



**Ministry of Water and Irrigation  
/Water Authority of Jordan**

**Invitation for Expression of Interest for Pre-qualification**

*For*

*“Detailed Design, Tender Documents, and Supervision of Works”*

*For*

*Umm El Lulu- Jerash*

*And*

*Hofa-Ajlun*

*Transmission Pipelines*

**Co-financed by the German Financial Cooperation funds provided through  
the**

**Kreditanstalt für Wiederaufbau (KfW).**

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## **Project Background**

The Water Authority of Jordan (WAJ) awarded two contracts in 2004 and 2005 to carry out a feasibility study and conceptual design for the Northern Governorates Water Loss Reduction Programme (WLRP), and Water Transmission Mains Project. These two studies have been completed in 2005 and have identified all components required to achieve the objective of the project which could be summarized as follows:

### 1. Feasibility Study for Water Loss Reduction Programme (WLRP):

The study area is Jerash, Irbid, Ajloun and Mafrq Governorates, located in the northern part of Jordan and covers an area of in excess of 5,000 km<sup>2</sup>. The population has been estimated at over 1.5 million with the majority of inhabitants getting piped water through a network of approximately 5,500 km of mains. Parts of the Project Area are mountainous with substantial elevation differences ranging from 300m in the Jordan Valley to above 1100m in Ajloun and Jerash while some areas, for example, Mafrq is flat in the desert areas.

Due to the scarce water resources in Jordan, and in the project area in particular, reduction of physical losses is of vital importance for the Water Authority of Jordan (WAJ).

The introduction of discrete distribution zones, with reliable flow and pressure measurements and improved management of the water network, will allow Non Revenue Water to be quantified, qualified, prioritized and reduced.

### 2. Feasibility Study for the Water Transmission mains:

Work on the feasibility study by CDM consultant began in April 2004, and ended in 2007. The desired output from the Feasibility Study was a prioritized list of projects that are required through year 2030, consisting of municipal water supply facilities needed within the service area of the Northern Governorates Water Authority. These facilities will comprise water transmission mains and associated components distribution storage reservoirs, pump station, water treatment plants, groundwater wells, water resources facilities and a centralized monitoring and control system.

This feasibility study has been coordinated with three on-going programs. The GTZ-funded OMS program (Operations Management Support), which has assisted in the development of a GIS mapping and database system within the Northern Governorates Water Administration, the KFW – funded Water Loss Reduction Program (WLRP), which comprises measures to reduce water losses from networks, and the GTZ funded National Water Master Plan (NWMP) of the Water Master Planning Directorate within the Ministry of Water and Irrigation (MWI) .

For each Governorate in the project area also the required sub-system transmission pipes to insure that sufficient water is reached to all zones identified in the WLRP Project.

The total construction cost of these components is about 100 million JD.

The major project out of the study is the construction of the Zatory – Hoffa Transmission pipeline is already has been funded USAID and WAJ and construction is ongoing. The project includes (48km) of DI (Ø 500 & Ø 700), new pump stations at Zatory, the project cost is estimated at about (33) million dollar.

This pipeline has a capacity to convey about 33MCM/yr from Mafrq to Irbid and will convey additional 12MCM/yr. from the east well fields (Aqeb wells) to Hofa PS near Irbid. This water will be available to the Northern Governorates due to the completion of Zara-Ma'en Project which will reflect benefits to Amman and other Governorates in terms of additional water supply.

The population of Jerash and Ajloun in 2005 were about 300,000 people which will increase to about 500,000 in 2030. The water demand is respectively about 12MCM/yr. and 24 MCM/yr. The total available supply to both governorates is 8.5MCM/yr. which shows the large deficit adding to that the physical losses problem in the existing distribution networks and the lack of sufficient hydraulic capacity in the existing transmission pipes, it is very essential to support the existing system with new transmission mains to increase the supply since new allocation of water from the Aqeb wells in the east of about 12MCM/yr has been made available to increase the supply to Irbid, Jerash and Ajloun and help in solving the problem of demand deficit in the Northern regions of Jordan.

