs for implementing the mitigation, monitoring and capacity building measures are also provided. Implementation will be accomplished primarily through a project management structure led by CWR/BVO and supported by staff of relevant government agencies seconded to the project and domestic and international consultants.

5.3 For Category A and B projects, timeline and status of EA:

Date of receipt of final draft: July, 2002

The first draft EA was submitted to the Bank for comment in April, 2002. The draft Final Feasibility Study with alternative landfill options was presented to the Bank in June, 2002. Based on this information, an update of the EA was completed and submitted to the Bank in July, 2002. A slightly amended version incorporating minor editorial revisions was received in October, 2002.

5.4 How have stakeholders been consulted at the stage of (a) environmental screening and (b) draft EA report on the environmental impacts and proposed environment management plan? Describe mechanisms of consultation that were used and which groups were consulted?

Copies of the Executive Summary of the Draft Final EA were distributed, in Russian, to attendees of the final public hearings in Temirtau and Karaganda, and were available to the public through EcoCenter of

Karaganda. Copies of all versions of the EA were presented in Russian to the Committee for Water Resources; and the English version of the EA was made available through the World Bank's Infoshop in May and again in July, 2002.

The public consultation process included hiring a local coordinator, and bringing local NGOs and government officials into the planning process. Initial public meetings were held in early February 2002 in Karaganda and Temirtau cities; a final public meeting was held in late April 2002 on the Draft EA, and mechanisms were developed to facilitate ongoing public consultation on the project through the implementation phase. A large number of local government officials, academics, students and NGO representatives attended the initial public meetings. Meetings were also attended by the MP from Karaganda, representing environmental interests in the local Parliament. The project and EA process were described; and comments were solicited on the scope and key issues. Participation and discussion were excellent. Major comments related to the agencies responsible for the project; the analytical and decision-making processes, project financing, cleanup approaches and technologies, and their respective environmental impacts. Lists of attendees and summaries of their questions and concerns were prepared (see EA, Appendix C, Record of Public Meetings) and were addressed in the EA. Section 7 of the EA provides a summary of the responses to public comments.

5.5 What mechanisms have been established to monitor and evaluate the impact of the project on the environment? Do the indicators reflect the objectives and results of the EMP?

The EMP establishes a detailed monitoring plan for the excavation and storage phases of the project. Mitigation actions will be incorporated into the contracts with firms carrying out the landfill construction and clean-up components of the project, and a firm specializing in project management will be engaged to ensure adherence to the mitigation program. The EMP also highlights the need for comprehensive environmental monitoring of the river basin as a whole, including collection of environmental health data. The implementation of the monitoring program is included in the institution-strengthening component of the project. Performance covenants within the Loan Agreement will address the implementation of recommended mitigation, monitoring and capacity building measures. Reporting on the EMP is included in project reporting requirements in Annex 1.

6. Social:

6.1 Summarize key social issues relevant to the project objectives, and specify the project's social development outcomes.

A social assessment of the state of water resources in the Nura River Basin was undertaken with TACIS financing. The report, dated June 2001, indicated that local residents and officials were extremely concerned about the condition of the Nura, which in their opinion has become a "gutter". They believed this problem is of national importance and asked for immediate action, not only from the government of Kazakhstan, but also from foreign organizations. The majority of respondents interviewed felt that public awareness of the pollution problems in the Nura River was inadequate and that more efforts should be made to disseminate information. A number of respondents, primarily specialists, felt that it was a waste of time to clean the river, since it would never be clean enough for household consumption.

As noted in Section C3, the project's social development outcomes include: i) reduced ecological risk to residents of Temirtau as a result of the containment/removal of mercury pollution from the AO Karbide factory; ii) reduced health risk to those residents who continue to use the Nura River as a direct drinking water source and for fishing and crop irrigation; iii) a less costly source of safe drinking water for the residents of Astana City, Temirtau and Karaganda, who currently rely at least in part on water from the Irtysh-Karaganda Canal, and (iv) reduced biodiversity degradation in the Kurgaldzhino Wetlands.

6.2 Participatory Approach: How are key stakeholders participating in the project?

In addition to the social assessment described above, other efforts were made to include key stakeholders in project design and preparation. An Inter-Ministerial Steering Committee was formed in March 2001 by State Decree #264, and a number of meetings have already been held. As part of the EIA process, public hearings, some of the first ever to be held in the region, were held in Karaganda and Temirtau. The hearings were very successful, significantly increasing public awareness of problems associated with the Nura River and allowing participants to discuss different alternatives for cleaning-up the mercury in the water. The process also served to demonstrate to participants the purpose of holding public hearings, a relatively new concept in Kazakhstan.

The project intends to ensure that stakeholders continue to be given the opportunity to participate in project preparation, and in the longer term, in implementation, monitoring and evaluation. As noted in C4, the group formed during the public consultations of the EIA under the leadership of the Deputy Akim of Karaganda and local members of the Mazhilis would be formalized and expanded, and would serve as a mechanism to keep the local population informed of project activities and progress and as a forum for dialogue between the public, NGOs, the Director of the Nura River Basin Authority, and the PMU. The PCG would also provide input into performance monitoring with respect to the project's environmental and social development goals by providing feedback on project issues and proposing revisions, if necessary, to ongoing project support activities.

The project cost estimate also provides for the financing of national and international specialists in public relations, who will be responsible for designing and disseminating an information program aimed at keeping stakeholders informed of the project's progress and outcomes.

6.3 How does the project involve consultations or collaboration with NGOs or other civil society organizations?

Non-governmental organizations participated in project preparation through the public hearings process, and it is intended that they will continue to participate in ongoing public consultations during the implementation and monitoring stages. The Public Consultative Group that has been established to facilitate stakeholder consultation and information will provide an ongoing forum for NGO participation. On special issues (e.g. local health moniroing, biodiversity and wildlife impacts), NGOs involved in these areas will be consulted directly.

6.4 What institutional arrangements have been provided to ensure the project achieves its social development outcomes?

Some of the social development outcomes of the project are passive in nature (e.g. reduced health risks as a result of removing sources of mercury pollution), and hence depend on the effective implementation of the proposed work program. Prequalification of bidders, transparent selection processes, and independent supervision will help to ensure that these outcomes are achieved. Other social development outcomes require measures apart from the effective implementation of civil works. Access to low cost water supply needs to be paired with a program to build public confidence in the safety of Nura River water. To this end, the project includes, in addition to the public relations program described above, significant investment in the development of a comprehensive water quality monitoring network, and training of local staff in its use. The environmental management plan that has been prepared for the project includes measures to ensure that formal and informal institutional organizations work effectively together during the development, implementation and monitoring of the project. This will help to ensure that any adverse social outcomes of project implementation are quickly identified and rectified.

6.5 How will the project monitor performance in terms of social development outcomes?

Since the focus of the project is on improving the quality of life for people living in the Nura River Basin by reducing exposure to mercury and eventually providing clean water, indicators to monitor social impacts and social development outcomes are inherent in the project indicators. Specific indicators will include water quality in the basin, risks of public exposure to mercury contamination, and the cost and quality of household water supply.

7. Safeguard Policies:

7.1 Are any of the following safeguard policies triggered by the project?

Policy	Triggered
Environmental Assessment (OP 4.01, BP 4.01, GP 4.01)	● Yes ○ No
Natural Habitats (OP 4.04, BP 4.04, GP 4.04)	○ Yes ● No
Forestry (OP 4.36, GP 4.36)	○ Yes ● No
Pest Management (OP 4.09)	○ Yes ● No
Cultural Property (OPN 11.03)	○ Yes ● No
Indigenous Peoples (OD 4.20)	○ Yes ● No
Involuntary Resettlement (OP/BP 4.12)	○ Yes ● No
Safety of Dams (OP 4.37, BP 4.37)	● Yes ○ No
Projects in International Waters (OP 7.50, BP 7.50, GP 7.50)	● Yes ○ No
Projects in Disputed Areas (OP 7.60, BP 7.60, GP 7.60)*	○ Yes ● No

7.2 Describe provisions made by the project to ensure compliance with applicable safeguard policies.

Environmental Assessment. The project triggers OP 4.01 and is rated A; thus an Environmental Assessment has been undertaken for the project (see Section E.5. above. The EA has been submitted to and reviewed by the Bank, and is in full compliance with Bank guidelines (including public consultation and disclosure). A copy of the Executive Summary is provided in Annex 11. The overall EA complies with the Envrionmental Assessement safeguard policy (OP4.01). EA Sections 3.1.7-9 and 4.3.2 address compliance with the Natural Habitats safeguard policy (OP4.04). The Cultural Property safeguard policy (OPN11.03) will be addressed during the detailed design stage through the development of a "chance find" protocol that can be utilized during project implementation. Mercury is highly toxic; therefore, the EMP focuses on proper management of exposure during excavation and containment at the landfill. Proper long-term operation and monitoring of the landfill will ensure that the project has a positive environmental impact. The project includes a component to establish a monitoring system and strengthen water management, with a view toward providing the downstream, protected, Kurgaldzhino wetlands with 100% of needed ecological flow. The quality of the water entering the wetlands will be much better as a consequence of this project.

Safety of Dams. (Annex 12) Effective water management within the Nura Basin depends on the operation of three reservoirs: Intumak, Samarkand and Sherubianur. A dam safety assessment was undertaken by international experts at Intumak dam. According to the Dam Safety Report prepared by Posch and Partners, the Intumak dam needs important rehabilitation measures, including completion of the spillway. Providing a positive water retention element to the Intumak dam body and within its foundations is another key element of the rehabilitation works both safety- and cost-wise. An international expert will be recruited to minimize uncertainties inherent in rehabilitating an existing structure. Priority safety-related interventions will be implemented by the project. Dam safety assessments have also been carried out at Samarkand and Sherubianur dams (although these two dams have been certified as safe by the Kazakh Commission on Dam Safety). The reports recommend that the physical and operating parameters for the dams be clarified and updated, that the operating rules be

amended, if necessary, based on these updated assessments, and that additional preparedness planning and monitoring activities be carried out. The Borrower has agreed to undertake the proposed remedial measures.

Integrated water resource management considerations favor the rehabilitation and upgrading of the bottom outlet structure at Intumak so that it can play a multipurpose role. The GOK will hire an independent expert to advise on the dam safety aspects of the project. Given the importance of reservoir storage for the successful operation of the project the existing storage capacities will be carefully checked. If necessary field surveys will be carried out. The Intumak reservoir could act as a sink for residual contaminants coming from the clean-up of upstream river stretch. To this effect, a sedimentation management strategy will be developed for the Intumak reservoir.

International Waterways. The project triggers OP 7.50 since the Nura (a wholly national river) is connected to the Ishim (which ends in Russia) by a canal near Astana. Per O.P. 7.50 and in consultation with the Bank's legal department, the Government of Kazakhstan sent a letter to the Government of Russia informing them of the project, its objectives, and its likely impacts, requesting any comments. To-date, none have been received, and in the absence of comment or objection, the Government of Kazakhstan intends to proceed with the project.

F. Sustainability and Risks

1. Sustainability:

Sustainability of the project outcomes will depend in part on the ability of the Basin Authority to control risks associated with recontamination of river and/or new sources of pollution in the region, and to effectively manage the water resource to ensure a reliable supply of potable water for the population in the Nura Basin. For this reason, the project assigns a high priority to legal and institutional strengthening of water resource monitoring and management capacity.

In addition, an ongoing program to encourage public participation in the project, and to educate them on the effects of pollution and the benefits of remediation works should help to promote a heightened level of awareness and commitment to the preservation of the water resources. The participation of experts from the Minamata Institute of Japan in the design and operation of the water quality monitoring program should enhance public confidence in the reliability of published findings, and alleviate any residual concerns about the safety of the Nura River as a source of water for drinking, irrigation and fisheries.

2. **Critical Risks** (reflecting the failure of critical assumptions found in the fourth column of Annex 1):

Risk	Risk Rating	Risk Mitigation Measure
From Outputs to Objective		
Local and regional water authorities and water users are unwilling to cooperate in the operation of the river basin management system	M	Strong support at all levels of government for integrated river basin management, as well as a good understanding within the coordinating water management body.
Local industries are unwilling or financially incapable of complying with environmental standards	M	Legal basis for enforcement of compliance Government understanding of, and support for measures to ensure sustainable water supply
Lack of proper long-term operation and	M	Activities to ensure sustainability will be part

monitoring of the landfill to avoid leakage and quickly identify the need for remedial actions.		of the operational contract
Cooperation between the regional environmental and water management agencies is not forthcoming	M	Institutional strengthening and provision of management tools will assist the water management authority in carrying out its duties and mobilizing support.
Monitoring Unit not financed for long-term	M	Financing secured through trust funds for project life time Long-term monitoring plan to be developed, including sustainable financing plan
Mercury Disaster	S	Quick action required by project to secure plant buildings
From Components to Outputs		
Timely availability of counterpart funding during project implementation.	M	Financial conditions in loan agreement will ensure availability of required resources from the central government budget on an annual basis
Government capacity and commitment to finance ongoing operating and maintenance costs of the Basin Management System	S	Financial conditions in loan agreement will ensure availability of required resources from the central government budget on an annual basis Grant financing is being sought to supplement financial resources of the Nura Basin Authority
Mercury clean-up operation proves to be technically and/or financially infeasible	M	Extensive advance preparation and analysis by reputable engineering consultants Relatively simple technology, intervention only in most critical instances
Lack of adequate implementation capacity within the PMU results in poor project management and/or extensive implementation delays	M	Project will provide funding for technical support of PMU
Overall Risk Rating	M	

Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N(Negligible or Low Risk)
M (Modest Risk)

3. Possible Controversial Aspects:

There are no controversial aspects anticipated. In its project timetable, the project has considered the urgency of the need for careful destruction of the plant building sites. However, should the buildings collapse in the meantime, some controversy could arise over the reasons for delays.

G. Main Loan Conditions

1. Effectiveness Condition

Apart from the issuance of a legal opinion, there are no conditions of loan effectiveness.

2. Other [classify according to covenant types used in the Legal Agreements.]

Disbursement condition:

- No disbursement with respect to civil works under Component 2 (rehabilitation of the Intumak Dam and reservoir) until International Panel of Experts has approved proposed works program

Annual Review

- Satisfactory implementation of Environmental Management Plan in accordance with the program defined during Negotiations

Financial

- Borrower to make annual provision in the central government budget to finance local costs of the project, as well as ongoing operating costs of River Basin Management Agencies.

- The Government will submit a letter to the Bank indicating its intention to include co-financing for the project in the draft Republican budget for 2004

- A satisfactory assessment will be carried out for the dams at Samarkand and Sherubianur and the report submitted to the Bank

- Regional and/or local administrators will have reached agreement with parties holding vested interests to develop the landfill at Opan, or at an alternative satisfactory landfill site.

H. Readiness for Implementation

☒ 1. a) The engineering design documents for the first year's activities are complete and ready for the start of project implementation.

☐ 1. b) Not applicable.

☒ 2. The procurement documents for the first year's activities are complete and ready for the start of project implementation.

☒ 3. The Project Implementation Plan has been appraised and found to be realistic and of satisfactory quality.

☐ 4. The following items are lacking and are discussed under loan conditions (Section G):

I. Compliance with Bank Policies

☒ 1. This project complies with all applicable Bank policies.

☐ 2. The following exceptions to Bank policies are recommended for approval. The project complies with all other applicable Bank policies.

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Piotr Krzyzanowski	Laura Tuck	Dennis de Tray
Team Leader	**Sector Director**	**Country Director**

Annex 1: Project Design Summary

KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
Sector-related CAS Goal:	**Sector Indicators:**	**Sector/ country reports:**	**(from Goal to Bank Mission)**
Reverse environmental degradation trends, particularly those affecting public health, welfare, and economic productivity	Improved potential for economic and social development in areas previously suffering from contamination	Economic data on employment, industrial production, agriculture etc. in areas affected by project. Implementation Progress reports on NEAP	Expenditures on environmental protection reduce risk of poverty by increasing economic productivity and improving health and quality of life
	Increased access to clean water supply	Poverty Assessment, Social Indicators	Cabinet/Parliament takes environmental problems and their impact on the economy and population as a priority issue for the country
	Reduced incidence of health problems related to environmental pollution	Social Indicators	Availability of, and access to an adequate health care system,

Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
Project Development Objective: To improve the welfare of the population in the Nura River Basin by cleaning up serious mercury pollution in and adjacent to the Nura River, providing a safe, secure and cost effective alternative source of water supply to meet growing needs of local water users, and restoring flow control in the river for flood management and ecological purposes.	**Outcome / Impact Indicators:** Increased reliance on local water resources by the users in the Nura basin	**Project reports:** Reports of the Municipal Vodokanals in Karaganda, Temirtau, and downstream communities	**(from Objective to Goal)** Continued strong political interest and support for policy and institutional reform in the water sector Effective ongoing water quality monitoring program, together with the capacity to respond to any degradation in measured indicators Willingness of the regional water and environmental agencies to cooperate
	Availability of additional land areas for productive use	Zoning reports, land use reports, site specific reviews and monitoring	
	Increased summer time flows to the Kurgaldzhino wetlands	Water balance reports from the River Basin Department	Willingness of local and regional authorities and the water users to cooperate and operate the river basin management system Enhanced institutional capacity for water resource planning and management
	Availability of Nura water to meet the additional demand for the city of Astana	Water balance reports from the River Basin Department Reports of the Astana regional /municipal Vodokanals	As above

Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
Output from each Component:	**Output Indicators:**	**Project reports:**	**(from Outputs to Objective)**
Removal of critical risk depositions of mercury in populated areas of Temirtau and in the Nura Basin	Mercury concentrations at AO Karbide site and adjacent facilities are reduced to at least ambient levels in the city Year-round mercury concentrations in the water from the Nura River are maintained at levels that meet standards for human consumption	Annual monitoring report for the affected areas to gauge achievement of mercury reduction targets Ongoing water quality monitoring reports	Competent implementation and supervision of clean-up program Timely implementation of cleanup at plant site Proper long-term operation and monitoring of the landfill to avoid and leakage
Improved capacity for flow management in the Nura Basin	Flood and dry season flows downstream of Intumak can be managed with a view to optimizing benefits of water resource	Water balance reports from the River Basin Department	Adequate resolution of concerns regarding the impact of higher reservoir levels at Intumak on the risks associated with mercury concentrations in the water
Properly trained and equipped Basin Management Authority	Seasonal flow management, as above Water quality is monitored on an ongoing basis Prompt action is taken to address any deterioration in water quality measures	Water balance reports from the River Basin Department Ongoing water quality monitoring reports Annual operating reports of the River Basin Authority	Enforcement of environmental regulations to preserve water quality Adequate financing mechanisms for the ongoing operation of the monitoring unit Ongoing government financing for water management institutions

Hierarchy of Objectives	Key Performance Indicators	Data Collection Strategy	Critical Assumptions
Project Components / Sub-components:	**Inputs: (budget for each component)**	**Project reports:**	**(from Components to Outputs)**
Clean-up of high risk mercury accumulations at the Karbide plant site and in the Nura River Basin	$44.08 million	- Contract documents and supervision reports for the mercury clean up program - Monthly reporting on implementation of the environmental management plan activities - Annual reports on landfill operation - Quarterly and annual PMRs	Technically feasible and financially affordable solutions for mercury clean-up Timely completion of detailed engineering Timely counterpart funding as budgeted Timely implementation of procurement
Rehabilitation of Intumak Dam and completion of spillway	$19.13 million	- Contract documents and supervision reports - Report from International Expert Panel - Final report containing data on mercury fate in Intumak - Quarterly and annual PMRs	Satisfactory resolution of uncertainties regarding long-term impacts of increasing reservoir levels Timely implementaiton of engineering and construction works
Strengthening the water resources management and monitoring capacity of institutions within the Basin Authority	$1.68 million	- annual supervision reports from international engineering consulting firm - Annual report on Basin Authority's activities including tariffs, permits granted, costs of water supply from various sources, etc.	Recurring cost financing of O&M costs of the Basin Management System
Project Management and Impact Monitoring	$2.53 million	- annual supervision reports from international engineering consulting firm - periodic reports from the Public Consultative Group - quarterly reports on implementation progress (PMU to CWR) which would also be sent to public constulative body	

Annex 2: Detailed Project Description
KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

By Component:

Project Component 1 - US$44.08 million

Nura Basin Mercury Clean-Up

This component of the project would include financing for excavation of contaminated hotspots, including the AO Karbide plant site at Temirtau (factory building, main drain, and adjacent waste disposal sites), the Zhaur Swamp, and critical areas of mercury accumulation along the banks and floodplains of the Nura River. Materials removed from the plant site and river-banks would be transported to a secure landfill for proper containment of the contaminated soil. The landfill would be constructed at a tentatively-identified site at Opan, adjacent to an existing landfill associated with the Ispatkarmet Metallurgical Plant. The project would also finance the initial operation and monitoring of the landfill. As part of this component, financing would be provided for inspection and monitoring of the landfill construction and soil-excavation process by independent experts to ensure that the selected contractors meet all technical standards and safeguards.