## **Alternative Transmission Systems**

The Feasibility Study for the Water Transmission Mains has identified the preferred future transmission system for the northern governorates by comparison of three different alternative systems. The basic rationale for each alternative has been as follows:

- Alternative 1: incorporates the best judgment of the investigators, and the results from detailed field investigations and cooperation with YWC senior staff. The general objective has been to minimize total pipe length and capital cost, and to achieve near-minimal power cost for pumping.
- Alternative 2: incorporates certain alternative pipeline routings for the flow, where it seemed possible that the number of pump stations might be reduced, or the total pumping costs might be reduced, but the most economical solution could only be determined by a detailed cost comparison.
- Alternative 3: incorporates the basic layout from previous studies, primarily those of SAFEGE and SOGREAH; the planning and design criteria have been updated to provide a consistent basis of comparison with Alternatives 1 and 2.

Of these alternatives, Alternative 1 was found to have the lowest capital cost, the lowest annual power cost for pumping, and the fewest number of pump stations (to minimize labor costs). As a result, Alternative 1 is the preferred alternative for development of the transmission system through the year 2035.

One major project out of the study Alternative 1 is the construction of the **Zatary – Hofa** Transmission pipeline of (48km) of DI (Ø 500 & Ø 700), new pump stations at Zatary of , estimated cost of (33) million dollar. This pipeline which has the capacity to convey 33 MCM/year from Mafrq to Irbid will convey 12MCM/year from the east well fields (Aqeb wells) to Hofa PS near Irbid. This water will be available to YWC service area due to the completion of Zara-Ma'en Project which will reflect benefits to Amman and other Governorates in terms of additional water supply.

The other Major required transmission mains out of the study Alternative 1 which serves to complete the above pipeline in order to increase the water supply to Jerash and Ajloun Governorates which suffers severe water shortages and has the lowest I /c/d in the region are:

- Um Lulu – Jerash water transmission pipeline
- Hofa \_ Ajloun water transmission pipeline.

## Project Objective

The objective of the project is to ensure a cost efficient and secure supply of drinking water in the governorates **Jarash** and **Ajloun** with the overall objective to contribute to an efficient and demand driven sustainable management of the existing water resources.

The Northern Governorates Water Transmission Feasibility Study had identified all major needed transmission mains as mentioned earlier.

In order to increase the water supply to Jerash and Ajloun Governorates which suffers severe water shortages, and having the works on the east transmission main **Zatary-Hofa** and new pumping stations at Zatary already started in 2009.

The other major identified transmission mains **to complete Zatary-Hofa pipeline** are needed as follows:

1. The construction of a new transmission pipeline from **Um Lulu to Jarash** and partly restructuring and rehabilitating the water reservoirs and the main distribution networks in Jarash that are directly linked to the transmission pipeline.
2. The construction of a new transmission pipeline from **Hofa to Ajloun**, and construction of Ishtafena reservoir which is directly linked and necessary for the transmission pipeline.
3. Rehabilitation / extension of Um Lulu, Hofa, and Samad pumping stations.

### Expected Estimated Transmission Pipeline Routes:

<b>1. Um Lulu Jerash System</b>			
<b>From</b>	<b>To</b>	<b>DN(mm)</b>	<b>Length (m)</b>
Um El- Lulu	Abo Ayyat Reservoir	500	12,000
Abo Ayyat	Jerash	400	22,000
<b>2. Hofa Ajloun System</b>			
<b>From</b>	<b>To</b>	<b>DN(mm)</b>	<b>Length (m)</b>
Hofa PS	Samad PS	800	9,400
Smad PS	Ishtafaina	400	18,031
Ishtafaina	Ajloun	300	3,465
Ajloun	Ajloun Reservoir	200	973

Note: These routes and diameters to be assessed studied and evaluated by the Consultant as one option of other alternatives for this study.

## **Project Strategy, Measures and Results**

The project implementation will be in two stages. Stage I comprises the Engineering Design whereas Stage II covers the Implementation and Site Supervision.

Stage I shall start with reviewing and assessing the feasibility study prepared by CDM international Development on February 2005 and the Conceptual Design Report prepared by the joint venture of MWH in association with MWH Arabtec Jardaneh and GKW Consultant on January, 2005. During the assessment of the conceptual design the overall scope of rehabilitation and restructuring measures and expected effects have to be reviewed and assessed as detailed as possible.

It is required that all feasibility study shortcomings and limitations are addressed and incorporated in the design. A close link with WAJ and YWC will ensure that WAJ experiences are considered in the planning and implementation of the project.

The achievement of the project objectives will be measured with the following indicators.

- Security of water supply
- Operation and Maintenance cost coverage
- Sustainable use of the Mafrqa wellfields

## **Duration of Services**

The total implementation period of the capital investment project is estimated to be 36 months. For the design stage 9 months. For pre-contract services (prequalification – to be realised already during the design stage, tendering, awarding and contract preparation) 3 months. Construction works are scheduled to take approximately 24 months.

## **Pre-Qualification Invitation and Terms:**

**Internationally Experienced Consulting Company** is defined for the purpose of this pre-qualification as: a consulting company that has delivered design and supervision services for water projects in at least two countries, with a minimum of three projects outside its home country, each of which is of minimum value of Euro 300,000.00). (*Jordanian consulting company listed as First Grade-A is also considered Internationally Experienced Consulting Company if it fulfils the above conditions*), **Or a Consortium of Consulting Companies** whose Consortium Leader has delivered the same.

For Non-Jordanian International Consulting Companies leading the joint venture or association, the technical input of the local company shall not exceed 70% of the expert months input. Efficient management and backstopping staff should be available to supervise the team at home and abroad.

1. WAJ /PMU hereby invites qualified Internationally Experienced Consulting Companies to submit their prequalification documents for consulting services required for the implementation of the project. Payment for the consulting services will be made through direct disbursement by KfW.
2. Interested consultants / consortia should inform WAJ/PMU by e-mail about the receipt of the invitation of expression of interest and whether or not they will submit a pre-qualification document

3. The pre-qualification proposal shall be submitted in one original and one copy to the following addresses. A pdf-document on a CD shall be included in each case:

To WAJ/PMU:

Eng. Raja Ammari  
Performance Management Unit (PMU)  
P.O.Box 2412  
Amman 11183  
Telefax: (962-6- 5627823)  
Raja\_Ammari@pmu.gov.jo

And one copy to

KfW,  
Dr. Stefan Gramel, L II c/2  
Palmengartenstraße 5-9,  
D-60325 Frankfurt am Main,  
Germany,

4. The deadline for submission of proposals is 18 August 2011 at 1:00 pm.

It is planned to establish a short-list of prequalified consultants and to invite the short-listed consultants to submit their technical and financial proposals. This short-list will comprise in maximum seven bidders. In case more than seven bidders pass the minimum level, the short list will comprise the seven best placed bidders.

5. The pre-qualification document in English language should have the following structure and content.

-Summary presentation of bidding Company (s) and – in case of a consortium - intended contractual arrangement, lead consultant (including letters of intent of participating firms).

- Proof of eligibility: that the firm (or in case of a consortium the consortium leader) has

- a. delivered design and supervision services for water projects in at least two countries, and
- b. executed minimum of three projects outside its home country, and
- c. minimum value of each project in B is Euro 300,000.00

-Statement of the consultant's financial strength (for each partner of an association):

- Table resuming the turn-overs and the income statements of the last 3 years;
- Balance sheets and income statements of the last 3 years;
- Bank reference including statement on total and still available credit line / guarantee limit.

-The consultant will give evidence of his experience gained in the last 10 years. The references will be presented separately for each partner of a consulting association. He will prepare meaningful lists of project references (a sample is given in Annex 1):

- 1.1 General Experience in water network and facilities (*Detail design and supervision*)
- 1.2 Specific Experience (Similar Projects). (*Detail design and supervision*)
- 1.3 Local and Regional Experience (MENA countries) in similar projects, (*Detail design*)

*and supervision)*

-Furthermore he will prove his suitability for the Project indicating his:

2.1 available technical know-how specific to the project, especially in the following fields:

- Detailed design and preparation of tender documents;
- Management and supervision of Water networks construction and rehabilitation, pumping stations;
- Electromechanics;
- Organizational and financial management of similar programs (only for leading company).