The intervention standards and quantities of material to be removed from each site were developed through a combination of integrated risk assessment followed by a technical and economic assessment of the least-cost form of intervention. The key findings of the risk assessment were as follows:

- At mean concentrations, the mercury levels pose acceptable levels of risk to the population that lives in the vicinity of the Nura. This is for all three of the vectors: direct contact with the soil, crop uptake and drinking the local waters. With regard to an appropriate risk management strategy, such a level of risk leads to a land-use zoning strategy rather than wholesale remediation, in the fllodplain. This is because the majority of the land poses acceptable risk levels, and given the area under consideration, areas of potential risk can be avoided or the land put to another less sensitive land-use (e.g. industrial development).

- Three points were considered of special significance:

  - The Zhaur swamp is currently a risk to human health;
  - The Main Drain sediments and waters exceed most screening values, and thus degrade the River Nura;
  - From comparison of the criteria with the concentrations found in the sediment from the oxbow lakes and backwaters and the calculated porewater concentrations, it is clear that there is a significant mercury inventory that can act as a slow but continuous source to wells and the river.

- The general conclusions from the data analysis and risk analysis are summarised below:

  - The measured water quality in the Nura River is uncertain. The various data sets give very different results and lead to very different conclusions. On the one hand the water quality leaving the Intumak reservoir is at best marginal, whilst other data (including the most recent sampling and analysis effort undertaken by the Consultant during the flood season in March and April 2002) indicates that it is quite safe. This can only be resolved through additional (long-term) measurement (to be carried out by other parties).
  - Some areas on the flood plain are to be considered hazardous and need addressing in some way.

Other areas are of acceptable risk for normal human activities and can be left alone.

- The Zhaur Swamp must be considered hazardous and remedial action is required there.
- The Main Drain could constitute a hazard and needs to be addressed in detail.
- AO Karbide Site, the associated waste water treatment plant and ash lagoons (previously used by the KarGress power plant, but more recently used as a deposit for mercury-containing waste by AO Karbide) are hazardous and require remedial actions. Data indicates that there has been an accumulation of mercury in the strata under AO Karbide during the whole period of industrial activity.

Based on these analyses, the following program of activities was proposed:

Sub-Component	Action	Quantities
Landfill	☒ Construct a secure, modular landfill with a capacity of at least 3 million cubic meters at a site to be agreed based on geological, financial, and environmental criteria.	50 ha
A/O Karbide Plant site, including main drain, sludge lagoon, and wastewater treatment plant	☒ buildings of former acetaldehyde production must be demolished; ☒ contaminated ground and debris must be excavated; ☒ the ground and debris must be disposed of in specially-designed landfills; ☒ the most highly polluted soil and construction debris, which have mercury concentrations higher than 1500 mg/kg, must be treated prior to disposal.	2,135,000 cubic meters
Zhaur Swamp	☒ Temporarily drain the Swamp and strip the surface soils and vegetation ☒ Remove the contaminated material to a safe modular designed storage facility; do not treat to remove the contamination.	474,000 cubic meters
Nura River Banks and Floodplains	☒ Zone the flood plain into use zones and enforce them ☒ Excavate the contaminated soils where that is shown to be justifiable by economic or fitness for purpose criteria (Excavation of contaminated soils must follow additional sampling and analysis at specific sites where alternative land uses are under consideration, for example, for extending agriculture activities.); ☒ Remove the excavated material to a safe modular designed storage facility – do not treat to remove the contamination.	728,000 cubic meters
KarGress Lagoon	☒ Consider possible use of Lagoon as a candidate for landfill site, even though it does not conform to local standards for distances between landfill and key infrastructure ☒ In the event that the Lagoon cannot be used for landfill, remove the contaminated material to a safe modular designed storage facility; do not treat to remove the contamination.	Minimum 1,000,000 cubic meters

Project Component 2 - US$19.13 million

Intumak Reservoir Réhabilitation. This component of the project would finance equipment and civil works to rehabilitate the dam at the Intumak Reservoir, which is located approximately 80 km downstream from Temirtau. The Intumak dam was built between 1982 and 1984 as part of a proposed irrigation scheme. However, the irrigation project was abandoned before the civil works for the dam had been completed. In particular, the regulating gates and the spillway were not completed in conformity with the design, and the reservoir was filled to less than three-fourths of its design capacity (180 million m3 out of a capacity of 250 million m3). Recent engineering studies indicate that there has been some water penetration of the dam, and that works should be carried out to reinforce the main structure, in order to prevent a possible breach and release of floodwaters and contaminants downstream. At the same time, it has been proposed that the spillway and gates be completed so that the reservoir can be operated at design capacity, even though the irrigation need did not materialize. Given that approximately 80 percent of the annual flow in the river occurs over a two month period in the Spring, this would offer significant benefits in terms of downstream flood control, and seasonal water storage. It would also ensure an adequate dry-season supply of water to the Korgalgzhin Wetlands – an ecological area which is included under the Ramsar Convention in the list of sites with global significance.

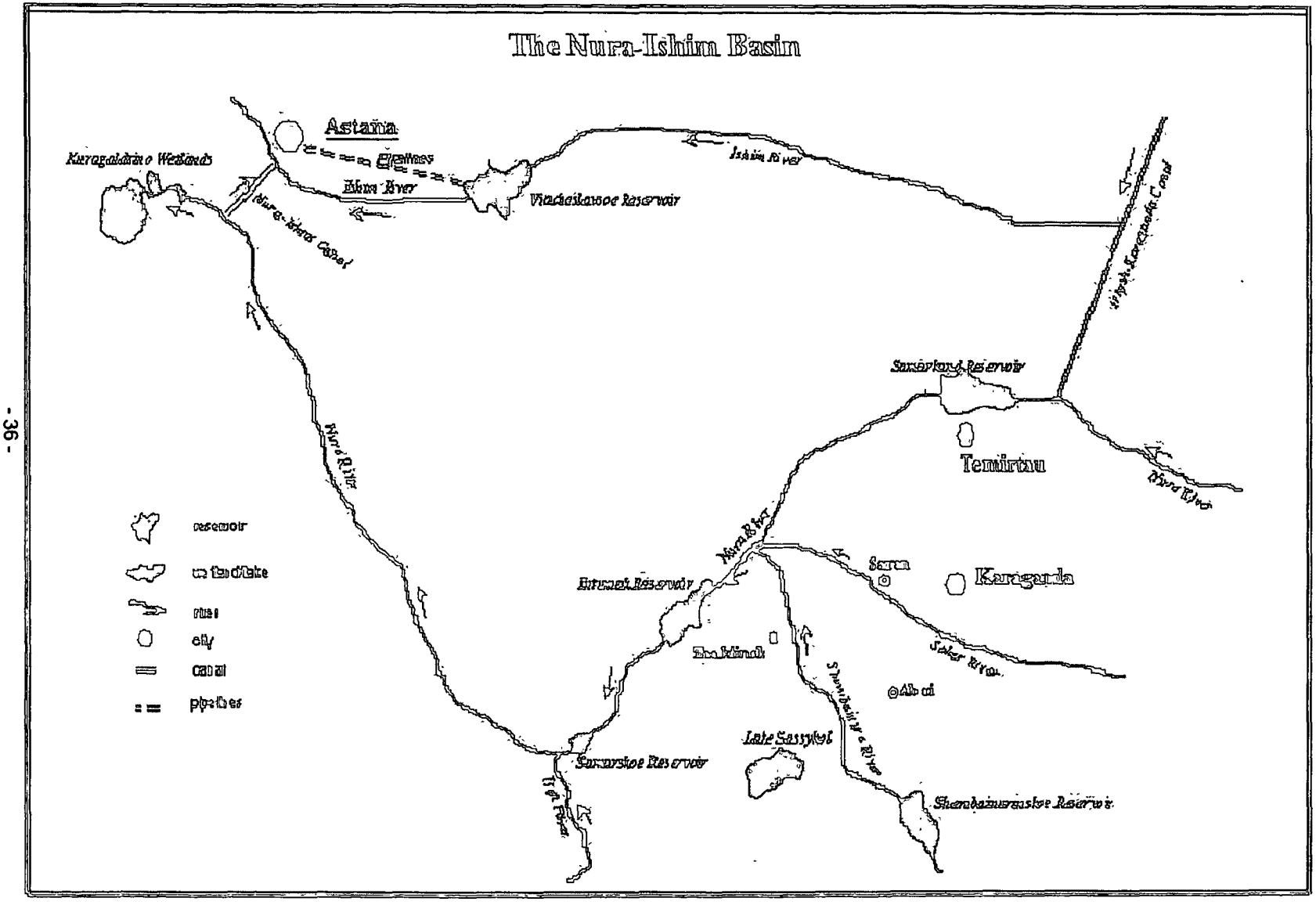
The component would finance rehabilitation of the Intumak Reservoir, including reinforcement of the dam and completion of the spillway and gates to allow the dam to operate as a mechanism for flow control at its original design reservoir level. However, owing to uncertainty about the possible impact of increased reservoir volumes on mercury methylation, the dam operational manual and an integrated water resources management plan for the Samarkand and Sherubianur reservoirs will be developed based on the findings and recommendations of an expert assessment. This assessment would be based on the results of a one-year monitoring program, including mathematical modeling, as well as consensus on the part of an International Expert Advisory Group. Grant financing has been sought for the design and implementation of the reservoir monitoring program, the analysis of results, and the expert assessment of the risks inherent in raising the operating level of the reservoir. In the event that the results of the monitoring and assessment indicate a risk of unacceptable levels of mercury methylation associated with increased operating levels, completion of the spillway and gates would be postponed until mercury deposits in the bottom of the reservoir could be removed and transferred to the landfill. Provision has been made in the cost estimate for this component to cover the cost of any additional dredging works required. While the amount of dredging required will be established based on the further monitoring and analysis, it is expected that the cost would be minor.

Project Component 3 - US$ 1.68 million

Nura-Sarysu River Basin Authority Strengthening. This component would finance technical assistance, training and equipment necessary to increase the institutional capacity of the Nura-Sarysu River Basin Authority, in order to strengthen its monitoring network, water pollution control system, and the regulatory framework within which it operates.

Project Component 4 - US$2.53 million

Project Management and Monitoring. This component would cover a number of activities related to project management and monitoring. One part of the component would finance the incremental operating costs of the Project Management Unit (PMU) which would be established to oversee and coordinate project implementation. A second part would finance technical assistance to the PMU, providing (i) training in areas such as procurement, disbursement, and project accounting, (ii) auditing of project accounts, (iii) assistance in the supervision of construction, monitoring and evaluation activities, and (iv) supervision of the implementation of the environmental management plan.


The Nura-Ishim Basin
Astana
Kuragaldino Wetlands
Ishim River
Vlachailovoe Reservoir
Nura-Ishim Canal
Nura River
Samarkand Reservoir
Temirtau
Nura River
Nura River
Karaganda
Sarya
Jakar River
Abai
Lake Sassykol
Samarskoe Reservoir
Shandaimurasloe Reservoir
reservoir
canal
river
city
canal
pipeline

Annex 3: Estimated Project Costs
KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

Cost by Component - Net of Contingencies

Project Cost by Component	Local (US$ 000)	Foreign (US$ 000)	Total (US$ 000)
1. Mercury Cleanup	**35,209**	**1,898**	**37,106**
1a. Preparation of OPAN Disposal Site	8,694	460	9,155
1b. Remediation of AO Karbide Site	17,500	1,437	18,937
1c Remediation of river bed sediments river bank ash, flood plain soils, Zhaur	9,015	0	9,015
2. Rehabilitation of Intumak Reservoir	**15,702**	**400**	**16,102**
3. Institutional Strengthening and Technical Monitoring	**1,146**	**268**	**1,414**
4.Project Management and Project Impact Monitoring	**1,337**	**792**	**2,128**
Total Baseline Costs	53,394	3,357	56,751
Physical Contingencies	5,065	318	5,384
Price Contingencies	4,973	313	5,286
Front End Fee		404	404
Total Financing Required			

Cost by Component - Including Contingencies

Project Cost by Component	Local (US$ 000)	Foreign (US$ 000)	Total (US$ 000)
1. Mercury Cleanup	**41,828**	**2,254**	**44,082**
1a. Preparation of OPAN Disposal Site	10,329	547	10,876
1b. Remediation of AO Karbide Site	20,789	1,707	22,497
1c. Remediation of river bed sediments, river bank ash, flood plain soils, Zhaur	10,709	0	10,710
2. Rehabilitation of Intumak Reservoir	**18,654**	**475**	**19,130**
3. Institutional Strengthening and Technical Monitoring	**1,362**	**319**	**1,680**
4.Project Management and Project Impact Monitoring	**1,588**	**940**	**2,528**
Total Baseline Costs	63,432	3,988	67,420
Physical Contingencies			
Price Contingencies			
Front End Fee		404	404
Total Financing Required			

Project Cost by Category	Local (US$ 000)	Foreign (US$ 000)	Total (US$ 000)
Civil Works	55,555	430	55,985
Goods	-	794	794
Consultant Services	2,780	5,940	8,720
Incremental Operating Costs	275	59	334
Other Recurrent	1,587	-	1,587
Total Costs	**60,197**	**7,222**	**67,420**
Front End Fee		404	404
Total Financing Required	**60,197**	**7,626**	

Annex 4: Cost Effectiveness Analysis Summary
KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

	Present Value of Flows		Fiscal Impact	
	Economic Costs	Financial Costs[1]	Taxes	Subsidies
Project Costs $ million @ 10% discount	43.6	52.2	8.5	

[1] If the difference between the present value of financial and economic flows is large and cannot be explained by taxes and subsidies, a brief explanation of the difference is warranted, e.g. "The difference between financial and economic costs arises from price controls on the inputs."

Summary of benefits and costs:
Cost Effectiveness Analysis

The proposed project represents a cost-effective solution to two issues: (i) the need to remove hazardous mercury deposits from the AO Karbide plant site and from the flood plains of the Nura River, and (ii) the need to provide a secure and safe drinking water supply to residents of Astana as well as communities adjacent to the river.

Mercury Clean-up Program: With respect to the first issue, detailed studies were carried out during project preparation to (i) define an appropriate level of intervention based on an assessment of the costs of adopting alternative standards with respect to cleanup versus the risks that untreated sites would lead to unacceptable dissemination of pollutants; and (ii) identify an optimum site for the landfill based on tradeoffs between the cost of development and maintenance versus the cost of transporting contaminated materials to the site. Briefly, the process involved a three tier assessment:

- Tier 1 Comparison of measured environmental media concentrations (soil, groundwater, etc.) with appropriate generic (non-site specific) guideline concentrations (such as WHO drinking water standards, etc). This screens out sites that can be regarded as not posing an unacceptable risk.
- Tier 2 Site-specific risk assessment used to generate site specific clean-up targets. This uses site-specific data, although literature values and conservative assumptions can be used to fill any gaps where site specific data is not available.
- Tier 3 A refinement of the Tier 2 risk assessment which incorporates additional site data and more sophisticated fate and transport modelling techniques to further reduce conservatism in the assessment.

In the context of this study several receptors were identified as set out below:

- drinking water supply of Karaganda;
- drinking water supply of Temirtau;
- (future contribution to the) drinking water supply of Astana;
- other points along the river; and,
- groundwater near or directly under the Zhaur Swamp

Based on the assessment of site concentrations, the fate and transport analyses, and the tolerance standards of various receptors,
a program of required interventions was defined in terms of the extent of the clean-up activities that were required. Within this program, a further analysis of the cost of alternative measures was carried out to establish the least-cost way of achieving the required reduction in pollution levels at the various sites.

Water Supply: With respect to the second issue, removing mercury pollution from the Nura River, together with implementation of a proper water management regime in the Basin, represents the most cost-effective means of providing:

- a second source of water for Astana City, from the Nura River, that is less expensive than the current arrangement, based on the Ishim River and the Irtish-Karaganda Canal.
- a less expensive source of water for the cities of Temirtau and Karaganda, that currently rely on water from a combination of the Irtish Karaganda Canal, groundwater sources and the Nura River.
- an improvement in the regularity of supply from the cities of Temirtau and Karaganda and the welfare gains related to that

For Astana, the current water source, the Ishim River, does not provide adequate flow to meet the needs of projected population levels. While the first mechanism of intervention would be to reduce the water losses in the existing system, which are currently estimated at approximately 50 percent, uncertainties related to hydrology as well as to demand growth suggest that there may be periods when additional supply is required. If the Nura River is judged unacceptable owing to mercury contamination, it would be necessary to pump additional water from the Irtysh-Karaganda canal in order to ensure water supply. The ongoing cost of pumping incremental water from the Irtysh River (over an elevation change of 450 meters) to the Viacheslav Reservoir is estimated at approximately US$ 0.17 per cubic meter, while the cost of transporting incremental water from the Reservoir to the city is estimated at $0.11 per cubic meter. By contrast, the Nura could provide up to 90 million cubic meters per year of additional water (equivalent to approximately 90 percent of projected demands) to Astana at a cost of approximately US$ 0.07 per cubic meter. Similar cost savings would accrue to the residents of Temirtau and Karaganda, at least for that portion of their water supply that is currently drawn from the Canal. In addition, the Nura would provide Astana with a water source that is independent of the existing reservoir and pipeline - a measure of protection against a catastrophic failure in the current system.

Economic Benefits:

While the focus of the analysis has been the selection of least-cost measures to address key issues, there are also a number of positive benefits associated with the project. Quantification of these benefits is subject to considerable uncertainty with respect both to unit value and the extent to which they will be realized. The following paragraphs briefly outline the approach taken to valuing these benefits, and the findings of the analysis.

Benefits from the Provision of Water to Astana City: Current water consumption in Astana is about 65 million cubic meters a year (water leaving the treatment facility). The future demand depends on: (a) the rate at which population increases; (b) changes in end use demand, which will probably increase as the population becomes richer and acquires a more water intensive lifestyle; and (c) savings in water resulting from better metering, higher tariffs and investment in reducing losses. Based on these factors, overall demand (measured at the exit from the treatment facility) is expected to increase over the next 15 years to 92 million cubic meters, but the demand measured at the point that it leaves the Viacheslav Reservoir will fall, from 192 million cubic meters currently to 102 million in 2017. This is because losses in the delivery system to the treatment facility are very large but are expected to be reduced as a result of upgrading of the pipes.

At present the natural flow of the Ishim River is generally enough to meet the demand of 192 million cubic meters during normal periods. In periods of water shortage, however, when the spring floods are less abundant, it is necessary to increase the level of the reservoir by pumping water from the Irtish-Karaganda Canal, through an extension to the canal, a distance of some 21 kilometers. The canal was only completed last year and the frequency with which it will be used has not been established, but some simulations based on the observed frequency of low and high flow periods in the river suggest that, at most, it will be needed 2-3 times in every 15 years (given the demand as presented in Table A1). Each time it is used, however, the cost is significant. To pump one cubic meter to be delivered to the Viacheslav Reservoir costs about US¢16 and hence to deliver 60 million cubic meters, which is the present capacity of the canal costs $9.6 million. In addition, the cost of delivering water from the reservoir to the city is also high. Present estimates put it at around 17 tenge, or US¢11/kWh This cost will decline as losses are reduced. Such declines are taken into account in the savings reported below. All cost data for both the Nura and Ishim water supplies are taken from the DFID, 2000 study on the Nura and Ishim Rivers as sources of water for Astana.

If the same water could be delivered from the Nura River, there would be a substantial saving in cost. For the pumped water, it is necessarily a stochastic calculation, as the frequency with which the additional water will be needed is not known. The present level of the Vyacheslav Reservoir is about 300 million cubic meters, which is at about the level at which some intake will be required unless the natural flow is substantial in the following year. Based on a number of simulations the expected cost of water from the canal is estimated at an average of around $2.2 million a year over the next 15 years.

The Nura River could supply up to a total of about 90 million cubic meters of water to the city at a cost of 10 tenge, or US¢7.0 per cubic meter. This flow could only be guaranteed, however, if the Intumak Reservoir was operational to regulate the flow of water. The annual benefits from both sources are shown in Table 1, with the canal costs set each year at the average, or expected value over 15 years. The average annual benefit is around $5.1 million.

Table 1: Benefits in Astana: Partially Replacing Ishim by Nura River Water

			Cost of Present Source		Net
Year	Nura Water		Canal Cost	Delivery Cost	Saving
	Mn. M3	$MN.	$MN.		$ Mn.
2004	0.00	0	2 18	0.00	0.00
2005	0 00	0	2.18	0.00	0.00
2006	0.00	0	2.18	0.00	0.00
2007	0.00	0	2.18	0.00	0.00
2008	90 00	6.00	2.18	9.50	5.67
2009	90.00	5.85	2 18	9.28	5.60
2010	90 00	5.71	2.18	9.04	5.51
2011	90.00	5.56	2.18	8.80	5.42
2012	90.00	5.41	2.18	8.54	5.30
2013	90.00	5.26	2.18	8.26	5.18
2014	90.00	5.11	2.18	7 98	5.04
2015	90.00	4.96	2.18	7.68	4.90
2016	90.00	4.82	2.18	7.37	4.73
2017	90.00	4.67	2.18	7.05	4.56
2018	90.00	4 52	2.18	6.71	4.37
	Average		2.18		5 12

Notes
1. Nura water costs US7 cents per cubic meter in 2004, but costs will fall slightly as distribution losses are redcued.
2. Ishim water costs start at 11 US cents per cubic meter but fall more rapidly as both distribution losses and delivery losses are reduced.

The forecast demand for potable water for Temirtau taken at the treatment plant falls from 29.5 million cubic meters in 2002 to 22.3 million in 2017. The population is assumed to remain constant at 170,000 and losses in the distribution system fall from the current level of 50 percent to 20 percent by the end of the period. In addition there is a demand for technical water that amounts to 61 million cubic meters. Currently Temirtau takes its water from the following sources: 51 percent from the Irtish Karaganda Canal, 20 percent from underground sources, and 29 percent from the Nura River. (Water Resources Committee Data). The water from the Nura River is only for technical purposes and not for drinking. The water from the Irtish Karaganda Canal includes about 10 million cubic meters for drinking purposes and 36 million for technical use, including 6 million that goes into the Nura River, to raise the level of the Samarkand Reservoir. The reason for adding this water to the reservoir is that the latter provides a major source of technical water for a metallurgical plant, and in summer the level falls too low for the reservoir to be able to serve the plant without additional water. An alternative solution would be to invest in a new technology for the plant that would treat and recycle water and reduce present demand for abstraction, as well as lowering the high pollution loadings for which the plant is responsible. With these changes in water management, and the mercury clean up program, it should be possible to use the Samarkand Reservoir to provide some potable water for the city. It is expected that this technical restructuring of will take place under the institutional strengthening component of the project.

As in the case of Astana, the water from the Irtish-Karaganda Canal is expensive. If some of the remaining water from this source could also be replaced, even partly, by water from the Nura River, there would be a substantial saving. With the change in the technology used by the metallurgical plant, the capacity of the Samarkand Reservoir will increase from the present 90 million cubic meters to 200 cubic million meters. This would allow the maximum sustainable rate of abstraction to go up from 50 million to 90 cubic meters. As noted earlier, the estimated additional cost of canal water is around US¢16/m3.

The savings from reductions in its use, and replacement by alternative sources are given in Table 2, and amount to about $7.5 million in the first year (taken as 2007), falling to $6.1 million in 2017. The benefits decline as demand for potable water is assumed to fall.

It should be noted that in so far as the water being replaced is not potable water but technical water, this can be done without the quality improvements being realized. When potable water is being replaced, however, it will require that both mercury and non-mercury pollution loadings in the Samarkand Reservoir are reduced to acceptable levels. This requires the pollution management and institutional strengthening components of the project to be implemented and to deliver concrete results, particularly in the operations of the metallurgical plant.

Table 2: Savings in Costs in Temirtau as a Result of Nura River

Amount from IK Canal	Alternative Source	Unit Cost US¢/M3	Unit Cost of Alternative US¢/M3	Total Cost of IK Water Replaced	Total Cost of Alt. Water	Net Saving
Mn. M^3				$ Million/ Year		
6	Metallurgical Plant	0.16	0	0.96	0	0.96
23.8	Samarskandski Reservior: Technical Water	0.17	0.01	4.08	0.27	3.81
16.92	Samarskandski Reservior: Potable Water (Maximum)	0.20	0.04	3.38	0.68	2.71
8.34	Samarskandski Reservior: Potable Water (Minimum)	0.20	0.04	1.67	0.33	1.33
TOTAL						
---	Maximum	2007	- -	--	-- --	7.48
	Minimum	2018				6.10

Notes:

1. Costs of water delivered to the user are taken as US¢ 4.0 per cubic meter without the pumping costs for the Irtish-Karaganda Canal, which are taken as US¢16 per cubic meter.
2. The amount of technical water from the reservoir is equal to the total annual demand, less 6 million M3, which is the reduction from the changes in the metallurgical plant.
3. The amount of potable water equals total demand less what is supplied from underground sources.

Benefits of Nura as an alternative source for Karaganda: With the population forecast to fall from 430,000 to 350,000 by 2018, water demand at the treatment plant in Karaganda is expected to fall from 75 million cubic meters this year to 46 million cubic meters by 2018. Most of the city's water (97 percent) comes from the Irtish-Karaganda Canal. If the Nura River were to be suitable as a source of potable water, considerable savings would be made. Indeed, up until the Second World War the city obtained its water from the Samarkand Reservoir. This would involve pumping the water up an elevation of 50 meters. The cost per cubic meter of water raised one meter is estimated at US¢0.035/kWh. Hence the cost of raising it 50 meters is US¢1.75, which compares favorably with the cost of US¢16/m3 for pumping from the Irtish-Karaganda Canal.

Assuming, for the reasons given above, that the amount of water from the reservoir is limited to 90 million cubic meters and, furthermore, that the first use of it is for Temirtau, the amount then available for Karaganda is 43.3 million m3. These figures, and the demand from Karaganda for potable water, are given in Table 3, along with the savings from switching from the Irtysh-Karaganda Canal to the Samarkand Reservoir. They increase from $6.2 million in 2007 to $7.4 million in 2018.

Table 3: Use of Samarkand Reservoir for Water Supply of Karaganda City to Replace Irtish-Karaganda Canal

Year	Demand for Water (MN M3)	Supply from Reservoir (MN M3)	Cost Saving US¢/M3	Total Saving $ MN.
2007	118.76	43.3	14.25	6.17
2018	66.65	51.8	14.25	7.39

Note: The supply from the reservoir is set at 90 million cubic meters, less the amount that is supplied to Temirtau

Other Benefits:

Welfare gains from an improvement in the regularity of supply to the cities of Temirtau and Karaganda

The clean-up of the Nura River will increase the amount of drinking water available to the cities of Temirtau and Karaganda. Social assessment studies (2002) carried out in these cities found that 74% and 73% of their populations, respectively, complain about water shortages. The availability of additional water sources will improve the regularity of water supply to households. The welfare gains associated with improved regularity are estimated from the WTP an amount additional to the monthly water bill for guaranteed regular water supply from the central water supply system. The social assessment study found that 26% of a random sample of urban households connected to the central systems in the cities of Astana, Temirtau and Karaganda had a positive WTP. Using a referendum elicitation method, the survey found the average sample (marginal) WTP to be US$ 0.75 per person per month, with a confidence interval of US$ 0.25 - US$ 2.67. Taking the lower bound as a conservative estimate of the marginal WTP and aggregating it to the populations of Temirtau and Karaganda city that are connected to the central water supply (70%), we found the annual total incremental welfare gain from regular water supply to be US$322 thousand in 2002. For the forecasts, account has to be taken of the changes in population (which is declining) and changes in real incomes (which are expected to increase in parallel with *per capita* GNP growth, conservatively estimated at 4% per annum over the next 15 years). We assumed that the regularity of water supply would start in 2007. Evidence from several studies suggests that the 'income elasticity' of demand for services such as regular water supply is at least one. Hence taking an elasticity of one would result in a conservative estimate of the future willingness to pay. By this method, the welfare gain reaches nearly US $489 thousand by the year 2018. Details are given in

Table 4.

Table 4: Benefits from Increased Regularity of Water Supply to Karaganda and Temirtau

Year	Population Karaganda	WTP Karaganda (US$ million)	Population Temirtau	WTP Temirtau (US$ million)	Total WTP (US$ million)
2007	413,840	250,170	170,000	102,767	352,937
2008	408,520	256,832	170,000	106,877	363,709
2009	403,200	263,627	170,000	111,152	374,779
2010	397,880	270,555	170,000	115,598	386,153
2011	392,560	277,615	170,000	120,222	397,837
2012	387,240	284,806	170,000	125,031	409,838
2013	381,920	292,129	170,000	130,032	422,162
2014	376,600	299,583	170,000	135,234	434,816
2015	371,280	307,165	170,000	140,643	447,808
2016	365,960	314,874	170,000	146,269	461,143
2017	360,640	322,708	170,000	152,120	474,828
2018	355,320	330,666	170,000	158,204	488,870

Increased environmental benefits in the form of safer and greater use of the Nura River and from the provision of more and cleaner water to the Kuragaldzhino Wetlands for recreational purposes.

At present the Nura River and the support zone of the Kurgaldzhino Wetlands Protected Area are used for hunting, fishing and tourism. Estimates reported in van Buekring and Hirsch for these activities are as follows. Licenses to the value of US $180,000 were issued in 2000, mainly for duck hunting, but also for goose, marmot, fox, roe deer, hare and elk. The Department of Fauna and Fishing (DFF) estimates the value of the non-commercial catch at US $10,000 for the same year. For tourism, the estimated number of persons making day trips was about 5 percent of the population, and the expenditure per person per day was about US $3

The estimates of hunting benefits are based on the value of the licenses plus the value of the meat. These represent the minimum willingness to pay for the activity (actual WTP will be higher but in the absence of any data it is not possible to estimate the full values). In the future the number of licenses issued will increase, as the demand for recreation increases, at the rate of 1 percent per annum. If the river and the wetlands are cleaned up as a result of the project, the growth in demand for licenses will be 2 percent per annum. These estimates are from the van Buekering and Hirsch study, based on expert assessments. Benefits from hunting are given in Table 6. They start out at around US $4,000 in 2007 and build up to around US $33,000 by 2018.

For fishing it is not possible, given the limited data to make an assessment of the recreational benefits. When the study commissioned specifically for this appraisal is available, some estimates for the fisheries benefits may be possible.

For tourism the data provide a 'point' estimate of the demand for recreation – so many visit days, with each visit entailing an expenditure of US $3. The following further assumptions have been made (Table 5). Based on these, the welfare benefits in the form of consumer surplus have been estimated and are reported in Table 6.

Table 5: Assumptions for Calculation of Recreational Benefits

Assumption	Value	Justification
Number of days per visitor per year on Nura River and Kurgaldzhino Wetlands	10	Based on discussions with local experts.
Price elasticity of demand for visits	-1	Recreational demand studies suggest these are not unreasonable
Income elasticity of demand for visits	1.25	
Demand function for recreation	Linear	Common default assumption
Increase in number of day visitors if quality improves % *per annum*	15*	Van Buekring and Hirsch based on local expert estimates.

(*) Builds up to this slowly over time, starting at 2% and reaching 15% by 2012

The benefits from tourism are more substantial than for hunting. They start out at US $25,000 in 2007 and build up to around US $840,000 by 2018, an increase of about 50 percent over the 'no project' case. The number of visitor days increases by 20 percent over the same period.

Biodiversity benefits from improvements in the Kurgaldzhino Wetlands

The Nura River discharges into the Kurgaldzhino Wetlands which is a protected area that was declared a Ramsar site in 1976 for its internationally significant biodiversity value. This site is also the only one in the region in which biodiversity is of major importance. However, high pollution levels in the Nura River have a negative effect on the flora and fauna species protected in these wetlands. The clean-up of the Nura River would avert future damage inflicted by mercury contamination. On the other hand, the wetlands are also threatened by hunting and fishing activities in the area, as well as by water extraction from the Nura for municipal and agricultural uses, all of which will likely intensify as a result of the project. In the DFF expert opinion reported by van Beukering et al. (2001), the project's overall impact on the wetlands' biodiversity will be to decrease the rate of degradation. The Nura clean-up would allow biodiversity levels to be higher than baseline levels by about 12%. This improvement would be reached gradually over 10 years following clean-up interventions as the impact of increased water quality on biodiversity is realized with a time lag.

To estimate the monetary value of improved biodiversity protection in the Kurgaldzhino Wetlands, a contingent valuation study was carried out in 2000 among the population of Astana (van Beukering et al., 2001). The study found that on average Astana residents are willing to pay US $1.17 per person per year to maintain the Kurgaldzhino Wetlands in an ecologically healthy state. This WTP is an expression of value that individual residents would derive if the Kurgaldzhino biodiversity was protected effectively. It is expected that this value would increase at the same rate as income. In this analysis, it is assumed that Temirtau and Karaganda residents would derive the same per person value from improved biodiversity protection. However, the value would be realized only partially since improvements in biodiversity protection will not achieve the full recovery of the wetlands. To reflect this, it is assumed that in 2007 the residents of Astana, Karaganda and Temirtau would enjoy 3 percent of their WTP or US¢ 3.5 per person per year. The value would reach 12 percent or US¢14 in 2018 (reflecting the quantified improvements in biodiversity that the project is expected to achieve). Aggregating this value for the populations of the three cities yields benefits of US $42 thousand in 2007 and US $304 thousand in 2018

Main Assumptions:

Cost-effectiveness indicators:[2]

It is expected that the proposed project will deliver water to residents of Astana at a cost of approximately US$ 0.07 per cubic meter. This compares with an estimated US$ 0.27 per cubic meter for water pumped through the Irtys-Karaganda canal.

[2] These indicators should compare the project with a suitable comparator, e.g. unit project costs of alternative project designs or international standards.

Annex 5: Financial Summary
KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

(US$ 000)

	Implementation Period						
	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Total Financing Required							
Project Costs							
Investment Costs	66,133	11,829	19,060	15,535	1,256	9,245	9,209
Recurrent Costs	1,287	3	226	226	254	289	289
Total Project Costs	67,420	11,832	19,288	15,760	1,510	9,533	9,497
Up Front Fees	404	404					
Total Financing	67,824	12,236	19,286	15,760	1,510	9,533	9,497
Financing							
IBRD/IDA	39,983	7,026	11,920	9,709		5,663	5,663
IBRD/IDA with front end fee	40,387	7,432	11,920	9,709		5,663	5,663
Government							
Central	27,436	4,804	7,366	6,052	1,510	3,870	3,834
Provincial							
Co-financiers							
User Fees/Beneficiaries							
Total Project Financing	67,824	12,236	19,286	15,760	1,510	9,533	9,497

Government Cash Flow (US$ 000)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Government Expenditures															
Investment Costs	4,800	7,141	5,826	1,256	3,582	3,545									
Recurrent Costs	3	226	226	254	289	289	289	289	289	289	289	289	289	289	289
Debt Service	454	722	1,239	1,453	1,609	5,826	5,755	5,553	5,351	5,149	4,947	4,745	4,544	4,342	4,140
Total Cash Flow	5,258	8,089	7,290	2,963	5,479	9,660	6,044	5,842	5,640	5,438	5,236	5,034	4,832	4,630	4,428
of which Total Taxes	1,731	3,103	3,295	222	1,498	1,492									
Present Value @ 10%															
Investment Costs															
Recurrent Costs															
Debt Service															
Total Costs															
Total net of Taxes															
Total Taxes															
Debt Service															
Loan Withdrawals	7,432	11,920	9,709		5,663	5,663									
Cumulative Loan	7,432	19,352	29,061	29,061	34,724	38,348	32,310	26,271	24,232	20,194	16,155	12,116	8,077	4,039	0
Principle Repayment						4,039	4,039	4,039	4,039	4,039	4,039	4,039	4,039	4,039	4,039
(5 years grace, 15 years repayment)															
Commitment Fee @ 0.25%	82	53	28		14	10									
Interest @ 5%	372	870	1,210	1,453	1,595	1,777	1,716	1,515	1,313	1,111	909	707	505	303	101
Total Debt Service	454	722	1,239	1,453	1,609	5,826	5,755	5,553	5,351	5,149	4,947	4,745	4,544	4,342	4,140

Annex 6(A): Procurement Arrangements
KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

Procurement

The procurement of civil works and goods of the Bank-financed component as well as all consulting services regardless of financing source, would be carried out in accordance with World Bank's Guidelines. Works and Goods would be procured in accordance with the World Bank *Guidelines: Procurement under the IBRD Loans and IDA Credits* (issued in January 1995, revised January and August 1996, September 1997, and January 1999). Consulting Services would be procured in accordance with *Guidelines: Selection and Employment of Consultants by World Bank Borrowers* (issued in January 1997, revised September 1997, January 1999 and May 2002).

The Committee for Water Resources (CWR) has established a Project Management Unit (PMU) and appointed a Project Coordinator, Procurement Specialist and Financial Management Specialist. The PMU will have its main offices in Astana. However, a branch office will be located in Karaganda in order to ensure close day-to-day supervision of the project, and coordination with local stakeholders.

Procurement methods (Table A)

The following procurement methods and thresholds are adopted for this project. In order to facilitate the procurement process the simplified procurement procedures are applied. Aggregate ceiling amounts for each procurement method are not predetermined. However, the procurement plan will be updated as necessary by the borrower and it will be reviewed in detail during the supervision mission that is to be carried out at least twice in a year.

The general strategy is to procure the equipment, civil works and services in larger packages, making contractors responsible for supply and installation of equipment. This would minimize coordination needs on the part of the implementing agency and simplify project implementation, mitigating the risk of project delays.

Procurement of Works. All four Civil works contracts will be carried out under ICB. These contracts are: Landfill Construction and Operation; Cleaning up the Territory of Karbid Site; River and Zhaur Swamp Excavation; and Rehabilitation of Intumak Reservoir. Prequalification would be carried out for all civil works contracts estimated to cost US$10 million or more.