The Consultant shall provide a short text indicating his project-specific experience as well as (in case of an association) the envisaged task distribution. Furthermore, a list of projects indicating the Consultant's experience in the above fields shall be submitted (independent for each partner in case of a consulting association). Alternatively, the Consultant may present the required information in the lists presented under 1.1. In this case the information relevant to the above fields shall be highlighted.

2.2 Personnel in regard to the services expected (individually for each partner in case of an association)

- Firm's subject range and general staff situation (list of staff and their qualification similar to the list given in Annex 2);
- Qualification of permanent professional staff and long-term associates in the fields mentioned under 2.1. In this context he will present a brief curriculum (max. 1 page) for each professional. An example is given in Annex 3.

2.3 Brief curriculums (max. 1 page) of his permanent staff and long-term associates experienced in the monitoring and backstopping of project teams, especially in the scope of KfW funded projects

- General backstopper;
- Deputy General backstopper;
- Backstopping in the specific fields mentioned under 2.1.

Note: If the general backstopper or his deputy is able to cover 1 or more of the specific fields, no separate backstopping staff needs to be indicated for these fields. However this shall be clearly indicated. The general backstopper as well as his deputy will have to belong to the leading company.

6. Interested consultants are requested to submit concise, clear and meaningful documents, which can easily be scrutinised, and to adhere to the above structure. Non-compliance or faulty information can be a reason for disqualification.
7. The evaluation procedure for the pre-qualification process will be done in accordance with the „Guidelines for Assignment of Consultants in Financial Co-operation Projects“. These Guidelines can be obtained under the KfW homepage ([www.kfw.de](http://www.kfw.de)).
8. The total available budget for the project “Engineering and Construction” is about 23 Million Euros.
9. Eligibility Check:



Only those Proposals meeting below eligibility criteria (4 Yes) will be evaluated.

The Bidder (if the Bidder is a consortium: the Consortium Leader) must show that

- a. It has delivered design and supervision services for water projects in at least two countries (Yes/No)
- b. It has executed a minimum of three projects outside its home country, (Yes/No)
- c. The minimum value of each project in (b) is Euro 300,000.00 (Yes/No)
- d. The commulative turn-over of the leading firm in the last 3 years shall not be less than € 5.0 million .(Yes/No)

Note: For each reference, Bidders have to deliver reference descriptions, technical data and contact details of the Client. The success of the projects must be documented by a positive reference letter from the Client, on request.

10. The specific evaluation criteria for the bidder determined for this pre-qualification are presented in the table below.

<b>Criteria</b>	<b>Max. Score</b>
<b>1. Experience</b>	<b>40</b>
1.1 General Experience as a water network and facilities ( <i>detail design and supervision</i> )	10
1.2 Specific Experience (Simillar Projects). ( <i>detail design and supervision</i> )	25
1.3 <u>Local and Regional</u> Experience ( MENA countries) in similar projects, ( <i>detail design and supervision</i> )	5
<b>2. Specific project-related qualification ( as per provided references)</b>	<b>60</b>
2.1 Assessment of available <u>technical knowledge</u> specific to the project: especially in the following fields:	<u>20</u>
- Feasibility Studies	4
- Detailed <u>design and Preparation of tender documents and supervision for the new and rehabilitation of:</u>	<u>12</u>
o Water pipeline construction and rehabilitation	6
o <u>Electromechanical works ( pumping stations)</u>	6
- <u>Organizational and financial management</u> of similar projects (only leading company).	4
2.2 <u>General Assessment of the personnel</u> in regard to the services expected including the relevant qualification and experience of the key personnel in permanent employment (or long-term associates) ( <i>international or local</i> )	15
2.3 Assessment of the key personnel in permanent employment to	10

Criteria	Max. Score
<u>monitor the project</u> team and to provide <u>back-up services</u> from the home office	
2.4 (Clarity and Completeness) <u>Form</u> of the application documents: are they clear, concise, complete, meaningful, related to the project and prepared with care.	5
2.5 Financial capabilities	10
<b>Total</b>	<b>100</b>