Procurement of Goods. Contracts for the supply of goods valued at more than US$100,000 will be procured under ICB. There will be one ICB contract for equipment for 17 gauging stations, and one for sampling materials. International Shopping (IS) may be used for goods valued at US$100,000 or less per contract. The equipment for three laboratories would be procured through IS procedure.

Procurement of Consulting Services. Recruitment of consulting firms to assist in construction supervision, detailed design and other consulting services estimated to cost more than US$100,000 will be carried out normally under the Quality and Cost-Based Selection method (QCBS) in accordance with the Bank Guidelines. For technical and financial auditing of less than US$200,000 per contract, the Least Cost Selection (LCS) method may apply. The short list may comprise entirely national consultants if the estimated cost of the assignment is below US$100,000.

Table A: Project Costs by Procurement Arrangements
(US$ million equivalent)

Expenditure Category	Procurement Method[1]				Total Cost
	ICB	NCB	Other[2]	N.B.F.	
1. Works	55.98 (39.19)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	55.98 (39.19)
2. Goods	0.68 (0.68)	0.00 (0.00)	0.12 (0.12)	0.00 (0.00)	0.80 (0.80)
3. Services	0.00 (0.00)	0.00 (0.00)	8.72 (0.00)	0.00 (0.00)	8.72 (0.00)
4. Incremental Operations Cost	0.00 (0.00)	0.00 (0.00)	0.33 (0.00)	1.59 (0.00)	1.92 (0.00)
5. Front-end fee	0.00 (0.00)	0.00 (0.00)	0.40 (0.40)	0.00 (0.00)	0.40 (0.40)
Total	56.66 (39.87)	0.00 (0.00)	9.57 (0.52)	1.59 (0.00)	67.82 (40.39)

1/ Figures in parentheses are the amounts to be financed by the Bank Loan. All costs include contingencies.

2/ Includes civil works and goods to be procured through national shopping, consulting services (including financial audit), services of contracted staff of the project management office, training, technical assistance services, and incremental operating costs related to (i) managing the project, and (ii) re-lending project funds to local government units.

Table A1: Consultant Selection Arrangements (optional)
(US$ million equivalent)

Consultant Services Expenditure Category	Selection Method							Total Cost[1]
	QCBS	QBS	SFB	LCS	CQ	Other	N.B.F.	
A. Firms	6.80 (0.00)	0.00 (0.00)	0.00 (0.00)	0.50 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	7.30 (0.00)
B. Individuals	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.50 (0.00)	0.00 (0.00)	1.50 (0.00)
Total	6.80 (0.00)	0.00 (0.00)	0.00 (0.00)	0.50 (0.00)	0.00 (0.00)	1.50 (0.00)	0.00 (0.00)	8.80 (0.00)

[1] Including contingencies

Note: QCBS = Quality- and Cost-Based Selection
QBS = Quality-based Selection
SFB = Selection under a Fixed Budget
LCS = Least-Cost Selection
CQ = Selection Based on Consultants' Qualifications
Other = Selection of individual consultants (per Section V of Consultants Guidelines), Commercial Practices, etc.
N.B.F. = Not Bank-financed
Figures in parentheses are the amounts to be financed by the Bank Loan.

Prior Review Thresholds (Table B)

For each ICB civil works contract estimated to cost US$500,000 or more and the first contract irrespective of the contract value will be subject to prior review by the Bank. For Goods each ICB contract estimated to cost US$250,000 or more and the first ICB contract irrespective of the contract value, and the first two IS packages will be subject to prior review. With respect to services, prior Bank review will be required for all terms of reference, irrespective of the contract value. For each contract with a consulting firm estimated to cost US$100,000 or more, the technical evaluation report will be submitted to the Bank for its review prior to the opening of the priced proposals. For contracts with individual consultants costing US$50,000 or more the qualifications, experience, terms of reference and terms of employment shall be furnished to the Bank for review prior to contract signature. All other contracts will be subject to ex-post review by the Bank.

Table B: Thresholds for Procurement Method and Prior Review

Category	ICB	NCB	IS	NS	Other Methods
1. Civil Works					
1.1 Procurement Thresholds	>$500,000	N/A	N/A	N/A	N/A
1.2 Prior Review	>$500,000 and the first contract	N/A	N/A	N/A	N/A
2. Goods					
2 1 Procurement Thresholds	>$100,000	N/A	<$100,000	N/A	N/A
2.2 Prior Review	>$250,000 and the first contract	N/A	First Two	N/A	N/A
	QCBS	**LCS**	**IC**		
3. Consultants					
3.1 Prior Review	>$100,000 otherwise TOR	>$100,000 otherwise TOR	>$50,000 otherwise TOR		

Note· Ex-post Review will be conducted for all post review contracts during the supervision mission.

Table B1. Capacity of the Project Management Unit in Procurement and Assistance Requirements in Procurement Monitoring System

A capacity Assessment of the Borrower was carried out in June 2001 and updated in November 2002 and the following arrangements have been agreed taking into account the experience gained in similar environmental projects financed by the Bank.

The overall implementation responsibility for the proposed project rests with the Committee for Water Resources (CWR) of Ministry of Agriculture. CWR will be assisted by a Project Management Unit (PMU) which will have its main office in Astana within CWR and a branch office in Karaganda for day-to-day supervision of project activities and coordination with local stakeholders. The PMU will be headed by a technical Coordinator and supported by a Procurement Specialist, a FMS, and an accountant.

Considering the lack of Bank procurement experience in the PMU and the current procurement environment in Kazakstan, the overall risk assessment for the proposed project is rated as medium to high To mitigate the procurement risk, procurement training will be provided through an extensive Project Launch workshop which will take place in September 2003 or prior to Loan Effectiveness whichever is earlier. Funding is also provided for further training of the procurement specialist at the ILO Institute in Turin. In addition, the services of an international procurement expert, with sufficient experience in Bank financed procurement, will be contracted on as and when needed basis. This expert will provide on the job training to the PMU's local procurement expert and other CWR and PMU staff. Moreover, service support from Bank's Procurement Specialist at the Resident Mission in Almaty will also be available on day-to-day procurement issues. Besides, procurement and prior review thresholds have been established on conservative basis (Table B).

Country Procurement Assessment Report status: carried out in June 2000
Are the bidding documents for the procurement actions for the first year ready by negotiations: Yes. Preparation of Bidding Documents for AO Karbide Plant site clean-up financed from JEP Grant will be completed by March 2003.

TRAINING INFORMATION AND DEVELOPMENT ON PROCUREMENT

Estimated Date of Project Launch Workshop: *September 2003* ***Date of publication of General Procurement Notice:*** *December 31 2002* ***Indicate if there is procurement subject to mandatory SPN in Development Business:*** *Yes* ***Domestic Preference for Goods:*** *Yes* ***Domestic Preference for Works, if applicable:*** *No*
Retroactive financing: No ***Project Preparation Facility:*** No ***Advance Procurement:*** *No*
Explain briefly the Procurement Monitoring System: The Committee for Water Resources will be assisted by the Project Management Unit based in Astana, in planning procurement of works, goods and services, preparation of bidding documents, bid evaluations, contract management and project monitoring. PMU's procurement expert will be responsible for the procurement activities. For complex issues, he will seek guidance from the international procurement specialist. All procurement documents requiring prior review would be cleared by a PAS and appropriate technical staff. All the procurement information is to be kept by the procurement expert of PMU. The Quarterly Progress Report will be submitted to CWR, Ministry of Finance and the World Bank. The information will include (i) revised cost estimates for each contract; (b) revised procurement plan indicating each procurement step.
Co-financing: Explain briefly the Procurement arrangements under co-financing: JICA (Japan) has confirmed its interest in possible parallel co-financing of the Intumak Reservoir rehabilitation component of the project, including its related follow-up monitoring requirements.
SECTION 4: PROCUREMENT STAFFING
Indicate name of Procurement Staff or Bank's staff part of Task Team responsible for the procurement in the Project: Takao Ikegami (PAS), Sr. Sanitary Engineer, (202) 473-2334; tikegami@worldbank.org
Explain briefly the expected role of the Field Office in Procurement: The service support will be expected from the Resident Mission in Almaty upon decentralization of procurement functions which is expected to be on July 1, 2003.

Component	Type	Estimated Number of Contracts	Procurement Methods	Invitation to Bid	Submission of Bids	Contract Signing
A. Civil Works						
A.1 Landfill construction and operation (comp 1a)	CW	1	ICB	Sep-03	Dec-03	Jan-04
A.2 Cleaning up the territory of Karbide Site (comp 1b)	CW	1	ICB (Prequal)	Sep-03	Dec-03	Jan-04
A.3 River and Zhaur Swamp Excavation (comp 1c)	CW	1	ICB	Jul-04	Sep-03	Jan-04
A.4 Rehabilitation of Intumak Reservoir (comp 2)	CW	1	ICB (Prequal)	Nov-05	Jan-06	Jun-06
B. Goods						
B 1 Equipment for 3 laboratories and Data acquisition and transmission centers(comp 3)	G	2	IS	Oct-03	Nov-03	Dec-03
B.2 Equipment for 17 gauging station (comp 3)	G	1	ICB	Oct-03	Dec-03	Jan-03
B.3 Sampling material (c2)	G	1	ICB	Oct-03	Dec-03	Jan-03
C: Consulting Services						
C1 Detailed Design	Consultant					
Nura River Clean-up (comp.1c)		1	QCSB	Sep-03	Dec-03	Jan-04
Intumak (comp 2)		1	QCSB	Nov-04	Dec-04	Apr-05
C.2 Construction Supervision	Consultant					
Landfill construction (comp 1a)		1	QCBS	Sep-03	Dec-03	Jan-04
Karbite site Clean-up (comp 1b) & Nura Riverbed cleanup (comp 1c)		1	QCSB	Jul-04	Sep-04	Jan-05
Intumak Rehabilitation (comp 2)		1	QCSB	Nov-05	Jan-06	Jun-06
C.3 Intumak Blue Ribbon Panel (comp3)	Consultant	10	IC	Nov-04	Nov-04	Jan-05
C.4 Monitoring Lab team (comp3)	Consultants	6	IC	Oct-03	Dec-03	Jan-04
C.5 Institutional Development (comp 3)	Consultant	1	QCBS	Oct-03	Nov-03	Feb-04
C.6 Project Management Unit (comp 4)	Consultants	3	QCBS	Feb-03	Mar-03	Apr-03
C.7 Contract Design	Consultant		IC	Jan-03	Feb-03	Mar-03
Landfill construction (c1a)		1				
Karbite site Clean-up (c1b) & Nura Riverbed cleanup (c1c)		1				
Intumak Rehabilitation (c2)		1				
C.8 AO Karbide Site Monitoring (c1b)	Consultant	1	IC	Apr-03	Jan-03	Sep-03
C.9 Financial Auditing (c4)	Consultant	3	LC	Dec-03	Jan-04	May-04
C. 10 Consultants for mathematical modelling(c.2)	Consultant	1	QCBS	Oct-03	Nov-03	Jan-04
C. 11 Consultant for sampling (c.2)	Consultant	1	QCBS	Oct-03	Nov-03	Sep-03
C. 12 Consultant for Manual Development (c.2)	Consultant	1	QCBS	Oct-03	Nov-03	Sep-03

Annex 6(B) Financial Management and Disbursement Arrangements
KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

Financial Management

1. Summary of the Financial Management Assessment

An assessment of the Financial Management arrangements for the Project was undertaken during appraisal to determine whether the financial management arrangements are acceptable to the Bank. These financial management arrangements include the PMU's systems of accounting, financial reporting, staffing, auditing, and internal controls in place during the project preparation phase.

The result of the assessment is that the Project satisfies the minimum WB FM requirements. A financial management action plan was developed and agreed with the PMU to further strengthen the FM arrangements of the Project beyond the minimum WB FM requirements.

A summary of the financial management assessment and conclusions are as follows:

Financial Management Assessment	*Rating*	*Comments*
1. Implementing Entity	Satisfactory	PMU within Committee of Water Resources to manage project
2. Funds Flow	Satisfactory	Simple funds' flow arrangement
3. Staffing	Satisfactory	PMU finance manager and accountant/cashier
4. Accounting Policies and Procedures	Satisfactory	FM Manual documents all accounting and related operational aspects of the project
5. Internal Audit	NA	No reliance placed on internal audit
6. External Audit	Satisfactory	PMU will make audit arrangements that are acceptable to the Bank.; Appointment of acceptable auditor will be a Credit Agreement dated covenant
7. Reporting and Monitoring	Satisfactory	FMR's prepared in accordance with WB requirements
8. Information Systems	Satisfactory	PMU has implemented "1C" software program that fully integrates WB reporting requirements (in accordance with FMR guidelines)
Overall Financial Management Rating	Satisfactory	

Country Financial Management Issues

A Country Financial Accountability Assessment (CFAA) for Kazakhstan had been carried out and completed in CY2002. The draft CFAA report identifies several areas of strength in the country, including an educated work force, strong accounting skills, and a commitment to reform. The areas for improvement included strengthening the internal audit function of the Committee of Financial Control and the independence of the external audit function of the Accounting Committee. The findings of the CFAA were disseminated to key Kazakhstan Government officials during a ½ day workshop on 2 April

2003 and currently, there is expected to be no impact of the proposed recommendations included in the CFAA on the financial management arrangements of the Nura River project.

Implementing entity

The Ministry of Agriculture (MoA) has overall responsibility for the Project and has assigned responsibility for its implementation to the Committee for Water Resources (CWR). A Project Management Unit (PMU) within the CWR will carry out the day-to-day activities of the project. The PMU Project Coordinator reports directly to the Chairman of the CWR, who in turn reports to the MoA. The PMU will carry out the project preparation activities under the PHRD Grant and the PMU will continue during IBRD Loan.

The PMU will be headed by a Project Coordinator and during the project preparation activities of the project, the financial management arrangements will be carried out by a Finance Manager. The Finance Manager is fully familiar with the bank financial management and disbursement requirements and the system that is being set up is fully satisfactory to the Bank.

Funds Flows

The PMU established within the Committee for Water Resources (CWR) will require the authorization of the CWR Chairman to operate and access funds within the Special Account (SA). The SA has been opened at a commercial bank in Kazakhstan which is acceptable to the World Bank, in accordance with the WB requirements.

Once the agreement is signed and the beneficiary's contribution agreed, the PMU will start executing payments for the relevant sub-component activities, as invoices are received from the suppliers. Invoices will be certified by the PMU in order to ensure that all the relevant goods were delivered, works done and services rendered, as per the technical specifications and terms of reference and then submitted to the CWR Chairman for authorization. The PMU will then execute the payments from each financing source in accordance with the financing agreement.

Government contributions will be received in a project account (denominated in Kazakhstani tenge), separate from the main budgetary account of the Government, that will be used specifically for the Government contribution to the Project. Government contributions will be received monthly, directly from the MoF, as part of the annual budgetary process.

The PMU will have the full rights to operate both the special and project accounts. All documentation pertaining to the project (relating to Credit funds, to the Government contributions and other donors as applicable) will be kept at the PMU.

Staffing

The PMU includes the Project Coordinator, finance manager (responsible for FM reporting for both Nura River and Northeast Water Supply Project), accountant / cashier (performs general office duties and petty cash arrangements for Nura River, Northeast Water Supply and Syr Darya Projects), and a procurement specialist. The finance manager will be responsible for the planning, budgeting, consolidation and reporting aspects, handle all financial accounting records, ensure that accounting records are kept up to date in the accounting software. The finance manager will also establish permanent contacts with the beneficiaries, the Bank, accounting departments of the relevant ministries, auditors and the Ministry of Finance.

The PMU staff will be responsible for: preparing the bidding documents; receive the offers and evaluate them in accordance with the WB regulations; submit the evaluations to the WB for no objection; sign contracts in an acceptable format; supervise the works performed by the contractors; certify (jointly with the beneficiaries' representatives) the acceptance of the goods, works and services provided in

accordance with the terms of reference and the relevant technical specifications. The payment documents will be prepared by the PMU only after the fulfillment of the above steps and submitted to the Chairman of the Committee for Water Resources (CWR) for review and approval. Group A signing authority resides with the Ministry of Finance and Group B signing authority rests with the Chairman and Deputy Chairman of the CWR.

Accounting Policies and Procedures

A financial management consultant company (*Altair 2002, Kazakhstan)* has developed the financial management system for the Project, in accordance with the Bank's OP/BP 10.02. The system features a customized accounting software fully responsive to the needs of Nura River Cleanup Project. The finance manager of the PMU will be the primary operator of the software, with the PMU Project Coordinator responsible for reviewing and approving all payments submitted to the Chairman of the Committee for Water Resources (CWR).

The FM consultant company assisted the PMU in finalizing the implementation and inputting the final cost estimates in the system. The software manual for "1C" has been provided by Altair 2002 and will be used by the finance manager. The financial management manual has been prepared by the finance manager. The FM manual documents the accounting procedures, internal controls and measures to ensure complete segregation of duties and avoid areas of potential conflict of interest.

The PMU staff, together with FM consultant, have developed a specific chart of accounts, detailed financial statements, reporting formats and methods, internal control procedures, disbursement and flow of funds arrangements, and assigned staff responsibilities in order to ensure a complete segregation of duties. The PMU will be fully in charge of recording and consolidating all payments, procurement, contracting, disbursement, reporting, accounting, planning, budgeting and auditing relating to the Project. Detailed accounts will be maintained for each Project component, its sub-components, and expenditure types (goods, works, services). The accounts will also reflect: the status of payment against each contract; utilization of the Special Account (SA) and replenishments made by the Bank; the amounts used from the Government contribution and other donors, and statements of sources and application of funds.
The PMU will maintain the Project accounts on the cash basis of accounting. The PMU will be responsible for preparing Financial Monitoring Reports (FMRs) and statements of expenses (SOEs) and submitting them to the World Bank, no later than 45 days after each quarter's end.

Internal Audit

There is no internal audit function in the unit and no reliance is being placed by the Bank on any internal Government of Kazakhstan financial reviews.

Reporting and Monitoring

The Project will prepare and submit Financial Monitoring Reports (FMR) in a form and frequency agreed with the Bank. The FMRs will be customized to reflect the country circumstances and the needs of the project, while meeting the Bank's minimum information requirements for the financial monitoring of the Project.

The FMR will therefore include (a) statement of sources and uses of funds by component and sub-component (including budget to actual comparisons and explanation of significant variances) (b) a detailed schedule for tracking disbursements against specific contracts for civil works, goods and consultants services, (c) output monitoring report and (d) a statement of reconciliation of the special account. The PMU will submit the quarterly FMRs for the Project to the Bank starting with the period in which disbursements will commence (most likely in the quarter ended March 31, 2004) and quarterly thereafter, no later than 45 days after the relevant quarter's end.

The project will also prepare annual financial statements, in a form acceptable to the Bank, and these will be submitted for external audit.

Accounting Software

The features of the financial management software will include, inter alia, customizable chart of accounts, foreign and local currency, English and Russian language, Excel and Word exporting, and integrated FMRs. The system has been developed, customized and installed by the financial management firm selected, "Altair 2002", an Astana-based entity. The system is based upon the "1C" enterprise package (off-the-shelf) produced in Russia and widely used by WB financed projects in Kazakhstan and Central Asia.

The system has been customized to respond to the Project components and specifics and will be able to produce routine reports such as: trial balance, general ledger, balance sheet, income and expenditure statement by sources of funds, cash flow, suppliers' ledger, and various budgets.

The software system has been modified to produce the quarterly Financial Monitoring Reports (FMR's) in accordance with the Bank's Financial Management requirements.

The PMU will maintain full accounting records for the Project, including details by Project components, sub-components, expenditure type (such as, goods, works and services), and financing source (WB, Government contribution, and other donors, as applicable).

A detailed FM manual of accounting procedures relevant to the Project has been prepared by the Finance Manager. The manual documents the accounting procedures, internal controls and measures to ensure complete segregation of duties and avoid any potential conflict of interest. All accounting entries will be maintained in both United States Dollars (USD) and in the Kazakhstani currency, Tenge.

2. Audit Arrangements

Annual audits for the project accounts will be carried out in accordance with the *Guidelines for Financial Reporting and Auditing of Projects Financed by the World Bank.* The audit reports will be in a format in accordance with the International Standards on Auditing promulgated by the International Federation of Accountants (IFAC). The audit reports will include a separate opinion on the operation of the Special Accounts and on disbursements made on the basis of SOEs. The audited financial statements, including the audit of the special accounts, and SOEs will be sent to the Bank within six (6) months of the end of the Government's fiscal year.

The PMU will have the project accounts audited (including special and project accounts and all statements of expenditures) in accordance with International Standards on Auditing, by a firm of independent auditors acceptable to the WB.

Appointment of independent auditors acceptable to the World Bank is a dated covenant specified in the Credit Agreement.

3. Disbursement Arrangements

Disbursements from the IBRD Loan will be made based on traditional disbursement methods. That is, from the Special Account with reimbursements made based on Statements of Expenditures (SOEs) and full documentation, and direct payments from the Loan Account.

Disbursements will be made upon receipt by IBRD of fully documented applications, except for contracts valued at less than US$500,000 each for works, and US$250,000 for goods, which would be made

against certified statements of expenditures (SOE). Supporting documentation for SOEs would be retained by the Borrower and made available to IBRD during supervision.

To facilitate project implementation, the Borrower has established a Special Account (SA) with a local commercial bank, Kazkommertsbank on terms and conditions satisfactory to the Bank.

Applications for replenishment of the Special Account would be submitted monthly or when one-third of the amount has been withdrawn, whichever occurs earlier. Documentation requirements for replenishment would follow standard Bank procedures as described in Disbursement Handbook, Chapter 6. Monthly bank statements of the Special Account, which have been reconciled by the Borrower, would accompany all replenishment requests.

Initial training of PMU staff will be carried out under the TA component of the project.

Allocation of loan proceeds (Table C)

Table C: Allocation of Loan Proceeds

Expenditure Category	Amount in US$million	Financing Percentage
Works	36.06	70%
Goods	0.79	100% of foreign goods, 100% of ex-factory cost of goods procureed locally, 84% of other locally procured goods.
Unallocated	3.14	
Total Project Costs	39.99	
Front-end fee	0.40	100%
Total	40.39	

Use of statements of expenditures (SOEs):

Disbursements will be fully documented, except that Statements of Expenditures (SOEs) will be used for: (i) contracts for goods of less than US $250,000 equivalent; and (ii) contracts for works of less than US $500,000 each. Full documentation in support of each SOE will be retained by the PIU for at least one year after receipt by the Bank of the audit report for the year in which the last disbursement was made for the relevant SOE. This information will be available for review by Bank missions during supervision, and by auditors. The minimum application size for payments directly from the loan account and for issuance of special commitments is 20% of the current Special Account authorized allocation.

Special account:

To facilitate disbursements against eligible expenditures, a Special Account (SA), the Borrower has established a Special Account (SA) for each Project with a local commercial bank, Kazkommertsbank to be maintained and operated by the PMU under terms and conditions satisfactory to the Bank. During the early stage of the project, the initial allocation of the SA would be limited to US$250,000. However, when the aggregate disbursements and sum of all outstanding special commitments under the Loan have reached the level of US$5.0 million, the initial allocation may be increased up to the authorized

allocation of US$0.5 million. Replenishment applications would be submitted on a monthly basis, and include reconciled bank statements as well as other appropriate supporting documents. The authorized allocation for the SA would be reviewed if a PMR-based disbursement method is used. Accounting for Special Account transactions and for all other project-related accounts will be maintained in accordance with the World Bank Financial Accounting Reporting and Auditing Handbook, January 1995. The SA would be audited annually by independent auditors acceptable to the Bank.

Supervision Plan

The development for further strengthening the financial management system, accounting policies and procedures and staff development will be monitored before effectiveness, during the first supervision mission and throughout project implementation.

The reports of the progress of the project implementation will be monitored in detail during supervision missions. The FMRs will be reviewed on a regular basis by the field-based FMS and the results or issues followed up during the supervision missions. Financial audit reports of each project will be reviewed and issues identified will be followed up. The field based FMS will monitor the agreed action plan to ensure that the appropriate remaining actions have been implemented by the PMU.

During the Bank's supervision missions, review the project's financial management and disbursement arrangements (including a review of a sample of SOEs and movements on the Special Account) to ensure compliance with the Bank's minimum requirements. It is envisaged that the FM supervision missions are carried out every three months initially, and subject to satisfactory FM performance by the PMU the frequency may be reduced.

Annex 7: Project Processing Schedule
KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

Project Schedule	Planned	Actual
Time taken to prepare the project (months)	24	40
First Bank mission (identification)		05/01/1998
Appraisal mission departure	11/01/2002	11/05/2002
Negotiations	01/20/2003	02/24/2003
Planned Date of Effectiveness	06/30/2003	

Prepared by:
Committee for Water Resources, Government of Kazakhstan

Preparation assistance:
Austrian Consultant Trust Fund (Posch & Partners)
TACIS/JEP (Ramboll International/ERM)
PHRD (BCEOM, Timothy Van Epp)
Italian Consultant Trust Fund (Carlo Lotti & Associates)

Bank staff who worked on the project included:

Name	Speciality
Piotr Krzyzanowski	TTL, Environment and Water Resosurces
Anil Markandaya	Economics
Margaret Wilson	Finance
Tijen Arin	Economics
Kirsten Oleson	Environmental Engineering
Takao Ikegami	Procurement
Evgeny Tyrtyshny	Operations Officer, Astana
Kathy Sharrow	Team Assistant
Kimberly Heuckroth	Junior Professional Associate
Da Zhu	Young Professional
Allen Wazny	Sr. Financial Management Specialist
Rohan Selvaratnam	Operational Analyst

Annex 8: Documents in the Project File*
KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

A. Project Implementation Plan

Operations Manual
Project Implementation Plan

B. Bank Staff Assessments

Financial Management Capacity Assessment
Procurement Capacity Assessment

C. Other

Nura River Basin Management - Institutional Assessment
Nura River Clean-up Project - Environmental Assessment
Nura River Clean-up Project - Feasibility Study
Dam Safety Assessment - Intumak
Dam Safety Assessments - Samarkand and Sherubianur
*Including electronic files

Annex 9: Statement of Loans and Credits

KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

26-Mar-2003

Project ID	FY	Purpose	Original Amount in US$ Millions IBRD	IDA	Cancel.	Undisb.	Difference between expected and actual disbursements* Orig	Frm Rev'd
P046045	2001	SYR DARYA CONTROL/NO ARAL SEA	64.50	0.00	0 00	59 62	3 29	0 00
P065414	2000	ELEC TRANS REHAB	140.00	0.00	0.00	119 54	82 74	0 00
P008499	1999	ROAD TRANSP RESTRUC	100.00	0 00	0 00	22 86	12.53	0.00
P008500	1999	ATYRAU PILOT WATER	16.50	0.00	0 00	5 06	4 62	0 00
P008503	1998	AG POST PRIV ASST (APL #1)	15 00	0 00	0 00	1 92	1 92	0 00
P008507	1997	UZEN OIL FIELD REHAB	109 00	0 00	0 00	38 48	38 48	18 79
P008510	1996	IRRIG & DRAINAGE	80 00	0 00	0 00	11 04	9 71	0 00
		Total:	525 00	0 00	0 00	258 53	153.29	18.79

KAZAKHSTAN
STATEMENT OF IFC's
Held and Disbursed Portfolio
Jun 30 - 2002
In Millions US Dollars

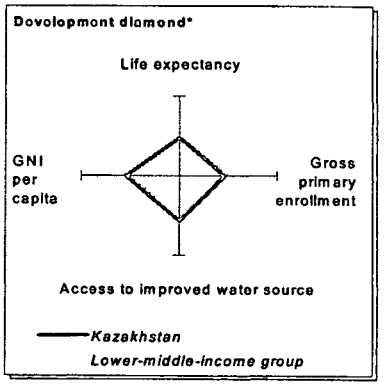
		Committed				Disbursed			
		IFC				IFC			
FY Approval	Company	Loan	Equity	Quasi	Partic	Loan	Equity	Quasi	Partic
1994/95/98	ABN AMRO Kazak	0 00	2.57	0.00	0.00	0 00	2.57	0.00	0 00
2000	FIOC	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
	IK	7.49	0.00	0.00	0.00	7.49	0.00	0.00	0.00
1998	Kazgermunai	0.00	0.68	30.75	0.00	0.00	0.38	12.71	0.00
1996	Kazkommertsbank	2.50	0.00	0.00	0.00	2.50	0.00	0.00	0.00
1997/99	Rambutya LLP	1.93	0.00	0.00	0.00	1 93	0.00	0.00	0.00
1999/02	SEF CASPI Ltd.	2.50	0.00	0.00	0.00	2.50	0.00	0.00	0.00
2001	SEF Const. Mat	0.87	0.25	0.00	0 00	0.67	0.00	0.00	0.00
1999	SEF LP-GAZ Ltd.	2.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
2000	SEF NefteBank	0.00	0.00	2 50	0.00	0.00	0.00	2.50	0.00
2001	Sazankurak	14.17	0.00	5.00	0.00	9.17	0.00	5.00	0.00
2000	TuranAlem	5.05	4.95	5.00	0.00	5.05	4.95	5.00	0.00
1999									
	Total Portfolio:	36.51	8.46	43.25	0 00	30.31	7.91	25.21	0.00

		Approvals Pending Commitment			
FY Approval	Company	Loan	Equity	Quasi	Partic
2002	Karachaganak	50.00	25.00	0.00	75.00
2000	Agrokaz	3.50	0.00	0 00	0.00
2001	Kazkommertsbk 2	15.00	0.00	0.00	0.00
2001	Ispat Karmet SME	0.00	3.37	0.00	0.00
2002	Astana Tower	5.00	0.00	0.00	0.00
	Total Pending Commitment:	73.50	28.37	0.00	75.00

Annex 10: Country at a Glance

KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

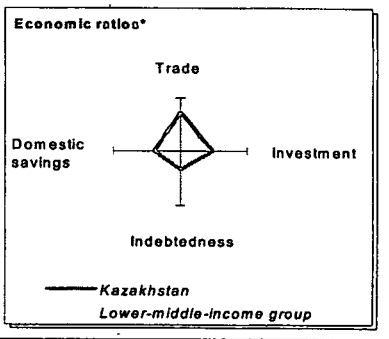
POVERTY and SOCIAL	Kazakhstan	Europe & Central Asia	Lower-middle-income
2001			
Population, mid-year *(millions)*	14.8	475	2,164
GNI per capita *(Atlas method, US$)*	1,350	1,960	1,240
GNI *(Atlas method, US$ billions)*	20.1	930	2,677
Average annual growth, 1995-01			
Population *(%)*	-1.0	0.1	1.0
Labor force *(%)*	-0.1	0.6	1.2
Most recent estimate (latest year available, 1995-01)			
Poverty *(% of population below national poverty line)*	32		..
Urban population *(% of total population)*	56	63	46
Life expectancy at birth *(years)*	66	69	69
Infant mortality *(per 1,000 live births)*	19	20	33
Child malnutrition *(% of children under 5)*	4		11
Access to an improved water source *(% of population)*	91	90	80
Illiteracy *(% of population age 15+)*	.	3	15
Gross primary enrollment *(% of school-age population)*	97	102	107
Male	97	103	107
Female	97	101	107



KEY ECONOMIC RATIOS and LONG-TERM TRENDS

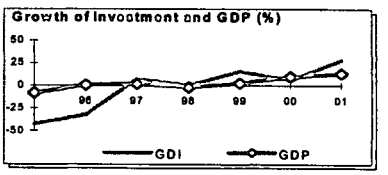
	1981	1991	2000	2001
GDP *(US$ billions)*	.	31.8	18.3	22.4
Gross domestic investment/GDP	.		17.9	25.8
Exports of goods and services/GDP	..	.	58.8	46.3
Gross domestic savings/GDP	.		27.3	23.4
Gross national savings/GDP	..	.	21.9	18.7
Current account balance/GDP	.	.	2.3	-7.8
Interest payments/GDP	.	.	3.9	3.1
Total debt/GDP	..		64.5	64.2
Total debt service/exports	..		31.4	31.1
Present value of debt/GDP			36.6	..
Present value of debt/exports	.	..	63.0	..

	1981-91	1991-01	2000	2001	2001-05
(average annual growth)					
GDP	.	-1.9	9.8	13.2	5.9
GDP per capita	.	-0.9	10.2	13.5	6.0
Exports of goods and services		-0.5	32.9	-3.3	7.2

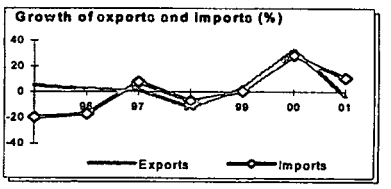


STRUCTURE of the ECONOMY

	1981	1991	2000	2001
(% of GDP)				
Agriculture		.	8.6	9.0
Industry			40.9	38.8
Manufacturing	.		18.3	15.6
Services	.		50.5	52.3
Private consumption	..	.	57.9	60.1
General government consumption	.	.	14.8	16.5
Imports of goods and services	.	.	49.3	48.7



	1981-91	1991-01	2000	2001
(average annual growth)				
Agriculture		-6.2	-3.3	16.9
Industry	..	-5.6	16.4	15.1
Manufacturing	.	.	15.6	14.8
Services		3.5	7.4	10.8
Private consumption	..	-2.9	4.1	18.9
General government consumption	.	-4.4	36.7	19.6
Gross domestic investment	.	-10.0	6.0	28.0
Imports of goods and services		-6.7	28.6	10.5

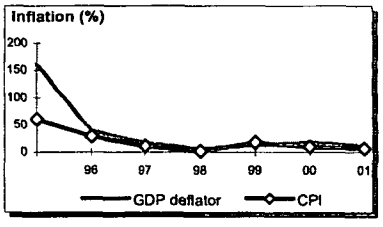


Note 2001 data are preliminary estimates

* The diamonds show four key indicators in the country (in bold) compared with its income-group average If data are missing, the diamond will be incomplete

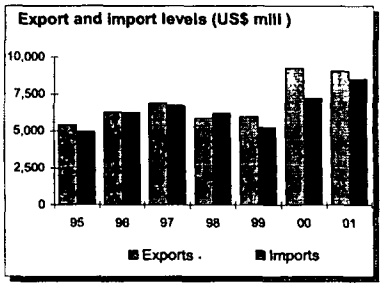
PRICES and GOVERNMENT FINANCE

	1981	1991	2000	2001
Domestic prices				
(% change)				
Consumer prices	.	47.1	9 8	6 4
Implicit GDP deflator	..	96.4	17 4	11.6
Government finance				
(% of GDP, includes current grants)				
Current revenue	.	..	21 8	21 6
Current budget balance	.	.	1.4	2.3
Overall surplus/deficit	..		-1 0	-0 9



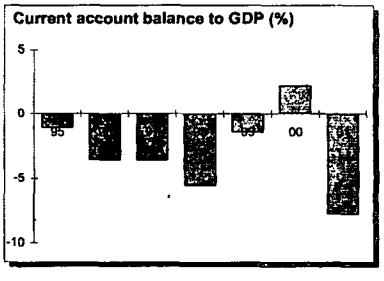
TRADE

	1981	1991	2000	2001
(US$ millions)				
Total exports (fob)	.	.	9,277	9,101
Fuel and oil products	.	.	4,827	4,733
Ferrous metals	.	.	1,178	1,009
Manufactures	.	.	670	1,490
Total imports (cif)	.	..	7,238	8,554
Food			539	836
Fuel and energy	.	..	572	790
Capital goods	..	..	2,405	2,837
Export price index *(1995=100)*	..	.	.	.
Import price index *(1995=100)*	.	.	.	..
Terms of trade *(1995=100)*	.	..	.	.



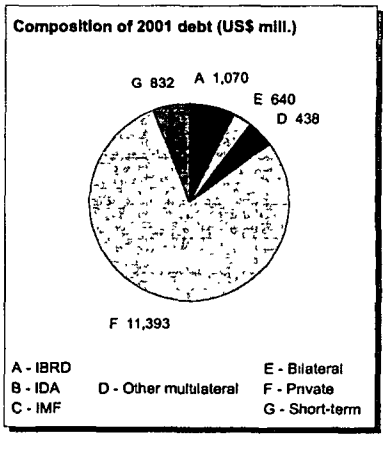
BALANCE of PAYMENTS

	1981	1991	2000	2001
(US$ millions)				
Exports of goods and services	..	.	10,419	10,393
Imports of goods and services	..	.	9,004	11,077
Resource balance	..	..	1,415	-684
Net income	..	.	-1,194	-1,215
Net current transfers	..		191	150
Current account balance	.	..	412	-1,749
Financing items (net)	.	..	-271	2,133
Changes in net reserves	..	.	-141	-384
Memo:				
Reserves including gold *(US$ millions)*	..	.	2,096	2,508
Conversion rate *(DEC, local/US$)*	.	5 10E-3	142.1	146.7



EXTERNAL DEBT and RESOURCE FLOWS

	1981	1991	2000	2001
(US$ millions)				
Total debt outstanding and disbursed	.	..	11,805	14,373
IBRD	..	..	1,057	1,070
IDA	.	.	0	0
Total debt service	.	..	3,338	3,331
IBRD	..	.	83	101
IDA	.	.	0	0
Composition of net resource flows				
Official grants	.	.	44	
Official creditors	.	..	36	34
Private creditors	..		868	2,128
Foreign direct investment	.	..	1,250	2,731
Portfolio equity	..	..	0	.
World Bank program				
Commitments	..	.	0	65
Disbursements	..	.	50	114
Principal repayments	..	.	20	47
Net flows	..		30	67
Interest payments	..	..	63	53
Net transfers	..		-33	13



Additional Annex 11: EA - Executive Summary
KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

July 2002
ES-10, Final EA

EXECUTIVE SUMMARY

Background

The Nura River in the northeastern part of Kazakhstan served for many years as a receptacle for a brew of untreated industrial wastes. Of particular concern, the carbide factory in Temirtau discharged large quantities of mercury into the river for 25 years. Mercury is a very toxic, mobile, persistent and bioaccumulative pollutant. The discharges ceased when the factory closed, but surveys of the factory site, river channel and floodplains conducted by international and Kazakh experts suggest that large quantities of mercury remain in the environment.

Some 1.5 million people live in the Nura-Ishim river basin. Most live in the national capital, Astana, and the cities of Karaganda and Temirtau, which together have a population of 925,000. The agricultural users in the Nura basin are found in scattered, small communities throughout the basin. Farmers once relied on highly subsidized irrigation systems, but with the removal of subsidies, most farmers abandoned irrigation and now rely on subsistence rainfed farming. Although many industrial enterprises have closed or scaled down production in the face of world market competition, water-consumptive heavy industry continues to employ the bulk of workers in the basin. In addition to serving direct human needs, the Nura eventually discharges into the Kugaldzino wetlands, an internationally-recognized nature reserve.