11. After having completed the evaluation of the pre-qualification documents, a short-list of consultants, which achieve 70 points or more, will be established. The list is, however, limited to the seven best placed consultants. Short-listed bidders will be invited to submit a technical and financial proposal. Consultants, who will not be prequalified, will be informed accordingly. WAJ/PMU is not bound to select any consultant.
12. Consultants (or any of their affiliates, subsidiaries, or their holding companies) shall not be hired for any assignment which, by its nature, may be in conflict with another assignment of the consultants. WAJ and KfW require the consultants to be neutral and independent of potential suppliers to the project. Members of an association of firms may take part in the present project either as consultants or as manufacturers/suppliers/construction firms. The consultants shall reveal any links with other firms and give a binding declaration that should they be awarded the contract the firms with which they are associated will not intend to take part in the project in any other form.
13. Consultants are free to associate themselves with other firms to ensure that all required know-how and experience is available to them. The pre-qualification documents need to clearly state the envisaged contractual arrangements and the envisaged task distribution. Declarations of cooperation from the different partners have to be provided.
14. It is KfW's policy to require that the consultants observe the highest standard of ethics during the selection and execution of the contract. Consultants should be aware that any fraudulent or corrupt activities disqualify them immediately from this Project, and will be subject to further legal investigation. They acknowledge this by signing the attached declaration (Annex 4). In case of an association this declaration has to be signed by each of the companies.
15. All cost towards a site visit, obtaining information/data and preparation/submission of the pre-qualification document, meetings, negotiations, etc. in relation with the pre-qualification or the subsequent proposal shall be borne by the consultants themselves.
16. At any time, WAJ/PMU either at its own initiative or in response to clarifications requested by an interested bidder received no later than ( 31/July/2011) may modify the request for pre-qualification. Such amendment(s) shall be sent in writing by facsimile or e-mail to all parties, which have informed WAJ about their participation. Consultants shall promptly acknowledge to WAJ/PMU receipt thereof in writing.
17. Consultants shall treat this request for qualification and its contents as confidential. Although details presented in this request have been compiled with all reasonable care, it is the consultants'

responsibility to satisfy them that the information is adequate and that there are no conflicts between various statements.

18. The preparation and the submission of the pre-qualification document is the responsibility the bidder and no relief or consideration can be given for errors and omissions.
19. After opening the documents and till short-listing of the qualified consultants, no correspondence of any type shall be entertained unless called for by WAJ.

Water Authority of Jordan

**Annex 1: Sample of project list**

Project name	Project description	Country	Project duration	Client	Financing institute	Consulting fees (Euro) (*)

Note:

(\*) In case of a consulting association only the applicant’s part shall be indicated. Alternatively to the consulting fees the total expert-input can be indicated distinguishing clearly between expatriate and local staff.

The Consultant is not bound to the above format and may use his standard project list. However, the information provided should at least include the items specified above.

**Annex 2: Sample of company's permanent staff list**

Name	Year of birth	Professional experience (years)	Employment with company (years)	Function within company (years)	Specialisation	Languages

**Note:**

Only the Bidder's key staff and permanent professional staff as well as long-term associates shall be included in the list.

The Consultant is not bound to the above format and may use his standard staff lists. However, the information provided should at least include the items specified above.

### ANNEX 3: SAMPLE CURRICULUM VITAE

#### PERSONAL INFORMATION

Name [ SURNAME, other name(s) ]

Nationality

Date of birth [ Day, month, year ]

#### EDUCATION AND TRAINING

- Dates (from – to) [Add separate entries for each relevant course you have completed, starting with the most recent. ]
- Name and type of organization providing education and training
- Principal subjects/occupational skills covered
- Title of qualification awarded

#### WORK EXPERIENCE

- Dates (from -to) [ Add separate entries for each relevant post occupied, starting with the most recent., add brief description of most important projects ]
- Name and address of employer
- Type of business or sector
- Occupation or position held
- Main activities and responsibilities

#### LANGUAGE SKILLS

MOTHER TONGUE

[ Specify mother tongue ]

OTHER LANGUAGES

[ Specify language ]

• Reading skills

[Indicate level: excellent, good, basic. ]

• Writing skills

[Indicate level: excellent, good, basic. ]

• Verbal skills

[Indicate level: excellent, good, basic. ]

**Annex 4: Declaration**

The parties to the awarding procedure emphasize the importance of a free, fair and competitive awarding procedure that precludes abuse. In this respect this company thus far has not offered or granted any inadmissible advantages either directly or indirectly to public servants or other persons in connection with its bid, nor shall it offer or grant any such incentives or rewards in the present awarding procedure or, in the case of an award, during the subsequent execution of the Agreement, (*Company's name* shall inform its employees of their respective duties and their commitment to observe this self-imposed obligation and to abide by the laws of the Federal Republic of Germany and the Republic of Burkina Faso.

(Place) ....., this ..... day of .....

Name of company .....

Signature(s)

Note: This declaration has to be signed by each partner of an association

## **Annex 5: Information Memorandum**

### **Project Area, population, Subscribers, and NRW**

This project focuses on two governorates of Jordan Ajlun, and Jerash which are served by Yarmouk Water Company (YWC), the corporatised Northern Governorates Water Administration.

YWC covers 4 of the 12 governorates of Jordan – Irbid, Ajlun, Jerash and Mafrq. YWC area is bordered to the north by Syria and the Yarmouk River, to the west by the Jordan River, to the south by the Amman- Zarqa metropolitan area, and to the east by Iraq.

The northern governorates contained about 1.59 million people in 2009, or about 26% of the national population on 32% of the national land area. The major city is Irbid with a population of 1.08 Million, placing it as the third largest city in Jordan after Amman and Zarqa. In contrast to Irbid, the Mafrq governorate covers a large sparsely-populated desert area, in which the eastern portion contains only isolated settlements that receive water supply from local YWC wells.

In 2009 the four northern governorates contained about 233,660 YWC subscribers. Water is rationed, with most customers receiving water only one or two days each week. Estimating the net water production delivered to the 4 governorates requires a complex set of calculations to account for the import and export of water to/from the YWC transmission mains, and to/from the areas outside the YWC service area (principally to Zarqa and Amman). The net supply of about 67.5 MCM corresponds to 134lcd. The non revenue water (NRW) 40% is high given the scarcity of water in Jordan, but half of the YWC water losses are concentrated in Mafrq governorate (67% NRW), where the losses are attributable to the relative aridity, lawlessness, and social problems encountered in the eastern portion of Mafrq. In Jerash, Ajloun and Irbid the NRW is much lower, at 35%, 35% and 30% respectively. In Jordan as a whole, the NRW is about 43%, composed of physical losses and administrative losses. Several programs are underway countrywide (including the YWC system) to reduce the physical losses by rehabilitation and restructuring of the distribution networks.

### **Existing YWC Water System**

YWC faces the daily challenge of operating a large number of local distribution networks that have been built to a low standard, and have inadequate hydraulic capacity to deliver good water service while the existing transmission system is fairly new and in good condition, the local distribution networks were developed under severe time and money constraints. The GIS database provides several indicators of the extent of the deficiencies. of the 6300 km of pipe in the YWC system, almost half of the pipes are 50 mm (2-inch) diameter or less; only 10% of the pipes are 200 mm (8-inch) or larger. As an indication of the contrast with other countries, many USA cities have a minimum pipe size of 200 mm, although this is primarily to provide fire protection rather than normal water service. Almost 80% of the pipe materials in the system are susceptible to rapid corrosion and deterioration, particularly the small galvanized iron pipes and the larger steel pipes. The French-funded studies found that more than half of the pipes are above-ground pipes, exposed to damage from traffic or to tampering.

YWC has installed an extensive system of bulk water meters to measure the flows produced from wells and springs, and the transfers of water between portions of the



system. The results have been used in this study to develop a verified hydraulic model of the existing transmission system, which serves the most heavily-urbanized portions of the service area. In addition, under this study, the rehabilitation requirements for improvements at well-heads and pump stations have been identified, and two reports completed: one dealing with electrical and instrumentation requirements; and a second dealing with mechanical requirements.