For many years, the basin residents consumed the highly polluted waters, but with Kazakhstan's independence, the mercury and other pollution became known and human use of Nura waters virtually ceased. Water supply alternatives to the Nura exist, however the Kazakhstan National Environmental Action Plan and other studies have assessed water management options and identified Nura River mercury cleanup as a top priority for providing long-term water supply to the basin.

In order to solve the problem of future water supply for the region, the Government of Kazakhstan (GOK) has requested the World Bank to prepare a loan for mercury cleanup from the Nura. The project objective is to provide users in the Nura-Ishim basin with access to safe, reliable, and affordable water supplies by cleaning up the mercury pollution, instituting effective water quality protection measures, and optimizing use of available water resources. Improved water supply from the Nura will in turn help meet additional demand for Astana; increase reliance on local water resources by basin users; and increase summertime flows to the Kurgaldzhino wetlands.

This loan project is part of the integrated World Bank Strategy for Kazakhstan. The Borrower for this project is the GOK Ministry of Finance. The main beneficiary is the GOK Committee for Water Resources of the Ministry of Natural Resources and Environmental Protection (CWR). The main components of the loan are clean-up of sites contaminated with mercury in the Nura River basin; rehabilitation of the spillway at the Intumak Reservoir; and institutional strengthening for water quality protection and water resources management. The Intumak Reservoir rehabilitation is included conditionally in the loan program, depending on the outcome of a 1-year study of the nature and significance of mercury methylation processes in the reservoir sediments.

Reasons for Project Classification

The proposed project's primary objectives are environmental restoration, specifically the cleanup of mercury contamination in the waters and soils of the Nura River basin, as a necessary step in assuring safe water supply and agriculture for humans and a clean environment for natural habitats and ecosystems. However, contaminated ground cleanup is a very complex process, not as predictable or as amenable to conventional engineering project management as other types of pollution control or infrastructure development. This is especially true where such a large number and diversity of sites must be addressed over an area as large as an entire river basin, and where the primary contaminant of concern is as toxic, mobile, persistent and bioaccumulative as mercury. The need for very careful planning and very specialized precautions and mitigating measures to prevent, minimize or respond to inadvertent releases of mercury compounds and associated pollutants requires conducting an Environmental Impact Assessment (EIA) and preparing an Environmental Management Plan (EMP). The proposed cleanup project has therefore been classified as a Category A project, because it could cause significant environmental impacts affecting an area broader than the sites or facilities subject to remediation.

Justification for Recommended Cleanup Action and Performance Levels

The mercury cleanup will utilize a flexible approach involving a combination of Kazakh and various World Bank or other international reference standards, in addition to risk-based cleanup levels, to determine both what level of existing contamination of soil, groundwater, sediments or surface water should trigger cleanup action at a specific site and what concentrations of hazardous substances can remain in the environment in order for cleanup to be deemed complete at a specific site. Reliance on multiple sources of standards is necessary, especially for soil cleanup, because few countries have a complete set of soil cleanup standards capable of addressing all envisaged cleanup situations. More importantly, given the magnitude and complexity of the proposed cleanup project, site-specific risk assessment, which quantifies contamination sources, pathways and receptors for each mercury contamination site in the river basin, is the most efficient and effective means of conducting the cleanup. Similarly, a risk-based approach (possibly in combination with European Union standards) is recommended for design of the landfill where contaminated materials will be moved for disposal.

Procedures Used to Prepare the Report

The CWR procured the services of a team of international and domestic environmental consultants to prepare the EIA. It should be emphasized that the EIA consultant team is independent of the project proponents – CWR and World Bank – as well as other project participants such as the feasibility study consultants. The team includes a project manager with extensive international experience in both EIA and contaminated site cleanup, as well as experts in public consultation, hydrogeology, geochemistry, geotechnical engineering, chemical engineering, biology, ecology and mercury cleanup. The team visited the project vicinity twice. During the first visit, the team met with the World Bank, CWR project implementation office and social impact assessment consultant in Astana and with the Nura-Ishim Water Basin Authority, Karaganda Region Akimat and Regional Department of Ecology in Karaganda; held initial public hearings in Karaganda and Temirtau cities; visited the contamination sites at AO Karbid and along the Nura River; and gathered and reviewed all available background documentation. The second visit focused on coordinating preparation of the EIA with the Feasibility Study; conducting the second set of public hearing in Karaganda cities; and obtaining and responding to World Bank and CWR comments on the Draft EIA.

Environmental Baseline Conditions

Several studies of mercury contamination in the Nura River basin have been conducted over the past 10-15 years. In general, mercury-contaminated soils and sediments have been discovered in the following high priority sites in the Nura River basin:

- The main mercury contamination sources in the Temirtau area, including the AO Karbid factory site (five buildings, main sewer line from production areas to wastewater treatment plant (WWTP), WWTP site, banks of main drain from WWTP to Nura), the Zhaur Swamp, and the old ash lagoon at the power plant;
- The river bed and river banks for 25 km below the Samarkand reservoir, including the backwaters of the river and oxbow lakes on the floodplains;
- Floodplains in the same 25 km river stretch, including an estimated 3% of whose topsoil (5.8 km2) is considered hazardous;

There are other heavy metals and organic pollutants found in the Nura River basin, but the mercury contamination is the most significant obstacle to assuring safe, reliable and affordable drinking water supply to residents of the basin. There are also other man-made and natural sources of the mercury, but the sources listed above are the primary sources.

Alternatives Considered

The EIA identifies and evaluates several alternatives to the proposed project, including the no action alternative; alternative ways of providing clean drinking water to the region; several cleanup technology alternatives, including different combinations of technologies and locations of their application; alternative off-site storage/disposal locations; and some implementation program alternatives. Despite the risks involved with a hazardous waste site cleanup of this magnitude, the benefits for public health and environment, especially by enabling the Nura River to serve as a future source of water supply to the region, outweigh the risks. Other sources of water supply in this dry region have been evaluated and found to cost more to develop and sustain than cleaning up the Nura River.

Different technologies, and different combinations of technologies and locations of their application (i.e., in-situ, on-site and off-site) may be appropriate for different contamination situations in the river basin. It is unlikely that a single solution will be found that addresses every situation. Therefore, further study of the appropriateness of specific cleanup technologies to specific contamination sites should be conducted during remedial design for each site or group of sites. (This process is already underway for the cleanup of the AO Karbide site and the Old Ash Fill.) In addition, water and land use restrictions should be imposed in appropriate areas of the basin to minimize risks to public health before, during and after remediation.

Likewise, alternative locations and designs are evaluated for a centralized landfill facility for treating and disposing the removed contaminated materials. The feasibility study provided preliminary evaluation of several sites, and then the EIA provided more in-depth evaluation of three alternative sites, including the Opan Landfill, KAR-GRES Ash Fill, and Zhaur Swamp:

- Opan Landfill is a bounded local depression located far from the Nura River Basin cleanup areas. Hydrogeologically the floor is formed by dense neogenic clays. Disposal of mercury soils here will not influence contamination of subsurface waters of the Nura River valley and surface waters of

Samarkand Reservoir and, owing to favorable landscape conditions, there will not be contamination of air. The Territorial Head Office "Centerkaznedra" has approved this site for waste disposal.

- **Kar-Gres Ash Fill** presents risks to human health and environment from: (1) dust generation, due to the high elevation of the site, and transport and deposition by prevailing winds to areas of population and employment north and east of the fill; and (2) leakage of contaminated leachate through the dikes into the adjacent interconnected system of ponds, wetlands and shallow ground waters that are part of the broader Nura River floodplain or drainage area.

- **Zhaur Swamp** suitability relative to Kazakh and international standards for landfill location and design would need to be better established with flood mapping and soil permeability testing. If the swamp were to be used as a landfill, then additional flood protection should be provided. There have been reports of multiple floods around the swamp and existence of a more porous stratum serving as an aquifer or conduit to the river and underlying a portion of the swamp and separated from it by a relatively thin layer of sub-clay soils.

For these reasons, the environmental consultant believes the Opan site to be superior to the Kar-Gres Ash Fill and Zhaur Swamp sites as a location for disposing mercury wastes from cleanup of the Nura River basin. Some additional information is needed, however, to develop the least impacting design and operation of the proposed landfill, as described below. In addition, it is strongly recommended that the landfill be subjected to the Kazakhstan permitting process (OVOS) and that additional public input be sought during that process on the design, operation, closure and post-closure of the landfill. Topics of special importance include site security, waste acceptance criteria, waste unloading and placement, dust and vapor control, erosion and runoff control, contingency planning and emergency response, inspections and monitoring, personnel training, citizen communications and citizen oversight committee.

Implementation program alternatives being considered include: (i) breaking the cleanup program into more manageable groupings of similar sites; (ii) combining the remedial design contracts with the remedial action oversight contracts for each group of sites; (iii) packaging any necessary additional sampling and analysis and treatability studies with the remedial design and remedial action for each group of sites to expedite cleanup wherever possible; and, (iv) providing independent contractors for program-wide oversight of environmental assessment and monitoring, health and safety assurance, and public consultation.

Predicted Impacts of the Chosen Alternative

No single alternative will be selected for cleanup of mercury contamination in the entire Nura River basin. Rather, the chosen strategy utilizes cleanup approaches tailored to site-specific conditions of each contamination area, including type of environment (buildings, swamp, river bed, river banks, floodplain, etc.), nearby population and land use, type of contaminated media (surface water, ground water, type of soil, etc.), size of site and volume of contaminated material, concentration of mercury, presence and concentrations of other contaminants, distance from disposal areas, etc. Some of these site-specific cleanup decisions will be made during the remedial design and remedial action stage, based on further sampling and analysis, treatability studies, etc. (This process is already underway for the Temirtau area source sites, such as the AO Karbide site, Zhaur Swamp site and Old Ash Fill site.) Certain unit processes, however, will be common to many of the site-specific cleanup approaches and their environmental impacts can be predicted. Most cleanup operations will involve excavation and removal of mercury-contaminated sediments, soil or building materials. The biggest risks of such operations are inadvertent increases in mercury releases to the environment, especially air, soil and surface water, of mercury that had been to some extent chemically or physically contained. Releases to the air are particularly problematic since mercury readily vaporizes, can be suspended in the air for long periods, transported long distances, and then redeposited on land or surface water during rain or snow, thus starting the cycle over again. Releases to surface water can occur through the stirring up of river bed sediments and river bank soils and through erosion of removed or residual contaminated soils from river banks and floodplains. All of these removal-related impacts will be short-term (during the cleanup period), very minor and avoidable or reducable by implementing the mitigation measures described in the Environmental Management Plan, or EMP (see below).

As mentioned, however, the cleanup design process is already underway for the Zhaur Swamp site where one option for cleanup would involve isolating the contaminated materials in place using a cover, berms and cut-off walls, rather than excavating and transporting them to an off-site landfill. This option may be acceptable environmentally only if it could be demonstrated that the isolated area would not be subject to flooding by the Nura River and that there is no risk of breakthrough of contamination below the swamp to a subsurface layer serving as an aquifer or route for transport of contamination to the river. The data available are conflicting with regard to both concerns. The flooding issue may be resolved by some combination of increasing the capacity of the Samarkand dam and reservoir, enlarging or moving the channel of the Nura River near the swamp, and encircling the swamp with a flood barrier. However, even if the possibility of flooding or subsurface transport to the river were relatively small, the consequences of such events could be catastrophic for public health and the environment, given the volume, mobiltiy, persistence and toxicity of mercury. For this reason, it is important to look very long-term. For example, flooding of the swamp may occur every 10 years or only once in 100 years. Either way, the consequences are unacceptable and therefore it is recommended that the contaminated materials in the Zhaur Swamp be excavated and transported to an alternative landfill location.

Another exception to the remove and transport approach is the option selected by the Feasibility Study for cleanup of the river bed itself. The proposed plan involves excavating a new river channel in clean soils so that the river water would not be in direct contact with contaminated materials at active cleanup sites in the existing channel. After cleanup, the river would be redirected to its current channel. Three alternative versions of this approach are possible, including using an ancient channel that is now dry; digging a new channel the full length of the the river where the cleanup sites will be; and digging the new channel in short sections only around individual cleanup sites and using them only during the cleanup of the respective sites. The last alternative is preferable from an environmental perspective, because it allows minimization of the length and time of river to be redirected at any one time. Also, it is likely that

flooding in the past few decades has reached the ancient river channel and left some mercury contamination there, while there is more flexibility to locate new channel sections in clean soils. In general, many impacts of this approach would be similar to those of excavating and transporting contaminated materials from upland areas, as discussed elsewhere in this summary. In addition, however, redirecting the river channel would adversely impact the natural ecosystem and biota of the existing channel for the short- to mid-term. Redirecting the river in short sections for short time periods will minimize these impacts and maximize the ability of the ecosystem and biota of clean upstream sections to recover and repopulate downstream sections. The net ecological effect on the existing channel of cleaning up the mercury contamination is expected to be positive.

Additional impacts of the excavate and transport approach are possible from the transport of contaminated materials; these include the possibility of mercury-contaminated dust blown from transport trucks as well as the more typical impacts of truck traffic such as noise, vibration and air emissions of hydrocarbons, nitrogen oxides and carbon monoxide from truck exhaust. Again, all of these impacts will be short-term (during the cleanup period), very minor and avoidable or reducable using the mitigation measures in the EMP.

Land disposal will be used to manage the removed mercury-contaminated materials. Unless properly located, designed and operated for the specific wastes being deposited, landfills pose a risk of wind-blown mercury-laden dust, mercury methylation and release of mercury vapors, formation of mercury-containing leachate entering ground water, and erosion and transport of mercury-containing materials through runoff to surface waters. Of the three alternative landfill sites evaluated by the EIA, the most suitable site, Opan Landfill, may involve the longest average transport distance from the waste excavation areas. However, any additional impacts from the increased number or length of truck trips needed to transport contaminated materials to the landfill location would be very minor, short-term (during the cleanup period), and avoidable or reduceable using the mitigation measures in the EMP. These transport impacts pose small incremental risks as compared with the potential catastrophic consequences of a flood of the Zhaur Swamp or of breakthrough of contamination in the dikes surrounding the Kar-Gres Ash Fill.

In summary, once in the environment, mercury is of great concern as it is mobile, persistent, bioaccumulative, bioconcentrating, and acutely toxic in some forms. It is these same properties that require the proposed project to be implemented in the first place. Therefore, it is important that the selected cleanup approaches be tailored to be as technically effective as possible at individual contamination sites in the river basin, while being sufficiently economical to allow most of the significant contamination areas to be cleaned up. In addition, though, each site cleanup should be designed and carried out with adequate mitigating measures and emergency response procedures to avoid inadvertent short-term releases to other environmental media, and hence to remediation workers, nearby residents and sensitive species, habitats and ecosystems. It is believed that all of these impacts can be avoided or mitigated to a large extent through implementation of the EMP (see below) which includes physical and institutional measures to prevent, minimize, monitor, contain or otherwise respond to releases during and after remediation.

The EIA also assesses the potential environmental impacts of economic and population growth induced by increased water supply resulting from the proposed project. Such impacts are very difficult to predict at this time but will probably be minimal. Residents and agriculture are already using contaminated water, so the project will be supplying more clean water as a proportion of the total water supply. In addition, parallel programs to repair leakages in the water supply networks of the region's cities will improve water supply efficiency and reduce the need to increase abstraction from the Nura River. Further, it is unclear that additional water supply by itself will be sufficient to stimulate economic growth

in the region; a wider range of environmentally sustainable development measures will likely be needed. A separate water resources planning study to be conducted using British DFID funding will address water supply needs and recommend rational water allocation among the cities, industries, agriculture and wetlands in the region.

Summary of the Environmental Management Plan

The EMP provides a thorough presentation on mitigation measures applicable to the stages of mercury contamination cleanup likely to be recommended in the final Feasibility Study. These include:

- Site management and institutional controls – limiting access to cleanup sites and restricting land and water uses where appropriate

- Health and safety protection for cleanup workers and nearby residents – medical monitoring, airborne mercury monitoring, personnel training, use of personal protective equipment, decontamination of equipment, communications

- Contingency planning and emergency response – on-site emergency response, community emergency response, incident reporting, practicing responses, first aid procedures and equipment, training, spill control and countermeasure plan

- Mitigation measures for removing wastes from buildings – recommended tools and techniques, including vacuum technology and cleanup kits, specialized for mercury removal

- Soil removal mitigation measures – timing of operations to avoid wet weather, flooding and high winds; covering of excavation areas and stockpiled soils to prevent mercury vapor and dust emissions and rain erosion, underlining of soil stockpiles to prevent leaching to clean soil and groundwater, installation of berms and ditches to control surface water run-on and run-off

- Soil transport mitigation measures – waste characterization and segregation, labeling and manifesting of trucks, safe loading and unloading, wetting wastes and covering trucks with canopies to prevent dust generation, emergency response, truck decontamination, truck maintenance

- Landfill mitigation measures – separate landfill cells for wastes with high moisture and/or high levels of organic mercury compounds, liners equivalent to European Union (EU) or other international standards; further evaluation of the need for leachate and gas collection and treatment; cover meeting EU or other international standards, waste analysis and acceptance procedures, facility inspection plan, contingency and emergency response plan, personnel training plan, environmental monitoring plan, and closure and post-closure plan.

The EMP also summarizes a series of environmental monitoring programs, aimed at measuring contamination in air, soil, surface water, sediments, ground water, drinking water, fish, crops, livestock, and humans before, during and after cleanup. Monitoring parameters, locations, frequencies and methods are provided for each cleanup program activity.

A program of capacity building is proposed, including organizational development, staffing, training and equipment procurement relating to health and safety, contingency planning and emergency response, environmental mitigation and monitoring, and social assessment and public consultation.

Institutional arrangements, schedules and costs for implementing the mitigation, monitoring and capacity

building measures are also provided. Implementation will be accomplished primarily through a project management structure led by CWR/BVO and supported by staff of relevant government agencies seconded to the project and domestic and international consultants.

Disclosure and Consultations with Affected Groups and Local NGOs

Disclosure of the EIA was made by providing copies of the Executive Summary of the Draft Final EIA in Russian to attendees of the final public hearing in Karaganda; making the Executive Summary of the Draft Final EIA available to the public through EcoCenter of Karaganda; providing copies of all versions of the EIA in Russian to the Committee for Water Resources; and making the English version of the EIA available through the World Bank's Info Shoppe.

A public consultation process has been implemented whereby a local coordinator was hired; local NGOs and government officials were brought into the planning process; initial public meetings were held in early February 2002 in two locations, Karaganda and Temirtau cities;a final public meeting was held in late April 2002 on the Draft EIA; and mechanisms were developed to facilitate ongoing public consultation on the project through the implementation phase. A large number of local government officials, academics, students and NGO representatives attended the initial public meetings. The project and EIA process were described; comments were solicited on what should be considered in the scope of the EIA and what key issues the EIA should focus on. There was excellent participation and discussion. The major comments related to what agencies are responsible for the project; what the decision-making process is; how the project will be paid for; what areas are contaminated and to what degree; what kinds of testing has been done and is planned; and what cleanup approaches and technologies are being proposed and what their respective environmental impacts are likely to be. Lists of attendees and summaries of their questions and concerns have been prepared (see Appendix C, Record of Public Meetings) and have been addressed in the EIA. Section 7 of the EIA provides a summary of the EIA responses to public comments.

Compliance with World bank safeguard policies

This EIA has been prepared and submitted in compliance with all applicable World Bank Safeguard Policies relating to EIAs. The overall EIA complies with the Envrionmental Assessement safeguard policy (OP4.01). EIA Sections 3.1.7-9 and 4.3.2 address compliance with the Natural Habitats safeguard policy (OP4.04). The Dam Safety safeguard policy (OP4.37) is addressed in a separate report (see Appendix B, References). The International Waterways safeguard policy (OP7.50) will be addressed separately through a letter from the Government of Kazakhstan to the Government of Russia. The Cultural Property safeguard policy (OPN11.03) will be addressed during the detailed design stage through the development of a "chance find" protocol that can be utilized during project implementation. The Pest Management (OP4.09), Forestry (OP4.36), Indigenous Peoples (OD4.20), Involuntary Resettlement (OD4.30), and Child and Forced Labor (Policy Statement) safeguard policies are not applicable to the proposed project.

Environment-Related Loan Conditionalities and Covenants

Environmental loan conditionalities and covenants will relate to the implementation of recommended mitigation, monitoring and capacity building measures, as described above.

Additional Annex 12: Dam Safety Analysis - Executive Summary
KAZAKHSTAN: NURA RIVER CLEANUP PROJECT

POSCH & PARTNERS
INNSBRUCK
AUSTRIA

REPUBLIC OF KAZAKHSTAN
DAM SAFETY STUDY
FINAL REPORT

1 General

1.1 Introduction

This report summarises the findings and analyses of 4 missions carried out between November 2000 and June 2001 for the assessment of the stability of the Intumak and Vecheslav dams. Regarding Vecheslav dam please refer to Volume 2.

The objectives of this study are to:

- Assess the stability of the dam in the present incomplete condition
- Verify the stability of the dam if completed by original design and
- Propose a preliminary layout of elements which need to be modified to comply with international standards

The Intumak dam is a partly completed dam on the Nura river, being located in Karaganda Oblast about 60 km to the west of Karaganda city. The site can be reached by asphalt road following the road Karaganda - Temirau and then branching off towards Kievka village and is located 6 km upstream of the village Intumak. The distance by road from Karaganda city is 105 km.

The landscape at the dam site is typical Kazakh steppe with flat topography and a soft depression creating the Nura river bed.

This report is based on the physical site investigations of the Austrian Consultants, extensive discussions with RGP Karaganda Water Supply Department and the Nura Sarysu River Basin Authority, the input from experts of the former Design Institute the Central Kazakh Institute for Water Supply Planning (Zentrkazkgiprovodchos) of Karaganda and the available design documentation from 1984 and 1990.

We herewith want to extend our appreciation to above institutions and individual experts for the good co-operation, their assistance and the valuable inputs provided.

1.2 General description of dam facilities

The dam was designed and constructed for irrigation purposes. Consequently it did not need to retain permanently water throughout the year and secondly a certain filtration rate (permeability) through the dam and its foundation was acceptable. But the current understanding is that the dam – if completed – should be used as a per annual water storage for balancing the river flow and to release a constant discharge into the downstream Nura bed to be ultimately used for the water supply of the national capital Astana. This new purpose requires more rigid design criteria.

The Intumak dam consists of the following elements:

- a 1,840 m long and 22.6 m high main embankment dam (earth), at the orographically right hand bank of the river bed
- a 17 meter wide bottom outlet with a capacity of 76 m^3/s
- another 90 m long section of embankment dam

- a 90 m wide spillway, with a capacity of 3,000 m^3/s and
- a 130 m long embankment dam at the left hand bank of the valley.

In addition to above dam elements, the following measures are needed in the reservoir area:

- a 5.5 km long Amangeldi village protection dam (earth) with a pumping station to return filtration water back to the reservoir
- a 1.5 km long embankment dam (earth) for Volkovskoe village and
- the protection of the Pavlodar - Shimkent oil pipeline against uplift.

1.3 Dam characteristics

The characteristic figures of Intumak dam reservoir based on the 1990 design are as follows:

Main dam facilities:

Crest length of main embankment dam	1840 m
Crest width	10.0 m
Dam type	earth fill dam with upstream clay blanket or clay core
Dam foundation	sand, partly rock
Max. dam height	22.6 m
Dam volume	approx. 2.2 Mill. m^3
Bottom outlet capacity	76 m^3/s
Spillway width	5 sections, each 16 m
Spillway type	weir crest with movable gates
Type of spillway gates	segment gates
Spillway capacity	3000 m^3/s

Amangeldi and Volkovskoej villages protection dams:

Type	earth fill dam (sand)
Crest length (5.5 and 1.5 km)	7.0 km
Crest width	4.0 m
Dam height	up to 5 m

Reservoir:

Volume at top water level	250 Mill. m^3
Usable volume	240 Mill. m^3
Maximum water depth	17.3 m
Average water depth	8.9 m
Reservoir Area under TWL	5220 ha
Area of low water (< 2 meter)	1100 ha
Reservoir length	approx. 20 km
Life period regarding siltation	500 years

Hydrological data:

Catchment area	31000 km^2
Average annual inflow	previously 260 latest data: 398 Mio. m^3/a
Calculated flow at 75% reliability	latest data: 186 Mio. m^3/a
Annual constant outflow (latest calculation)	8.0 m^3/s
Flood flow at 0.1% probability (over spillway)	3000 m^3/s

Levels:

Top Water Level (TWL), design water level	456.4

Maximum permissible water level (at max. discharge)	458.9
Dead volume level	447.0
Dam crest elevation	460.7

1.4 History

In 1975 a preliminary study and design was carried out to assess the viability of building an irrigation dam on the Nura river near Intumak. The estimated costs were 16 mio. Rubel.

In 1982 the idea become another push when the decision was taken on Oblast level to build the dam. At that time no detailed design and cost estimate was available, so the design was done in parallel to construction.

The dam was constructed between 1982 and 1984. Funds came from the Ministry of Water Resources and Irrigation under the draught prevention program. Since this program ended in 1984, works had to be stopped, despite the fact that the dam was incomplete.

The main dam across the Nura river had been completed, also the bottom outlet structure with the exception of its upper part and the lifting devices. The spillway channel had only been excavated, not concreted and the steel gates had not been installed. The embankment dam on the left side of the river bed was not started. The Amangeldi village protection dam was done but the protection layers and clay layers were incomplete.

The test filling of the reservoir was ordered in 1984. According to the engineers the water level reached elevation 455 m asl., corresponding to 190 mio. m^3 storage volume. It then had to be lowered because the oil pipeline Pavlodar - Shimkent which crosses the reservoir area, had not been sufficiently protected against uplift before, and also the protection dam for the Amangeldi village did not withstand the water pressure.

In 1989 the ownership of the dam was transferred to the State Organisation Intumak Repair and Construction Department. The ownership was later changed again and presently the owner of the dam is the RGP Karaganda Water Supply Department.

In 1990 a revised design was carried out for the completion of the dam, with an increased design water level which levels are used in this study.

In the mid 1990-ies the pipeline company reported to the Nura Sarysu River Basin Authority that the oil pipeline had now been sufficiently protected and the reservoir could be filled.

1.5 Institutions involved

The following organisations and institutions were / are directly involved in the project:

- Oblast Akimat of Karaganda
- RGP Karaganda Water Supply Department
- Nura-Sarysu River Basin Authority
- Trunk Oil Pipelines of Kazakhstan and Central Asia
- ZENTRAKASGIPROVODCHOS (Central Kazakhstan Institute for Water Supply Design, abbreviated "Design Institute

2 Geology

The Intumak dam is a "floating" dam. The embankment dam was constructed on natural alluvial soils in the valley floor, which consist of pervious interbeds of sands and gravel which rest on less permeable

strata clay containing lenses of silty clay. Weathered rock crops out on both sides of the dam.

By international standards, a detailed geological map of the excavated and approved foundation bed needs to be prepared before placement of the dam material. Such an information is not available. Only meagre geological and soil engineering data is available for evaluation of the ground conditions below the dam. The only available geological cross section parallel to the dam access shows 25 boreholes with lengths from 5 to 25 meters in a spacing of 45 to 100 m.

The foundation of the spillway crest and the bottom outlet consists of faintly weathered, hard and closely jointed pyroclastic rock. No major problems are anticipated for the foundation of theses structures and for the required additional excavation for the spillway channel.

The available hydrogeological information of the sediment layers beneath the dam may be sufficient for a seasonally filled flood control structure, but are insufficient for a floating clay core earthfill dam for permanent impoundment. Improvements are required to reduce the seepage underneath the dam. At the dam side a deposit of water filled sand and gravel overlies the bedrock on both sides of the dam, and a basal clay layer in the centre section of the dam.

Only general estimates can be given of the amount of underflow and seepage below the dam, but it may reach close to the design criteria. The construction of a cutoff wall, possibly down to the impermeable clay layer is strongly recommended, to improve the situation.

It maybe also necessary to do some grouting in the closely jointed rock to reduce the infiltration losses and underneath passage of water below the proposed spillway. This however also depends on the design of the spillway and needs to be decided then.

3 Hydrology

The Intumak dam is situated on the Nura river at river km 570. The catchment area is 31000km². The average annual precipitation in the catchment area is 215mm, the evaporation 735mm. A significant part of the precipitation occurs in form of snow and consequently about 80% of the annual runoff occurs within 2 months, during the spring flood period, that is from March to May.

3.1 Annual discharge

Hydrological observations on the middle section of the Nura river started in 1916 at the station Romanovskoe. Stations are equipped with staffs and read manually. It is reported that the major stations are read twice daily and even more frequently during the flood season. Since the river bed cross sections are not stabilised, also the flow velocities are measured frequently. But most of the stations have data gaps.

Data from the stations Volkosvkoe and the Nura town Tobolsk were correlated to arrive at averaged data for the calculation of the natural discharges into the Intumak reservoir for the period 1892 to 1960. In the 1990-ies the Institutes Kazgiprovodkhoz of Almaty and Centrekazgiprovodkhoz Karaganda calculated the discharges for the period 1935 to 1984 by using restored natural discharges. The period till 1984 is characterised by equal number of high and low water cycles. Only after 1984 the repeating pattern of the rivers of the central Kazakhstan has been weak.

The average monthly inflow into Intumak reservoir, including the wastewaters from Karaganda and Temirtau can be seen from the following table:

	Months												Annual			
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Natural	Sewage	Draw off and Losses	Total
Average	8	8	8	234	52	19	14	13	13	13	8	8	342	96	-40	398
P=50%	8	8	8	170	45	16	12	11	10	10	10	9	255	96	-34	317
P=75%	8	8	9	49	41	15	13	9	9	9	8	8	111	96	-21	186

3.2 Maximum flood discharges

The flood flow with a probability of 0.1% i.e. a probability of 1 in 1000 years has been determined at 3,000 m³/s. The calculation does not include the retention effect of the upstream reservoirs of Samarkant and Sherubainura. This was done since the Regulations for Operating Water Reservoirs in the Central Kazakhstan provide for a maximum filling of the reservoirs at the beginning of the spring flood, with subsequent forced emptying. The reason for this regulation is that firstly the dam operators feel uncertain and generally make sure that they do not loose too much water and secondly the unreliable forecast.

3.3 Water quality and ecological aspects

The inflow into the Intumak reservoir is polluted by the Karaganda - Temirtau industrial wastewaters, by which the mineralisation of the water is doubled to about 400 mg/l in spring and to a maximum of 1,200 mg/l in winter. However, as a result of the collapsed industry, the decrease in population and the adoption of water saving technologies, the wastewater discharges reduced to half, compared to 1990.

The permissible concentrations for oil products, biological oxygen demand, nitrates and heavy metals are exeeded. But in general the quality of the Nura water has improved in the recent years. Intumak reservoir could possibly function as a pollutant trap, but this has not been studied.

Attention should be paid also to the Korgalzhy nature reserve downstream the Nura river. This is an internationally recognised ornithological reserve. A sufficient inflow into the reserve is important to maintain the water level in the lake. According to the Institute Kazgiprovodkhoz Almaty, the required inflow is 265 mio. m³/year. Other institutes estimate higher volumes. Due to the reduced water abstractions during the last years, the level of the lake has stayed just a little below the multi-annual average. The effect of the Intumak reservoir on the flow pattern should be carefully studied.

4 embankment dams

4.1 Main Dam

Description and Original Design

Since the original purpose of the dam was for irrigation, a seepage rate of up to 4.5 m³/s has been accepted as design criteria. The cohesive soils of the bottom land and oxbow were not suitable for the dam foundation, so the top soils had to be removed in the area of the dam foundation to a depth of 1 m and in the area of the main river bed and oxbow to 6 m. The interconnection of the dam with the rock foundation on the left bank was achieved with a concrete beam embedded into the rock and connected with the clay core and the clay shield at the bottom land area of the oxbow.

Locally available fill material (mainly sands with little gravel) had been used for the construction of the embankment dam. It was placed in layers of 30 to 40 cm and compacted by sheep food and vibrating rollers. The dam was mainly built during 2 winter seasons by working around the clock. The rip rap was placed during the warm period and with a lag of not more than 3 meters. The construction was done by 2 different contractors and allegedly tests results and quality controls were carried out, but no records are anymore available.

On the upstream dam surface and on top of the dam body clay and silty clay or loam material was placed in an additional construction phase as an inclined and less permeable dam sealing zone. The thickness of this zone decreases from the reservoir floor to the dam crest from 3 to about 1 m. This sealing zone is extended towards the reservoir floor by a horizontal sealing blanket of the same material with a length of 15 to 45 m, depending on the water load. A protection layer and a filter layer are placed on top of the sealing zone. Both dam slopes are protected by a stone rip rap.

A medium grain filter layer (gravel) and a course drainage zone (rock) were constructed at the downstream dam toe followed by a drainage channel.

Some piezometers have been installed in the dam for monitoring and maintenance but no other devices like seepage weirs and surveying grid, and no monitoring has been done.

Assessment

A comprehensive investigation program was carried out from March to June 2001 to assess the stability of the main dam. A topographical survey was carried out, 7 exploration drillings done, penetration tests made, 9 new piezometers installed, 3 test pits excavated and a large number of soil laboratory analyses was done. Also 15 old piezometers were identified and included in the monitoring program.

Topographical Survey

A topographical survey of the main dam, the bottom outlet and the spillway section was carried out by using absolute elevations. A scale was drawn on the intake tower of the bottom outlet for recording of the water level in the reservoir. Also the piezometers and other special observations were included in the survey system. The dimensions of the main dam correspond with the design, the spot heights taken at the Amangeldi village dam show that it is insufficient high at several locations.

Piezometer Observations

Water levels in the piezometers were observed from 24th March to 12th May 2001, covering the flood period. The level in the reservoir increased rapidly, in the first days in average 56 cm/day and reached a maximum elevation of 453.4 m which is 3.2 m below the top water level. Most of the piezometers show a worryingly rapid increase of the pore water pressure.

The hydraulic gradients between the newly installed piezometers on the dam crest and the corresponding ones at the downstream dam toe reached mostly some 2% percent, in one case 4%. Some of the old piezometers showed even ten times higher gradients but the correct function of these old piezometers has to be questioned.

Piping Phenomenon

During a detailed inspection of the downstream dam toe, at least 2 locations were identified where seepage flows and piping phenomenon through the dam foundation were observed. At both locations the dam foundation must be classified as being in "critical condition" and not stable under the existing hydraulic gradient.

The discharge from the bottom outlet creates between the bottom outlet and chainage NK10 a very high water level in the downstream drainage channel and also a corresponding high pore water pressure in the dam. Because of this problem, a detailed inspection of this dam section regarding a piping phenomenon was not possible.

Penetration Tests
Penetration tests with heavy equipment were carried out to determine the density of the dam fill material, the clay core and the dam foundation. Surprisingly, at many places the dynamic resistance was adequate at the upper strata of the dam but became rather low in the lower sections, despite the fact that the pore water pressure did not influence the results essentially. Low densities were in particular observed at the location of the old Nura river bed and where the piping phenomenon was observed. There, only about 2 blow counts per 10 cm penetration were needed, whereas in good locations 40 to 50 blow counts per 10 cm were recorded.

Soil Laboratory Analyses
A large number of material samples were brought to Kazhydro Almaty for analysis.

The analysis of the *dam foundation material* shows a great range of grain size distribution. Material near the upper graduation curve is insufficient stable to material near the lower graduation curve, if no sand filter is located in between. The material contains a high percentage of sand and the silty sand explored in the dam foundation bears basically a liquefaction risk in case of high earthquake load. The maximum earthquake load in the Intumak region is reported to be low, but the liquefaction risk should be checked in more detail in the design stage. The silty clay or loam material explored near the old river bed demonstrates that not all fine material has been removed and excavated before placing the dam. Permeability tests resulted in a Kf value of 3 E –5 m/s.

The *dam shell and filter material* shows a narrow range of explored material. The permeability tests in the laboratory show approximately the same values like for the dam foundation material. The silty sand found in the dam shell is again possibly prone to the same liquefaction risk under a high earthquake load.

The grain size analysis of the *dam sealing material* shows again a wide range of explored material. At some locations it seems that the condition of the sealing blanket and must be classified as "very poor" or "poor". The permeability tests showed Kf-values ranging from 2 E-6 to 7.8 E-5m/s. Conclusively, the clay blanket and the clay core must be defined as permeable or semi-permeable compared to the normally required permeability coefficient of a zoned clay core or clay blanket dam for per annual impoundment.

Proposed Improvement and Rehabilitation Works
An improvement (rehabilitation) of the dam is absolutely necessary before the reservoir is filled up to the design water level (elevation 456.4 m asl) and also to increase the safety of the dam under current conditions. The most probable alternatives for rehabilitation of the dam are:

Alternatives 1 and 1a: steel "sheet piling" at upstream dam toe
This is the construction of a cutoff wall by steel sheets at the upstream dam toe, to reduce a higher underflow and seepage through the foundation. It will reduce the hydraulic gradient and the risk of piping phenomenon. The interface between the steel sheets, the clay blanket and the protection layer needs to be done very carefully. However, this solution requires to empty the reservoir for construction works and it does not decrease the permeability of the clay blanket. The depth of the wall depends on the actual foundation conditions and the water load.

Alternatives 2 and 2a: "slurry cutoff wall" at upstream dam toe
This alternative is similar to alternatives 1 and 1a, but uses a slurry cutoff wall instead of sheet piling which by preliminary cost estimates cheaper.

Alternatives 3 and 3a: "central slurry or concrete cutoff wall"
This means the construction of a slurry or concrete cutoff wall through the crest of the dam. The advantage is that this solution also compensates any imperfections of the clay blanket and improves the permeability of the dam. The construction works can be done without emptying the reservoir.

Alternative 4 and 4a: upstream slurry cutoff wall or steel sheet piling and concrete facing
This alternative combines alternatives 1 or 2 with the placing of concrete slabs on the upstream face of the dam (similar to Vecheslav dam). This alternative has the advantage that it compensates imperfections of the clay blanket but the disadvantage that the reservoir needs to be emptied for execution of works.

Recommendation
The cost comparison shows that obviously alternatives 1 and 2 are cheaper than the others. But, alternatives 1 and 2 are not recommended from the technical point of view, if the reservoir will be used for permanent storage.

Alternative 3 is clearly cheaper than alternative 4. So alternative 3 is recommended for implementation. The cost have been determined at 1.22 mio. USD.

4.2 Village Protection Dams

Amangeldi village protection dam
A 5.5 km long embankment dam has been designed and constructed for the protection of the villages Aktoebe and Shanalatap. The dam has a crest width of 4.0 m and a height of up to 5 m.

About 2/3 of the total length of the Amangeldi village dam has been inspected. Basically most of the dam shell is finished but the locally designed clay sealing and protection layers have not been constructed. It was reported that the dam was destroyed and repaired at two or tree locations during test filling of the reservoir. It was also observed that at several locations the dam crest was not sufficiently high for the proposed water level in the reservoir.

The dam needs to be repaired at certain sections, the crest level be raised where required and the dam be sealed with a clay blanket and protected with rip rap.

Volkovskoe Village Protection Dam
A 1.5 km long protection dam of earth for protection of the village Volkovskoe has been designed but not constructed. The dam is required and needs to be constructed.