YWC service area is divided into ten ROUs (Regional Operations Units), the system contains 204 water sources, measured at 148 locations (individual wells, well fields, or springs). During 2009, total water production of 70.7 MCM was obtained from 93 locations, by ROU and by portion of the transmission system (East and West). A portion of the production was exported to Amman and Zarqa, and 67.5 MCM is delivered to the northern Governorates (this value excludes losses in the East and West transmission systems). Major well fields are those include the Tabaqat Fahel and Wadi Al Arab well fields in the west transmission system, and the Aqeb and Zatory well fields in the East transmission system.

### **Existing and Potential Water Supply Sources**

An extensive review has been carried out of the aquifer systems and major groundwater basins in northern Jordan and the water uses both for public water supply and private water use (primarily for irrigation). As in many previous studies, it is concluded that groundwater levels are dropping in all the major aquifers and basins, and that groundwater abstractions exceed the safe yield from groundwater recharge.

Reducing the groundwater abstractions to a sustainable level, while meeting the forecast of YWC water demand, will require several measures: re-allocation to YWC of water exports from the Aqeb and Zatory well fields, presently exported to the Amman-Zarqa water systems; reduction of irrigation water demands by several means (water pricing, reduced allocations, efficiency improvements, wastewater reuse, buy-out of wells, transfer of irrigation use from the highlands to the Jordan Valley, control over illegal wells); and possible development of several springs in the Jordan Valley, subject to constraints or mixing with other sources to reduce salinity to useable levels. Water quality has been examined, and it is concluded that all the existing and potential water sources (except the high-salinity springs) can be treated relatively easily to achieve the Jordan drinking water standards.

The key issue, resolved in collaboration with the NWMP (National Water Master Plan), is the allocation of water sources to the northern governorates over the planning horizon extending to year 2030. The phased expansion of the YWC system to year 2030 adopted 9 existing and potential sources of water that include:

1. The YWC net production in 2009 of 70.7 MCM. It is assumed that the production from the existing wells will remain constant, and that some of the wells that were not operated in 2009 could be operated to meet seasonal peak demands, including the maximum daily demand, which is targeted at 120% of the average demand.
2. The small amount of water imported from Balqa and Zarqa governorates in 2009, amounting to 0.179 MCM.
3. An allowance of 500 m<sup>3</sup>/hour to YWC from the King Abdullah Canal. After treatment, the water can be carried to Irbid by the existing Wadi Al-Arab system, without any expansion required in pumping or pipe capacity.
4. Re-allocation to YWC of the water exported to Amman and Zarqa water supply from the Aqeb-Zatory well fields in 2009, amounting to 2.116 MCM.
5. The Yarmouk River allocation of 30 MCM to YWC under the NWMP, to come from the Al Wehdeh Dam, currently under construction.
6. The Corridor wells currently supply about 10 MCM to the Amman-Zarqa water system, and have required a significant investment in large long pipelines. The MWI has indicated recently that the Corridor wells would be made available to

YWC late in the planning period, when Amman and Zarqa have water available from the Disi project.

7. Local wells serving small local systems. Under the WLRP, a number of local water systems have been identified that serve villages and rural areas, which cannot be supplied conveniently or economically from the transmission system. These local systems are (and will continue to be) supplied by local groundwater wells. Additional wells, or wells of increased capacity, will be required to meet the localized growth in water demand, which is estimated at 5 MCM in 2025 by the WLRP. The timing for expansion in local well capacity will be spread over the planning period, from 2005 to 2030, depending upon local circumstances.
8. Several springs are investigated as potential new sources of water for YWC. Two of the springs have relatively low salinity, and could be blended with the remaining sources of water for the West transmission system, to increase the supply by about 2 MCM For Jarash
9. Two of the springs have relatively large flows, but are too salty for direct potable use expensive desalination of brackish water will be required, to obtain an estimated additional supply of about 2 MCM.