The construction and repair of the Amangeldi and Volkovskoe protection dams is estimated to cost 1.07 mio. USD.

The Oil Pipeline Pavlodar - Shimkent
Also the oil pipeline from Pavlodar to Shimkent which crosses the reservoir area, and a valve station has been inspected. The relevant 3 km long section has not been protected by riprap.

Conflicting information is provided about sufficient protection against uplift. This needs to be crosschecked by a physical inspection. It may be necessary to relocate the valve station, if the reservoir is filled to the maximum water level.

Consequently a budget of 0.06 mio. USD has been earmarked for the protection of the oil pipeline and the possible replacement of the valve station.

5 Spillway

Description and Original Design

The spillway which has been excavated only, consists of an inlet canal, the spillway and an outlet canal. The inlet canal is 160 m long and will be a concrete structure based on rock.

The spillway itself is proposed to consist of 5 sections with a clear opening of 16 m and each section is to be equipped with 6.4 m high segment gates. The steel gates have actually been manufactured, supplied and stored at Karaganda. In the meantime they have been cut into pieces and are consequently of no further use.

The outlet canal has a length of 1.06 km and has been designed on the basis of a hydraulic model made at Kazgiprovodkhoz Almaty.

Assessment

The capacity of the spillway is originally designed for 3000 m^3/s, corresponding to a 1000 year flood. Generally this return period is also applied internationally for the design of spillways. But recently the trend goes towards increasing the safety which means a design for higher floods, like the 1 in 10.000 years, or even for the probable maximum flood (PMF). Generally, this it is a compromise between economical possibilities and maximum safety. Since the spillways of the two reservoirs upstream and the one downstream of Intumak are designed also for 1000 year flood, this criteria should be applied.

The freeboard of a dam is the difference in elevation between crest level of the dam minus the maximum water level. The latter is determined under consideration of ice set-up, wind set-up, wave up-rush and safety height. Per original design the freeboard is 1.8 m based on a wind velocity of 27 m/s. By international recommendations the wind velocity is 35 m/s, corresponding to a probability of 5%. This then leads to a required minimum freeboard of 2.0m.

International criteria also require the application of the "n-1-rule" for gated spillways (moveable gates). This means that the design flood (3000m^3/s) must be able to pass, even if one of the gates is closed (blocked). In this case the spillway would be only capable of discharging 2500 m^3/s, which is insufficient.

The horizontal section of the spillway canal directly behind the gates is sufficient wide and deep, but the plunge pool seems to be too short and critical flow will occur in this section. The downstream section of the spillway canal leading back to the original river bad is too small and needs to be redesigned on the basis of a hydraulic model.

Extent of the Reservoir

A contour map has been obtained from the reservoir area. However, the map does not reach up to the beginning of the reservoir and also mentions that hydrogeological investigations were only done up to the top water level (456.4 m asl.) but not up to the maximum water level (458.9 m asl.). The missing information would need to be obtained in the next project stage.

Proposed Rehabilitation

Generally two types of spillway are applicable, one with a fix weir or one with a gated weir. The fix weir solution has the advantage of being the safest solution, does practically not require maintenance nor power supply and no operation errors can happen. The disadvantages are that the water level can not be regulated and the required length of the weir crest is long.

The weir crest for the fixed weir would have to be 350 m long to be able to discharge the design flow on the basis of the defined maximum water level. The weir could also be combined with other safety devices like an erodable dam or fuse gates made of concrete which give way when the incoming flood exceeds the 3000 m^3/s.

In case a gated weir is constructed, it shall be designed to comply with the "n-1-rule" which means, the capacity has to be increased compared to the original design. Segment gates are preferably built in approx. square format, so 6 gates are proposed with a clear width of 13 m each and a height of about 8 m.

What type of spillway shall finally be selected, depends on the final purpose of the reservoir and needs to be decided in the final design stage.

As mentioned before, the spillway canal downstream the gates needs to be enlarged on the basis of a hydraulic model

The cost for construction of a gated spillway are estimated at 9.57 mio. USD. The cost for a fix weir solution are estimated to be 2 to 3 mio. USD less.

Theoretically the steel gates installed at the Samarskaya dam, downstream of Intumak which is not in use any more, could be dismantled, refurbished and installed at the Intumak dam. But this would have to be investigated carefully to see if any cost savings would be possible.

6 Bottom Outlet

Description and Original Design

The bottom outlet consists of the intake tower, then two galleries (tunnels) running through the dam and a valve chamber with an outlet building at the downstream end. 4 pipes of DN 1400 mm run through the galleries which start at the inlet gates and end at the outlet valves. The inlet tower has 4 individual rectangular chambers with slots in the side walls to accommodate stop logs, thrash rack and steel gates. No trash rack nor stop logs are installed, presumably also no steel gates. The galleries are currently filled with water closely up to the culvert level and are not accessible.

A pre-cast concrete frame structure forms the upper part of the inlet tower which is supposed to accommodate a crane mounted on a travelling bridge. The brickwork between the columns has not been done, the roof is damaged and with the exception of the travelling bridge no lifting devices are installed.

The discharge capacity of the bottom outlet has been determined to be 76 m^3/s at top water level in the reservoir. Currently only one valve is open and water discharges through this pipe.

Assessment

Capacity

Different criteria can be applied for the design of bottom outlets. These can be: the required lowering velocity of the water level in the reservoir, or the maximum capacity of the downstream section of the river bed, or the maximum rising velocity of the water level in the reservoir, or the required lowering of the water level in the emergency of a potential dam failure, or a certain flow through the bottom outlet, etc. The most relevant criteria for the Intumak dam is the need to lower the water level in the reservoir within a given time period in an emergency case.

The volume of the Intumak reservoir at the top edge of the gates is approx. 300 mio. m^3. The required

lowering of the water level of 75% within 10 to 20 days at full inflow during the spring flood period results in a required bottom outlet capacity of 190 to 330 m^3/s. This means that the capacity of the bottom outlet has to be increased substantially. That can only be achieved if the pipes are removed from the galleries and if the entire cross section of the galleries is used for the discharge of the water. Then the capacity is about 200 m^3/s.

Inspection of galleries and concrete quality
Attempts were made to pump out the water from the galleries to enter them for inspection. Since no suitable pump could be found, it was not possible. But a draw down of the water level of 94 cm could be achieved with a mobile pump and the recovery of the water level was recorded. In this way the seepage into the gallery could be determined to be about 2 l/s. This information is sufficient for the time being, since the galleries will need to be fit with a concrete relining anyway and so stop the leakage at no extra cost.

Also the concrete quality of the bottom outlet structure was tested at different spots. The results show a wide variation, ranging form 14 to 25 N/mm^2 and in average 20 N/mm^2. This confirms that the quality is not really good but the structure can be used for its purpose.

Proposed Improvement and Rehabilitation Works
The suggestion is to remove the pipes from the galleries and to use the galleries directly for discharge. For that purpose the surface of the galleries needs to be protected by a concrete relining. This will also stop any leaks.

A new little intake structure shall be placed just upstream to the existing intake tower to accommodate stop logs, trash racks and hydraulically operated steel gates.

The downstream end of the galleries should be designed such that they are permanently submerged and precautions made to avoid freezing of the water in the galleries in the winter period.

A cost estimate was carried out for the proposed works and resulted in 1.32 mio. USD.

7 Dam operation and hydropower potential

7.1 Dam operation

The main purpose of the dam is anticipated to be for flow balancing, to create a more less constant downstream flow for use of the water for the water supply of the national capital Astana.

A simple water balance calculation has been done, considering inflow, outflow, seepage and evaporation, to show the varying water levels and volumes in the reservoir over the year. It shows that the reservoir with a capacity of 250 mio. m^3 is able to retain the entire flood inflow for an average hydrological year and to produce a constant outflow of 8 m^3/s.

This is only a general indication and a more sophisticated storage simulation needs to be done on the basis of long series of daily hydrological data, if probabilities of dam filling and overflow for different hydrological years are needed. Furthermore, the underground filtration rate in the reservoir area is not known.

7.2 Hydropower potential

The existing dam has the potential for energy production through a small hydropower plant. The bottom outlet could be combined with such a plant. Based on the current assumptions of the dam use, the outflow would be constant at 8 m^3/s and the water level in the reservoir fluctuating from top water level

to minimum water level over the year.

This would require that one of the four pipes in the bottom outlet is used as a penstock, moved to the sidewall and be protected by concrete surrounding. One of the four inlets needs to be modified to serve as the inlet for the penstock. A cone wheel pulp turbine with a runner diameter of 1 m is suggested to be installed at the end of the penstock, located in a little power house to be constructed next to a gallery.

Based on above assumptions, the installed capacity could be 750 kW, producing in average 4.12 GWh/year (= mio. KWh/a). This would be more than sufficient energy to cover the self demand at the dam (gates, lighting, heating etc.) and the excess energy could be fed into the public grid which is 11 km away at Intumak village, or be used otherwise.

A first economic analysis was carried out, to show the feasibility of such investment. The payback period is 10 years and the internal rate of return (IRR) 7.9% on the basis of an energy sales price of 2 US-cents/KWh (= 3 Tenge/KWh). The installation is certainly attractive if the sales price is the typically internationally applied 4 US-cents/KWh. Then the system reaches an IRR of 19.1% and a payback period of 6 years.

8 Conclusions, Total Cost and recommendations

8.1 Conclusions

The main dam was found to be not in a condition to retain permanently water without being rehabilitated. Even the present status is critical in the flood period. The most feasible rehabilitation alternative is the construction of a slurry wall reaching from the dam crest sufficiently deep into the dam foundation.

The Amangeldi village protection dam needs to be completed and the Volkovskoe village protection dam constructed.

Two different types have been proposed for the construction of the spillway, the fix weir type and a weir with movable gates. The final selection can be made once the ultimate (multi) purpose of the dam has been defined. The gated weir type has been included in the cost estimate, as this is the more expensive solution (to be on the safe side).

The bottom outlet has insufficient capacity and needs to be modified. This can be done by removing the pipes from the galleries, relining the galleries and construction of a new inlet with four hydraulically operated gates.

8.2 Total Cost

The total cost for the proposed completion and rehabilitation works have been determined as follows:

Cost Estimate	[%]	[Mio. USD]
Spillway	72.2%	9.57
Bottom Outlet	10.0%	1.32
Main Dam Repair	9.2%	1.22
Repair of Protection Dams Amalgildi and Volkovskoje	8.1%	1.07
Pipe Line Crossing	0.5%	0.06
TOTAL	100.0%	13.24

8.3 Recommended further works

Final purpose of the reservoir

The final (multi) purpose of the reservoir has influence on the layout of the dam and spillway and needs to be defined.

Principally the reservoir could serve as:

- flow balancing reservoir (detention basin)
- flood retention reservoir (to cut flood waves only)
- hydro power station
- settling basin for pollutants and
- centre of a recreational area.

Recommended Investigations for the Reservoir

Having in mind the possible purpose of the reservoir, a detail assessment should be carried out about the impact the reservoir has regarding environmental aspects:

- how well does it function as a pollutant trap,
- the actual inflow of mercury and other pollutants into the reservoir in dissolved and particle form,
- the sedimentation efficiency in general,
- the outflow of pollutants through the bottom outlet and over the spillway,
- the amount of pollutants accumulated in the reservoir till today,
- the possibly required shut-off periods if the tail water is used for water supply
- a conclusive statement about the impact of the reservoir on pollution accumulation and pollution reduction and
- a quantification of the economic benefits of the completed dam with respect to pollution mitigation.

On the basis of above findings, the final purpose of the dam should be defined, storage simulations be carried out, the optimum size of the dam be defined, before moving to the detail design stage.

Regarding Embankment Dams

- The piezometers together with the reservoir level should be monitored also in future

- the downstream canal which creates a backflow to the dam toe should be diverted away from the dam and then the dam section between the bottom outlet and profile NK10 be inspected
- survey of the Amangeldi village dam in the design stage.

Regarding Spillway

- optimisation of the spillway considering the maximum accepted flood area (maximum water level), the required reservoir volume, the elevation of the main dam and safety aspects.
- Hydraulic model for proper design of the spillway.

Regarding Bottom Outlet

- An inspection of the galleries is advisable in the detail design stage.

Others

- The actual protection of the oil pipeline Pavlodar - Shimkent needs to be verified
- Verify if the 4 km long section of the road Temirtau - Kievka village would be flooded at maximum water level
- Optimise and design the pumping station to return seepage water from the Amangeldi village dam
- Verify actual status of expropriation and land acquisition for the proposed reservoir area.

MAP SECTION

KAZAKHSTAN

NURA RIVER CLEAN-UP PROJECT

ASTANA PROJECT CITIES
ROADS
RAILROADS
NATIONAL CAPITAL
REGION CAPITALS
SELECTED CITIES
REGION BOUNDARIES
INTERNATIONAL BOUNDARIES

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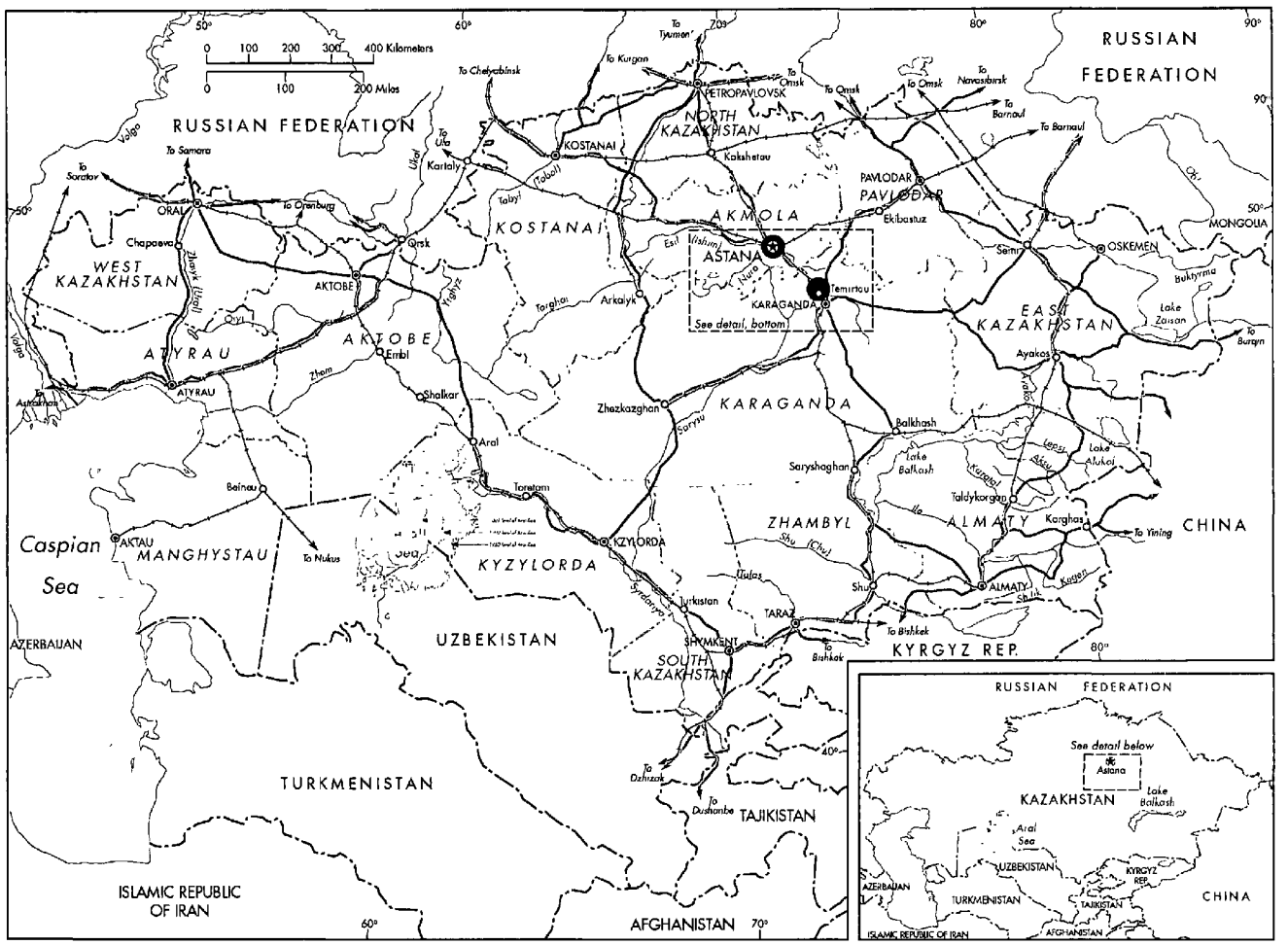

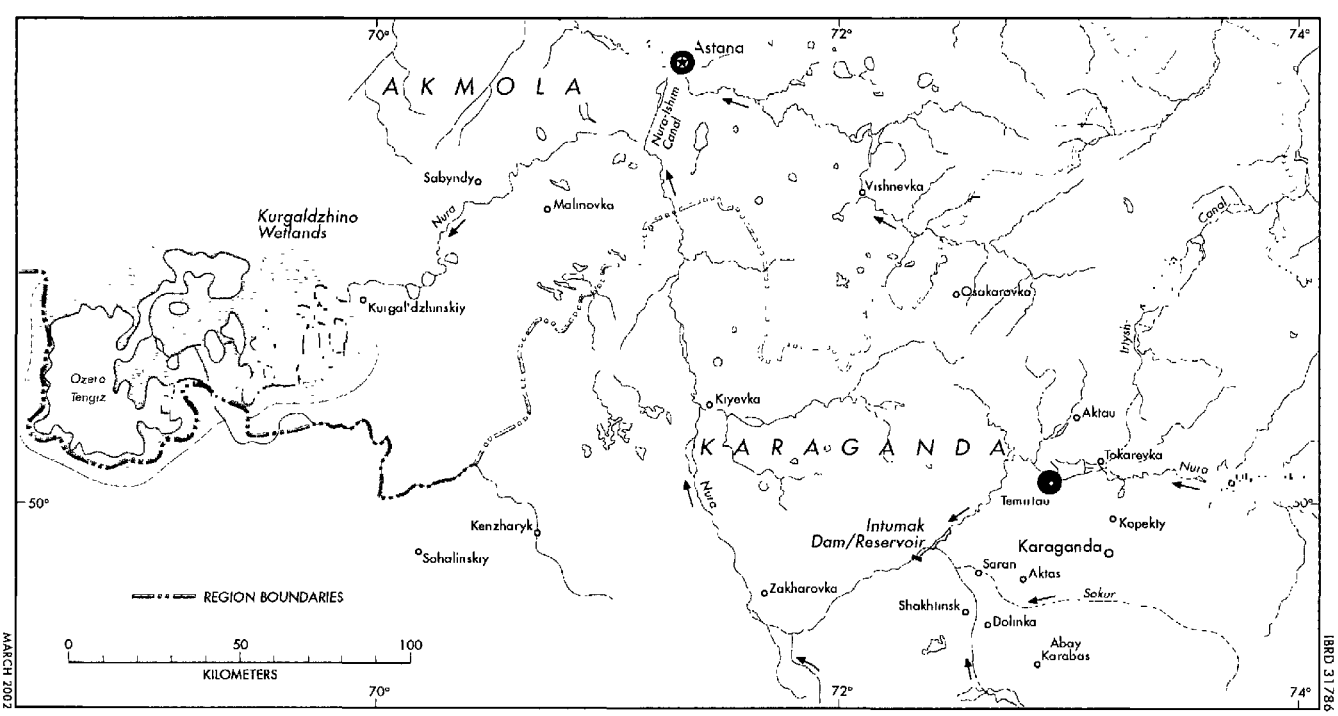

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